Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 21	Graz 2015
STRATI 2015	Graz, 19 – 23 July 2015		

Rhaetian duration: Astronomical calibration of Austrian key sections

GALBRUN, Bruno[1], BOULILA, Slah[1], KRYSTYN, Leopold[2], RICHOZ, Sylvain[3], BARTOLINI, Annachiara[4], GARDIN, Silvia[4]

[1] Sorbonne Universités, UPMC Univ Paris 06, CNRS, UMR 7193, Institut des Sciences de la Terre Paris (ISTeP), Paris, France, email: bruno.galbrun@upmc.fr
[2] University of Vienna, Department of Paleontology, Althanstrasse 14, 1090 Vienna, Austria
[3] Institute of Earth Sciences, University of Graz, Graz, Austria
[4] Sorbonne Universités, UPMC Univ Paris 06, MNHN, CNRS, UMR 7207, Centre de Recherches sur la Paléobiodiversité et les Paléoenvironnements (CR2P), Paris, France

An accurate time scale does not yet exist for the entire Triassic, and much work is needed to improve it, especially for the Late Triassic. The total duration of the Late Triassic can be estimated at about 30 Myr, but the relative durations of Carnian, Norian and Rhaetian are still poorly known. This is particularly true for the Rhaetian which duration estimates vary from 3 to 9 Ma. These discrepancies result from numerous attempts to correlate the two main independent data sets used to construct the Late Triassic time scale : (1) the APTS (Astronomically calibrated geomagnetic Polarity Time Scale) from the Upper Carnian-Lower Jurassic continental sucession of the Newark rift basin (eastern North America), and (2) some magnetic polarity sequences from well biostratigraphically dated tethyan marine successions. The difficulty in unambiguously correlate these two data sets is due to the recurrent problem to biostratigraphically correlate marine and continental sections, and unambiguously correlate magnetic polarity sequences whose "black-white fingerprint" can be distorted by variations in sedimentation rate and hiatus. New Zircon U-Pb dates for volcanic ash beds within the Rhaetian Aramachay Formation in Northern Peru were very recently published pointing a duration of 4.14 Myr for the Rhaetian. To analyze the tempo and rate of the numerous biotic and environmental events occurring at the end of the Triassic, an accurate estimate of the duration of the Rhaetian is of paramount importance.

We addressed this issue by the astronomical calibration through cyclostratigraphic studies of some reference marine successions in the Northern Calcareous Alps of Austria. We analysed four key sections encompassing the whole Rhaetian: (1) the Steinbergkogel section proposed as the Norian-Rhaetian GSSP, (2) the Zlambach section which covers most of the Lower Rhaetian, the Middle Rhaetian and basal part of the Upper Rhaetian, (3) The Eiberg section, covering the Upper Rhaetian, was the subject of many stratigraphic studies, and finally (4) the Kuhjoch section, Rhaetian/Hettangian (Triassic/Jurassic) GSSP. Magnetic susceptibility (MS) was used as the proxy for the cyclostratigraphic analysis. MS was measured every 10 cm on samples from each studied section. Since the sections studied correlate perfectly we were able to construct a 150 m composite record of MS variations encompassing the whole Rhaetian. Our goal were to demonstrate the astronomical forcing recorded by these austrian sedimentary successions, and to astronomically calibrate the duration of the Rhaetian using 405 kyr orbital eccentricity cycle as a geochronometer. Following removal of a long-term trend, the data were analyzed using spectral analysis with the multitaper method (MTM). The MS variations have cyclic patterns across a wide range of frequencies. Milankovitch frequencies from precession to long eccentricity were recognized. Cycles with an average thickness of 8 m are interpreted to correspond to the 405 kyr orbital eccentricity term. After tuning we used these cycles to estimate the duration of the Rheatian. Our results rather go towards a relatively short duration of 5.6 Myr.