Supplementary Material

The supporting information of manuscript “Impact of microstructure on solar radiation transfer within sea ice during summer in the Arctic: A model sensitivity study” contains 4 figures and 2 tables. These figures and tables are not shown in the main text, but useful for understanding this study.



**Figure S1.** Spectral albedo and transmittance with varying (a) gas bubble volume fraction (*V*a) and (b) radius *r*a.



**Figure S2.** Spectral albedo and transmittance with varying (a) brine pockets volume fraction (*V*b) and (b) length *l*b.



**Figure S3.** Variations in scattering coefficient of gas bubbles (*σ*a) against the changing exponent of the distribution functions under different (a) gas bubble volume fraction (*V*a) for a constant size ranges of 0.5 to 2 mm and (b) gas bubble radius (*r*a) for constant *V*a = 3%. Also shown are the total deviations of broadband albedo and transmittance (*α*B and *T*B) for the entire testing range under the default parameters.

**Table S1.** Parameters used in the radiation transfer model and their references

|  |  |
| --- | --- |
| Parameters | References |
| refractive index of gas bubbles | Light et al. (2004) |
| refractive index of brine pocket | Kou et al. (1993); Smith & Baker (1981) |
| refractive index of PM | Light et al. (1998) |
| *N*a, *N*b | Light et al. (2003) |
| *k*i | Warren & Brandt (2008); Grenfell & Perovich (1981) |

**Table S2.** Parameters used in the Figure 10A and their references

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ice type | *V*a (%) | Albedo | Ice thickness | Method | Reference |
| Melting blue ice | 2 - 3.5a | 0.32 | 1.2m – 1.8m | Measure | Grenfell & Maykut (1977) |
| Young ice | 3.33 | 0.47 | 1m | Model | Grenfell (1983) |
| 4.39 | 0.51 |
| 6.51 | 0.60 |
| 8.64 | 0.62 |
| First-year iceb | 4 | 0.48 | 1.74m | Measure | Mobley et al. (1998) |
| New ice | 0.5 | 0.16 | 0.12m | Measure | Taskjelle et al. (2016) |

a Salinity of ice paper didn’t be documented. So range of *V*a is present here.

b *V*a of the surface layer is presented here. Because the ice albedo is predominantly controlled by this layer.

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