Geophysical Research Abstracts, Vol. 9, 00453, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00453

Using a flow model to explain geodetic data, preliminary results from Eyafjallajökull, Iceland

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Swelling of magma reservoirs is commonly detected in active volcanic systems and usually marks the beginning of volcanic unrest. However, for swelling to occur, magma must be fed into the reservoir from another location. Magma transport requires pressure gradients. Present modelling usually lumps the different components of the plumbing system into a single pressure source. This has the advantage of simplicity, but provides no information on magma dynamics. Fluid dynamics can be used to study the flow rates of volcanic processes. It is anticipated that advanced results can be reached following a multi-disciplinary approach.

Eyafjallajökull in south Iceland is a stratovolcano rising to an elevation of 1666 m above sea level. The summit is covered by an icecap which covers 80 km^2. The volcanic system shows little, episodic high-frequency earthquakes with few eruptions. Two well documented intrusive episodes occurred in 1994 and 1999. The spatio-temporal evolution of the 1999 episode has been studied by analysing a series of Interferometric Synthetic Aperture Radar Images (Pedersen, 2006).

Here, we show preliminary results in which we use a flow model to explain the observed geodetic signal. By combining the flow rates obtained from the fluid dynamic approach, with the source parameters calculated from geodetic data, more-advanced time dependent models will be created. This will give us insight into the volcanic processes at depth, crucial for eruption prediction.

Pedersen, R and Sigmundsson, F (2006) Temporal development of the 1999 intrusive episode in the Eyjafjallajökull volcano, Iceland, derived from InSAR images