Comment on "IL-GLOBO (1.0) – development and verification of the moist convection module" by Rossi et al.

This manuscript presents the work of developing an online-coupled Lagrangian transport model in a GCM model GLOBO. The convective scheme is the Kain-Fritsch parameterization which has been thought as a suitable scheme for model grid spacing of 10 km or so. It is a further development of GLOBO and can be widely used for transport of chemistry or aerosol in the atmosphere.

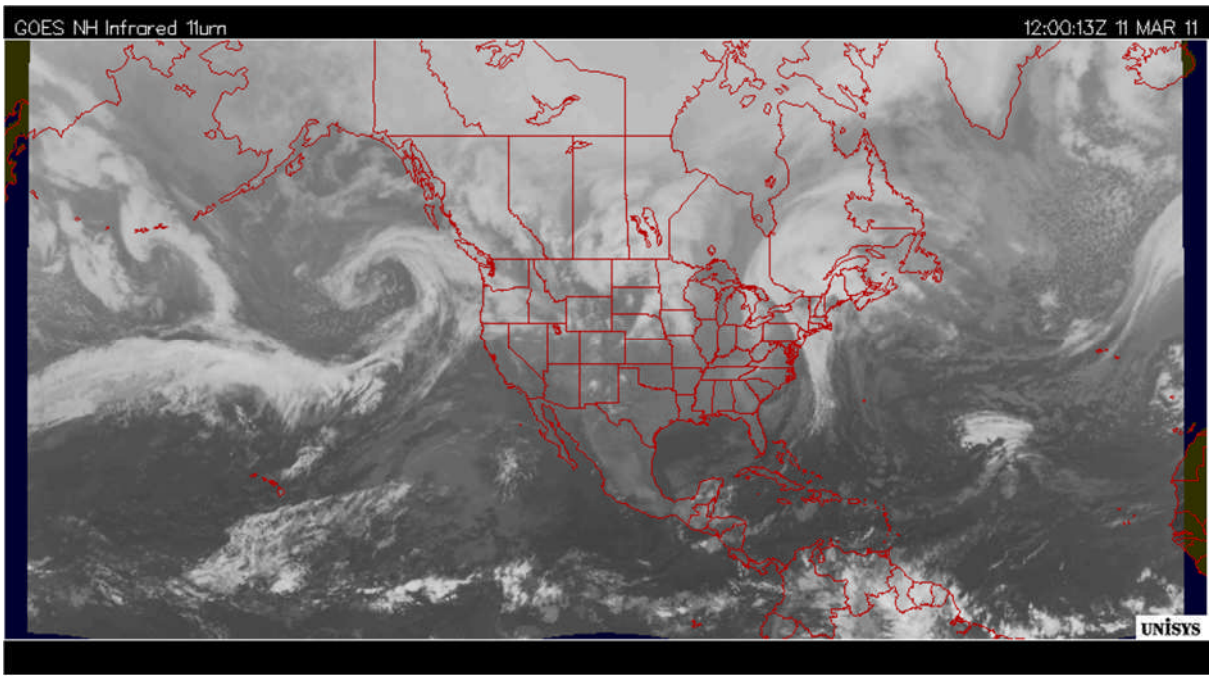
The idea of the Lagrangian particle dispersion model is not new and has been used before. The authors implemented the module into a GCM with clearly description of the procedure and verification. The abstract and the summary give sufficient information.

The paper is generally well structured and well written. There are a few major concerns and some minor corrections. Once the concerns are clarified and the corrections are made, the manuscript can be accepted for publication.

General comments:

The first concern is the resolution. The model verification used a grid of 362 × 242, i.e., about 100 km at mid-latitudes. I would like to see the result of a simulation with a finer resolution, for example, 20 km. The reason is that there have been some other convective schemes suitable for coarse resolutions as in this study. An advantage of the Kain-Fritsch scheme is that it can be used for finer resolutions. A 100-km resolution simulation did justify the implementation of the scheme. Therefore, a finer resolution simulations is required.

The second concern is the lack of signals outside the tropics. Below is a satellite image of North America on 11 March 2011. It shows that there were some big weather systems between 30 – 60 ºN which apparently had convections. I wonder why Fig. 5 did not reflect the features at all. Figures 4 and 5 of Forster et al. (2007) showed evident signals of upward convective mass fluxes in their monthly mean plots. Why the convective mass fluxes were so small in your simulations? This should be clarified.



Specific comments:

P 8241, L10-11. “in conjunction with appropriate, fairly common, environmental conditions.”

Three conditions requires for convection to occur: unstable stratification, moisture and triggering. “appropriate, fairly common, environmental conditions” is an obscure expression.

P 8241, L16. “below or near”.

Change it to “smaller than or close to”.

P8242, L10. The subject is plural (something and something). Change “was” to “were”.

P8243, L24. Why the equilibrium level is abbreviated to LET? It is commonly expressed as LE or LNB (level of neutral buoyancy) or LOC (limit of convection).

P8245, L5. Typo. Change “fore” to “for”.

P8245, L15. Delete “.” between “i” and “giving”.

P8245, L17. Do you think you need a subscript i in $p^{u\varepsilon}$?

P8246, L1. Why Equation 4 can be used to define $p_i^{u\delta}$ at any level? You do not use it to define Equation 5, you just borrow a similar idea to define $p_i^{u\delta}$.

P8246, L7. What does the overbar mean?

P8247, L4. Where a well-mixed state is maintained? Anywhere? Everywhere?

P8250, L8-9. It would be interesting to see the impact of a finer resolution on the result as I raised in the main points.

Acknowledgement: The GOES satellite image is obtained from UNISYS.