

Antarctic ice shelves melting in real-time

Some Antarctic ice shelves are thinning dramatically and we are facing a potential collapse of the West Antarctic Ice Sheet (WAIS). Antarctic ice shelves act as a restraint on the flow of ice from the continental interior into the ocean, and as such act as a control on the Antarctic Ice Sheet's contribution to global sea level.

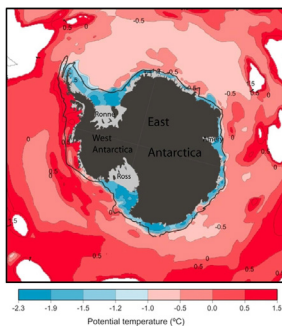


Photo courtesy of Svein Østerhus

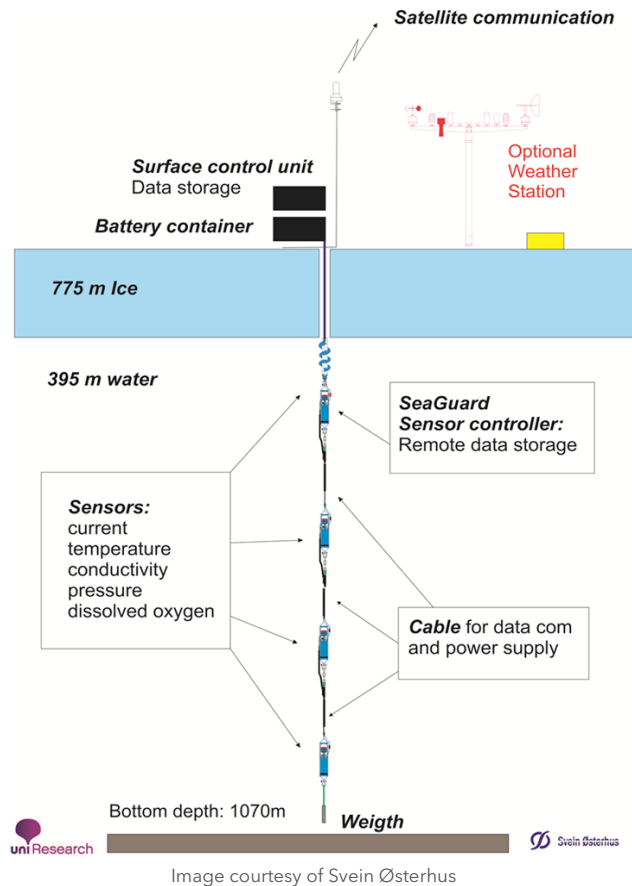


Photo courtesy of Svein Østerhus

Satellite data have shown the Amundsen Sea sector of the ice sheet to be reducing in size, indicating increased ice flow into the ocean, but the three largest of Antarctic ice shelves, the Amery, Ross and Filchner-Ronne, are thought to be broadly stable. They appear not to be retreating, nor are they thickening or thinning in any dramatic way. However, a recent study has suggested that the presently cold oceanographic regime over the southern Weddell Sea continental shelf might be vulnerable to a shift to much warmer conditions. Such a shift would have major consequences for Filchner-Ronne Ice Shelf (FRIS), the world's largest ice shelf when measured by ice volume. These changes will have global effects, both in their effect on global sea level as a reduced ice shelf allows more grounded ice to flow into the ocean, and in long-term changes in the production of deep and bottom waters.

For this reason, it is paramount to establish a long-term observing system for the oceanic regime of Filchner-Ronne Ice Shelf to follow the development and act as an alert system for ocean-induced Antarctic glacier retreat.

An on-line observatory was installed in December 2014 under the Filchner-Ronne Ice Shelf by researchers from Uni Research, Bjerknes Centre for Climate Research in Norway and the British Antarctic Survey. The equipment is composed of a string measuring currents, conductivity, temperature and oxygen at 4 different levels under the ice shelf and data is transferred in real time via satellites. Drilling a more than 700m long hole through the ice using hot water made the installation possible. The intention is to keep the system running for many years by a yearly change of batteries.



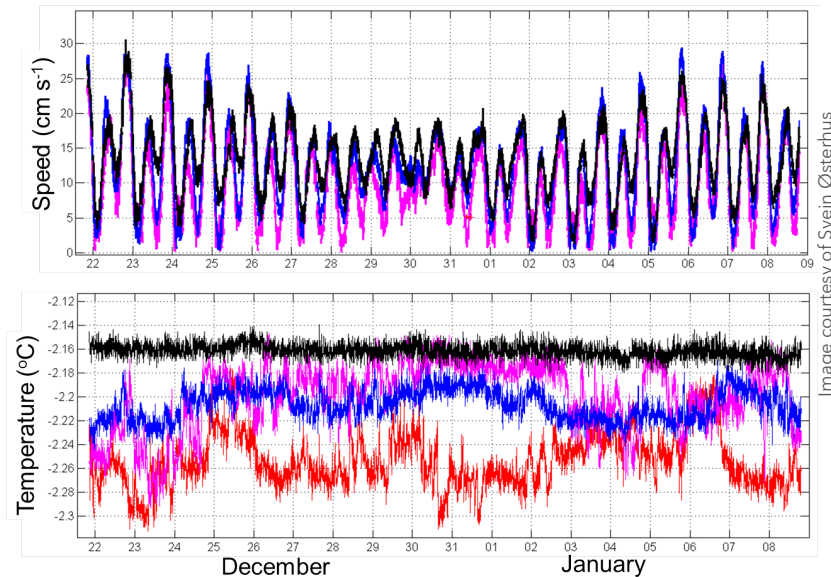
Long term observations of the flow of dense waters from their area of formation to the abyss of the World Ocean, and the return flow of warm waters are central to climate research. For the Weddell Sea, an important component of such a system entails monitoring the formation of High Salinity Shelf Water (HSSW) on the continental shelf north of Ronne Ice Front, the transformation to Ice Shelf Water (ISW) beneath the floating Filchner-Ronne Ice Shelf, and the flux of ISW overflowing the shelf break to the deep Weddell Sea. Equally important is the inflow of warm water toward the Filchner-Ronne Ice Shelf cavity.

Observations combined with theory and results from numerical modelling will improve our understanding of fundamental climate processes in Antarctica: ocean-ice shelf interaction, heat fluxes and basal melt, water mass transformation and deep-water formation. Ultimately, this will improve global and regional climate scenarios and reduce uncertainties in future sea-level predictions. The observing system will provide high quality data from a severely under-sampled but climatically important region and maintain one of the longest oceanographic time series in Antarctica.



Photo courtesy of Svein Østerhus

Data from moored instruments



Building on the Filchner-Ronne Ice Shelf experience, the In-line Zpulse DCS was developed by Aanderaa. This versatile product is also well-suited for buoy applications, string solutions with the SeaGuard product line replacing and extending the successful 4100 DCS series.

The new In-line ZPulse DCS will simplify your sensor integration by offering a built-in multi-port sensor hub, allowing you to plug'n play additional measurement parameters (add up to 6 sensors e.g. conductivity, pressure, temperature, oxygen, etc.). The unit connects in-line to a combined mooring and signal cable and can be connected to a continuation cable at the opposite end. It can hold a load of up to 1300kg. Available data output formats are AiCaP, RS232 and RS422.



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