Observing Global Ocean Mass Change from Satellite Gravimetry: Challenges and Progress

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As a key indicator of climate change, the global mean sea level (GMSL) has risen at an average rate of 3.3 mm per year over the past three decades, with a notable acceleration. This rise is primarily due to the thermal expansion of seawater as the oceans absorb around 90% of the Earth's heat excess, as well as an increase in global ocean mass due to melting land ice. Since 2002, the GRACE and GRACE-FO satellite gravimetry missions have provided direct measurements of ocean mass change, significantly improving our understanding of the causes of GMSL rise. However, major challenges remain due to the missions' limited spatial resolution and short time coverage. This talk demonstrates how refining data processing methods and incorporating satellite laser ranging data — a traditional satellite gravimetry technique with a legacy spanning several decades — has made it possible for the first time to close the GMSL budget over the last 30 years using direct observations.

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