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Mass redistributions at the core-mantle boundary from satellite gravity

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The core-mantle boundary appears as a complex region at the interface between the fast-moving core flows and the slowly convecting mantle, which could play a role in understanding sudden changes in the secular variation of the geomagnetic field, the 'geomagnetic jerks'. One hypothesis suggests that temporal variations in CMB topography may be involved, potentially affecting core flows at the top of the core (Mandea et al, 2015). Measured by the GRACE satellites from 2002 to 2017, the spatio-temporal variations in the Earth's gravity field can provide us new constraints on SUCH mass redistributions at the core mantle boundary.
To separate superimposed contributions in the total gravity field and guide the identification of their sources by pattern recognition, we use the second-order spatial derivatives of the gravity potential at different spatial scales. Combining this tool with a multi-scale temporal analysis, we can select rapid signals at large spatial scale, concomitant with geomagnetic jerks. Then, to investigate their sources at depth, we compare the observed gravity signals with gravity variations associated with water cycle sources. The results of our current investigation are discussed here.

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