Progress in the assimilation of GIIRS data at ECMWF

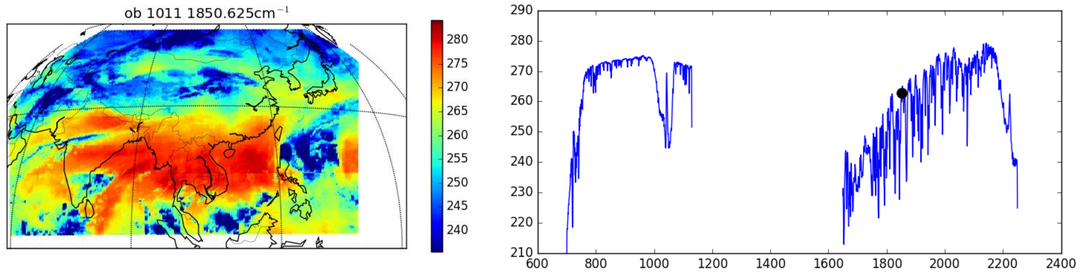
Chris Burrows, Tony McNally and Dorothée Coppens

Many thanks to Qiang Guo (CMA), Peter Lean (ECMWF), Simon Elliott, Pierre Dussarrat (EUMETSAT).

chris.burrows@ecmwf.int

1. Introduction

GIIRS, on board the Chinese satellite FY4-A is the first hyperspectral infrared instrument on a geostationary platform. Its scanning domain covers China and the surrounding regions, and the instrument produces radiances for 1650 channels with 0.625cm^{-1} spectral resolution.



Here, we present the latest progress in the assimilation strategy for GIIRS, following beneficial improvements to the data processing at CMA.

2. *Current* assimilation set-up

Channel selection: 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 19, 21, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 67, 93, 97, 101, 105, 115, 130, 237, 269, 329, 377, 510, 514, 518, 522, 526, 530, 534, 538, 542, 546, 565, 569, 573, 577, 581, 585, 985, 994, 1011, 1018, 1030, 1055, 1069, 1091, 1099, 1111, 1139, 1174, 1191, 1209, 1216, 1223, 1245, 1251.

Pixel numbers used: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94 (chosen to avoid potential bimodal sampling).

Ob errors: Desroziers based on early assimilation experiment. Scaling factor=1. Condition number set to be 500.

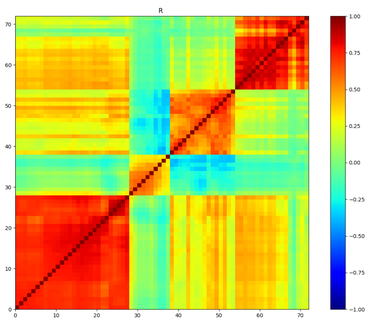
Bias correction predictors: constant for window/ozone channels. Constant, 1000-300hPa thickness, 200-50hPa thickness, 10-1hPa thickness and 50-5hPa thickness for temperature/WV-sounding channels.

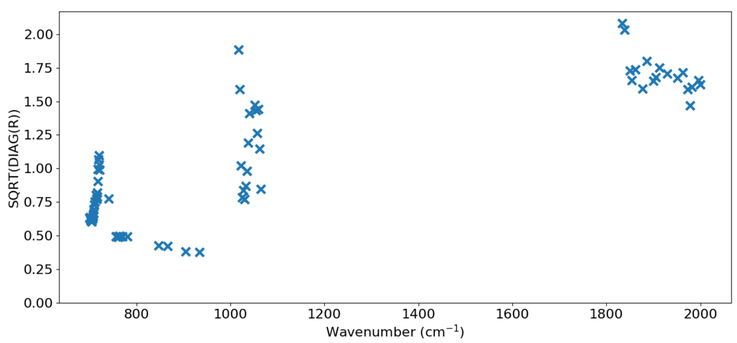
Ozone anchor channel: 542.

No spectral shift applied.

3. Observation errors

The Desroziers (2005) technique has been applied to a subset of GIIRS channels. The correlations are significantly larger than those diagnosed for CrIS. Below are the correlation matrix and STDs.





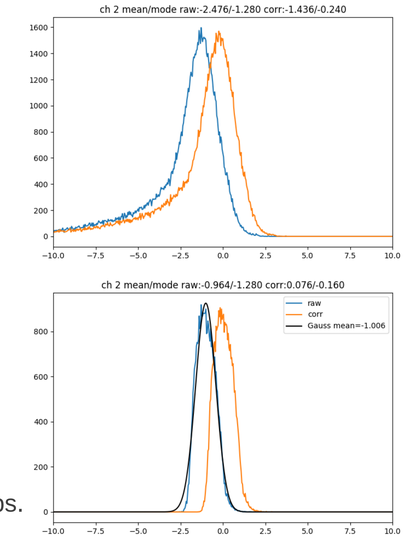
4. Interaction between bias correction and cloud detection

Cloud detection needs bias-corrected obs.

Bias correction needs cloud-cleared sample.

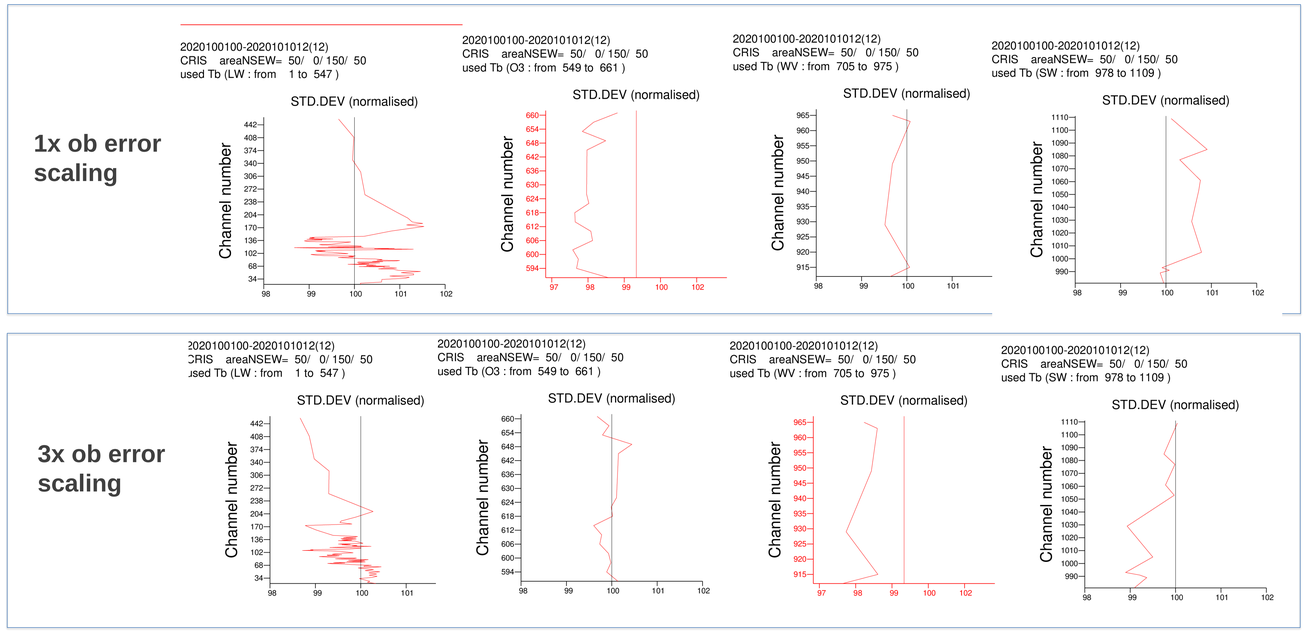
This loop was broken by selecting a window channel which was used to identify cloud free spectra over ocean.

Gaussians were fitted to the O-B histograms of all the channels, and the means were taken as the initial bias corrections for the variation scheme, thus allowing the McNally & Watts (2003) scheme to work without detrimental interactions taking place.



O-B histograms for channel 2 showing the cloud detection and bias determination steps.

5. Short-range forecast fit to independent CrIS observations



6. Conclusions

We have presented a methodology for the assimilation of hyperspectral GEO data from GIIRS. Although this is still being refined, we are seeing promising fits to independent CrIS observations when the observation errors are inflated.

We are looking forward to early access to FY-4B data following the successful recent launch.