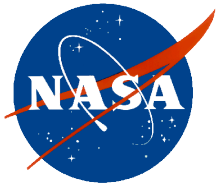
National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California



Introducing Spatially Distributed Fire Danger from Earth Observations (FDEO) using Satellite-based Data in the Contiguous United States

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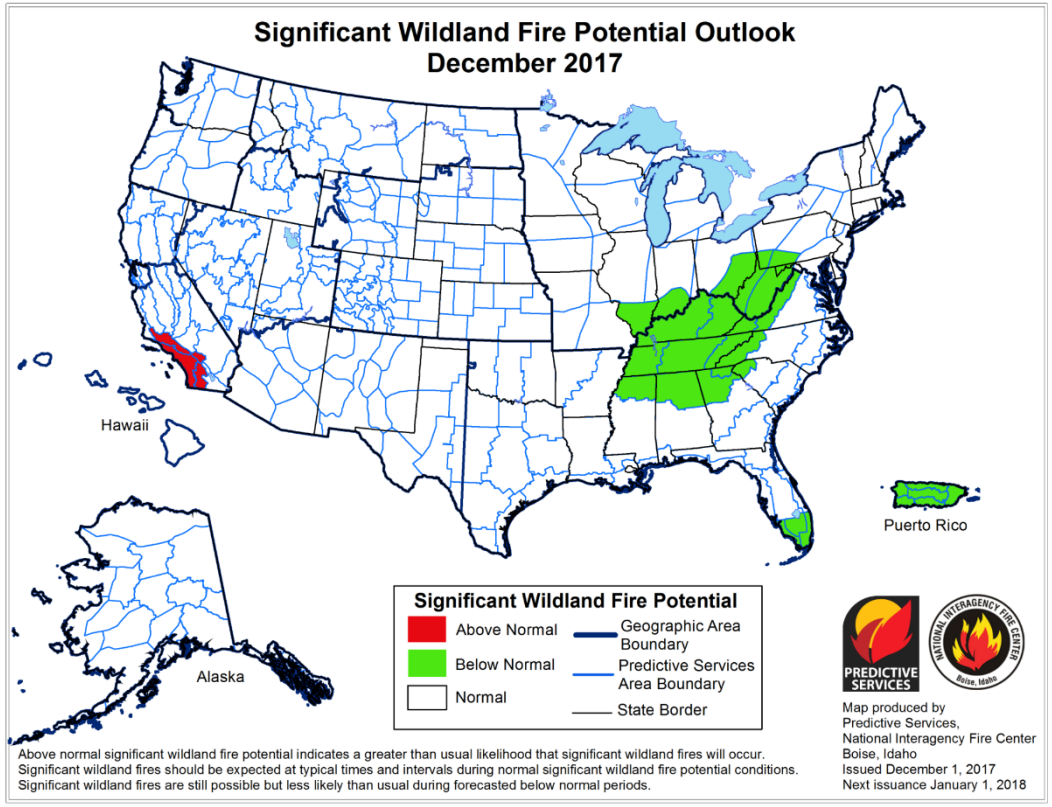
2) University of Arizona
3) University of California Irvine

Collaborators:
Ed Delgado[4], Brad Quayle[5]
4) National Interagency Fire Center
5) US Forest Service

USFS Pitch Fest June 2rd 2020

Current State

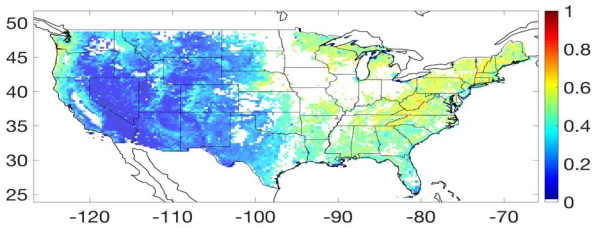
- Use expert knowledge and meteorological forecasts to draw perimeters on a map for 1-month, 2-month and 3-and-4-month fire danger forecast



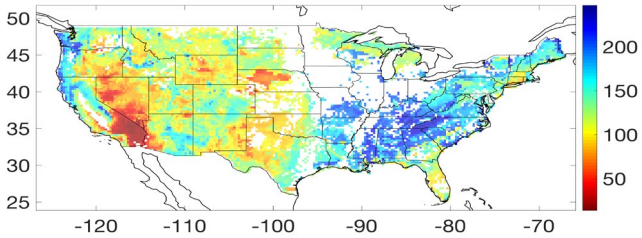
- ✓ Subjectivity involved
- ✓ Vague definition of normal according to NIFC managers

Deterministic Solution

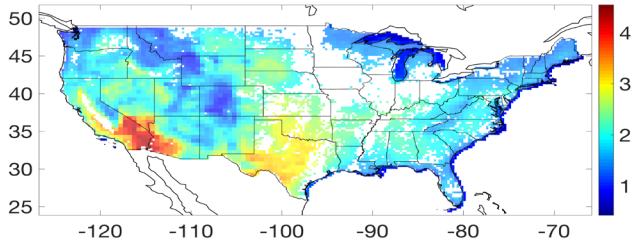
Aug 2010 Enhanced Vegetation Index



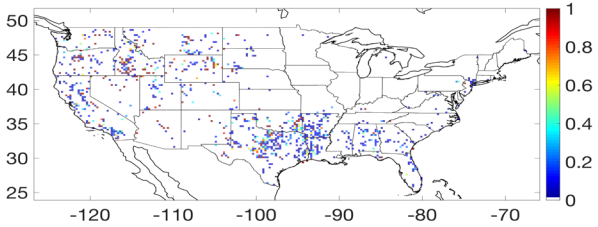
Aug 2010 Soil Moisture



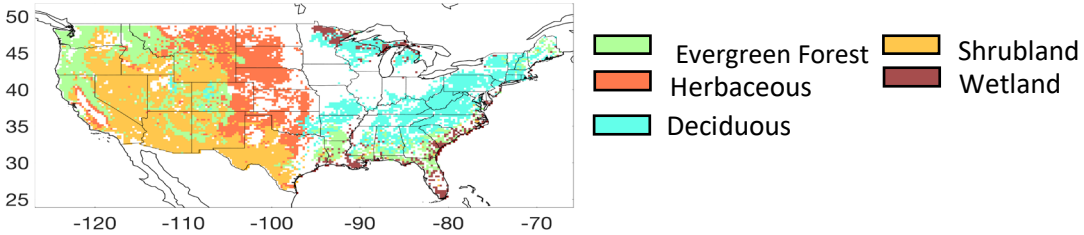
Aug 2010 Vapor Pressure Deficit (VPD)-kPa



Aug 2010 FPA Burned Area-Sq Km



Land-Cover

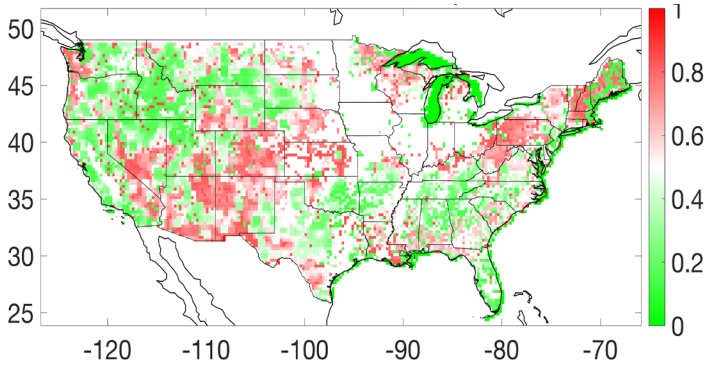


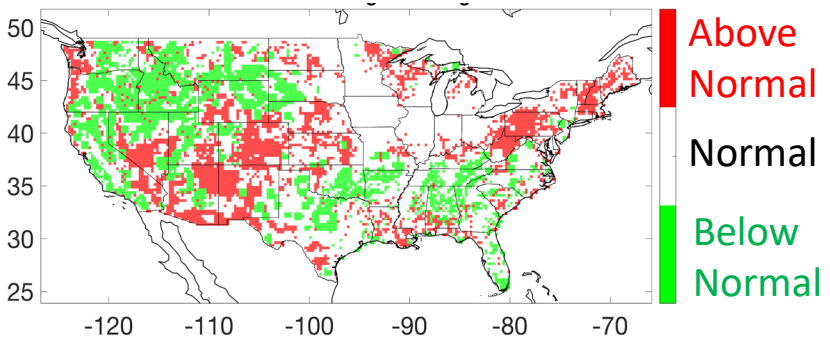
- Select the “best” variable based on the relationship between prior month hydrology and wildfire burned area
- Developed one model for each land cover type based on the best variable

Fire Danger from Earth Observations (FDEO)

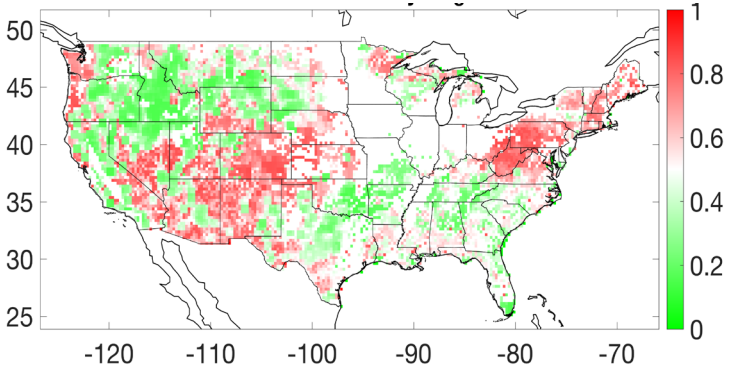
Burned Area Aug 2013

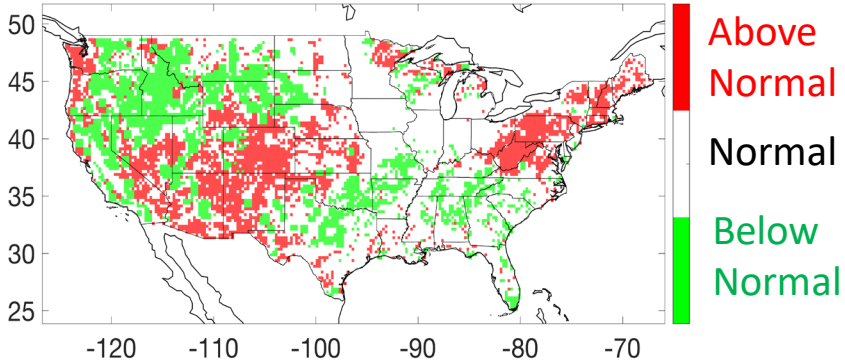
Observation





Prediction





Probability

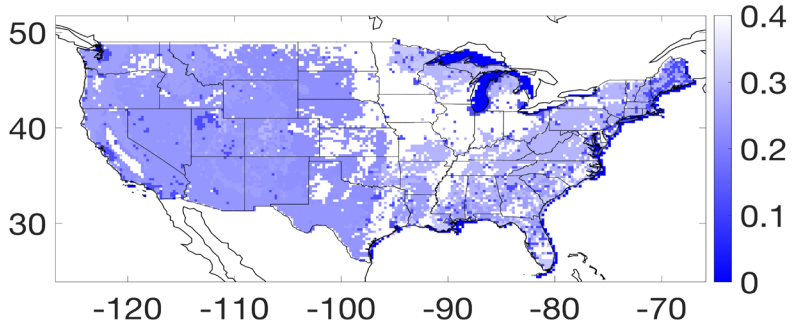
Categorical

Validation

Burned Area Aug 2013

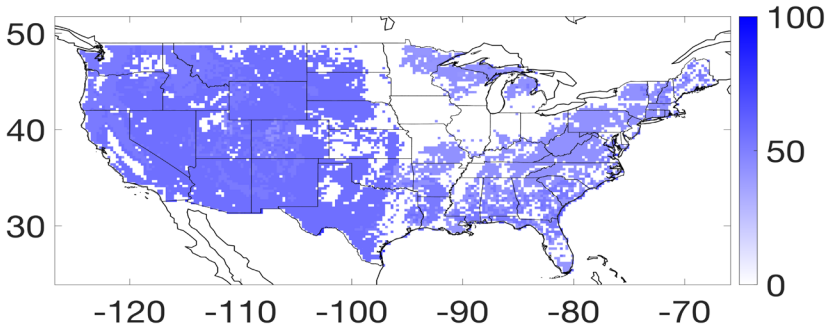
$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n} e_i^2}, \quad e_i = p_i - o_i$$

RMSE

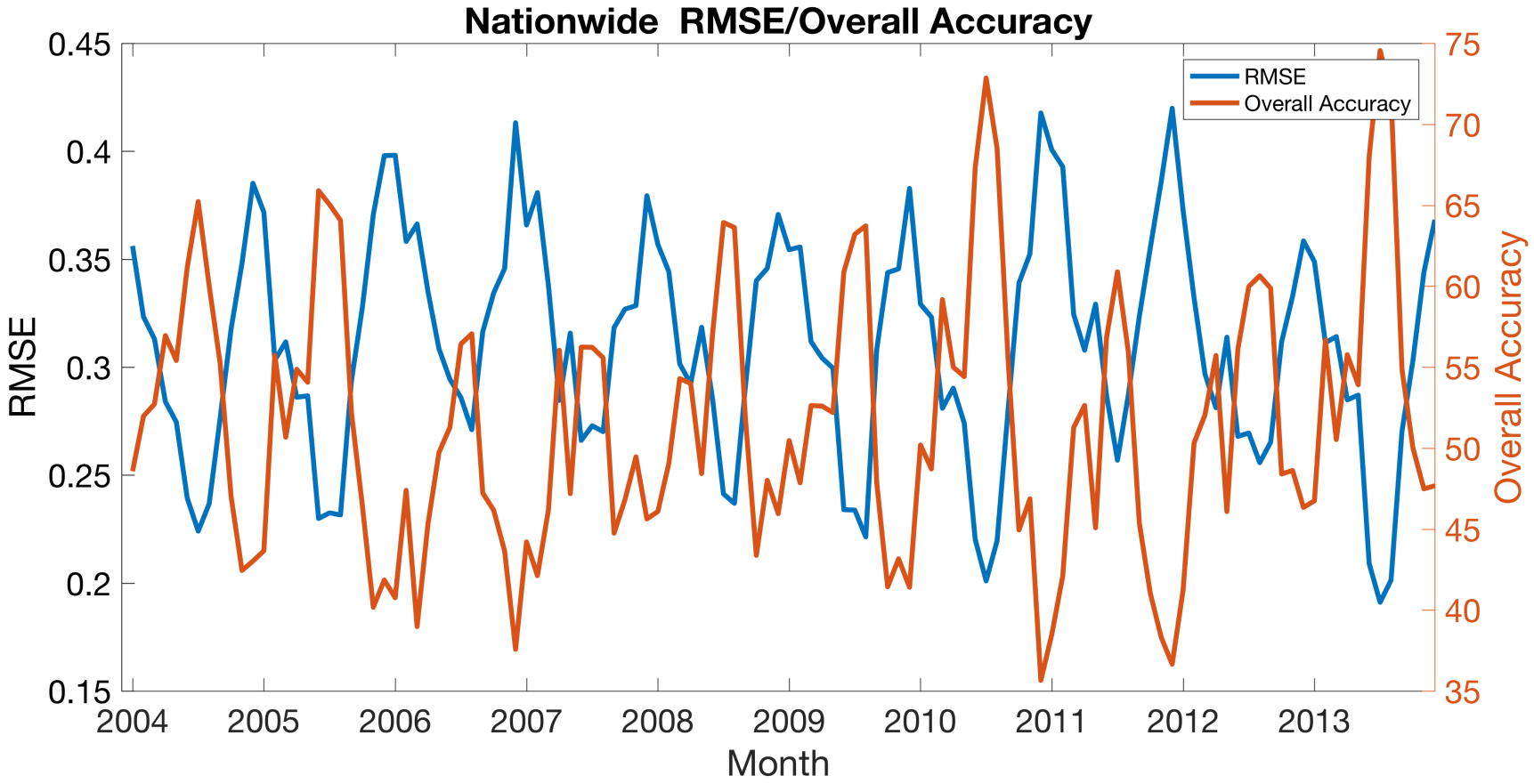


$$OA_{LC} = \frac{Number\ of\ Correctly\ Classified\ Grids}{Total\ Number\ of\ Grids}$$

Overall Accuracy



Validation



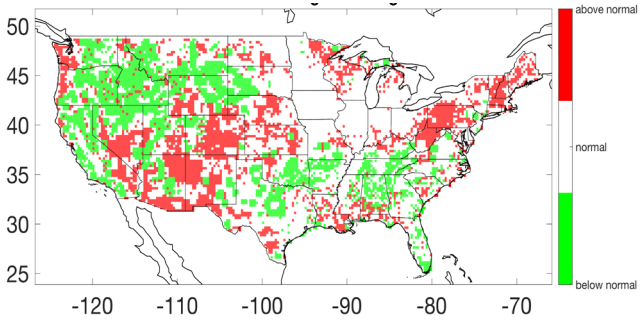
Time series of RMSE and OA

We see higher OA and lower RMSE in spring and summer time (fire season)

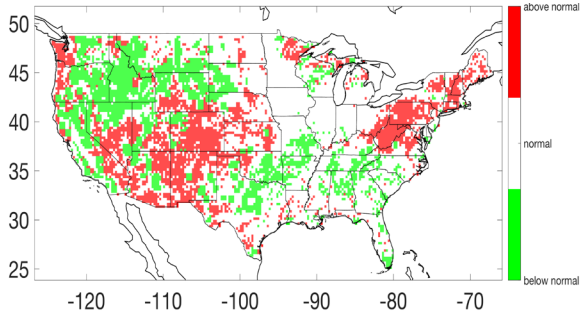
NIFC Comparison

Burned Area Aug 2013

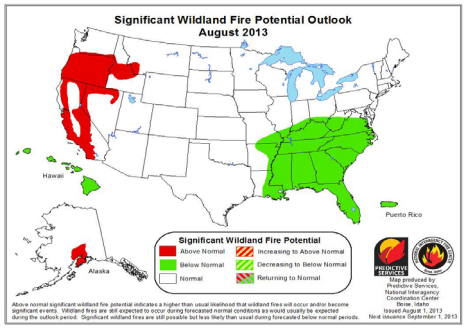
Categorical Observation



Categorical Prediction



NIFC Categorical Prediction



- Continue collaboration with USFS and NIFC
- Transition to operations with stakeholder engagement

Farahmand A., Stavros EN Reager JT, Behrangi A., 2019, Spatially Distributed Fire Danger Prediction Using Satellite-based Data in the Contiguous United States, Remote Sensing

Thanks!