Geophysical Research Abstracts
Vol. 17, EGU2015-1645, 2015
EGU General Assembly 2015


# Evidence of organic matter in the Ocean-Continent Transition of Alpine Tethys from Totalp, Eastern Swiss Alps

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Evidence from ocean ridge drilling and dredging and from the exhumed Tethyan continental margin in the Alps demonstrates that mantle serpentinization occurs at slow-spreading ocean ridges and magma-poor rifted continental margins. Observations at white smokers suggest that methane produced by serpentinization can support methanotrophic bio-systems which use methane as their only source of carbon. An important question is whether such biosystems are more generally pervasive in their association with serpentinized mantle in the subsurface. The answer to this question has important global implications for the importance of the hidden sub-surface bio-systems, the fate of methane and the carbon cycle. We examine whether serpentinized exhumed mantle at magma-poor rifted continental margins shows evidence for methanotrophy. Fieldwork sampling of km scale exposure of orogenically exhumed serpentinized mantle in the eastern Swiss Alps allows 3D mantle sampling not possible at ocean ridges and has the potential to answer the question regarding localized versus pervasive sub-surface methanotrophic biosystems.

The Totalp massif in the eastern Swiss Alps has been chosen for an initial study to investigate the presence or absence of methanotrophic biosystem within serpentinized exhumed mantle in the Tethyan OCT. Totalp has little Alpine deformation and its metamorphism is no more than prehnite-pumpellyite grade.

Hands specimens and cores have been taken from the Totalp area in order to sample serpentinization and its lithological diversity in the search for presence or absence of biomarkers. Thin sections analysis reveals multiple serpentinization events. XRD analysis shows complete serpentinization of the olivines and orthopyroxenes.

The samples for bio-geochemical analysis were cut and ground to powder, processed by soxhlet extraction and then analysed by GC and GCMS in order to determine the full range of biomarkers. Total carbon and total organic carbon was also determined for the samples.

Samples collected from the Totalp area show evidence of organic hydrocarbon in the form of alkanes. The majority of the samples contain n-alkanes in the range C20 - C32. Some samples contain isoprenoids in different concentrations dependent on their lithology, for example pristane and phytane are found in Totalp's sediments. The organic molecular distribution is consistent with the temperature history of the basin. Totalp samples are characterized by TC contents of 0.03These first results from Totalp showing evidence for preserved organic matter and biosystems in the serpentinized mantle of the ancient Tethyan OCT are encouraging. Much more work is required to understand whether the organic matter is generated from methane-driven biosystems, and if so whether the methane originated from an organic or inorganic source?