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MAGNITUDE OF THE AEROSOL SHORTWAVE INDIRECT EFFECT IN SPRINGTIME ARCTIC LIQUID WATER CLOUDS

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ABSTRACT

We assess the expected magnitude of the diurnally-averaged shortwave aerosol first indirect effect in Arctic liquid water clouds, in the context of recently discovered longwave surface heating of order 3-8 W m^{-2} by this same aerosol effect detected at the Barrow, Alaska ARM Site. We find that during March and April, shortwave surface cooling by the first indirect effect is comparable in magnitude to the longwave surface heating. During May and June, the shortwave surface cooling exceeds the longwave heating. Due to multiple reflection of photons between the snow or sea ice surface and cloud base, the shortwave first indirect effect may be easier to detect in surface radiation measurements than from space.

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