



Discerning Between Real and Artificial Velocity Change in Time-Dependent Seismic Tomography

Alex Hobé¹, Ari Tryggvason¹, Olafur Gudmundsson¹, and the SIL Seismological Group*

¹Uppsala University, Department of Earth Sciences, Sweden (alex.hobe@geo.uu.se)

*A full list of authors appears at the end of the abstract

Volcanoes and volcanic systems are very dynamic. The influx of new magma, changes in the hydrothermal system, and eruptions produce large changes in the velocity structure. Such changes can be inferred using Time-Dependent Seismic Tomography (TDST), as has been done by multiple authors (e.g. Koulakov et al. 2013, Hobé et al. 2020). Due to the nature of the inversion process inherent to tomographic methods, it is difficult to discern between real and artificial differences between epochs. In TDST, such artificial differences can arise from differences in raypath-geometry (due to differences in station and earthquake distributions), the employed regularization in the inversion process, and errors due to multiple sources (e.g. travel-time picks, and assumptions in the forward model). This study provides two novel ways of inferring the influence of these artificial sources of velocity change in tomographic models: a baseline reconstruction (Hobé et al. 2020) and time-varying reconstructions. These reconstructions are produced for the Krysuvik volcanic system. The velocity differences produced by the "true" data are then compared to those produced in the synthetic reconstructions. We show that the differences in the obtained models cannot solely have been produced artificially and therefore that there must have been significant velocity changes in the area.

References:

Hobé et al. (2020): Imaging the 2010-2011 inflationary source at Krysuvik, SW Iceland, using time-dependent Vp/Vs tomography, WGC 2020, forthcoming

Koulakov et al. (2013): Rapid changes in magma storage beneath the Klyuchevskoy group of volcanoes inferred from time-dependent seismic tomography, J. Volcanol. Geotherm. Res.

SIL Seismological Group: SIL Seismological Group, Icelandic Meteorological Office, Reykjavik, Iceland