



## **Upper tropospheric temperature and humidity retrieval from nadir THz and infrared sounders.**

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The Earth's thermal emission spectrum provides information relevant to the chemical composition, the temperature and the dynamics of the atmosphere as well as to cloud properties. Current nadir and limb space-borne sounders operate either at wavelengths lower than 20  $\mu\text{m}$  (InfraRed) or greater than 100  $\mu\text{m}$  (microwave domain). The far-InfraRed (IR) spectral region between 100 and 500  $\text{cm}^{-1}$ , also referred to as the THz region, has not yet been used. THz radiation mainly originates from water vapor emissions at different tropospheric altitudes, including the upper troposphere. Furthermore, THz observations will be less and differently sensitive to tropospheric clouds than microwave and IR measurements.

As demonstrated by the Far-Infrared Spectroscopy of the Troposphere (FIRST) instrument<sup>1</sup>, new technologies now allow for the development of satellite sensors covering the full IR region including the THz frequencies. Hence, characterization of THz sounders for upper-tropospheric humidity measurements is becoming an interesting issue with the prospect of near future applications. We will present the results of mid-tropospheric and tropospheric humidity retrievals using both the THz and the IR channels of the FIRST instrument. The advantages of coupling both spectral regions will be discussed.

(1) M. G. Mlynczak, Johnson D. G., Latvakosky H., Watson M., Kratz D. P., Traub W. A., Bingham G. E., Wellard S. J., Hyde C. R., and X. Liu. First light from the far-infrared spectroscopy of the troposphere (FIRST) instrument. GRL, 33:L07704, 2006.