

**Cenozoic synorogenic deposits in the Southern Central
Andes: a key to understanding the causes and
consequences of orogenic building**

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In the last decade, numerous works dating either synorogenic deposits or exhumation in the Southern Central Andes (30°-36°S) were published. While these studies provide important insight into spatiotemporal latitudinal variations in the Andean evolution, a comprehensive regional and critical view of these new findings and their significance for its orogenic evolution is still missing. Combining sedimentological, structural and thermochronological analysis from proximal to distal areas of the foreland basin system at different latitudes from 30° to 36° S provides a three-dimensional view for the structural and depositional evolution of this segment of the orogen. In the northern study segments, above the flat slab subduction zone (30-33°S), five morphostructural provinces can be recognized, from west to east: Coastal Cordillera, Principal Cordillera, Frontal Cordillera, Precordillera and Sierras Pampeanas. The Precordillera and Sierras Pampeanas terminate southward at 33°S and Frontal Cordillera at 34°S. To the south, only the San Rafael block appears as an important positive feature in the foreland.

Using several complementary techniques (sedimentary analysis of provenance, facies analysis, U/Pb geochronology, thermochronology, 3D kinematic models and paleostress inversion), we can reconstruct the episodes of uplift of the different ranges and the pattern of deposition in the basin through time. This multidisciplinary approach allows us to challenge previous evolutionary models. The beginning of the Andean cycle has been proposed in the upper Cretaceous, with foreland deposits only recognized in the southern part of the studied area (south of 32°S). Our results suggest an initial Eocene compressive phase took place in the northern area.

While Late Cretaceous and Eocene phases are locally recognized, the Miocene pulse is widely registered along the study area. In the Main (or Principal) Cordillera, uplift is synchronic along strike, and occurs around 20-18 Ma. The uplift in the northern area appears to be sealed at ~16 Ma, whereas it continued into the upper Miocene in the south. In addition, different blocks from the Cordillera Frontal were synchronously activated at ~17-16 Ma. The Western Precordillera uplift has also been synchronic along strike since 14-13 Ma. This suggests that the uplifting sequence in the southern Central Andes is not controlled by the flattening of the slab (~10 Ma), as previously proposed. The results of this multidisciplinary approach question the idea that the sole first control of all Andean construction is subduction dynamics.