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Roles of geodetic methods on volcanic activity forecasting

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Since the beginning of the GPS continuous measurements in mid 1990's, it has been demonstrating the usefulness in the volcanic activity monitoring. The most recent such example is a detection of deep source inflation preceding the 2011 January eruption of Shinmoe Crater of Kirishima volcanic complex.

Another example is prediction experiment of Asama Volcano. Asama volcano nested in the central part of Japan is a highly active volcano repeating eruptions since prehistoric period. The recent activity started in 2004 after 20 year long dormancy followed by further eruptions in 2008 and 2009. Distance change of a baseline spanning over the volcano edifice derived from GPS continuous measurements operated by the Geospatial Information Authority of Japan (GEONET) shows a series of repeating episodes of inflation and deflation. During the inflation period volcanic activities near the surface (seismicity, fumarole and SO2 emission, etc.) become culminating (Murakami, 2006). All the eruptions after 2004 are confirmed to have happened during inflation period. A suggested magmatic model is that episodic intrusions of magma from the depth to a shallow reservoir are driving volcanic activity near the surface. To the present no apparent periodicity is confirmed in the temporal evolution of the ground deformation. In this presentation, we discuss the possibility of prediction of the beggining of a new episode, based on a certain regularity of the deformation's temporal evolution. It is noteworthy that the temporal change of the baseline length is a chain of successive similar episodes. Each episode shares the similarity in shape but not in magnitude. More importantly the starting point of each episode drops on a single line suggesting a time-predictability following the same discussion in case of earthquake predictability. We see similar tendency also around Meakan Volcano, easetern Hokkaido.

In this presentation we discuss the roles of geodetic method in volcanic eruption prediction including the search of possible candidate sites of super eruption.

Keywords: Volcanic Eruption Prediction, GPS: Global Positioning System, Geodesy, Disaster Mitigation, Super Volcano