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COMPORTAMIENTO DE LAS RAZONES ISOTOPICAS DE ESTRONCIO A LO LARGO DEL RUMBO DE LA ZONA VOLCANICA MERIDIONAL (SVZ) DE LOS ANDES, CON ENFASIS EN LA REGION ENTRE LOS 41°30' Y 46°00'S

BEHAVIOUR OF THE STRONTIUM ISOTOPE RATIOS ALONG THE STRIKE OF THE ANDEAN SVZ WITH EMPHASIS IN THE 41°30'S - 46°00'S REGION

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Three petrographic provinces are currently distinguished in the Southern Volcanic Zone (SVZ) of the Andes (33°-56°S ; see López, 1984 and references therein). Provinces I (33° - 37°S) and II (37° - 46°S) face the oceanic Nazca plate and are separated from Province III (48° - 56°S), or Austral Volcanic Zone (AVZ), that faces the oceanic Antarctic plate, by a small volcanic gap (46° - 48° S), occurrig where the Chile Rise intersects the continent. In the northern section of the SVZ (33° - 46°S), the age of subducted Nazca plate decreases southward from about 50 Ma at 33°S to about 0 My at 46°S (Cross and Pilger, 1982). Likewise, the thickness of the continental crust decreases from about 50 km. at 33°S to about 30 km. at 46°S. What is not well known is how regularly these parameters vary with latitude. Whilst Province I is characterized by a predominance of hornblende andesites and more silicic volcanics over rocks with less than 56 wt°/o SiO_2, Province II exhibits a predominance of basalts and basaltic andesites, although dacites are important in several volcanic centers. Rhyolites are scarce throughout the latter province. Like Province I, most volcanoes of Province III contain rocks of andesitic composition in which hornblende is a common phenocryst phase.

The easy access to volcanoes located between 36°-41°30'S has determined, in part, that most Sr-isotope studies have been carried out in rocks from this region. Less abundants are data from the 33° - 36°S and 46° - 56°S regions, where access as well as climatic conditions are important handicaps.

In this contribution we report Sr-isotope ratios obtained in samples from thirteen volcanic centers located between 41°30'S and 46°00'S. Rocks from three of these centers (Maca, Cay and Hudson; 45° - 46°S) already had Sr-isotopic determinations (see Stern et al., 1984). Our aim is to fill the data gap between 41°30'S and 45°00'S and discuss how the $^{87}Sr/^{86}Sr$ ratios behave along the strike of the SVZ of the Andes.

The histogram in Fig. 1 shows that the Sr-isotope ratios in the 0.70420 - 0.70430 range are the most frequent ones. Samples showing these ratios are basalts, basaltic andesites and andesites. Six out of thirty two samples, varying in composition from basalts to dacites, have Sr-isotope ratios in the 0.70430 - 0.70440 range and six, whose

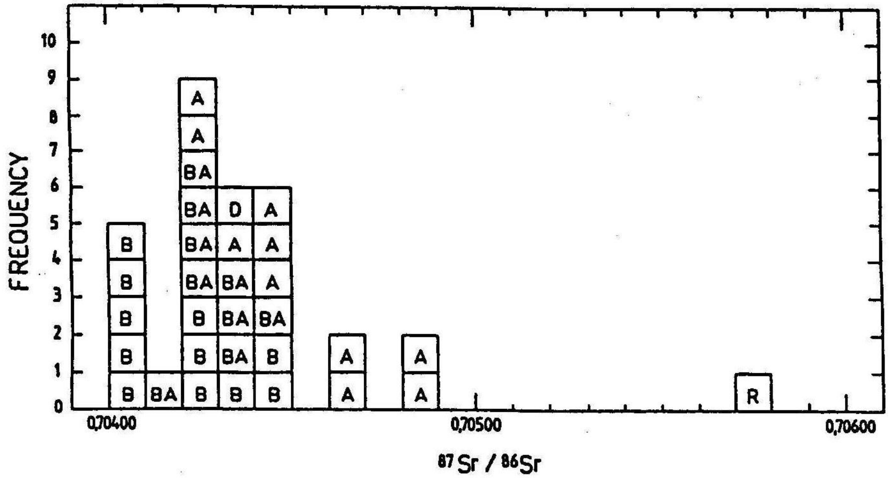

Fig.1. Histogram of whole-rock $^{87}Sr/^{86}Sr$ ratios for Andean SVZ rocks between 41°30'S – 46°00'S. B, BA, A, D and R denote basalts, basaltic andesites, dacites and rhyolites respectively.

Fig.1. Histograma de razones $^{87}Sr/^{86}Sr$ en roca total de la SVZ (Zona Volcánica Meridional) de los Andes entre 41°30'S y 46°00'S. B, BA, A, D y R indica basalto, andesita basaltica, andecita, dacita y violita respectivamente.

compositions vary from basalts to andesites, have ratios in the 0.70440 - 0.70450 range. The lowest values (0.70400 - 0.70410) are exhibited by five basalts, and none of the thirty two samples analyzed has $^{87}Sr/^{86}Sr$ ratios lower than 0.70400. Likewise, none of the samples with SiO_2 less than 64 wt°/o has Sr-isotope ratios higher than 0.70500. The highest ratios (0.70576) is exhibited by a rhyolite (SiO_2 = 74.44 wt°/o) from the small Chaiten volcano (42°50'S) located inmediately to the west of the huge Michinmahuida volcano (42°48'S), whose rocks, of basalt to andesite composition, have Sr-isotope ratios in the 0.70440 - 0.70450 range.

When our data are integrated with those from the literature (see: Deruelle et al., 1983; Harmon et al., 1984; Stern et al., 1984; Hickey et al., 1985 and references therein), and plotted versus the latitude (Fig. 2), it can be appreciated that the detailed behaviour of the Sr-isotope ratios along the strike of the Andean SVZ is complex. However, a general wave-like pattern with two maxima (at 33°-34°S and at 42°30'S) and two minima (at 37°S and 45°S) is observed in the northern section (33°-46°S) of the SVZ. This general behaviour of the Sr-isotope ratios is not matched by any tectonic or geographic feature of the SVZ.

Although crustal contamination seems to have played an important role in the northernmost part of the SVZ (33° - 34°S), at Antuco volcano (37°20'S) this contribution is apparently insignificant. The complex behaviour of the Sr-isotope ratios south of Antuco volcano could be attributed to local isotopic heterogeneities in the mantle. However, the continental crustal contribution cannot be excluded. For example, the higher Sr-isotope ratios together with higher 0-isotope ratios and somewhat, lower Nd-isotope, K/Rb and Ba/Rb ratios of Osorno volcano rocks when compared with other nearby basalts from the SVZ, favor crustal contamination at least at local scale (Hickey et al., 1985). Likewise, the relatively high Sr-isotope ratios at Chaiten volcano also seems to reflect a high degree of crustal component in its genesis.

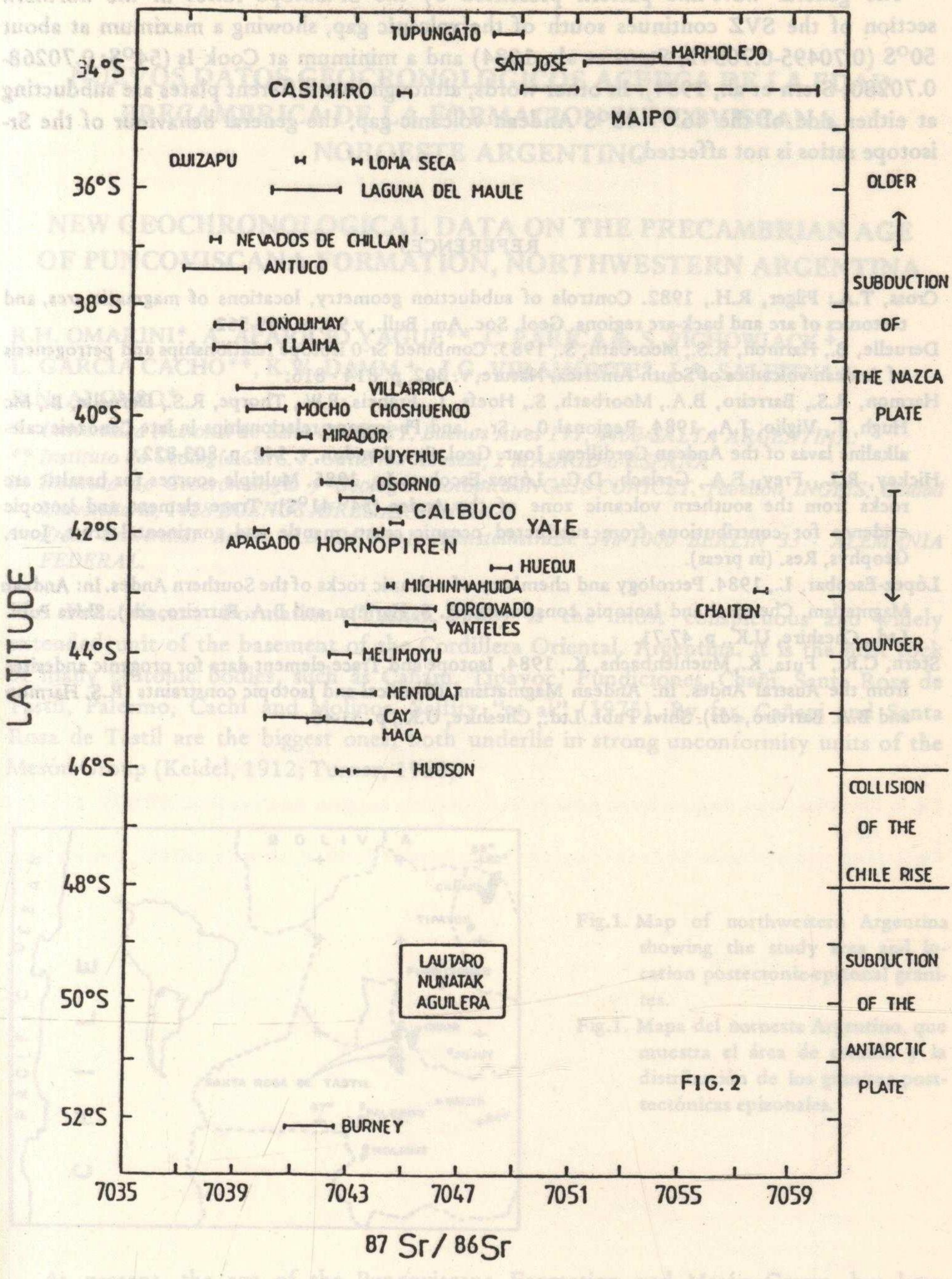

Fig.2. Andean SVZ whole-rock $^{87}Sr/^{86}Sr$ ratios as a function of latitude.
Fig.2. Razones $^{87}Sr/^{86}Sr$ en roca total de la SVZ andina en función de la latitud.

The general wave-like pattern presented by the Sr-isotope ratios in the northern section of the SVZ continues south of the volcanic gap, showing a maximum at about 50°S (0.70495-0.70541; Stern et al., 1984) and a minimum at Cook Is (54°S; 0.70268-0.70280; Stern et al., 1984). In other words, although two different plates are subducting at either side of the 46° - 48°S Andean volcanic gap, the general behaviour of the Sr-isotope ratios is not affected.

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