

Synoptic CO₂ Variability at Ring 2 Sites

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Summer 2009 CMMAP Intern



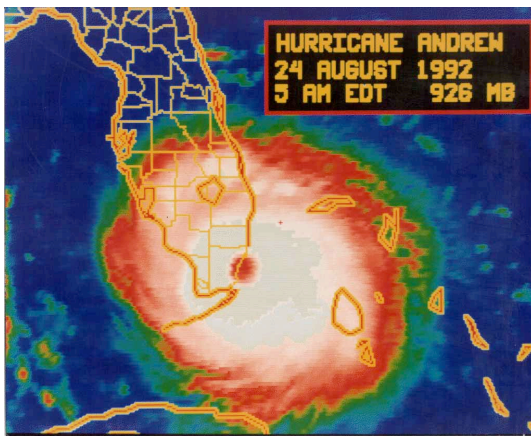
Synoptic CO₂ Variability at Ring 2 Sites



About Me



- Undergraduate at University of Wisconsin – Madison
- Studying Atmospheric and Oceanic Science
- Hurricane Andrew



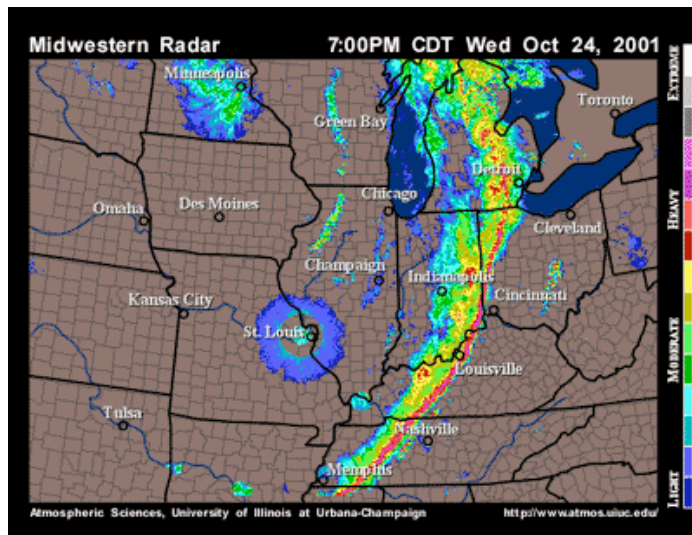
Goals & Significance

- Find problem areas in model simulated CO₂ levels by comparing model output with observations
 - Focus on Midwest in summer 2007
- Speculate on future model improvements
- Knowledge gained can be used to improve long term climate modeling of important trace gases such as CO₂

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Synoptic Variability

- Synoptic = Time scale on the order of days - week
- Example: Mid-Latitude Cyclone
 - Cold front
 - Warm front



Synoptic CO₂ Variability at Ring 2 Sites

Observations = Ring 2

- Five towers in the central United States which measure CO₂ concentrations near the surface
- High frequency (hourly) observations from spring 2007 to summer 2008

Site	Date installed	Latitude	Longitude	Sampling Heights
Kewanee, IL	26-Apr-07	41.2762 N	89.9724 W	30/140 m AGL
Centerville, IA	27-Apr-07	40.7919 N	92.8775 W	30/110 m AGL
Mead, NE	30-Apr-07	41.1386 N	96.4559 W	30/120 m AGL
Round Lake, MN	1-May-2007	43.5263 N	95.4137 W	30/110 m AGL
Galesville, WI	29-Jun-07	44.0910 N	91.3382 W	30/140 m AGL

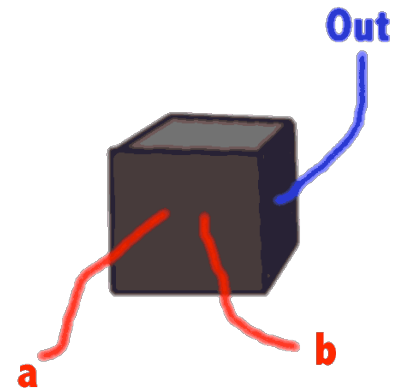


Synoptic CO2 Variability at Ring 2 Sites

Model = PCTM

- Parameterized Chemistry Transport Model
- CO2 fluxes input from
 - SiB (Simple Biosphere Model)
 - Ocean Models
 - Known fossil fuel emissions
- Goddard Earth Observation System 5.1.0 (GEOS5) reanalysis data set used to drive transport

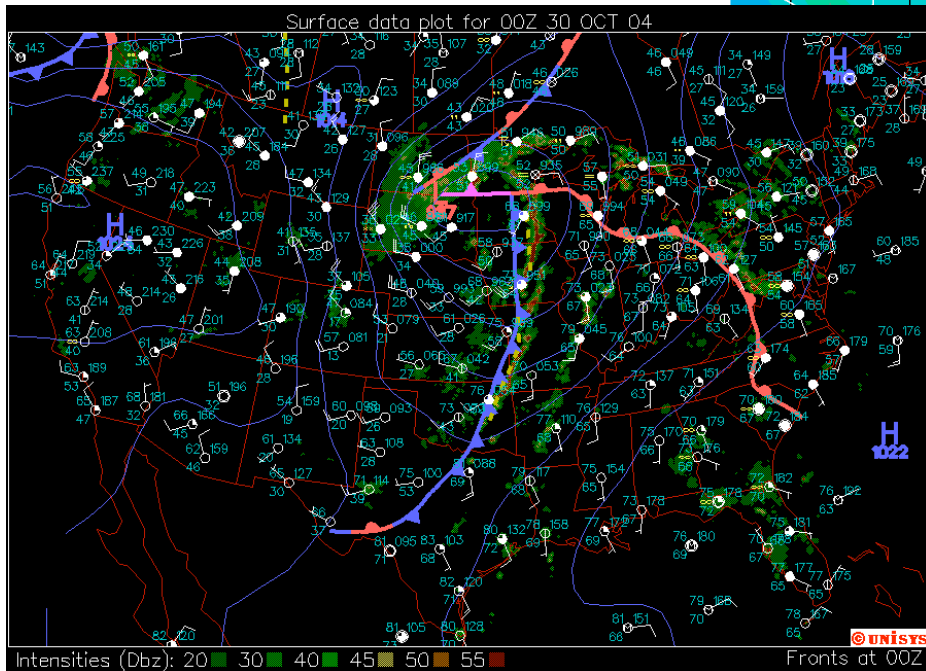
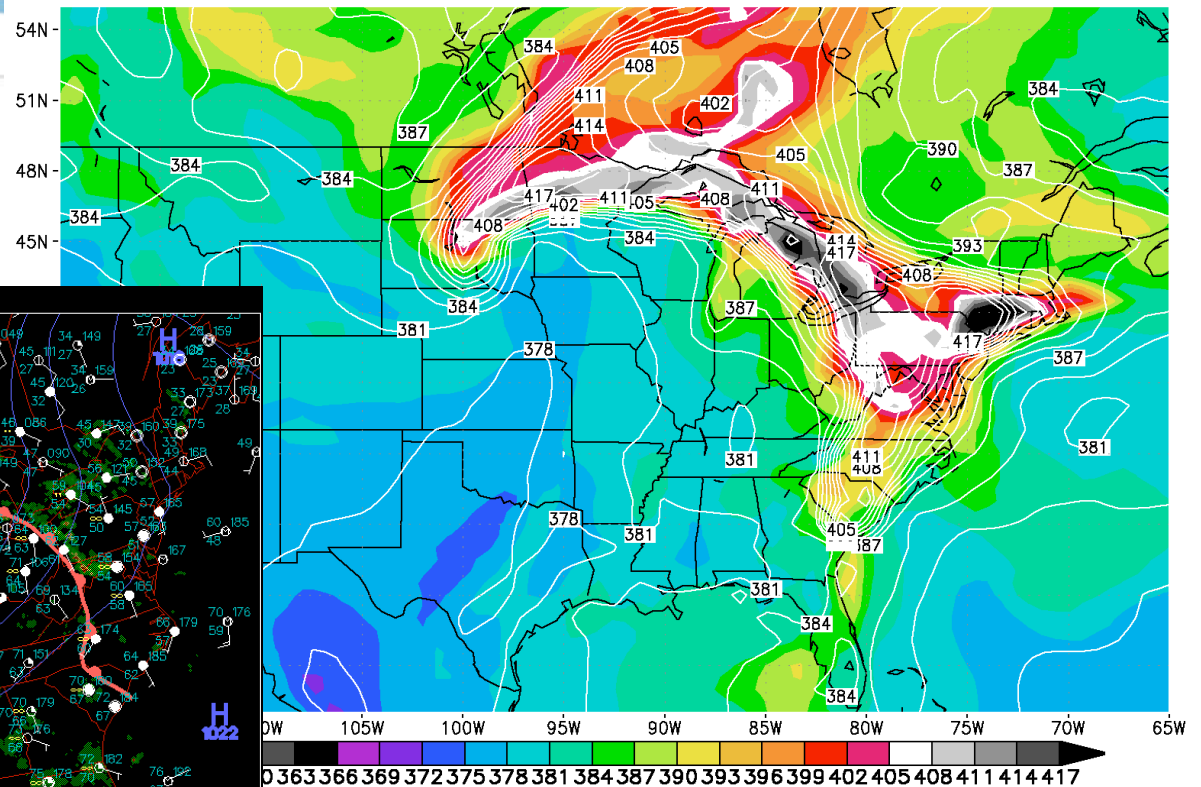
OR...



Synoptic CO2 Variability at Ring 2 Sites

Model = PCTM

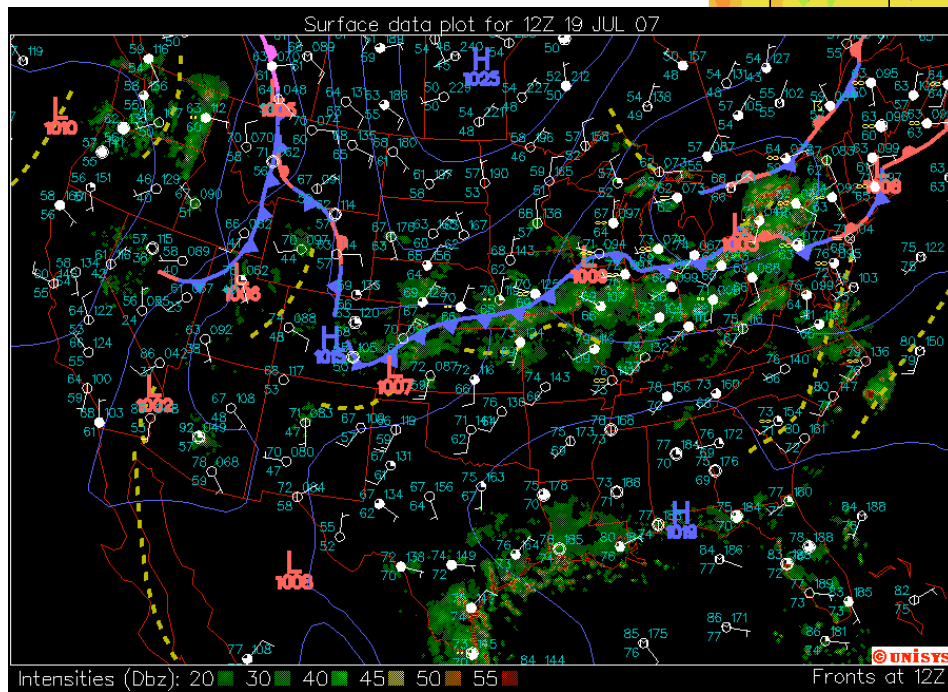
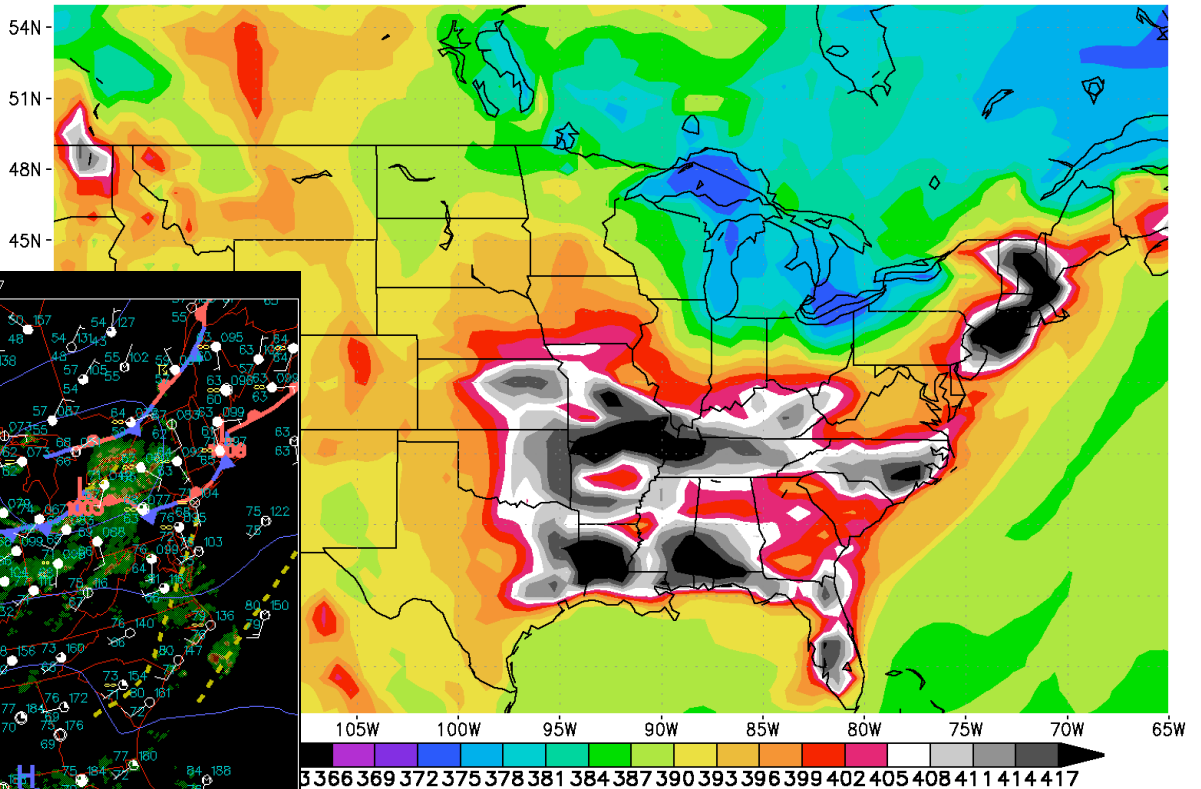
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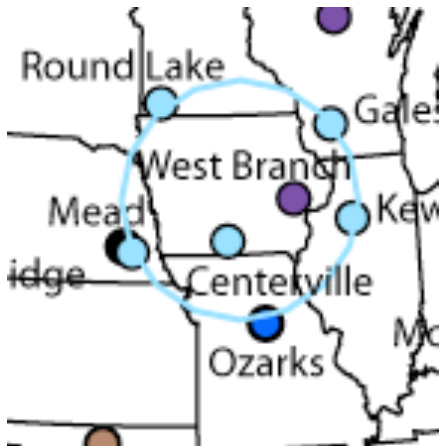
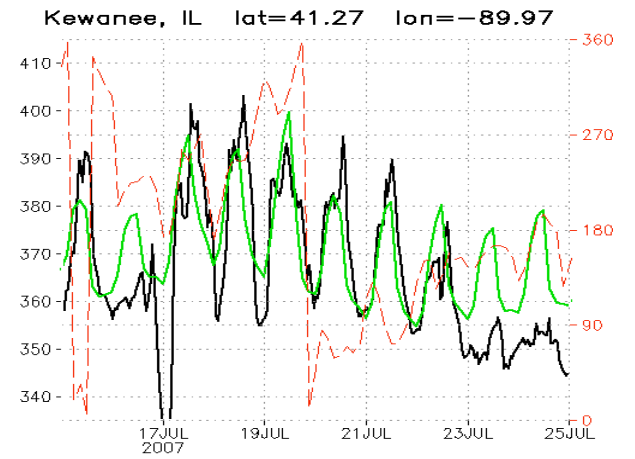
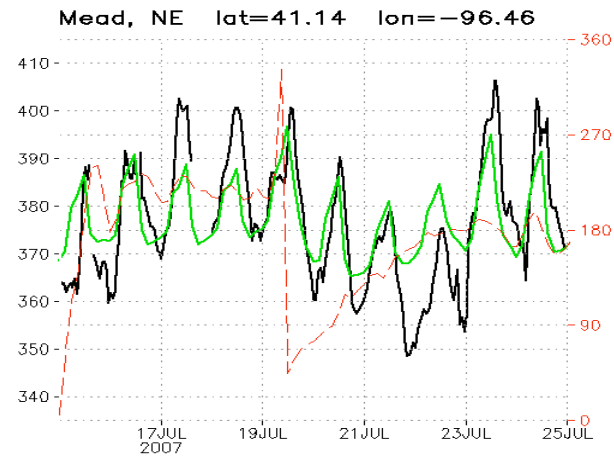
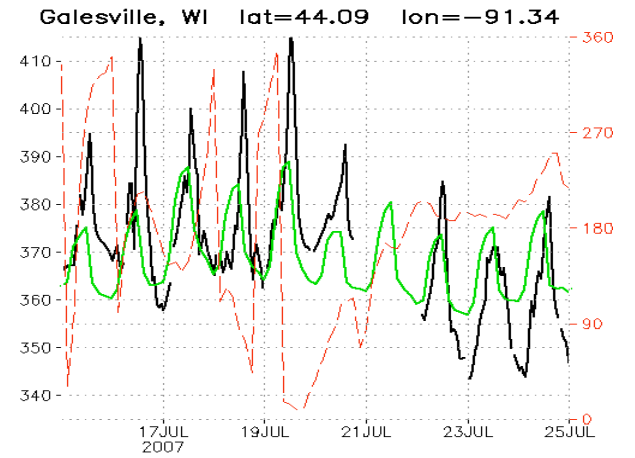
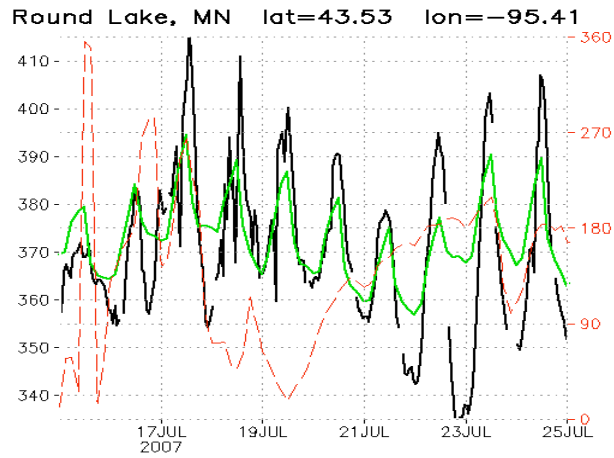


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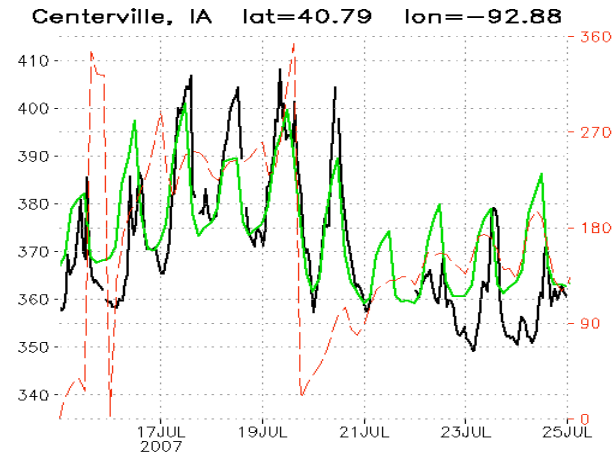
July 15th – 25th 2007

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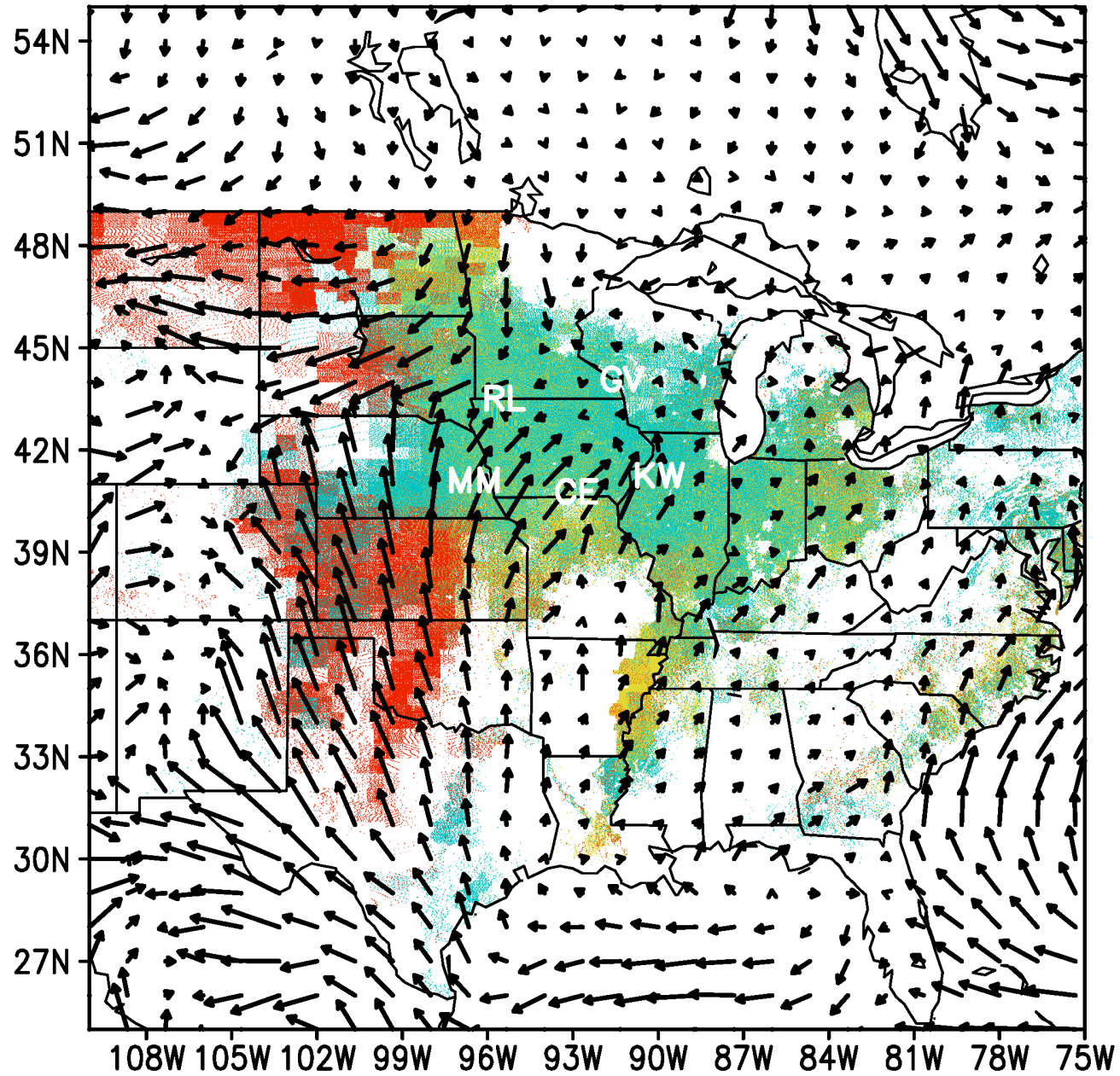




KEY
 PCTM ———
 Ring 2 Obs ———
 Wind Dir - - -

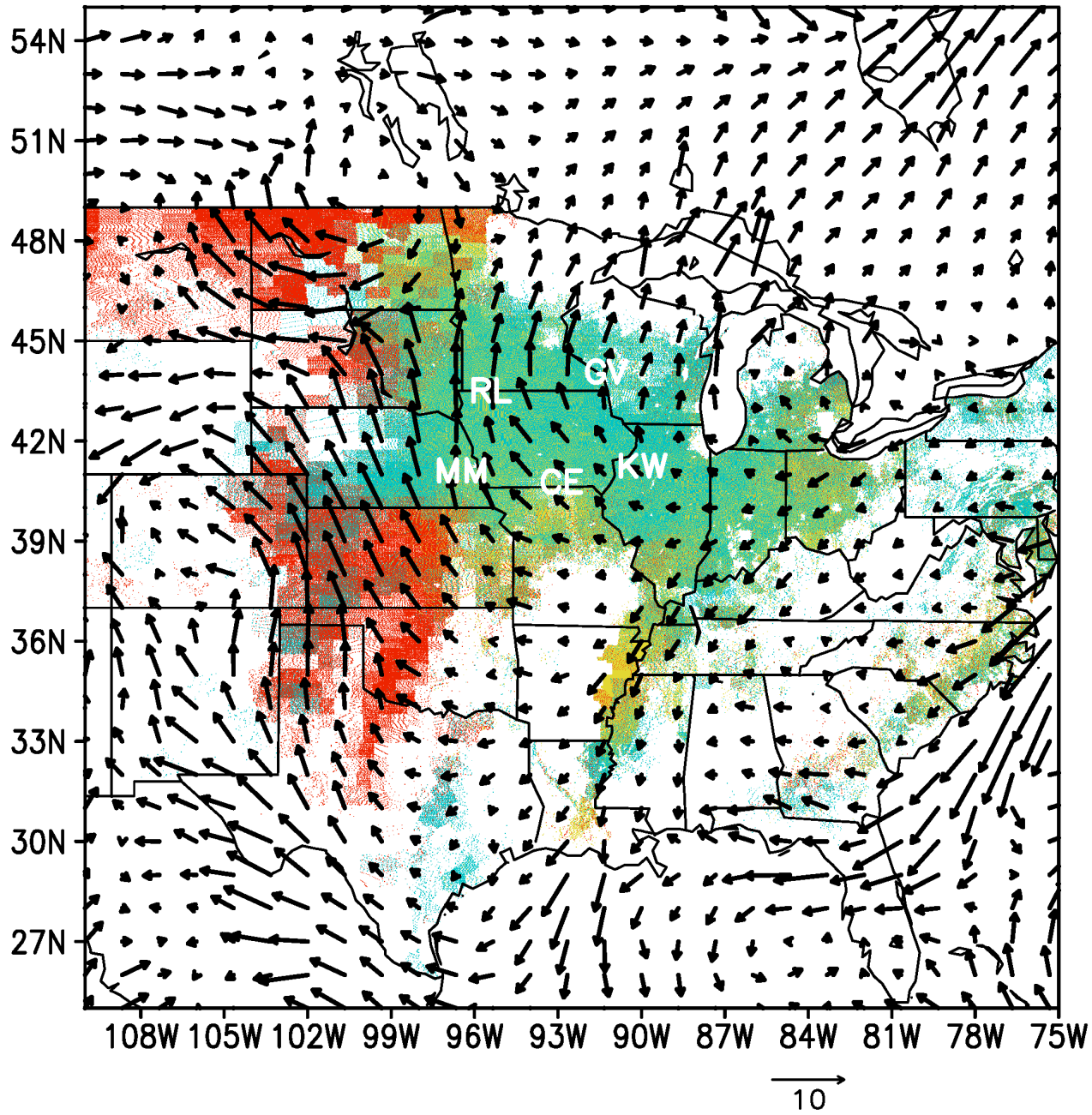


0z18jul, 2007



→
10

0z23jul, 2007



Findings

- Diurnal cycle is well-represented temporally
 - Maxima and minima underestimated
- Fronts and “where air comes from” matter
- Crops are important: Not enough drawdown of CO₂ over Midwest where agriculture dominates in summer
- Next Step: Look at effect of adding crop representation to SiB