

ISRO's GSICS Activities for Intercalibration of the INSAT-3D radiances

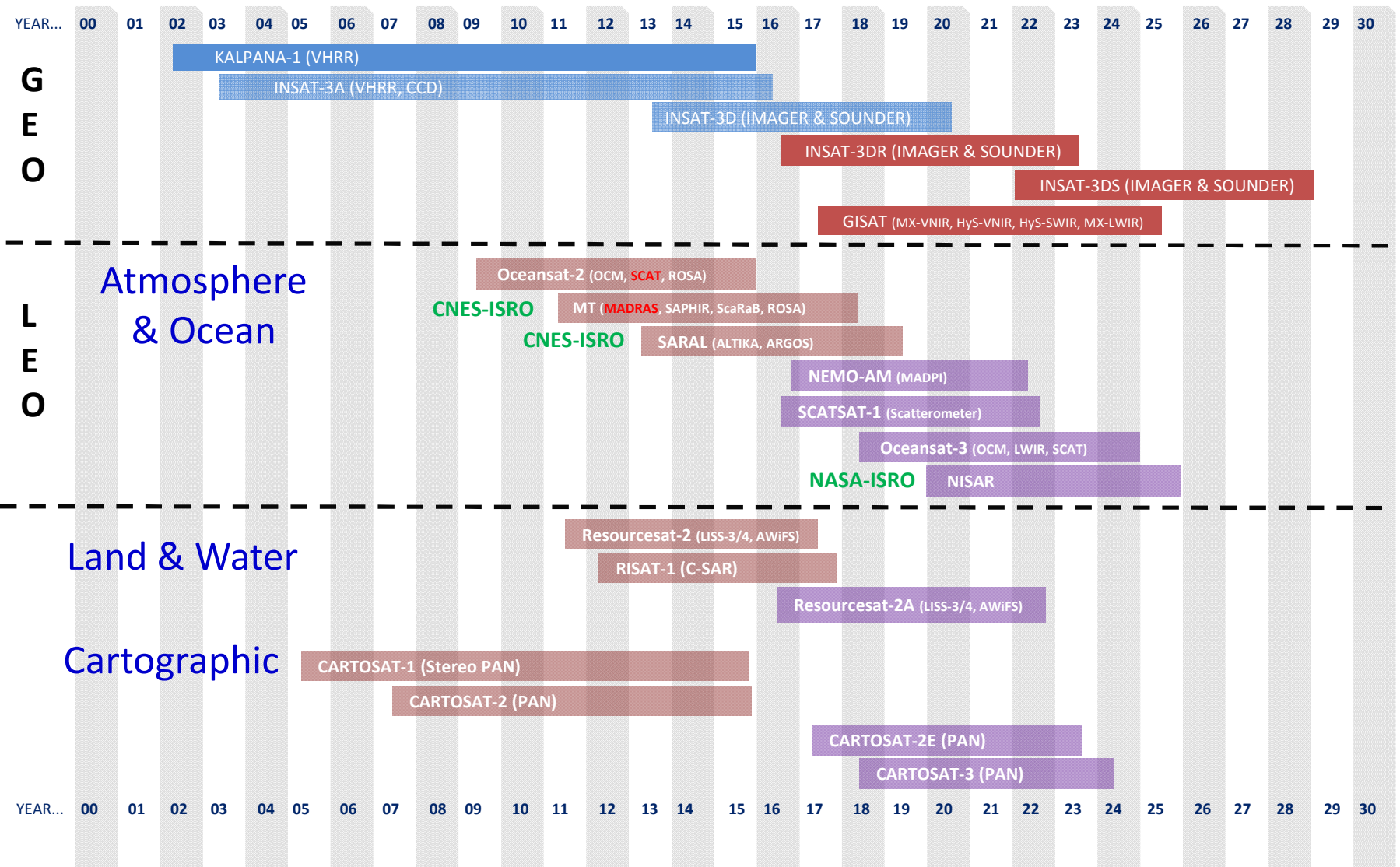
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Space Applications Centre (ISRO)

India

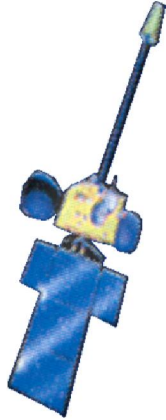
ISRO Current satellites for Earth Observations



Indian Meteorological Geostationary Satellites



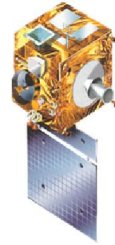
INSAT-1D
VHRR
1990



INSAT-2A/2B
VHRR
1992/93



INSAT-2E
VHRR, CCD
1999



KALPANA-1
VHRR
2002



INSAT-3A
VHRR, CCD
2003



INSAT-3D
Imager/ Sounder
2013



INSAT-3DR
Imager/ Sounder
2016



GISAT
MX-LWIR/MX-VNIR/
Hys-VNIR/Hys-SWIR
2017

ISRO GSICS website development

← → ↻ 🏠 122.252.237.243:8086/GSICS_ISRO/ 🔍 ☆

 Government of India
  SAC
 Meteorological and Oceanographic Satellite Data Archival Centre
 Space Applications Center, ISRO

M O S D A C



GLOBAL SPACE-BASED INTER-CALIBRATION SYSTEM (GSICS)



- GSICS is an international collaborative effort initiated in 2005 by World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS).
- The objective of GSICS is to provide calibration corrections needed for accurately integrating data from multiple observing systems and ensuring consistent observations for climate monitoring weather forecasting, and environmental applications.
- ISRO as a member organization of GSICS is carrying out the inter-calibration activity for Indian meteorological satellites in order to provide the calibration correction coefficients to the international users.

GSICS PRODUCT SUMMARY

Monitored satellite/instrument	Reference satellite/instrument	Status	GSICS Product	Documentation
INSAT-3D/Imager	Metop-A/IASI	Demo	Near real-time correction Re-Analysis correction Bias monitoring	ATBD README Publications
INSAT-3D/Sounder	Metop-A/IASI	Demo	Near real-time correction Re-Analysis correction Bias monitoring	ATBD README Publications
Kalpana-1/VHRR	Metop-A/IASI	Under development	-	ATBD README Publications
INSAT-3A/VHRR	Metop-A/IASI	Under development	-	ATBD README Publications

6 Channel IMAGER

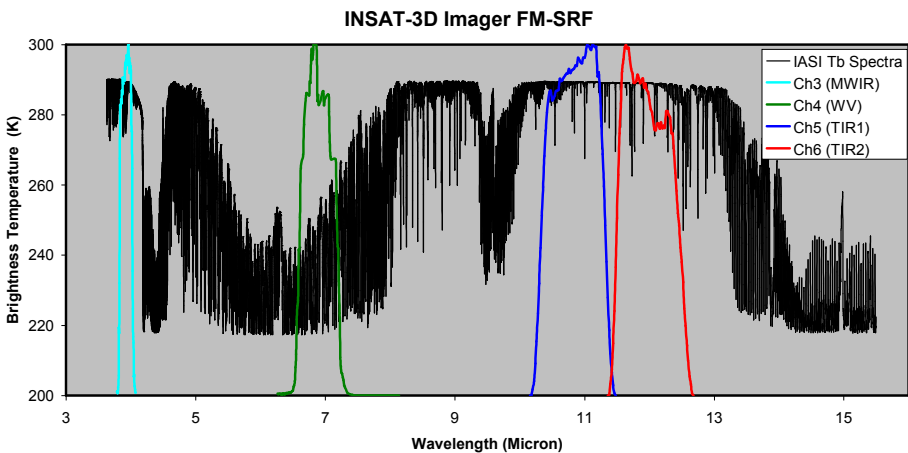
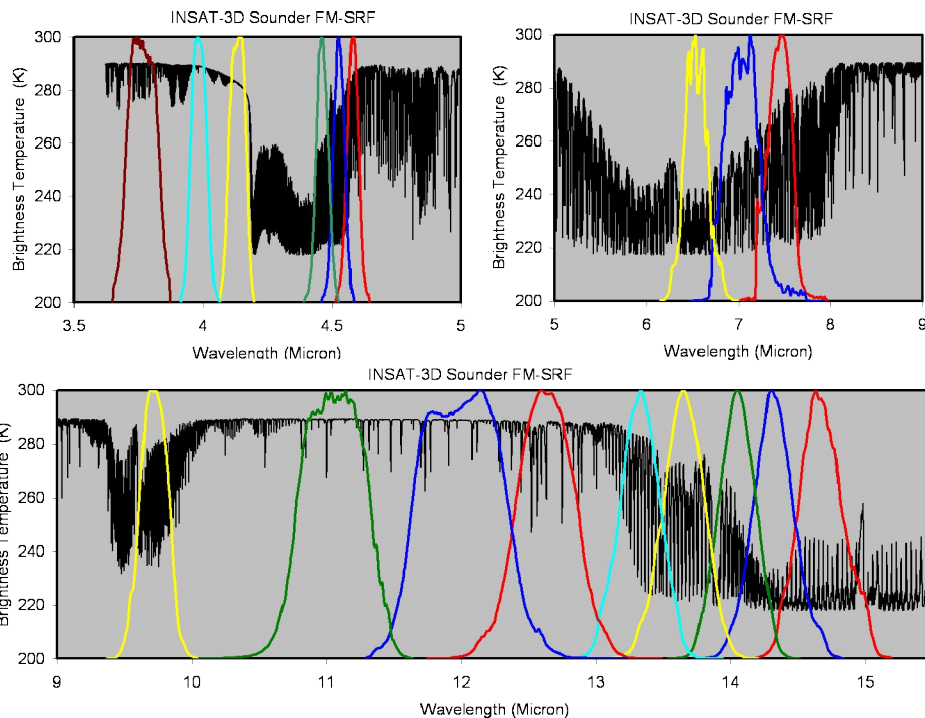
19 Channel SOUNDER

Spectral Bands	(μm)	Res
Visible	: 0.55 - 0.75	1 km
Short Wave Infra Red	: 1.55 - 1.70	1 km
Mid Wave Infra Red	: 3.70 - 3.95	4 km
Water Vapour	: 6.50 - 7.10	8 km
Thermal Infra Red – 1	: 10.30 - 11.30	4 km
Thermal Infra Red – 2	: 11.30 - 12.50	4 km

• Spectral Bands (μm)	
Short Wave Infra Red	: Six bands
Mid Wave Infra Red	: Five Bands
Long Wave Infra Red	: Seven Bands
Visible	: One Band
• Resolution	: 10 km

Launch Date: 26 Aug 2013

Location: 82E



Data Source: IASI L1C Eumetsat

Temporal Collocation: 5 min IMG, 10 min SND

Spatial Collocation: IASI pixel (12 km)

Zen. angle collocation:

$$\text{maxzen} = 0.1$$

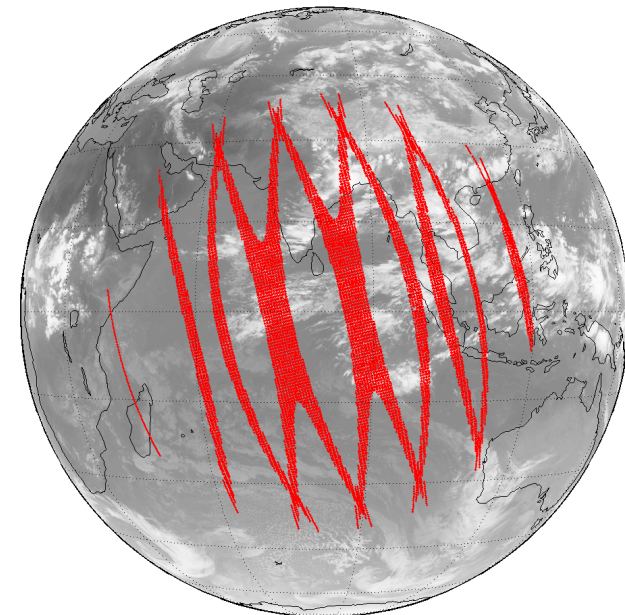
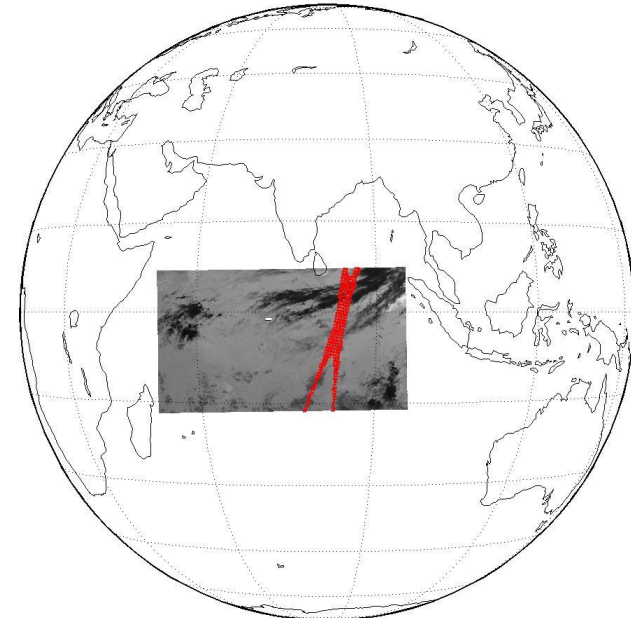
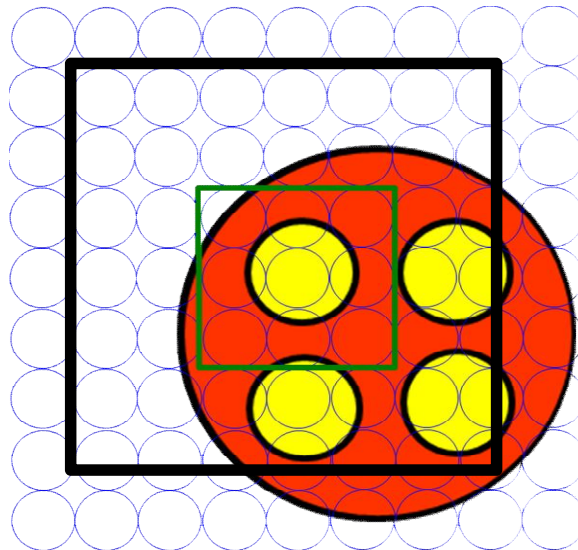
$$\left| \frac{\cos(\text{geo_zen})}{\cos(\text{leo_zen})} - 1 \right| < \text{max_zen}$$

Spatial homogeneity test:

- Std. Dev. within target and environment
- Convolved broadband radiance:

$$R_{conv} = \left[\sum_{i=1}^n R_{IASI}^i S_{INSAT}^i \Delta v \right] / \left[\sum_{i=1}^n S_{INSAT}^i \Delta v \right]$$

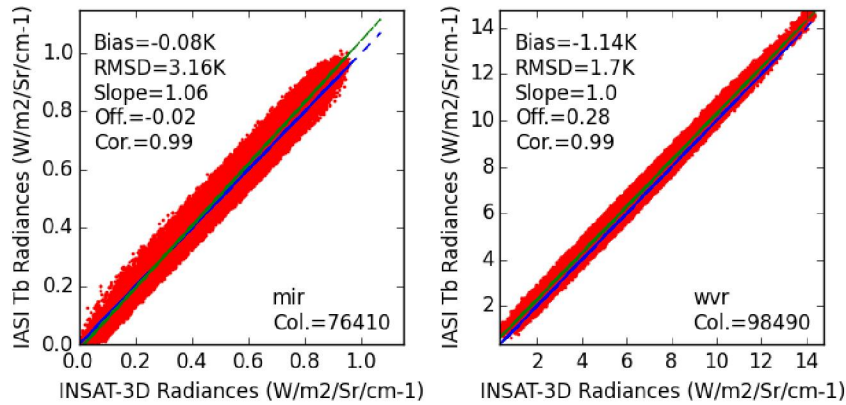
Channel	Spatial Collocation Threshold	Target area (no. of GEO pixels)	Environment area (no. of GEO pixels)
IMAGER			
MIR	4 km	5×5	15×15
WVR	8 km	3×3	7×7
TIR1	4 km	5×5	15×15
TIR2	4 km	5×5	15×15
SOUNDER			
Ch. 1-18	10 km	3×3	7×7



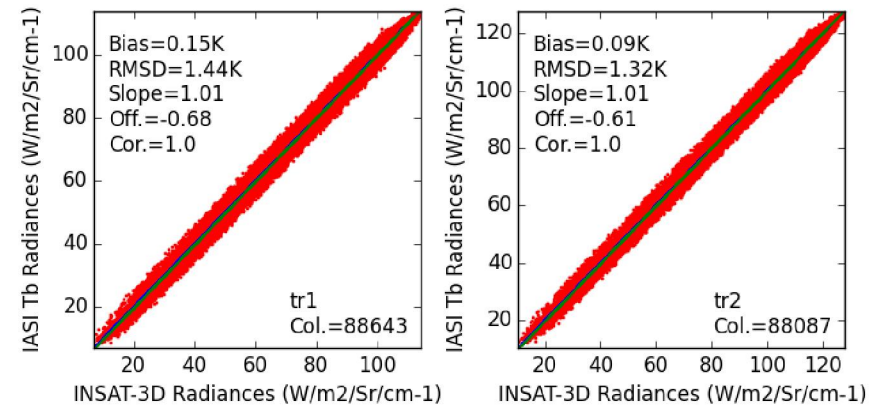
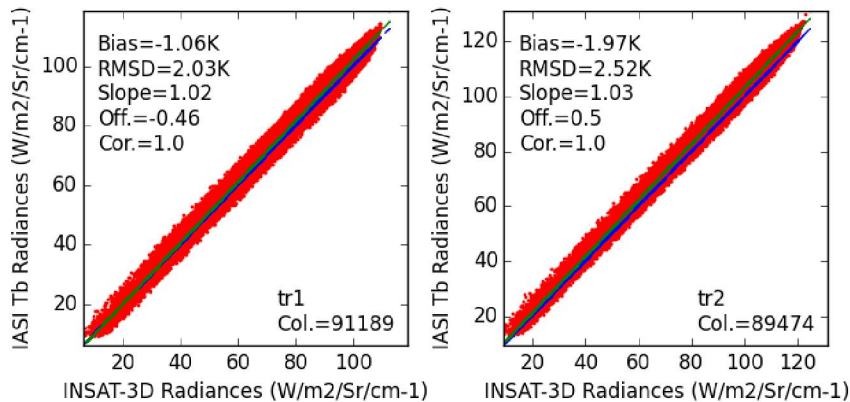
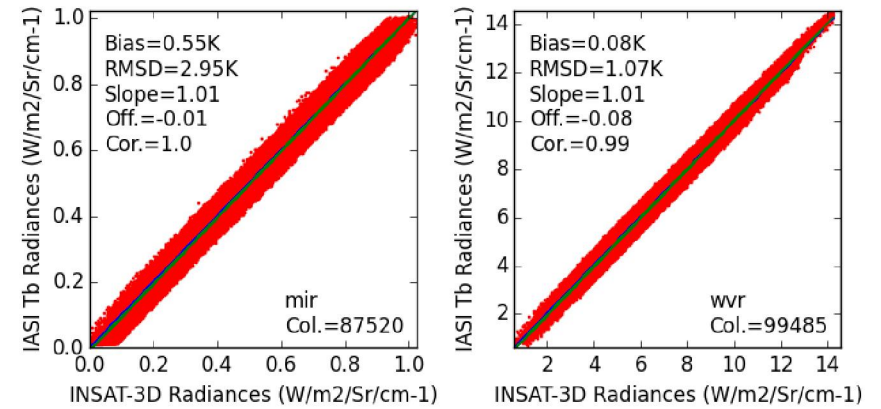
INSAT-3D Imager Bias (INSAT3D – IASI)



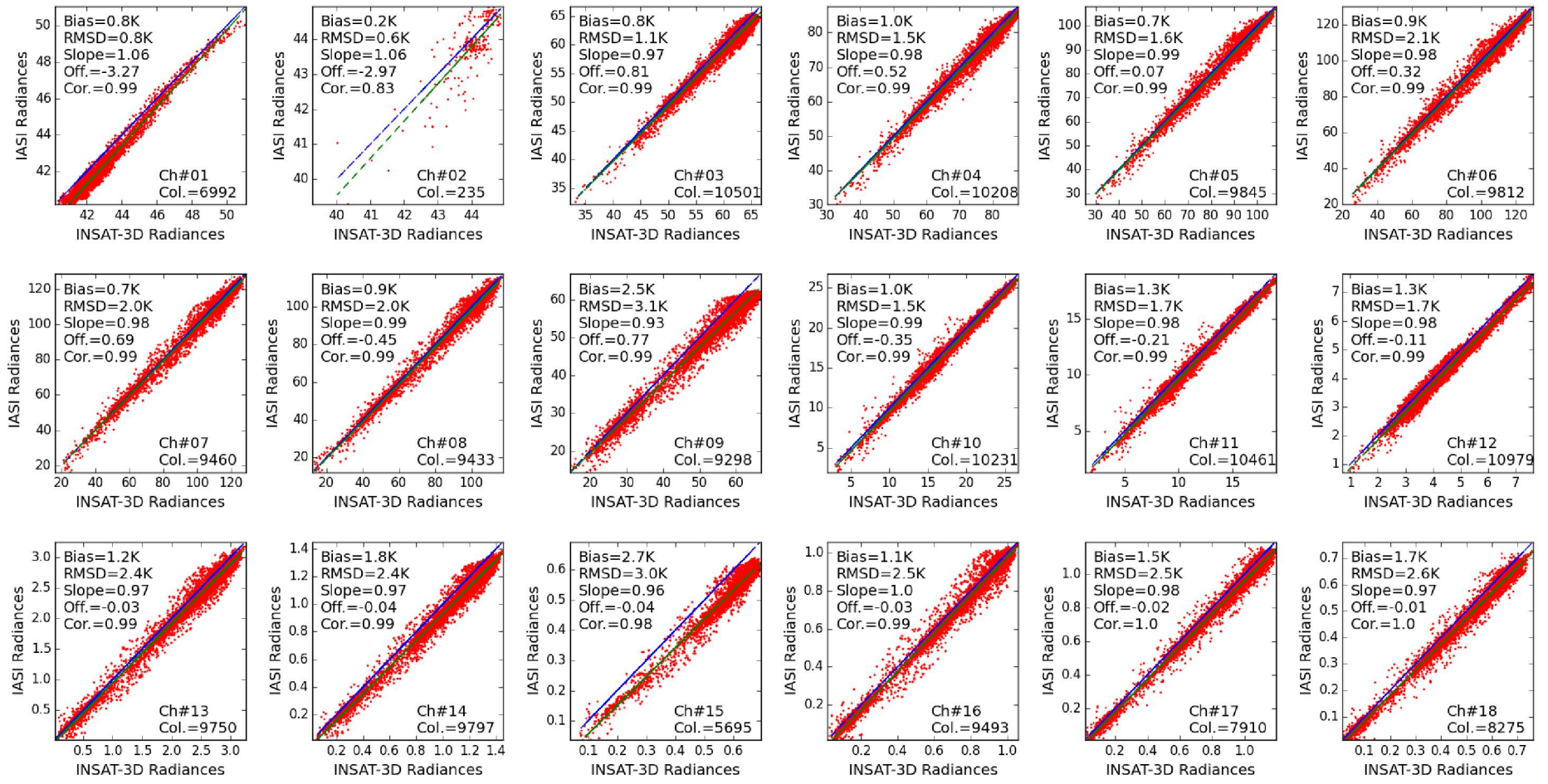
INSAT-3D Imager Dec-2015 (Night)



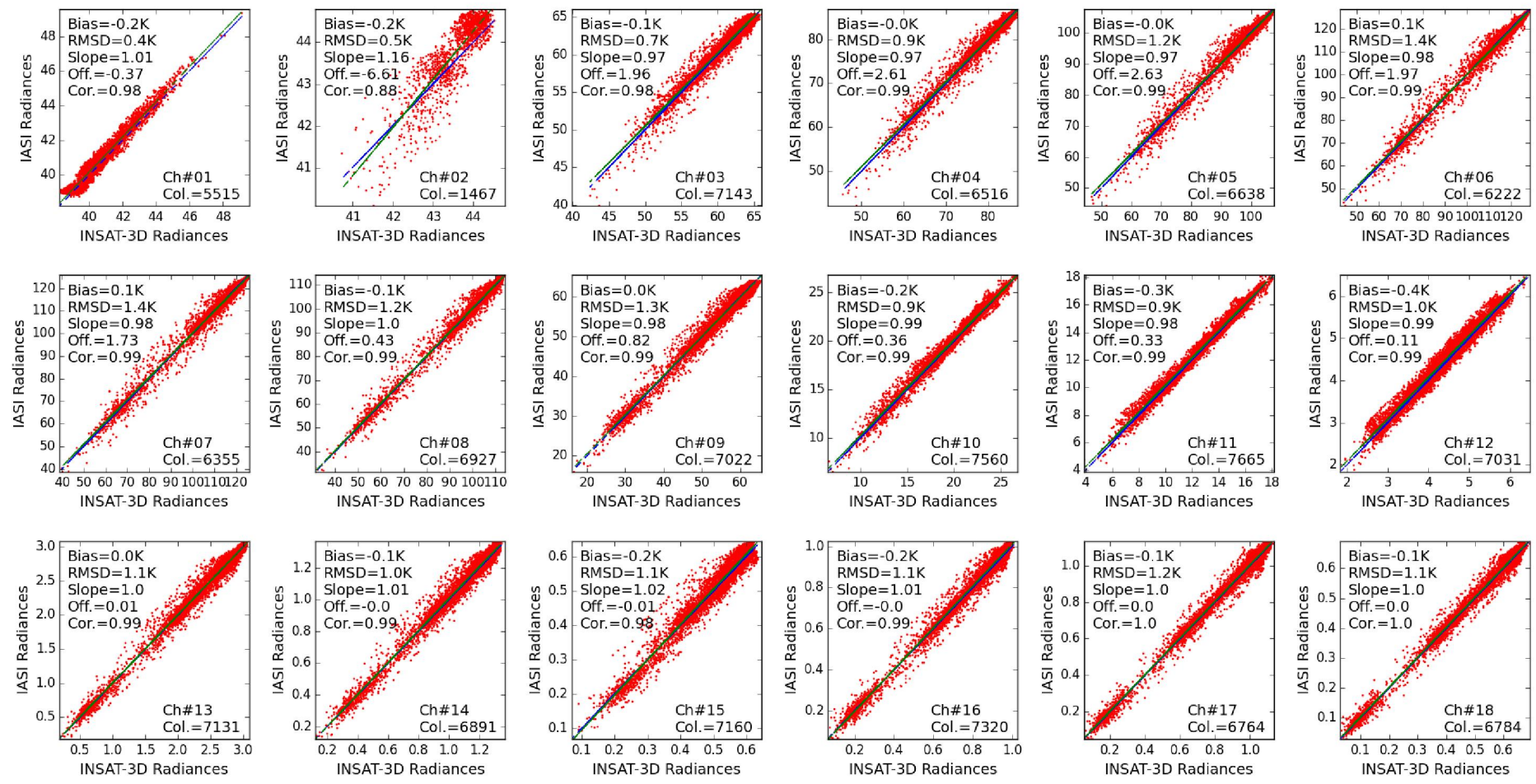
INSAT-3D Imager Feb-2016 (Night)



INSAT-3D Sounder Dec-2015 (Night)

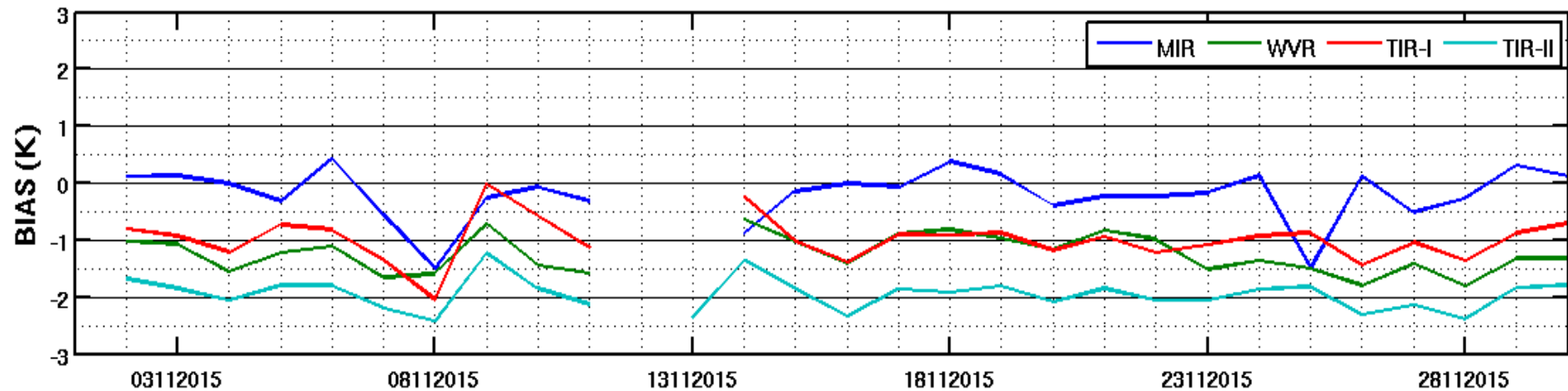


INSAT-3D Sounder Feb-2016 (Night)

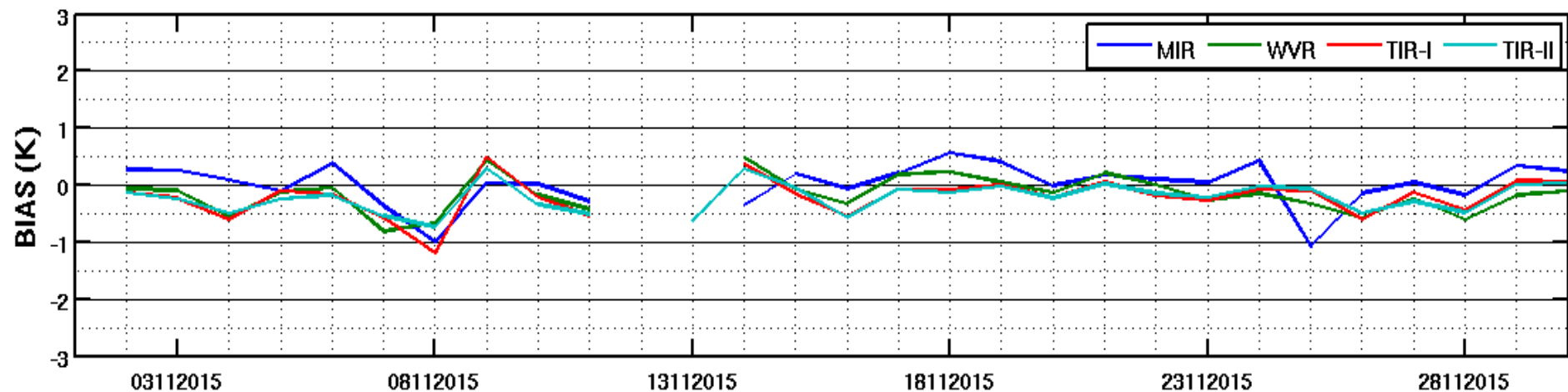


INSAT-3D Imager Channel Bias before and after GSICS correction coefficients (Nov 2015)

Before GSICS Correction



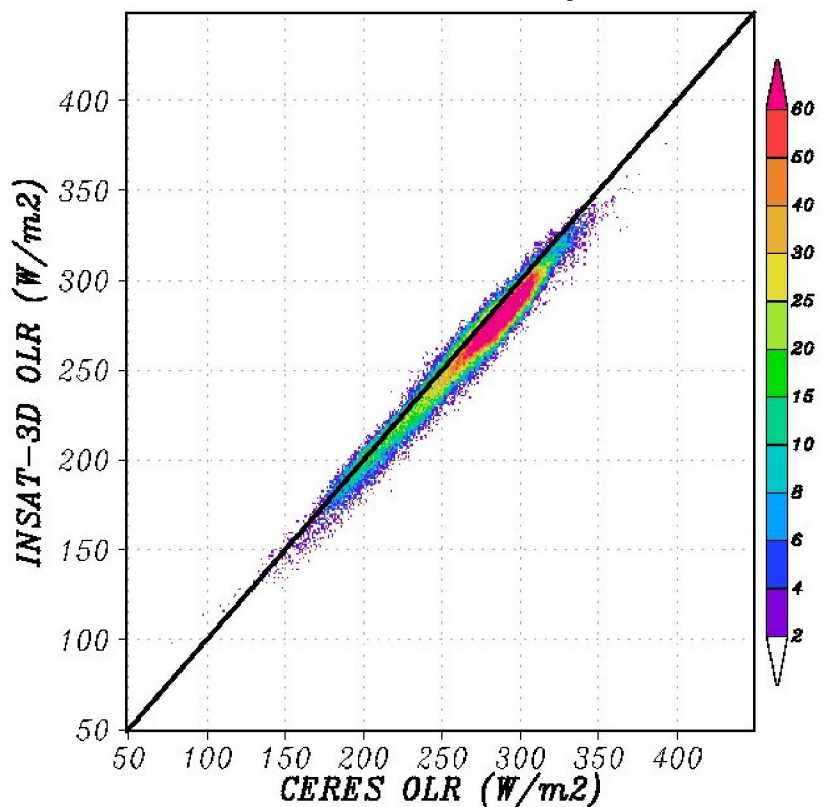
After GSICS Correction



OLR improvement after day-to-day GSICS correction

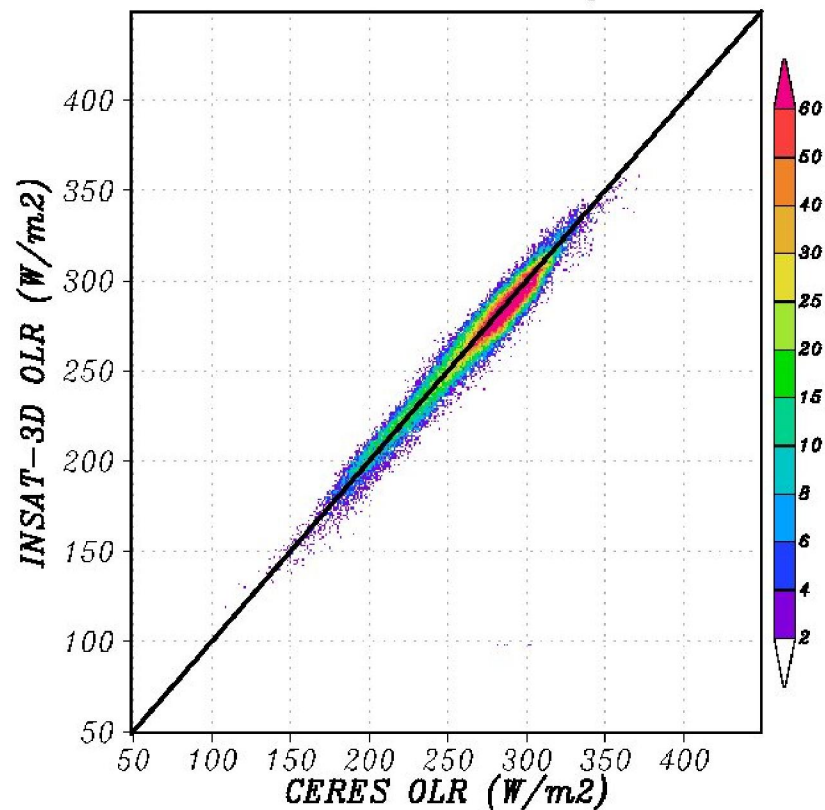
Density Plot of OLR for the Month of November, 2015

Corr: 0.98 Bias: 7.96 URMSD: 7.61 No of Col.Points: 117251



Density Plot of OLR (After GSICS Correction) for the Month of November, 2015

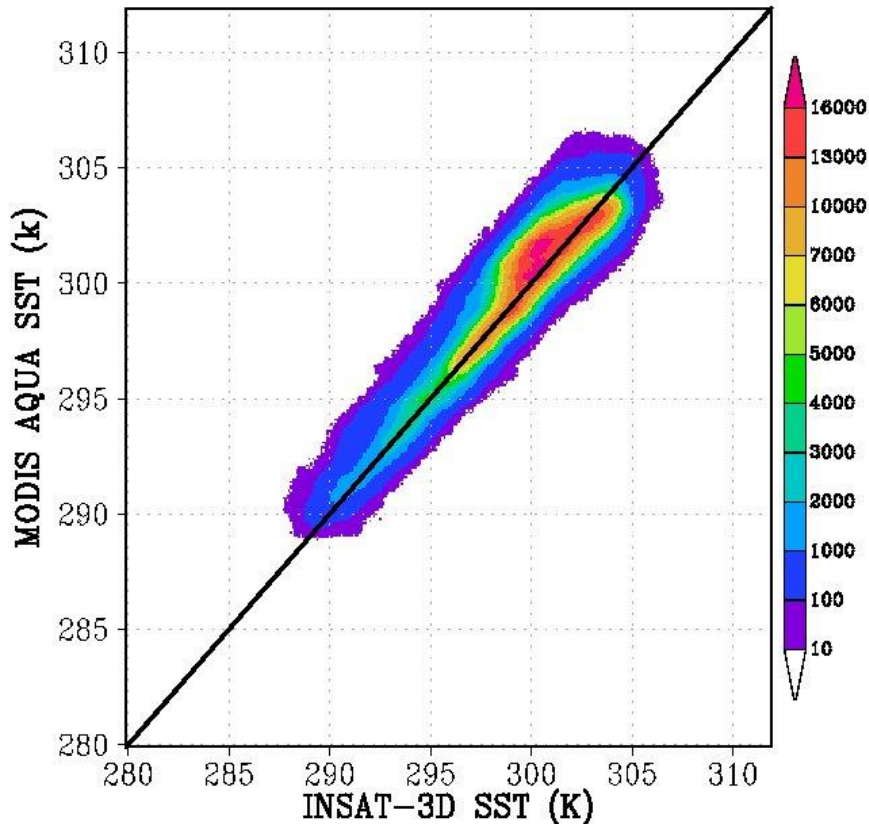
Corr: 0.96 Bias: 1.98 URMSD: 10.31 No of Col.Points: 98787



SST improvement after day-to-day GSICS correction

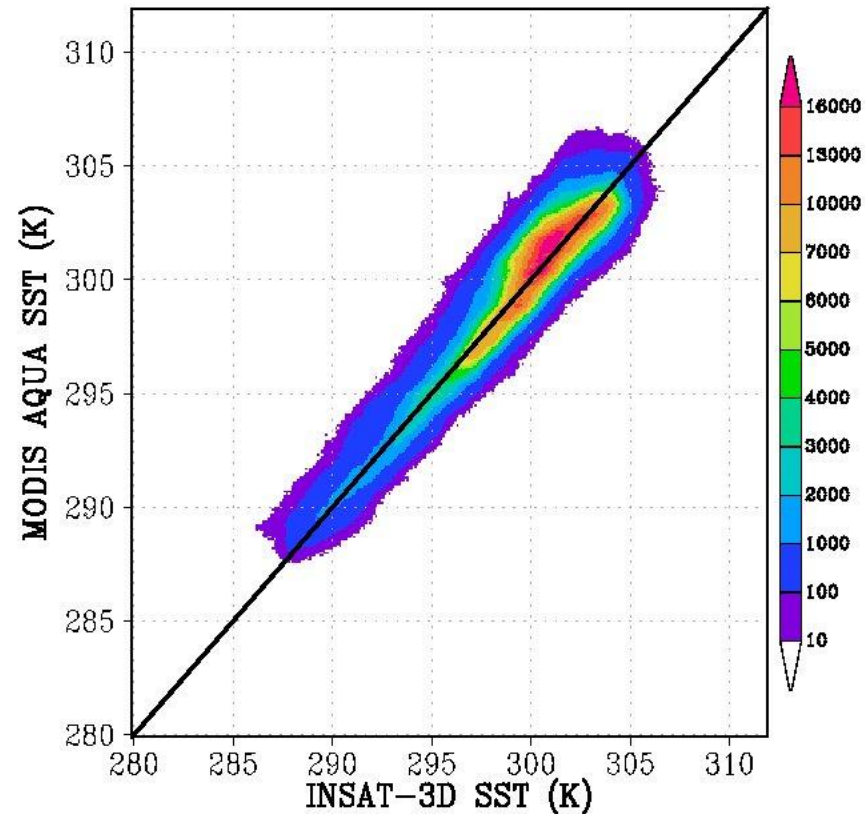
Density Plot of SST for the
Month of Nov, 2015 (01:00 to 12:30 UTC)

Corr: 1.00 Bias: -0.35 URMSD: 1.01 Coll-Pts: 29851483



Density Plot of SST for the (After GSICS Correction)
Month of Nov, 2015 (01:00 to 12:30 UTC)

Corr: 1.00 Bias: -0.15 URMSD: 0.98 Coll-Pts: 26256775



Summary

- ISRO is involved in the inter-calibration of Indian geostationary satellite radiances.
- Initially only infrared channels are being attempted
- GSICS website is ready and under Test & Evaluation before being operational.
- INSAT-3D Imager and Sounder products in GSICS Demo phase
- Initial assessment shows improvement in the L2B products after GSICS correction.
- GSICS correction procedure to be implemented in the L2B product generation.