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Benefit of multi-pair quantum satellite gravity missions in Earth science applications

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Data from the GRACE and GRACE-FO missions have contributed significantly to our understanding of the Earth system. However, the spatial and temporal resolution, latency, and data quality being heterogeneous over time, render key scientific and operational applications difficult. Simulations indicate that all this will significantly improve with the MAGIC (i.e. GRACE-C and NGGM) mission concept, with even further improvements expected from future multiple-pair missions with novel quantum sensors.

In this contribution, we assess the potential of multi-pair quantum mission formations as were investigated in ESA's QSG4EMT study for three areas of application (1) water cycle research, (2) ocean mass change and regional sea level budget, and (3) Earthquake and submarine volcano observation. We explicitly include simulation experiment that involve assimilation of future data products into models, as well as the fusion with other (radar altimetric) data sets.

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