1. This training module describes the NOAA/CIMSS Prob Severe statistical model, provides examples of the model output in AWIPS-II, and briefly discusses model validation and model limitations. This training is on Prob Severe All Hazards, which grew out of forecaster requests for a separate product for each type of Severe Weather – Strong Winds, Large Hail and Tornadoes.

2. ProbSevere is a pre-polygon product designed to augment forecaster confidence in pulling the trigger on a warning. It gives the probability that a particular radar object will produce severe weather in the next 60 minutes. You can use it for initial issuance, or for extending issuance. In all cases, ProbSevere should be used as an additional guidance, combined with forecaster experience and traditional analysis techniques when determining if one should issue a warning or not.

3. ProbSevere v2 – or ProbSevere All Hazards – has a product for each of the hazards. That is, there is ProbWind, ProbHail and ProbTor. The computed probabilities for each are a function of different observed and modeled parameters, as outlined on this slide. (The second slide graphically shows the predictors). There are differences: for example, ProbTor includes no satellite-derived growth rates because those predictors did not add sufficient value to the ProbTor probabilities relative to other products such MLCAPE or low-level azimuthal shear.

4. The satellite imagery is used in two ways; to track clouds across space and time—in the same way a human views satellite imagery loops and to quantify the cloud growth rates, which are used as predictors in ProbWind and ProbHail. The radar data are used in a similar manner as the satellite data. The radar data are used to track storm cells in reflectivity imagery—again like how a meteorologist looks at a loop of radar imagery. And to quantify the intensity of the precipitation core of a developing thunderstorm, which is used as a predictor in the model. The total lightning data are used to quantify the number of lightning flashes per minute within a radar tracked storm cell. It's possible that Satellite objects will be tracked before radar objects can be identified. At some point, the developing radar objects inherit the existing satellite object values.

5. The benefit of ProbSevere is that it distills information (gigabytes) from disparate sources and condenses it into a statistically relevant estimate that is much smaller and more easily moveable.

6. ProbSevere displays in AWIPS include all the different parameters that are considered when computing the probability, and that varies from ProbWind to ProbHail to ProbTor. The contour is around the radar object. Note that the AWIPS display can show two contours – one showing the largest value of ProbWind/Hail/Tor, and one of (typically) ProbTor so that more than one probability can be tracked at once. GLM data within the radar object are tracked, and reported in the read-outs, but GLM data are not used in the computation of probabilities. That continues to rely on Earth Networks Total Lightning.

7. This is a ProbHail example from 2018. It shows how ProbHail values increase as Predictor values change. In this case, ProbHail increased as MESH and Lightning Activity increased markedly. Model updates occur every 2 minutes. Cloud observations are characterized at Weak, Moderate or Strong so that a forecaster needn't puzzle about how important a particular value is.

8. This is a ProbWind example with a QLCS-looking feature in February 2018. For this case, ProbWind is helping focus the forecaster's attention on the particular radar cell that perhaps needs more interrogations than its neighbor. That can be a common occurrence when many radar echoes are crowding into a WFO. ProbSevere can help a forecaster decide which ones are most important to view.

9. This ProbTor example demonstrates how this product might be used in a very favorable tornadic environment. Changes in the ProbTor probability are linked to changes in the Predictors. In the near future, Meteorogram plots will give a graphical representation of the changes in all ProbSevere parameters and in the ProbSevere values itself.

10. Validation. The biggest improvement that ProbSevere offers is in terms of lead time. ProbSevere will key on a relevant radar object and note its potential several radar scans before a warning is typically issued by the National Weather Service forecaster. Probability of Detection (POD), False Alarm Rate (FAR) and Critical Success Indices (CSI) between the NWS Forecaster and ProbSevere are similar – but lead time is better for ProbSevere. That's why its use might help you as a forecaster issue a warning a little bit earlier. It might give you that extra confidence to make the warning decision. Note that ProbHail, ProbWind and ProbTor show less bias than ProbSevere v1 – that's what the Reliability Diagrams in Frames 2, 4, 6 and 7 show. A forecast with low bias lies near the line with a slope of 1. Note also how the separation of ProbSevere into ProbWind/ProbHail/ProbTor has increased the skill of the ProbSevere All Hazard products compared to the legacy product.

11. A critical thing to keep in mind: ProbSevere values will vary from one day to the next based on the environment. As the kinematics change, so too will ProbTor (for example) values. Use this product in a relativistic sense: compare values in one cell to values in another. That will tell you where to focus radar attention for example.

12. There are caveats with this product that you should know about. Take time to read over this slide to understand them! ProbSevere caveats are on the first frame, ProbTor caveats are on the second. ProbSevere can struggle with QLCS storms in particular because the radar object can become very long. Work is ongoing to address this shortcoming.

13. Summary Slide. Read and understand this! In particular, use ProbSevere in conjunction with radar interrogation techniques to zero in on the most warn-able part of a complex. In this way you may be able to increase lead-time on your warnings.

14. Where to direct your comments and questions. ProbSevere is available online. Search for NOAA/CIMSS ProbSevere. As of 2020, the data can be seen here: https://cimss.ssec.wisc.edu/severe_conv/probsev.html