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

Third edition: Climate and ocean processes in shaping the future environment.

Hybrid event

26 - 30 September 2022

The Arctic is undergoing rapid climate changes; polar regions have been warming at more than twice the global average over recent decades leading to the "Arctic Amplification".

Atmosphere, ocean, land surfaces, sea ice and ice sheets changes in polar regions result from numerous interactions, both radiative and non-radiative, biological, geological and also involving the social aspects. Due to the complexity of the underlying processes, the climate dynamic in that area will also reflect on changes outside the Arctic environment. Therefore, since the Arctic is the key area for the future of our Earth, the scientific research in the Arctic is carried out with an interdisciplinary approach providing a holistic view of climate evolution.

The main goal of the School is to facilitate international and interdisciplinary cooperation in studies on climate and ocean processes in shaping the future environment with special attention to the Arctic natural environment and both local and global societies.

We except that participants of the International School on Integrated Environmental Studies in the Arctic will understand the need for interdisciplinary scientific approach to discuss issues connected to the both, climate changes and ocean roles as a wider perspective of numerous interactions related to mentioned elements of earth's system in polar regions.

The 5-day program will cover a wide range of disciplines: climatology, atmospheric and marine chemistry, biology and physics, cryosphere, studies of marine ecosystems in the Arctic and its socio-economic development.

Each day of on-side day we will provide 2 or 3 lectures (each 60' long) and dedicated practical classes on board of r/v Oceania, ship belonged to the Institute of Oceanology PAN (all day cruise) where you will be working in small teams with real instruments with guidance from eminent scientists and group mentors, on interdisciplinary projects.
This practical course is designed for early career scientists (graduate students, PhD students and young researchers, up to 2 years after completion of PhD) who want to gain confidence, experience and in-depth knowledge about the interdisciplinary Arctic, with a special emphasis on science fieldwork.

The School is co-sponsored by **Aerosol d.o.o., Slovenia,** a developer and manufacturer of Aethalometer, Total Carbon Analyzer, DRI-2015 OC/EC Analyzer and associated instrumentation. Aerosol is focused to research and development in the field of carbonaceous aerosols; and **project Oceanographic Data and Information System eCUDO.pl,** No POPC.02.03.01-00-0062/18-00, co-financed from European Regional Development Fund, Digital Poland Operational Program, 2.2 Priority Axis.

The School comprehensive program includes the following research topics:

- Oceanography basics and Arctic cryosphere
- Marine and terrestrial food webs, external drivers (abiotic and biotic), and adaptations to changing conditions in the Arctic.
- Societal relevance of climate change in the Arctic.
- Biodiversity changes and adaptations to changing climate.
- Physical and chemical atmospheric processes, including long range and local sources of pollution.
- Long-term observations and trends in aerosols, temperature, precipitation, clouds, radiation and ice and snow cover/extent.
- Exercise on atmosphere, oceans, biology, ecology and chemistry on-board r/v Oceania

ORGANIZING COMMITTEE

Luca Ferrero; University of Milano-Bicocca
Paulina Pakszys; IO PAN
Christoph Ritter; AWI
Tymon Zielinski; IO PAN

LECTURERS AND MENTORS

Anna Bulczak; IO PAN
Sandro Dahlke; AWI
Miroslaw Dareki; IO PAN
Agata Dragan-Gorska; IO PAN
Christoph Ritter; AWI
Jan Marcin Weslawski; IO PAN
Joanna Piwowarczyk; IO PAN
Kai Bischof; University of Bremen
Aleksandra Koroza; IO PAN
Karol Kulinski; IO PAN
Luca Fererro; University of Milano-Bicocca
Marcin Wichorowski; IO PAN
Paulina Pakszys; IO PAN
Jan Wejer; IO PAN
Roberta Zangrando; University of Milano-Bicocca
Tymon Zielinski; IO PAN

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IMPORTANT DATES AND DEADLINES

- Registration opening 13 June 2022
- Registration closing 31 August 2021
- Decision Letter 5 September 2022
- The school 26 - 30 September 2022

SCHOOL LANGUAGE

All classes and activities will be run in English.

LOCATION

The school lecturers will be held online within ZOOM platform, also on PADLET as an additional tool for posters/idea/presentation. School is hosted by the Institute of Oceanology, Polish Academy of Sciences in Sopot, Poland, and here will be provided other activities within a school.

RESEARCH BACKGROUND AND INTERESTS SUBMISSION

School webpage: www.oceanofchanges.com/INES2022
In any case please contact Paulina Pakszys (email: pakszys@iopan.pl)

This initiative is a joint effort of the Institute of Oceanology Polish Academy of Sciences, University of Milano-Bicocca, Alfred Wegener Institute, University of Florence, Norwegian Institute for Air Research and Norwegian Polar Institute.

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SCHOOL PROGRAM WITH LECTURE DESCRIPTIONS

MONDAY, 26 SEPTEMBER 2022

9:00-10:00 I LECTURE: SCHOOL OPENING WITH GENERAL OVERVIEW OF SCHOOL AND SCHOOL TOPIC

School opening by Luca Ferrero from University of Milano-Bicocca, Paulina Pakszys from IO PAN, Christoph Ritter from AWI and Tymon Zielinski from IOPAN. We will provide short lecture about general interaction between ocean and atmosphere (Tymon), rising key atmospheric topics in the Arctic (Luca),basic properties of the Arctic planetary boundary layer (Christoph) and introduction to r/v Oceania with rules on-board (Paulina).

Lecturers: Luca Ferrero, UNIMIB; Paulina Pakszys, IO PAN; Christoph Ritter, AWI; Tymon Zielinski, IO PAN.

10:00-10:30 Q&A and BREAK

10:30-11:30 II LECTURE: Satellite altimetry applications in the Arctic: ocean, sea ice and snow on ice

This lecture will explain how satellite altimetry is used to retrieve sea surface height and sea ice thickness in the Arctic Ocean. The long-term changes of sea level, surface ocean geostrophic circulation and ice thickness, related to the climate change, will be discussed.

Lecturer: Anna Bulczak, IO PAN

11:30-12:00 Q&A and BREAK

12:00-13:00 III LECTURE: Overview of the atmospheric measurements during the international Polar drift campaign MOSAiC

During the international MOSAiC campaign between fall 2019 to fall 2020 numerous atmospheric measurements directly in the central Arctic have been performed. In this talk an overview of the MOSAiC expedition is given. Further, some atmospheric measurements like sounding via balloons and UAV or in the Arctic boundary layer will be introduced. The data from the campaign show the complexity of the Arctic atmosphere on various scales.

Lecturer: Sandro Dahlke, AWI

13:00-13:30 Q&A and BREAK

13:30-14:30 LUNCH

18:00 - ... ICEBREAKER (at IO PAN)

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TUESDAY & WEDNESDAY, 27-28 SEPTEMBER 2022

Half group Activities on-board r/v Oceania (all day cruise)
Practical course on-board assisted by Oceania staff and Oceanographers from IOPAN. You will learn exactly the entire process: from the preparation of the equipment, to the measurement, to the pre-treatment of the collected material.

Lecturers onboard: Marcin Stokowski, Agata Dragan-Gorska, Jan Wejer, Paulina Pakszys, Aleksandra Koroza; IO PAN

Half group lecturers at the Institute
9:00-10:00 IV LECTURE: Arctic Amplification: the complexity of atmospheric feedbacks
Arctic Amplification is one of the most important climatic issues of the Arctic environment. It is due to several factors and brings to climatic feedbacks that enhance it and reflects on other areas of the globe. The lecture will focuses on the atmospheric processes related to the Arctic Amplification and the climatic effect in the Arctic itself and regions far from the Arctic to open a discussion about future studies required to improve the actual knowledge.

Lecturers: Luca Ferrero, UNIMIB

10:00-10:30 Q&A and BREAK

10:30-11:30 V LECTURE: Organic particulate matter in Arctic Atmosphere
Atmospheric Aerosols or particulate matter (PM) are small pieces of solid or liquid substance in the air. PM characteristics depend on their size, origin, and chemical composition. Sources of PM are both natural and anthropogenic. The organic fraction of atmospheric aerosols includes primary biological aerosol particles (PBAPs) and organic contaminants (OCs). PBAPs are relevant in cloud processes and may play an important role in global climate changes. They can act as cloud condensation or ice nuclei and the impact of CCNs and INs on radiative forcing is not yet fully understood. OCs emitted in the atmosphere through long range transport from mid-latitudes reach the Arctic. According to the most recent assessment by the IPCC, warming occurs faster and with greater magnitude in the Arctic compared to other parts of the world. Climate change in the Arctic is resulting in extreme events: sea ice retreat, melting glaciers, thawing permafrost. Such changes also affect the environmental distribution and fate of contaminants because the most important drivers of OCs transport, partitioning, and transformation are their physical–chemical properties, many of which depends on temperature.

Lecturer: Roberta Zangrando, CNR ISP

11:30-12:00 Q&A and BREAK

12:00-13:00 VI LECTURE: Carbon cycle in the changing Arctic
The Arctic is one of the regions, where the effects of climate change are the most prominent. This also refers to the carbon cycle and the marine CO2 system, for which shrinking of the sea ice extent, melting glaciers and seawater freshening, as well as changes in the ecosystem productivity and rising pressure from the CO2 increase are the main drivers of changes

Lecturer: Karol Kulinski, IO PAN

13:00-13:30 Q&A and BREAK

13:30-14:30 LUNCH

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THURSDAY, 29 SEPTEMBER 2022

9:00-10:00 VII LECTURE: Climate - biodiversity and the Arctic
The accelerated global warming reported from the Arctic region impacts heavily on the marine ecosystems - not only the sea ice melt, but number of temperature- correlated phenomena are reshaping this part of the globe.

Lecturer: Jan Marcin Weslawski, IO PAN

10:00-10:30 Q&A and BREAK

10:30-11:30 VIII LECTURE: Marine underwater vegetation - A harbinger of Arctic change?
As ecosystem engineers in many Arctic fjord systems, seaweeds are of utmost ecological relevance providing habitat and food to a vast number of associated organisms. Many fjords, however, are in the process of transition from an Arctic to a boreal state, which manifests in a marked reduction of ice influence. Hence, a critical question in Arctic fjord ecology is whether benthic seaweed production will increase with reduced sea ice cover and higher water temperatures along the borealization gradient or whether e.g. increased turbidity and less light caused by melting glaciers may counteract this? Here we will discuss the latest trends in the development of seaweed communities in Arctic fjord systems and its potential implications to ecosystem function and coastal livelihoods.

Lecturer: Kai Bischof, University of Bremen

11:30-12:00 Q&A and BREAK

12:00-15:00 IX LECTURE: WORKSHOP ON DATA COLLECTED DURING THE CRUISE
Together with the scientists who conducted classes on board s/y Oceania, we will try to summarize the collected and obtained data and the further aspect of how to apply them in everyday scientific work and the stages/method of their analysis.

Lecturers: Miroslaw Darecki, Tymon Zielinski, Paulina Pakszys, Aleksandra Koroza, IO PAN

13:30-14:30 LUNCH (in between)

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FRIDAY, 30 SEPTEMBER 2022

9:00-10:00 VII LECTURE: Decade of data – quality, availability of the oceanographic data.
Unprecedented growth of data volumes, ubiquity of data driven services and development of data management technologies is changing the way we are living. These "data revolution" has great influence on science enabling new paradigm of research: intensive data analysis. Data collected once have the great potential of exploitation far beyond the primary intended purpose. To unblock this potential and explore much of the value of data resources, research communities are using the best efforts to raise findability of data resources, make them accessible, build common sense on standards, assure data interoperability and finally foster people to reuse precious data resources. The Svalbard Integrated Arctic Earth Observing System (SIOS) is establishing a regional observational system for long term measurements in and around Svalbard, addressing Earth System Science (ESS) questions related to Global Change. Organizations contributing to SIOS provide data resources and tools to explore them. SIOS promotes free and open access to data to any person or any organization interested in.

Lecturer: Marcin Wichorowski, IO PAN

10:00-10:30 Q&A and BREAK

10:30-11:30 VIII LECTURE: Sustainable world in times of global changes
We live in a world where environmental data is increasingly being amassed and models are generating finer scale and increasingly dense numbers of outputs, resulting in the production of high level scientific information on climate and ocean. However, the knowledge generated is often inaccessible, incomprehensible and misunderstood by society. During the course we will discuss the need for sustainability actions, as well as climate change impacts on global environment and the humans.

Lecturers: Tymon Zielinski and Joanna Piwowarczyk, IO PAN

11:30-12:00 Q&A and BREAK

12:00-13:00 IX LECTURE: OPEN DISSCUSSION

Lecturers: Luca Ferrero, UNIMIB; Paulina Pakszys, IO PAN; Christoph Ritter, AWI; Tymon Zielinski, IO PAN.

13:00-13:30 Q&A and BREAK

13:30-14:30 LUNCH

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