Predicting the depth of the lithosphere-asthenosphere boundary from surface heat flow in the Carpathian-Pannonian region: the role of pargasitic amphibole

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It was shown recently (Green *et al*.., 2010) that pargasitic amphibole is the most important water bearing phase in the upper mantle. Its melting and instability at 3 GPa (~ 90 km of depth) or ~1050 °C lead to a significant drop in the water storage capacity of the upper mantle. The melt or free fluid forming during the decomposition of pargasite weakens considerably the rheology of the upper mantle resulting in lower seismic velocity, higher conductivity and stronger anisotropy.

If this petrologic model is correct, then we should see geophysical anomalies at ~90 km depth globally, expect places where the heat flow is high. In this areas, where the heat flow is higher than ~60-70 mW/m^2 -considering an average continental geotherm - the temperature may exceed the pargasite stability at ~1050 °C in a depth shallower than 90 km. The Carpathian-Pannonian region (CPR) which is characterized by high heat flow, and both geophysical and geological data are abundant, is an excellent natural laboratory to test such a petrophyscial model. Depth of the 1050 and 1100 °C isotherm was calculated beneath the CPR from heat flow data and compared the depth of major geophysical anomalies indicating the lithosphere-asthenosphere boundary.

Paleoredox chemistry of Cenomanian–Coniacian black shales at high paleolatitudes: Implications for the extent of anoxia during OAE2

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Cretaceous oceanic anoxic events (OAEs) have been studied in detail during the last decades. OAE2 is of particular interest as it reflects one of the largest perturbations of the global carbon cycle in the Mesozoic. It is characterised by a widespread deposition of organic rich sediments which is reflected by a positive carbon isotope excursion (CIE) in the terrestrial and marine record. Whereas the paleoredox conditions in low and mid-paleolatitudes are well constrained for OAE2, data from high paleolatitudes are still scarce.

The paleoceanographic response at high paleolatitudes during OAE2 is here characterized by samples from Axel Heiberg Island in Canada. Preliminary palynological analyses indicate a Late Cenomanian–Coniacian age for the section. Bulk organic carbon isotope data have been corrected using the hydrogen index (Rock Eval pyrolysis) to account for changes in organic matter sourcing. Our corrected isotope record correlates in detail with the European carbonate reference curve and confirms our biostratigraphic model. Iron speciation (Fe_{HR}/Fe_T and Fe_{Py}/Fe_{HR}) data point to anoxic but non-euxinic conditions at high paleolatitudes during OAE2. Furthermore the Sverdrup Basin was intermittently suboxic to anoxic (ferruginous) throughout most of the latest Cenomanian–Coniacian. Despite very high TOC (>10%) and hydrogen index values, molybdenum concentrations are relatively low during OAE2 but increase after the event. This suggests a global drawdown of the seawater molybdenum reservoir caused by the widespread extent of ocean anoxia/euxinia in the Cretaceous oceans during OAE2.

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