

Using NWP fields to characterise GIIRS

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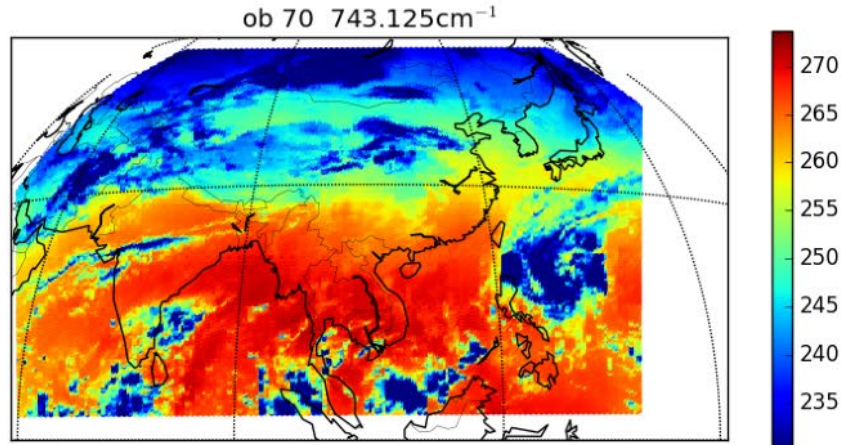


Motivation

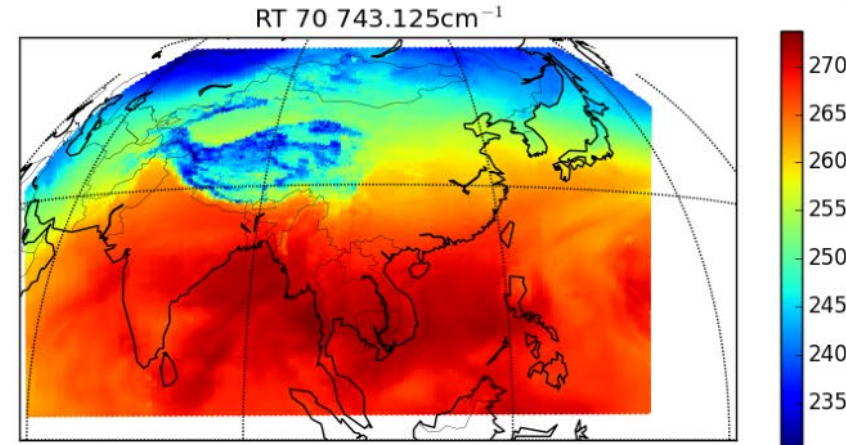
- Comparison of GIIRS with independent observations is useful, however NWP model fields are available at **all locations and times**.
- The drawback is that simulations are only available for cloud-free scenes.
- I will refer to **O-B** statistics a lot. This is observations minus model simulations (i.e. “backgrounds”).

Comparing GIIRS observations with NWP equivalents (lower trop).

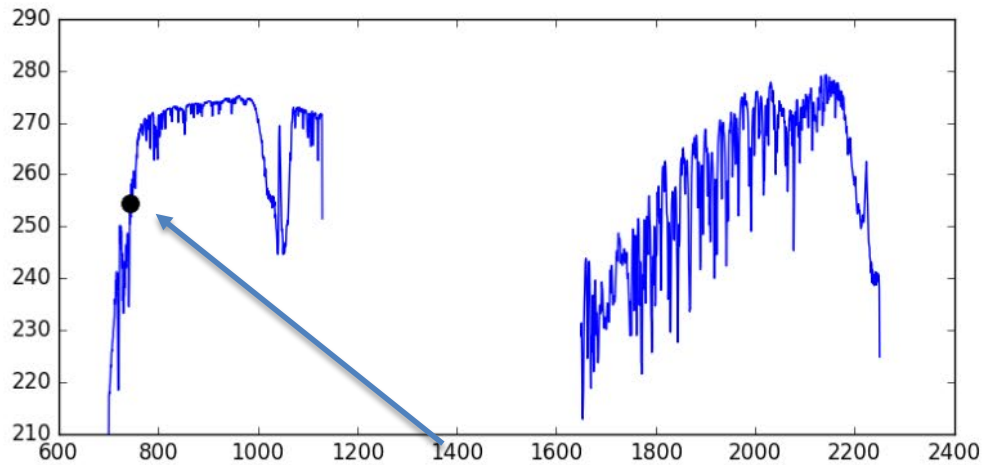
Obs (BT) from one scan



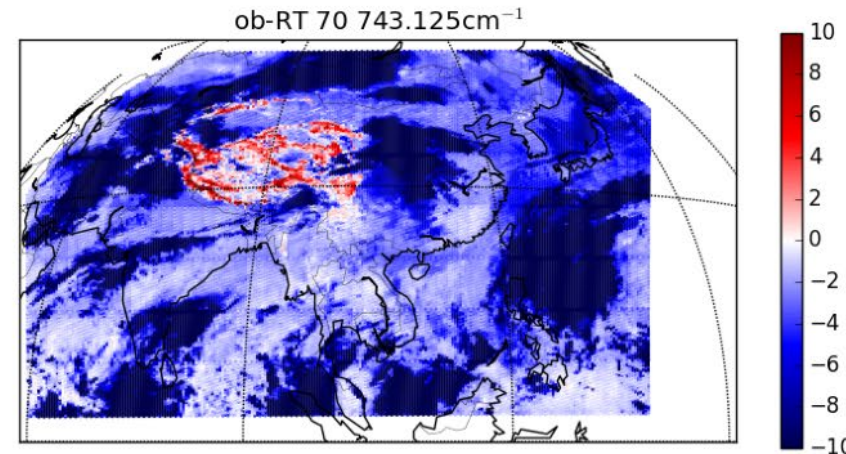
Clear sky simulations
(ECMWF analysis + RTTOV)



NWP-
SAF



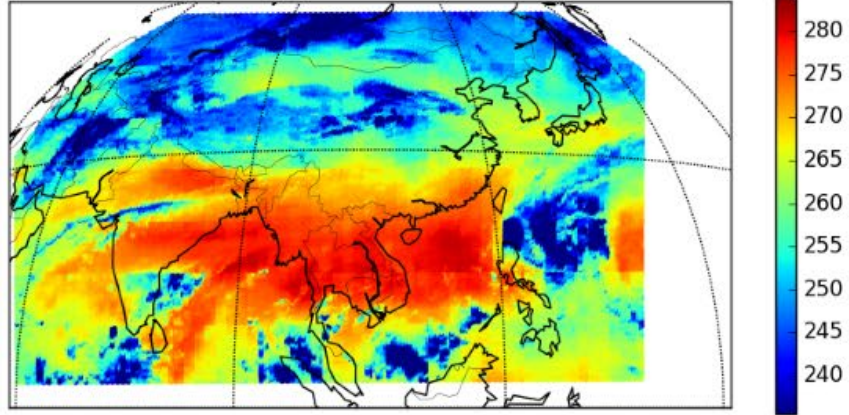
Spectrum indicating channel



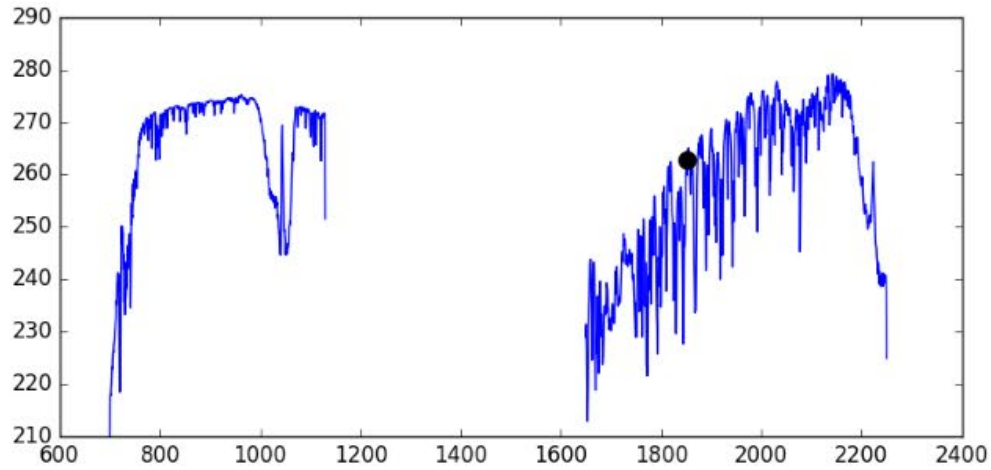
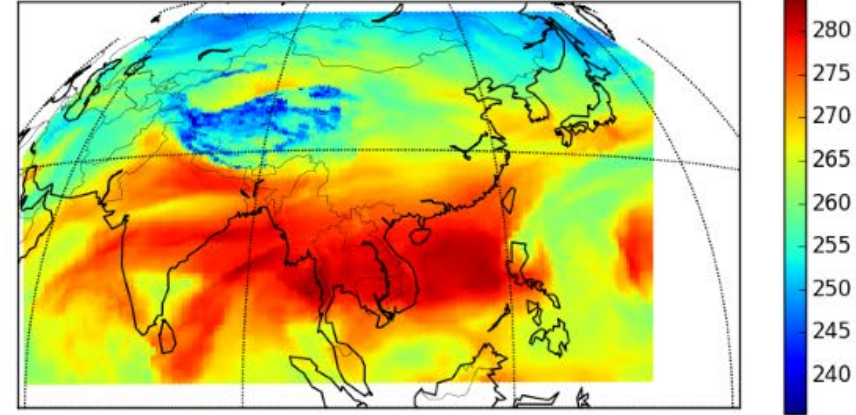
Obs minus simulations

Low peaking water-vapour (quite clean)...

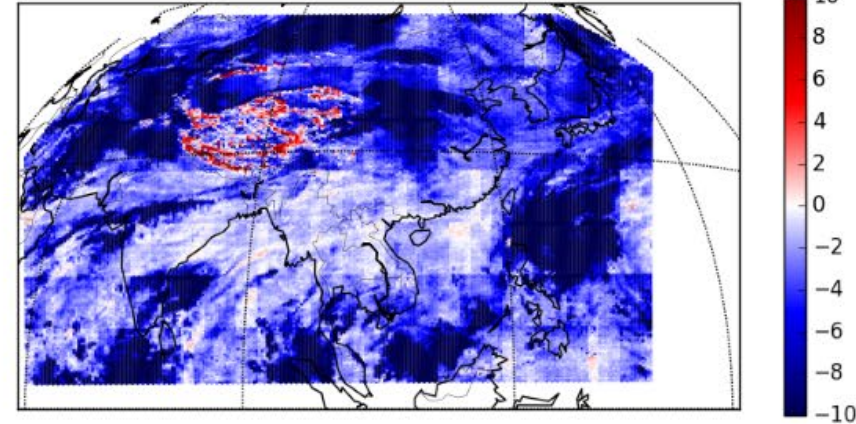
ob 1011 1850.625cm⁻¹



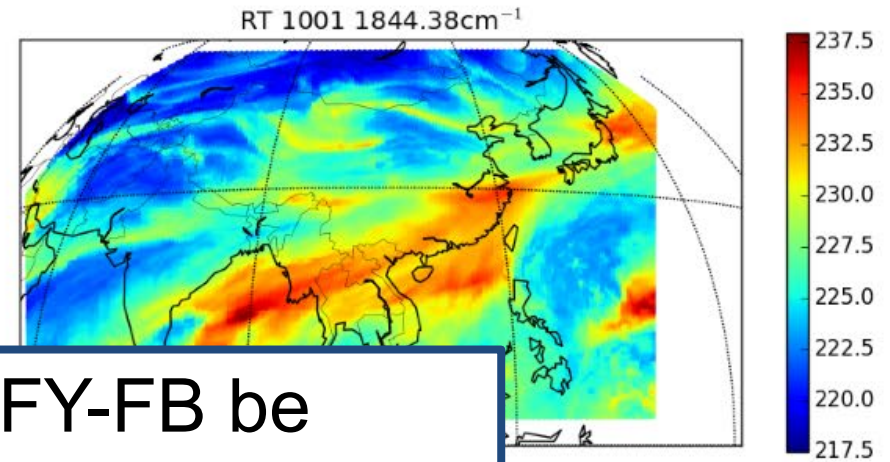
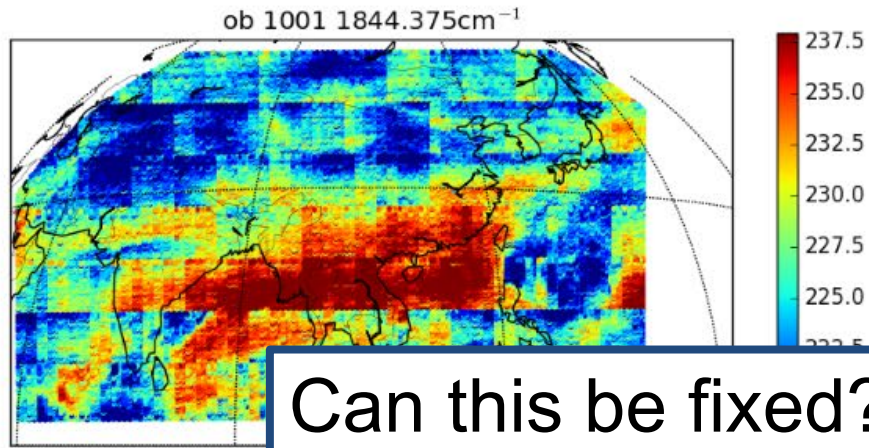
RT 1011 1850.62cm⁻¹



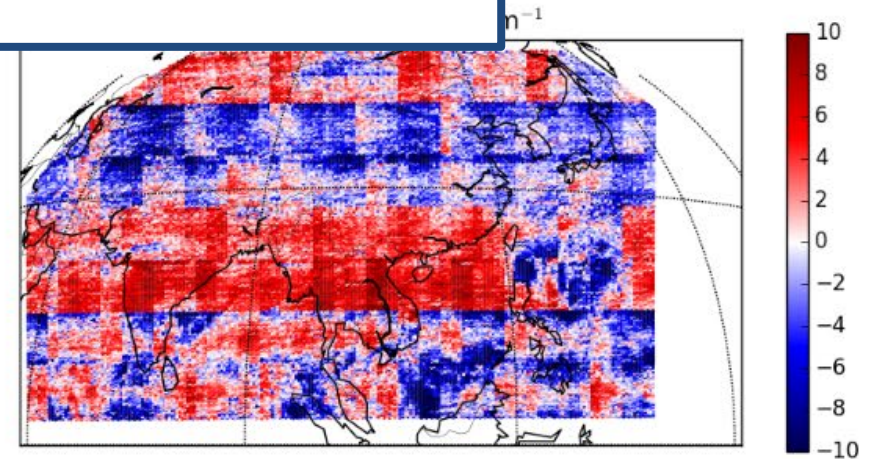
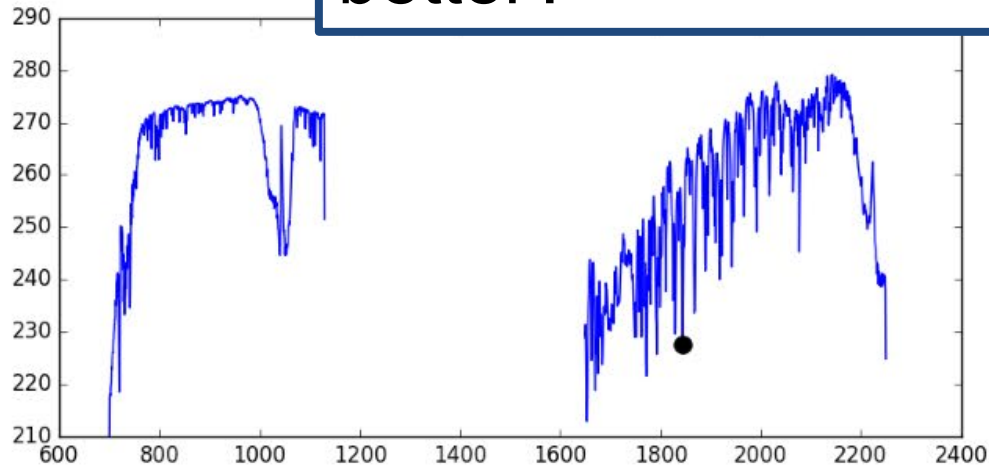
ob-RT 1011 1850.62cm⁻¹



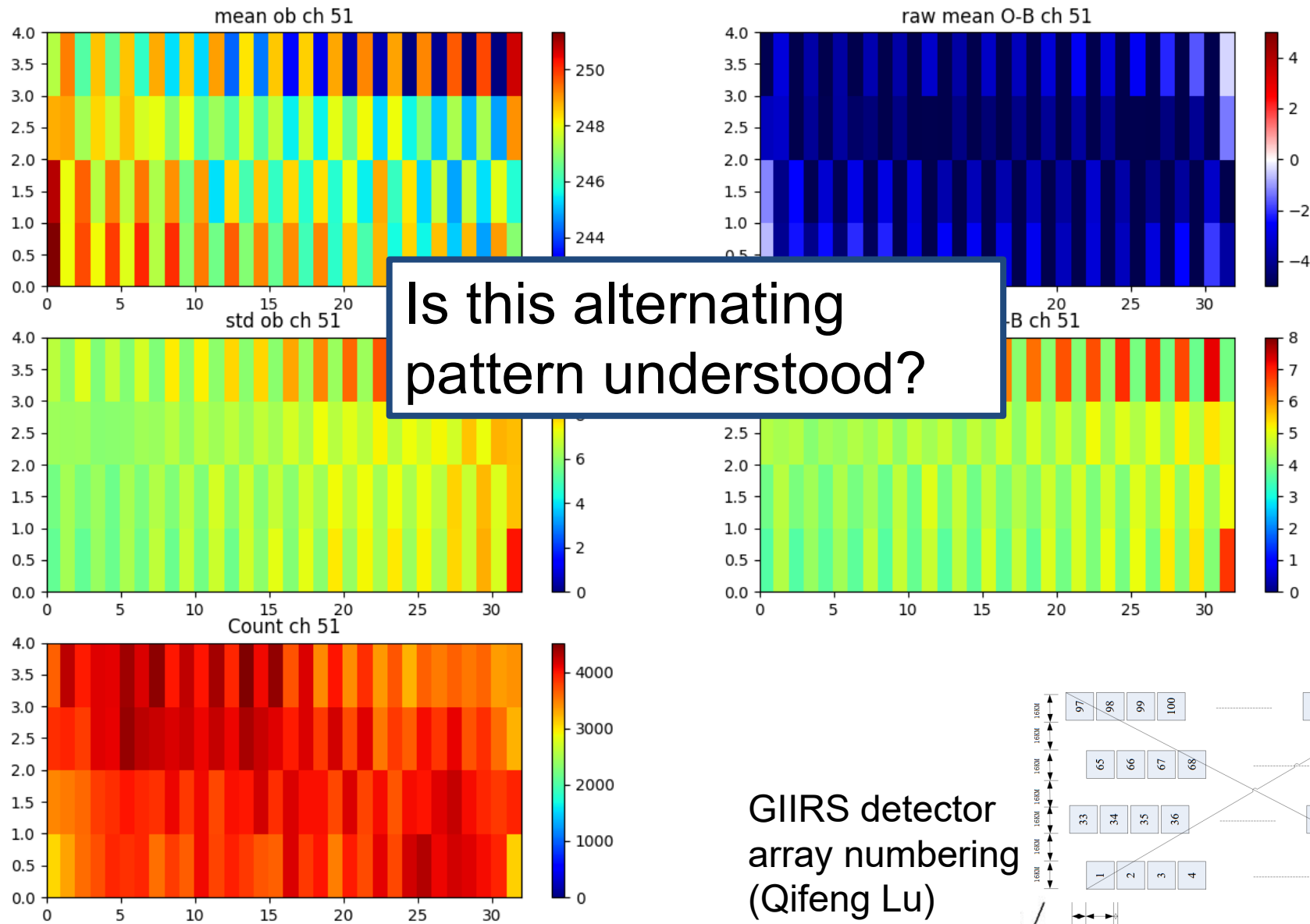
On a WV absorption line: noisy



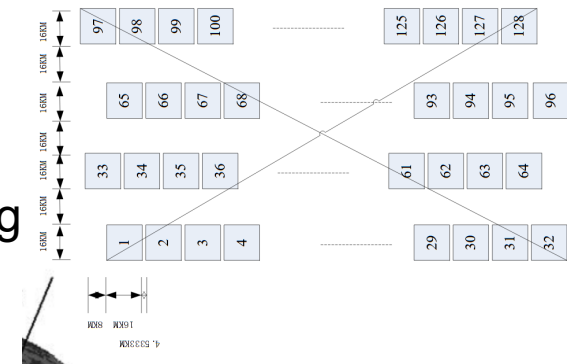
Can this be fixed? Will FY-FB be better?



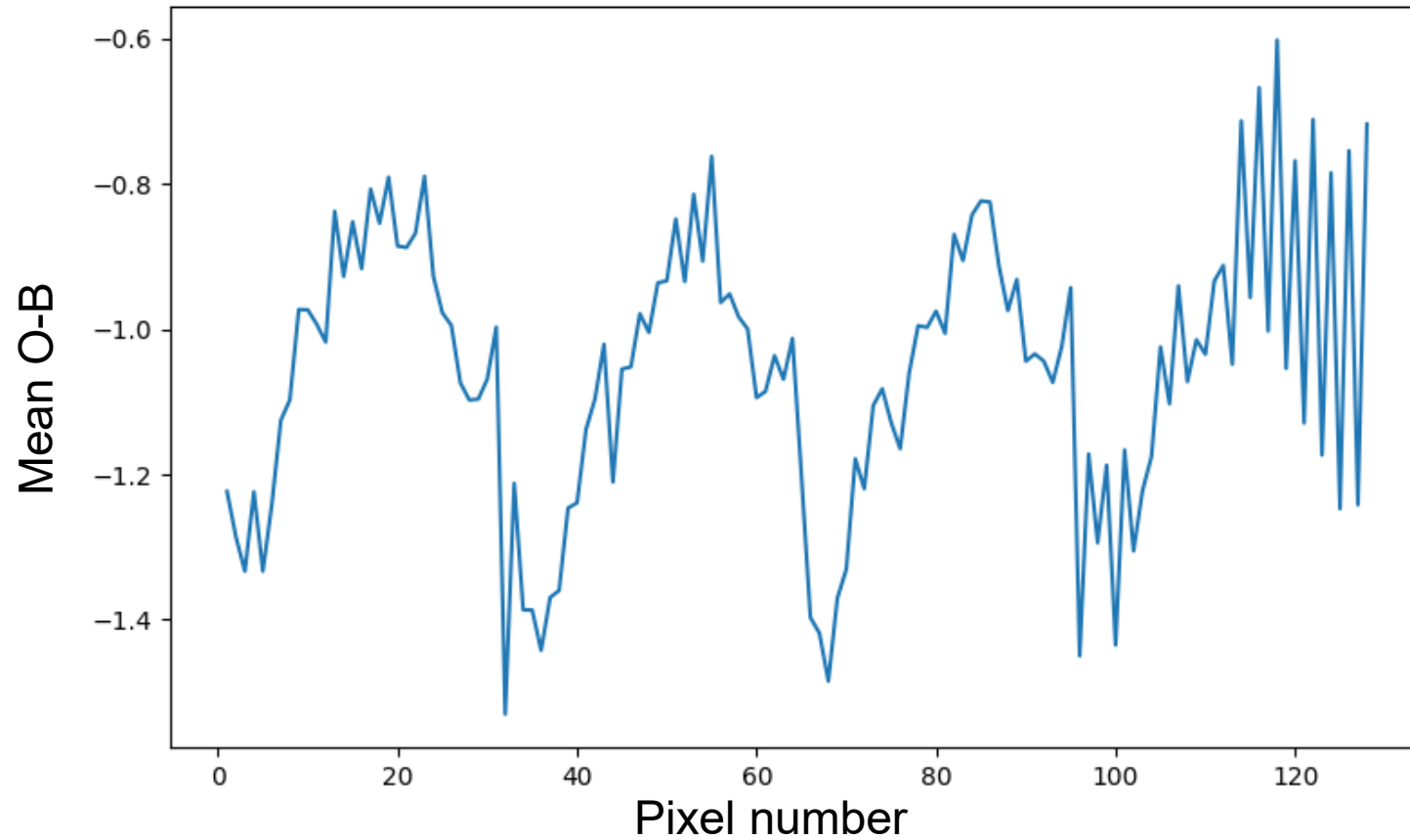
Across the detector array, there is a checkerboard-like bias pattern in LWIR.



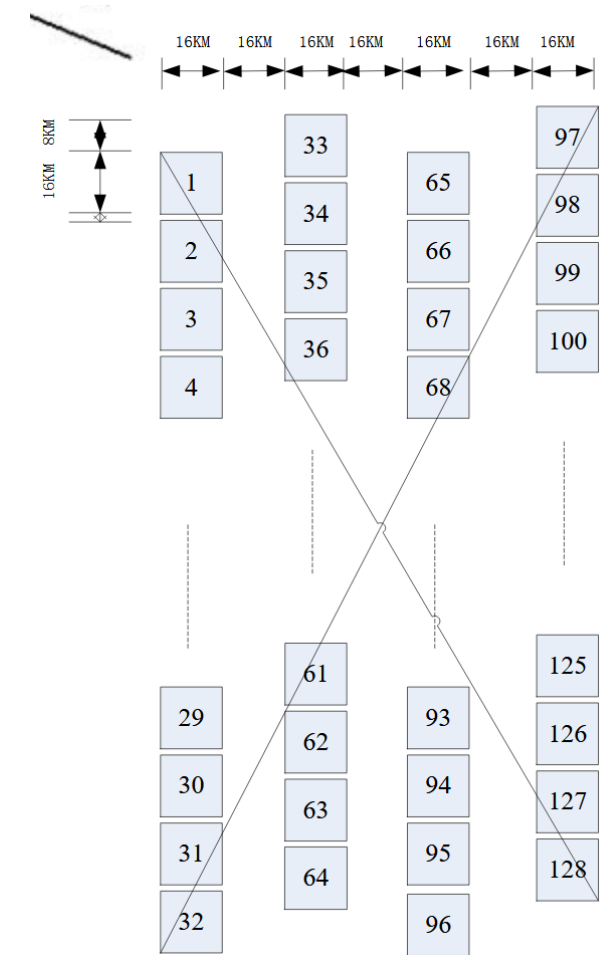
GIIRS detector array numbering (Qifeng Lu)



Temperature sounding channel 6 (703.125cm-1)

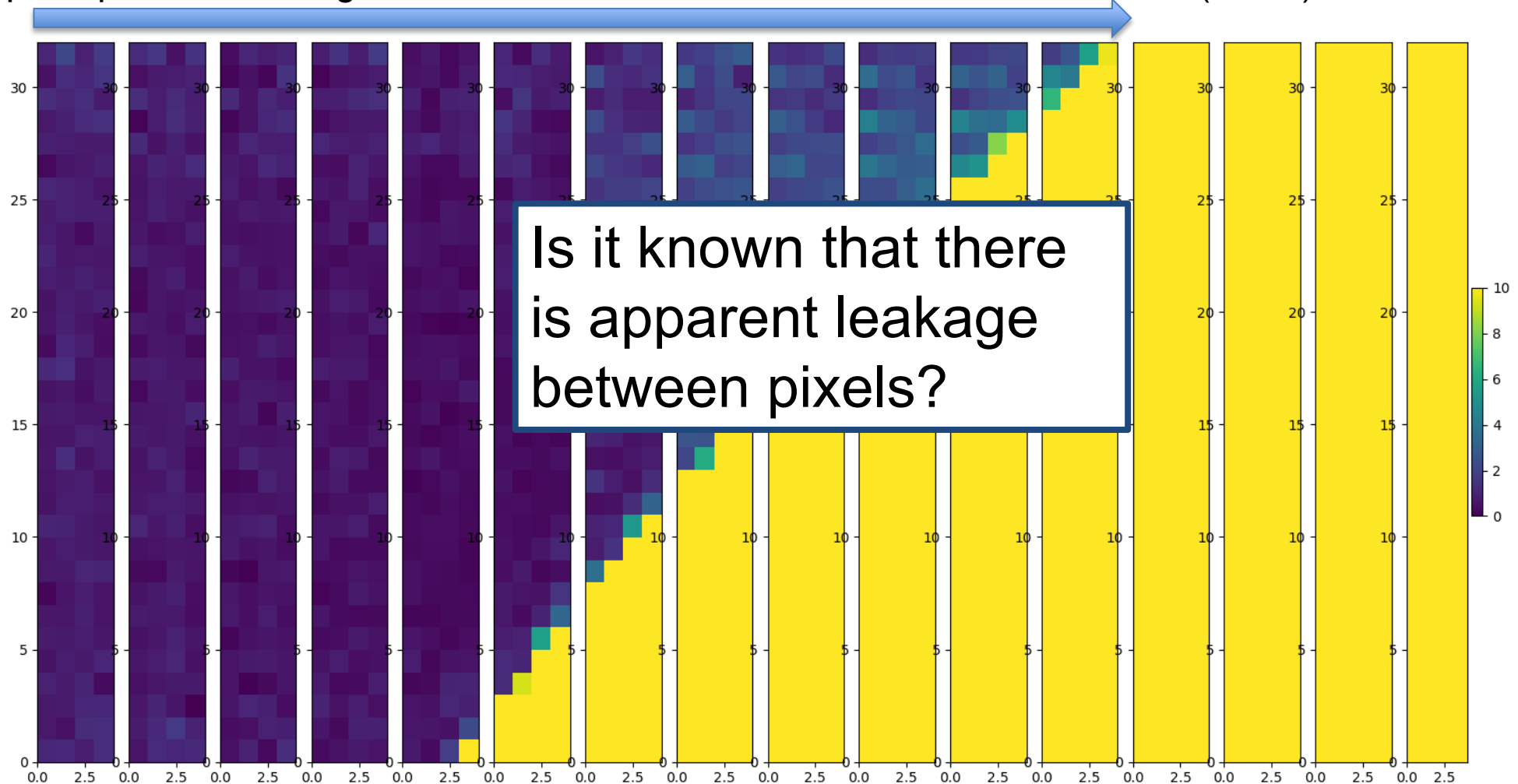


GIIRS detector array numbering (Qifeng Lu)



GIIRS measurements at the limb.

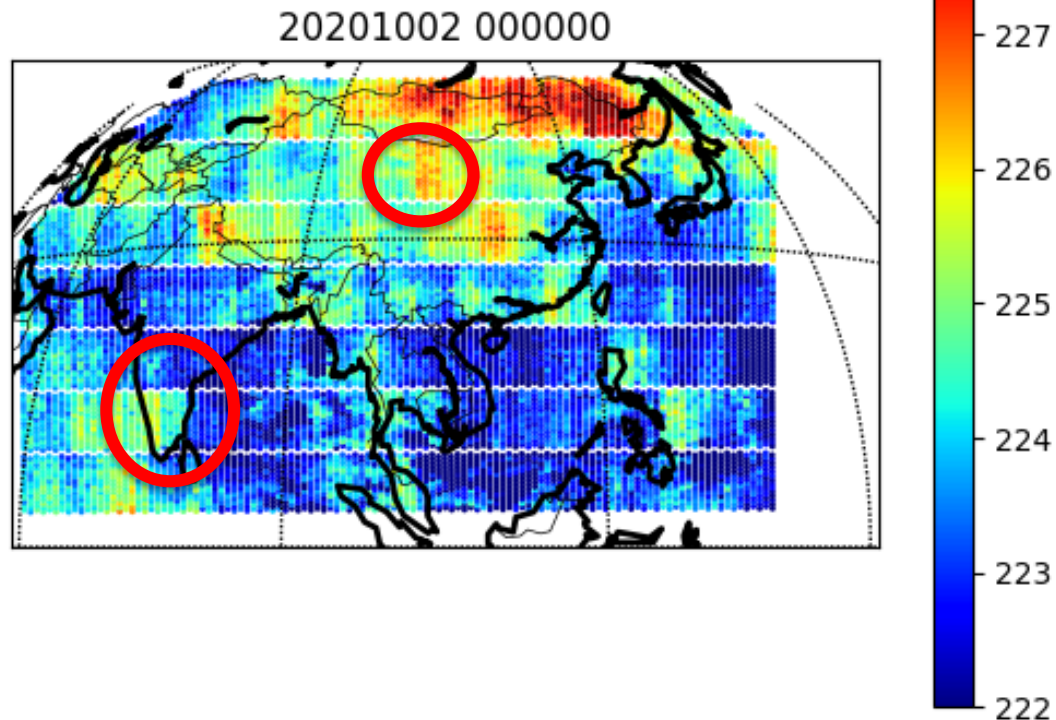
Space pixels have larger radiances when there is more Earth in the dwell (LWIR).



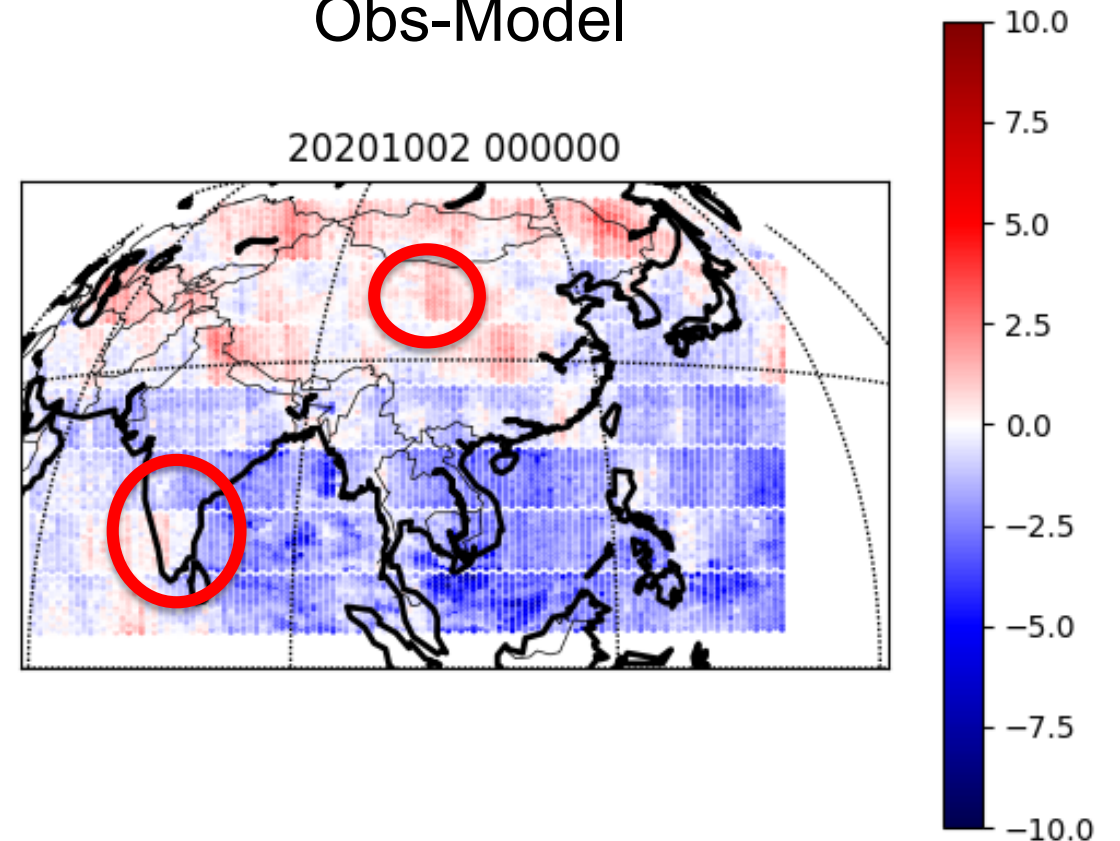
The FY-4A bias structure has **spatial discontinuities**

- Shown here are results for **Channel 34 for a single scan**. This is a high peaking channel.
- Similar effects are seen for the **LWIR** temperature-sounding, **Ozone** and **MWIR** channels (although not the window channels).
- The bias structure **changes from scan to scan**.

Observations (BT)



Obs-Model

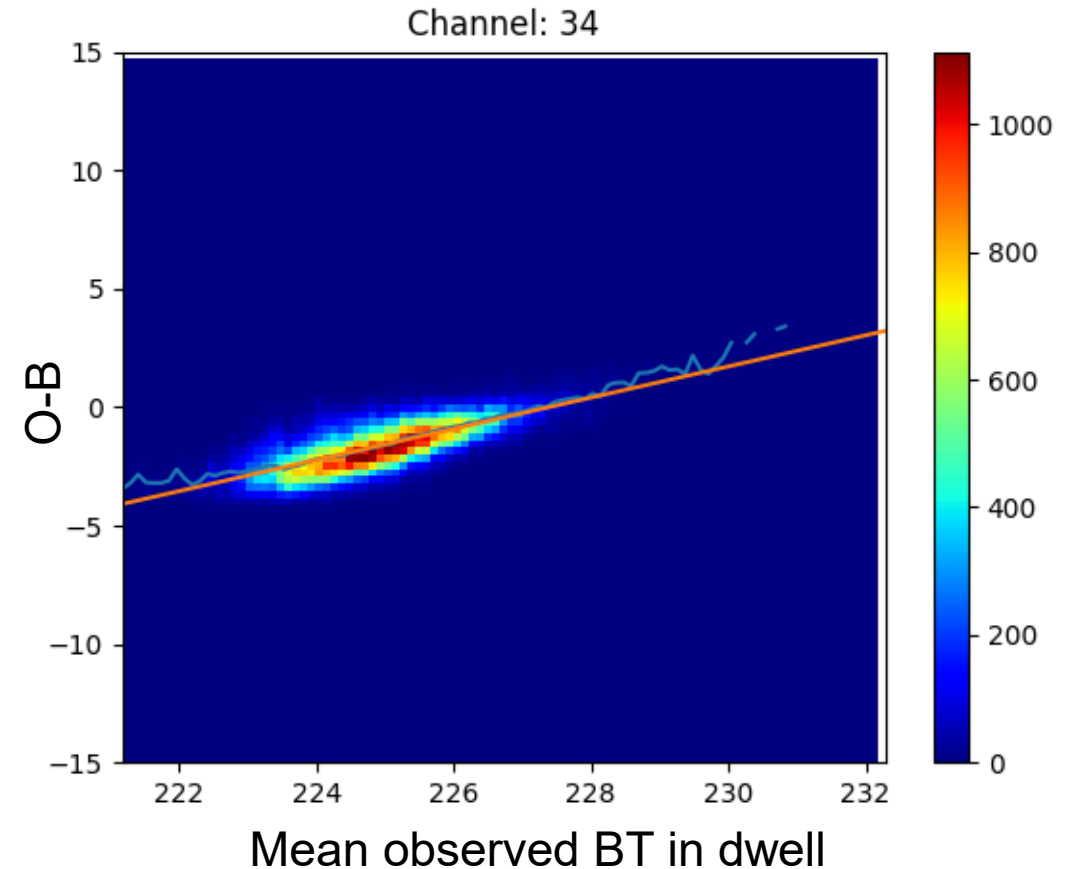


Is the bias related to the average BT within each dwell (4x32 pixels)?

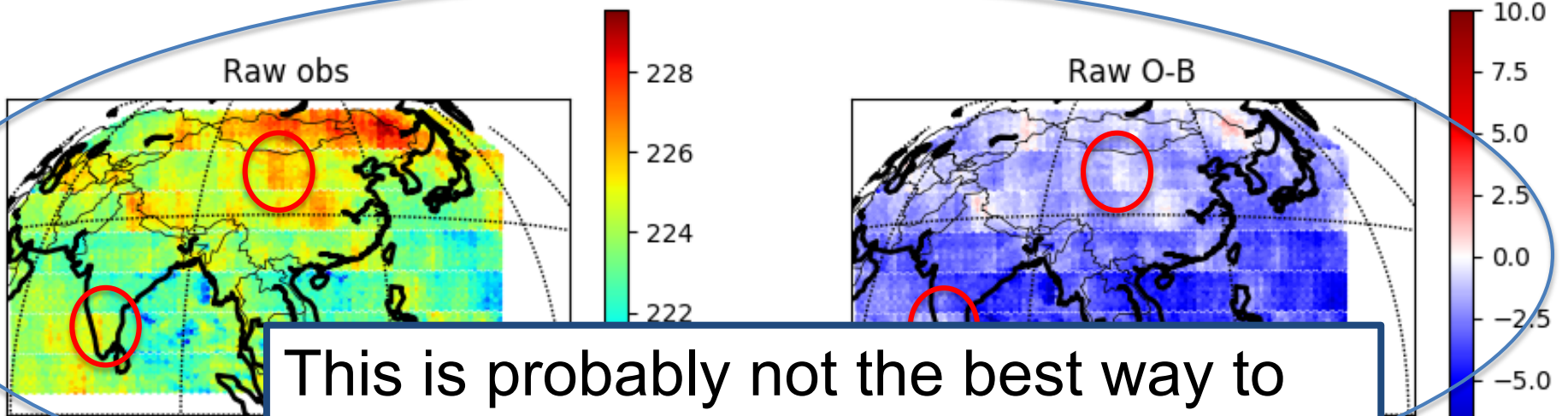
- Averaging radiance across the dwell would have been more correct, but I think this is a second order issue.
- For this channel, the **correlation is very clear** between the bias and the mean BT within each dwell (the orange line is a linear regression).

Suggestion:

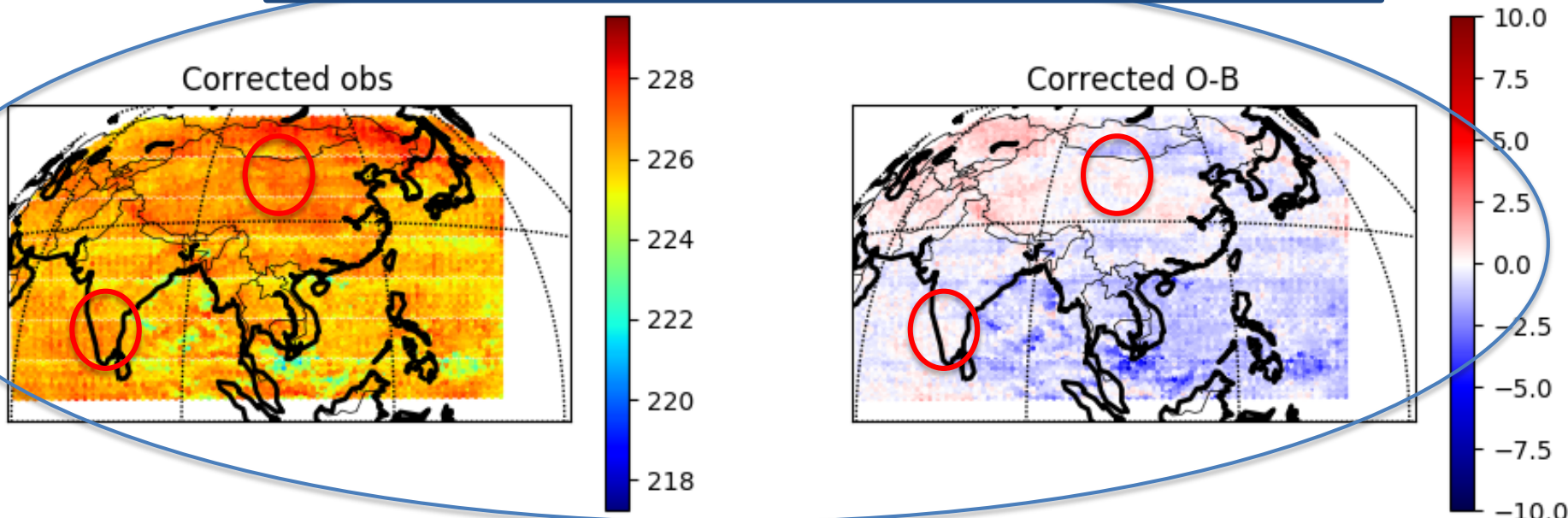
- Use the linear fit to “**bias-correct**” the observations dynamically based on the mean measured BT in each dwell.



Applying this as a correction



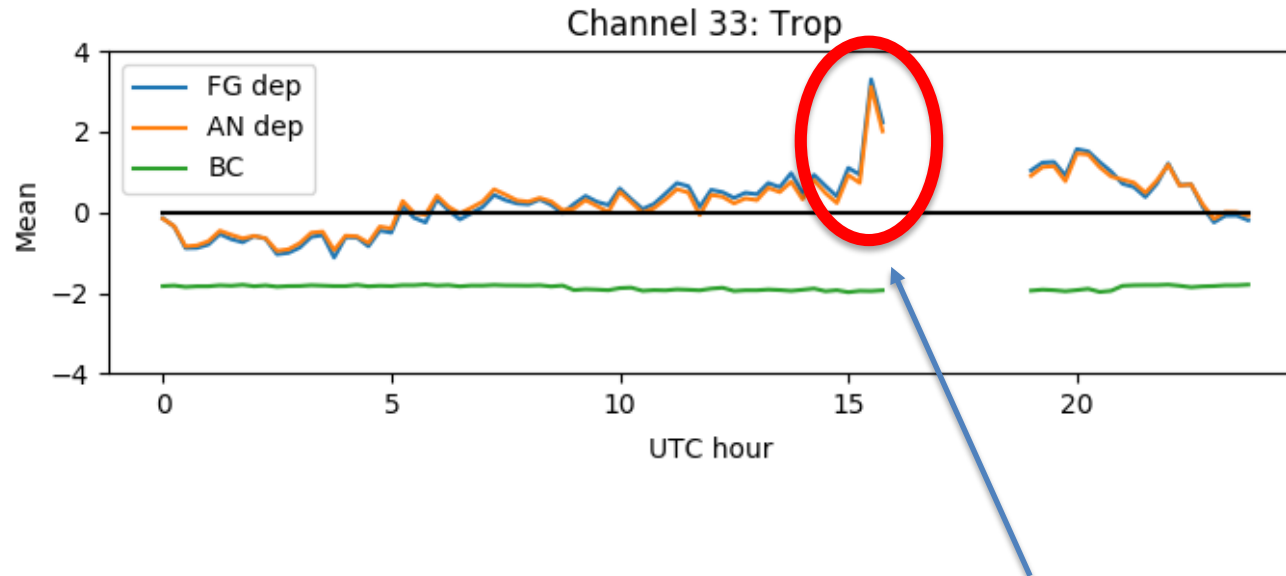
This is probably not the best way to correct the problem, but maybe it can point towards a better solution.



COMPARE.
The correction
smooths the
spatial bias
pattern.

Diurnal signal

- Each day, close to local midnight, observations are not provided to avoid solar contamination.



- The last scan before the stream stops is also contaminated for some channels.