

Characterizing vegetation spatial heterogeneity for cloud-resolving hindcasts in the SGP

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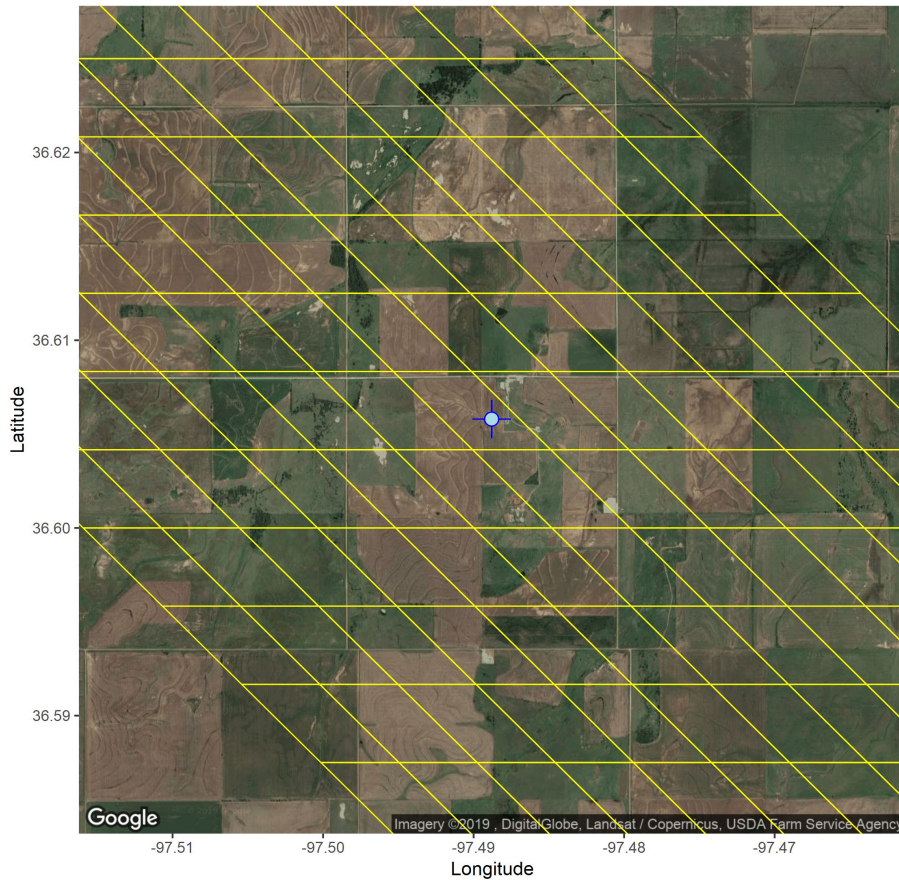
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“Interactions Among the Land Surface, Convective Boundary Layer, Clouds and Aerosols”
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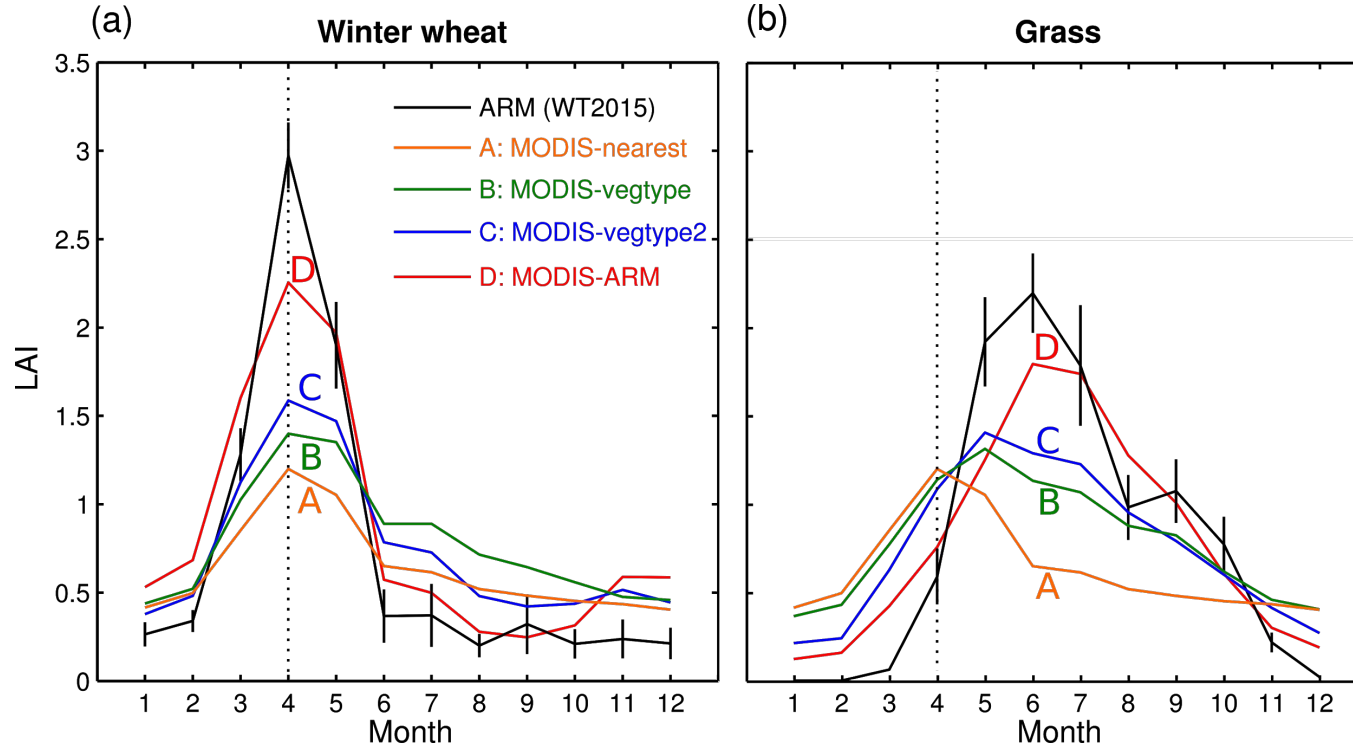
Rockville, MD



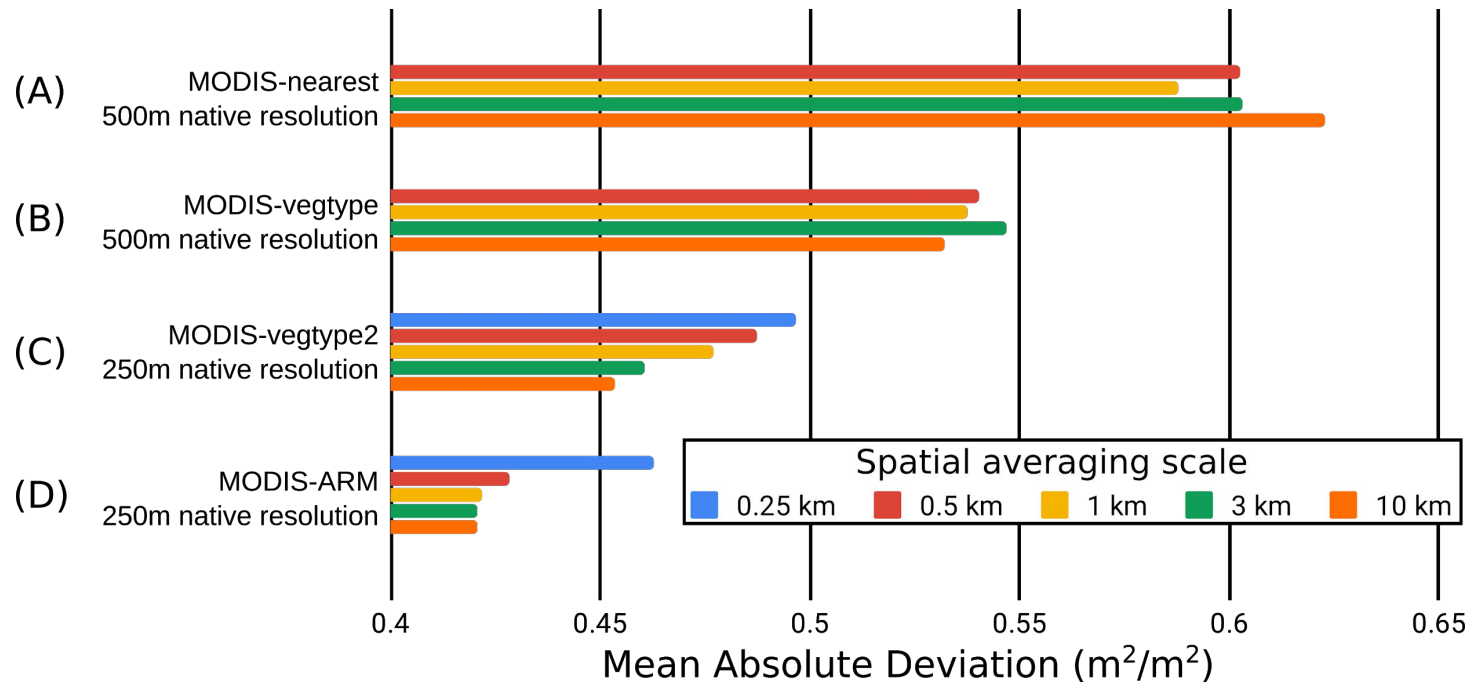
500m MODIS grid at ARM SGP site

- Heterogeneity in surface energy partitioning is largely a tractable problem, because it is driven by vegetation (Williams and Torn 2015; GRL), which is better observed than soil moisture.
- 500m MODIS products are too coarse to resolve individual fields at SGP.
- But LAI of the two dominant vegetation types varies systematically with growing season.
- This implies conditional averaging based on vegetation type.
- We tested these strategies against ground-based ARM MFR (NDVI and derived LAI) from two neighboring fields.

Conditional averaging is the solution

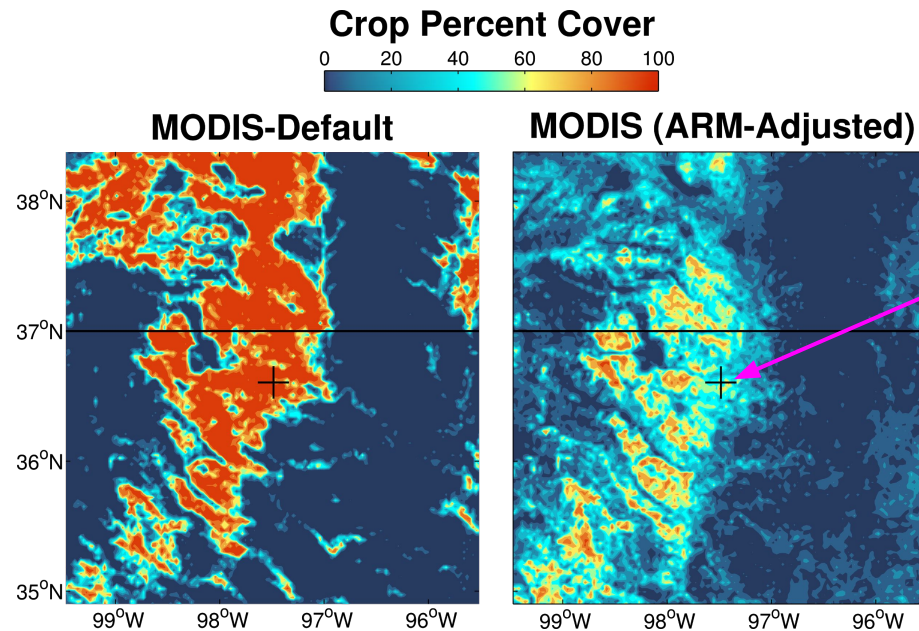


- Avoid simply using the nearest pixel.
- Averaging conditionally on vegetation types works best.
- MODIS has its own vegetation type algorithms - these are poor for crop/grass distinction.
- We developed a new algorithm using ARM Multifilter Radiometers to reclassify MODIS pixels by vegetation type based on Williams and Torn (2015) and Riley et al. (2009).



- What scale to conditionally average over?
- Estimates become stable for averaging scales beyond 500 m (we chose 3km)
- Heterogeneity is most important at these larger scales (Lee, Zhang and Klein 2019; JAS).
- For 2 vegetation types, this gives 2 LAI estimates per 3 km grid cell - “subgrid PFTs”.
- Do not compare climate model grid-mean averages to ARM fluxes, use subgrid PFTs.

Now we can model land-surface heterogeneity



- Produced 3km LAI dataset that better characterizes the mixture of crops and grasses.
- Currently used as land-model forcing for cloud-permitting hindcasts (WRF).
- Enables consistent comparison of land models to observations at extended facility sites.
- Dataset will be available on NERSC following publication.