The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2017-94-RC2, 2017

The Cryosphere Discussions
Open Access
EGU

Interactive comment on "A multi-layer physically-based snowpack model simulating direct and indirect radiative impacts of light-absorbing impurities in snow" *by* Francois Tuzet et al.

Anonymous Referee #2

Received and published: 11 August 2017

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.

Two small points: 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.

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.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2017-94, 2017.