Objective

- Integrate near-daily remotely-sensed inundation maps (from SMAP) with an ecosystem process model (DLEM) to produce more accurate greenhouse gas emission estimates (e.g., CH4).

Method Development

- Derive inundation from AMSR-E footprint-matched time series (SMAP analog).
  - Lower resolution than SMAP (37 vs. 3-9 km).
  - Higher errors in vegetated areas than SMAP (e.g., dry bias).
- Model daily CH4 flux from subgrid types separately, e.g., run DLEM with:
  - Inundated/saturated wetland (excluding masks).
  - Non-wetland (from local land cover; excluding masks).
  - Subsaturated wetland (e.g., 75%, 90%, 95% saturated; planned for future work).
- Model daily mixed grid cell CH4 flux from composite cells, e.g.:
  \[ CH4 = f(\text{wetland}) \times CH4(\text{wetland}) - [1-f(\text{wetland})] \times CH4(\text{non-wetland}) \]

SMAP

- Soil Moisture Active Passive Mission
  - Launch expected Nov. 2014.
  - 36x7 km L-band (~1.4 GHz) microwave radiometer.
  - ~3 km L-band synthetic aperture radar (SAR).
  - 2.3 day revisit period.
  - Potential for inundation mapping:
    - 3-9 km resolution.
    - Water detection or water fraction retrieval.
    - Better under-canopy water detection (than higher frequencies).
    - Better detection skill using time series (than less frequent datasets).

DLEM

Dynamic Land Ecosystem Model

- Quantifies regional GHG fluxes (including CH4, CO2, N2O) daily given atmospheric forcing (including precipitation) (Tian et al., 2010).
- 1° resolution with subgrid land cover.
- Models soil saturation but no dynamic inundation extent.
- Baseline model: Wetlands extents externally prescribed from monthly wetlands coverage data (e.g., Papa et al., 2010).

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References