Minutes

On 13 November, 2020, the SPS Chair Lucia Angiolini and ViceChair Mike Stephenson, with the help of Jeanine Newham (BGS), organized a zoom webinar for the corresponding members.

Twenty-six persons from different parts of the world attended the webinar: Deepa Agnihotriu, Lucia Angiolini, Sylvie Bourquin, Simonetta Cirilli, Luca Costamagna, Eliana Coturel, Giusy Forte, Claudio Garbelli, Charles Henderson, Hana Jurikova, Leopold Krystyn, Evelyn Kustatscher, Ruslan Kutygin, Lance Lambert, Lorenzo Marchetti, Giovanni Muttoni, Tadeusz Peryt, Ausonio Ronchi, Tamra Schiappa, Joerg W. Schneider, Lucas Spencer, Amalia Spina, Mike Stephenson, Geoff Warrington, Liz Weldon, Dungxun Yuan and Yichun Zhang.

The agenda of the meeting comprised the following topics: an Introduction to the SPS by Lucia Angiolini, a presentation on the continental Permian by Joerg W. Schneider, a presentation on the marine Permian by Charles Henderson, Break Out sessions to discuss issues of the Permian, and final comments.

In the introduction, Lucia Angiolini presented the main objectives of SPS which are: 1) to define the series and stages of the Permian by means of internationally agreed GSSPs and to establish a high resolution temporal framework based on multidisciplinary approaches; 2) to provide the international forum for scientific discussion and interchange on all aspects of the Permian, specifically on refined intercontinental and regional correlations. Then, she presented the already ratified Permian GSSPs and the two missing ones, the Artinskian and Kungurian GSSPs (Fig. 1).

The main goal of the Executive for next year is to turbocharge the Artinskian-base and Kungurian-base GSSPs to complete the Permian System. The candidates are: Dal'ny Tulkas section, Bashkortostan, Russia for the base-Artinskian and Mechetlino, Bashkortostan, Russia for the base-Kungurian. Additional goals are to frame all Permian events into the time scale: evolution, climate, palaeogeography, marine and continental correlations, to revise the timescale where it needs to be improved and to increase the size, diversity and international coverage of the Permian Community. The Break Out sessions were organized for this purpose, to discuss together issues of the Permian, stimulate circulation of ideas and thoughts, and receive more contributions from a larger number of researchers.

After the introduction, two very interesting presentations were given by Joerg W. Schneider and Charles Henderson. These are summarized below in the two abstracts they kindly provided.

Summary of the SPS Webinar presentations

Permian nonmarine-marine correlations: State of the art – future tasks

By Joerg W. Schneider and the Late Carboniferous - Permian - Early Triassic Nonmarine-Marine Correlation Working Group

The presentation provided an overview of the progress made by the members of the Late Carboniferous - Permian - Early Triassic Nonmarine-Marine Correlation Working Group since 2013/2014. Details are published in the report of the group given by J.W. Schneider in Permophiles 69 (2020). The most important outcome was a compilation of nonmarine biostratigraphic methods suitable for long-range correlations and the connection of nonmarine sections to the marine Standard Global Chronostratigraphic Scale (SGCS), published by an international team of 18 authors (Schneider et al., 2020). Based on this, the following conclusions were drawn in the Webinar:

1) Climate results from interference between processes in the oceans and on the continents. We need to understand this coupled land-sea system for the understanding of ancient ecosystems and for the prediction of present and future processes on Earth.

2) Late Pennsylvanian, early to middle Cisuralian as well as Lopingian and Early Triassic nonmarine-marine correlations have already reached a good level. Late early Cisuralian and Guadalupian nonmarine biostratigraphy and connections to the SGCS are still unsatisfactory. Among other regions, the well exposed and fossiliferous late early Permian to Early Triassic deposits on the East European Platform bear a high potential for the solution of this problem.

3) The most challenging future task for nonmarine-marine correlations in the Late Carboniferous–Middle Triassic are global north-south correlations. Biostratigraphic correlations among the biotic provinces of Euramerica, Angara, Cathaysia, and Gondwana are still in a very unsatisfactory state. Sections of the East European Platform and Siberia in Russia, those of the Karoo basin in South Africa, sections in North China, in Jordan and North Africa as well as in the Paraná basin of South America should be a focus of further research of the SPS.

To promote progress a call for global cooperation in the correlation of the most important and well investigated continental and mixed marine-continental basins as well as for the establishment of regional continental reference sections will be published in the next issue of Permophiles.

References

Schneider, J.W., 2020.Summary report of the Nonmarine-Marine Correlation Working Group and notes from the former Vice-Chair of the SPS. Permophiles, v. 69, p. 37-40.

Schneider, J.W., Lucas, S.G., Scholze, F., Voigt, S., Marchetti, L., Klein, H., Opluštil, S., Werneburg, R., Golubev, V.K., Barrick, J.E., Nemyrovska, T., Ronchi, A., Day, M.O., Silantiev, V.V., Rößler, R., Saber, H., Linnemann, U., Zharinova, V., and Shen, S.Z., 2020. Late Paleozoic-early Mesozoic continental biostratigraphy – Links to the Standard Global Chronostratigraphic Scale: Paleoworld, v. 531, p. 186-238. oi.org/10.1016/j.palwor.2019.09.001

The Marine Permian

by Charles Henderson

The presentation started with an historical review of the establishment and subdivisions of the Permian system, from Murchison in 1841 to the heated debate on the number of series at the 1991 Perm meeting and finally to the paper by Jin et al., 1997 in Episodes, a classic compromise that has directed the activities of SPS ever since. An important aspect of the original Permian and all modifications was "looking at the rocks", as there are common signatures, for example, cyclothems of the Asselian and major 3rd order sequences and flooding surfaces in the Sakmarian and Artinskian and above. The importance of not being detached from the rock record while we also consider taxonomic issues was underscored in the webinar and several sections were shown: the SW Ellesmere Island sections, which includes 1100 metres of cyclic (glacial-eustatic control) upper Kasimovian to lowermost Sakmarian; the GSSP at the Aidaralash section; the GSSP for the base-Sakmarian at the Usolka section, which includes facies that are similar to the central Sverdrup Basin Hare Fiord Formation; the proposed base-Artinskian GSSP at Dalny Tulkas in the southern Urals characterized by a strong rock signature and many fossils and U-Pb age dates and stable isotopic signals, all available for broader correlation; and the proposed base-Kungurian GSSP Mechetlino section, with a conodont succession identical at the Rockland section in Nevada and also in the Sverdrup Basin, demonstrating widespread, but not global, correlation for this Cisuralian (Lower Permian) stage.

Above this level in Russia, the succession is dominated by non-marine facies with some restricted marine, so the presentation moved to west Texas to define the Middle Permian or Guadalupian. In a recent paper, Shen et al. (see Permophiles 69 for Guadalupian report) show the geochronologic ages and fossils that assist correlation between south China and west Texas, but they conclude that the base-Roadian, base-Wordian and base-Capitanian GSSP definitions may need some minor revision or fine-tuning in the area. The outcrops in the Guadalupe Mountains National Park are outstanding as shown by the slides, for instance that of stratotype canyon, the GSSP for the base-Roadian, and these carbonates are subject to many sequence stratigraphic analyses (Kerans et al., 2014). The recognition of conodont geographic clines within transgressive facies allows the correlation of the base-

Roadian into the Canadian Arctic, but strong provincialism limits correlation of younger units. The Middle Permian includes extensive carbonate platform deposits in the Maokou Formation of south China.

The Delaware Basin in west Texas became isolated, resulting in the deposition of evaporites, so the presentation moved to South China for the best Upper Permian (Lopingian) fossiliferous carbonates, deposited within the equatorial zone. The base-Lopingian (base-Wuchiapingian) GSSP at the Penglaitan section along the Hongshui River (Laibin, Guangxi) was flooded due to a new dam, but a nearby site is being intensively studied as a substitute. The GSSP at Penglaitan is really a natural boundary as it occurs near the correlative conformity within lowstand deposits. By having the GSSP within the lowstand, it means that rocks above the sequence boundary in other parts of the world are always Lopingian. The base-Changhsingian GSSP was celebrated at Meishan in 2006 at the same site where the base-Induan (base-Triassic or top-Permian) was celebrated in 2001. A Geopark was created to recognize these two GSSPs, which makes the location the body stratotype for the Changhsingian.

The presentation transported participants through 47 million years from the base Permian at 298.9 Ma to the top at 251.9 Ma. The greatest mass extinction in Earth history (EPME) occurred just before the end (251.94 Ma), and briefly the world was dominated by microbial units that span the PTB. The talk concluded that there is still work to do, first to complete the Permian GSSPs (base-Artinskian, base-Kungurian). But when we do, the Permian community should focus on looking at the entire Permian rather than focusing on only the boundaries. With the completion of the marine Permian time scale, there should be a renewed focus to consider marine-continental correlations. The final statement was “don’t forget the rocks”.

A series of Break Out sessions were held as part of the webinar, where each of the Break Out groups was assigned a questions to discuss and answer. A spokesperson from each group then reported back. The reports are provided *in note form* below.

Comments from Group 1

Reported by Evelyn Kustatscher

Question: What is the most important scientific question to be answered in the Permian?

A synopsis of the group’s answers: The most important scientific questions are 1) Accessibility of Palynological data: Data from palynology from the oil drilling companies are not accessible. 2) Most of the charts (Palaeogeography, biomes, palaeoclimate maps) that we are dealing with are some 20 years old but we still use

them because there are few or no alternatives at the moment. 3) Correlation marine/no-marine successions. 4) How/why and when of the end of the Permian glaciation? Also when and how of the Permian glaciations? 5) What about the Guadalupian/Lopingian extinction? 6) Vegetation changes that might influence sedimentational rates? 7) Sea-level changes: what effect does it make on preservation/environmental of fossils in the sediments? 8) How does the climate change, how can we get to much higher resolution correlation? The seasonality, the latitudinal gradients? How can we improve/track this? 9) Why not reconsider the Permian from the scratch: produce new palaeographic maps based on sedimentologically sensible datasets that are updated?

Comments from Group 2

Reported by Charles Henderson

Question: What are the main palaeontological gaps in Permian studies?

The following gaps were discussed. 1) The Middle and Upper Permian continental record in Russia and South Africa (and other regions), especially of the vertebrate succession. 2) The correlation of marine and continental successions, especially where they interfinger, through increased use of palynostratigraphy. 3) Middle Permian provincialism means we should be looking more at the similarities (clines) rather than the differences (taxonomic over-splitting) of conodonts and fusulinaceans, but also other invertebrates to reduce correlation gaps. This could mean a North-South consideration as mentioned by Joerg W. Schneider in his presentation on the continental Permian record. 4) It was noted that one gap is with taxonomy, this must still be emphasized, for microflora, but also all fossil groups. 5) There could be a concerted paleontologic focus on better integrating some of the regional scales (e.g. Wolfcampian and Leonardian) with the global time scale. 6) Finally, the fact that we have focussed on boundaries to define GSSPs has left many gaps – in other words, we agreed that it is important to emphasize the entire Permian, including how the biotic record is affected by climate change and paleogeography.

Comments from Group 3

Reported by Hana Jurikova

Question: Is it important to have an updated website for the Permian? How should Permophiles be developed?

A synopsis of the group's answers: 1) We need a website to include all

Permophile issues, collect all submission work, all Permian works published, have a forum, etc. We need a members' page as well a page for the general public. 2) How to build it? We need an infrastructure, and regular updates are very important. ICS needs to be consulted to see if possible to make it in the framework of the ICS website. Eventually organize a call to find people who can help in structuring and managing the website. 3) Permophiles: we need more contributions, for example summaries / advertisements of recently published works and we need to attract younger researchers.

Comments from Group 4

Reported by Spencer Lucas

Question: How do we build the Permian community? How do we get young researchers interested in Permian stratigraphy?

A synopsis of the group's answers: 1) Identify important and interesting problems of Permian Earth history that can only be resolved with a strong grasp of timescale and correlations. 2) Emphasize that Permian timescale problems are global problems that require integration of marine and nonmarine datasets, necessary to the ordering of Permian Earth history—in other words, "sell" the timescale research based on its great relevance to all aspects of understanding the Permian World.

Comments from Group 5

Reported by Liz Weldon

Question: What do we do next, after the estabishment of GSSPs?

A synopsis of the group's answers: 1) Focus on north-south correlations. 2) In several countries (e.g. India) it is diffiicult to find boundaries and there are no radiometric dates, in others (e.g. UK, Australia) there are problems of correlation with the International Time Scale. 3) Focus on breaks in sequences. 4) Focus on land-marine correlation to make the Permian more relevant. 5) Permophiles should continue to provide a forum for discussion and ammendaments of boundaries.

To conclude, the Break Out sessions were really stimulating and many topics were discussed and proposed to continue the studies of the Permian.

Among the most relevant issues that should be addressed in the near future to "fit the whole Permian world into this timescale" (cit. Spencer Lucas), are for certain North-South correlation, correlation of marine and continental successions, especially where they interfinger, and correlation of regional scales with the global time scale. These were the most reported topics during the Break Out sessions. Correlation is the watchword. However, to achieve correlation we need more robust and up-to-date palaeogeographic maps. Palaeogeography is thus the other main topic to develop. Palaeoclimate is also of concern and it also requires a good palaeogeographic base.

To build the community and attract young scientists we need to better advertise timescale research and show how this is important to understand the Permian world. We need also a good, attractive and interactive website not only for Permian researchers but for the wider audience. And finally, we need to keep Permophiles going as a great forum for Permian discussion, and for soliciting and providing more and more contributions.

As additional information, immediately afer the webinar, the ICS executive was contacted on the website question, and the SPS website is currectly being deployed and updated in the main ICS site by Nick Car (Canberra, Australia) with Yichun Zhang.

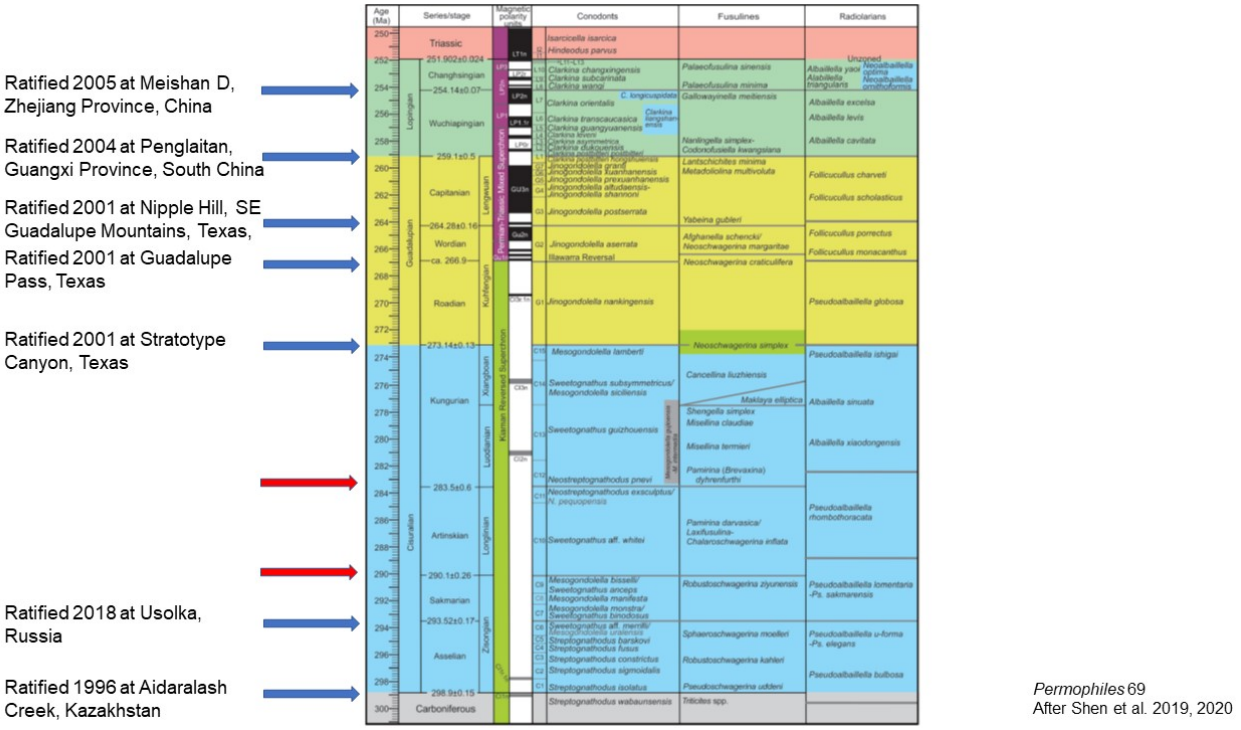

Fig. 1: The Permian GSSPs

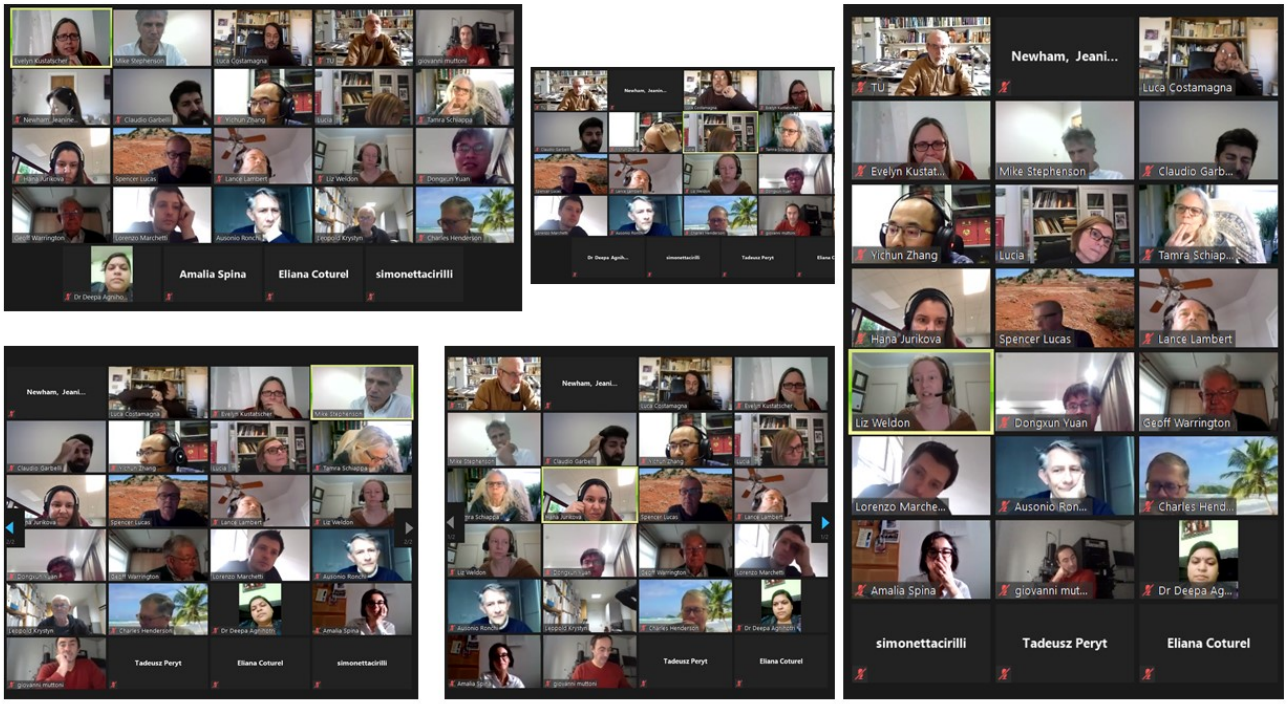

Fig. 2. Screenshots from the 13 November webinar