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Characterisation of algal blooms on seasonal snowfields through a combination of field spectrometry, drone imagery and radiative transfer modeling at Hardangerjøkulen (Hardanger glacier), Southern Norway

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Pigmented microalgae bloom on glaciers and snowfields worldwide, contributing to carbon storage and enhanced surface melt through surface darkening. The darkening impact of snow algal blooms is being increasingly studied on terrestrial glaciers and ice sheets but less attention has been given to seasonal snowfields, despite their ecological and climatic relevance. Algal blooms are typically widespread but heterogeneously distributed and therefore high resolution airborne observations provide important insights to better understand the spatial patterns and impact of the blooms. Here, we present 130 field spectra colocated with low-cost and light-weight drone imagery acquired over 6 different snowfields in July and August 2023 around Hardangerjøkulen (Hardanger glacier), Southern Norway. We combine these high-resolution measurements with radiative transfer modeling to provide estimates of abundance, carbon storage and albedo impact of snow algal blooms on seasonal snowfields.