Geophysical Research Abstracts, Vol. 7, 04920, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04920

Constraining the post Jurassic Evolution of Western Peru through Fission Track and (U-Th/He) dating

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Western Peru including the Western Cordillera and the coastal margin consist mainly of the Coastal Batholith and the Precambrian to Palaeozoic Arequipa Massif. The Coastal Batholith of Peru consists of over one thousand different plutons ranging in age from Upper Jurassic to Upper Cretaceous and from Eocene to early Miocene. It forms a complex but well defined linear feature which follows nearly the entire Peruvian coast, extending through isolated plutons into Ecuador and Chile. The granitoid petrology of the individual intrusive bodies has only minor variations. The climatic zones run parallel to the Andes - almost the entire coastal region is subject to the same very dry climate. Hence many parameters that might have an effect on erosion rates such as variations in climate and in rock type are tightly constrained and uniform within the whole area. This makes Western Peru an exquisite region to study the evolution of a coastal margin in an area of active subduction.

The tools best suited to reconstruct the evolution of the Western Cordillera and the Peruvian coastal margin are low temperature geochronometers such as fission-track and (U-Th)/He. Over 100 samples have been collected from locations in the Western Cordillera and the Peruvian Coastal margin between Piura (Lat. 5˚30S) and Tacna (Lat. 18˚S) at altitudes from sea level to 3500 m. Cooling histories determined through modeling of the fission track data sets for locations north of San Juan (Lat. 15.30˚S) show a very similar evolution. Rapid exhumation in Late Eocene was followed by heating and renewed cooling during Oligocene time. The heating phase is interpreted as burial by Tertiary sediments, and the subsequent cooling was due to the erosion of this sediment cover and the granite itself. A 23 Ma old (zircon fission-track age) ignimbrite deposited just on the granites in the Nazca area (Lat. 15˚S) reveals that

significant erosion of Eocene and Oligocene sediments had taken place in the coastal margin of central Peru, prior to the Early Miocene. This observation is further supported by Oligocene (U-Th)/He ages. Between Chala (Lat. 16˚S) and Tacna apparent apatite fission-track ages are Cretaceous and with only minor variation. Modeling, which is supported by (U-Th)/He ages, suggest that South of San Juan (Lat. 15.30˚S) no significant amounts of sediment were deposited or eroded since the late Paleocene to early Eocene.

Events revealed by modeling of the fission-track data for locations north of Chala are in excellent agreement with those described by Sebrier (1988), i.e. 45- 40 and 28-26 Ma. The upper Oligocene event is further supported by (U-Th)/He apatite ages. While these events have affected the coastal region of central and northern Peru, areas south of Chala have been undergoing remarkably long slow exhumation since the Late Cretaceous, uninterrupted by events seen in the north. The Upper Cretaceous to Paleocene zircon fission-track ages of the Coastal Batholith are interpreted to represent initial cooling ages of the intrusions whereas the Early Jurassic ages for the Arequipa massif are thought to date the onset of subduction. This is the first extensive study applying low temperature dating techniques in the Peruvian coastal margin and the Western Cordillera.