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## A direct measurement of water vapor at Europa and implications for the magnetospheric environment

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Previous investigations suggested local anomalies in Europa's atmosphere, advancing the idea of possible water plumes. Now a global survey with the Keck observatory provided a direct detection (3.1 sigma) of line emission from H<sub>2</sub>O at infrared wavelengths on one out of 17 observing dates in 2016 and 2017. The non-detections on the 16 other dates resulted in sensitive upper limits for H<sub>2</sub>O abundance at various longitudes, providing reference to the rate and location of occurrence.

When active, outgassing at plumes locally increases the neutral density in Europa's bound atmosphere. Such atmosphere anomalies in turn might lead to small scale (compared to Europa's diameter) features in the electromagnetic interaction signals such as in magnetic field perturbations, or to an increased mass loss from Europa. The strength and detectability of plume-related magnetospheric signals depend on the relative abundance of plume gas (when active) compared to the sputtered atmosphere.

The new results from the infrared survey suggest that outgassing occurs at lower levels than previously estimated, with only rare localized events of somewhat stronger plume activity. In this presentation, we put these observations in context and discuss if and how plume activity might affect the magnetospheric environment.