DroughtCast: A Machine Learning Forecast of the US Drought Monitor

Problem: The US Drought Monitor (USDM) provides weekly drought assessments to inform government disaster relief. Accurate drought **forecasts** are needed to further improve national resilience to drought

Method: A new data-driven machine learning framework was developed that provides USDM ensemble forecasts with 1-12 week lead times. Advanced RNN[1] learning uses SMAP L4 soil moisture and productivity as key predictors; with the RNN trained on the historical USDM record.

Finding: DroughtCast accurately forecasts USDM categorical distributions and severity levels at all lead times. The model captures drought diversity and behavior, and implicitly represents the subjective nature of the USDM.

Impact: New capacity for rapid, accurate USDM early warning forecasts with up to 12-week lead times for better drought response & mitigation.

[1]Sequence-to-Sequence Recurrent Neural Network (RNN) learning (Sutskever et al. 2014)
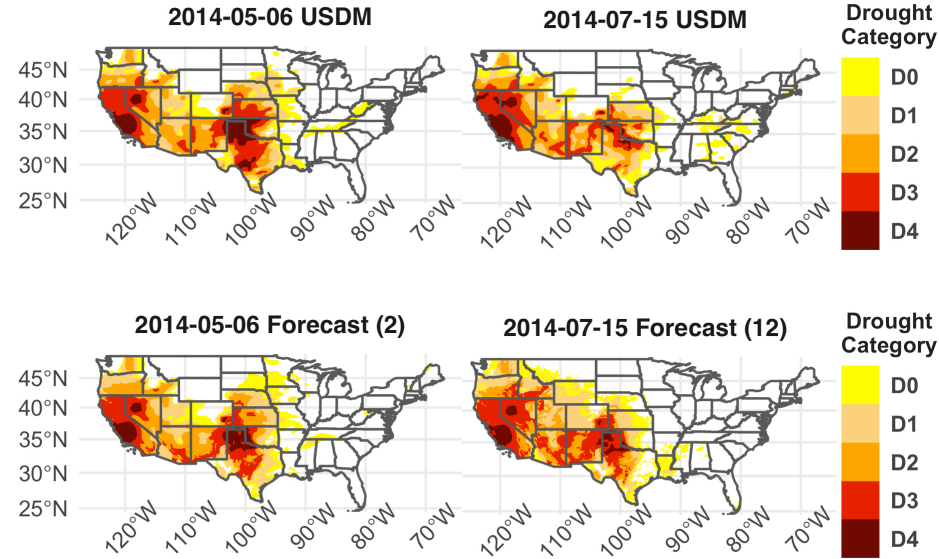
USDM maps for two representative dates in 2015 (top) vs. corresponding forecasts from DroughtCast (middle) at 2-week (left) and 12-week (right) lead time.
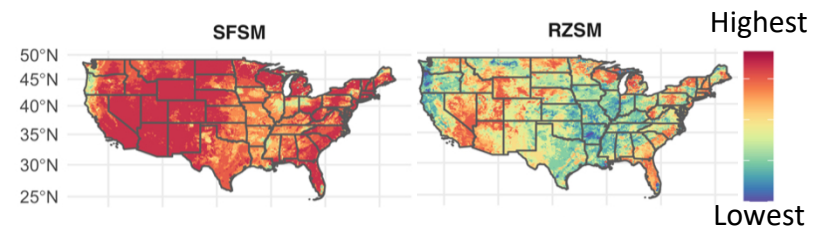
Relative importance of SMAP surface & root zone soil moisture (SFSM, RZSM) to drought forecasts.