NMM-WRF NESTING

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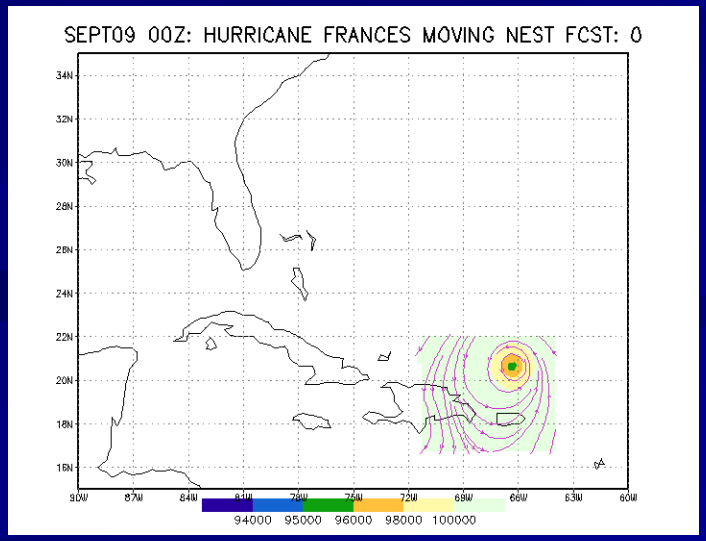
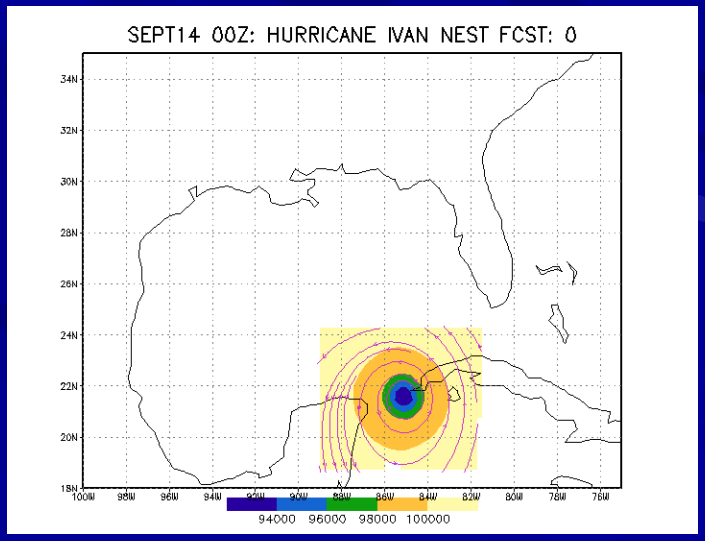
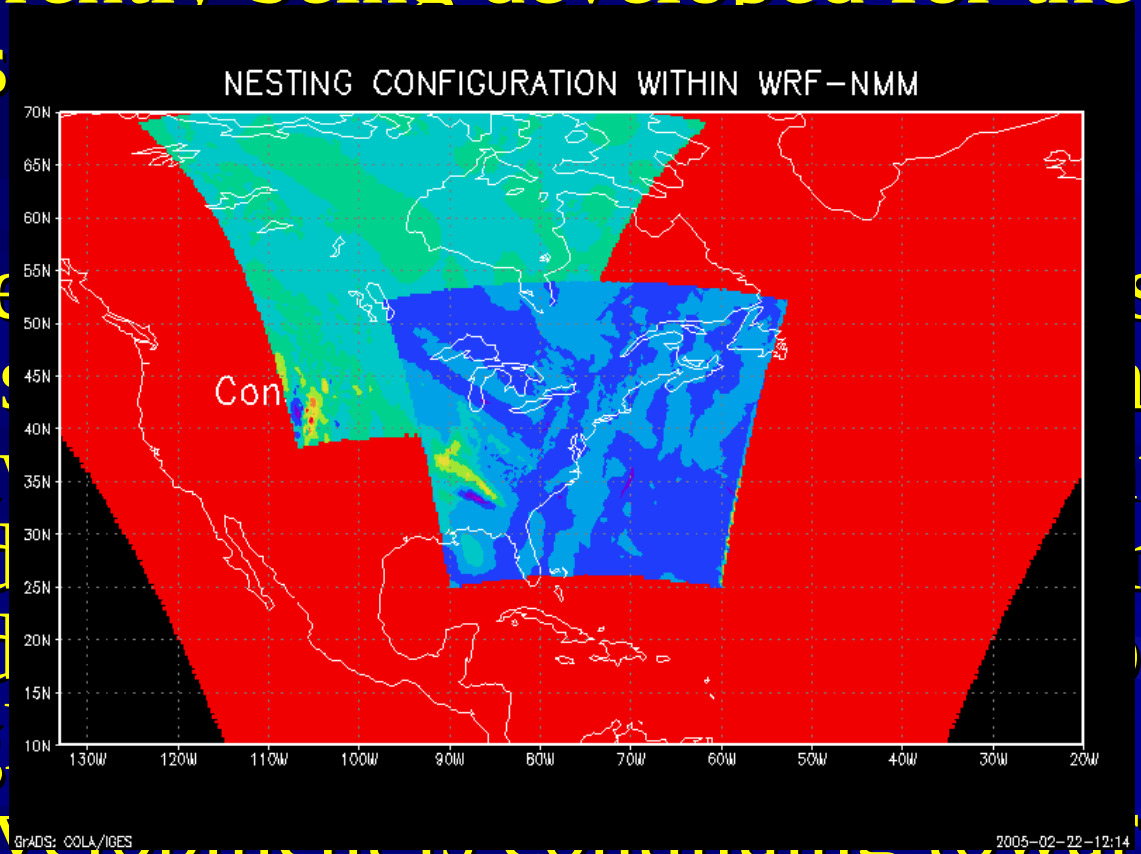




Status of NMM-WRF NESTING

- A horizontal mesh refinement capability is currently being developed for the E-grid bas

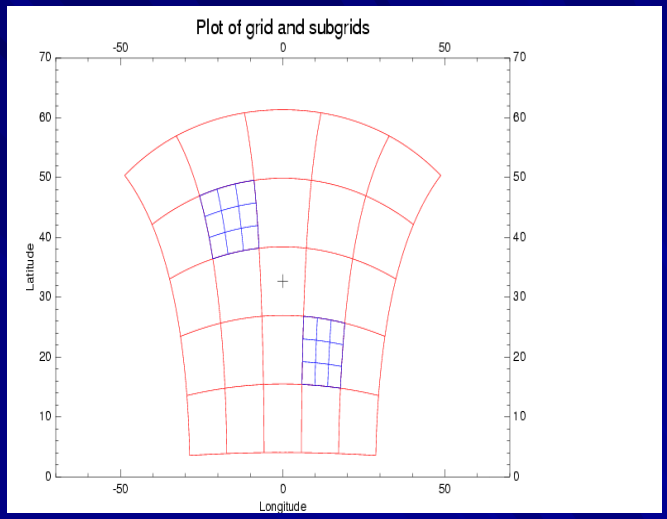


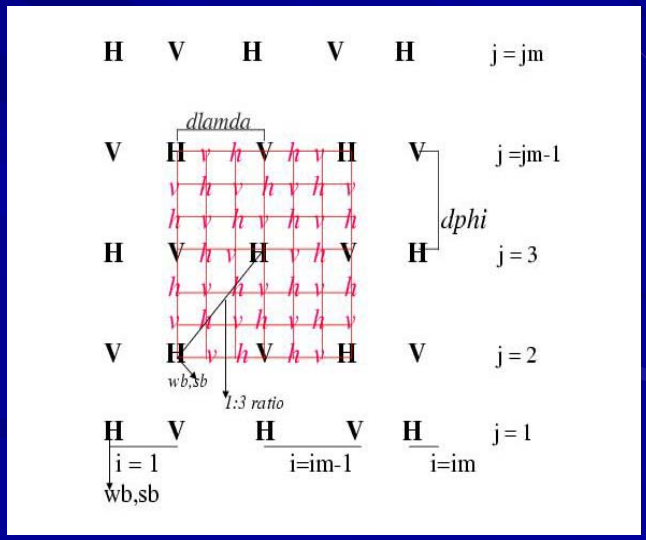
- The scopic mes teraction bet t domain and n nests and n of the hig

Development is continuing towards allowing two-way interactions.

Salient Features: Telescopic Grid

- All interpolations are done on a rotated lat-lon, E-grid with the reference lat-lon located at the centre of the parent domain.
- Consequently the nested domain can be freely moved anywhere within the grid points of the parent domain, yet the nested domain lat-lon lines will coincide with the lat-lon lines of the parent domain at integral parent-to-nest ratio.
- This coincidence of grid points between the parent and nested domain eliminates the need for more complex, generalized remapping calculations in the WRF Advanced Software Framework and is expected to aid better distributed memory performance, and portability of the modeling system.



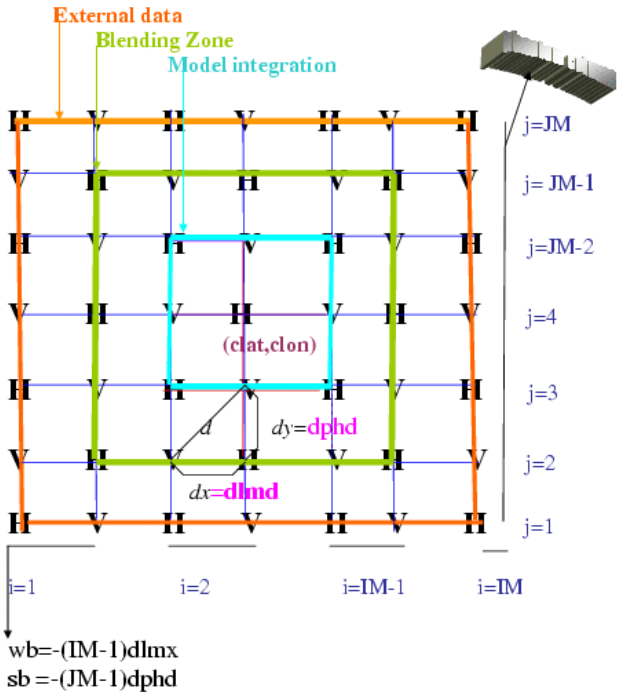


Salient features: Initial Conditions

- Simple bi-linear interpolation is used for initializing all the meteorological fields along the horizontal.
- Nearest neighbor approach is adopted for prescribing most of the land state variables.
- High-resolution topography and land-sea mask are redefined over the nested domain using the wrfsi dataset.
- To be consistent with the NMM model numerics, quasi-hydrostatic mass balancing is carried out after introducing the high resolution topography. Cubic spline interpolation is used to interpolate data back and forth from standard pressure surfaces on to the hybrid surfaces.

Salient features: Nested Boundary Conditions

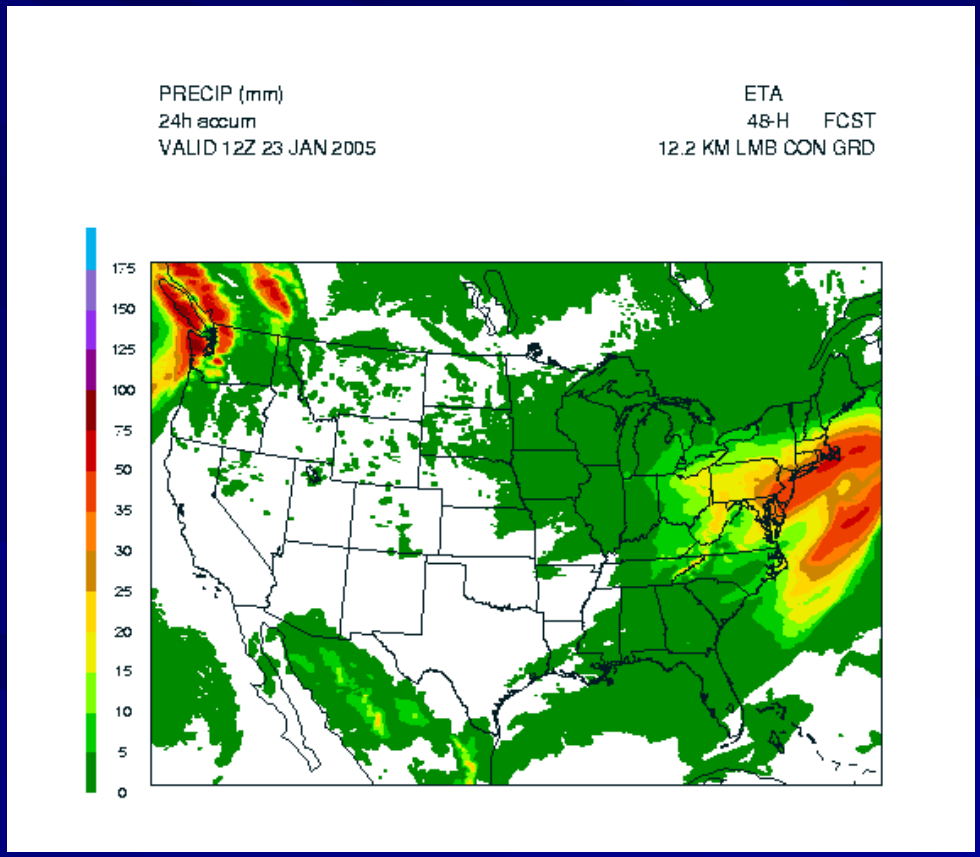
- Because c…and the fact that the input i…xternal boundary conditions…ll separated from dyna…he model integration…laries are updated a…e parent domain exactly th…rent domain is updated fr…source. This approach … produces an effective v…erface without much dist…



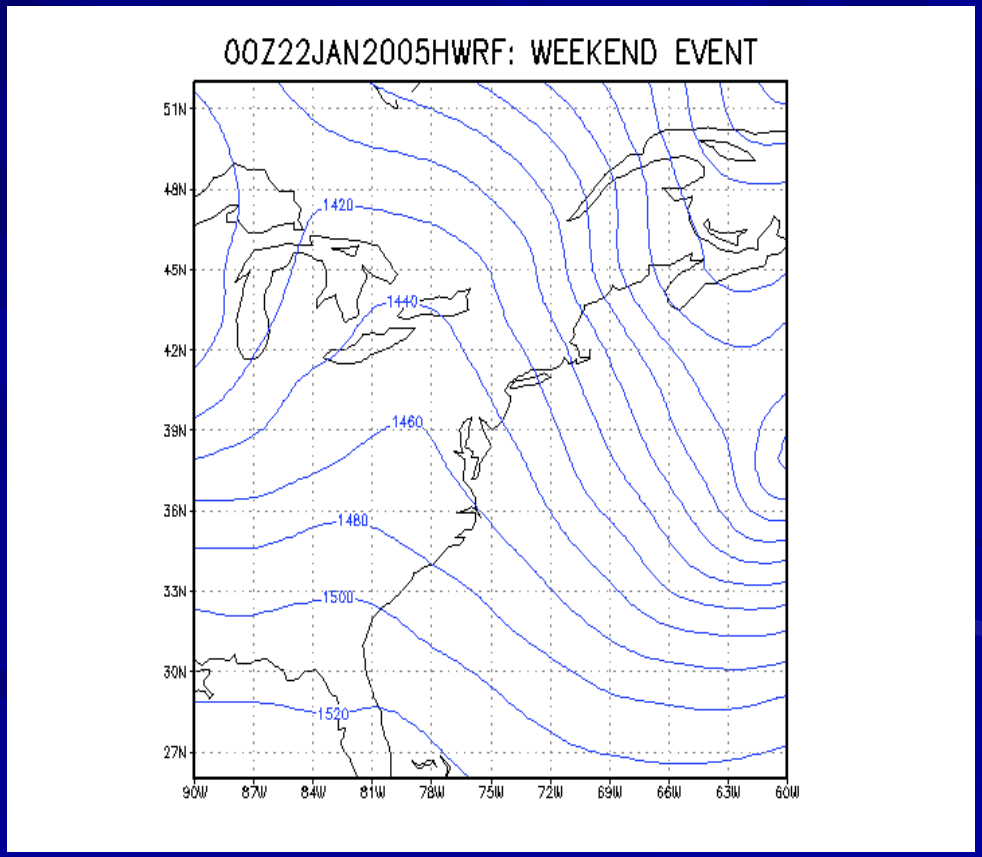
* Given wb,sb, clat and clon, the above rotated lat-lon grid system can be transformed to a lat-lon grid system.

Case of DC snow storm

Parent domain
(BMJ+MYJ physics)



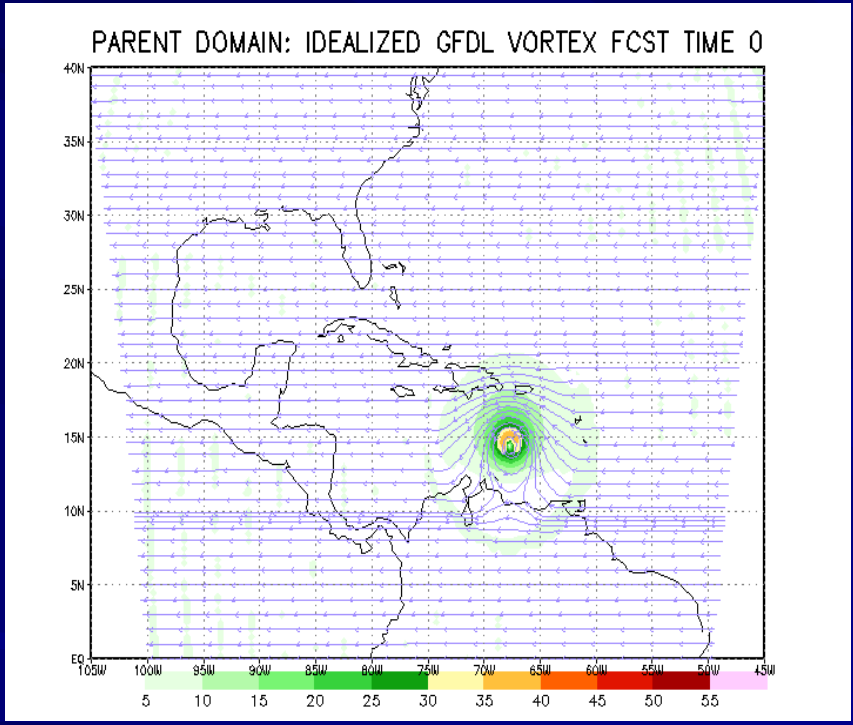
Nested domain
(BMJ+MYJ physics)

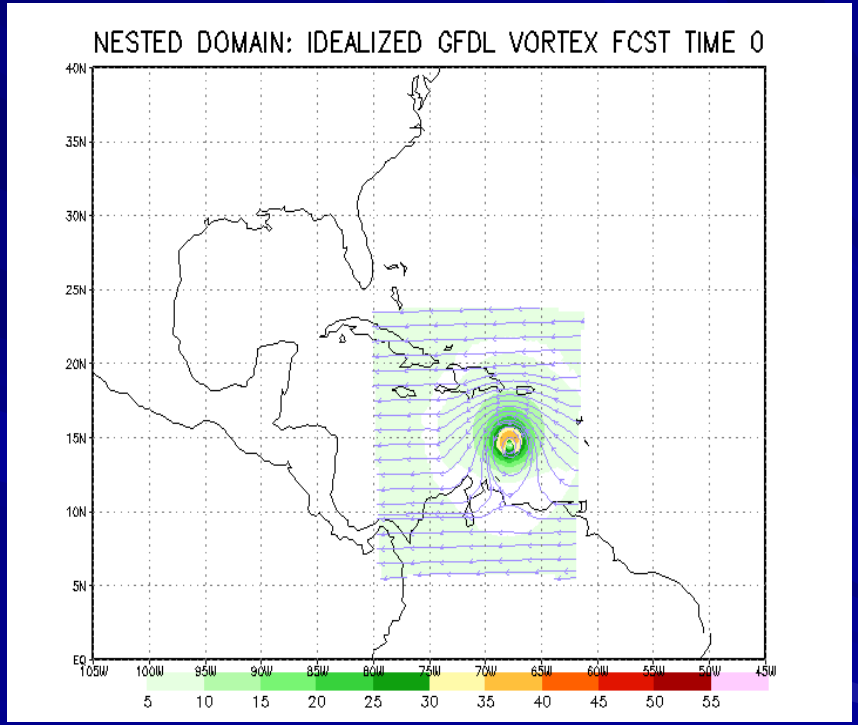


GFDL IDEAL* VORTEX INITIALIZATION

Parent domain of the size of about
60^o x 60^o at 36 km resolution
(BMJ+MYJ physics)

Nested domain of the size of about
20^o x 20^o at 12 km resolution
(BMJ+MYJ physics)





* The initial condition for this idealized case did not include topography and land, however, as in the case of static, one-way nest the code is general enough to take care of topography.

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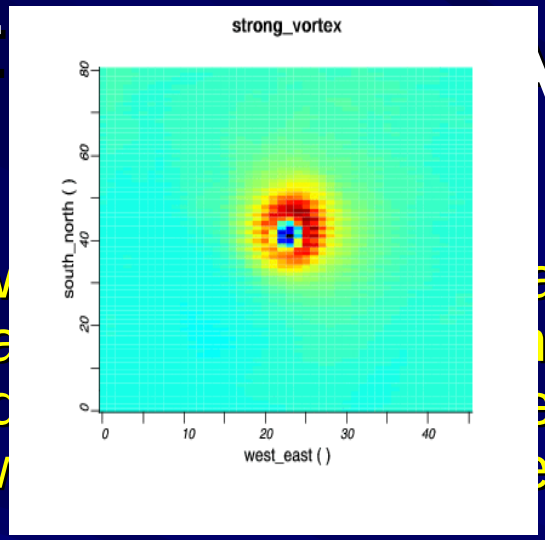
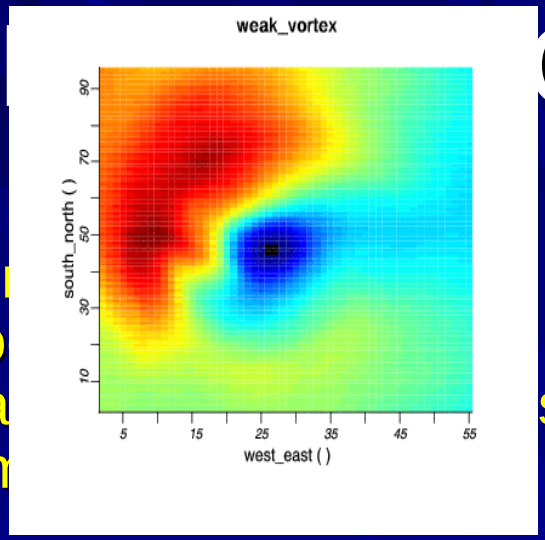
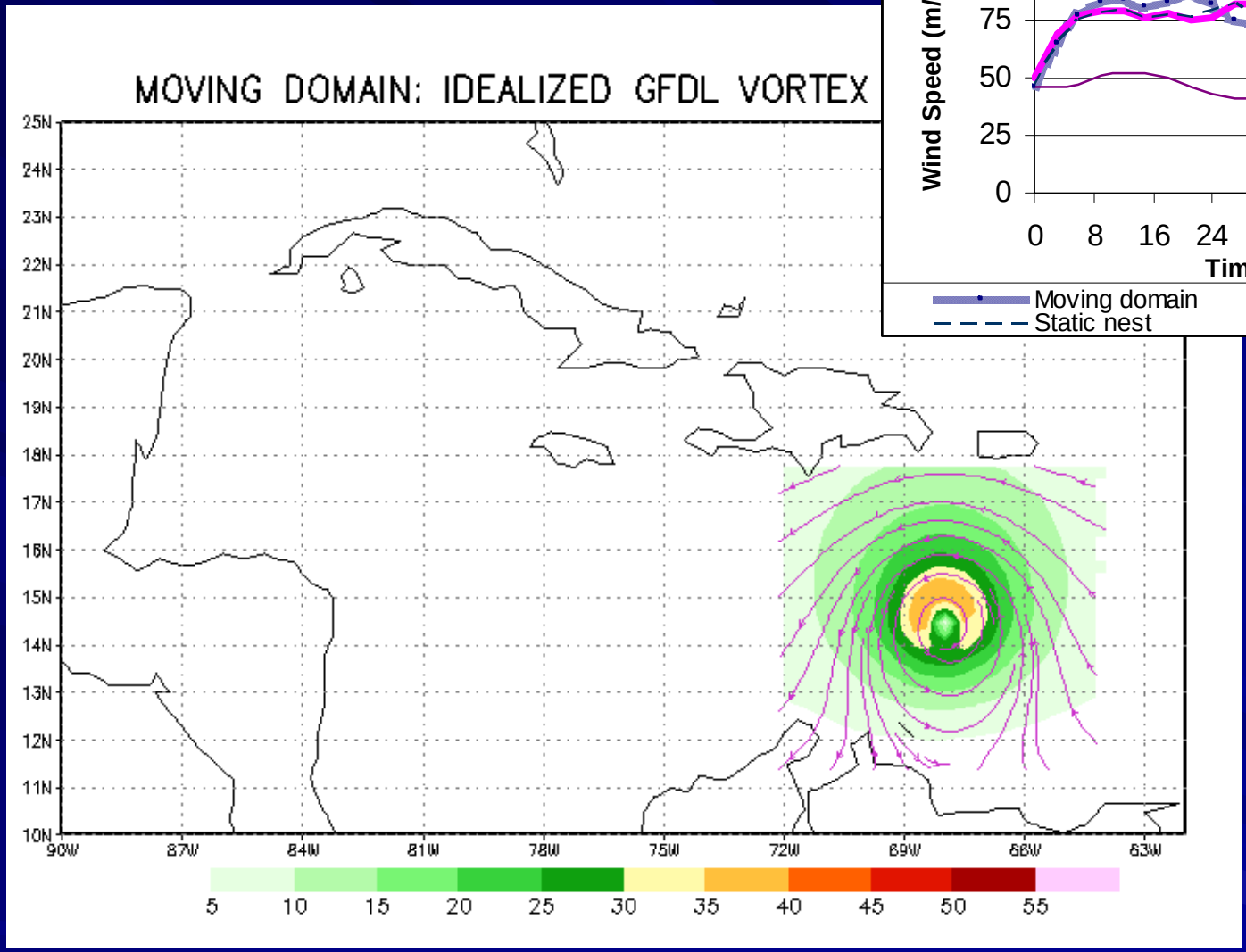
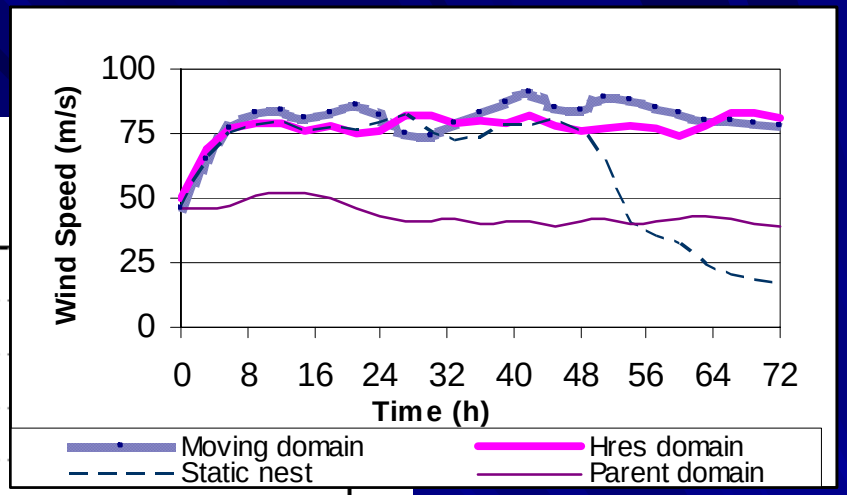




- V anged between the and a ear interpolation co c e-way static nest wa s time v eading edge of the m
- The nest was "set to sail" on the parent domain using a simple criterion based on variations in dynamic pressure. The so called “stagnation point” was chosen to be the center of the storm (Gopalakrishnan et al 2002, MWR.)
- 50 processors were used. It took about 25 minutes for 3 days of forecast (time step ratio of 60s:20s.)

Moving domain of size of about $7^0 x 7^0$ at about 12



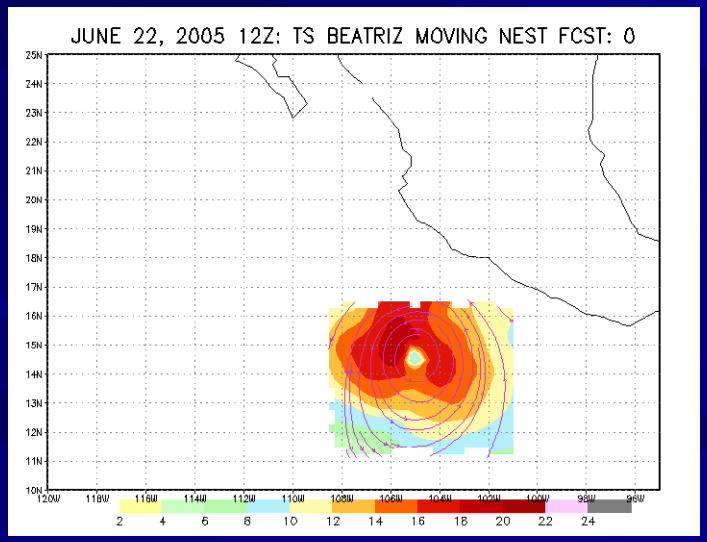


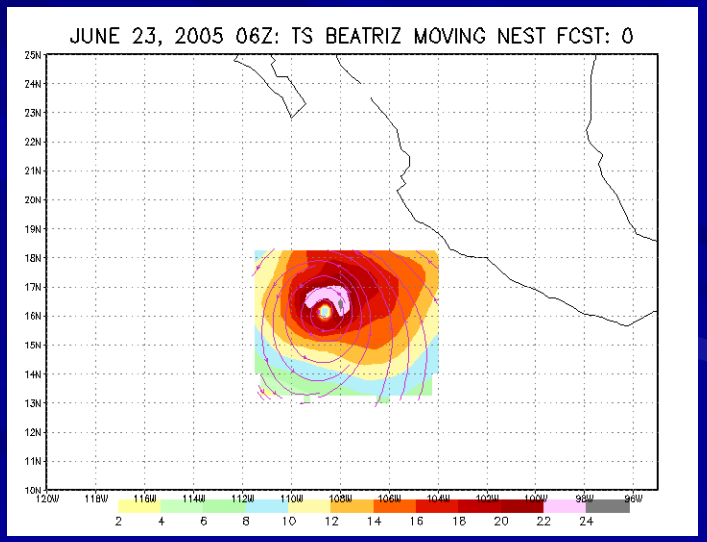
Despite the miniature size of the nested domain, as long as the vortex is located in the center of the nest, we see the effect of lateral boundary diffusion to be limited and we are indeed able to hold on to the intensities!

Future Work

- Rigorous real-time testing for hurricanes.
- Two way interactions.

WORK IN PROGRESS





NMM-WRF TUTORIALS

VENUE : DTC

DATE : SEPT 27-29, 2005