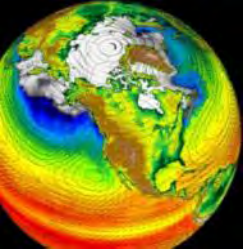
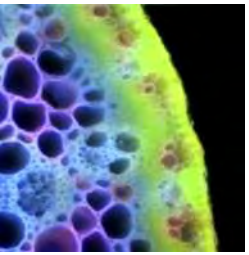




Science Highlights:
How to inform the uninformed

Environmental System Science
Principal Investigator Meeting
Potomac, MD

April 26-27, 2016

Jared L. DeForest, Ph.D.

Science Highlights

An important way to communicate scientific accomplishments to program managers, BER, the Office of Science and the public.

- BER has a new publication highlight policy and procedure
  - Will greatly streamline the process of posting highlights online
- A template that the author fills out when the publication has a DOI number
  - Should clearly articulate and distill the major points of the publication for a several audiences (scientists to the general public)
- Requested for all BER-funded projects
  - National Labs & University
- Consider sending a one-slide PowerPoint slide
  - Required for DOE-Labs, highly recommend for university projects

[Day] [Month] [Year]

[Title in Capitalized Format]

[Subtitle not capitalized, ending with a period.]

The Science

[A sentence or two, accessible to the non-specialist.]

The Impact

[A sentence or two, accessible to the non-specialist. The "impact" of a use-inspired science highlight is typically a potential technological advance while the "impact" of a discovery science highlight might be to open up new frontiers of science or resolve a longstanding question.]

Summary

[A paragraph, hopefully still accessible to the non-specialist, but may be more technical if necessary.]

Contacts (BER PM)

[Name]
[Institution with optional title, optional address]
[Email and/or telephone]

(PI Contact)

[Name]
[Institution with optional title, optional address]
[Email and/or telephone]

Funding

[Explanation of funding ***including citation of all significant sources, including non-DOE sources if applicable***; formatting is flexible: can be a bulleted list, a sentence, or a short paragraph.]

Publications

[List publications one per line in the format used by Nature:
M. Butterworth, "Optimal sugar content of artificial maple syrup." *Science* **35**, 221 (2012). [DOI].]

Related Links

[include optional related links, one per line]

Physiologically-linked precipitation variability indices predict water stress for multiple plant species with differing water use strategies in central US

Contact: Lianhong Gu, *lianhong-gu@ornl.gov*, 865-241-5925 DOE/Office of Science/Biological & Environmental Research

Objective

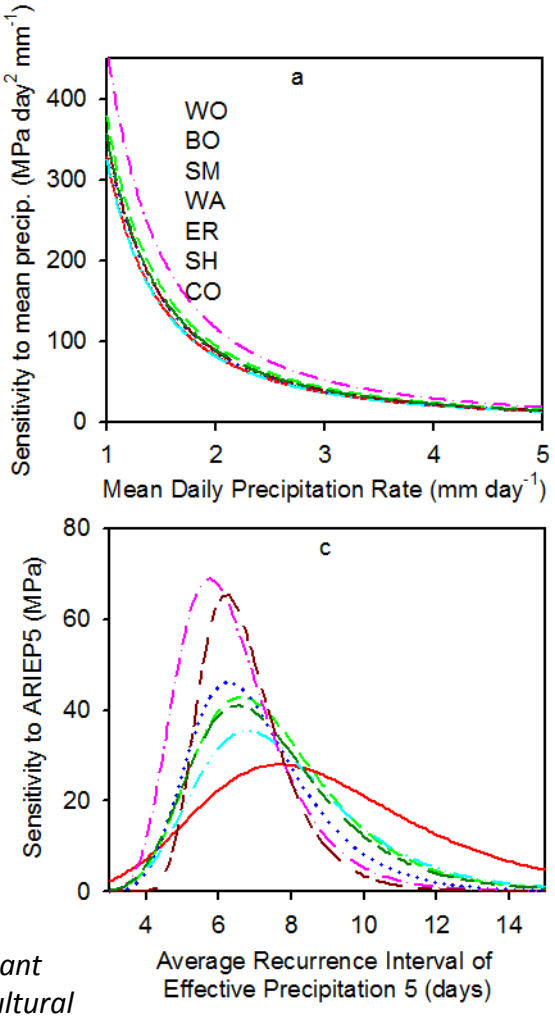
- Understand and predict how precipitation regimes affect water stress for plant species in a central US deciduous forest

New Science

- Variations in precipitation regimes may alter frequency, severity and timing of plant water stress
- How precipitation regimes affect water stress levels for plant species with contrasting water use strategies is not well understood
- We developed physiologically-linked precipitation variability indices and demonstrated their capacity to predict water stresses for key tree species
- We discovered that tree species water stress responses and water use strategies were better explained by precipitation variability than to amount

Significance

- Our study establishes a simple approach to quantifying physiological drought and the ecological impacts of precipitation regimes needed to predict tree responses to changing climate.

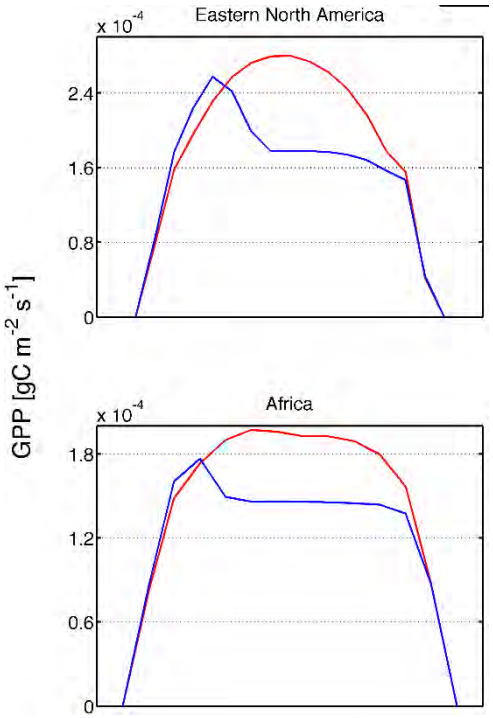


Citation: Gu L, Pallardy SG, Hosman KP, Sun Y (2016) Impacts of precipitation variability on plant species and community water stress in a temperate deciduous forest in the central US. Agricultural and Forest Meteorology 217: 120-136.

Climate Change Science Institute
AT OAK RIDGE NATIONAL LABORATORY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE U.S. DEPARTMENT OF ENERGY

Representing Leaf and Root Traits Improves Carbon and Nitrogen Cycling Predictions



Gross Primary Production (GPP) in the default model (**blue**) had an unrealistic diurnal cycle that is resolved with improved representation of root and leaf physiological traits (**red**).

Ghimire, B., W. J. Riley, C. D. Koven, M. Mu, and J. T. Randerson (2016b), Representing leaf and root physiological traits in CLM improves global carbon and nitrogen cycling predictions, 10.1002/2015MS000538 , *JAMES*.

Scientific Achievement

We improved the representation of nitrogen cycling and nitrogen controls on the carbon cycle by explicitly representing observationally-constrained dynamic leaf and root physiological traits.

Significance and Impact

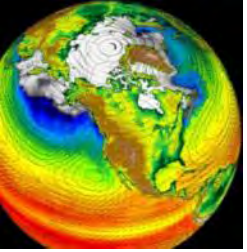
- Current coupled nutrient and carbon representations in site and global land models (e.g., CLM4.5 and ALMv0) have known conceptual errors that affect global predictions.
- This work dramatically improved predictions of energy and CO_2 exchanges with the atmosphere.

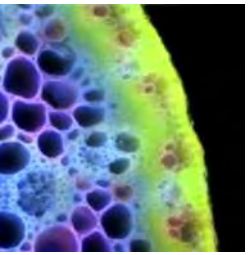
Research Details

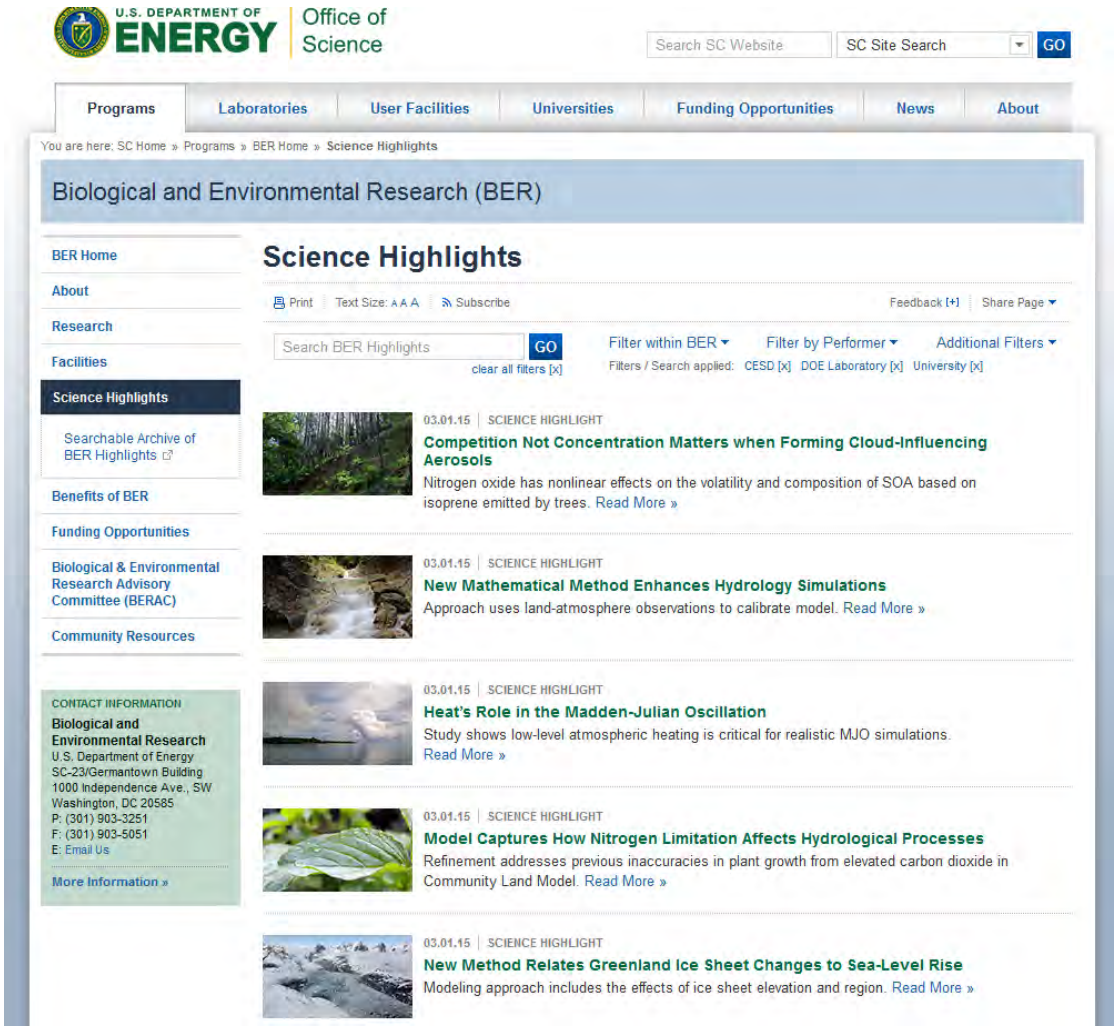
– Representing root and leaf traits removed the bias from CLM's instantaneous down-regulation approach.

– We improved the nutrient competition representation, leading to realistic estimates of nitrogen uptake.

– Results motivate ongoing work to integrate the Equilibrium Chemistry Approximation approach for nutrient competition



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Questions?