



Application of GEM-AQ for the forecast of meteorology in Pacific 2001 with uniform and variable-resolution

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A fully integrated multi-scale atmospheric forecasting and simulation system was applied for weather forecasting in Vancouver August 2001. This modeling system consolidates both GEM-AQ (Global Environmental Multi-scale and Air Quality Model) and LAM (Limited Area Model) in a single flexible modeling frame. Two cases of simulation were performed for August 9. Both cases shared the same initial condition. In Case1, GEM-AQ runs at horizontally $4^{\circ} \times 4^{\circ}$ uniform resolution to generate spatial and lateral boundary conditions for LAM. LAM then runs at horizontally $0.09^{\circ} \times 0.09^{\circ}$ and vertically 58 hybrid layers for 24 hours. In Case 2, GEM runs at horizontally $0.09^{\circ} \times 0.09^{\circ}$ uniform resolution and at vertically 58 layers directly over Vancouver area, with a smooth degradation of resolution to the maximum of $4^{\circ} \times 4^{\circ}$ in the outer domain. This method not only avoids the abrupt change in spatial resolution due to nesting, but also keeps the simulations in one dynamic system. The purpose is to compare two different model applications in order to better understand how reliable the numerical methods are, as well as the effects of boundary conditions and the consistency of dynamics and physics schemes. Results from Cases 2 confirmed the existence of the precipitation found in Case1, with similar pattern but less noise. Precipitation was found over Pacific Ocean between hour 0100 GMT to 0400 GMT, and over north of Vancouver Island after hour 0900 GMT. The simulated wind fields at surface showed "on-shore flow" after hour 1300 GMT and "off-shore flow" before hour 1300GMT. The diurnal variations of temperature over land and ocean can be clearly seen. High temperature ($>35^{\circ}\text{C}$) was predicted around Lower Fraser Valley.