Sea Ice Mass Balance Buoys (IMBs): First Results from a Data Processing Intercomparison Study

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IMBs are autonomous instruments able to continuously monitor the growth and melt of sea ice and its snow cover at a single point on an ice floe. Complementing field expeditions, remote sensing observations and modelling studies, these in-situ data are crucial to assess the mass balance and seasonal evolution of sea ice and snow in the polar oceans. Established subtypes of IMBs combine coarse-resolution temperature profiles through air, snow, ice and ocean with ultrasonic pingers to detect snow accumulation and ice thermodynamic growth. Recent technological advancements enable the use of high-resolution temperature chains, which are also able to identify the surrounding medium through a „heating cycle". The temperature change during this heating cycle provides additional information on the internal properties and processes of the ice. However, a unified data processing technique to reliably and accurately determine sea ice thickness and snow depth from this kind of data is still missing, and an unambiguous interpretation remains a challenge.

Following the need to improve techniques for remotely measuring sea ice mass balance, an international IMB working group has recently been established. The main goals are 1) to coordinate IMB deployments, 2) to enhance current IMB data processing and –interpretation techniques, and 3) to provide standardized IMB data products to a broader community.

Here we present first results from two different data processing algorithms, applied to selected IMB datasets from the Arctic and Antarctic. Their performance with regard to sea ice thickness and snow depth retrieval is evaluated, and an uncertainty is determined. Although several challenges and caveats in IMB data processing and -interpretation are found, such datasets bear great potential and yield plenty of useful information about sea ice properties and processes. It is planned to include many more algorithms from contributors within the working group, and we explicitly invite other interested scientists to join this promising effort.