The RHUBC Campaign: Analysis of Water Vapor Profiles

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The Radiative Heating in Underexplored Bands Campaign

Motivation:
• Mid-tropospheric radiative cooling modulates vertical motions of the atmosphere
  > Occurs primarily in water vapor absorption bands that are opaque at the surface
  > Approximately 40% of the OLR comes from the far-IR
  ➔ Need to validate water vapor absorption models in these normally opaque bands

RHUBC-II Campaign – Atmospheric Radiation Measurement Program (DOE)
• Held in location with extremely low water vapor: Atacama Desert, Chile
  - high altitude site – Cerro Toco (5350 m)
• July – November 2009
• Key Instruments
  ➢ Vaisala RS-92 radiosondes – ~130 launches
  ➢ G-band Vapor Radiometer Profiler (GVRP) – 15 channels on side of 183.3 GHz WV line
  ➢ SAO FTS – zenith radiance from 300-3500 GHz (resolution 3 GHz)
  ➢ U. Cologne HATPRO – 7 channels from 22.2-31 GHz, 7 channels from 51-58 GHz
  ➢ NASA LaRC Far-IR Spectroscopy of the Troposphere (FIRST) – 100-1600 cm⁻¹ (res. 0.6 cm⁻¹)
  ➢ CNR (Italy) Radiation Explorer in the Far-IR (REFIR-PAD) – 100-1400 cm⁻¹ (res. 0.5 cm⁻¹)
  ➢ U. Wisc. Atmospheric Emitted Radiance Interferometer (AERI) – 550-3000 cm⁻¹ (res. 0.5 cm⁻¹)

Analysis of the data collected is underway

Specifying Water Vapor Profiles During RHUBC-II

• Sondes provide an initial determination of the water vapor field above the site, but have known issues.
  ➢ To establish baseline WV profiles for this study:
    – the Miloshevich adjustment is applied
    – a constant scaling factor is then retrieved using the GVRP channels and MonoRTM radiation code.

Initial Evaluation of Multi-level WV Retrieval from GVRP Measurements: 9/19, 1530 UT; PWV~0.28mm

- Derived from Miloshevich et al. (1999) and Miloshevich et al. (2008)
- Shows multi-level water vapor measurements retrieved from GVRP measurements and MonoRTM calculations. The retrieval biases the retrievals are presented on the left panel. The method used in the calculation is shown on the right panel.