Petrogenetic model for Somuncura plateau basalt in an extra back-arc province: Dehydration of hydrous wadsleyite beneath Patagonia

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Oligocene to Middle-Miocene Somuncura plateau basalts widely cover an area of roughly 40,000 km2 in extra-back arc province of northern Patagonia (Argentina). Previous studies suggested two contrasting models for the magamatism in extra-back arc region; 1) upwelling of small-scale hot spot (Kay et al., 1992; 1993) and 2) OIB-like asthenospheric upwelling triggered either by the slab rotation of the Farallon-Nasca plate (Ignacio et al., 2001) or by opening of slab window beneath the region, that followed ridge subduction (e.g., Gorring et al., 1997). In this study, we determined major & trace element compositions and K-Ar ages of 47 basaltic samples collected from northern Somuncura plateau and surrounding area (Cerro Colorado, Quetlequile, Las Bayes, etc.) to understand spatiotemporal magmatic evolution of the region. Our K-Ar data indicate that the activities of Somuncura basalts started in Oligocene (36 Ma), were most active at 22-23 Ma, and attenuated toward Middle-Miocene (18-10 Ma) in the Somuncura region, but are traceable in surrounding area down to 5.6-0.34 Ma. As for the whole rock chemistry, variation in major elements is likely to result from different degree of partial melting of hydrous peridotite. 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. Compared to the latter source, the former one is quite different from that of the Quaternary to recent arc basalts in the Andean volcanic front (e.g., Villarica and Calbuco). We suggest the following scenario based on our preliminary results; 1) as uppermost wet mantle transition zone beneath the Somuncura region up-warped by the slab rotation of the Farallon-Nasca plate, hydrous melt might be produced due to phase change of hydrous wadsleyite to olivine in the up-warped parts, 2) the hydrous melt might then ascend interacting with the surrounding wedge mantle, and 3) with decreasing magma production with time, contamination of lithospheric mantle beneath the region, which had already metasomatised by a previous arc volcanism, largely contributed for the petrogenesis of the post-Somuncura plateau basalt.