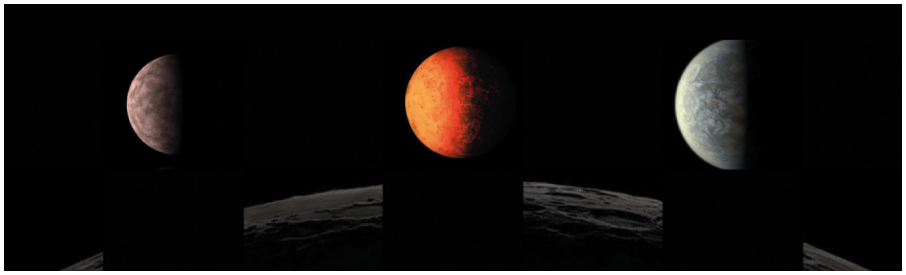

Contribution ID: **32** Type: **Talk**

On HCl in the Martian atmosphere during northern summers

Friday 24 October 2025 15:25 (15 minutes)

One of the primary objectives of the ExoMars Trace Gas Orbiter (TGO) mission was to search for previously undetected trace gases that could be diagnostic of active geology or a biosphere. The first such gas was hydrogen chloride (HCl), detected with the ACS and NOMAD spectrometer suites. The presence of HCl on Mars was expected to be an indication of active magmatic processes. However, HCl was found to be widespread and we quickly identified a pronounced seasonal cycle in HCl. These aspects indicated that its behaviour was mainly governed by strong photochemical interactions linked to water vapour. The original source of HCl, its sinks, and how its abundance is regulated over time remain a mystery.
ACS MIR is a cross-dispersion spectrometer operating in solar occultation geometry, which provides excellent sensitivity to weak absorption signatures and vertical structure. HCl was discovered in perihelion data shortly after the 2018 Mars Global Dust Storm in Mars year 34, and its signal disappeared shortly after the late season storm. A similar trend has since been observed in the following Mars years (MYs), with HCl returning alongside warm atmospheric temperatures, increasing water vapour content, and dust activity - all driven by southern summer occurring at perihelion. Modeling work to define HCl behaviour leave the unanswered question: if HCl has a limited photochemical lifetime, what sources are replenishing atmospheric chlorine?
In MY35, two exceptional detections were made by ACS MIR in northern summer, near aphelion, around Alba Mons. We performed a dedicated search for HCl in MY 37, and in MY38 accompanied this time by NOMAD and the iSHELL spectrograph of the IRTF ground telescope. New observations detected HCl again in the Alba Mons area. They will be discussed using data from the CaSSIS camera of TGO, HiRISE on MRO, and MOLA from MGS.

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Session Classification: Mars Science