Satellite Gravimetry-based Monitoring System for Water Resources Management and Natural Hazards Monitoring

C.K. Shum[1,✉], Yu Zhang[1], Vibhor Agarwal[2], Orhan Akyılmaz[3], Ehsan Forootan[4]

[1]*Division of Geodetic Science, School of Earth Sciences, The Ohio State University, United States*
[2]*Department of Geology and Environmental Geosciencs, University of Dayton, United States*
[3]*Department of Geomatics, Istanbul Technical University, Turkey*
[4]*Department of Planning, Aalborg University, Aalborg, Denmark*

✉*ck.shum@outlook.com*

Abstract

The advent of dedicated Earth gravity satellite missions during the Decade of the Geopotential, in to 2000, revolutionized measurements of gravity signals and mass transports within the Earth system with pioneering satellite gravimetry missions initiated during the Decade of Geopotential Missions in 2000: CHAMP, GRACE, and GOCE missions. Temporal satellite gravimetry missions, Gravity Recovery And Climate Experiment (GRACE), 2002–2017, and GRACE-Followon (GRACE-FO) twin-satellite missions, 2018–, are innovative sensors cable of observing global mass transport signals within the Earth system at monthly sampling and spatial scale longer than 333 km (half wavelength). The onset of climate change and its ensuing effects exacerbate adverse impacts on global environmental and ecological regimes, and natural or anthropogenic hazards such as abrupt climate/weather episodes, surface and groundwater depletion, storms, cyclones, large floods, and prolonged droughts. Timely monitoring of climate or hazardous weather variables governing these complex processes at an adequately downscaled spatio-temporal resolutions provide a means for applications to potentially improve water resources management and hazards response. Here we postulate the plausible spatio-temporal downscaling of GRACE/GRACE-FO data inverted Earth's mass change would enable accurate monitoring of the aforementioned natural hazards and surface/groundwater sensing for improved water resources management and disaster response, and present preliminary results for case studies on monitoring of groundwater, snow-storm, and floods.

Keywords: *Satellite Gravimetry, GRACE/GRACE-FO, Natural Hazards, Water Resources*