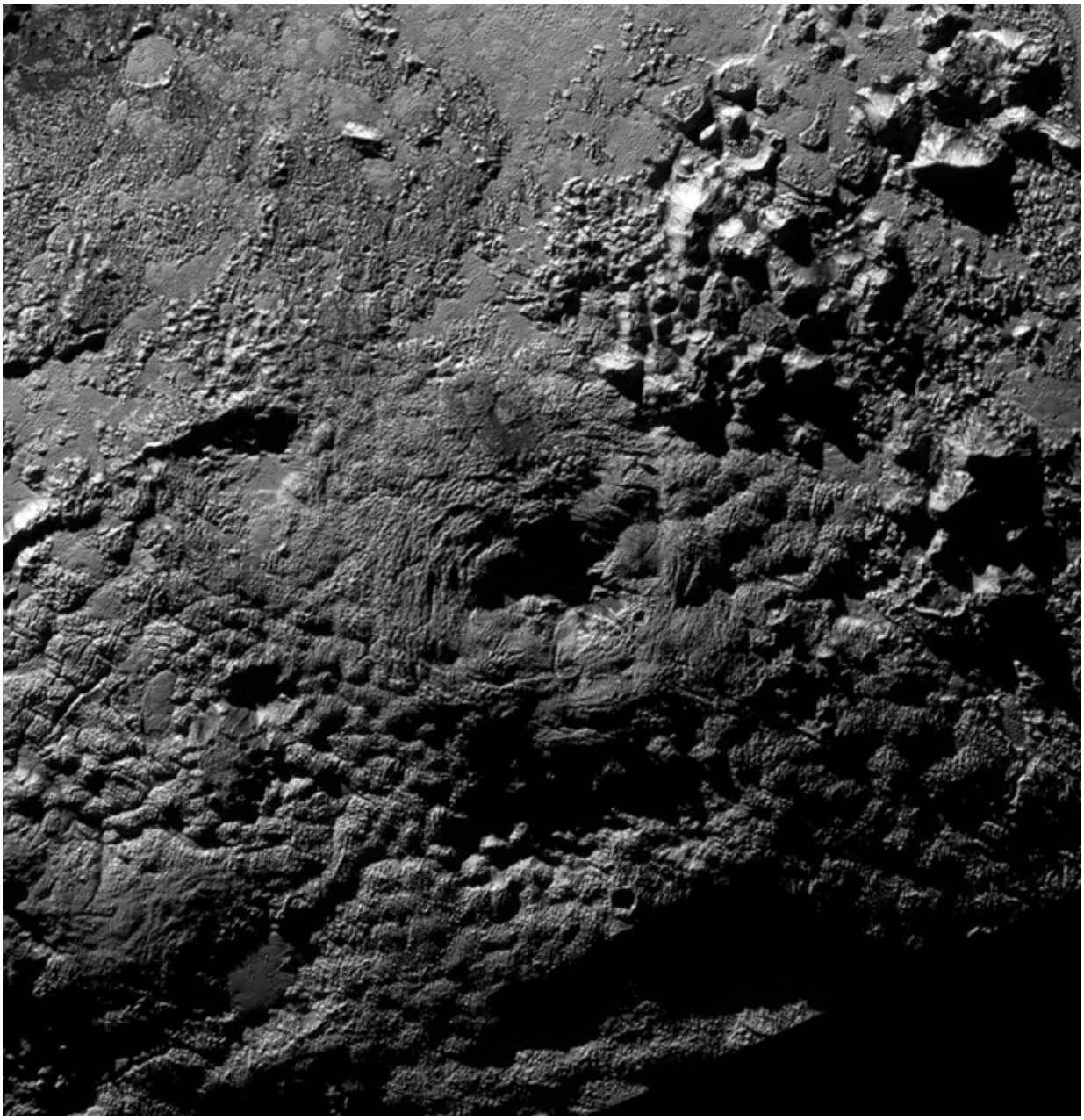
Frozen cones on Pluto—the first discovery of ice volcanoes?

November 10 2015, by Helen Maynard-Casely



Ice Volcanoes on Pluto? Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute

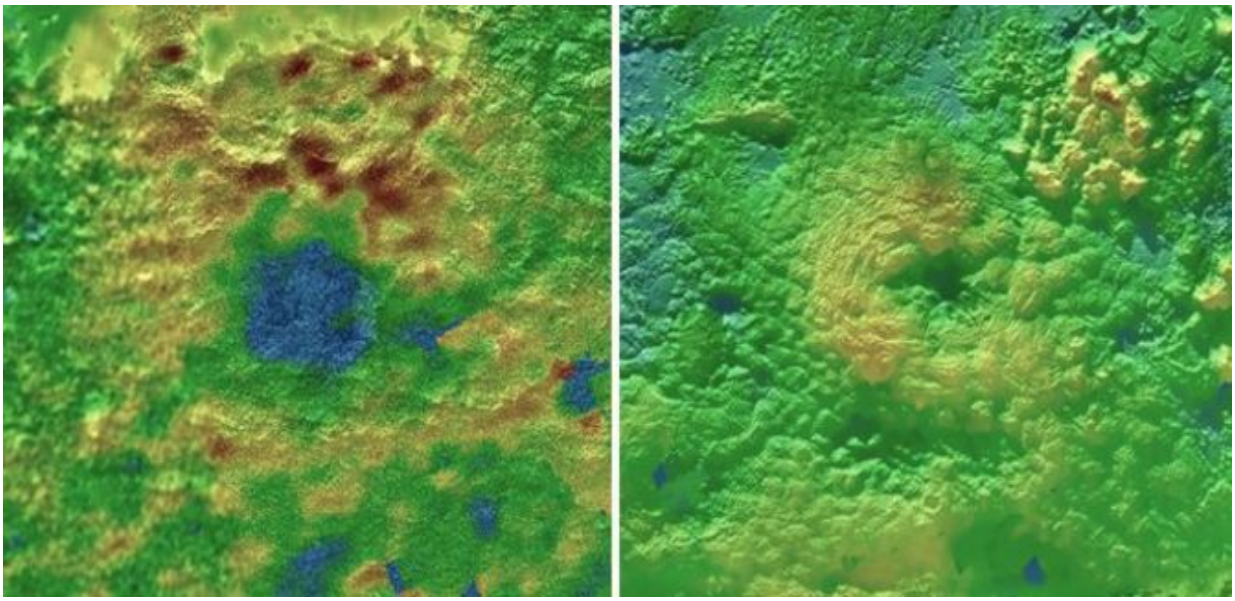
Ice volcanoes have shaped my life, and until today I didn't even know if they actually existed. Now, thanks to NASA's New Horizons spacecraft, there's a good chance we've found a frozen volcanic cone on the surface of Pluto.

The first type of scientist I ever wanted to be was a volcanologist. Aged 12 the prospect of running up and down volcanoes and finding out what make them tick really enthused me.

Then, a pivotal moment for me, I must have been about 16, I watched 'The Planets' on TV and heard scientists talk of the possibility of ice volcanoes on the moons of Jupiter and Saturn (or cryo-volcanoes given that they would erupt a temperatures below −150 °C). For me, the fact that the solar system could possibly build volcanoes out of materials other than rock was captivating.

I steered away from an undergrad in geophysics to planetary science and my future of investigating icy stuff was set.

We've been searching for ice volcanoes in the solar system for a while and so far no 'smoking caldera' has turned up. For instance, we know that the surfaces of the icy moons Europa (orbiting Jupiter) and Titan (orbiting Saturn) are geologically young. However, the puzzle as to how they resurface is continuing as no 'cryo-volcanic' features have yet been spotted on these moons.



Topographic maps of Piccard Mons (left) and Wright Mons (right). Credit: NASA/JHUAPL/SWRI

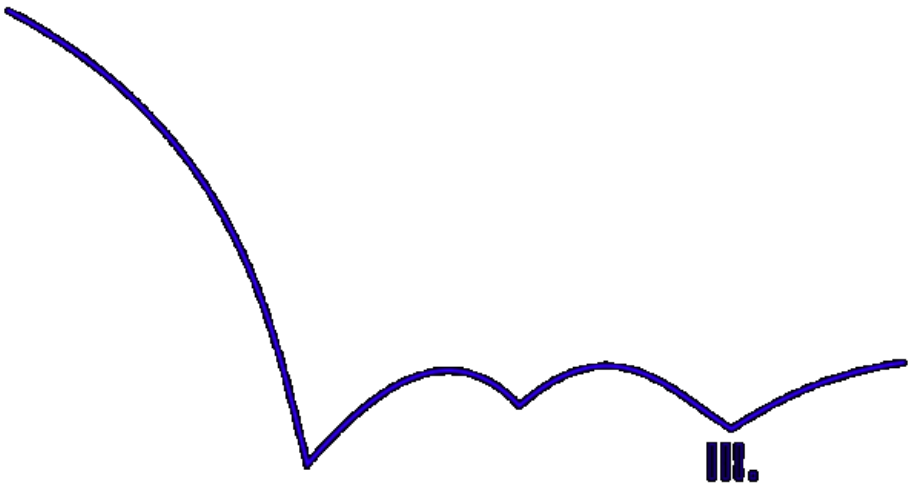
But now, 16 years after I watched that program, we've actually now got the first hint of a volcano of ice sitting on another body. In the pictures that New Horizon's took of the Southern edge of Sputnik Platina, two volcano features have been spotted. They've been informally named Wright and Piccard Mons (I've been reliably informed that 'Piccard' is in reference to Jacques Piccard the oceanographer).

It is early days in the discovery, but as Dr Oliver White, one of team of scientists looking through New Horizon's data, said 'These are big mountains with a large hole in their summit, and on Earth that generally means one thing - a volcano".

The surface of Pluto hovers about 44 K (about -230°C) so, I'm sure you're wondering how anything can be fluid enough at those chilly temperatures to erupt. This is because the ice that makes up these

mountains is not pure, it will contain a significant amount of substances like methane, nitrogen and ammonia.

When mixed with water these materials, especially ammonia, cause an effect known as 'freezing point depression' lowering the temperature that the water becomes solid. In fact, anything that dissolves in water will have this effect, but ammonia is particularly effective at it – lowering the freezing temperature to -100 °C. Ok, so that's not quite the -230°C of the surface so then this raises the possibility that internal heating may have play a role on Pluto too.



Freezing curve of ammonia-water system.

New Horizons is only a fifth of the way through downloading all of the data it collected as it shot past Pluto, there's hopefully a lot more of these features yet to be identified. More importantly for knowing more about Wright and Piccard Mons is the spectroscopy data that's on it way. Analysing the sunlight reflected off them will hopefully give us a hint of their chemistry. Once we have that, then we can start to build models of how these things have built and speculate if they are still active or not.

As well as sending all the data it has already collected, New Horizons is now on its way to the next encounter. Little nudges last week to the frightenly fast trajectory is propelling the spacecraft towards 2014 MU69, a Kuiper Belt object that it will hopefully fly past in 2019. Given all that New Horizon's has discovered (from only a fifth of the data) it is rather exciting to think what we are going to see further out.

Source: The Conversation