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# Organic matter in the ancient Alpine Tethyan Ocean Continental Transition

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Studies of hydrothermal vents in modern ocean settings suggest that methane produced by serpentinization can support methanotrophic bio-systems. Are such bio-systems locally restricted to hydrothermal vents or are more pervasive, being linked with the geology of serpentinized mantle in the subsurface? Answering this question has implications for our understanding of the global importance of hidden sub-surface bio-systems, the fate of methane and the carbon cycle.
The ocean-continent transition (OCT) of magma-poor rifted continental margins, exhumed within mountain belts by continent collision, provides an opportunity to investigate this question. Initial data from the Totalp unit in the Eastern Swiss Alps, representing exhumed OCT of the Alpine Tethyan rifted continental margin, shows the presence of various hydrocarbons (Mateeva et al., in prep.). Samples from other Tethyan OCT locations, consisting of the Tasna nappe and Platta unit of the Eastern Swiss Alps and Chenaillet in the Western Alps, have also been analysed to investigate the presence or absence of methanotrophic biosystems within serpentinized exhumed mantle and associated ophicalcite and syn-rift sediments.
Samples from these remnant Tethyan OCT locations are characterized by low and varied organic carbon concentrations that reflect the large lithological diversity of this area. The samples contain hydrocarbons in the form of n-alkanes mostly in the range C20 – C32, polynuclear aromatic hydrocarbons (PAHs) and various biomarkers (e.g. steranes, hopanes). A typical sample from the hydrothermal system in Platta shows the lithological characteristics of a black smoker, but with no indication of a more developed biosystem.
Preliminary results from the examined Tethyan OCT locations (Tasna, Platta, Chenaillet) show evidence for the preservation of marine organic matter in the serpentinized mantle and overlying sediments, although there is no unequivocal indication that the organic matter is generated from methanotrophic bio-systems. Nevertheless, focussing on Tethyan hydrothermal systems and on contemporary analogues such as ODP cores will be critical in understanding whether methanotrophic biomarkers can be preserved and if so whether the methane originated from serpentinization.