Florida Department of Transportation Research

Analysis of Prospective Systems for Fog Warnings
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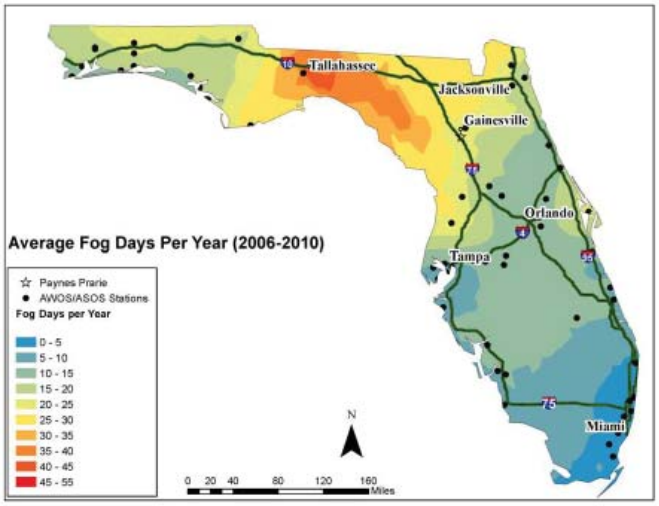
Florida nearly leads the nation in fatal vehicle crashes due to fog and smoke conditions. Between 2002 and 2009, 299 people in Florida died in vehicle crashes related to fog and smoke conditions. In January 2012, heavy fog and smoke were blamed for a crash on I-75 south of Gainesville, involving seven semi-trucks and 12 passenger cars, killing 11 and hospitalizing 18. Four years earlier, heavy fog and smoke were blamed for another serious crash on I-4 between Orlando and Tampa. This crash involved more than 70 vehicles, killing four people and injuring 38.



Climitological location and frequency of fog in Florida.

Fog is condensed water vapor in air at or near ground level. The opaqueness of fog may increase substantially by the presence of smoke.

There are four distinct types of fog. Avection fog occurs when a warm moist air mass moves over a cool surface. Upslope fog forms from the expansion and cooling of air as it is lifted up the side of a hilly surface. Frontal fog occurs in the cool stable air mass ahead of a warm front. Radiation fog, the most common type of fog in Florida, forms upward from the ground as the night progresses and is usually the most opaque near sunrise. This type of fog typically requires clear skies and abundant low-level moisture.

Recently, researchers at Florida State University studied existing systems that detect fog and identified prospective systems for warning drivers of foggy conditions. They conducted a literature review of existing forecasting models including the Croft et al., Conceptual Model for the Southern U.S., the United States Postal Service (USPS) conceptual model and forecast methods, and forecasting using model output stations. They also examined research data collection networks such as Mesonet stations, which collect mesoscale meterological phenomena, and examined the capabilities of the Model Output Statistics (MOS) technique, which forms the backbone of modern weather forecasting. Researchers found that while numerical weather forecast models do an excellent job of forecasting upper air patterns, they do not do well in forecasting localized fog, such as in areas where elevation is just a few feet, nor can they measure visibility.

Researchers found that fog frequently occurs at too low an elevation for conventional radar to detect, and it is difficult for satellite imagery to distinguish fog from low-level stratus. The National Weather Service can detect fog with Automated Surface Observing Systems (ASOS) and Automated Weather Observing Systems (AWOS). However, because these systems are generally located only at airports, fog that forms in other locations is not being detected.

Researchers identified several approaches to improve fog forecasting such as testing new forecast methodologies in real time and developing a more extensive inventory of locations where fog is likely to form. Researchers recommend FDOT install ASOS-type fog visibility sensors at Paynes Prairie and other low-lying areas known for frequent fog events. Researchers also recommend that FDOT develop a forecast distribution method to alert officials of fog conditions so they can monitor visibility and, if necessary, close roads.

FDOT Contact: Mark Wilson, FDOT Traffic Engineering and Operations
Principal Investigator: Peter Ray, Florida State University
For more information, visit http://www.dot.state.fl.us/research-center.