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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The distribution of snow black carbon observed in the Arctic and compared to the GISS-PUCCINI model" *by* T. Dou et al.

Anonymous Referee #2

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The manuscript presents result of black carbon measurements in the Arctic and compiled data on snow black carbon measurements carried out by Doherty et al. (2010) in same region. The results of snow black carbon measurements are compared with model simulations using NASA GISS composition-climate model. The authors report the results of measurements carried out during July 2010, Doherty et al. (2010) measurements during August 2005 and 2008.

It is not very clear, how the snow black carbon is measured, it may be standard procedure but it will be really important to include in the paper for the benefit to the readers. The density of snow is very much dependent on the meteorological conditions; it will be interesting to include meteorological parameters for the period in which measurements are presented, i.e. July 2010, August 2005 and 2010.

Snow density is a very important parameter. Authors have taken a mean value of surface and subsurface snow observed in different types of snow layers from the SHEBA campaign. In the absence of real snow density data a large uncertainty in model simulations may occur. How the radiative forcing was estimated?

The authors have used two data sets, discussion related to two data sets may be mentioned. Biomass burning emissions can disperse up to short and long ranges depending upon meteorology, these emissions are only restricted to the Russian Arctic and beyond! Abstract may be rewritten, authors may include some quantitative values of decrease of snow albedo and radiative forcing.

Introduction, line 20 It is still controversial – it is not controversial, it depends on uncertainty in ground measurements and physical parameters, mostly lack of data.

Observations The earliest observations of sBC mainly started . . .. Include only references associated with measurements.

Page 11250, line 21 Do not use short form It's The authors have mentioned that it is impossible to measure actual density which is one of the important parameters and this can cause a large uncertainty in the results discussed in the paper.

4. Initial field in the Arctic Ocean??? – The authors mentioned about SWE, not very clear of the purpose of its inclusion.

5. Inter-comparison between model results and observations As stated in the paper, "Present observations of sBC show sketchy but identifiable variations", when it is sketchy, authors may provide firm observations, ofcourse sBC may show contrast depending upon the meteorological conditions and close to the source of emissions and long range transport of emissions. In the present paper, all these parameters are not clear in the paper. The wind pattern may be shown if there is any event during 2007-2010 when black carbon could have been transported from continent.

Figure 7 shows a large difference in model and observed results in contrast, Why there

is large difference in the observed and modeled values. Sometime difference is higher in winter, sometime during summer?, the results must be discussed in detail.

The albedo of snow is highly wavelength dependence, decrease of albedo is qualitatively mentioned but wavelength is not mentioned.

Since there is a large difference in observed and model results, the authors may try to improve model to get a realistic simulation.

At several instances in the manuscript, structure of sentences is not clear, authors may improve language and focus their discussion.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 11245, 2012.