Capabilities of the Havemann-Taylor Fast Radiative Transfer Code (HT-FRTC): Hyperspectral Radiance Simulations and Atmosphere and Surface Retrievals

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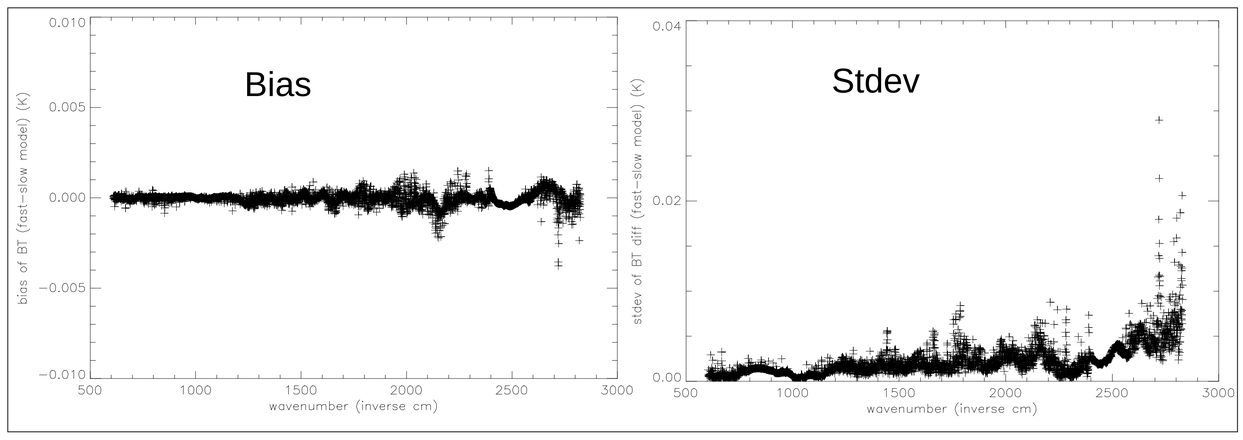
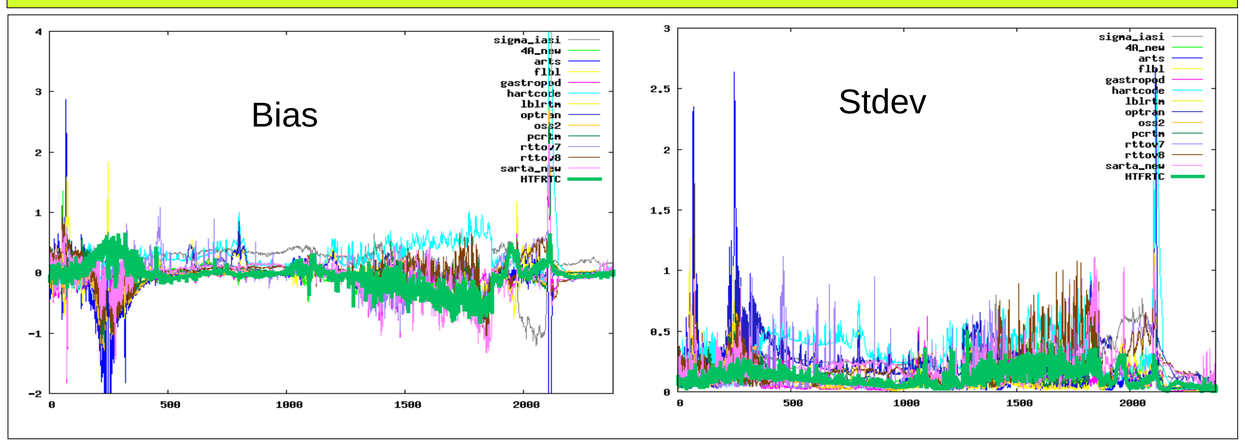
- ✓ **The HT-FRTC uses principal components, these can be 'line-by-line' sensor-independent principal components**
- ✓ **Works in the microwave, infrared and short-wave**
- ✓ **Does treat water vapour, ozone, carbon dioxide and 50 other trace gases (LBLRTM 12.2)**
- ✓ **Does treat any spectrally resolved surface emissivity / reflectance**
- ✓ **Does include 20 different aerosols as well as water and ice clouds and liquid and frozen precipitation**
- ✓ **Incorporates an exact treatment of scattering as well as the Chou-scaling approximation**
- ✓ **Works for any sensor-height, for up and down-looking instruments (air / space borne or ground-based)**
- ✓ **Is able to compute radiances, fluxes and transmittances**
- ✓ **Includes the solar and lunar source and can account for spherical earth**
- ✓ **A full hyperspectral radiance calculation takes less than one millisecond**
- ✓ **The HT-FRTC is used in a 1D-Var retrieval system in principal component space**

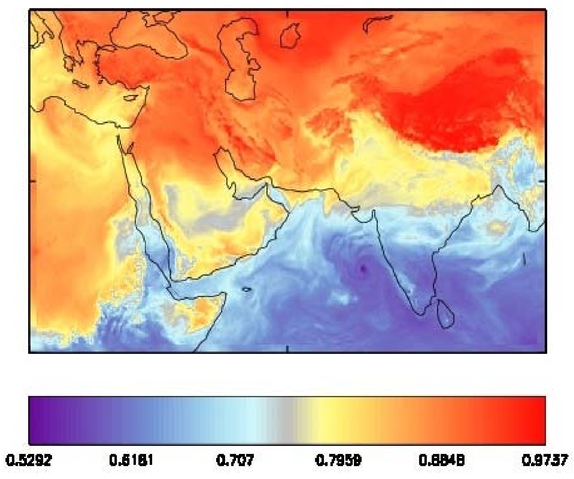
1. HT-FRTC code validation: accuracy against line-by-line for ARIES



2. HT-FRTC code validation: model intercomparison for AIRS

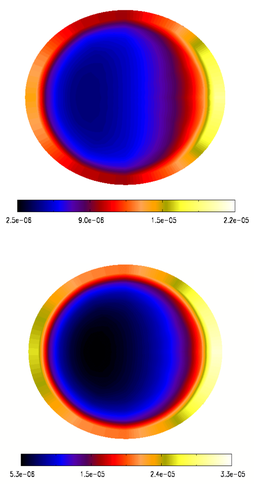


3. IR transmittances



Broadband 8-12μm transmittances

4. Night sky brightness



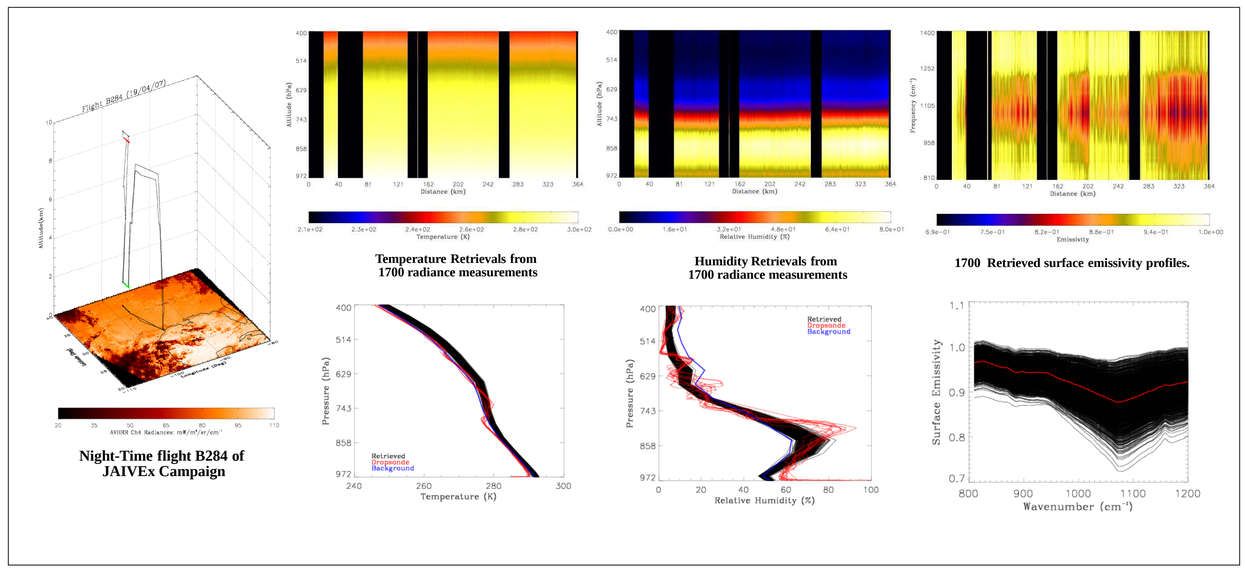
Moon zenith 45º, incident from the right

Grass

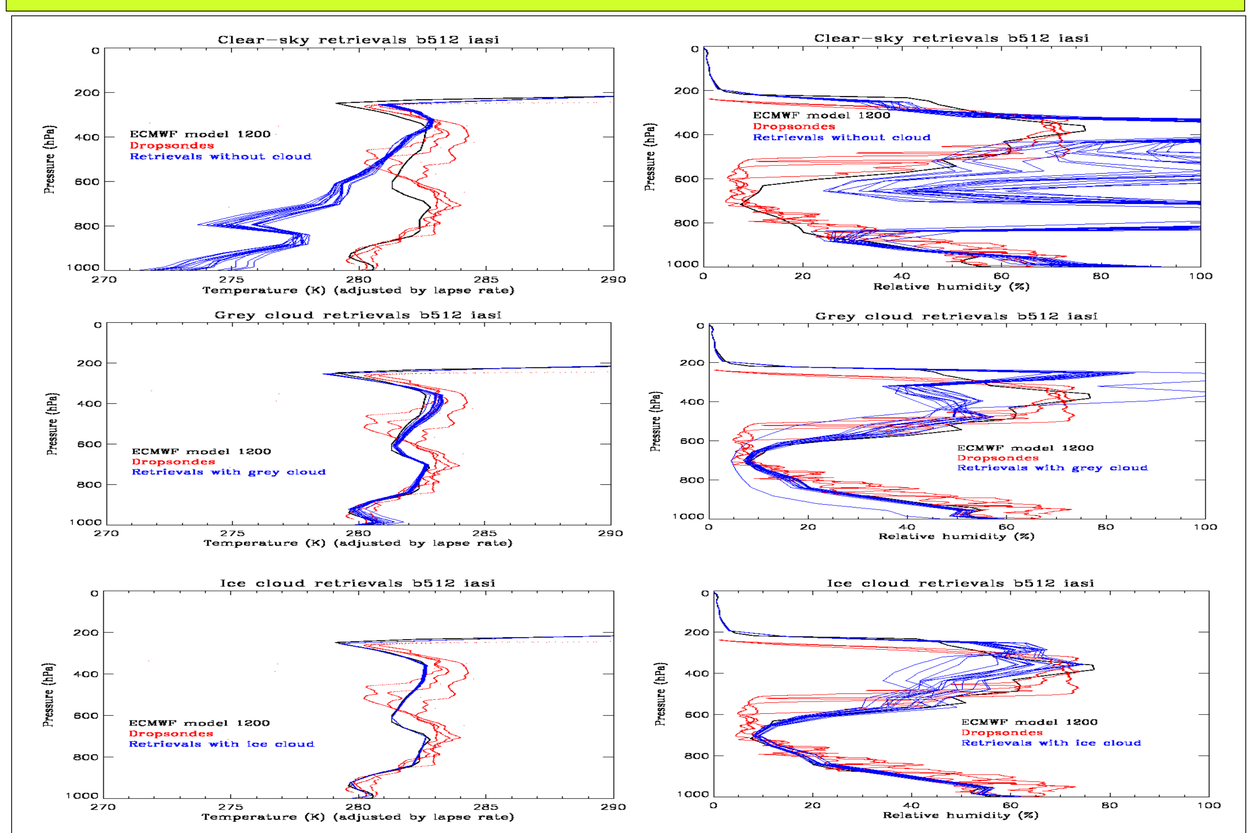
White sand

Sky hemisphere

5. Surface Emissivity Retrievals over the Oklahoma ARM Site



6. IASI 1d-Var Cirrus Cloud Retrievals



Cirrus cloud (275 to 475 hPa): Retrieved ice water content is 171.0±64.4 mgm^{-3} and cloud fraction is 0.47±0.04.

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