Séminaire Vendredi le 23 mai 2014 11:00h / Seminar Friday May 23rd 2014 11:00h

Subject/ Sujet : Extended-range high-resolution dynamical downscaling over a continental-scale spatial domain with mesoscale simulations

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Abstract/Resumé :

Extended-range high-resolution mesoscale simulations are currently being carried out at Environment Canada to produce multi-year surface-layer meteorological fields over Canada. The outputs of the ongoing work are of tremendous interest to weather dependent energy industries, particularly the wind energy sector. Long-term mesoscale simulations over such a large spatial domain require mechanisms to control the deviations in the large-scale atmospheric structures from the coarse-resolution driving fields (obtained from regional analysis). As enforcement of the lateral boundary conditions is not sufficient to restrict such deviations, large-scale features of the simulated high-resolution meteorological fields are therefore spectrally nudged towards the driving fields. During the present work different spectral nudging approaches have been investigated to propose an optimal nudging strategy. Controlling the evolution of the atmospheric large scales in general improves the outputs of mesoscale simulations within the surface layer. The results however demonstrate that divergence of the prognostically evolving surface fields from their expected values resulting from inherent model bias as well as any lack of correlation with respect to the observations may be compounded by temporal integration over an extended period, leading to substantial inaccuracies in the prediction of surface-layer atmosphere. A forcing strategy based on grid nudging of the relevant surface fields (including surface temperature, soil-moisture, and snow conditions) towards their expected values is devised to limit any considerable deviation. Sensitivity of the near-surface atmosphere to the nudging of the different surface fields has been examined to determine an optimal approach.