

Retrieving Boundary-layer Thermodynamic Profiles and Cloud Properties

From Infrared Spectra: An Update on AERloe Operational Processing

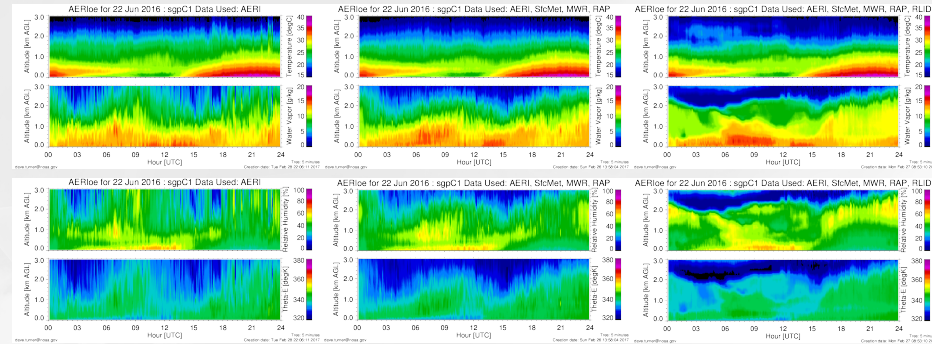
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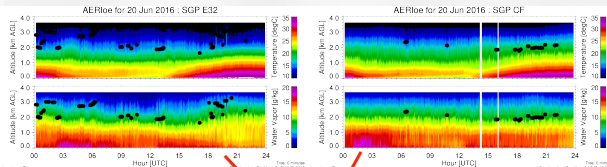
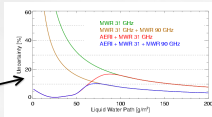
- High temporal resolution temperature (T) and humidity (q) profiles needed
- Atmospheric Emitted Radiance Interferometer (AERI) measures downwelling spectral IR radiance
- AERI radiance data have information on T(z), q(z), and cloud properties

- Problem is ill-posed (i.e., multiple profiles could give observed radiance)
- AERloe is 1-D variational retrieval algorithm to provide these profiles
- Incorporating additional information provides additional constraints and improves retrieval
 - Surface meteorology observations of T and q – primarily constrains q(0)
 - MWR brightness temperature (T_b) observations – primarily constrains PWV and improves LWP
 - Rapid refresh (RAP) NWP model output above 4 km – primarily constrains mid-to-upper trop
 - Raman lidar (RLID) water vapor and temperature observations – above 500 and 1000 m, resp

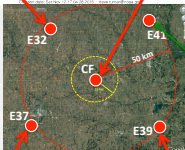


- AERI network at SGP site allows spatial variability of T(z) and q(z) to be investigated
- Provides additional information to develop forcing datasets for LASSO project

- CF and EFs have Doppler lidars to measure horizontal winds and turbulence in w'
- CF and EFs have microwave radiometers (MWR) to retrieve LWP and PWV
 - Addition of MWR T_b obs to AERloe improves the retrieved LWP dramatically

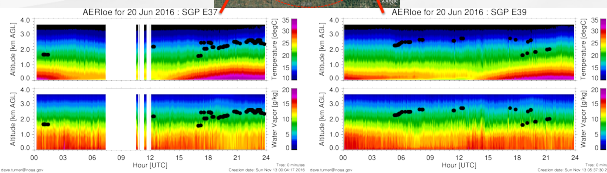


Black dots are cloud base heights where the LWP > 5 g/m²

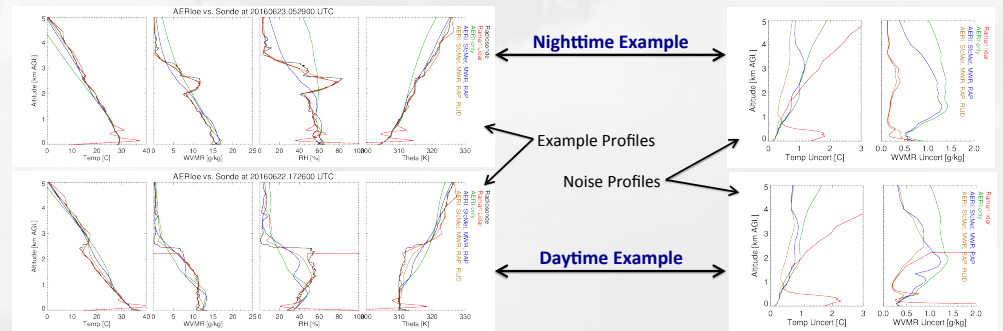


E41 has an ASSIST, which is slightly different than the AERI. AERloe needs to be modified to process these data

Note significant differences in evolution of T(z), q(z), and clouds from site-to-site!



Using Progressively More Data as Constraints



- AERIs located at all ARM sites; how well do retrievals work in other locations?
- Demonstration time-height cross-section and profiles, statistics at Ollktok

