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Geocemical provinces of magmatism in the south-eastern part of the Pacific Ocean

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Comparison of geochemical signatures of island magmatism in the south-eastern part of the Pacific Ocean and tholeiites of the Bransfield and Powell rift zones revealed the similar character of the enrichment which reflects the melting of a close mantle source. But alkaline magmatism of the islands in the west of Antarctic and Marie Byrd Land differs from the enriched basalts of the northern province (Bransfield, Powell, BTJ) by showing more radiogenic Sr values and non-radiogenic Nd.

The tectonic development of the South Ocean is characterized by its formation under stationary conditions of Antarctic continent. As a result of this, for the volcanic islands distributed at the western part of the Antarctic we observe no long mountain ridges typical for their development under conditions of the moving plate. Intraplate magmatism evolution was coincided with the extinction of the old subduction zones, formation of the new rift zones and separation of South America from Antarctic [Udintsev, Schenke, 2007; Teterin, 2008]. Such complicated geodynamics caused the possibility of formation of rupture cracks reaching the underlying metasomatizated mantle and decompression melting with further island formation.

In Oligocene due to migration of asthenospheric flow from the west to east in the result of destruction of previously united continental blocks there was formed the Scotia Sea, South Sandwich island arc as well as Drake Passage. This caused the mechanical weakening of South Atlantic lithosphere and the starting at the end of Oligocene – beginning Miocene of the new plate border formation – American-Antarctic ridge, which propagated in the eastern direction till the Bouvet triple junction [Dubinin et al., 1999]. The close geochemical signatures of mantle source for islands basalts including the Bouvet Island and the enriched tholeiites of the western extremity of the SW Indian Ridge proves the development of a specific geochemical province enveloping the southeastern part of the Pacific Ocean and the southern part of the Atlantic stretched till the Bouvet triple junction. The plume influence is limited by Andrew Bain and Du Toit fracture zones and is not continuing to the western part of the Indian Ocean and South Atlantic. Spreading zones were formed during kinematic reorganization of the West Antarctic region 30 Ma, when South America was separated from the West Antarctica. This process has lead to formation of enriched tholeiitic basalts. New results for tholeiites from the ridges near Bouvet triple junction show that fragments of ancient continental lithosphere could be involved into melting during the early history according to Re-Os isotope data and Ni-Mn olivine contents. These components can be as high as dozens percent. Such scenario could be fulfilled when in the course of under asthenospheric flow directed from west to east there could be created conditions for possible separation of some blocks from the continental roots of America, Antarctica, or Africa with their involving into the further melting in the rift zones during formation of small cells directed towards the spreading zones [Smith, Lewis, 1999]. Their melting or involving into oceanic mantle will result in the formation of differently enriched tholeiites with some garnet signatures and isotopically characterized by the enriched source displayed at the West Antarctica islands.

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