**Question #1: Within the limits of predictability, what is the optimal spatial and temporal resolution needed to provide a useful and versatile digital service while maintaining scientific validity?**

GENERAL COMMENTS: Although differences existed in the responses, there were also many commonalities. Discussion seemed to focus on two common themes: (1) public grid consumption and (2) grid verification (i.e., remaining scientifically valid, but, yet performing the job) in relation to the above stated question. In addition, it was pointed out that we must not be too quick to conclude, generalize, and/or project the future of digital services.

WR advocated NDFD should provide nearly seamless grids at several spatial and temporal resolutions to meet a diversity of user needs. This voice was echoed by both SR and CR. For example, CR stated, "Give customers what they want. If we do not, someone else will."

ER stated, "NWS forecasting culture must evolve from product centric (deterministic) to a probabilistic system that provides decision support data." Along that note, ER and SR encouraged an acceleration of the existing ensemble data into AWIPS; and to develop EPS post-processing methods enabling the delivery to forecasters via AWIPS of highly detailed grids of sensible weather elements of which the resolution should match the NDFD. Similarly, SR stated that output grids should never be of higher resolution than the input grids. ER also advocated the continued investment into local high-resolution EPS projects and the development of procedures to move successful systems to national operational production at NCEP. In further support of probabilistic forecast expression, SR also explicitly stated that an ensemble approach should be employed beyond 72 h and that producing more grids than can reasonably be quality controlled is not the best approach in any system.

The level of effort brought by the ER team was exemplary. It should be noted that their report provides a creative and scientifically valid approach to expressions of uncertainty in the digital forecast process era.

TEMPORAL RESOLUTION: Of those NWS Regions that provided 'specific' answers, the following conclusions were drawn:

| | |
|---|---|
| 0-6 hours | minute → hourly |
| 0-24 hours | hourly |
| 25-72 hours | three hourly |
| 73-184 hours | six or 12 hourly |

Some regions proposed that somewhere between Days 3 and 4, the forecast should be expressed probabilistically – in contrast to the currently employed deterministic expressions. WR and SR both advocated decreasing temporal resolution as forecast lead time increased only on the LDFD scale. Also noted as potentially useful (particularly in days 1 to 3) was the use of probabilistic expressions of exceeding critical thresholds for specific weather elements (e.g., risk of exceeding 33 kt over marine waters).

SPATIAL RESOLUTION: Some Regions felt that there was either no limit, or that resolutions <5 km could be used in a separate 'native WFO grid' (i.e., different from NDFD; perhaps a formalized LDFD) to resolve terrain and\or mesoscale processes vital to expressing any deterministic portion of the forecast – most logically in the very shortest timescales. Other NWS Regions felt that 5 km was optimum given both current tools and the state of the applied science. SR stated that within the LDFD, offices could decide for themselves a scientifically valid spatial horizontal resolution given the need to represent terrain and\or mesoscale features within each county warning area and discontinue the one size fits all method.

It is important to note that both SR and WR recognized there could be a place for two separate grid resolution structures; an LDFD and the NDFD. SR felt the LDFD could be used for verification purposes while WR advocated verification across all scales. Specifically, WR advocated that the LDFD (1-2.5 km) should float while the NDFD (5 km) should not float. SR stated that depending upon the forecast element, the resolution could change.

AR and WR stated that by no means should spatial resolution decrease with increasing forecast lead time due to the need to represent complex geoclimatic signatures imposed by coastlines and terrain. ER and SR advised that spatial scales should decrease with increasing forecast error (i.e., SR suggested the establishment of some sort of regional error baseline, and the ER focused on the deterioration (or not) of the flow regime stability).

MISCELLANEOUS: WR and ER added that either ISST (or an ISST-like team) be tasked with discovering and understanding NDFD enhancements that would robustly support risk-based management systems. Specifically, ER advised that producing a CONOPS that would detail a 'shared vision' between all elements of the NWS (e.g., NWSHQ, NCEP, WFOs) would be a good approach.