Strategies for improving predictions of heterotrophic respiration

Objective

Propose improved representation of heterotrophic respiration (HR) in Earth system models by grouping metabolism and flux characteristics across space and time.

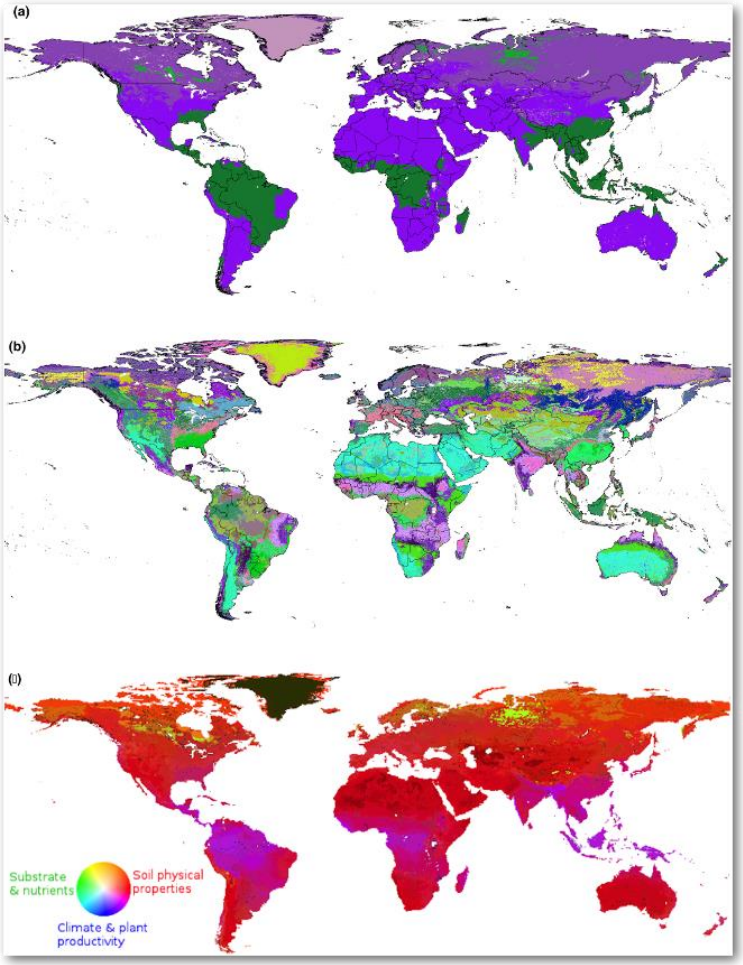
Approach

- Develop Decomposition Functional Types (DFTs), analogous to plant functional types (PFTs), for models.
- We applied cluster analysis to produce example DFTs based on global variability in biotic and abiotic factors that influence decomposition processes.

Results/Impacts

- We showed how annual HR can be spatially grouped, complementary to but distinct from existing PFTs.
- We suggest prioritizing synthesis of existing data, constraining process models with measurements, and decoupling decomposition from fixed site data as critical next steps to build a foundation for DFTs in global models for yielding robust, scalable estimates of HR.

Bond-Lamberty, Ben, Daniel Epron, Jennifer Harden, Mark E. Harmon, **Forrest M. Hoffman**, **Jitendra Kumar**, Anthony David McGuire, and Rodrigo Vargas (2016), Estimating heterotrophic respiration at large scales: Challenges, approaches, and next steps, *Ecosphere*, 7(6), doi:10.1002/ecs2.1380.



Example cluster analyses delineating DFTs from 11 global climatic, edaphic, carbon flux, and topographic characteristics. Randomly colored maps show the (a) five and (b) 50 most-different land regions from simultaneous consideration of all 11 variables. Map (c) is the 50-region map colored by three dominant, orthogonal PCA factors.