Geothermobarometric results at the northern tip of Antarctic Batholith: Tectonic implications

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The geological relationships between the Antarctic Peninsula (AP) and South America (SA) have been the subject of sustained study in recent decades. However, there are many problems unsolved yet [1]. This work provides new information that could be used to compare and relate the magmatic and tectonic processes occurring at the northern end of AP and southern tip of SA.

Using EPMA analysis in diorites from the northern Antarctic Batholith, we have determined the composition of a selected group of minerals. Knowing the compositions of amphiboles, we have estimated the temperature (T) and pressure (P) at which they crystallized, according to several geothermobarometers [2, 3].

The results indicate that minerals are not homogeneous, but most are zoned. Particularly for amphiboles, the difference of crystallization T for the many zones could reach 200ºC. These results are interpreted as crystallization in, at least, three stages.

The crystallization T and P of amphiboles in their many zones are revealed and, by extension, an approximation for the T-P crystallization conditions of the plutons. Using a preliminary approximation of lithostatic pressure we propose a specific range of depths of intrusion; they all have been emplaced at upper crust (less than 10-15 kms). Using SHRIMP zircon U-Pb crystallization ages, exhumation rates have been inferred. They seem to rise up since Eocene to Miocene in almost ten times.

[1] Hervé, Miller & Pimpirev (2006), *Antarctica: Contributions to global earth sciences*, 217-227. [2] Otten (1984), *Contrib Mineral Petrol* **86**, 189-199. [3] Schmidt (1992), *Contrib Mineral Petrol* **110**, 304-310.

Boron, lithium and nitrogen isotope geochemistry of K- and NH_4-rich illite/smectite clays in fossil hydrothermal systems

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Boron (B), lithium (Li) and nitrogen (N) transported by hydrothermal fluids may be incorporated into illite – smectite (I/S), as progressive illitization of smectite occurs [1]. Two illitic size fractions (<0.2μm; 0.2 – 2.0μm), distinct in age and composition, were selected corresponding to K-I/NH_4-I mixtures and to a continuous conversion series of smectite to NH_4-I via interstratified structures.

The $\delta^{11}B$ (‰) values range from -5.1 to -5.5‰ in the K-I/NH_4-I mixed phase samples and from -12.6 to -22.4‰ in the mixed-layered NH_4-I-S. The δ^7Li values measured in K-I/NH_4-I mixed phase ranges from +5 to +12.8‰ and in NH_4-I-S samples ranges from -0.5 to -12.3‰. Lower Li concentrations around few ppm were measured, whereas the B concentrations range from 400 to 1457 ppm. The $\delta^{15}N$ measurements in K-I/NH_4-I clays show a mean value of +5.4‰ and in NH_4-I-S series range from +4.8 to +14.6‰. Nitrogen contents range from 0.15 to 1.2 wt.%.

The results obtained have important implications for understanding sources of fluids cycling through subduction zones. The $\delta^{11}B$, δ^7Li and $\delta^{15}N$ values obtained on NH_4-I-S indicate two different fluids, one very high in B and N, confirming a contribution from sedimentary organic matter. The $\delta^{11}B$ and δ^7Li composition of fluids that produced older K-I/NH_4-I clays fits best with a magmatic source. The isotopically light composition of these trace elements provides an important contribution to subducted sediments in volcanic arcs.

[1] Williams, L.B., and Hervig, R.L. (2005) *Geochim. Cosmochim. Acta* **69**: 24: 5705-5716.