Hazardous Weather Testbed – Mid-term Evaluation

1.) **Project Title:** 2010 Spring Experiment

2.) **Organization:** NOAA's Hazardous Weather Testbed (HWT)

3.) **Evaluator(s):** Storm Prediction Center (SPC), National Severe Storms Laboratory (NSSL), Hydrometeorological Prediction Center (HPC), Aviation Weather Center (AWC), National Weather Service (NWS)

4.) **Duration of Evaluation:** 17 May 2010– 18 June 2010

5.) **Products Evaluated:**

a. Satellite-based Convection Analysis and Tracking (SATCAST) – University of Alabama in Huntsville (UAH)

SATCAST is a proxy for the AWG version of the GOES-R convective initiation algorithm. Wayne Mackenzie and John Walker, from the University of Alabama in Huntsville were funded by the GOES-R Risk Reduction Visiting Scientist Program to come demonstrate the product. Both visited during the first two weeks of the Spring Experiment. The product was evaluated separately from the two forecast programs since it is very experimental and not ready to be shown to forecasters to avoid pre-mature opinions of the product being made.

The product has so far performed above expectations made by myself in addition to the product developers and the various researchers who have taken the time to look at it, especially considering that this is the very first demonstration of the product. We are consistently seeing lead times of 15-45 minutes and beyond based on the first occurrence of base radar reflectivity reaching 35 dBZ. The product does become more diagnostic in cases of extremely high CAPE, uncapped environments, such as in the Southeastern US. These results are similar to what we saw with UWCI during last year's experiment. The product has been flowing since the beginning of the experiment directly to SPC via NASA SPoRT's LDM feed. Data latency is a slight issue, with the product arriving about 12-13 minutes past image stamp time, but this appears to be a computer resource.

b. University of Wisconsin Convective Initiation (UWCI) – University of Wisconsin Cooperative Institute of Meteorological Satellite Studies (UW-CIMSS)

The UWCI, and associated cloud-top cooling rate, product has been flowing to the SPC since last spring when it was evaluated similarly to the SATCAST product in last year's Spring Experiment. The product is currently flowing into SPC operations and the HWT, via the EFP (in N-AWIPS format) and EWP (in AWIPS format). Main evaluations have been occurring in the EWP, however, there have been some instances where the EFP has used the product within their afternoon forecast updates. The AWC group has also used it on their satellite imagery to depict areas of growth on a larger scale. The EWP participants have been evaluating the product during real-time and archive case events and have been providing feedback mostly via written survey, comparing the product to radar signatures and the first occurrence of CG lightning strikes.

Feedback from the forecasters has varied so far, based mostly on the case in which it has been evaluated. Overall, forecasters definitely see the utility of the product within short-term forecasting and nowcasting applications. Lead-times have varied from 0 to 30 minutes on forecaster subjective assessment of convective initiation, with similar values seen over radar. Lead-times over the first occurrence of CG lightning are longer, sometimes reaching 60 minutes, but there has been a concern raised by the forecasters in using this as a definition of CI having seen some storms reaching in excess of 60 dBZ with no CG. Forecasters have noted that they find the cloud-top cooling rate to be much more valuable as it is much less stringent on showing signals and provides them with a physical value for storm growth. They have also mentioned that the UWCI detections have been missing many, sometimes obvious events and would not mind if there were more false alarms if that meant a better detection probability. The forecasters are aware of the thin cirrus false alarms and that the product will not operate over cirrus contaminated areas, so that has not been an issue.

c. Overshooting-top and Thermal Couplet detection (OTTC) – UW-CIMSS

The OTTC products began flowing to the SPC and HWT at the beginning of this year's Spring Experiment into both N-AWIPS and AWIPS formats. Again, main evaluation took place within the EWP, with feedback being received similar to the UWCI. The thermal couplet portion of the OTTC product only began delivery halfway through the first week and has yet to be evaluated by the forecasters since no detections have been seen at this point.

Overshooting top detections have been shown to be lagging radar signatures and even the actual occurrence of severe weather by tens of minutes. Forecasters have been somewhat disillusioned at this

point to the product's usefulness in severe warning operations. They have noted where they might see the product being useful, such as storms over areas where radar coverage is extremely limited or not yet in the CWA. They also note the potential usefulness of this product in aviation forecast operations or over large bodies of water. The forecasters are well aware that this is not due to the methodology of the product, but rather to the detection efficiency of the current GOES satellites and fully expect the product to improve with better sensor resolution.

d. 8-km total lightning flash extent density pseudo-GLM (PGLM) – NASA Short-term Prediction Research and Transition Center (SPoRT) / NSSL

The PGLM product has been flowing into the EWP AWIPS systems since the middle of the first week of the experiment. There have been some issues with data flow because individual LMA networks have been turned off for maintenance on days where severe weather has occurred within their domains. Because of this, we have only been able to evaluate the product in real-time twice during some very marginal severe weather events over Huntsville, AL and Washington DC. We have been able to run an archived case from 24 May 2008 over Norman, OK for four of the forecasters so far.

Initial feedback has been very positive, with forecasters seeming very excited by the idea of seeing rapidly updating total lightning during severe weather events. They have noted that the PGLM allowed them to identify regions of new convective development in lines of radar reflectivity that were otherwise indistinguishable. They have also noted the use of the PGLM in indentifying areas of more intense convective activity in similar instances. Some issues have been raised regarding the display of the product within AWIPS. During the archive case, and early on in the demonstrations, the product was provided as a smoothed grid, which was found to remove signals of peak lightning activity. The product was modified to look more like 8km grid boxes and forecasters then found that it was hard to follow trends in lightning flash extent density rates without frame by frame sampling of the data, which slowed down their warning process. Recommendations of providing a 'lightning flash rate trend' product have been repeatedly offered up during discussions.

e. Simulated Satellite Imagery - Cooperative Institute for Research in the Atmosphere (CIRA) / UW-CIMSS

The simulated ABI imagery provided from the NSSL-WRF 00Z 4km model run is being provided within the HWT's N-AWIPS systems from

two separate sources, UW-CIMSS and CIRA. Although the forecast times and amount of bands being provided are slightly different between the two sources, there has been some confusion as to which data to be looking at within the EFP by the participants. Typically because the CIRA imagery extends further in time (out to 06Z for two bands), the participants have been displaying that since it matches with the times they are required to issue their forecasts for. The data arrives by 9am CDT (out to 00Z), with an update at around 11am CDT to pull in the remainder of the data. This has provided some roadblocks in the extent of the use of the data within the EFP since their morning forecasts have to be issued before that update and the early morning model data does not extend far enough into their forecast time frames. Typically the simulated satellite imagery is evaluated in the afternoon, but not used to make the forecasts since updated model data from more recent model runs is available at that time.

We have shown the simulated model data as a proof-of-concept of what is possible for new methods of displaying model output during the daily map briefings. There is much excitement regarding the possibilities of making simulated satellite imagery alongside all the traditional and other experimental model fields currently available. There is also much excitement and a strong push for simulating GOES-R products and channel differences using the simulated satellite imagery as a decision aid.

f. Simulated Lightning Threat - UAH

The simulated lightning threat provided by Bill McCaul (UAH) from the NSSL-WRF 4km model run is being provided within the HWT's N-AWIPS systems and is being demonstrated within the EFP. Unlike the simulated satellite imagery, the lightning threat output is being produced for the entire span of NSSL-WRF forecast times. The aviation forecast group in particular has looked at it a few times to make their forecasts over the past two weeks. So far feedback has been positive, but due to the myriad of model information the EFP participants are tasked with evaluating, detailed feedback is not available at this time. It will be exciting to see what feedback can be gathered while Bill McCaul arrives at the Spring Experiment this next week.

g. 0-3 Hour Severe Hail Probability – CIRA

The severe hail probability product from Dan Lindsey (CIRA) is being provided within the SPC and HWT's N-AWIPS systems. The product has been delivered to the SPC and HWT since last year's Spring

Experiment, and since has been expanded from a 1-hour to a 3-hour forecast based on feedback from those experiments. The product has been informally evaluated during side discussions to this point. The product seems to do well in forecasting the occurrence of severe hail 1-2 hours in the future. However, the product does seem to have similar probabilities for storms that do not produce hail to those that do, which provides some uncertainty in the forecasts. The product will be evaluated in more detail when Dan Lindsey arrives during the last week of the experiment.

h. Nearcast – UW-CIMSS

The Nearcast product was not provided to the HWT by the start of the Spring Experiment and has not been evaluated.

6.) **Conclusion**

Overall the first two weeks of this year's Spring Experiment is going smoothly, despite the few IT difficulties we have had getting the products routinely made available within operational systems. There had been some concern regarding product delivery timeliness. Most of the products did not become available for testing within the systems until the final two weeks before the experiment despite the operations plan's required deadline of April 1. This limits our ability to fully test and develop displays for the products prior to real-time evaluations, which causes regular dataflow issues and crashing that severely hinders demonstration efforts within the experiments.

The new format for the Proving Ground's involvement in the Spring Experiment has been very fruitful, providing much more detailed feedback than the previous year. Including the Proving Ground products within the EWP specifically has been very successful and forecasters are very open to evaluating the products and providing detailed feedback. The feedback forms, currently provided in paper following every IOP, have been a little too long. The forms were shortened slightly, but it should be investigated into using computer-based surveys for future experiments. Finally, the forecasters in the EWP appreciate the ability to overlay the products on radar and satellite imagery in AWIPS, but in their current format it dims the image below significantly which makes cloud and radar features very hard to see. Changing the data format for the AWIPS systems in future experiments should also be investigated.