

Texas Water Storage Observed by GRACE

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Outline

The GRACE Mission

10 Year Mission Epoch

The Current Effort

RL05 Release

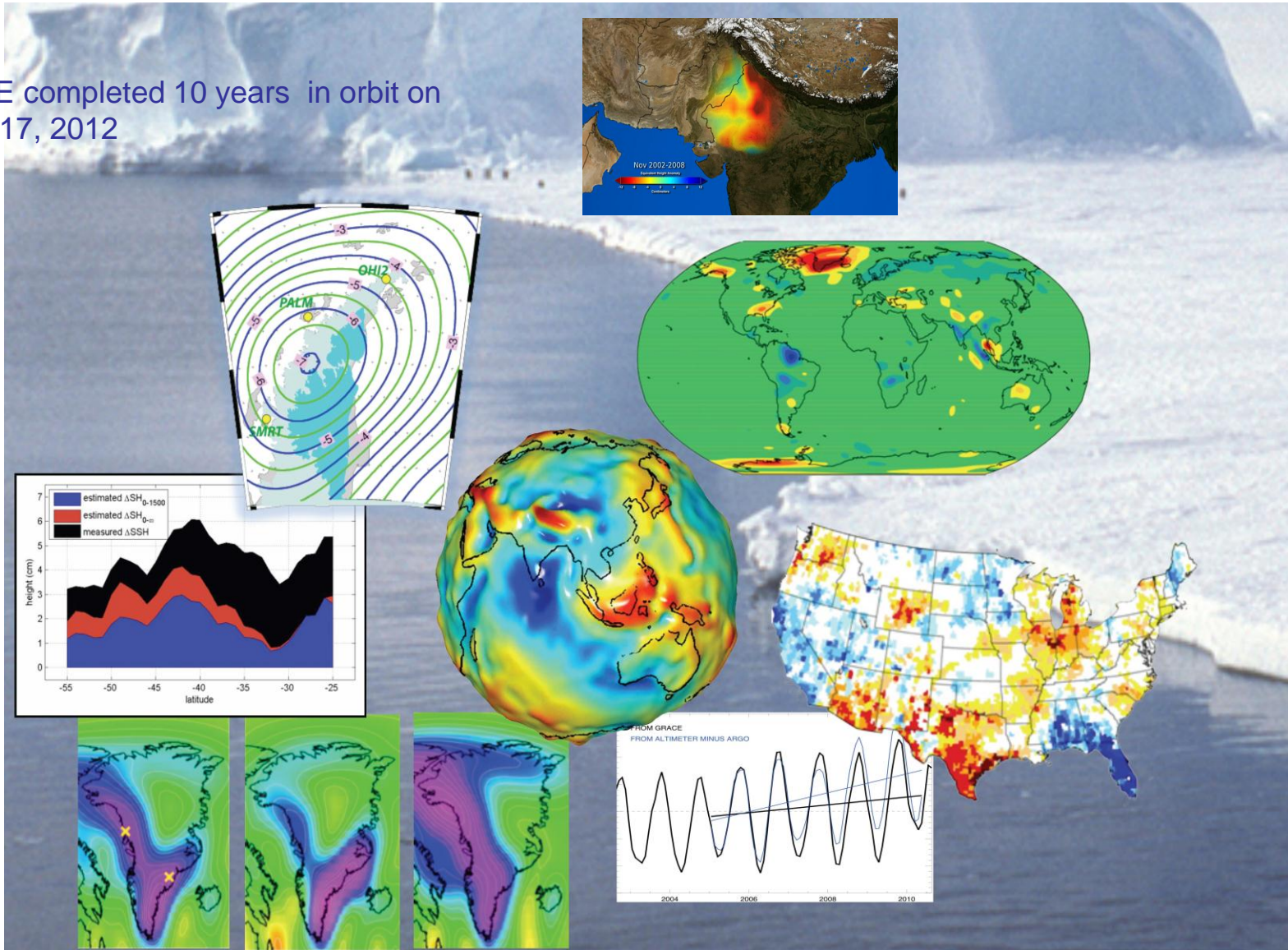
Mission Operations

Implications for Texas Water Storage Measurements

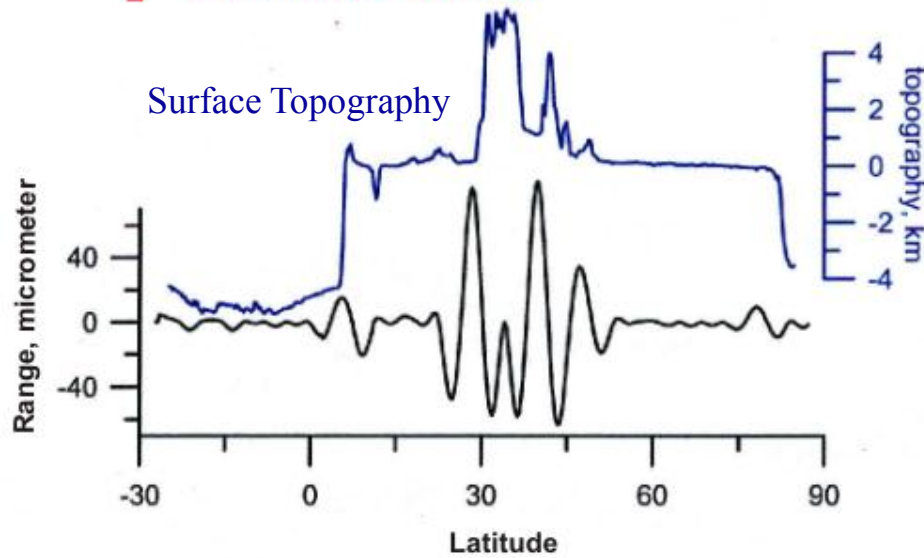
Future Plans

First Decade of Grace Gravity Measurements

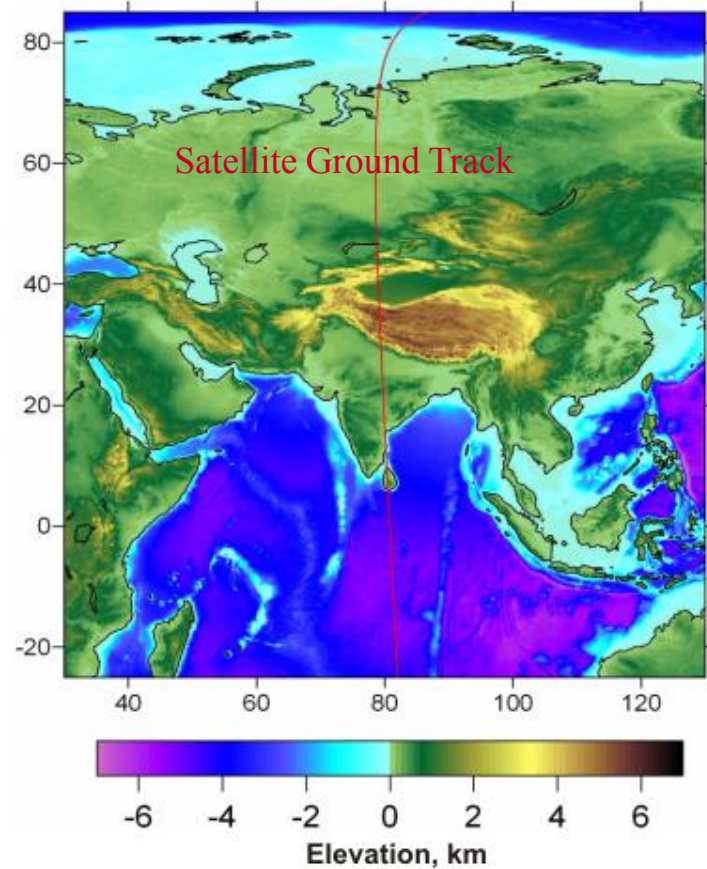
GRACE completed 10 years in orbit on March 17, 2012



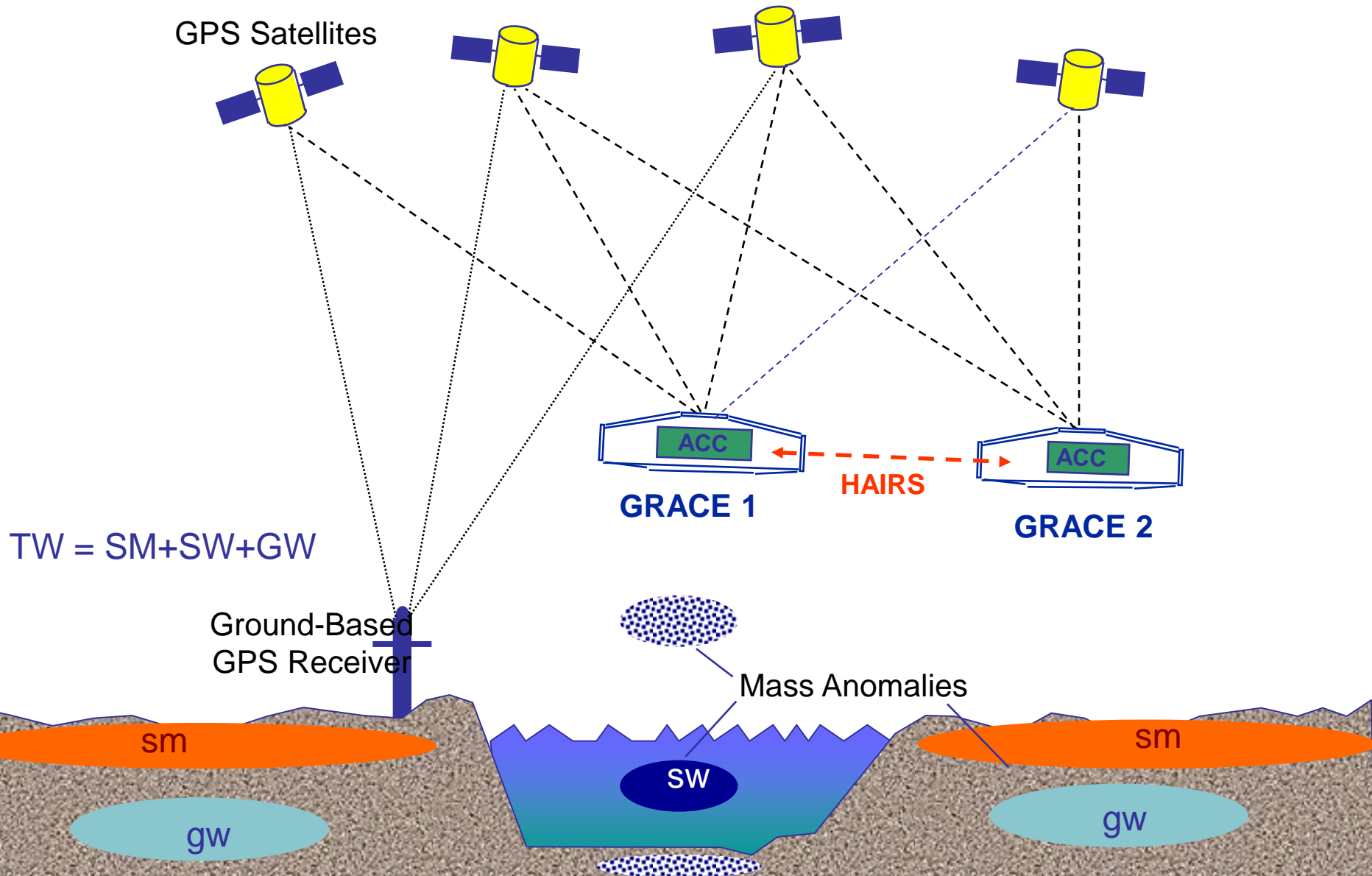
Signal in the Inter-Satellite Range Measurement



Inter-Satellite Range Measurement



Grace Mission Concept



GRACE Contribution

The general water balance equation is:

$$P = E + Q + DS$$

where

P is precipitation

Q is runoff

E is evapotranspiration and

DS is the change in storage (in soil or the bedrock)

The gravity signal associated with DS results from DM

$$DM = DMI + DMs + DMg$$

where

DMI is surface storage

DMs is soil moisture

DMg is ground water

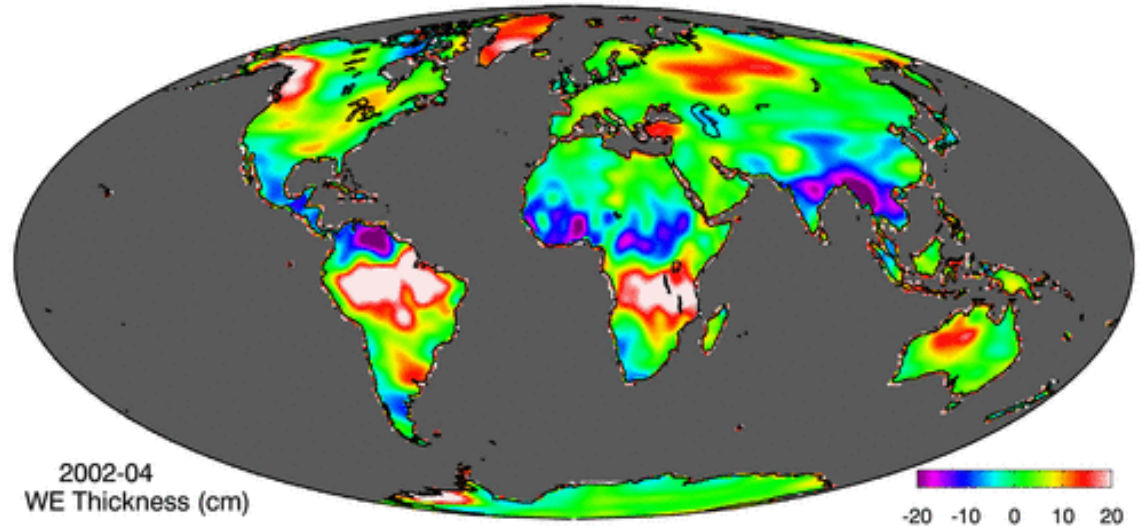
The GRACE RL05 Solution

- The GRACE RL05 solution is based on the reanalysis of 10 years of GRACE data, taking advantage of improvements in modeling and data quality and the additional data from the extended mission.
- Consists of ~120 monthly solutions which are used to determine;
 The *mean gravity field* defined as the population average and
 The *monthly departures* from the mean field, which captures the temporal variability
- The RL05 solution provides a significant improvement in *accuracy* and *spatial* resolution.
- The improved accuracy and extended data length on which the solution is based will allow more complete studies of seasonal and decadal signals involved in climate change processes.

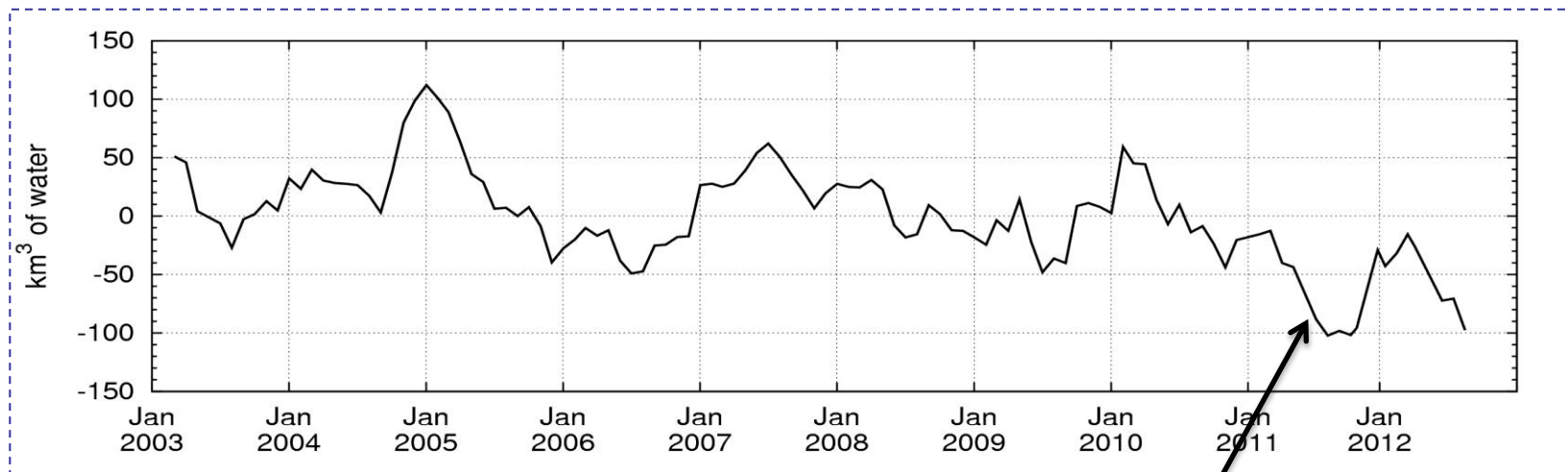
Collecting Water Data Globally (GRACE)

Force of gravity responds to changes in water volume

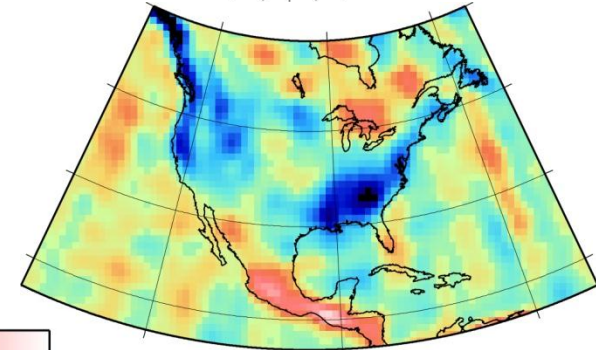
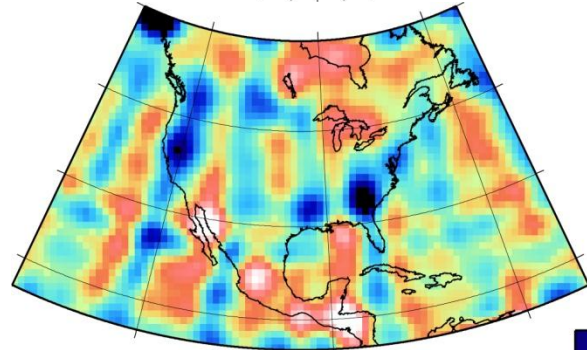
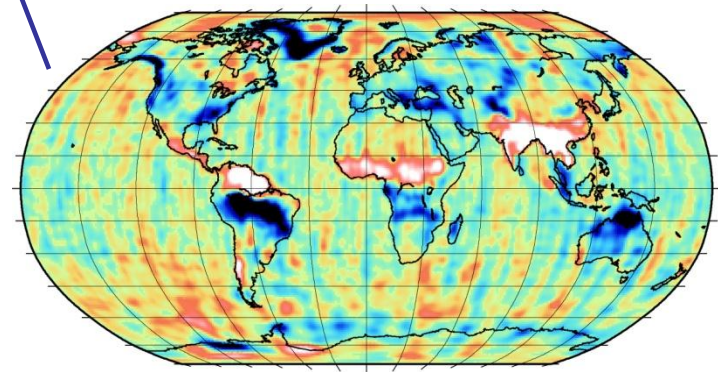
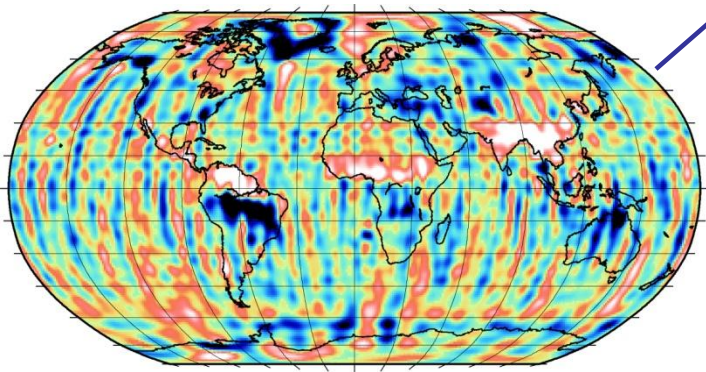
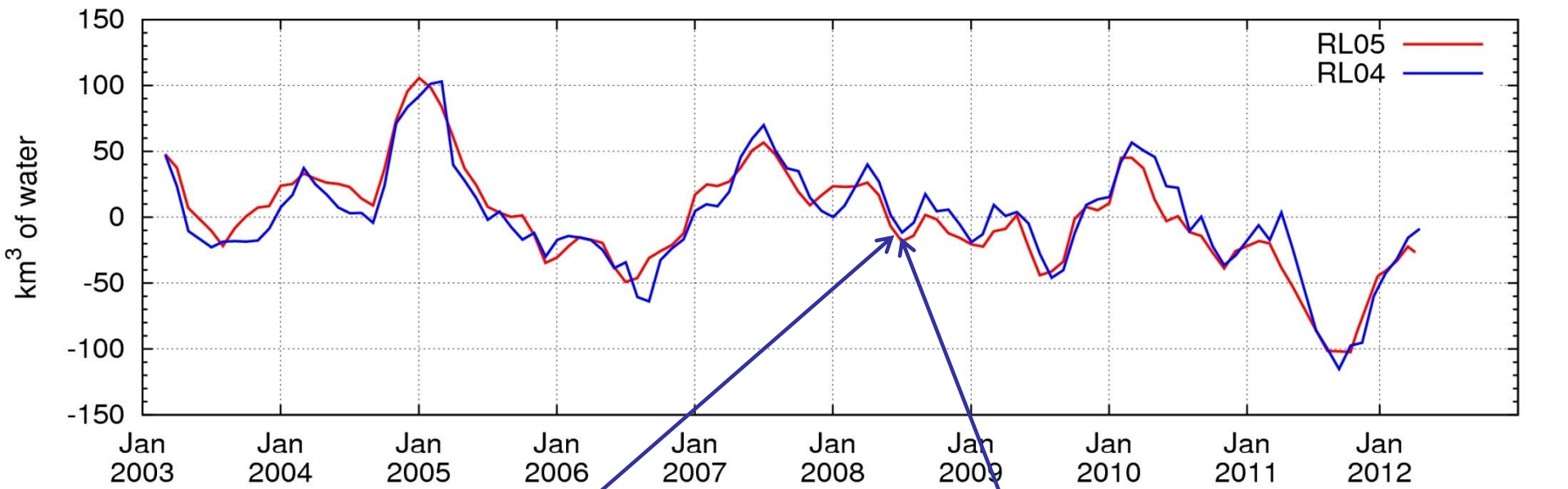
Water is really heavy!



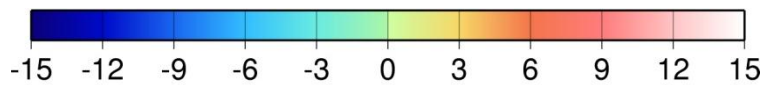
Gravity Anomaly of Texas, 2003 – 2012



In 2011, we lost 75 Km³ of water or 53 Lake Travis's



2010 05



RL04

RL05

- equivalent water height (cm)

Summary and Future Concerns

GRACE TWS provide an accurate record of the state water variations
Basin scale/regional products would be valuable

Data Product Improvement

Calibration, Validation and Error Assessment

Model and Surface Measurement Comparisons

Improved Spatial resolution

Assess effect on signal

Improved Temporal Resolution

10 vs 30 day resolution

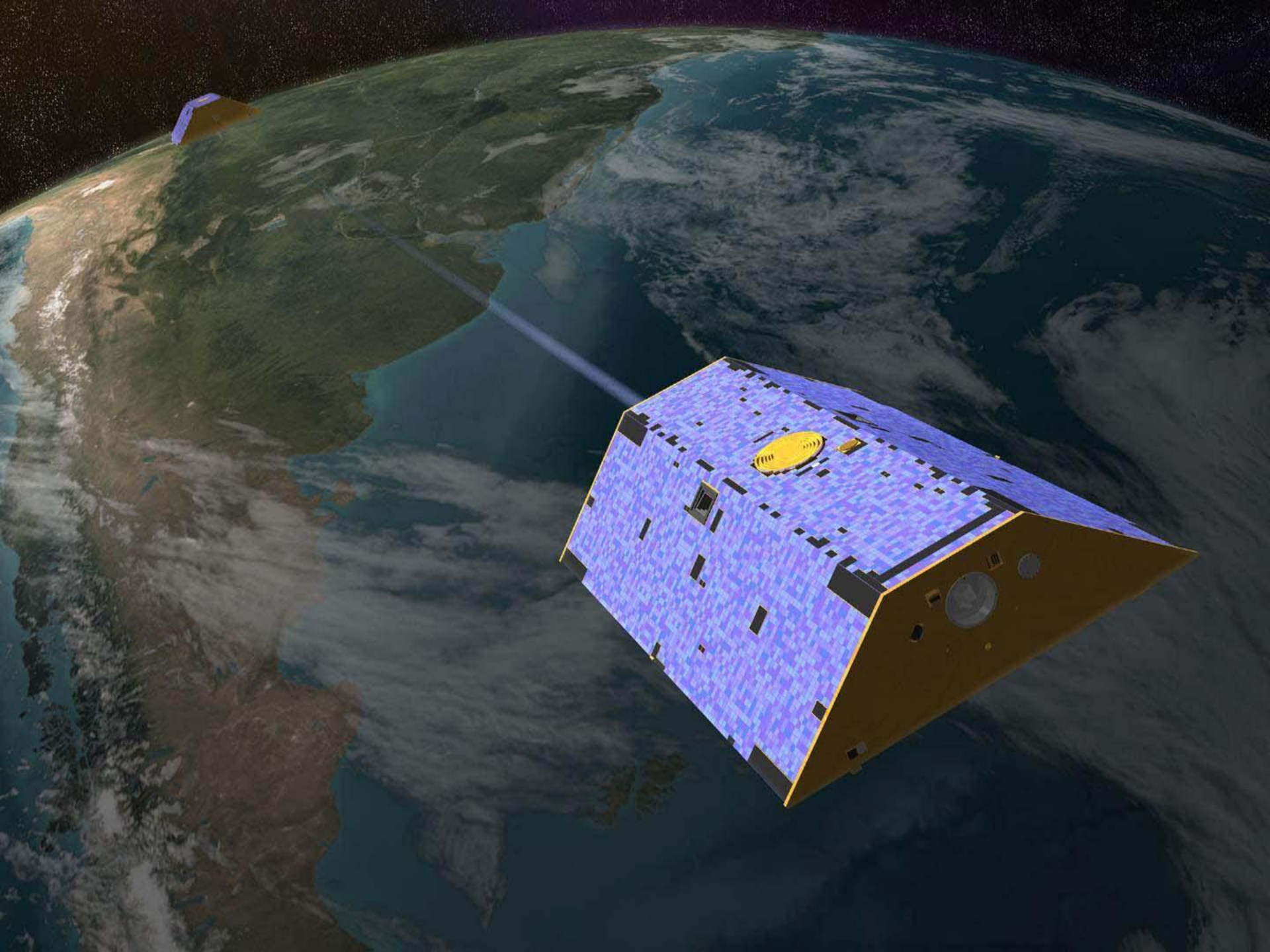
Data Product Distribution for Hydrology Applications

Gridded Values at Earth's Surface

Format

Product Latency

Daily product update



Modeled Soil Moisture Variation

