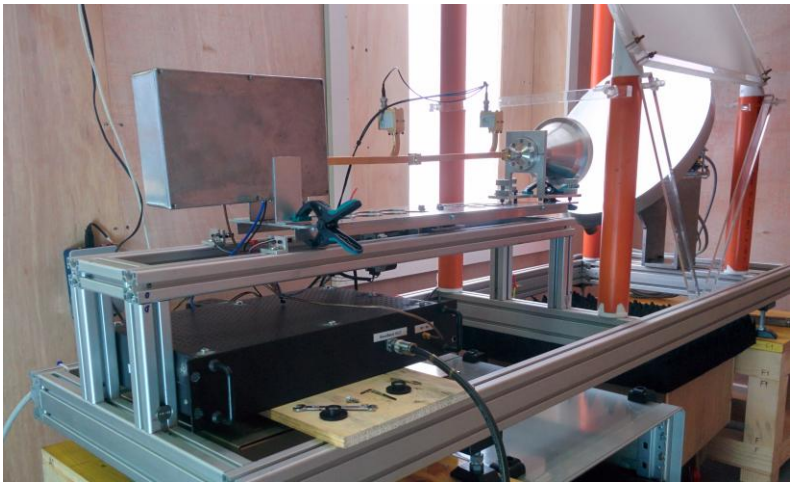
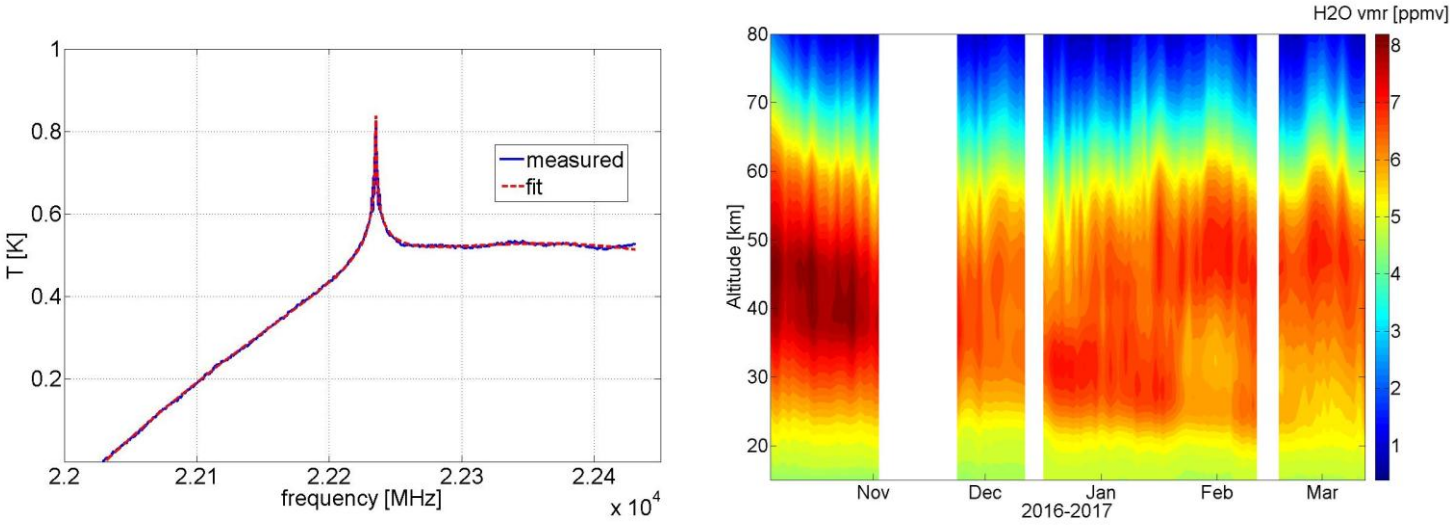
water Vapor Emission Spectrometer for Polar Atmospheres at 22 GHz (VESPA-22)



VESPA-22 continuously measures stratospheric and mesospheric vertical profiles of water vapor, as well as its total (tropospheric) column content. Vertical profiles have a temporal resolution of 12 hours whereas the column content is measured every 30 minutes. Vertical profiles are employed for studying stratospheric processes related to the ozone depletion. Water vapor column contents are useful for studying the Arctic radiation budget and climate processes.

Vertical profiles are derived from measuring the spectral emission of water vapor at 22.23 GHz. The pressure broadening characteristics of spectral lines allow us to estimate the vertical distribution of water vapor by studying its spectral line shape. Vertical profiles range from about 25 to 75 km altitude.

VESPA-22 was custom-designed and built at the INGV, Rome, and was installed at the Thule High Arctic Atmospheric Observatory (THAAO, http://www.thuleatmos-it.it/) in July 2016. It is meant to participate to the Network for the Detection of Atmospheric Composition Change (NDACC, http://www.ndsc.ncep.noaa.gov/) with long-term measurements.



Left: The H2O emission line at 22.23 GHz. Right: Time series of water vapor concentration vertical profiles from October 2016 to mid-March 2017. Large temporal gradients in water vapor concentration can be ascribed to the winter Polar vortex dynamics at different altitudes.

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