



**International School on
INtegrated Environmental Studies in the Arctic (INES)
with respect to climate changes**

28 September – 2 October 2020

Lecture descriptions

Prior to the school, all participants will obtain a script, which will contain background knowledge, necessary to follow the lectures. The script will be made available to the participants after the decision letter in May.

School schedule

Block of lectures: 45' + break 15' + 45' + break 15'

Day 1 Oceanography basics and Arctic cryosphere + Biology/Ecology

9.00-11.00 Oceanography basics and Arctic cryosphere

Introduction of Arctic conditions: ice cover, glaciers, specific atmospheric condition

Lecturer: Adam Nawrot, Snow and Ice cover specialist

11.00-13.00 Marine and terrestrial food webs, external drivers (abiotic and biotic), and adaptations to changing conditions in the Arctic.

The marine and terrestrial ecosystem in European Arctic is very closely coupled, as most of the birds collect food at sea and nests on land, nutritioning the coastal tundra. The cold temperature forced slow metabolism, slow growth, and often large size in most of marine invertebrates in Arctic. This is changing now with ongoing warming. The Arctic food web gets more diverse, dispersed, with number of new species of small size.

Lecturer: Jan Marcin Węślawski, Marine Ecologist; Ulf Karsten, Marine biologist

13.00-14.00 Lunch break

14.00-16.00 Biodiversity changes and adaptations to changing climate.

Contrary to most other regions, the warming brings higher diversity to the Arctic, as the species, that were removed from the high North by glaciation are coming back with the rising temperature. This creates major alteration of the ecosystem, that are not straightforward to predict.

Lecturer: Jan Marcin Węślawski, Marine Ecologist; Ulf Karsten, Marine biologist

16.15-19.00 Workshop: Societal relevance of climate change in the Arctic.

We now realize that processes, which take place in the Arctic have significant influence on both marine ecosystems and human activities, which in turn have serious socio-economic

implications for the rest of the world, with special significance for Europe. Therefore, using interactive techniques, in groups, we will discuss and work on a project to increase general awareness of good practices in ocean and climate mitigation and adaptation actions, including broadly understood SDGs in relation to Arctic issues

Lecturers: Joanna Piwowarczyk, Social Ecology Expert; Tymon Zielinski, Researcher

19.15 **Icebreaker**

Day 2 **Physical and chemical atmospheric processes with focus on the Poles**

9.00 – 15.45 **Physical and chemical atmospheric processes, including long range and local sources of pollution.**

9.00-11.00 General atmospheric observation and remote sensing in the Arctic
Lecturer: Christoph Ritter, Leading lecture

11.00-13.00 The role of aerosol chemistry in the Arctic Climate: transport, local aerosol formation and implication for optical properties and heating rate.
Lecturer: Luca Ferrero, Environmental application lecture

13.00-14.00 **Lunch break**

14.00-16.00 Written in the ice. Past climate reconstructions from ice cores.
Lecturer: Carlo Barbante, Leading lecture

16.00-18.00 Ice core and sediment markers for reconstruction of paleoclimate and ice extent
Lecturer: Rita Traversi/Silvia Becagli, Environmental application lecture

Day 3 **Practical exercise day with measurements at sea on board a research vessel**

During the day long research cruise in the Gulf of Gdansk, onboard r/v Oceania, participants will have a chance to take active part in real oceanographic and atmospheric measurements. The participants will be able to work using state-of-the-art instruments and then will be involved in data analyses.

9.15-10.00 Transport to r/v Oceania

10.00 – 18.00 **Interdisciplinary measurements on board r/v Oceania.**

10.00-11.00 Boarding, travel to the stations

Familiarization with the rules and regulations onboard

11.00-18.00 Working in groups

12.00-13.00 Lunch break

18.00-18.30 Transport to the IO PAN

Day 4 **Long-Term Evidences**

9.00- 16.00 **Long-term observations and trends in aerosols, temperature, precipitation, clouds, radiation ice and snow cover/extent.**

Sustained, accurate, long-term global observations of key variables in the climate system are essential to describe seasonal-to interannual or even decadal climatic modulation or trends in the Arctic about aforementioned topics with examples. The main goal is working with the quality-controlled collection that documents changes in the environment as well as the

background data from previous day for experimental studies. This day will be separated into blocks of activities.

16.00-17.00 **Lunch break**

Day 5 **Practical exercises on climate data**

9.00-13.00 **Real data analyses.**

During this day, participants will be divided into groups in order to complete small research projects, based on real data, either collected during the measurements on r/v Oceania, or, in case of lack of such data, using data sets prepared by the organizing team. At the end of the day, each group will present the outcome of their project. Each group will be assigned to a lecturer.

13.00-14.00 **Lunch break**

14.00 **Closing of the school**