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PhD thesis: Provenance and tectonic setting of Ordovician sequences from Precordillera Terrane and San Rafael block: paleogeographic implications in the proto-Andean margin of Gondwana.

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The objective of my PhD is to study the provenance of clastic rocks in the Precordillera (Argentina), a terrane which is related to a Laurentian origin and have been collided during Middle to Upper Ordovician with Gondwana. The origin and evolution of this crustal block is highly discussed (f.e. Cingolani et al., 1992; Dalziel et al., 1994; Astini, et al., 1995; Kay et al., 1996; Aceñolaza et al., 2002; Keller, 1999; Cingolani et al., 2002). Detailed stratigraphic and facies analyses were done on the carbonate and siliciclastic record as well as on the paleontological material (f.e. Baldis et al., 1982; compilations in Astini et al., 1995 and Keller, 1999). Relationships to Laurentia are quite obvious (Dalla Salda et al., 1992; Astini et al., 1995; Keller, 1999) but recently argued by Finney et al., (2003; 2005). However, all these studies can not prove if the Precordillera is a crustal block derived from Laurentia or if it is part of Gondwana or a parautochthonous block which was located near Laurentia and displaced by strike-slip movements along Gondwana (f.e. Aceñolaza et al., 1998). Basement outcrops are extremely sparse and the basic to ultrabasic rocks exposed on the western flank of the terrane is strongly discussed regarding its origin and emplacement as well as exhumation processes (f.e. Davies et al., 1999). Some isotopic data from xenoliths found in Tertiary volcanic rocks of the Precordillera point to a Grenville overprint (Kay et al., 1996) and the same occurred in a clastic sedimentary unit exposed in the southeastern part of the Precordillera (Cingolani et al., 2003).

The analytical approach using provenance techniques include sampling, petrography, geochemistry (major, trace and rare earth elements), heavy minerals analysis, Sm-Nd and Pb-Pb isotopes and zircon dating using ICP-MS-LA at a later stage. The outline of the project is to understand the provenance of each unit and compare them to try to discriminate between those with a clear Laurentian origin from those with a Gondwanan signal.

The funding provided by the IAS grant scheme helped to cover expenses for the Sm-Nd analysis. These were done at the Laboratorio de Geologia Isotopica (Laboratory of Isotope Geology) from the Universidade Federale do Rio Grande do Sul, Brazil. I would like to remark that they allowed me to do Pb-Pb isotopes as well and for the same cost. The samples correspond to the following sedimentary Formations: La Chilca (Asghill-Llandoverly), Los Azules (Llanvirn), Ponon Trehue (Tremadoc-Arenig), Yerba Loca (Caradoc), Los Sombreros (Llanvirn-Llandeil) and Gualcamayo (Arenig-Llanvirn).

Isotopic methods are effective in obtaining information about the provenance of sediments. In particular, Nd isotope composition reflects the composition of that of the source rock and is not altered during weathering or diagenesis. Juvenile material can be recognized by higher ϵ_{Nd} values than those of old upper crustal rocks. Sm-Nd isotope data can also be used to estimate the average crustal residence age (model age) of the ultimate protolith.

Sm-Nd and Pb-Pb whole-rock data would help to decipher the provenance of Ordovician siliciclastic sediments from Precordillera (Cuyania terrane). These isotopes as well as Tdm ages would determine the source areas and would give an insight of the protoliths. The data will be compared with those from the Appalachians (Bock et al., 1994), Famatina, and Puna (Bock et al., 2000). This would give to the project a very high impact and the possibility to publish the data in international journals.

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