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Ocean tidal loading effects in Tierra del Fuego (Argentina): observations and modelling

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Pressure tide gauge observations in Lago Fagnano, Tierra del Fuego, southernmost South America, have revealed a significant deviation of the observed tidal lake-level signal from a theoretical prediction including the effects of both the solid earth tides (body tides) and the ocean tidal loading as modelled based on a global ocean tide model and Farrell's (1972) Green's functions for the Gutenberg-Bullen A earth model. This discrepancy has been attributed to an anomalous enhancement of the amplitudes of the ocean tidal loading effect with respect to the model. It may be explained by deficiencies of either the load model (ocean tide model) or the earth model (Green's functions) applied in the loading effect modelling.
In order to shed more light on this anomaly, tidal gravity metre observations have been carried out at four sites in the Argentine part of the Tierra del Fuego main island since 2009. A LaCoste-Romberg D gravity metre with digital feedback was used. Here we present the results of the gravimetric records, the first tidal gravity observations in the Tierra del Fuego region. The results are interpreted with an emphasis on the M2 ocean tidal loading signal.
Pressure tide gauge records were obtained at three locations off the Atlantic coast of the Tierra del Fuego main island. These represent the first offshore sea-level observations in the region and are used for a regional validation and improvement of a global ocean tide model. A very good agreement between ocean tide model and observations is found. This serves as a basis for a refined regional modelling of ocean tidal loading effects.
The modelled ocean tidal loading gravity signal is compared with the observations. Our gravimetric results support the conclusions drawn from the Lago Fagnano lake-level observations. However, the amplification of the tidal loading gravity signal appears to be confined to the southern part of the island. These results are discussed with regard to possible implications for the applied earth model.