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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,

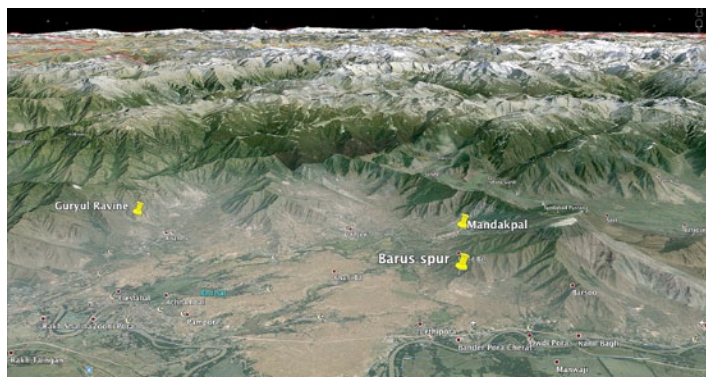


Fig. 1. Google Earth oblique view of the three main visited localities in the Kashmir Valley: Guryul Ravine, Mandakpal and Barus Spur.

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

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

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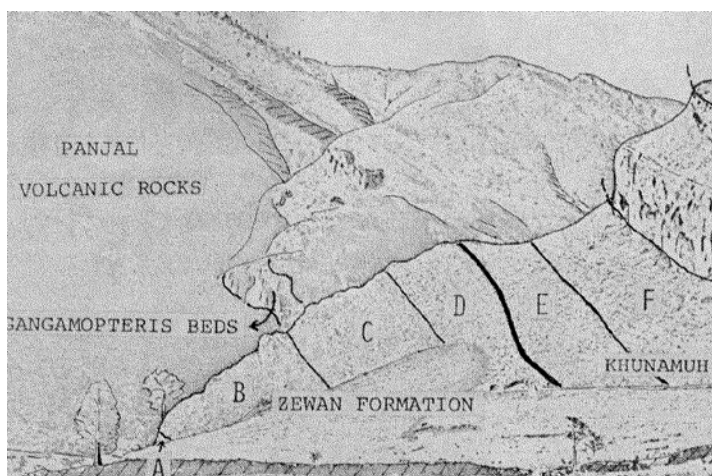


Fig. 2. Part of the Nakazawa et al. (1975, plate 1) showing the succession of Members B to D of the Zewan Formation and Members E, F and G of the Khunamuh Formation.

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

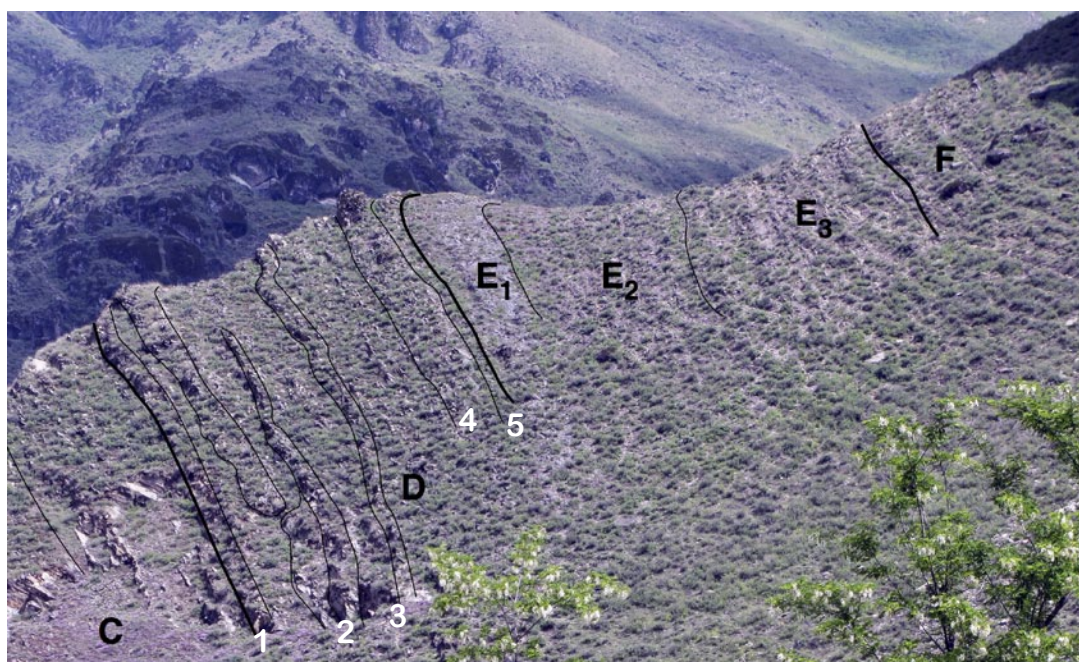


Fig. 3. Field view of the top of the Zewan Formation (members C and D) with mass flows, slumped channels and lower seismite beds (1, 2, 3) overlain by the upper seismite (4) and a tsunamite bed (5) according to Brookfield et al. (2013) and by Members E and F of the Khunamuh Formation. The Permian-Triassic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

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 Khunamuh 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 particularly 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.

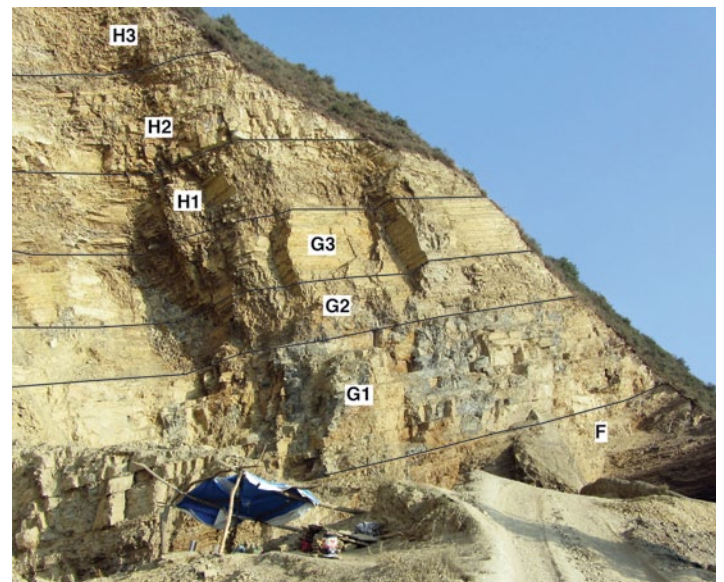


Fig. 6. The upper quarry wall showing the Olenekian limestone lithological units (see text above).

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.