First results from the Volcano Deformation Database Task Force

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Observations of surface displacements at volcanoes (both uplift and subsidence) are only one tool used to study volcanic activity, but they have played an important role in understanding magma movements and in forecasting during many eruptions (e.g. Kilauea, Mt. St. Helens, and Mt. Augustine, Alaska). On the other hand, many volcanoes also exhibit deformation without leading to an eruption, and some eruptions may not produce ground deformation or it might have been missed with the limited available datasets.

Forecasting can be improved from our aggregate knowledge of volcano behavior – for example, what are the properties of a deformation episode at a volcano that do or do not lead to eruption? It is currently difficult to assemble this type of aggregate knowledge, especially on a short timescale in response to a volcanic crisis. At the same time, we now have the opportunity to monitor all of the volcanoes of the world for ground deformation thanks to satellite Interferometric Synthetic Aperture Radar (InSAR). Although appropriate InSAR data have not yet been analized over all of the world's volcanoes, the number of known deforming volcanoes has more than tripled since 1997.

Thus, recognizing the need for global information on volcano deformation and the opportunity to address it (with InSAR and other techniques), we have established a Volcano Deformation Database Task force as part of Global Volcano Model.

The three objectives of our organization are:

1) to compile deformation observations of all volcanoes globally into a database that will be part of WOVOdat and the Global Volcanism Program of the Smithsonian Institution.

2) document any relation between deformation events and eruptions for the Global assessment of volcanic hazard and risk report for 2015 (GAR15) for the UN.

3) to better link InSAR and other remote sensing observations to volcano observatories.

We present the first results from our global study of the relation between deformation and eruptions, focusing on the southern Andes. We find that available InSAR data are rarely available in the critical days to weeks before the eruption of a volcano that has been dormant for decades to millenia. For example, while ground deformation was observed before the 2011 eruptions of Cordon Caulle and Cerro Hudson, the observations were too infrequent to see any change in the pattern or rate of deformation before the eruptions. Before 2011, Cordon Caulle and Cerro Hudson both erupted in the 20th century, but the 2008 eruption of Chaiten was preceeded by millenia of dormacy and still had no measured precursury deformation up to two weeks before eruption. New InSAR missions with more frequent observations along with ground observations from tiltmeters and GPS are essential to constrain whether there is a reliable deformation signal before eruption.