CHARACTERISTICS NRSER

Georgia Tech

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Figure 1: Good Morning America report on "black ice" Media definitions for "black ice" often differ from more technical definitions written by the scientific community. (Image: Good Morning America, 12/28/10)

Figure 2: Road crews clean up accident on I-285 Black ice developed overnight on 1/16/15 in Monroe County, GA, causing widespread traffic accidents. (Image: Atlanta Journal-Constitution, 1/16/15)

"BLACK ICE""? ΤS

"Black ice" is a term that has many definitions used in both the media and scientific literature. For forecasting purposes, a consistent definition is needed to distinguish between meteorological conditions caused by winter weather events and those caused by the freezing of residual water on roadway surfaces.



IMPORTANCE OF FORECASTING

- 24 times greater risk of accidents on icy roads (Kilpelaninen 2007)
- Anti-icing measures, take before event begins, are more effective than de-icing techniques, after ice has formed (Audrey 2001)
- Road closures have significant economic impacts (Berrocal 2010) Thus, accurate advance forecasting and communication with transportation and emergency response partners is critical to mitigate enhanced risk created by black ice conditions.

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RESEARCH QUESTIONS

- How frequently does black ice occur in the Atlanta, GA metropolitan area?
- What common meteorological factors are present in these cases to aid in future black ice prediction?
- Can the recently deployed RWIS observation network and METRo road forecast model be utilized to improve black ice forecasting?

METHODS



- Major cases of black ice in Atlanta area identified by finding articles from the region's largest newspaper, The Atlanta Journal-Constitution through a LexisNexis database search. (Articles are archived back to 1991.) Search terms included "black ice", as well as
- combinations of other words like "ice", "accident", and "roads"
- Recent events (2004 present) were verified by crosschecking with archived Area Forecast Discussions (AFDs) from the Peachtree City, GA Weather Forecast Office. Corresponding weather data was obtained from:
 - Hourly METAR observations from Hartsfield-Jackson Atlanta International Airport (KATL) to create hourly composites for the progression of black ice events.
 - Georgia RWIS observations and forecasts from METRo (Model of the Environment and Temperature of Roads) near an icing event that occurred on 1/16/2015

BLACK ICE CLIMATOLOGY

events happened in Atlanta from November through February, with peak black ice occurrence in January. Many black ice events only lasted 1 day, although some events

- persisted for as many as 6 days.
- The average black ice event from 1991 -2015 lasted 2.2 days.





METEOROLOGICAL COMPOSITES

FIRST DAY OF BLACK ICE EVENT

- Temperatures decline from avg. 42°F (± 8°F) at 4 PM EST the afternoon before to 28°F (± 6°F) by 7 AM EST the morning of the event.
- Low ceilings (median height between 5000 10000 feet) and predominantly overcast skies. Precipitation was also frequently observed prior to events.



CONTINUED BLACK ICE DAYS

- Average temperatures remain below freezing, even during daytime hours.
- Clear skies and high ceilings overnight (median: unlimited, after 10 PM EST) allow for radiational cooling, extending black ice events



FIRST ICE-FREE DAY

Average temperatures peak at 43 °F (± 7 °F) at 4 PM EST and stay above freezing overnight. Cloud cover more variable, with higher ceilings during day.



WEAT 2040

RWIS OBSERVATIONS ROAD SURFACE FORECAST A system of 27 RWIS stations were installed in throughout metro. Atlanta in Dec. 2014. A black ice event on 1/16/2015 served as a chance to utilize system ROAD SURFACE FORECAST RWIS OBSERVATIONS to estimate icing risk. During this event, **RWIS** sensors and METRo forecasts were able to identify roadways with greatest Figure 6: Comparison of road surface forecast vs. observations, 1/16/15 icing potential. ted sites are closest to major accidents re



- Figure 3: AJC front-page stories about icing events in Atlanta (Image: Atlanta Journal-Constitution, 1/29 1/30/15)

Black ice