Geochemical feature of basalt from the Hangai -Hentei belt, central Mongolia

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Some papers propose palaeogeographical maps showing the Paleo-Mesozoic wide ocean between the Angaran (Siberian platform) and the North China cratons on the basis of geophysical data, few geological evidence of such an ocean, however, has been found. Here we show the concrete evidence of the ocean, i.e. newly discovered huge accretionary complex having radiolarian chert and underlying Polynesian-type basalt from Khangai-Khentei belt, Mongolia, in this paper. Lithology and geologic structure of the belt clearly indicate its formation process as an accretionary prism under the subduction system at continental margin. The accretionary complex in Mongolia is composed of sandstone and mudstone with minor amount of radiolarian chert, siliceous mudstone, basalt and limestone. The radiolarian cherts trending NE to E are well exposed in the east and south of Ulaanbaatar and are usually red in colour, stratified rhythmically, yield late Silurian to late Devonian radiolarians and conodonts. A bed is several centimetres thick. The basalts here composed of lava showing pillow structure in some places, hyaloclastite and tuff. The basalts are intercalated with red tuffaceous mudstone and red chert layers including radiolarian fossils in a place, and are conformably overlain by bedded radiolarian chert. The lava showing intersertal or ophitic textures is generally altered and most of minerals except for plagioclase and clinopyroxene are largely replaced by secondary minerals such as muscovite, chlorite and calcite. Chilled margin, radial joints, and spherical-ellipsoidal vesicles are observed in the lava. Sixty samples of the basalt associated with the radiolarian chert from three localities were taken for chemical analysis. The samples are much richer in K2O, TiO2, Fe2O3∗and P2O5 than the average of MORB, and some of them carry normative nepheline. The basalt is characteristically enriched in most incompatible elements compared with MORB. A characteristic humped pattern in the spidergram, in which left-hand incompatible elements, K, Rb, Ba, Th, Ta and Nb, show great enrichment relative to MORB but the least incompatible element Y shows a little enrichment, clearly indicates WPB. The discrimination diagrams using Ti, Y, Nb, Mn, P show that the basalt are of within plate alkaline basalt. The basalt has very high Nb/Zr (0.22 in average) and high TiO2/Al2O3 (0.21 in average) ratios, both of which identical to the Polynesian-type OIB. Nb/Y vs. Nb/Zr diagram (Tatsumi et al., 1998) also shows that the basalts are clearly of the Polynesian-type, and some of them maybe of HIMU basalt. Although further study on isotopic ratio are needed, the basalt of the accretionary complex likely contains HIMU basalt. The ocean probably resulted from rapid spreading of ocean floor between Siberia and China attributed to temporal whole mantle convection.