

## Rosaly's Volcano



**In other radar-mapping news, the Cassini orbiter has discovered a sea of liquid methane or ethane near Titan's north pole. Since this first-of-its-kind feature extends beyond the mapping swath, its exact extent is unknown, but it is at least 100,000 square kilometers in size—bigger than Lake Superior, which is shown on the right for comparison. And as it is bigger in proportion to Titan's total surface area than the Black Sea, our largest inland sea, is to Earth (at least 0.12 percent versus 0.085 percent), it is, indeed, a sea. The comparison image is from NASA's SeaWiFS, or Sea-viewing Wide Field-of-view Sensor project.**

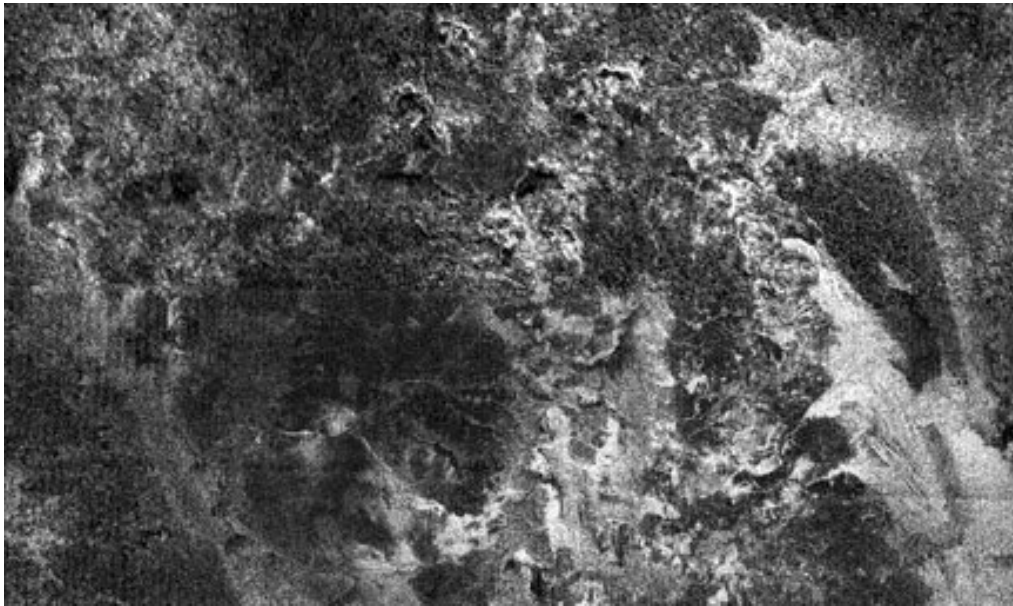
The notoriously foggy city of San Francisco was an appropriate venue for the unveiling of the latest pictures of methane-haze-clouded Titan, shown by JPL's Rosaly Lopes at the annual meeting of the American Association for the Advancement of Science (AAAS). Every February, scientists, journalists, and policymakers from around the world gather to showcase and ogle the year's top science stories. The session devoted to Cassini-Huygens, the JPL-European Space Agency-Italian Space Agency mission that has been exploring Saturn and its moons since 2004, emphasized how closely Titan's surface geologic processes resemble Earth's. According to Lopes, the investigation scientist on Cassini's RADAR team, "Titan is the Earth of the outer solar system."

Indeed, recent views of Titan's northern latitudes reveal the full extent of a volcano that Lopes thinks could be a lot like one of our own. The 180-kilometer-wide Ganesa Macula, endearingly dubbed "Rosaly's volcano" by some of Lopes's colleagues and members of the press, is a

large, conical volcano that could resemble either the “pancake domes” of Venus or shield-shaped volcanoes like Hawaii’s Mauna Loa. But unlike terrestrial volcanoes, from which molten rock gurgles, Ganesa spews thick slurries of a “cryolava” that had been thought to be made of water mixed with ammonia.

Although Titan’s opaque atmosphere hinders spectroscopic analysis of its surface, some clues about the composition of its cryomagma can be gleaned from radar images of individual flows, whose lobate margins are clearly defined. A thick, viscous fluid, like hot tar, would be required to make such lobes—a thinner liquid would simply run off. An isolated flow in another region, around 2,200 kilometers away from Ganesa, is estimated at 300 meters thick, suggesting that the material moves with some difficulty. A water-ammonia slurry would not move that way, Lopes and colleagues argue in a paper in the February 2007 issue of *Icarus*, but adding a dash of methanol to the mix would thicken the cryolava up just fine.

Some individual flows are huge—the newly named Winia Fluctus extends at least 23,700 square kilometers, an area slightly smaller than the state of Vermont.



**Recent radar images of a region of Titan, the largest of Saturn’s moons, reveal a fuller extent of a province riddled with volcanic activity. At 180 kilometers across, Ganesa Macula (shown with base outlined) is so far the largest cryovolcanic feature seen. In this region, bright areas are cryolava. On the volcano, the left arrow points to one of several thin cryolava channels and the right arrow points to where such a channel spills out into a flow. All flows seem directed toward the right (east), suggesting an overall eastward slope to the region.**

Despite the multitude of volcanic landforms recently found on Titan’s surface, no eruptions in progress have been spied. But this could be because only around 15 percent of the surface has been radar imaged so far, with very little of the overlap needed to show surface changes.

Lopes also thinks that many of Titan's methane or ethane lakes, which so far have been seen only at latitudes north of about  $70^{\circ}$ , could be housed in volcanic craters, or calderas. Alternatively, she suggests that they could be like karstic lakes on Earth, in which water fills sinkholes formed over pockets of dissolved rock. But it is clear that the Ganesa region, near latitude  $50^{\circ}$  north, houses an unusually high concentration of recently active volcanoes.

The *Icarus* paper points out that the volcanic provinces on Mars and Venus are associated with large bulges in the crust, presumably caused by the upwelling of magma from below. Whether a similar bulge will be found on Titan remains to be seen. So stay tuned—future flybys could also pick up surface changes from recent eruptions.

The AAAS meeting was especially meaningful for Lopes, as she was the only JPL scientist among the 449 new members elected to the status of Fellow by their peers. At the meeting's close, David Baltimore, professor of biology, Nobel laureate, and former Caltech president, stepped into the AAAS presidency for the coming year. —EN

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