Introduction of a new suite of fog/low stratus products into NWS operations

Michael J. Pavlonis, NOAA/NESDIS

Low ceiling and visibility is a weather hazard that nearly every forecaster, in nearly every National Weather Service (NWS) Weather Forecast Office (WFO), must regularly address. In addition, national forecast centers such as the Aviation Weather Center (AWC) Alaska Aviation Weather Unit (AAWU), and the Ocean Prediction Center (OPC) are responsible for issuing low ceiling and visibility related products. As such, reliable methods for detecting and characterizing hazardous low clouds are needed. Traditionally, hazardous areas of Fog/Low Stratus (FLS) are identified using a simple stand-alone satellite product that is constructed by subtracting the 3.9 and 11 μm brightness temperatures. The 3.9-11 μm brightness temperature difference (BTD) has several major limitations. In an effort to address the limitations of the BTD product, the GOES-R Algorithm Working Group (AWG) developed an approach that fuses satellite, Numerical Weather Prediction (NWP) model, Sea Surface Temperature (SST) analyses, and other data sets (e.g. digital surface elevation maps, surface emissivity maps, and surface type maps) to determine the probability that Instrument Flight Rules (IFR) conditions are present. IFR conditions are characterized by a cloud ceiling below 1000 ft and/or a surface visibility less than 3 miles. Satellite and non-satellite predictors are used in a naïve Bayes model to determine the probability of IFR at the resolution of the satellite data. The GOES-R fog/low cloud algorithm is an enterprise system in that it can use satellite data from a variety of current data sensors (GOES, MTSAT, MODIS, AVHRR and SEVIRI) and future operational sensors (ABI and VIIRS) and NWP data from a variety of models (GFS, RUC, and RAP). Validation efforts, using surface observations over CONUS from each month of the year, indicate that the GOES-R IFR probability product is nearly twice as skillful as the traditional 3.9-11 μm BTD product at identifying IFR conditions. The GOES-R FLS algorithm also produces an estimation of the fog/low stratus thickness (cloud top height minus cloud base height). The GOES-R FLS thickness product can be used to infer dissipation time for single cloud layer radiation fog events. The GOES-R IFR probability and FLS thickness products are available in AWIPS and have been evaluated within NWS operations during the last two years as part of the Satellite Proving Ground. Forecaster feedback collected so far has been predominantly positive and product improvements have been made as a result of the feedback. References to these products within Area Forecast Discussions (AFD's) indicate that the products are influencing operational forecasts. The goal of this presentation is to describe the challenges associated with developing a new application based fused product line and successfully introducing that product line to NWS operations.