Forecast Icing Potential (FIP)

Part I - Mission Connection

Product Description - The Forecast Icing Potential (FIP) product is an automatically-generated forecast index of icing potential developed by the In-Flight Icing Product Development Team sponsored by the Federal Aviation Administration's Aviation Weather Research Program. The FIP is scheduled for operational implementation by the National Weather Service Aviation Weather Center in January of 2004.

Purpose - The FIP ingests the full resolution 20 km hybrid B RUC model to produce an icing potential forecast for the continental United States. The total icing potential demonstrates the confidence that an atmospheric location, represented by a three-dimensional grid box, will contain supercooled liquid water that is likely to form ice on an aircraft. The algorithm analyzes the model output from a vertical column, determines the cloud top and base heights, checks for embedded cloud layers, and identifies a precipitation type.

Schedule - FIP total icing potential output files for f01, f02, and f03 hour forecasts are generated hourly, and for f01, f02 f03, f06, f09, and f12 hour forecasts every three hours in GRIB format with file sizes on the order of 2 MB each

Audience - The FIP total icing potential product was approved for limited operational use by the Aviation Weather Technology Transfer (AWTT) board attended by the Federal Aviation Administration (FAA) and the National Weather Service.   The FIP is meant to be used as a supplement, not as a substitute for the icing data contained in AIRMETs and SIGMETs . It is authorized for use by operational meteorologists and trained dispatchers only.

Presentation Format - The FIP total icing potential GRIB output is available through:

1. The AWIPS/NOAAPORT satellite broadcast network (SBN)

2. National Weather Service (NWS) FTP servers at:

    ftp://tgftp.nws.noaa.gov/SL.us008001/DC.avspt/DS.fipgb/PT.grid_DF.gr 1

3. The family of services (FOS) high resolution data service and server access service

Web Interface - The FIP total icing potential product is also available for public viewing at the following internet URLs:

http://aviationweather.gov/exp/fip/

Feedback Method - The Aviation Weather Center is always seeking to improve the representation of our products based on user feedback. Comments regarding the FIP should be sent to the feedback email address on the web page containing the product.

Technical comments for the FIP product developer may be addressed to:

National Weather Service
Attn: Jack May, Director
Aviation Weather Center
Phone: (816) 584-7208
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Part II - Technical Description

The Forecast Icing Product (FIP) was developed at the National Center for Atmospheric Research under the Federal Aviation Administrations' Aviation Weather Research Program. The FIP examines numerical weather prediction model output to calculate the potential for inflight aircraft icing conditions. This icing potential demonstrates the confidence that an atmospheric location, represented by a three-dimensional model grid box, will contain supercooled liquid water that is likely to form ice on an aircraft. The algorithm analyzes the model output from a vertical column, determines the cloud top and base heights, checks for embedded cloud layers, and identifies a precipitation type. Once the likely locations of clouds and precipitation are found, the physical icing situation is determined, and a fuzzy logic method is used to determine the icing potential. The fuzzy logic interest maps are based on clues from the model output reflecting relevance to the presence of icing. After the information is extracted, the interest maps are combined in a manner that reflects their significance for icing, given the physical situation present. The entire model domain is examined and the result is a three-dimensional depiction of the icing potential at the model valid time.

The FIP uses output from the 20-km Rapid Update Cycle hybrid B model (RUC), which is run hourly at the National Center for Environmental Prediction and generates forecasts with one-hour granularity out to three hours. Every three hours the model is permitted to generate forecasts out to twelve hours. The model has a full cloud physics package, much of which was developed at NCAR under FAA support. The condensate field has five species including two water species (cloud water and rain water). Numerous fields from the model are used to determine the icing potential at each model grid box.

Approver: Jack May