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# Analysis of the lower Martian atmosphere by combined processing of radio occultation and Mars Climate Sounder measurements

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Comprehensive measurements of the Martian atmosphere, especially high-resolution temperature and pressure fields of the lower atmosphere, are needed for the characterization of scientifically important Martian weather and climate features such as wind, dust storms, atmospheric tides, and seasonal hydrogen escape. In addition, spatial information about the atmospheric state is necessary for planning of future aero braking events and for prediction of various aspects of the entry, descent, and landing of spacecraft.
While the individual measurements obtained from sensors such as infrared radiometers, spectrometers or radio occultation payloads onboard Mars Odyssey, Mars Express, or Mars Reconnaissance Orbiter, are processed on a routine basis to derive detailed information about the atmospheric state, inter-technique comparisons are beneficial to understand the specific sensor characteristics and to reduce the risk for misinterpretations. We will show how the combination of measurements based on the tomography principle can improve the understanding of atmospheric processes on Mars, especially of those, which are characterized by distinct horizontal temperature and pressure gradients.
In contrast to Earth, horizontal temperature and pressure gradients on Mars can be much more severe. Based on end-to-end simulations we will show how and under which conditions it is possible to reconstruct these gradients from radio occultation and Mars Climate Sounder measurements using tomography principles. Successfully applied to real observations, the enhanced temperature and pressure retrievals can provide crucial information for improving our understanding of atmospheric dynamics, especially over complex terrain, at the day-night terminator, or the Northern polar vortex.