

Abstract 24 – Paper ID: 059**Simulation of LW Window Channel Brightness Temperature (BT-11) for
INSAT-3DR Using Machine Learning Model**

Aswathy U¹, Krishnaveni R. B.¹, and Dr. Jyotirmayee Satapathy¹

¹Amrita School of Physical Sciences, Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kollam – 690525,
India

Email: aswathyu079@gmail.com

Abstract

This study investigates the behaviour of brightness temperature of LW window channel (BT-11) under cloudy sky conditions using machine learning techniques and INSAT-3DR L2 satellite data, with focus on how BT-11 measurements are influenced by various cloud and atmospheric factors. Under successful simulation this ML model can emulate a radiative transfer model with an emphasis on lesser and simpler computation loads for meteorological application utilising satellite data. Collocated sounder and imager data from INSAT-3DR for the year 2024, over the Central India region during the pre-monsoon season (March–May), is used in the simulation. The input dataset comprises L2 products such as atmospheric temperature and humidity profiles, surface temperature parameters, surface pressure, and other thermodynamic parameters along cloud conditions, cloud properties viz. CTT (Cloud Top Temperature), CTP (Cloud Top Pressure), etc. Two machine learning models, Extreme Gradient Boosting (XGBoost) and Random Forest, are designed to train the datasets to predict the corresponding brightness temperature. Feature importance analysis and correlation studies reveal strong physical relationships, particularly surface temperature. And, XGBoost model is found to provide the better accuracy in simulating brightness temperatures.

Keywords: INSAT 3DR, XGBoost, Cloud Top Pressure, Cloud Top Temperature, Brightness Temperature (BT-11), Surface Temperature