ACP-2018-869 review comments

The present study tries to characterize BC source attributions and its implications on glacier runoff over the Hindu Kush Himalayan region. The motivation of the work is established in the introduction. Satellite data, black carbon (BC) observations, reanalysis data, and global model are used and subsequently introduced with select relevant details. In the main part of the work, the results are presented and analyzed, and the authors carefully quantify and discuss the model performance, especially the implication of BC from surrounding regions to glacier runoff in different seasons.

The manuscript is thorough, clear, compelling, and presents the results with good figures and tables. I recommend publication after attending to the following major and minor revisions.

1, There is a good review paper including discussions of BC effects over the Himalayas and Tibetan Plateau (Qian et al., 2015). We suggest the author refer it in the section of introduction.

Qian, Y., Yasunari, T. J., Doherty, S. J., Flanner, M. G., Lau, W. K., Ming, J., Wang, H., Wang, M., Warren, S. G., and Zhang, R.: Light-absorbing particles in snow and ice: Measurement and modeling of climatic and hydrological impact, Adv. Atmos. Sci., 32, 64-91, 2015.

2, The present work evaluates the model performance about BC concentrations in air, but lack of evaluations for BC-in-snow

concentrations. Please add, because the author also thinks the absorbing effect of BC in snow is important in this region. There are some observations of BC concentration and radiative forcing in snow across the Tibetan Plateau and Himalayas, such as Zhang et al., (2017).

Zhang, Y., et al. (2017), Light-absorbing impurities enhance glacier albedo reduction in the southeastern Tibetan plateau, J. Geophys. Res. Atmos., 122, doi:10.1002/2016JD026397.

3, As the author acknowledged, the wet deposition is an important process for BC simulations in the model, so modeled precipitation evaluations against the meteorological station observations or reanalysis data are essential for confidence.

4, In present study, an aerosol tagging method was used, please provide a little bit more details about this technique in your model in the section of methodology. Recently, an explicit emission tagging method has been developed in a global-aerosol model (Wang et al., 2014), could the author add some descriptions about the differences between two tagging methods?

Wang, H., Rasch, P. J., Easter, R. C., Singh, B., Zhang, R., Ma, P. L., Qian, Y., and Beagley, N.: Using an explicit emission tagging method in global modeling of source-receptor relationships for black carbon in the Arctic: Variations, Sources and Transport pathways, J. Geophys. Res.-Atmos., 119, 12888-12909, doi:10.1002/2014JD022297, 2014.

5, In fact, previous works pay attention to characterize BC source-receptor relationships over the Tibetan Plateau and Himalayas. The author should describe the same points, differences and the new discoveries with previous works, such as Kopacz et al., (2011) and Zhang et al., (2015).

Kopacz, M., et al. (2011), Origin and radiative forcing of black carbon transported to the Himalayas and Tibetan Plateau, Atmos. Chem. Phys., 11, 2837–2852, doi:10.5194/acp-11-2837-2011, 2011.

Zhang, R., et al. (2015), Quantifying sources, transport, deposition, and radiative forcing of black carbon over the Himalayas and Tibetan Plateau, Atmos. Chem. Phys., 15, 6205-6223, https://doi.org/10.5194/acp-15-6205-2015, 2015.