International School on INtegrated Environmental Studies in the Arctic (INES)

with respect to climate changes

INES plan of fall webinars 2020.
28 September – 2 October 2020

Seminar times (CEST): 10:00 – 11:00 and 11:30 – 12:30.

28 September 2020

1. It is high time for sustainability science in the Arctic by Tymon Zielinski; Institute of Oceanology PAN.

https://cutt.ly/efFzTE9

In environmental studies, we apply sophisticated tools, systems and applications for storing, processing and maintaining data and then publishing the outputs of our analyses. However, the knowledge we generate is often inaccessible, incomprehensible and misunderstood by large parts of society. During the webinar, using the philosophy of the sustainable development, I discuss the importance of the change of research/education approaches in order to tackle current and future environmental challenges. I introduce such concepts as sustainability, sustainable science and quality education, all based on critical thinking.

2. Chemical fingerprints for paleoclimate and present climate reconstruction at Poles from Ice core measurements by Carlo Barbante; Institute of Polar Sciences – CNR and Ca'Foscari University of Venice.

https://cutt.ly/GfFxiCf

The primary purpose of the paleoclimatology is the analysis of the archives that preserve the information of the climate changes in the past, and translating of the measured variables present in encrypted form, into useful data. This is of crucial importance not only for obtaining information about the principle of functioning of the climate system, but also for learning about similar changes that are happening today, or might happen in the future.
The abrupt climate change events that happened during the Last Glacial Period, are the most remarkable variations of the climate in the past and are well recorded in ice cores from the Poles. These events are characterized with very rapid temperature, accumulation rate and atmospheric circulation variations over short time, sometimes happening only in a few decades, with large temperature shifts.

29 September 2020

3. Aerosol and cloud feedbacks on climate in the Arctic by Luca Ferrero; University of Milano-Bicocca.

https://cutt.ly/ifFxs9S

The Arctic is warming at a double rate with respect to the rest of the globe (Arctic Amplification). Many factors contributes to this Amplification. Most of them are related to the feedbacks induced by the direct aerosol interaction with the solar radiation and the clouds influence on both shortwave and longwave (terrestrial) radiation; the cloud presence itself is linked to the aerosol properties. Thus, the knowledge of the role played by the aerosol is crucial for

understanding the actual climate change in the Arctic and also for predictions on future scenarios. This talk will resume the most important aerosol properties, evolution, interaction and feedbacks in the Arctic area discussing them in the global context of the climate change.

4. Divergent consensuses on Arctic Amplification influence on mid-latitude severe winter weather by Judah Cohen; Atmospheric and Environmental Research/MIT.

https://cutt.ly/yfFxzio

The Arctic has warmed more than twice as fast as the global average since the late 20th century, a phenomenon known as Arctic amplification (AA). Recently, there have been significant advances in understanding the physical contributions to AA and progress has been made in understanding the mechanisms linking AA to mid-latitude weather variability. Observational studies overwhelmingly support that AA is contributing to winter continental cooling. While Arctic warming is strongest at the surface, it extends throughout the mid-troposphere. In addition, the sea ice loss and associated warming is not uniform across the Arctic, but rather regionally focused including in the Barents-Kara Seas, a key region for disrupting the polar vortex. The probability of severe winter weather increases across the Northern Hemisphere continents following polar vortex disruptions. While some model experiments support the observational evidence, the majority of modeling results show little connection between AA and severe mid-latitude weather. Rather the excess warming generated in the Arctic due to sea ice loss and other mechanisms is not redistributed vertically in model simulations, but rather horizontally suggesting the export of excess heating from the Arctic to lower latitudes. Divergent conclusions between model and observational studies, and even intra-model studies, continue to obfuscate a clear understanding of how AA is influencing mid-latitude weather.

30 September 2020

5. Why is Atlantic water important in the Arctic? - Its links to climate, sea ice, tidal glaciers and Arctic ecosystems by Agnieszka Beszczynska-Möller; Institute of Oceanology PAN.

https://cutt.ly/qfFxnTH

Climate change is most pronounced in the Arctic. The Arctic Ocean, which covers less than 3% of the Earth's surface, is highly sensitive to abnormal conditions in lower-latitude oceans. The Arctic Ocean provides an oceanic pathway between the Pacific and Atlantic oceans and it also receives an Atlantic water (AW) input, modifies it, and returns back to the North Atlantic. Two branches of Atlantic water, the Fram Strait branch (FSB) and the Barents Sea branch (BSB), carry an enormous amount of heat and salt into the the Arctic Ocean. They also bring a continuous supply of nutrients for primary production (phytoplankton growth) and transport living organisms of lower-latitude Atlantic origin into the Arctic.
Dramatic warming of the AW inflow to the Arctic observed in the recent decades has a profound impact on ocean climate and dynamics, and shrinking sea ice cover in the eastern Arctic Ocean. Abnormal influx of warm and salty AW destabilizes the water column and increases mixing. The cool, fresh protective upper ocean layer is weakening, warm Atlantic layer is shoaling and in effect, oceanic heat becomes available for intensified sea ice melting. When sea ice declines, ocean underneath absorbs even more solar radiation and warms further, which melts even more ice. Warmer AW that enters Arctic fjords is a trigger of accelerated melting and calving of marine-terminating glaciers. Changes in ocean temperature, stratification, mixing, and biogeochemistry caused by varying Atlantic inflow are reflected at various levels of the Arctic ecosystem. Water mass and albedo changes in the Arctic Ocean may affect local and global climate, including the Atlantic meridional overturning circulation.
The lecture will introduce the oceanic exchanges in the Arctic, describe pathways and variability of the Atlantic water inflow, and review its impacts on different components of the Arctic system, including climate, sea ice, tidal glaciers and ecosystem.

6. Climate change at Ny-Alesund by Christoph Ritter; Alfred Wegener Institute.

https://cutt.ly/RfFxvyF

Ny-Alesund is a research supersite in Spitsbergen, an archipelago in the European Arctic. In the talk the relevance of atmospheric research in the Arctic will be outlined. Next, briefly, the history of the settlement Ny-Alesund, the research programs and stations will be introduced. A focus will be laid to current international atmospheric research activity. Climate change in Ny-Alesund is clearly visible by an increase of winter temperature, an increased active layer of the permafrost ground and the retreat of glaciers. However, local, regional and global processes act together, hence the causes of this climate change also involve changes in the atmospheric circulation on a regional scale. In this talk some recent publications on this topic will be introduced to provide a first overview on atmospheric research in this region.

7. BONUS webinar: Multiple faces of carbonaceous matter: High time resolution measurement of TC, OC and BC in South California by Klemen Kunstejl; Aerosol Company, the developer and manufacturer of Magee Scientific instruments.

https://cutt.ly/efLu7JU **13:00- 13.30 (CET)**

During this webinar, we will briefly describe all important milestones in the history of Magee Scientific/Aerosol companies, summarize the key technologies and overview the "what´s new" in the product portfolio. The second part of the presentation will focus on a newly developed high time-resolution online TC-BC method. Namely with an interconnection of Total Carbon analyzer TCA08 and Aethalometer® AE33, a revolutionary OC/EC analyzer known as Carbonaceous Aerosol Speciation System CASS is obtained for determination of BC, BrC, TC, and OC content of suspended particles in near-real time. This CASS instrument was used for carbonaceous aerosol measurement in central Los Angeles. In collaboration with the South Coast Air Quality Management District, an air monitoring campaign was conducted from March 2018 to December 2019. The diurnal patterns for eEC and eOC concentrations are compared for different seasons. The effect of morning rush hour peak in eEC is particularly pronounced in colder months, when higher traffic density is coupled with shallower mixing height. During warmer months eOC concentrations exhibit mid-day peak, which is associated with generation of secondary OC through photochemical processes in the atmosphere.

1 October 2020

8. Is ice needed in the Arctic - for what? by Jan Marcin Weslawski; Institute of Oceanology PAN

https://cutt.ly/PfFxQGP

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.

9. Ocean/atmosphere interaction in polar areas through the study of chemical and biological parameters by Silvia Becagli; University of Florence.

https://cutt.ly/JfFxTEd

In this seminar will be given hints on the ocean-atmosphere interaction in Polar Regions with particular attention to the interconnections between oceanic primary production and atmospheric gaseous and particulate compounds.
The concentration of the atmospheric compounds arising from phytoplankton activity will be investigated with respect to oceanic parameters (chlorophyll and primary productivity, in turn related to the phytoplankton taxonomic composition and physiological state), to the variations of solar and photosynthetically active radiation, and to the dynamics of sea ice. These processes have a strong climatic relevance due to the aerosol interaction with solar radiation, its possible interaction with cloud formation and properties, in a region where other aerosol sources are very limited. Besides, understanding and quantifying the correlation between atmospheric compounds and oceanic primary productivity (affecting the oceanic and atmospheric CO2

budget) has a relevant importance in studies on global change because this interaction is influenced by, and in its turn influences, climatic variations.

2 October 2020

10. Atmosphere/snow exchanges in the Antarctic ice sheet by Rita Traversi; University of Florence.

https://cutt.ly/9fFxU0w

The knowledge of the chemical composition and the physical parameters of the atmospheric aerosol in Antarctica is pivotal to study major natural sources, tropospheric transformation processes and prevailing long-range transport patterns of the aerosol components.
To this purpose, atmospheric aerosol is collected and analysed in current times (through devoted sampling and analysis campaigns) as well as "reconstructed" from chemical stratigraphies obtained from firn/ice cores drilled in strategic drilling sites in Antarctica.
Nevertheless, inferring the chemical composition and physical properties of past atmosphere is hindered by complex interactions occurring at the snow/atmosphere interface, such as adsorption and reactions on the crystal surfaces, photochemical reactions, interstitial diffusion and advection of air and trace gases between individual crystals and through the snow layers.
These processes must be understood in order to evaluate the impact of atmospheric chemistry on snow composition and viceversa, i.e. to interpret more reliably the chemical records from ice cores.
In this seminar, an overview of the most relevant processes taking place at the atmosphere/snow interface and their impact on polar atmospheric and ice core studies will be provided.

11. The water cycle of Svalbard catchments by Adam Nawrot and Bartlomiej Luks; Institute of Geophysics PAN.

https://cutt.ly/BfFxOgc

The Arctic is a polar desert full of water in its different phases. Glaciers, ice, snow, rain and flowing water are all parts of the water cycle, which is important for both biotic and abiotic environment. Water transports nutrients and changes the Earth's surface.
The webinar will focus on the Svalbard archipelago. You will learn how glacierized and non-glacierized catchments differ from each other, what role is played by snow and rain, what can be brought to the Arctic by the wind, how much 222Rn can be found in subglacial water and how to do measurements in this unique polar ecosystem.