

Continuous high resolution gravity measurements at a geothermal field in Northern Iceland

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For a better understanding of the sustainability of geothermal resources, we want to quantify subsurface mass changes caused by production and injection of fluids at the Theistareykir geothermal field in Northeast Iceland. For this purpose, we installed three superconducting gravity meters (iGrav006, iGrav015 and iGrav032) and two spring gravity meters (gPhone061 and gPhone128) in vicinity to the new geothermal power plant that started operation in October 2017.

Prior to the Iceland installation, all gravity meters were setup at the gravimetric observatory J9 in Strasbourg for simultaneous side-by-side measurements. The obtained data were used for instrumental calibration, comparison of noise levels and tidal analysis. In Theistareykir, three of our measuring sites are set up close to the geothermal production and injection wells. The fourth site is located outside the geothermal field, to provide reference measurements that are unaffected by the activities of the power plant. At each site additional physical parameters, which influence the local gravity signal, are measured. This includes the continuous monitoring of GPS-positions, rainfall, soil moisture and snow thickness. Moreover, snow weight and snow water equivalent are measured at the site close to the production wells.

Here, we present the results of the unique intercomparison of three superconducting gravity meters and two gPhones at Strasbourg and the initial time series obtained at the geothermal site in Iceland. A preliminary interpretation of the gravity variations with regard to the geothermal activities and the hydro-meteorological dynamics is given.