



Effect of meteorological observations from aircraft on NWP short-term forecasts of aviation-impact fields including precipitation, ceiling and visibility

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The Rapid Update Cycle (RUC) model was developed by NOAA/ESRL/GSD in the 1990s as a short-term, Continental United States (CONUS) scale forecast model designed to run more frequently than conventional operational models, and to use off-synoptic time data in addition to the traditional data sources. A great portion of this off-time data is from aircraft observations, now known as AMDAR (Aircraft Meteorological Data Relay). AMDAR provides high-frequency wind, and temperature data mainly at upper levels of the troposphere from commercial jet aircraft. The RUC model is now run at an hourly frequency at a horizontal grid resolution of 13 km over the CONUS domain (soon to be expanded to the North American domain). The amount of data ingested by the RUC has expanded to include not only AMDAR but increasing amounts of satellite, wind profiler, and radar data. These data have helped improve short-term (0 to 24 h) forecast accuracy of the RUC model.

A new type of aircraft data that has recently been added is called TAMDAR, for Tropospheric AMDAR. TAMDAR data is different from traditional AMDAR in that it includes measurement of humidity, an important parameter that has been difficult to quantify with high vertical resolution except through standard rawinsondes (RAOBs) that are launched at widely spaced locations every 12 h. In 2005, a private company

(AirDat, LLC, of Raleigh, North Carolina, United States) installed TAMDAR instrumentation on approximately 50 commercial regional aircraft flying in the middle portion of the CONUS. TAMDAR not only added the critical measurement of moisture to wind and temperature observations in the vertical, but its deployment on regional aircraft provided ascent/descent profiles in many airports not previously covered by weather-reporting aircraft, and in addition flights are at lower altitudes than traditional jet aircraft.

With support from the U. S. Federal Aviation Administration, NOAA/ESRL/GSD has been evaluating the impact on RUC forecasts of AMDAR data in general, and TAMDAR data in particular, through a variety of means. Since 2005 we have operated parallel runs of the RUC model (at 20 km horizontal grid resolution) with and without AMDAR and TAMDAR. We have also performed detailed retrospective studies of particular active-weather time periods. In this paper we will discuss the impact of TAMDAR and AMDAR data on short-term forecasts of the RUC model for meteorological fields of particular interest to aviation, including precipitation, ceiling, and visibility.