

# Decision report on the defining event for the base of the Rhaetian stage.

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The Task Force on the placement of the GSSP for the Norian-Rhaetian boundary has recently finished a vote between two proposed conodont datums (*Misikella hernsteini* vs. *M. posthernsteini*) resulting in a

## 61 % majority for the *posthernsteini* datum as base of Rhaetian definition

[base *hernsteini* Zone – 5 votes, base *posthernsteini* Zone – 14 votes, Abstain – 2]

Taking aside the 2 Abstains, the majority for the *posthernsteini* datum would have reached 66% – demonstrating the high level of support for this datum within the Task Force.

*Misikella posthernsteini*, as phylogenetic descendent of *M. hernsteini*, offers a well-established first appearance date (FAD) both in the proposed GSSP candidate Steinbergkogel, Austria (Krystyn et al., 2007; Krystyn, 2008) and throughout LPL Tethyan sediments. However, since *M. posthernsteini* is very rare at the beginning, large conodont quantities may be needed (at least 50 p-elements of the genus) for a safe recovery of the FAD of the species and thus for an exact placement of the Norian-Rhaetian boundary (Krystyn et al., 2007). In cratonic America, *Misikella posthernsteini* is rather rare and may appear much later, already in the late Rhaetian (Orchard et al., 2007). Therefore it should be mentioned that in biofacially and biogeographically less favourable environments/regions, use of this event without additional control may cause uncertainties in regional or intercontinental correlations.

### Proxies for the *posthernsteini* datum

A corresponding low latitude pandemic proxy is the FO of the heteromorphic ammonoid *Paracochloceras suessi* (and the closely allied genus *Cochloceras*) and of sagenitid ammonoids of the *Sagenites reticulatus* group (Krystyn, 2008) as well as the disappearance of the genus *Metasibirites* (Krystyn et al., 2007). The *posthernsteini* datum may also correlate to the FO of the conodont *Epigondolella mosheri* morphotype B sensu Orchard as well as to that of the radiolarian *Precitriduma mostleri*, respectively to the base of this zone – a possible first-order intercontinental marker tool (Orchard et al., 2007) though this is in part questioned (Kozur, written comm.). Of more regional value may be the entry of dwarf monotids in parts of the Tethys around this time (McRoberts et al., 2008) as well as the disappear-

ance of monotid bivalves in the Boreal Realm (Dagys & Dagys, 1994). The *posthernsteini* event follows relatively closely above the FO of its forerunner, *M. hernsteini*, and that of several ammonoid taxa (*Tragorhacoceras occultus*, *Rhaetites gigantogaleatus*, *Stenarcestes ptychodes*), all common and helpful tools for recognizing proximity to the Norian-Rhaetian boundary in the Tethys Realm (Krystyn, 2008). Palynological proxies (FO of *Rhaetogonyaulax rhaetica* and/or *Rhaetipollis germanicus*) with importance for marginal marine and continental cross-correlations are more difficult to establish but may appear not far below the *posthernsteini* datum. Several other presumed typical Norian elements (*Granuloperculatipollis rudis*, *Enzonalosporites vigens*, *Vallasporites ignacii*) otherwise occur still in the early Rhaetian (Kuerschner et al., 2008) and form therefore no suitable boundary markers.

A prominent magnetic polarity change from a long Normal to a distinct Reversal occurs closely below the *posthernsteini* datum. This reverse interval is intercalated between a stratigraphically thicker (below) and a significantly thinner (above) normal magnetic polarity interval, which constitutes a relatively distinctive magnetic zonation (Krystyn et al., 2007). It can be recognized in other Tethyan magnetostratigraphies such as the Austrian Scheibelkogel, the Italian Pizzo Mondello and the Turkish Oyuklu sections (Gallet et al., 1996; 2007; Muttoni et al., 2004); its comparability to the polarity signature of the lacustrine Newark APTS magnetochronology is, however, disputed (Gallet et al., 2007 vs. Muttoni et al., 2009).

The  $\delta^{13}\text{C}_{\text{carb}}$  curve shows no significant variations around the *posthernsteini* datum. For a detailed discussion of the carbon isotope record see Richoz et al. (2007) and Krystyn et al. (2007).

### References

- Dagys, A. S. & Dagys, A. A., 1994: Global correlation of the terminal Triassic: Mem. Geol. (Lausanne), v. 22, 25-34.
- Gallet, Y., Besse, J., Krystyn, L. and Marcoux, J., 1996: Norian magnetostratigraphy from the Scheibelkogel section, Austria: constraint on the origin of the Antalya Nappes, Turkey: Earth and Planetary Science Letters, v. 140, 113-122.
- Gallet, Y., Krystyn, L., Marcoux, J., Besse, J., 2007: New constraints on the End-Triassic (Upper Norian-Rhaetian) magnetostratigraphy: Earth and Planetary Science Letters, v. 255 (3-4), 458-470.
- Krystyn, L., Bouquerel, H., Kuerschner, W., S. Richoz and Gallet, Y., (2007): Proposal for a candidate GSSP for the base of the Rhaetian stage. New Mexico Museum of Natural History and Science, Bulletin 41, 189-199.
- Krystyn, L.: The Hallstatt pelagics – Norian and Rhaetian Fossilagerstaetten of Hallstatt. - Berichte der Geologischen Bundesanstalt, v. 76, 81-98.
- Kürschner, W. M., Krystyn, L., Richoz, S., 2008: An integrated palaeontological, geochemical & palynological study of the Rhaetian Zlambach marls in the Northern Calcareous Alps (Austria). - Berichte der Geologischen Bundesanstalt, v. 76, 13-14.

- McRoberts, C.A., Krystyn, L., and Shea, A., 2008. Rhaetian (Late Triassic) *Monotis* (Bivalvia: Pectinacea) from the Northern Calcareous Alps (Austria) and the End-Norian crisis in Pelagic faunas: *Journal of Paleontology*, v. 51, 721-735.
- Muttoni, G., Kent, D.V., Olsen, P., di Stefano, P., Lowrie, W., Bernasconi, S., Martin Hernandez, F., 2004: Tethyan magnetostratigraphy from Pizzo Mondello (Sicily) and correlation to the Late Triassic astrochronological polarity time scale, *Geol. Soc. Am. Bull.* v.116, 1043-1058.
- Muttoni, G., Kent, D.V., Flavio, J., Olsen, P., Rigo, M., Galli, M. T. and Nicora, A., 2009: Rhaetian magnetostratigraphy from the Southern Alps (Italy): constraints on Triassic chronology. *Palaeogeography, Palaeoclimatology, Palaeoecology*, online.
- Orchard, M.J., Carter, E.S., Lucas, S.G., and Taylor, D.G., 2007, Rhaetian (Upper Triassic) conodonts and radiolarians from New York Canyon, Nevada, USA: *Albertiana* v. 35, 59-65.
- Richoz, S., Krystyn, L. and Spötl, C., 2007: Towards a carbon isotope reference curve of the Upper Triassic. *New Mexico Museum of Natural History and Science, Bulletin* 41, 366-367.