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Zircon U-Pb Geochronological Constraints on Rapid Exhumation of the Mantle Peridotite of the Xigaze Ophiolite, Southern Xizang(Tibet)

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The Xigaze ophiolite crops out in the central segment of the Yarlung Zangbo suture zone, southern Tibet (Fig. 1). It is characterized by large amounts of ultramafic units with minor mafic rocks. The mafic rocks consist of gabbros, diabases, dolerites and basalts. The gabbroic rocks of the Xigaze ophiolite occur as layered bodies or fine-grained dikes intruding into mantle sections. Small scale gabbroic bodies are well-preserved in Dazhuqu, Baigang and Jiding. However, their formation time and generation mechanism are not well understood or interpreted.

In this study, nine samples of mafic rocks from the Xigaze ophiolite, including seven gabbros and two rodingites, were selected for in situ zircon secondary ion mass spectrometry (SIMS) U-Pb and Hf isotopic analyses. These rocks display a geochemical feature like melts of normal mid-ocean ridge (N-MORB) type. The U-Pb data yielded identical ages of 124-129 Ma within uncertainties (Fig. 2). Positive zircon $\varepsilon_{Hf}(t)$ values indicated that these

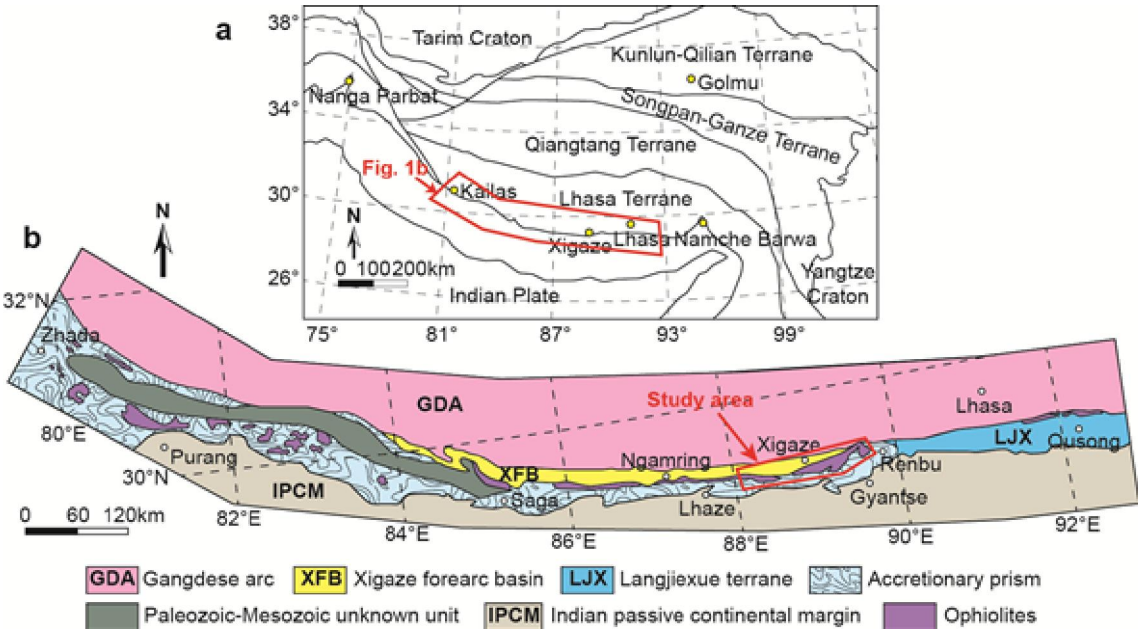

Fig.1 Sketch geological map of southern Xizang（Tibet）illustrating the distribution of the Yarlung Zangbo ophiolites.

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samples had an origin of depleted mantle source.

Combined with previous studies on mafic dikes, amphibolite blocks and radiolarian cherts, it can be concluded that the Yarlung Zangbo ophiolites were formed over a short period of time from 120 to 130 Ma. Hence, a rapid exhumation of the mantle peridotites and gabbroic rocks of the Xigaze ophiolite may have occurred to get intrusion of the diabase/dolerite dikes and sills. It excludes the existence of a long-term ancient magma chamber or lens. It is more likely that the gabbroic rocks are a series of plutonic intrusions beneath an ancient slow-spreading ridge, rather than products of magma chambers. Furthermore, the rapid exhumation may be ascribed to a detachment fault. Therefore, the "Chapman detachment model" can be applied to the generation of the Yarlung Zangbo ophiolites (Fig. 3).

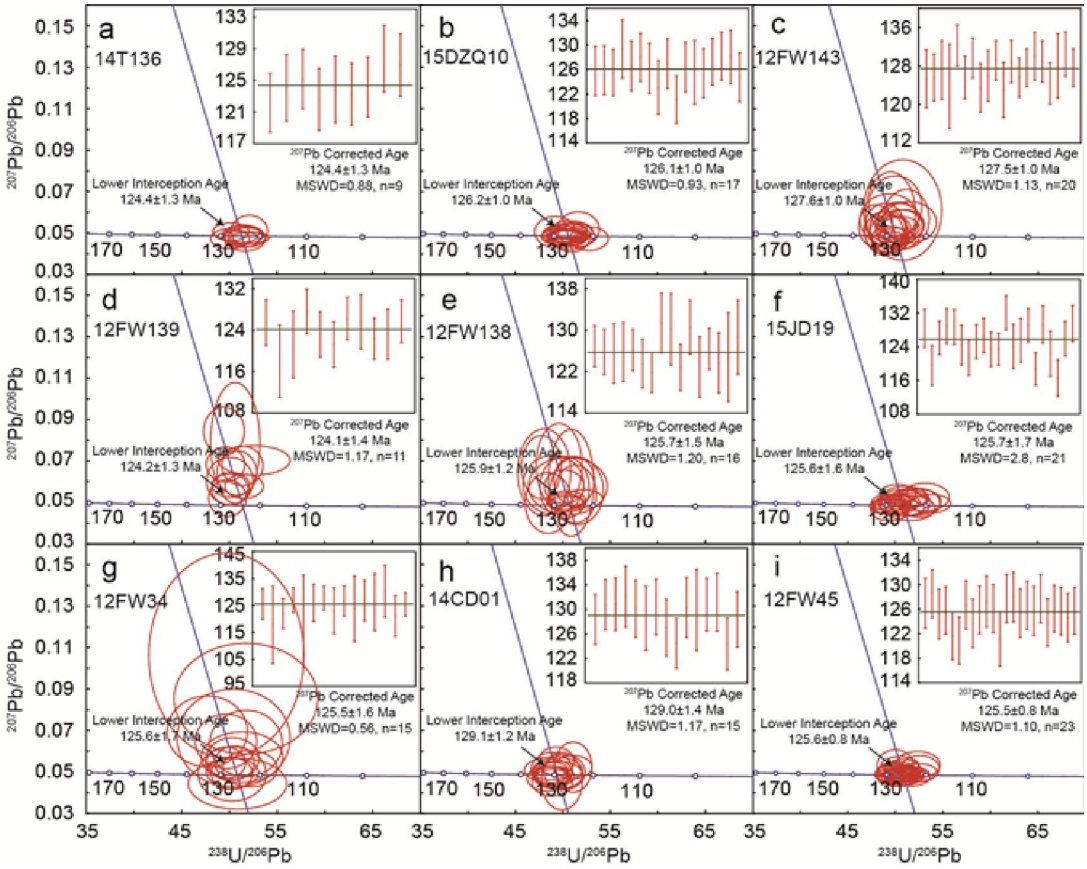

Fig. 2 Tera-Wasserburg Inverse Concordia diagrams and weighted average ages for zircon grains from the mafic rocks of the Xigaze ophiolite. The errors are in 2σ.

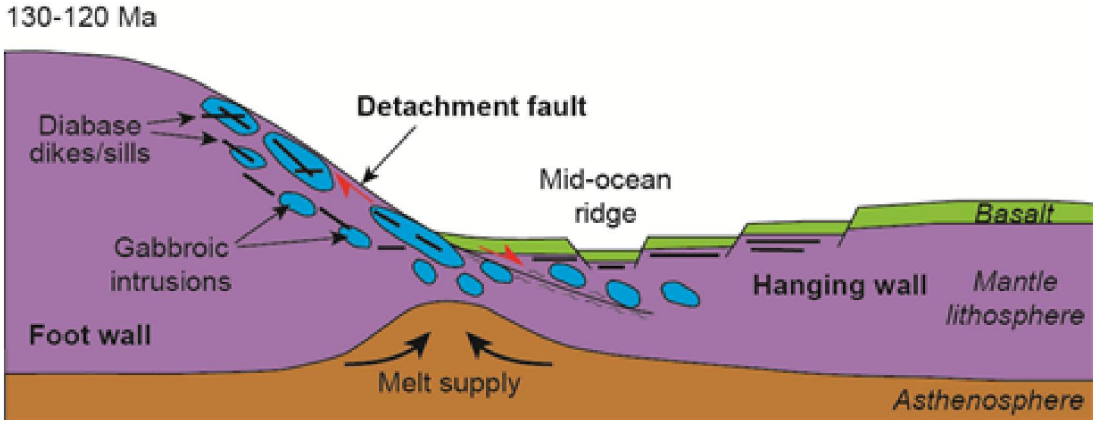

Fig.3 Cartoon showing generation of the mafic rocks and rapid exhumation of mantle peridotites of the Xigaze ophiolite, according to the "Chapman model" (Escartín et al., 2003, 2011).