A USER'S GUIDE TO CO-OPS VISIBILITY SENSOR OBSERVATIONS

The American Meteorological Society defines visibility as "the greatest distance in a given direction at which it is just possible to see and identify with the unaided eye (a) in the daytime, a prominent dark object against the sky at the horizon, and (b) at night, a known, preferably unfocused, moderately intense light source. A wide variety of factors contribute to changing this distance.

CO-OPS deploys automated visibility sensors at locations selected in concert with supporting PORTS® partners. The sites must be both acceptable for sensor operation and useful for the user. Because fog can be patchy, it is important for users to understand how to interpret the disseminated data.

The sensors used by CO-OPS optically examine a small volume of air to determine the scattering characteristics of the air parcel, the most common technique used to measure visibility. Scatter can be caused by fog, smog, dust – any particles in the air will suffice. When the scatter is small the visibility is good, while large scatter means the visibility at the location of the sensor is poor.

It is important to realize that the visibility range provided by the sensor, more correctly known as Meteorological Optical Range (MOR), is a measurement made at a single point. When fog or other scattering particles are uniformly widespread it may be reasonable to presume the MOR applies over large distances, ie. a reading of 5 nautical miles means a person will see sufficiently large objects at that distance. But such a presumption may not be valid, and the sensor has no way of observing MOR except at the deployment site. The larger the reported MOR the greater the probability of non-uniform conditions, and the less accurate the MOR observation becomes. This is why CO-OPS limits the reported MOR to a range of 5.4 nautical miles (10 kilometers). Some users may wish to consider spacing multiple sensors along critical routes (the FAA often deploys multiple sensors along the length of a runway).

The sensor lenses are susceptible to contamination, by salt spray for example. The optics contain devices within the lenses to monitor such contamination, and the sensor will issue a warning and apply corrections. When contamination becomes severe, the sensor provides an error and no MOR values are reported. CO-OPS has tested the sensor and found it to be very tolerant of lens contaminants, well beyond expected maintenance intervals.

Automated visibility sensor observations are generally considered to have an accuracy of 10 - 20%. Users may wish to incorporate this level of performance into any decision-making tools which utilize these data.

Additional sources of visibility measurements information:

WMO *Guide to Meteorological Instruments and Methods of Observation*, Sixth Edition, WMO-No. 8

Office of the Federal Coordinator for Meteorology, *An Overview of Applied Visibility Fundamentals*, FCM-R3-1982

Crosby, John D., 2002. *Visibility Accuracy: What's Realistic?*
http://www.envirotechsensors.com/FAQ.htm