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One kilometre-thick ultramylonite, Sierra de Quilmes, Sierras Pampeanas, NW Argentina

M.A. Finch, R.F. Weinberg, M.G. Fuentes, P. Hasalovà, R. Becchio

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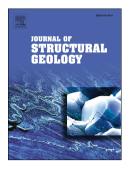
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- 2 Argentina.
- 3 Finch, M. A.¹, Weinberg, R.F.¹, Fuentes, M. G.², Hasalovà, P.^{1,3}, Becchio, R.²,
- ¹School of Earth, Atmosphere and Environment, Monash University, Clayton, VIC, 3800.
- ²Instituto Geonorte, National University of Salta, INENCO-CONICET. Av. Bolivia 5150. 4400.
- 6 Salta, Argentina.

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³Centre for Lithospheric Research, Czech Geological Survey, Klárov 3, 118 21, Prague 1, Czech
Republic.

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ABSTRACT

- We describe a 1km-thick ultramylonite forming the high strain base of the >3.5 km thick El
- 14 Pichao shear zone in the Sierra de Quilmes. This shear zone thrusted granulite facies
- migmatites onto amphibolite facies rocks during the 470 Ma Famatinian orogeny. Strain
- grades upwards from ultramylonites to weakly sheared migmatites across the 3.5 km zone
- and the mylonitic rocks define a geochemical field narrower than the protolith suggesting
- they underwent mixing and homogenization through shearing. Ultramylonites this thick are
- uncommon. The width of a shear zone, in the absence of significant compositional
- 20 rheological contrasts controlling strain localization, is controlled by the balance between
- shear heat generation and diffusion. Under typical crustal conditions a strain rate of 10^{-12} s⁻¹ is
- required to form a 1 km-thick ultramylonite, and this is achieved when large movement
- velocities are imposed across the shear zone. We postulate that the El Pichao shear zone and
- 24 its thick ultramylonite accommodated a significant fraction of convergence velocities driving
- 25 the orogeny, and that the wide mylonitic shear zones characteristic of the Cambrian-
- 26 Ordovician deformation of the Sierras Pampeanas result from the convergent movement
- being taken up by only a few active major shear zones.

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