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Structural styles and tectonic inheritance in the Andean fold-thrust belt and foreland basin

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Andean orogenesis is expressed in the diverse deformational records of crustal structures and sedimentary basins in western South America. Here we summarize retroarc structural styles within the Andean orogenic belt and foreland basin system through consideration of regional contractional fault geometries, their kinematic interactions with other structures, and the comparative involvement of crystalline basement and sedimentary cover rocks. In assessing the controls on structural style, we emphasize the importance of precursor conditions and employ the concept of *tectonic inheritance* to identify four factors that influence Andean deformation. (1) *Structural inheritance* involves the reactivation of preexisting faults or basement fabrics and accompanying inversion of sedimentary basins. (2) *Stratigraphic inheritance* is exemplified by the preferential localization of interconnected thin-skinned structures above regional décollements developed in wedge-shaped stratigraphic packages versus isolated basement-involved thick-skinned fault structures formed in provinces with limited cover strata. (3) *Rheological properties* guide the activation of new structures by means of the integrated strength, rock and mineral composition, fluid content and pressure, and associated mechanical heterogeneities and anisotropies that define crustal and lithospheric architecture. (4) *Thermal structure* in the form of initial thermal conditions and later thermal perturbations (such as cooling/heating episodes related to arc magmatism, subducting slab dynamics, or lithospheric removal) can promote inboard advance or outboard retreat of deformation. Spatial and temporal variations in the relative importance of these four inherited attributes likely resulted in a complex evolution of structural styles during Andean shortening.

The major styles include: (1) thin-skinned fold-thrust systems affecting principally cover strata with ramp-flat structures above gently dipping regional décollements that ultimately root in middle to upper crustal levels; (2) thick-skinned basement-involved block uplifts delineated by isolated high-angle reverse fault structures that penetrate deeply and may root in the lower crust; (3) pre-Andean (preorogenic) and (4) Andean (synorogenic) extensional basins that have been inverted by fault reactivation during later shortening; (5) upper-crustal backthrust belts linked to deeper foreland-directed structures; and (6) salt-involved contractional structures with weak décollement horizons that facilitate lateral flow of evaporite facies. These structural styles are not mutually

exclusive and may overlap in time and space. We propose that evaluation of the contrasting roles of structural, stratigraphic, rheological, and thermal inheritance will help explain how numerous Andean structures do not bear simple relationships to the history of plate convergence, subduction, and magmatism along the western margin of South America.