Exploration of Developing CubeSat Soil Moisture retrievals using Machine Learning

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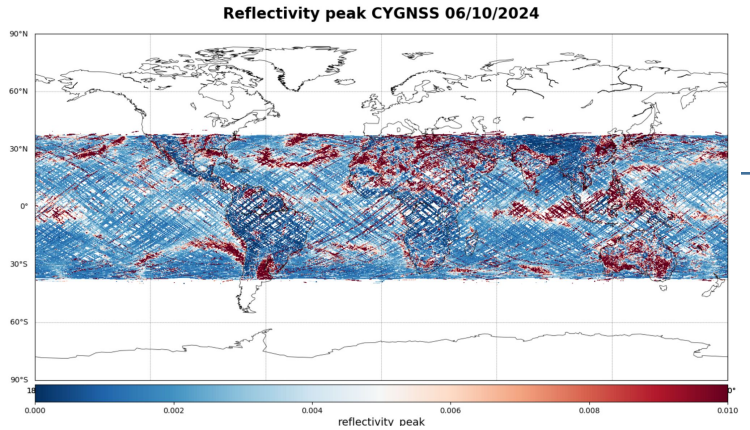
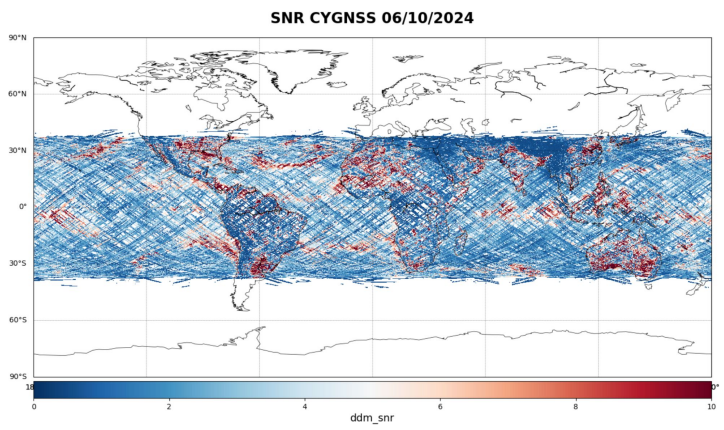
Objectives

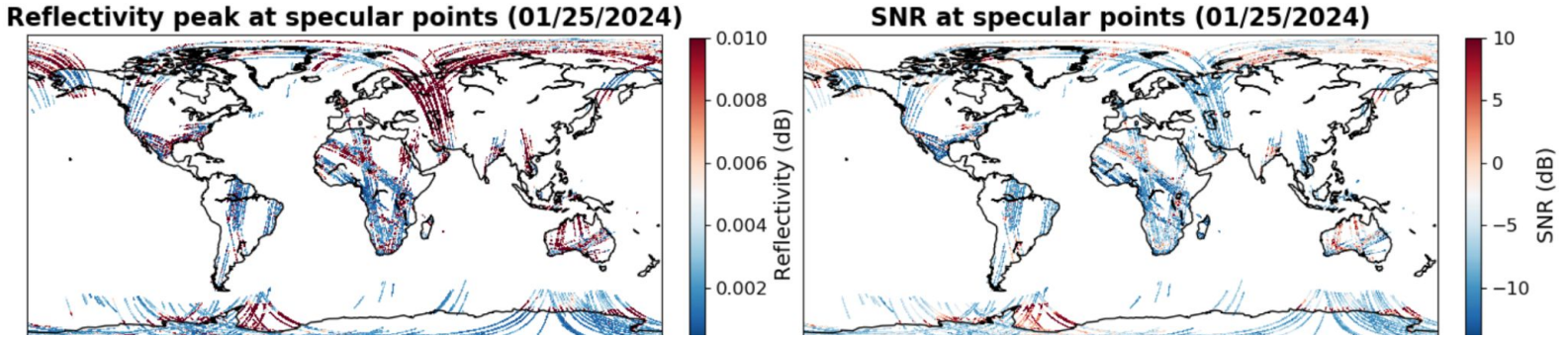
- Process CYGNSS and SPIRE data: extracted and gridded at 9 km spatial resolution
- Compare spatial and temporal patterns;
- Assess consistency for soil moisture retrieval potential
- Train machine learning models

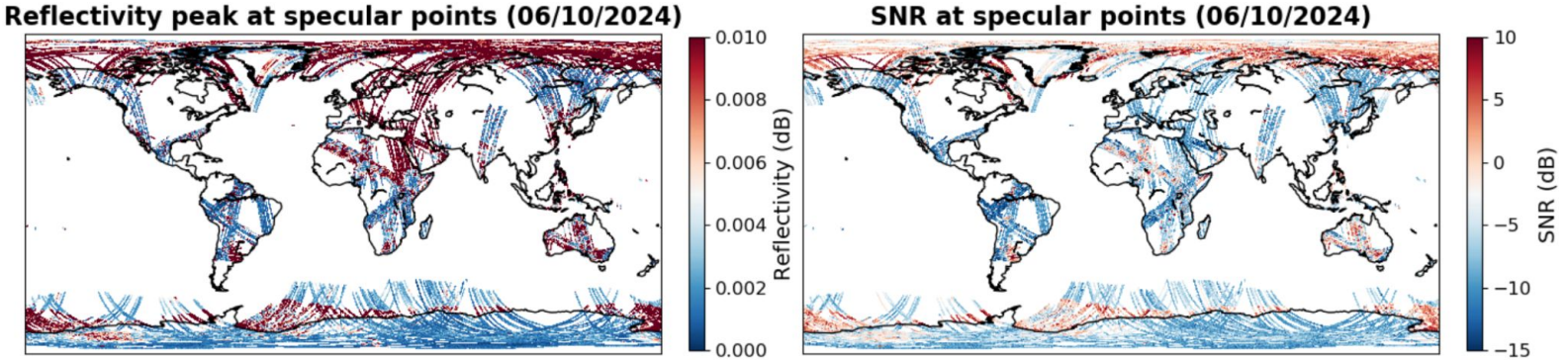
Primary Results

- CYGNSS: low-cost, finer resolution (L-band), higher coverage density
- SPIRE: coverage in high-latitude, snow-covered regions
- Seasonal effects: summer yields more data points
- Consistency in large-scale features

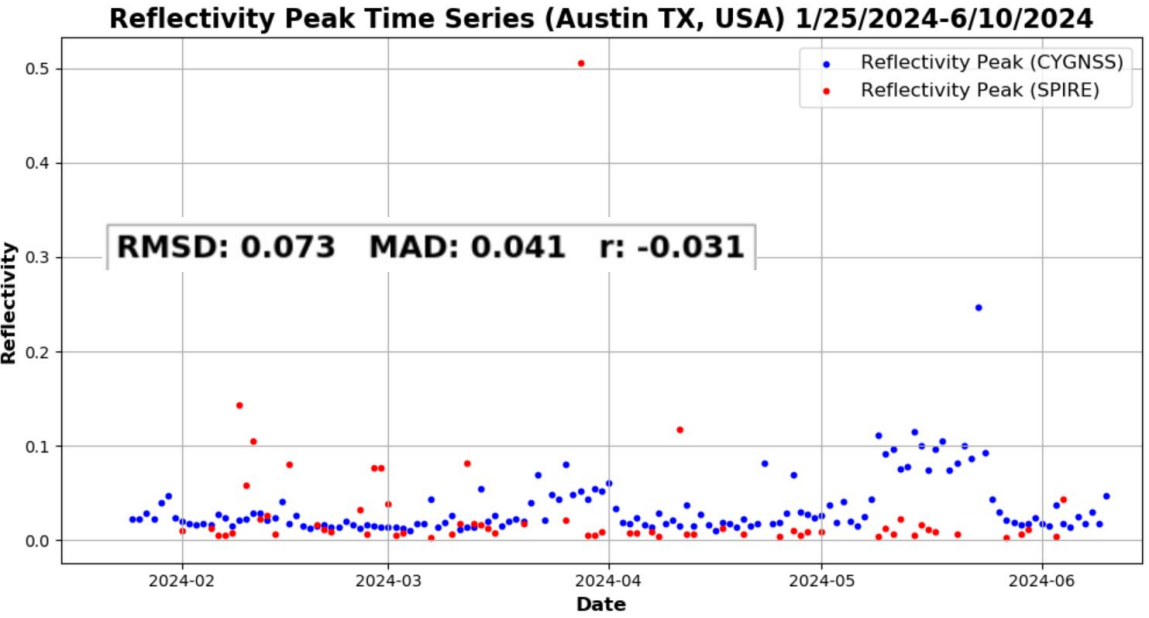


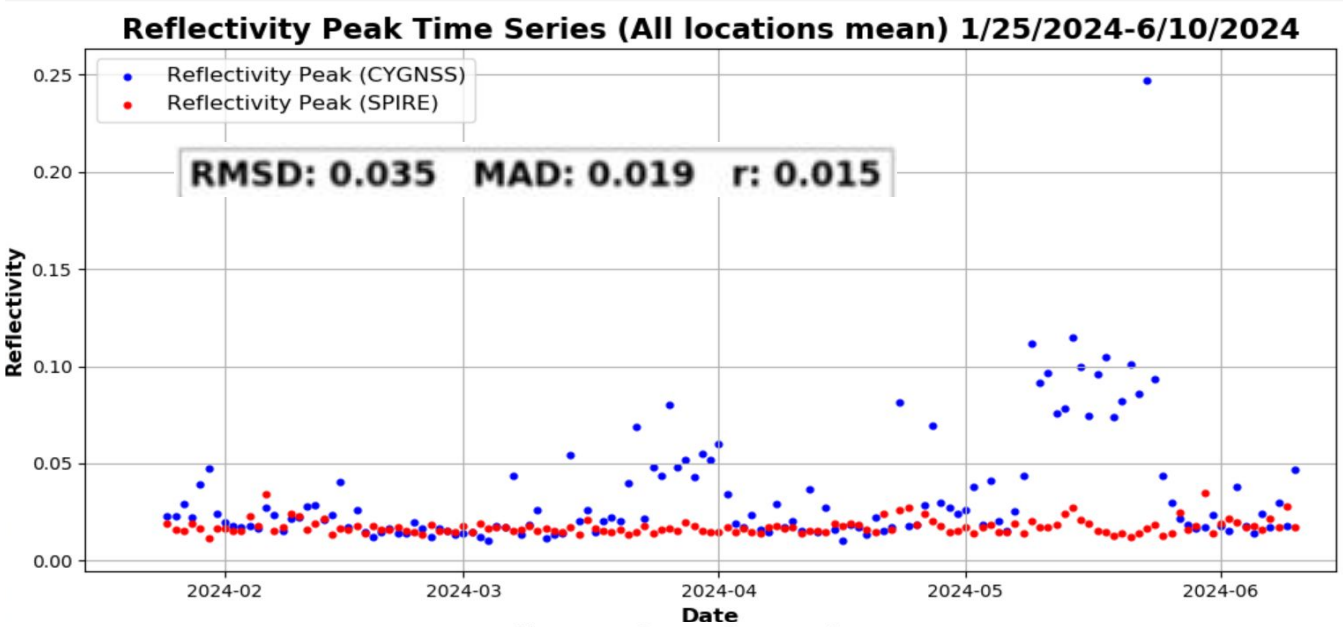


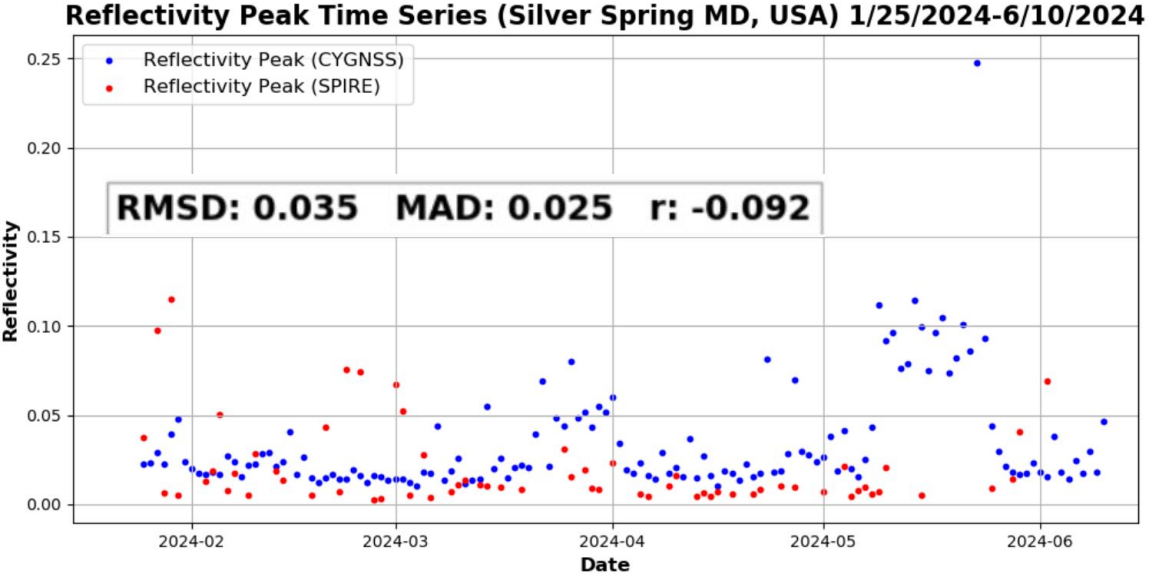


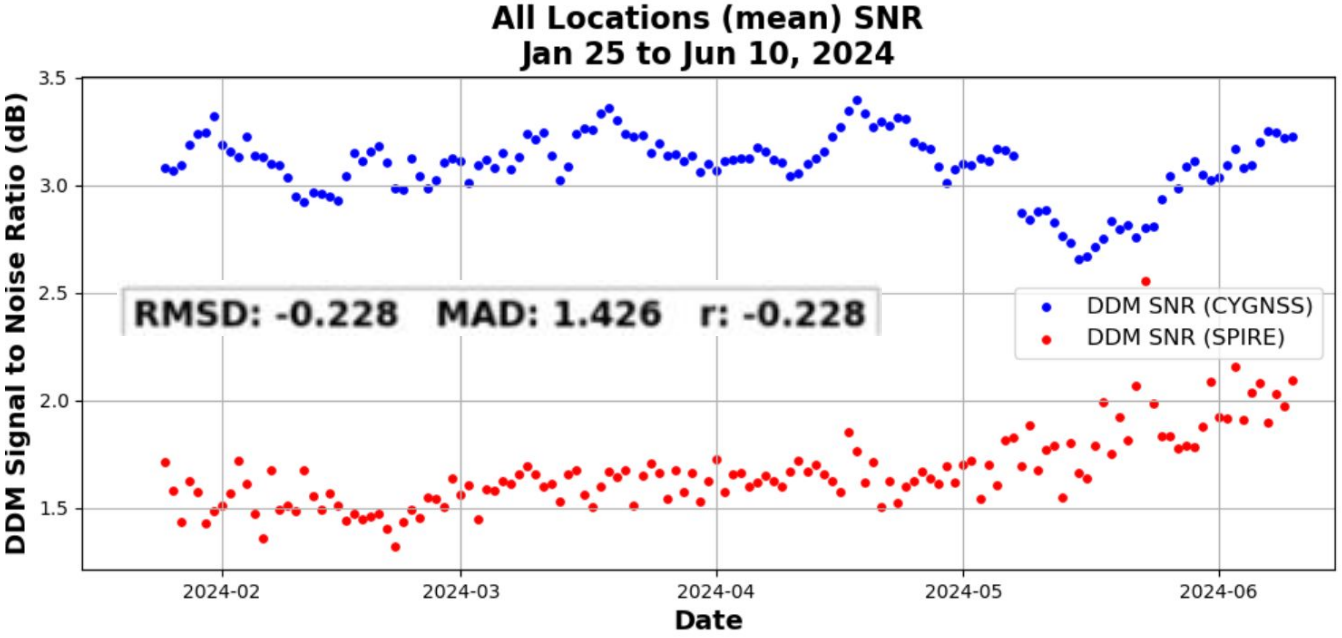


Time Series comparison

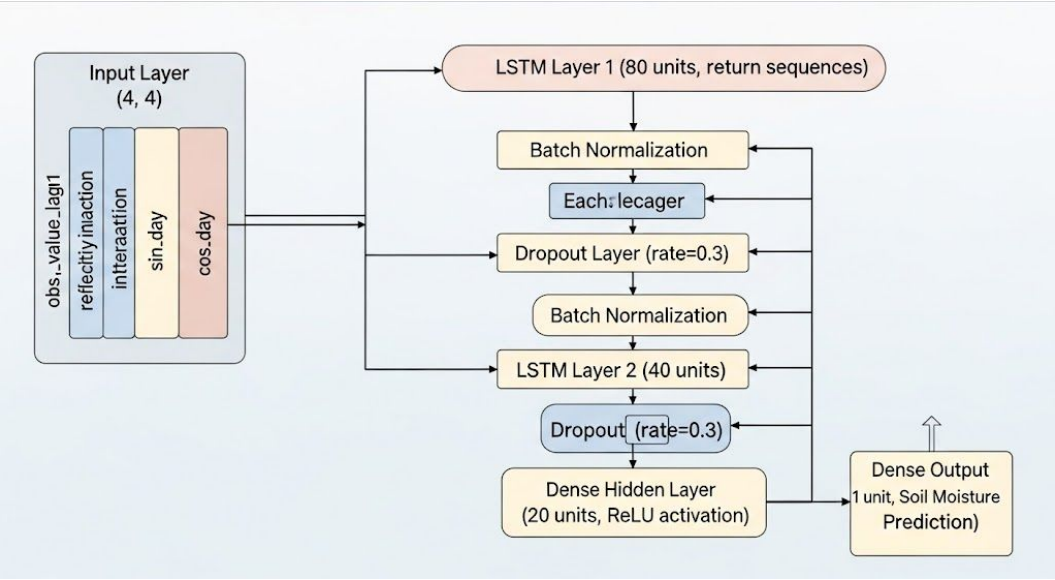


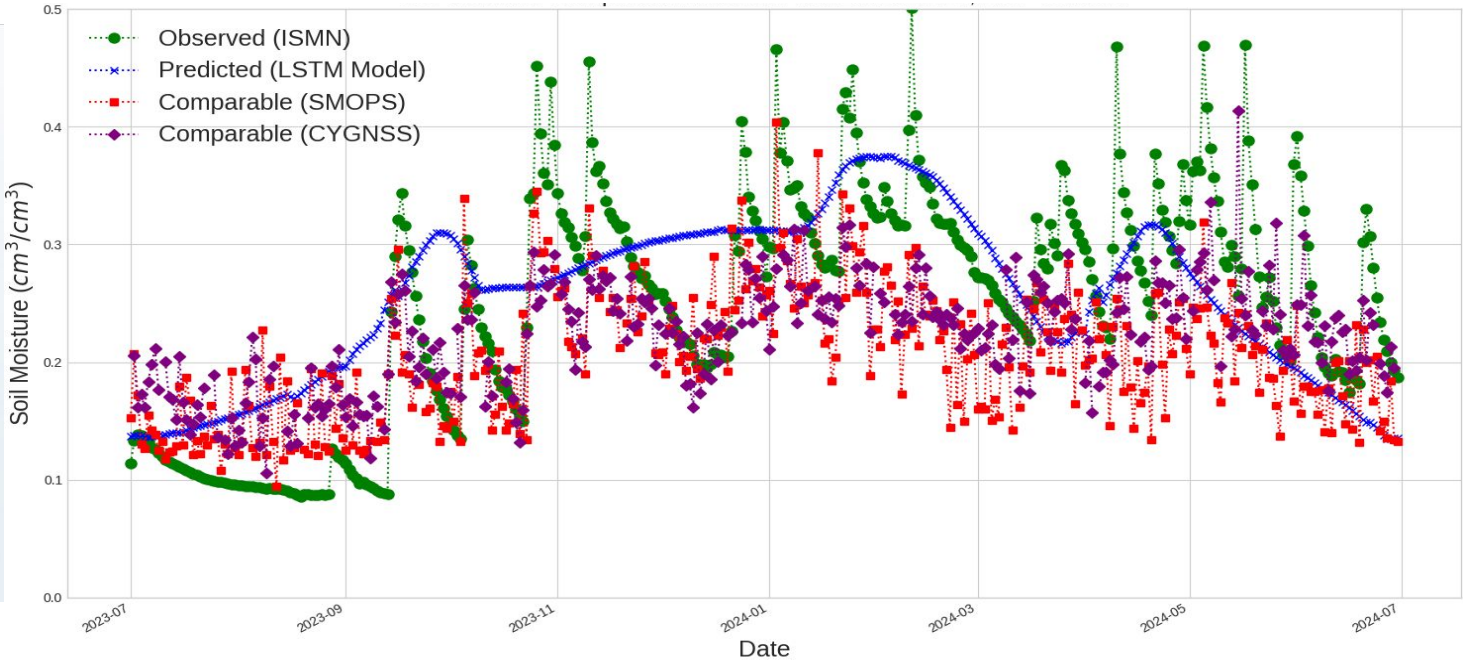


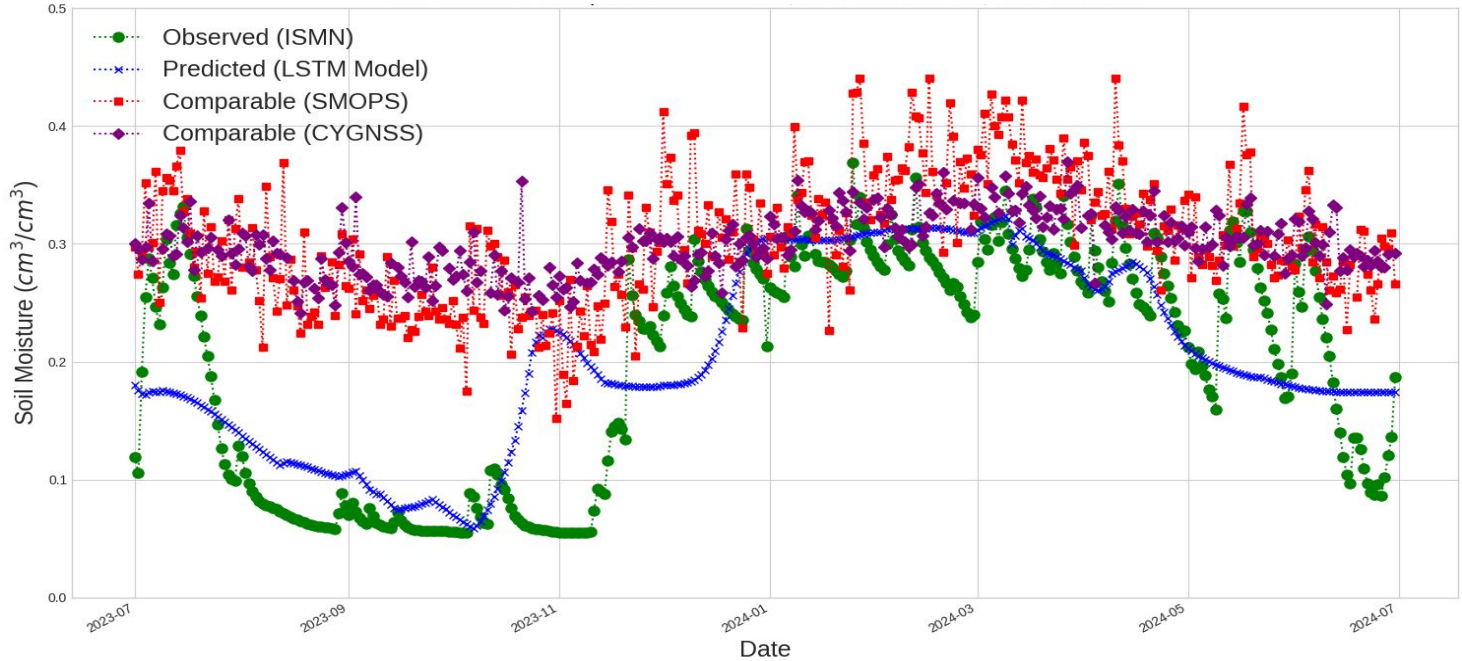




Machine Learning model in predicting soil moisture based on observed data







- Model: 4-layer LSTM (autoregressive)
- Training data range: 8/2018-6/2023
- Prediction range: 7/2023-6/2024
- Cross Validations
- Datasets:
  - Predicted
  - Observed
  - SMOPS
  - CYGNSS