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Tectonic controls of the high-frequency sedimentary cycles in the Upper Triassic Dachstein platform carbonates, Northern Calcareous Alps

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High-frequency cycles are common feature of the Triassic platform carbonates from the Western Tethys basins. The 4^{th} and 5^{th}-order cycles have been particularly intensively studied in the Middle Triassic of the Dolomites and in the Upper Triassic of the Dachstein platform. The cycles display both shallowing and deepening upward trends and encompass carbonates formed from subtidal to supratidal environments.

The high-frequency cycles are commonly ascribed to the glacio-eustasic mechanisms controlled by the astronomical Milankovitch cycles. Recent radiometric data challenged the direct link between the orbital forces and these cycles for the Middle Triassic of the Dolomites (Mundil *et al*., 2003). Moreover, there is no evidence of Triassic glaciations hence an alternative genetic model of the cyclicity is needed.

According to field revision of the Upper Triassic Dachstein carbonates they display common features indicative for synsedimentary tectonic and seismic mobility. Very common are synsedimentary faults, reaching in scale from few millimetres to meters. Many of the features previously interpreted as karstic fissuring appeared to be tectonic cracks. The brittle faultings affected completely lithified carbonates are commonly accompanied by contemporaneous breccias (e.g. hydraulic breccia) and by flowage of the unconsolidated sediments. The quake motion involved development of cm-sized recumbent folds, flowage deformations and dewatering structures. Particular record of paleoseismic events are *in situ* -deformed stromatolites. The stromatolites show brecciation, cracking and intrastratal liquefaction, obliterating the original laminated fabrics.

Common syndepositionary deformations indicate that the topographic and bathymetric changes of the Triassic carbonate platforms could be controlled by tectonic block movements. Paleoposition of all of the discussed platforms within strike slip zones confirms this presumption.

Considering the cyclic facies succession in terms of syndepositional tectonics one cycle would reflect the crustal downwarp influencing platform subsidence (deepening trend) that became abruptly arrested and succeeded by rapid uplift during the elastic rebound. Such a course of deformations explains plausibly the direct switch off between the subtidal and subaerial paleoenvironments observed e.g. in the Lofer cycles. In opposite case $i.e.$ under upwarping regime one would observe shallowing upward trend replaced by sudden sinking.

The proposed model of "swinging block" tectonics may be adequately referred to the recent counterparts particularly well recognised in the Chilean and North American western coastal margin. The measured elevation changes in these seismic areas reach rate of several mm/year during the strain buildup The crustal swelling lasts for several hundreds to some thousands year. The coseismic vertical displacement during elastic rebound event may reach values between several centimetres to several meters and takes less than several minutes time and may play havoc against the stroked perilitoral zoneThe most subsidence-effective are earthquakes of magnitude > 8 (Atwater & Hemphill - Halley, 1997).

The radiometrically estimated period of the cycle from the Triassic of Dolomites is shorter than 3000 y. (Mundil *et al*., 2003). The quake recurrence intervals measured in subrecent examples from plate-boundary belt range between several hundreds and 3000 years. The accordance between the Triassic high-frequency cycles and the recent subsidence-effective earthquakes strongly supports the assumed working model. Also the remarkable asymmetry of these cycles is plausibly explained in terms of the intermittent strain accumulation and release as already postulated by Cisne (1986).

Cisne, J.L., 1986. Earthquakes recorded stratigraphically on carbonate platforms. Nature, 325: 320 - 322.

Mundil, R., Zühlke, R., Bechstädt, Peterhaensel, A., Egenhoff, S., Oberli, F. Meier, M., Brack, P. & Rieber, H., 2003. Cyclicities in Triassic platform carbonates: synchronizing radio-isotopic and orbital clocks. Terra Nova, 15: 81-87.