

Supplemental document: Inferring Inherent Optical Properties of Sea Ice Using 360-Degree Camera Radiance Measurements

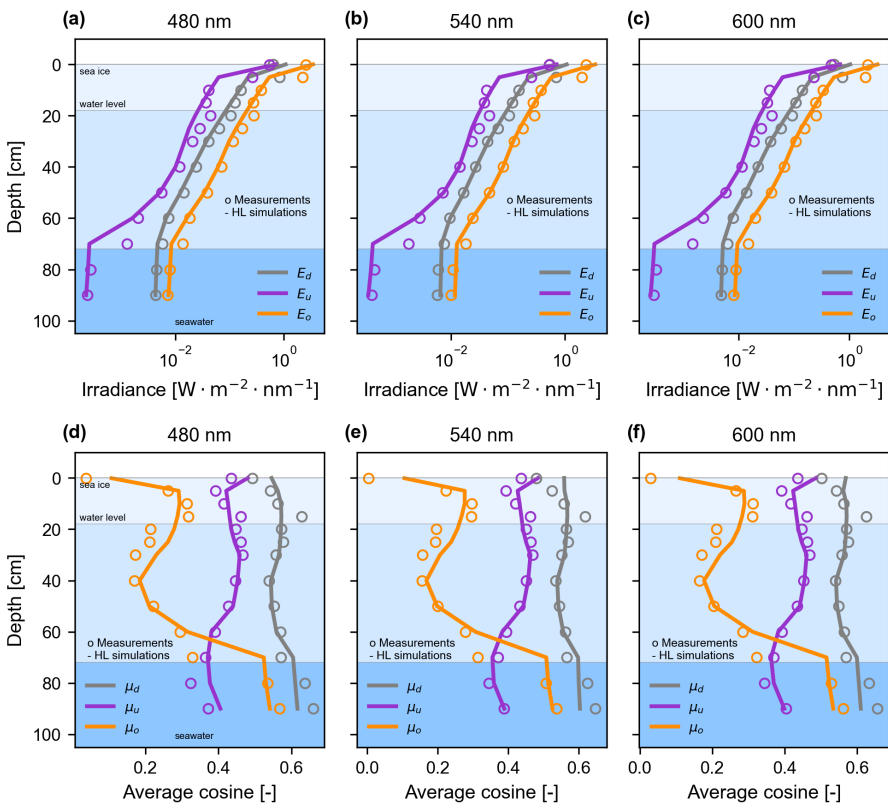


Figure S1: Vertical profiles of all irradiance quantities (planar downward, planar upward, and scalar) measured and simulated in the 480 nm (a), the 540 nm (b), and the 600 nm (c) spectral channels. In the same order of wavelengths, the second row shows the average cosines (planar downward, planar upward, and scalar) as a function of depths across the different boundaries measured during the fieldwork.

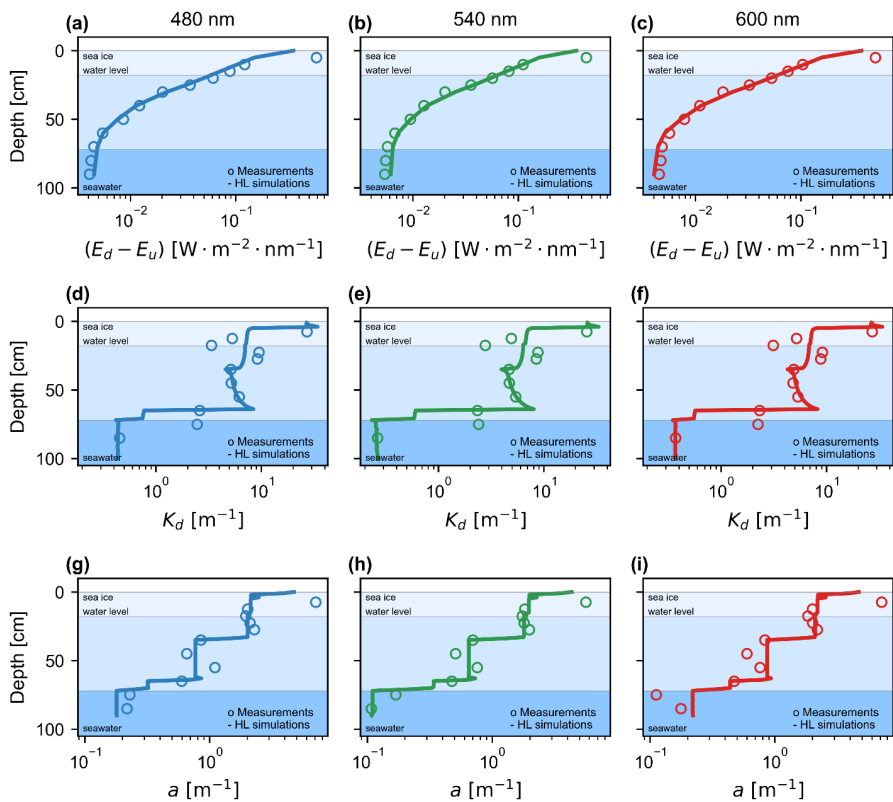


Figure S2: In order of rows from top to bottom, the figure displays the net planar irradiances, the diffuse attenuation coefficients for the downwelling irradiance, K_d (in m^{-1}), and the Gershun's Law derived absorption coefficients. The observations are presented as circle markers while the HydroLight simulations are shown as plain lines. The rows from left to right are respectively the 480 nm, 540 nm, and 600 nm spectral bands.

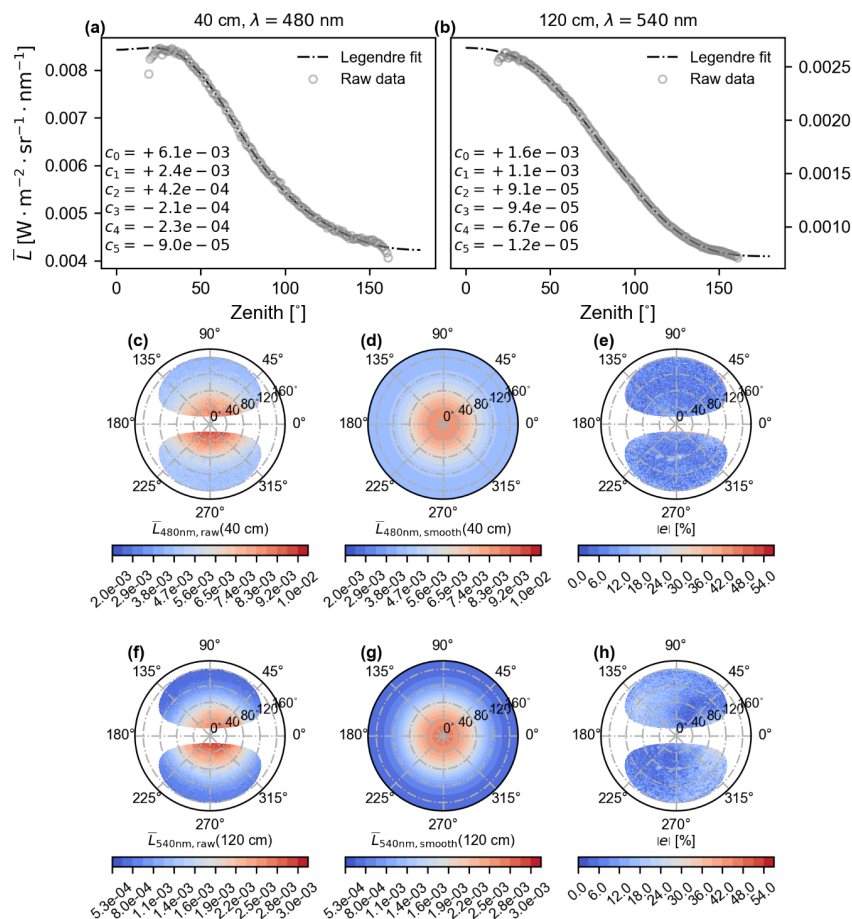


Figure S3: Legendre polynomials fit results on the azimuthally averaged angular radiance distributions measured in High Arctic. Two radiance distributions example are shown: at a depth of 40 cm and at $\lambda = 480$ nm, and at 120 cm for the band centered on 540 nm. The first row displays the Legendre polynomials curves fitted over the zenithal radiance (with the Legendre coefficients $c_1, c_2, \dots, c_5$) for (a) the first and (b) the second case. The second and third rows display (in order of case) the raw angular distributions for all the zenithal and azimuthal

directions (c)-(f), the Legendre polynomials curves re-projected over all the azimuth 360° (d)-(g), and the relative errors between the latter (e)-(h). The average and standard deviation of the relative errors $|e|$ are respectively 6.2 % and 5.4 % for figure (e) and 8.6 % and 6.0 % for figure (h).

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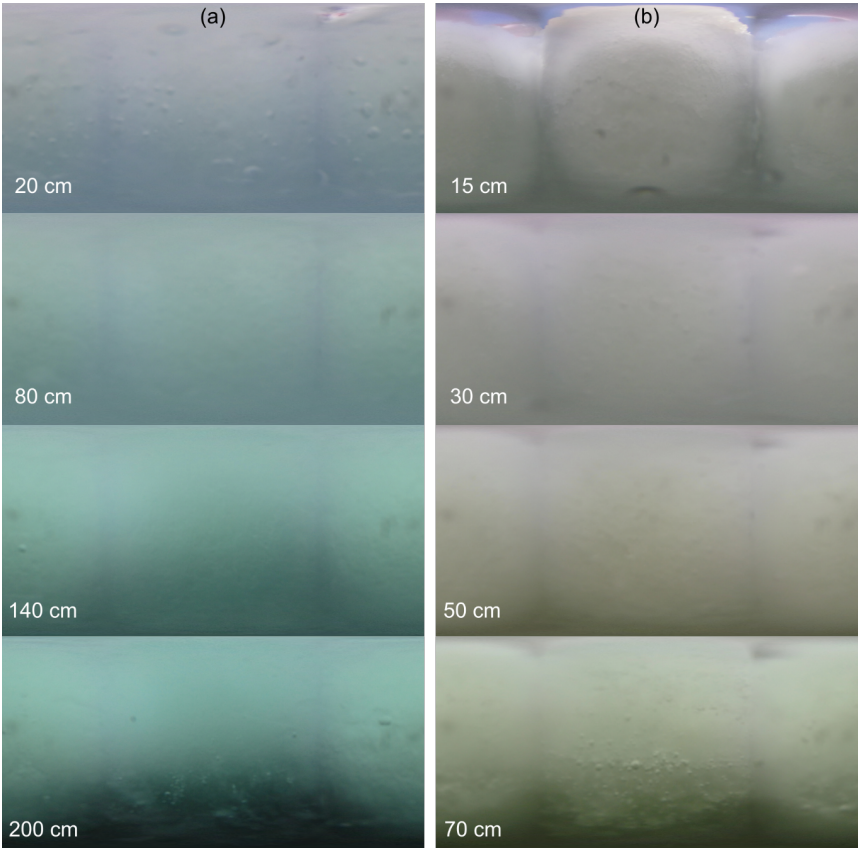


Figure S4: Fisheyes jpeg circular images (saved along DNG raw files) transposed into equirectangular grids. The images are shown column-wise for multiple depths within sea ice at (a) High Arctic (185 cm thick ice) and (b) Chaleur Bay sites (80 cm thick ice). These equirectangular grids have longitudes (FOV in x) x latitudes (FOV in y) less than 360° x 180° as acquired below the waterlines. We can interestingly observe greener colours in the Chaleur Bay ice (b) compared to bluer ones in Arctic sea ice (a).

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