

# KMA's GSICS Activities of IR inter-calibration

Dohyeong Kim

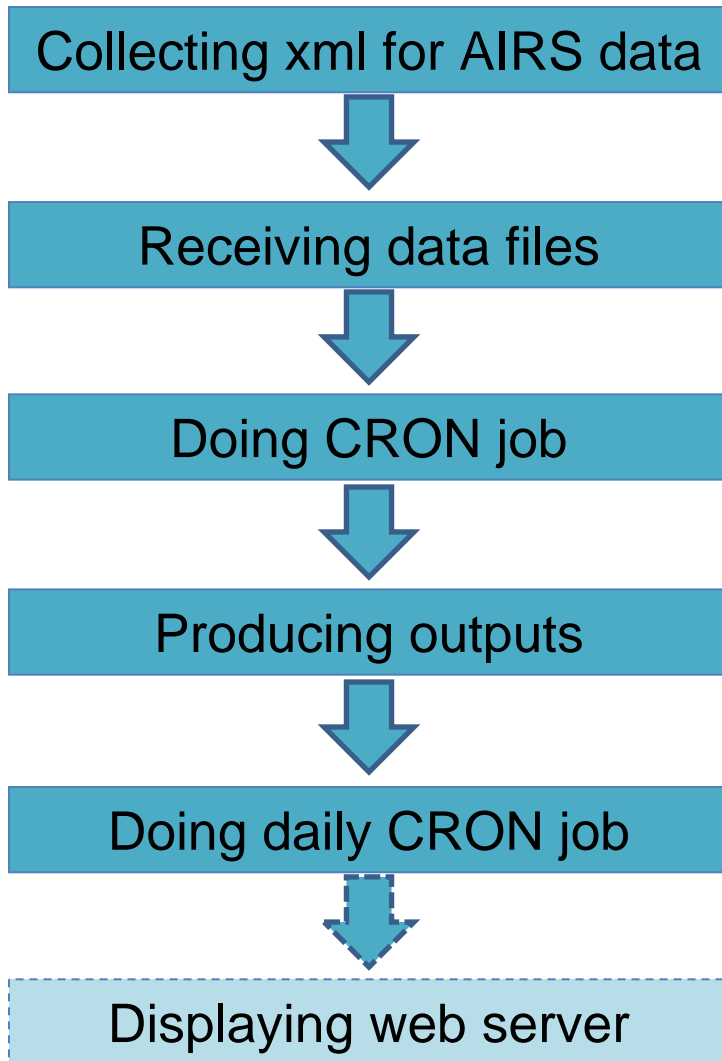
GSICS GRWG, GDWG, Tokyo  
2009. 1. 28~30

# GEO-LEO IR Calibration

## □ Establish the inter-calibration system for MTSAT-1R with AIRS/IASI

- Implement GSICS S/W using MTSAT-1R data
- Period : Jun.2007 ~ May. 2008
- Test conditions for collocation
  - Time : 15 min vs. 5 min time difference
  - Space : The effect of spatial inhomogeneity
  - Time vs. TBB difference
  - $TB_{GEO}$  vs. TBB difference
  - Convolution and constraint method

# Overview of data flow



/home/cmdps/data/AIRS/xml/\*.xml

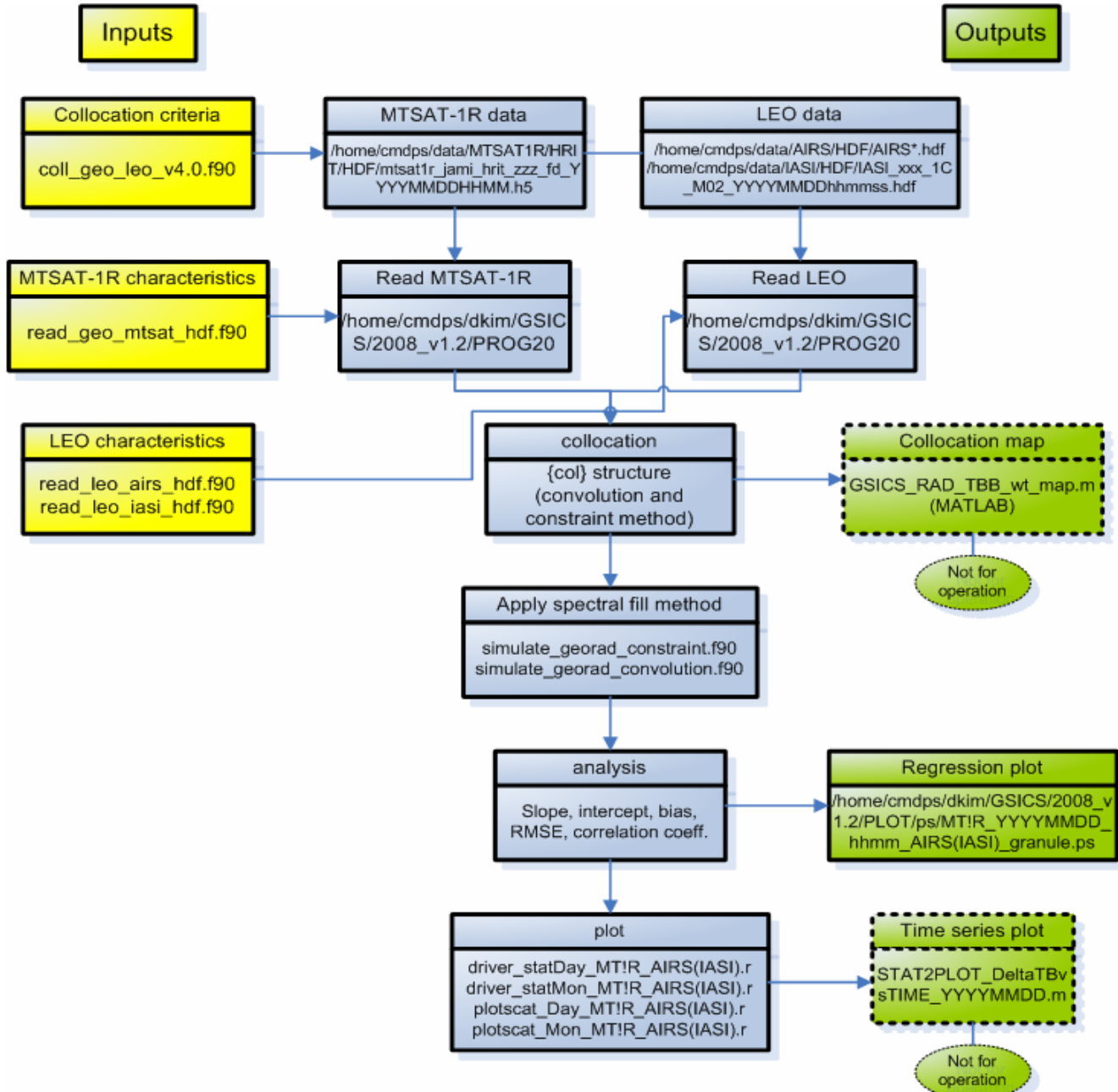
GEO: /home/cmdps/data/MTSAT1R/HRIT/HDF/\*.h5  
LEO: /home/cmdps/data/AIRS(IASI)/HDF/\*.hdf

AIRS\_runshell.csh  
IASI\_runshell.csh

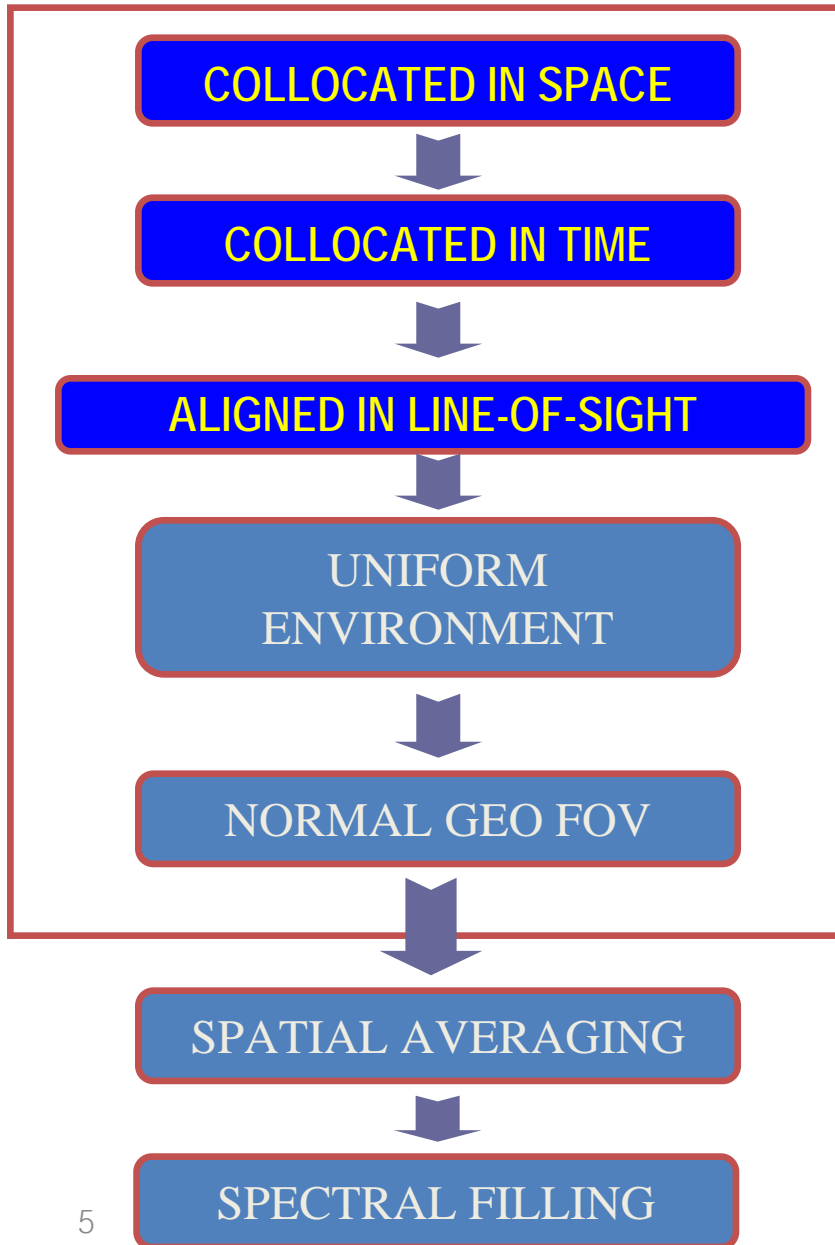
/home/cmdps/dkim/GSICS/2008\_v1.2/PLOT/\*.ps  
/home/cmdps/dkim/GSICS/2008\_v1.2/  
OUT\_AIRS(IASI)/\*.txt

Not yet

# Details of data processing



# Collocation procedure of GSICS S/W (1/3)



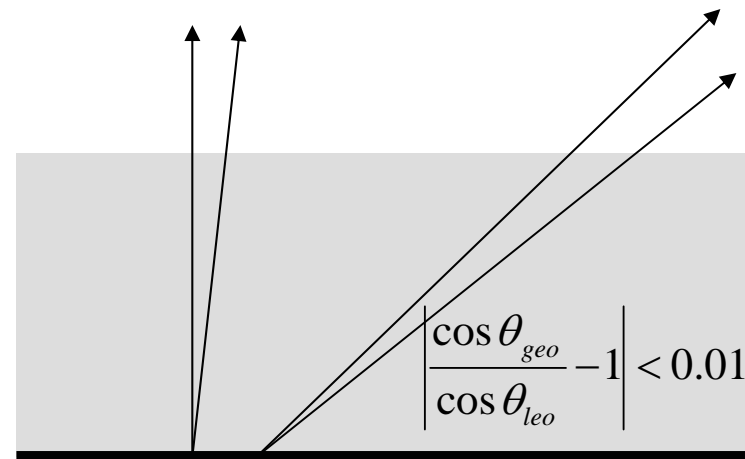
## 1. Space collocation:

GEO pixel closest to the LEO granule center

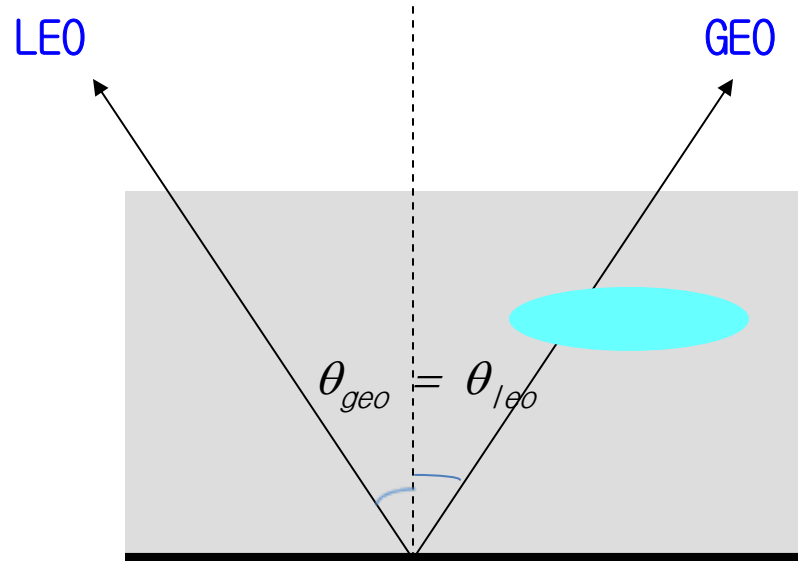
## 2. Time collocation:

$$|T_{\text{LEO}} - T_{\text{GEO}}| < 900 \text{ s (=15min)}$$

## 3. Viewing angle alignment:

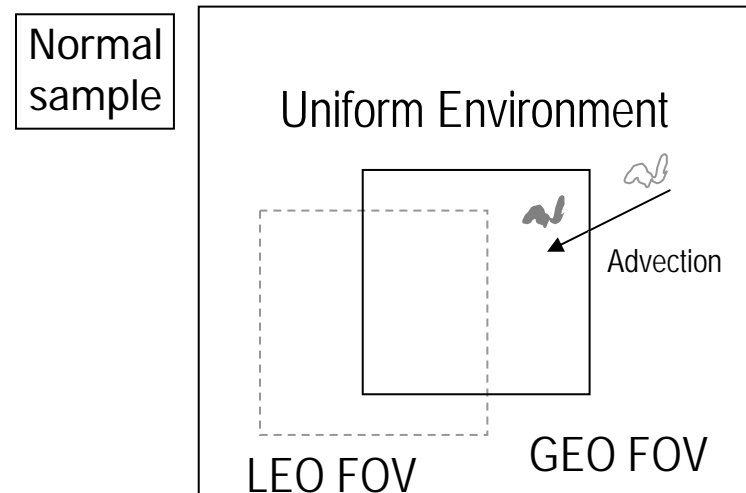
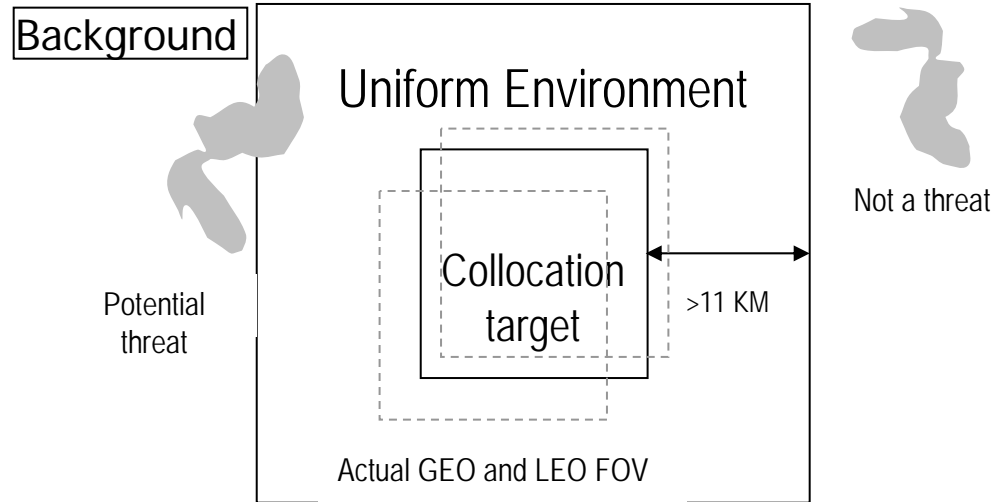
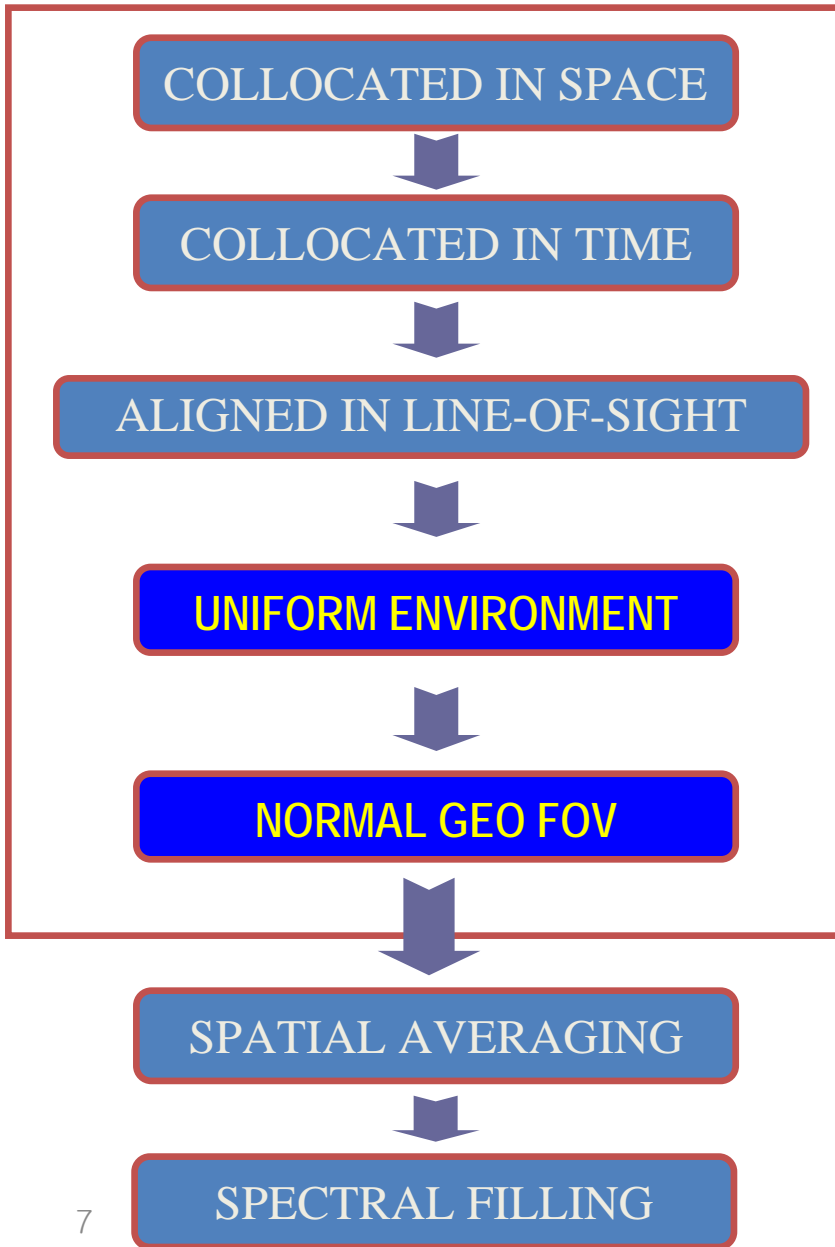


# Collocation (Angle)



IR channels are sometimes sensitive to difference in azimuth angle

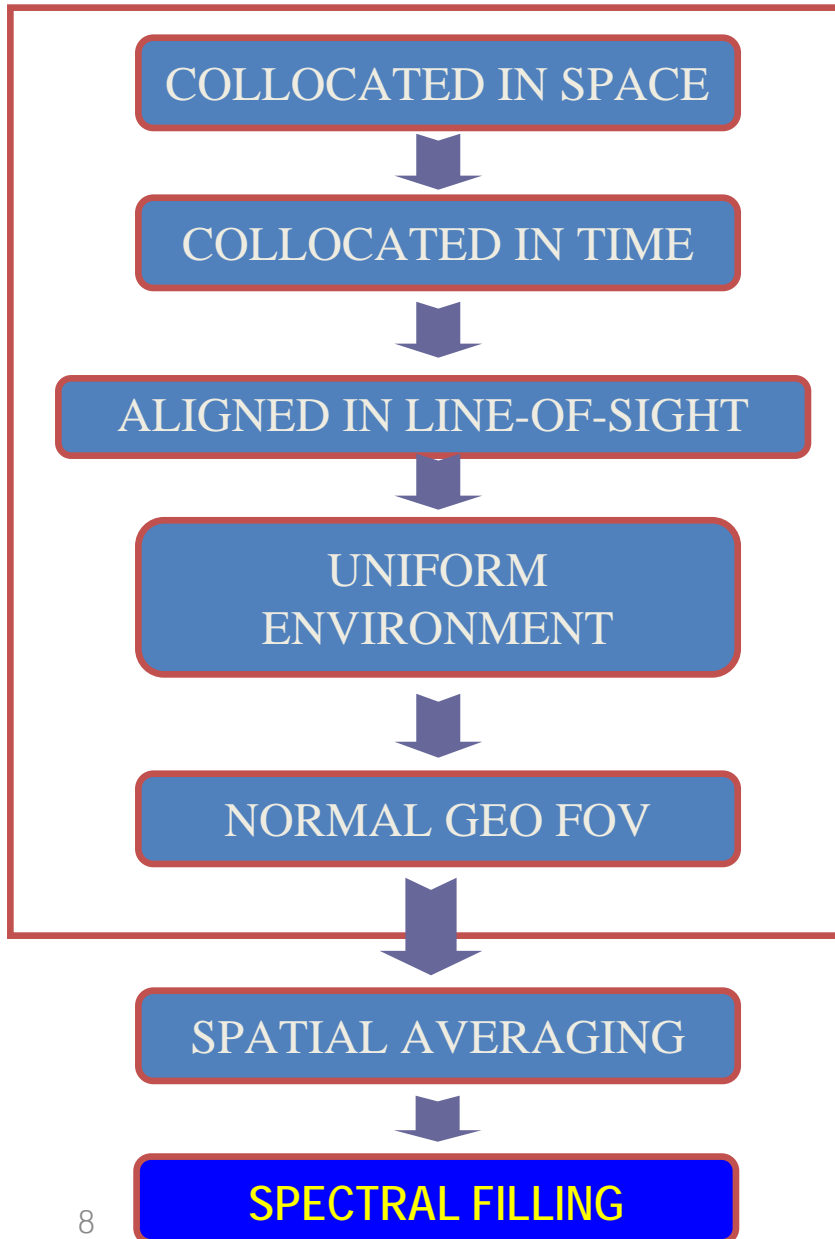
# Collocation procedure of GSICS S/W (2/3)



$$\frac{\sigma_{GEO}^{env}}{\overline{m}_{GEO}^{env}} < 0.05$$

$$\left| \overline{m}_{AIRS}^{FOV} - \overline{m}_{AIRS}^{ENV} \right| \leq 1.5\sigma$$

# Collocation procedure of GSICS S/W (3/3)



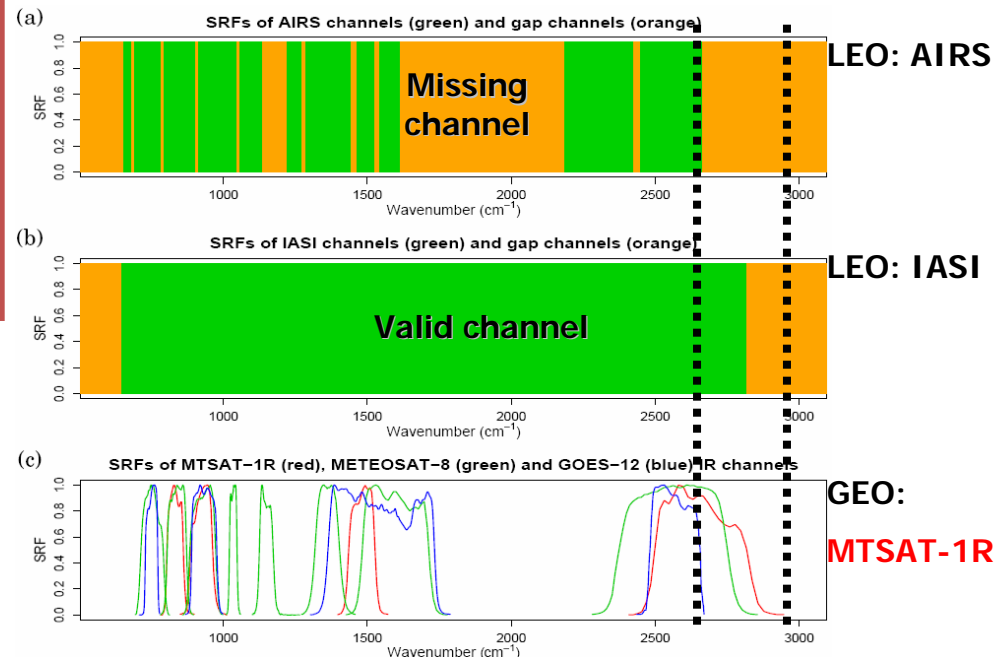
## Spectral filling method

### 1. Convolution method

- Linear interpolation using only US profile
- Proposed by NESDIS

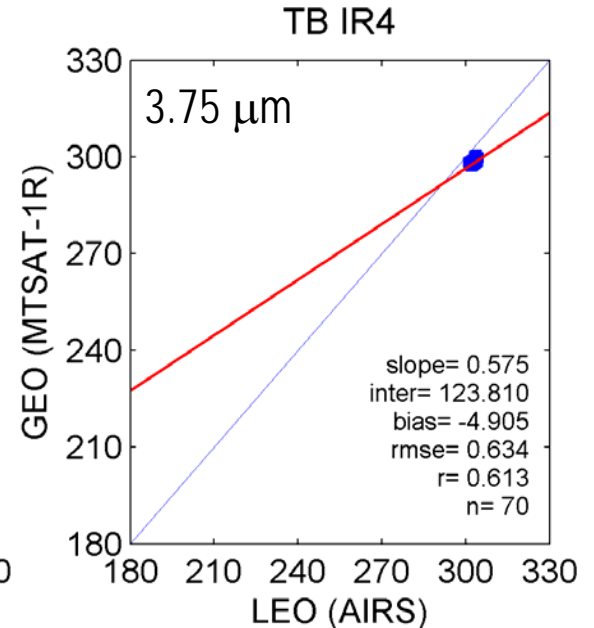
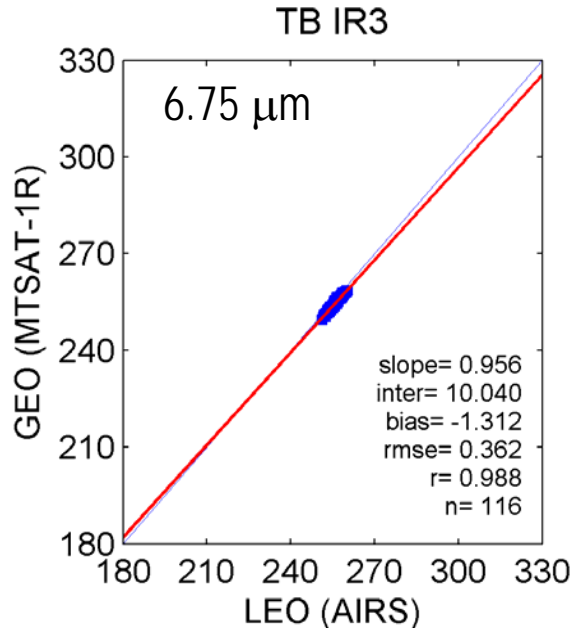
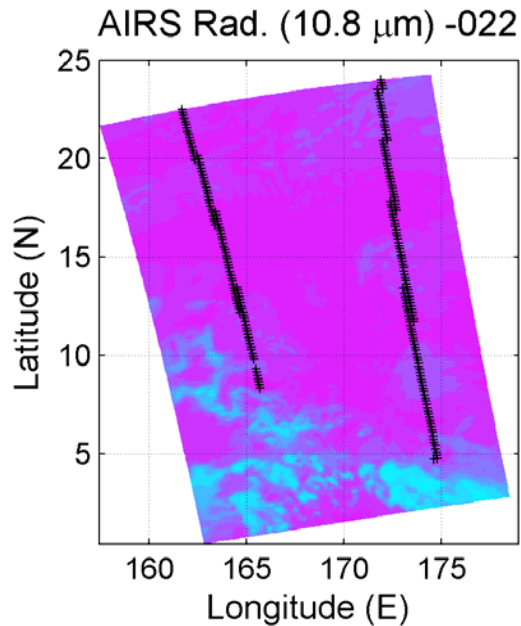
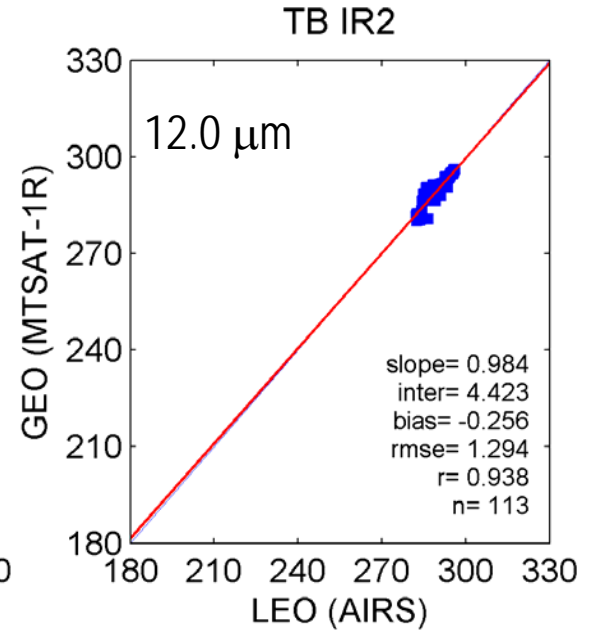
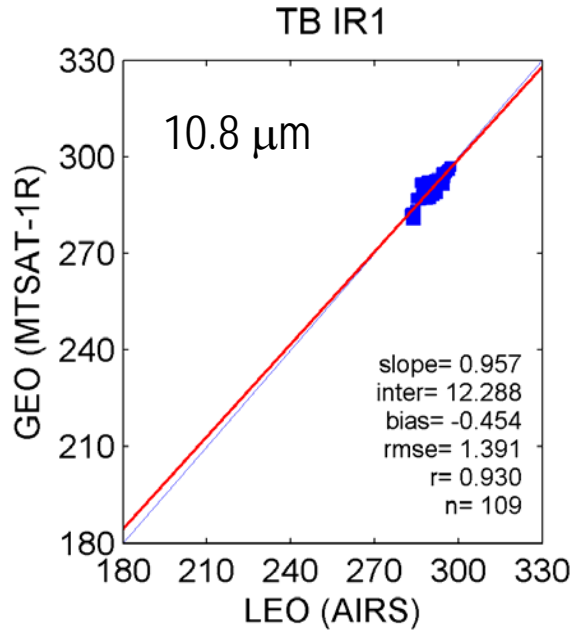
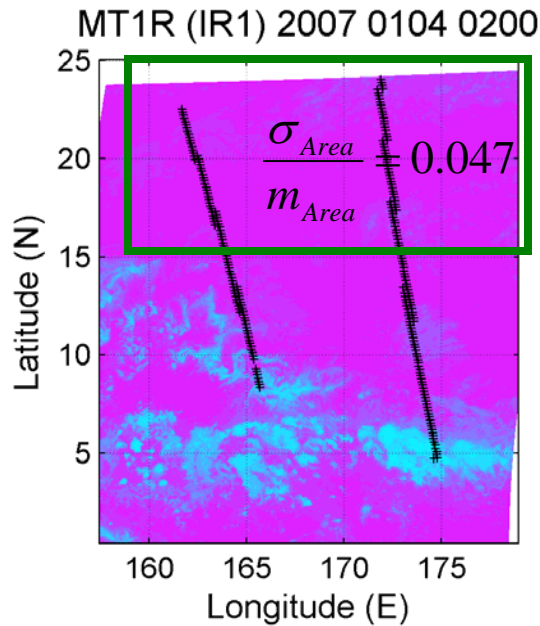
### 2. Constraint method

- Least square method using 8-profile
- Proposed by JMA

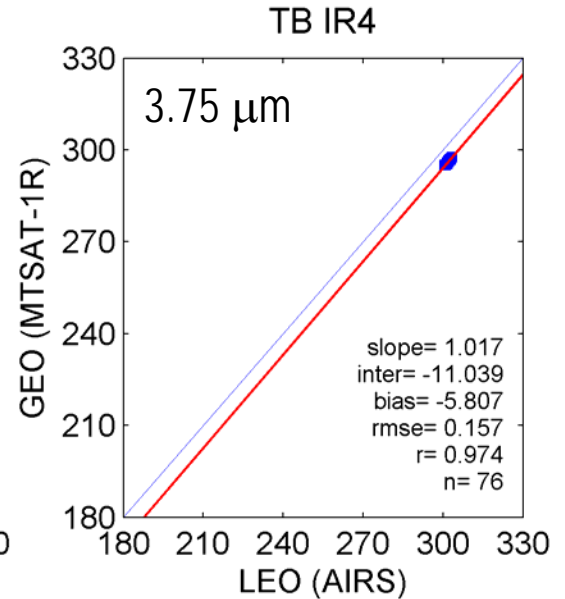
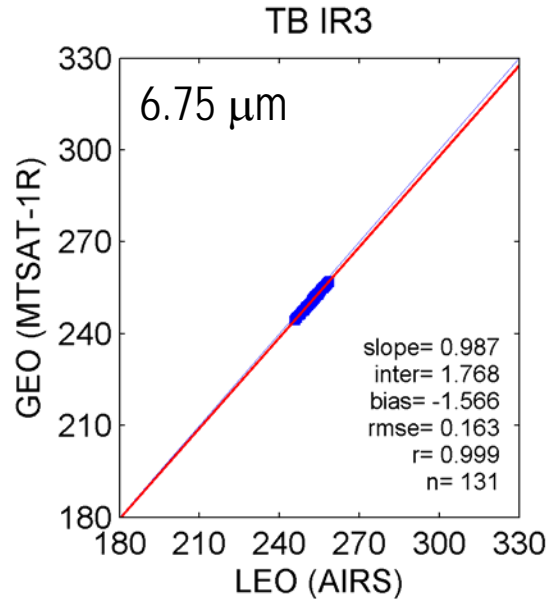
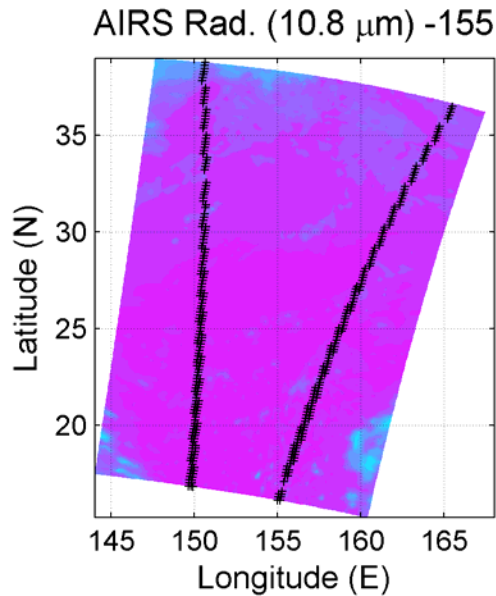
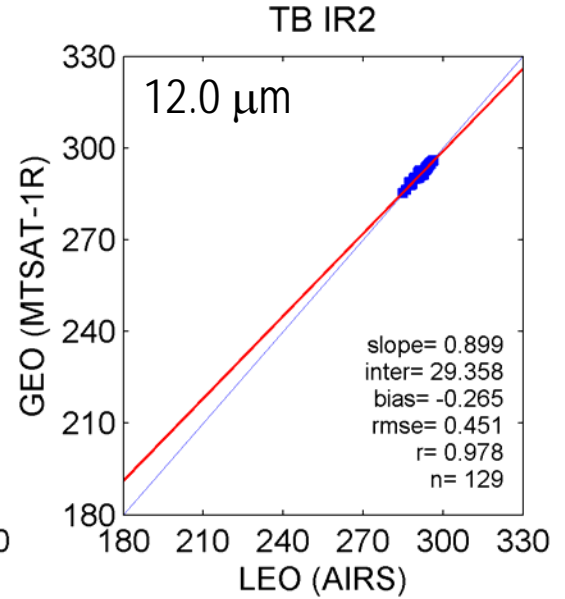
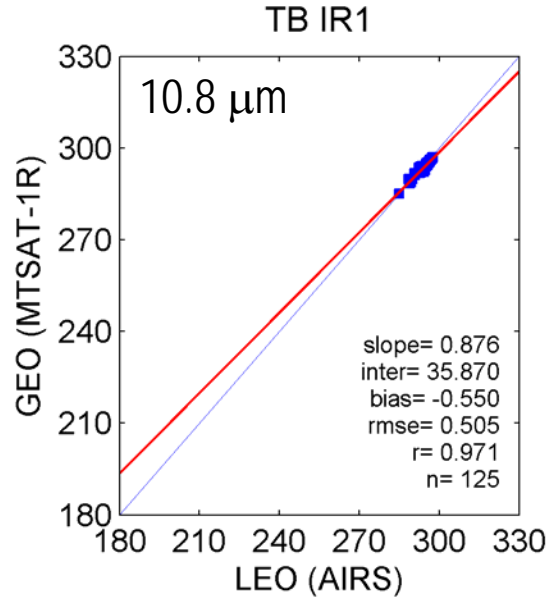
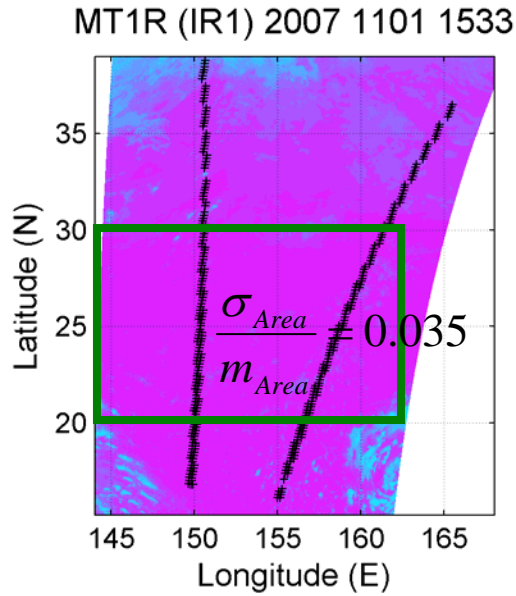




# Uniformity I-1: Relatively homogeneous cases ( $\frac{\sigma_{Area}}{m_{Area}} < 0.05$ )

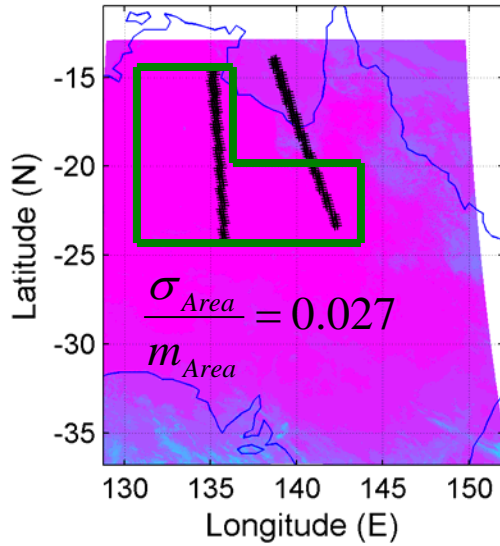


# Uniformity I-2: Relatively homogeneous cases ( $\frac{\sigma_{Area}}{m_{Area}} < 0.05$ )

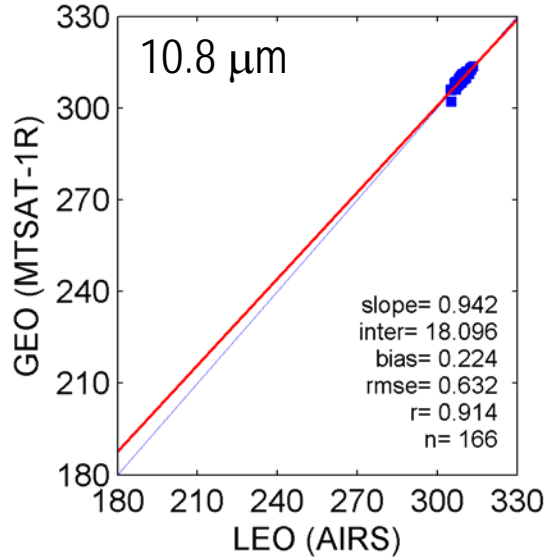


# Uniformity I-3: Relatively homogeneous cases ( $\frac{\sigma_{Area}}{m_{Area}} < 0.05$ )

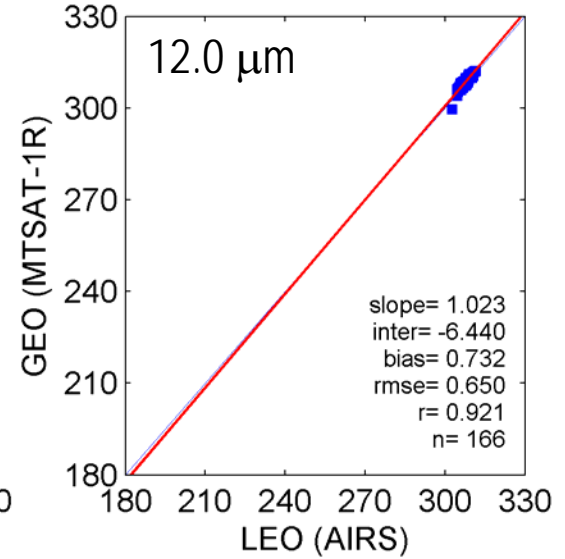
MT1R (IR1) 2007 0808 0433



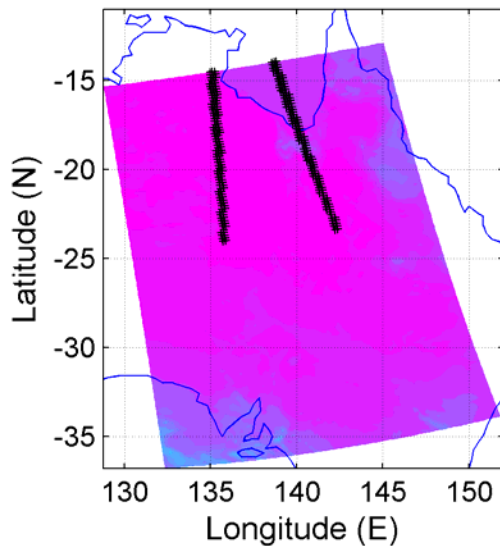
TB IR1



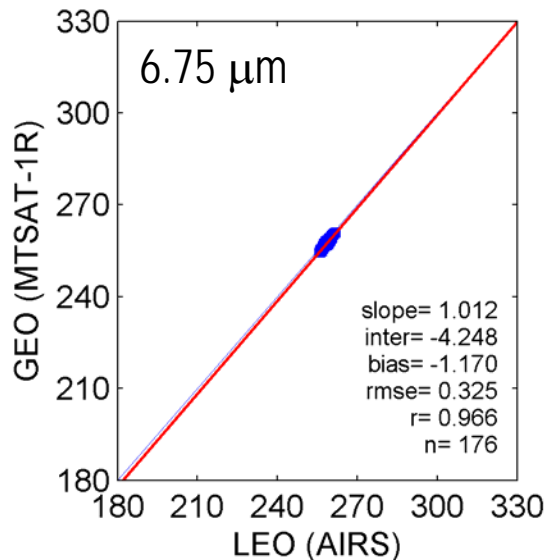
TB IR2



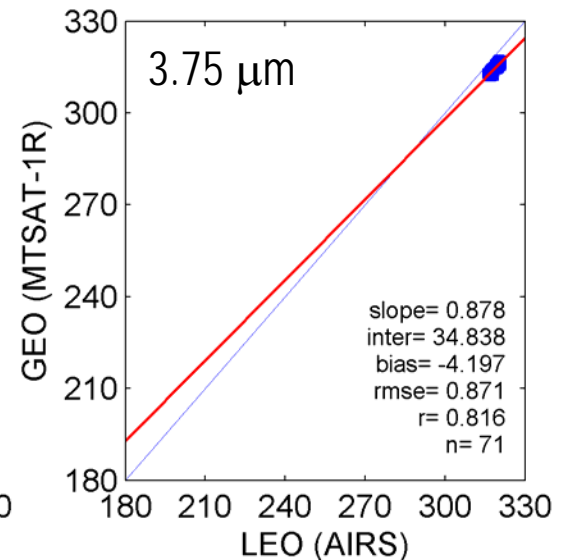
AIRS Rad. (10.8  $\mu\text{m}$ ) -045



TB IR3

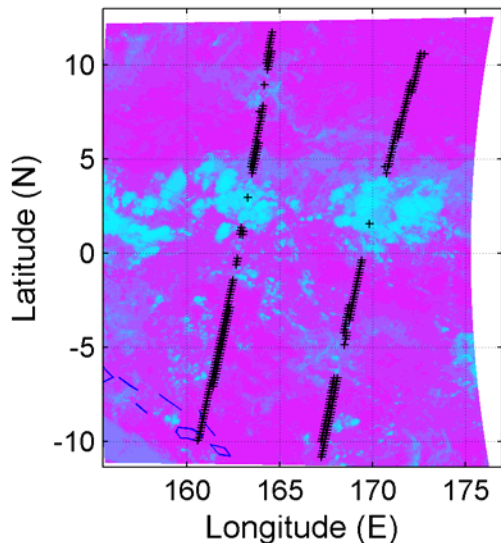


TB IR4

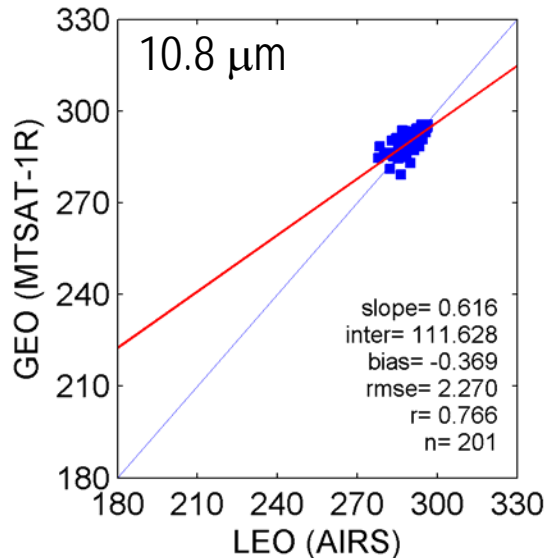


# Uniformity II-1: Relatively *inhomogeneous* cases

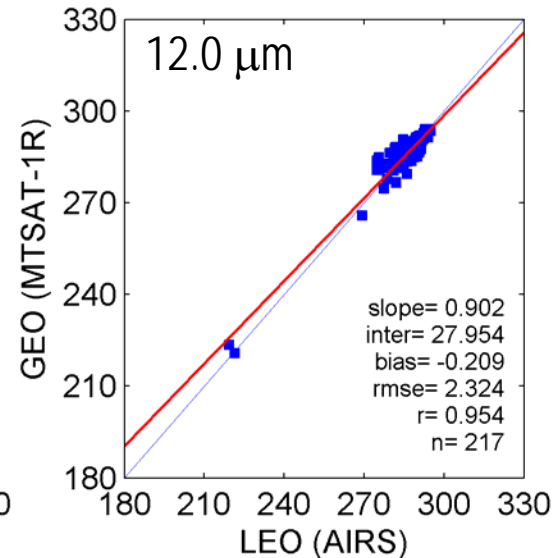
MT1R (IR1) 2007 0104 1433



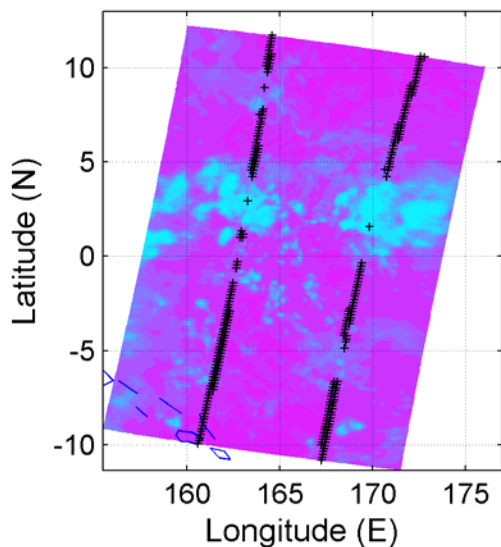
TB IR1



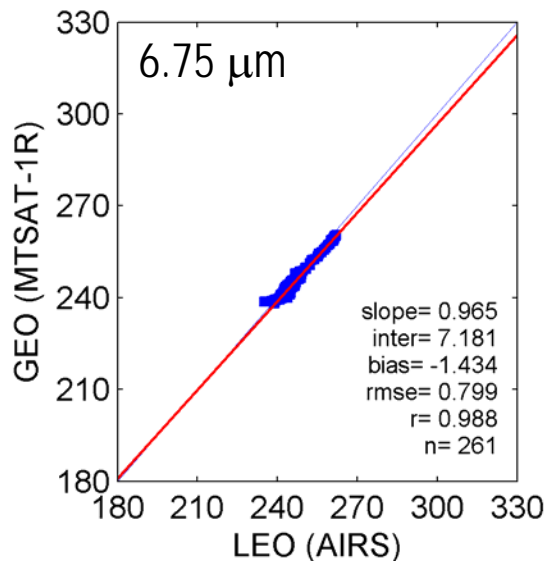
TB IR2



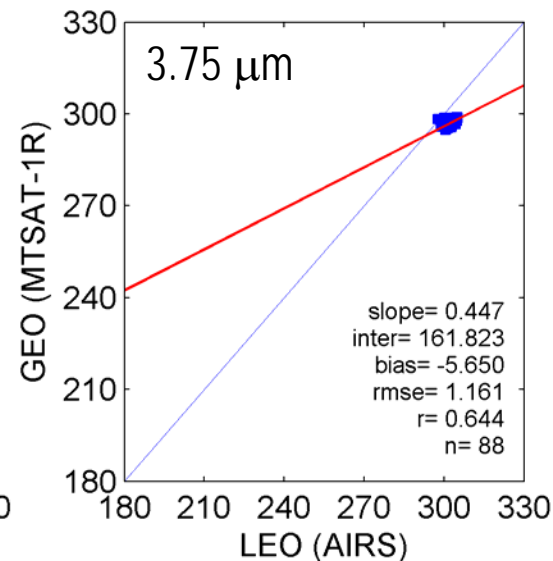
AIRS Rad. (10.8  $\mu\text{m}$ ) -145



TB IR3

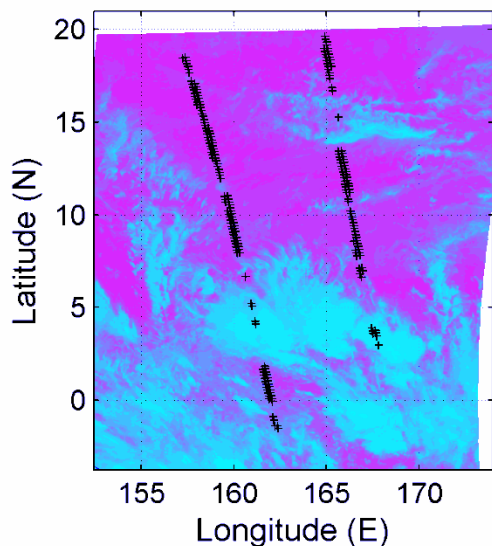


TB IR4

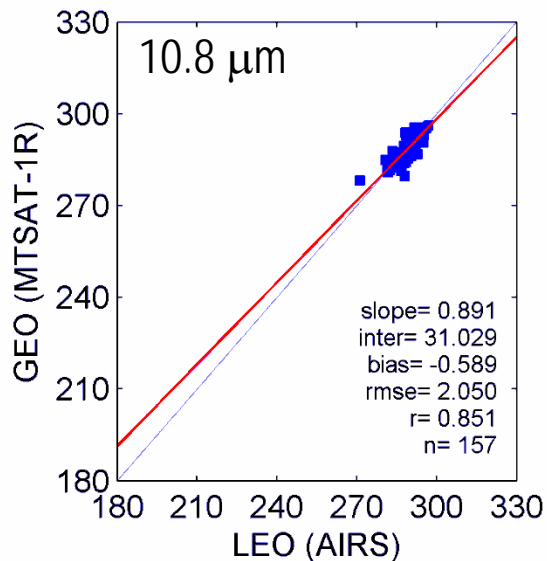


# Uniformity II-2: Relatively *inhomogeneous* cases

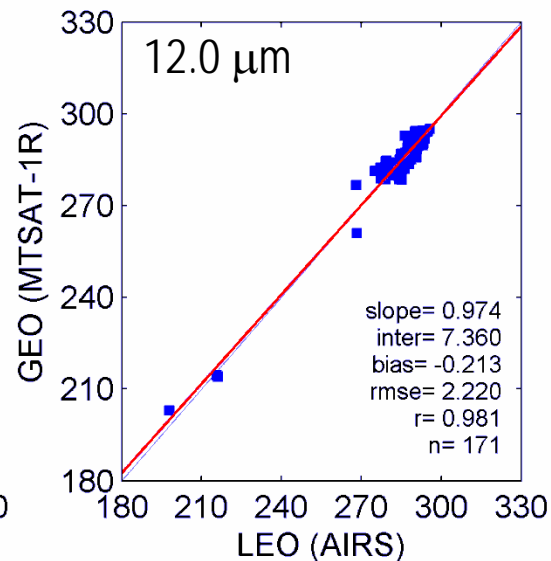
MT1R (IR1) 2007 0201 0233



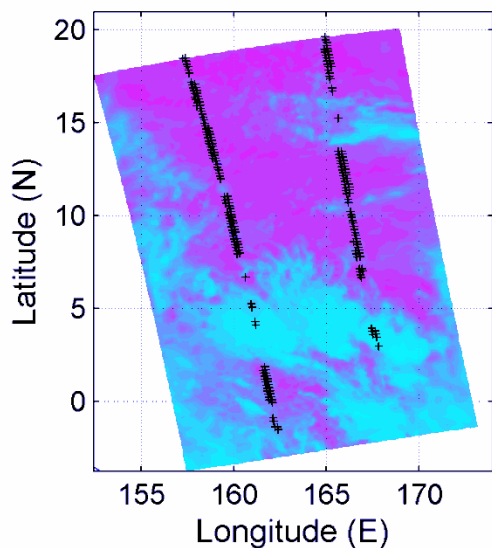
TB IR1



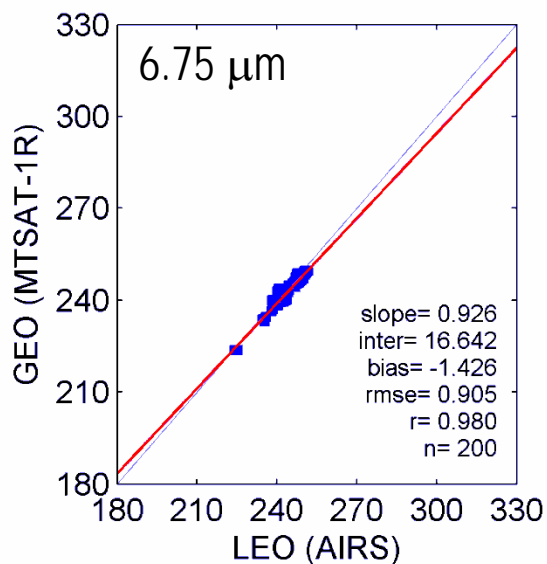
TB IR2



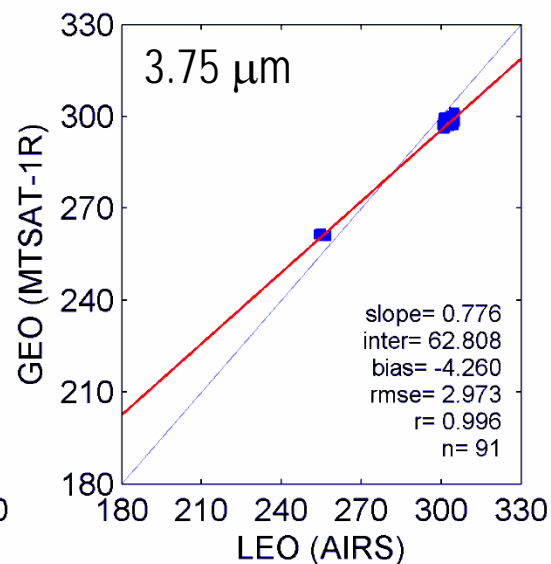
AIRS Rad. (10.8  $\mu\text{m}$ ) -026



TB IR3

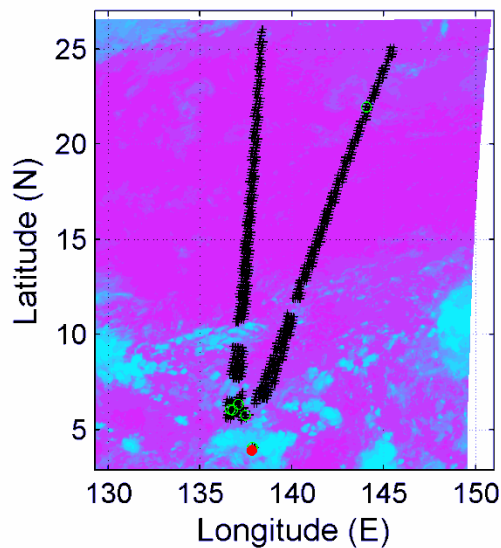


TB IR4

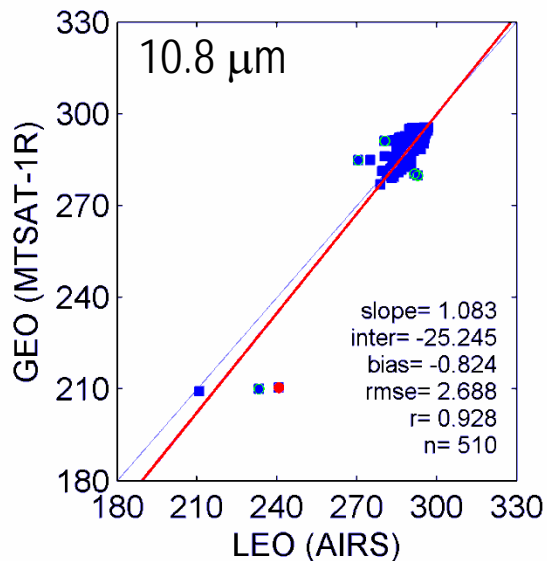


# Uniformity II-3: Relatively *inhomogeneous* cases

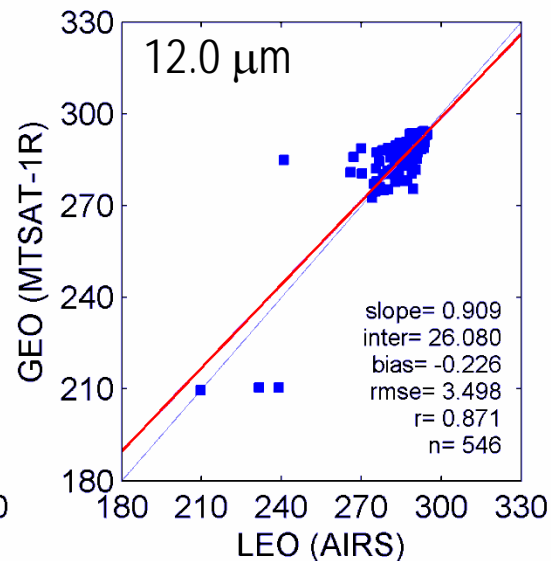
MT1R (IR1) 2007 0501 1633



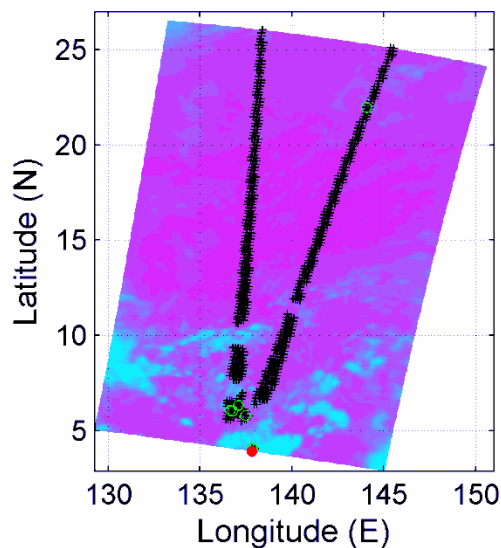
TB IR1



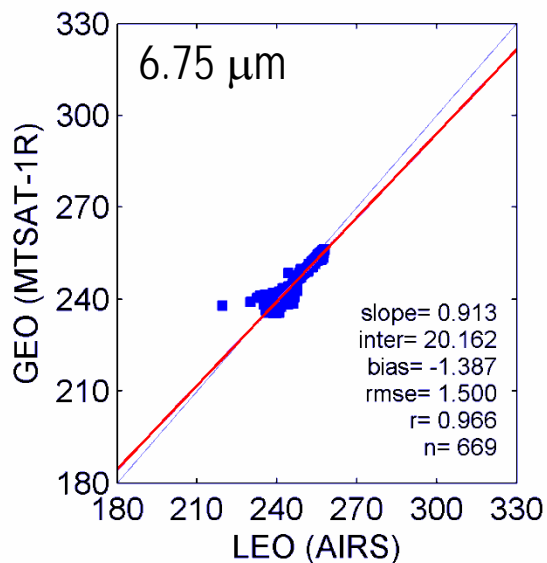
TB IR2



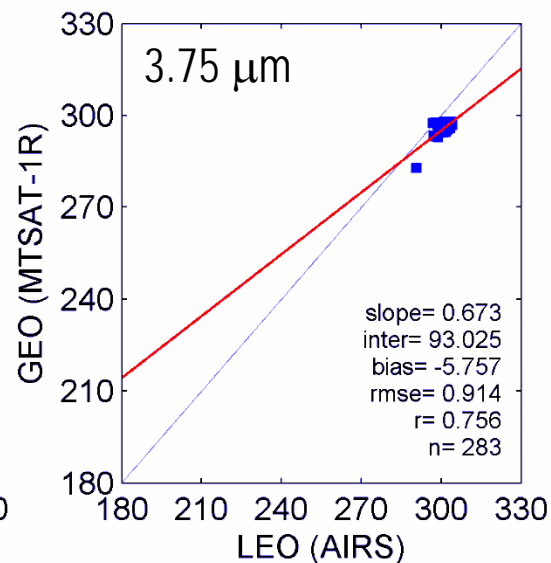
AIRS Rad. (10.8  $\mu\text{m}$ ) -164



TB IR3

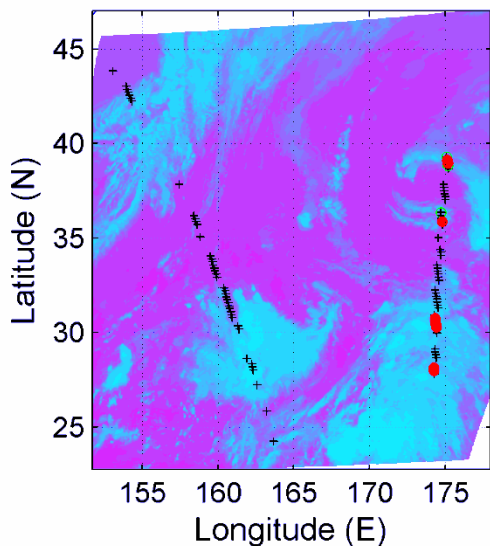


TB IR4

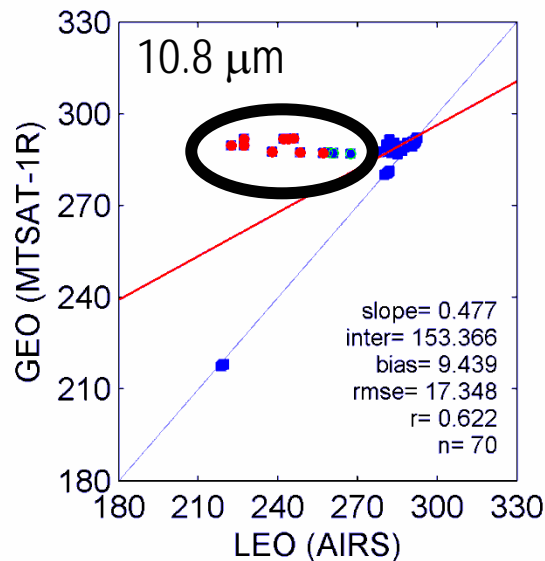


# Uniformity II-4: Relatively *inhomogeneous* cases

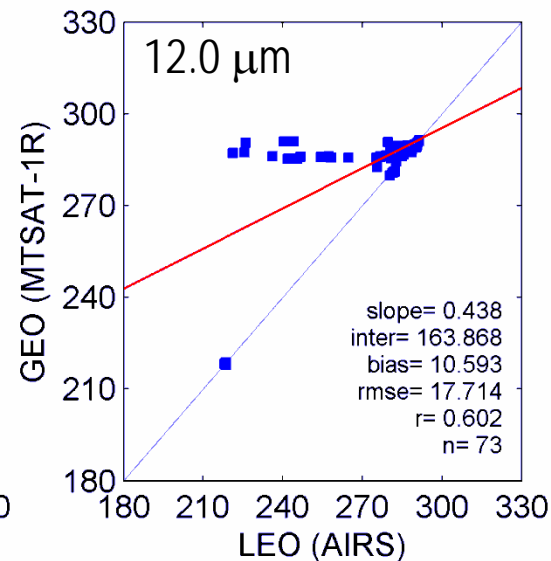
MT1R (IR1) 2007 0701 0200



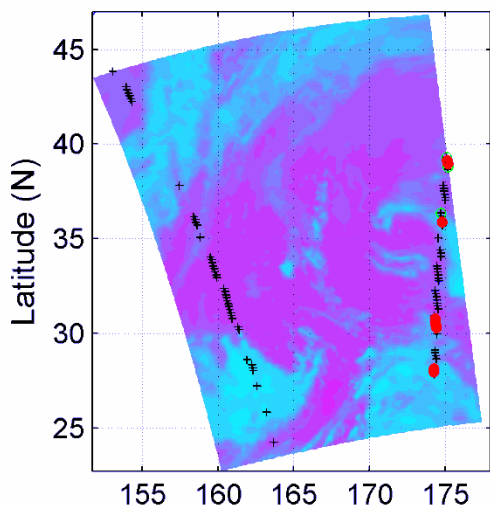
TB IR1



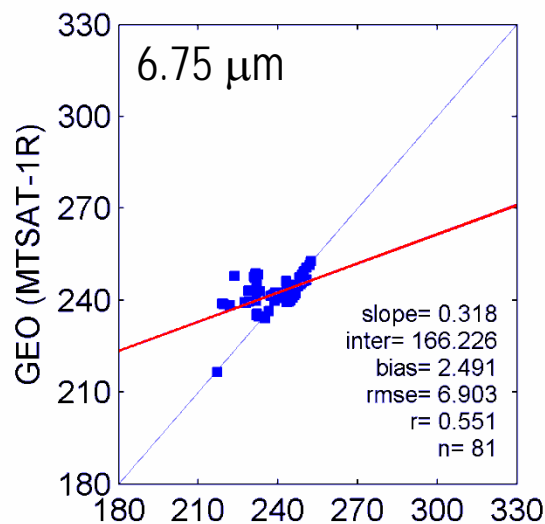
TB IR2



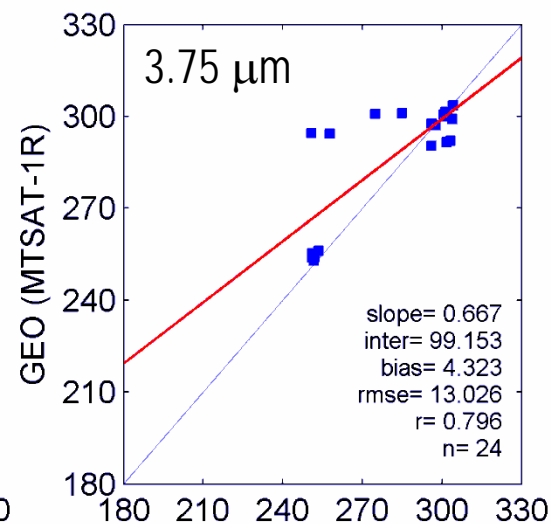
AIRS Rad. (10.8  $\mu\text{m}$ ) -021



TB IR3



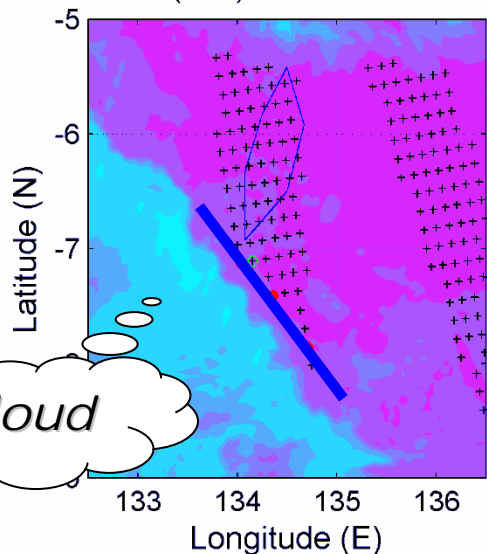
TB IR4



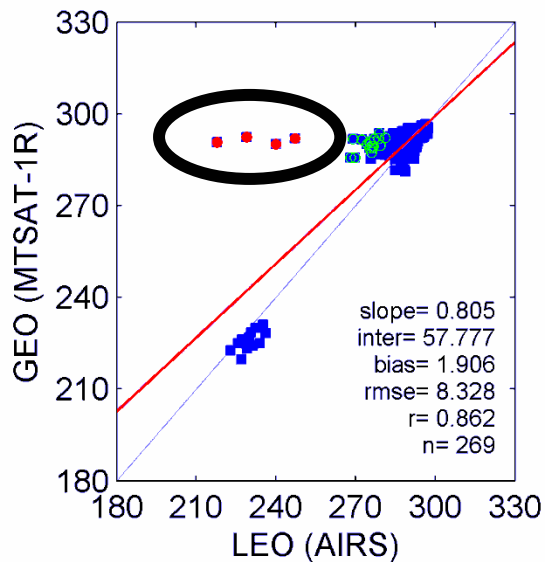
→ Filtering problem of Inhomogeneous scene for operation

# Time Check I: Time Difference < 15 min

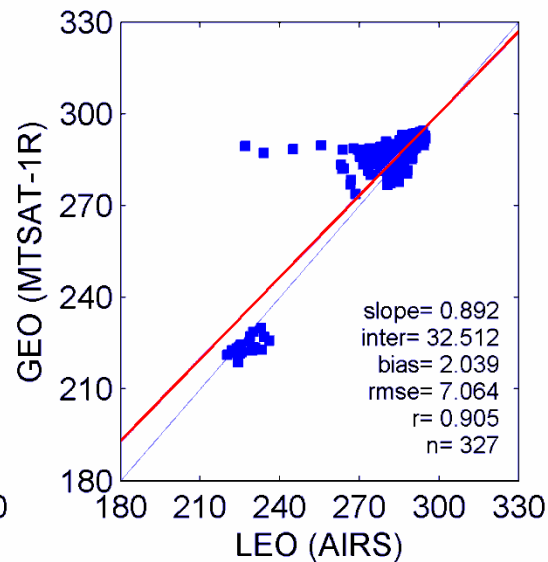
MT1R (IR1) 2007 0301 0433



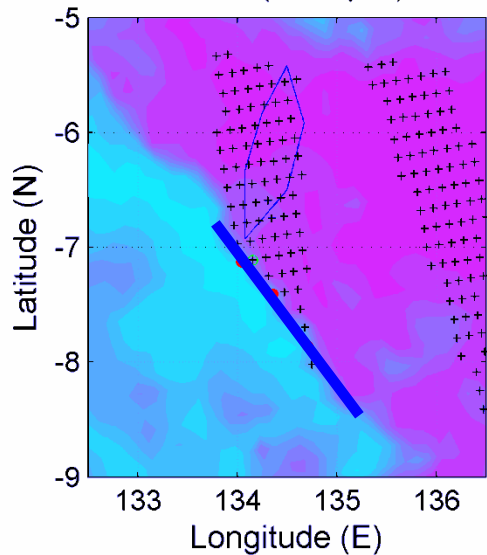
TB IR1



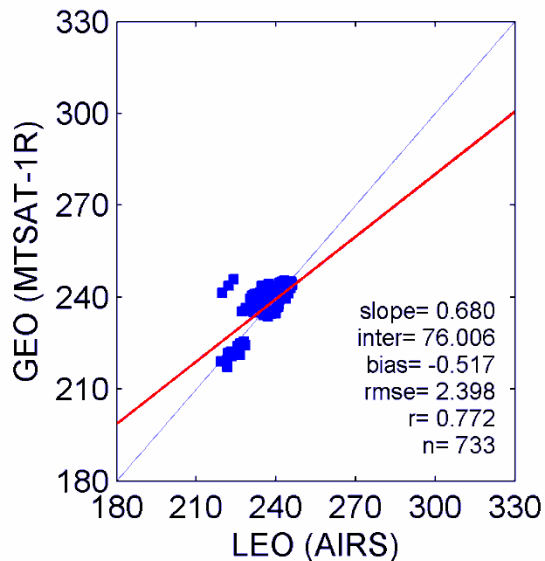
TB IR2



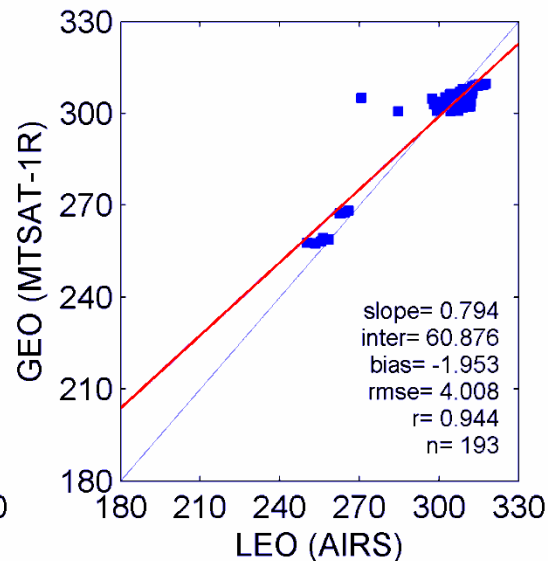
AIRS Rad. (10.8 μm) -046



TB IR3



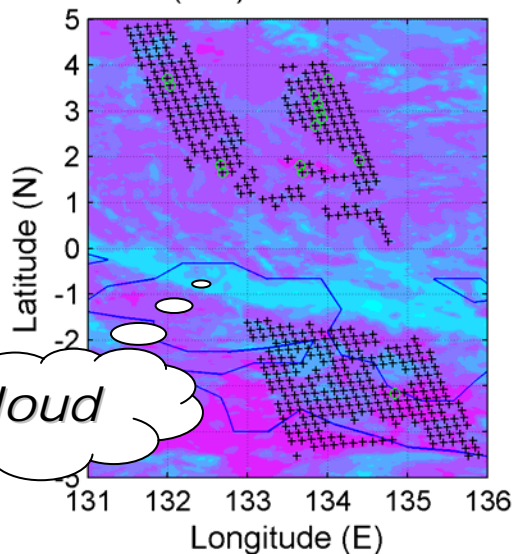
TB IR4



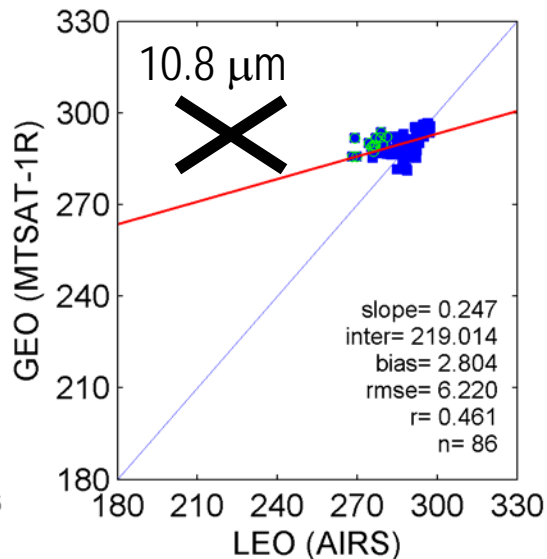


# Time Check II: Time Difference < 5 min

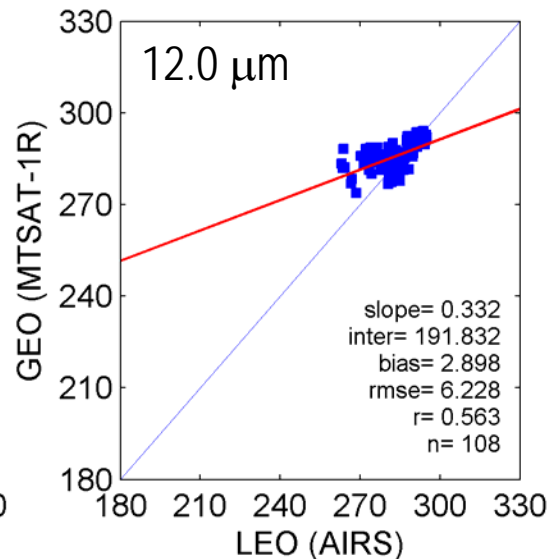
MT1R (IR1) 2007 0301 0433



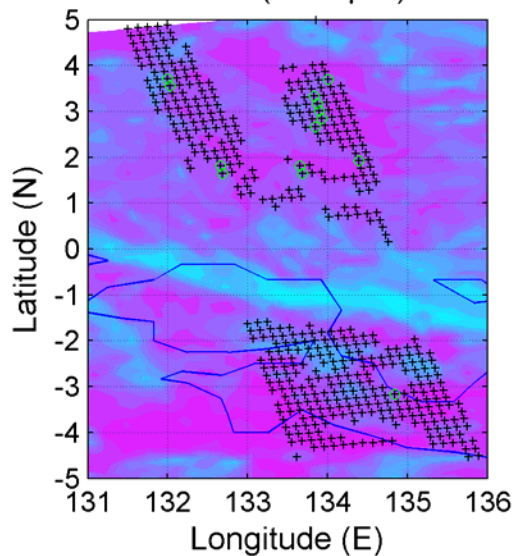
TB IR1



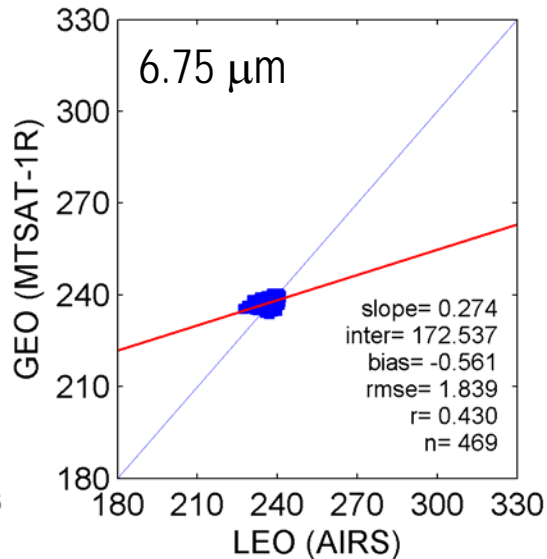
TB IR2



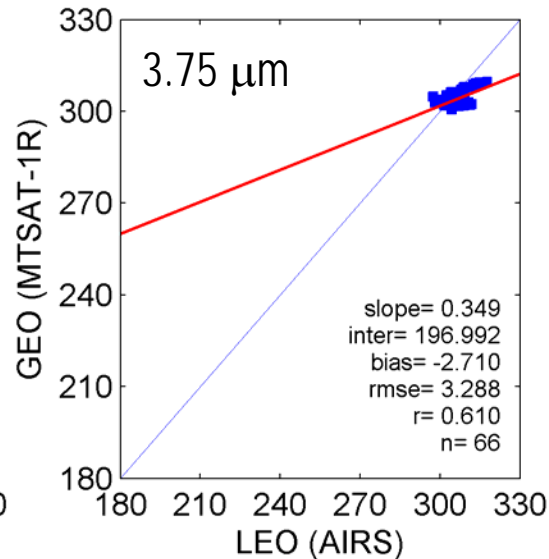
AIRS Rad. (10.8 μm) -046



TB IR3

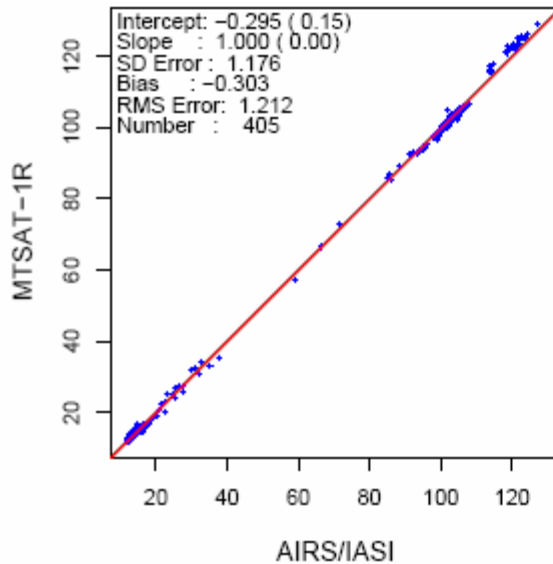


TB IR4

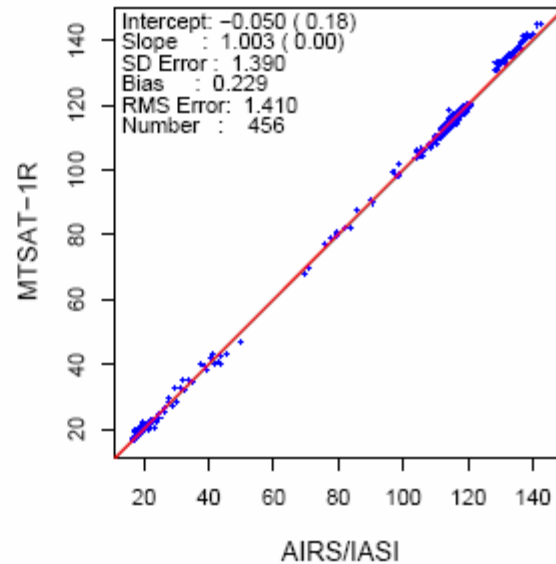


# 3.7 $\mu$ m channel issue in constraint method

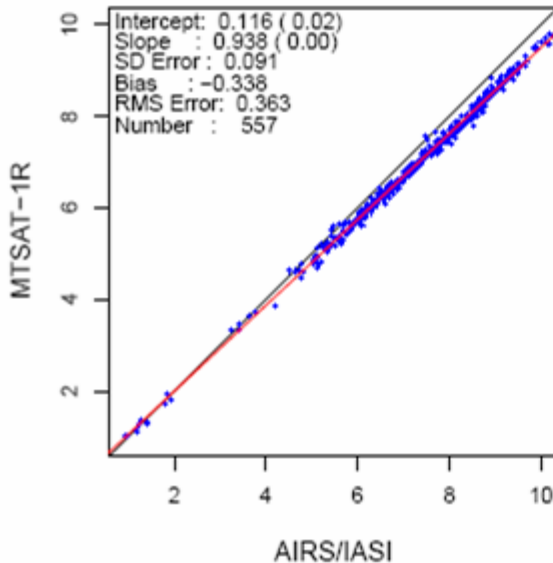
RAD\_IR1(20080403)



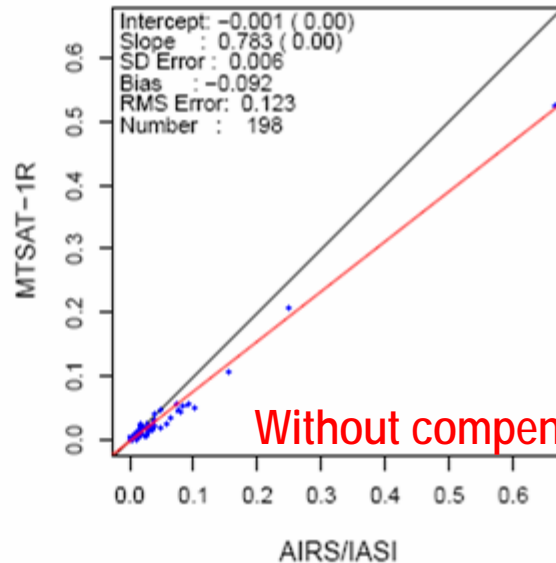
RAD\_IR2(20080403)



RAD\_IR3(20080403)



RAD\_IR4(20080403)



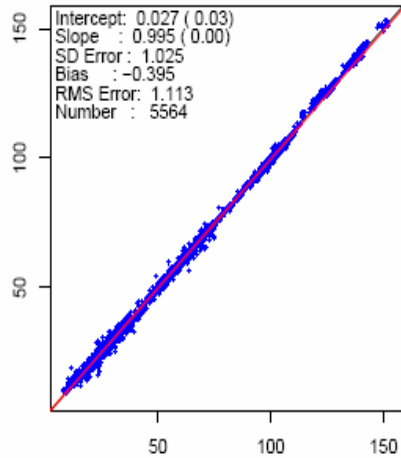
Without compensation

# 3.7 $\mu\text{m}$ channel issue in constraint method

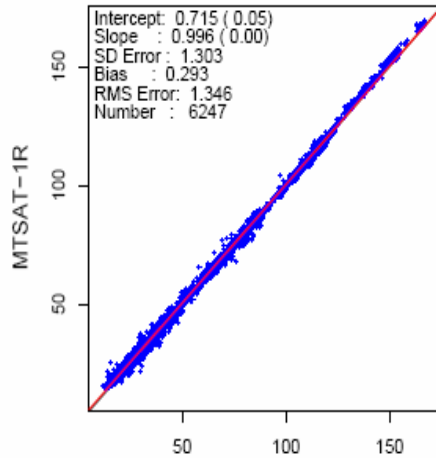
## Constraint Method

## Convolution Method

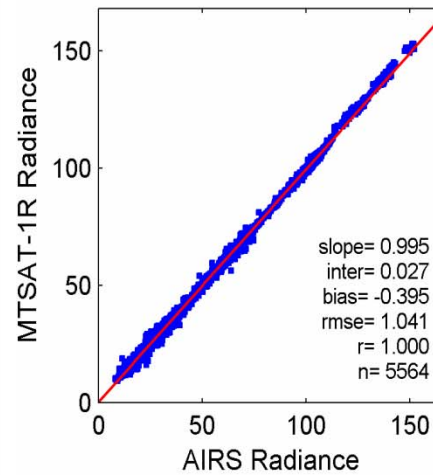
RAD\_IR1(200804)



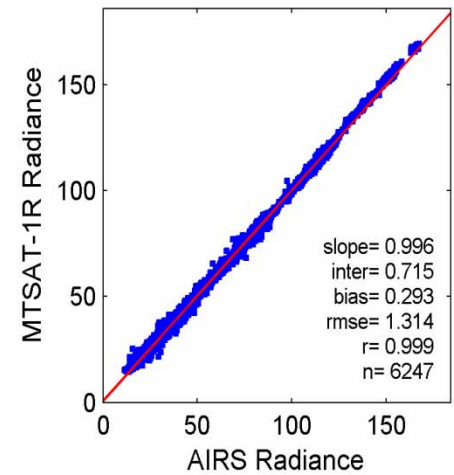
RAD\_IR2(200804)



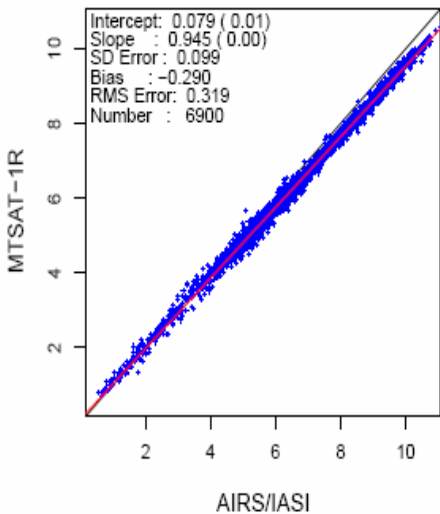
IR1(200804)



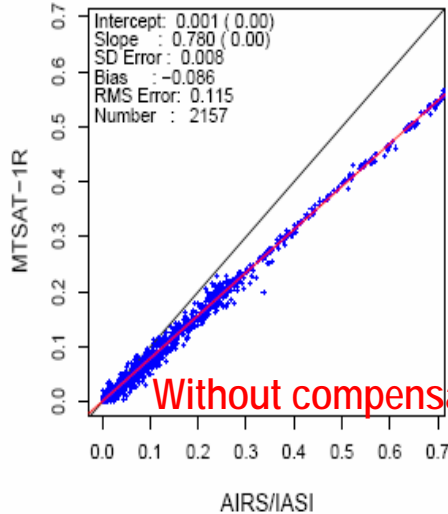
IR2(200804)



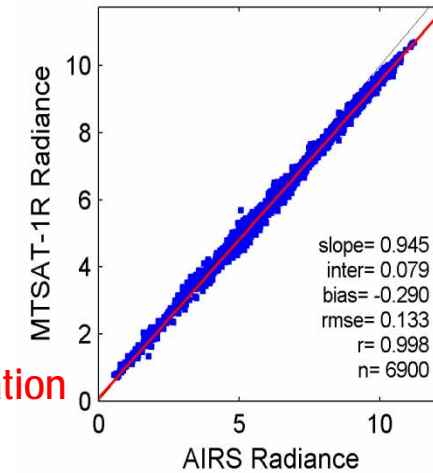
RAD\_IR3(200804)



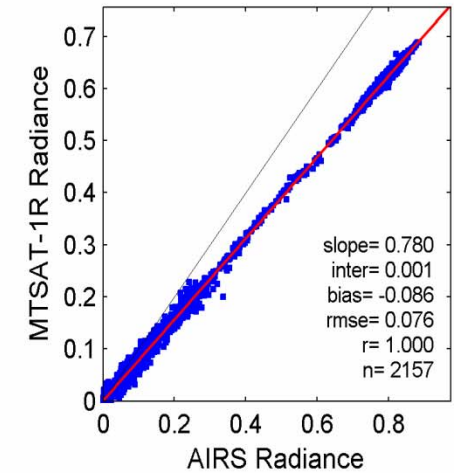
RAD\_IR4(200804)



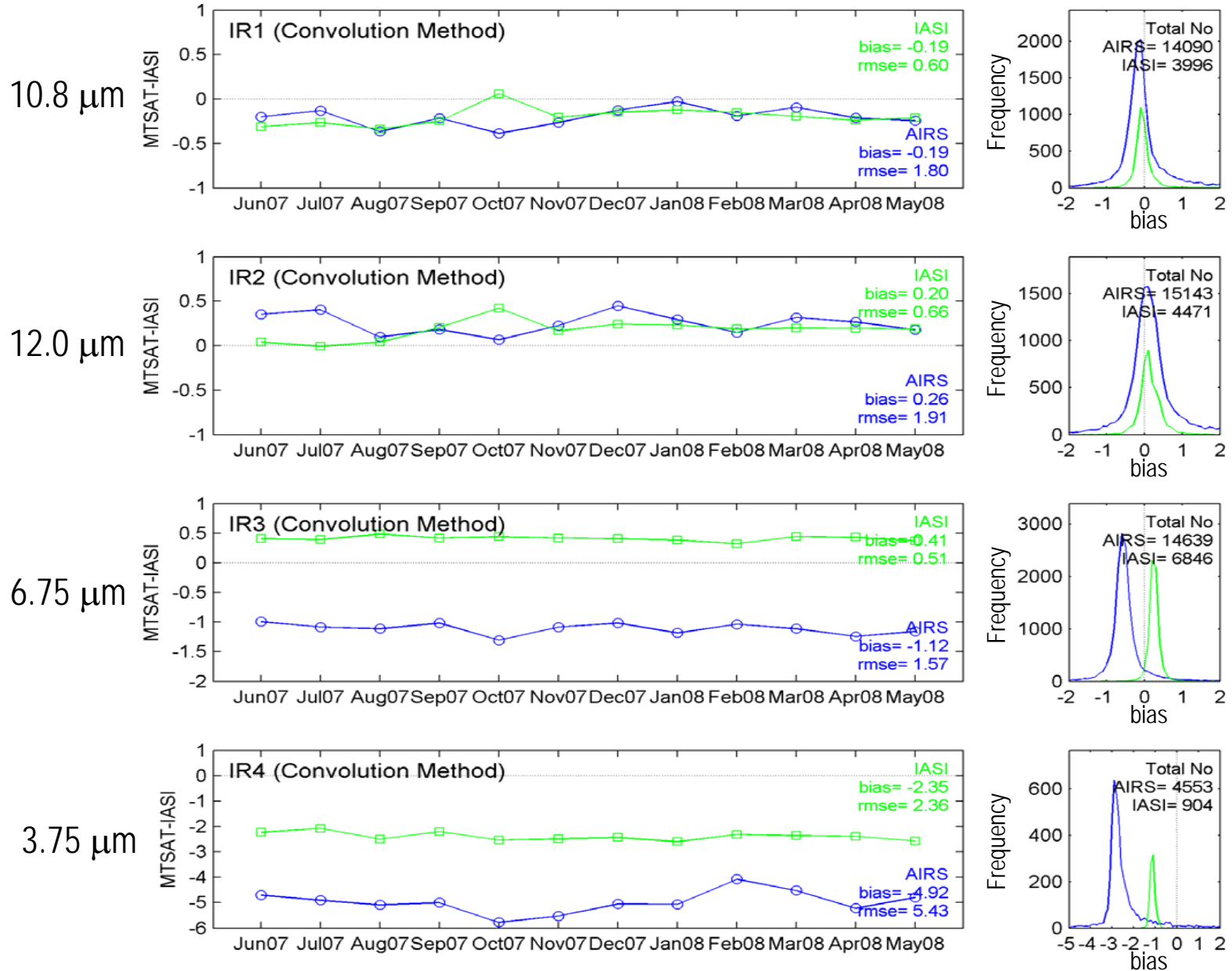
IR3(200804)



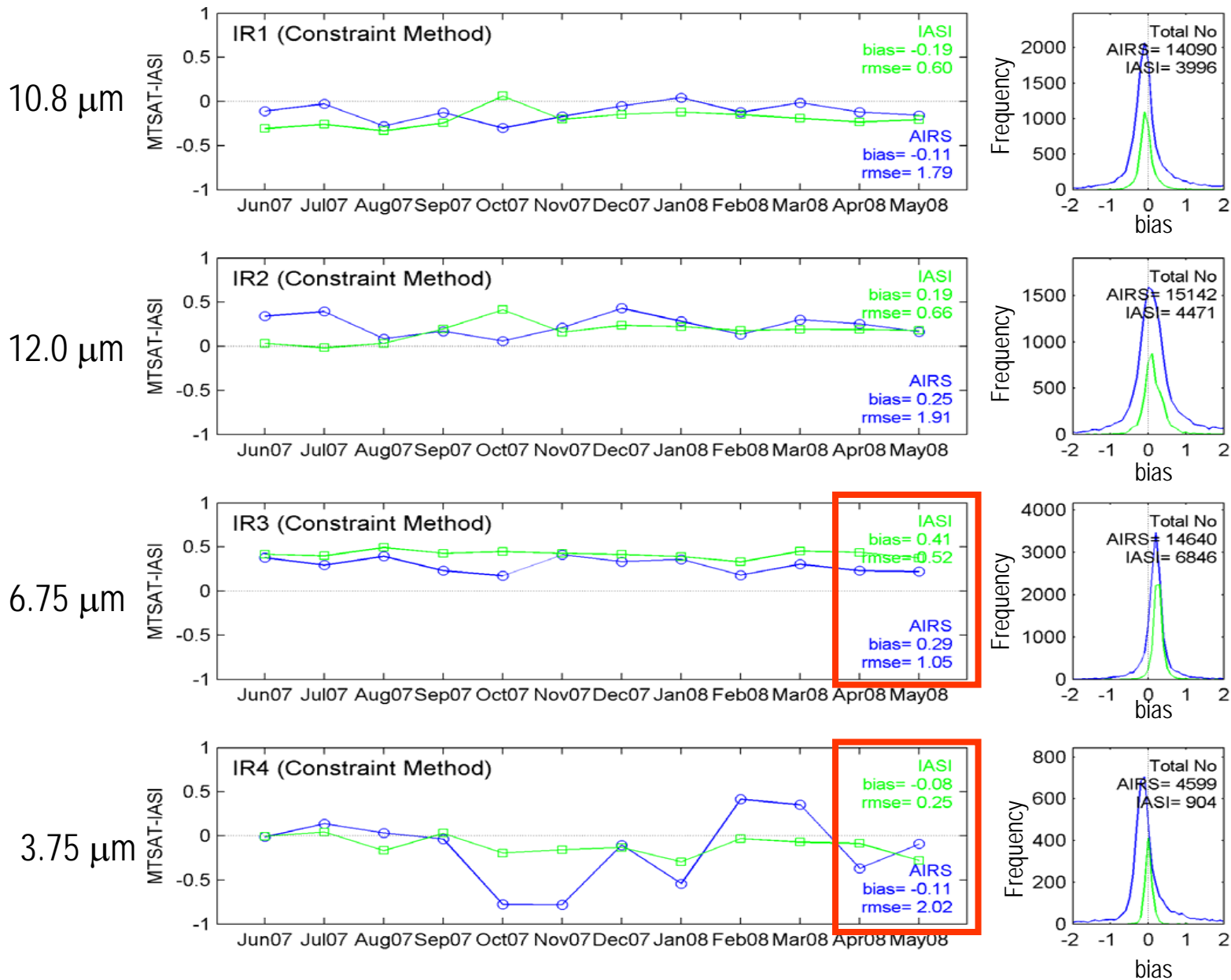
IR4(200804)



# Time series of $\Delta T$ (MTSAT-AIRS/IASI) with Convolution method

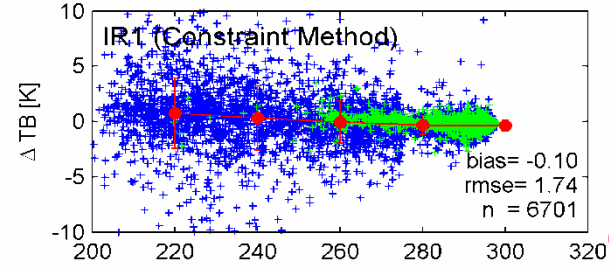
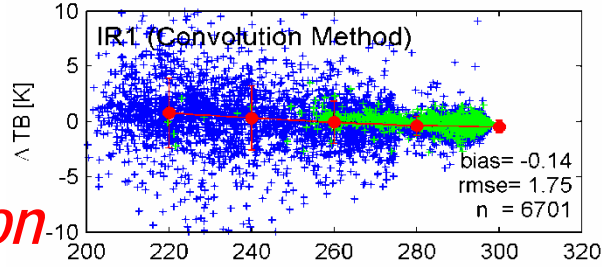


# Time series of $\Delta T$ (MTSAT-AIRS/IASI) with Constraint method



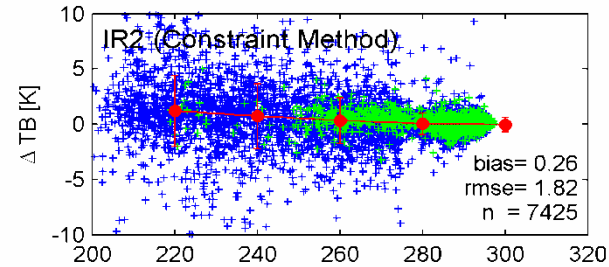
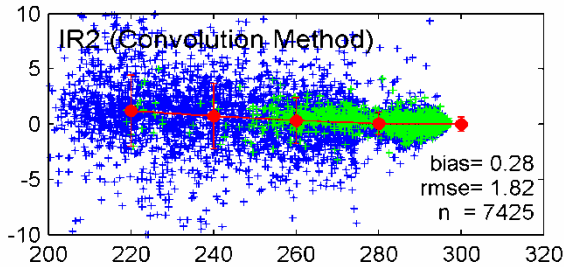
# Convolution vs. Constraint method

10.8  $\mu\text{m}$   
*Convolution*

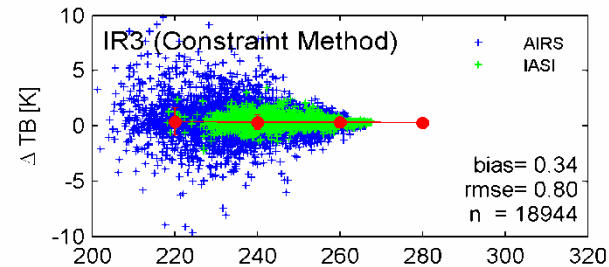
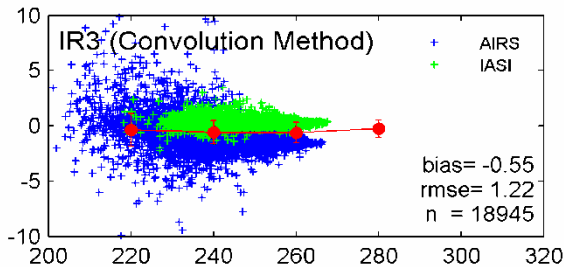


*Constraint*

12.0  $\mu\text{m}$



6.75  $\mu\text{m}$



3.75  $\mu\text{m}$

