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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Radiative Forcing by Light-Absorbing Particles in Snow in Northeastern China Retrieved from Satellite Observations" *by* Wei Pu et al.

Anonymous Referee #2

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Summary This study uses remote observations (and models) to quantify the radiative forcing (RF) of light absorbing particles deposited in snow in Northeastern China. The authors use a combination of observations and models, including MODIS, SNICAR, SBDART, as well as ERA-Interim reanalysis and MIROC5 BC deposition simulations. Spatial variations in the RF are primarily attributed to light absorbing particles, and multiple linear regression shows BC deposition and snowfall explains the bulk of the spatial variation in light absorbing particles (based on an impurity index). Finally, the inferred RF is compared with in situ estimates.

Overall, the authors combine a lot of data from various sources to construct the RF

of light absorbing particles in snow. There are a lot of uncertainties! But the authors appear to do a good job at acknowledging these uncertainties, and quantify them when possible.

Comments Why use ERA-Interim for snowfall data? Is it any good? Why use MIROC5 for BC deposition data? What about the other CMIP5 models? Where does BC emission density come from? Why only year 2014, when the study spans 2003-2017? are there not internanual variations in BC emissions? Or is this not important? Several awkward/incomplete sentences exist. For example, L 15 P 26. This paper uses a large number of data sets. It would be helpful to list these in figure captions, as a reminder of where the variable comes from. The quoted RF represents a snap shot under clear sky conditions (and other caveats). I think this should be included in the abstract, since it puts the very large RF (∼45 W/mˆ2) into context. Figure 2. "density" repeated. Figure 4. Dotted areas hard to see.

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