Atmos. Chem. Phys. Discuss., 14, C9954–C9956, 2014
www.atmos-chem-phys-discuss.net/14/C9954/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric transport simulations in support of the Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE)" *by* J. M. Henderson et al.

Anonymous Referee #1

Received and published: 9 December 2014

Review of Henderson et al. for Atmospheric Chemistry and Physics

This paper presents an regional atmospheric model evaluation for support of carbon atmospheric transport studies. The primary (high resolution) domain is in the vicinity of Alaska. The use of a regional climate model to provide input to the transport model is a welcome addition. The model validation is solid, albeit not particularly innovative. The validation supports the viability of the use of the regional climate model, as comparison of forecasts to observations shows that the errors are within reasonable limits. I support this paper for publication after a number of revisions that I would refer to as minor.

P. 7: It's not clear to me why three grids are necessary. Couldn't this work have been done with just the inner most grid and the intermediate grid?

P.7, line 30: Did you consider spectral nudging over standard grid nudging so as to force the large-scale pattern, but not fine scales? (Glissan et al. 2013, J. Climate, 26, 3985-3999.)

P. 7, lines 6-7: It may not read 100% clear that that the 0.1 m/s wind speed reduction is from WRF v3.4.1 to v3.5.1.

P. 15, line 1: From Fig. 3a, it appears that the minimum amplitude biases are closer to 1500-1600 UTC.

P. 15, line 23: 2.5 m/s RMS

P. 17 lines 3-4: I would suppose the coastline issues (where observing site distance from the coast is less than the grid spacing) would be another important source of bias and root mean square error at these coastal North Slope sites.

P. 18: The land surface model is another potential source of error. The LSM soil temperatures tend to be very slow to "spin-up", and could have biases whether or not they are spun-up. It would not surprise me if the extended period of cold bias at Deadhorse during June-July 2012, as seen in Fig. 10a was a period when the ground heat flux term was consistently cooling the surface, rather than showing the usual balanced diurnal cycle.

P. 21: It should be pointed out that a reanalysis (with some procedure for data assimilation) will tend to have a smaller error than a forecast. (Otherwise, what is the value of doing the reanalysis?) Also, since the near-surface errors tend to be larger than the free-atmosphere errors, that links the near-surface errors to boundary layer processes and surface energy processes. The latter can, of course, be related to clouds in the free atmosphere leading to radiation errors. This should apply to the temperature errors seen in Figs. 10a and 12a.

P. 23 and Figure 14: Is if possible to calculate Froude numbers for the different grid resolutions, so the flow can be thought of in terms of hydrolic jumps?

Fig. 17: The figure appears to be mislabelled.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 27263, 2014.