Objectives

• Develop a deep-learning-based forward emulator (DLFE) to see if neural networks are good alternatives for calculating BTs for the 22 GHz radiometer.

• Develop a retrieval algorithm using a deep neural network with BT for predicting the total precipitable water vapor density (TPW) from the atmosphere for 91 layers in altitude.

Data

• MonoRTM simulated BTs for 22 GHz radiometer

• Surface P and T, and air T and water vapor profiles (91-layer) extracted from ECMWF

• Emissivity: [0.3, 0.7]

• Sensor zenith angle: [0, 70]
Development of a Smart Ground-based Radiometer for Weather Study - ML TPW retrieval algorithm for the 22 GHz radiometer

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TPW Retrieval Figures
Conclusion and Future Work

**DLFE**

- Neural networks can be used in place of current meteorological methods for quickly calculating scientific measurements.
- DLFE gave highly accurate BT predictions and was significantly faster than the radiative transfer model.
- More testing is required to determine if DLFE generalizes well to new data, as the testing dataset came from the same data collection that was used for model training.

**TPW Retrieval**

- More work needs to be done to increase the accuracy in the upper layers
  - Highly accurate in layers 1 to 60, but slightly less accurate in layers 61 to 91
- To improve accuracy in upper layers, we can add more features for the model’s input.
  - We have already tried adding the 91-layer pressure to the model’s input with no noticeable improvement, so we will have to look for additional features contained in the ECMWF data.
  - Directly use TPW as label