Predicting changes in weather and climate is very important for life and human economic activity, thus information about current state of weather is provided in media as **weather forecasts**. The forecasts are produced after the analysis observations of many meteorological elements such as air temperature, atmospheric pressure, humidity, cloud cover and so on. Their continuous, local and regional variations are the biggest challenge in forecasting at long lead times.

Extremely frequent rainfalls, cold winters and spring floods in Europe are the consequence of changing the relationship between relatively stable Icelandic Low and Azores High. Since the air always flows from higher to lower pressure centers, the pressure gradient between the two regions causes stronger than normal westerlies from the eastern Atlantic towards the European continent. Depending on strength of the above-mentioned low and high, the velocity and direction of westerlies is changing, thus the air temperature and humidity over Europe and North America change as well. Over Poland, the air becomes dry and cold or mild and warm, which especially applies to winter (cold winters and thaws). The regular (in different time scales) air pressure differences between Icelandic Low and Azores High are called the **North Atlantic Oscillation (NAO)**. Because NAO has a great impact on the European climate (specially in boreal winters) the scientists try to predict its dynamics. Despite significant progress in this matter and the usage of increasingly sophisticated forecasting techniques, the level of correctness and lead time leave a wide field for further research.

So far most attempts to forecast the NAO index were based on the air pressure above the ocean obtained from the meteorological stations representing the centres of Icelandic Low and Azores High. These predictions are restricted up to two weeks. The proposed innovative approach to this problem is the use of information about the **dynamics of the ocean** and attempt to construct forecasts up to **three months into the future**. This is supported by the stable characteristics of ocean parameters in comparison with the meteorological data. When constructing a new method for predicting NAO we will use the information about ocean heat content within the northern part of the Atlantic Ocean basin. Initial data on the ocean surface topography will be obtained from the Prognocean Plus system, which works as a science-oriented service based on the high-performance supercomputing infrastructure.