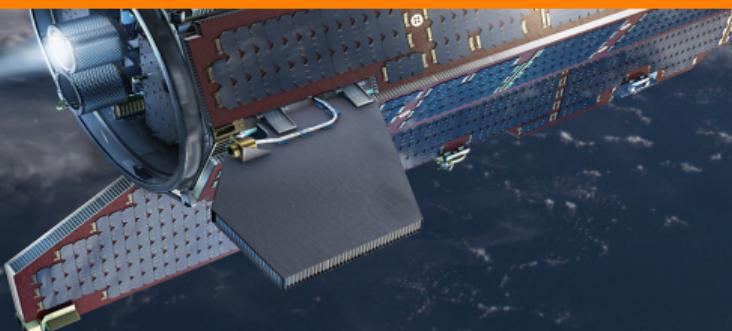




# Planetary Gravity Missions



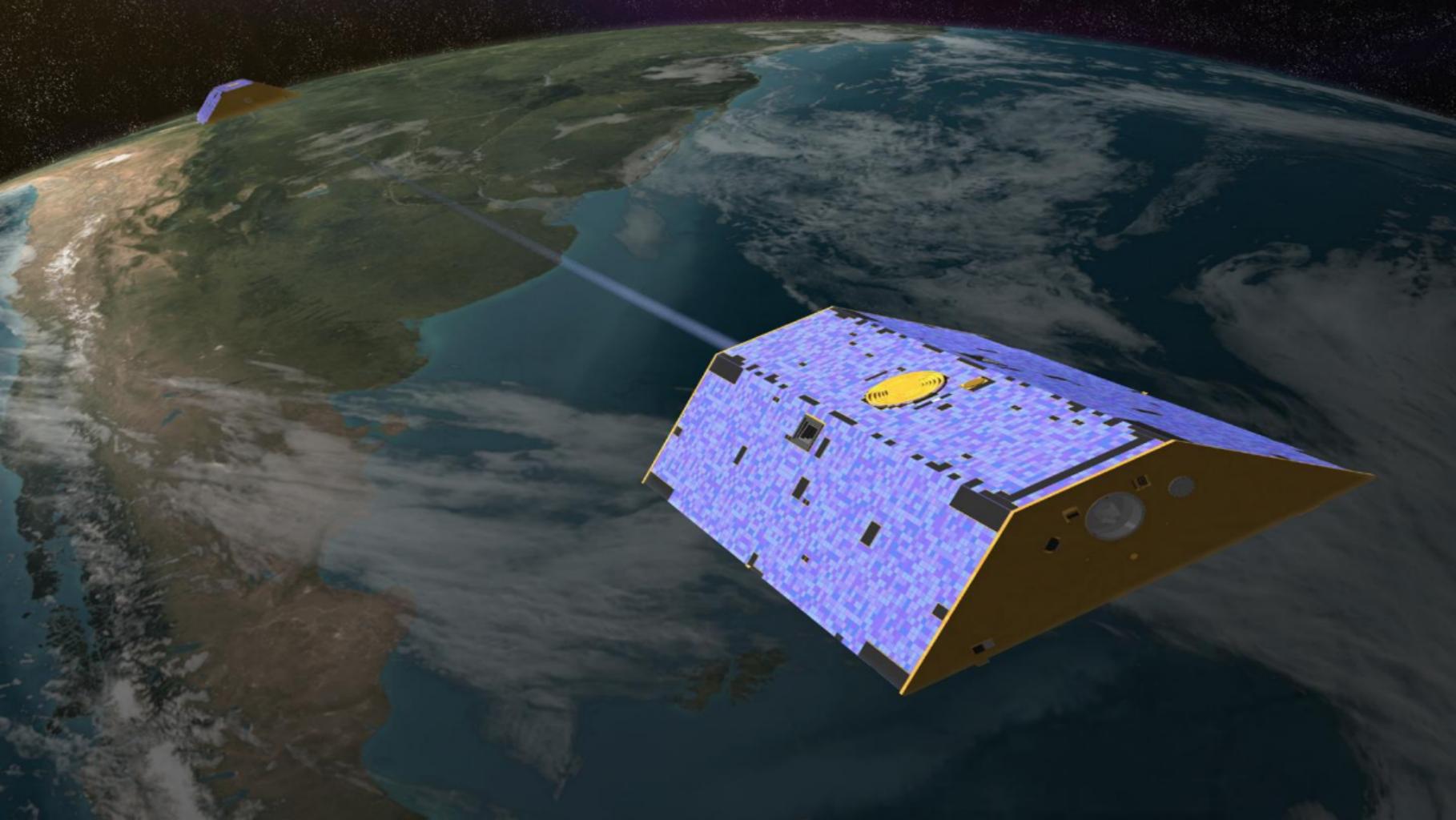
# Gravity Mapping from orbiting satellites

## ① Earth missions

- GRACE
- GOCE

## ② Moon missions

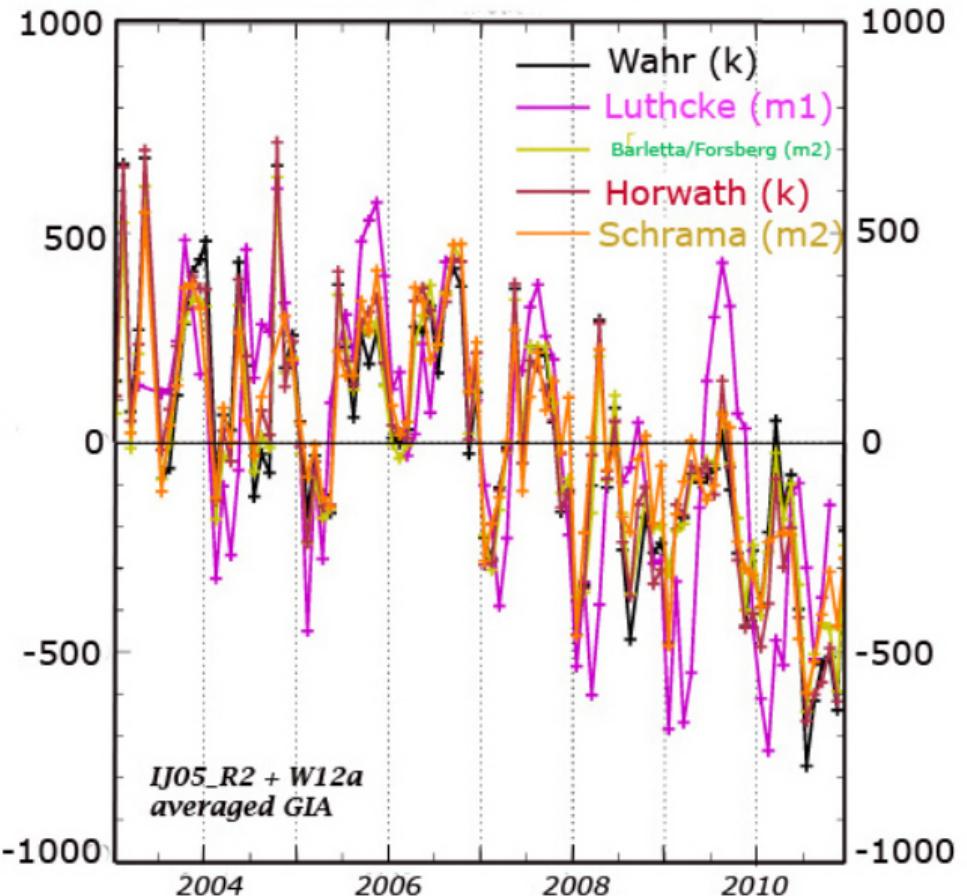
- Lunar Prospector
- GRAIL



# 1 - GRACE

- Tom & Jerry
- Precise measurement of changing positions and velocities
- Time change in mass of water, ice, solid earth
- Ice sheet and ground water volume changes

## 5 IMBIE - GRACE time series

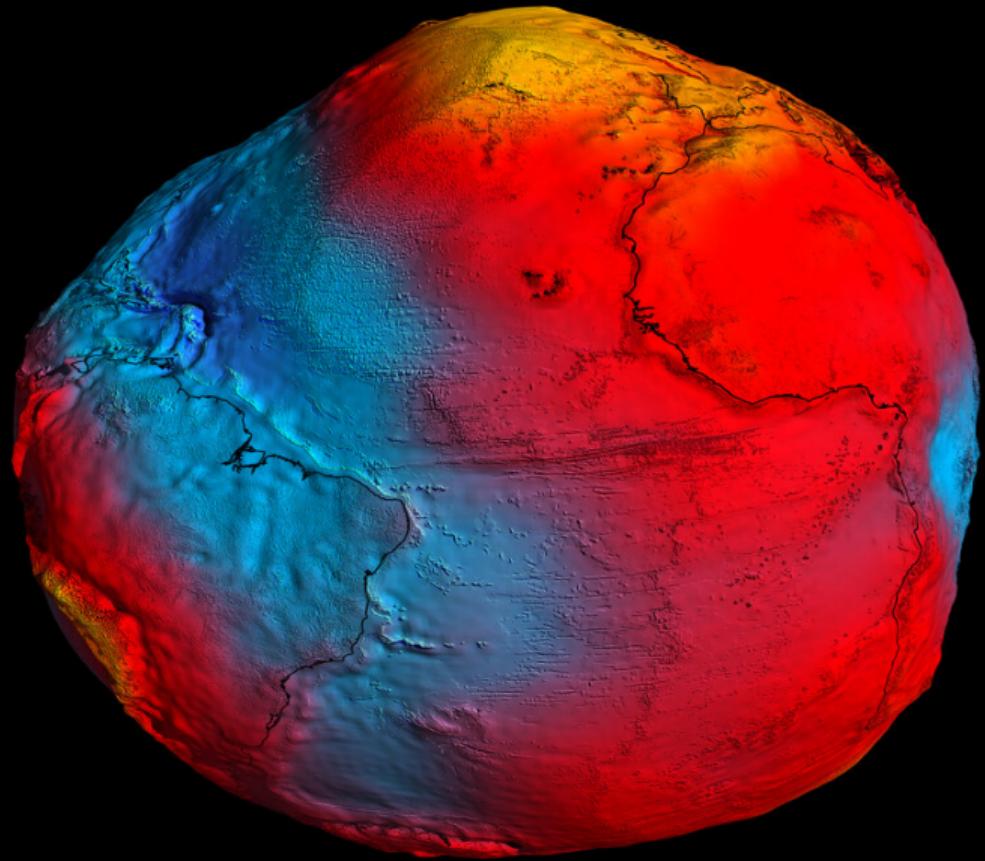


Monthly changes in Antarctic ice mass, in gigatones, as measured by NASA's Gravity Recovery and Climate Experiment (GRACE) satellites from 2003 to 2011.

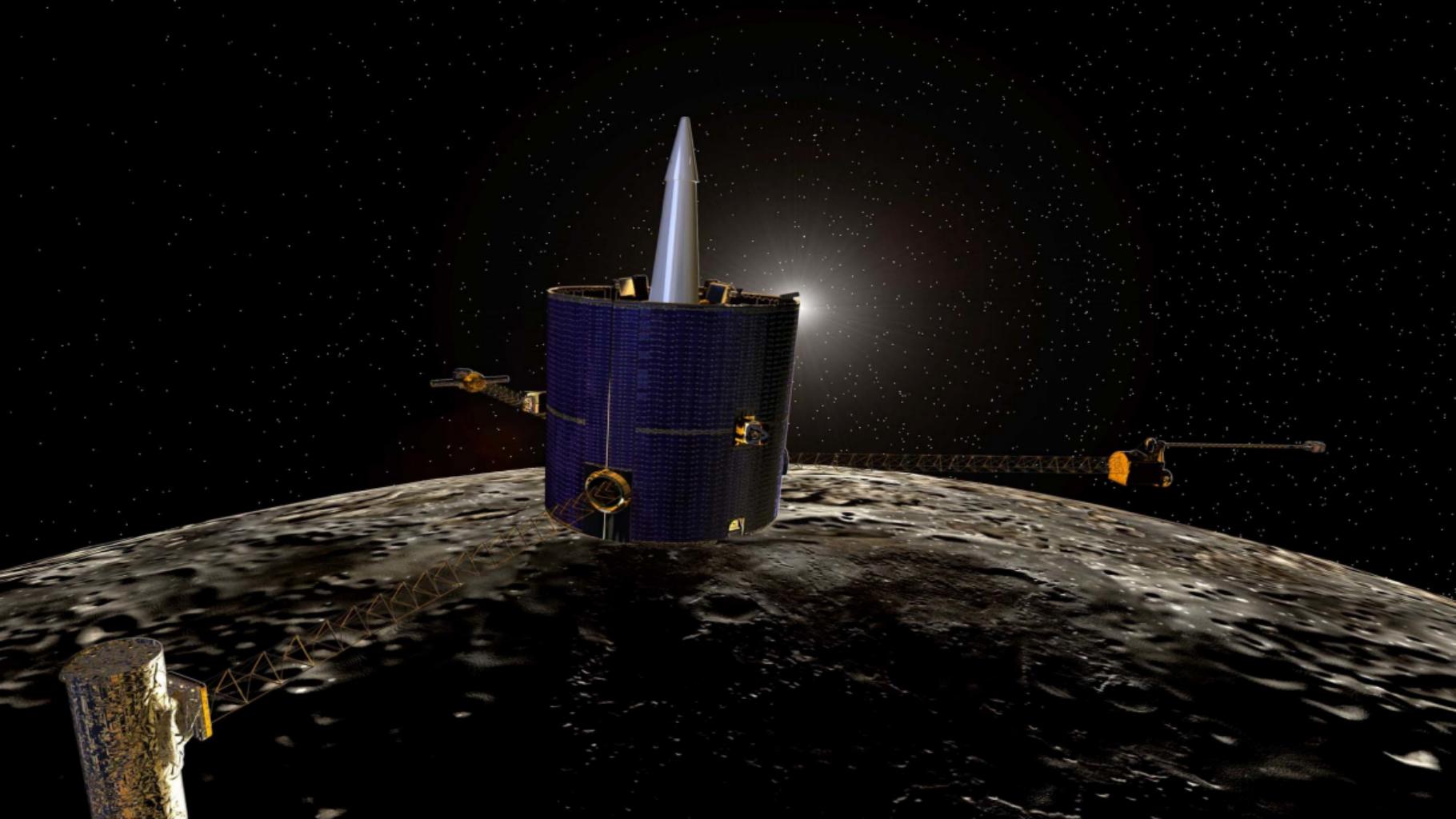


## 2 - GOCE

- Oceanography, solid Earth physics, geodesy and sea-level research
- Mapped the best geoid of Earth so far
- 2009-2013

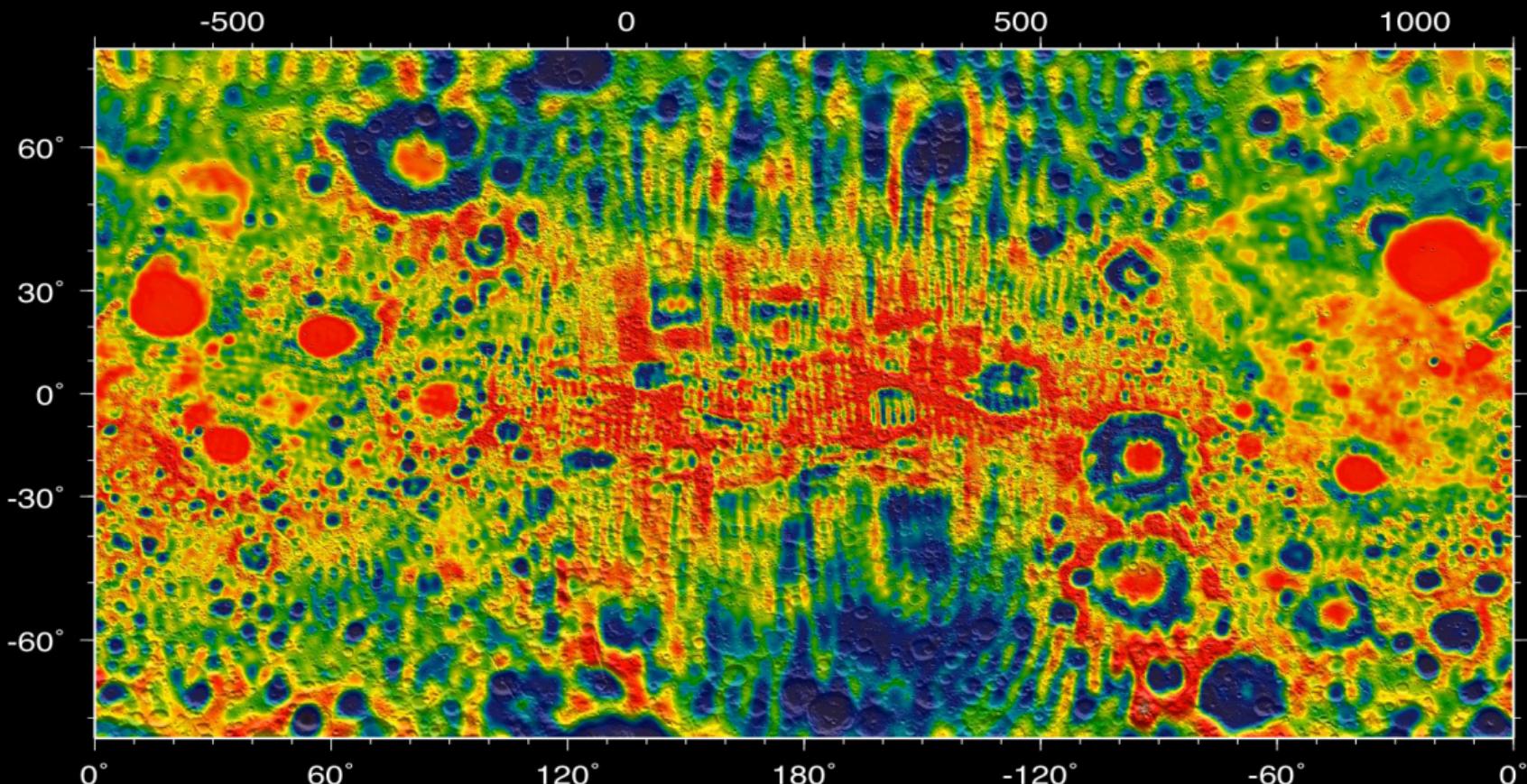


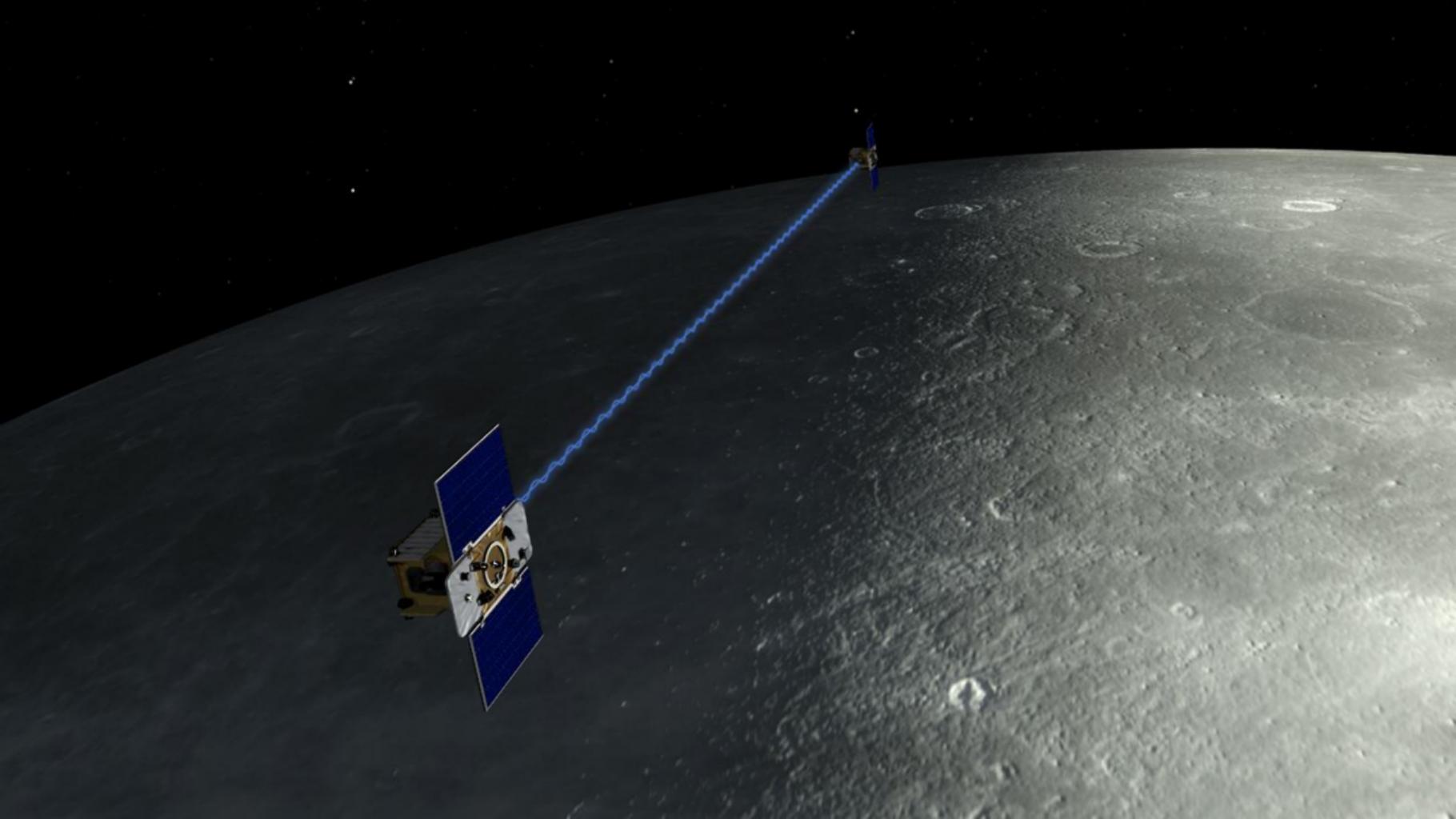
Earth geoid



# 3 - Lunar Prospector

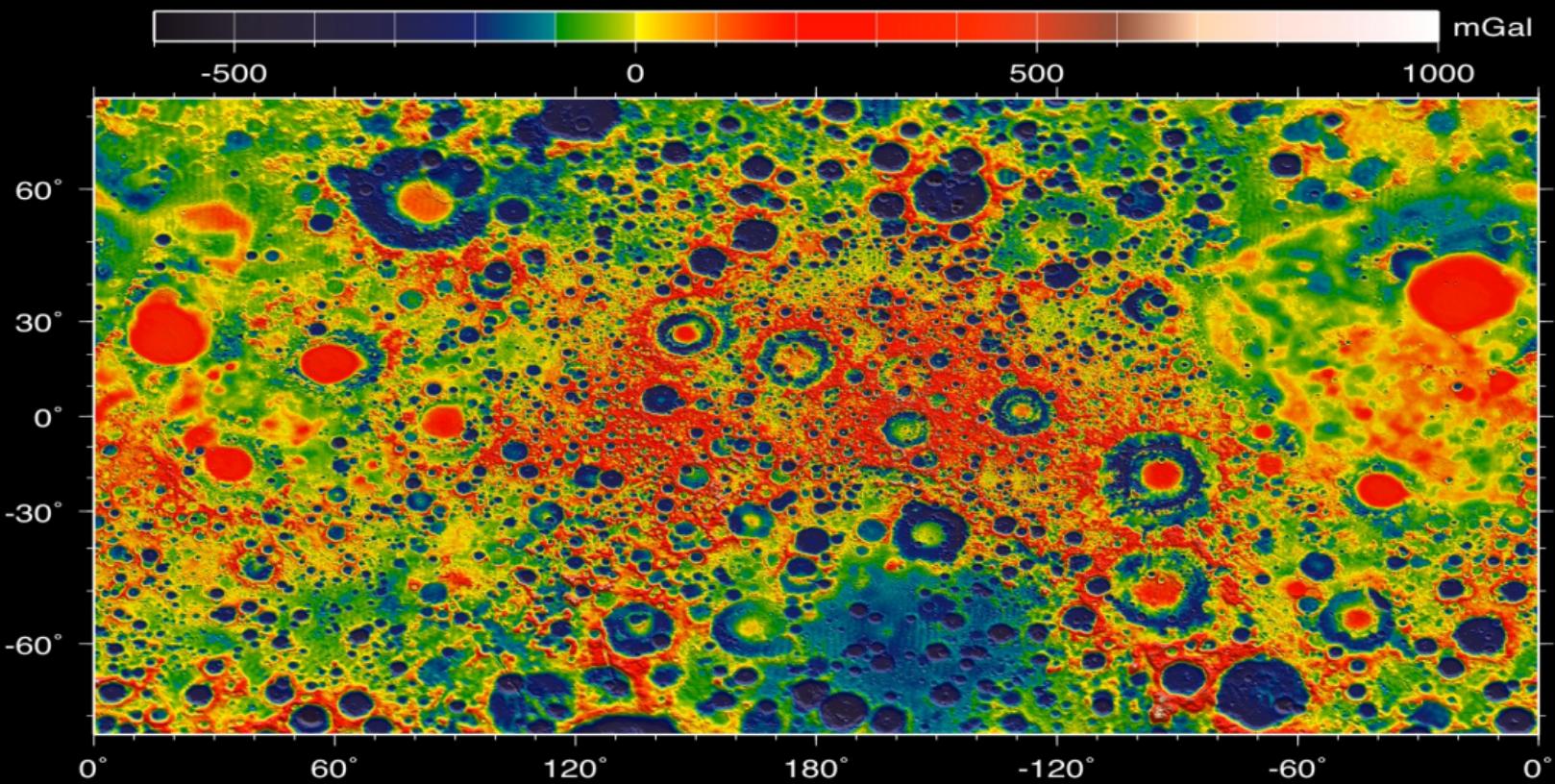
- Multi-mission (1999-2003)
- Found water ice in the Moon poles
- Mapped the gravity of the Moon

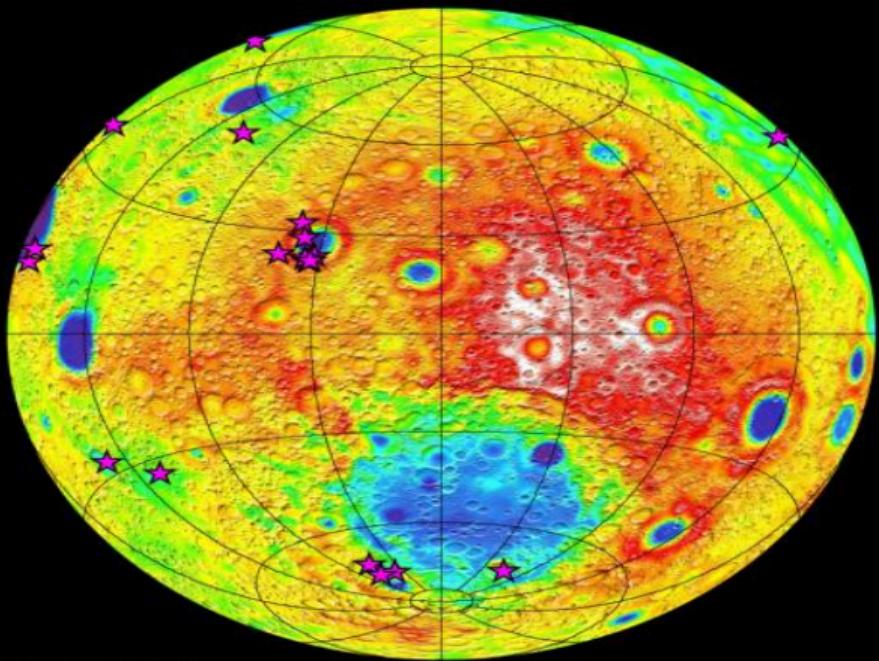
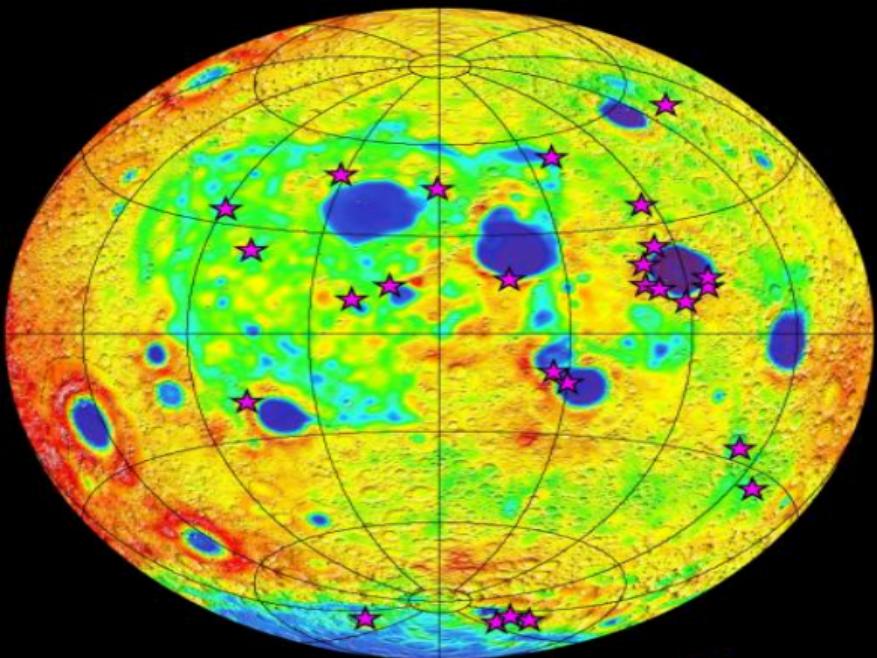




## 4 - GRAIL

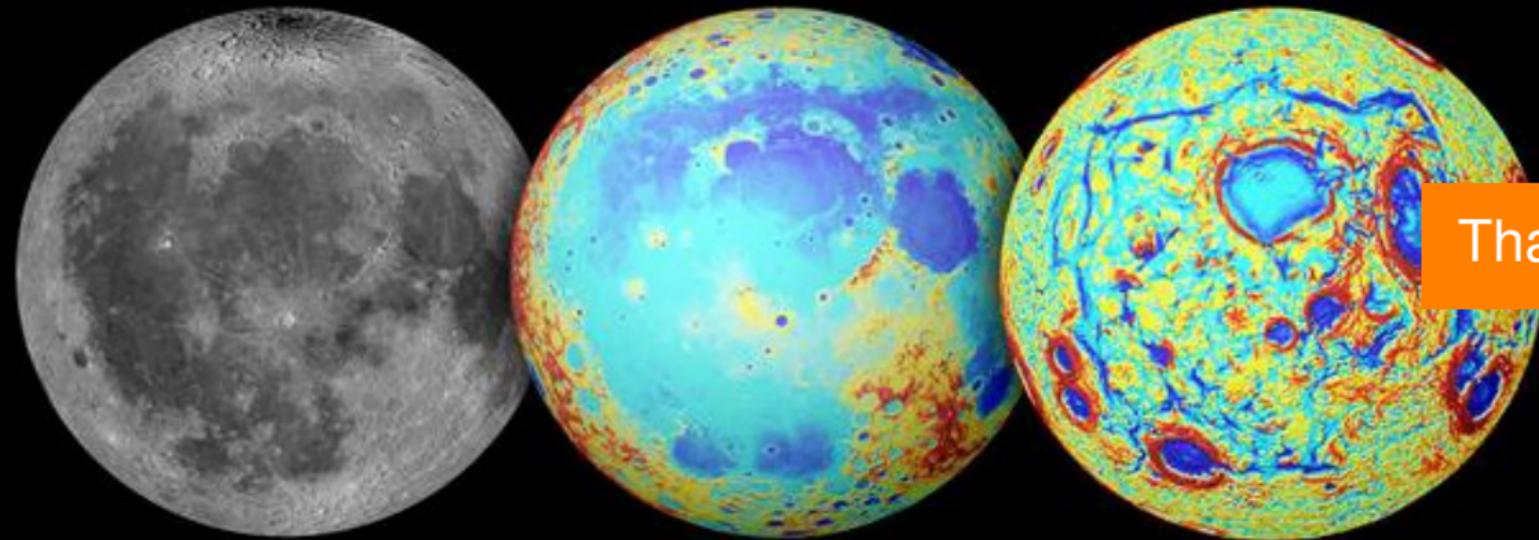
- Ebb & Flow
- Absence of atmosphere on the Moon
- Polar orbits, then concentric (declining) orbits, impact
- Mapped gravity better than what was possible on Earth





★ Olivine-rich exposures





Thank you