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Autonomous observations of sea ice mass balance during MOSAiC

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Four seasonal ice mass balance buoys were deployed as part of the MOSAiC distributed network. These instruments measured vertical profiles of snow and ice temperature, as well as snow depth and ice thickness every six hours. Ice growth, surface melt, and bottom melt, as well as temporally averaged estimates of ocean heat fluxes, were calculated from these measurements. The buoys were installed in October 2019, with durations ranging from February 2020 to July 2020. Three of the buoys were destroyed in ridging events in February, March, and June 2020. The fourth buoy lasted until floe breakup in July 2020. The sites were separated by tens of kilometers, but had very similar air temperatures. While air temperatures were similar, snow – ice interface temperatures at different buoys varied by as much as 15 C due to differences in snow depth and ice thickness. Initial ice thicknesses ranged from 0.30 to 1.36 meters. During the growth season snow depths typically were around 0.1 to 0.2 meters, except for one case where the buoy was in a snow drift and the snow depth exceeded 0.5 meter. Peak growth rates of about 0.8 cm per day occurred in January. In mid-January there was a rapid increase in ice thickness associated with an aggregation of platelet ice. This aggregation only lasted for two weeks. In mid-April, air temperatures increased to nearly 0 C, almost ending the growth season.