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Differential summer melt rates of ridges, first- and second-year ice in the central Arctic Ocean during the MOSAiC expedition

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During the melt season, sea ice melts from the surface and bottom. The melt rates substantially vary for sea ice ridges and undeformed first- and second-year ice. Ridges generally melt faster than undeformed ice, while the melt of ridge keels is often accompanied by further summer growth of their consolidated layer. This summer consolidation is related to refreezing of less saline meltwater, originating from snowmelt and ridge keel melt. We examine the spatial variability of ice melt for different types of ice from *in situ* drilling, coring, and from multibeam sonar scans of remotely operated underwater vehicle (ROV). Seven ROV scans, performed from 24 June 2020 to 28 July 2020 during the Multidisciplinary drifting Observatory for the Study of the Arctic Climate (MOSAiC) expedition were analyzed. The area investigated by the ROV (400 by 200 m) consisted of several ice ridges, surrounded by first- and second-year ice. Seven ice drilling transects were additionally performed to validate ROV measurements. The maximum keel depth of the ridge investigated by ice drilling was 6.5 m. We show a substantial difference in melt rates of first-year ice, second-year ice, and sea ice ridge keels. We also show how ridge keels decay depending on keel depth, width, steepness, and orientation relative to the ice drift direction. These results are important for quantifying ocean heat fluxes for different types of ice during advanced melt, and for estimation of the ridge contribution to the total ice mass and summer meltwater balances of the Arctic Ocean.