OAK RIDGE National Laboratory

Quantifying the drivers and predictability of seasonal changes in African fire

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Analytical Framework and Machine Learning Techniques Used to Quantify and Predict Seasonal Variation in African Fire

Objective

- We investigated the changes in seasonal environmental drivers and predictability of African fire using the SGEFA and ML techniques.

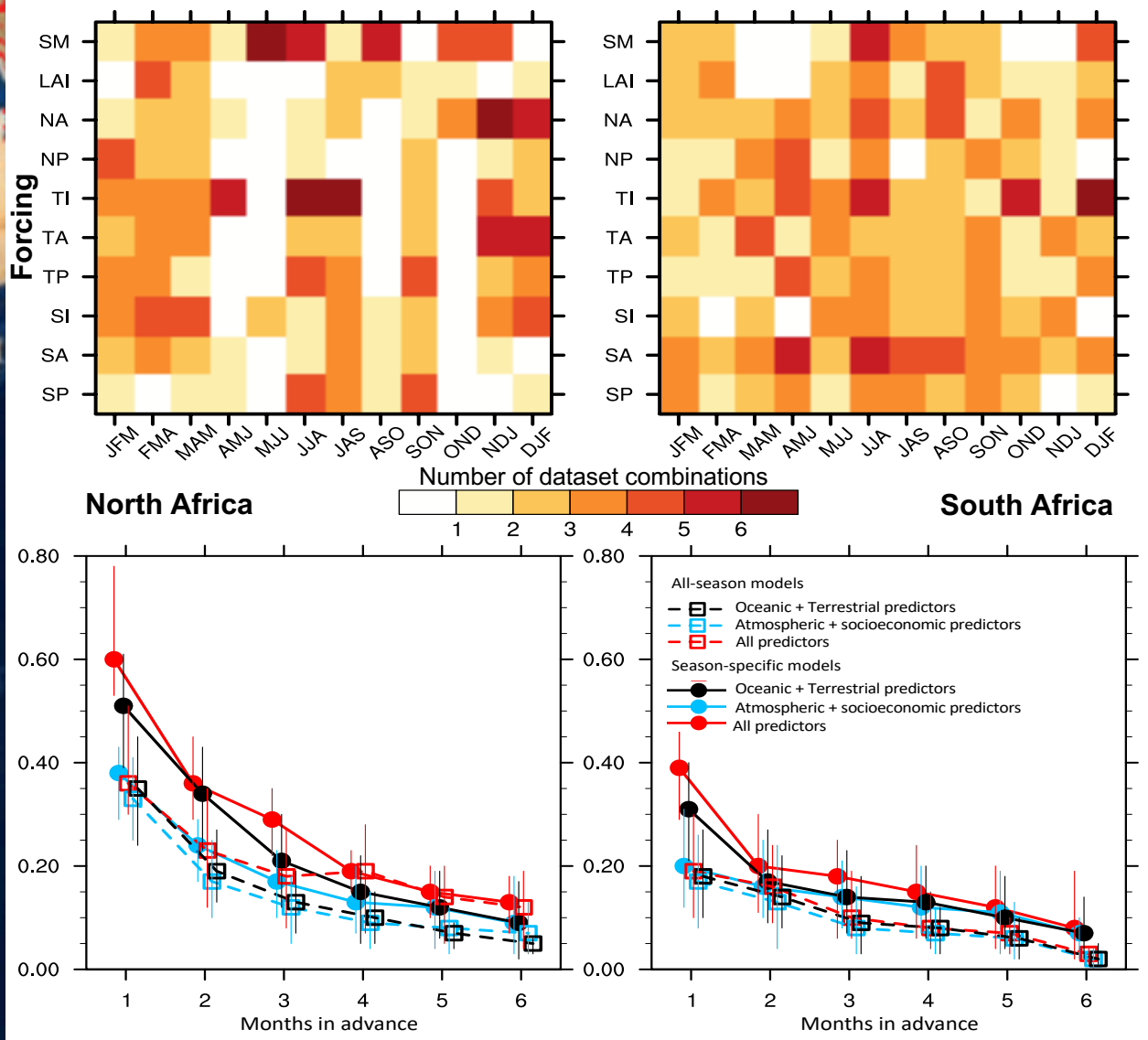
New Science

- The impacts of sea-surface temperature, soil moisture, and leaf area index were quantified and found to dominate the fire seasonal variability by regulating regional burning condition and fuel supply.
- Compared with previously-identified atmospheric and socioeconomic predictors, these slowly evolving oceanic and terrestrial predictors were further identified to determine the seasonal predictability of fire activity in Africa.
- The combined SGEFA-MLT approach achieved skillful prediction of African fire one month in advance.

Significance

- We provide the first clear evidence of the drivers underlying seasonal changes in African fire, and an encouraging regional diagnostic and prediction framework that can be generalized for building a global fire early-warning system.

Citation *Yan Yu**, Jiafu Mao*,**, and coauthors (2020). Quantifying the drivers and predictability of seasonal changes in African fire. Nature Communications, 11 2893.*



Drivers and predictability of the African fire carbon emission anomalies

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Future Research and Relationship to White Paper

- Investigation of the driving mechanisms behind long-term global wildfire changes;
- Constraint of wildfire activities;
- Development of wildfire metrics for ILAMB;
- Modeling of the wildfire processes in the peatland/boreal forests;

- Challenges and Current Research in RGMA
  - High latitude biogeochemistry and climate;
  - Extreme events;
  - Atmosphere and aerosol interactions;
- Gaps in current researches
  - Impact of extremes on terrestrial ecosystems;
  - Deposition of iron, nitrogen, and phosphorus on ocean and land ecosystems;