Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-393-RC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Predicting cloud ice nucleation caused by atmospheric mineral dust" *by* Slobodan Nickovic et al.

Anonymous Referee #2

Received and published: 13 June 2016

This paper develop a regional dust-atmospheric modeling system, considering dust aerosol's effect on IN, present some new and interesting results. I recommend accepted this paper for publication to do the revisions that specified below:

Page 2 line 28: To our knowledge, this is the first time that all ingredients needed for cold cloud formation by dust are predicted in operational forecasting mode within one modeling system. Please give more evidence.

Page 4 line 25: .....the spread of errors in predicting IN concentrations at a given temperature has been reduced from a factor of ∼1000 to ∼10. Please give some evidence or support for this conclusion.

Page 4 line 29: Why do you choose -5âĎČ, since the underlying measurements were only taken at temperatures lower than -9âĎČ. Moreover, you set the temperatures for

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warmer clouds range -36âĎČ to -10âĎČ (page 4 line 17). Please give more discussion.

Page 5 line 9: Sdust is ice nucleation active surface linked to dust concentration. As we know that dust aerosols lifted to the mid and upper troposphere can serve as ice nuclei, here you use the surface value of dust. Will it affect the model results?

Page 5 line 12-13: Please give some related evidence.

Page 5: paragraph 1 on section 3, please give details description for the ground observe instruments.

Page 8 line 14-15: Why the model can't predict the ice below 4-4.5km while the cloud radar can detect? Due to the temperatures you set in section 2.3(-10∼–36âĎČ) , the vertical distribution of dust aerosols, or any other reason? You should give more discussion.

Page 8 line 27: The position for the pictures in Fig.5 should be left and right.

Page 9 line 20: there is a redundant question mark.

Figure 1: The colorbar and coordinate are unclear. The compared results for the second case should also be given and discussed.

Figure 3: Please give the meaning for each color and the title for x-y coordinate.

Figure 5: For the first case, the mean values of IWPL are mainly greater than NL. However, for the second case, the mean values of IWPL are mainly less than NL. Please give more discussion.

There are some research discuss dust aerosols effect on clouds and precipitation, please discuss more about the relationship between dust and clouds in Section 1.

References:

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cloud properties and radiative forcing over dust source and downwind regions derived from A-Train data during the Pacific Dust Experiment, Journal of Geophysical Research, 115 (2010), D00H35, doi:10.1029/2010JD014109.

Huang, J., P. Minnis, B. Lin, Y. Yi, S. Sun-Mack, T. Fan, and J. Ayers, 2006: Determination of ice water path in ice-over-water cloud systems using combined MODIS and AMSR-E measurements, Geophysical Research Letters, 33 (21)L21801, doi:10.1029/2006GL027038.

Huang, J., P. Minnis, B. Lin, Y. Yi, M. Khaiyer, R. Arduini, A. Fan, and G. Mace, 2005:Advanced retrievals of multilayered cloud properties using multispectral measurements, Journal of Geophysical Research, 110 (D15) (2005), D15S18, doi:10.1029/2004JD005101.

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