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Petrogenesis of Permian basalt from Luoji region of Shangri-La, Western Yunnan

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Logie region of Shangri-La County in Yunnan Province located in southern margin of the Yidun island arc, The West is situated next to the ZhongZan Block and GeZan deep fault, eastward extension is the junction zone of Ganzi - Litang, the south stands beside the Yangtze block, which has been considered the extended range of Ganzi Litang(Hou Z.Q.,2004;Pan G.T.,2004;Mo X.X.,1993;Zou J.X.,2011). Existing research shows that this area develops a set of ophiolite mélangé, the basic lavas is the upper part endmember of the ophiolite rock sequence (Coleman R G,1977), the exposed strata in logie area are the Lower Permian system Mushengtutu group (p1ms) and mid- upper Permian Logie group. this paper considers the set of ophiolite mélangé as the objects, as intending to obtain relevant information of ophiolite mélangé

formation and mixture, it presumes to study from the petrology and major and trace element geochemistry to investigate the causes and tectonic setting.

at lower part of the Mushengtutu group (P_{1ms}) in early Permian, there mainly have the altered basalt, almond-shaped basalt, minor tuffaceous slate and limestone blocks, and a set of almond-shaped breccia tufflava at the bottom of it; The upper part are mainly formed with massive basalt, which composed of volcanic quality flysch construction together with siliceous rocks, siliceous limestone, containing bioclastic siliceous debris limestone and tuff in the form of repeating rhythm. lower basalt in Mid- Late Permian logie group (P_{1j}) are mainly mafic massive basalt; while pillow- basalts exist at the upper. From the bottom up mafic volcanic construction formed

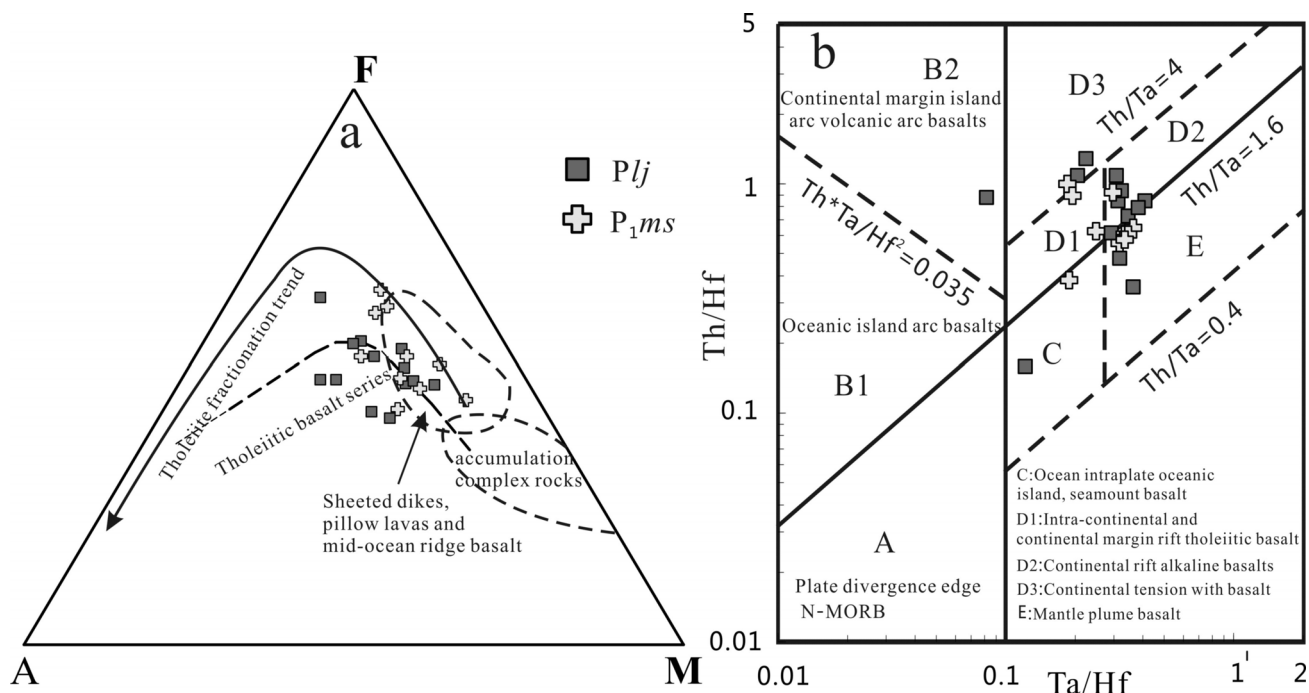


Fig.1 AFM(a) and Th/Hf-Ta/Hf(b) diagram of the basalts from Luoji Area

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by basalt → siliceous rocks or basalt → siliceous carbonate → rock with repeated rhythm.

Logie group and MuShengtou group basalts have similar content of each oxide, the latter contains less FeO than the former one, on the whole basalt has high Al_2O_3 (average 13.39wt%) which close to the average content of Al_2O_3 of Pacific ocean ridge tholeiitic basalts (14.86 wt%) (Melson W G, 1976) and that of oceanic island tholeiitic basalts (13.45 wt%) (Zhang Q., 2001), the high TiO_2 content is similar to ocean island basalts. on the TAS (omitted) and Nb/Y-SiO₂ graphic, sample falls on the two areas: sub-alkaline and alkaline basalts, impling of Logie District basalt parental magma is the evolution series of sub-alkaline to alkaline. AFM diagram (Figure.1a) shows the sample toward the iron-rich evolution, the evolution trend is similar to the tholeiitic series. It is considered that the basalt originated in sub-alkaline - alkaline series of tholeiitic basalts.

ΣREE is between 70.89-313.84 $\mu\text{g/g}$, has an average of 159.67 $\mu\text{g/g}$, and rich the LREE and loss of HREE relatively (LREE / HREE = 4.06-10.52), (La / Yb) N = 3.25-11.22, indicating that the LREE had a certain degree of sub-exclusive, in the LREE chondrite-normalized diagram, it has no abnormal Eu significantly, the LREE normalized values decreasing from La to Lu, proofing basalts has characteristics of intraplate extension environmental in Luoji District, sample allocation model is significantly different from steeply dipping to the left N-MORB, performing generally IAB) and OIB characteristics; In trace elements primitive mantle-normalized spider diagram, the vast majority of rock enriched in LILE elements Ba, K, Sr and high field strength elements Th, Hf, Ta, Nb, Zr, Y, etc., performing uplift of left side and lower right side and Sm-Yb with obvious negative slope significantly different from N-MORB, but similar to OIB (Wilson M, 1989).

Combining extensional environment showed in REE patterns with sub-alkaline-alkaline series changes of basaltic magma, and Th/Hf-Ta/Hf diagram (Figure 1b) the author argues that in Early Permian tectonic environment of this area was initial continental rift, With the rift valley stretching to Late Permian, basalt magma source region had been changing from shallow to deep, from sub-

alkaline magma to alkaline magma, and gradually had transformed into the initial ocean basin, that is the formation of the pillow basalts of the upper part of Logie group, in which E-MORB→OIB transition trend basalt is ophiolite component of the transition environment from mid-ocean ridge to the mainland, it is the residual product in Ganzi- Litang combination belt, while OIB basalt may be related to the role of "hot spots" deep from the mantle, not a member of the ophiolite, but it is the formation of the continent or transitional environment from continental margin rift to basin margin orogenic belt.

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Key words: Logie ophiolite melange; Basalts formation; Shangri-La Yunnan Province; Garze-Litang Belt

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