

# Joint Biogeochemistry-Land-Chemistry Session

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# Science Goals for CESM2

- Closing the global CH<sub>4</sub> cycle (ocean–LANL has version; wetlands-tuning needed)
- Improving the nitrogen (& C) cycle (land-ocean transfer, trace gases, ammonia from manure, riverine (inorganic N), nutrients going to regional ocean models )
- Trace gas emissions from fires – MVM done- trace gases & aerosols
- Trace gas emissions from urban areas
- Improve biogenic VOCs
  - Reduce differences in MEGAN emissions between active vs prescribed LAI – tune for CN
  - Other biogenic emissions algorithms – Tim Butler, Forrest H, Jeff Chambers (Amazon) – form working group on this
- Ozone feedback on vegetation health-need ozone passed to CLM-what to do with run with no atm chem
- Stomatal resistance in land model is overestimated (needed for ozone dry dep) [MVM found recently]- not easily fixed in the short-run
- Water and carbon isotopes
- {Representation of microbes in land (controlling C & N) }
- Representation of SOM substrate chemistry – next gen.
- Competitive interactions for nutrients (abiotic, microbial, plants)
- Spatial heterogeneity – a focal area for next gen
- Coupling DMS, HCs, OCs, primary&sec. aerosols, et al. ocean->atm
- Dust – nutrient deposition – ACME:ocean part – and erosion (loss from land)
- CICE5 – coupled into CESM with BGC
- Emissions of ice nuclei from land and oceans (e.g., pollen)

# Current Development Activities

- Land model fire emissions -> atmosphere gases (CO, NO, VOCs, etc) – Maria Val Martin (CSU/Sheffield)
- Coupling BGC CH<sub>4</sub> and NH<sub>4</sub> emissions – Peter Hess (Cornell)
- Other biogenic emissions algorithms
- New BGC
  - CLM4.5 (Koven et al. 2013)
- Reactive transport capability
  - CLM4-BeTR (Tang et al. 2013)
  - CLM-PFLOTRAN (Bisht and Riley submitted; Pau et al. in review)
- Watershed-scale hydrology and reactive transport
  - CLM+PAWS (Shen et al. 2013; Riley and Shen 2014, others)
- Leaf level nutrient competition (Ghimire et al.)
  - Coupling with new nutrient competition algorithm

# Development Priorities for the next year

- {based on session discussion}

# Methane emissions simulated by CLM4 and CLM4.5 – same BGC module

