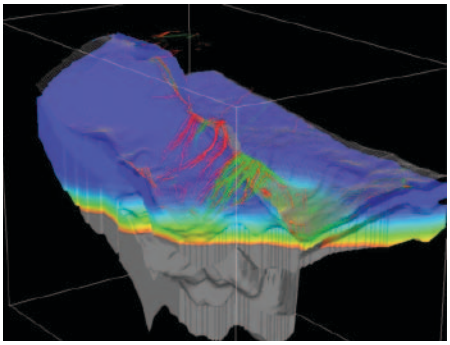


Basin temperature, oil flow (green), gas flow (red), and leakage in the southeastern Taranaki Basin, New Zealand. Created using the PetroMod™ model; software provided by IES/Schlumberger.

can be produced at only a certain range of temperatures; rising temperatures at greater depths would bring more potential source rocks into temperature conditions under which oil and gas can be produced and released.

In fact, the researchers found that the early Eocene warming led to the production and release of 50% more oil and gas than would have occurred under a constant temperature scenario. Some of this newly produced oil and gas would not have been trapped in sedimentary layers deep in the basin but would have leaked to the surface and potentially reached the atmosphere, where it could have acted as a climate feedback, causing further warming. (*Geophysical Research Letters,* doi:10.1029/2011GL050345, 2012) —EB

Active and passive microwave data improve soil moisture estimates

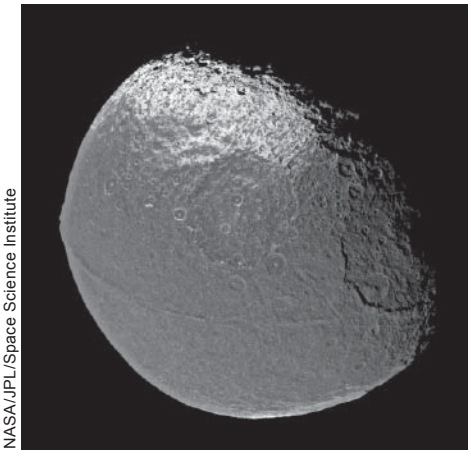
Assimilating satellite observations from active or passive microwave sensors into models can improve soil moisture estimates, a new study shows. Passive sensors detect radiation emitted naturally from the land surface, while active sensors emit a radiation pulse toward the Earth surface and measure the energy reflected back to the satellite. *Draper et al.* assimilated soil moisture derived from the active Advanced Scatterometer (ASCAT) and passive Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E) satellite sensors into a land surface model and assessed the resulting soil moisture estimates against in situ observations from 85 sites in the United States and Australia.

The researchers found that the active and passive microwave data similarly improved the model's soil moisture estimates. Following the recent failure of AMSR-E, the new study shows that systems designed to assimilate AMSR-E soil moisture can switch to ASCAT data without loss of accuracy. Improved soil moisture estimates could be useful for applications such as weather and drought forecasting. (*Geophysical Research Letters*, doi:10.1029/2011GL050655, 2012) —EB

How did the equatorial ridge on Saturn's moon Iapetus form?

Saturn's moon Iapetus is one of the most unusual moons in our solar system. Perhaps the most bizarre feature of Iapetus is its equatorial ridge, a 20-kilometer-high, 200-kilometer-wide mountain range that runs exactly along the equator, circling more than 75% of the moon. No other body in the solar system exhibits such a feature; as *Dombard et al.* show, previous models have been unable to adequately explain how the ridge formed.

The authors propose that the ridge formed from an ancient giant impact that produced a subsatellite around Iapetus. Tidal interactions with Iapetus ultimately led to orbital decay, eventually bringing the subsatellite close enough that the same forces tore it apart, forming a debris ring around Iapetus. Material from this debris ring then rained down on Iapetus, the researchers say, creating the mountain ring along the equator.



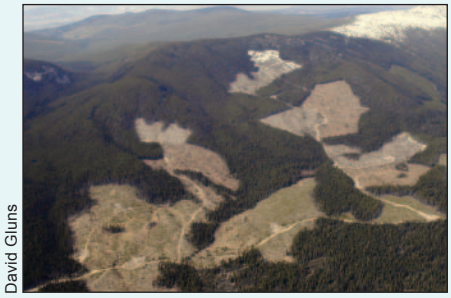
NASA/JPL/Space Science Institute

A new study explains how the unusual ridge along the equator of Saturn's moon Iapetus could have formed.

Model investigation overthrows assumptions of watershed research

A 2009 study revealed serious flaws in a standard technique used by hydrological researchers to understand how changes in watershed land use affect stream flow behaviors, such as peak flows. The study caused academics and government agencies alike to rethink decades of watershed research and prompted *Kuraś et al.* to reinvestigate a number of long-standing assumptions in watershed research using a complex and well-validated computer model that accounts for a range of internal watershed dynamics and hydrologic processes.

For the test site at 241 Creek in British Columbia, Canada, the authors found not only that deforestation increased the severity of floods but also that it had a scaling influence on both the magnitudes and frequencies of the floods. The model showed that the larger the flood, the more its magnitude was amplified by deforestation, with 10- to 100-year-return-period floods increasing in size by 9%–25%. Following a simulated removal of half of the watershed's trees, the authors found that 10-year-return-period floods occurred twice as often, while 100-year-return-period events became 5–6.7 times more frequent. This proportional relationship between the increase in flood magnitudes and frequencies following deforestation and the size of the flood runs counter to the prevailing wisdom in hydrological science.



David Gluns

Using the moderately deforested experimental watershed at 241 Creek, British Columbia, Canada, researchers investigated the effect of tree removal on flood magnitudes and frequencies.

The authors suggest that this finding has major implications for the lifespan and safety of structures like bridges and dams, human settlements, drinking water quality, and the sustainability of river ecosystems. (*Water Resources Research*, doi:10.1029/2011WR010705, 2012) —CS