The ISST response (11/25/2003) to Eastern Region SSD's comments on the ISST's Eta extension proposal (received by the ISST on 11/14/2003)

Thanks very much for giving our downscaling proposal careful thought and for taking time to express several concerns. These are both exciting and challenging times in the National Weather Service -- the more we work together the better off we will be.

Below we address the specific concerns raised in your note:

1. Concern: Running the Eta within the GFS amounts to giving the forecasters another model.

The degree and extent to which the internal Eta solution will drift from the GFS solution has been an important topic of discussion on our team. Here is at least a bit of background and a discussion on where we stand.

First, looking at synoptic-scale drift. The domain will be relatively small, essentially bordering CONUS, and lateral boundaries will be updated every 3 hours. Similarly tight domains will be run for OCONUS sites. This will limit the internal degrees of freedom and is expected to satisfactorily capture the GFS synoptic evolution. Although this has not been tested with the proposed configuration, both Geoff DiMego and Eric Rogers feel comfortable that the Eta extension will, in fact, reflect the GFS as far as the basic synoptic features are concerned. They have run a similar configuration, albeit at a coarser resolution for climate modeling, with reasonable results. We are currently discussing with EMC ways to explore this issue with at least a few experimental runs. Although far from exhaustive, this should allow us to get a sense on how much internal drift is likely to occur. If, in fact, the solution drifts substantially we will be working with EMC to enable an internal nudging process to ensure the solutions track more closely. Internal nudging has proven very effective within the MM5 configuration and there is no reason to expect differently with the GFS/Eta hybrid.

Second, looking at the mesoscale differences. The desired outcome (and reason for the extension) is for differences to occur on the mesoscale as the desired Eta solution essentially downscales the synoptic-scale forecast of the GFS. EMC generally feels the Eta is a superior model in resolving boundary layer structure and precipitation processes on the mesoscale. This is especially true when considering interactions with terrain on the scale of the NDFD, which will be captured with the 12-km Eta and not by the much coarser GFS. We would not argue that this is the ideal method, rather it has been conceived and designed as a stop-gap process until a more evolved processed can be developed. Nonetheless, when given the current practices of adjusting the medium-range coarse objective forecasts to fine-scale NDFD terrain, this method appears far superior to the current ad hoc approaches.

The Eta extension will provide a balanced, objective solution to the medium range forecast period that can be easily ingested into GFE. It will contain a physically consistent and downscaled solution that nearly matches the NDFD. To complete the

process of downscaling, a set of standard SmartInit scripts will be distributed that will be designed to take optimal advantage of the distributed grids. The result will be a common starting point for all offices that will be free of boundary discrepancies. Obviously there will be times when the GFS evolution is not favored and the forecasters will need to resort to other methods...but they will be no worse off then they are today for these cases. Thus, the ISST sees this project as a positive step in the IFPS era.

2. Concern: Forecasters need to see more than just the downscaled grids within GFE.

The grids that will be distributed have not been finalized, but grids sufficient to evaluate the synoptic evolution will be included. At a minimum these will include 500 mb, MSLP, and precipitation. These grids will be viewable in a normal way within D2D. Our assessment suggests we have sufficient bandwidth to accomplish transmitting this blend of grids. Hopefully this addresses your concern about forecasters not being able to view anything except the downscaled grids within the GFE environment.

3. Concern: Providing too much detail at the medium ranges.

We couldn't agree more that the time frame for our forecasters to be adding high-resolution detail is in the shorter ranges. Nonetheless, with the current framework of GFE and NDFD such detail is required at all time ranges (at least in areas of varying terrain) and must be obtained from some process. Perhaps this need is more dramatic in the West, but we have heard requirements across the country for the high resolution presentation. We don't want to get too far off topic, but your suggestion that detail only be added as the forecast valid time approaches is very reasonable and certainly applies to weather features free of surface influences. For good or bad, the current framework of NDFD is essentially a blend of basic weather forecasts with very detailed climate signals (e.g., cold valleys, small-scale rain shadows, and diurnally-controlled phenomena like marine stratus and sea breezes). Your point is true for the component of the NDFD forecast coming from the non-forced weather features but not for the climate signal. The NDFD framework requires the climate signal detail throughout the forecast period. It is this element that is being targeted by the Eta extension.

4. Concern: It will be a significant task to implement.

To ingest the Eta extension grids will be no different than adding a locally run mesoscale model, which many offices are currently doing. It does not require any special configuration of AWIPS. The required CDL files will be distributed along with the SmartInit scripts. Essentially, the local office setup should be nearly trivial. As far as the Regions' setup to distribute the grids, we realize that not all offices are set up similarly with LDM and that it may take more effort. The Western Region SSD has generously offered to help those who might not be prepared to ingest the new grid set.

5. Concern: Improve GFS grids and use those as an alternate.

This would certainly provide some relief and is also being pursued. The additional vertical levels would be most beneficial to lapse-rate adjustments in the SmartInit process. However, for wind (one of several particularly difficult fields to downscale) they would not be particularly helpful. Wind downscaling, to be done effectively, needs the benefit of a full physics model and the correctly resolved terrain. This is what will be accomplished with the Eta extension.

6. Concern: Forecaster resources and attention will be diverted away from the shorter ranges.

By providing a much more realistic objective starting point at the medium ranges that can be loaded without any CWA boundary discrepancies, forecasters will, in fact, be freed of spending non-productive time "fixing" grids in the medium range. This will then allow them to focus more on the short range...something we see as a very important benefit of implementing the Eta extension.

7. Concern: Pursue the use of ensemble MOS and other probabilistic model guidance.

We fully agree. The team has developed a few preliminary ideas on how to do this and plans to push development in this area. Nonetheless, this will be a rather slow process given the "deterministic" character of the IFPS/GFE configuration.

We hope these comments help satisfy your concerns. If you have any comments or further questions, we welcome further dialogue. We are scheduling an ISST Forum with Region focal points for next month to continue this conversation.

Most respectfully,

The ISST.