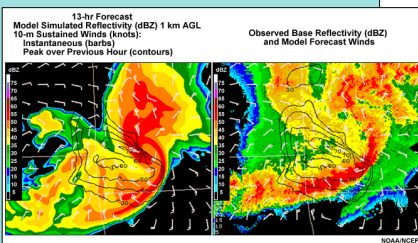
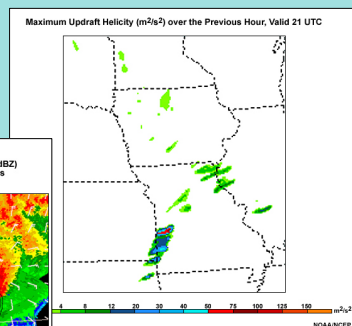


## Effective Use of High-resolution Models

<http://meted.ucar.edu/nwp/hires>

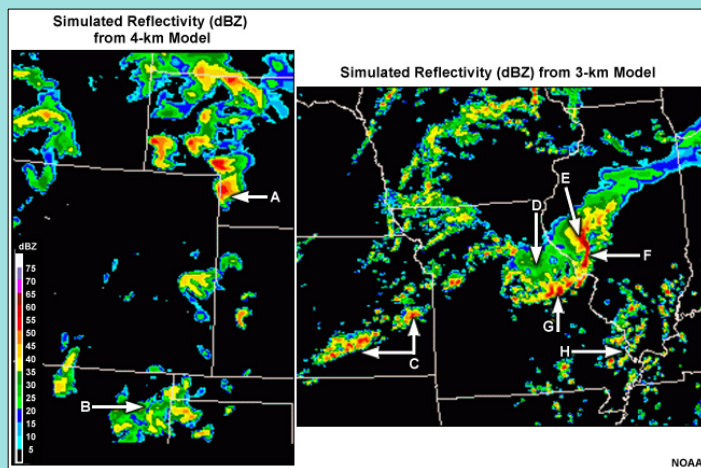
### Motivation for forecaster training

- High priority: NWS training needs assessment survey
- Real-time availability
  - NCEP high-resolution window runs (4-km WRF-NMM, 5-km WRF-ARW)
  - High-resolution Rapid Refresh (HRRR, 3 km, new run every hour – ensemble!)
  - Hazardous Weather Testbed (many model runs at 1, 2, 3, and 4 km)
  - NWS forecast offices, private sector, and universities running models
- Storm-scale diagnostics
- A few remarkable successes conveying details about high-impact events



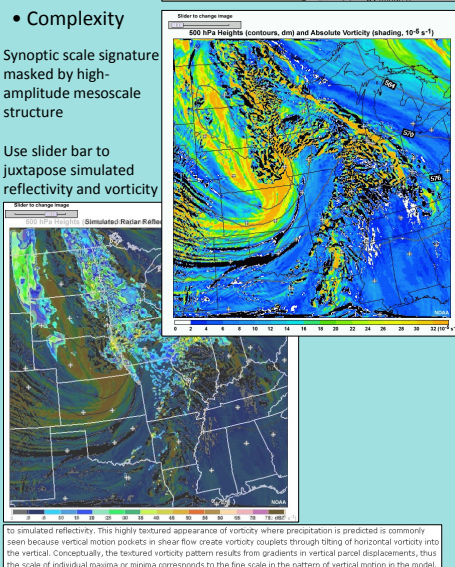
### Interactive learning

- Can you identify the features marked on these maps of simulated reflectivity forecasts?

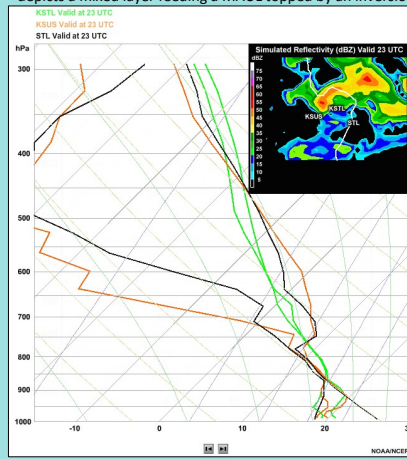


### Interpretation

- Is it real?
- Predictability
- Interpreting as event over some area instead of point forecast
- Complexity



Forecast soundings around predicted convection in a 4-km model show sharp detail including cool low levels and dry aloft behind storm, saturated to tropopause in storm. Ahead of the storm, the model signals ascending shallow cumulus as it depicts a mixed layer feeding a MAUL topped by an inversion.



### Training covers model limitations

- Reminds forecasters that scales near the grid spacing are not resolved, yielding poor forecasts
    - convective details, evolution
    - flow over complex terrain
  - Case study highlights central role of initial/boundary conditions supplied by coarser-resolution model. Forecasters are urged to independently evaluate the large-scale flow, frontal positions, etc. being downscaled by the high-resolution model
- Other limitations covered are
- sensitivity to physics and dynamics
  - spin-up time after cold start
  - short memory of small-scale information from hot start

### Future training

- COMET NWP Training Series *Effective Use of NWP in the Forecast Process*  
[http://meted.ucar.edu/dl\\_courses/nwp](http://meted.ucar.edu/dl_courses/nwp) will include a course on special topics such as complex terrain, coastal environment, and convection. These will highlight applications of high-resolution models. Available by end of 2012
- COMET Operational Models Matrix  
<http://meted.ucar.edu/nwp/pcu2> will add information about HRRR (not available before late 2011)

### Downscaling module

- Downscaling of NWP Data  
<http://meted.ucar.edu/nwp/downscaling> compares dynamical downscaling (high-resolution models) to physical and statistical downscaling