

A 70 Myr record of cyclic continental back-arc melting along the West Gondwana margin

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New continental crust forms above subduction zones as a result of heat and mass transfer from the asthenosphere. However, the timescales and nature of this transfer remain debated. It has recently been recognized that magmatic activity in arcs can be cyclical at 50 to 1 Myr timescales [1–3] but the reason for this cyclicity is undetermined. Back-arcs are typically high flux terranes [4] and may record valuable complementary information. Here, we investigate turbidites in the back-arc of the West Gondwana margin during the Cambrian–Ordovician Famatinian Orogeny of NW Argentina, and present the first recorded field and geochronologic evidence for cyclical partial melting away from juvenile arc magmatism. Laser ablation U-Pb dating of zircons in anatectic granites reveals up to five age populations in individual hand specimens, spanning 70 Myr and peaking every 10–15 Myr. Thorough thermal reworking of a newly deposited, thick pile of sediments in the back-arc leads to significant stratification of the continental margin through anatexis and upward magma transfer. Most significantly, this demonstrates that back-arcs may undergo thermal cyclicity similar to that observed in magmatic arcs, suggesting that the arc/back-arc system pulsates in harmony at a 10–15 Myr frequency, modulated by mantle heat and mass transfer.

[1] DeCelles *et al.* 2009, *Nature Geoscience* **2**, 251–257. [2] deSilva *et al.* 2015, *Elements* **11**, 113–118. [3] Kirsch *et al.* 2016, *American Mineralogist* **101**, 2133–2154. [4] Currie & Hyndman, *Journal of Geophysical Research* **111**, B08404.