

LONGHORN

Long-term oceanographic monitoring in Hornsund

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Background and objectives

Hornsund is a fjord in southern Svalbard with several bays influenced by tidewater glaciers

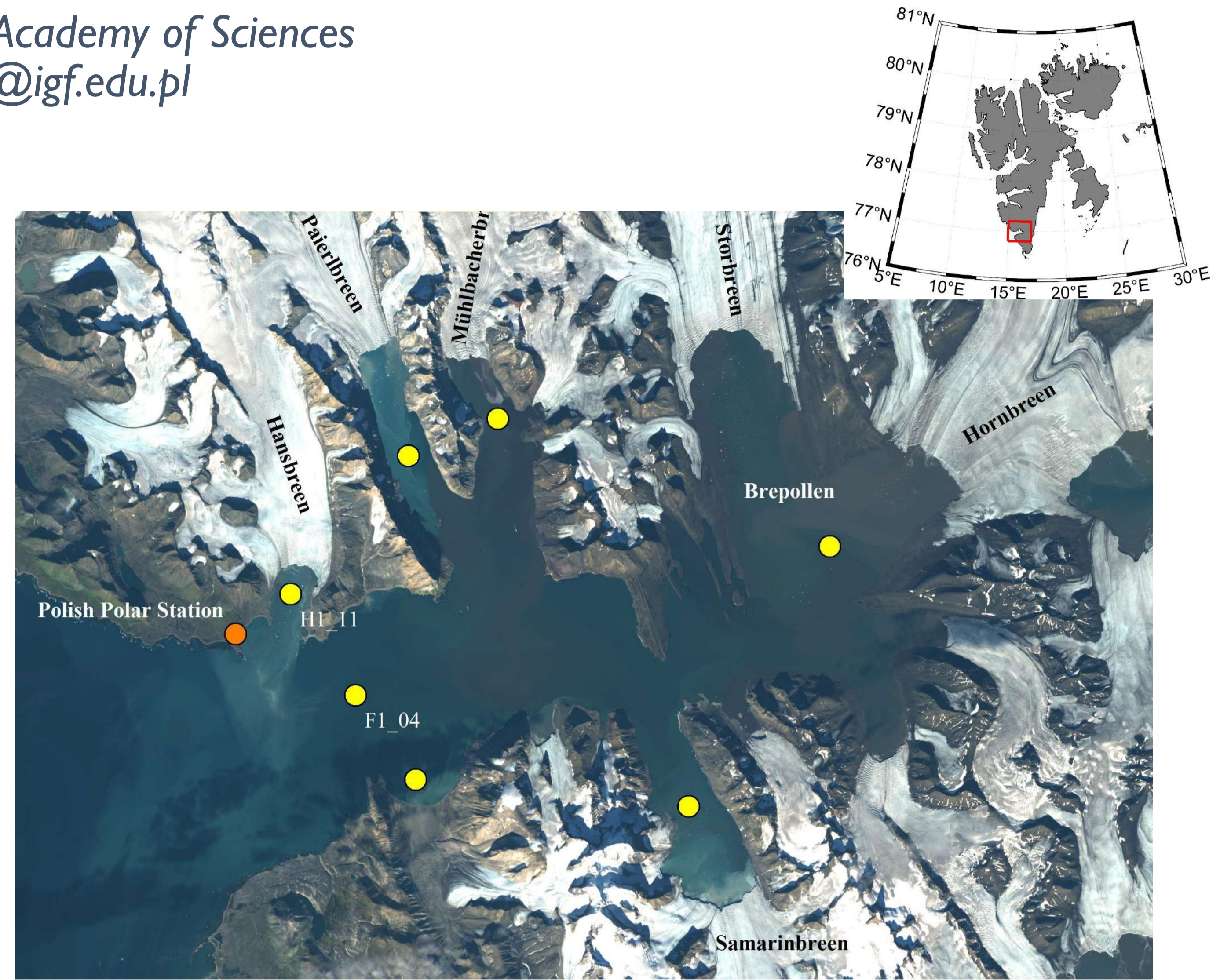
Hornsund is also home for the **Polish Polar Station** making it possible to conduct **consistent seasonal and interannual monitoring**

The long-term data set provides possibility to study **interactions between marine, glacial and coastal systems** in order to understand the influence of intensified glacier melt on supply of organic and mineral matter, freshwater discharge and biological productivity

Instruments used in field data collection include CTD, water sampling, sediment traps, underwater moorings and timelapse cameras

Monitoring has been **ongoing since 2015**

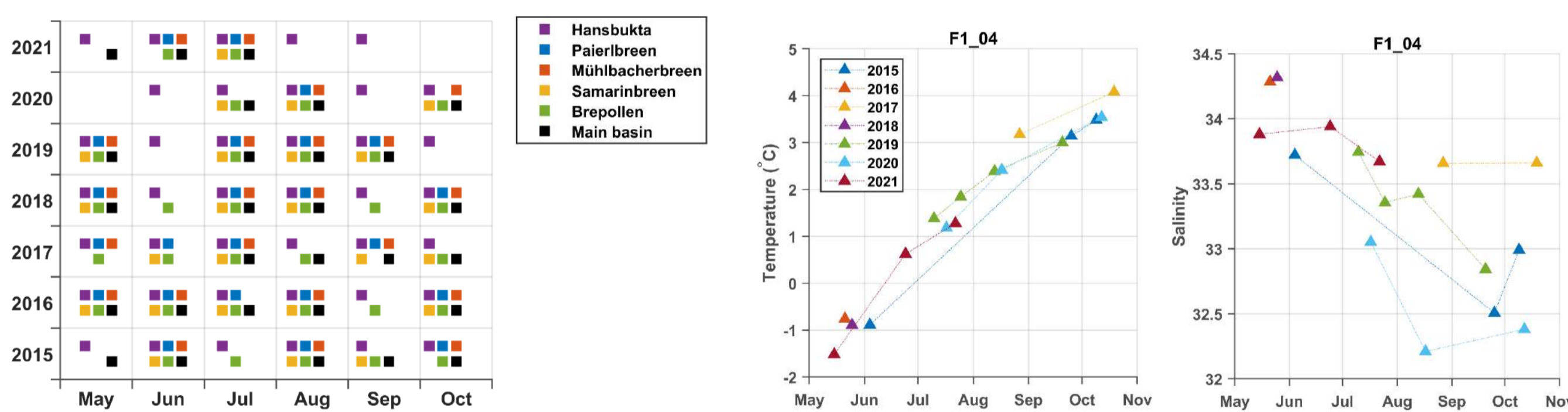
All **data is freely available** at the data repository of Institute of Geophysics Polish Academy of Sciences <https://dataportal.igf.edu.pl>



Above: Map of Hornsund with Polish Polar station (orange dot) and stations chosen for hydrographic monitoring from 2022 onward (yellow dots). In addition, hydrographic observations are conducted at four stations 500 meters from the glacier fronts. Image taken in August 2022 by Landsat.

Hydrographic properties in five different bays influenced by tidewater glaciers

Vertical profiles of salinity, temperature, turbidity and dissolved oxygen are collected in various parts of the fjord between May and October since 2015. Occasional observations during winter months are also available

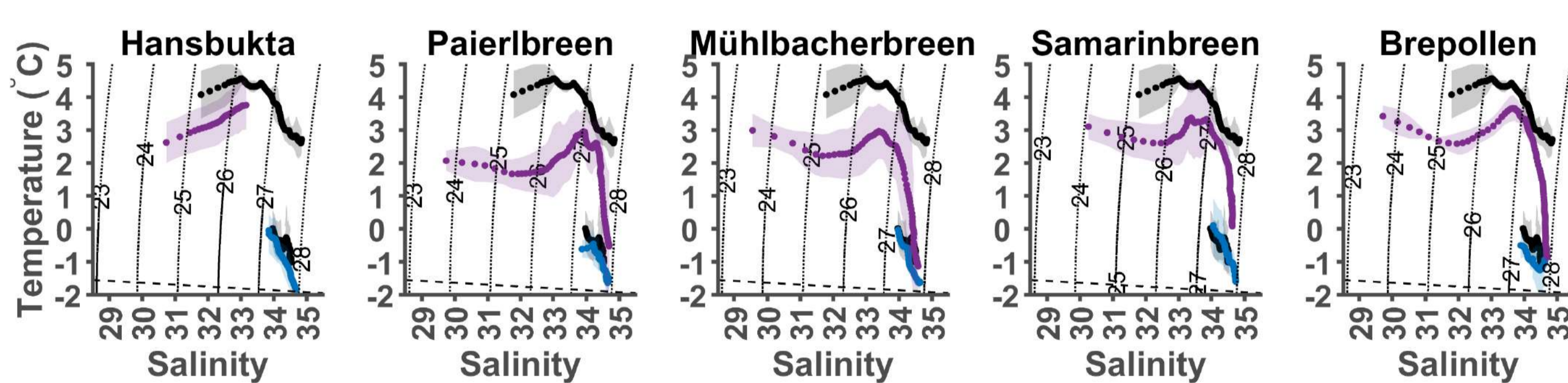


Above: Availability of hydrographic observations from six different areas in Hornsund

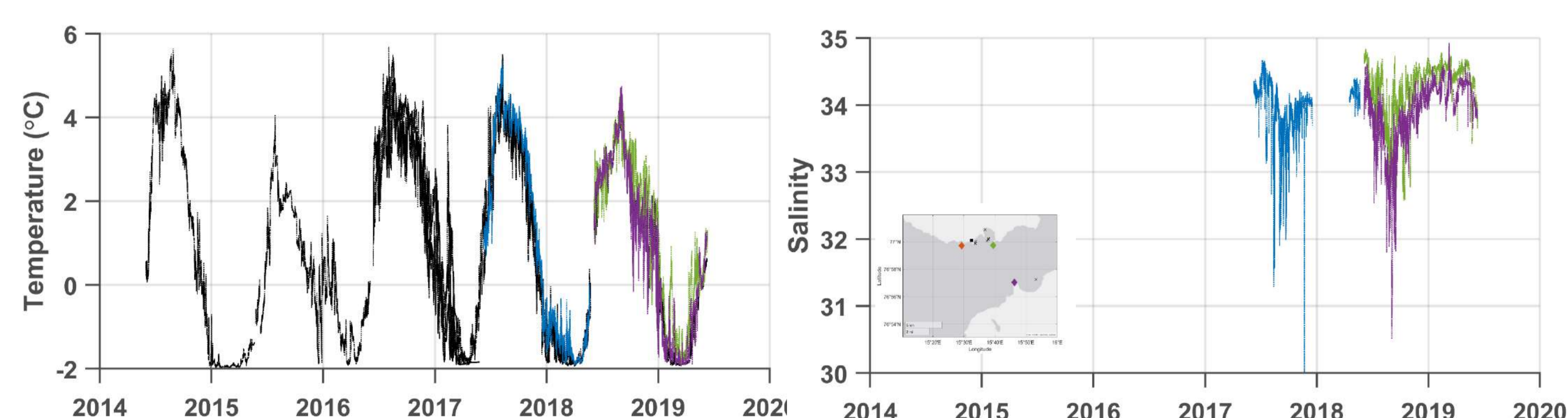
Above: Example of interannual and seasonal variability of temperature below 100 m and salinity above 30 m at the station F1_04.

Monitoring of glacial bays reveals how **the proximity of glaciers keep both temperature and salinity lower** than in the middle part of the fjord

The sills separating the bays from the main basin likely help to store part of the cold and saline water formed during the winter throughout the melt season



Above: Temperature-Salinity diagrams from five bays with tidewater glaciers in Hornsund. Average spring conditions (blue) are computed from all available data in May, average summer conditions (purple) are computed from data collected in August. As a reference, conditions in the main basin of the fjord (black) are represented by station F1_04.



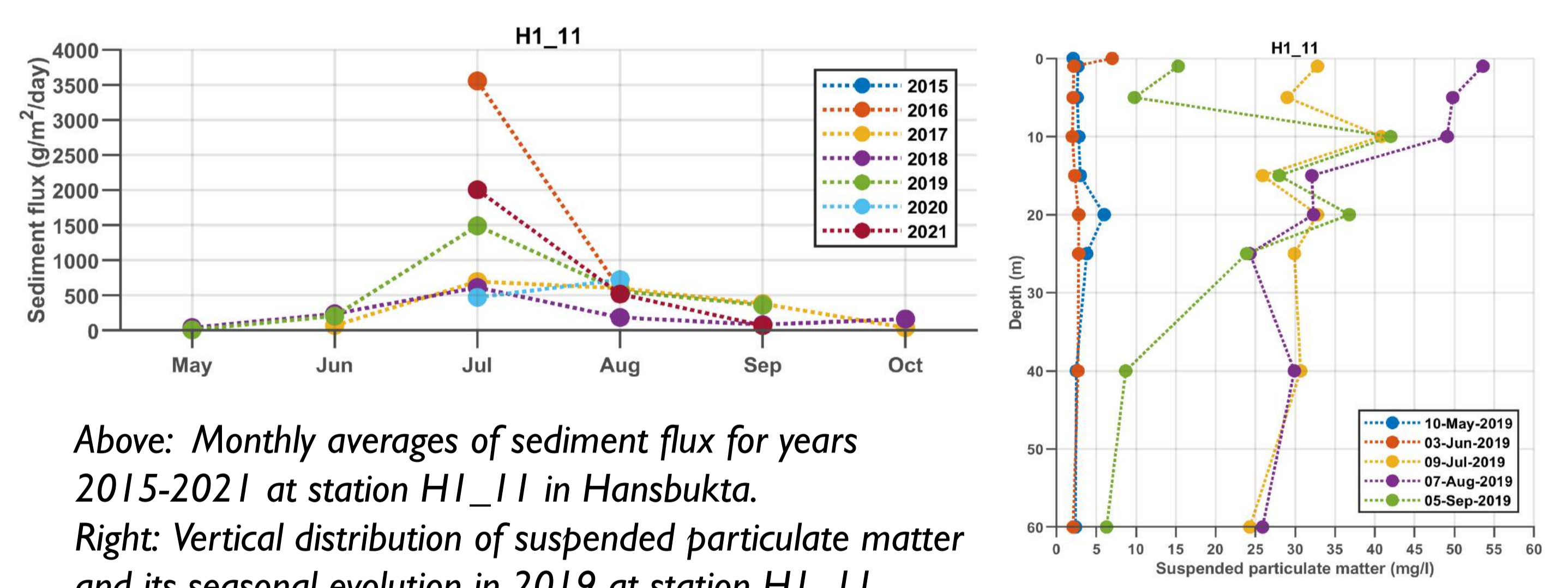
Above: Year-round temperature (left) and salinity (right) observations from bottom-moored instruments. The depth of the sensors varied between 16 and 23 m. The location of moorings with both temperature and salinity sensors are shown with coloured diamonds on the map. The locations of moorings with only temperature sensors are marked with black crosses. The location of Polish Polar Station is indicated with a black square.

Suspended particulate matter and sediment flux in Hansbukta

Meltwater discharge from tidewater **glaciers supply particulate matter** into the fjord

Seasonal and interannual variability of particulate organic and inorganic matter as well as sediment fluxes are monitored with bottom-moored sediment traps and water sampling in close proximity of glaciers

Most comprehensive data set is available from Hansbukta, where the sediment flux has its peak in July while the amount of suspended particulate matter remains high until September



Above: Monthly averages of sediment flux for years 2015-2021 at station H1_11 in Hansbukta.

Right: Vertical distribution of suspended particulate matter and its seasonal evolution in 2019 at station H1_11.

Other

All year observations of temperature, salinity, turbidity and photosynthetically active radiation (PAR) are obtained with bottom-moored instruments in selected locations

Sea ice conditions, glacier activity and coastal erosion are monitored in Isbjornhamna, the area around the Polish Polar Station, using autonomous time-lapse cameras

Underwater acoustic recordings of ambient noise as well as continuous **tide and wave measurements** have been ongoing since 2013