Data, Observation & Modelling

Fri. Nov 13, 2026 9:00 AM - 10:30 AM JST | Fri. Nov 13, 2026 12:00 AM - 1:30 AM UTC | Room A (Oshidori) (2F)

Oral A4 Ocean Observing Systems and Data Quality

Chair: Sigmund Kluckner, Takeshi Doi

10:15 AM - 10:30 AM JST | 1:15 AM - 1:30 AM UTC

[MBtCkkTq-06] From Radiometric Intercomparison to Skin SST Retrieval: Algorithm Development Using INSAT- 3DR and Meteosat-8 TIR Observations

*Swadhin Satapathy[1] (1. National Institute of Science Education and Research (India))

Accurate skin-SST retrieval at high temporal resolution from satellites remains a persistent challenge in remote sensing inversion, often neglected due to the inherent limitations of in situ observations and the widespread focus of many algorithms on bulk SST. Leveraging the continuous monitoring capabilities of geostationary satellites, we developed a robust skin-SST retrieval framework for INSAT-3DR and Meteosat-8. To ensure high-quality inputs for the retrieval framework, we performed a detailed intercomparison of the Brightness Temperatures (BTs) of the thermal infrared window channels using more than 1.5 billion collocated clear-sky observations over the Bay of Bengal. We applied a bias-correction scheme that significantly improved the consistency of observations and reduced the mean observation-minus-model (O-M) difference to zero. We address this inverse problem by integrating prior knowledge from a large ensemble of 10 years of ERA5 cloud-free datasets and using the RTTOV radiative transfer model to generate an extensive lookup table (LUT) that maps physical states to corresponding simulated BTs. We then implemented a Bayesian 1D-Var framework and developed a machine learning (ML) model that uses the LUT to learn complex patterns, thereby improving retrieval. We achieved correlations of 0.934 and 0.960 for 1D-Var and 0.942 and 0.957 for the ML retrieval for INSAT-3DR and Meteosat-8, respectively, when compared against ERA5 skin-SST. Comparison of the retrieved skin-SSTs with ISFRN shipborne radiometer skin-SSTs shows correlations exceeding 0.95 for both satellites, with biases of 0.2 K for ML and 0.1 K for the 1D-Var algorithm. Furthermore, incorporating the diurnal variations in skin-SST on a peak-warming day results in substantial differences of 35-40 W/m^2 in the estimated air-sea latent heat flux. By successfully leveraging a physically constrained dataset, our method significantly improves the accuracy of skin-SST retrieval, enabling improved ocean monitoring from geostationary platforms.

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