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Transient tectonic switch in volcanic arcs: observations from the Southern Andes (33S - 38S).

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It has been shown that in the aftermath of megathrust earthquakes the forearc region moves trenchwards promoting crustal extension altering the long term stress regime in place before the earthquake during the inter-seismic periods. In the far field such variations are less well-recognised and their influence on volcanic arc activity poorly constrained.

To tackle this problem we deployed a temporary seismic network in the volcanic arc of Southern Andes from November 2013 to April 2015 to investigate the tectonic deformation imposed by the M8.8 2010 Maule megathrust earthquake. The network is centred on the Nevados de Chillan Volcanic Complex is an Andean-transverse NW-oriented structure whose orientation is not well compatible with the current tectonic regime. The Nevados de Chillan faces one of the regions that slipped the most during the 2010 M8.8 Maule earthquake. The system was also reactivated after the earthquake and its activity is still ongoing at writing.

We compared the deformation of the geological records such as faults, fractures and dikes (assumed to be representative of inter-seismic periods) against the focal mechanisms inverted from shallow moderate-magnitude earthquakes occurred in the arc from 2010 to 2015. We found out that the geological record shows the imprinting of both long term inter-seismic and perturbed shorter term post-seismic deformation. In particular, the latter may create the conditions to re-activate NW pre-existing tectonic structures enhancing the magma upwelling sitting in the upper lithosphere.

Our work suggests that the kinematics driving the growth of NW-striking volcanic systems in the Southern Central Andes are affected by both magmatic and tectonic processes, with the latter experiencing short-lived perturbations.