Living Planet Symposium 2016

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Paper 2713 - Session title: Beyond GOCE, GRACE & Swarm

10:50 **GOCE and future gravity missions for geothermal energy exploitation**

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Geothermal energy is a valuable renewable energy source the exploitation of which contributes to the worldwide reduction of consumption of fossil fuels oil and gas. The exploitation of geothermal energy is facilitated where the thermal gradient is higher than average leading to increased surface heat flow. Apart from the hydrologic circulation properties which depend on rock fractures and are important due to the heat transportation from the hotter layers to the surface, essential properties that increase the thermal gradient are crustal thinning and radiogenic heat producing rocks. Crustal thickness and rock composition form the link to the exploration with the satellite derived gravity field, because both induce subsurface mass changes that generate observable gravity anomalies. The recognition of gravity as a useful investigation tool for geothermal energy lead to a cooperation with ESA and the International Renewable Energy Agency (IRENA) that included the GOCE derived gravity field in the online geothermal energy investigation tool of the IRENA database. The relation between the gravity field products as the free air gravity anomaly, the Bouguer and isostatic anomalies and the heat flow values is though not straightforward and has not a unique relationship. It is complicated by the fact that it depends on the geodynamical context, on the geologic context and the age of the crustal rocks. Globally the geological context and geodynamical history of an area is known close to everywhere, so that a specific known relationship between gravity and geothermal potential can be applied. In this study we show the results of a systematic analysis of the problem, including some simulations of the key factors. The study relies on the data of GOCE and the resolution and accuracy of this satellite. We also give conclusions on the improved exploration power of a gravity mission with higher spatial resolution and reduced data error, as could be achieved in principle by flying an atom interferometer sensor on board a satellite.

More information can be found here:

IRENA online tool: http://irena.masdar.ac.ae/?map=1046%20

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