Geophysical Research Abstracts
Vol. 14, EGU2012-9082, 2012
EGU General Assembly 2012

On the mutual relationship between conceptual models and datasets in geophysical monitoring of volcanic systems

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Geophysical datasets are essential to guide particularly short-term forecasting of volcanic activity. Key parameters are derived from these datasets and interpreted in different ways, however, the biggest impact on the interpretation is not determined by the range of parameters but controlled through the parameterisation and the underlying conceptual model of the volcanic process. On the other hand, the increasing number of sophisticated geophysical models need to be constrained by monitoring data, to transform a merely numerical exercise into a useful forecasting tool.

We utilise datasets from the "big three", seismology, deformation and gas emissions, to gain insight in the mutual relationship between conceptual models and constraining data. We show that, e.g. the same seismic dataset can be interpreted with respect to a wide variety of different models with very different implications to forecasting. In turn, different data processing procedures lead to different outcomes even though they are based on the same conceptual model. Unsurprisingly, the most reliable interpretation will be achieved by employing multi-disciplinary models with overlapping constraints.