DAMM-MCNiP Paper Outline

1. Title: Substrate diffusion is an important control on soil C efflux
   1. Authors: Rose Z. Abramoff, Eric A. Davidson, Adrien C. Finzi
   2. Add Kathleen?
2. Abstract
   1. Take home: Need to model substrate supply and microbial pools in order to represent seasonal C fluxes.
      1. MCNiP adds inertia.
3. Intro
   1. C important, substrate supply is important
   2. Birch effect theory – fast pulse after rain
   3. Important to represent diffusion constraints on substrate supply, even in a relatively wet ecosystem such as HF.
4. Methods
   1. Short description of HF data collection (include Kathleen?)
      1. Soil respiration
      2. Litter inputs and C:N (archive)
      3. Root exudates & turnover (me)
   2. Model equations
   3. Model diagnostics
      1. How sensitivity analysis
         1. SOBOL
         2. GLUE
   4. Model run lengths, spin-up, defaults
      1. Fake soil moisture data, timeline of response to pulse
      2. Damm & damm-mcnip comparison
5. Results
   1. Model diagnostics
      1. Activation energy is very important (in all models)
   2. Fake moisture run (run all models, esp. damm and dmc)
      1. Need DAMM to respond to water
      2. Need MCNiP to “remember” growth induced by water
      3. Figure(s)
         1. Track DOC
         2. Mic
         3. SOC
   3. Model comparison with HF data
      1. Comparison figure
      2. Regression/residuals figures?
   4. Priming demo (will this fit?)
      1. Potential application of model
      2. Priming figure that is now pulse change in C:N
6. Discussion
   1. Model diagnostics & fake moisture run
      1. Parsimonious
      2. Activation energy important in all models
      3. Decomposition is major control on downstream processes such as uptake and respiration, implying that the representation of these processes could be simplified.
   2. Model comparison and priming demo
      1. Model sensitivity to soil moisture better in dmc compared to damm
         1. Need to model soil efflux
      2. Including N brings down C efflux due to limitation
      3. Something about N pulse experiment.
   3. Conclusion
      1. We developed simple model with water, temp, microbes, N
      2. Needs
         1. Recycling N pool
         2. Plant coupling
         3. Minerals
         4. Parameter estimation
      3. Flexible, easy to use, requires only temp, moisture and inputs.
      4. No oscillations?

\*\*\*Try instead of priming figure:

1. Steady state SOC at different temperature values/soil moisture values/C:N
2. CUE?
3. Can make flying carpet if need

\*\*\*After model comparison figures, before priming

1. Model root litter decomposition?
2. Model leaf litter decomposition?
3. Model variation in C efflux due to variation in root exudates measured over the year (is the range in C efflux right?)

\*\*\*Before model comparison figures

1. Compare linear regression based models using temp and moisture scalars (a la other ESMs) to show that they can’t reproduce C efflux measurements.
   1. Find the paper that Bill Riley sent me about this.
      1. Found it, now do some lit search to supplement (find more and more recent equations).
      2. Century (parton et al 1987 sssaj), Roth, Daycent, CLM-cn (Bonan et al 2013 GCB)