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Deep water carbonate platforms and volcanism: Alpine Triassic

Wolfgang Blendinger and Rainer Müller

Technische Universität Clausthal, Institut für Geologie und Paläontologie, Leibnizstr. 10, D-38678 Clausthal-Zellerfeld

Middle and early Late Triassic carbonate platforms of the Alps are mainly composed of automicrite and cement and developed in one or several basins with contemporaneous acidic igneous activity. Satellite images show that the narrow (<3 km diametre) platform cores of the Dolomites are alingned on and overlap circular structures (fractures, depressions) with diametres ranging from 2 to 40 km. Outcrop data show that the synsedimentary structural setting ranges from (apparently) flat platform bases to platforms that subsided up to 1.7 km stronger than the surrounding basinal areas. Platform top sediments, traditionally considered to reflect a peritidal environment, occur locally as lateral equivalents of mounds composed of automicrite, which exhibit elevations of up to 150 m above the contemporaneous platform top sediments. The platform cores in the Dolomites exhibit subcylindrical breccia pipes and funnels with diametres of <1 km, whereas flanks and prograding platform interior rocks are not affected. Brecciation was accompanied by marine internal sedimentation, acidic „Pietra Verde“ volcanism, matrix dolomitization and saddle dolomite cementation indicating high temperatures, and is dated as Triassic.

The circular structures, associated depressions and contemporaneous igneous activity point to volcanic factors controlling carbonate sedimentation. The volume loss in the subsurface causing preferred platform subsidence is interpreted as the result of subsolution of the carbonate substratum of the platforms and explosive eruption of acidic magmatic material („Pietra Verde“) through the platforms. Brecciation of the platform interior is interpreted as partly hydrothermally caused, partly caused by volcanic blasts. Volcanic gases, transported to the sediment-water interface in hydrothermal systems, can account for the initiation of carbonate platform nucleation. Locally developed mounds adjacent to „peritidal“ platform strata are interpreted as hydrothermal in origin. The mounds indicate geometrically that the platforms were in fact deep water accumulations shaped by storm waves and hydrothermal diagenesis rather than by eustatic sea level changes at the metre scale.