Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-568-RC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Processes controlling the seasonal variations of ^{210}Pb and ^{7}Be at the Mt. Cimone WMO-GAW global station, Italy: A model analysis" *by* Erika Brattich et al.

Anonymous Referee #2

Received and published: 10 October 2016

This manuscript uses the Global Modeling Initiative chemistry and transport model (GMI-CTM) driven by the NASA's MERRA assimilated data to simulate the seasonal variations of 210Pb and 7Be at the WMO-GAW station of Mt. Cimone (44°12' N, 10°42' E, 2165 m asl, Italy). The GMI-CTM model is well evaluated by using the observed seasonal variations of 210Pb and 7Be at Mt. Cimone in this study. The model well reproduced the seasonal pattern of 210Pb concentrations at the site together with very reasonable mechanisms controlling the seasonal 210Pb variation. However, the model failed in reproducing the seasonal pattern of 7Be, particularly the underestimations of 7Be in the summer season. The authors performed model sensitivity experiments and found that the wet scavenging process designed in the model is the dominant reason

for 7Be underestimations, and the next is the low sensitivity caused by the coarse spatial resolution of model. The manuscript is interesting with important significance and high quality of science, and presentation is good. I have the following suggestions for the authors to consider.

1)How about the actual precipitation at Mt. Cimone in Figure 4? The difference between actual, modeled, and GPCP precipitations would support that wet scavenging is the main reason controlling 7Be seasonal variations shown in Figure 8. Please notice the precipitation comparisons in Figure 4 (ij), which shows that the model precipitation is generally lower than that of GPCP, meaning that the modeled wet scavenging processes perhaps is lower than the reality. This weak modeled wet scavenging seems to be very significant for the 7Be concentrations shown in Figure 8.

2)One section can be added to illustrate the model results of this study in comparison with historical model studies. Those model studies may include as follows: 7Be: Brost, et al., J Geophys Res, 96, 1991; 210Pb: Feichter,et al., J. Geophys. Res., 96, 1991; Lee, H. N., et al., J Geophys. Res., 109, D22203, 2004, doi: 10.1029/2004JD005061. 7Be/210Pb: Koch et al., J Geophys. Res, 101(D13), 1996.

3)The WMO-GAW station, Mt. Cimone (44°12' N, 10°42' E, 2165 m asl, Italy) is quite close to the Apls stations, such as Jungfraujoch (46.32°N, 7.59°E, elevation 3580 m asl) and Zugspitze(47. °N, 11.0°E, 2962 m a.s.l.) in the model grids. How about the general results of the model and observation comparisons for those two stations in 2005? I believe these comparisons will support the conclusion that coarse of the model runs is one of the reasons for the worse 7Be comparisons.

4)For Figure 8, I am confused that without the wet-scavenging process, the 210Pb concentration is even lower than that of observed from January to July. The convection uplift of 222Rn seems does not support the summer 210Pb maximum but on the contradictory. How about the sensitivity experiments with case of 7Be/210Pb in Figure 8? Why do you show the sensitivity test for ji-1 grid rather than the ji grid in this figure?