Geophysical Research Abstracts
Vol. 20, EGU2018-11429-1, 2018
EGU General Assembly 2018


# Improvements to ceiling/visibility/turbulence forecasts from the 2018 HRRR/RAP US model and supersite observations for North American aviation applications

Stan Benjamin (1), Stephen Waygandt (1), Joseph Olson (1), Ming Hu (1), Terra Ladwig (1), Curtis Alexander (1), Ismail Gultepe (2,4), Wayne Feltz (3), Martin Agelin-Chaab (4), John Komar (5), Gary Elfstrom (5), Faisal Boudala (2), and Binbin Zhou (6)

(1) NOAA Earth System Research Laboratory, Boulder, CO USA (stan.benjamin@noaa.gov), (3) Environment and Climate Change Canada (ECCC), Toronto, Canada (ismail.gultepe@canada.ca), (2) NOAA SSEC/CIMSS and University of Wisconsin, Madison, WI 53706, USA, (4) University of Ontario Inst. of Tech. (UOIT), Faculty of Engineering and Applied Science, Oshawa, Ont., Canada, (5) University of Ontario Inst. of Tech. (UOIT), ACE, Oshawa, Ontario, Canada, (6) NOAA/NCEP Environmental Modeling Center, and Science Applications Inter. Corp., Camp Springs, Maryland, USA

More accurate ceiling, visibility, and turbulence forecasts will result in changes to the US NOAA-NCEP HRRR (3km, High-Resolution Rapid Refresh) and RAP (13km, Rapid Refresh, HRRR-parent) hourly-updated models in spring 2018. The HRRR and RAP forecasts for wind, moisture/cloud, and vertical motion fields are the backbone for the US aviation hazard forecasts. Current HRRR/RAP predictions from NCEP show deficiencies in ceiling/visibility forecasts and excessive local vertical motion contaminating turbulence and cloud forecasts. These future improvements are the result of better cloud and surface assimilation, a new vertical coordinate, and a revised visibility diagnostic. Introduction of hybrid mass-flux and eddy-diffusivity (EDMF), and improved subgrid-scale clouds into the MYNN PBL scheme were shown to be essential for improved cloud and ceiling accuracy.

In this paper, data assimilation improvements (improved surface-observation assimilation, satellite/METAR cloud retention) essential for these upcoming NOAA/NCEP prediction system changes were described. These improvements to the boundary-layer, cloud microphysics, and land-surface schemes are designed to address cloud forecast deficiencies and the most recent results on cloud and visibility forecast accuracy are shown. The upcoming HRRR/RAP model changes at NOAA/NCEP models are expected in May 2018, shortly after the EGU Spring Conference.

Observations are used for evaluating model aviation-hazard forecasts, including the Toronto, CA supersite meteorological observations, representing fog, snow, rain, blowing snow, gust, and boundary layer and icing conditions. The PanAm UOIT (University of Ontario Institute of Technology) Meteorological Supersite (PUMS) observations are being collected from April 2015 to date. Various meteorological measurements from a weather and environmental unmanned aerial vehicle (WE-UAV), a fog and snow tower (FSOS), and a supersite are part of the project. Results suggested that integrated observing systems based on data from a supersite as well as satellite sites can provide better information applicable to aviation operations and boundary layer weather research, and validation of NWP and remote sensing retrievals. These datasets are already available for ECCC and NOAA models including HRRR and RAP.