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Peridotites, Gabbros and Basalts Exposed on San Jorge,Santa Isabel and Choiseul Islands (Solomon Islands): Accretion of Ontong Java Plateau's Fragments or Exhumation of Arc Related Rocks?

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The Ontong Java Plateau (OJP) is the largest and thickest oceanic large igneous provinces (LIPs) (Coffin and Eldholm, 1994). Its 36 km thick crust was formed in two short periods of less than 3Ma by two pulses at 122Ma and 9OMa (Ar-Ar dating of basalts from ODP sites) related to major changes in the Pacific Plate motion (Neal et al, 1997). In the 125-90Ma period the OJP has moved very little relative to the postulated hotspot source (Louisville hotspot) located at 42 S 159 W (Tejada et al, 1996). Since the second magmatic event (90Ma), OJP moved passively toward the Solomon arc until they collided 10Ma ago (Neal et al, 1997). Because of the collision of OJP with the Solomon arc, exhumation and partial obduction of the leading edge of the OJP occurred and plutonic rocks (peridotites and gabbros) associated with pillow-basalts were exposed on Choiseul, Santa Isabel and San Jorge islands (Neal et al, 1997). In Choiseul, Siruka Ultramafics were emplaced as a coherent thrust sheet. These exposed peridotites are essentially tectonised altered harzburgites and dunites with highly sheared textures. REE patterns for Choiseul whole rocks have low MREE to HREE ratios consistent with partial melting in the garnet peridotite facies. Extreme fractionation of LREE relative to HREE (Ce/YbN = 0.005) indicates an origin as residues of fractional melting (Parkinson et al, 1997)4. Santa Isabel is divided in two parts by a major fault system - the Kapito-Korigole-Fault-System (KKFS). In the northern part, terranes belong to OJP whereas in the southwestern part of the island and on San Jorge island arc related rocks crop out. On the OJP side of Santa Isabel, Neal et al (1997) described the Sigana basalts as being similar to those recovered by deep ocean drilling programs and dated at 122Ma and 90Ma. They are both low-K tholeiites with flat REE patterns and slight depletion in the highly incompatible elements. These patterns are typical of oceanic plateau lavas. Associated with these basalts, peridotites and cumulate gabbros are found in Santa Isabel as thin fault-bound slices (Parkinson et al., 1997). These peridotites are moderately foliated and rich in clinopyroxene (Wo=47,5; En=49,5) and orthopyroxene (En=89) with spinel (60<Cr#<73) and very rare olivine. Surprisingly, their mineral association is similar to that of the San Jorge peridotites which, according to Parkinson et al., (1997), belongs to the arc section. Based on spinel compositions, Parkinson et al., (1997) determined that they are fragments of supra-subduction zone mantle. In contrast, their REE patterns are similar to those of Choiseul ultramafics, with marked depletion in LREE relative to MREE and steep MREE-HREE slopes. However, when the proportion of clinopyroxene increases, the MREE-HREE slope becomes flatter. The trace element patterns for the ultramafic rocks from all islands exhibit striking positive anomalies in U, Pb, Sr and Sc resulting of a possible metasomatism of magmatic liquid. Major and trace elements for peridotites from Choiseul, Santa Isabel and San Jorge are similar. So, peridotites related to the Solomon arc setting and to the OJP can not be distinguished. However, it is important to interpret their composition either in terms of melting residues or in terms of very poor cumulates equivalent to gabbros. We propose here to focus on their isotopic compositions (Sr, Nd) which should help characterize their tectonic setting (arc or oceanic plateau).

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