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10Be surface exposure dating reveals strong active deformation in the central Andean backarc interior

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Understanding the deformation associated with active thrust wedges is essential to evaluate seismic hazard. How is active faulting distributed throughout the wedge, and how much deformation is taken up by individual structures? We address these questions for our study region, the central Andean backarc of Argentina. We combined a structural and geomorphological approach with surface exposure dating (10Be) of alluvial fans and strath terraces in two key localities at ∼32° S: the Cerro Salinas, located in the active orogenic front of the Precordillera, and the Barreal block in the interior of the Andean mountain range. We analysed 22 surface samples and 6 depth profiles. At the thrust front, the oldest terrace (T1) yields an age of 100-130 ka, the intermediate terrace (T2) between 40-95 ka, and the youngest terrace (T3) an age of ∼20 ka. In the Andean interior, T1′ dates to 117-146 ka, T2′ to ∼70 ka, and T3′ to ∼20 ka, all calculations assuming negligible erosion and using the scaling scheme for spallation based on Lal 1991, Stone 2000. Vertical slip rates of fault offsets are 0.3-0.5 mm/yr and of 0.6-1.2 mm/yr at the thrust front and in the Andean interior, respectively.
Our results highlight: i) fault activity related to the growth of the Andean orogenic wedge is not only limited to a narrow thrust front zone. Internal structures have been active during the last 150 ka, ii) deformation rates in the Andean interior are comparable or even higher that those estimated and reported along the emerging thrust front, iii) distribution of active faulting seems to account for unsteady state conditions, and iv) seismic hazards may be more relevant in the internal parts of the Andean orogen than assumed so far.

References

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