



Age and origin of magmatism at the Marie Byrd Seamounts (Amundsen Sea)

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The Marie Byrd Seamounts (MBS) form a large intraplate volcanic province aligned sub-parallel to the northern shelf of Marie Byrd Land (West Antarctica). This seamount cluster spans over 800 km in E-W direction and consists of 8 large volcanoes and 30 minor volcanic structures. The seamounts are located in 3.5 to 4 km water depth and have an areal coverage of up to 75x50 km at their base and reach a height of 3 km above the surrounding seafloor. So far, knowledge of the age and origins of this enigmatic seamount province is very limited, and their existence is difficult to explain by classical hotspot models. R/V Polarstern cruise ANT-XXIII/4 collected new bathymetric and geophysical data as well as igneous rocks for the first time. This data and samples are used to acquire formation ages and to decipher petrogenesis and magma sources in order to obtain a spatiotemporal evolution of the MBS. In connection with geophysical data and plate reconstruction models, these investigations contribute to the reconstruction of the tectonic evolution of the SW Pacific and to the ongoing discussions on the origin of intraplate volcanism. The bathymetry of the largest ones of the MBS reveals a guyot-like morphology indicating that they once formed ocean island volcanoes that eroded at sea level and subsequently subsided 1.6 km in the western and 2.4 km in the eastern part of the province. Uneroded small cones on the flanks and on the erosional platform of the seamounts represent late stage or post-erosional, post-subsidence phases of volcanism, respectively. $^{39}\text{Ar}/^{40}\text{Ar}$ age dating of the dredged samples exhibit Cenozoic ages ranging from ca. 65 Ma (Pa-

leogene) in the western to ca. 52 Ma (Eocene) in the eastern part of the seamount chain. The ages clearly show that the voluminous MBS formed well after the full development of the Pacific-Antarctic-Ridge and the break-up of New Zealand from West Antarctica. The relatively short time span of magmatism coincides with a phase of major plate reorganization in the Bellinghausen and Amundsen Sea (Eagles et al., G-cubed 5,7, 2004), possibly causing volcanism induced by plate fracturing. First geochemical results show that the obtained samples mostly consist of relatively evolved volcanic rocks of the alkaline differentiation series. Sr-Nd and in particular Pb isotopes display a two component mixing array of depleted upper mantle and an enriched (EM) mantle component. The presence of EM could either reflect shallow recycling of lithospheric sources during continental break up or contamination by continental crust, which -based on new seismic refraction data - seems to extent much farther north of the shelf break than previously thought (Gohl, USGS OFR, in press). However, primitive basaltic glass from a recent lava flow dredged at the base of Peter I Island, located on ocean crust of the Bellinghausen Sea, define the EM mixing end-member and thus seem to exclude extensive assimilation processes for the evolved MBS lavas. In conclusion, shallow recycling of fertile continental lithosphere into the upper mantle during the final breakup of Gondwana followed by plate fracturing and upwelling of the fusible material most likely explain the origin of the enriched MBS component. However, lithospheric delamination as suggested for the conjugate New Zealand margin (Hoernle et al., EPSL 248, 2006) also deserves consideration.