# Direct radiance validation of IASI - results from JAIVEx

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# Contents

This presentation covers the following areas

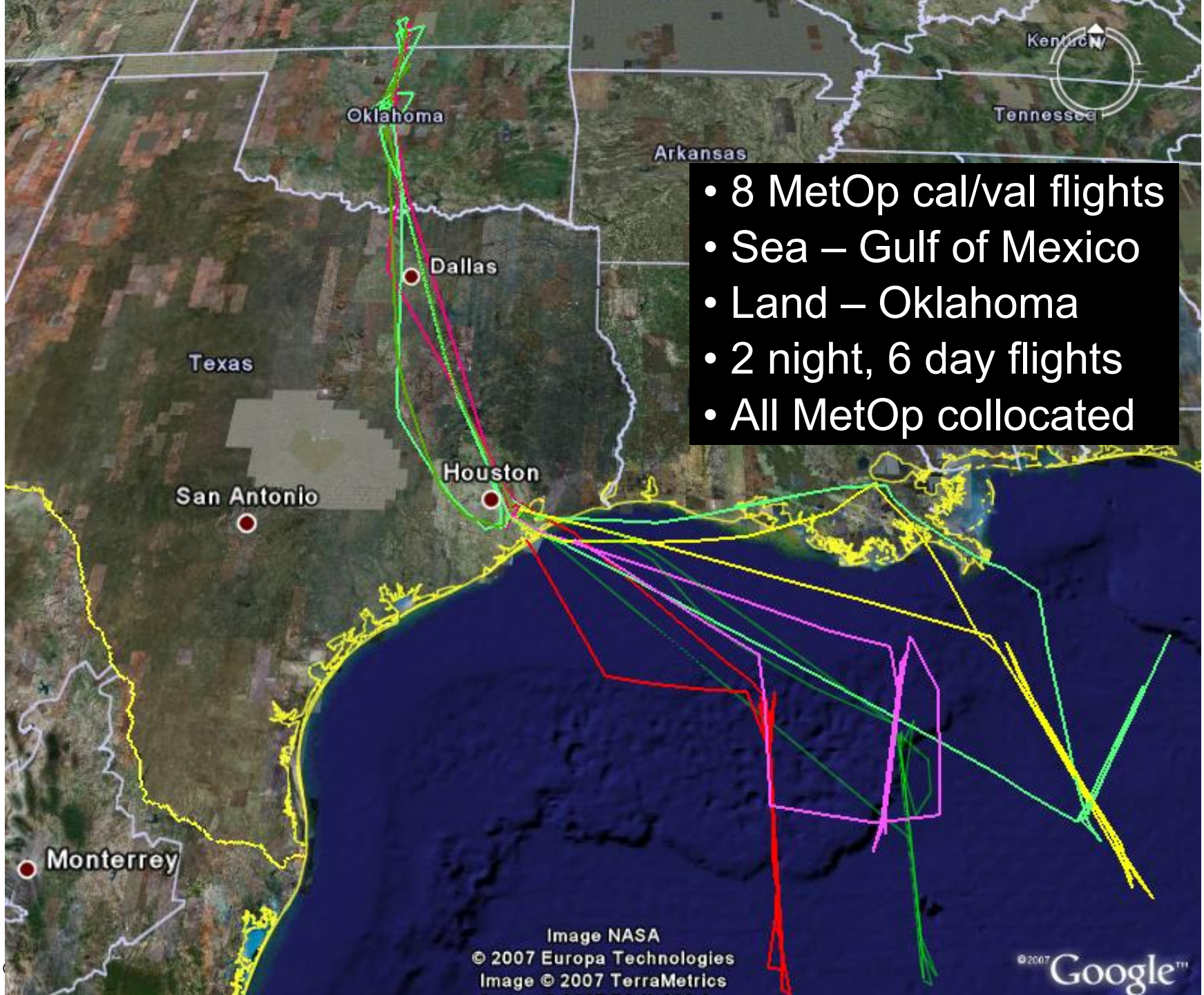
- JAIVEx campaign overview
- IASI direct radiance validation
- Case studies available for research

# JAIVEx overview

- The **J**oint **A**irborne **I**ASI **V**alidation **Ex**periment (**JAIVEx**) was based in Houston, Texas in April-May 2007, combining measurements from FAAM BAe 146 and NASA WB-57 (interferometers, profile and surface measurements) in conjunction with MetOp overpasses
- Campaign aim to collect collocated radiance and profile data for validation of IASI radiances in support of NWP satellite data assimilation and retrieval algorithms

# Collocated set of measurements


- IASI (MetOp)
- NAST-I, S-HIS (WB-57)
- ARIES (FAAM 146)
- Dropsondes *T*, *q*
- FAAM in situ *T*, *q*
- FAAM in situ CO, $O_3$
- ARM CART obs
- Surface *T*, $\varepsilon$


Oklahoma
Arkansas
Tennessee
Dallas
Texas
Houston
San Antonio
Monterrey
• 8 MetOp cal/val flights
• Sea – Gulf of Mexico
• Land – Oklahoma
• 2 night, 6 day flights
• All MetOp collocated
Image NASA
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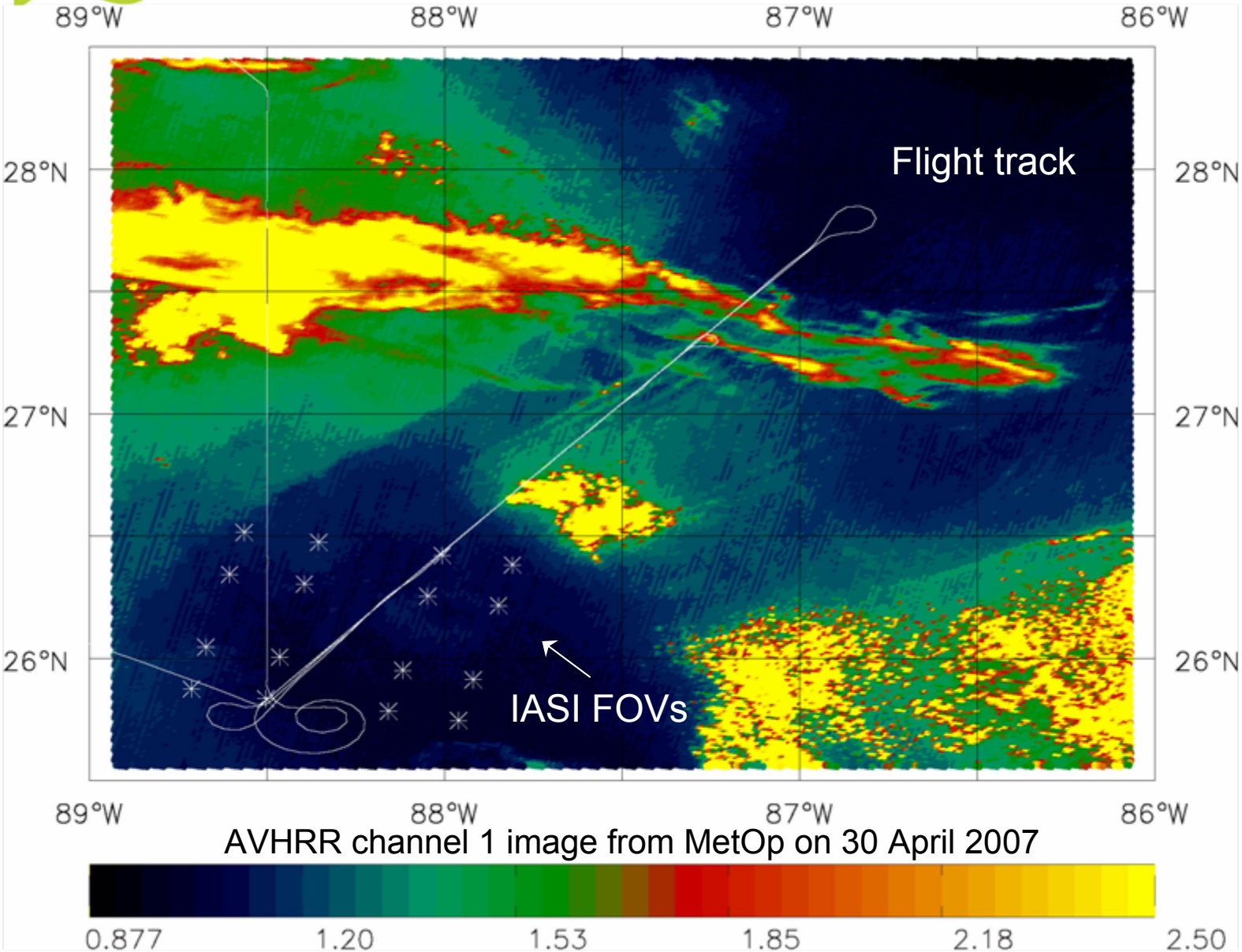
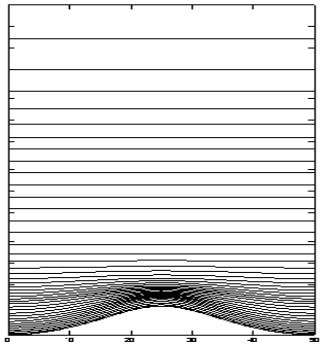
# Gulf of Mexico 30/4/2007



# Radiative transfer simulations

- For case study select dropsondes released closely in time and space with clear-sky interferometer FOVs
- Construct profiles of temperature and humidity etc. for input to line-by-line radiation code; top-up above aircraft profile with NWP model fields
- Output line-by-line infrared simulated spectra for ARIES and IASI
- Compare observed spectra with simulated ones

**top of atmosphere (MetOp)**

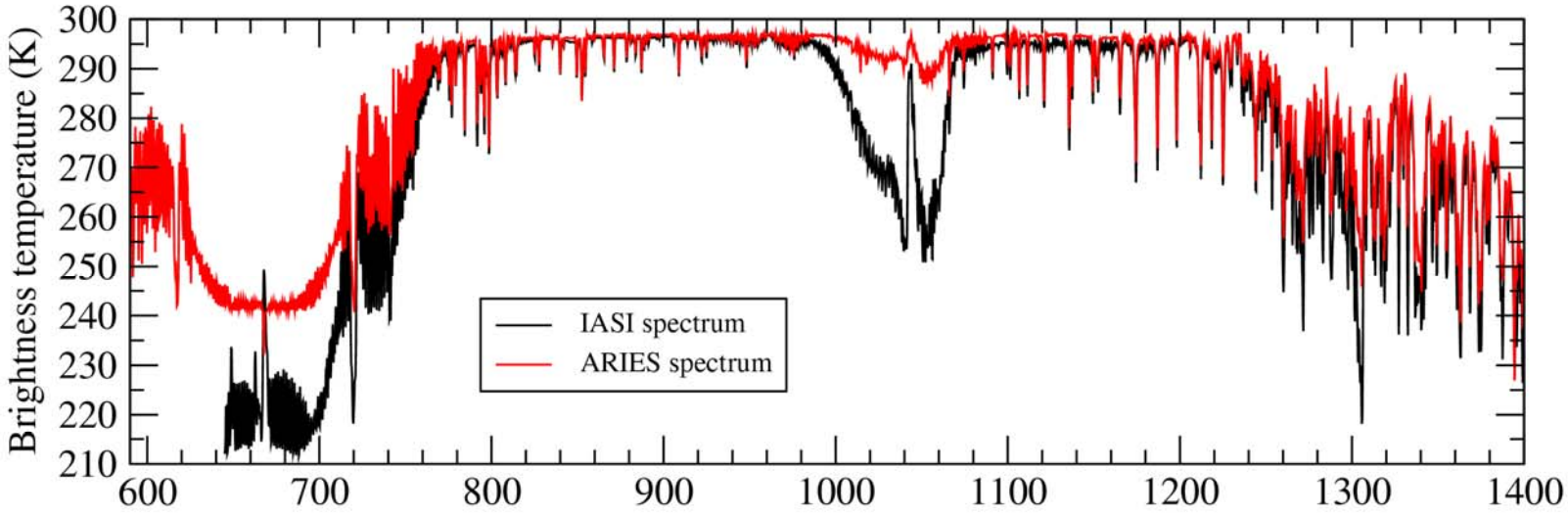


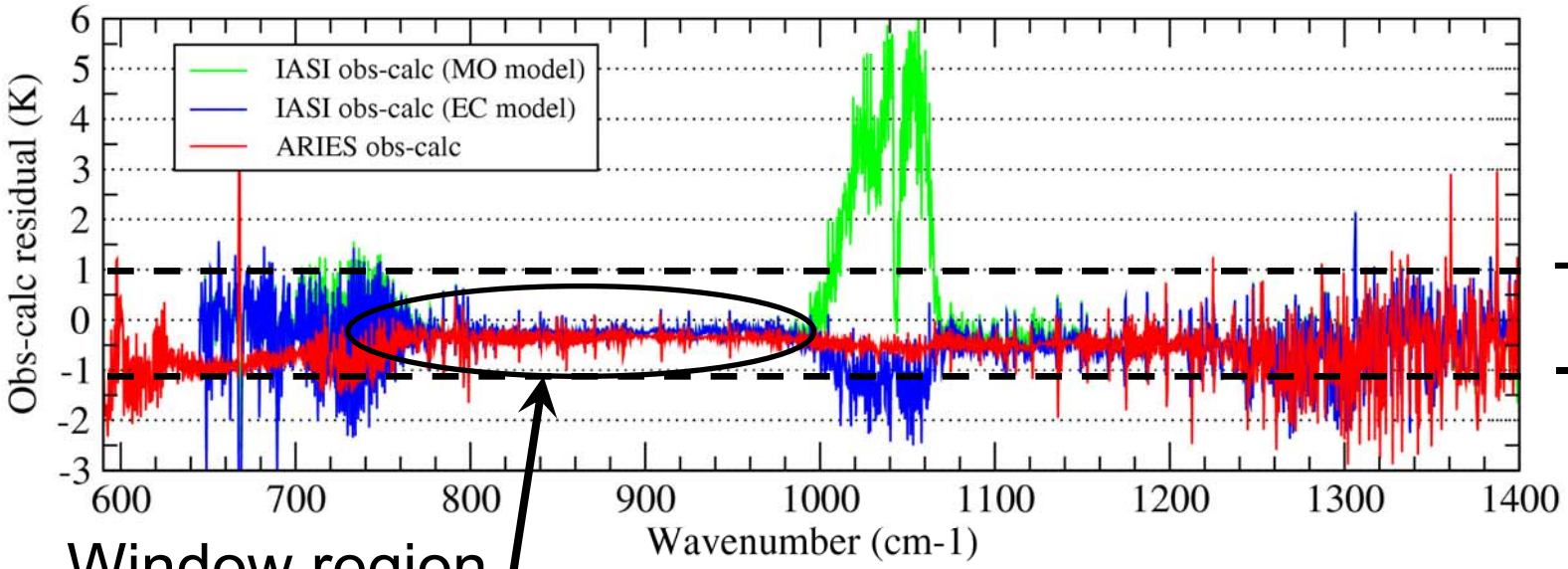
Model fields from Met Office UM and ECMWF analyses

**BAe 146 max alt.**

Dropsondes and FAAM 146 in situ measurements

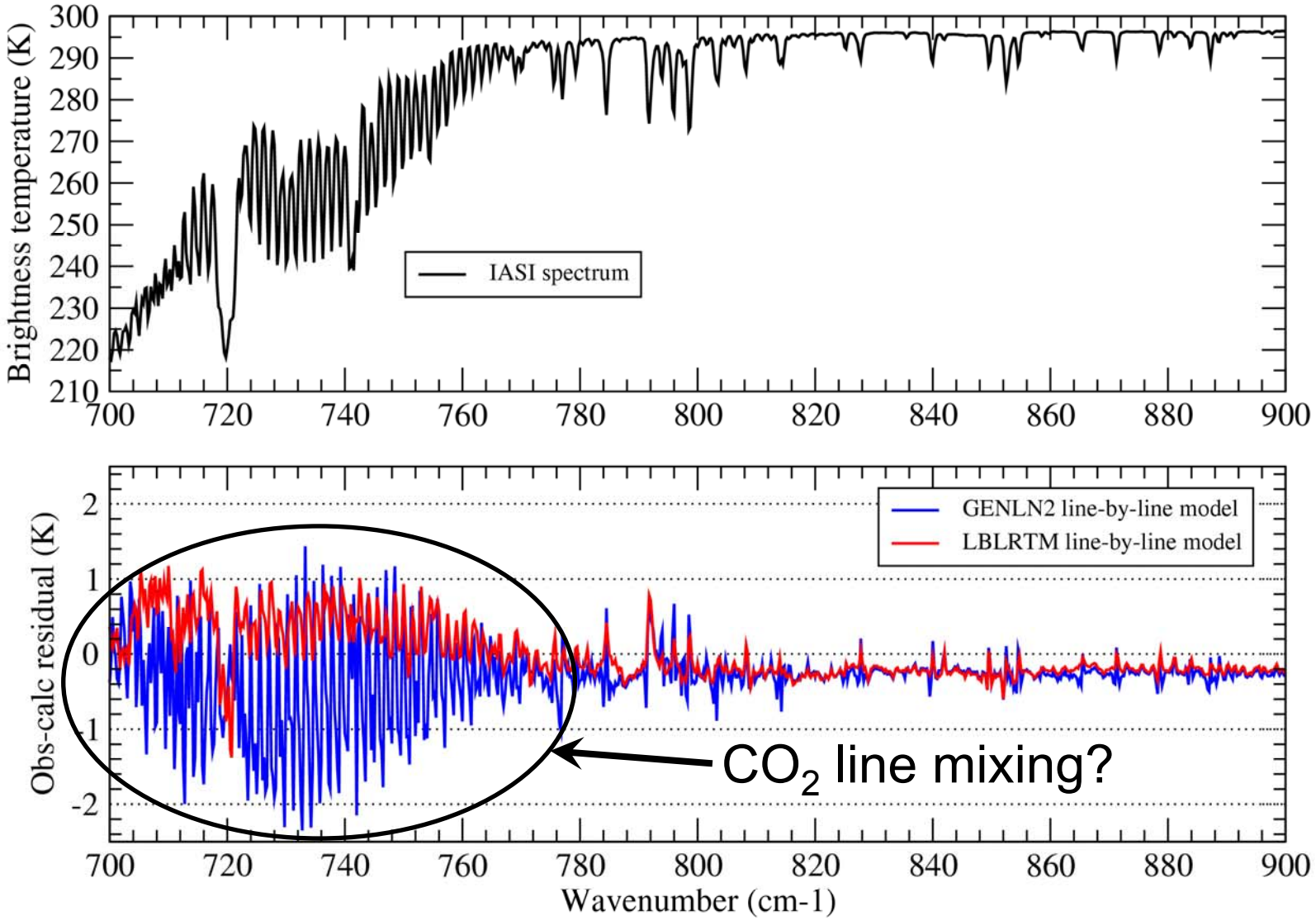
# Radiance validation 30/4/07

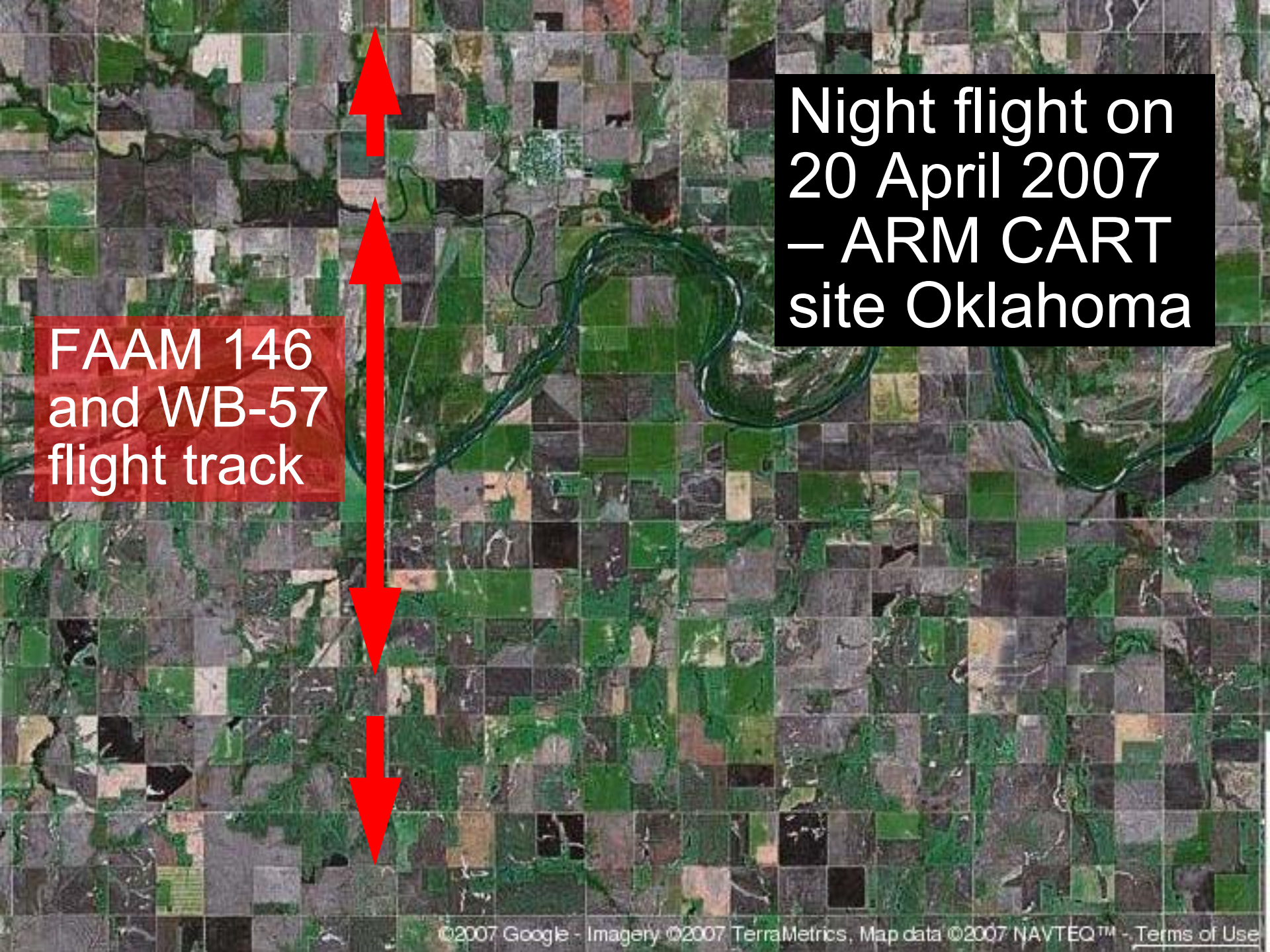



Window region residual ≈ −0.2 K

# RT code differences




Night flight on 20 April 2007 – ARM CART site Oklahoma
FAAM 146 and WB-57 flight track
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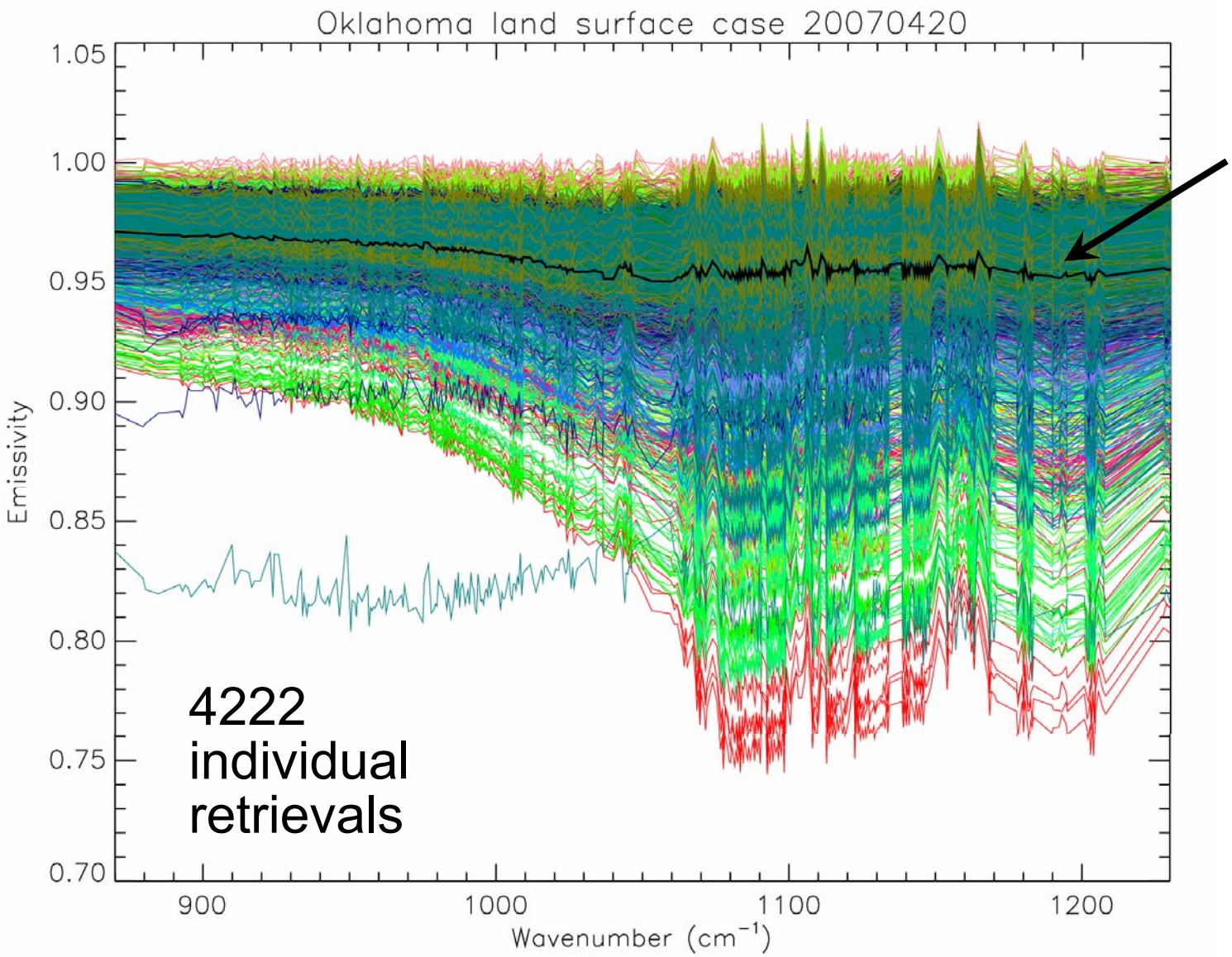
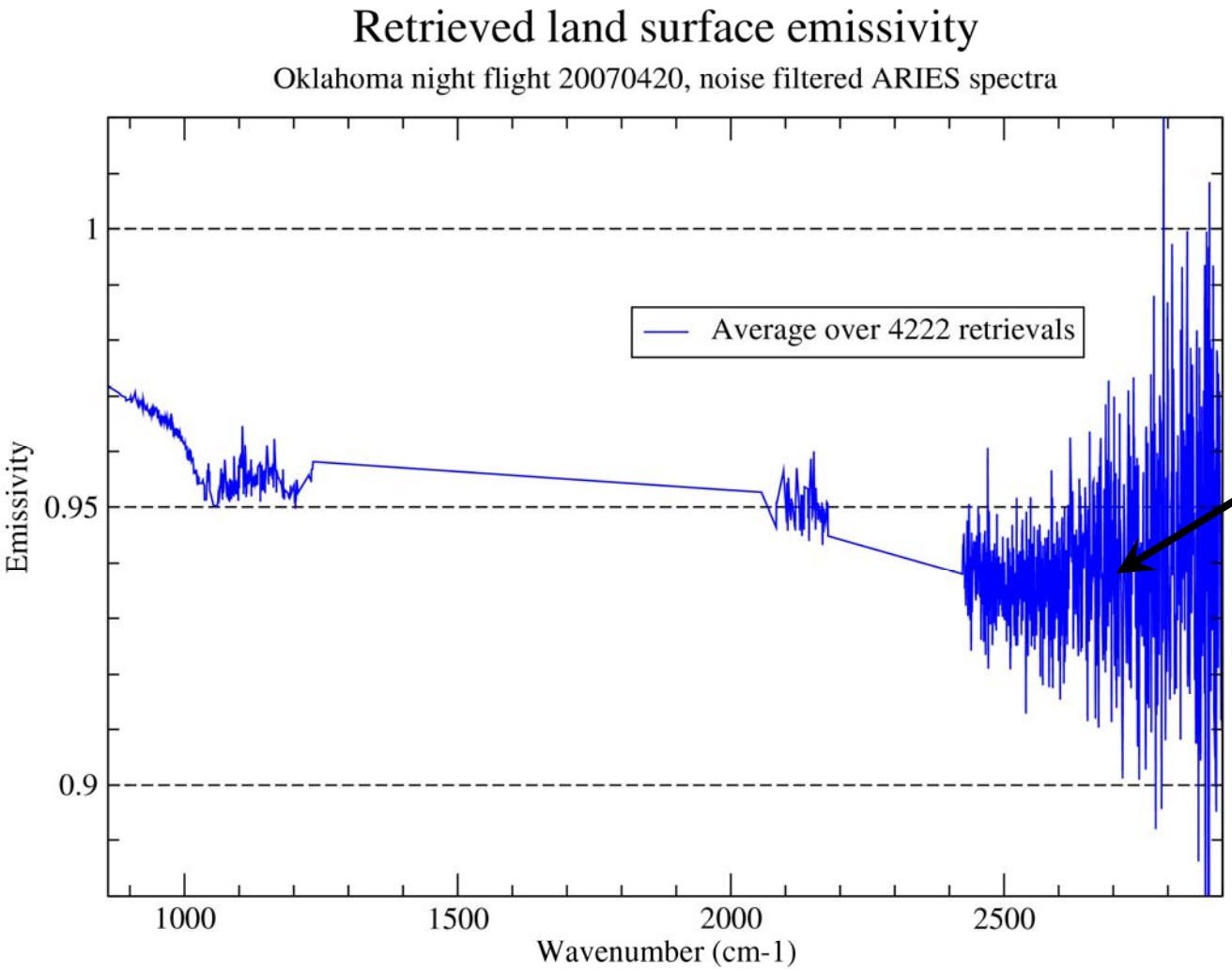
# Oklahoma emissivity



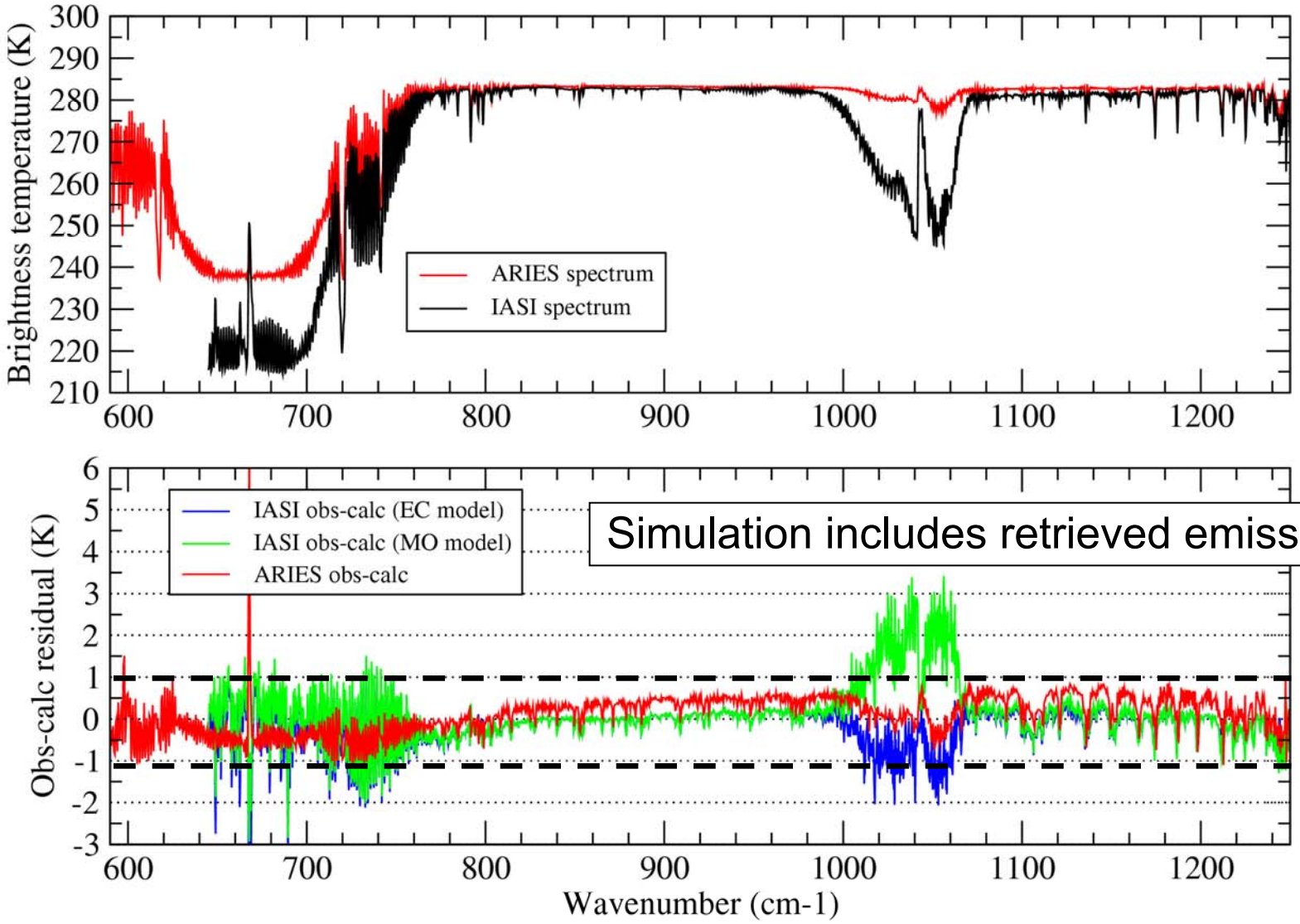

Average emissivity spectrum

# Oklahoma emissivity cont.

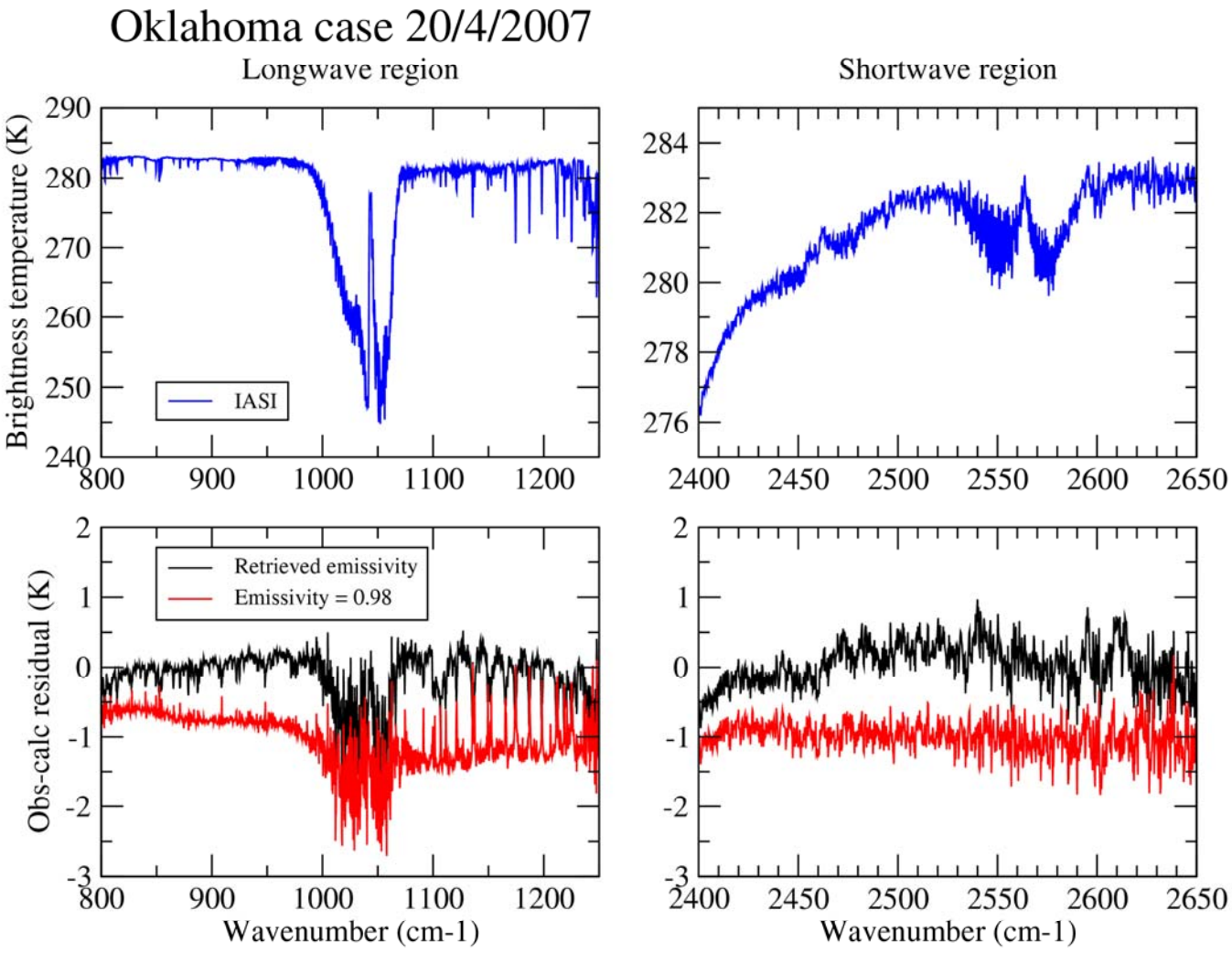



Reduced emissivity at higher wavenumbers

# Radiance validation 20/4/07



# Dependence on emissivity

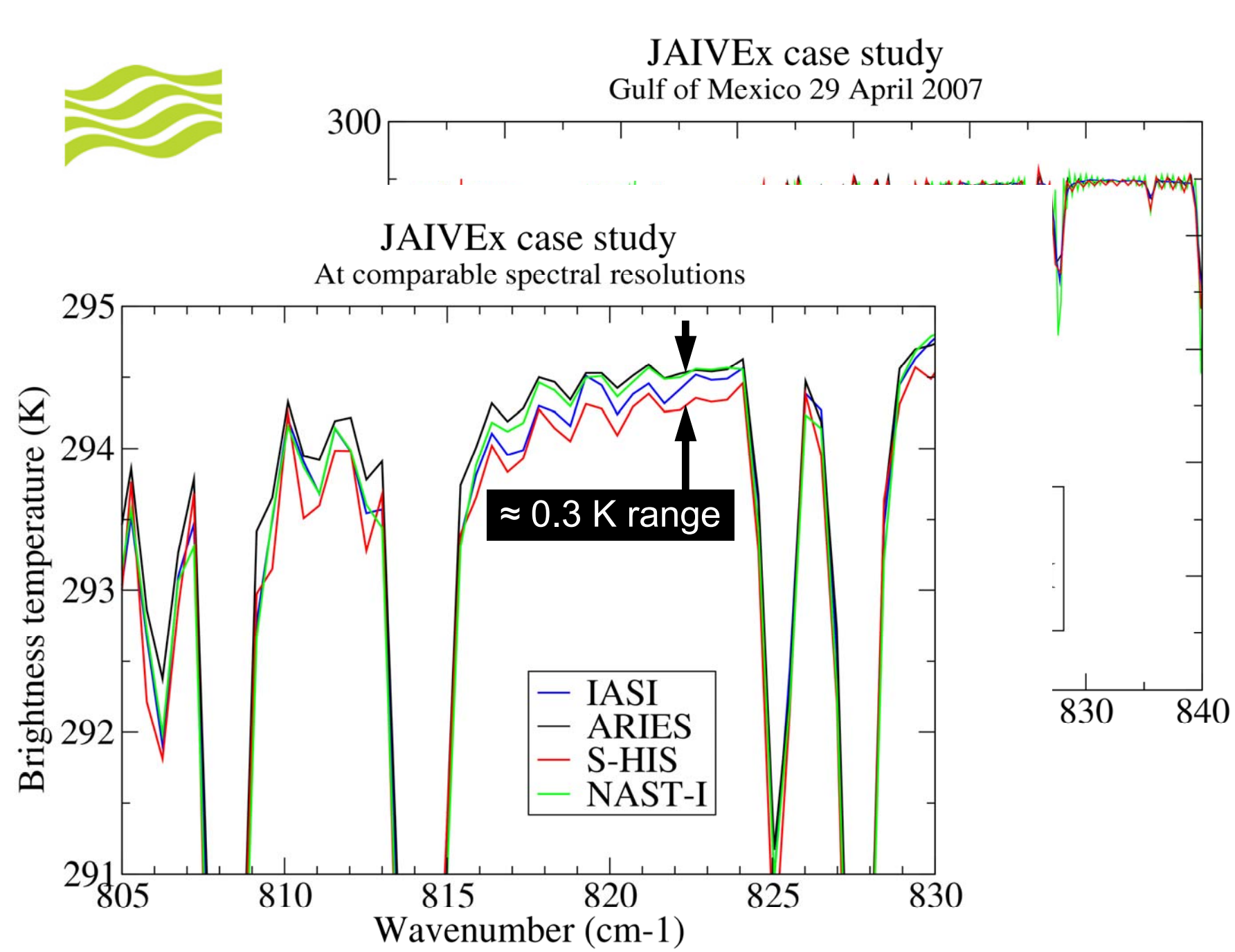



Residuals closer to zero with retrieved emissivity and temperature

# Case studies

# JAIVEx case studies

- JAIVEx science team initiative to maximise use of campaign data set
- Case studies have been identified: well-characterised subset of data
- Clear-sky radiance fields of view selected
- Collocated atmospheric profiles provided
- Representative surface parameters included
- Freely available for academic research


JAIVEx case study
Gulf of Mexico 29 April 2007
300
830
840
JAIVEx case study
At comparable spectral resolutions
295
294
293
292
291
Brightness temperature (K)
≈ 0.3 K range
IASI
ARIES
S-HIS
NAST-I
805
810
815
820
825
830
Wavenumber (cm-1)

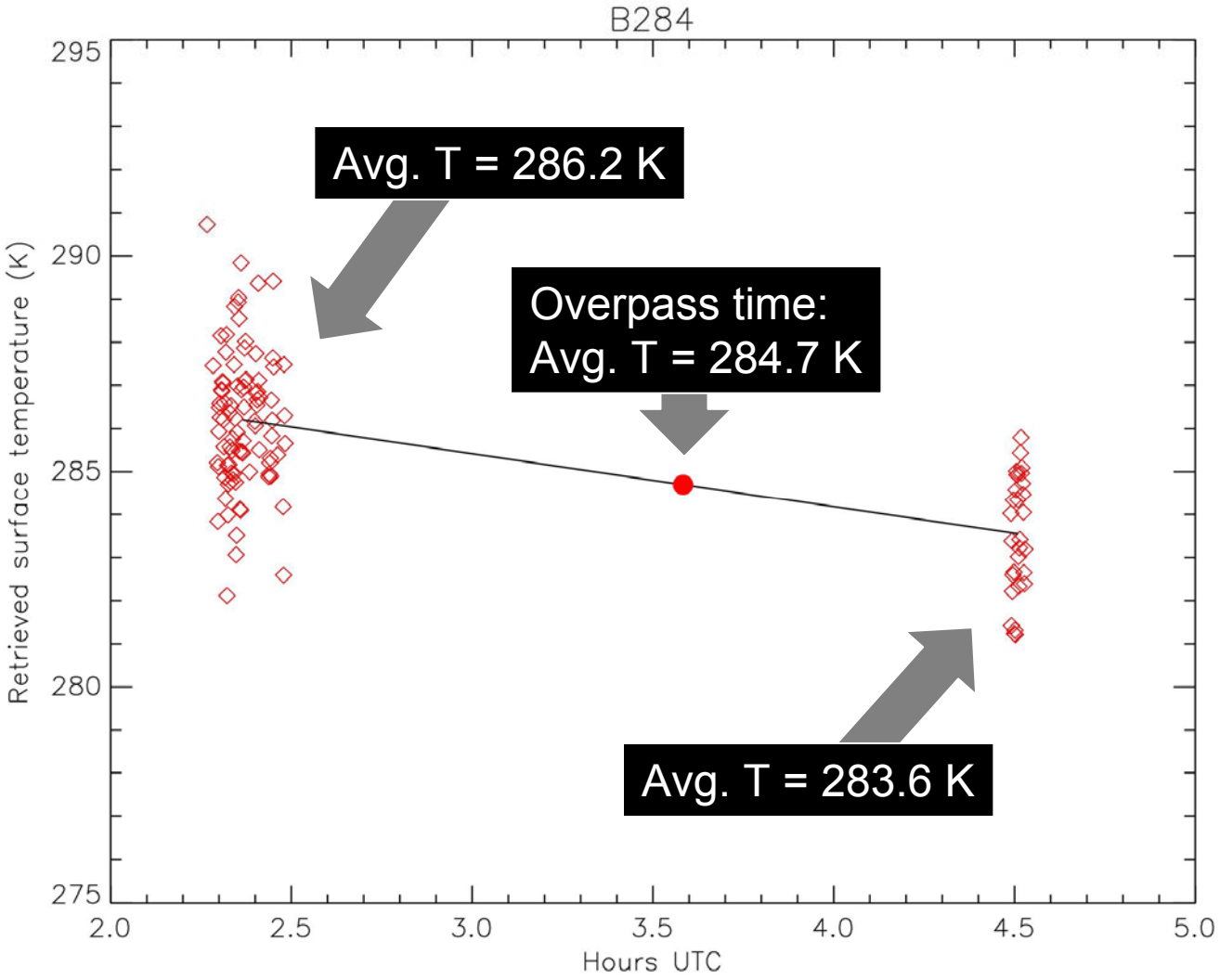
# Conclusions

- JAIVEx represents a comprehensive data set for IASI cal/val and testing of retrieval algorithms
- IASI radiometric calibration validated to within 0.2-0.3 K both against other interferometers and best simulations
- ARIES retrieved land surface emissivity and skin temperature shows some skill when included in simulations of spectra from altitude
- JAIVEx case studies are available now to exploit this data set

# Questions and answers

# Oklahoma, 19 April 2007 (surface retrievals)

ARIES retrieved surface temperature from runs at 3000 feet



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