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ANDEAN SUSPECT TERRANES

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The techniques and concepts of terrane analysis were applied to the Phanerozoic tectonics of the Pacific margin of South America. This analysis was, in essence, a comparison of the geologic histories of adjacent areas that are separated by known or inferred major faults. Maps and time-stratigraphic columns were compiled in detail for many areas in each Andean country. Isotopic dating and biostratigraphic controls on overlap and suturing assemblages were evaluated to constrain timing of terrane accretion. Structural relationships between terranes were evaluated. These data were then synthesized into composite terrane columns and a 1:5,000,000 tectonic assemblage and terrane map of Andean South America.

The objective was a consistent continent-scale view of important tectonic assemblages and terranes. This view can then be applied to paleogeographic interpretations and plate motion correlations, as well as a refined regional view of the tectonic history of Andean South America. Primary data were used as much as possible in the compilation. There have been several terrane interpretations of various parts of the Andes, and these were considered and incorporated with some adjustments and refinements into this continent-scale compilation. Some of the more important of these include: northern Andes - Case, et al. 1984, Mégard 1987; Colombia - Etayo-Serna, et al. 1983, Restrepo and Toussaint 1988, Forero 1990, Aspden and McCourt 1986 ; Ecuador - Feininger 1987, Litherland and Aspden 1990, Lebrat et al. 1987; Argentina, Chile - Ramos, et al. 1986, Ramos 1984, Mpodozis and Forsythe 1983.

Southern South America is a Pan-African collage of basement provinces (Hoffman 1991, Ramos 1988). Hence, the Andean belt does not show continuity of assemblages or orogenic events along its length until after the close of the Pan-African events (Brasiliano cycle). The Andean trend of assemblages begins in Late Cambrian-Ordovician when sedimentary assemblages are continuous for longer stretches of the Andean margin.

The Paleozoic tectonics of Andean South America are distinct from the

subduction-dominated Mesozoic-Cenozoic tectonic evolution. In the central to southern Andes, lower Paleozoic continental margin terranes (Puna and Precordillera terranes) accreted against a margin characterized by a latest Precambrian-Lower Cambrian clastic rift assemblage that was deformed and metamorphosed in the middle Cambrian (Brasiliano cycle). Precambrian-Lower Paleozoic continental terranes (Arequipa and Chilenia terranes) were accreted outboard of the continental margin terranes. All these terranes were accreted by early or middle Paleozoic. A widespread orogenic event affected all the Andean margin in the late Devonian-Carboniferous, followed by the development of a volcanic and magmatic arc along the central and southern Andes in the Late Carboniferous. The assemblages of this arc overlap the terranes in the central and southern Andes. In the northern Andes, Precambrian to lower Paleozoic terranes of continental character (at least in part) (Zamora, Mérida, and Eastern Cordillera?) underwent final accretion resulting from the late Paleozoic collision of Gondwana and Laurentia. The 'Pacific' margin of South America, against which all these Precambrian and lower Paleozoic continental and continental margin terranes were accreted, has no exposed, through-going miogeocline of latest Precambrian-early Paleozoic age, as is present in North America. This lack of a clear miogeocline makes the definition of the continental margin uncertain. Hence, many of the continental terranes recognized may be shuffled and reworked South American crust.

In the late Paleozoic, subduction complexes (Chiloé and Magallanes terranes) of continentally derived turbidites with tectonically included oceanic materials were accreted during development of the late Carboniferous continental margin arc that extended from northern Patagonia to northern Chile and perhaps into Peru. In the latest Paleozoic to Triassic, the crustal 'mush' of Patagonia (and part of west Antarctica) was accreted ('cratonized') coeval with the back-arc deformation of the Ventana ranges and Cape fold belt. An extensive Permian-Early Triassic volcanic-plutonic assemblage extends from northern Patagonia to southern Peru, apparently the result of relaxation (extension) of crust thickened during development of the Carboniferous continental margin arc.

A continental margin arc again developed along the central and southern Andes beginning in the Late Triassic. As these arc assemblages are not present to the north, The arc system may have trended offshore to the north, off the continental margin of Peru and perhaps North America before the

Figure 1: Andean suspect terranes. Limit of Andean deformation and exposed shield areas shown by shaded lines.

central Atlantic opened. The continental margin arc, with probable island arc extensions to the north, continued development through the Jurassic and Early Cretaceous as a marine arc with well-developed marine back-arc basins. Only minor terrane accretion occurs along this part of the Andes from the latest Paleozoic through Early Cretaceous (Darwinia terrane). In the middle Cretaceous, the continental margin arc from southernmost South America to southern Peru changed it's fundamental character to a subaerial, compressive arc, shedding sediments to the east, coeval with the rifting of South America from Africa. The change in arc type was Late Cretaceous in central Peru, as a result of accretion of the Canta terrane. In the northern Andes several Mesozoic-Cenozoic terranes with clear oceanic affinity (Amaime, Cauca-Macuchi, Piñon, and Baudó terranes) along with one Precambrian-Paleozoic continental terrane (Amotape terrane) were accreted in the Cretaceous-Cenozoic. These oceanic additions to the continent were by an oblique subduction/strike-slip process similar to much of the Mesozoic-Cenozoic terrane accretion process in western North America. The development of an uplifted continental margin arc in the Eocene, shedding coarse sediments to the east, followed the accretion of the Cretaceous oceanic terranes in the northern Andes. Several small terranes of oceanic or subduction complex character (Villa de Cura, Cordillera de la Costa, Tinaco-Caucagua terranes) were accreted against a Paleogene flysch basin (Guarico-Roblecito terrane) in northern South America, as a result of interaction with the Caribbean plate. The continental margin arc eventually extended the length of the western South America, with the subduction orogen culminating in the Neogene Andean orogeny.

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