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The Platta ophiolites in Eastern Switzerland: what do they tell us about the formation of the Alpine Tethys?

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The ophiolites in the South-Pennine Platta nappe in SE Switzerland show many differences to the more classical ophiolite sequence described from the Paleotethys and Neotethys of the Eastern Mediterranean region. The aim of this presentation is to summarize the lithological and structural characteristics of these ophiolites that were interpreted, based on structural, sedimentological and petrological observations, to form remnants of a Zone of Exhumed Continental Mantle (ZECM) representing the transition between oceanic and continental crust along the northwestern Adriatic margin.

The most prominent structure within the Platta ophiolites is a detachment system that is characterized by an up to hundred meters thick brittle damage zone that is capped by a well-defined core zone formed by serpentine gouges. These fault rocks record a complex fluid and reaction assisted retrograde deformation history that initiated within the stability field of serpentine. At the seafloor these fault rocks were reworked and/or altered and replaced by calcite resulting in so-called ophicalcites. The relation between high-temperature peridotite mylonites showing a top-to-the-continent sense of shear and the later brittle detachment faults showing a top-to-the-ocean sense of shear is not yet fully understood.

The mantle rocks in the ZECM change oceanwards form spinel lherzolites to plagioclase peridotites, the latter resulting from the reaction with infiltrating asthenospheric melts.

Increasing magmatic activity going oceanwards is also indicated by the observation that gabbroic bodies intruded in partially serpentinized peridotites at a shallow depth and pillow lavas generally become more voluminous and grade from T- to N-MORB oceanwards. Near the continental edge they form isolated volcanic bodies emplaced

directly onto exhumed mantle whereas further oceanwards they are more voluminous and associated with syn-magmatic high-angle normal faults. Trace element compositions and Nd isotopic compositions of basalts and parental liquids of the gabbros are very similar and represent aggregated melts of low to moderate degrees of partial melting of an asthenospheric source. They may be the products of a steady process which combined extensional deformation with magma generation and emplacement recording the transition into seafloor spreading. In the syn-extensional gabbros, microstructures reveal a deformation history ranging from syn-magmatic to seafloor conditions. This deformation was acquired during their intrusion into partially serpentinized mantle rocks and subsequent exhumation. U/Pb on zircon from these gabbros, interpreted as crystallization ages, gave 161 ± 1 Ma, which corresponds to the age of radiolarian cherts, the first sediments sealing continental and oceanic basement units in the ocean continent transition.

The occurrence of isolated allochthons of continental origin stranded onto subcontinental mantle is incompatible with mantle exhumation at a mid-ocean ridge as well as the observation that the same mantle rocks form primary relationships to lower crustal rocks in the adjacent Malenco area. The observations made in the Platta ophiolite are remarkably similar to the rocks drilled from the ocean-continent transition along the west-Iberian passive margin. Thus, the Platta ophiolites were not formed by classical seafloor spreading, but represent transitional crust separating continental and oceanic crusts. Consequently, they record the marginal units of the Alpine Tethys and the processes related to the opening of this ocean.