Towards a sharper image of the Lazufre complex in the Central Andes by combining independent data from magnetotellurics and InSAR

Heinrich Brasse[1], Ingmar Budach[1], Daniel Diaz[2], Thomas R Walter[3]

[1]Fachrichtung Geophysik, Freie Universität Berlin, Germany, [2]Departamento de Geofisica, Universidad de Chile, Santiago, Chile, [3]GFZ - Geoforschungszentrum Potsdam, Germany

E-mail: heinrich.brasse@fu-berlin.de

The Lazufre volcanic complex in the Central Andes constitutes one of the largest inflating volcanic systems in the world. An InSAR time series produced by combining the ERS1, ERS2 and Envisat radar data archives allowed to detect an uplift increasing to currently 3-4 cm/a, affecting an area of over 2000 sq km. Geodetic inversion modeling hints at influx of magmatic material into the upper crust at approx. 10 km depth. Since partial melts are good electrical conductors, such a system forms an ideal target for deep electromagnetic investigation, particularly magnetotellurics (MT).

Preliminary long-period magnetotelluric soundings were carried out along a W-E running profile across the structure from the Chilean Precordillera into the Argentinian Puna. Additional sites were placed around the center, although coverage was limited due to difficult accessibility and other logistical issues. Dimensionality and strike analysis did not yield an unequivocal electrical preference direction; induction vectors clear hint at a three-dimensional subsurface conductivity distribution. Thus two-dimensional modeling needs to be regarded with care. Nevertheless, the resulting model already shows a vast conductor beneath Lazufre, extending through the entire crust. This is corroborated by three-dimensional inversion: a high-conductivity zone rises obliquely from the upper mantle to a depth of approximately 10 km. Therefore, the depth of the roof of the high conductivity region correlates well with the depth of the magmatic sill inferred from InSAR data. Although the mantle source is only poorly resolved, we believe that melts originating from the upper mantle constitute the source of the volcanic uplift. Other features of the model comprise a conductor associated with the Precordillera Fault System and the well-conducting Puna; both structures are in accordance with earlier studies farther to the north.

©IAVCEI 2013 Scientific Assembly. All rights reserved.