

## CHRONOLOGY OF LATE PALEOZOIC EVENTS IN ANDEAN SOUTH AMERICA

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Accumulation of isotope age determinations for the Andean belt of South America during recent years and general increase in the geological knowledge of the area stimulate us to try to analyse existent data in a tentative of discriminating, at a reconnaissance level, the tectonic events affecting the area.

Previous attempts in this line can be found in the literature for other continents, but no comprehensive treatment for disclosing the tectonic history of South America during the Phanerozoic using the isotope age data is known to us.

Most of the data used in this research were compiled from the literature and a small portion represent analyses performed by the senior author. Greater part of the published isotope ages, specially K-Ar determinations, was obtained at the Centro de Pesquisas Geocronológicas, University of São Paulo, by several South American geologists and could then be adequately compared with ours.

The general span of time covered by this review includes from the Lower Paleozoic (Devonian) to Cretaceous, but special emphasis was put on the Late Paleozoic-Lower Mesozoic interval ("Gondwana").

The approach to the problem was through the construction of histograms representing the absolute frequency of radiometric K-Ar and Rb-Sr age determinations. Due to the lack of precision for comparative purposes, Pb- $\alpha$  ages were not considered.

Three curves were obtained, one for Rb-Sr data, other for K-Ar data and the third for total number of age determinations available (about 200). They indicate that the region underwent at least six tectonic events during the Devonian-Cretaceous time interval (from 400 to 100 m. y.).

For the Late Paleozoic two major cycles were recognized. The first event occurred  $350 \pm 20$  m.y. ago, near the Devonian-Carboniferous boundary and could be correlated with the early stage of development of the Variscan orogeny. The second event, placed in the  $270 \pm 20$  m.y. age interval, corresponds approximately to the Lower Permian, and is equivalent to the Hercynian orogeny.

For the rest of the Phanerozoic, three other events were discriminated. At the  $210 \pm 30$  m.y. age interval occurred the most important of them, indicated by the Rb-Sr and K-Ar determinations. It could be correlated with the final stage of the Variscan orogenic cycle and if

this assumption is correct, then the Variscan cycle in South America extended to the beginning of the Mesozoic, being outphased with corresponding cycle in Europe and North America which ended in the Upper Paleozoic. The other two events, the first at the  $150 \pm 20$  m.y. interval (Jurassic) and the second at the  $110 \pm 20$  m.y. interval (Cretaceous), correspond to the early stages of development of the Andean orogeny (Alpine cycle) and could be correlated, the first to the Nevadan and the second, to the Laramide orogenies.

The results were interpreted in connection with the geological setting, specially the stratigraphic one. Their possible relationship with the paleogeographic and paleoclimatic history of the continent during the Late Paleozoic were also examined.

## THE PERMO-CARBONIFEROUS BASINS OF ARGENTINA

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Permo-Carboniferous rocks are known in Argentina in various areas: Salta Province (Northern Argentina-Bolivian Basin), in the subsurface of northeastern Argentina (Chaco-Paraná Basin), Precordillera of San Juan and Mendoza, Cordón del Plata and southern La Rioja (Calingasta-Uspallata and Rio Blanco basins), western Pampean Ranges (Paganzo Basin), Patagonia (Central Patagonian Basin) and in the Southern Hills of the Province of Buenos Aires. Other small exposures are known in west central Mendoza, northern Neuquén and Islas Malvinas.

The sequences in the northern Argentina-Bolivian Basin start in the Lower Carboniferous (Tupambi) and continue into the Permian (Mandiyuti) with a stratigraphical break at the end of the Carboniferous. No marine deposits are known in Argentine. The age of the southern part of the basin has been established on pollen. Diamictites occur at the base (Tupambi) and probably also at the top.

The sequences in La Rioja, San Juan and Mendoza Provinces show common features, although each one has evolved differently in space and time. The first marine transgression occurred during Lower Carboniferous, and sedimentation continued into the Lower Permian, with one important break at the end of the Lower Carboniferous in the Rio Blanco Basin, and at the end of the Upper Carboniferous in the Calingasta-Uspallata Basin. Diamictites occur in the latter in the Upper Carboniferous. The sequences south of the Rio Mendoza, with an inadequate biostratigraphy are difficult to interpret.

The Central Patagonian Basin is now better understood. Sedimentation probably started in Middle Carboniferous times and continued during the Permian, with apparently no major breaks. Diamictites occur in the Upper Carboniferous.