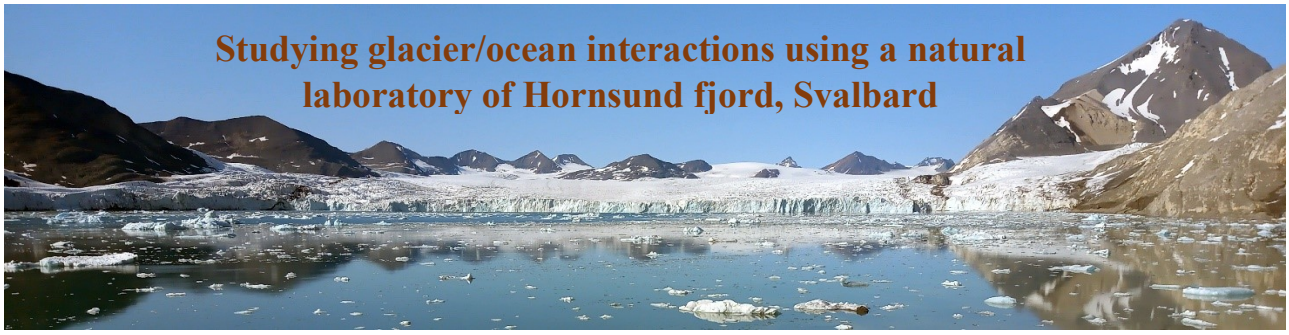

Global climate change is increasingly being felt in Poland and other parts of the world. Particularly striking is the rapidity of the changes taking place in the polar regions. The Arctic is warming four times faster than other parts of the globe. Rising temperatures are fueling the rapid disintegration and melting of glaciers, which are disappearing at an alarming rate. The disappearance of glacial ice is crucial not only for the environment itself, but also directly for our lives. Freshwater runoff from melting ice is causing ocean levels to rise. By the end of this century, the sea level rise will become a great threat not only to hundreds of millions of people living on the coasts, but also to entire countries and their economies. Moreover, freshening of the seas will also affect the Earth's global water cycle that will have a colossal impact on the occurrence of extreme weather events in different parts of the world.

Particularly important, interesting and yet poorly understood are the processes of ice loss at the contact with the warming ocean. These phenomena occur in areas that are usually far from civilization, plunged into darkness for almost half of the year, and very unfriendly to humans. The detachment of icebergs the size of multi-story buildings from the edges of glaciers, a process known as calving, poses an immediate threat to life, and is also one of the most important mechanisms for the disintegration of marine-terminating glaciers. The second most important process is the melting of ice deep below the water surface, which cannot be studied by commonly available methods such as satellite measurements. The processes of calving and submarine melting depend on many environmental factors, such as weather conditions or water temperature at the interface between glaciers and the ocean. What is more, the impact of calving icebergs on the sea surface and the supply of fresh water from underwater melting affect the surrounding environment. Unfortunately, calving and melting processes, as well as the factors affecting them and their environmental effects, are very poorly understood. The project aims at answering this urgent issue.

The project will take advantage of the unique features of Hornsund fjord, which is part of the Svalbard archipelago located in the Arctic. Hornsund is a home to the year-round Polish Polar Station that provides logistical support and conducts long-term monitoring of the sea, land and glacier processes. Hornsund has a number of bays with marine-terminating glaciers, which are close to each other, but are very different environmentally (e.g., water depth, size of glaciers, weather). All this makes Hornsund a natural laboratory for studying glacier/ocean interactions. The unique research features of Hornsund will be combined with new measurements in various glacier bays using state-of-the-art, innovative techniques. One example is year-round recordings of underwater sounds, the analysis of which will help in determining the ice loss at glacier/ocean boundaries. The project will answer some very important questions:

1. How do processes of glacier/ocean interactions work in different bays of Hornsund fjord and what are their causes and effects?
2. What happens at the glacier/ocean boundary during the polar night?
3. What are the interrelationships between various processes occurring in glacial bays and what is their significance for the glacier mass loss?

By answering these questions, the results from Hornsund will contribute to a better understanding, monitoring and prediction of glacier decay on a global scale.