IASI bias correction at KIAPS observation processing system

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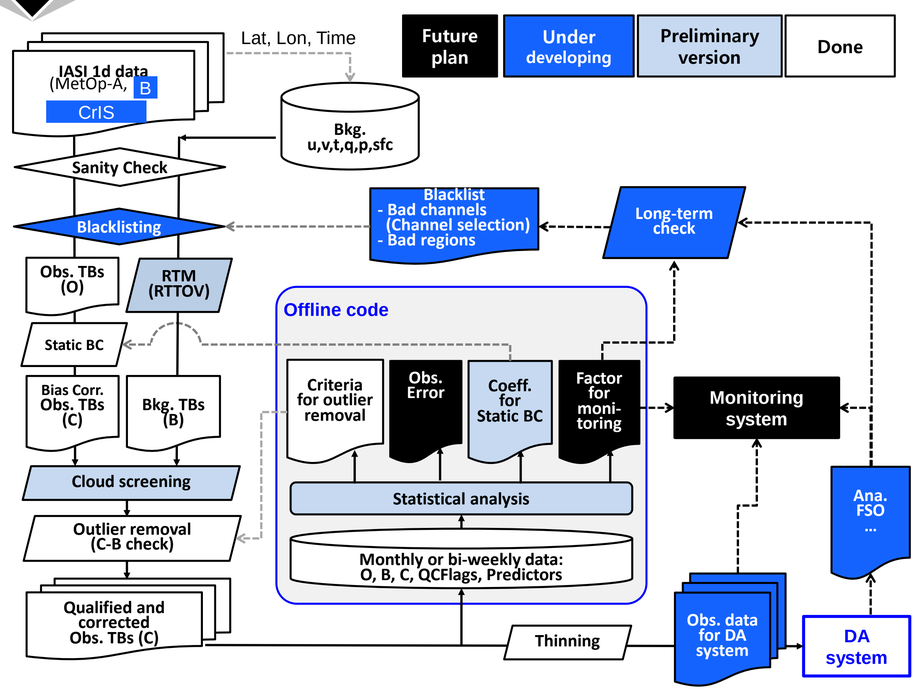
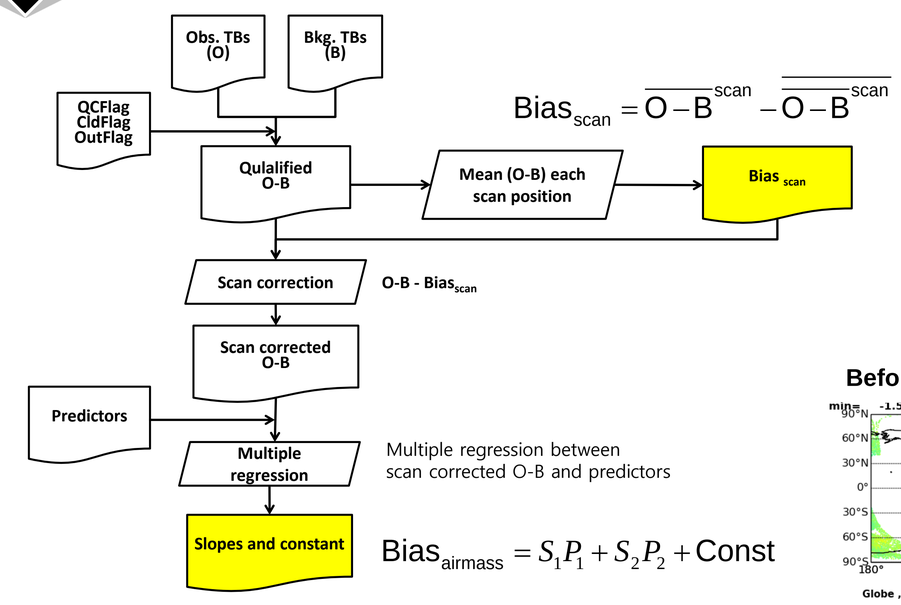
1 Introduction

- **The processing system of Infrared Atmospheric Sounding Interferometer (IASI) radiances developed at Korea Institute of Atmospheric Prediction Systems (KIAPS) is introduced and its preliminary results are described here.**
- **Brightness temperature (TB) observed for one month in November, 2012 is extracted from IASI Level1d BUFR data using ECMWF BUFR decoder. The background TB is simulated by RTTOV version 10.2 using UM 6-hour forecast data.**
- **We adopt NWP SAF cloud detecting algorithm (McNally and Watts, 2003) to remove cloud contamination in observed TB for each IASI channel.**
- **And also we remove bias of observed TB for each IASI channel and scan position. We assumed that the bias of background TB is negligible compared to that of observed TB.**

2 IASI processing in KIAPS



3 IASI bias correction



$$Bias_{scan} = \overline{O-B}^{scan} - \overline{\overline{O-B}^{scan}}$$

$$Bias_{airmass} = S_1 P_1 + S_2 P_2 + Const$$

Predictor1:
$Thickness_{(850\text{-}300\ hPa)} - \overline{Thickness_{(850\text{-}300\ hPa)}}$

Predictor2:
$Thickness_{(200\text{-}50\ hPa)} - \overline{Thickness_{(200\text{-}50\ hPa)}}$

Fig. 1. The predictors for air-mass correction.

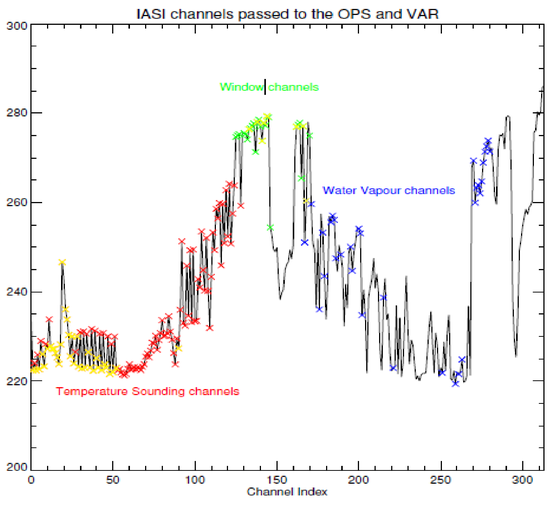


Fig. 2. IASI channels passed to the OPS and VAR in UM (Weston, 2011, Fig.2)

Original IASI: total 8461 channels

KIAPS: 314 channels are used (level1d data from KMA)
- **300 channels (Collarad, 2007)**
- **14 channels (CNES monitoring)**

*** Channel selection is our future work**

UM
- **OPS: 183 channels**
- **VAR: 138 channels**

4 Scan biases

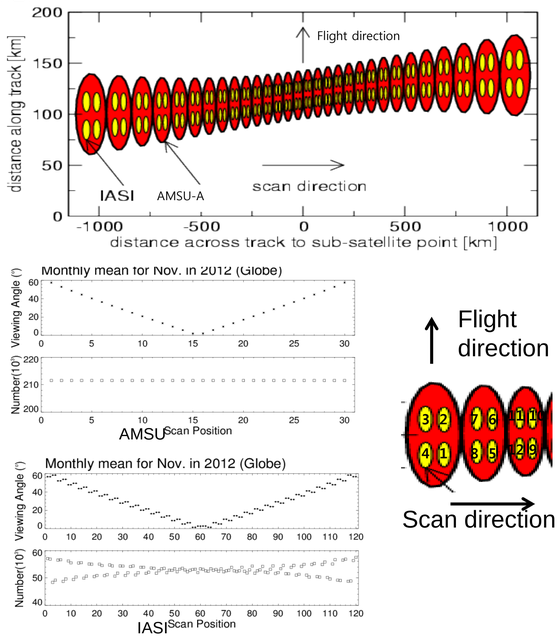


Fig. 3. IASI scan position
- IASI: 120 scan position = (4 x 30)
- AMSU-A: 30 scan position
In level 1d data, 1 pixel in 4 is chosen by using AVHRR data. The selected pixel is the most warmest and homogeneous field of view.

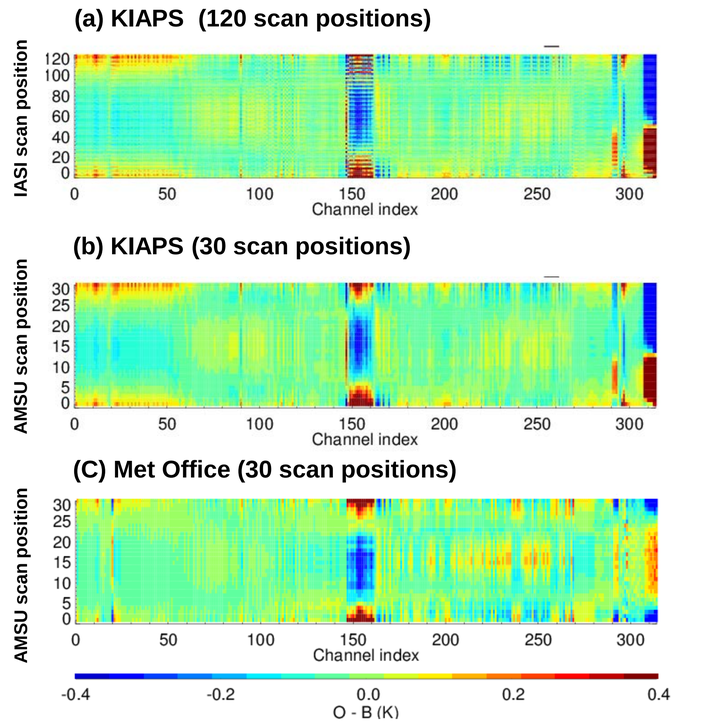


Fig. 4. IASI scan bias of KIAPS (a, b) and Met Office (c). In KIAPS, 120 scan position is default. To compare with Met Office, the scan biases are calculated for 30 scan position. The scan biases are totally different between KIAPS and Met Office. The variations along with scan positions are larger in KIAPS for temperature channels, on the other hands the variations are larger in Met Office for water vapor channels.

5 Air-mass coefficients

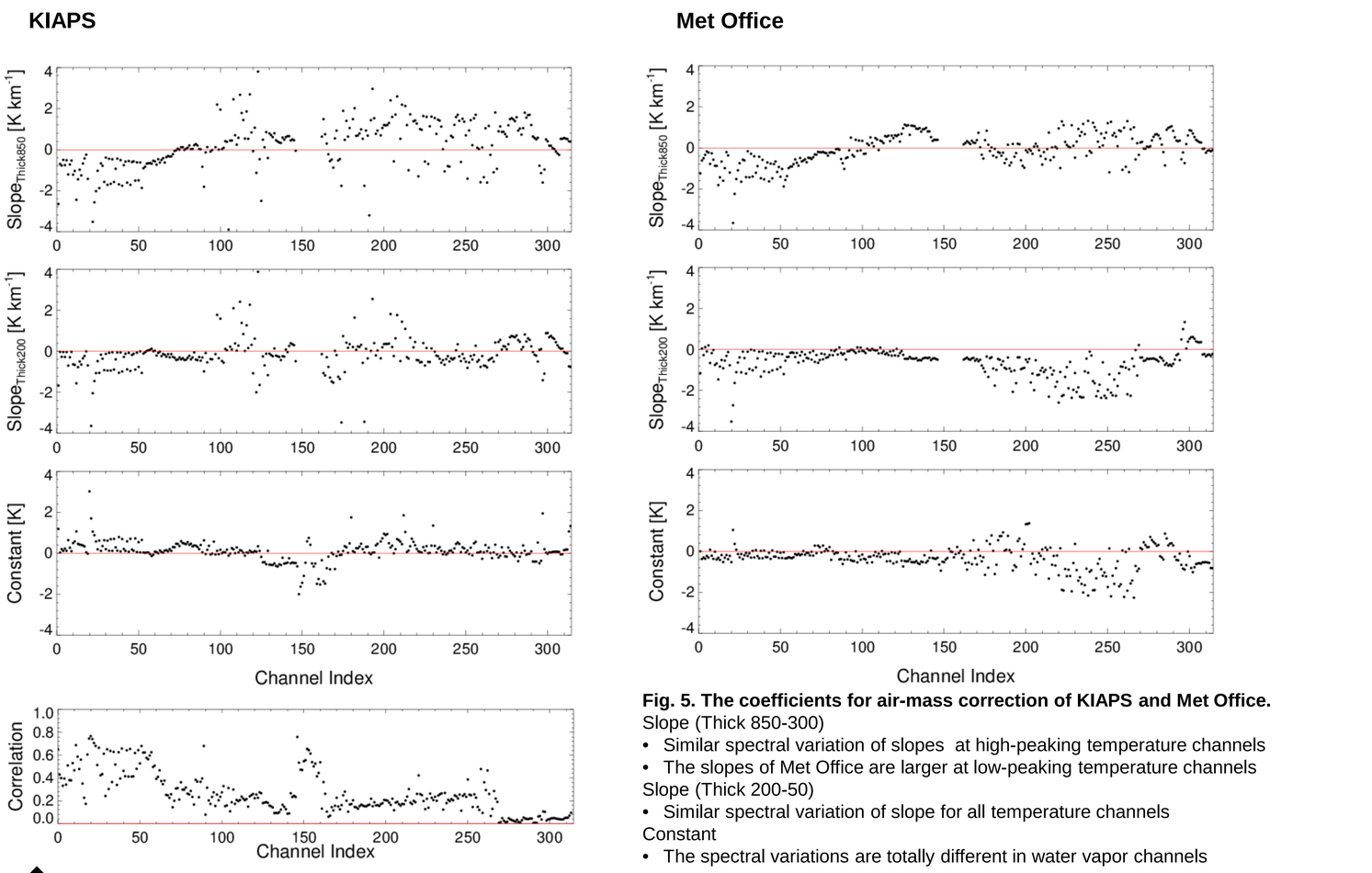


Fig. 5. The coefficients for air-mass correction of KIAPS and Met Office.
Slope (Thick 850-300)
- Similar spectral variation of slopes at high-peaking temperature channels
- The slopes of Met Office are larger at low-peaking temperature channels

Slope (Thick 200-50)
- Similar spectral variation of slope for all temperature channels

Constant
- The spectral variations are totally different in water vapor channels

6 Results of bias correction

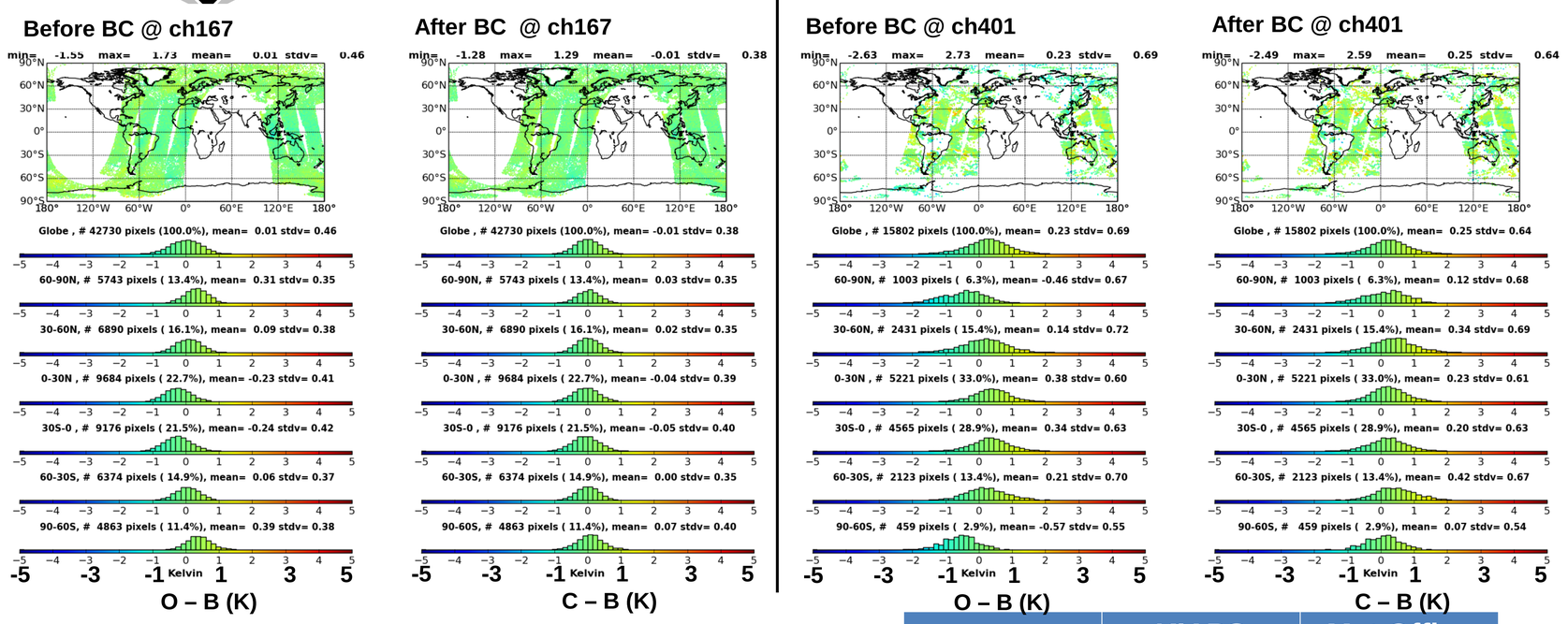


Fig. 6. O-B distribution before and after bias correction at ch 167 and ch 401.
- channel 167 (686.5 cm^{-1}, peak @ ~ 70 hPa, 18.8 km, Index: 49)
- channel 401 (745.0 cm^{-1}, peak @ ~640 hPa, 4.0 km, Index: 113)
- The irregular biases in each latitude bins are reduced after bias correction

	KIAPS	Met Office
Background	UM ver 7.9 physics PS28, SURF 18.5	UM ver 8.2
Data processing	KOPS	OPS
RTTOV version	UM: ver. 7 KOPS: ver. 10.2	OPS: ver. 9.3
Day/Night	Day & Night	Day & Night
Region	All surface type (Land, Ocean, Sealce)	All surface type (Land, Ocean, Sealce)
Time window	6 hour (+3h, -3h)	6 hour (+3h, -3h)
Thinning	Not thinned data	Not thinned data

7 Summary

- **The framework for IASI processing in KIAPS is established.**
- **The bias correction coefficients are calculated for each IASI channel and scan position during Nov. 2012. The bias correction coefficients of KIAPS are compared with Met Office values. The air-mass correction slopes are similar in two organization, but scan biases and constants are some different. The differences of bias coefficients between KIAPS and Met Office may be due to the RTTOV version and UM version used in each organization.**
- **The calculated coefficients are apply to the same time period and then the irregular biases in each latitude bins are reduced .**