Six main facies in the post-extinction basal triassic (griesbachian) of Oman, from deep to shallow and from euxinic to well oxygenated

Aymon Baud

Institute of Earth Sciences, University of Lausanne, Geopolis, 1015 Lausanne, Switzerland

This short sedimentological approach results from field works done first with Lausanne and later Zurich PhD plus PostDoc students and paleontologists, with colleagues from France, Austria, Italy, and Canada.

During the Permian-Triassic transition (PTt) the calcite compensation depth (CCD) is marked by a rise from deep to shallower depth in the paleo-oceanic Buda'yah section (Baud et al., 2012), showing a basal Triassic facies of light calcareous shale and platy lime mudstone beds overlying dark late Permian radiolarite chert beds and siliceous shales. The platy lime mudstone beds include an Upper Griesbachian bloom of calcite filled spheres (radiolarians ?) that marks a potential world-wide event.

The next main facies occur on the continental-slope deposit of the Wadi Maqam section (Richoz et al., 2010, 2012) where we observe the same CCD rise, here from chert bands in Late Permian dolomite beds to 3 m thick boundary calcareous shales and up to 9 m of basal Triassic laminated papery limestones and stromatolite deposits in euxinic environment.

If apparently continuous deposits during PTt occur on shallow continental margin cropping out in the autochthonous, dolomitized Permian-Triassic water carbonate succession, gaps are present in the Saih Hatat (Weidlich & Bernecker, 2011) as in the Djebel Akhdar (North Oman mountains). The main basal Triassic facies on the Saiq Plateau sections consists of light thin bedded dolomudstone overlying brown azoique dolomudstone with disrupted and deformed beds (seismite, described in Baud et al., 2016).

During Triassic and Lower Jurassic times the Hawasina and Batain basins have been the sites of large-scale debris flows and olistostromes. Within the great number of reworked blocks, the discovery of basal Triassic highly fossiliferous boulders, revealed three new facies of Griesbachian limestones built, for two of them, by skeletal accumulations in well oxygenated water. These facies are in marked contrast with the euxinic muddy carbonate (dolomudstone) of the shallow water platform sediments. Their origins are from seamount or oceanic plateau, above fair-weather wave base.

The first of these three facies consist of a bivalve bioherm overlain by a Bivalve biostrome with rare Brachiopod, Gastropod and a new type of Crinoid, well dated by conodonts and characterize the Griesbachian Wasit block facies described by Krytsyn et al., (2003) and Twitchett et al., (2004). A similar Griesbachian coquina facies occur in the not yet described Naksi block in the Wadi Wasit and another coquina block in the Asselah area (Batain).

The second facies is a crinoidal lime-packstone discovered in an Asselah block described by Brosse et al. (2018) and showing among crinoids a rich assemblage of bivalves, gastropods and ammonoides.

The third facies show for the first-time a stromatactis pelagic Hallstatt-type limestone of Griesbachian age. It has been discovered by H. Bucher in a 30m thick reworked block (RAA) comprising Late Permian and Early Triassic carbonate succession in Djebel Rabat. After a preliminary sedimentological study, it is interesting to note the disrupted and deformed beds at the Permian-Triassic contact due to possible seismite.

References :

Baud, A., S. Richoz, B. Beauchamp, F. Cordey, S. Grasby, C. M. Henderson, L. Krystyn and A. Nicora (2012). The Buday'ah Formation, Sultanate of Oman : A Middle Permian to Early Triassic Oceanic Record of the Neotethys and the late Induan microsphere bloom. Journal of Asian Earth Sciences 43(1) : 130-144.

Baud A. Richoz S. & Krystyn, L., 2015. Seismites during the Permian-Triassic-transition : the Oman record. 2nd Boreal Triassic Conference 2015, Svalbard, NGF Abstracts and Proceedings, no.4, page 1.

Krystyn, L., S. Richoz, A. Baud and R. J. Twitchett (2003). A unique Permian-Triassic boundary section from the Neotethyan Hawasina Basin, Central Oman Mountains. Palaeogeography Palaeoclimatology Palaeoecology 191(3-4) : 329-344.

Richoz, S., A. Baud, B. Beauchamp, S. Grasby, C. Henderson, L. Krystyn and R. Twitchett (2010). The Permian-Triassic transition in the Sumeini area. in IGCP 572 Field Guide Book 2 : The Permian-Triassic transition in the Oman Mountains. Baud, A. & Bernecker, M. ed., GUtech, 79-100.

Richoz, S., A. Baud, L. Krystyn, B. Beauchamp, S. Grasby and M. Henderson Charles (2012). The Sumeini Group in Oman : Northern Gondwana Slope development in a Permo-Triassic Environment. International Conference on the Geology of the Arabian Plate and the Oman Mountains 7-9th January, 2012, Muscat, Sultan Qaboos University Abstract book, 200-201

Twitchett, R. J., L. Krystyn, A. Baud, J. R. Wheeley and S. Richoz (2004). Rapid marine recovery after the end-Permian mass-extinction event in the absence of marine anoxia. Geology 32(9) : 805-808.

Weidlich, O., & Bernecker, M. (2011). Earthquake-triggered post-depositional deformation at the rim of the Arabian Platform (Permian–Triassic, Oman Mountains). In Third EAGE Workshop on Arabian Plate Geology (pp. cp-271).