Séminaire Vendredi le 30 mai 2014 11:00h / Seminar Friday May 30th 2014 11:00h

Subject/ Sujet : High-resolution Surface Analysis for Extended-Range Mesoscale simulations

Langue/language : Anglais/English

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Abstract/Resumé :

Extended-range simulations with the limited-area configuration of the Global Environmental Multiscale (GEM-LAM) model are currently being carried out at Environment Canada (EC) over a continental-scale mesh with a grid spacing of 2 km. The objective is to generate 2008-2010 database of near-surface atmospheric fields over the entire country. Simulations performed over extended range are, however, prone to drifts of land-surface variables that can be detrimental to the quality of the simulated meteorological fields. In order to prevent such drifts, grid nudging of relevant land-surface variables, such as soil moisture, surface temperature and snow conditions, towards a high-resolution reference dataset is devised. The operational analysis is not suitable to serve as a reference due to its insufficient resolution. In this work, EC's Surface Prediction System (SPS) is, therefore, used to generate the hourly surface analyses over the 2-km GEM-LAM grid.
SPS is an offline surface model based on the two-layer Interaction Soil Biosphere Atmosphere (ISBA) land surface scheme. It requires updates of atmospheric forcing at regular intervals. Hourly atmospheric forcing is obtained from EC's operational weather forecasts, whereas the six-hourly precipitation accumulations are readjusted in accordance with the Canadian Precipitation Analysis. Furthermore, optimal interpolation is employed to assimilate 2-m temperature and humidity observed hourly at land-based stations across Canada into the forcing fields. These fields are then used to drive a continuous SPS integration over the three-year period. In order to prevent potential accumulation of errors, a scale-selective relaxation of simulated soil moisture towards the operational regional analysis is implemented. In this way large-scale SPS soil moisture components are controlled by the regional analyses, while allowing free development of fine-scale features that are not well resolved in the analyses. Based on the proposed approach, the outputs of SPS have a higher resolution and outperform operational analyses in terms of bias and standard error, particularly for surface temperature. Using the SPS outputs for surface nudging has significantly improved the extended-range atmospheric mesoscale simulations.