

## GEOPHYSICS

# Gravity's Rainbow

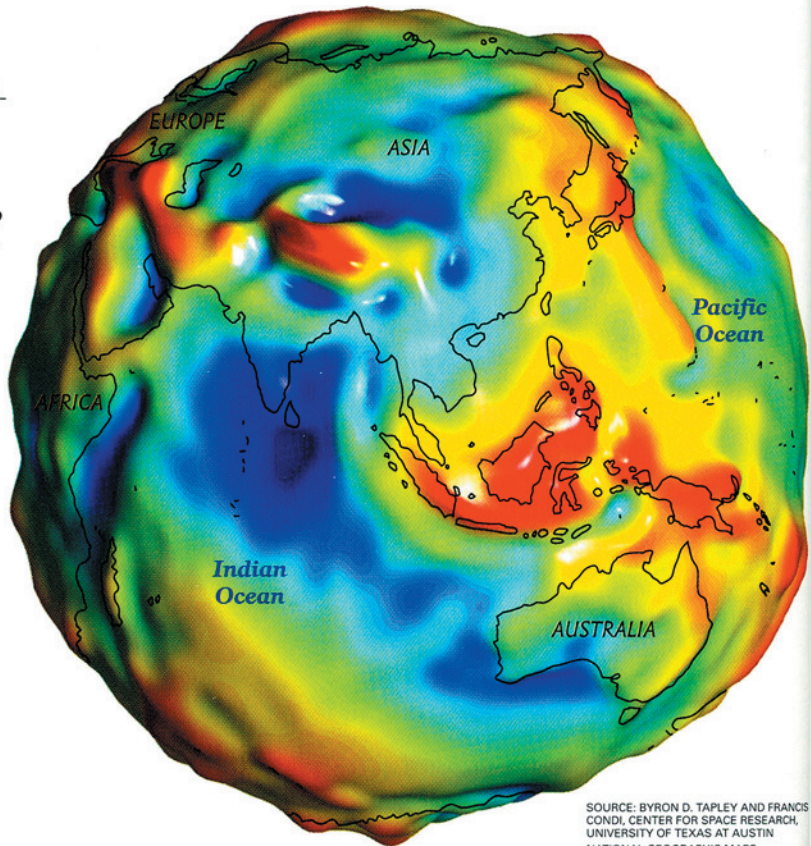
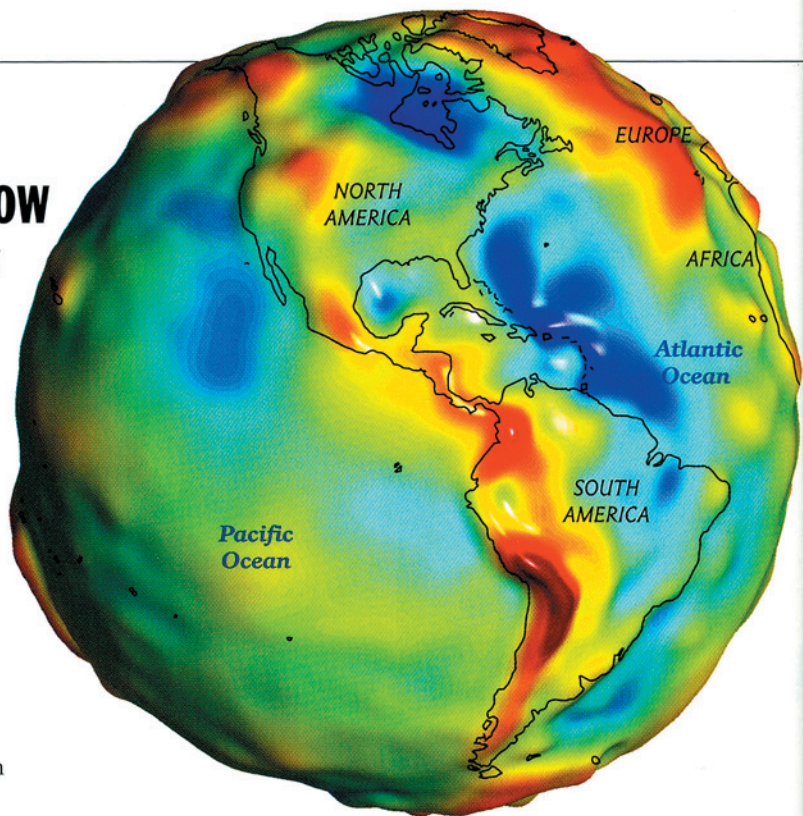
*Mapping places with pull*

**W**inds gust, tides ebb, but gravity, we presume, doesn't change. Yet scientists have long known that very heavy masses—mountain ranges, polar ice caps, atmospheric and ocean currents—generate slight gravitational tugs. Now a pair of recently launched satellites—part of a joint U.S.-German project called GRACE (Gravity Recovery and Climate Experiment)—are mapping gravity's fluctuations. "While you can make surface measurements with gravimeters," says Byron Tapley, GRACE's director, "only satellites can measure the whole Earth each month."

So how does GRACE work? Normally the twin satellites, positioned 137 miles apart, move in lockstep. But varying gravitational pull from features below makes the lead satellite speed up or slow down. Onboard sensors record the rate and duration of acceleration caused by these gravitational ripples, and GPS receivers plot the location where it happens. Stitch the data together and you get a map of Earth's ever changing gravitational field. Features at or below the surface create visible anomalies; those due to colliding tectonic plates are some of the most intense.

Surveying thousand-mile swaths of the planet at a time, GRACE will allow scientists to track polar ice melt and spot aquifers. "Eventually," says Tapley, "we will be able to let countries in Africa know how their aquifers are changing."

—Michael Behar



SOURCE: BYRON D. TAPLEY AND FRANCIS CONDI, CENTER FOR SPACE RESEARCH, UNIVERSITY OF TEXAS AT AUSTIN  
NATIONAL GEOGRAPHIC MAPS

Gravity scale

