Abstract

Sangie volcanic arc is a unique example of a collision between facing volcanic arcs, along with Halmahera volcanic arc in the Molucca Sea region of northeastern Indonesia. It's approximately 500 km in length and 70 km in width. Even though the arc contains 25 volcanoes along its length, almost half (5 of its 12 active volcanoes) are situated on or near the northeast tip of Sulawesi.

Ryukyu volcanic arc in Japan's triple junction formed by the subduction of the Philippine Sea Plate beneath the Eozanian Plate. Lying on the north end of the chain, the south Sulawesi island contains Kirishima volcano group (more than 20 young and old volcanoes) and 4 active volcanoes.

1. To monitor these volcanoes' deformation, we use 4 years (2007-2011) of ALOS-PALSAR SAR data to perform time series InSAR survey of the Sangie volcanic arc.
2. L-band InSAR is a valuable tool for volcanic deformation monitoring.

Methodology

- SAR images obtained from ASF, 2007-2011, for Sangie arc.
- InSAR processing - 250 interferograms produced by RICK PAC after generating SLCs with GAMMA.
- Time series processing: Small Mainland Subset (SMS) [Berardino et al., 2002] with University of Miami's PALSAR package.
- Par selection: all interferograms within the limits of perpendicular spatial, temporal baselines and Doppler center frequency difference, plus interferograms with the same month (seasonal deceleration) from the low coherence manually.
- Pixel selection: temporal coherence above a threshold of 0.7 [Tizzani et al., 2007].
- Noise phase correction: tropospheric estimation using ECMWF weather re-analysis with PyAPS (Soltani et al., 2012).
- DEM error correction (Takahashi and Arimoto, 2012) and quadratic/planar ramp removal.

Conclusion

- L-band time series InSAR is a valuable tool for volcanic deformation monitoring.
- Substantial phase ramp still remains after the correction of tropospheric delay and topographic residual. This phase ramp (mainly due to ionospheric delay) can be eliminated partially by plane or quadratic ramp method.
- Soputan and Lokon-Empung twin volcanoes in North Sulawesi, western Indonesia have been deforming during 2007-2011 time period; and a interesting uplift was detected on the west lava dome of Soputan volcano.
- Minami-dake of Sakurajima volcano and Kaimondake of Kirishima volcano groups in Kyushu, southern Japan had intense surface deformation on their crater detected by our time series InSAR survey. Both ground and airborne InSAR results agree with corresponding volcanic bulletin reports.

Time Series Deformation of Sangie Volcanic Arc

- Continuous linear subsidence for the crater of Soputan and Lokon-Empung twin volcanoes.
- Temporary uplift for the west lava dome of Soputan volcano.

Reference