The Canadian Airport Nowcasting System (CAN-Now): An Overview

by

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ABSTRACT

The Canadian Airport Nowcasting Project (CAN-Now) has developed an advanced prototype all-season weather forecasting and nowcasting system that can be used at major airports. This system uses numerical model data, pilot reports, ground in-situ sensor observations (precipitation, icing, ceiling, visibility, winds, etc.), on-site remote sensing (such as vertically pointing radar, ceilometer, and microwave radiometer) and off-site remote sensing (satellite and radar) information to provide detailed nowcasts out to approximately 6 hours. The nowcasts, or short term weather forecasts, should allow decision makers at airports such as pilots, dispatchers, de-icing crews, ground personnel or air traffic controllers to make plans with increased margins of safety and improved efficiency. The system has been developed and tested at Toronto Pearson International Airport (CYYZ) and Vancouver International Airport (CYVR). A Situation Chart has been developed to allow users to have a high glance value product which identifies significant weather related problems at the airport. New products combining observations and numerical model output into nowcasts have being tested. Some statistical verifications of forecast products, with comparisons to persistence and observations, covering both a winter (2009/10) and summer (2010) period have been performed.

1. SUMMARY

The CAN-Now system has been evaluated with full field tests during the winter of 2009/10 and the summer of 2010 (Isaac et al., 2011, 2012). Some conclusions can now be reached.

a) A web-based Situation Chart (Fig. 1) is a useful quick glance tool for alerting users to potential weather problems. Once those problems have been identified, it is relatively easy to get more information and make appropriate decisions. As an example, if a significant wind shift is expected in the near future at the airport, perhaps due to a gust front or a frontal passage, then selection of an alternate runway by the Air Navigation Authority can be made more efficiently reducing operational problems. However, the Situation Chart is more complex than is necessary for some users in the airport environment, for example at the de-icing pad, so further improvements are necessary to get high-glance information to all users.

b) There is a need for measurements at high time resolution. Conditions at the airport can vary quickly on scales of several minutes.

c) There is a need for NWP model data at time resolutions better than one hour for the same reason as mentioned above for the observations. Higher spatial resolution models, on average, can provide more accurate forecasts.

d) There is value in using more than one numerical weather forecast model in the products partly because of their different

physical parameterizations. Although the model and nowcast products have been statistically verified based on seasonal observations, it is necessary to do more objective validations and verifications for high impact events.

e) The blended nowcast systems developed have demonstrated skill compared to only model based systems. Currently, the simulation results of INTW Nowcast system (Huang et al., 2012) are used for the Situation Chart. However, with further improvements in the Adaptive Blending of Observations and Models (ABOM) technique (Bailey et al., 2012) may be used, and it might be possible to blend or merge the two techniques.

f) There is a great deal of future work necessary to more accurately measure precipitation amount and precipitation type. These are very critical parameters necessary in the application of de-icing fluids.

g) The forecast of vertical wind shear and direction at the airport remains a significant problem, especially because the NWP models do not do a good job with these parameters.

h) There is a need to develop more spatial products around CYYZ and perhaps CYVR. Although forecasts are being shown for the airport bedposts, this is perhaps not sufficient. More upstream surface observations would also be useful.

i) The idea of using INTW and the various CAN-Now forecasts to produce a semi-automated First Guess TAF, for any airport, is now being actively studied.

j) There is a need to get more forecaster involvement in using and modifying CAN-Now products. The CAN-Now website has a Blog where forecaster and user comments can be made. In addition, there are text descriptions of the current weather (TAF Plus) prepared by the forecaster and available from the Situation Chart. However, more can be done.

k) Overall, for most variables, the nowcast systems can outperform persistence after the first one or two hours, and provide more accurate forecasts than individual Numerical Weather Prediction models out to 6 hours.

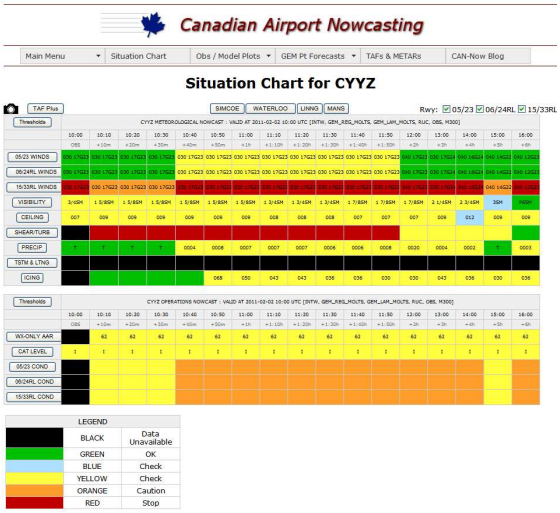

Fig. 1: The CAN-Now Situation Chart

2. REFERENCES

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