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# CMDV-MCS LAM/LES Plans

William Gustafson, PNNL

# We need high-resolution gridded details



- CMDV-MCS's goal is to improve simulations of large convective systems

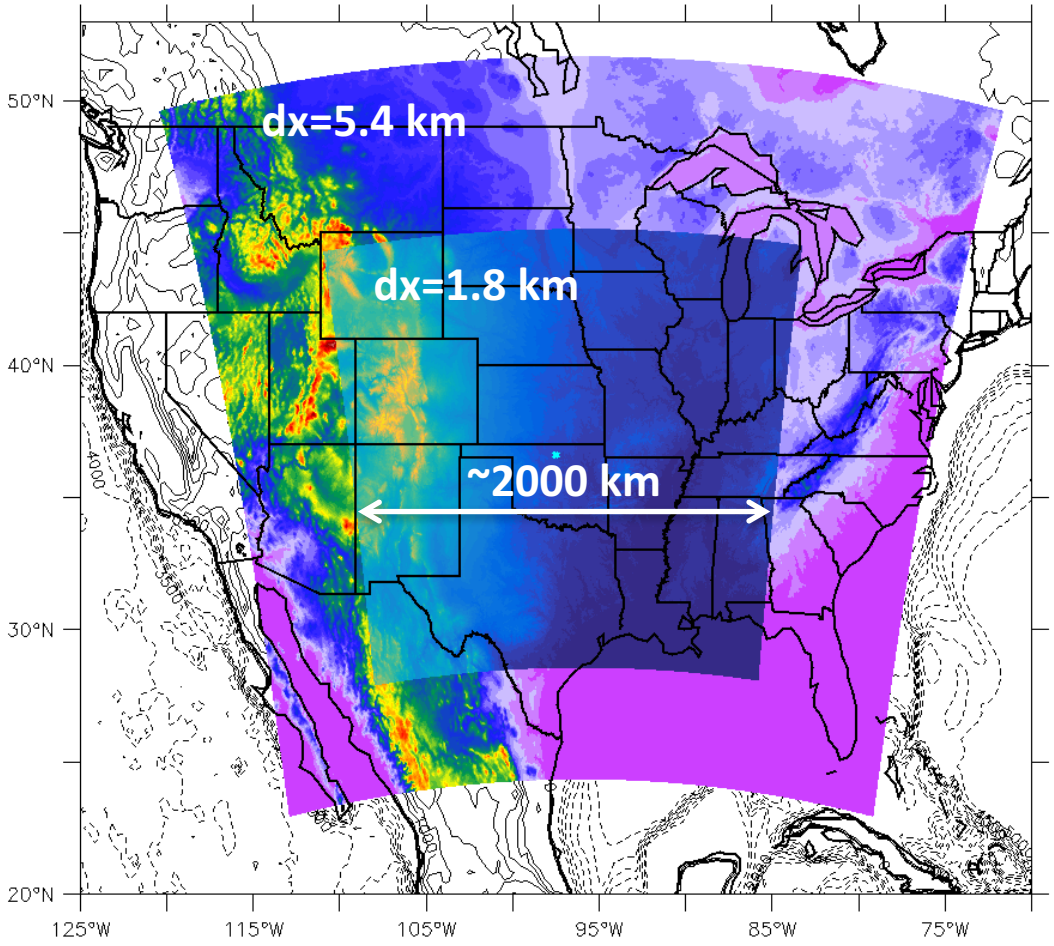
- To do this, we need…
  - Detailed flow information in and around the storms
  - Cloud population statistics, e.g., diameters, spacing, heights
  - Updraft statistics, e.g., core sizes, velocities, dilution
  - Difficult to measure quantities, e.g., heating rate profiles, fluxes, covariances

- Sometimes, we need scenario testing for "what if" questions…
  - What if heating profiles are assumed to be perfectly sinusoidal?
  - What if cloud heating is applied at coarse scales instead of its true spatiotemporal scale?
  - What if cloud and radiation components do not communicate information?

# Limited-Area Model Simulations



- Plans for 2017 are to run ~8 MC3E cases, mainly driven by needs of param. developers
- Designed to nest within RAP, NAM, or ACME-RR
  - Proposed grids with dx=5.4 & 1.8 km
  - P3 microphysics
- 2nd & 3rd years will add simulations for PECAN and seasonal comparisons with ACME-RR and MMF simulations

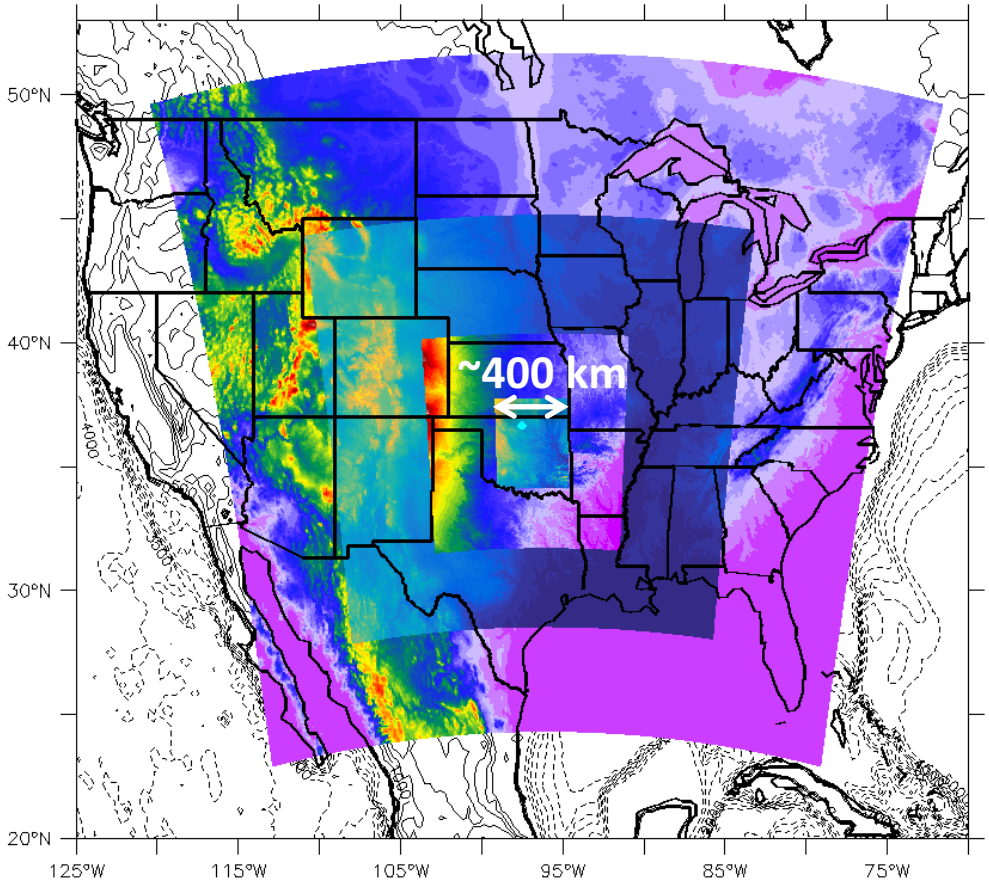


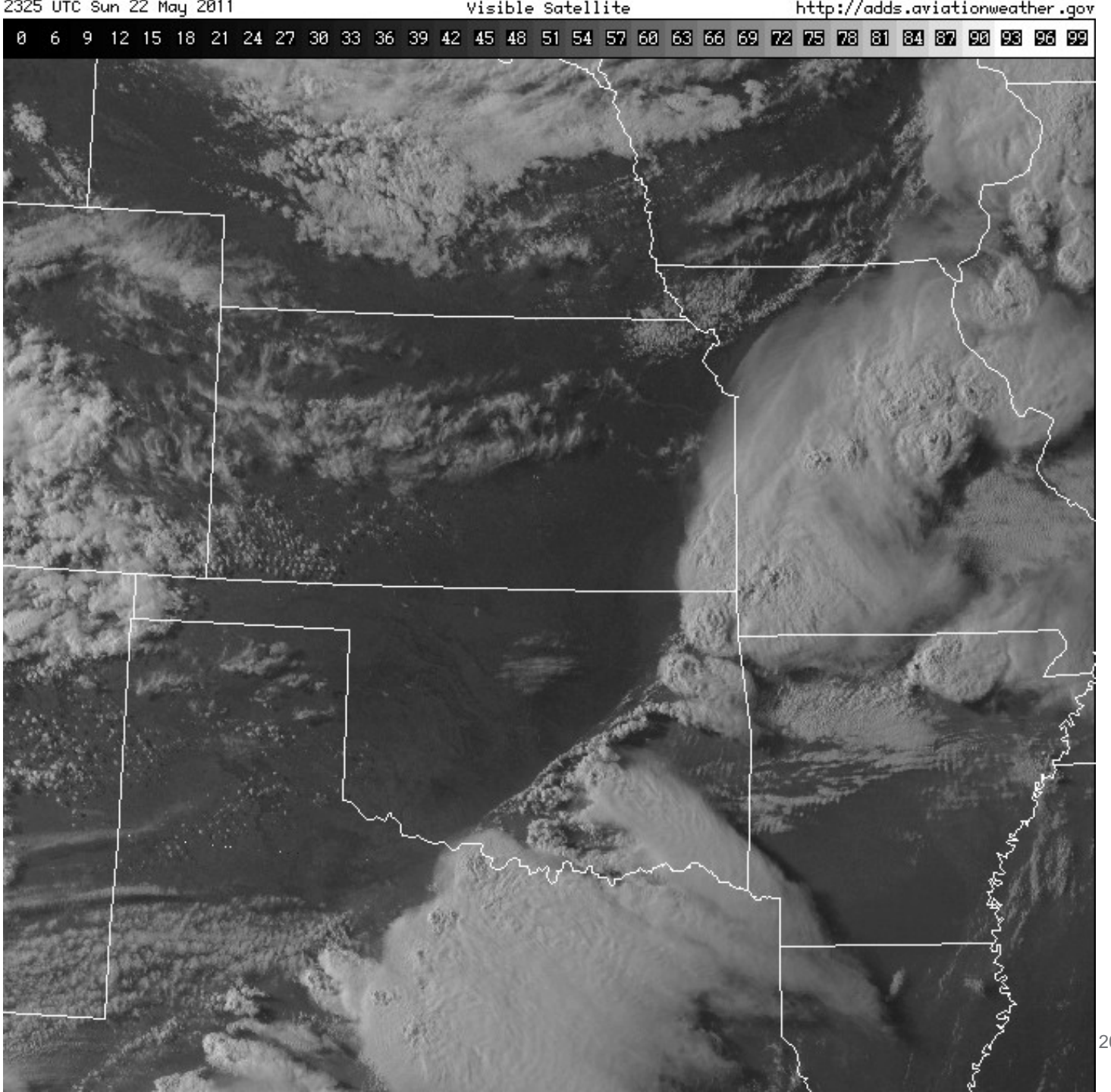
# Large-Eddy Simulations



LES provides benchmark simulations for (a) process-level understanding of MCS initiation and (b) propagation CLUBB-Deep and microphysics parameterization development

- Plans for 2017 are to demonstrate translating LES domains for deep convection
  - GigaLES control simulation for one case, ~450 km across
  - Ensemble of translating ~100 km domains over concurrent time & space as control
- Nested WRF configuration, dx=5.4, 1.8, 0.6, 0.2 km
- Plans for subsequent years depend on success of translating LES and available computing resources

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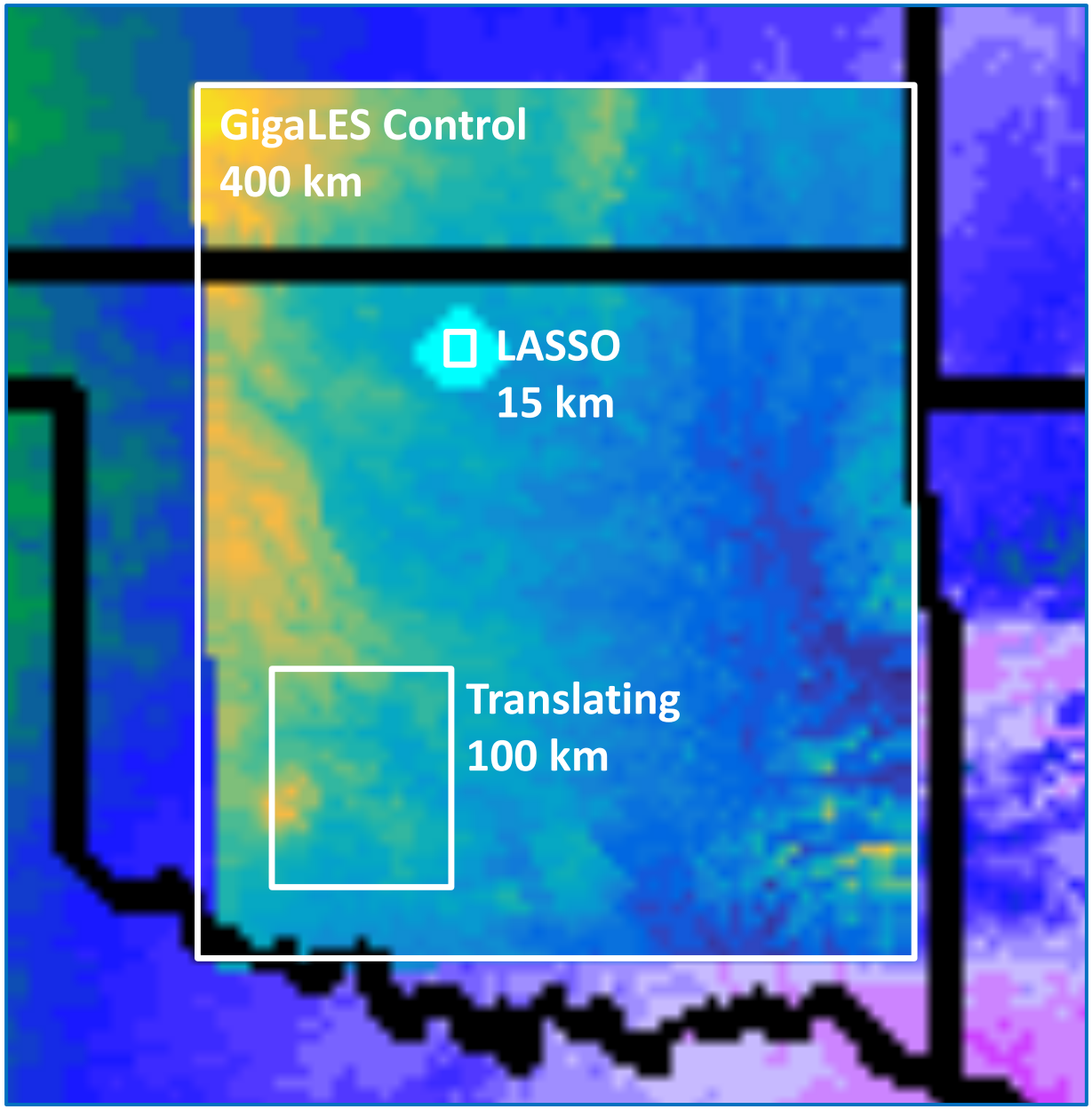


GigaLES barely captures a small MCS event

Translating domain >16x cheaper than GigaLES

Translating domains successfully used for WRF hurricane simulations [Davis et al., 2008, MWR]

Will compare results from ensemble of translating domains to the GigaLES control to establish credibility of the translating approach

# Computational Considerations



- Estimated run costs
  - 2000 km LAM simulation: ~25k core hours
  - 500 km LES simulation: ~10 mil. core hours
  - 100 km LES simulation: ~350k core hours
- Total need: ~35 million core hours (Edison-like) & 0.5 PB storage

- NERSC
  - Requested 67 mil. MPP; received 15 mil. (7.5 mil. core hours)
  - This also needs to meet development needs of MMF, spectral-bin MP, etc.
- ALCC
  - Requested 114 million core hours on Mira

# Are there details that you would like a certain way?



- LES simulations of this magnitude are meant to be shared!
- Let me know if you are interested in using the output and if there are certain aspects you would like customized.
  - Do you require certain outputs and/or output frequencies?
  - Not all “standard” WRF output can be assumed due to cost.