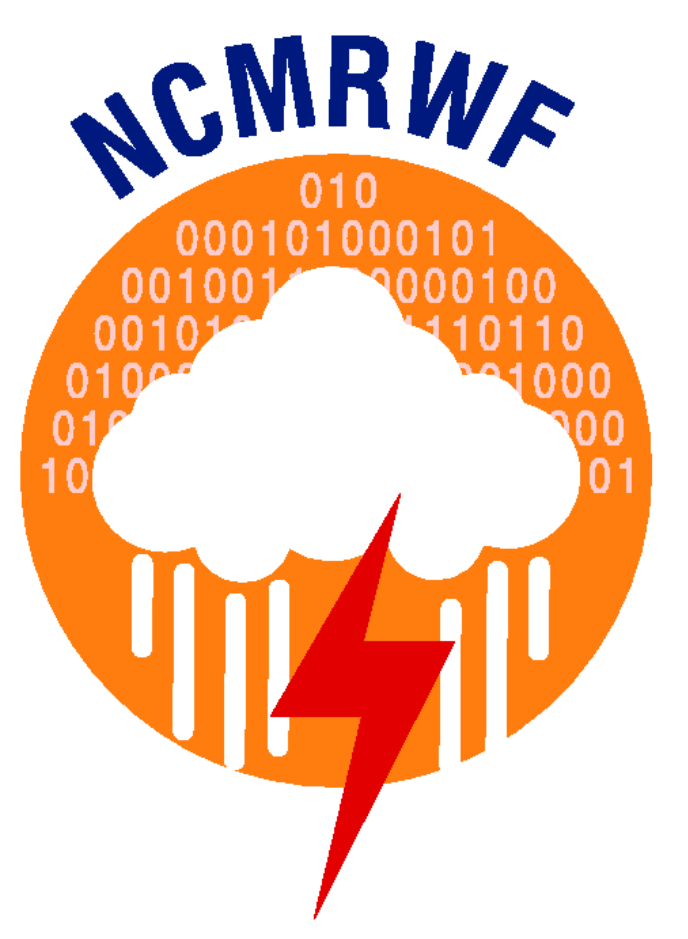


सत्यमेव जयते

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The Impact of INSAT-3D Sounder Radiance Assimilation in the
NCMRWF Global Forecast System (T574L64)
V.S. Prasad, Sanjeev Kumar Singh, and C.J. Johny

Introduction

- NCMRWF (National Centre for Medium Range Weather Forecasting), the premier modeling Centre of ESSO/MoES, India is working on developing a seamless modelling suite for weather forecasting from days to a season utilizing Coupled Data Assimilation and Forecast System.
India has a prestigious space programme and has launched the INSAT-3D satellite on 26 July 2013 which has an atmospheric sounder for the first time along with improved VHRR imager.
NCMRWF is also consistently updating its data processing and assimilation systems to make use of all new observations from time to time and setup the operational processor such as monitoring of data quality, development of observation operator and quality control.

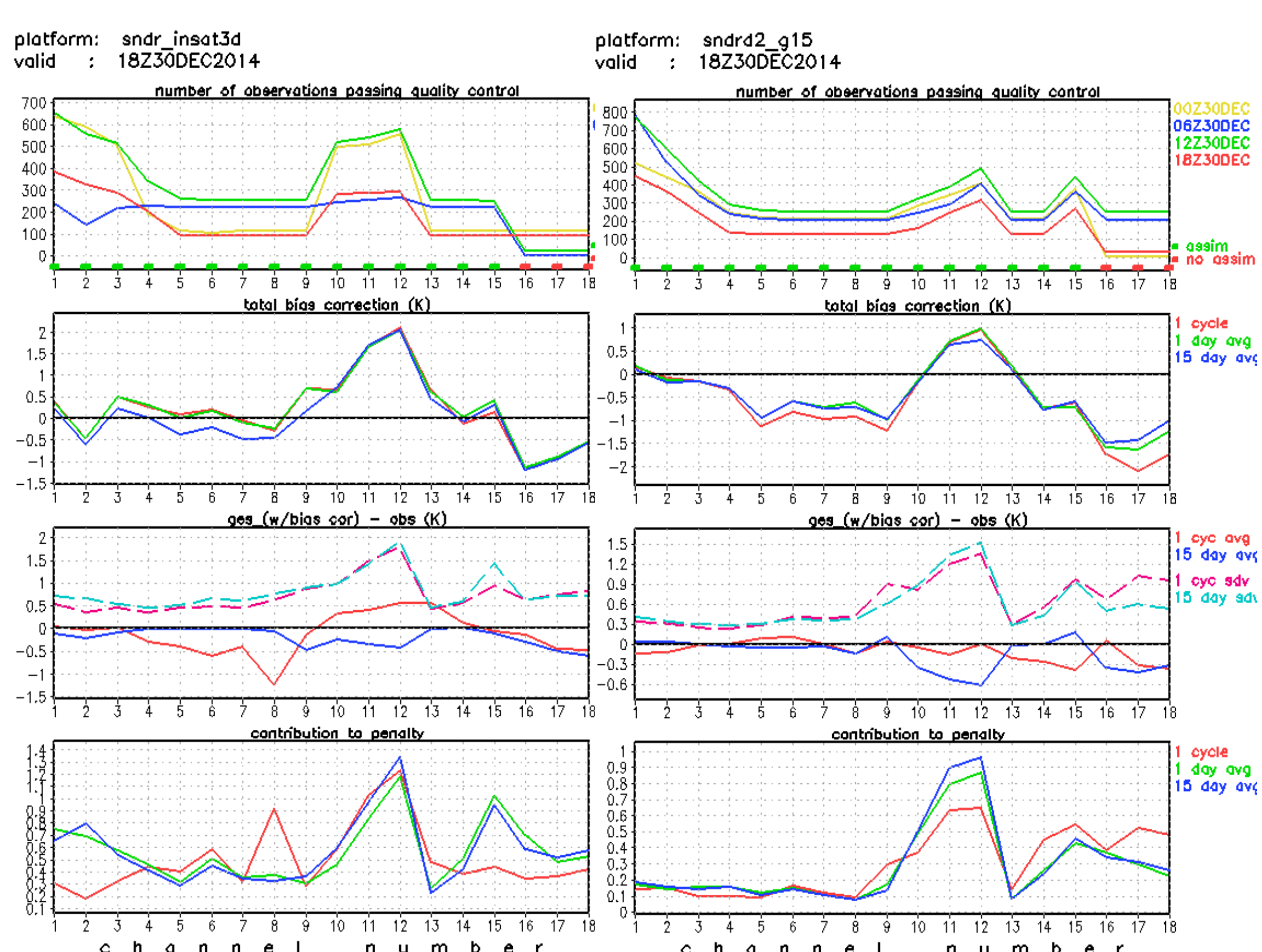
INSAT -3D Overview

- INSAT-3D is a meteorological, data relay and satellite aided search and rescue satellite developed by the Indian Space Research Organisation and was launched successfully on 26 July 2013 from French Guiana. It is positioned at 82 Degree East longitude.
INSAT-3D has a 6 channel imager and 19 channel sounder payload. This adds a new dimension to weather monitoring through its atmospheric sounding system, which provides vertical profiles of temperature (40 levels from surface to ~70 km), humidity (21 levels from surface to ~15 km) and integrated ozone from surface to top of the atmosphere.

Table with 3 columns: Channel No., lambda_c (Delta lambda) (in micrometers), and Principal absorbing constituent. It lists 19 channels with their respective wavelengths and constituents like CO2, water vapor, ozone, and vis.

Validation of INSAT-3D Sounder

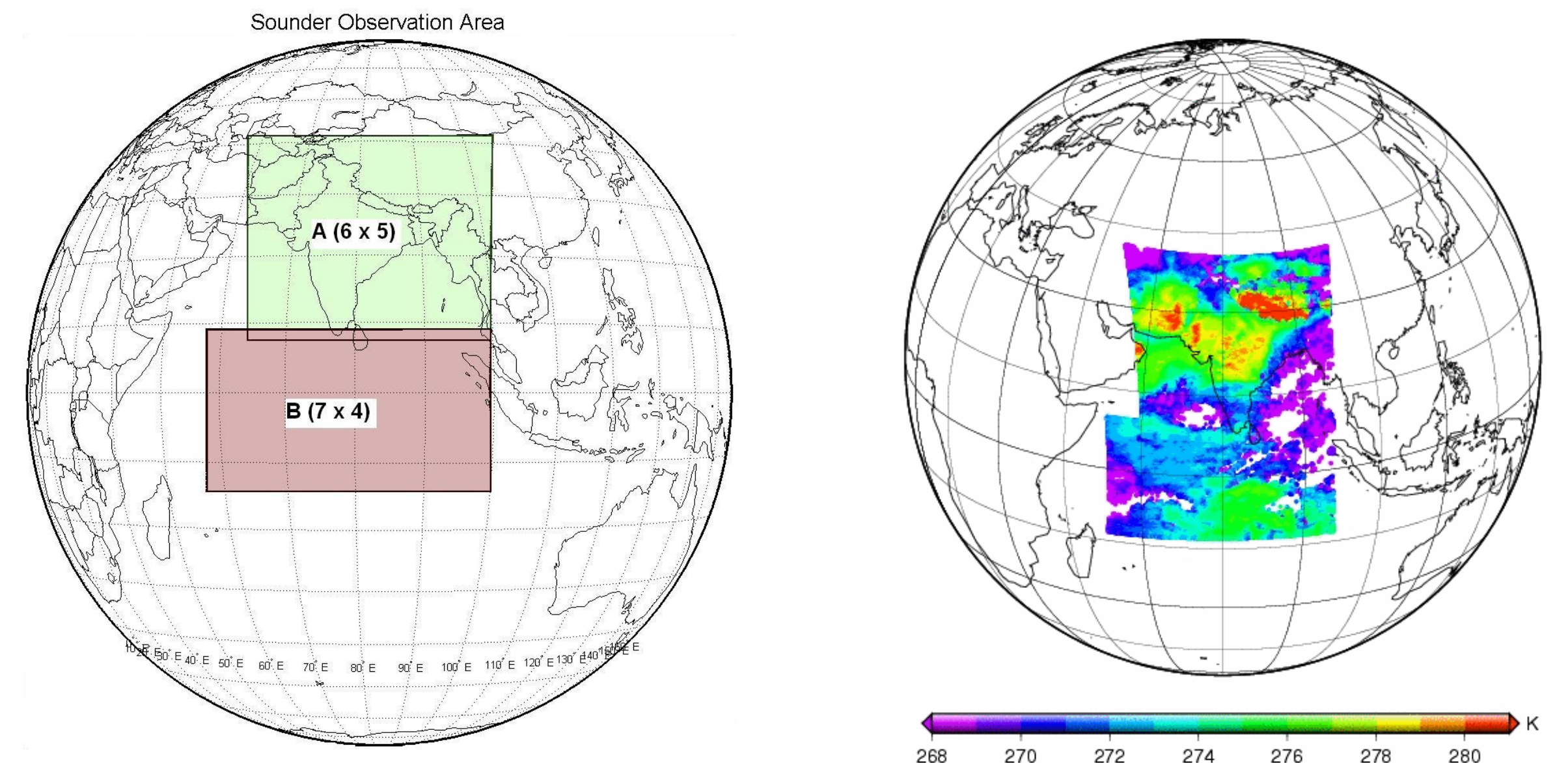
In order to validate the INSAT-3D sounder channels, we have compared with the GOES-15 sounder channels assimilation statistics (e.g., average and standard deviation of total bias correction, simulated-minus-observed, and contributed penalty) and found that INSAT-3D assimilation statistics have good agreement with the GOES-15.



INSAT-3D Sounder: Simulation/Assimilation

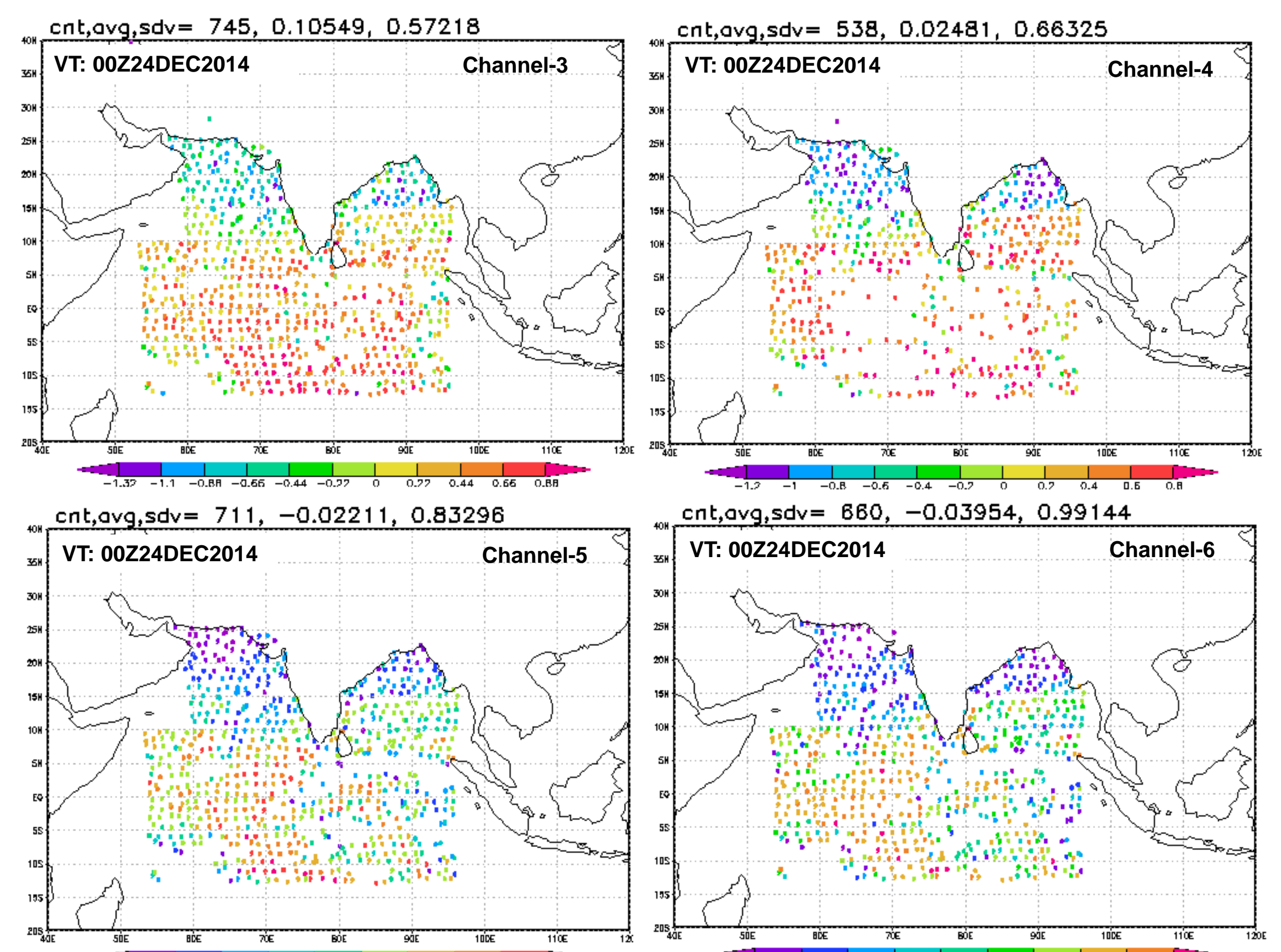
An accurately parameterized Community Radiative Transfer Model (CRTM) is used to simulate/assimilate the sounder radiances from/in the NGFS models (Prasad et al., 2011) for clear atmospheric conditions. In this study, a new clear sky product of INSAT-3D has been used for assimilation.

INSAT-3D observations used for assimilation on 24DEC2014 at 00UTC

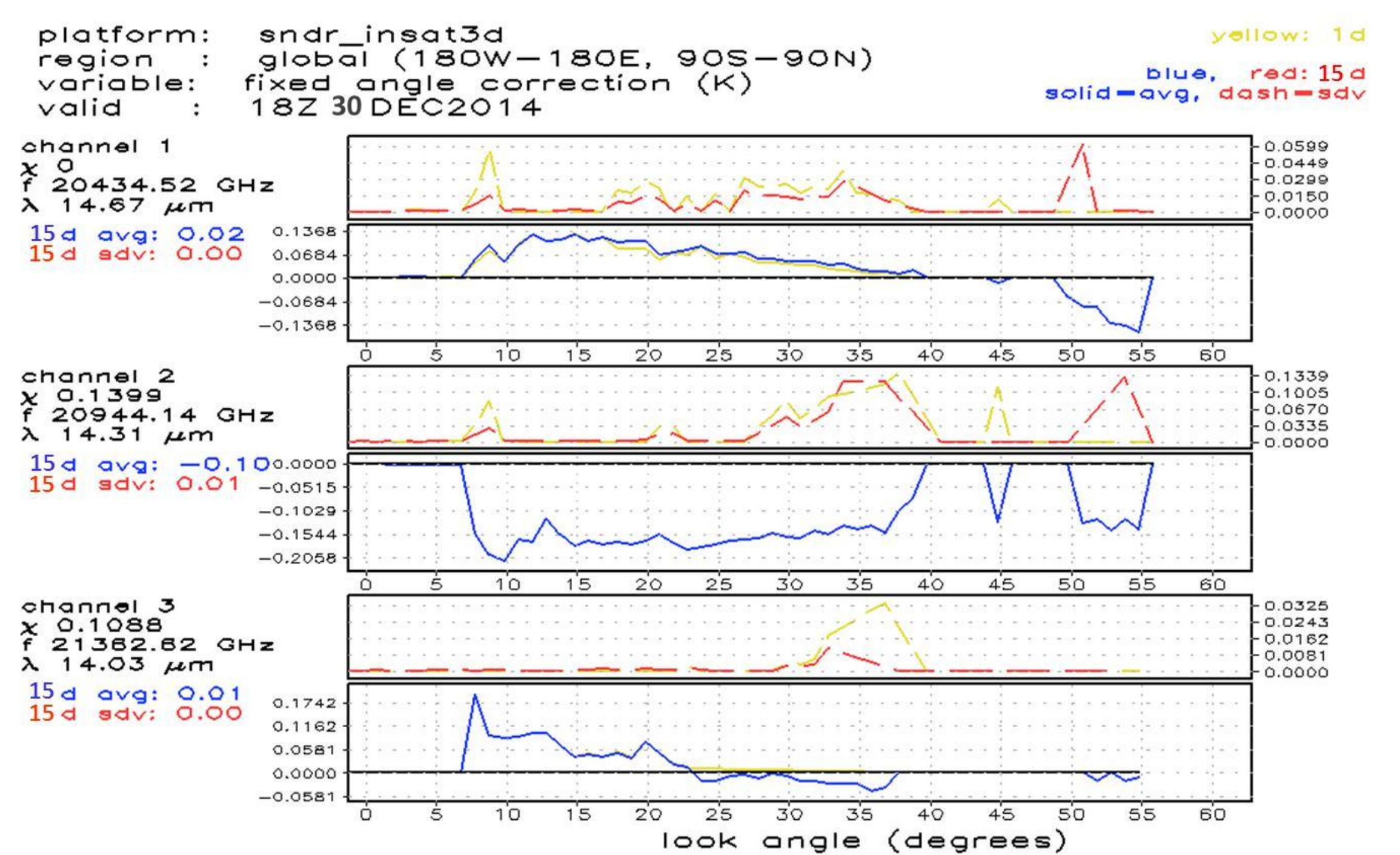


- Scan time: A: 6 x 5 = 30 Frames x 1.8 min = 54 min
B: 4 x 7 = 28 Frames x 1.8 min = 51 min
This sounding repeated every hour over land (A)
Every 6th hour sounding over Ocean (B)

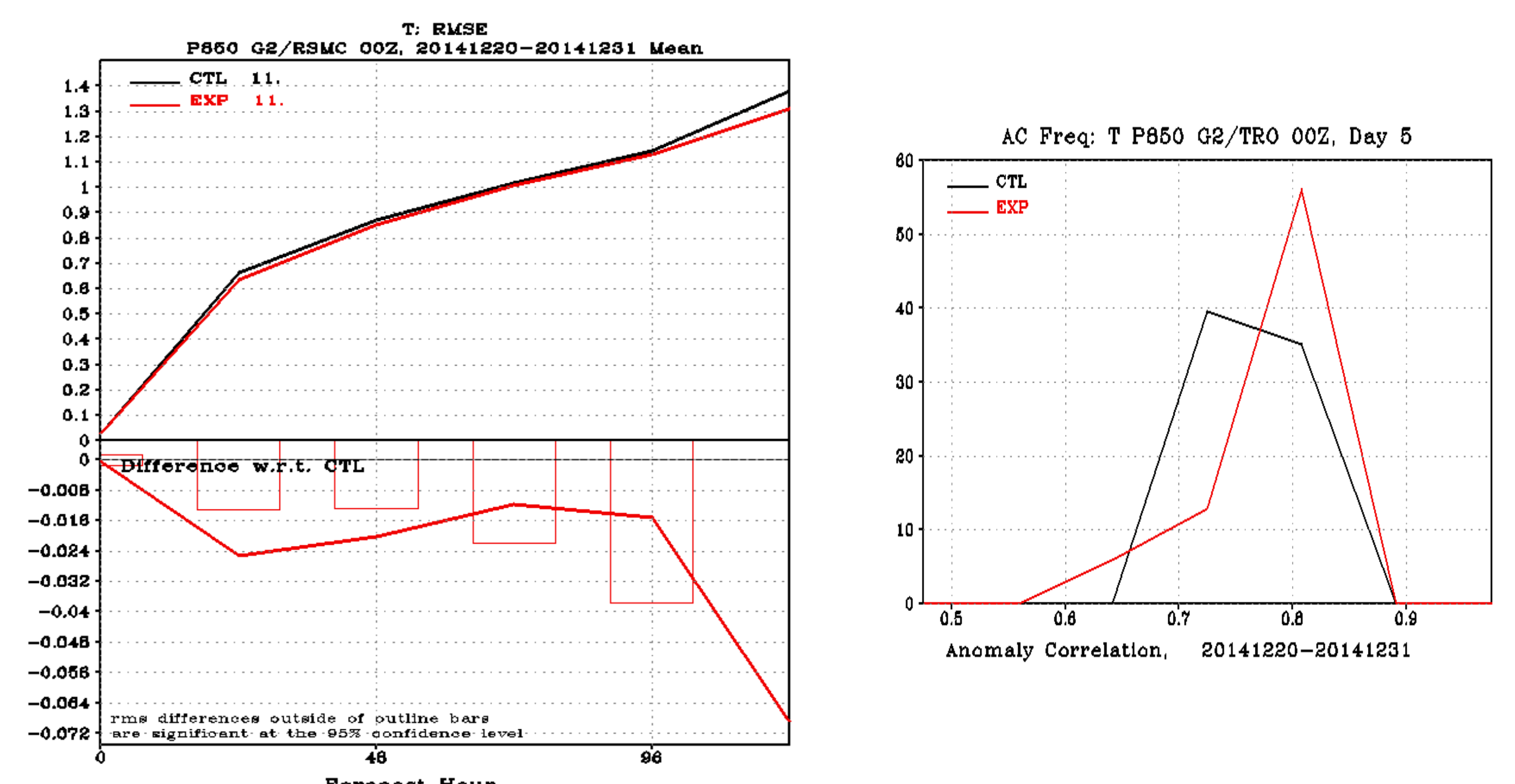
INSAT-3D ges_(w /bias_cor) - obs (K) Brightness Temperatures



INSAT-3D fixed angle correction



Impact of INSAT-3D Sounder



OSE was conducted for the period 16-31 Dec 2014. It is observed that impact of 3D sounder data is neutral to marginal positive. In terms of RMSE the impact is statistically not important (at 95% confidence level). But in terms of Anomaly Correlation frequency of higher (+ve) scores are increased and lower scores decreased

Reference

Prasad V.S., Saji Mohandas, Munmun Das Gupta, E.N. Rajagopal and Surya Kanti Dutta, 2011: Implementation of Upgraded Global Forecasting Systems (T382L64 and T574L64) at NCMRWF, NCMRWF Technical Report, pp. 1-72.

Acknowledgment to Dr. Paul van Delst, NCEP, NOAA for computing the INSAT-3D CRTM coefficients.