GRACE Secular Trends and Periodic Variations at Global and Regional Scales
Reginald R. Muskett
Geophysical Institute & the International Arctic Research Center, University of Alaska Fairbanks, AK, USA

Abstract
The International GRACE Follow-On (GRACE-FO) mission is an essential component of the global observing system dedicated to monitoring the Earth’s water cycle and its role in climate change. GRACE-FO, launched in 2018, is the successor to the GRACE twin satellite mission that operated from 2002 to 2017. GRACE-FO’s twin satellite configuration and superior spatial resolution enable monitoring of global mass changes with unprecedented accuracy and resolution. This is particularly true for the Southern Hemisphere, where GRACE-FO’s improved sensitivity and spatial resolution are expected to significantly enhance our understanding of regional water cycle variations.

The above plots illustrate the GRACE-FO sub-regionally averaged time series trends and variations on parts of the Lena River Basin in Siberia from August 2002 through December 2006. The basin is split into sub-regions A-F, with each showing varying degrees of water mass change. The Arctic Ocean had a volume loss while the Siberian Sea had near-zero to volume gain from August 2002 through December 2006. The Greenland Sea sub-region shows a significant volume loss; however, the trend may be contaminated by the strength of the mass loss from the Greenland ice sheet. The area-averaged variation of the basin, from area-B through area-F, seasonal variability is well resolved. Overall, the strength and significance of the trends increase from south to north, and the Barents Sea, where there is Atlantic Water inflow, shows an interesting multi-year decrease in volume to December 2004, and an increase in volume after that date.

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