EGU26-1803, updated on 09 Jun 2026
https://doi.org/10.5194/egusphere-egu26-1803
EGU General Assembly 2026
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Elastic deformation of the Earth due to surface loading: finite element modelling and implications for inverse gravimetry

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Gravitational data from satellites in Earth's orbit can be used to reconstruct secular and periodic mass movements at the Earth's surface. These include tidal effects caused by the Moon, seasonal variations in rainfall, and the melting of glacial ice at the poles.
Such mass transports not only lead to variations in the observed gravitational signal, but also act as surface loads that induce elastic deformation of the Earth on short timescales.
In this talk, we present a method for calculating these deformations using the finite element method (FEM), along with some numerical examples. Finally, we outline directions for future research, in particular the inverse problem of reconstructing surface mass distributions from GRACE data while explicitly accounting for deformational effects.