



Volcanism and tectonics in action along the Southern Andes: space-time analysis of current deformation recorded by GNSS and seismicity

Andres Tassara (1), Scott Giorgis (2), Vicente Yáñez (1), Francisco Garcia (1), Juan Carlos Baez (3), and Luis Lara (4)

(1) Department of Earth Sciences, Universidad de Concepcion, Chile (andrestassara@udec.cl), (2) Department of Geological Sciences, SUNY-Geneseo, USA, (3) Centro Sismológico Nacional, Universidad de Chile, Chile, (4) Observatorio Volcanológico de los Andes del Sur, SERNAGEOMIN, Chile

The Southern Andean margin is perhaps the best natural laboratory on Earth to study the relationship between volcanism and active tectonics. Convergence between Nazca and Southamerican plates along the Southern Andes is relatively rapid (66 mm/yr) and slightly oblique (15-20°) with respect to the continental margin. The trench-normal component of convergence is mainly released along the megathrust fault by great subduction earthquakes. At the time scale of millions of years, the trench-parallel component has been mostly released by dextral strike-slip along the Liquiñe-Ofqui Fault Zone (LOFZ), a long-lived (Eocene-Recent) crustal-scale structure more than 1000 km long which is intimately related to the Southern Volcanic Zone (SVZ) of the Andes. Volcanic systems of the SVZ are clustered near intersections of the LOFZ with oblique and inherited basement structures. In contrast with this clear relationship between crustal tectonics and volcanism at long time-scales, little is still known (here and elsewhere) at the time scale of earthquakes and eruptions about the mechanisms by which they actually interact to create the observed long-term relationship. Into this framework, we are taking advantage of the largely unpublished and very unique geodetic and seismic database that is available for us via the project Active Tectonics and Volcanism at the Southern Andes (ACT&VO-SA) in order to gain understanding about the physical link between contemporary tectono-volcanic processes occurred recently along the southern Andean margin and the long-term construction of the LOFZ-SVZ. We will present a characterization of the current surface velocity field along this region deduced from a kinematic analysis of a network of continuous GNSS stations operating since 2007 and relate this with the spatio-temporal evolution of crustal seismicity recorded by seismic networks maintained by Chilean institutions in order to analyze the possible connection between crustal deformation and several volcanic eruptions occurred over the last years. Preliminary results indicate that monoclinial vorticity (i.e. the ratio between pure shear and simple shear deformation), as computed from GNSS vectors averaging station velocities between 01/01/2008 and 31/12/2009 (i.e. previous to the 27th February 2010 Mw8.8 Maule earthquake), is mostly concentrated along the main branch of the LOFZ roughly where large eruptions occurred at volcanoes Llaima (2008-2009), Puyehue-Cordon Caulle (2011), Villarica (2015) and Calbuco (2015). We will produce a detailed analysis of geodetic and seismic data in space and time in order to refine this preliminary result, which we hope would stimulate a rich discussion on the relationship between volcanism and tectonics at different time-scales both along the Southern Andes and other active margins.