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Interactive comment on "Impacts of absorbing aerosol deposition on snowpack and hydrologic cycle in the Rocky Mountain region based on variable-resolution CESM (VR-CESM) simulations" *by* Chenglai Wu et al.

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We thank Dr. He for the comment and pointing out the recent relevant studies. The SNICAR model we used assumes spherical snow grains and aerosol-snow external mixing to calculate the snow albedo. We have explicitly stated the assumptions in the revised manuscript. We have also included these recent studies on the effect of snow grain shape and aerosol-snow internal mixing on snow albedo, as well as the discussions on this effect and its potential impacts on our model results: "Note that the SNICAR model we use assumes spherical snow grains and aerosol-snow external

mixing for the calculation of snowpack optical properties (Flanner et al., 2007; Oleson et al., 2010). Recent studies have shown that non-spherical snow grains play a critical role in snow albedo calculations and reduce the snow albedo reductions included by LAAs compared with spherical snow grains (e.g., Liou et al., 2014; Dang et al., 2016; He et al., 2014, 2017). Nonetheless, the knowledge of snow grain shape evolution is limited and thus spherical snow grains are assumed. Studies have also shown the significant enhancement of solar radiation absorption with larger snow albedo reductions by aerosol-snow internal mixing compared to aerosol-snow external mixing (e.g., Flanner et al., 2012; He et al., 2014; Liou et al., 2014). However, although without considering aerosol-snow internal mixing, the SNICAR model we use assumes absorption-enhancing sulfate coatings to hydrophilic BC, which can mimic BC coatings by snow and compensate the neglect of absorption-enhancement by aerosol-snow internal mixing (Flanner et al., 2007; Flanner et al., 2012). Therefore, the impacts of BC in snow shown in this study (section 4) are not necessarily biased low. Despite this, assuming dust-snow external mixing this study may underestimate the impacts of dust in snow. "

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