



Direct radiance validation of IASI - results from JAIVEx

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- IASI direct radiance validation
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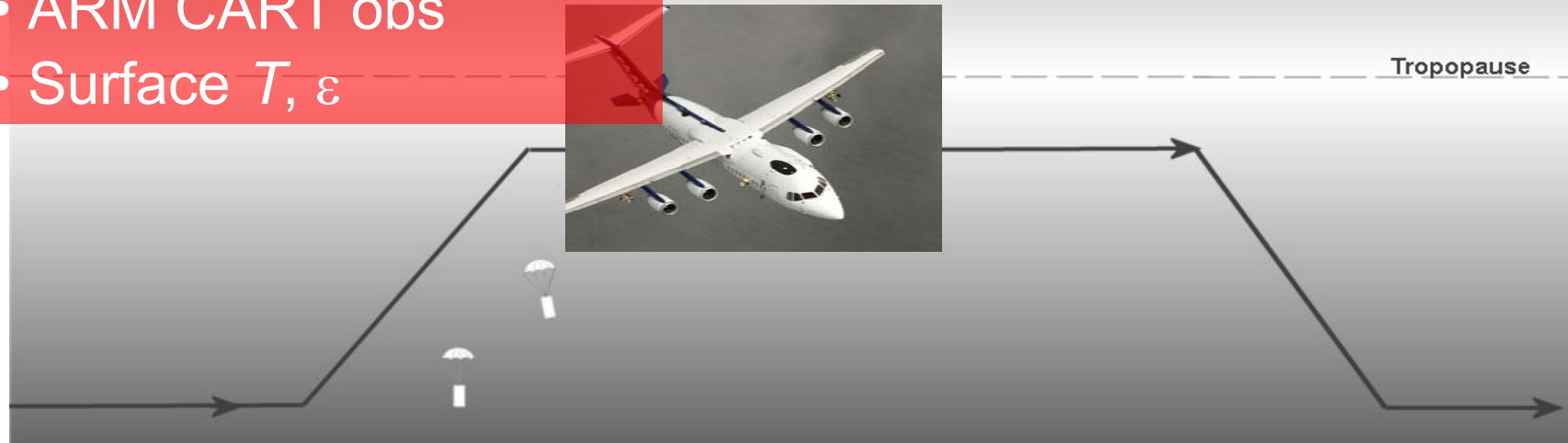


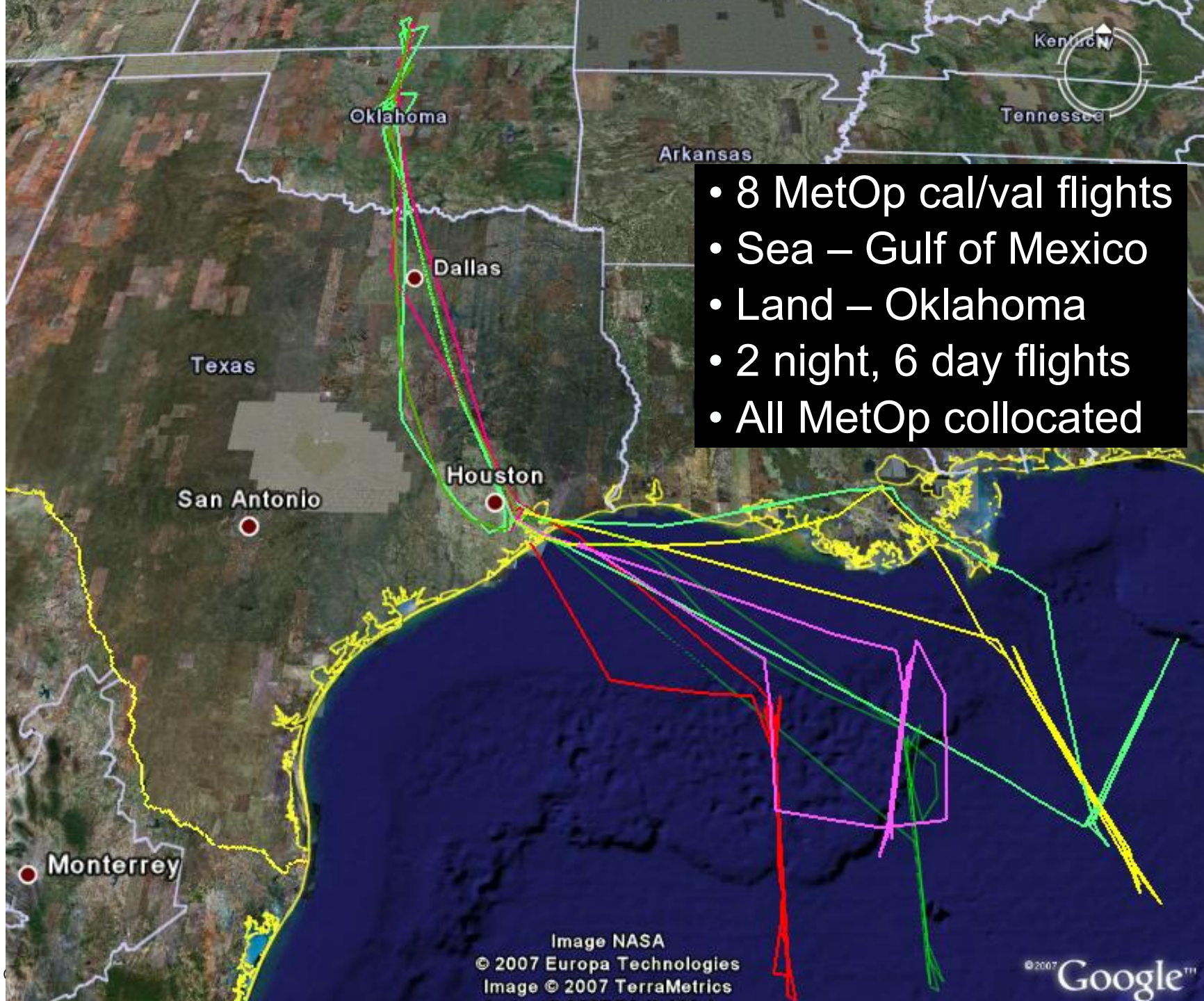
JAIVEx overview

- The **J**oint **A**irborne **I**ASI **V**alidation **E**xperiment (**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, ε

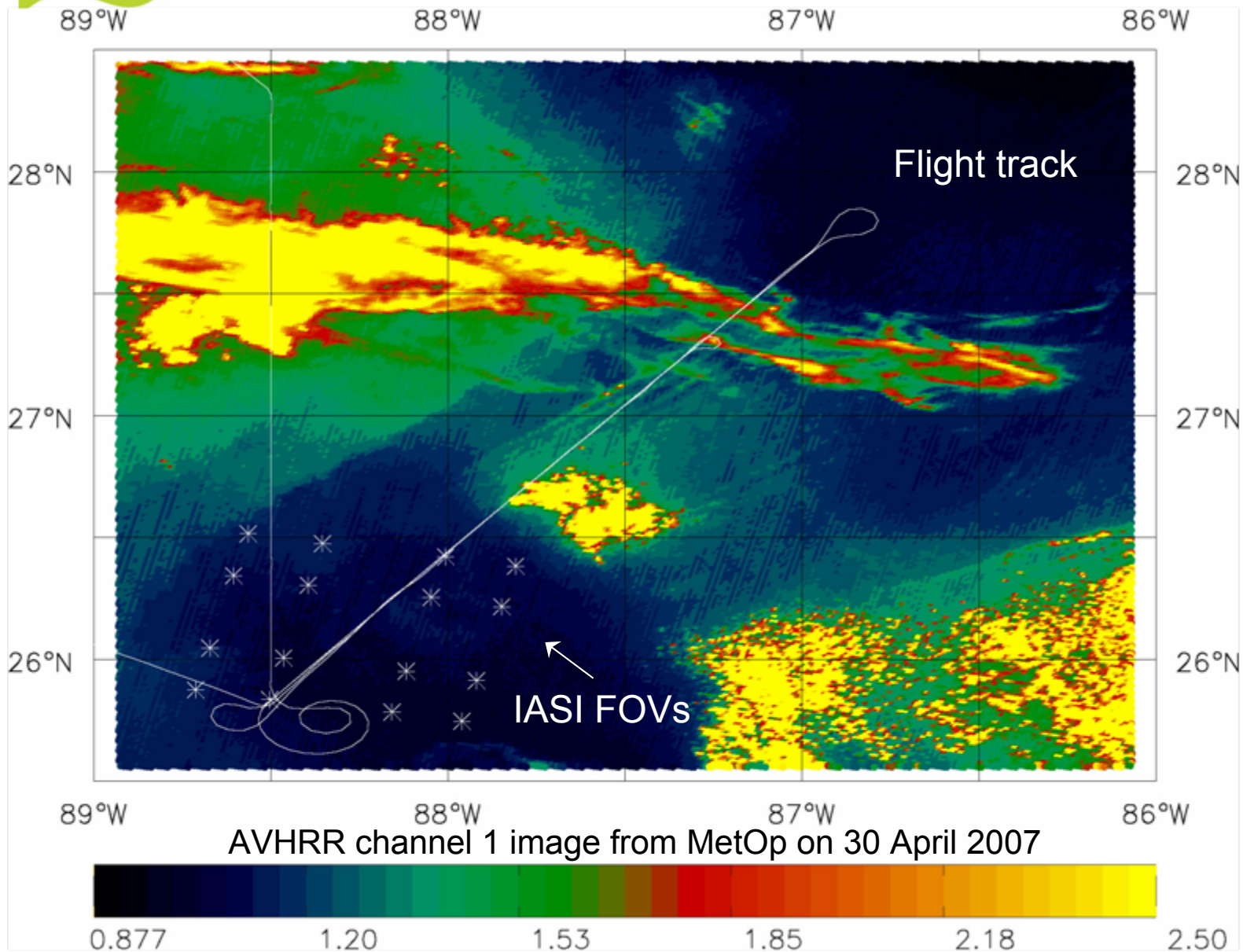




- 8 MetOp cal/val flights
- Sea – Gulf of Mexico
- Land – Oklahoma
- 2 night, 6 day flights
- All MetOp collocated



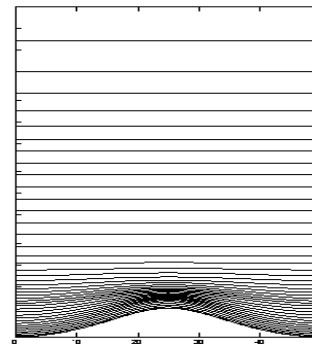
Gulf of Mexico 30/4/2007



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)

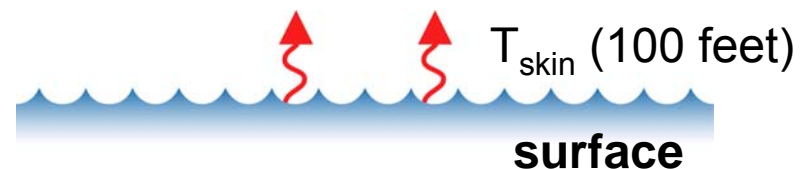


Model fields from
Met Office UM and
ECMWF analyses

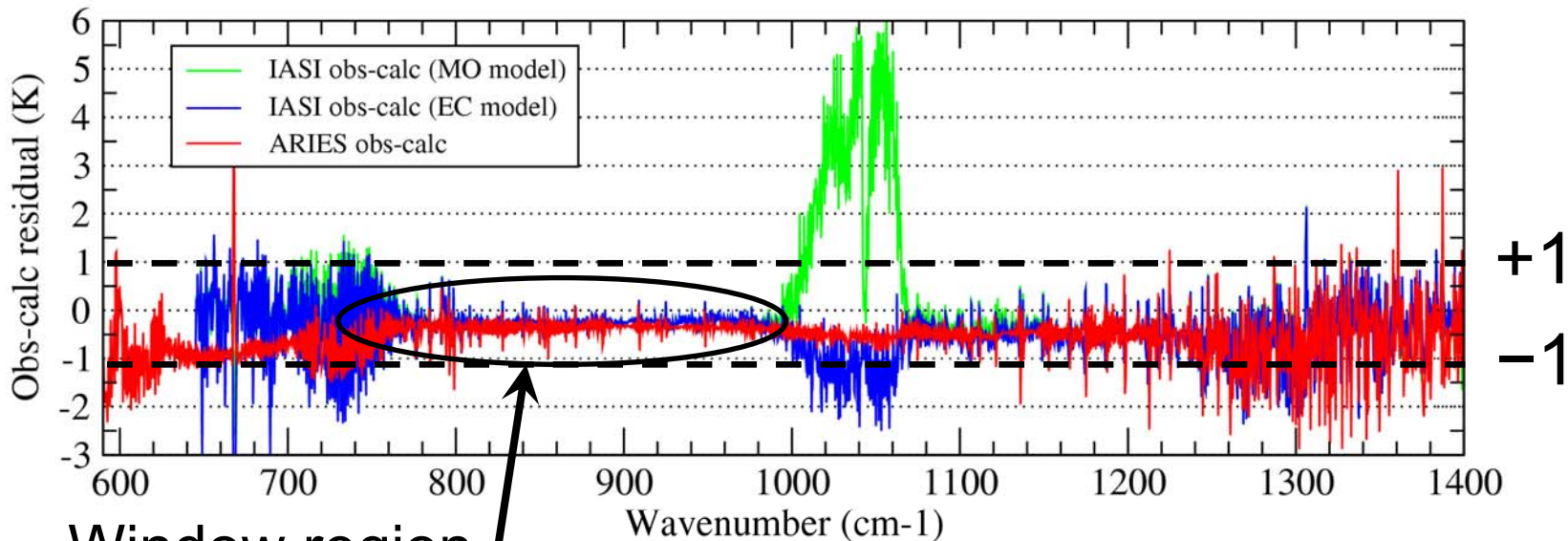
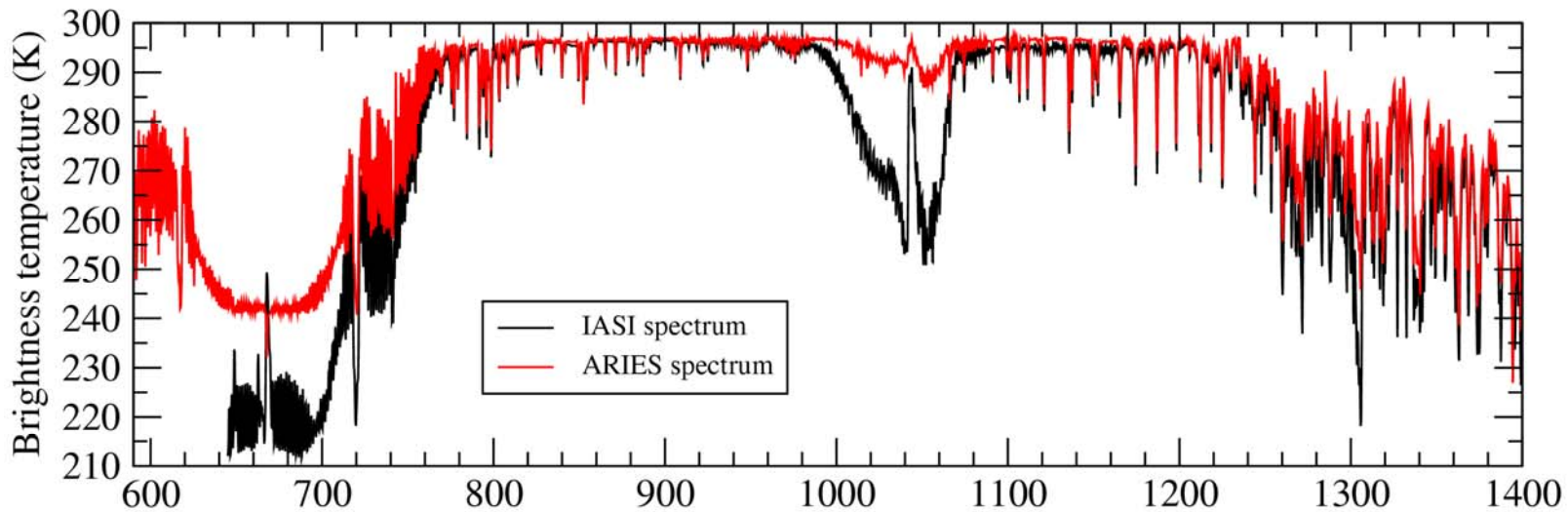
B Ae 146 max alt.



Dropsondes and
FAAM 146 in situ
measurements

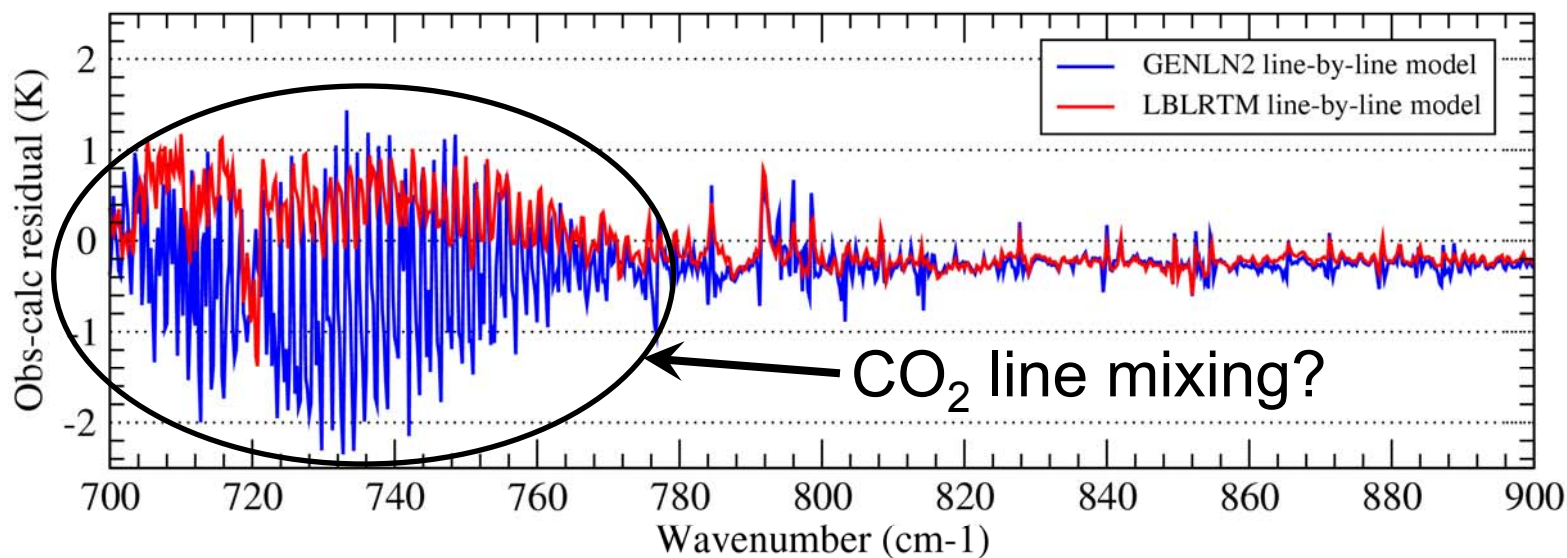
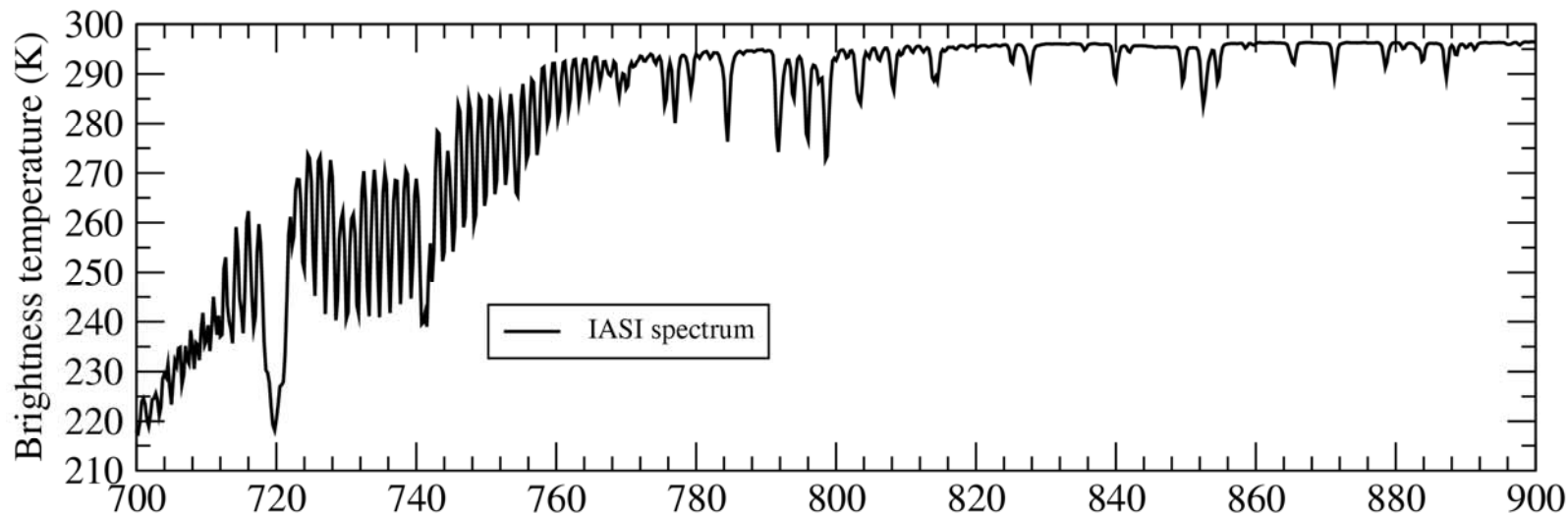


Radiance validation 30/4/07



Window region
residual ≈ -0.2 K

RT code differences



Night flight on
20 April 2007
– ARM CART
site Oklahoma

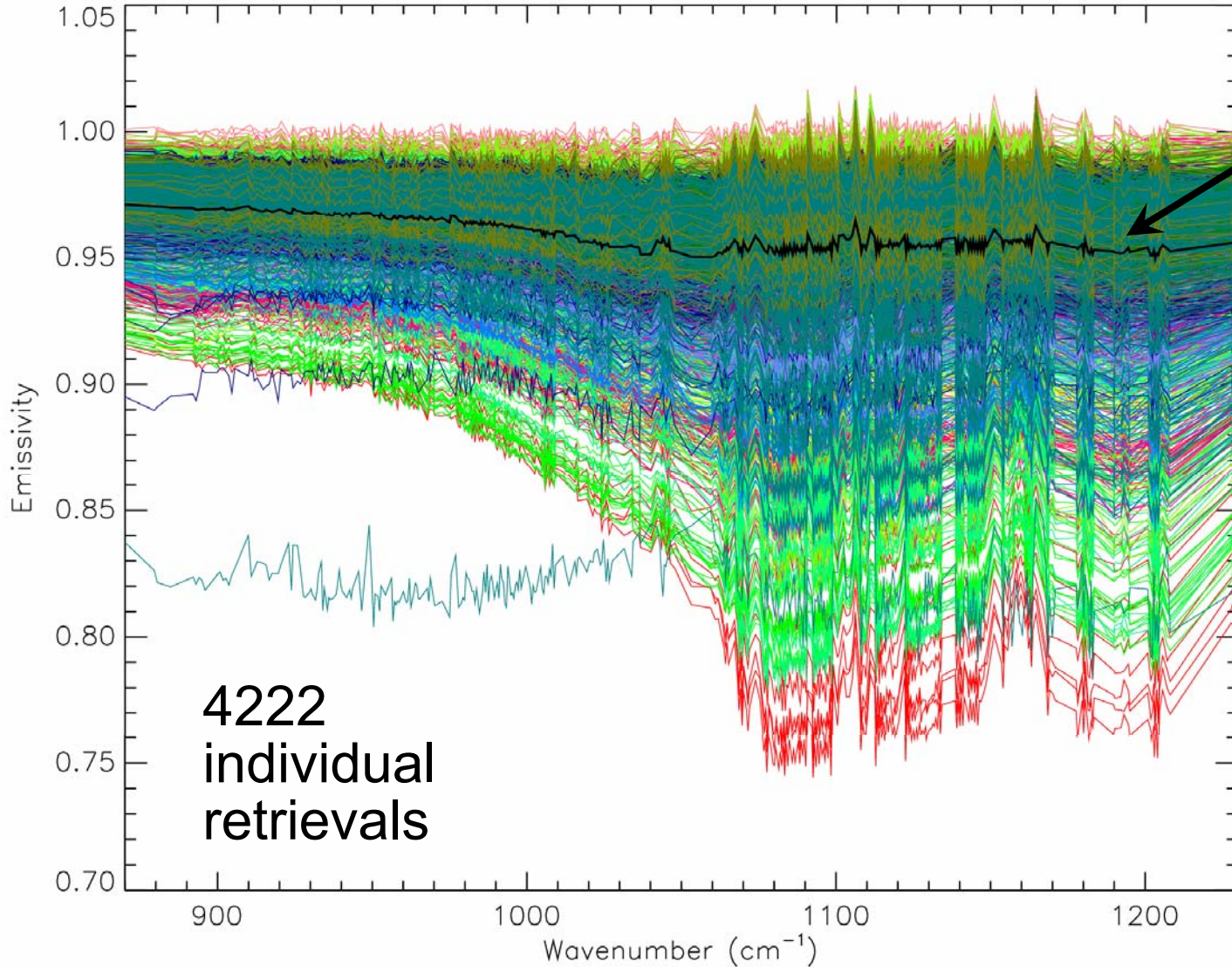
FAAM 146
and WB-57
flight track





Oklahoma emissivity

Oklahoma land surface case 20070420



Average
emissivity
spectrum

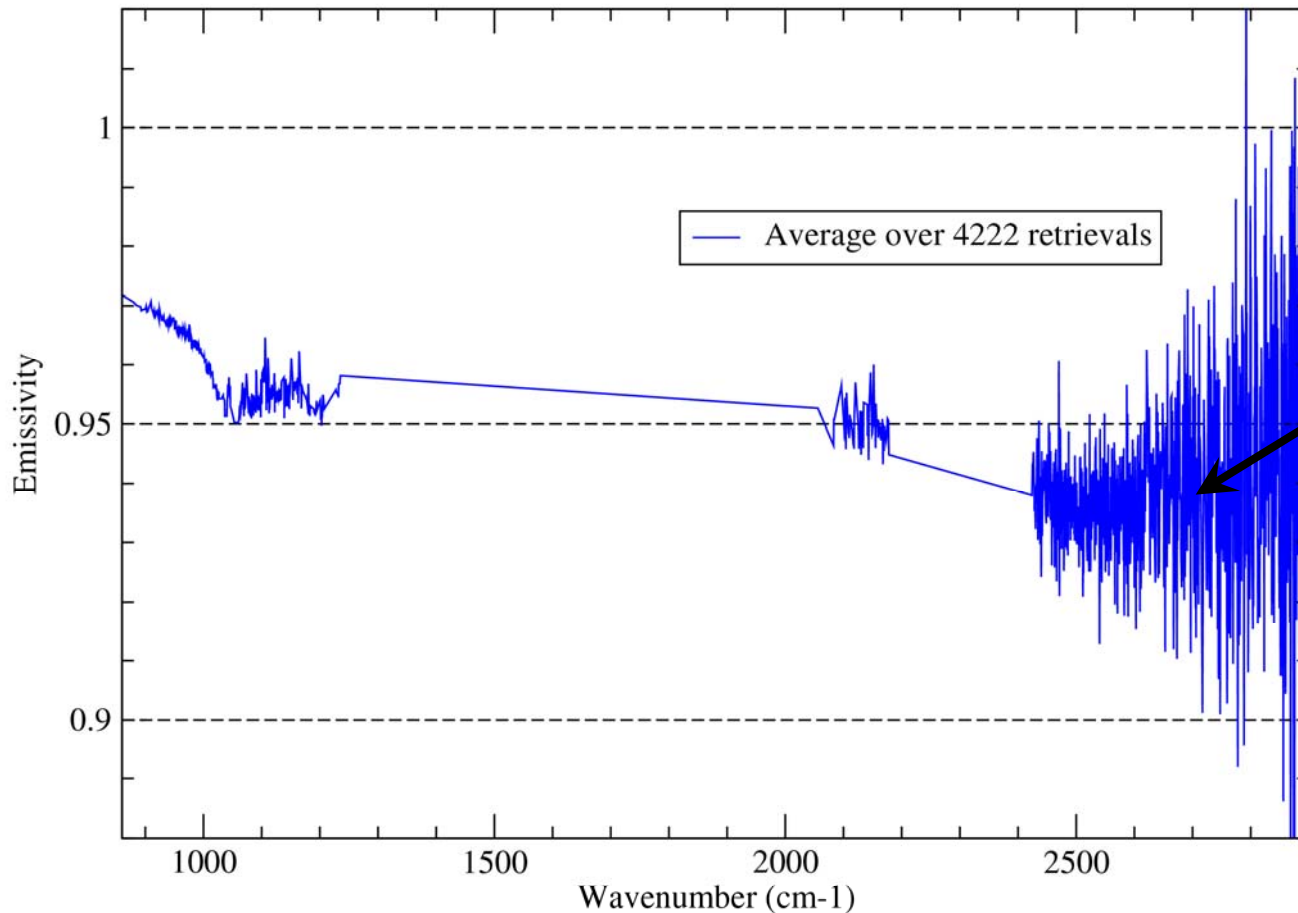
4222
individual
retrievals



Oklahoma emissivity cont.

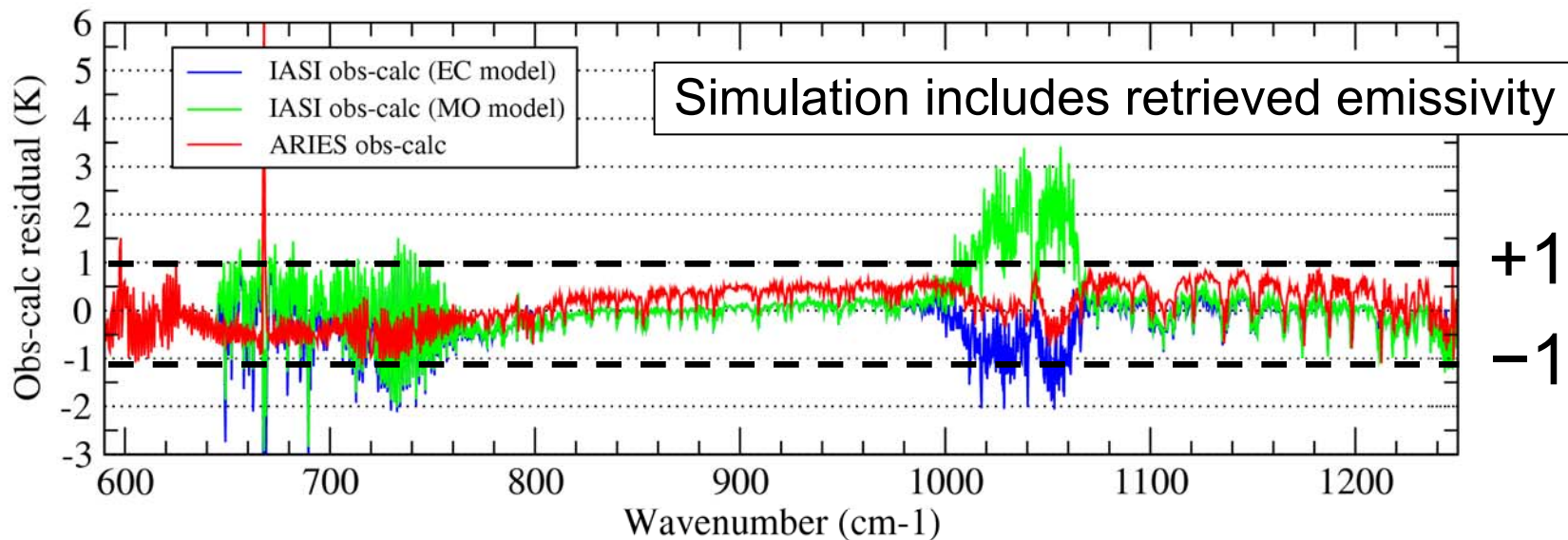
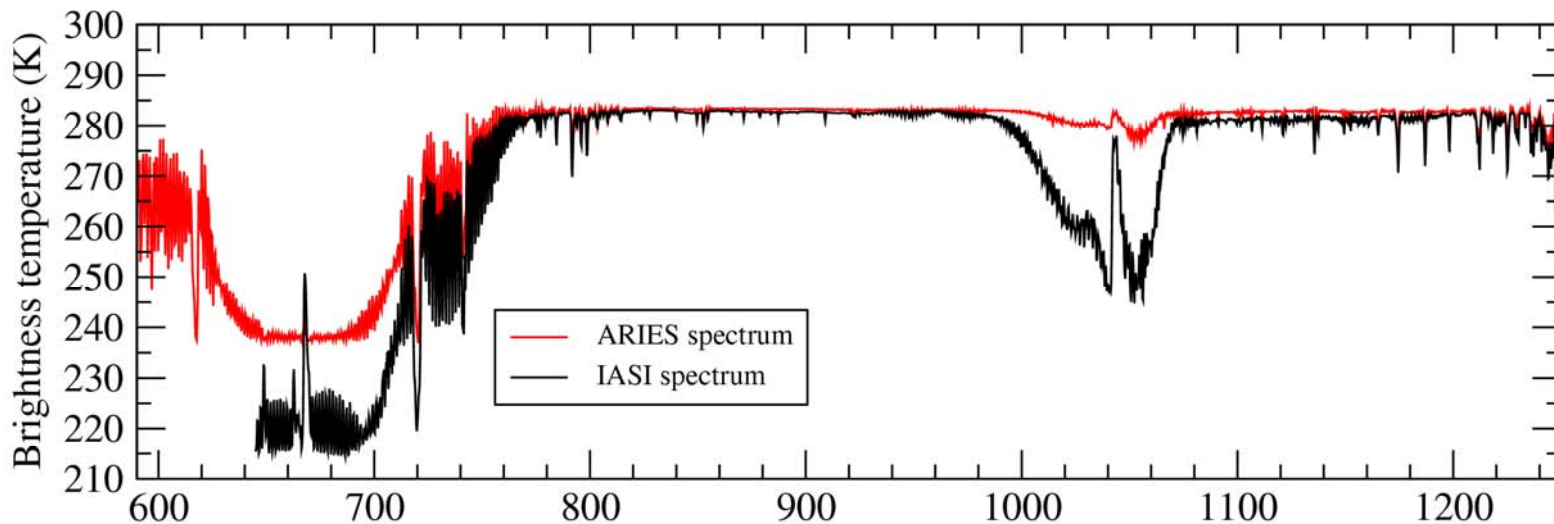
Retrieved land surface emissivity

Oklahoma night flight 20070420, noise filtered ARIES spectra



Reduced emissivity at higher wavenumbers

Radiance validation 20/4/07

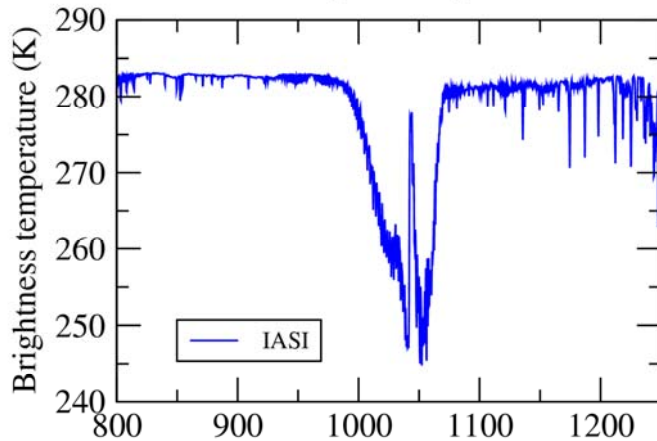




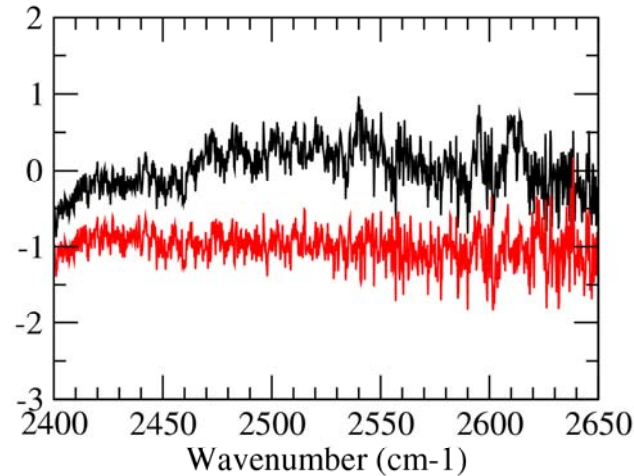
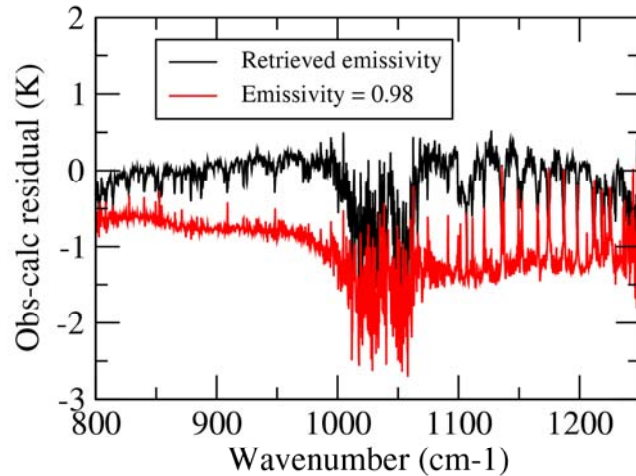
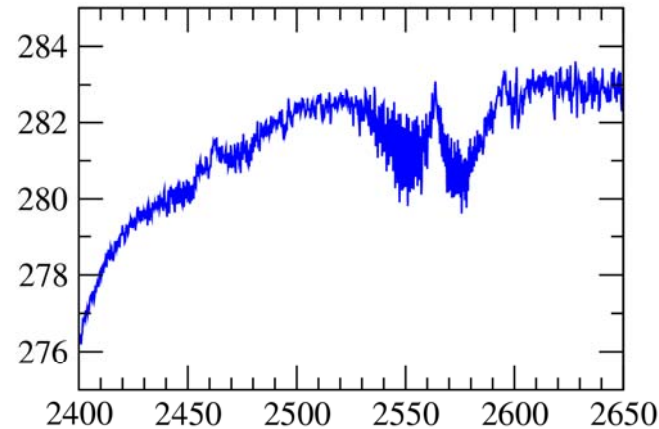
Dependence on emissivity

Oklahoma case 20/4/2007

Longwave region



Shortwave region



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



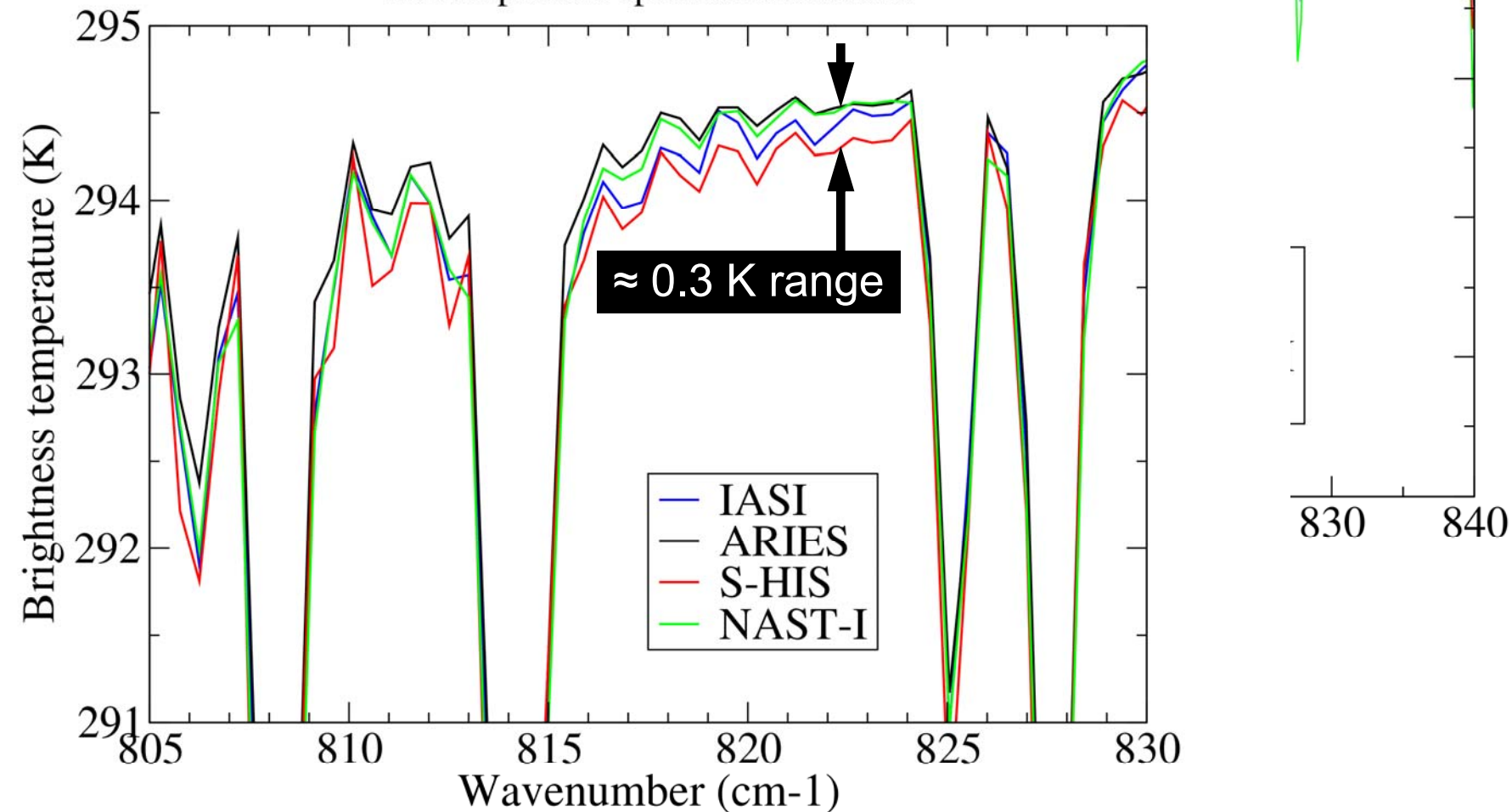
JAIVEx case study

Gulf of Mexico 29 April 2007



JAIVEx case study

At comparable spectral resolutions





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

