

Khosro

Ghobadi-Far

Aerospace Department and CIRES, University of Colorado Boulder

Oral

The future, joint NASA/ESA Mass-change And Geosciences International Constellation (MAGIC) has the main objective of improving accuracy and spatiotemporal resolution of mass change fields that can be obtained from satellite gravimetry. In particular, the enhanced spatial and temporal sampling of observations from MAGIC allows for reducing the temporal aliasing error, leading to enhanced mass change data.

Analysis of GRACE, GRACE-FO and MAGIC is conventionally done in terms of the inverted gravity and mass change fields over a certain period like a week or month. Given that some extreme climate events such as floods can happen at shorter time scales (like days), the inverted mass change fields sometimes fail to properly capture the rapidly changing mass variability associated with such rapid processes. Direct analysis of inter-satellite tracking data along the GRACE and GRACE-FO orbits has proved to be very effective in detecting high frequency geophysical processes such as floods and tsunamis. Here I present the results of the along-orbit analysis approach in terms of Line-of-sight Gravity Difference (LGD) extended to MAGIC. After discussing the extension of LGD technique from polar to the inclined pair, I show that along-orbit analysis of this dual-pair satellite gravity constellation has the potential for efficiently observing and modelling extreme, rapid mass changes associated with floods, tsunamis, and rapid snow melt events. In particular, the added value of the inclined pair for observing rapid mass changes is rigorously examined and quantified. The approach presented here broadens the scope of geophysical applications that can be studied by MAGIC.

Meeting homepage

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