Hypoxenoliths in the shoshonite on the northern Tibet plateau and their geological implications

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Large amounts of Cenozoic volcanic rocks are exposed in the Hoh Xil region, northern Tibetan plateau, in which older lavas occur as thick sheet flows with a flat surface and weathering crust and younger volcanoes remain relict volcanic cones or vents. The relict cones are usually small (<100 m in diameter) and distributed along faults. Trachyte and shoshonite are dominant rock types, and various xenoliths and hypoxenoliths were found in these rocks. The xenoliths are rock fragments of early igneous rocks and gneiss. The hypoxenoliths are mainly phenocrysts of clinopyroxene, orthopyroxene and olivine, which have a different composition from the small crystals and matrix minerals in the rocks. The hypoxenolith olivines are characcterized by high MgO (Fo up to 84), while olivines in matrix are as low as Fo=71; both hypoxenolith orthopyroxene and clinopyroxene have relatively higher MgO and lower Al2O3 than other type pyroxenes. P-T calculation indicates that the sources of these hypocrystals were much deeper (>30 kb) than those of their host rocks (~20 kb).

Based on the geological and geophysical results obtained recently by our Sino-France cooperation project, we proposed an inward subduction model to explain the mechanism of the uplift of the Tibetan plateau. The discovery of hypoxenoliths from the Cenozoic volcanic rocks suggests a deep magma source, which is consistent with the tomographic evidence of a low velocity body or a mantle plume at the depth of 150-250 km beneath the Cenozoic volcanic region of Hoh Xil, northern Tibetan plateau.