Development of IASI processing at KIAPS and Preliminary Results

***Hyoung-Wook Chun** (hw.chun@kiaps.org), *Sangil Kim, +Yoonjae Kim, *Jeon-Ho Kang, *Sihye Lee, and *Ju-Hye Kim

* Korea Institute of Atmospheric Prediction Systems (KIAPS), Seoul, Korea, +Korea Meteorological Administration, Seoul, Korea

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

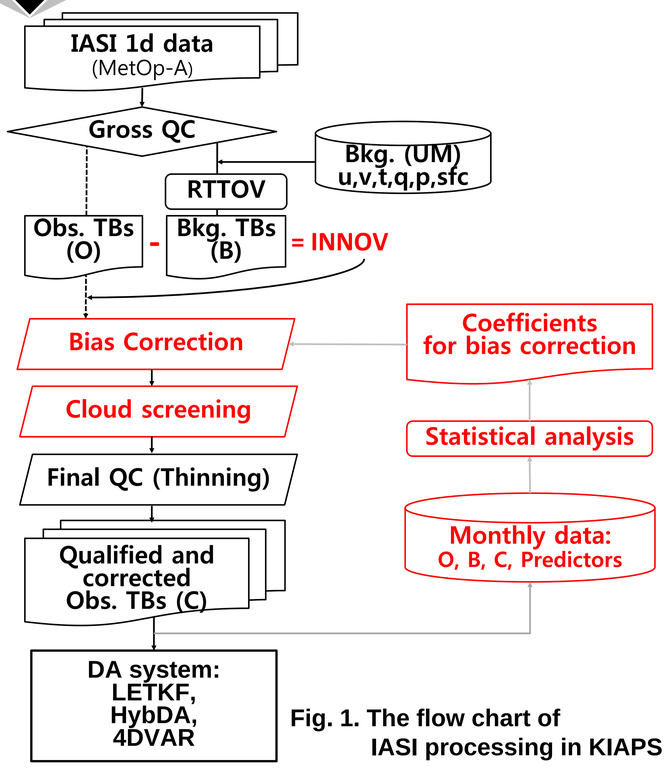


Fig. 1. The flow chart of IASI processing in KIAPS

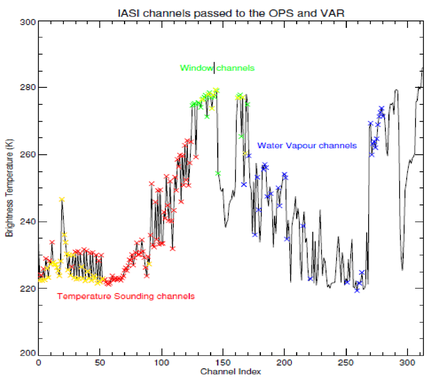


Fig. 2. IASI channels passed to the OPS and VAR in UM (Weston, 2011, Fig.2)

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**

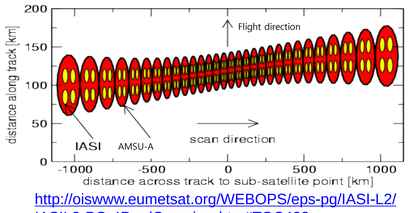


Fig. 3. IASI scan position

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.

http://oiswww.eumetsat.org/WEBOPS/eps-pg/IASI-L2/IASIL2-PG-4ProdOverview.htm#TOC422

3 O, B, O-B

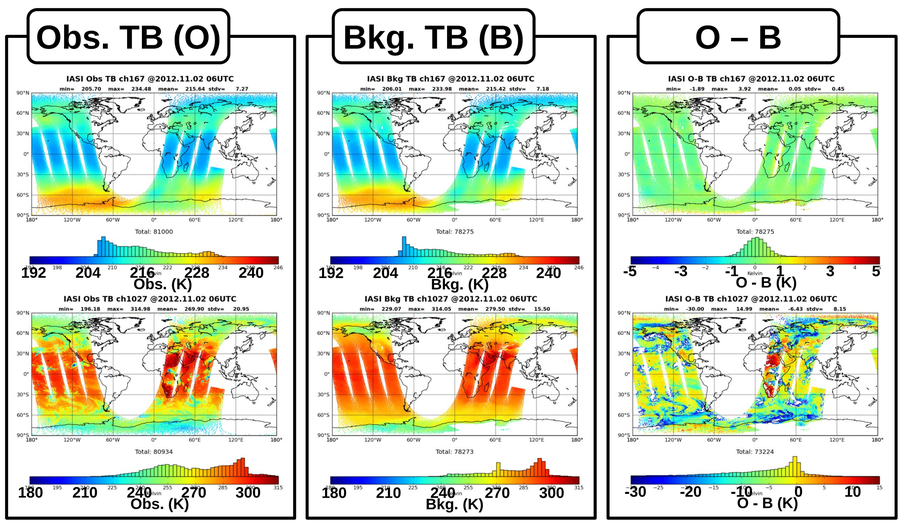


Fig. 4. Distribution of observed TB (O), background TB (B), and innovation (O-B) at two channel.
- **channel 167 (686.5 cm^{-1}, 14.6 μm, peak @ 70 hPa, 18.8 km, Index: 49)**
- **channel 1027 (901.5 cm^{-1}, 11.1 μm, peak @ 900 hPa, 1.3 km, Index: 140).**

4 Cloud screening

NWP SAF cloud screening algorithm (McNally and Watts, 2003) is used.

Clear pixel
Cloudy pixel in map

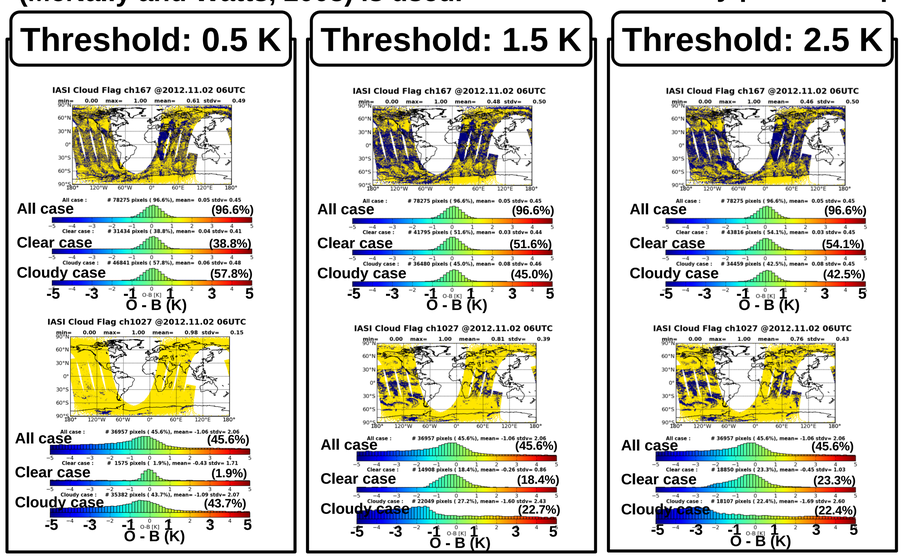


Fig. 5. Distribution of cloud detection and histogram of all, clear, cloudy case at channel 167 and channel 1027.

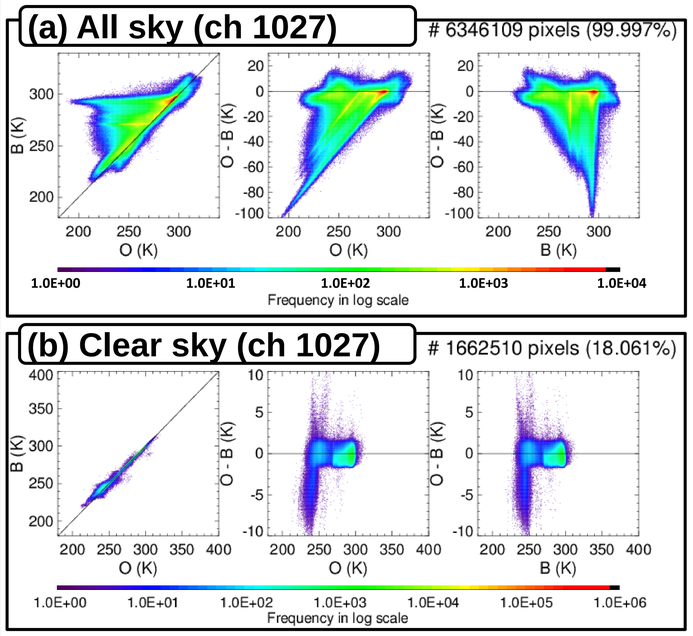


Fig. 6. The sample of 2D histogram of (a) all sky and (b) clear sky for channel 1027 during Nov. 2012.

Unexpected large lerrors are found in (b) where TBs are less than 250 K.

5 Bias correction

$$y = h(x) + b^{scan} + b^{air}(x) + e^{obs}$$ (Harris and Kelly, 2001)

y : Obs. TB

$h(x)$: Bkg. TB

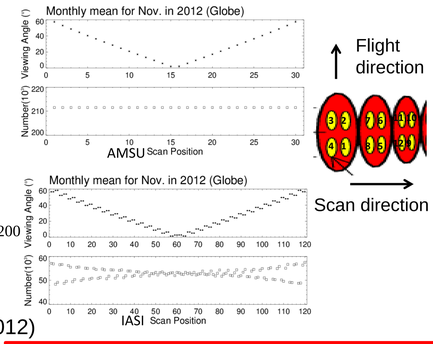
$b^{scan} = b^{scan}$(scan position)

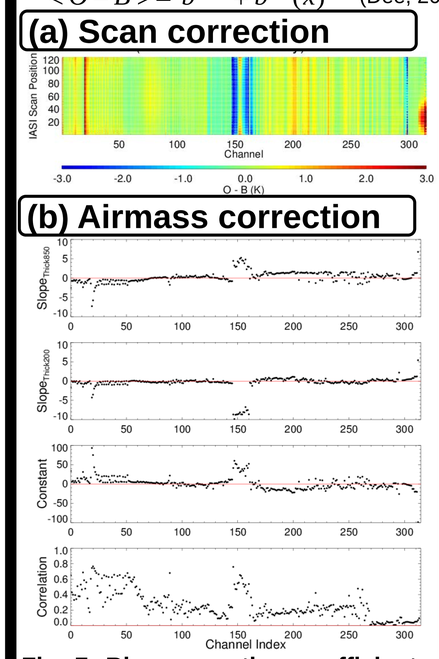
$b^{air}(x) = \beta_0 + \beta_1 \mathrm{Thick}_{850} + \beta_2 \mathrm{Thick}_{200}$

e^{obs} = random observation error

Average the Innovations (O - B):

$< O - B >= b^{scan} + b^{air}(x)$ (Dee, 2012)





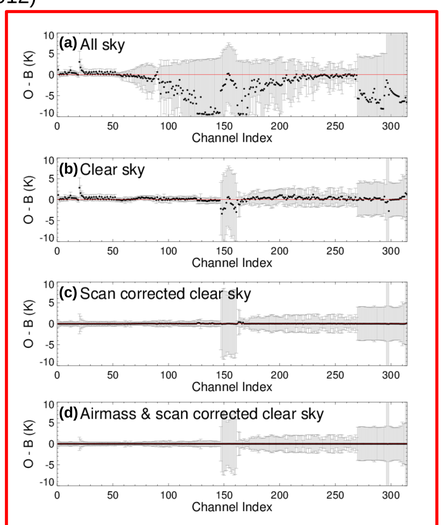


Fig. 7. Bias correction coefficients for (a) scan and (b) airmass for Nov. 2012.

Fig. 8. The monthly mean (solid black dots) and the standard deviation (vertical gray bars) of O – B for (a) all sky, (b) clear sky, (c) scan corrected clear sky, and (d) scan and airmass corrected clear sky for Nov. 2012.

6 Summary

- **The framework for IASI processing in KIAPS is established.**
- **We checked the extracted observed TB from IASI level 1d BUFR and simulated TB by RTTOV 10.2 using UM forecast data.**
- **Cloud contaminated pixels are well removed by using NWP SAF cloud screening algorithm with threshold as 1.5 K. But we also found large errors where TBs are under 250 K.**
- **The bias correction coefficients are calculated for each IASI channel and scan position during Nov. 2012. And the calculated coefficients are apply to the same time period.**

7 Reference

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8 Acknowledgements

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