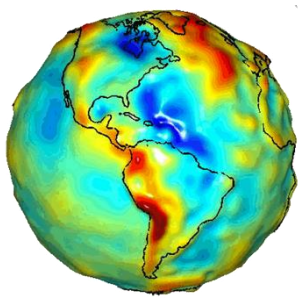
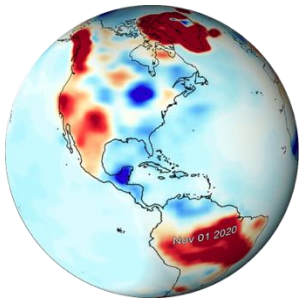
GRACE Tellus GRAVITY RECOVERY & CLIMATE EXPERIMENT

National Aeronautics and Space Administration





GRACE-FO gravity field(left) and water storage anomaly (right)

Mission Overview

GRACE Follow-On (GRACE-FO) continues the unique two-decade record of Earth's gravity and mass changes from the original GRACE mission. GRACE-FO provides vital long-term data for tracking groundwater, flood potential, drought, and sea level change. The mission defines accurate geodetic datums and geospatial data and also provides stable atmospheric reference profiles for precise weather forecasting. Together, these geodetic and water-related resources and hazards observations support critical decision-making for economic growth and national to local resilience.

Key Data Products for Applications

GRACE-FO observations track water storage changes across the Earth system and feed into higher-level data products that provide lower latency and higher spatial resolution data to meet user needs and support their decision frameworks.

- Global terrestrial water storage anomalies: mapped and for major river basins
- Hydrologic drought/wetness indices: Disaggregated land water storage changes and forecasts (e.g., shallow groundwater, root zone / surface soil moisture)
- Key Earth system indices for long-term trend analysis: glacier mass balance and sea level
- Global geodetic data: geopotential coefficients & gravity and deformation
- GPS radio occultation and thermosphere density and winds

National Interest:

Operational Users and Applications

Federal Operational Monitoring Systems, Services, and Infrastructure

- U.S. Drought Monitor USDM (NDMC, USDA, DoC, NOAA, NASA): Used for streamflow forecasts and water supply, crop, and forest assessments. GRACE-FO data are assimilated into a NASA-supported hydrologic model for weekly groundwater and soil moisture wetness indicators, which is published by the National Drought Mitigation Center and used as a key input to the USDM weekly reports (POC M. Rodell).
- National Geospatial Infrastructure, Assets & Planning (NGS, NOAA, NGA): Data are critical to the National Spatial Reference System for defining accurate geodetic datums and reference frames to ensure consistent coordinates that enable accurate positioning, navigation, and mapping (e.g., DGEOID2022).
- Coastal Military Installations (USACE): Sea level rise impacts (Sweet, et al. 2022).

State Water Management and Decision Support

- California Department of Water Resources (CA DWR): GRACE-FO Central Valley groundwater storage estimates are included in the semi-annual public groundwater reports (since 2024), enabling statewide groundwater assessment and management in support of the Sustainable Groundwater Management Act (POC: JT Reager).
- State of Texas Rivers & Aquifers total Water Storage (STRAWS) dashboard: University of Texas and Texas Water Development Board tool tracks changes in major Texas aquifers and river basins, and guides water infrastructure investments.

Private Sector

- Individuals and Businesses: Known users include farmers and agricultural commodity interests, energy producers, insurers, supply chain logistics consultants, and others (GRACE-FO user survey; POC M. Rodell).

Global Security and Capacity Building

- Coastal Planning: GRACE-FO data are used to track the processes (e.g., ice melt, land hydrology) that contribute to local sea level changes, enabling informed planning and mitigation investments (e.g., World Bank portal).
- Water and Biosphere Risk Tools: GRACE-informed groundwater indicators are integrated into WWF global risk tools used by industry and finance for water-risk and related assessments (POC: J. Kusche).
- India—Ministry of Water Resources: GRACE-informed groundwater assessments have been used in national water planning and reporting (2016; 2025).