IN SEARCH OF THE INDIAN MANTLE DOMAIN IN THE PALEO-PACIFIC: NEW INSIGHTS FROM PERMIAN ROCKS IN NEW ZEALAND

O. Nebel (1), C. Münker (1), Y. J. Jacobsen (1), N. Mortimer (2), K. Mezger (1)
(1) Institut für Mineralogie, Universität Münster, Germany, (2) Institute of Geological and Nuclear Science, Dunedin, New Zealand

In the SW Pacific region, two major mantle reservoirs are sampled along the boundary of the Pacific and Australian-Indian plates. The boundary of these two reservoirs is presently exposed along the Australian-Antarctic Discordance (AAD). In order to examine the possible occurrence of the Indian-type mantle domain in Permain time we investigated primitive subduction related basalts and basaltic andesites from the Permain Brook Street Terrane in Southern New Zealand (Takitimu Mountains and Longwood Hills). The intraoceanic volcanic arc rocks erupted in the Paleo-Pacific, to the east of the active Gondwana margin. Most samples display remarkably homogeneous and primitive initial $\epsilon$Nd and $\epsilon$Hf values ranging from 7.4 to 9.7 and from 12.1 to 13.5, respectively. These Nd and Hf isotope patterns and the characteristic Nb and Ta depletions are most likely the result of admixture of a MORB-derived fluid to a depleted mantle source in a paleo-subduction zone where Nd and Hf were immobile. The trace element characteristics, in particular the low Th/Yb ratios, do not provide evidence for the presence of significant amounts of subducted pelagic sediment in the magma sources. Hence, the trace element and Nd-Hf isotope systematics support an intraoceanic arc setting similar to the present day Mariana arc. In $\epsilon$Hf vs. $\epsilon$Nd space, the analyzed samples plot to the left of the mantle array towards more radiogenic $\epsilon$Nd, and are similar to $\epsilon$Hf–$\epsilon$Nd values of Indian-type MORB. This feature can be explained by (1) the presence of subducted pelagic sediments or (2) the involvement of a mantle domain similar to the Indian MORB source. Since addition of subducted sediments can be ruled out from the trace element characteristics, the presence of an Indian-type mantle domain is the most likely explanation. In addition to its specific Hf-Nd isotope signature, Indian-type MORB is also characterized by a distinct Pb isotope composi-
tion. Lead isotope analyses on leached feldspars and relict magmatic clinopyroxenes will be used to test this hypothesis. The presence of the Indian-type mantle domain in the Permian Pacific has far reaching implications for the history and evolution of the Australian-Antarctic Discordance. The known westward migration of the AAD from its Cretaceous position east of Australia to its present location [Gurnis et al. 1998] is therefore possibly coupled with a westward migration of the isotopic mantle boundary discovered beneath the AAD. Gurnis, M., et al. 1998, Science, 279:1499-1504.