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THE OPHIOLITE TERRANES IN TIBET YARLUNGZANGBO RIVER SUTURE ZONE AND ITS EVOLUTION OF NEO-TETHYS, CHINA

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The ophiolites of Yarlungzangbo river suture zone are relicts of Neo-Tethyan oceanic lithosphere. They are terranes of oceanic lithosphere affinity. According to the characteristics of its origin and distribution, it can be divided into Western Yarlungzangbo River terrane (Xi Yarlungzangbo Jiang terrane, XY), Xiugugabu terrane, Middle Yarlungzangbo River terrane, Eastern Yarlungzangbo River terrane and Southern Motou terrane.

These terranes are composed of ophiolites and its superstratum of marine facies. On its southern and northern sides, there are tectonostratigraphic terranes and welded magmatic arcs.

Western Yarlungzangbo river terrane (WY). The terrane extends from Zhongbo County for more than 500 km in length and the width is from 1 to 2 km. This terrane mainly consists of mantle peridotite. And in some places (for example, Gongzhu lake, Jianapeng, menshi), we have found the related gabbro, sheeted sills (veins), pillow lavas and radiolarite.

On its southern side, the terrane contact with the Jiwugunba tectonostratigraphic terrane is by a thrust fault. On its northern side, there is the Gangdise welded magmatic arc.

By studying its petrology and petrochemistry, we suggest that it may have been generated in a tectonic environments such as a marginal sea during the late Jurassic to Early Cretaceous.

Xiugugabu terrane (XG). This terrane extends from Xiugugabu to Daba, its length is nearly 400 km, and its width is approximately 30 km. The terrane consists of mantle peridotite, cumulate gabbro, diabase sills (vein), pillow basalt and radiolarite, and related flysch clastic sedimentary rocks of Triassic and Cretaceous ages. This terrane may be a composite terrane

with two ophiolite sequences representing Triassic and Cretaceous Tethyan oceanic crust. Compared with the Western Yarlungzangbo river terrane, Xiugugabu terrane is relatively similar to oceanic original ophiolite. It is emplaced at the end of the Cretaceous.

Middle Yarlungzangbo river terrane (MY). The terrane extends from Dazhuqu to Dajiling, its length is nearly 600 km, and its width is 10 to 12 km. The relatively complete ophiolite sequences in Tibet are exposed at the terrane. From bottom to top, the sequences of the terrane include: 1) mantle peridotite, 2) mafic-ultramafic cumulates, 3) massive gabbro, 4) trondjhemite, 5) sheeted sill (dike) swarms, 6) pillow basalt and radiolarite and 7) related flysch-like clastic sedimentary rocks of late Cretaceous. Radiolaria from the upper part of the ophiolite include Xiphostylus, Cenellipsis, Sphaerozoum, Cenosphaera, and others. This assemblage is Late Jurassic or Early Cretaceous in age. Potassium/argon dating of hornblende from garnet-hornblendite in the melange at the base of the meta-peridotite gives an emplacement age for the ophiolite terrane of 81 Ma.

Its geotectonics, petrology and geochemistry, indicates that it may be generated in a tectonic environment such as an initial oceanic basin.

Eastern Yarlungzangbo river terrane (EY). The terrane extends from Qiangna to Milin County, Langxian County and Qushui County. Its length is more than 500 km, and its width is approximately 10 km. Complete ophiolite sequences have been described from Zedang and Norbusa. The sequences are somewhat different from MY. From the base to the top it includes: 1) mantle peridotite, 2) mafic-ultramafic cumulates, 3) gabbroic diabase sill swarms, 4) pillow amygdaloidal spilitic keratophyre with intercalated radiolarite. Radiolaria assemblages suggest a cretaceous age for the radiolarite. According to the Eocene molasse deposits overlying on the ophiolite, the emplacement and accretion age may be in the end of late Cretaceous to Early Tertiary. The geochemical characteristic of EY and MY is representative of initial oceanic lithosphere while EY is thought to have formed in an ocean island or island arc environment (Wa-ng Xibin, 1987; Wang Guquing, Xia Bin, 1987, Xia bin, Shiyangshen, Guo Lingzhi, 1989).

Southern Motou terrane (SM). The terrane is near the corner of Yarlungzangbo river. It is mainly composed of mantle peridotite, some of the ocean crustal sequences and deposits of marine facies of Cretaceous age. On its eastern and western sides, there are Dingri terrane and Moladabad

terrane separately. It also is the relicts of Neo-Tethyan oceanic crust which developed during the Cretaceous period. The accretion age may be the end of the late Cretaceous.

The cumulates of these ophiolite terranes developed relatively poorly, and are different from the ophiolites of Troodos, Bay of Island and Semail. In the latter, magma chambers of huge thickness had developed (Hopson, et al., 1981; Coleman, 1977). The cumulates in the Yarlungzangbo river suture zone developed fairly well at MY; in the others (WY, XG, EY and SM), there are some cumulates only in parts of the area. There are mainly sheeted sills other than erect sheeted dikes below the pillow basalts in the MY. In the ophiolite sequences of the WY, XG, EY and SM, there are practically only diabase veins, we can barely find the sheeted sills. The small thickness of the above terranes, suggests that the ancient oceanic crust was relatively thin. The thickness of the ancient crust represented by the MY is 2 to 3 km, and it is only one half to one third of the thickness of modern oceanic crust. The thickness of the others is ever thinner (only 1 km or so). The characteristics of the ophiolite sequences of the terranes, reveal the differences of their original environments and at the same time reveal the differences of fashion and intensity of structural force during emplacement and accretion.

In Tibet, the developing time of the western segment of Neo-Tethys is earlier than the middle and eastern segments. The developing time of the western segment may be late triassic to Jurassic, and the middle and eastern segment may be Jurassic to Cretaceous.

The developing of the ophiolite sequences is related to the activity of a mantle plume. Because of the heterogeneity of the components in the upper mantle and crust and the non-simultaneousness of the developing time of the ocean basins, the ophiolites of different places have its own sequences and characteristics of petrochemistry.

During the late early Mesozoic (may be at early Cretaceous), the Neo-Tethys ocean represented by the Yarlungzangbo river ophiolite zone gradually began to subduct northly from west to east. The terranes successively emplaced or accreted the orogenic belts at the end of late Cretaceous or early Tertiary. The generation of the huge welded magma arcs of late Yenshan to Himalayan stage (Gangdis arc and Lhasa arc) relate closely to the subduction of eastern Tethys oceanic crust and the accretion of the ophiolite terranes.

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