Second Inter-PHD seminar @ DAIS

On May 17th, the second inter-PHD seminar will be organized at the DAIS. This event offers a chance for Ph.D. students of different Ph.D. degrees to share knowledge and foster interdisciplinarity, and it is the second of a series we hope to organize. Ph.D. students will present their field of work in a tutorial way considering the mix of competences of the audience. All Ph.D. students are invited to participate.

May 17th : 9.30 - 13.00
Room: C, Zeta building (65 places)

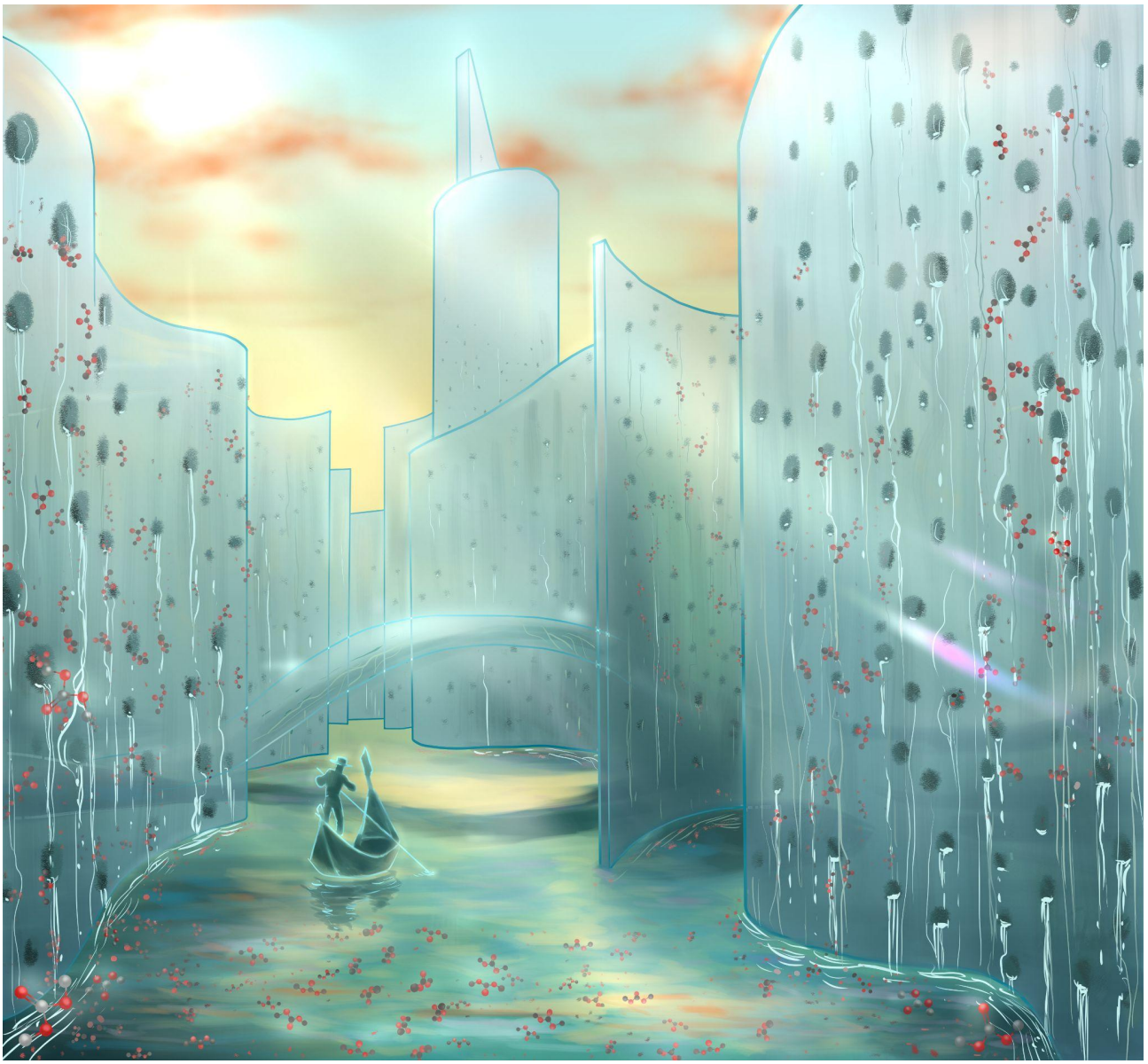
Program:

Giacomo Trapasso, Ph.D. student in Environmental Sciences.

Title: Green solvents in membrane production

Abstract: Chemistry is usually associated with environmental and health risk, also due to the notorious disasters happened over the last decades: Minamata Bay in 1945, Seveso in 1976, Bhopal in 1984 and the current problem of microplastics are only few examples. Starting from the mid XX century, the long-term consequences of human rapid industrial development could not be ignored anymore, leading scientists to research more sustainable processes for the production of chemical products. Over the years different principles have been proposed that serve as guidelines for a green transition towards a safer and cleaner chemistry. The so-called “12 Principles of Green Chemistry”, introduced by Paul Anastas and John Warner in 1998, were the foundations on which modern sustainable chemistry have grown on. These principles were then expanded, enabling scientists to protect and benefit the economy, people and the planet by finding creative and innovative ways to reduce waste, conserve energy, and discover replacements for hazardous substances. In this scenario, membrane science could play a crucial role, being a sustainable technology that offers many benefits, among which low energy consumption, excellent selectivity and flexibility, minimal maintenance, and simple operational conditions.

Membranes are thin semipermeable barriers that selectively allow separation of compounds present in a gas or a liquid. Processes that rely on these materials are employed in a wide variety of industrial applications such as hydrogen isolation, CO_2 removal, hemodialysis, wastewater treatment and many others. Their use allows energy savings on the production cost compared to other traditional separation technologies. Nevertheless, the preparation of membranes does not always fulfill sustainability obligations, especially when considering the commonly employed solvents. In this talk we explore how green chemistry can be applied to design safer chemical and industrial processes with the aid of sugar-derived polymers and sustainable solvents.



Fatima Tehreem, Ph.D student in Computer Science.

Title: Polarization Filter Array camera and its Applications

Abstract: Polarization is one of the basic properties of light and it has been proved quite useful in numerous machine vision tasks. With the development of Polarization Filter Array (PFA) cameras the acquisition process of light polarization has become fast, easy and affordable. PFA cameras are now readily available and they are being used in computer vision applications more than ever. This talk provides an introduction to the imaging technology being used in PFA cameras and applications where using PFA cameras can provide significant performance improvement as compared to using normal color cameras.

Francesco De Rovere, PhD student in Polar Sciences

Title: Transition of Kongsfjorden's climate from Arctic to Atlantic: water mass variability and atmospheric drivers

Abstract:

Since the mid-1980s, Arctic air temperature has been warming at a much higher rate than the global mean, a process termed *Arctic Amplification*. The Arctic ocean has accumulated heat as well and it is experiencing an *Atlantification* process, i.e. the advance of the typical Atlantic regime toward higher latitudes. Understanding the future evolution of the Arctic thus requires knowledge about the interactions between Atlantic and Arctic water masses at high-latitudes.

Kongsfjorden is an Arctic research hotspot located in the north-western region of the Svalbard archipelago. Its hydrography is influenced by the warm and saline Atlantic waters and the cold and fresh Arctic waters. The recent hydrographic changes in Kongsfjorden as well as their atmospheric forcing mechanisms are investigated by means of oceanographic and atmospheric observations from *in-situ* monitoring programs and reanalysis products. Firstly, the recent water mass variability and long-term temperature and salinity evolutions are examined. Secondly, the large-scale oceanic and atmospheric drivers to the observed variabilities are inspected. Finally, Atlantic water intrusions in the fjord are investigated to define the mechanisms of such events and explain its large inter-annual variabilities. Interpreting Kongsfjorden's dynamics is crucial to understand future evolution of this fjord in a much warmer Arctic, under the influence of *Atlantification* and *Arctic amplification*. Furthermore, fjords are common modulating systems for land-sea-ice interactions in Arctic environments, and insights from this research can also be indicators for the other similar shelf-fjord systems in the Arctic.

Matteo Mastropierro, Ph.D student in Science and Management of Climate Change

Title: On the response of Amazon basin vegetation to El Niño and mean-state changes in CMIP6 models under the SSP5-8.5 scenario

Abstract: The Amazon basin rainforest plays a fundamental role in the Earth system due to its importance for the global carbon cycle. If and by which extent the Amazon rainforest will remain a net carbon sink still remains an open scientific question with many uncertainties, with some evidence indicating a less effective sink under increased cumulative emissions and radiative forcing scenarios compared to the historical conditions. Water availability and Soil Moisture influencing Amazon vegetation productivity are mainly related to the El Niño Southern Oscillation (ENSO), responsible for a vast part of the observed interannual variability (IAV) in tropical biomes. Both a projected change in ENSO properties (like SST amplitude, SSTA) or changes in mean state atmospheric conditions could have important implications on its teleconnection patterns and impacts in the Amazon region. To further elucidate the relative importance of ENSO and mean state climatic drivers with respect to land carbon uptake in the Amazon basin, we focus our research on the Net Ecosystem Productivity (NEP) responses to climatic change and variability. Within this research, we used thirteen Earth System Models (ESMs) participating to the CMIP6 project with the aim of exploring their different representation of Amazon vegetation carbon responses to ENSO in historical and SSP5-8.5 scenario simulations. In this contribution, we will illustrate the modeled impacts of projected changes of El Niño events on Amazon NEP and contrast them with projected mean-state changes, illustrating how both contributions lead to diversity across models in terms of magnitude and trend in simulated vegetation dynamics. We will discuss possible sources of the model specificities revealed by our multi-model analysis, including land scheme parameterizations, simulated changes in local water availability and temperature and associated biases, and the diverse representation of ENSO and its teleconnection across models. Moreover, the inclusion or improvement of the state-of-the-art vegetation mortality scheme may enhance the negative carbon anomalies in the Amazon basin impacting on the rainforest ecosystem resilience and carbon budget.