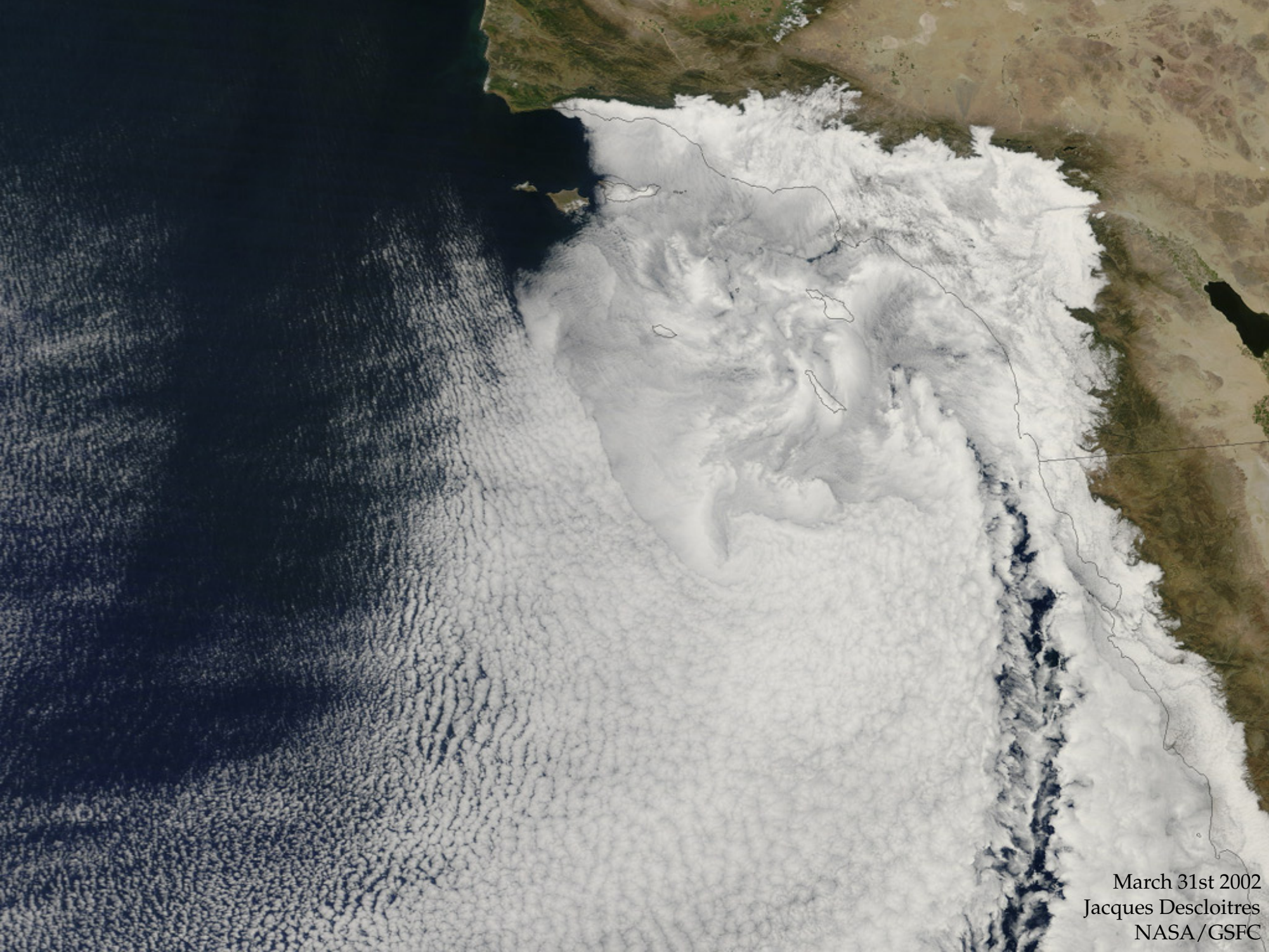
March 31st 2002
Jacques Descloitres
NASA/GSFC

How do cloud-types affect inter-satellite biases?

Paul W. Staten, Brian Kahn, and Mathias Schreier
NASA JPL/Caltech

December 11, 2013

What we do:

We combine HIRS radiances...
with AVHRR cloud types....
at the pixel scale.

What we see:

T_b's confirm validity of interpolated cloud grid.
Statistics highlight instrument differences.

What now?

Homogenize the data record.
Calculate observed and modeled radiance trends.

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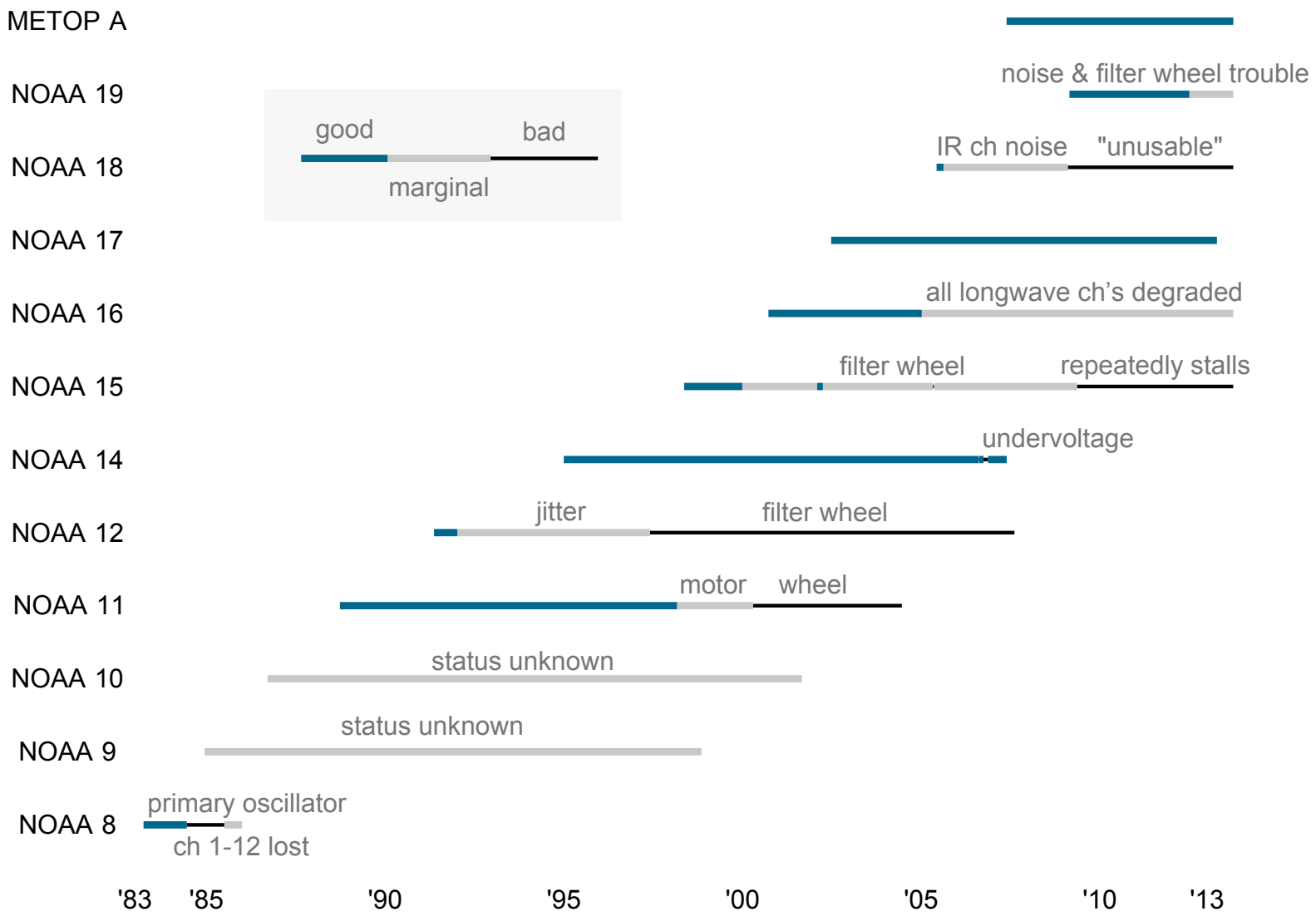
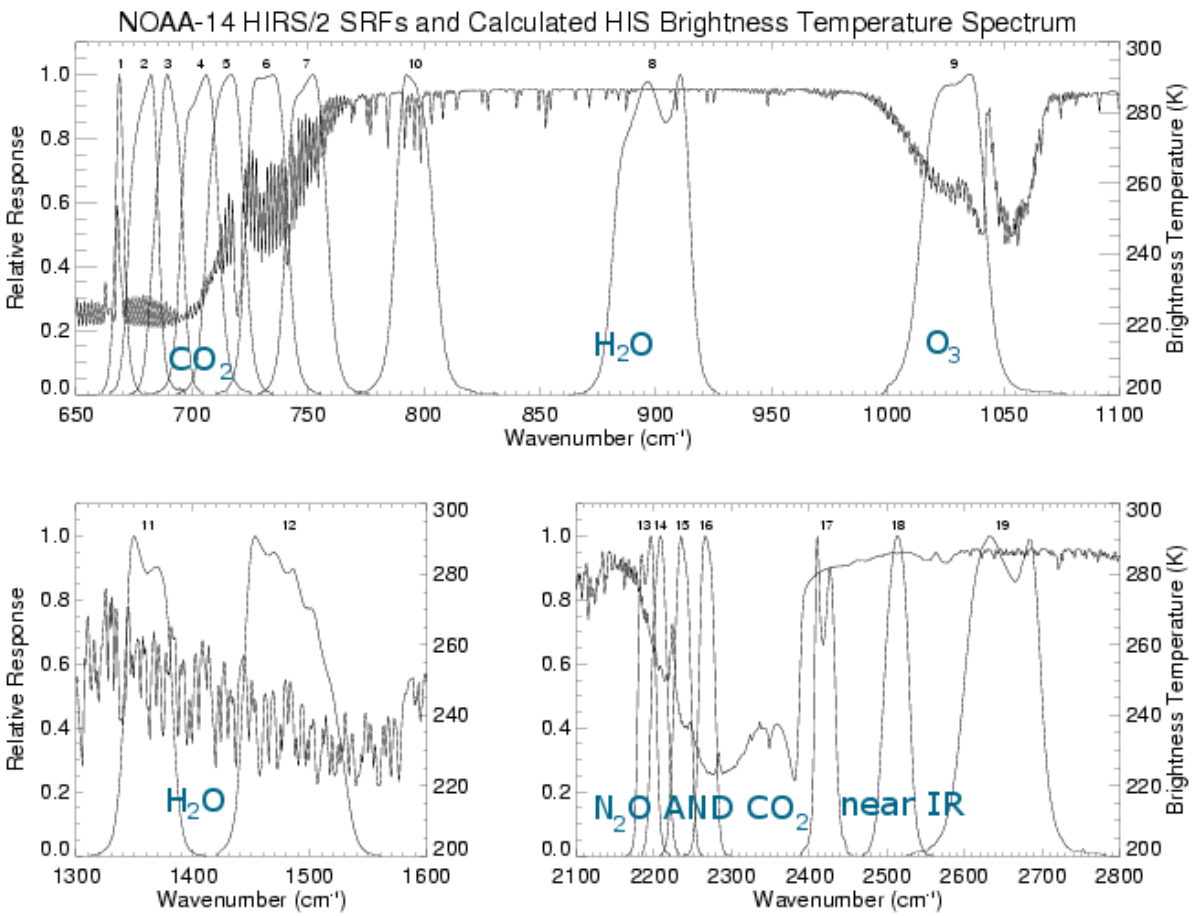
HIRS instruments span* the last 30 years



HIRS channels are selected for atmospheric sounding



credit: Irina N. Sokolik, Georgia Tech

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1. AVHRR 4 km imager data
   - global coverage
   - visible and near-IR
2. CLAVRx processing algorithm
   - NCEP/NCAR reanalysis background
   - Bayesian approach
   - Mixed Daytime and daytime/nighttime output
3. Cloud typing
   - Daytime & nighttime CLAVRx cloud type (Pavolonis et al., 2005)
   - Daytime ISCCP cloud type (isccp.giss.nasa.gov)

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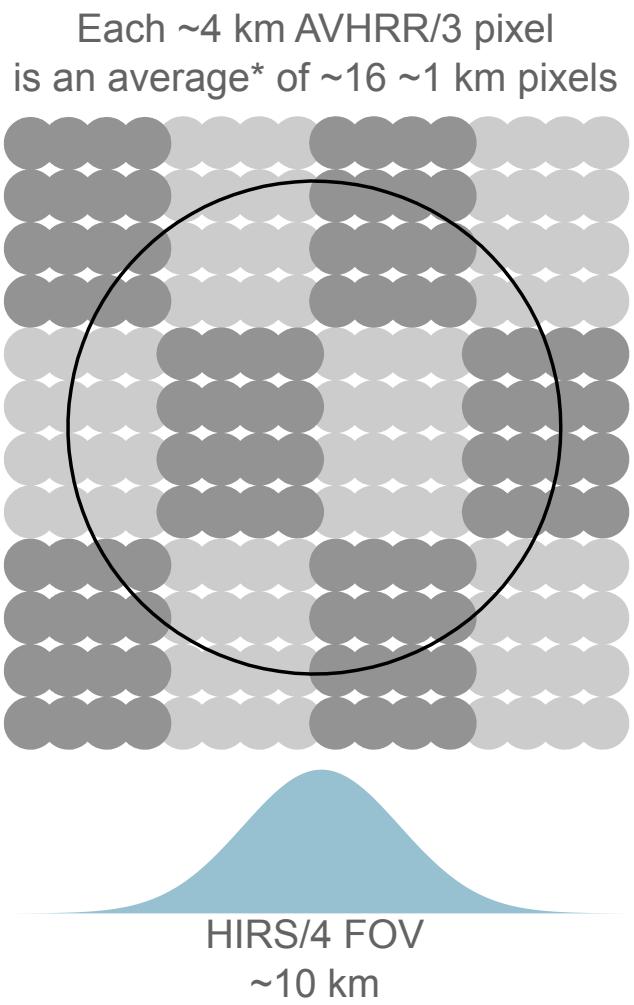
Each HIRS pixel contains info from several AVHRR pixels



- T_b from 19 HIRS channels
- Fractions of 13 CLAVRx cloud types (including clear)
- Fractions of 10 ISCCP cloud types (including clear)

What we do:

We combine HIRS radiances...
with AVHRR cloud types....
at the pixel scale.

What we see:

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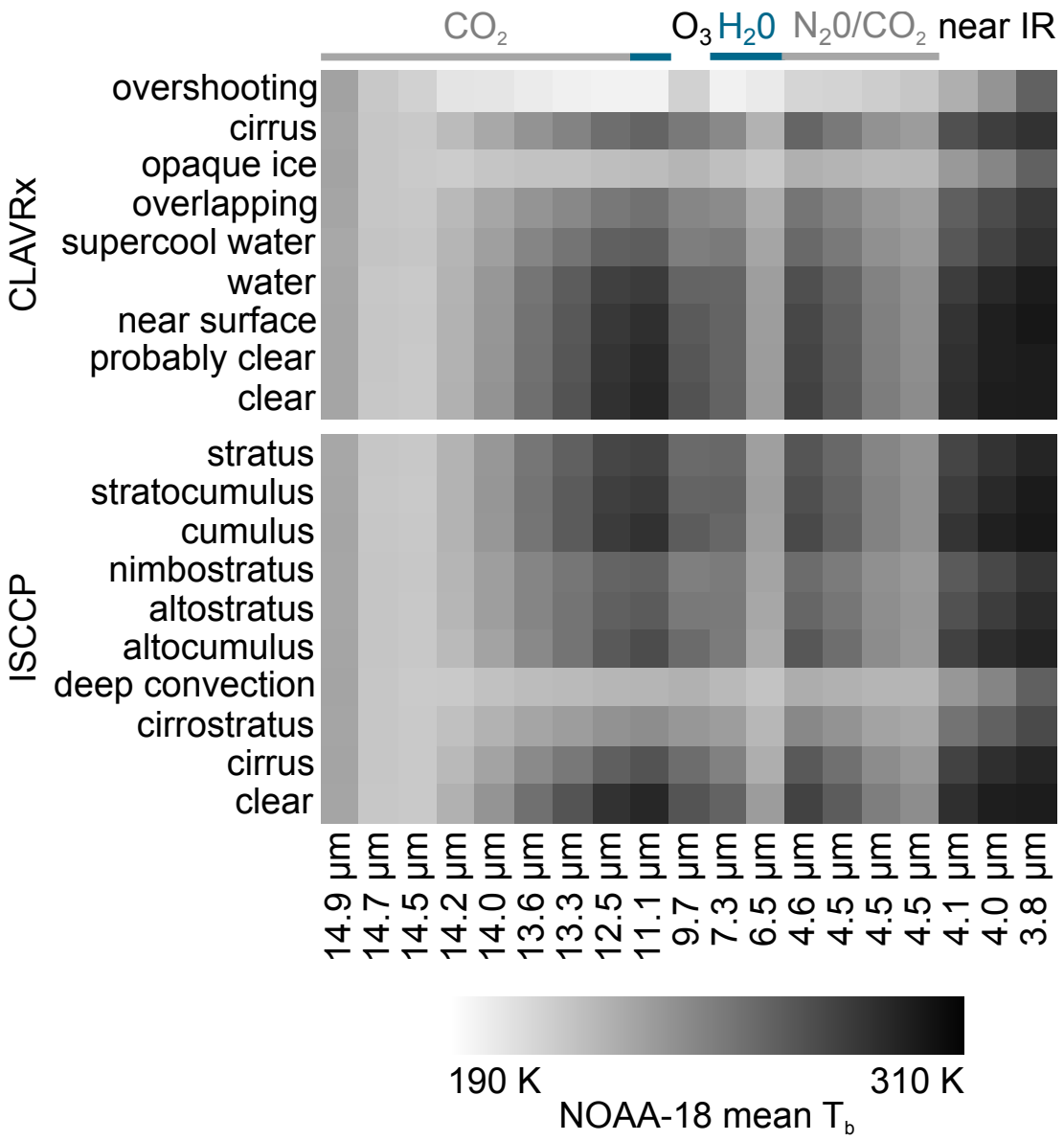
Statistics highlight instrument differences.

What now?

Homogenize the data record.
Calculate observed and modeled radiance trends.



- NOAA-18
- Oct–Nov 2009
- NE Pacific
- Overshooting classification stands out
- HIRS/4 T_b's coincide with channel weighting functions

What we do:

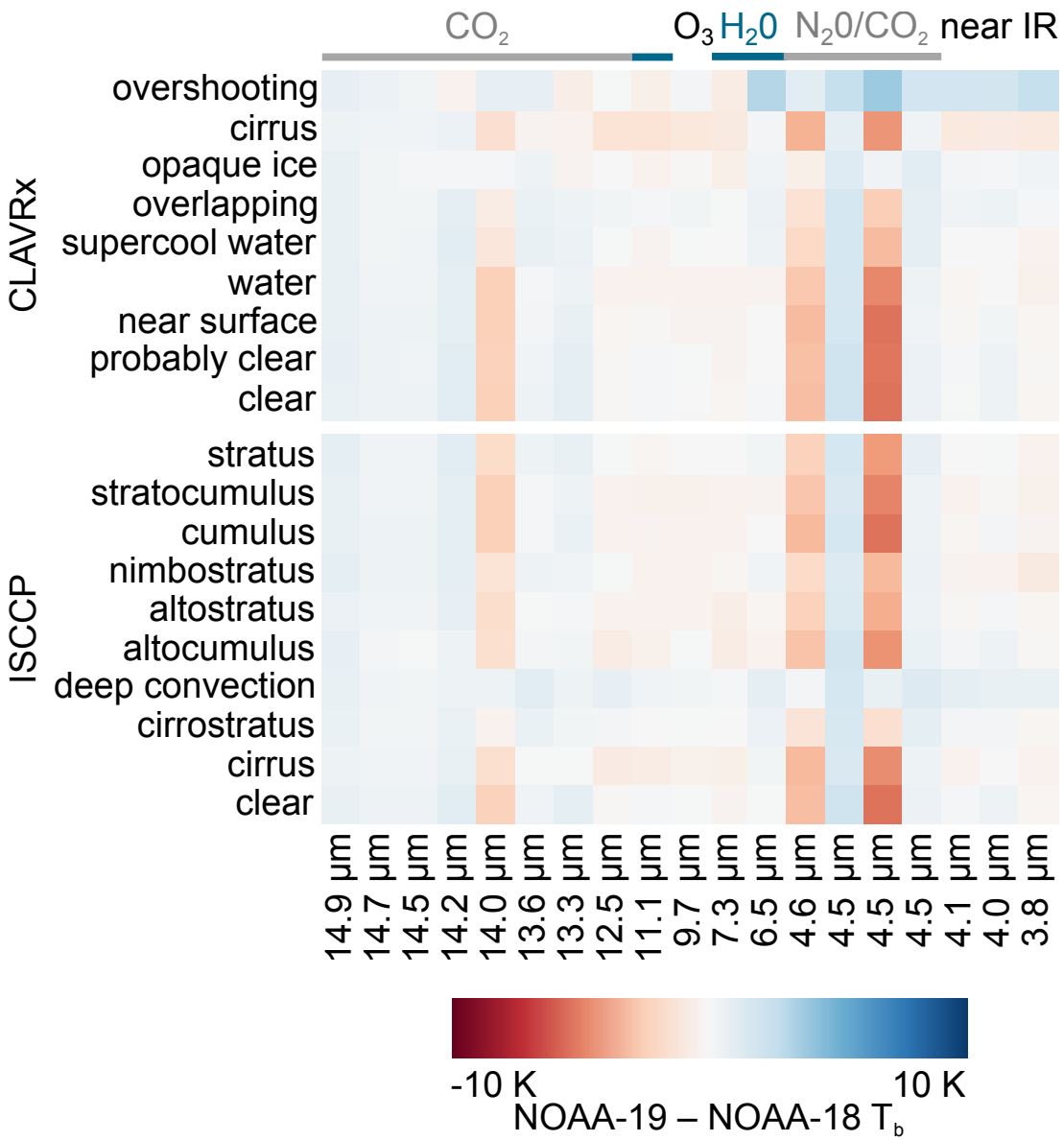
- We combine HIRS radiances...
- with AVHRR cloud types....
- at the pixel scale.

What we see:

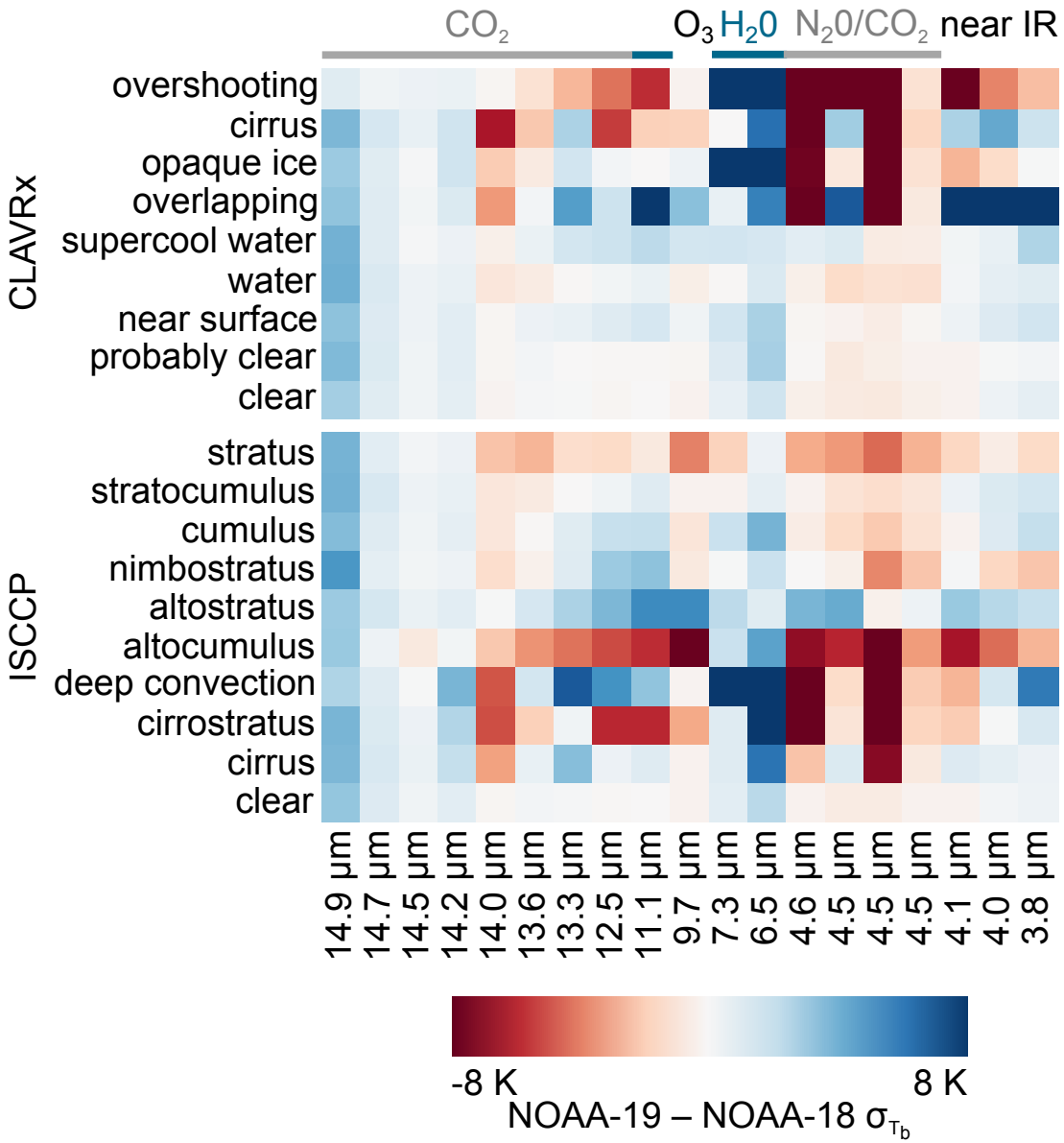
- T_b's confirm validity of interpolated cloud grid.
- Statistics highlight instrument differences.

What now?

- Homogenize the data record.
- Calculate observed and modeled radiance trends.



- NOAA-19 – NOAA-18
- Mean ΔT_b
- Scene-radiance dependent biases (Shi et al., 2008)
- Large biases only for "slicing" channels.



- NOAA-19 – NOAA-18
- $\Delta\sigma_{T_b}$
- Lower σ_{T_b} for most channels for low- and mid-level clouds.
- Same channels show ΔT_b and σ_{T_b} differences.

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with AVHRR cloud types....
at the pixel scale.

What we see:

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What now?

Homogenize the data record.
Calculate observed and modeled radiance trends.

- Spectral response function shifts (Chen et al., 2013)
- Diurnal cycle (Foster & Heidinger, 2013)
- HIRS, IASI, and AIRS differences

What we do:

We combine HIRS radiances...
with AVHRR cloud types....
at the pixel scale.

What we see:

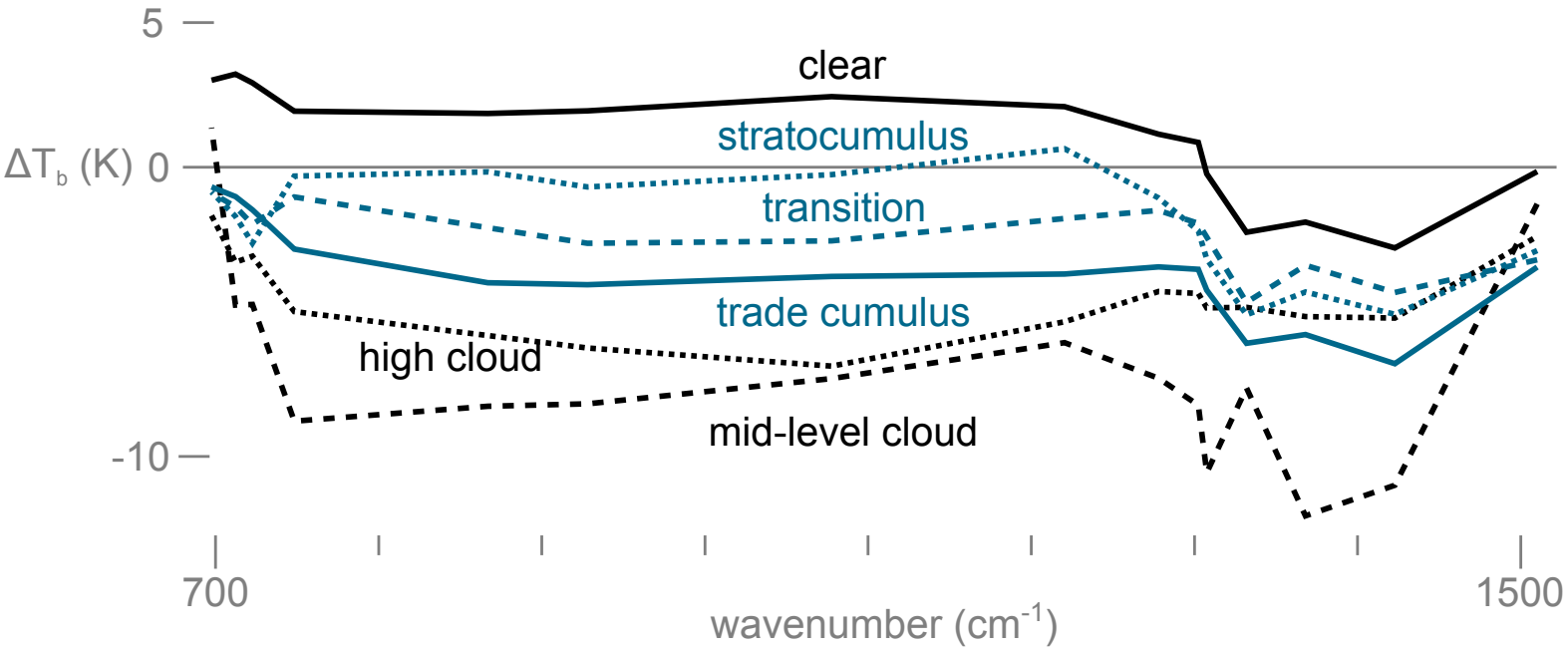
T_b's confirm validity of interpolated cloud grid.
Statistics highlight instrument differences.

What now?

Homogenize the data record.
Calculate observed and modeled radiance trends.

- Cloud type changes
- Type-specific radiance trends
- Modeled cloud statistics $\rightarrow$

Modeled AIRS T_b's from retrieved profiles match observed AIRS T_b's for some cloud types.



Adapted from Schreier and Sušelj, 2014 (in prep)

But higher-order stats match poorly.
What about models?

Thanks.

NASA Satellite Calibration Interconsistency Studies program &
Lucia Tsaoussi

Andy Heidinger &
Hai-tien Lee