Surprising Variability of Titan's High-Altitude Winds

Similar to earth, Titan has a system of high-altitude winds/jets that encircle the whole globe, but the driving force responsible for the highest-altitude winds is currently unknown. We wanted to investigate whether Titan's wind speeds vary over short timescales at these altitudes, and, if so, why.

Using the Atacama Large Millimeter Array telescope (ALMA) telescope, we measured microwave emission from the Hydrogen Cynanide (HCN) molecule, which is concentrated at the high altitudes of the thermosphere –the boundary between Titan's atmosphere and space. Tracing this molecule confirmed the presence of surprisingly fast wind speeds (up to 830 mph) in Titan's thermosphere. We detected an unexpected 47% drop in the speed of the thermospheric jet over a relatively short period of 9 Earth months (17 Titan days).

Our observations are consistent with a dynamical instability of Titan's high-altitude equatorial jet, implying strong and fast fluctuations of its driving force. Additional observations over shorter timescales will be required to properly characterize this phenomenon and link the cause of the wind variations to seasonal change or other energy sources.

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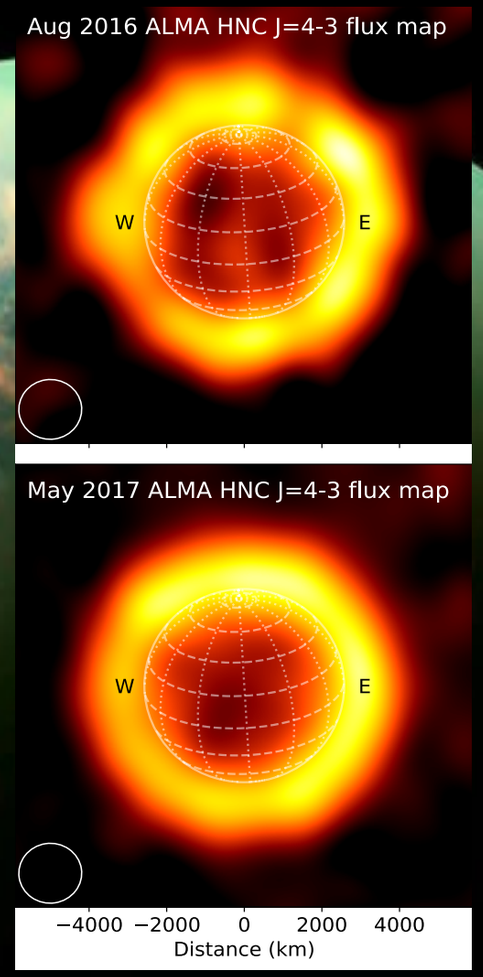

2016 and 2017 ALMA Maps of sub-mm emission from the HNC molecule, which is concentrated at altitudes > 800 km, making it a unique probe of Titan's thermospheric processes.