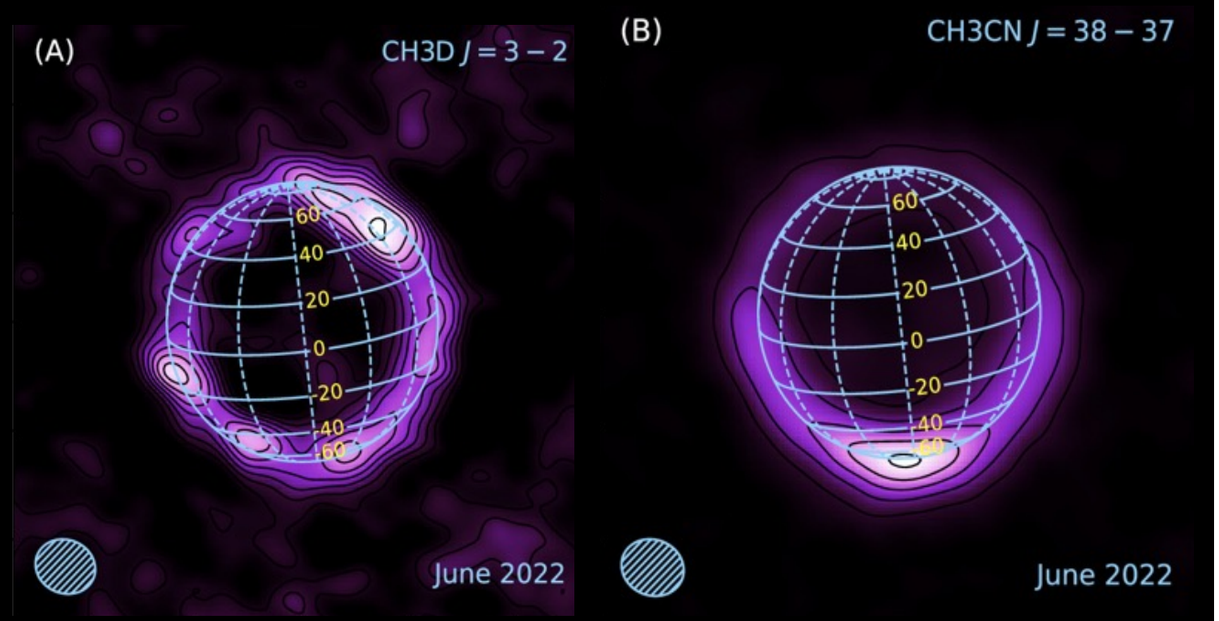
Observations of Titan's Stratosphere during Northern Summer

Despite the large number of observations of Titan's atmosphere, measurements of the stratosphere are sparse during Titan's northern summer and fall, and the missing temperature and chemical abundance information raises questions about atmospheric circulation and evolution over Titan's 29-year seasonal cycle.

To fill this gap, observations in 2022 during Titan's northern summer were made by Goddard scientists using the Atacama Large Millimeter/submillimeter Array (ALMA). Maps were generated for Titan's stratospheric temperature and abundances of two key atmospheric gases (acetonitrile CH_3CN and CH_3D, which is a form of methane).

Results show that the acetonitrile abundance changed significantly since previous observations and is now highly concentrated at southern latitudes. A global concentration of methane was inferred, which indicated a higher-than-expected variability of methane in both time and location on Titan.

Future observations with ALMA will enable further insight into Titan's atmospheric structure and composition and to higher altitudes than were possible using Cassini infrared data for some chemical species.



Maps of observed stratospheric gases in Titan's atmosphere: (A) methane CH_3D, which is present at all latitudes, and (B) acetonitrile CH_3CN, which is concentrated at high southern latitudes.

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