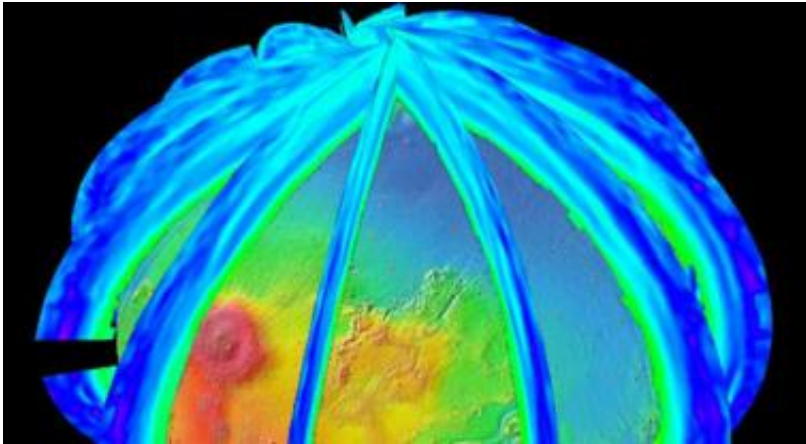


Tracing the Big Picture of Mars' Atmosphere

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The Mars Climate Sounder instrument on NASA's Mars Reconnaissance Orbiter maps the vertical distribution of temperatures, dust, water vapor and ice clouds in the Martian atmosphere as the orbiter flies a near-polar orbit.

(PhysOrg.com) -- One of the instruments on a 2016 mission to orbit Mars will provide daily profiles of the changing structure of the planet's atmosphere.

The joint European-American mission, ExoMars Trace Gas Orbiter, will seek faint gaseous clues about possible life on Mars. This instrument, called the ExoMars Climate Sounder, will supply crucial context with its daily profiling of the atmosphere's changing structure.

The [European Space Agency](#) and NASA have selected five instruments for ExoMars Trace Gas Orbiter. The European Space Agency will

provide one instrument and the spacecraft. NASA will provide four instruments, including ExoMars Climate Sounder, which is coming from NASA's Jet Propulsion Laboratory, Pasadena, Calif.

Two of the other selected instruments are spectrometers -- one each from Europe and the United States -- designed to detect very low concentrations of methane and other important trace gases in the [Martian atmosphere](#).

"To put the trace-gas measurements into context, you need to know the background structure and circulation of the atmosphere," said JPL's Tim Schofield, principal investigator for the ExoMars Climate Sounder. "We will provide the information needed to understand the distribution of trace gases identified by the spectrometers. We'll do this by characterizing the role of atmospheric circulation and [aerosols](#), such as dust and ice, in trace-gas transport and in chemical reactions in the atmosphere affecting trace gases."



The Mars Climate Sounder instrument, shown here prior to its installation onto NASA's Mars Reconnaissance Orbiter for the mission's 2006 launch, will get a similar-looking sibling at Mars in 2016.

The ExoMars Climate Sounder is an infrared radiometer designed to operate continuously, day and night, from the spacecraft's orbit about 400 kilometers (about 250 miles) above the Martian surface. It can pivot to point downward or toward the horizon, measuring temperature, [water vapor](#), dust and ices for each 5-kilometer (3-mile) increment in height throughout the atmosphere from ground level to 90 kilometers (56 miles) altitude.

Schofield and his international team have two other main goals for the investigation, besides aiding in interpretation of trace-gas detections.

One is to extend the climate mapping record currently coming from a similar instrument, the Mars Climate Sounder, on NASA's Mars Reconnaissance Orbiter, which has been working at Mars since 2006. The orbital geometry of the Mars Reconnaissance Orbiter mission enables this sounder to record atmospheric profiles only at about 3 p.m. and 3 a.m. during the Martian day, except near the poles. The ExoMars Trace Gas Orbiter will fly an orbital pattern that allows the spacecraft to collect data at all times of day, at all latitudes.

"We'll fill in information about variability at different times of day, and we'll add to the number of Mars years for understanding year-to-year variability," said Schofield. "The most obvious year-to-year change is that some years have global dust storms and others don't. We'd like to learn whether there's anything predictive for anticipating the big dust storms, and what makes them so variable from year to year."

A third research goal is to assist future landings on Mars by supplying information about the variable density of the atmosphere. At a chosen landing site, atmospheric density can change from one day to the next, affecting a spacecraft's descent.

"We want to provide background climatology for what to expect at a

given site, in a given season, for a particular time of day, and also nearly real-time information for the atmospheric structure in the days leading up to the landing of a spacecraft launched after 2016," said Schofield.

The 2016 ExoMars Trace Gas Orbiter is the first in a series of planned Mars mission collaborations of the European Space Agency and NASA. A variable presence of small amounts of methane in the Martian atmosphere has been indicated from orbital and Earth-based observations. A key goal of the mission is to gain a better understanding of methane and other trace gases that could be evidence about possible biological activity. Methane can be produced both biologically and without life.

Besides the two spectrometers and the climate sounder, the orbiter's selected instruments include two NASA-provided imagers: a high-resolution, stereo, color imager, and a wide-angle, color, weather camera. The orbiter will also serve as a communications relay for missions on the surface of Mars and will carry a European-built descent-and-landing demonstration module designed to operate for a few days on the [Mars](#) surface. JPL, a division of the California Institute of Technology, manages NASA's roles in the mission.

Provided by JPL/NASA

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