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A quality assured surface wind database in Eastern Canada

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This work summarizes the results of a Quality Assurance (QA) procedure applied to wind data centred over a wide area in Eastern Canada. The region includes the provinces of Quebec, Prince Edward Island, New Brunswick, Nova Scotia, Newfoundland, Labrador and parts of the north-eastern U.S. (Maine, New Hampshire, Massachusetts, New York and Vermont). The data set consists of 527 stations compiled from three different sources: 344 land sites from Environment Canada (EC; 1940-2009), 40 buoys distributed over the East Coast and the Canadian Great Lakes provided by the Department of Fisheries and Oceans (DFO; 1988-2008), and 143 land sites over both eastern Canada and north-eastern U.S. provided by the National Center of Atmospheric Research (NCAR; 1975-2007).

The complexity of the QA process is enhanced in this case by the variety of institutional observational protocols that lead to different temporal resolutions (hourly, 3-h and 6-h), unit systems (km/h in EC; m/s in DFO and knots in NCAR), time references (e.g. UTC, UTC+1, UTC-5, UTC-4), etc. Initial corrections comprised the establishment of common reference systems for time (UTC) and units (MKS). The QA applied on the resulting dataset is structured in three steps that involve the detection and correction of: manipulation errors (i.e. repetitions); unrealistic values and ranges in wind module and direction; abnormally low (e.g. long constant periods) and high variations (e.g. extreme values and inhomogeneities). Results from the first step indicate 22 sites (8 EC; 14 DFO) showing temporal patterns that are unrealistically repeated along the stations.

After the QA is applied, the dataset will be subject to statistical and dynamical downscaling studies. The statistical approaches will allow for an understanding of the wind field variability related to changes in the large scale atmospheric circulation as well as their dependence on local/regional features like topography, land-sea contrasts, snow/ice presence, etc. The dynamical downscaling will allow for process understanding assessments by performing high spatial resolution simulations with the WRF model. Finally, model validation will be targeted through the comparison with observations.