

2014 REPORT OF THE NONMARINE-MARINE CORRELATION WORKING GROUP

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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



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.

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 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). 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 northwest 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 four 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.



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

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.



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.

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), the sections in the Vladimir region west of Moscow 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 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; after references). 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!

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Fig. 4. Following page shows 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.

