5.4 CONTINENTAL-SCALE WEATHER RADAR DATA ASSIMILATION USING NORTH AMERICAN DATA

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Determining the impact of assimilating weather-radar data in numerical weather prediction models at continental scales is still relatively uncommon. This is partly due to data availability, but also due to data quality issues when data are available. As Environment and Climate Change Canada (ECCC) starts replacing its weather radar network, C-band radars are being replaced with S-band systems, and ECCC is preparing for a new generation of quantitative applications based on the new data. Weather radar data assimilation is being introduced to ECCC, and the initial focus is on weather radar quality control and impact studies using a large model domain with the Canadian Regional Deterministic Prediction System (RDPS) covering North America and surrounding waters.

Archived weather-radar data from the Canadian and American networks, around 180 radars, have been used in this study for the summers of 2014 and 2016. Canadian C-band data require significant quality control, mostly to address clutter but also attenuation and metrics designed to characterize data quality in various ways. NEXRAD Level II data and McGill University data, both at S band, do not require the same processing for clutter, but are subject to the other quality controls. The BALTRAD Toolbox is used to quality control all radar data, and generate continental composites at 2.5 km horizontal resolution containing both corrected and uncorrected reflectivity data and associated quality fields. Radar data quality monitoring functionality has been established that utilizes hourly surface observations of precipitation occurrence.

At continental scales, latent heat nudging (LHN) is deemed a suitable first technique for exploiting the radar data. The system developed for the RDPS is intended to provide a low-cost benchmark against which to compare more advanced assimilation techniques in the future. For this impact study, forecast skill with and without LHN will be discussed. When validated against radar composites, LHN improves precipitation forecasts for approximately three hours. Verification against aircraft measurements indicates small but significant improvements of temperature and winds throughout the atmospheric column for lead times up to 36 hours. A comparison against precipitation forecasts by the McGill algorithm for precipitation nowcasting by Lagrangian extrapolation (MAPLE) will also be made.