Response to RC2:

a) Tuzet et al., 2017 describe a state-of-the-art model suite to describe the evolution of a snow pack (snow accumulation, metamorphism and melt), with strongly improved capabilities to account for the impact of light absorbing impurities (LAI), namely black carbon (BC) and mineral dust. The snowpack model SURFEX/ISBA-Crocus is coupled to computation of in-snow radiative transfer (RT) with the model TARTES and atmospheric RT with ATMOTARTES, while deposition of LAI is simulated with the atmospheric model ALADIN-Climate. Comparing Crocus runs with and without accounting for the presence of LAI, the direct (snow darkening) and indirect (accelerated snow grain metamorphism) of LAI are apportioned.
The paper presents a novel physically based approach to estimate the impact of LAI on snow albedo.

The author are grateful for the review and positive feedbacks that help improving the manuscript. A response to each comments is provided hereafter.

Two small points:

b) Page 9 – subpoint 2.3: The atmospheric RT representation used by Tuzet et al., 2017 does not detailedly account for light absorbing aerosol and could be extended.

The atmospheric model indeed only account for one type of aerosols with a fixed vertical profile. It could be extended. We however think that the impact of such improvement would be small since the model is only used to compute the spectral distribution of the irradiance.
A statement about this has been added in the discussion (page 17 line 14):
Concerning atmospheric radiative transfer (Section 2.3), ATMOTARTES only has a rough representation of the effect of LAIs in the atmosphere (one type of aerosols and constant vertical profile). This could be extended as in SBDART (Richiazzi et al., 1998) but the impact would be limited while the numerical cost would be significantly increased.

c) Page 1 – Abstract: Some of the formulations/statements in the paper in review should be improved or clarified (improper English language; like 14ff). What do you want to say with: Indeed, the model performances are not deteriorated compared to our reference Crocus version, while explicitly representing the impact of light-absorbing impurities.

The abstract was modified as follows :

Page 1 Line 13 has to be modified: The model simulates snowpack evolution reasonably, providing similar performances to our reference Crocus version in term of snow depth, snow water equivalent, near-surface specific surface area and shortwave albedo. Since the reference empirical albedo scheme was calibrated at Col de Porte, improvements were not expected to be significant in this study.

References:

Ricchiazzi, P., Yang, S., Gautier, C., and Sowle, D.: SBDART: A research and teaching software tool for plane-parallel radiative transfer in the 35 Earth's atmosphere., Bull. Am. Met. Soc., 79, 2101–2114, 1998.