Deep Learning Models for Soil Moisture Retrieval from Remote Sensing Observations

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esa

Objectives

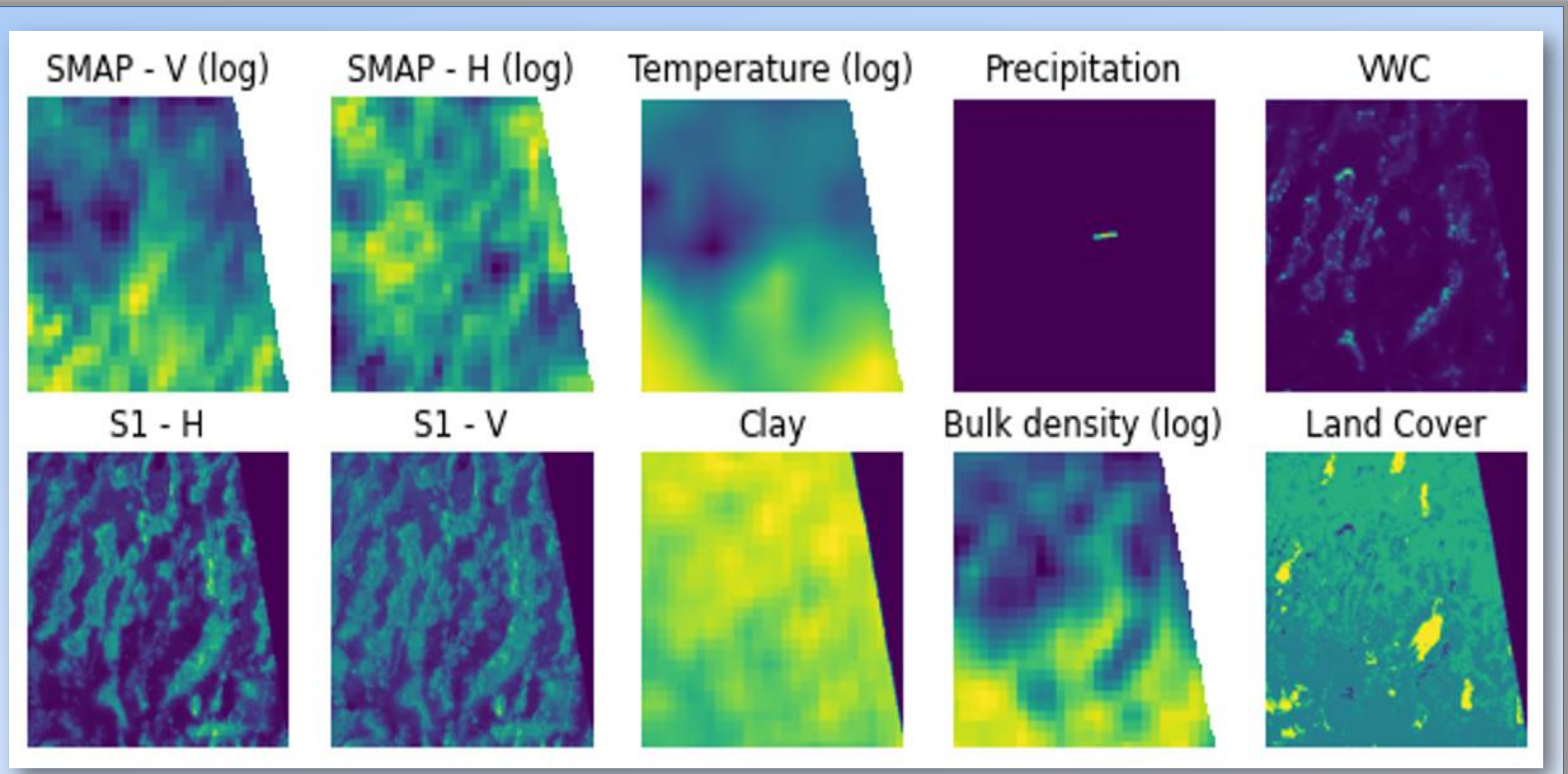
- Prediction of surface soil moisture from satellite microwave observations using in-situ observations

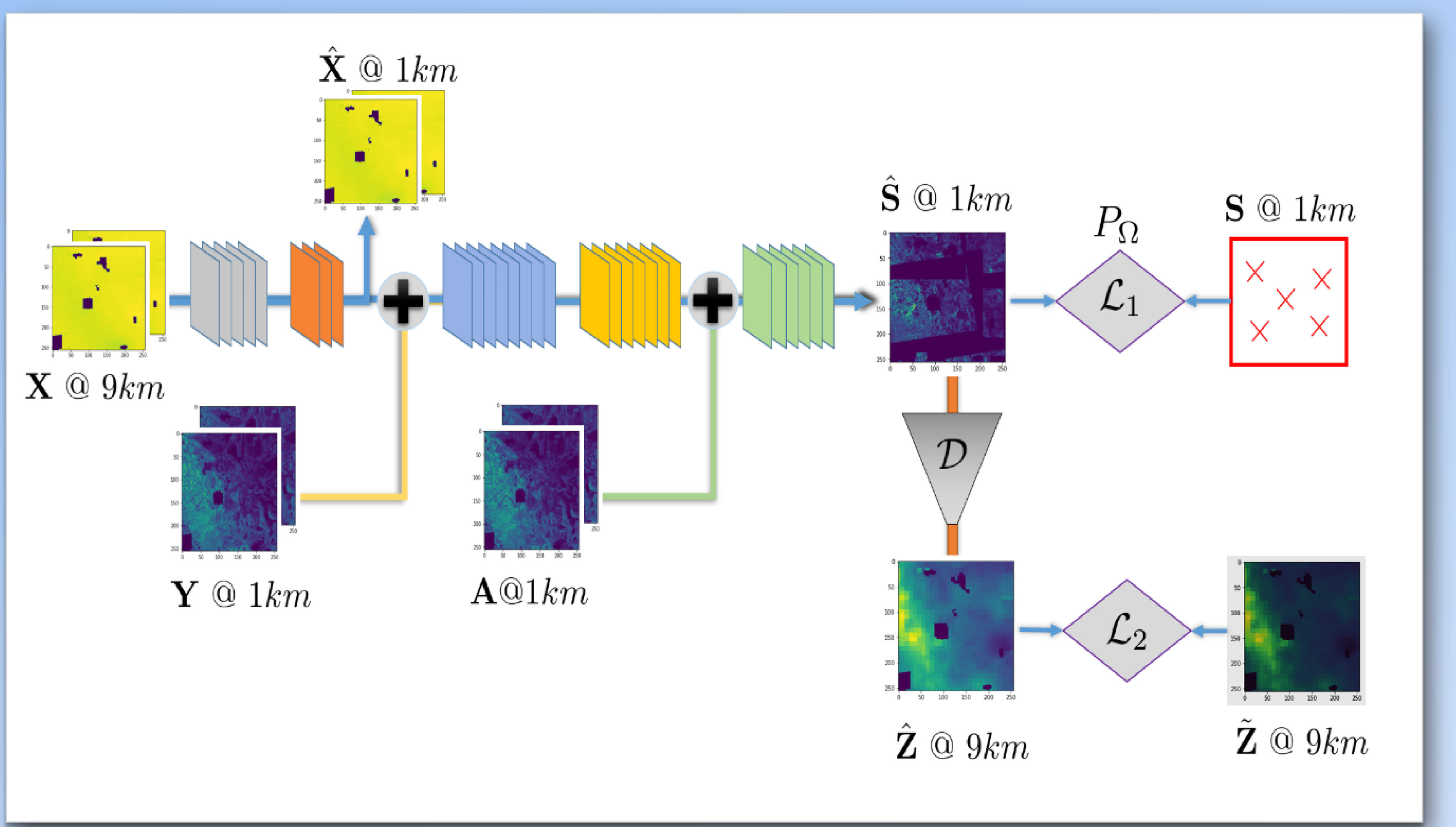
Data sources

- NASA Soil Moisture Active Passive (SMAP)
- ESA Sentinel 1 mission platforms
- International Soil Moisture Network
- Ancillary (land cover, clay fraction, etc)

Area of Interest

- Contiguous United States (CONUS)
- June 2017, 2018, 2019, and 2020.





Deep Learning Model

multi-input multi-output DNN capable of ingesting any available measurement and produce estimates at different scales (1km and 9km).

Inputs

- Low resolution brightness temperature (X)
- Radar backscatter (Y)
- Ancillary observations (A)

Output

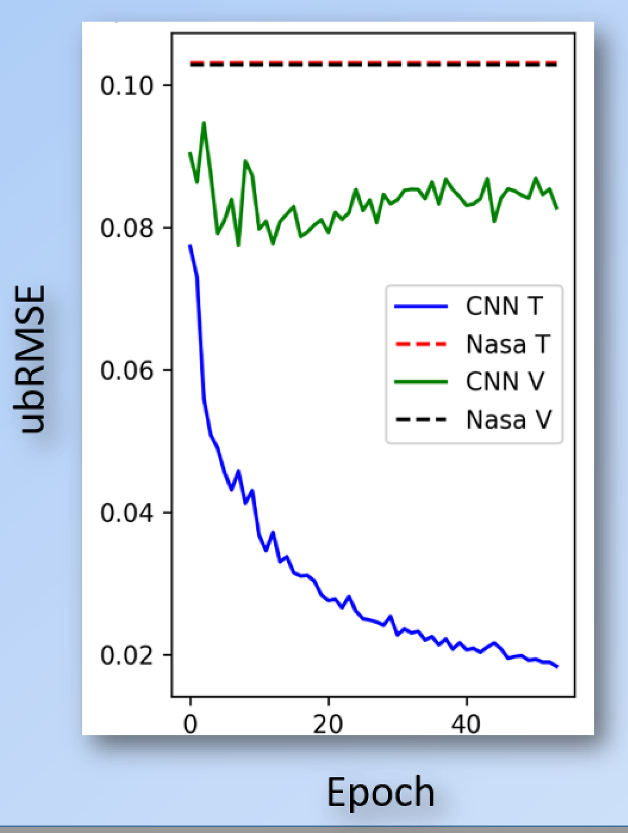
- High & Low spatial resolution SM (S)

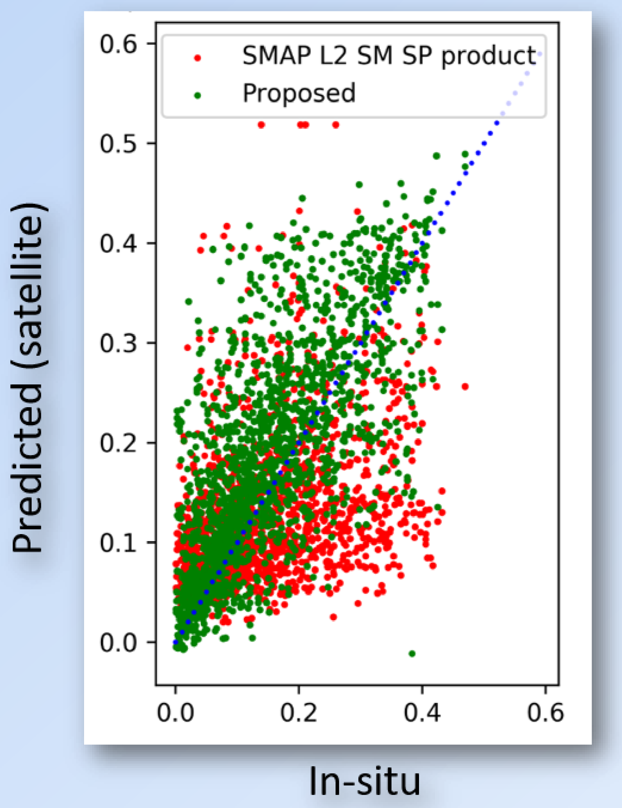
Loss

- In-situ observation (S)
- Nasa 9km SMAP L2 product

Objective Evaluation

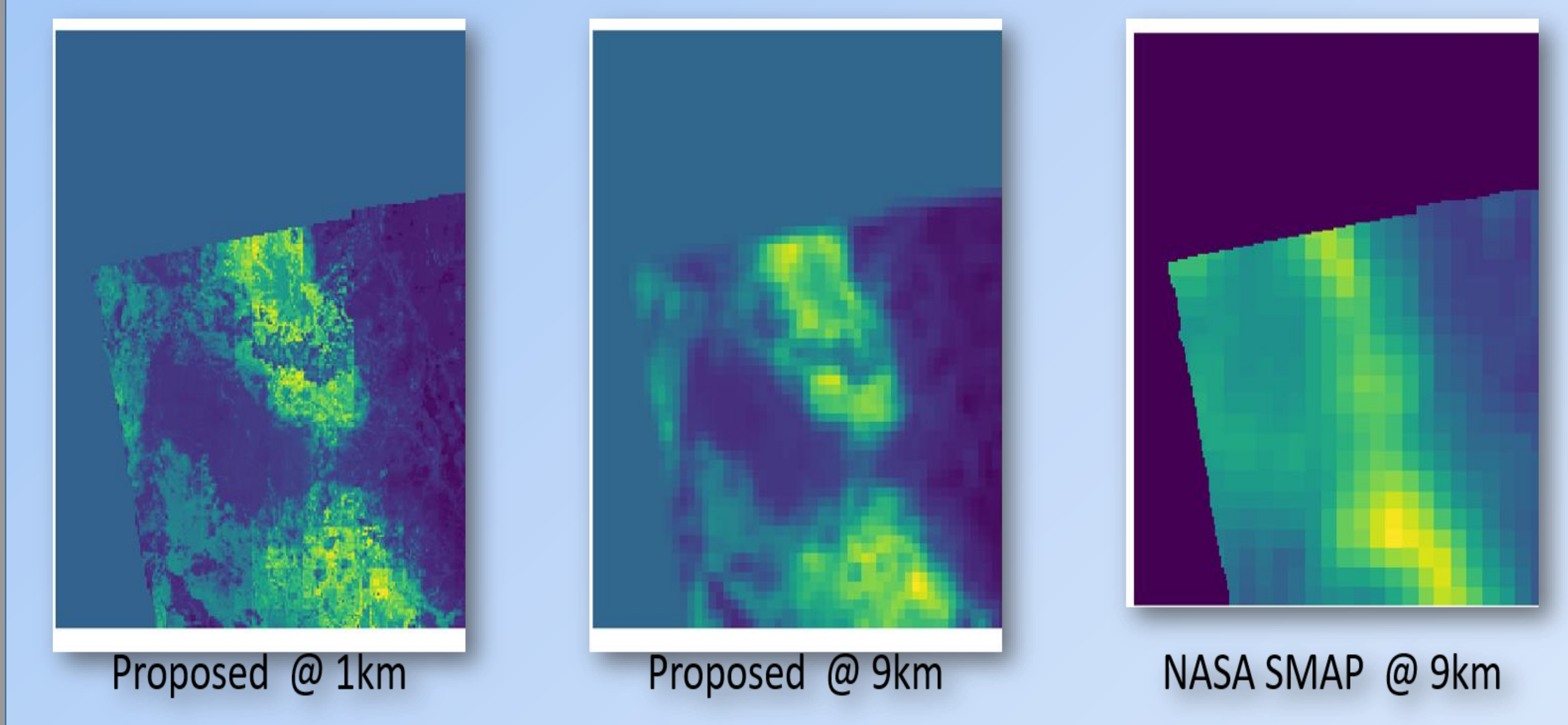
- *Left subfigure*: Estimation error in unbiased Root Mean Squared Error, for the proposed (CNN) and NASA SMAP product (NASA) models on the training (T) and validation (V) sets.
- *Right subfigure*: Scatter plot of the in-situ vs predicted SM values (at the in-situ locations) for the validation set only.





Subjective Evaluation

In addition to higher estimation accuracy, the proposed model also offers a significant increase in the spatial resolution of the estimations.



Different spatial features are observed, related to high spatial resolution land features, that are captured by the proposed approach.

Discussion

The data-driven approach (i) surpasses physical model at coarse scales (ii) provides higher resolution estimations.

Next step

Incorporate temporal dynamics.

https://sites.google.com/view/calchas-eu

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