

Seasonal evolution of snow depth on Arctic and Antarctic sea ice from Snow Buoy measurements

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Snow depth is one of the sea ice Essential Climate Variables, because it dominates the energy and momentum exchanges across the atmosphere-ice-ocean interfaces and actively contributes to sea ice mass balance. Due to its exceptionally high spatial and temporal variability, snow depth is one of the least known and most difficult to observe parameters of the Arctic and Antarctic sea ice cover. Accurate and operational methods for snow depth and snow accumulation retrievals by remote sensing are still under development. In this study, we present results from more than 50 Snow Buoys, drifting with the pack ice or installed on landfast sea ice. Snow depth time series of the buoys show a high data quality, in particular in comparison with other types of measurements, and contribute valuable data sets for comparisons with remote sensing methods and re-analysis data sets, as well as for 1D snow pack modelling. The snow pack on sea ice of the Arctic Ocean shows strong regional and inter-annual differences, but is often composed from many snow fall events all through the year. Additional air temperature measurements reveal above freezing temperature events in winter with likely impacts on the snow pack properties. However, their impact on snow depth directly is negligible. During summer, strong surface ablation and a complete melt of the snow pack is most common. On Antarctic sea ice, almost no reduction in snow depth was observed over summer, allowing an annual net snow accumulation of 0.2 to 0.9 m. The complete data set is available in near real time through the data portal www.meereisportal.de.