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Unraveling the geochemistry of melts in exhumed mantle domains in present-day and fossil magma-poor rifted margins

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The role of magmatic processes occurring during the continental break-up and the onset of steady-state seafloor spreading are still a matter of debate. Beside the tectonic processes like stretching, thinning and exhumation, magmatic processes also play a key role in the evolution and breakup of magma-poor rifted margins. To unravel the impact of such processes, Ocean-Continent-Transitions (OCTs) are of particular interest. OCTs are complex areas where hyper-extended continental crust, exhumed mantle and proto-oceanic crust occur. All these domains have been identified and sampled in both present-day (Iberia/Newfoundland margins) and fossil margins (Platta/Err nappes). In this study, we present preliminary results that enable to characterize the nature of the mantle rocks and the melts found in the OCTs of these paleo- and present-day margins with the aim to investigate how the mantle evolves from initial exhumation to final lithospheric breaks.
In OCTs two types of mantle rocks can be observed: (i) a « sub-continental type » free of syn-exhumation melt imprint preserving the early geochemical evolution, and (ii) a « refertilized type » characterized by melt infiltration and mantle-melt interaction. Melts from these domains have different major, trace element and isotopic compositions and can therefore be used to constrain how melt interacts with the mantle and to understand the role of magmatic processes in the break-up. We therefore summarized whole-rock, in-situ and isotopic analysis available in the literature from the Iberia/Newfoundland present-day margin system and completed the existing database with new additional data from the Iberia margin. These new data have been obtained using in-situ technics mainly on clinopyroxenites, serpentinized peridotites and gabbros of ODP drill cores. Around 200 new data have been acquired using the LA-ICPMS technic. Preliminary results show that clinopyroxenes in serpentinized peridodite breccia from ODP site 637A and 899B are less LREE depleted compared to clinopyroxenes from other sites in the Iberia margin, showing a lower partial melting rate and thus a differential magmatic activity within this margin transect trough time and space. Moreover, new analysis on clinopyroxenites from ODP leg 173 site 1070, will help to constrain the PT conditions during formation of the OCT. Future work in the Platta nappe will be useful to test whether or not the geochemistry of melts and its establishment are defined by the same characteristics in fossil magma-poor margins.