

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2020-461

Anonymous Referee #1

Referee comment on "On the influence of erect shrubs on the irradiance profile in snow"
by Maria Belke-Brea et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2020-461-RC1>, 2021

Belke-Brea et al. present interesting work on the difficult subjects of measuring and modelling light transmission in snow with buried shrubs. The introduction makes shrubs sound rather like invasive species that have only recently arrived in the tundra; they are actually natural (albeit expanding) components of tundra biomes. Trapping of snow by shrubs is likely to have more influence on the insulating properties of a snowpack, but absorption of light by buried branches clearly does have an influence and has received less attention. The title could be modified to reflect that a lot of this paper is about the influence of soot.

A wind rose would be a nice addition to Figure 2 in place of the wind direction arrows, if the AWS can provide. Do you have any information on the frequency and volume of waste burning in winter?

The measured absorption coefficients in Figure 4 clearly cannot be fitted well by adding dust to the snow, but Figure 4(b) does not look like the best possible fit for 400-450 nm (a negative bias could be removed).

How close together and how comparable were the sites for snow pits without shrubs? Table 1 shows that snow depth increased by 7 cm between 22 and 28 November. Doesn't that mean that the clean snow in ZOI4 on 28 November was already on the ground when the snow was judged to be dirty on 22 November?

Comparing with Figure 5, I think that the ZOI depths in Table 2 are wrong.

Above 700 nm, the increased grain size of depth hoar will have an effect of decreasing

absorption coefficients. Could the large grains and voids in the snow around shrub branches act as pipes for transmission of near-infrared light (just to make modelling radiative transfer even harder)?