Petrogenesis of Somuncura plateau basalt in an extra-back arc province: melting of hydrous wadsleyite beneath northern Patagonia

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Somuncura basaltic plateau widely covers an area of roughly 40,000 km^2 in extra-back arc province, northern Patagonia (Argentina). Previous studies suggested two contrasting models for the magamatism in extra-back arc region; 1) upwelling of either small-scale hot spot and 2) OIB-like asthenospheric upwelling resulted by the slab rotation of the Farallon-Nasca plate. However, further discussion supported by concrete evidence is required to specify magmatism of the Somuncura basalt. In this study, we determined both major & trace element compositions and K-Ar ages of 63 basaltic samples collected from northern Somuncura plateau and surrounding area to understand spatiotemporal magmatic evolution of the region. Our K-Ar ages indicate that the activity of Somuncura basalts started in Oligocene (36 Ma), were most active at 22-23 Ma, and attenuated toward Mid-Miocene (18-10 Ma) in the Somuncura region, but is traceable in surrounding area down to 5.6-0.34 Ma. The alkalinicity increased and concentration patterns of "fluid-favor elements" (e.g., K, Rb, Ba, Sr and Pb) seemed to change with time i.e., Ba and Sr are enriched in the Somuncura plateau basalt (36-20 Ma) while Rb, K and Pb are enriched in the post-Somuncura plateau basalt (18-0.34 Ma), which is here attributed to multiple upwelling of fluid-rich asthenospheric mantles and, compared to the latter source, the former one is quite far from that of the Quaternary to recent arc basalts in the Andean volcanic front. This matter suggests the following scenario of its magmatism; 1) uppermost "wet" mantle transition zone beneath the region might be up-warped triggered by the slab rotation of the Farallon-Nasca plate, 2) hydrous met might be produced to change hydrous wadsleyite (β -phase olivine) to (α -phase) olivine in the up-warped parts, 3) the hydrous melt might ascend with interaction of the surrounding wedge mantle and 4) with decreasing its magma production, contamination of lithospheric mantle beneath the region, metasomatised by a past arc volcanism, be largely contributed after formation of the Somuncura basaltic plateau.