Supplementary Information



Supp Info 1: A) Hourly radiative forcing for H_{bio} and L_{bio} surfaces; B) the mean absorption feature depth per unit wavelength for each surface type; C) p-values for spectral Bonferroni-corrected t-tests for albedo between each surface class; D) t-statistics for spectral Bonferroni-corrected t-tests for albedo between each surface class; E) Particle size distribution for the mineral sample; F) ANOVA p and F-statistic for the albedo of each surface class.



Supp Info 2: Confusion matrices and normalised confusion matrices for the final RF model applied to UAV (A,B) and Sentinel-2 (C,D) multispectral data. Confusion matrices show predicted class on the y-axis and actual class on the x-axis. The score at the intersections shows the frequency of instances – i.e. higher scores along the top-left to bottom-right diagonal indicate a more accurate classifier.

Albedo	Snow	Clean Ice	Light Algae	Heavy Algae
Max Feature depth	0.08	0.07	0.05	0.04
Assymetry	0.04	0.01	-0.02	-0.02
HCRF				
Max Feature depth	0.08	0.07	0.05	0.03
Assymetry	0.05	0.007	-0.03	-0.03

Supp Info 3: Characteristics of absorption feature centered on 1.03 μm for mean albedo and HCRF spectra. Assymetry refers to the relative area of the feature left (negative) and right (positive) of the axis of symmetry at 1.03 μm.



Supp Info 4: Classified and albedo maps for multiple Sentinel-2 tiles from the western coast of the GrIS on 21st July +/- 3 days in 2016 and 2017. Colorbars are common to both years and y axis labels are common to all subplots.