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Mesozoic to Cenozoic U-Pb zircon ages from Graham Land, West Antarctica: the magmatic evolution of the Antarctic Peninsula batholith

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The plutonic rocks of the Antarctic Peninsula form one of the major intrusive bodies located along the circum-Pacific rim. Spanning ages of ∼240 to 9 Ma and emplaced over 1300 km long and 200 km wide along Graham and Palmer Land, these rocks represents a key unit to understand the magmatic and tectonic evolution of the Antarctic Peninsula. In the north, the plutons intrude Paleozoic- Mesozoic low-grade meta-sedimentary rocks, and intrudes schists and ortho- and paragneisses with Triassic to Carboniferous metamorphic ages, further south.

The origin of the arc of Antarctic Peninsula has been in dispute since the interpretation of Vaughan and Storey (2000) who suggested that these plutonic rocks are part of an allochthonous arc, contradicting the traditional interpretation that these rocks are autochthonous and are part of the continental arc which formed along the southern margin of Gondwana (Suarez, 1976). We will address the magmatic and tectonic evolution of the Antarctic Peninsula by providing crystallization ages (zircon U-Pb and hornblende $^{40}Ar/^{39}Ar$) of the main plutonic units, together with the characterization of the tectonic environment within which magmatism was occurring (geochemical studies and isotopic tracing).

We present 45 LA-ICP-MS U-Pb (zircon) and 4 $^{40}Ar/^{39}Ar$ (hornblende) dates of plutons and dikes from the west coast of the northern Antarctic Peninsula and the South Shetland Islands. Their geochemical composition shows affinities with calc-alkaline, supra-subduction zone rocks (Pearce et al., 1984). The U-Pb zircon ages range between ∼160 Ma (Stonington Island) to ∼9 Ma (Cornwallis Island), with a peak in the Early Cretaceous (Albian and Aptian). Upper Jurassic to Eocene intrusions were emplaced in a constant, approximately stationary position. Magmatism displaced ∼50km westwards during the Miocene, which is currently exposed on Watkin Island (∼22 Ma), Snodgrass Island (∼19 Ma), Litchfield Island (∼19 Ma) and Cornwallis Island (∼26 Ma).

The identification of a westward displacement of the Miocene rocks may be related to the formation of oceanic lithosphere of the Scotia Plate at the north, by changing the configuration of the regional plate dynamics, provoking a westward migration of the arc. Future analyses of isotopic tracing in Nd, Sr and Pb will allow to have a better characterization of these rocks.

Suarez. 1976. Geology 4, 211-214.

Pearce et al. 1984. Journal of Petrology 25(4), 986-983.

Vaughan and Storey. 2000. Journal of the Geological Society, London 157, 1243-1256.