UNIVERSITY of TASMANIA

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Dire prediction for dwarf planet's atmosphere

Pluto's atmosphere is predicted to ultimately collapse and freeze over, new research has found.

University of Tasmania astronomers joined an international collaboration for the 28-year study of Pluto's atmosphere and its evolution.

The research, 'Pluto's lower atmosphere and pressure evolution from ground-based stellar occultations, 1988-2016', was published in *Astronomy and Astrophysics*.

Associate Professor Andrew Cole from the University's School of Natural Sciences, together with colleagues including Drs Kym Hill, Barry Giles, and the late John Greenhill, worked with researchers from more than eight countries across almost three decades to compile and analyse the data.

The Tasmanian astronomers used observations from the 1.3 metre-Harlingten telescope at the Greenhill Observatory.

Pluto is the smallest, coldest and most distant dwarf planet with an atmosphere in the Solar System. Pluto orbits the Sun every 248 years, and its surface temperature is between -228 to -238 degrees Celsius. Its atmosphere consists of nitrogen, with traces of methane and carbon monoxide.

"The University's scientists have been working on Pluto's atmosphere since the 1980s, and our ambition has always been to gain a better understanding of the atmosphere's evolution," Dr Cole said.

"Together with national and international colleagues, we were able to construct seasonal models of Pluto and how it responds to changes with the amount of sunlight it receives as it orbits the Sun.

"What the study found was when Pluto is farthest away from the Sun, and during its Winter in the Northern Hemisphere, nitrogen freezes out of the atmosphere.

“The atmospheric pressure has tripled over the past three decades, but as the planet orbits, our modelling showed that most of the atmosphere would condense out to almost nothing left.

“What our predictions show is that by 2030 the atmosphere is going to frost out and vanish around the whole planet.”

The international study aimed to record the seasonal evolution of Pluto’s surface pressure by observing ground-based stellar occultations to gain the atmosphere’s profile including density, pressure and temperature.

A ground-based stellar occultation occurs when a planet passes in front of a background star, allowing astronomers to measure the absorption of starlight by the planet’s atmosphere. They can only do this if they are lucky enough to position their telescopes along the path traced out by the planet’s shadow, which passes over a given spot on the Earth’s surface for just a minute or two.

“If it does freeze over, Pluto may appear brighter in the sky due to sunlight reflecting,” Dr Cole said.

The study’s results were also used in comparison with NASA’s New Horizons mission which gathered data during a flyby study of Pluto in 2015.

“The striking red terrain seen in the New Horizons images could fade away if they are snowed under with nitrogen frost,” Dr Cole said.

“This research has been crucial in furthering our understanding of Pluto and testing what we know about atmospheres, ices, and climate at extreme conditions.”

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