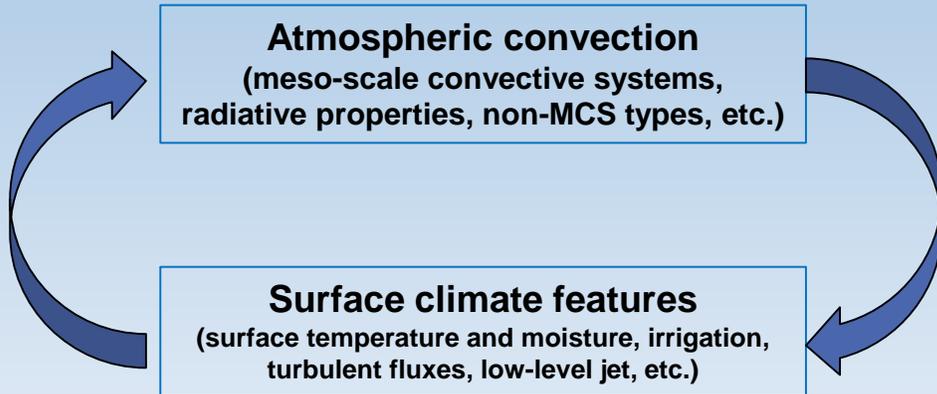


Summertime convection and surface climate over the Central U.S. in a regional convection-permitting simulation



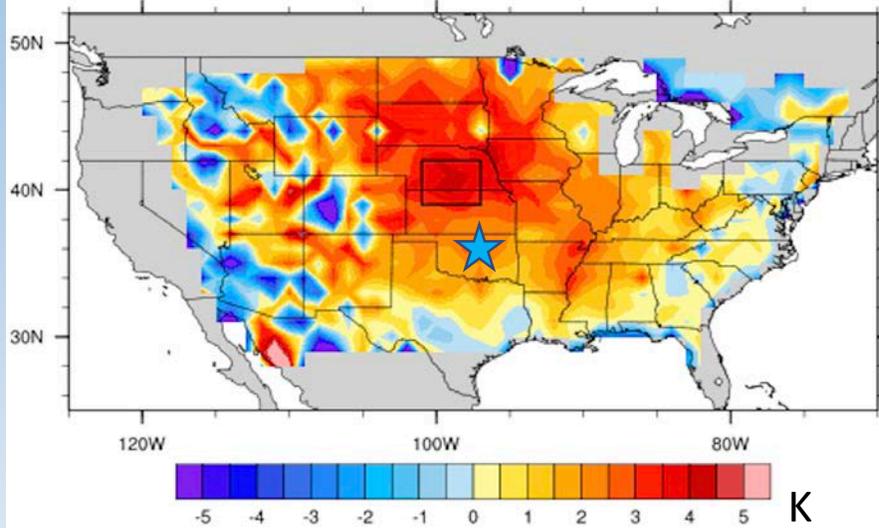
2020 RGMA PI Meeting

LLNL: Hongchen Qin, Hsi-Yen Ma, Steve Klein

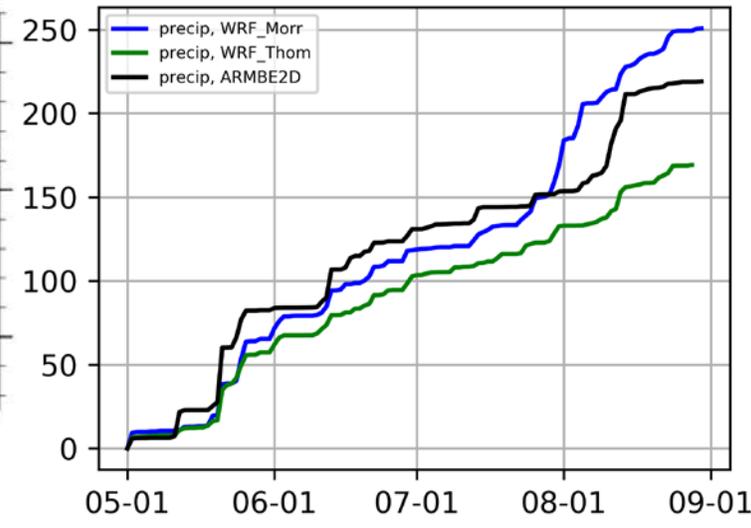
PNNL: Zhe Feng, Huancui Hu, Ruby Leung

T_{2m} warm biases and evaporative fraction

WRF_{Morrison} T_{2m} bias, 2011 JJA



Accumulated precip, mm | ARM SGP

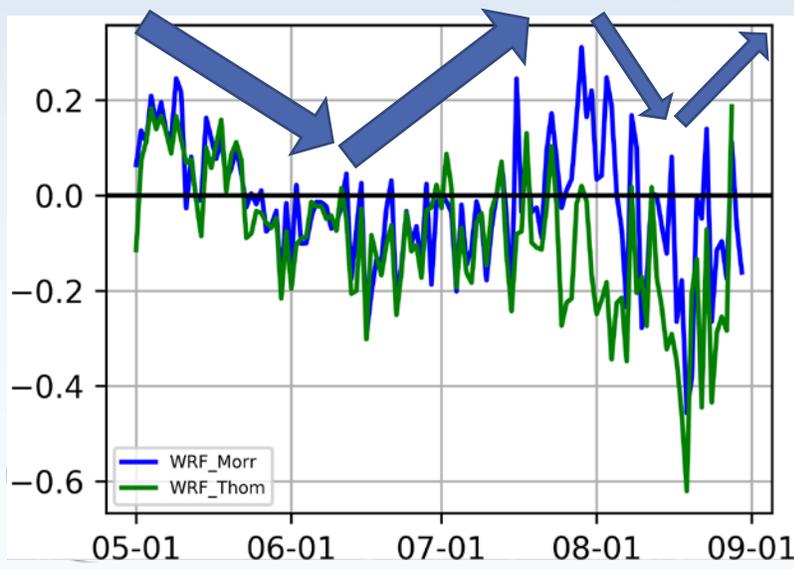


- The MCS-enabled, high-resolution WRF (4-km, 65 vertical layers) simulations still suffer from the warm biases. (WRF_{Morrison} < WRF_{Thompson})
- WRF_{Morrison} : ~4K @Nebraska-Kansas, ~2-3K @ARM SGP.
- EF bias is largely negative while T_{2m} bias is largely positive, and the trend of EF bias is reversely correlated with T_{2m} bias.

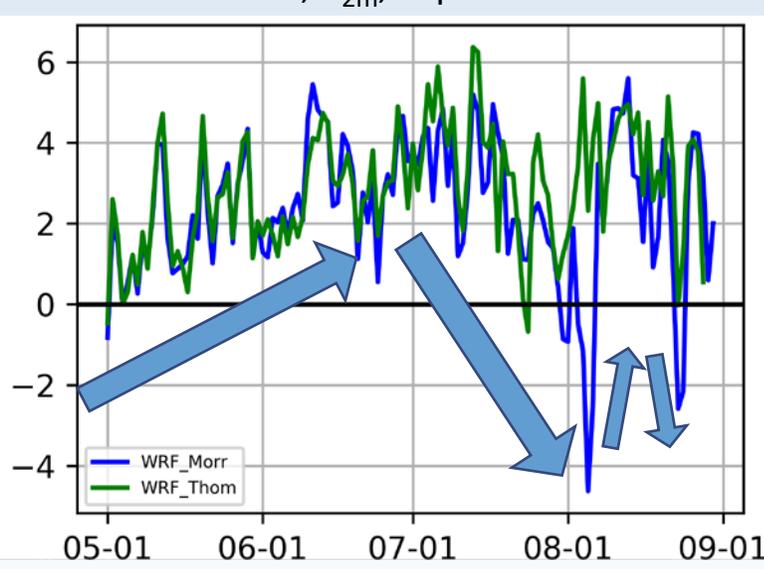
- Comparing to WRF_{Morrison}, WRF_{Thompson} has less accumulated precip, lower EF values and larger T_{2m} warm biases.

T2m benchmark: NOAA QCLCD
SGP obs. comes from ARMBE2DGRID

WRF bias, EF or LH/(SH+LH), unitless | ARM SGP

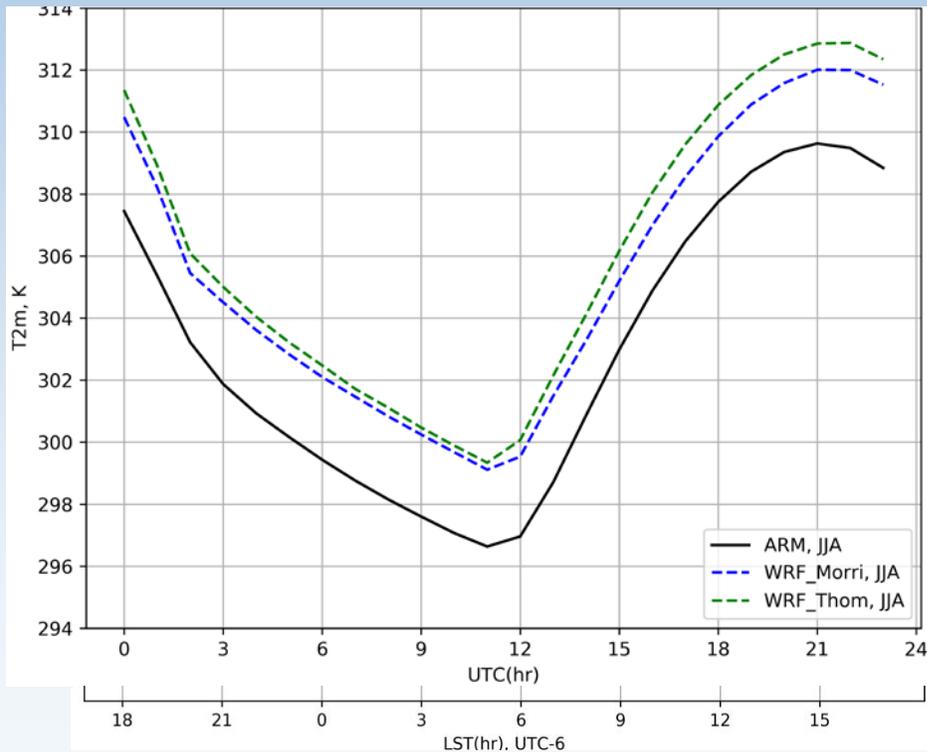


WRF bias, T_{2m}, K | ARM SGP



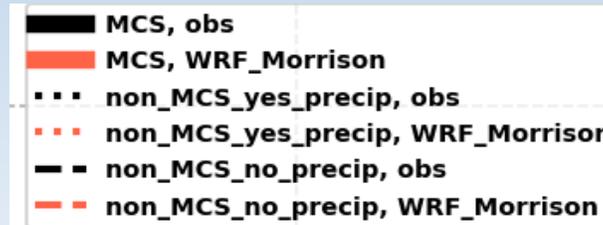
Diurnal cycle of T_{2m} and categorical decomposition

T_{2m} diurnal cycle, 2011 JJA | ARM SGP

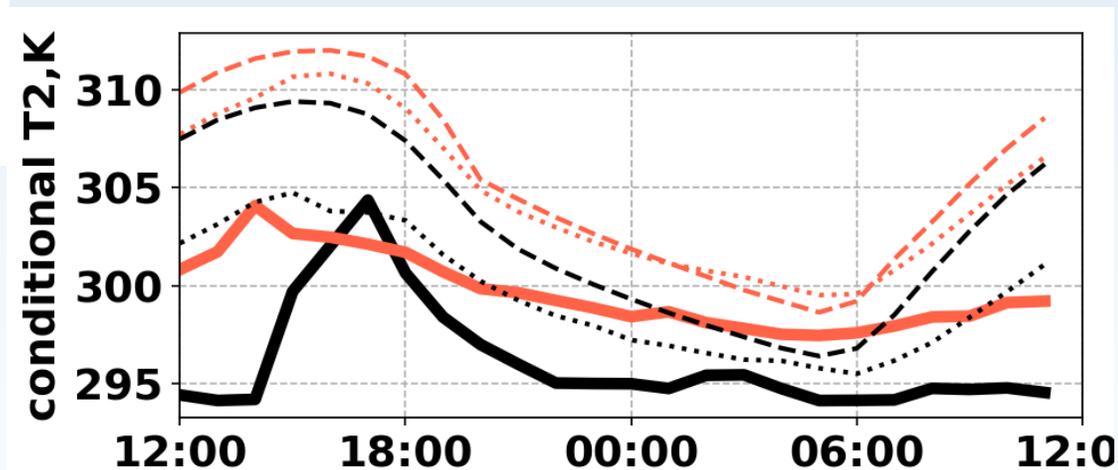


Three categories:

- C1: MCS
- C2: Non-MCS with precipitation
- C3: Non-MCS without precipitation



WRF_{Morrison}: conditional mean T_{2m} , 2011 JJA | ARM SGP



- Warm biases occur throughout the day in both simulations.
- For the better performing WRF_{Morrison}:
 - All three categories have warm biases in $T_{2m_conditional}$. It is particularly large in C2.
 - ARM SGP C1 site: T_{2m} bias contribution from the 2nd category is quite large (frequency & conditional mean).

Research outlook & opportunities

☐ ATM

- Do CPMs simulate correct distribution of MCSs and other convection such that they provide correct precipitation to the surface?
- Do CPMs simulate correct distribution of clouds in MCSs and other convection such that they provide correct radiative forcing to the surface?

☐ LND

- Does the land component of CPMs provide correct surface fluxes of energy and water to the atmosphere?

☐ L-A interactions

- How are L-A interactions represented differently in CPMs?
- ❖ *Can the most critical aspects of CPMs impacting simulations of the coupled water and energy cycles be identified in order to prioritize the efforts needed to improve CPM simulations?*