**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Evaluation of cloud convection and tracer transport in a three-dimensional chemical transport model" *by* W. Feng et al.

Anonymous Referee #2

Received and published: 21 November 2010

This paper evaluates the simulation quality of a convective tracer, Radon-222, corresponding to various source and treatment of meteorological data to force convention within the TOMCAT transport model framework. The simulation results are compared with observations available at a few locations. Detailed comparisons are made for some diagnostic parameters available from ECMWF analyses as well as remote sensing products. The results can overall serve as useful guidance for the chemistry-transport model developers, and could be published in Atmos. Chem. Phys. after accounting for the concerns listed below.

I understand the authors have made great effort for testing so many of the meteorolog-

ical data products for convection parameterization schemes in TOMCAT. However, less effort is probably made to reveal the highlight of their results. For example the lines 19-23 of the abstract suggest increasing resolution do not change much in TOMCAT simulations. While Fig. 1,2,5 have so many panels hiding the essential differences between the model versions. I suggest the authors to choose a fewer panels where differences are clearer and state the results from other simulations in the Fig. caption or text briefly. I am also a bit surprised why Radon simulation was not done for 1x1 degree model run, particularly for the J_T106 case.

The problem with the rain rate (section 4.3) is that do we really expect simulate the rain rate in an offline model correctly? I suspect this because the model do not account evaporation/evapotranspiration, surface roughness etc. processes realistically, which has been also shown in your paper.

Section 4.4: I am a bit skeptic of such comparisons. How are the model results samples for Fig. 12. Unless the model results are sampled at the same time and location of measurements and then averaged, we cannot really assess the model simulation quality. The differences seen in Fig. 12 can easily be due to model sampling error, if we take some lessons from Fig. 11 & 13.

Past research have shown that model resolution do play significant role in simulation quality under the GCM or GCM-like frameworks [Wild et al. ACP, 2008; Patra et al., GBC, 2008; Rind et al., JGR, 2007]. Again I felt, a comparison of Radon simulations using G_5.6 and J_T106 cases would have been interesting.