Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07576, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07576
EGU General Assembly 2008

Plume-ridge interaction revisited: Evidence for mixing of melts from He, Ne and Ar isotope and abundance systematics

N. A. Stroncik (1), S. Niedermann (1) and K. M. Haase(2)

(1) GeoForschungsZentrum Potsdam, Telegrafenberg, D-14473 Potsdam, Germany, (nicole@gfz-potsdam.de / +49 (0) 331 288 1474 / +49 (0) 331 288 1423) (2) Department of Earth Sciences, University of Aarhus, C. F. Møllers Allé 110, DK-8000 Aarhus C, Denmark

Submarine volcanic glass He, Ne and Ar data from the Pacific-Antarctic-Rise at its intersection with the Foundation Seamount Chain have been obtained to further elucidate one of the main outstanding problems in plume-ridge interaction studies: the physical state in which mantle flow and mixing occur in those settings. In areas where hotspots are located close to MORs the deep mantle plume flow creating the hotspot at the surface interacts with the ridge system as indicated by along-axis bathymetric and gravitational anomalies as well as geochemical and isotopic anomalies of mid-ocean ridge basalts. Today 21 of the about 50 active hot spots have been identified to interact with MORs, inducing such anomalies along 15 to 20% of the length of the global MOR system. In general, plume-ridge interaction processes have been the subject of intense geochemical and geophysical studies because they provide information on mantle flow and melting dynamics. Despite these intense studies no conclusive answer to the physical state of the mixing process could be obtained up to now. Mixing of plume mantle and mid-ocean ridge basalt source material may either be in the form of two solids, of solid-melt or of two melt phases only. The positive correlation of $^{4}He/^{40}Ar^{*}$ with $^{206}Pb/^{204}Pb$ as well as the negative correlation of $^{4}He/^{40}Ar^{*}$ with $^{40}Ar^{*}$ and ^{4}He concentrations, combined with a lack of correlation between $^{4}He/^{40}Ar^{*}$ and ridge depth or MgO concentration observed in the Pacific-Antarctic-Rise magmas, indicate that the enriched mantle plume material has been extensively degassed prior to mixing with the mid-ocean ridge source material. De-

gassing of the plume source and mid-ocean ridge source material prior to mixing is also suggested by the He versus Pb isotope systematics. However, the occurrence of degassing processes requires the existence of melts, implying that mixing between the plume and the mid-ocean ridge material occurs in the physical form of melts.