Constraints from fission track analysis on the evolution of the Rio Tinguiririca valley area in the Main Cordillera of the Andes, Central Chile,

Waite, K.*, Fügenschuh, B.*, Schmidt, S.***

*Institute of Mineralogy and Petrology, University of Basel, Bernoullistrasse 30, 4056 Basel, Switzerland
e-mail: k.waite@unibas.ch

**Institute of Geology and Paleontology, University of Innsbruck, Austria

***Department of Mineralogy, University of Geneva, Switzerland

In the Rio Tinguiririca valley in the Main Cordillera of the Andes of central Chile, 35° south, parts of a stratigraphic section ranging from the late Jurassic to the Quaternary are exposed. Fission track analysis was carried out on samples from all the stratigraphic units exposed in the area in order to gain information on the low-grade metamorphic history of the Central Andes and to test older models for the metamorphic and tectonic evolution of the area.

The sequence exposed in the Rio Tinguiririca valley is characterised by several distinctive features not found in other localities in the Central Andes (Charrier et al., 1996); the deposits of the middle Cretaceous (Aptian to Albian) Colimapu Formation and of the middle to late Micoene Farellones Formation are completely missing in the study area. Instead, a volcanic tuff layer, the White Tuff, and a unit consisting of fan deposits and alluvial plane deposits, the Brownish-Red Clastic Unit, unconformably overlie the Late Jurassic deposits of the Baños del Flaco Formation.

The fission track data give some indications of the style and timing of metamorphic events in the study area, enable more accurate constraint of the age of the Brownish-Red Clastic Unit and allow some statements on the tectonic evolution of the study area from the Late Jurassic to present.

Burial metamorphism has been proposed by various authors as the main mechanism to produce large suites of rocks altered at low grades in the Central Andes. The results of this study indicate that, on the contrary, hydrothermal alteration connected to magmatic and/or volcanic activity was the main cause of alteration of the rocks and that burial metamorphism played at most a very minor role. Pulses of hydrothermal activity appear to have occurred from Cretaceous to almost recent times and led to alteration of the rocks at slightly varying metamorphic conditions at different times in different parts of the study area.

A new model is proposed for the tectonic evolution of the study area. Fission track analysis of detrital zircons from the Brownish-Red Clastic Unit shows that the unit must have been deposited during the latest Cretaceous (Maastrichtian) and that it is certainly younger than the White Tuff.

Thermal modelling shows that considerable exhumation of the lower part of the Rio Damas Formation occurred during the Late Cretaceous to Early Tertiary. This exhumation is thought to be connected to tilting and erosion of the Mesozoic units in the area prior to the formation of an extensional basin in the Late Eocene. Data from the Eocene to Miocene Coya Machali Formation imply that sedimentation within the Tertiary basin continued somewhat longer than hitherto supposed.

REFERENCES