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The Impact of Mesoscale Resolution on the simulation of Warm Season Precipitation over the Continental United States

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Conclusions:

During the spring and summer months, a significant percentage of precipitation over the central plains is the result of eastward propagating mesoscale systems originating in the lee of the Rockies (Tuttle and Davis 2006). At approximately 1/4 degree resolution we find these orographically induced propagating precipitation events in CAM/CESM. These events have reasonable phase speed, occur at the northern terminus of the low-level jet, are associated with strong mid-level Westerlies, and are further supported by the Mountain Plains Solenoid (MPS), as in observations (Tripoli and Cotton 1989, Tuttle and Davis 2006).

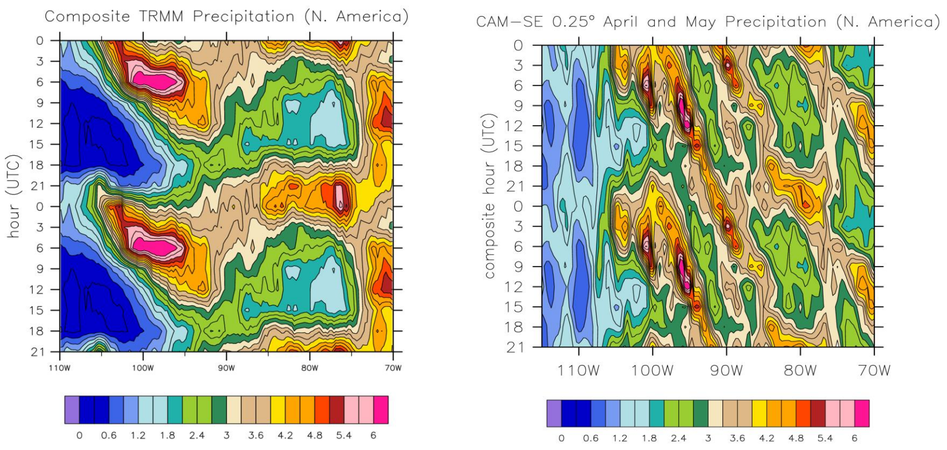

Fig 1: Composite diurnal precipitation hovmollers show events are coherent in both observations and CAM.

Fig 2: Hovmollers of 3-hourly precipitation for a single May and a single June for CAM and NARR illustrate that the phase speeds of propagating events are reasonable. One notable difference between the May and June hovmollers for CAM is the absence of eastward propagating events in June, which is an area for further study.

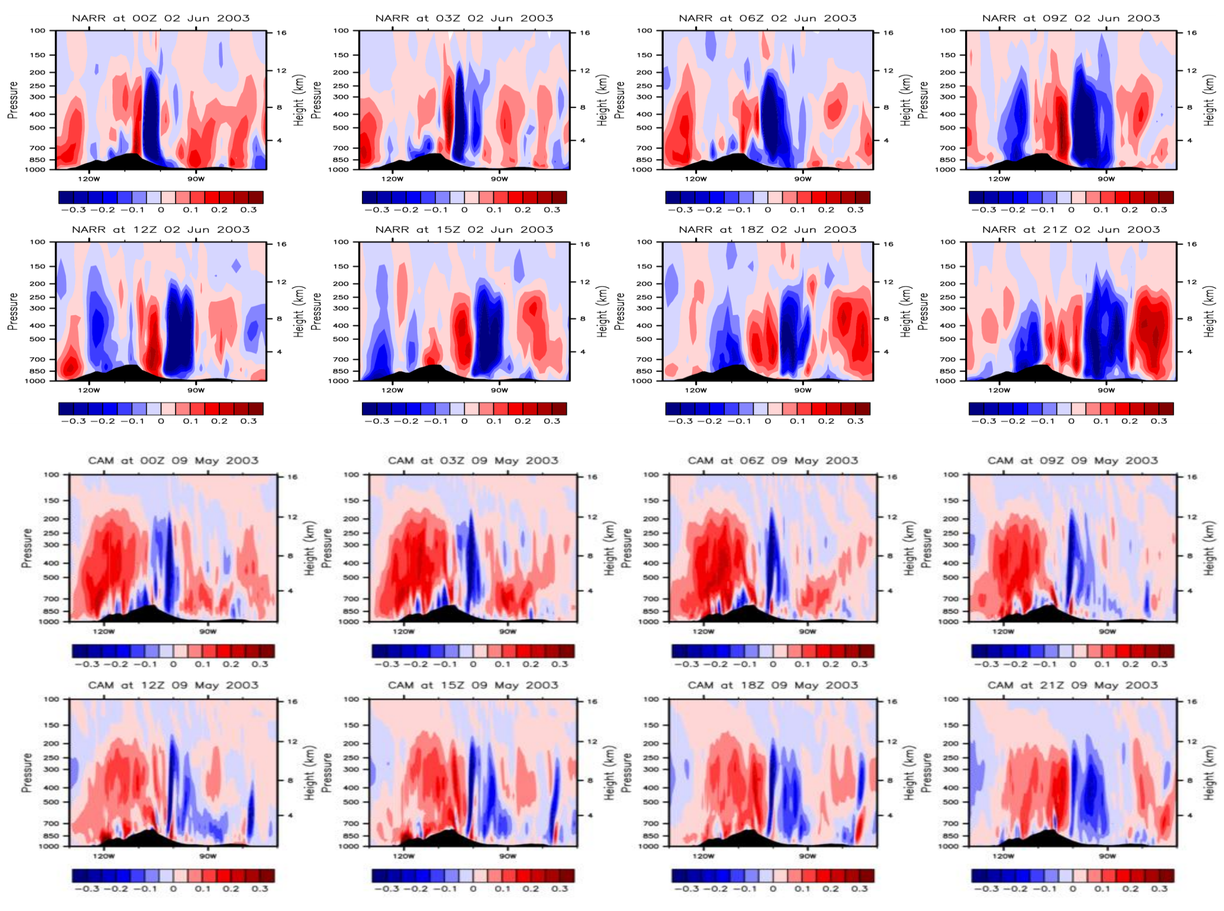

Fig 3: 3-hourly Omega averaged from 30-40 degrees North for NARR (top 8 panels) and for CAM (lower 8 panels). Rising motion in the lee of the Rockies occurs during 0-6Z, progressing eastward through the day, and ending with sinking motion over the Rockies by 18-21Z.

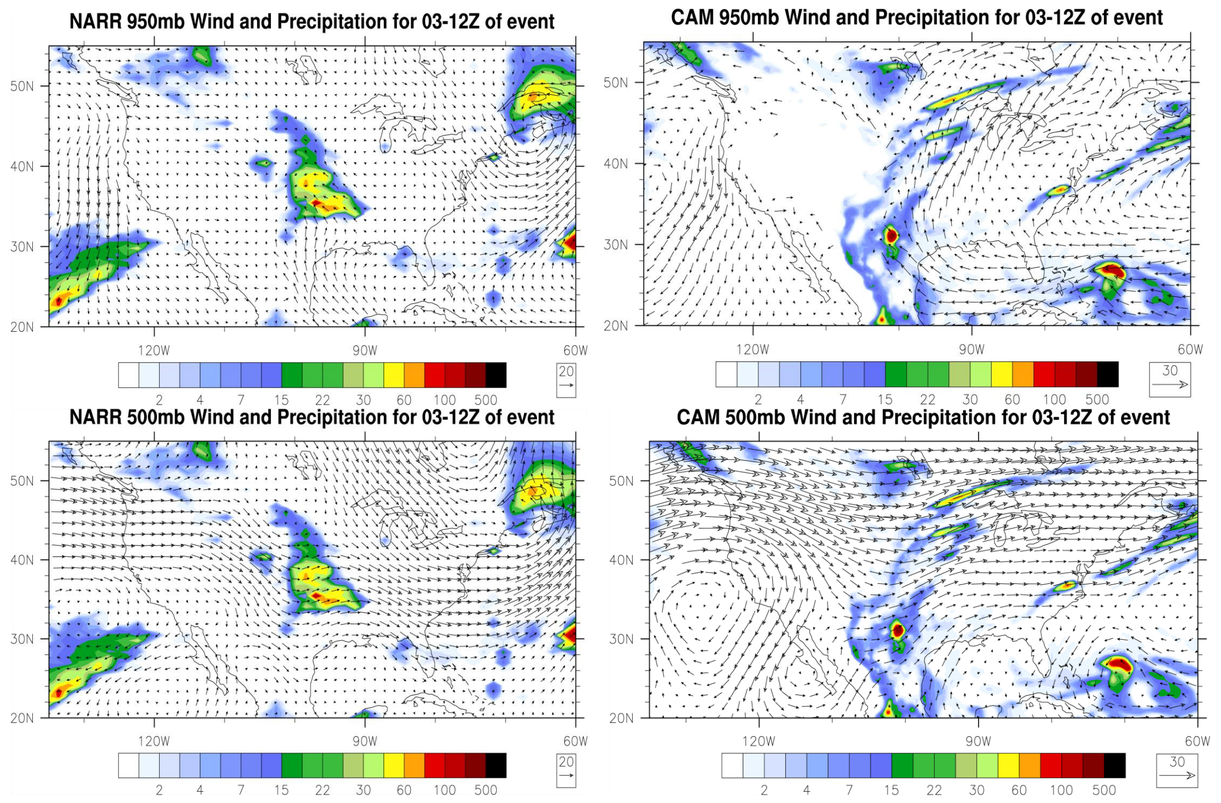

Fig 4: Precipitation for 3-12Z for NARR (left panels) and CAM (right panels) overlayed with low-level winds (top) and mid-level winds (bottom). The nighttime precipitation maximum occurs at the northern terminus of the low-level jet, and is associated with strong mid-level Westerlies implying westerly shear in the vertical.

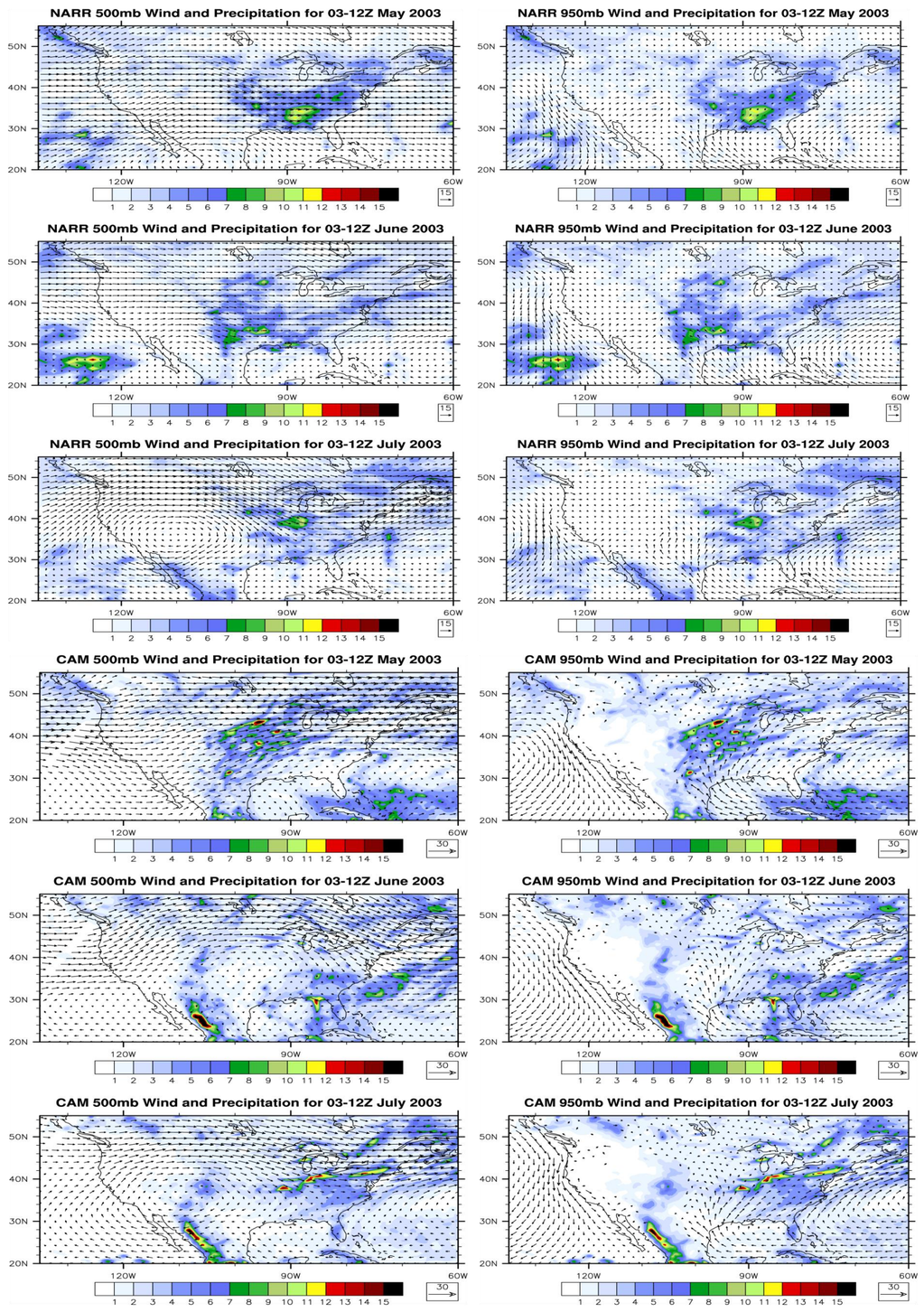

Fig 5: Monthly mean precipitation averaged for 3-12Z for May, June, and July, with low and mid-level winds overlayed for NARR and CAM. Looking briefly at the absence of eastward propagating events into the summer months in CAM, we note that the northern terminus of the low-level jet does not fall in the lee of the Rockies, and the mid-level Westerleis are weak in the area of the jet terminus suggesting an absence of westerly shear in CAM.

References:

Tripoli G. and W. Cotton, 1989: Numerical Study of an Observed Orogenic Mesoscale Convective System, Part 2: Analysis of Governing Dynamics*, Mon. Wea. Rev.*, **117**, 305-328.

Tuttle J. and C. Davis, 2006: Corridors of Warm Season Precipitation in the Central United States, *Mon. Wea. Rev*., **134**, 2297-2317.