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# Early extension in a foreland basin: structural and sedimentological evolution of the El Cajon and Campo Arenal basins, NW Sierras Pampeanas, Argentina

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Foreland basin sequences provide a record of the tectonic and climatic evolution of mountain belts. While the dominant control on basin architecture is thrust loading, this is occasionally modified by the development of extensional structures associated with flexure in the forebulge areas. Here, we utilise seismic reflection profiles to document a previously unrecorded early phase of foreland extension possibly associated with the migration of such a forebulge in the region east of the southern Puna, NW Argentina.

Intramontane basins straddling the eastern border of the southern Puna Plateau in the Sierras Pampeanas and Eastern Cordillera record a complex history of transition from a foreland-basin to compartmentalised foreland characterized by meridionally oriented intramontane basins and intervening reverse-fault bounded basement ranges. These basins are structurally and hydrologically akin to basins in the Puna, but contrastingly were only temporarily isolated and record alternating episodes of filling, deformation, exhumation, and renewed integration with the foreland. While uplift and exhumation in the Puna region was ongoing during the Oligocene, uplift of adjacent ranges to the east began in the Late Miocene to Early Pliocene, dissecting the foreland.

We utilise 11 industry seismic reflection profiles to investigate the longer-term structural and sedimentological evolution of the El Cajón and Campo Arenal basins located between the eastern Puna border, and Aconquija and Quilmes ranges to the west and east respectively. We identify 4 seismic sequences separated by unconformities and their correlative conformities that we use to reconstruct the temporal and spatial development of the basin. We document a westward thickening that might be anticipated due to thrust loading in the present Puna in all 4 sequences. Furthermore, a north to

south migration of the depocentre along the western margin suggests a 'zipping up' and southward migration of the active thrust front. In contrast however, we observe extensional faults with of ∼5-10 km length and a few hundred metres of displacement, with classic half-graben geometries, initially occurring in the west in Sequence 1 and later the east of the basin during Sequence 2. During later Sequences 3 and 4, these small-scale normal faults are inverted during shortening. This inversion is significant in the north, whilst in the south structures remain close to the null point, or in overall extension. The timing of extension cannot be exactly constrained. Deposition in the adjacent Santa María basin, to the north, commenced c.13Ma although, given the thickness of the Sequences 1 and 2, the onset of sedimentation in the Campo Arenal and Cajón basins was possibly earlier.

There are two possible mechanisms to explain the early extension: (1) Extension within the El Cajon basin is associated with a regional change in the tectonic stress field; (2) The migration of a forebulge (∼150 km ahead of the thrust front) creating a flexure that generates small extensional structures on the back of the bulge. We favour this second mechanism, as it would create the observed normal faults whilst maintaining the overall crustal shortening.