UNIVERSIDAD DE CONCEPCIÓN
DEPARTAMENTO DE CIENCIAS DE LA TIERRA
10° CONGRESO GEOLÓGICO CHILENO 2003

ON THE INFLUENCE OF PALEOZOIC PALEOGEOGRAPHIC PATTERNS ON ANDEAN MOUNTAIN BUILDING IN NORTHWESTERN ARGENTINA AND NORTHERN CHILE

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During the entire Phanerozoic the western margin of South America has been facing the open ocean. In the southern central Andes, most of this time active margin processes governed the style of basin development, deformation, magmatism, and metamorphism. An exception may be represented by the Silurian to Early Carboniferous interval for which facies architectures in the basin in northern Chile together with the absence of compressional deformation, metamorphism and magmatism suggest a passive margin setting. It has been a long accepted view that depocenters and magmatic arcs migrated westward during the Paleozoic, and eastward in the Mesozoic and Cenozoic. This seemed to suggest continental growth by terrane accretion during the Paleozoic. This view was strongly influenced by the recognition of the accretion of exotic terranes to this margin south of c. 27°S during the Paleozoic. Terrane bounding faults and sutures represent first order crustal discontinuities. Regarding the southern central Andes, however, most, if not all, of the proposed Paleozoic terrane boundaries failed their tests. Furthermore, geochemical studies of the metamorphic basement, the sedimentary cover and the magmatic rocks emphasize the temporal and spatial homogeneity of the evolved geochemical compositions of the respective rock units throughout the Paleozoic. This is interpreted to represent the dominance of crustal recycling over the formation of new crust by addition of juvenile magmas. In summary these data indicate (i) that the Paleozoic crust of the southern central Andes had a relatively homogenous and evolved geochemical composition, and (ii) that a probable segmentation of the crust by structural discontinuities is not due to the hitherto proposed tectonostratigraphic terranes.

In this context, a re-examination of the basic tenet of westward migration of basins and arcs seems to be required. And indeed, within a limited level of spatial tolerance, the Ordovician continental magmatic arc, the subsequent Late Ordovician Oclóyic orogen acting as the Arco Puneño positive area in the Silurian to Early Carboniferous, and the Late Carboniferous-Permian continental magmatic arc all occupy essentially the same area. Furthermore, like a Russian doll, these elements are now contained within the Cenozoic continental arc system. In a very similar fashion, Paleozoic basins, and to a lesser degree their depocenters, also occupy relatively constant positions east and west of arcs and Arco Puneño. A variation of the theme represents the evolution in Jurassic and Cretaceous time when arcs and peri-arc basins in fact had shifted westward into northern Chile. They were associated with back-arc rifting and the formation of extensional basins. Paleozoic structural discontinuities represent the

zones of crustal weakness which were reactivated to accomodate Cretaceous back-arc rifting in the region of northwestern Argentina.

On a broad scale this may imply a threefold lithotectonic subdivision of the Paleozoic crust, and thus of the structurally complex basement of the modern Andes, from east to west (present coordinates) in (i) a zone strongly dominated by sedimentary rocks, (ii) the axial zone consisting predominantly of magmatic rocks, and (iii) the western zone which is characterised by sedimentary and to a lesser degree by magmatic rocks. The potential influence of this subdivision on the character of magmatism and the distribution of deformation especially in the fore-arc and back-arc areas of the Mesozoic and Modern orogen needs further examination.

On a smaller scale, inherited Paleozoic structures may be identified, which significantly influence the modern structural evolution at the regional or local level. The NW-trending Olacapato-El Toro fault in the northwestern Argentinian Andes, now a fault with a sinistral strike-slip component, is recognized to have acted as a structural boundary causing abrupt facies changes already in the Late Precambrian Puncoviscana and the Cambrian Mesón basins. In the Cordillera Oriental of northwestern Argentina, NE-dipping Paleozoic structural discontinuities were reactivated as growth faults during Cretaceous rifting and as reverse faults during Neogene compression. The depocenters of the Jurassic basin of northern Chile are located mainly in the Valle Longitudinal and appear to have been controlled by a system of conjugate NW-SE and NE-SW trending faults which were later used as feeder channels of subsequent magmatic activity, and to accommodate Cenozoic partly rotational block movements. The NW-SE trending faults are running parallel to the northern boundary of the Early Paleozoic Cuyania terrane and in one case coincide with it. The Cuyania Terrane lies south of 27°S in western central Argentina. Its northern and eastern suture approximately along the Valle Fertil fault marks the Early Paleozoic continental margin of South America in this region.

Another major and enigmatic feature of the southern central Andes is a positive gravity anomaly running from north of the Salar de Atacama to the SSE into the Cordillera Occidental and southern Puna. This gravity anomaly offsets the modern arc and has been inferred to represent an inherited structure residing in mid-crustal levels. It was variably proposed to represent anything from dense Precambrian basement, Ordovician oceanic crust, Cretaceous rift-related mafic bodies to a reflection of the distribution of major lithologies in the Recent crust, among other things.

All examples illustrate the first order control inherited Paleozoic structures and crustal predispositions exert at different scales on the style and development of subsequent mountain building processes.