Provenance and tectonic setting of Upper Paleozoic sedimentary and plutonic rocks from eastern Peru (10°S) – first results

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The Late Paleozoic to Early Mesozoic tectonic evolution of the western margin of Gondwana in South America has been related to an active Andean type convergent margin. Within the Peruvian Andes, the spatial and temporal distribution and the evolution of the arc-related elements are at present not fully understood or recognized. In this contribution, new reconnaissance petrographic, geochemical and geochronological data are presented from Carboniferous plutonic and sedimentary rocks at 10°S (E Peru), and their relation to the Late Paleozoic arc and regional models are reviewed.

Granitoids are variable from diorite to granodiorite with local two-mica granite plutons associated with migmatites close to the contacts with older metamorphic rocks. They intrude Ordovician metamorphic rocks, and show fault contacts with Carboniferous sedimentary rocks. The presence of amphibole and titanite suggest a typical I-type genesis, whereas both amphibole and plagioclase seems to be the early crystallization phases, while biotite, K-feldspar and quartz are late. Nb-Y-Rb plots suggest arc-related signatures, and high LILE/HFSE are also characteristics of subduction magmatism. K-Ar on an amphibole from a granodiorite gives 356 ± 9 Ma, whereas U-Pb SHRIMP data on two migmatites show metamorphic overgrowths at 325 ± 8 Ma and oscillatory zoned cores of magmatic origin with ages ~350 Ma. K-Ar and Ar-Ar ages on host metamorphic rocks also show a similar Carboniferous thermal resetting spectra.

Clastic sedimentary rocks from the lower and middle members of the Ambo Group were sampled in its type area (Newell et al., 1949). These rocks have been interpreted as foreland basin related deposits, formed in a continental environment, with minor sea transgressions (Zapata et al., 2004). Their stratigraphic relations are discordant with Ordovician metamorphic rocks, whereas Permian to Early Mesozoic red beds discordantly cover them. Recent biostratigraphic data suggest a Tournaisian to Visean age (Lower Carboniferous) for the deposition of the group. The rocks are relatively well sorted, but the grains are angular to rarely sub-rounded. They can be defined as greywackes. The most abundant framework components are quartz and lithoclasts. Quartz is mainly non-undulose, with most grains of similar form, although large elongated grains as well as slightly rounded ones with resorption embayments are abundant. The latter can be interpreted as a result of rapid cooling, thus of volcanic origin. The lithoclasts (~Lm45 Lv45 Ls10) can be divided in those derived from metamorphic rocks (schists, gneisses and phyllites), (meta-)sedimentary sources (siltstones, fine-grained greywackes, quartzites) and volcanic precursors (quartz and feldspar phenocrysts in an altered carbonate- to sericite-rich matrix). Plagioclase varies from albite to andesine, and is more abundant than alkali feldspar and relatively fresh. Accessories are amphibole, biotite, and muscovite, and zircons are mainly brown elongated, well-rounded or show equidistant axes. The matrix is made of altered labile lithoclasts, and composed of angular quartz, albite and chlorite as well as muscovite. Overall composition of the rocks using Nb/Y and Zr/Ti ratios (after Winchester and Floyd, 1977) is mainly dacitic. Silica-rich rocks are depleted in Zr and strongly enriched in Cr, pointing to a zircon-poor source or a high degree of sorting. All other samples are enriched in Zr and depleted in Cr, and show relatively high concentrations in Nb, Ti and Pb. This, and variations in Zr/Th and Ti/Zr ratios, point to a mixing of different sources, an upper continental crust component and a less fractionated source.

These preliminary results shows that the arc-typical magmatism is not necessarily synchronous with the deposition of associated sedimentary rocks. At this stage a retro-arc foreland basin would be a preferred hypothetical tectonic setting for the Ambo Group. Additionally, this continental magmatic activity and "Ambo type" basin evolution is older than in northern Peru (Haeberlin, 2002), and therefore shows the typical diachronism of continental convergent margins.

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