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Spatial distribution of surface hoar crystals in sparse forests

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Abstract. Surface hoar size and location relate directly to avalanche initiation trigger points, and they do so in small-scale spatial distribution. Physically, surface hoar will grow where the snow surface is cold relative to the air and water vapour is plentiful. Vapour aside, snow cools at a rate primarily by longwave radiation emittance. Emittance can be restricted by clouds, trees, and terrain features. With 96 independent spatial point samples of surface hoar size, we show the extreme small-scale size variation that trees can create, ranging from 0 to 14 mm in an area of 1 m². We relate this size variation to the effects of trees by using stereo photography to estimate the amount that trees impinge on sky view at each point. Though physically related to longwave escape, radiative balance can be as difficult to estimate as surface hoar size itself. To estimate point surface hoar size by expected maximum areal crystal and dry terrain greyscale value only. We confirm this relation by using a different area and in a different formation cycle. There, its overall average error was 1.5 mm for an area with surface hoar sizes ranging from 0 to 7 mm.

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