1. Summary

Study Area: Kirishima volcano group in southern Kyushu Island, southwest Japan.

Problem: How did the volcanic deform in time and space during the volcanic active period in 2010-2012? How does it evolve from magma flow to hydrothermal activity?

Data: InSAR time-series deformation from 3 tracks of ALOS/PALSAR over ascending and descending orbit from 2006 to 2011, 13 continuous GPS sites with data from 2006 to 2012.

Key Findings:
- Two deformation sources are identified: a deep magma chamber at ~14 km depth subvertical to the west of Shimoe-dake’s summit, corresponding to the 2011 eruptive event, started inflating ~1 year before the eruption and a shallow source at ~1 km depth beneath the summit, which corresponds to the 2008-2010 phreatic events.

2. InSAR Processing

Kirishima (Ble, i.e. Foggy Mountain in Japanese), which means a lot of tropospheric delay!

Data: ALOS-PALSAR ascending track 424 and descending track 72 and 73 from 2006 to 2011 pro- vided by JAXA. It is an average ~10σ median GDR provided by the Geospatial Information Authority of Japan (GSI) [Tobita et al., 2003].

Time series InSAR Small Baseline Subset (SBAS) [Benz et al., 2002, TGRS] using PySAR:
- Network selection on the basis of 120 days and 1 km, then drop low coherence (5% manually)
- Phase correction
  - tropospheric delay using GDWM with atmospheric analysis with FAPAR [Janka et al., 2011, GIE];
  - SAR covariance error correction [Pasquale and Ameneghi, 2013, TGRS].
- Drop InSAR sites with obvious tropospheric turbulence using normalized sum of displacement for per epoch, as shown on Fig. 3.3.

3. Time Series Displacement

Volcanic unrest of the 2011 Eruption at Shinmoe-dake (Kirishima), Japan, revealed by InSAR and GPS data and modeling

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4. Pre-eruptive Deflation at Shallow Source

Definition at Shinmei-dake’s Summit caused by the phreatic explosion occurred in August 2008 (VEI=1) and March, April, May, June and July 2010. We choose elastic homogeneous, isotropic half-space InSAR models with Gauss-Seidel scheme and method to inverse source’s geometry using GoSAR software. Depths are shown relative to the half space (2010) and to the summit (2011).