



UW Study-1: Climate Product Evaluation Using AIRS and IASI Data Sets

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Study Topics

- Objectives
- Data Used
- Method
- Expected Outcome
- Areas for Collaboration



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Climate Product Evaluation Using AIRS and IASI Data Sets

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Study Objectives

Climate Product Evaluation using AIRS and IASI Data Sets

- Use measured, spectrally-resolved radiances to investigate the characteristics of monthly and annual mean, regional spectral products. Characterize the (1) fundamental information content that can be extracted from such products, and (2) short term climate and weather “noise” properties.



Study Objectives (cont)

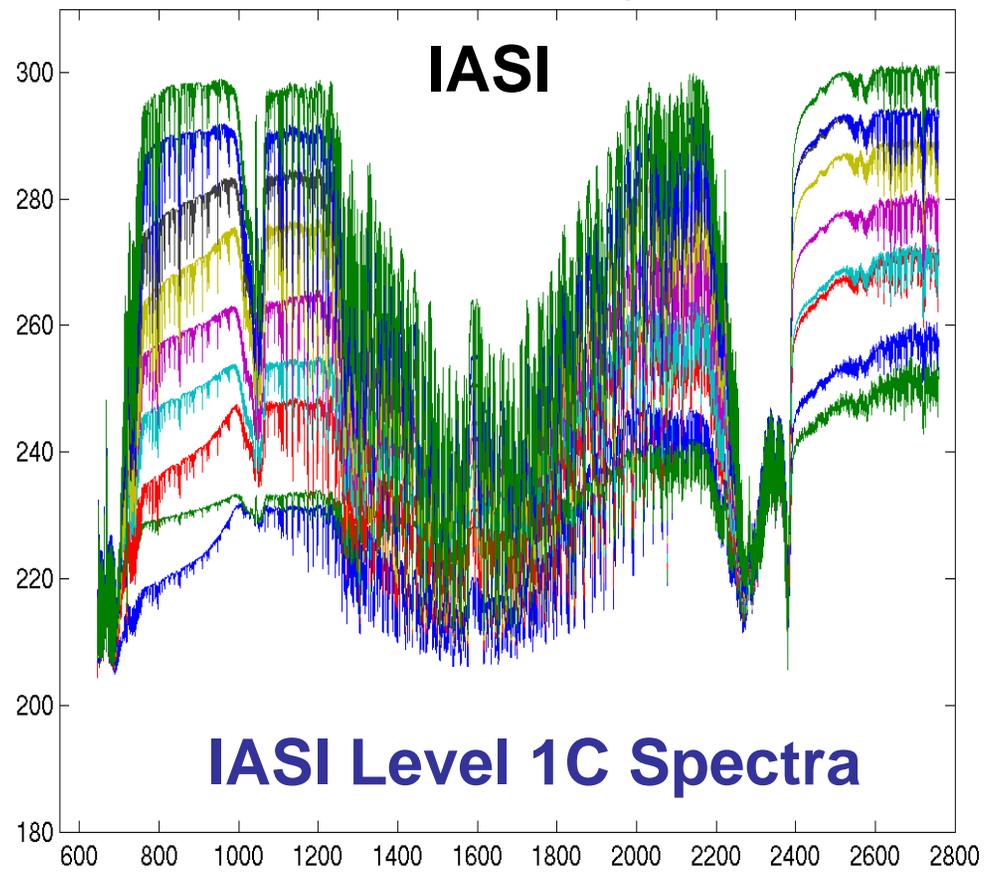
Climate Product Evaluation using AIRS and IASI Data Sets

- Obtain model IR radiances from collaborators in the modeling effort to prepare comparisons of observations and calculations. The purpose is not to assess trends but to understand to what degree the weather and climate noise that ***we need to average away*** to uncover long-term trends is represented in models.



Data Used: Metop & AQUA

Global Polar Sun-Synchronous



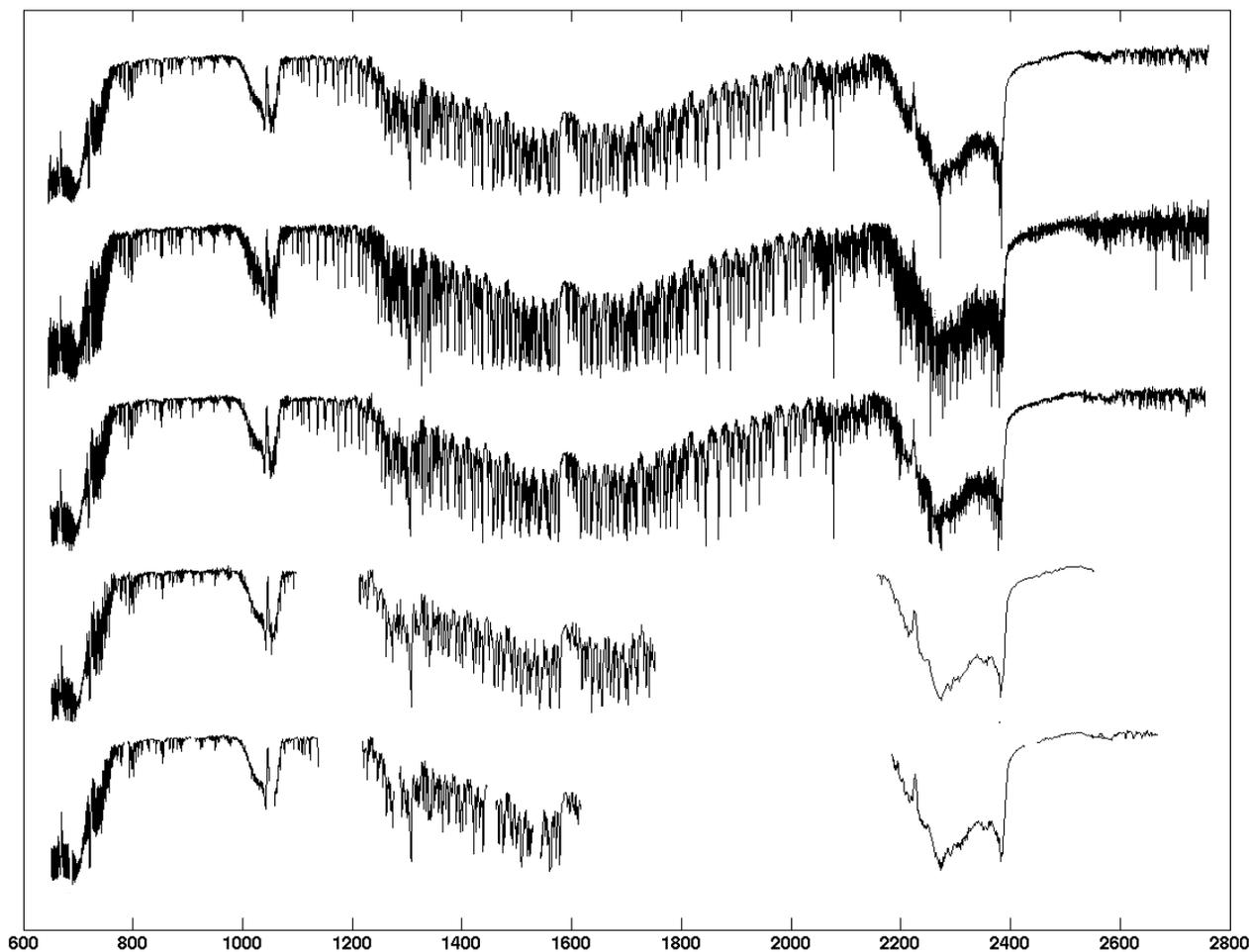
IASI on top of METOP-A

15.5 μm \longleftrightarrow 3.62 μm



Data Used: IASI & AIRS

Brightness Temperature



IASI L1C
(0.5 cm⁻¹ apodized)

IASI full resolution
(0.25 cm⁻¹ unapodized)

CLARREO
(0.5 cm⁻¹ unapodized)

CrIS
(truncated to 0.625, 1.25,
and 2.5 cm⁻¹)

AIRS
($v/\Delta v \sim 1200$)

15.5 μm ← Wavenumber (cm⁻¹) → 3.62 μm



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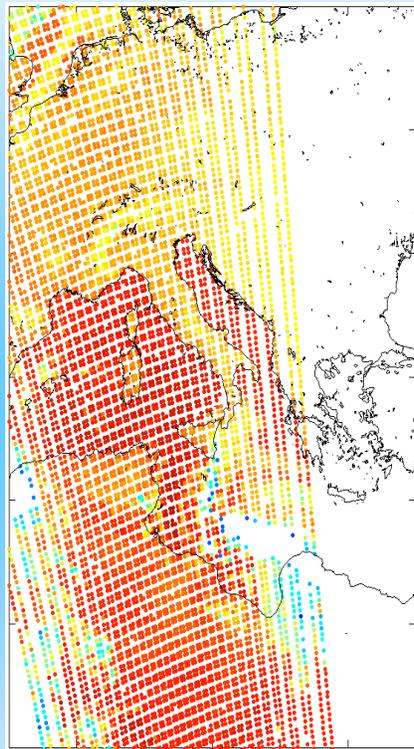
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Data Used: IASI & AIRS

IASI

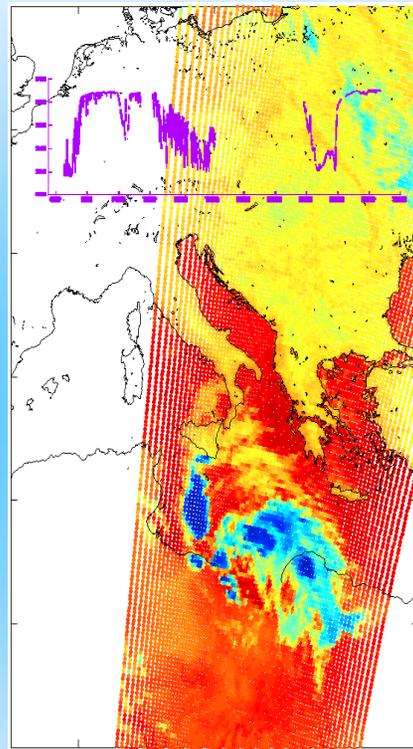
2007.10.15 ~22:15 UTC



900 cm⁻¹ Radiance (mW/(m² sr. cm⁻¹))

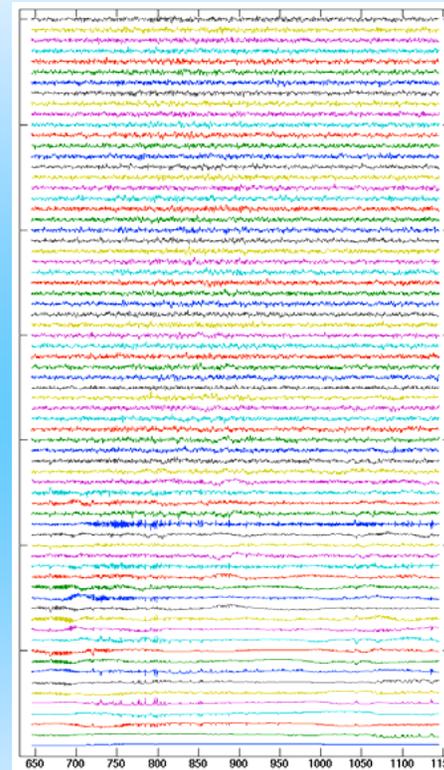
AIRS

2007.10.16 ~00:30 UTC



IASI

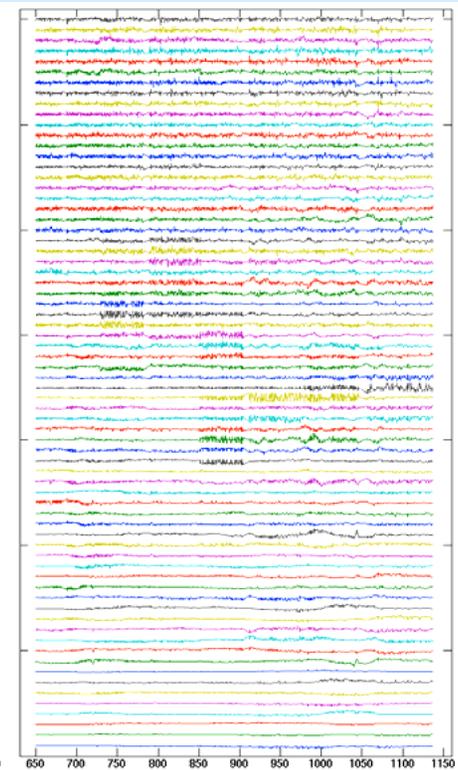
Principle Components



wavenumber (cm⁻¹)

AIRS

Principle Components



wavenumber (cm⁻¹)

IASI and AIRS information content (including error characteristics) has been evaluated by detailed examination of principle components.



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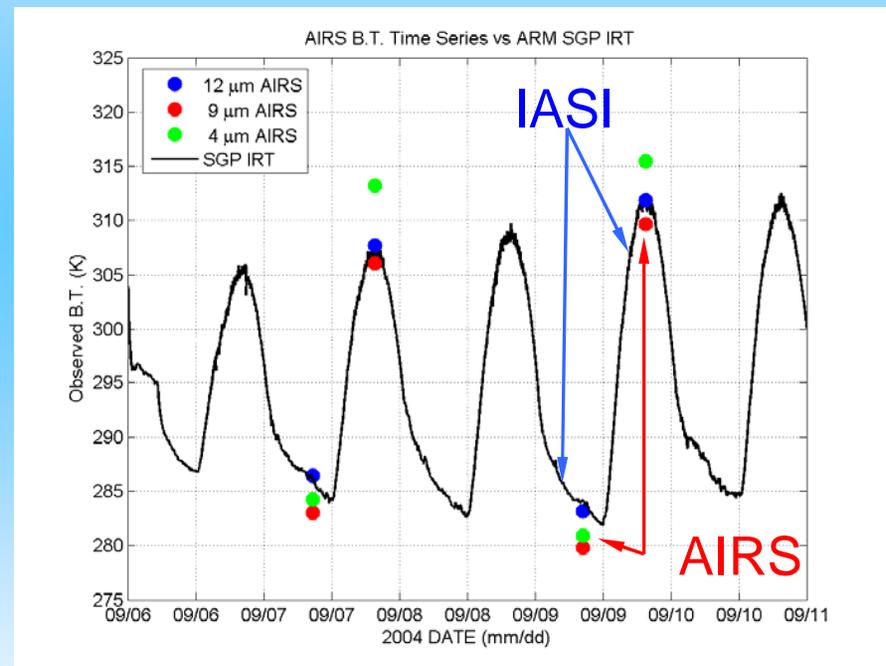
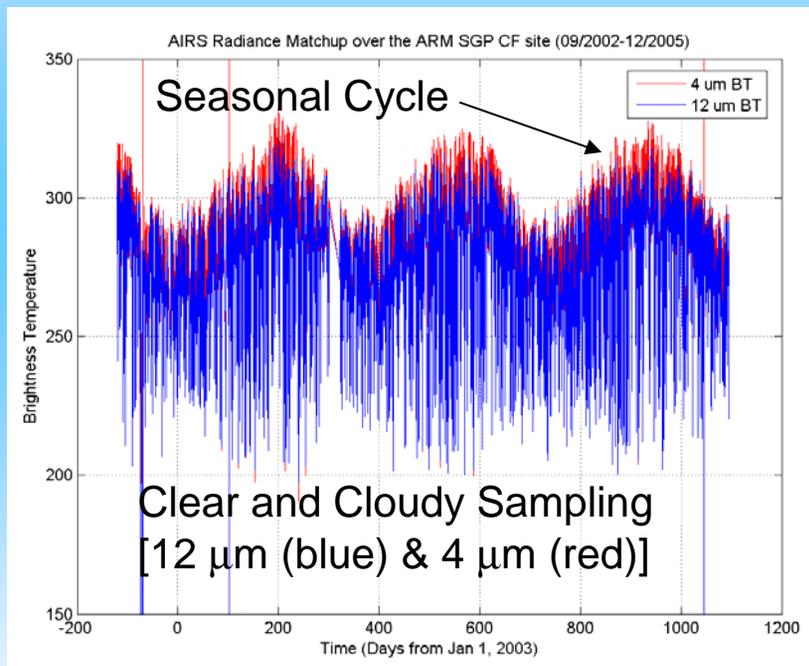
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Study Methods: Temporal Sampling

- IASI and AIRS observations are in AM and PM orbits.
- Example from ARM Southern Great Plains (Oklahoma) shows that Aqua AIRS is near Max/Min of diurnal cycle while METOP IASI samples a higher time rate of change.

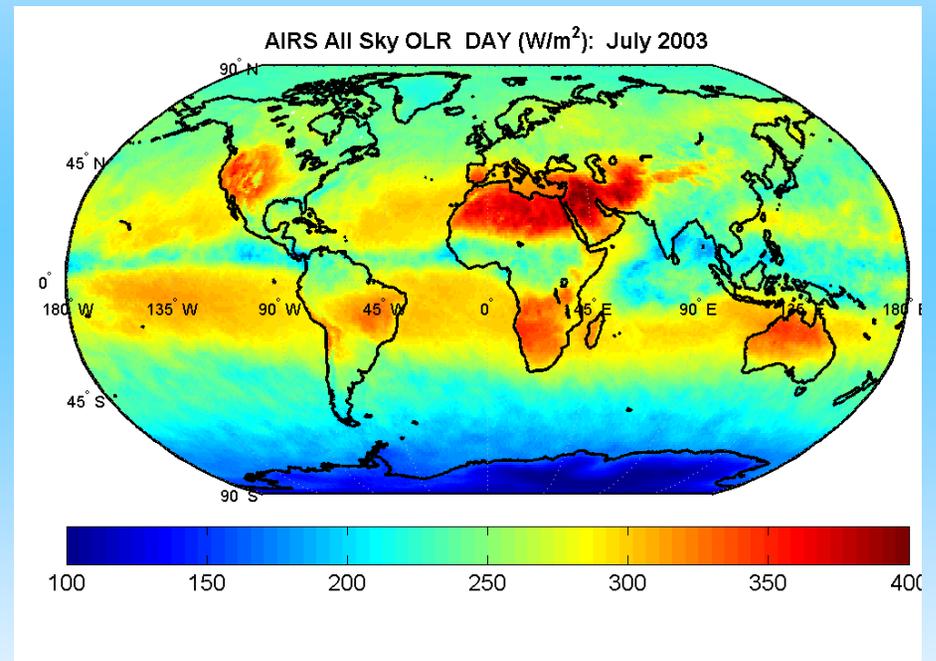
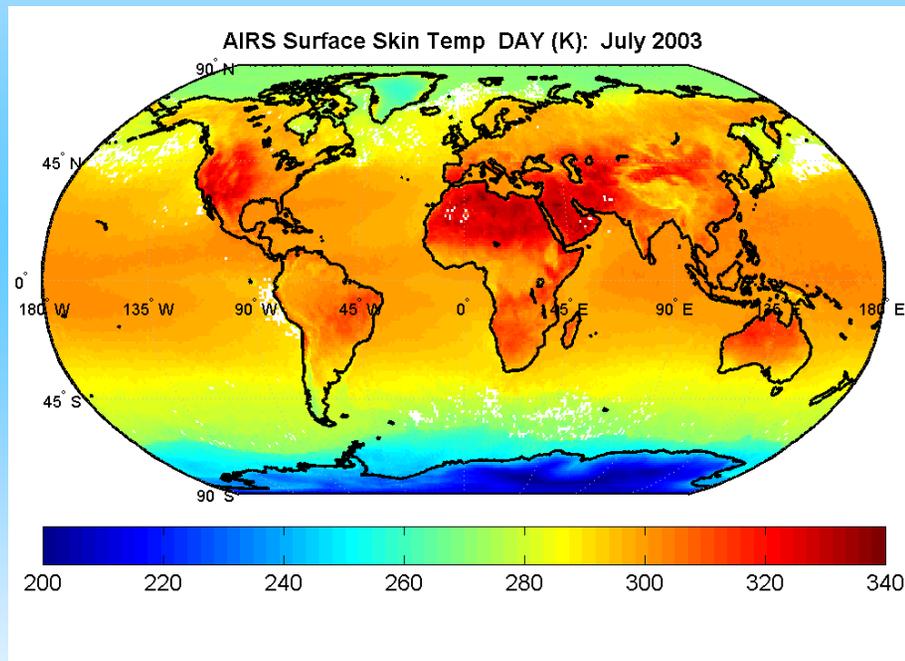


AIRS BTs at ARM SGP (2002-2005) and blowup of clear period.



Study Methods: Spatial Sampling

- IASI and AIRS observations are at 15 km scale length (or less).
- The radiances will be averaged within a granule to match CLARREO FOVs.
- The spatially averaged radiances will be binned into larger grid cells (> 1 deg).



Example AIRS LST and All Sky OLR products are at 1 degree resolution.

Expected Outcome

- Synthetic CLARREO radiance product
 - Time and Space histograms of spectral channels within pre-specified spatial grids.
 - Principal component analysis at fixed times (global and within sampling bins)
 - Time series analysis to highlight weather “noise” in the principal components.
 - All products are a function of FOV size.
- Comparison of synthetic observed and simulated model CLARREO radiances for the same space and time sampling.
 - Quantify “weather noise” in the difference.
 - Verify the sampling statistics required for the CLARREO mission.



Areas for Collaboration

- Obtaining model fields binned over the same time and space domains.
- Obtaining model radiances (band model and high spectral resolution infrared).
- Analysis comparison methods (e.g Dykema, Harvard and Yuk Yung, CalTech)
- Interpretation of radiance results between measurements and models.

