Geophysical Research Abstracts, Vol. 7, 07814, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07814

Petrology and magnetic susceptibilities of rocks of the Antarctic Peninsula: Implications for the redox state of the batholith and the extension of metamorphic zones

Anke S. Wendt (1), Alan Vaughan (1), Olivier Vidal (2), Fausto Ferraccioli (1), Alexander Tate (1)

(1) British Antarctic Survey, N.E.R.C., High Cross Madingley Road, Cambridge CB3 0ET, U.K., (2) LGCA, Université J. Fourier, 1381 rue de la Piscine, 38041 Grenoble, France,

(aswe@bas.ac.uk/Fax: +44-1223-221-646)

The Antarctic Peninsula is considered to be an example "par excellence" for testing tectonic processes along active continental margins. However, reconstructing the geological history of the Antarctic Peninsula is a challenging task because individual outcrops are scattered over large geographical distances, and structural relationships are often obscured by thick layers of ice. The traditional view of the Antarctic Peninsula is that it formed part of the active palaeo-Pacific margin of Gondwana and was affected by east-directed subduction from Mesozoic to Tertiary times. Subduction is inferred to have formed a magmatic arc complex, in which volcanic and plutonic rocks were distributed widely along the length of the peninsula. However, recent discoveries suggest that the Antarctic Peninsula is composed of at least two suspect terranes, one of accretionary complex origin and the other a possible microcontinental arc, in contact with para-autochthonous rocks of the continental Gondwana margin.

The combination of rock physical properties and petrological analyses allow us to relate plutonic and metamorphic rocks in a semi-quantitative way, which is crucial for mapping and for testing the recent terrane model for the region. Specifically, we present magnetic susceptibility, (as indicator of volumetric magnetite distributions) and pressure and temperature (PT) data from a variety of plutonic and metamorphic rocks distributed along the Antarctic Peninsula. The integration of the magnetic susceptibilities and the PT data with structural parameters and geochronological ages allow us to define the redox state of the peninsula batholith and its genetic relationship

to the metamorphic rocks.

The redox state of the plutonic rocks suggest that the magma primarily reflects contamination with pre-existing continental crust for Triassic and Jurassic times across the peninsula and more juvenile subduction-related components for the Cretaceous across Palmer Land. This produced an early low-magnetic susceptibility trend across the Antarctic Peninsula, superposed by a paired high/low magnetic susceptibility trend in W-E direction across Palmer Land. Both magnetisation trends were then modified along major shear and fault zones during uplift of greenschist- to lower granulite facies rocks.

Metasediments uplifted along these shear and fault zones, are considered to represent the pre-existing continental source involved in early granitoid generation. Subduction of the proto-Pacific oceanic plate beneath the Antarctic Peninsula is suggested to have then triggered upper mantle/lower crustal melting producing the observed paired high/low magnetic susceptibility trend. Orthogneiss reflect either the redox state of the original plutons or delineate together with metabasalts and metagabbros the trend of the shear and fault zones.

By combining these data with structural observations, we suggest that a transpressive stress regime in a rotational subduction setting, triggered the uplift of the Antarctic Peninsula.