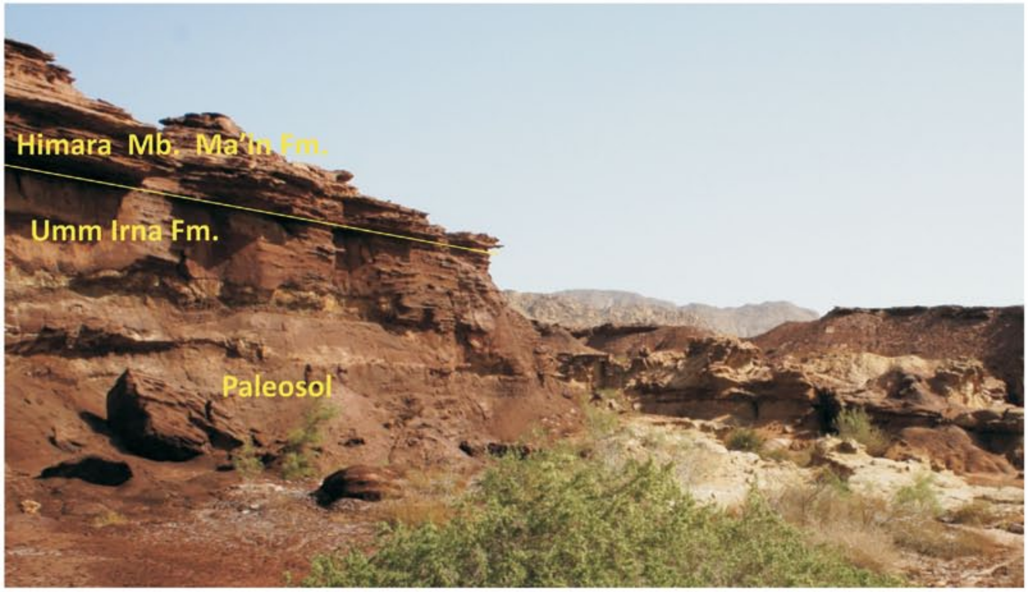
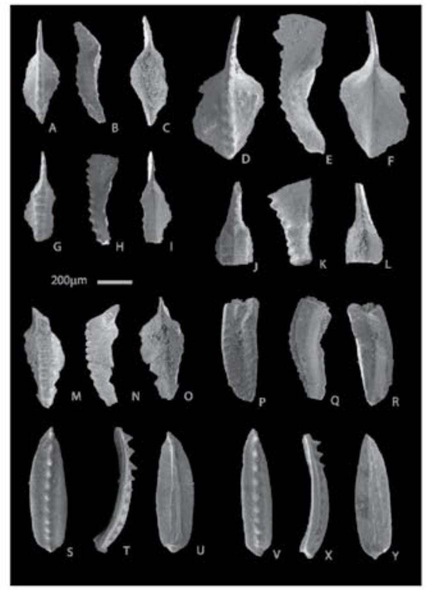
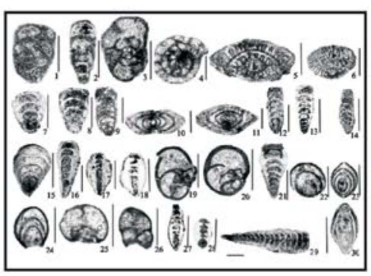
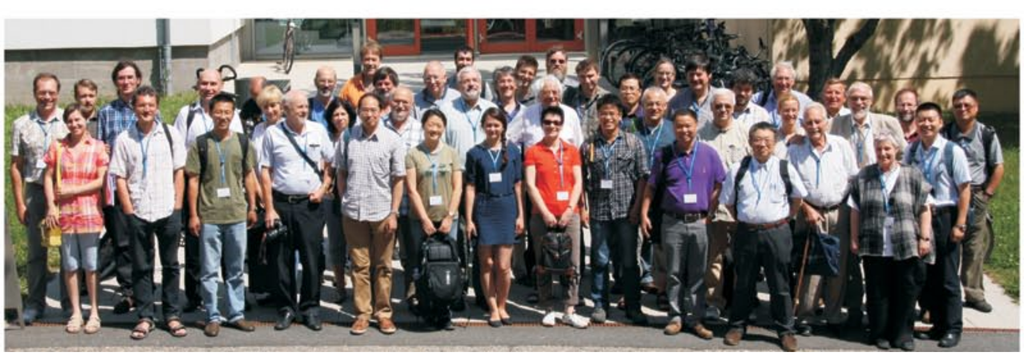
Permophiles

International Commission on Stratigraphy
International Union of Geological Sciences









Newsletter of the
Subcommission on
Permian Stratigraphy
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EXECUTIVE NOTES

Notes from the SPS Secretary

Lucia Angiolini

Introduction and thanks

The preparation of Permophiles 60 started in Paris in December 8-9, 2014, when Shuzhong Shen and I had the opportunity to participate in the DARIUS Programme Final Symposium, a very interesting conference on the geology of the Middle East and Central Asia, with sessions on the Cimmerian Blocks, Central Asia, Zagros, Eastern Black Sea-Caucasus and Anatolia. Worthy of note for Permian researches were the presentations of Shen on a high-resolution Permian timescale, Angiolini et al. on the Permian succession of SE Pamir, Balini et al. on the Permian succession of Bagh-e-Vang in Central Iran, and Zanchi et al. and Berra et al. on the Permian of Jandaq and Anarak, Central Iran.

It was a pleasure for me to host Shuzhong Shen in Milano after the Paris meeting, where we had the opportunity to continue our discussion on the Permian timescale and on Permian brachiopods, of course!

In this foreword, I would like to thank Valery Chernykh and Charles Henderson for their correspondence about the conodont-based primary signals for the base-Sakmarian and base-Artinskian GSSPs, which keep the discussion very active and promote good science.

I was very happy to have received many contributions from our Permian colleagues, that make this issue rich and interesting. So I want to thank Irene Vuolo and co-authors, Keyvan Zandkarimi and co-authors, Daniel Vachard, Mike Stephenson and co-authors, Aymon Baud and coauthors, Joerg Schneider and coauthors, and Stephen Kershaw for their interesting contributions to this issue.

Also, I would like to thank Claudio Garbelli for his assistance in editing this and previous issue of Permophiles.

Finally, I would like to keep drawing your attention to the new SPS webpage that Shuzhong Shen has provided at http://www.stratigraphy.org/permian/, where you can find information about Permophiles, what's going on in the Permian Subcommission, an updated version of the list with addresses of the SPS corresponding members and, very important, the updated Permian timescale.

Previous and forthcoming SPS Meetings

The last business meeting was held during the Field Meeting on Carboniferous and Permian Nonmarine – Marine Correlation, 21 – 27 July 2014, in Freiberg, Germany, about which Schneider et al reported in this issue (p. 31).

A forthcoming SPS meeting is scheduled during the XVIII International Congress on the Carboniferous and Permian (ICCP 2015) to be held at the Kazan Federal University, City of Kazan, Russia, August 11 – August 15, 2015. All voting members are warmly invited to participate in a pre-congress field excursion organized by the Permian Subcommission on Stratigraphy to investigate the three candidate Cisuralian GSSPs in the southern Urals (this issue p. 39).

The first circular of the meeting is available at the end of this Permophiles issues, along with that of Strati 2015.

Permophiles 60

This issue starts with two very important letters commenting on the conodont-based primary signals for the GSSPs for the base-Sakmarian and the base-Artinskian GSSPs, sent by Valery Chernyk and Charles Henderson. Valery Chernyk replies to the comments of Charles Henderson published in Permophiles 59 at p. 13-17, strengthening the potential of the Usolka and Dal'ny Tulkas sections. Valery may accept the choice of *M. uralensis* as the species index of the lower boundary of the Sakmarian mainly because the levels of the first appearance of *M. uralensis* and *Sw. merrilli* are very close in the Ural sections, but he disagrees on the necessity to establish a new species for the forms assigned to *Sw. whitei* from the Urals. Valery underlines the fact wider diagnoses are needed to include widely geographically separated forms which cannot be identical. Also, Valery does not agree with the occurrence of *Sw. whitei* in the Asselian of the Midcontinent. On the other hand, Charles Henderson replies to Valery Chernyk's letter explaining that there are essentially two *Sweetognathus* lineages, one dominated by *Streptognathodus* with only relatively rare specimens of *Sweetognathus* and a second, occurring above, that is dominated by *Sweetognathus* with only a few specimens of *Streptognathodus*. Charles underlines there are two *Sweetognathus whitei* species – near homeomorphs, but distinguishable; as a result he suggests to describe the new species, about 7 Myrs younger than the *Sw. whitei* from Florence, which will define the GSSP for the base-Artinskian in the Urals.

The following report by Vuolo et al. supports the two lineages-model of Charles Henderson, as it shows the occurrence of *Sw. whitei* along with *Mesogondolella monstra*, *Streptognathodus* sp., *Sweetognathus bucaramangus*, *Sw.* cf. *merrilli*, and *Sw.* cf. *behnkeni* in the early Sakmarian of SE Pamir.

Keyvan Zandkarimi and co-authors describe the foraminifers occurring in the Permian succession of Valiabad, N Iran. They confirm the Sakmarian age of the Dorud Group, the Guadalupian age of the Ruteh Formation and associated basalts and the Wuchiapingian-Changhsingian age of the Nesen Formation.

Daniel Vachard provides a contribution on the foraminifer genus *Colaniella*, commenting on its life habit, distribution and on the stratigraphic range and evolution of its species. The author shows that the distribution of *C. parva* should be restricted to the late Changhsingian, making this taxon a useful marker from Greece to South China and Japan, through Caucasus, Afghanistan, Pamir and the Himalaya.

Mike Stephenson and co-authors describe a Permian-Triassic boundary section from the Dead Sea in Jordan. The authors have recently discovered thin carbonate beds (Nimra Member, Ma'in Formation) occurring above marginal marine siliciclastics (Himara Member, Ma'in Formation) and containing conodonts and foraminifers of late Induan to early Olenekian age.

Aymon Baud and co-authors report on the first IGCP 630 field workshop, held on November 17-22, 2014, in Kashmir, India. This program is aimed to investigate the recovery of ecosystems following the end-Permian mass extinction. The authors analyze all the Permian succession of Kashmir, from the Lower Permian Panjal Trap to the Upper Permian Zewan Formation and the overlying Khunamuh Formation, with the Permian-Triassic transition recorded in its Member E1.

Joerg Schneider and co-authors describe the activities of the Nonmarine-Marine Correlation Working Group for 2014, which resulted in the organization of a Field Meeting on Carboniferous and Permian Nonmarine-Marine Correlation, held at the Technical University Bergakademie Freiberg in Germany from July 21 to July 27, 2014. The participants benefitted two days of scientific presentations, followed by visit to the most important Carboniferous and Permian outcrops in eastern Germany and the Czech Republic. The report of Joerg Schneider and co-authors include a

a correlation chart which should stimulate the Permian community to provide data to improve the suggested correlation.

The abstract of Stephen Kershaw presents a model – derived from the modern Black Sea - which supposes that upwelling and advective circulation could draw suspended pyrite framboids onto the shelf to be deposited in oxygenated sediments. This has very important implication for potentially misleading interpretations of low oxygen conditions at the Permian–Triassic transition.

Finally, two obituaries, respectively by I.A. Ignatiev and Yu.V. Mosseichik and by Alfredo Arche, remember the two Permian women scientists Marina Durante and Carmina Virgili, who sadly passed away in the autumn of 2014.

Future issues of Permophiles

The next issue of Permophiles will be the 61th issue.

Contributions from Permian workers are very important to move Permian studies forward and to improve correlation and the resolution of the Permian Timescale, so I kindly invite our colleagues in the Permian community to contribute papers, reports, comments and communications.

The deadline for submission to Issue 61 is a 15th April, 2015. Manuscripts and figures can be submitted via email address (lucia.angiolini@unimi.it) as attachments.

To format the manuscripts, please follow the TEMPLATE that you can find on the new SPS webpage at http://permian.stratigraphy.org/ under Publications.

We welcome your contributions and advices to improve the webpage as we move forward.

Notes from the SPS Chair

Shuzhong Shen

I would thank Lucia Angiolini and her family for their hospitality when I was in Milano. We discussed how to edit this issue of Permophiles in Milano and Lucia did most of the work in editing this issue.

First of all, I would call all SPS voting members to participate in a field excursion to investigate the three Cisuralian GSSP candidates in southern Urals, which will be held between August 6 and 9, 2015. This field excursion will be held just before the 18th ICCP meeting, so all participants can continue to attend the ICCP meeting after the excursion. SPS will apply for some financial support from ICS to cover at least a part of the field excursion for all voting members. To establish the remaining three GSSPs in the Permian is the priority for SPS's recent future work. After this field excursion - which will be very helpful to make a decision on the GSSPs (see detail in this issue for the itinerary of the field excursion) - and some updates of the proposals, I hope we will finally be able to judge the quality of the three candidates.

I would also thank SPS vice-chair Jörg Schneider, who organized an excellent Carboniferous-Permian transitional meeting in Freiberg, Germany between 21-27 July, 2014. A SPS business meeting was held during his meeting. The chair and vice-chair of the Carboniferous Subcommission, Barry Richards and Xiangdong Wang attended the meeting. They both made a great progress on how to organize the joint working group on Carboniferous and Permian transition. It was a pity for me to miss this meeting because I had to give an oral defense for a NSFC project. A detailed report of the working group is given by Jörg Schneider et al. in this issue too.

There are a few important reports in this issue. In particular, I would mention that Valery Chernyk and Charles Henderson provided more extensive comments and discussions on the index species of the Artinskian-base GSSP. Irene Vuolo et al. reported an important discovery that *Sweetognathus* merrilli and *Sweetognathus* whitei are in association with *Streptognathodus* sp., Mesogondolella monstra from a single sample in SE Pamir. As we have already known, *Streptognathodus* became extinct in middle Sakmarian based on available records globally. Therefore, it is a problem if we choose *Sweetognathus* whitei as the index species for the Artinskian-base GSSP because it also occurs in the middle Sakmarian of SE Pamir. If the *Sweetognathus* species at the Dal'ny Tulkas section in Southern Urals is different from that found in Pamir, then the southern Urals species needs to be described and the stratigraphic relationship between those *Sweetognathus* species needs to be clarified in the proposal. In addition, Daniel Vachard provides an interesting review on the temporal and spatial distributions of the foraminifer genus Colaniella, which is latest Permian (Changhsingian) in age.

I thank all contributors for this issue and I would like to remind that we look forward to your opinions on the remaining GSSPs.

SUBCOMMISSION ON PERMIAN STRATIGRAPHY

ANNUAL REPORT 2014

1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

International Subcommission on Permian Stratigraphy (SPS)

Submitted by:

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1.OVERALL OBJECTIVES, AND FIT WITHIN IUGS SCIENCE POLICY

Subcommission Objectives: The Subcommission's primary objective is to define the series and stages of the Permian, by means of internationally agreed GSSP's, and to provide the international forum for scientific discussion and interchange on all aspects of the Permian, but specifically on refined regional correlations.

Fit within IUGS Science Policy: The objectives of the Subcommission involve two main aspects of IUGS policy: 1. The development of an internationally agreed chronostratigraphic scale with units defined by GSSP's where appropriate and related to a hierarchy of units to maximize relative time resolution within the Permian System; and 2. Establishment of framework and systems to encourage international collaboration in understanding the evolution of the Earth during the Permian Period.

3a. CHIEF ACCOMPLISHMENTS AND PRODUCTS IN 2013

The proposals of the Sakmarian-base and Artinskian-base GSSPs have been published in Permophiles 58. After the proposals were published, we received a couple of comments and discussions on the conodont taxonomy for the index species and quality of the sections from the working group members, which have also been published in the subsequent Permophiles 59. Since discrepancies on the taxonomy of conodonts and selection of the conodont index species for the definition of the two GSSPs are present in the working group, voting for the proposals in SPS has been postponed.

In addition, we organized an international group to do a joint field excursion on the Guadalupian Series in West Texas in May, 2013. During this field excursion more than 1000 kg samples were collected for conodont and high-resolution geochemical analyses. Three GSSP markers were placed at the GSSP sections. We have processed all conodont samples and tried to get the lineage for the three GSSPs.

3b List of major publications of subcommission work (books, special volumes, key scientific paper)

Two issues of Permophiles (Issues 58 and 59) have been published since November, 2013.

Two proposals for the Sakmarian-base and Artinskian-base GSSP have been published in Permophiles 58. They will be used for voting in SPS after the WG has updated the proposals following the suggestions and comments from the WG members and SPS voting members.

An updated Permian timescale has been published in the proceeding volume of STRATI 2013 by Shen and Henderson (2014).

A paper to call restudy of the base of the Permian (Lucas, 2013) and a reply (Davydov, 2013) were published in Permophiles 58.

3c. Problems encountered, if appropriate

We have encountered problems that discrepancies in conodont taxonomy and selection of the index species of the two proposals for Sakmarian-base and Artinskian-base GSSPs are present.

We also met a problem for the Lopingian-base GSSP which will be flooded after a dam established in 5 years for electronic power in the downstream of the Hongshui River in Guangxi, South China. We have extensively discussed with the local government and a detailed plan for searching the replacement of the GSSP section nearby the GSSP has been made**.**

4a. OBJECTIVES AND WORK PLAN FOR NEXT YEAR (2014)

The primary objectives are to complete the last three GSSPs (Sakmarian, Artinskian, and Kungurian stages).

4b. Specific GSSP Focus for 2014

The priority of 2014 for GSSP is to decide which index species we should use for the definitions of the Sakmarian-base and Artinskian-base GSSPs and the index species should be formally described and published before a voting can go ahead.

5. SUMMARY OF EXPENDITURES IN 2013

As planed in the Annual Report 2013, SPS secretary Lucia Angiolini and former SPS chair Charles Henderson visited Nanjing in March, 2014 for Permophiles and discussion of the plan for the Sakmarian-base and Artinskian-base GSSPs. The fund from ICS has been partly spent on paying their stay in Nanjing (US$956). An SPS business meeting was held in Freiberg, Germany and chaired by the SPS vice-chair Joerg Schneider, which costed 350US$. SPS chair Shuzhong Shen traveled to Milan on December 9, 2014 for the editing of Permophiles 60 as a part of task with SPS Secretary Lucia Angiolini. This costs about 500US$. We still have ~1700US$ surplus from this year's budget. This is mainly because the Freiberg business meeting did not spend money for inviting young colleagues to attend the meeting. We will transfer this money to next year's budget for organizing the field excursion to visit the three potential GSSPs in southern Urals and ICCP business meeting in 2015 in Kazan, Russia.

6. BUDGET REQUESTS AND ICS COMPONENT FOR 2014

1) A field excursion on the three potential GSSP sections in southern Urals will be organized by Valery Chernyk (XVIII ICCP-A3). We will invite all voting members to attend the field excursion (US$4500).
2) A session and an SPS business meeting on the Permian GSSPs will be organized during the 15th ICCP meeting (500US$).
3) Supporting a part of Lucia Angiolini's stay in Nanjing in May, 2015 and editing Permophiles (US$1000).
4) I have not decided to attend the STRATI 2015 Conference yet depending on time availability. I may use a part of budget for this meeting or use my own project money.

In total: US$4300 <u>[=6000 (budget for 2015) -1700 (surplus from 2014)]</u>

APPENDICES

7. CHIEF ACCOMPLISHMENTS OVER PAST FIVE YEARS (2009-2014)

1) A new SPS website has been established.
2) Three GSSP bronze markers have been placed on the GSSPs in the Guadalupe National Park in the USA.
3) The high-resolution timescale of the Permian system has been significantly refined (see SPS webpage Permian Timescale).

4) SPS decided to search a new GSSP candidate for the Kungurian Stage after an investigation on the previous candidates. Now two candidates for the Kungurian-base GSSP are available, but further work is necessary before a voting process is conducted.
5) Significant progress on the Sakmarian-base and Artinskian-base GSSP candidates has been made. Proposals for voting have been published and extensively discussed.
6) Two monuments have been built and a protected area has been established at Penglaitan, Laibin, Guangxi Province, China for the Wuchiapingian-base GSSP.
7) Seven formal issues and two supplementary issues of Permophiles have been published since 2009.
8) A working Group on the Carboniferous-Permian transition between marine and non-marine has been initiated in 2014.

8. OBJECTIVES AND WORK PLAN FOR NEXT 4 YEARS (2014-2018)

1) Publishing the revised versions of the proposals, organizing the field excursions and establishing the three (at least two) GSSPs for the Cisuralian.
2) Organizing a working group on the Guadalupian and global correlation for chemostratigraphy and geochronologic calibration. Publish the official papers for the three Guadalupian GSSPs.
3) Searching the replacement of the Lopingian-base GSSP nearby the stratotype section at Penglaitan, Guangxi, South China because the original will be flooded in 5-10 years by a dam for electric power.
4) Developing a large working group on the correlation between marine and continental sequences. This has already been initiated.

9. ORGANIZATION AND SUBCOMMISSION MEMBERSHIP

9a Names and Addresses of Current Officers and Voting Members

See new officers and voting members since August, 2012 in this issue.

9b List of Working (Task) Groups and their officers

1) Kungurian-base GSSP Working Group; Chair-Bruce Wardlaw.
2) Sakmarian-base and Artinskian-base GSSPs Working Group; Chair-Valery Chernykh.
3) Guadalupian Series and global correlation; Chair-Charles Henderson.
4) Correlation between marine and continental Carboniferous-Permian Transition; Chair-Joerg Schneider.
5) Neotethys, Paleotethys, and South China correlations; Chairs Lucia Angiolini and Yue Wang.

9c Interfaces with other international project

SPS interacts with many international projects on formal and informal levels. SPS has taken an active role in the development of a project on the correlation between marine and continental Permian sequences bilaterally supported under the foundation of the Sino-German Centre for Research Promotion (SGCRP) by NSFC and DFG. In 2014, SPS chair organized an international cooperative project on the correlation of the Guadalupian Series between South China and Mt. Guadalupe in Texas, USA, which has been approved by NSFC.

Officers and Voting Members since August, 2012

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Honourary Members

REPORTS

Remarks on Henderson's comments in Permophiles 59, p. 13-17

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When our paper "Uralian stratotypes of the stage boundaries of the Lower Series of the Permian System" was published in Permophiles, 59 (Chernykh and Chuvashov, 2014), Charles Henderson added his comments about the ideas that we presented in our article. In particular, Henderson thoroughly examined the problem of the lower boundaries of the Sakmarian and Artinskian stages in the

Urals sections proposed by us as limitotypes, and made a number of remarks which, in spite of the optimistic conclusion of his paper, essentially set us aside in the solution of the choice of this GSSP. Briefly, I will discuss below Henderson's comments, which concern in general conodonts, and I will briefly comment them.

1. It is proposed to give great confidence to the U-Pb data that supports Henderson's conclusions.

A general answer to this proposal could be: until now in stratigraphy, radiochronological data have been considered only when these data did not contradict the biochronological data. I think that also now no one attempts to correlate, for example, the lower boundary of the Asselian to the date of 299,0 my. The same remark can be made also with respect to any other non-paleontological data which can be used for correlation only when accompanied by biochronological markers.

2. With reference to the unpublished data of Mark Schmitz, Henderson asserts that "the Eiss Limestone *Sw. merrilli* have a strontium isotopic signature close to the base of the Permian and topotype specimens of *Sw. whitei* from the Tensleep Sandstone of Wyoming have a strontium isotopic signature within the Asselian". Henderson stated "Given the strontium isotopic values, their occurrence within cyclothems, and the U-Pb ages from Bolivia" that "these *Sweetognathus* forms from Bolivia and the mid-west USA are all Asselian (or earliest Sakmarian)" (Henderson, 2014, p. 14).

In connection with this, I want to say that the *Sw. merrilli* and *Sw. whitei* stratigraphical distribution in the Midcontinent is clearly fixed in the monograph of Boardman et al. (2009). These authors indicate that the FAD of *Sw. merrilli* falls at the base of the Bader Limestone Formation (Eiss Limestone), and that *Sw. whitei* appears at the base of the Barneston Limestone Formation (Florence Limestone). The level of the first appearance of *Sw. merrilli* is compared with the lower boundary of the Sakmarian stage, and the level of appearance of *Sw. whitei* – with the lower boundary of the Artinskian stage.

Boardman et al. (2009) do not separate the intermediate forms (*Sw. binodosus*, *Sw. anceps*) in the lineage of *Sw. merrilli* - *Sw. whitei*; therefore, according to their data, the distribution of *Sw. merrilli* overlaps with the distribution of *Sw. whitei*. I can assume only that among those forms which are named *Sw. merrilli*, there are other members of the *Sw. merrilli* - *Sw. whitei* lineage. But, in any event, the first appearance of these forms makes it possible to define the lower boundaries of, respectively, the Sakmarian and Artinskian stages in Midcontinent, and so also in the Urals.

In the same paper, it is shown that only one species of the genus *Streptognathodus*, *S. florensis*, occurs together with *Sw. whitei*. Judging by some images in the paper of Rhodes (1963), I can assume that Rhodes also found *S. florensis* together with *Sw. whitei*, but referred them to *S. elongatus* and *S. wabaunsensis* (all of these forms have accessory denticles on the inner side). If this is so, there are no Asselian forms in the Rhodes locality. Concerning the presence of the forms *Ozarkodina* cf. *O. delicatula* (Stauffer and Plummer) and *Spathognathodus* cf. *S. minutus* (Ellison), these forms are probably reworked. Thus, I do not think that Henderson had sufficient paleontological arguments for the assertion that "these *Sweetognathus* forms from Bolivia and mid-west USA are all Asselian (or earliest Sakmarian)" (Henderson, 2014, p. 14).

3. Henderson considers that "neither *Sweetognathus merrilli* nor *Sw.* aff. *merrilli* have been recovered from the Urals" (Henderson, 2014, p. 14), and therefore he proposes to choose the indicator of the lower boundary of the Sakmarian stage from the representatives of the genus *Mesogondolella*.

I do not protest the choice of *M. uralensis* (of which Henderson insists) as the species index of the lower boundary of the Sakmarian for two reasons. The first, and not the main reason, is that the controversy can delay the adoption of the boundary proposal; the second, and basic reason, is that the levels of the first appearance of *M. uralensis* and *Sw. merrilli* are so close in the Ural sections, that both of these species could be used for the correlation of the lower boundary of the Sakmarian stage. I foresee that, in reality, *Sw. merrilli* would be used more frequently as a boundary species because it is known in many locations away from the Urals.

4. Henderson assumes that true *Sw. whitei* is different from Uralian *Sweetognathus* which I assigned to *Sw. whitei* and he intends to describe the Ural forms as a new species. Henderson gives a the brief discussion of the characteristic features of the species *Sw. whitei*, and adds the comment that "associated taxa include abundant specimens of *Streptognathodus* including *S. fusus* and *S. postfusus*, which are typical of Upper Asselian" (Henderson, 2014, p. 16). All characters indicated for *Sw. whitei* are also diagnostic for the Ural forms, "including transverse ridges and pustulose microornament" (ibid). The difference consists of the fact that "the transverse ridges are regular in shape and the borders drop vertically toward the platform (Fig. 2.7); pustulose microornament is regularly distributed, closely packed and restricted to the upper surface only. Associated conodont taxa typically include species of *Mesogondolella* and no specimens of *Streptognathodus* co-occur because the genus is extinct" (ibid).

I noted above that *S. florensis* is the only species of the genus *Streptognathodus* in the Artinskian sections of Midcontinent. This species is named in the mentioned above work "the youngest *Streptognathodus* in our collections from Kansas" (Boardman et al., 2009, p. 33). Thus, the assertion that *Sw. whitei* is accompanied allegedly by Asselian streptognathodids is not correct. It is possible that in the Urals we did not find yet species of *Streptognathodus* in the early Artinskian deposits. But, if we find *S. florensis* together with *Sw. whitei* in the Ural sections, we will not change their age to Asselian.

Now I will discuss briefly the problem of the identification of conodont species in sections which are considerably far apart from each other (for example, on different continents). I do not have the possibility to give a detailed account of my views on conodont taxonomy and thus, the reasons which I consider important for us as conodont workers to find the same forms of conodonts on different continents, even in periods of significant biogeographical isolation. But, in any case, each specialist must present well the inevitability of geographical variability of such separated populations, which can be assigned only to one species. Moreover, it suffices to compare specimens of *Sw. whitei* from the sections of Nevada, Kansas and Wyoming (Ritter, 1986) or *Sw. merrilli* from the Ural sections Usolka and Kondurovka in order to see the specific changes in morphology. This comment applies not only to species of the genus *Sweetognathus* because a similar situation can be seen in the cases of the American and Ural representatives of cosmopolitan species of the genus *Streptognathodus* such as *S. firmus*, *S. simulator*, *S. wabaunsensis*, *S. isolatus*, and others.

I recently participated in a very friendly discussion with James Barrick concerning the diagnosis of the species *Streptognathodus simulator* Ellison, which is a good marker of the lower boundary of the Gzhelian stage. We discussed my proposal to accept a wider diagnosis, which makes it possible to carry the American and Ural forms to this species which differ somewhat from each other. A consensus was achieved, but the fact remains: these very widely geographically separated forms cannot be absolutely identical forms of one species.

I do not see a great need for the redescription of the species *Sw. whitei*, because the original description of Rhodes completely applies to the American, the Ural, and the Chinese forms of this species (see Ritter, 1986; Wang Cheng-Yuan et al, 1987). But, I have no objections of the plans of Henderson to carry out this work. Possibly, in the process of doing this project, he will discover how to refine some aspects which escaped my and our predecessors attention.

I think that it is necessary to complete the work on the stage boundaries of the Lower Series of the Permian System. The stratotypic sections proposed by us and the species-indicators of the lower boundaries satisfy the present requirements and can be accepted by the stratigraphic commission, at least, at first reading.

References

Boardman, D., Wardlaw, B., and Nestell, M., 2009. Stratigraphy and Conodont Biostratigraphy of Uppermost Carboniferous and Lower Permian from North American Midcontinent. Kansas Geological Survey Bulletin, v. 255, 253 p.

Henderson, C. M., 2014. Response and Comments by C.M. Henderson: The GSSP Process and the GSSPs proposed for base-Sakmarian and base-Artinskian stages. Permophiles, v. 59, p. 13-17.

Chernykh, V. V., and Chuvashov, B. I., 2014. Response and Comments by V. Chernykh and B. Chuvashov: Uralian stratotypes of the stage boundaries of the Lower Series of the Permian System. Permophiles, v. 59, p. 8 -13.

Rhodes, F.H.T., 1963. Conodonts from the topmost Tensleep sandstone of the Eastern Big Horn Mountains, Wyoming. Journal of Paleontology, v. 37 (2), p. 401-408.

Ritter, S.M., 1986. Taxonomic revision and phylogeny of post-Early Permian crisis *bisselli-whitei* Zone conodonts with comments on late Paleozoic diversity. Geologica et Palaeontologica, v. 20, p. 139-165.

Wang, C.Y., Ritter S.M. and Clark D.L., 1987. The *Sweetognathus* complex in the Permian of China: implications for evolution and homeomorphy. Journal of Paleontololgy, v. 61 (5), p. 1047-1057.

Remarks on Chernykh's Comments

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Friendly disagreement is very important to the development of science and I appreciate the respectful tone of Valery Chernykh's remarks reported above. As I have faced a death and additional near tragedies in my family very recently, I am increasingly reminded of the things that matter most in life and they are not conodonts and paleontology. But conodonts and paleontology are valuable diversions to challenge our intellect and advance scientific knowledge.

The issues that we face with the definition and correlation of two Lower Permian (Cisuralian) GSSPs are one such challenge. The challenge is really about how to tell time. As stratigraphers it is our primary goal to recognize time and we hold decisions with reverence because it seems a meaningful event has been defined. In today's world, time is measured to extreme accuracy, a level of precision far beyond what we can expect from the rock record. However, our current studies of the past emphasize the value of increasing resolution. Valery and I are both conodont paleontologists and, as such, we are used to telling time using speciation events. The limitation of our work is that, by itself, it lacks the most important aspect of science – the ability to test the results. Modern evolutionary developmental biology provides the knowledge how evolution could in fact repeat itself. The fossil record is replete with cases of homeomorphy and iterative evolution that could possibly be interpreted in different ways if we had additional means to test. In fact, we have these tools now and they include disciplines like geochronology, sequence stratigraphy and stable isotopic stratigraphy.

I have presented the arguments in recent issues of Permophiles (58 and 59). Yes I do need to complete a paper, but my attention has been diverted recently. This paper is in preparation. It will show that there are essentially two *Sweetognathus* lineages – one that is locally distributed in equatorial western Pangea (Permophiles 59, p. 16) and perhaps more widely during the early Sakmarian (see Vuolo *et al*., this issue for a SE Pamir occurrence) during an interval dominated by high frequency cyclothems, and a second that is nearly global in distribution and occurs above the cyclothemic succession. Sample populations of the former are dominated by *Streptognathodus* with only relatively rare specimens of *Sweetognathus*. Sample populations of the latter are dominated by *Sweetognathus* and include only a few specimens of *Streptognathodus* in the lower parts of the lineage and none higher, because of extinction. As a result there are two *Sweetognathus whitei* species – near homeomorphs, but distinguishable upon more detailed view (Permophiles 59, p. 15). I did not see these differences in my previous work until my eyes were opened by testing the correlations. I reported geochronologic and Sr-isotopic constraints that pointed at major problems with the correlation of the two species as one (Permophiles 59, p. 14). I also pointed at the very different successions in which they are found – the sequence stratigraphic test (Permophiles 58, p. 23) supporting the geochronologic and Sr-isotopic results. In my view, science cannot advance if we choose to ignore these other well-tested correlation tools. In other words, we may have to admit that paleontology can be occasionally wrong. However, when integrated with the rest of the stratigraphic tool-box, paleontology remains an incredibly valuable tool to tell relative time.

The Boardman et al. 2009 paper (see reference in Chernykh's remarks) is an excellent paper that provides a wealth of data on the mid-west USA succession. I think that more work is needed on this succession. Valery argues that there must be *Sw. binodosus* and *Sw. anceps* between the first occurrence of *Sw. merrilli* in the Eiss and *Sw. whitei* in the Florence. There are a few figured specimens (Plate 30, figs. 3,4) from the Schroyer and Florence that resemble *Sw. binodosus*, but these have the irregular transverse ridges and pustulose microornament typical of the older lineage. Note also the irregular shaped transverse ridges and irregularly distributed pustulose microornament of *Sw. whitei* from the Florence limestone (Plate 30, fig. 9) that resembles *Sw. anceps*. There are a number of figured specimens of *Streptognathodus* spp. from the Schroyer for example that resemble *Streptognathodus fusus*. My samples from the Florence (and Tensleep of Wyoming = topotype of *Sw. whitei*) have very abundant *Streptognathodus* specimens that I will figure as *S. fusus* or *S. postfusus* in association with rare *Sw. whitei*. My samples from the Arctic and from the FAD level at Dalny Tulkus contain common *Sw*. aff. *whitei* and zero specimens of *Streptognathodus*. I agree with Valery that *Sweetognathus whitei* does not need to be redescribed, but the new species, about 7 Myrs younger, which will define the GSSP for the base-Artinskian, does. We both agree that this is a good level for the GSSP.

Valery indicates that he is happy with *Mesogondolella uralensis* as a defining species for the base-Sakmarian. I suggested this species because the FAD is close to that recognized by *Sw. merrilli* (actually *Sw*. aff. *merrilli*). However, I have not seen this species in my work in Canada and the USA, but other species of *Mesogondolella* like *M. striata* and *M. monstra* are common elsewhere in my experience.

Finally, I do agree with Valery that there are problems identifying species that are considerably far apart. Geographic variation is an important consideration and I have described geographic clines in some of my previous work. The fact that these problems exist clearly points to the need for independent tests that can be provided by other correlation techniques. We should not hesitate to use them!

Co-occurrence of *Sweetognathus whitei* Rhodes, 1963 with early Sakmarian conodonts in SE Pamir

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In the framework of a project funded by the DARIUS Programme, several conodont samples were collected in the Permian succession of the Cimmerian block of SE Pamir (Tajikistan) within different sections (Angiolini et al., 2011; 2012; in press). A sample collected in the upper part of the Cisuralian Tashkazyk Formation of the Bazar Dara Group yielded a well preserved conodont fauna (Angiolini et al., in press). This conodont association comprises *Mesogondolella monstra*, *Streptognathodus* sp., *Sweetognathus bucaramangus*, *Sw*. cf. *merrilli*, *Sw*. cf. *behnkeni*, and *Sw. whitei* (Fig. 1). According to Chernykh (2005), *Mesogondolella monstra* is typical of the Tastubian (early Sakmarian) and *Sw. merrilli* has been correlated with the early Sakmarian (Chernykh and Chuvashov, 2014) in its type region.

Sw. whitei is a very controversial species: it has been considered a marker for the Artinskian (Boardman et al., 2009; Chuvashov *et al*., 2013; Chernykh and Chuvashov, 2014) and its FAD at the Dalny Tulkas section has been proposed as the definition of the base of the Artinskian Stage (Chuvashov et al., 2013), but it has been also reported to occur in the Asselian-early Sakmarian (Lucas, 2014; Henderson, 2014). Henderson (2014) in particular distinguished two "*Sw. whitei*" species: a *Sw. whitei* from the Florence limestone, midwest USA, and correlated as Asselian-Sakmarian in age and *Sw.* aff. *whitei* from the Dalny Tulkas section in southern Urals, Russia as Artinskian in age. The two forms are very similar, but differ in terms of transverse ridges and pustulose micro-ornamentation: in fact *Sw. whitei* Rhodes bears bell-shaped transverse ridges that are somewhat irregular in shape, with a pustulose micro-ornamentation irregularly distributed on top and on the slope of the ridges, while the younger *Sw.* aff. *whitei* shows more regular transverse ridges and more regular pustulose micro-ornamentation, which is confined to the upper surface of the ridges (Henderson, 2014). Given the plasticity typical of *Sweetognathus* species it would be prudent to investigate other regions to determine how well this differentiation holds up. In such studies, it will be important to look at sample populations and to consider the entire assemblage.

Henderson (2014) reported that *Sw. whitei* Rhodes appears in association with abundant *Streptognathodus* specimens, while *Sw.* aff. *whitei* is associated with *Mesogondolella* specimens and no *Streptognathodus* because of the extinction of the latter taxon in the early to mid-Sakmarian.

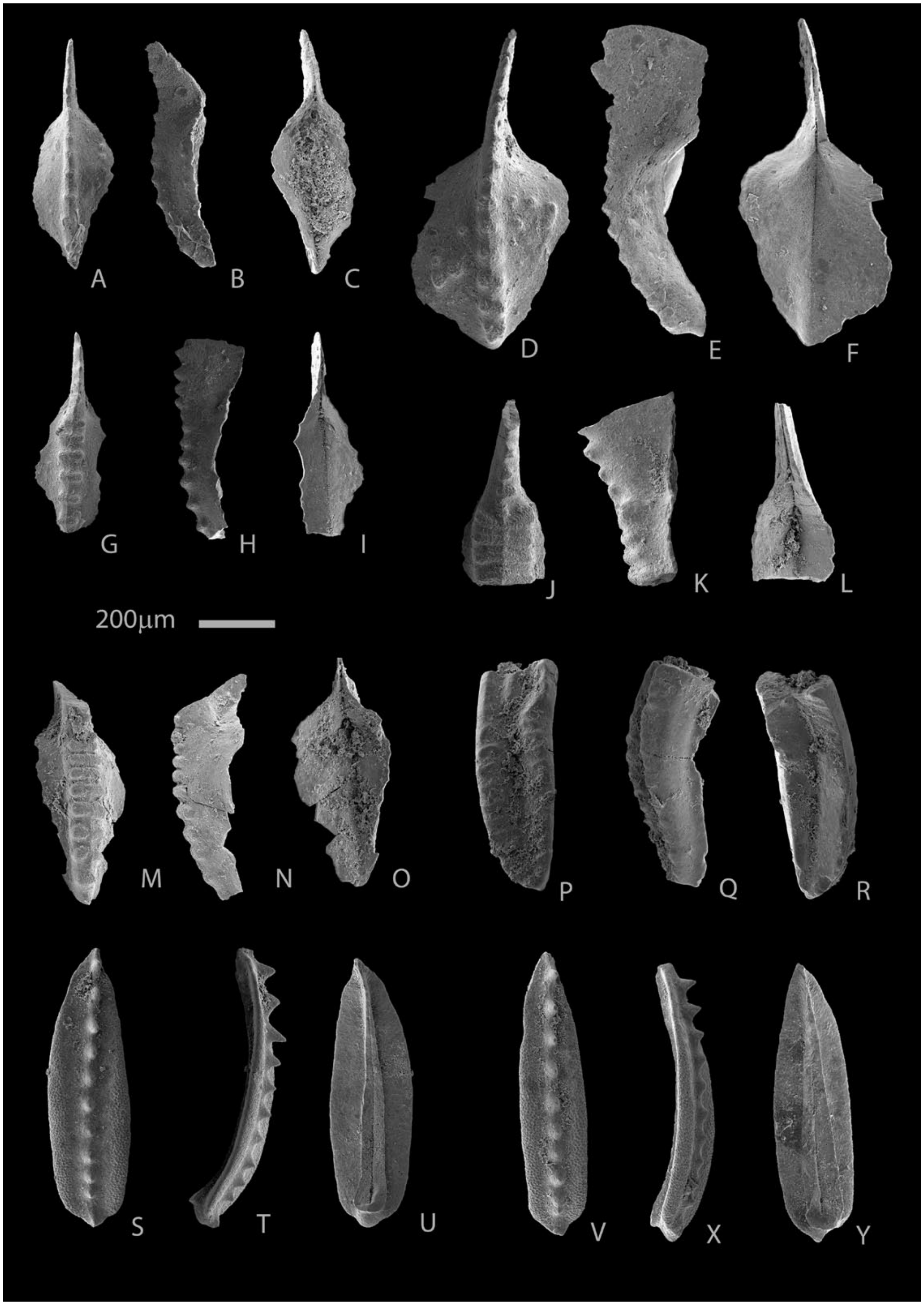

Fig.1. Conodont fauna from the Tashkazyk Formation, SE Pamir, Tajikistan (from Angiolini et al., in press).
A. *Sweetognathus* cf. *merrilli*, upper view; fig. B. *Sweetognathus* cf. *merrilli*, lateral view; C. *Sweetognathus* cf. *merrilli*, lower view; D. *Sweetognathus* cf. *bucaramangus*, upper view; E. *Sweetognathus* cf. *bucaramangus*, lateral view; F. *Sweetognathus* cf. *bucaramangus*, lower view; G. *Sweetognathus whitei,* upper view; H. *Sweetognathus whitei,* lateral view; I. *Sweetognathus whitei,* lower view; J. *Sweetognathus* cf. *behnkeni*, upper view; K. *Sweetognathus* cf. *behnkeni*, lateral view; L. *Sweetognathus* cf. *behnkeni*, lower view; M. *Sweetognathus whitei,* upper view; N. *Sweetognathus whitei,* lateral view; O. *Sweetognathus whitei,* lower view; P. *Streptognathodus* sp., upper view; Q. *Streptognathodus* sp., lateral view; R. *Streptognathodus* sp., lower view; S. *Mesogondolella monstra*, upper view; T. *Mesogondolella monstra*, lateral view; U. *Mesogondolella monstra*, lower view; V. *Mesogondolella monstra*, upper view; X. *Mesogondolella monstra*, lateral view; Y. *Mesogondolella monstra*, lower view.

The co-occurrence of *Sw. whitei*, *Streptognathodus* sp. and *Mesogondolella monstra* in the upper part of the Tashkazyk Fm. supports an early Sakmarian age for the species *Sw. whitei* in SE Pamir. This is confirmed by the associated late Sakmarian brachiopods, at the top of the Tashkazyk Fm. (Grunt and Dmitriev, 1973; Angiolini et al., in press). An association of *Streptognathodus* and *Mesogondolella monstra* was recorded also in the basal part of Bagh-e-Vang section, Central Iran, another Cimmerian block. In the Iranian samples, *Streptognathodus postfusus, Streptognathodus logissimus* occur together with *Mesogondolella monstra* and point to an early-middle Sakmarian age (Balini et al*.,* 2014). The presence of species of *Streptognathodus* together with *Mesogondolella monstra*, a good marker for the early middle Sakmarian, reinforces the interpretation of an early-Sakmarian age for the SE Pamir fauna and thus of *S whitei*.

In addition to these data, such older forms of *Sw. whitei* reported from Nevada (Ritter, 1987) and Bolivia (Suarez Riglos et al., 1987) are now confirmed to be of late Asselian and early Sakmarian age, based on strontium isotopes and high-precision U-Pb data (Henderson, 2014). To be noted that, as reported by Henderson (2014), the Bolivian conodont fauna contains, besides *Sweetognathus whitei,* abundant *Streptognathodus* specimens, like *S. fusus* and *S. postfusus* which are typical of the Upper Asselian (Chernykh, 2006).

The overlapping of the *Streptognathodus* and *Sweetognathus* lineages is still controversial: they overlap only for a very short period in the lowermost Sakmarian in the Urals, but they overlap for a longer period in the mid-west USA (Henderson, 2014).

It does seem clear that *S. whitei* or similar species are associated with *Streptognathodus* sp. and other early Sakmarian conodont and brachiopods, thus raising a problem to use this species as the index species for the base of Artinskian Stage. However, with the description of a new species and clarification of distributional data, the base-Artinskian GSSP will be well founded.

References

Angiolini, L., Zanchetta, S., Zanchi, A., Malaspina, N., Nicora, A., Rettori, R., Vachard, D. and Vuolo, I., 2011. DARIUS project “Permian stratigraphy in SE Pamir” (project CA 11-01). 2011 Technical and scientific report, 40 pp.

Angiolini, L., Zanchi, A., Zanchetta, S., Nicora, A., Henderson, C., Rettori, R., Vachard, D., Vezzoli, G. and Vuolo, I., 2012. DAIRUS project “Permian stratigraphy in SE Pamir” (project CA 12-01). 2012 Technical and scientific report, 74 pp.

Angiolini, L., Zanchi, A., Zanchetta, S., Nicora, A., Vuolo, I., Berra, F., Henderson, C., Malaspina, N., Rettori, R., Vachard, D., and Vezzoli, G. From rift to drift in South Pamir (Tajikistan): Permian evolution of a Cimmerian terrane. In press in Journal of Asian Earth Sciences (Published online).

Balini, M., Nicora, A., Sohrabi, Z., Angiolini, L., Vuolo, I., Henderson, C., Leven, E., Vachard, D., Borlenghi, M.L., Mandrioli, R. and Bahrammanesh, M., 2014. The sedimentary evolution of the Early-Middle Permian Bagh-e-Vang basin (Central Iran). In: DARIUS, "Evolution of the Black Sea to Central Asia Tethyan Realm since the Late Paleozoic", Final Symposium, Abstract Volume, pp. 30-31.

Boardman, D.R., II, Wardlaw, B.R. and Nestell, M.K., 2009. Stratigraphy and conodont biostratigraphy of the uppermost Carboniferous and Lower Permian from North American Midcontinent. Kansas Geological Survey Bulletin, v. 255, 253 pp.

Chernykh, V.V., 2005. Zonal Methods and Biostratigraphy – Zonal scheme for the Lower Permian of the Urals according to conodonts. Institute of Geology and Geochemistry, Urals Branch of RAS. Ekaterinburg, 217 pp. (In Russian).

Chernykh, V.V., 2006. Lower Permian conodonts of the Urals. Institute of Geology and Geochemistry, Urals Branch of RAS. Ekaterinburg, 130 pp. (In Russian).

Chernykh V.V. and Chuvashov, B.I., 2014. Response and comments from V. Chernykh and B. Chuvashov. Uralian stratotypes of the stage boundaries of the Lower Series of the Permian System. Permophiles, v. 59, p. 8- 13.

Chuvashov, B.I., Chernykh, V.V., Shen, S. and Henderson, C.M., 2013. Proposal for the Global Stratotype Section and Point (GSSP) for the base-Artinskian Stage (Lower Permian). Permophiles, v. 58, p. 26-34.

Grunt, T.A. and Dmitriev, V.Y., 1973. Permian brachiopods of Pamirs. Transactions of Paleontological Institute, v. 136, p. 1-211 (in Russian).

Henderson C.M., 2014. The GSSP Process and the GSSPs proposed for base-Sakmarian and base-Artinskian stages. Permophiles, v. 59, p. 13- 17.

Lucas S.G., 2014. Comment from S. Lucas.Two Recently Proposed Lower Permian GSSPs. Permophiles, v. 59, p. 6- 7.

Rhodes, F.H.T., 1963. Conodonts from the topmost Tensleep sandstone of the Eastern Big Horn Mountains, Wyoming. Journal of Paleontology, v. 37 (2), p. 401-408.

Riglos Suárez, M., Hünicken, M.A. and Merino, D., 1987. Conodont biostratigraphy of the Upper Carboniferous-Lower Permian rocks of Bolivia. In Austin, R.L., ed. Conodonts: investigative techniques and applications. British Micropalaeontological society, Ellis Horwood Publishers, London, p. 317-325.

Ritter, S.M., 1987. Biofacies-based refinement of Early Permian conodont biostratigraphy, in central and western USA. In: Austin, R.A. (Ed.), Conodonts– Investigative Techniques and Applications. British MicropalaeontologicalSociety Series. Ellis Horwood Ltd., Chichester, England, p. 382–403.

Permian Foraminiferal Biozonation in the Alborz Mountains at Valiabad Section (Iran)

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Introduction

The Valiabad section (coordinates: N 36˚15’32”; E 51˚18’44”) is located south of Chalus City (Fig. 1). The section can be reached from a small road departing from the east side of the main Karaj-Chalus road about 130 km from Karaj. This section has been mapped in the Marzan Abad map (1/100000) by Vahdati (1979) and it contains a Paleozoic succession typical of the area. The formations cropping out along this section are: Kahar Barut Formation, Lalun Formation, Zaigun Formation, Mobarak Formation, Dorud Formation, Ruteh Formation, and Nesen Formation. In this report, the foraminifers from the Dorud, Ruteh and Nesen formations are described.

Previous work on the Dorud Fomation

In 1963, Assereto had introduced the Dorud Formation for a succession cropping out along the upper part of Djajrud Vally (Dorud-Shemshak Road) in Central Alborz. The lower part of section was unit 1 which then Bozorgnia (1973) separated and named Dozde Band Formation. So, the Dorud Formation consisted of two clastic units separated by limestones with fusulinids. Ghavidel-Syooki (1995) suggested a Lower Permian age for the formation at Hassanakdar.

Gaetani et al. (2009) elevated the Dorud Formation to Dorud Group and suggested an uppermost Carboniferous to Sakmarian age. The group comprises the Toyeh Formation (lower red sandstone and siltstone), the Emarat Formation (bioclastic and oncoidal limestone) and Shahzaid Formation (upper sandstone and siltstone).

Previous work on the Ruteh Formation

The formation was introduced by Assereto (1963) northwest of Ruteh village. Lasemi (2000) compared the facies of the Ruteh Formation with some recent carbonate of the Persian Gulf.

Mahdavi & Vaziri (2010) indicated that the age of Ruteh Formation is Artinskian to Murgabian.

Gaetani et al. (2009) based on foraminifers and brachiopods suggested a Wordian to Capitanian age and a depositional setting of a carbonate ramp above the fair weather wave base.

Previous work on the Nesen Formation

The Nesen Formation has been introduced by Glaus (1964) and then revised by Stepanov et al. (1969), Bozorgnia (1973), Mokhtarpoor (1997) and Lasemi (2000).

Angiolini & Carabelli (2010) published a study on the brachiopod fauna from the Nesen Formation.

Gaetani et al. (2009) revised in detail the lithostratigraphy and indicated a Wuchiapingian and Changhsingian age (equivalent of the Dzhulfian to Dorashamian, respectively).

Accordi to Mahdavi & Vaziri (2009), the formation is upper Dzhulfian (i.e., roughly upper Wuchiapingian).

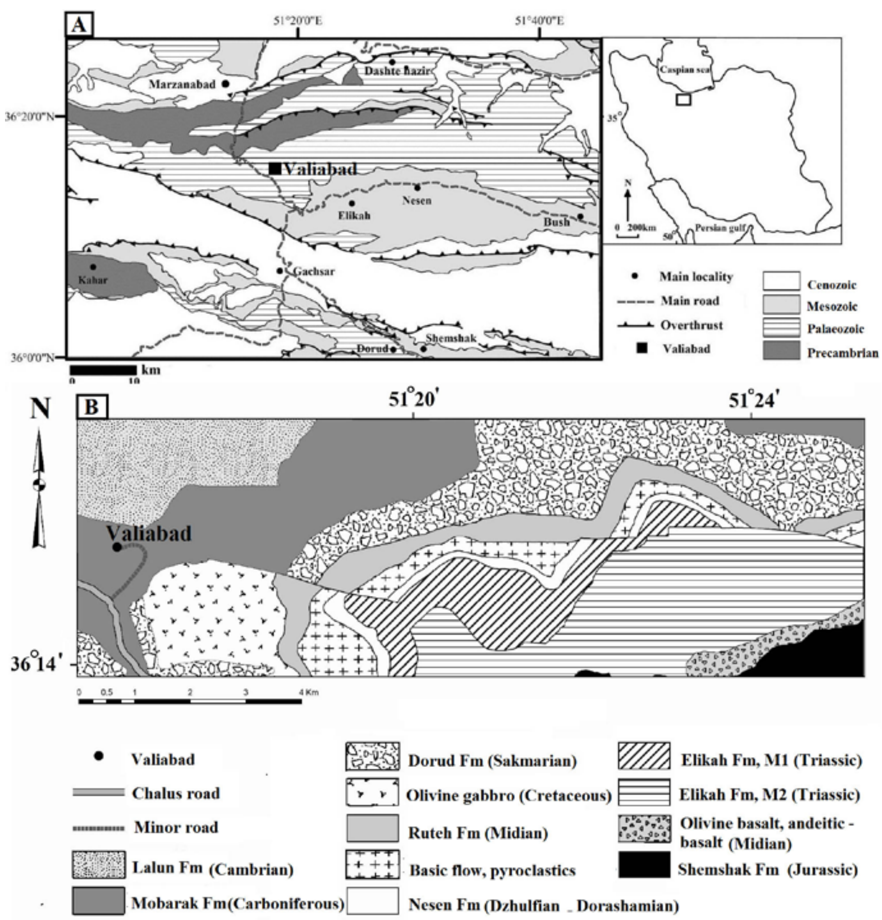


Fig. 1. Geological sketch map showing the .location of the the Valiabad section.

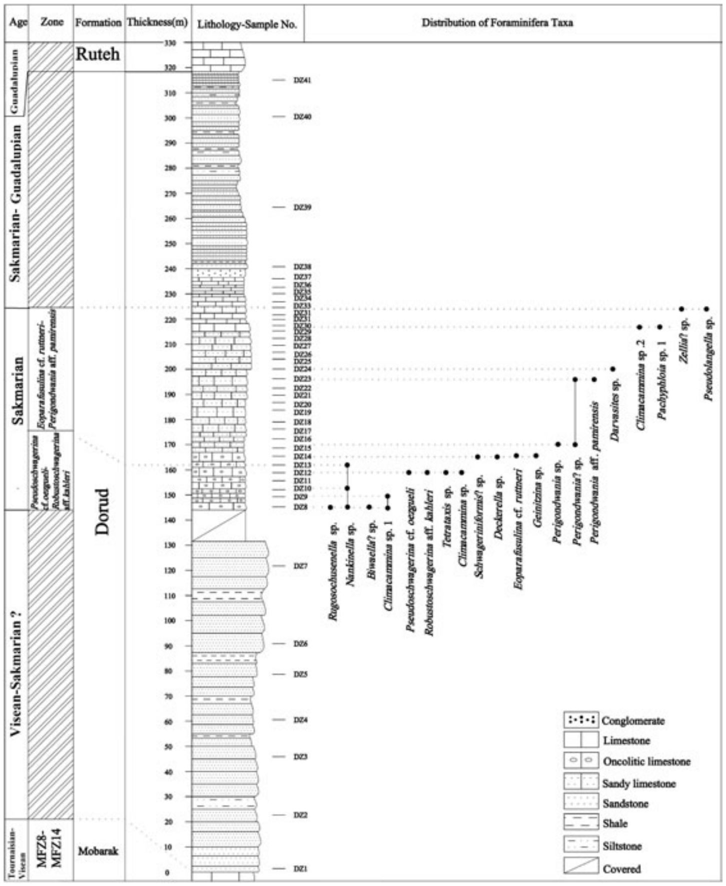


Fig. 2. Stratigraphic log of the Dorud Group.

Lithostratigraphy and biostratigraphy of the Dorud Group in the Valiabad section

This group is 312 m thick and unconformably overlies the Mobarak Formation (Fig. 2). It has been divided into 3 units, as follows:

1) 144 meters of thick dark red sandstone with iron concentrations (hematite and magnetite) interbedded with orange shale and light brown siltstone The upper part of section is light gray with thick and light brown sandstone. In this member we have not found any fossils.

2) 93 meters of limestone with: 23 m of light brown oncolitic limestone with fusulinids and algae as oncolite nuclei; 48 m cream-colored sandy limestone; 22 m medium to thin bedded and dark gray limestone with fusulinids.

The foraminifers are as follows: *Tetrataxis* sp., *Climacammina* sp. 1, *C.* sp. 2, *C.* sp., *Deckerella* sp., *Nankinella* sp., *Biwaella* sp., *Rugosochusenella* sp., *Schwageriniformis*? sp., *Darvasites* sp., *Eoparafusulina* cf. *ruttneri* Davydov and Arerifard, 2007, *Pseudoschwagerina* cf. *oezgueli* Kobayashi and Altiner, 2008, *Zellia* sp., *Robustoschwagerina* aff. *kahleri* (Miklukho-Maklay, 1949), *Perigondwania* aff. *pamirensis* (Leven, 1993), *Perigondwania* sp., *Geinitzina* sp., *Pachyphloia* sp. 1, *Pseudolangella* sp. (Plate 1).

3) 82 m of siliciclastic sediments with 40 cm-thick intercalated conglomerate; sandstone and thin shale in the upper part.

Lithostratigraphy and biostratigraphy of Ruteh Formation along the Valiabad section

The thickness of this formation is about 220 m and it overlies

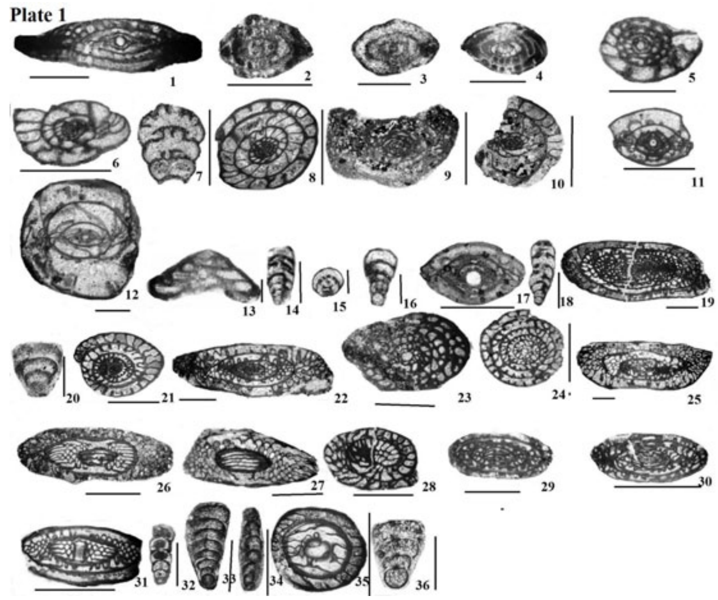


Plate 1 Foraminifers of the Dorud Formation, scale 1 mm except for 13-16, 18-20, 32-34, 36 where it is 0.5mm. 1. *Rugosochusenella* sp., spl : DZ8 ; 2-4. *Nankinella* sp., spl : DZ8-DZ10 ; 5-6. *Biwaella* sp., spl : DZ8 ; 7. *Climacammina* sp. 1, spl: DZ9; 8-11. *Pseudoschwagerina* cf. *oezgueli* Kobayashi and Altiner, 2008, spl: DZ12; 12. *Robustoschwagerina* aff. *kahleri* (Miklukho-Maklay, 1949), spl: DZ12; 13. *Tetrataxis* sp., spl: DZ12; 14-16. *Climacammina* sp., spl : DZ12 ; 17. *Schwageriniformis*? sp., spl: DZ14; 18. *Deckerella* sp., spl: DZ14; 19. *Eoparafusulina* cf. *ruttneri* Davydov and Arerifard, 2007, spl: DZ14; 20. *Geinitzina* sp., spl: DZ14; 21-22. *Perigondwania* sp., spl: DZ15 ; 23-24. *Perigondwania*? sp., spl : DZ15 ; 25-28. *Perigondwania* aff. *pamirensis* (Leven, 1993), spl. 23; 29-31. *Darvasites* sp., spl. DZ24, 32. *Climacammina* sp. 2, spl: DZ30; 33-34. *Pachyphloia* sp. 1, spl: DZ30; 35. *Zellia* sp., spl. DZ33; *Pseudolangella* sp., spl: MZ33.

basalts. Here, we distinguish 6 units (Fig. 3, Plate 2).

1) 39 m of medium-bedded sandstone. It contains: *Cribrogenerina sumatrana* (Volz, 1904), *Schubertella* sp., *Grozdilovia ambigua* (Deprat, 1913), *Geinitzina* ex gr. *primitiva* Potievskava, 1948, *Langella perforata* (Lange, 1925), *L. conica* de Civrieux and Dessauvagie, 1965, and *Pachyphloia* sp. 1.

2) 28 m of thin dark gray limestone with *Eotuberitina* sp., *Globivalvulina vonderschmitti* Reichel, 1946, *Cribrogenerina sumatrana* (Volz, 1904), *Nankinella* sp., *Schubertella* sp., *Grozdilovia* aff. *ambigua*, *Misellina* sp., *Armenina* sp., *Geinitzina* ex gr. *primitiva, Langella* sp., *Pachyphloia* sp. 1, *Pachyphloia* sp. 2.

3) 45 m of thick dark gray limestone with shale intercalations with *Earlandia* sp., *Palaeotextularia* sp., *Climacammina valvulinoides* Lange, 1925, *Climacammina* sp., *Deckerella* sp., and *Pachyphloia pedicula* de Civrieux and Dessauvagie, 1965.

4) 28 m of thick light brown limestone with *Earlandia* sp., *Palaeotextularia* sp., *Nankinella* sp., *Sphaerulina* sp., *Boultonia* sp. *Codonofusiella* sp., *Chusenella sinensis* Sheng, 1966, and

Pachyphloia pedicula de Civrieux and Dessauvagie, 1965.

5) 45 m of dark limestone with chert with *Climacammina major* Morozova, 1949, *Deckerella composita* Reitlinger, 1950, *Staffella* ? sp., *Nankinella* sp., *Dunbarula mathieui* Ciry, 1948, *Codonofusiella* sp.

6) 35 m of light gray dolomitic massive limestone with *Nankinella* sp., *Langella perforata* (Lange, 1925), *L. conica* de Civrieux and Dessauvagie, 1965, and *Pachyphloia* sp. 2.

Plate 2

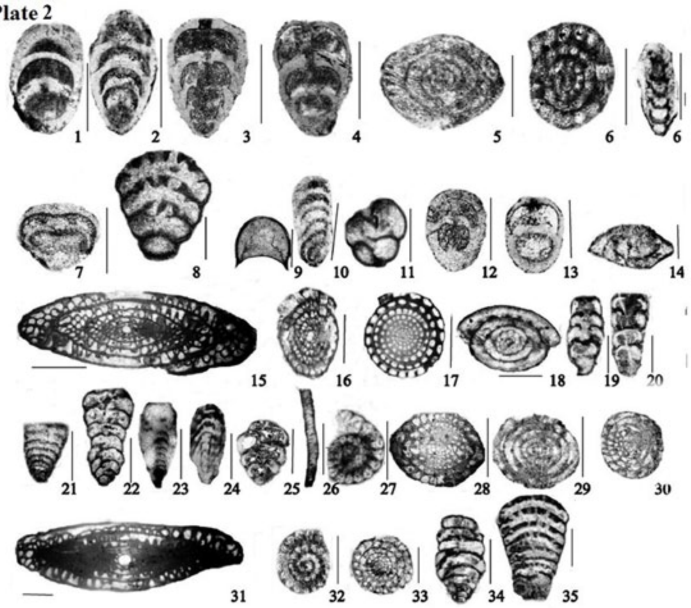


Plate 2 Foraminifers of the Ruteh Formation, scale 0.5 mm except for 7, 9, 21-26 where it is 0.3 mm.

1-2. *Langella perforata* (Lange, 1925), spl: RZ9, RZ10; 3-4. *Langella conica* de Civrieux and Dessauvagie, 1965, spl. RZ9, RZ49; 5-6. *Schubertella* sp., spl. RZ14, RZ20; *Pachyphloia* sp. 1, spl. RZ14; 7. *Geinitzina* ex gr. *primitiva* Potievskaya, 1962, spl. RZ17; 8. *Cribrogenerina sumatrana* (Volz, 1904),spl: RZ23; 9. *Eotuberitina* sp., spl: RZ16; 10. *Pachyphloia* sp. 2, spl: RZ16; *Globivalvulina vonderschmitti* Reichel, 1946, spl: RZ16; 12-13. *Langella* sp., spl:RZ18, RZ20; 14. *Nankinella* sp., RZ20; 15-16. *Grozdilovia* aff. *ambigua* (Deprat, 1913), spl. RZ20; 17. *Armenina* sp., spl. RZ22; 18. *Misellina* sp., spl: RZ23; 19-20. *Deckerella* sp., spl: RZ25; 21. *Climacammina* sp., spl: RZ25; 22. *Climacamminia valvulinoides* Lange1925, spl: RZ27; 23-24. *Pachyphloia pedicula* de Civrieux and Dessauvagie,1965, spl:RZ27; 25. *Palaeotextularia* sp. spl. RZ30, 26. *Earlandia* sp., spl: RZ30;27. *Codonofusiella* sp., spl: RZ41; 28. *Nankinella* sp., spl: RZ42; 29-30. *Sphaerulina* sp., spl: RZ41; 31. *Chusenella sinensis* Sheng, 1966 spl: RZ41; 32. *Boultonia* sp., spl: RZ41; 33. *Staffella*? sp., spl: RZ34; 34. *Deckerella composita Reitlinger*, spl: RZ54, 35. *Climacammina major* Morozov,1949 spl: RZ54.

Lithostratigraphy and biostratigraphy of Nesen Formation in the Valiabad section

The thickness of this formation is 83 m and it has been divided into 2 units (Fig. 4, Plate 3):

1) 32 m of conglomerate with light brown color and cobbles of basalts and marly limestone with cream color. It contains

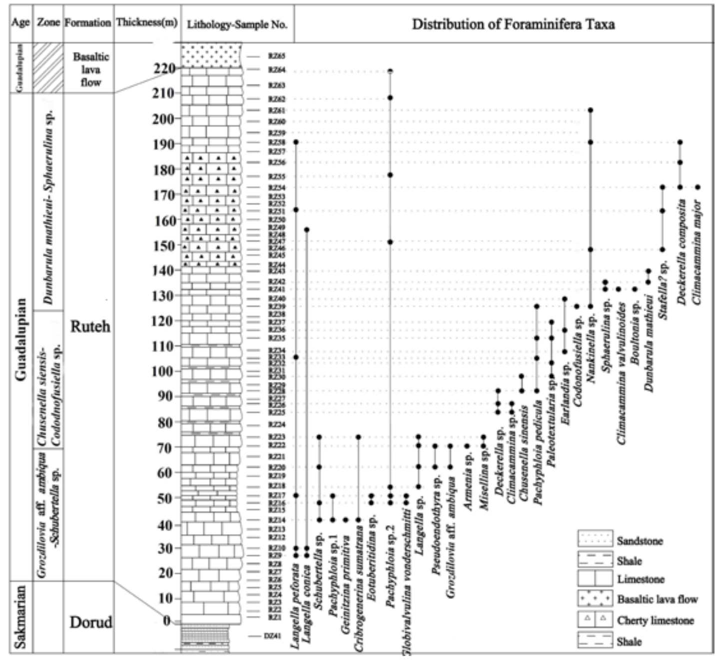


Fig. 3. Stratigraphic log of the Ruteh Formation.

Climacammina sp., *Postendothyra tenuis* Lin, 1948, *Reichelina media* Miklukho-Maklay, 1954, *R. pulchra* Miklukho-Maklay, 1954, *Codonofusiella* sp., *Nanlingella* cf. *meridionalis* Rui and Sheng, 1983; *Langella* sp. and *Robustopachyphloia* sp.

2) 51 m of limestone with intercalation of chert followed by medium-bedded limestone with *Climacammina* sp., *Globivalvulina bulloides* (Brady, 1876), *Paraglobivalvulina mira* Reitlinger, 1965, *Reichelina pulchra* Miklukho- *Langella* aff. *acantha* (Lange, 1925), *Langella* sp., *Rectoglandulina* sp., *Pachyphloia pedicula* de Civrieux & Dessauvagie, 1965, *P. ovata* De Civrieux and Dessauvagie, 1965, *P. cukurkoyi* de Civrieux & Dessauvagie, 1965, *P. iranica* Bozorgnia, 1973, *P.* sp. 1, *P.* sp. 2, *Aulacophloia martiniae* Gaillot and Vachard, 2007,
Ichthyofrondina palmata (Wang 1974).

Conclusions

Base on previous work by Leven (1993), Vachard (1996), Gorgij (2006, 2011), Davydov and Arefifard (2007), and Gaetani et al. (2009) two biozones have been distinguished in the Dorud Group:

Assemblage zone 1 *Pseudoschwagerina* cf. *oezgueli*-*Robustoschwagerina* aff. *kahleri*

Assemblage zone 2 *Perigondwania* aff. *pamirensis* .

Based on correlation of Leven & Gorgij (2011) and unpublished data of Zendkarilmi and Vachard, three biozones have been detected in the Ruteh Formation:

Assemblage zone 1 *Grozdilovia* aff. *ambigua* of early Gudalupian age with possible Kungurian reworking);

Assemblage zone 2 *Codonofusiella* sp. -*Chusenella sinensis* of late Guadalupian age;

Assemblage zone 3 *Sphaerulina* sp. - *Dunbarula mathieui* of latest Guadalupian age.

Based on correlation of Leven & Gorgij (2011), two biozones has been detected in the Nesen Formation:

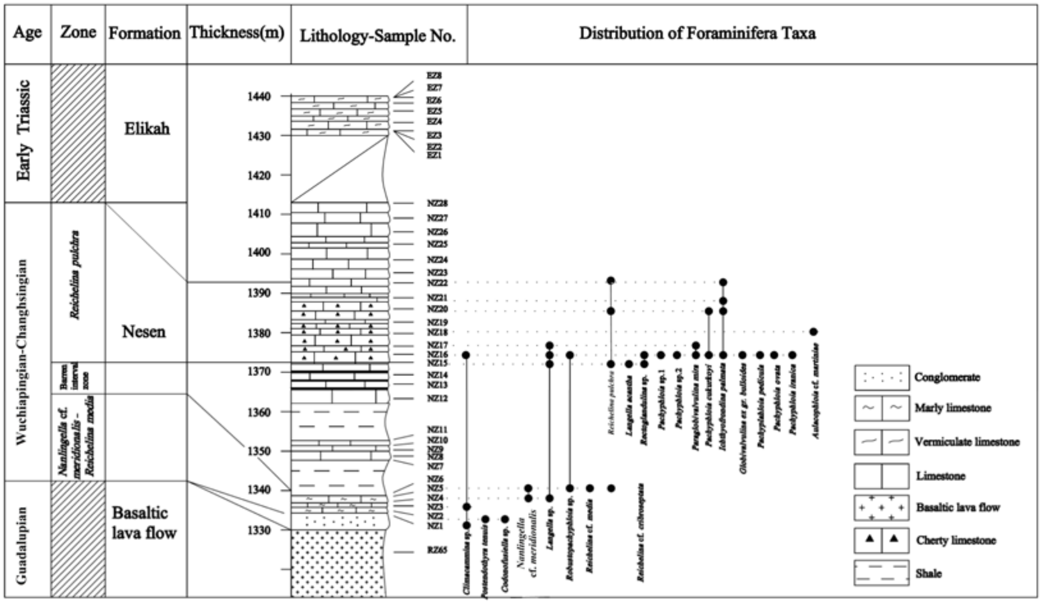


Fig. 4. Startigraphic log of the Nesen Formation.

Assemblage zone 1: *Nanlingella* cf. *meridionalis-Reichelina media*
Taxon range zone 2: _*Reichelina pulchra*
The age is Wuchiapingian-Changhsingian.
The correlation of the Valiabad succession with other successions in Iran is shown in Fig. 5.

References

Angiolini, L. and Carabelli, L., 2010. Upper Permian brachiopods from the Nesen Formation, North Iran. Special Papers in Palaeontology, v. 84, p. 41–90.

Assereto, R., 1963. The Paleozoic formations in Central Elburz (Iran), (Preliminary Note). Rivista Italiana di Paleontologia e Stratigrafia, v. 69 (4), p. 503-543.

Bozorgnia, F., 1973. Paleozoic foraminiferal biostratigraphy of central and east Alborz Mountains, Iran. National Iranian Oil Company, Geological Laboratories Publication, v. 4, 185 p.

Brady, H.B., 1876. A monograph of Carboniferous and Permian foraminifera (the genus Fusulina accepted). Palaeontographical Society of London, v. 30, p. 166.

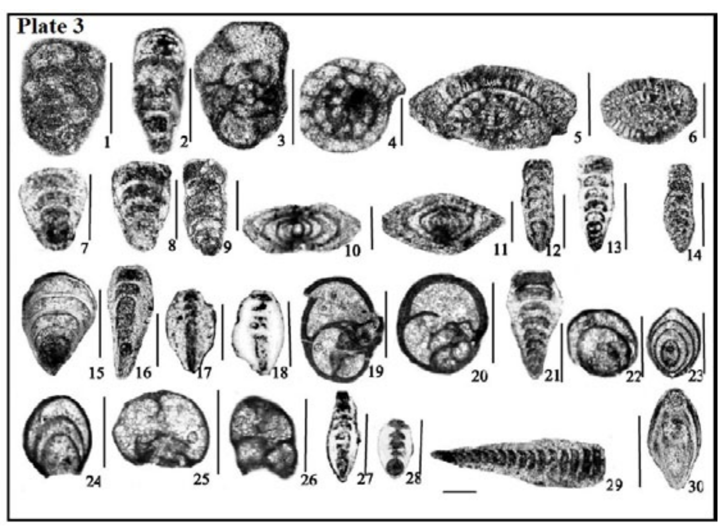
Davydov, V.I. and Arefifard, S., 2007. Permian Fusulinid Fauna of PeriGondwanan affinity from the Kalmard region, East–Central Iran and Its Significance for Tectonics and Paleogeography. Palaeontologia Electronica, http://palaeoelectronica.org/2007_2/00124/index.html

De Civrieux, S. & Dessauvagie, J.M., 1965. Reclassification de quelques Nodosariidae, particulièrement du Permien au Lias. Maden Tetkik ve Arama Enstitüsü Yayinlarindan (M.T.A.), v.124, p. 1–178.

Deprat, J., 1913. Etude des fusulimides de Chine et d'Indo-Chine. Les fusulinides des calcaries Carboniferous et Permian du Tonkin, du Laos et du Nord-Annam. Mem. Serv. Geol. Indochina, v. 2, p. 1-74.

Gaetani, M., Angiolini, L., Ueno, K., Nicora, A., Stephenson,

Plate 3 Foraminifers of the Nesen Formation , scale 0.5mm except for 7-9, 28 where the scale is 0.3 mm.
1-2. *Climacammina* sp., spl: NZ3; 3. *Postendothyra tenuis* Lin, 1948, spl : NZ3 ; 4. *Codonofusiella* sp., spl : NZ3 ; 5-6. *Nanlingella* cf. *meridionalis* Rui and Sheng, 1981, spl : NZ4 ; 7-8. *Langella* sp., spl. NZ4; 9. *Robustopachyphloia* sp., spl: NZ4;10. *Reichelina media* Miklukho-Maklay, 1954; spl: NZ5; 11. *Reichelina cribroseptata* Miklukho-Maklay, 1954, spl: NZ5; 12-14. *Langella* aff. *acantha* (Lange, 1925), spl: NZ15; 15. *Rectoglandulina* sp., spl: NZ15; 16. *Pachyphloia* sp. 1, spl: 17. NZ16; 17-18. *Pachyphloia* sp. 2, spl: NZ16; 19-20. *Paraglobivalvulina mira* Reitlinger, 1965, spl: NZ16, NZ17; 21. *Pachyphloia cukurkoyi* de Civrieux & Dessauvagie, 1966, spl: NZ16; 22-24. *Ichthyofrondina palmata* (Wang 1974), spl : NZ16, NZ19, NZ20 ; 25-26. *Globivalvulina bulloides* (Brady, 1876), spl: NZ16; 27. *Pachyplahloia pedicula* De Civrieux & Dessauvagie, 1966, spl : NZ16 ; 18. *Pachyphloia ovata* de Civrieux and Dessauvagie, 1965, spl : NZ16 ; 29. *Pachyphloia iranica* Bozorgnia, 1973 ; 30. *Aulacophloia martiniae* Gaillot and Vachard, 2007, spl: NZ18.



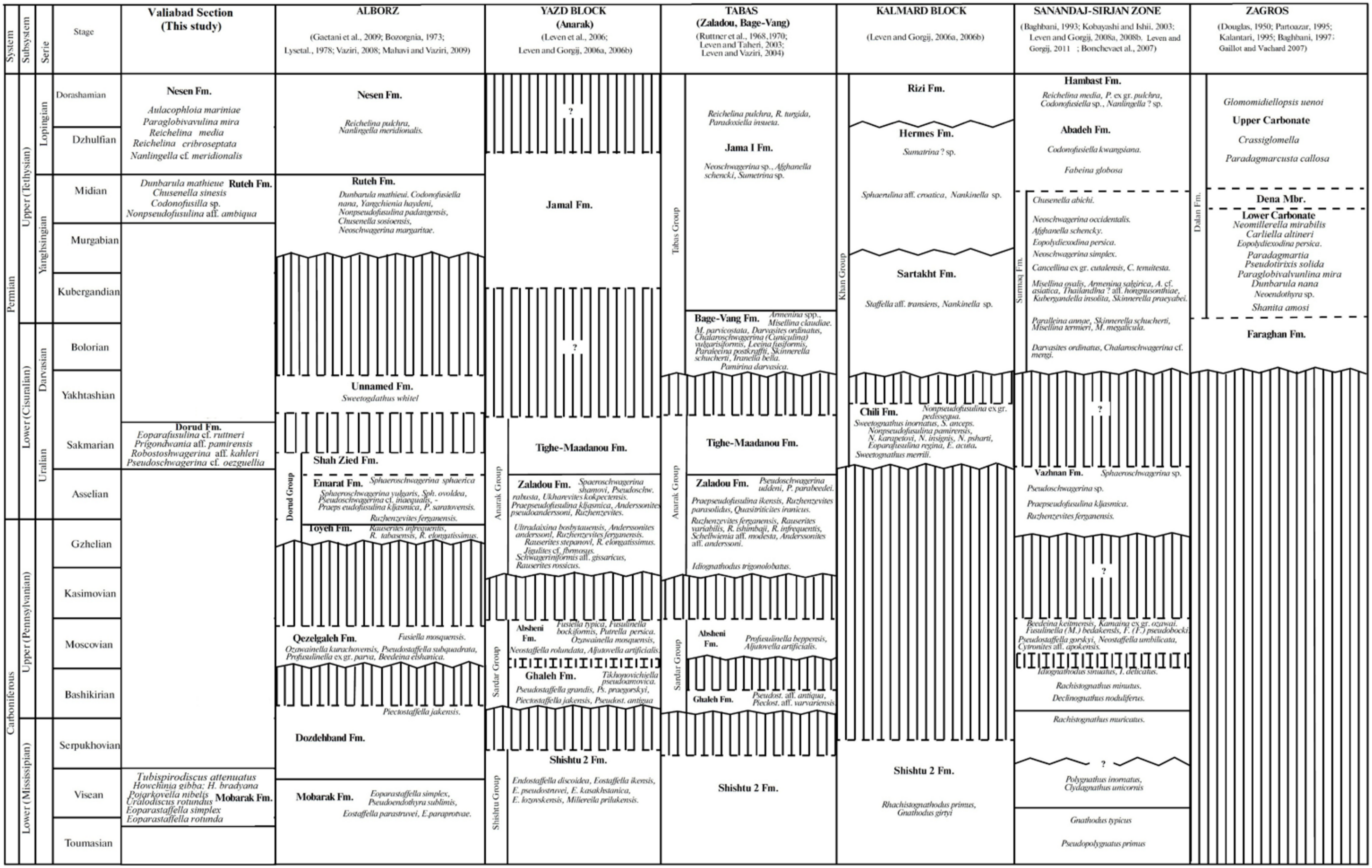


Fig. 5. Correlation table of the Permian successions in Iran.

M.H., Sciunnach, D., Rettori, R., Price, G.D., Sabouri, J. 2009. Pennsylvanian-Early Triassic stratigraphy in the Alborz Mountains (Iran). Geological Society, London, Special Publications v. 312, p. 79-128.

Gaillot, J. and Vachard, D., 2007. The Khuff Formation (Middle East) and time-equivalents in Turkey and South China: biostratigraphy from Capitanian to Changhsingian times (Permian), new foraminiferal taxa, and palaeogeographical implications. Coloquios de Micropaleontologia, v. 57, p. 37-223.

Ghavidel-Syooki, M., 1995. Palynostratigraphy andpaleogeography of a Palaeozoic sequence in the Hassanakdar area, Central Alborz Range, northern Iran. Review of Palaeobotany and Palynology, v. 86, p. 912–1009.

Glaus, M., 1964. Trias und Oberperm im zentralen Elburs (Persien). Eclogae Geologicae Helvetiae, v. 57, p. 497–508.

Lange, E., 1925. Eine mittelpermische Fauna von Guguk Bulat (Padanger Oberland, Sumatra). Verhandelingen van het geologisch mijnbouwkunding Genootschap voor Nederland en Koloniën, geologisch serie, v. 7, p. 213–295.

Lasemi, E. and Mokhtarpour, H., 2000. Sedimentary Environment and Sequence stratigraphy of Permian rocks at at Bibishahrabanou Section (South of Tehran). Earth Science Journal, Geological Society of Iran, v. 7, p. 45-57 (in Persian).

Leven, E.Ja., 1993. Early Permian Fusulinids from the Central Pamir. Rivista Italiana di Paleontologia e Stratigrafia, v. 99 (2), p. 151–198.

Leven, E.Ja. and Gorgij, M.N., 2006. Upper Carboniferous–Permian Stratigraphy and Fusulinids from the Anarak Region, Central Iran. Russ. J. Earth Sci., v. 8, p. 1–25.

Leven, E.Ja and Gorgij, M.N., 2011. Fusulinids and Stratigraphy of the Carboniferous and Permian in Iran. Stratigraphy and Geological Correlation, v. 19,(17), p. 687-776.

Lin, J., 1984. Foraminifera. In: Biostratigraphy of the Yangtze Gorge Area (3) Late Paleozoic Era. Geological Publishing House, Beijing, p. 110-177 (in Chinese).

Mikhailov, A., 1939. Kharakteristike rodov nizhnekamennougolnykh foraminifer territorii SSSR; nizhnekamennougolnye otlozhenii severo-zapadnogo kryla Podmoskogo basseina (On characteristic genera of Early Carboniferous foraminifers in territories of the USSR; the lower Carboniferous deposits of the northwestern limb of Moscow basin). Sbornik Leningradskogo Geologicheskogo Upraleniya, v. 3, p. 47-62 (in Russian).

Miklukho-Maklay, K.V., 1954. Foraminifery verkhnepermskikh otlozhenii severnogo Kavkaza (Foraminifers from the Late Permian deposits of the northern Caucasus). Trudy VSEGEI, Gosgeoltekhizdat, v. 1, p.1–163 (in Russian; French translation BRGM n° 2683: p. 1–216).

Mahdavi, M. and Vaziri, S.H., 2010. Lithostratigraphy and Microbiostratigraphy of the Ruteh Formation in Northwest of Khur, Central Alborz, Iran. Journal of Sciences, Islamic Republic of Iran, v. 21(3), p. 237-250.

Morozova, V.G., 1949. Predstaviteli semeytsv Lituolidae I Textulariidae iz verkhnekamennougolnykh i artinski otlozhenii bashkirskogo Priuralya (Members of families Lituolidae and Textulariidae from late Carboniferous and Artinskian from the Bashkir Pre-Urals). Akademyia Nauk SSSR, Trudy Instituta Geologicheskikh Nauk 105, geologicheskaya seriya, v. 35, p. 244–275 (in Russian; French translation: BRGM, n° 783).

Potievskaya, P.D., 1962. Predstaviteli nekotorykh semeystv melkikh foraminifer iz nizhney Permi severozapadnoy okrainy Donbassa (Representatives of certain families of small foraminifers from the Early Permian of the northwestern border of the Donets Basin). Akademiya Nauk Ukrainskoi SSR, Instituta Geologicheskikh Nauk, Trudy, seriya stratigrafii i paleontologii, v. 44, p. 49–94 (in Russian).

Reichel, M., 1945. Sur un Miliolidé nouveau du Permien de l'île de Chypre. Verhandlungen der Naturforschenden Gesellschaft in Basel, v. 56 (2), p. 521–530.

Reitlinger, E.A., 1981. K sistematike Endotiridey (On the systematics of the endothyrids). Voprosy Mikropaleontologii, v. 24, p. 43-59 (in Russian).

Stepanov, D. L., Golshani, F. and Stocklin, J., 1969. Upper Permian and Permian–Triassic Boundary in North Iran. Reports, Geological Survey of Iran, 12 pp.

Sheng, J.C. and He, Y., 1983. Shanita-Hemigordius (Hemigordiopsis) (Foraminifera) fauna in western Yunnan, China. Acta Paleontologica Sinica, v. 22, p. 55–59.

Vachard, D. and Montenat, C., 1996. The Carboniferous of Afghanistan. In The Carboniferous of the World, III -The former USSR, Mongolia, Middle Eastern Platform, Afganistan, and Iran. Wagner, R.H., Winkler Prins C.F., Granados, L.F. (eds). International Union of Geological Sciences Publication 33, Instituto Tecnológico GeoMinero de España and National Naturhistorisches Museum v. 3, p. 459-487.

Vahdati, F., 1999. Geological map of Marzananad (scale of 1:100.000), Geol. Surv. Iran, sheet No. 6262.

Volz, W., 1904. Zur Geologie von Sumatra, Beobachtungen und Studien. II. Einige neue Foraminiferen und Korallen sowie Hydrokorallen aus dem Oberkarbon Sumatras. Geol. Palaeont. Abh. neue Folge, 6 (Ganz Band 10) Heft (2), p. 93–112 (177–196).

Wang, Y.J., 1974. A handbook of the stratigraphy and paleontology in Southwest China. 454 pp. Nanking Institute of Geology and Paleontology eds: Science Press, Academia Sinica (in Chinese).

Colaniella, wrongly named, well-distributed Late Permian nodosariate foraminifers

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Etymology and historical background of the genus *Colaniella*

Due its semolina pudding shape (pyramis in ancient Greek) - a comparison which is also at the origin of the name pyramid for the monuments of ancient Egypt - this genus was initially called *Pyramis*, and its type species, *Pyramis parva* (Colani, 1926). As the name *Pyramis* was pre-occupied (by, at least, six valid zoological taxa, according to Loeblich and Tappan, 1964, p. C328), it was changed to *Colaniella* by Likharev et al. (1939). However, this name is ethically inadequate. If Miss Colani, who was a specialist of the Quaternary of the former French Indochina, worked once in the Palaeozoic, that was uniquely at the instigation of the boss of the Geological Survey and with the goal to demonstrate that the exceptional work of the genial geologist and palaeontologist Jacques Deprat (see for instance, Deprat, 1912) was erroneous and even fraudulent. This attempt failed because it was not funded (Durand-Delga, 1990; Vachard and Locatelli, work in progress). Calling a Permian fossil *Colaniella*, it is a little like entitling Verdi's opera 'Iago' instead of 'Othello ! Moreover, the diagnosis of Colani was inconsistent with the true architecture of the foraminifer; in particular, she confused the micritic filling of the chambers with the walls, and, *vice versa* the hyaline walls with the chambers (Reichel, 1946a; Miklukho-Maklay, 1954). Finally, Colani even questioned whether the genus belongs to the foraminifers (Reichel, 1946a, p. 544). Hence, de Civrieux and Dessauvagie (1965) proposed the substitution of *Colaniella cylindrica* Miklukho-Maklay, 1954 to replace *Pyramis parva*, as type species, because this latter was too poorly described. However, due to the rule of priority and other rules of the International Code of Zoologic Nomenclature, we must maintain *ad vitam eternam*, these semantic and taxonomic inconsistencies called *Colaniella* and *Colaniella parva*.

Another inconsistency was introduced when the "family" Colaniellidae Fursenko in Rauzer-Chernousova and Fursenko, 1959 was created to include two genera, *Colaniella* and *Multiseptida* Bykova, which are currently considered as belonging to two different foraminiferal classes (Vachard et al., 2010). The emendation of Wang (1966) of a subfamily Colaniellinae composed of *Colaniella*, *Pseudocolaniella* Wang, 1966, *Paracolaniella* Wang, 1966, and *Cylindrocolaniella* Loeblich and Tappan, 1985 (= *Wanganella* Sosnina in Kiparisova et al., 1966, pre-occupied) was more objective, because the colaniellins constitute a homogeneous group stratigraphically confined to the Late Permian. Then, a few other taxonomic vicissitudes occurred; e.g., *Paracolaniella* was synonymized with *Colaniella* (Ishii et al., 1975), and a genus *Pseudowanganella* was created by Sosnina (1983), with a type material which only partially corresponds to true colaniellins, or inversely, represents a transition between the genera *Protonodosaria* and *Colaniella*. Its presence only in poorly dated olistoliths of Primorye (southeastern Siberia, Russia) do not allow a solution to this problem to be found, for the moment.

Criteria of the genus, species and lineages

Colani's incoherent diagnoses , for the genus and the type species, were successively rectified by Likharev et al. (1939), Reichel (1946a,b), Miklukho-Maklay (1954), de Civrieux and Dessauvagie (1965), Wang (1966), Ishii et al. (1975), and Jenny-Deshusses and Baud (1989).

The genus *Colaniella* is now defined as a foraminifer, of medium-size for a Permian nodosariate, with a height up to 0.800 mm in the small species (*C. nana*, *C. minima*, with 7-10 chambers), and 1.200-1.850 mm (rarely 2.200 mm) in the typical species. Its shape is biconical, more or less elongate. The spherical proloculus is followed by 12-20 (more rarely 24-30) uniseriate, truncated pyramid-shaped, strongly overlapping chambers, the height of which increase slowly, as as do the septal thicknesses. The chambers are internally subdivided into numerous chamberlets by one or several orders of radiate, incomplete septula, connected with the wall (see illustrations and reconstructions in Reichel, 1946a,b; Ishii et al., 1975; Jenny and Baud, 1989). The central part of the chambers is not subdivided ; the sutures are inconspicuous. The outer surface bears 12-18 longitudinal costae, weakly convex, which are the external projections of the first order septula . The wall is hyaline, unilayered, and typical of the Permian nodosariates. The aperture is terminal, central and simple; occasionally slightly depressed, but not stellate (as described by some authors; e.g., Loeblich and Tappan, 1987).

The specific criteria defined by Jenny-Deshusses and Baud (1989) are based on: (a) the small vs. large size of the test, (b) its general shape, and (c) the orders of septula (1st, 2nd or 3th). These features allow the definition of the following groups of species: *C.* ex gr. *minima* Wang, 1966 (with only first order septula), *C.* ex gr. *parva* (with three orders of septula and globose tests), and *C.* ex gr. *lepida* Wang, 1966 (with three orders of septula, but elongate tests).

The most advanced species (i.e., late Changhsingian in age) of the group *C. parva*, like *C. parva, C. cylindrica*, *C. media* Miklukho-Maklay, 1954, *C. inflata* Wang, 1966, *C. leei* (Wang, 1966), etc., are very similar and must be now biometrically differentiated.

The five lineages (sic: successions) defined by Ishii et al. (1975, p. 127) seem to be still coherent (see the description and measurements of the species in Okimura (1988, fig. 4)):

1. Colaniella nana-C. minima-C. pulchra-C. lepida;
2. C. minima - C. xikouensis;
3. C. pulchra-C. media-C. leei;
4. [*C. nana*] - *C. inflata* - *C. parva*;
5. [*Cylindrocolaniella* sp.]-*C. cylindrica*.

Detailed stratigraphic distribution from the latest Guadalupian to the latest Changhsingian

The so-called early Guadalupian (sic: Early Midian (Abadehian) "in Jenny-Deshusses and Baud, 1989) distribution results from several misinterpretations and errors of dating.

It seems that the direct ancestors, i.e., the specimens with the typical truncated pyramidal shaped chambers and the corresponding curvature of the septa, but without subdivisions by internal septula, are known from the latest Guadalupian of Tunisia and Zagros (Ghazzay et al., Zendkarimi, unpublished data). The poorly developed inner septula are also known in rare specimens of the Perigondwanan margin, in Taurus (Turkey) (Çatal and Dager, 1974), Zagros (Iran; Gaillot and Vachard, 2007), and Oman (Weidlich and Vachard, unpublished data). However, all the Wuchiapingian representatives of the genus, seem to be confined to the Salt Range, Pakistan (Okimura, 1988, Nakazawa, 1989, Mertmann, 2000) which is therefore a refuge-area for the primitive *Colaniella*. All the other Wuchiapingian reports of *Colaniella* are doubtful and/or to be re-dated as Changhsingian in age (see, for example, Vachard et al., 1993, 2003), based on the revised stratigraphic distribution of the fusulinid genus *Shindella* associated to them. *Shindella* was indeed previously attributed to the late Midian and/or to the Wuchiapingian (Kotlyar et al., 1984; Vachard et al., 2003), following the same misinterpretation of age for the contemporaneous *Colaniella,* described by Chediya and Davydov (1982) and Jenny and Deshusses (1989). Subsequently, *Shindella* was assigned to the late Dorashamian (Kotlyar et al.

1999a), which is correlatable to the late Changhsingian. In fact, the genus *Shindella* (including "*Palaeofusulina*" *nana* Likharev (pars), *P. simplicata* Sheng, and *P. pamirica* Leven) is present in the Changhsingian beds of South China (Sheng, 1963; Rui and Sheng, 1981), SE Pamir (Leven, 1967; Chediya and Davydov, 1982; Kotlyar et al., 1990, 1999a), southern Primorye (Kotlyar et al., 1999a; Kobayashi, 1999), northwestern Caucasus (Pronina-Nestell and Nestell, 2001, pl. 7, fig. 11-12, 14), Greece (Vachard et al., 2003), and Turkey (Leven and Okay, 1996, pl. 9, fig. 3; pl. 10, fig. 23).

Even if it was endemic in the Salt Range during the early Wuchiapingian, the genus *Colaniella* perhaps migrated as early as the late Wuchiapingian to Japanese western terranes, where *C. minima* is occasionally found in association with the *Nanligella simplex* (Sheng and Chang) (see Ishii et al., 1975).

Whatever its Wuchiapingian and early Changhsingian palaeobiogeography, the genus *Colaniella* experienced during the late Changhsinghian a mass migration across the eastern Tethys, and more episodically towards the western Tethys (see the *Colaniella*-line of Altiner in Sengör et al., 1988 and here Figs 1-2). The rarer, western outcrops are located in southern Italy (Abriola Limestone, Luperto, 1963, and Sicily, Jenny-Deshusses et al., 2000), Greece (Attica, Salamis Island and Hydra Island, Reichel, 1946a-b; Clément et al., 1971; Baud et al., 1991; Altiner and Özkan-Altiner, 1998; Vachard et al., 1993, 2003); Montenegro (former Yugoslavia, Kochansky-Devidé, 1964); northwestern Turkey (Leven and Okay, 1996); Crimea (Russia, Pronina and Nestell, 1997); North Caucasus (Russia, Miklukho-Maklay, 1954; Kotlyar et al., 1983; Pronina-Nestell and Nestell, 2001); Central Iran (Bagh-e Vang section, Partoazar, 1995); Oman (Glennie et al., 1974); Central Afghanistan (Vachard, 1980; Vachard and Montenat, 1996); SE Pamir (Chediya and Davydov, 1982; Kotlyar et al., 1984). In contrast, *Colaniella* is widespread throughout the eastern Tethys: Pakistan, Himalaya (Ladakh, Lys et al., 1980), Kashmir (Nakazawa et al., 1975b; Ishii et al., 1975), South China (Sichuan, Hunan, Jiangxi, Shanxi, Guizhou, Kueichow, Wang, 1966; Lin, 1978; Zhao et al., 1981; Jiang and Wang, 1985; Lin et al., 1990; Fan et al., 1990; Shang et al., 2003), Indosinia terranes (North Viet-Nam, Colani, 1926; Thailand, Ueno et al., 2010; Fontaine et al., 2012; Malaysia, Vachard, 1990; Fontaine et al., 1994; Cambodgia, Nguyen Duc Tien, 1979, 1986), Primorye (Sikhote-Alin, Russia, Vuks and Chediya, 1986);, and the western Panthalassan terranes of Japan (Maizuru Belt, Yahkuno District, Mikata District, Kyushu Island, Ishii et al., 1975; Kobayashi, 1997, 1999, 2002, 2003, 2013) (Figs. 1-2). However, the colaniellins are totally absent from the terranes of the North American Cordillera.

Rare fusulinids and smaller foraminifers characterize the latest Permian (i.e., late Changhsingian), due to the numerous disappearances after the end-Guadalupian mass extinction. There are mainly *Palaeofusulina* Deprat, *Paraglobivalvulinoides* Zaninetti and Jenny-Deshusses, and the advanced *Colaniella*. More local foraminiferal Changhsingian biomarkers are *Louisettita* Altiner and Brönnimann, *Paradagmarita* Lys, *Emiratella* Gaillot and Vachard, *Baudiella* Altiner and Özkan-Altiner, *Gallowayinella* Chen, *Neohemigordius* Wang and Sun *sensu stricto, Kamurana* Altiner, and *Geinitzinita* de Civrieux and Dessauvagie (Gaillot and Vachard, 2007 and unpublished data).

These taxa have their LAD (last appearance datum), a few meters below the FAD (first appearance datum) of the conodont *Hindeodus parvus* (Kozur and Pyatakova), characteristic of the base of the Triassic. For example, only 2 metres of carbonate sediments are accumulated between the LAD of *Colaniella* and the FAD of *H. parvus* in the Laolongdong section (South China) (Jiang et al., 2008). A similar occurrence of this LAD, a few metres below the PTB (Permian-Triassic Boundary) can be observed in other Chinese sections, for example in the Nanpanjiang Basin (Song et al., 2009) and West Yunnan (Ueno and Tsutsumi, 2009). Similarly, in northwestern Caucasus (Pronina-Nestell and Nestell, 2001) and southern Tibet (Wang et al., 2010), the genus *Colaniella* remains present up to the last beds of the Permian.

Colaniella parva, (referred to as *Pyramis parva* in Vietnam), has been already mentioned to be associated to *Palaeofusulina prisca* Deprat, a late Changhsingian marker. Reichel (1946a) indicated a similar assemblage in Greece (Salamis Island), with Changhsingian fusulinids (see also Altiner and Ozkan-Altiner, 1998). In northern Caucasus (Miklukho-Maklay, 1954 ; Pronina-Nestell and Nestell, 2001), its late Changhsingian age is confirmed by the co-occurrence of *Palaeofusulina nana* (Likharev). Furthermore, in Japan (Kobayashi, 1997, 2002, 2003, 2013), Altimour (Kabul Block, Aghanistan) (Vachard, 1980), South China (Fan et al., 1990; Lin et al., 1990), and Lamayuru (Himalaya; Lys et al., 1980), *C. parva* is invariably associated with other species of *Palaeofusulina* and/or other palaeofusulinins. In some Tibetan sections, it is possible to speculate, based on the data of Wang et al. (2010), that the local late Changhsingian may be divided into two zones of foraminifers: (1) *Colaniella parva* Zone; (2) a *Colaniella parva- Dilatofusulina-Urushtanella*? assemblage Zone.

Palaeoenvironments and palaeobiogeography of the *Colaniella* groups of species

Due to the taxonomic composition of the assemblages, relatively poor in algae and fusulinids, the *Colaniella* biotopes were probably located in the outer part of the carbonate ramps of the tropical regions, in areas previously occupied (during the late Guadalupian) by the *Yabeina* and *Lepidolina* oligotypic assemblages (compare with Ghazzay et al., in press).

Like many nodosariates, *Colaniella* had probably an infaunal habitus in the uppermost centimetres of the sediment deposited on the sea bottom. Occasionally, this mode of life may have lead to an elongation and cylindrization of the test, especially developed in the genus (probably morphogenus and/or taphotaxon) *Cylindrocolaniella*. Due to its mode of life, the palaeogeographic distribution of *Colaniella* was probably controlled by the paleogeographic continuity vs. absence of continuity of the Upper Permian carbonate ramps, within the tropical and/or subtropical Tethyan and western Panthalassan provinces and subprovinces. *Colaniella* is extensively studied and constitutes an excellent paleobiogeographic marker (Ishii et al., 1975; Jenny-Deshusses and Baud, 1989; Sengör et al., 1988). It is reported in the following areas and localities, from west to east (Figs. 1-2):

- Italy (Luperto, 1963; Jenny and Stampfli, 2000; Jenny-Deshusses et al., 2000);
- former Yugoslavia (Kochansky, 1964; Nakazawa et al., 1975b; Jenny-Deshusses and Baud, 1989);

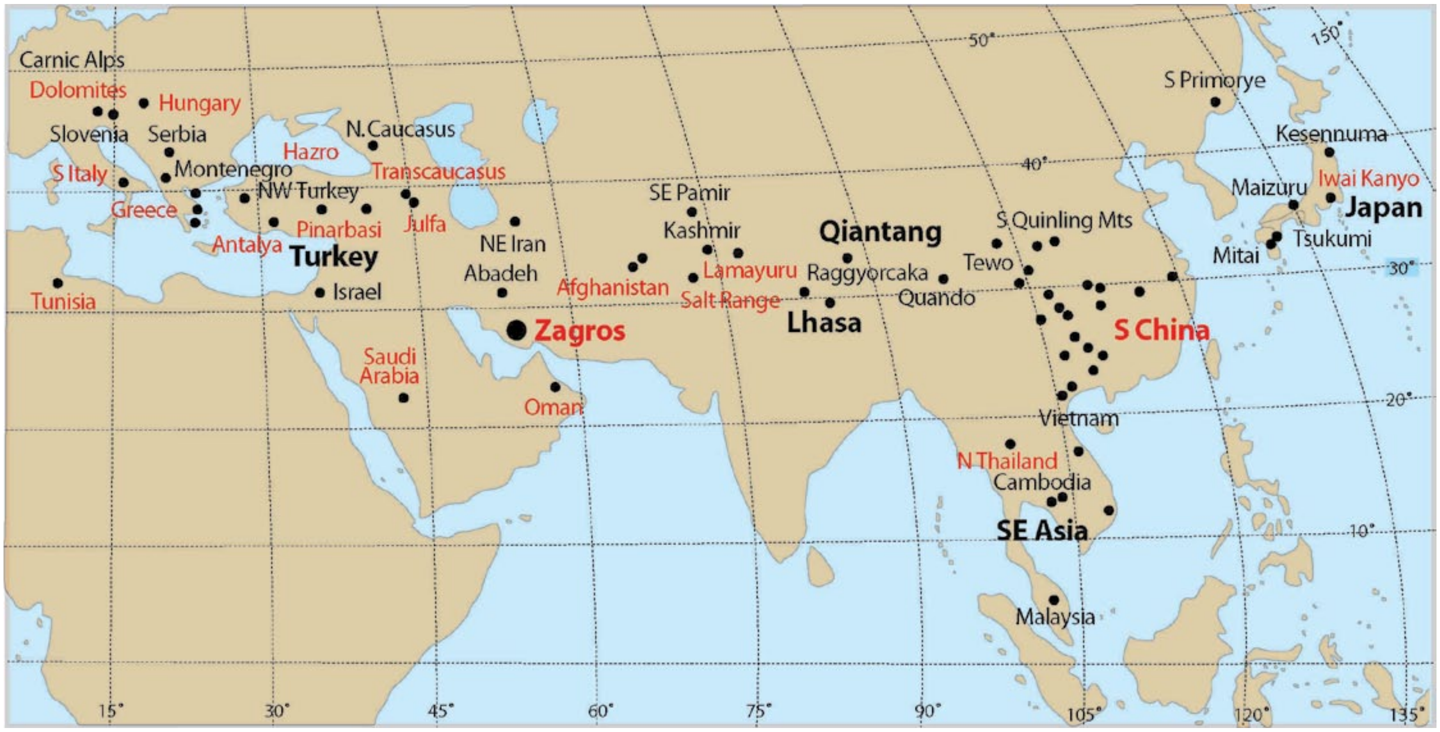

Fig. 1. Map showing the modern location of Lopingian limestones with foraminifers, and the geographic equivalence with the outcrops and areas mentioned in Fig. 2.

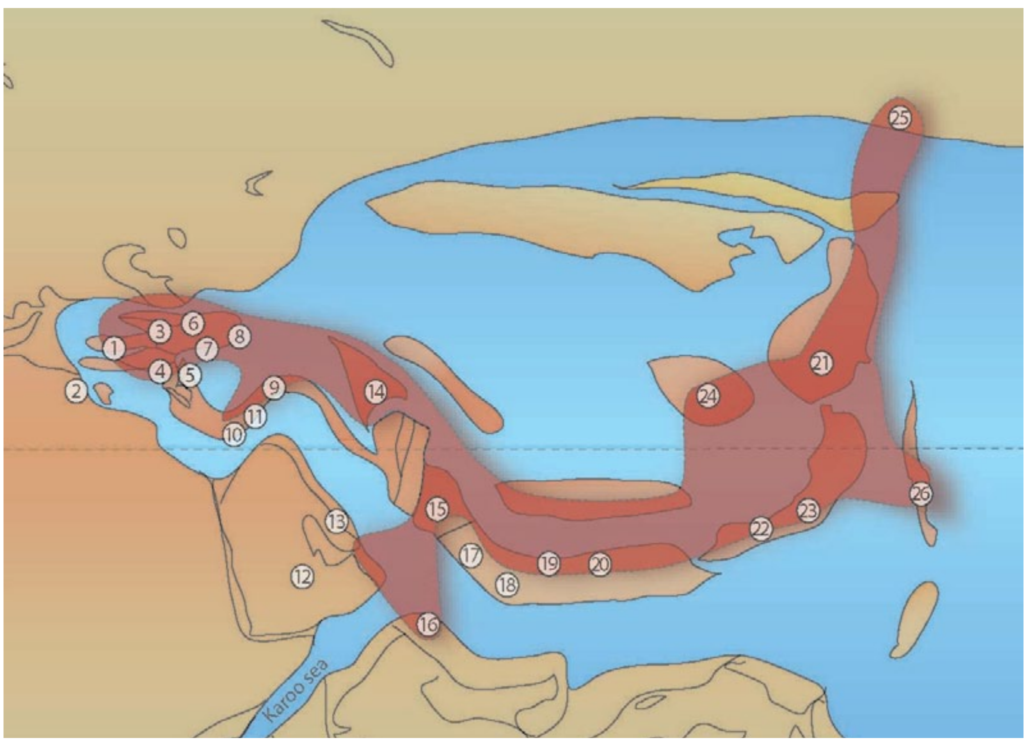

Fig. 2. Palaeobiogeographical distribution of the genus *Colaniella* during the Late Permian. In the late Changhsingian, due to the rapid opening of the Neotethys between the Perigondwanan margin (13, 16) and the Cimmerian subcontinent (15-20), the connection with the Salt Range in Pakistan (16), centre of speciation during the Wuchiapingian, and consequently, with the Perigondwanan areas, was interrupted. The numbers indicated on the map (from 1 to 26) correspond to the following areas: (1) Sicily; (2) Tunisia; (3) Albania; (4) Montenegro; (5) Greece; (6) Crimea; (7) NW Turkey; (8) NW Caucasus; (9) central Turkey; (10) Cyprus; (11) Taurus (southern Turkey); (12) Saudi Arabia; (13) Zagros (southern Iran) and Oman; (14) Alborz and central Iran ; (15) Central Mountains of Afghanistan; (16) Salt Range; (17) Kashmir; (18) Lamayuru; (19) western Tibet; (20) southern Tibet; (21) South China; (22) Thailand; (23) Malaysia; (24) Indochina (Vietnam); (25) Primorye; (26) Japan terranes.

- Albania (Bignot et al., 1982);
- Greece: Salamis, Hydra, Aegina, Evvia, Attica (Renz and Reichel, 1945; Reichel, 1946a; Clément et al., 1971; Nakazawa et al., 1975a; Ishii et al. 1975; Argyriadis and Lys, 1977; Lys, 1988; Jenny-Deshusses et al., 1989; Baud et al., 1991; Altiner and Özkan-Altiner, 1998; Vachard et al., 1993, 2003);
- Cyprus (Lys, 1988);
- Crimea (Pronina and Nestell, 1997; Kotlyar et al. 1999b);
- northern Caucasus (Likharev et al., 1939; Miklukho-Maclay, 1954; Kotlyar et al., 1984, 1999a; Pronina-Nestell and Nestell, 2001);
- Rare in Turkey (Sellier de Civrieux and Dessauvagie, 1965: Anatolia; Çatal and Dager, 1974; Jenny-Deshusses and Baud, 1989, Leven and Okay, 1996; Hazro: Lys, 1988);
- Oman (nappes d'Hawasina, Glennie et al., 1974; wadi Wasit: Jenny-Deshusses and Baud, 1989; Jebel Qamar, Pillevuit, 1993);
- northern Alborz (Emmarat) (Jenny-Deshusses, 1983; Jenny-Deshusses and Baud, 1989; Jenny and Stampfli, 2000);
- Central Iran (Partoazar, 1995);
- Afghanistan, Kabul Block (Altimour), central Mountains (Koh-e Nalyab) (Lys, 1977; Argyriadis and Lys, 1977; Vachard, 1980; Lys, 1988; Jenny-Deshusses and Baud, 1989; Jenny and Stampfli, 2000);
- Salt Range (Nammal, Chiddru, Zaluch Nala) (Ishii et al., 1975; Okimura et al., 1985; Okimura, 1988; Jenny-Deshusses and Baud, 1989, Partoazar, 1995);
- SE Pamir (Likharev et al., 1939; Ishii et al., 1975; Chediya and Davydov, 1982; Okimura et al., 1985; Kotlyar et al., 1984, 1999a);
- Kashmir (Guryul Ravine) (Ishii et al., 1975; Nakazawa et al., 1975b; Jenny-Deshusses and Baud, 1989; Kobayashi, 1999);
- Ladakh Himalaya (Lys et al., 1980; Lys, 1988);
- Zanskar Himalaya (Jenny-Deshusses and Baud, 1989);
- Lhasa Terrane (e.g., Kobayashi, 1999);
- western Tibet (Raskas, Zonghba) (Jenny-Deshusses and Baud, 1989);
- southern Tibet (Wang et al., 2010);
- South China (Wang, 1966, Ishii et al., 1975; Okimura et al., 1985; Kobayashi, 1999; Ueno et al., 2010);
- Thailand (Toriyama, 1984; Ueno et al., 2010; Fontaine et al., 2012);
- Malaysia, Kelantan (Ishii et al., 1975; Toriyama, 1984; Okimura et al., 1985; Vachard, 1990, Fontaine et al., 1994; Partoazar, 1995);
- Indochina: Viet-nam (Colani, 1926; Cambodgia (Nguyen Duc Tien, 1979, 1986);
- Maritime Provinces of Far East Russia (Sikhote-Alin Range; Likharev et al., 1939; Ishii et al., 1975; Kotlyar et al., 1990, 1999a; Kobayashi, 1999);
- Japan (Maizuru Belt, Kyushu, Shikoku, southern Kitakami Mountains) (Ishii et al., 1975; Okimura et al., 1985; Kobayashi, 1997, 1999).

Well-known Permian areas seem to be devoidof typical *Colaniella*: Zagros, Taurus, Lhasa Block, Karakorum (Jenny-Deshusses and Baud, 1989), Hindu Kush (Vachard, 1980), western Serbia and Hungary (Kobayashi, 1999; Nestell et al., 2009), and Tunisia (Ghazzay et al., in press), even if some atypical or misinterpreted colaniellins were mentioned from these areas. Its occurrence in Timor (Lys et al., 1980; Jenny-Deshusses and Baud, 1989) seems to be very questionable and cannot be confirmed here. As mentioned above, the colaniellins seem to be totally absent from the Americas.

In order to conclude about the palaeobiogeographic significance of the species of *Colaniella*, it is possible to summarize that the colaniellins probably appear on the Perigondwanan margin of the Tethys at the end of the Guadalupian. The Wuchiapingian and early Changhsingian representatives of the lineage are very limited and probably relatively endemic to the Salt Range (Pakistan). The advanced forms, which are late Changhsingian in age, are more widespread, but especially abundant in all the eastern Tethys, west of SE Pamir, and western Panthalassa (Japan terranes). In the western Tethys, colaniellins are present along the northern margin of the Tethys, are rarer in the Cimmerian terranes, but seem to be absent along the Perigondwanan margin (Fig. 2).

Further possible studies

More accurate biostratigraphic investigations

New studies are necessary in the sections of the Salt Range Pakistan, especially for understanding the transition between *C.* ex gr. *minima* and *C. parva* (i.e., the possible presence of species with two orders of septula) and in order to allow a more accurate biozonation of the Wuchiapingian and early Changhsingian based on smaller foraminifers.

Palaeobiogeography and geodynamics across Tethys and Panthalassa

Intuitively, the *Colaniella* distribution confirms the palaeogeographic homogeneity of the eastern Tethys and its relative independence from the western Tethys. Nevertheless, contrary to the distribution of the neoschwagerinin and gifuellin fusulinids, *Colaniella* is totally absent in the North American Cordillera terranes. This is further evidence of the oceanic opening which began in the Wuchiapingian, was already important in the Changhsingian, and rapidly and strongly increased during the Triassic.

History of the latest Permian-earliest Triassic (PTB) Nodosariata

Apparently, all the colaniellins disappear at the PTB, but many nodosariates cross through this limit and are probably at the origin of all the hyaline foraminifers, largely dominant in the Mesozoic, Cenozoic and Recent seas. The Late Permian-Early Triasssic Nodosariata (e.g., de Civrieux and Dessauvagie, 1965; Groves and Altiner, 2005; Groves et al., 2007; Gaillot and Vachard, 2007 ; Karaeva and Nestell, 2007; Gu et al., 2007; Song et al., 2009) therefore appear to be the most interesting foraminiferal group to study now, in order to understand the problem of the macroevolution of the foraminifers, and the transitions between the classes Fusulinata (microgranular-walled), Textulariata (agglutinating), Miliolata (porcelaneous) and Nodosariata-Rotaliata (hyaline) (Rigaud et al., in press).

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References

Altiner, D. and Özkan-Altiner, S., 1998. *Baudiella stampflii* n. gen. n. sp., and its position in the evolution of Late Permian ozawainellid fusulines. Revue de Paléobiologie Genève, v. 17 (1), p. 163-175.

Argyriadis, I. and Lys, M., 1977. La dynamique de la lithosphère au Permien supérieur et ses relations avec la biostatigraphie en Méditerranée et au Moyen-Orient. Communications Colloque sur la géologie des régions égéennes, Athens, v. 3, p. 1217-1224.

Baud, A., Jenny, C., Papanikolaou, D., Sideris, Ch. and Stampfli, G., 1991. New observations on Permian stratigraphy in Greece and geodynamic interpretation. Bulletin of the Geological Society of Greece, v. 25 (1), p. 187-206.

Bignot, G., Kodra, A., Neumann, M. and Pirdeni, A., 1982. Le Permien supérieur des Alpes Albanaises. Etude préliminaire. Comptes Rendus de l'Académie des Sciences de Paris, v. 295, p. 883-886.

Çatal, E. and Dager, Z., 1974. Toros bölgesi permiyenine ait yeni bir *Colaniella* türünüm tanimi (Description of a new *Colaniella* species from the Permian of Taurus region). Bulletin Geological Society Turkey, v. 17 (1), p. 187-191.

Chediya, I.O. and Davydov, V.I., 1982. Stratigraphic range of *Colaniella* (foraminifera). Doklady Akademyi Nauk SSSR (English translation: Scripta Publ. Co.), v. 252, p. 55-59.

Clément, B., Guernet, C. and Ly,s M., 1971. Données nouvelles sur le Carbonifère et le Permien du mont Beletsi, en Attique (Grèce). Bulletin de la Société Géologique de France, v. 12 (1), p. 88-91.

Colani, M., 1926. Nouvelle contribution à l'étude des fusulinidés de l'Extrême-Orient. Mémoires du Service géologique de l'Indochine, v. 11 (1), p. 9-199.

de Civrieux, J.M. and Dessauvagie, T.F., 1965. Reclassification de quelques Nodosariidae particulièrement du Permien au Lias. Maden Tetkik ve Arama Enstitüsü Yayinlarindan, v.124, p. 1-178.

Deprat, J., 1912. Etude des Fusulinidés de Chine et d'Indochine et classification des calcaires à Fusulines. Mémoires du Service géologique de l'Indochine, v. 1 (3), p. 1-76.

Durand-Delga, M., 1990. L'affaire Deprat. Extrait des Travaux du Comité Français d'Histoire de la Géologie, 3e série, v. 4 (10) http://www.annales.org/archives/cofrhigeo/deprat.html

Fan, J., Rigby, J.K. and Qi, Jing-wen, 1990. The Permian Reefs of South China and comparisons with the Permian Reef Complex of the Guadalupe Mountains, West Texas and New Mexico. Brigham Young University Geology Studies, v. 36, p. 16-55.

Fontaine, H., Bin Amnan, I., Khoo, Han-Peng, Nguyen Duc Tien and Vachard, D., 1994. The *Neoschwagerina* and *Yabeina-Lepidolina* zones in Peninsular Malaysia, and Dzhulfian and Dorashamian in Peninsular Malaysia, the transition to the Triassic. Geological Survey of Malaysia Geological Papers, v. 4, p. 1-175.

Fontaine, H., Hoang Thi-Than, Kavinate, S., Suteethorn, V. and Vachard, D. (2012). North Thailand. 1-Very Fossiliferous limestone belonging to the end of the Permian (Upper Changhsingian) in Wiang Sa Area. 2- Another Upper Permian Limestone in Phrae Area. J. Sci. Technol. MSU, v. 31 (1), p. 51-62.

Gaillo,t J. and Vachard, D., 2007. The Khuff Formation (Middle East) and time-equivalents in Turkey and South China : biostratigraphy from Capitanian to Changhsingian times (Permian), new foraminiferal taxa, and palaeogeographical implications. Coloquios de Paleontología, v. 57, p. 37-223.

Glennie, K.M., Bœuf, M.G.A., Hughes Clarke, M.W., Moody-Stuart, M., Pilaar, W.F.H. and Reinhardt, B.M., 1974. Geology of the Oman Mountains, Part I, II & III. Verhandelingen van het Koninklijk Nederlands geologisch mijnbouwkunding Genootschap, Deel., v. 31, 2 volumes, p. 1-423.

Ghazzay, W., Vachard, D. and Razgallah, S. Revised lithostratigraphy and biostratography by fusulinids of the Middle-Late Permian of Jebel Tebaga (Tunisia) with some questions about the end-Guadalupian crisis. Revue de Micropaléontologie (in press).

Groves, J.R. and Altiner, D., 2005. Survival and recovery of calcareous foraminifera pursuant to the end-Permian mass extinction. Comptes Rendus Palevol, v.4, p. 487-500.

Groves, J.R., Rettori, R., Payne, J.L., Boyce, M.D. and Altiner, D., 2007. End-Permian mass extinction of lagenide foraminifers in the Southern Alps (Northern Italy). Journal of Paleontology, v. 81 (3), p. 415-434.

Gu, Song-zhu, Feng, Qing-lai, and He, Wei-hong, 2007. The last Permian deep-water fauna : Latest Changhsingian small foraminifers from southwestern Guangxi, South China. Micropaleontology, v. 53 (4), p. 311-330.

Ishii, K.-i., Okimura, Y., and Nakazawa, K., 1975. On the genus *Colaniella* and its biostratigraphic significance. Journal Geosciences, Osaka City University, v. 19 (6), p. 107-129.

Jenny-Deshusses, C. and Baud, A., 1989. *Colaniella,* foraminifère index du Permien tardif téthysien : propositions pour une taxonomie simplifiée, répartition géographique et environnements. Eclogae geologicae Helvetiae, v. 82 (3), p. 869-901.

Jenny, C. and Stampfli, G., 2000. Permian palaeogeography of the Tethyan Realm. Permophiles, v. 37, p. 24-33.

Jenny-Deshusses, C., Martini, R. and Zaninetti, L., 2000. Découverte du foraminifère *Colaniella* Likharev dans le Permien supérieur de la vallée du Sosio (Sicile). Comptes Rendus de l'Académie des Sciences de Paris, v. 330, p. 799-804.

Jiang, Na-Yuan and Wang, Ke-Liang, 1985. An attempt to discuss the significance of *Colaniella* as facies-fossil. Journal of Stratigraphy, v. 9 (1), p. 47-52.

Jiang, Hong-Xia, Wu, Ya-Sheng and Cai, Chun-Fang, 2008. Filamentous cyanobacteria fossils and their significance in the Permian-Triassic boundary section at Laolongdong, Chongqing. Chinese Science Bulletin, v. 53 (12), p. 1871-1879.

Karavaeva, N.I. and Nestell, G.P., 2007. Permian foraminifers of the Omolon Massif, northeastern Siberia, Russia. Micropaleontology, v. 53 (3), p. 161-211.

Kiparisova, L.D., Markovsky, B.P., and Radchenko, G.P., 1956. Material for palaeontology, new families and genera. Vsesoyuznogo Nauchno-issledovatelskogo Geologicheskii Institut (VSEGEI) novya_seriya, Paleontologiya, v. 12, p. 1-354 (in Russian).

Kobayashi, F., 1997. Upper Permian foraminifers from the Iwai-Kanyo area, West Tokyo, Japan. Journal of Foraminiferal Research, v. 27 (3), p. 186-195.

Kobayashi, F., 1999. Tethyan uppermost Permian (Dzhulfian and Dorashamian) foraminiferal faunas and their paleogeographic and tectonics implications. Palaeogeography, Palaeoclimatology, Palaeoecology, v. 150, p. 279-307.

Kobayashi, F., 2002. Lithology and foraminiferal fauna of allochthonous limestones (Changhsingian) in the upper part of the Toyoma Formation in the South Kitakami Belt, Northeast Japan. Paleontological Research, v. 6 (4), p. 331-342.

Kobayashi, F., 2003. Palaeogeographic constraints on the tectonic evolution of the Maizuru Terrane of Southwest Japan to the eastern continental margin of South China during the Permian and Triassic. Palaeogeography, Palaeoclimatology, Palaeoecology, v. 195, p. 299-317.

Kobayashi, F., 2013. Late Permian (Lopingian) foraminifers from the Tsukumi Limestone, Southern Chichibu Terrane of eastern Kyushu, Japan. Journal of Foraminiferal Research, v. 43 (2), p. 154-169.

Kochansky-Devidé, V., 1964. Die Mikrofossilien des jugoslawischen Perms. Paläontologische Zeitschrift, v. 38, p. 180-188.

Kotlyar, G.V., Zakharov, Y.D., Kochirkevich, B.V., Kropacheva, G.S., Rostovtscev, K.O., Chediya, I.O., Vuks, G.P. and Guseva, E.A., 1984. Evolution of the latest Permian biota, Dzhulfian and Dorashamian stages of the USSR. Akademiya Nauk SSSR, Dalnevostochnyi Nauchnyi Tsentr, Biologo-Pochvennyi Institut Leningrad, p. 1-200 (in Russian).

Kotlyar, G.V., Zakharov, Y.D., Kropacheva, G.S., Pronina, G.P., Chediya, I.O. and Burago, V.I., 1989. Evolution of the latest Permian biota, Midian regional stage of the USSR. Leningrad "Nauka", Leningradskoe Otdelenie, p. 1-177 (in Russian).`

Kotlyar, G.V., Kropacheva, G.S., Sosnina, M.I., Pronina, G.P. and Chediya, I.O., 1990. Zonal divisions of Late Permian marine deposits of southern Primorye. In. New data on the Palaeozoic and Mesozoic biostratigraphy of the south Far-East. Akademiya Nauk SSSR, Dalnevostochnoe Otdelenie, Dalnevostochnyi Geologicheskii Institut, p. 104-116 (in Russian).

Kotlyar, G.V., Baud, A., Pronina, G.P., Zakharov, Y.D., Vuks, V.Y., Nestell, M.K., Belyaeva, G.V. and Marcoux, J., 1999a. Permian and Triassic exotic limestone blocks of the Crimea. Geodiversitas, v. 21 (3), p. 299-323.

Kotlyar, G.V., Nestell, G.P., Zakharov, Yu.D. and Nestell, M.K., 1999b. Changhsingian of the northwestern Caucasus, southern Primorye and southeastern Pamirs. Permophiles, v. 35, p. 18-22.

Leven, E.Ya., 1967. Stratigraphy and Fusulinids from the Permian deposits of Pamir. Akademiya Nauk SSSR., Geologicheskii Institut, Izdatelstvo Nauka, v. 167, p. 1-224 (in Russian).

Leven, E.Ya. and Okay, A.I., 1996. Foraminifera from the exotic Permo-Carboniferous limestone blocks in the Karakaya complex, northwestern Turkey. Rivista Italiana di Paleontologia e Stratigrafia, v. 102 (2), p. 139-174.

Likharev, B., Lyutkevich, E., Martynov, A., Ryabinin, A., Soshkina, E., Spizharskii, T., Khabakov, A., Chernov, A., Chernynshev, B., Shulga-Nesternko, M. and Yakovlev, N., 1939. Atlas of the leading forms of the fossil fauna U.S.S.R., tome 6 : Permian system. Tsentralnyi Nauchno-Issledovatelskyi Geologo-Razvedochnyi Institut (TsNIGRI), GONTI IKTP SSSR, Leningrad, Moskva, p. 32-47 (in Russian).

Lin, J.-X., 1978. Carboniferous and Permian Foraminiferida. In Hubei Instititute of Geological Science and others, eds. Paleontological atlas of Central South China (micropaleontological volume). Geological Publishing House, p. 10-43 (in Chinese).

Lin, J.-X., Li, L.-X., and Sun, Q.-Y., 1990. Late Paleozoic foraminifers in South China. Science Publication House, 1-269 (in Chinese).

Loeblich, A.R. and Tappan, H., 1964. Sarcodina, chiefly «Thecamoebians» and Foraminiferida. In Moore R.C. ed. Treatise of Invertebrate Paleontology, Part C, Protista 2. Geological Society of America and University of Kansas Press, 2 volumes, p. C1- 900.

Loeblich, A.R. and Tappan, H., 1985. *Cylindrocolaniella*, a new name for the foraminiferal genus *Wanganella* Sosnina, 1956 non *Wanganella*, Laserow, 1954. Journal of Foraminiferal Research, v. 15 (3), p. 218.

Loeblich, A.R. and Tappan, H., 1987. Foraminiferal genera and their classification. Van Nostrand Reinhold Company Publisher, 1 volume of text, X + 970 pp., 1 volume of plates, VIII + 212 pp. + 847 pl., New York.

Luperto, E., 1963. Nuovo genere di Foraminifero nel Permiano di Abriola (Potenza). Bolletino della Società Paleontologica Italiana, v. 2 (2), p. 83-88.

Lys, M., 1977. Biostratigraphie du Carbonifère et du Permien d'Afghanistan (micropaléontologie). Mémoires hors-série de la Société Géologique de France, v. 8, p. 291-308.

Lys, M., 1988. Biostratigraphie du Carbonifère en Mésogée (Espagne, Afrique du Nord, Régions Egéennes, Proche-Orient). Etudes micropaléontologiques (Foraminifères) paléobiogéographie. Documents du Bureau de Recherches Géologiques et Minières (B.R.G.M.), v. 147, p. 1-315.

Lys, M., Colchen, M., Bassoullet, J.P., Marcoux, J. and Mascle, G., 1980. La biozone à *Colaniella parva* du Permien supérieur et sa microfaune dans le bloc calcaire exotique de Lamayuru, Himalaya du Ladakh. Revue de Micropaléontologie, v. 23 (2), p. 76-108.

Mertmann, D. (with the collaboration of Sarfraz A.), 2000. Foraminiferal assemblages in Permian carbonates of the Zaluch Group (Salt Range and Trans Indus Range, Pakistan). Neues Jahrbuch für Paläontologie Monathefte, 2000 (3), p. 129-146.

Miklukho-Maklay, K.V., 1954. Foraminifers of the Late Permian deposits of the northern Caucasus. Trudy VSEGEI, Gosgeoltekhizdat, v. 1, p. 1-163 (in Russian; French translation BRGM n° 2683, p. 1-216).

Nakazawa, K., 1989. Correlation of the marine Upper Permian of Tethys. XIe Congrès International Stratigraphie Géologie Carbonifère, Beijing 1987, 2, p. 229-234.

Nakazawa, K., Ishii, K.I., Kato, M., Okimura, Y., Nakamura, K. and Haralambous, 1975a. Upper Permian fossils from Island of Salamis, Greece. Memoirs Faculty Sciences Kyoto University, series Geology Mineralogy, v. 41 (2), p. 21-44.

Nakazawa, K., Kapoor , H.M., Ishii, K.-i, Bando, Y., Okimura, Y., Tokuoka, T., Murata, M., Nakamura, K., Nogami, Y., Sakagami, S. and Shimizu, D., 1975b. The upper Permian and the lower Triassic in Kashmir, India. Memoirs of Faculty of Science, Kyoto University, series of geology and mineralogy, v. 42 (1), p. 1-106.

Nestell, G.P., Sudar, M.N., Jovanovi, D. and Kolar-Jurkovšek, T., 2009. Latest Permian foraminifers from the Vlaši mountain area, northwestern Serbia. Micropaleontology, v. 55 (5), p. 495-513.

Nguyen, Duc Tien N.D., 1979. Etude micropaléontologique (Foraminifères) de matériaux du Permien du Cambodge. Thèse 3e Cycle, Université Paris Sud Orsay, p. 1-166.

Nguyen, Duc Tien N.D., 1986. Foraminifera and algae from the Permian of Kampuchea. CCOP Technical Bulletin, v. 18, p. 116-137.

Okimura, Y., 1988. Primitive Collaniellid foraminiferal assemblage from the Upper Permian Wargal Formation of Salt Range, Pakistan. Journal of Paleontology, v. 62 (5), p. 715-723.

Okimura, Y., Ishii, K.-i. and Ross, C.A., 1985. Biostratigraphical significance and faunal provinces of Tethyan late Permian smaller foraminifera. In Nakazawa, K. and Dickins, J.M., eds. The Tethys, her paleogeography and paleobiogeography from Paleozoic to Mesozoic. Tokai University Press, p. 115-138.

Partoazar, H., 1995. Permian deposits in Iran. In Hushmandzadeh, A., ed. Treatise on the Geology of Iran, v. 22, p. 1-7 +1-340 (In Persian with English abstract).

Pillevuit, A., 1993. Les blocs exotiques du Sultanat d'Oman ; évolution paléogégraphique d'une marge passive structurale. Mémoires de Géologie, Lausanne, v. 17, p. 1-249.

Pronina, G.P. and Nestell, M.K., 1997. Middle and late Permian foraminifera from exotic limestone blocks of the Alma river basin, Crimea. In Ross C.A., Ross J.R.C. and Brenckle P.L., eds. Late Paleozoic foraminifera; their biostratigraphy, evolution, and paleoecology; and the Mid-Carboniferous boundary. Cushman Foundation for foraminiferal Research, Special Publication, v. 36, p. 111-114.

Pronina-Nestell, G.P. and Nestell, M.K., 2001. Late Changhsingian foraminifers of the northwestern Caucasus. Micropaleontology, v. 47 (3), p. 205-234.

Rauzer-Chernousova, D.M. and Fursenko, A.V., 1959. Fundamentals of paleontology, tome 1, Protista. Izdateltsvo Akademii, Moscow, p. 1-368 (in Russian).

Reichel, M., 1946a. Sur quelques foraminifères nouveaux du Permien méditerranéen. Eclogae Geologicae Helvetiae, v. 38 (2) (sic 1945), p. 524-560.

Reichel, M., 1946b. A propos de *Pyramis parva* Colani. Eclogae geologicae Helvetiae, v. 39, p. 371-373.

Renz, C. and Reichel, M., 1945. Beiträge zur Stratigraphie und Paläontologie des ostmediterranen Jungpaläozoïkums und dessen Einordnung in griechischen Gebirgssystem. Eclogae geologicae Helvetiae, v. 38 (2), p. 211-270.

Rigaud, S., Vachard, D., Martini, R. and Rettori, R. Agglutinated versus microgranular: End of a paradigm? Journal of Systematic Palaeontology (in press; DOI, p. 10.1080/14772019.2013.863232).

Rui, L. and Sheng, J., 1981. On the genus *Palaeofusulina*. Geological Society America, Special Paper, v. 187, p. 33-37.

Sengör, A.M.C., Altiner, D., Cin A., Ustaömer, T. and Hsü, K.J., 1988. Origin and assembly of the Tethyside orogenic collage at the expense of Gondwana Land. In. Audley-Charles M.G. and Hallam A., eds. Gondwana and Tethys. Geological Society London, Special Publication, v. 37, p. 119-181.

Shang, Q., Vachard, D. and Caridroit, M., 2003. Isolated Foraminifera from the Changxingian (uppermost Permian) of Southwest China. Acta Micropaleontologica Sinica, v. 20 (4), p. 377-388.

Sheng, J.C., 1963. Permian fusulinids of Kwangsi, Kueichow and Szechuan. Palaeontologica Sinica, n.s., B, 10, p. 1-247 (in Chinese).`

Song, Hai-jun, Tong, Jin-Nan, Chen, Z.Q., Yang, Hao and Wang, Yong-Biao, 2009. End-Permian mass extinction of foraminifers in the Nanpanjiang basin, South China. Journal of Paleontology, v. 83 (5), p. 718-738.

Sosnina, M.I., 1983. Some new representatives of the miliolids and nodosariids of the Late Permian of southern Primorye (Foraminifera). Ezhegodnik Vsesoyuznogo Paleontologischeskogo Obshchestva, v. 26, p. 29-47 (in Russian).

Toriyama, R., 1984. Summary of the fusuline faunas in Thailand and Malaysia. Geology and Paleontology of Southeast Asia, v. 25, p. 137-146.

Ueno, K. and Tsutsumi, S., 2009. Lopingian (Late Permian) foraminiferal faunal succession of a Paleo-Tethyan mid-oceanic carbonate buildup: Shifodong Formatio in the Changning-Menglian Belt, West Yunnan, Southwest China. Island Arc, v. 18, p. 69-93.

Ueno, K., Miyahigashi, A. and Charoentitirat, T., 2010. The Lopingian (Late Permian) of mid-oceanic carbonates in the Eastern Palaeotethys: stratigraphical outline and foraminiferal faunal succession. Geological Journal, v. 45, p. 285–307.

Vachard, D., 1980. Téthys et Gondwana au Paléozoïque supérieur; les données afghanes : biostratigraphie, micropaléontologie, paléogéographie. Documents et Travaux IGAL, Institut Géologique Albert de Lapparent, 2, 2 volumes, p. 1-463.

Vachard, D., 1990. Fusulinoids, smaller foraminifera and pseudo-algae from southeastern Kelantan (Malaysia) and their biostratigraphic and paleogeographic value. In Fontaine H. ed. Ten years of CCOP Research on the Pre-Tertiary of East Asia. CCOP Technical Publications, v. 20, p. 143-167.

Vachard, D. and Montenat, C., 1996. The Carboniferous of Afghanistan. In Wagner R., ed. Carboniferous of the World. IUGS Publication, v. 3, p. 459-487.

Vachard, D., Martini, R., Zaninetti, L. and Zambetakis-Lekkas, A., 1993. Révision micropaléontologique (Foraminifères, Algues) du Permien inférieur (Sakmarien) et supérieur (Dorashamien) du Mont Beletsi (Attique, Grèce). Bolletino della Società Paleontologica Italiana, v. 32 (1), p. 89-112.

Vachard, D., Zambetakis-Lekkas, A., Skourtso,s E., Martini, R. and Zaninetti, L., 2003. Foraminifera, algae and carbonate microproblematica from the Late Wuchiapingian/Dzhulfian (Late Permian) of Peloponnesus (Greece). Rivista Italiana di Paleontologia e Stratigrafia, v. 109, p. 339-358.

Vachard, D., Pille, L. and Gaillot, J., 2010. Palaeozoic Foraminifera: systematics, palaeoecology and responses to the global changes. Revue de Micropaléontologie, v. 53, p. 209-254.

Vuks, G.P. and Chediya, I.O., 1986. Foraminifers from Lyudyansk Suite (southern Primoye)). In: Correlations of Permian-Triassic deposits of Eastern USSR. Academy of Sciences USSR, Far-Eastern Scientific Centre, Institute of biology and Pedology, Project IGCP , v. 203, p. 82-88 (in Russian).

Wang, Kuo-Lien, 1966. On *Colaniella* and its two allied new genera. Acta Paleontologica Sinica, v.14 (2), p. 206-232 (in Chinese with English abstract).

Wang, Yue, Ueno, K., Zhang, Yi-Chun and Cao, Chang-Qun, 2010. The Changhsingian foraminiferal fauna of a Neotethyan seamount : the Gyanyima Limestone along the Yarlung-Zangbo Suture in southern Tibet, China. Geological Journal, v. 45, p. 308-318.

Zhao, J.-K., S. Jin-Zhang, Yao, Zhao-Qi, Liang Xi-Luo, Chen, Chu-Zhen, Ru,i Lin and Liao, and Zhuo-Ting, 1981. The Changhsingian and Permian-Triassic boundary of South-China. Bulletin Nanjing Institute Geology and Paleontology, Academia Sinica, v. 2, p. 58-69 (in Chinese with English abstract).

Permian-Triassic transition, Dead Sea, Jordan: preliminary report

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Siliciclastic sedimentary rocks outcropping along the northern margins of the Dead Sea, Jordan were first assigned a Triassic age by Cox (1932). Later Huckriede and Stoppel (in Bender, 1974) recognised Scythian conodonts high in the succession in what is now known as the Dardur Formation; while a Late Permian age was assigned to the lower part of the succession by Bandel and Khoury (1981). The sedimentology and structure of this lower part (known as the Umm Irna Formation) was studied in detail by, amongst others, Makhlouf (1987) and Powell and Moh'd (1993); but most recent work has focussed on well-preserved macro-plant fossils (e.g. Kerp et al., 2006) and palynology (Stephenson and Powell 2013, 2014). The palynomorph assemblages allowed correlation with similar Upper Permian successions across the

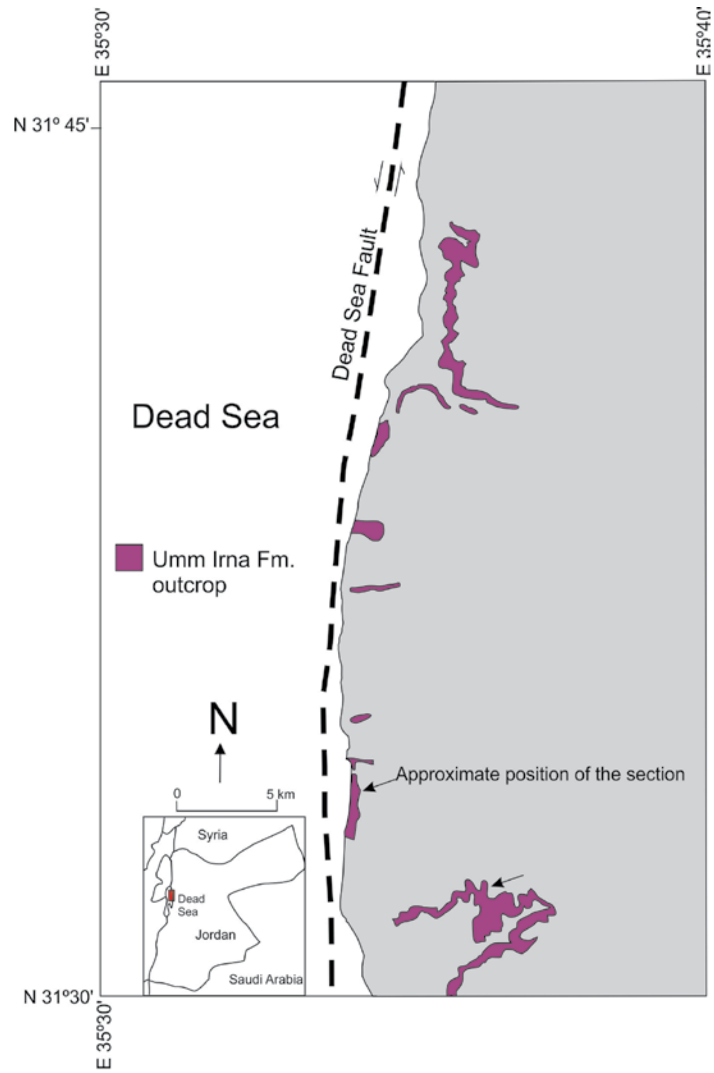

Fig. 1. Location of the section.

Arabian Platform such as the Gharif Formation and 'basal-Khuff clastics' which represent important hydrocarbon plays.

The upper surface of the alluvial Umm Irna Formation is marked by a major sequence boundary (see Stephenson and Powell, 2013, their fig. 7), above which lie the shallow red-bed marginal marine siliciclastic beds of the Himara Member (Ma'in Formation) passing up to greenish-grey-yellow marine siliclastic and thin carbonate beds of the Nimra Member (also Ma'in Formation; Fig. 2). The thin carbonate beds which occur in two localities, a cliff section at N 31°32'25.5" E 35°33'30.3" and a road side section at N 31°32'27.4" E 35°33'32.2" were unrecognised in the field, or in the subsurface, up to now.

A preliminary study shows that the thin carbonate beds of the Nimra Member contain conodonts (including representatives of *Hadrodontina* Staesche,1964 and *Pachycladina* Staesche,1964) and foraminifera (representatives of *Cornuspira*? and *Meandrospira*) indicating an approximate age range of late Induan to early Olenekian.

A Capitanian to Wuchiapingian age range was derived from spores and pollen from paralic to fluvial facies in the upper part of the Umm Irna Formation stratigraphically around 15 metres below the

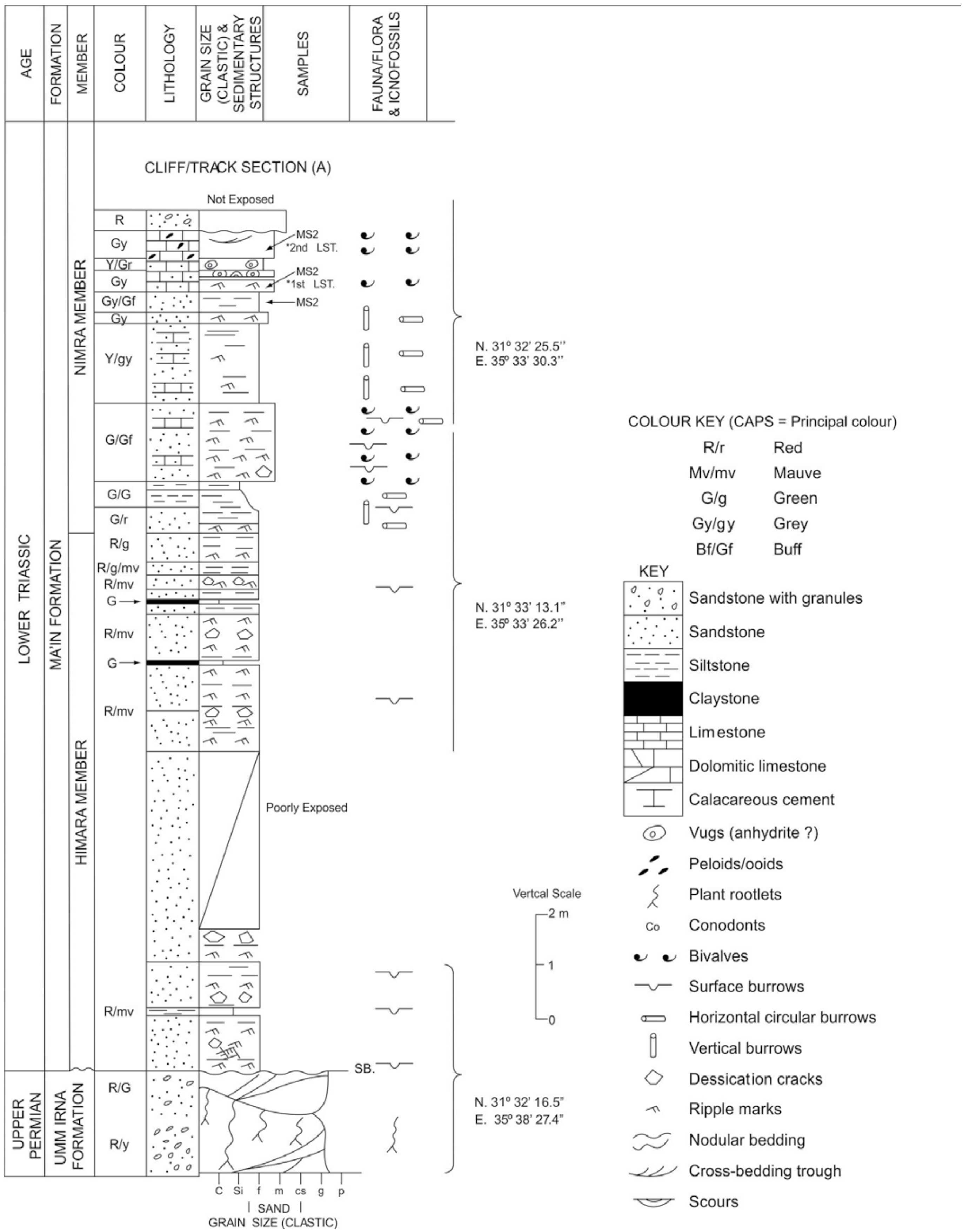

Fig. 2 Sedimentary log of the cliff section at N 31°32’25.5’’ E 35°33’30.3’’.

limestone beds of the Nimra Member(see Stephenson and Powell, 2013, their fig. 9). Recent work suggests that the Umm Irna assemblages are in the upper part of that range (Stephenson and Powell 2014). At present it is now known whether the sequence boundary that separates the paralic/fluvial succession of the Umm Irna Formation from the overlying shallow marine Himara Member represents a significant time gap. If it does not, then it is possible that claystone and siltstone units below the fossiliferous Nimra Member (Fig. 2) may contain fossils allowing sequences to be further constrained by age. More details of the conodont and foraminifera faunas will be described in subsequent papers, and further samples for biostratigraphy will be collected in 2015.

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References

Bandel, K. and Khoury, H. 1981. Lithostratigraphy of the Triassic in Jordan. Facies, v. 4, p. 126.

Bender, F. 1974. Geology of Jordan, Gebruder Borntraeger, Berlin, pp. 196.

Kerp, H., Abu Hamad, A., Vörding B. and Bandel K., 2006. Typical Triassic Gondwana floral elements in the Upper Permian of the paleotropics. Geology, v. 34, p. 265-268

Makhlouf, I.M. 1987. The stratigraphy and sedimentation of Upper Cambrian, PermoTriassic and Lower Triassic rocks along the northeastern margin of the Dead Sea basin, Jordan. Unpublished Ph.D thesis, University of Newcastle upon Tyne, U.K.

Powell, J.H. and Moh'd, B.K. 1993. Structure and sedimentation of Permo-Triassic and Triassic rocks exposed in small-scale horsts and grabens of pre-Cretaceous age; Dead Sea margin, Jordan. Journal of African Earth Sciences, v.17, p. 131-143.

Stephenson, M.H. and Powell, J. H. 2013. Palynology and alluvial architecture in the Permian Umm Irna Formation, Dead Sea, Jordan. GeoArabia, v. 18, p. 17-60.

Stephenson M.H. and Powell J.H. 2014. Selected spores and pollen from the Permian Umm Irna Formation, Jordan, and their stratigraphic utility in the Middle East and North Africa. Rivista Italiana di Paleontologia e Stratigrafia, v. 120, p. 145-156.

Report on the first IGCP 630 field workshop, November 17-22, 2014, in Kashmir (India)

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The IGC Program 630, started in 2014, aims to investigate the recovery of ecosystems following the end-Permian mass extinction through the analysis of the rock and fossil records via studies of biostratigraphy, paleontology, paleoecology, sedimentology,

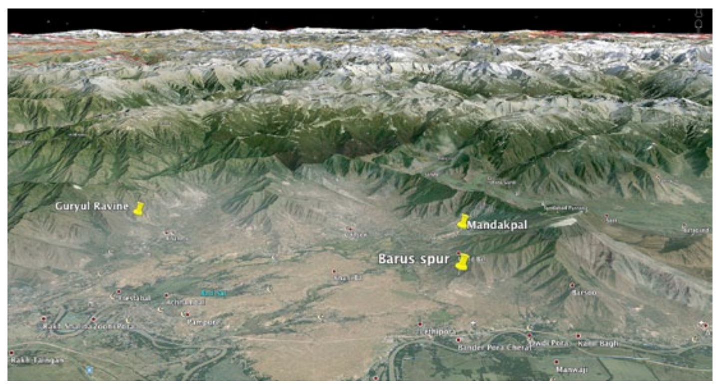

Fig. 1. Google Earth oblique view of the three main visited localities in the Kashmir Valley: Guryul Ravine, Mandakpal and Barus Spur.

geochemistry and biogeochemistry. Professors Ghulam Bhat and Zhong Qiang Chen have organized the first IGCP 630 field workshop. Due to catastrophic flooding in Kashmir Valley during September 2014, the workshop planned in October was postponed to November 17-22, 2014. One of us (AB) prepared with Prof. Ghulam Bhat the Field workshop guidebook (Baud and Bhat, ed., 2014). This guide-book takes account of the important contributions of Nakazawa et al. (1975), Nakazawa and Kapour (1981), and Brookfield et al. (2003).

On November 17, at Hotel Heemal restaurant, Srinagar, a welcome address was given to the participants by Prof. Ghulam Bhat, followed by a short presentation of the IGCP 630 Program by its leader Prof. Zhong Qiang Chen.

Dr. Aymon Baud presented an introduction to the fieldtrip, with the main topics to be discussed on the late Permian transgression, the Permian-Triassic transition, the lower Triassic stratigraphic succession at the three main visited localities: Guryul Ravine, Mandakpal and Barus Spur, all situated in the Kashmir Valley (Fig. 1).

The first day of the field workshop, November 18, was dedicated to

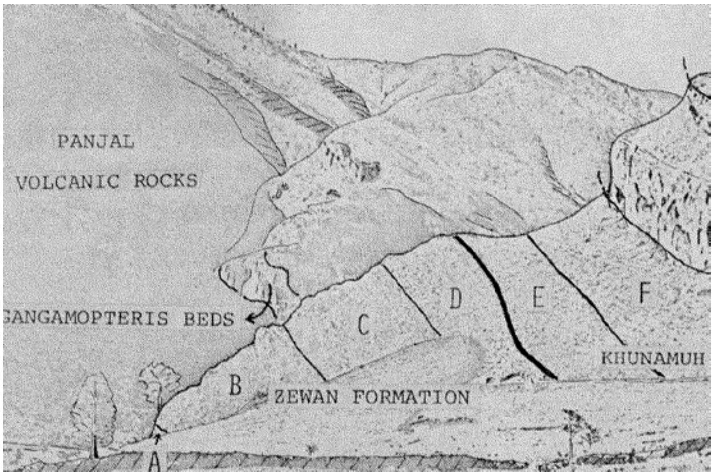

Fig. 2. Part of the Nakazawa et al. (1975, plate 1) showing the succession of Members B to D of the Zewan Formation and Members E, F and G of the Khunamuh Formation.

the Permian marine transgression over the Lower Permian Panjal Traps, about 3 km thick in the area, and to the upper Permian Zewan Formation followed by the lower Khunamuh Permian-Triassic transition beds.

During the first stop, the participants had opportunity to look at the contact between the Lower Permian Panjal Trap and at the Middle Permian Gangamopteris unit with his distinctive white Novaculites beds (Figure on the Permophiles cover page).

The complete Upper Permian Zewan Formation was crossed and examined in next stops 2 to 5 with examinations of the fossiliferous carbonate platform of the Member A and the calcareous sandstone and shale of Members B, C and D (Fig. 2). Lower and upper seismite beds crop well out in the upper part and at the top of the Member D (Fig. 3). The tsunamite deposits published by Brookfield et al. (2013) were the subjects of closely examination as the following Permian-Triassic transition beds of Member E1 of the Khunamuh Formation (Algeo et al., 2007). Prof. Zhong Chen and his two PhD students, Lei Zhang and Yuangeng Huang started a detailed sampling of the E and F members of the Khunamuh Formation along the measured section prepared in 2012 and 2013 by Nicolas Goudemand, Max Meyer, Morgane Brosse and Marc Leu with the help of Prof. Ghulam Bhat (red numbering). A new carbon isotope study of the uppermost Permian and all the Lower Triassic succession is in preparation (Goudemand et al., in prep.) and the former carbon isotope curve of Baud et al. (1996) was discussed in the guidebook.

The Olenekian part of the Guryul Ravine section (Fig. 4) was examined and sampled during the next day, November 19. The section started with the cliff forming Member G of the Khunamuh Formation formed by thick bedded limestones well cropping out within four old quarries; the thin bedded limestone of the overlying Member H were examined in the eastern quarry. Sampling was done higher up, 200 m above the quarry, along the measured section worked out in 2013 by Marc Leu, Morgane Brosse and Aymon Baud. It consists of limestones and shales, Smithian to Spathian transition in age, followed by nodular limestone with a seismite bed at the top (Leu et al., 2014). From the overlying Spathian massive limestone cliff only a red limestone near the top was sampled.

The new Mandakpal section, about 15 km east of Guryul Ravine was the subject of November 20 field work. During the first stop we looked at a brachiopod rich interval, about 2 m thick, corresponding to the upper part of Member B in Guryul Ravine (late Wuchiapingian – early Changhsingian) and our brachiopod

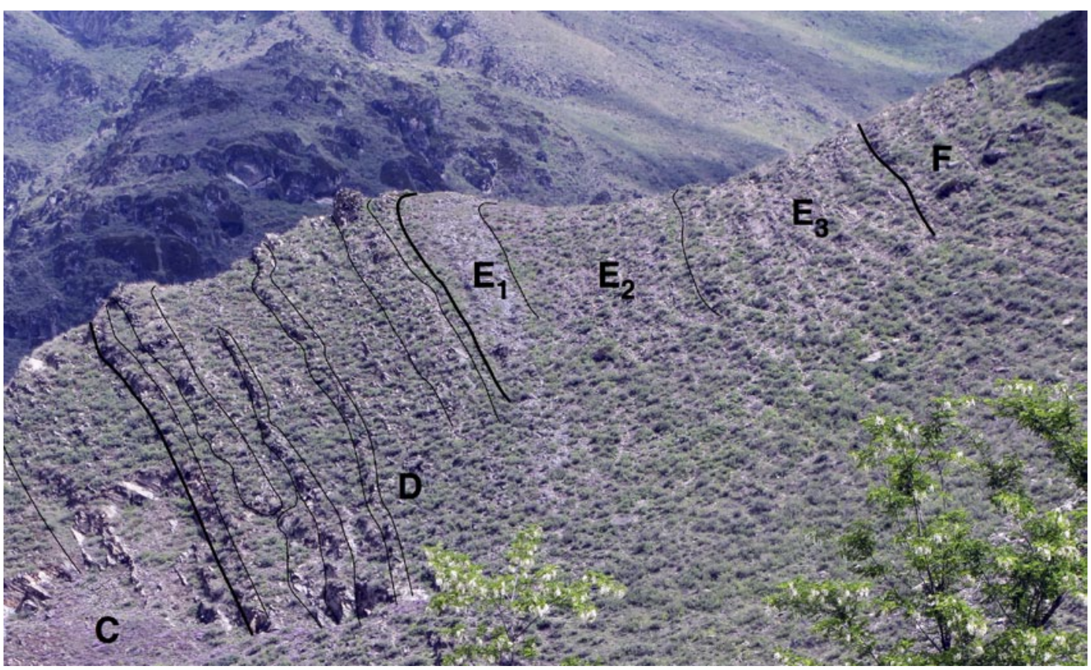

Fig. 3. Field view of the top of the Zewan Formation (members C and D) with mass flows, slumped channels and lower seismite beds (1, 2, 3) overlain by the upper seismite (4) and a tsunamite bed (5) according to Brookfield et al. (2013) and by Members E and F of the Khunamuh Formation. The Permian-Triassic boundary is at the base of Member E2.

Fig. 4. Field view of the Olenekian members G, H and I of the Khunamuh Formation with the quarries (Q2- Q4) as seen during the second workshop day (Nov 19th).

Fig. 5. A 15 m-thick succession from the upper Zewan Formation to the basal Khunamuh Formation. The seismite (?) level is correlated with bed 46 (top of Zewan Formation) in Guryul Ravine section and unit Zewan D up is missing in Guryul Ravine.

specialist, Prof. Zhong Qiang Chen started to collect individual brachiopod specimens belonging at least to 20 various species, with the help of his two PhD students. This level is cropping out about 30m above the top of the Zewan Member A -limestone cliffs housing very recent large quarries.

The second stop deals with the correlative seismite bed cropping out at the top of Zewan Formation in the Guryul Ravine section. But to our surprise we noticed that in Mandakpal the seismite bed is not at the top, but at least 10 m below the top of Zewan Formation (Fig. 5). Seemingly, these 10 m of uppermost Zewan with shales and calcareous sandstones are missing in the Guryul Ravine section.

The next stop 3 was the upper quarry with the outcrop of upper part of the correlative Member F of Guryul Ravine with here an interval of black limy mudstones and shales. Within the northern wall of the quarry, the overlying correlative Olenekian members G and H of Guryul Ravine can be well seen at distance (Fig. 6).

As shown to the participants, all the quarries along the hill mainly consist of lower Olenekian limestones. At the end of the day, Prof. Ghulam Bhat invited all the participants to his new house for a tea with delicious cakes and cookies.

The Barus Spur section, about 10 km SW of Mandakpal, was the subject of the last field workshop day, November 21. Looking first to the contact with the Panjal Traps (Fig. 7) we took attention to the very thick, white, siliceous novaculite beds. Above, the correlative limestones of the upper part of Member A of the Zewan Formation are very rich in bryozoans (Fig. 8). Again, the about 2-m-thick brachiopod rich interval of the upper Member B was well exposed and a detailed sampling was done by Prof. Zhong Qiang Chen and his students. Higher up, and as in the Mandakpal section, the seismite bed is not at the top but at least 7 m below the top of the Zewan Formation (Member D, Fig. 9). The following Member E of the Khumamuh was densely sampled by Prof. Zhong Qiang Chen and his Ph. D. students. A group photo was taken in the foot of the hills (Fig. 10).

In the evening, the official dinner took place in a newly reopened Restaurant close to Heemal hotel. The participants warmly thanked the organizers, and particularily Prof. Ghulam Bhat.

On November 22, most of the participants started their long travel home and Prof. Ghulam Bhat provided the necessary special permission paper for sample exportation asked by some of the participants.

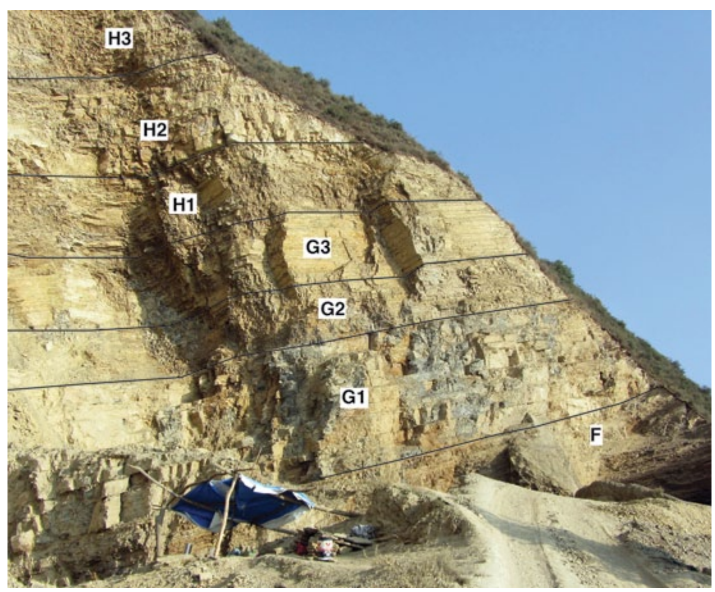

Fig. 6. The upper quarry wall showing the Olenekian limestone lithological units (see text above).

References

Algeo, T.J., Hannigan, R., Rowe, H., Brookfield, M., Baud, A., Krystyn, L. and Ellwood, B.B., 2007. Sequencing events across the Permian-Triassic boundary, Guryul Ravine (Kashmir, India). Palaeogeography, Palaeoclimatology, Palaeoecology, v. 252, p. 328-346.

Fig. 7. Prof. Z.Q. Chen showing the contact of white novaculite beds over the Panjal Traps.

Fig. 8. Bryozoan beds of the upper part of Member A of the Zewan Formation.

Fig. 9. View on the top of the Zewan Formation seismite and Zewan D up, followed by the correlative shaly Member E1 of the Khunamuh Formation, about 6 m thick.

Baud, A., Atudorei, V. and Sharp, Z., 1996. Late Permian and Early Triassic Evolution of the Northern Indian Margin: Carbon Isotope and Sequence Stratigraphy. Geodinamica Acta, v. 9, p. 57-77.

Baud, A. and Bhat, G., ed. 2014. The Permian-Triassic transition in the Kashmir Valley. IGCP 630 Field Guide Book 1, p.1-36.

Brookfield, M.E., Algeo, T.J., Hannigan, R., Williams, J. and Bhat, G.M., 2013. Shaken And Stirred: Seismites and tsunamites at the Permian-Triassic Boundary, Guryul Ravine, Kashmir, India. Palaios, v. 28 (8), p. 568-582.

Brookfield, M.E., Shellnutt, J.G., Qi, L., Hannigan, R., Bhat, G.M. and Wignall, P.B., 2010. Platinum element group variations at the Permo-Triassic boundary in Kashmir and British Columbia and their significance: Chemical Geology, v. 272, p. 12-19.

Brookfield, M.E., Twitchett, R.J., and Goodings, C., 2003. Palaeoenvironments of the Permian-Triassic transition sections in Kashmir, India. Palaeogeography Palaeoclimatology Palaeoecology, v. 198, p. 353-371.

Leu, M., Baud, A., Brosse, M., Meier, M., Bhat, G., Bucher, H. and Goudemand, N., 2014. Earthquake induced soft sediment deformation (seismites): new data from the Early Triassic Guryul Ravine section (Kashmir). In 19th International Sedimentological Congress 2014, Geneva, Switzerland, Abstract book, p. 396.

Nakazawa, K. and Kapoor, H.M., 1981. The Upper Permian and Lower Triassic faunas of Kashmir. Memoirs of the Geological Survey of India, New Series, v. 46, p. 1-204.

Nakazawa, K., Mohan Kapoor, H., Ishii, K., Bando, Y., Okimura, Y. and Tokuoka, T., 1975. The Upper Permian and Lower Triassic in Kashmir, India. Mem. Fac. Sci., Kyoto Univ., Ser. Geol. and Min., v. 42, p. 1-106.

Fig. 10. Participants in front of the Barus Spur hills.

Report on the activities of the Nonmarine-Marine Correlation Working Group for 2014 – program for 2015 and future tasks

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The number of nonmarine Carboniferous and Permian stratigraphers is very low compared to that of marine stratigraphers working on this time interval. In order to obtain more man power for the Nonmarine-Marine Correlation Working Group (NMCG), the chairs of the Subcommissions on Carboniferous (SCCS) and on Permian Stratigraphy (SPS), Barry Richards and Shuzhong Shen, agreed to organize a joint working group to study the global correlation between Carboniferous and Permian marine and nonmarine deposits. This agreement was made during a business meeting of the SCCS and the SPS linked to the International Meeting on the "Carboniferous-Permian Transition" at the National Museum of Natural History and Science, Albuquerque that was held from 19 to May 25, 2013 and organized by Spencer Lucas (Lucas et al., 2013).

As the kickoff for this now extended working group, a Field Meeting on Carboniferous and Permian Nonmarine-Marine Correlation was held at the Technical University Bergakademie Freiberg in Germany from July 21 to July 27, 2014. The aim of the meeting, organized by Joerg W. Schneider, Olaf Elicki, Stanislav Oplustil, and Spencer Lucas, was to bring together all colleagues who are interested in the correlation of Carboniferous, Permian and Early Triassic continental deposits with the global marine time scale (Elicki et al., 2014; Schneider et al., 2014). About 70 participants from Western and Eastern Europe, North and South America, North and South Africa, and Asia joined the meeting (Fig. 1). Two days of the meeting were devoted to scientific presentations, followed by five days of field excursions to the most important Carboniferous and Permian outcrops in eastern Germany and the Czech Republic, including Permian-Triassic transitional outcrop sections. The Czech part of the excursion was prepared and guided by the team of Stanislav Oplustil, Charles University, Prague, and the German part by the team of Joerg W. Schneider, Technical

Fig. 1. Group photo during the Field Meeting on Carboniferous and Permian Nonmarine-Marine Correlation (CPC 2014), held at the Technical University Bergakademie Freiberg in Germany from July 21 to July 27, 2014.

Fig. 2. Continental Permian-Triassic transitional profile at Dalongkou, Xinjiang Uyghur Autonomous Region, sampled for conchostracan biostratigraphy, paleobotany and geochemistry during field work of the Sino-German cooperation group in September 2014.

University Bergakademie Freiberg. The excursions were supported by Stanislav Stamberg, Museum Hradec Kralove, Ronny Rößler, Museum of Natural Science and Petrified Forest Chemnitz, and Ralf Werneburg, Museum of Natural History Schleusingen.

On July 21, after the scientific session in Freiberg a joint SPS and SCCS business meeting together with a meeting of the "Sino-German Cooperation Group on Late Palaeozoic Palaeobiology, Stratigraphy and Geochemistry" was held. The meeting was chaired by Barry Richards for the SCCS, by Joerg W. Schneider for the SPS, and Hans Kerp for the Sino-German Cooperation Group. The most important outcomes of the meeting were firstly that the workers from the various continental basins should be challenged to promote their detailed local and regional knowledge toward the global aims of the SCCS and SPS. Reports on methods, results and perspectives of nonmarine as well as nonmarine – marine intra-basinal and inter-basinal correlations as well as of global correlations should be summarized in nonmarine-marine correlation charts (see below, Fig. 4). The decision was made, that all of the task groups on the Carboniferous and Permian subcommissions should include at least one geoscientist experienced in nonmarine-marine correlations. Leaders of the two subcommissions will need to search for volunteers to join the task groups. A second important outcome was the decision to establish cooperative research proposals to achieve the central goals of the working group. It was agreed that the proposals must be suitable for raising funds from various national and international sources for the realisation of our scientific goals. Fortunately, first activities of the second point have already been realised in 2014 as outlined below.

From September 6 to 18 a collaborative field work that included a meeting of the Sino-German Cooperation Group and a SPS workshop chaired by Shuzhong Shen, Joerg W. Schneider, Hans Kerp and supported by the Vice Chair of the SCCS, Xiangdong Wang, was carried out in NW China, Xinjiang Uyghur Autonomous Region. The fieldwork and the meeting focused on Late Permian and Permian/Triassic boundary nonmarine-marine correlations. The fieldwork during these two weeks and the preceding 4 weeks of fieldwork of a Sino-German team (PhD students from Nanjing and Freiberg) in South and North China were very successful. A wealth of samples around the PT-boundary for conchostracan and fossil plant biostratigraphy, isotopic ages and geochemistry was recovered from the excellent outcrops (Fig. 2) for collaborative studies.

In direct alignment with the goals of the Nonmarine-Marine Correlation Working Group the international "Kazan Golovkinsky Stratigraphic Meeting" was held from the 20 to 23 of October 2014 at the Kazan Federal University, Russian Federation, Republic of Tatarstan. The meeting was dedicated to "Carboniferous and Permian Earth systems, stratigraphic events, biotic evolution, sedimentary basins and resources" (Nurgaliev et al., 2014). Participants from Tatarstan, other federal republics of Russia, Germany, South and North Africa as well as France presented and discussed the latest results on marine and nonmarine Carboniferous and Permian biostratigraphy. During the meeting a further business meeting of the SCCS and the SPS was held, chaired by Alexander S. Alekseev, the chairman of the Russian Commission on Carboniferous Stratigraphy, and J.W. Schneider. Additionally, a meeting of the organizing committee of the XVIII International Congress on the Carboniferous and Permian (ICCP 2015) in Tatarstan, Russia, chaired by Vladimir V. Silantiev, the congress secretary, and Alexander S. Alekseev, was held. Preceding the meeting, five days of fieldwork and sampling for biostratigraphy and isotopic ages have shown the high quality of the outcrops in the Volga-Kama region of Tatarstan for the solution of the global Middle-Late Permian nonmarine-marine correlation problem (Fig. 3). Additionally, the excellent preparation and documentation of the outcrops on the East European platform for the ICCP 2015 excursions was demonstrated. This congress, for the first time held in the name-giving area of the Permian System, will be surely a very stimulating highlight for the tasks of the SCCS and SPS.

Summarizing the results of the last few years, the present state of nonmarine-marine correlation is demonstrated by Schneider et al. (2014). It is shown that starting from the Early Kasimovian, i.e. the base of the Late Pennsylvanian, to the Sakmarian/Artinskian transition in the Middle Cisuralian, several good and reliable direct biostratigraphic correlations between mixed marine-continental and purely continental profiles in North America and Europe do exist. They are also partially well supported by some isotopic ages. But, beginning in the Middle Cisuralian and lasting up to the Early Lopingian, no link of Euramerican continental deposits to the marine standard scale exists thus far. This lack of data is mainly caused by the transition from wet to dry red beds during the Kungurian (Schneider et al., 2010; Oplustil et al., 2013) and a thereby mostly restricted fossil content apart from tetrapod tracks and conchostracans. Additionally, most Euramerican continental profiles are very incomplete, and interrupted by several hiatuses. A solution of this problem could most likely be found on the Russian Platform in the Ural foreland. As shown by Sennikov & Golubev (2006, 2012), Newell et al. (2010), and Silantiev (2014) and others, the sections in the east of the Russian Platform provide a biostratigraphically well subdivided and uninterrupted sedimentary record from the late Early Permian (Kungurian) to the Middle Triassic (Ladinian). Correlations to the marine scale are tentative thus far. Fortunately, just recently in similar late Cisuralian to middle Lopingian sections of the Volga-Kama region near Kazan, volcanic ash horizons were discovered (pers. com. V. Davydov), which will enable more reliable correlations to the marine time scale. The correlation of the various continental basins with those sections on the Russian platform will be one of the most promising future tasks of the working group.

As discussed during the Freiberg meeting this year, the best way to promote nonmarine-marine correlations will be the joint compilation of annotated correlation charts (see e.g., Roscher & Schneider, 2005) by all interested colleagues. The result should be a joint presentation to the ICCP-XVIII Congress in Kazan 2015, followed by a joint publication of all contributors by the end of 2015 as was done by Menning et al. (2006). To start the work, a preliminary correlation chart of several basins is presented here (Fig. 4). We know this chart is wrong in many details, but it should provoke the researchers of the respective basins to contribute his/her detailed knowledge and to improve the interbasinal correlations and the correlation with the international chronostratigraphic scale. Those colleagues who are interested in the compilation of the correlation chart should contact Joerg W. Schneider via e-mail. He will send a CorelDraw and/or an Adobe Illustrator file of the chart for improvements as well as an example for the argumentation of correlations as demonstrated, e.g., in Roscher & Schneider (2005). Let us start now!

References

Elicki, O., Schneider, J.W. and Spindler, F., 2014. CPC-2014 Field Meeting on Carboniferous and Permian Nonmarine-Marine

Fig. 3. Outcrop of Middle to Late Permian fossiliferous continental deposits at the Monastery Ravine on the right bank of Volga River near Tetyushi town (180 km south of Kazan) in the Volga-Kama region of the East European Platform. V. Davydov, V. Golubev, and M.Arefiev sampling volcanic ashes.

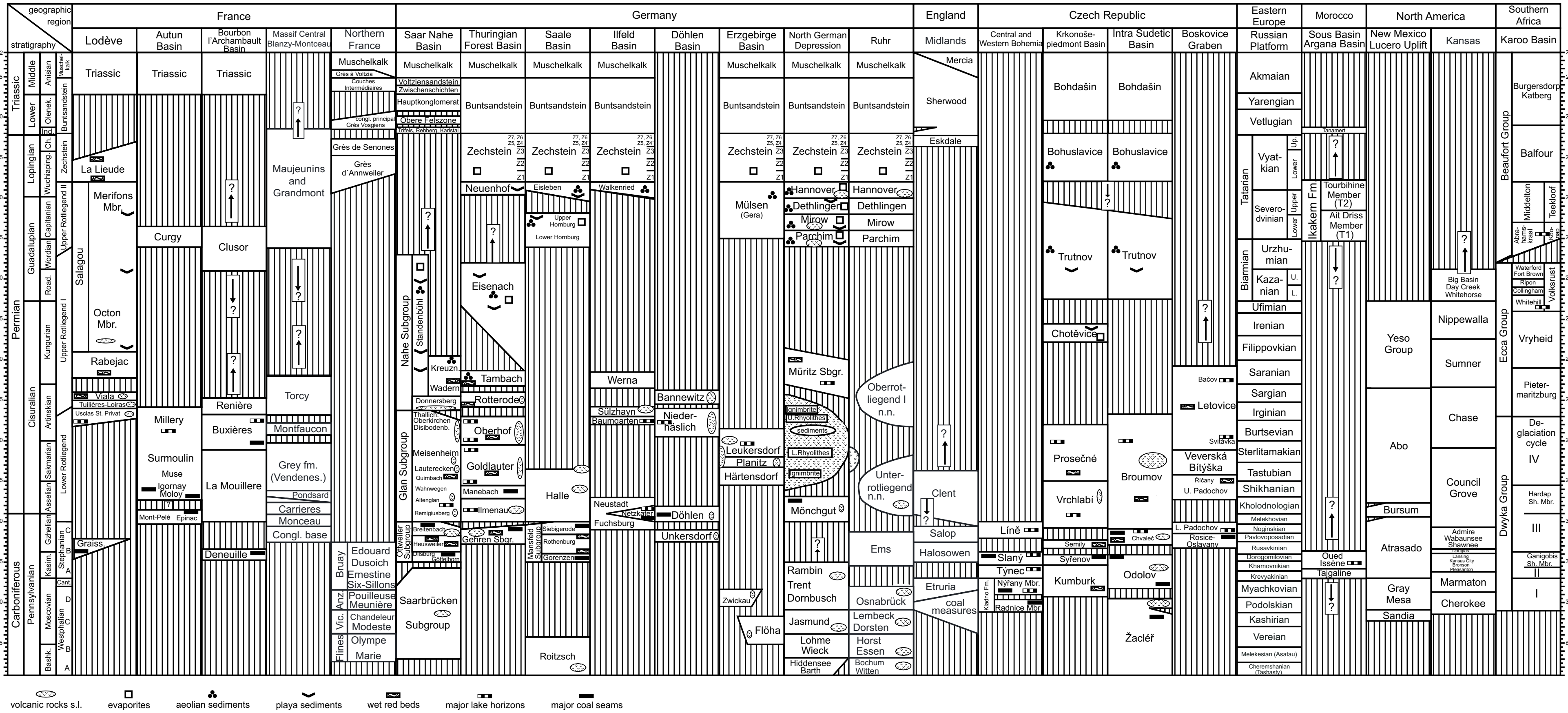

Fig. 4. Example of a nonmarine-marine correlation chart. It should provoke the researchers of the respective basins to contribute his/her detailed knowledge and to improve the interbasinal correlations and the correlation with the international chronostratigraphic scale. If you are interested in the joint compilation and publication of a global nonmarine-marine late Carboniferous to Early Triassic correlation chart, please ask JWS (Joerg.Schneider@geo.tu-freiberg.de) for a CorelDraw or Adobe Illustrator file of the chart and for the annotations of your correlations.

Correlation. Abstract Volume. Wissenschaftliche Mitteilungen, Institut für Geologie, v. 45, 80 pp.

Lucas, S.G., Di Michele, W.A., Barrick, J. E., Schneider, J. W. and Spielmann, J. A., eds, 2013. The Carboniferous-Permian transition. New Mexico Museum of Natural History and Science, Bulletin 60, 465 pp.

Menning, M., Alekseev, A.S., Chuvashov, B.I., Davydov, V.I., Devuyst, F.-X., Forke, H.C., Grunt, T.A., Hance, L., Heckel, P.H., Izokh, N.G., Jin, Y.-G., Jones, P.J., Kotlyar, G.V., Kozur, H.W., Nemyrovska, T.I., Schneider, J.W., Wang, X.-D., Weddige, K., Weyer, D. and Work, D.M., 2006. Global time scale and regional stratigraphic reference scales of Central and West Europe, East Europe, Tethys, South China, and North America as used in the Devonian-Carboniferous-Permian Correlation Chart 2003 (DCP 2003). Palaeogeography, Palaeoclimatology, Palaeoecology, v. 240, p. 318-372.

Newell A.J., Sennikov A.G., Benton M.J., Molostovskaya I.I., Golubev V.K., Minikh A.V., and Minikh M.G., 2010. Disruption of playa-lacustrine depositional systems at the Permo-Triassic boundary: evidence from Vyazniki and Gorokhovets on the Russian Platform. Journal of the Geological Society of London, v. 167, p. 695-716.

Nurgaliev, D. K., Silantiev, V.V. and Urazaeva, M.N., eds, 2014. Kazan Golovkinsky Stratigraphic Meeting "Carboniferous and Permian Earth systems, stratigraphic events, biotic evolution, sedimentary basins and resources", October, 20–23 2014. Abstract volume, 104 pp.

Opluštil, S., Šimůnek, Z., Zajíc, J. and Mencl, V., 2013. Climatic and biotic changes around the Carboniferous/Permian boundary recorded in the continental basins of the Czech Republic. International Journal of Coal Geology, v. 119, p. 114-151.

Roscher, M. and Schneider, J.W., 2005. An annotated correlation chart for continental late Pennsylvanian and Permian basins and the marine scale. In Lucas, S.G. and Zeigler, K.E., eds. The Nonmarine Permian, New Mexico Museum of Natural History and Science Bulletin, v. 30, p. 282-291.

Schneider, J.W., Lucas, S.G., Werneburg, R. and Rößler, R., 2010. Euramerican Late Pennsylvanian / Early Permian arthropleurid/tetrapod associations – implications for the habitat and paleobiology of the largest terrestrial arthropod . In Lucas, S. G., Schneider, J. W. and Spielmann, J. A., eds. Carboniferous-Permian transition in Canon del Cobre, northern New Mexico. New Mexico Museum of Natural History and Science, Bulletin, v. 49, p. 49-70.

Schneider, J.W., Opluštil, St. and Scholze, F., 2014. CPC-2014 Field Meeting on Carboniferous and Permian Nonmarine-Marine Correlation. Excursion Guide. Wissenschaftliche Mitteilungen, Institut für Geologie, v. 46, 121 pp.

Schneider, J.W., Lucas, S.G., Barrick, J., Werneburg, R., Shcherbakov, D.E., Silantiev, V., Shen, S.Z., Saber, H., Belahmira, A., Scholze, F. and Rößler, R., 2014. Carboniferous and Permian nonmarine-marine correlation – methods, results, future tasks. In Nurgaliev, D. K., Silantiev, V.V. and Urazaeva, M.N., eds. Kazan Golovkinsky Stratigraphic Meeting "Carboniferous and Permian Earth systems, stratigraphic events, biotic evolution, sedimentary basins and resources", October, 20–23 2014. Abstract volume, p. 73-77.

Sennikov, A.G. and Golubev, V.K., 2006. Vyazniki Biotic Assemblage of the terminal Permian. Paleontological Journal, v. 40, p. 475-481.

Sennikov, A.G. and Golubev, V. K., 2012. On the Faunal Verification of the Permo–Triassic Boundary in Continental Deposits of Eastern Europe: 1. Gorokhovets–Zhukov Ravine. Paleontological Journal, v. 46 (3), p. 313–323.

Silantiev, V.V. 2014. Permian Nonmarine Bivalve Zonation of the East European Platform. Stratigraphy and Geological Correlation, v. 22 (1), p. 1-27.

Abstract volumes of the Freiberg CPC-2014 Meeting as well as the Kazan Golovkinsky-Meeting 2014 and the CPC-2014 Excursion Guide are available as pdf´s under the following links:

CPC-2014 Meeting abstracts:
http://tu-freiberg.de/sites/default/files/media/palaeontologie---stratigraphie-1722/schneidj/cpc-2014_bookofabstracts.pdf

CPC-2014 Meeting excursion guide:
http://tu-freiberg.de/sites/default/files/media/palaeontologie---stratigraphie-1722/schneidj/cpc-2014_excursionguide.pdf

Kazan Golovkinsky abstracts:
http://tu-freiberg.de/sites/default/files/media/palaeontologie---stratigraphie-1722/schneidj/kazan_golovkinsky_stratigraphic_meeting_2014_abstract_volume.pdf

Abstract from "Modern Black Sea oceanography applied to the end-Permian extinction event" in press in Journal of Palaeogeography 2015

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The modern Black Sea has a mixed upper layer in the top 150–200 m of the water column, below which the water is anoxic, separated from the mixed layer by a redox boundary. There is limited vertical movement of water. Pyrite framboids form in the water column of the anoxic zone, then have been traditionally interpreted to sink immediately and accumulate in the sediments of the Black Sea. Thus the occurrence of framboids in sediments in the rock record is widely interpreted to indicate poorly oxygenated to anoxic conditions in ancient environments. However, in the Permian–Triassic boundary (PTB) microbialites of South China, which formed in shallow marine conditions in contact with the atmosphere, the published occurrence of framboids is inconsistent with abundant gastropod and ostracod shells in the microbialite. Furthermore, in the modern Black Sea: (a) framboids may be suspended, attached to organic matter in the water column, thus not settle to the sea floor immediately after formation; and (b) the redox zone is an unstable complex area subject to rapid vertical water movement

including occasional upwelling /Fig. 1).

The model presented here supposes that upwelling through the redox zone can lead to upward transport of suspended pyrite framboids into the mixed layer. Advective circulation could then draw suspended framboids onto the shelf to be deposited in oxygenated sediments. In the Permian–Triassic transition, if framboids were upwelled from below the redox boundary and mixed with oxygenated waters, sediment deposited in these conditions could provide a mixed signal for potentially misleading interpretations of low oxygen conditions. However, stratigraphic sampling resolution of post-extinction microbialites is currently insufficient to demonstrate possible separation of framboid-bearing layers from those where framboids are absent.

Profound differences between microbialite constructors and sequences between western and eastern Tethys demonstrate barriers to migration of microbial organisms. However, framboid occurrences in both areas indicate upwelling and emphasise vertical movement of water from the lower to upper ocean, yet the mixed layer advective motion may not have been as effective as in modern oceans. In the modern Black Sea, such advection is highly effective in water mixing, and provides an interesting contrast with the PTB times.

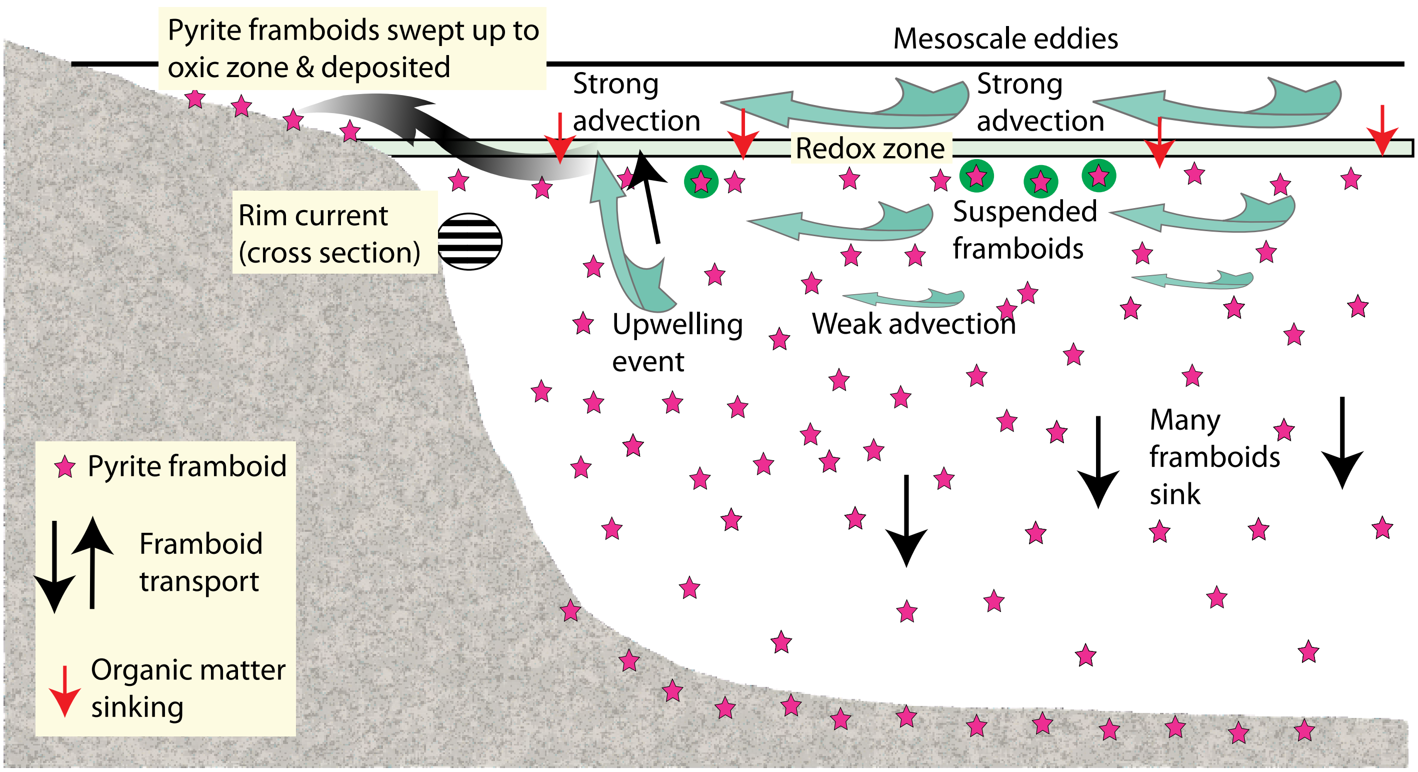


Fig. 1. Possible transport paths of pyrite framboids in the Black Sea.

OBITUARY

MARINA V. DURANTE (1934-2014)

On 29 October 2014, well-known Russian palaeobotanist Dr. Marina Viktorovna Durante died after a prolonged illness.

She was born 26 January 1934 in Dmitrov (Moscow region). In 1957 she graduated from the Geological Department of Moscow State University as a geologist and stratigrapher.

In 1957–1965 M.V. Durante worked on several expeditions of "Aerogeology" Trust under extremely difficult conditions in the regions of Altay-Sayana mountains and Verkhoyanie, studying the geology and stratigraphy of the Middle and Upper Palaeozoic deposits. In 1967 she took part in the geological survey of the territory of Mongolian Peoples Republic and at that time began to study fossil plants under the guidance of S.V. Meyen (1935–1987).

In 1968 M.V. Durante became a post-graduate student in the Geological institute of USSR (= Russian) Academy of Sciences. Her PhD thesis (1971) was untitled "Palaeobotanical basing of the stratigraphy of the Upper Palaeozoic of Mongolian Peoples Republic". In the following years M.V. Durante conducted fruitful investigations of the Upper Palaeozoic floras and stratigraphy of Siberia, Mongolia and North China.

M.V. Durante was a member of Interdepartamental stratigraphical committee of the USSR, as well as of the corresponding international commissions, subcomissions and working groups in the field of Carboniferous and Permian stratigraphy. She took part in several international research programs and projects, and was a co-author of fundamental monograph "The Carboniferous of the World". After S.V. Meyen's death, she was the go-to expert on

the palaeobotany and phytostratigraphy of the Upper Palaeozoic Russian.
Her last years were burdened by serious trials: she became blind and lost much physical strength, but did not lose hope. Her spirit and optimism, modesty and kindness remains in the memory of her disciples and colleagues.

I.A. Ignatiev and Yu.V. Mosseichik.
Any and all transliteration errors are attributable to M.T. Dunn.

CARMINA VIRGILI (1927-2014)

Carmina Virgili died in Barcelona on the 21st of November, 2014 where she was born 87 years ago.
During her academic career she lectured in Stratigraphy at Barcelona (1949-1963), Oviedo (1963-1968) and Madrid (1968-1996).
She was a pioneer on the modern studies of the Permian and Triassic in Spain, starting with her Ph.D. Thesis (1956), in which she made the first correct interpretation of the Triassic successions of the Catalan Coastal Ranges and remains the reference work for the Triassic of Northeastern and Central Spain.
In 1968, she created a research team at the Complutense University of Madrid dedicated to the Permian and Triassic stratigraphy and paleogeography, still active. Under her direction, fundamental new data were discovered: the presence of Permian sediments in the Iberian Ranges and Central System (Central Spain), the correct description and dating of Lower Permian, Upper Permian and Triassic sediments in Central and Eastern Spain, the interpretation of their mutual relationship, boundaries and subdivision into Formations and Members, changing radically the previously accepted interpretations, among many others.
She introduced in Spain the palynological techniques in collaboration with the Laboratories of the Universities of Strasbourg (France) and Utrecht (Holland) with great success, as all the main continental and shallow marine formations of the Permian and the Triassic were dated and the inter-basinal correlations were refined up to European standards. She encouraged many of the members of the research team to have long periods of study at French and English Universities, a very unusual practice in Spain in the 70's and 80's.
She acted as the Spanish representative in several IUGS-UNESCO Research Programs and in the IUGS-UNESCO Sub-commissions on Permian and Triassic Stratigraphy.
She published more than one hundred scientific articles and books. At the end of her scientific career she became interested in the History of Geology and wrote a book on Lyell and several articles on the relationship of the English geologist and Spain.
She was the first woman to be Professor (1963) and Dean of a Faculty (1977) after the Spanish Civil War. She was Junior Minister for Universities and Research (1982-1985, Dean of the College d'Espagne, Cité Universitaire, Paris (1987-1996) and Senator for Barcelona, Labour Party (1996-2000).
Carmina will be dearly missed by her former students, disciples, friends and colleagues in different institutions.

Alfredo Arche

Fig. 1 Prof. Carmina Virgili receiving the Honour Medal of the Universidad Complutense de Madrid in January 2013).

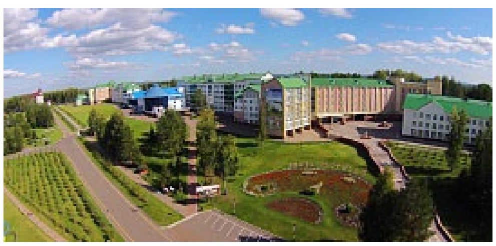
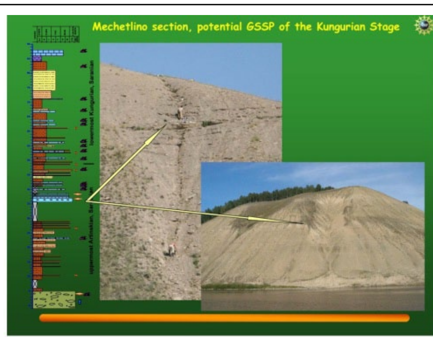
ANNOUNCEMENTS

Call for participation in a field excursion to the Cisuralian candidate GSSPs

This is an invitation for all SPS voting members and any other colleagues who are interested in a field excursion organized by the Permian Subcommission on Stratigraphy to investigate the three candidate Cisuralian GSSPs in the southern Urals. The field excursion will be guided by Dr. Valery Chernyk who has most intensively studied the conodonts of the three GSSP candidates. The three sections are: 1) Usolka section, the best-exposed section for the Carboniferous/Permian boundary and the Sakmarian and Artinskian boundary with abundant conodonts, fusulinids and ash beds; 2) Dal'ny Tulkas section, the Sakmarian/Artinskian boundary candidate; 3) Mechetlino Quarry and Mechetlino sections, candidates for the Kungurian-base GSSP.

SPS hopes that all voting members will take this opportunity to visit all three sections; SPS will apply for some financial support from ICS to cover a part of the excursion fees for all voting members who are willing to join in the excursion (depending upon how many members decide to participate).

Below is the detailed itinerary for the excursion between August 6-8, 2015 just BEFORE the ICCP meeting in Kazan. All participants will attend the ICCP meeting after the field excursion.

Date		Program
06.08	 Resort Yangan-Tau	Arrival to Ufa (preferably in the first half of the day). (fare around 100 Euro) 14.00. Departure from Ufa to Yangan-Tau by a bus (http://www.yantau.ru/eng/). Evening meal in Lido-na-Pushkina Restaurant http://lido-ufa.ru/restorani/lido-na-pushkina/ Bashkirian and European cuisine
07.08	 Mechetlino Section  Resort Krasnousolsk	8.30 – 14.00. Departure from Mechetlino, base of the Kungurian GSSP candidate 14.00-15.00. Lunch 15.00 -19.00. Trip to the resort Krasnousolsk (http://krasnousolsk.ru/3d/)

08.08	 Usolka Section  Dal'ny Tulkas Section	08.00. Departure from Usolka section, base of the Sakmarian GSSP candidate 08.30 -12.00 Sampling Upper Carboniferous and Lower Permian deposits, fossil collecting 13.00-15.00 Lunch. 15.00-19.00 Departure from Dal'ny Tulkas section, base of the Artinskian GSSP candidate 19.00-20.00 Dinner
09.08	 Schichani Section	07.30. Departure from Krasnousolsk to Ufa. 08.00-10.00. Stop on the Schichani Section. 10.00-12.00. Trip to the Ufa airport, flight to Kazan .

Cost of excursion – 500$

KAZAN FEDERAL UNIVERSITY

Русский

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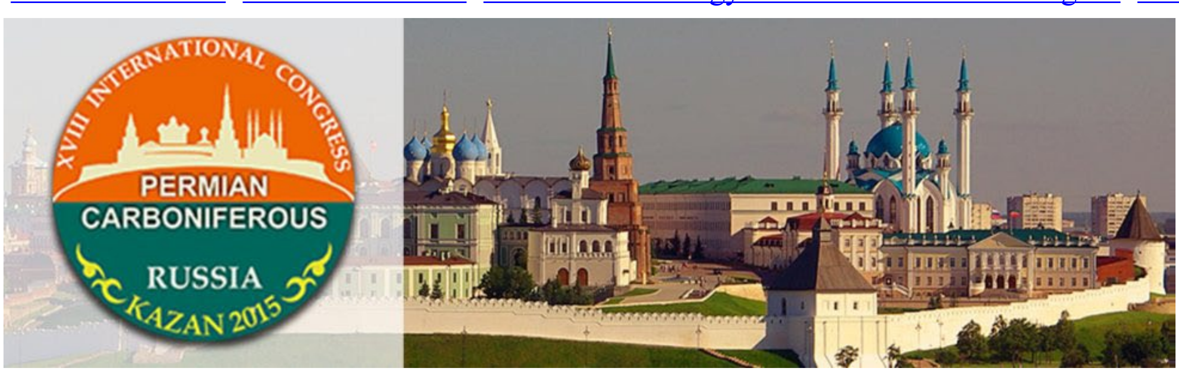

ICCP 2015

First Circular

XVIII INTERNATIONAL CONGRESS ON THE CARBONIFEROUS AND PERMIAN

(ICCP 2015)

Invitation

It is our privilege and pleasure to invite you to the XVIII International Congress on the Carboniferous and Permian, to be held at the Kazan Federal University, City of Kazan, Russia, August 11 – August 15, 2015.

The Carboniferous and Permian successions of Russia have a long history of study and are renowned for excellent outcrops that occur over a vast territory, a considerable variety of depositional types, and abundant fossils. This makes Russia one of the most famous and popular locations for basinal studies, global and regional tectonic reconstructions, paleogeographical and biostratigraphic research, and upper Paleozoic fossil collecting. Carboniferous and Permian research in Russia has recently seen a marked increase in activity. National and international projects have focused on documentation of candidates for global stratotypes for stage and substage boundaries in historical and newly discovered sections, and paleotectonic reconstructions of the Uralian Ocean, leading to new interpretations of the evolution of the Paleo-Tethys. Considerable progress was made in the study of Carboniferous and Permian successions in Siberia and the Russian Far East. Exciting fossil excavations revealed new faunas in the Cis-Uralian Region, which in combination with modern geochemistry technologies has led to great advances in our understanding of the paleoclimate at the end of the Paleozoic, and new insights into the causes and consequences of Carboniferous-Permian events, especially the P-T extinction. The ICCP-XVIII Congress in Kazan will provide an important forum for discussion of the most relevant cutting-edge topics of Carboniferous-Permian geology and paleontology, and a unique opportunity to see and collect from exceptional geological localities in the European and Asian regions of Russia.

General sponsors

Russian Academy of Sciences

Interdepartmental Stratigraphic Committee of Russia

Carboniferous and Permian Commissions of Russia

The International Subcommission on Carboniferous Stratigraphy

The International Subcommission on Permian Stratigraphy

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Congress Organizers

Kazan (Volga region) Federal University

Lomonosov Moscow State University

A.P. Karpinsky Russian Geological Research Institute (VSEGEI), St.-Petersburg

The Paleontological Institute, Russian Academy of Sciences, Moscow

The Geological Institute, Russian Academy of Sciences, Moscow

Perm State National Research University

The Zavaritsky Institute of Geology and Geochemistry, Russian Academy of Sciences, Ural Branch, Ekaterinburg

Institute of geology of the Ufimian scientific centre, Russian Academy of Sciences, Ufa

North-East Interdisciplinary science research institute, Russian Academy of Sciences, Far East Branch, Magadan

Organizing committee

President of the XVIII International Congress on the Carboniferous and Permian
Professor Ilshat R. Gafurov
Rector of Kazan (Volga Region) Federal University

Chairman of Tatarstan Rectors Union

http://kpfu.ru/about-university/ilshat-gafurov

Chairman of the Organizing Committee
Professor Danis K. Nurgaliev
Vice-Rector for Research
Director of Institute of Geology and Petroleum Technologies
http://kpfu.ru/about-university/danis-nurgaliev

Scientific Committee

Alexander S. Alekseev, Igor V. Budnikov, Alexander S. Biakov, Zhong Q. Chen, Boris I. Chuvashov, Annette E. Goetz, Valeriy K. Golubev, Natalia V. Goreva, Olga L. Kossovaya, Galina V. Kotlyar, Elena I. Kulagina, Svetlana V. Nikolaeva, Tamara I. Nemyrovska, Victor V. Ogar, Galina Y. Ponomareva, Barry C. Richards, Shuzhong Shen, Vladimir V. Silantiev

Venue

The City of Kazan is among the most ancient cities in Russia. With a population of 1.2 million people, it is a cultural and industrial center included in the UNESCO World Heritage list, and its mosaic of Muslim and Christian architecture contributes to its unique atmosphere and scenery. Kazan is easily accessible from Europe via Frankfurt, Moscow or St. Petersburg, and its position in the center of European Russia makes it an ideal base from which to explore a wide variety of sections and outcrops located in several adjoining districts of Russia.

Schedule for 2015

August 10: Arrival to Kazan, Registration and welcome reception

August 11 – August 15: Talk and poster sessions, workshops

August 13: Mid-Congress field excursions and Congress banquet

August 16: Departure from Kazan

Travel

By air to Kazan via Moscow or St. Petersburg.

By train to Kazan via Moscow (12 hours) or St. Petersburg (14 hours).

Obtaining a visa to visit Russia: Please check to see if your visit to Russia will require a visa. http://www.visitrussia.org.uk/visaform/not-need/ or http://ru.vfsglobal.co.uk/ The process involves contacting the nearest Russian embassy or consulate in the country where your passport is issued. We will send an official invitation letter issued by Kazan University to delegates who need to apply for a visa. Please send us a request for a visa invitation.

Scientific Programs

Meeting Format: The meeting will consist of concurrent sessions of talks, each of 20 minutes (including questions and discussion). Talks will be grouped based on broad geological topics. There will be one poster session, which will include afternoon refreshments. Speakers will normally be limited to one presentation (talk) at the meeting. Individuals may participate as a non-presenting coauthor on additional talks. Individuals may participate in as many posters presentations as they wish. Details will follow in the Second Circular.

XVIII INTERNATIONAL CONGRESS ON THE CARBONIFEROUS AND PERMIAN

Session titles

1. Carboniferous stage boundaries, stratotype sections, and GSSPs

2. Permian stage boundaries, stratotype sections, and GSSPs

3. Carboniferous and Permian high-resolution stratigraphy (multi-proxy correlations)

4. Late Paleozoic glaciations and interglacials: impact on ecosystems and sedimentation

5. Carboniferous and Permian plate tectonics and orogenies

6. Late Paleozoic marine macrofossils: systematics, biostratigraphy, and paleobiogeography

7. Late Paleozoic continental biota: systematics, ecosystems, and paleobiogeography

8. Micropaleontology: systematics, phylogeny and biostratigraphy

9. The terrestrial late Paleozoic world: paleosols, lithofacies, and environments

10. Sequence stratigraphy and cycles

11. Late Paleozoic reefs, biostromes, and carbonate mounds

12. Cold-water to tropical carbonate lithofacies and environments

13. The late Paleozoic oceans: paleoceanography

14. Latest Devonian and mid-Carboniferous extinctions and recovery

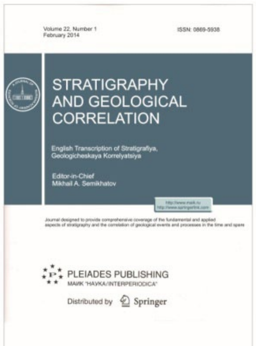
15. End-Permian mass extinction and Early Triassic recovery

16. Carboniferous and Permian coal and mineral deposits

17. Eurasian conventional and unconventional hydrocarbon systems

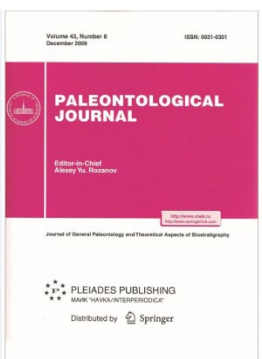
Call for Abstracts: Abstracts for the meeting are due on April 1, 2015. A request for abstracts will be announced in the Second Circular, which will also have instructions for electronic submission. The Abstract volume for the meeting will be edited by Alexander A. Alekseev, Galina V. Kotlyar, Svetlana V. Nikolaeva and distributed to registered delegates at the meeting.

Proceedings Volume: Congress proceedings are planned for publication in two bimonthly peer-reviewed scientific journals of MAIK "Nauka/Interperiodica" publishing house.



Stratigraphy and Geological Correlation (Stratigrafiya, Geologicheskaya Korrelyatsiya) covering fundamental and applied aspects of stratigraphy and the correlation of geologic events and processes in time and space.

Paleontological Journal (Paleontologicheskii Zhurnal) is oriented toward the anatomy, morphology, and taxonomy of fossil organisms, as well as their distribution, ecology, and origin. It also publishes studies on the evolution of organisms, ecosystems, and the biosphere and provides information on global biostratigraphy.



Manuscripts for the proceedings volumes are encouraged, and should be prepared following the Guide for Authors of MAIK "Nauka/Interperiodica" (http://www.maik.rssi.ru/). Contributed papers relating to the topics of ICCP are invited from registered participants. Please note that the deadline for contributions to the proceedings volume is scheduled for October 30, 2015.

Workshops: Several free workshops will be scheduled and are mainly designed for the Subcommissions on the Carboniferous and Permian stratigraphy.

Any colleagues or working groups wishing to hold a special symposium or workshop are advised to contact the organizers with their ideas no later than December 31, 2014.

Language: The official language for the scientific program and all the businesses of the meeting are Russian and English. The working language is English.

Proposed Field excursions

A. Pre-congress excursions:

A1. Lower Carboniferous of the St. Petersburg region (north-western Russia).

A2. Moscow Basin. Stratotypes of the Serpukhovian, Moscovian, Kasimovian and Gzhelian stages.

A3. Southern Urals. Deep water successions of the Carboniferous and Permian. Lower Permian GSSPS.

A4. Middle Permian - Lower Triassic continental sequences in Vologda and Arkhangelsk regions (north of European Russia) and localities of flora, tetrapods, non-marine fishes and invertebrates.

B. Mid-congress excursions:

B1. Permian deposits and historical-cultural sites along the Volga River (boat tour).

B 2. Middle Permian paleosols in succession of the Urzhumian Stage around Kazan.

C. Post-congress excursions:

C1. Volga and Kama Region. Middle and Upper Permian.

C2. Middle Urals. Carboniferous and Permian marine and continental successions.

C3. Carboniferous reference sections: potential candidates for the base of the Serpukhovian GSSP, deep-water and shallow-water sections of the eastern slope of the Southern Urals, organic buildups.

Dates and payment for field excursions will be detailed in the Second Circular.

Guest Program: No formal guest program is planned at this time. However, the congress organizers can help coordinate local excursions to suit most interests. Feel free to request information, provide suggestions or share potential interests. See the Official Kazan City Guide at http://gokazan.com/

Accommodation: A large variety of hotels is available in the city of Kazan (see the ICCP website). Kazan Federal University will provide low cost dormitory accommodation for all students – participants of the Congress – in the 2013 Summer Universiade Games Village.

Travel insurance: Participants should have valid health insurance for the entire journey. All foreign participants are required to bring with them health insurance contracts, covering the period of the trip, from an insurance company that provides an international insurance policy.

Climate: Kazan has a continental climate with warm, often hot, dry summers. August is hot, average 21?C to 25?C, infrequently exceeding 33?C or dropping below 16?C. There is a possibility of light rain. Overall it is pleasant.

Type of clothing and weather conditions: For the field excursions, you are advised to bring sturdy field boots (rubber boots could be useful), a raincoat, and a hammer. All hotel rooms are normally air-conditioned.

Registration

Registration form will be available on the Congress website: www.ICCP2015.kpfu.ru after March 1, 2014.

Registration fees:

	Before April 1, 2015 (Early Bird)	After April 1, 2015
Regular participant	400 Euro, this price is inclusive of the Congress fee, the volume of Abstracts, and refreshments during session breaks	450 Euro; this price is inclusive of the Congress fee, the volume of Abstracts, and refreshments during session breaks
Student	200 Euro as above: students must show a valid student ID card	250 Euro as above: students must show a valid student ID card
Accompanying person	80 Euro, as above: with the exception of the volume of Abstracts	100 Euro, as above: with the exception of the volume of Abstracts

Geohost program

The organizers are trying to raise funds to support regular participants and students from countries with struggling economies. The funds will be used to waive the registration fee and to pay the accommodation during the Congress. If your participation in the Congress depends on such financial support, please fill in the application form on the Congress website: www.ICCP2015.kpfu.ru or kpfu.ru/iccp2015

Important Dates

March 1, 2014: First Circular available for distribution and online.

February 1, 2015: Second Circular available for distribution and online.

March 1, 2015: Deadline for Application form to the Geohost program.

April 1, 2015: Deadline for Early Bird payment and abstract submission.

May 1, 2015: Third Circular available for distribution and online.

October 30, 2015: Deadline for manuscript submission to the Proceedings volumes.

Contact us

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Institute of Geology and Petroleum Technologies	www.iccp2015.kpfu.ru
Kremlevskaya St., 4/5	kpfu.ru/iccp2015

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Address: Russian Federation Republic of Tatarstan Kazan Kazan Federal University Institute of Geology and Petroleum Technologies Kremlevskaya St., 4/5

- Registration
- Accommodation
- Kazan
- Kazan University
- How to get to Kazan
- List of participants
- Geohost program
- Scientific Committee

INVITATION AND VISA REQUIREMENTS

Наверх

Подробности: http://kpfu.ru/iccp2015

2nd International Congress on Stratigraphy
STRATI 2015
19. - 23. July 2015, Graz, Austria

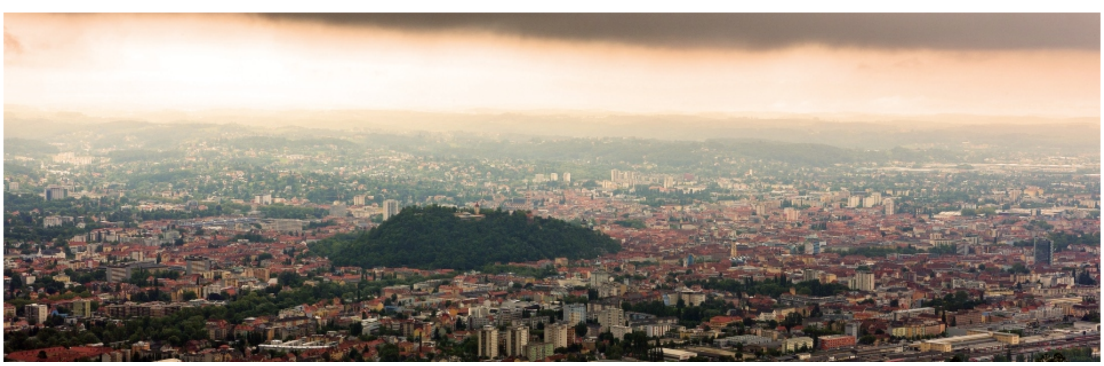
First Circular

The congress follows the invitation by the International Commission on Stratigraphy (ICS) of the International Union of Geological Sciences (IUGS) to be held in Graz (Austria), July 19-23, 2015. The congress will be open to all topics in stratigraphy. The technical program will range from the Archean to the Holocene, across all techniques and applications of stratigraphy and the discoveries that the stratigraphic record reveals about the Earth system. In addition, it will also serve as the primary venue for ICS business, for ICS subcommissions to meet and awarding the ICS stratigraphy prizes.

Venue and organization

The congress will take place on campus of the University of Graz, Austria. It will be organized by the Institute of Earth Sciences of the University of Graz in cooperation with other Austrian Earth Sciences institutions representing the Austrian Earth Science community (e.g., Geological Survey of Austria).

Chair: Werner E. Piller, Professor at the University of Graz, chair of the Austrian National Committee of Geosciences, the Austrian Commission on Stratigraphy and the Austrian National Committee for the IGCP. The organization and logistics will be guaranteed by the local organizing committee.



Location

Graz is the second largest city of Austria and a well suited location for organizing international conferences. Graz is also well known for cultural highlights, which is reflected in its status as a UNESCO World culture heritage site. Graz is located about 200 km south of Vienna and can be reached by plane (from Vienna, Munich, Frankfurt, Berlin, Stuttgart and Zurich) or by train.

Important dates

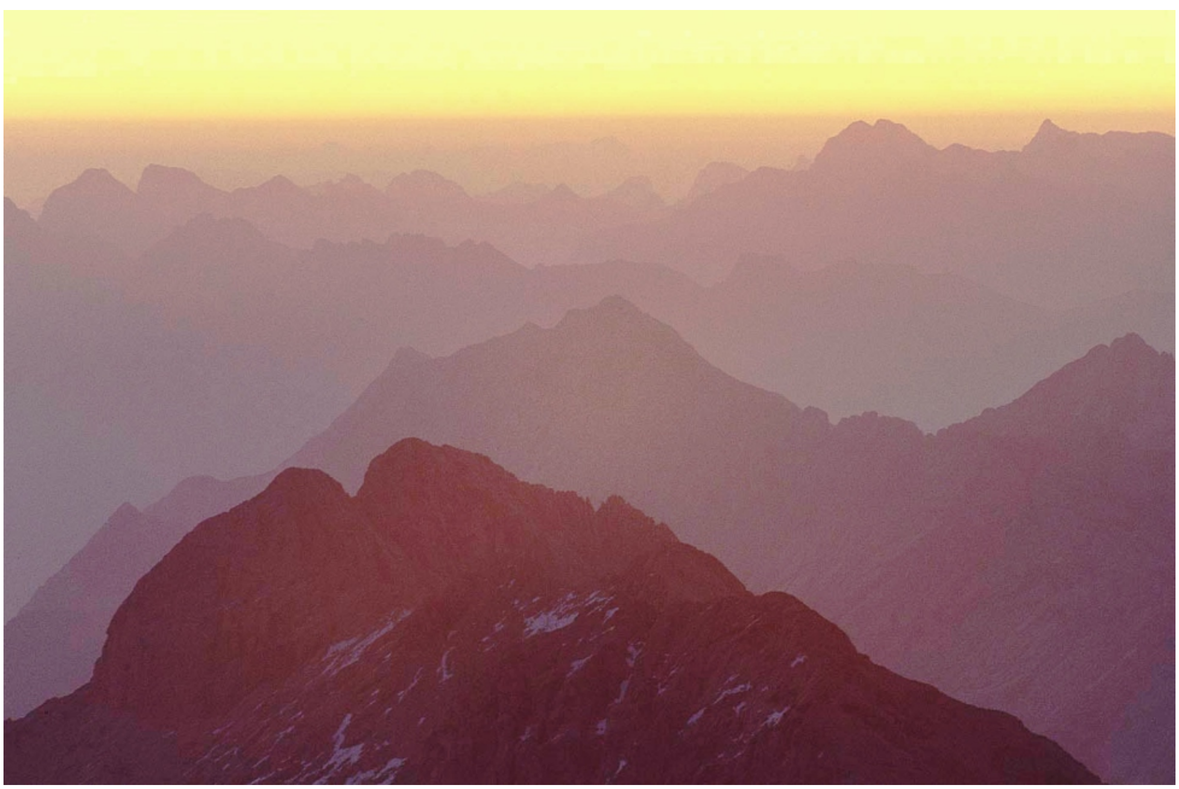
Scientific session proposals and Workshop proposals:
Deadline for announcement: 1st October 2014
http://strati2015.uni-graz.at/
Subcommisson meetings of ICS:
Deadline for announcement: 1st October 2014
at http://strati2015.uni-graz.at/
Workshop proposal:
Deadline for announcement: 1st October 2014

The second conference circular will be distributed in fall 2014 and will provide information on registration fees and on prices for social events. It will also provide detailed information on field trips, in particular on logistics and prices.

Contact

If there are any conference inquiries please contact us:
Conference homepage: http://strati2015.uni-graz.at/
Conference e-mail: strati2015@uni-graz.at
Personal contact conference chair: werner.piller@uni-graz.at

Postal address:
2nd International Conference on Stratigraphy - Strati 2015
c/o: Institute of Earth Sciences, Department of Geology and Palaeontology
University of Graz, Heinrichstrasse 26, 8010 Graz, Austria



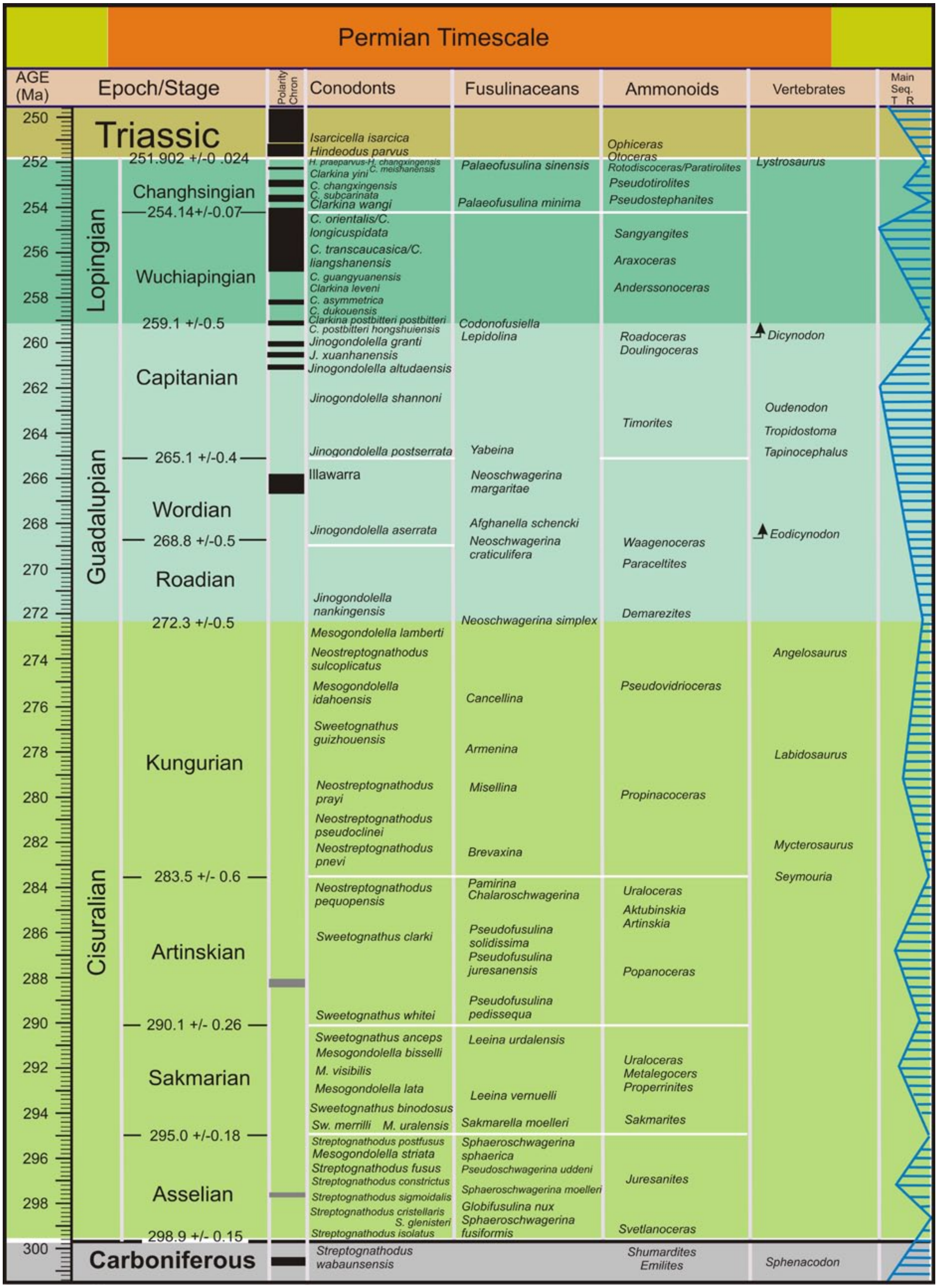
SUBMISSION GUIDELINES FOR ISSUE 61

It is best to submit manuscripts as attachments to E-mail messages. Please send messages and manuscripts to Lucia Angiolini's E-mail address. Hard copies by regular mail do not need to be sent unless requested. To format the manuscripts, please follow the TEMPLATE that you can find on the new SPS webpage at http://permian.stratigraphy.org/ under Publications. Please submit figure files at high resolution (600 dpi) separately from text one. Please provide your E-mail addresess in your affiliation. All manuscripts will be edited for consistent use of English only.

Prof. Lucia Angiolini (SPS secretary)

Università degli Studi di Milano, Dipartimento di Scienze della Terra "A. Desio", Via Mangiagalli 34, 20133 MILANO Italy, e-mail: lucia.angiolini@unimi.it

The deadline for submission to Issue 61 is April 15, 2015.



Note: This is the latest version of the Permian timescale which SPS recommends (Shen et al., 2013, New Mexico Museum of Natural History and Science, Bulletin 60, p. 411-416). We welcome any comments to improve it. All the information will be updated from time to time here. Geochronologic ages are combined from Burgess et al. (2014, PNAS 111, 9, p. 3316–3321); Shen et al. (2011, Science 334, p. 1367-1372) for the Lopingian; Zhong et al. (Lithos, in press) for the Guadalupian-Lopingian boundary; Schmitz and Davydov, (2012, GSA Bulletin 124, p. 549-577.) for the Cisuralian, Henderson et al. (2012, The Geologic Time Scale 2012 (vol. 2), p. 653-679) for the base of Kungurian and the Guadalupian. Tetrapod biochronology is after Lucas (2006, Geological Society London Special Publications 265, p. 65-93).