Séminaire Vendredi 28 Novembre 2008 / Seminar Friday November 28th, 2008

Conférencier/Lecturer: Mateus Reszka (ARMA/Downsview)

Sujet/Subject: Dynamical Constraints for Global 3D-Var Assimilation using GEM-Strato.

Présentation/Presentation: Anglais/English

Lieu/Room: Grande salle du premier étage CMC, 11 :00 AM

Résumé / Abstract:

Assimilation experiments are presented in which the traditional, statistically-derived dynamical balance operators are replaced by new, flow-dependent constraints. The assimilation scheme is the 3D variational (3D-Var) system used at the Canadian Meteorological Centre (CMC) while the forecast model is a version of the Global Environmental Multiscale (GEM) model, with the lid at 0.1 hPa. In the new operators, the stream function is related to the temperature and the vertical wind by exploiting the Charney nonlinear balance equation and the Quasigeostrophic (QG) omega equation, respectively. These equations, linearized about the background state, are solved at every analysis time to obtain balanced temperature and omega increments. Both balance relations introduce flow dependence into the system and influence the spatial characteristics of the resulting analyses.

Single-observation experiments show that the increment structure conforms to the background mean flow and, particularly in regions of strong curvature of the jet stream, tends to be aligned with the jet. Scores against radiosondes computed for month-long assimilation cycles using the new balance operators have been compared with control cases, under both solstice and equinox conditions. In the tropics the new constraints improve both the O-P and O-A bias for the zonal velocity. In the extratropics the main impact is in the temperature standard deviation, which shows significant improvement at all levels for the O-A error, although for O-P error it shows some deterioration above 200 hPa. The level of decorrelation of the control variables has also been computed. Results are somewhat mixed, however the new balances seem to induce greater decorrelation in the upper stratosphere and lower mesosphere. Compared to the Charney balance, the QG omega balance has a relatively small impact on the assimilation, presumably because at present it does not include any diabatic forcing.