

FIELDWORK IN ICELAND: PUTTING THEORY INTO PRACTICE

Under the Vulcano

A two-week field trip to Iceland “that was all they were told beforehand. After one year of studying at Delft University of Technology, MSc students headed towards this geodetically very interesting island in June 2013. Here the authors, two of the students, describe the background to the fieldwork, the activities performed and their impressions.

Reinier Oost and Dieuwertje Wesselink



In the Krafla volcano region, located in the very north of Iceland, a blend of natural geophysical processes and human-induced deformations are causing vertical and horizontal movements of the Earth's surface, while groundwater circulation and volcanic processes cause mass displacements. A major source of human-induced vertical deformations is the injection and extraction of groundwater by the geothermal power plant at the Krafla volcano. In view of a plan to build a new power plant in the vicinity of the existing one, societal demand for monitoring these deformations is rising. For this purpose the Krafla power plant established a GPS campaign network in the region five years back with a density of one point every few kilometres. Each point of the network has to be re-surveyed once every year or few years aimed at establishing long time series. The Krafla volcano is well known due to the fires that lasted from 1975 until 1984 and is rather active, which complicates the separation of human-induced deformation from the ones caused by natural processes such as plate spreading, post-glacial rebound and volcanic processes.

GPS Fieldwork

Our fieldwork, which lasted two weeks on site, was aimed at quantifying the magnitude of the different causes of deformation through measurements. GPS receivers and total stations had to be transported to the off-road benchmarks by car or on our backs, sometimes in snow-covered conditions. The surface deformations are a matter of several millimetres to a few centimetres per year and GPS is accurate enough to measure these small changes provided that the equipment is set up very precisely, exactly levelled and positioned above the marker in the ground. Not only do the measurements in the field have to be carried out carefully but also a lot of post-processing is required to obtain the high levels of accuracy necessary to quantify horizontal and vertical surface movements over time.

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