MAGM-1: Arcos magmáticos fanerozoicos

O-Sr-Nd isotope constraints on the origin of intermediate magmas in the Famatinian arc, NW Argentina

Pablo H. Alasino[1], C Casquet[2], C Galindo[2], C Rapela[3], R. Pankhurst[4], J Dahlquist[5], C. Recio[6], E Baldo[5].
(1) Centro Regional de Investigaciones Científicas y Transferencia Tecnológica de La Rioja (CRILAR), Consejo Nacional de Investigaciones Científicas y Técnicas
(2) Dpto. de Mineralogía y Petrología- Instituto de Geociencias (IGEO), Universidad Complutense-CSIC, Madrid, España
(3) Centro de Investigaciones Geológicas (CIG, CONICET, Universidad Nacional de La Plata, La Plata, Argentina
(4) British Geological Survey, UK
(5) Centro de Investigaciones en Ciencias de la Tierra (CICTERRA), CONICET-Universidad Nacional de Córdoba, Córdoba, Argentina
(6) Area de P. y Geoquímica, Dto. de Geología, Universidad de Salamanca, Salamanca, España

The origin of Early Ordovician Famatinian intermediate igneous rocks is controversial and has been ascribed to either (i) partial melting of a Proterozoic crust-lithospheric mantle section, or (ii) interaction between mafic magmas and supracrustal materials. We explore the new geochemical evidence from 35 bulk rock O-Sr-Nd isotope compositions from three crustal sections of the arc, a relatively deep one (LC) represented by the Sierra de Valle Fértil, a mid-crustal section (MC) in the Western Sierra de Famatina and SW Sierra de Velasco, and an upper crustal section (UC) in the Sierra de Los Llanos, central Sierra de Famatina and Sierra de Narváez. δ18O values allow us to distinguish four main groups: G1 represented by two meta-gabbros with low δ18O values (*ca.* +5.3‰), one from LC and one from MC; G2 comprising a wide range of rocks (10 meta-gabbros/gabbros, eight diorite-tonalite-granodiorite samples, three granites and two rhyolites) of all levels with δ18O values from +6.6 to +10‰; G3 consists of two hybrids of MC with δ18O values of +8.7 and +9.9‰ formed by interaction between partially molten country rocks and metaluminous tonalitic magmas; and G4 formed by five Ordovician metasedimentary rocks and three Crd-bearing granites of the three levels with the highest δ18O values (+10.6 to +13.8‰). There is no major difference in isotope composition between mafic G2 rocks thought to be derived from a metasomatized sub-arc mantle (δ18O= +7.4 to +9.4‰, $^{87}Sr/^{86}Sr_{i=}$ 0.706 to 0.709 and εNd_i= 3.7 to 5.8) and intermediate rocks of the same group (δ18O= +6.6 to +9‰, $^{87}Sr/^{86}Sr_i$= 0.705 to 0.709 and εNd_i= 0.5 to 4.4, except for two LC samples with values about +9.5‰, 0.711 and 5). G2 granites and rhyolites show higher values of δ18O (+8.5 to +10‰) but similar $^{87}Sr/^{86}Sri$ (0.706 to 0.709) and εNd_i (*ca.* 3.5). Remarkably, the range of δ18O values from +6.6 to +10‰ for most G2 samples does not correlate with aluminum saturation index (ASI). Except for some G2 tonalite samples of LC and G3 hybrids from thermal aureoles, the ASI values remain unchanged within each group of rocks. Generation of the G2 intermediate rocks cannot be related to the bulk assimilation of partially melted metasedimentary rocks of G4 through partial melting by mafic intrusions. We conclude that sub-arc mantle melting was the main process involved in the formation of the metaluminous G2 intermediate rocks with restricted contamination (≤ 20%) by continental crust melts.