SEDIMENTOLOGY, PETROGRAPHY, AND TECTONIC SIGNIFICANCE OF CRETACEOUS TO LOWER TERTIARY DEPOSITS IN THE TINGRI-GYANGTSE AREA, SOUTHERN TIBET

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Abstract

Cretaceous and Lower Tertiary sedimentary rocks are well exposed in the Tingri-Gyangtse area, tectonically belonging to the central Tibetan Himalayas, to the south of the Indus-Yarlung-Zangbo suture. The Cretaceous Tianba flysch in the Tianba-Jiabula region is correlative with the Giumal Group sandstone in Zanskar, northwestern Himalayas. There are significant amounts of chrome-rich spinels in turbiditic sandstones from the upper part of Tianba Flysch, which might suggest ophiolite derivation and a Cretaceous ophiolite obduction event on the northern Indian continental margin in southern Tibet. However the compositional range of these detrital spinels closely matches that of spinels from intra-plate basalts. About 5% of the spinels contain melt inclusions. The compositions of melt inclusions correlate well with those of host spinels. Melt inclusion geochemistry also suggests a source of hotspot basalts. It is concluded that the Rajmahal volcanics were the source for these Cr-rich spinels. The continuous Cretaceous to Lower Eocene marine sedimentary series in the Gamba and Tingri areas suggest that the Indian-Asian collision must have started after the deposition of the youngest marine shelf sediments. Petrographical analysis of sandstones reveals that the monocrystalline quartz grains of cratonic origin are dominant in the Paleocene Jidula Formation; in contrast there are significant amounts of immature framework grains with a distinct ophiolitic and volcanic arc influence present in the Eocene Youxia Formation and the younger Shenkeza Formation. Geochemistry in both sandstones and shales complement the petrographic data indicating that the source of the Jidula Formation primarily consisted of quartzose basement rocks, while the Youxia and Shenkeza Formations are mainly derived from the uplifted Gangdese arc-trench system. The compositions of Cr-rich spinels in the Youxia and Shenkeza sandstones are similar to those from fore-arc peridotites, most likely from the arc and ophiolite rocks along the Yarlung-Zangbo suture to the north. No spinels have been observed in the Jidula sandstones. Therefore the early Tertiary detrital sediments in Tingri record a marked change in provenance in the early Tertiary, which indicates that the onset of India-Asia collision was at ~47 Ma in southern Tibet.

I would like to dedicate this dissertation

to my parents, Weilan Jiang & Shouqing Zhu,

who would have been proud to have seen its completion.

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