HERE WE ARE, BACK FROM THE SUMMER BREAK

Giuliana Panieri

Here we are, back from the summer break, ready to start again with new energy and enthusiasm. Autumn brings challenges that we want to turn into opportunities: we are consolidating ongoing collaborations, opening new research fronts by joining international consortia for proposals to be submitted to the European community, both in the Arctic and in Antarctica, and preparing upcoming field campaigns at the Poles.

We have launched the working group on the next IPY, involving many young colleagues; preparations are underway for the Arctic Circle Forum – Polar Dialogue in Rome, and our researchers are giving new momentum to ISP's participation in the Arctic Council working groups.

These are important steps that show how ISP is increasingly an active part of the international dialogue on polar research. In the coming months, there will be several national and international events – such as the Svalbard Conference and the Arctic Circle Assembly – valuable opportunities to share results, engage with colleagues and partners, and strengthen Italy's role in polar research.

All of this is possible thanks to the team spirit that defines us: every project, expedition, and result stems from the commitment of those working in the field, in the laboratories, and in all support activities.

Let's move forward together with passion, trust, mutual support, and the willingness to remain a little bit dreamers.

Giuliana

toward the Fifth International Polar Year (2032-2033)

IN THIS ISSUE:

Arctic 2025 – Two moorings, one mission: Italy Strengthens Monitoring in the Heart of the Fram Strait

Patrizia Giordano e Leonardo Langone

Picture 1. NATO R/V Alliance sailing in the ice during the ACO25 campaign. Credits: Juri Klusack

Between July 5 and 31, 2025, the CNR-ISP conducted a scientific expedition to the Svalbard Islands as part of the Arctic Climate Observatory 2025 (ACO25) oceanographic campaign.

The mission took place aboard the NATO research vessel Alliance (Picture 1), equipped and operated by the Italian Navy. Researchers from the CNR-ISP in Bologna, along with technical staff from OGS Trieste, participated in a cruise coordinated by the NATO Centre for Maritime Research and Experimentation (CMRE) based in La Spezia (Picture 2).

Picture 2. Researchers from CNR-ISP Bologna, OGS Trieste technicians, CMRE personnel, and members of the Italian Navy crew at the conclusion of the nS1 mooring deployment Credits: Ivan Pennisi

During ACO25, the main objective of the CNR team was to recover and service the S1 mooring, which has been operational since 2014 in international waters along the southwestern margin of the Svalbard Archipelago (Photo 3). The S1 site is a key component of the Arctic Marine Observatory managed by CNR-ISP, a long-term monitoring network that plays a crucial role in investigating the ongoing Atlantification and climate change processes in the region. Deployed at a depth of 1,038 meters, the mooring S1 consists of a 600m-long instrumented line, equipped with oceanographic sensors, hydrophones, and automated sediment traps for collecting sinking particles, plastics, and zooplankton.

Due to an unforeseen technical issue, the recovery of mooring S1 was not possible during the ACO25 expedition. In response, the scientific team carried out a high-resolution morphobathymetric survey to obtain a detailed view of the seafloor. This survey led to the identification of an optimal site for the deployment of a new mooring, located approximately 3.3 nautical miles north of S1.

Picture 3. Study area surveyed during the ACO25 campaign Credits: Patrizia Giordano

The new mooring, named nS1, was promptly assembled using instrumentation provided by the three participating Research Institutions, with the support of the MIUR PNRR ITINERIS project (Picture 4). Like its predecessor, nS1 is about 600 meters long, and will operate in parallel with S1.

The installation of the second mooring strengthens the Italian Arctic Marine Observatory. Together, the datasets from S1 and nS1 will provide a full year of high-resolution measurements, essential for advancing our understanding of the oceanographic processes that act in this critical region of the global climate system.

Picture 4. Deployment of an ADCP current profiler on the top-buoy of the nS1 mooring during the ACO25 oceanographic campaign. Credits: Patrizia Giordano

This integrated observational setup will enable scientists to track with greater precision the intrusion of Atlantic waters into the Arctic Ocean, monitor changes in zooplankton biodiversity, and assess the presence and composition of microplastics and microfibers transported by different water masses. Furthermore, having two observation sites allows for the investigation of mesoscale oceanographic structures, such as eddies, fronts, and subsurface currents, that play a key role in transporting heat, nutrients, and biota as well as in facilitating water mass exchanges. These dynamic processes, which remain poorly documented in this part of the Arctic, are fundamental for understanding the impacts of ongoing Atlantification.

Adding valuable context to these efforts, a recent study by Bensi et al. (2025), published in the State of Environmental Science in Svalbard (SESS) Report 2024, analyzed long-term oceanographic time series collected through the SIOS Marine Infrastructure network as part of the ARiS project. The findings confirm that progressive Atlantification is profoundly transforming the marine environment around Svalbard. Rising temperatures and salinity levels, observed both seasonally and interannually, reflect the increasing influence of warm, salty Atlantic water, not only along the continental slope but also within fjord–shelf interaction zones. This ongoing trend is closely linked to decreasing sea ice cover and significant ecological shifts in the region.

The study offers a robust scientific overview of the phenomenon, highlighting the importance of systematic and continuous time-series observations for tracking and interpreting ongoing climate change. In this context, the work carried out with the S1 and nS1 moorings fully aligns with this approach. The new data will complement and strengthen the SIOS network, contributing valuable insights into Arctic environmental dynamics. Operating multiple moorings simultaneously enhances monitoring in areas particularly sensitive to Atlantification and mesoscale activity, providing synchronized measurements of temperature, salinity, currents, and biodiversity. The continuity of observations over time, also highlighted by Bensi et al. (2025) as a key factor for detecting even the slightest

variations, is ensured by these long-term observing systems.

The recovery of the two moorings is scheduled for summer 2026, after which the acquired datasets will undergo detailed analysis. Both the ACO25 campaign and the recent scientific publication serve as clear examples of how collaboration among CNR-ISP, OGS, NATO-CMRE, and the broader SIOS international scientific community can generate meaningful and shared outcomes. They provide clear evidence of a research approach that integrates strategic vision, scientific expertise, and international collaboration to address the major environmental challenges of our time with rigor and continuity.

Italy and Greenland: New Opportunities for Joint Research

Renato Roberto Colucci e Andrea Spolaor

An Italian delegation composed of researchers, universities, and private companies visited Nuuk, the capital of Greenland, to strengthen relations with local institutions and communities and to launch new scientific and technological collaborations.

Dr Roberto Renato Colucci and Dr Andrea Spolaor, researchers from the Institute of Polar Sciences of the National Research Council of Italy (CNR-ISP), took part in the meetings to present the research activities carried out by CNR-ISP in Greenland. These projects range from glaciology to paleoclimate reconstruction, atmospheric studies, and environmental contamination monitoring, as well as the use of satellites and drones to analyze the effects of climate change on the landscape. In Nuuk, the researchers met with key partners such as ASIAQ Greenland Survey, the University of Greenland (Ilisimatusarfik), and the Greenland Institute of Natural Resources.

The meetings provided an opportunity to showcase the expertise and infrastructures available at the CNR for polar research, generating strong interest and openness to cooperation. Greenlandic institutions emphasized not only their willingness to collaborate but also the limitations imposed by a small research community and scarce human resources—factors that highlight the importance of international synergies.

The mission also involved the Polytechnic University of Turin, the University of Bologna, and the National Institute of Oceanography and Applied Geophysics in Trieste, which presented projects spanning from natural sciences to the humanities. On the industrial side, Italian companies E-Geos and WSense showcase innovative solutions in satellite observations and underwater technologies for data collection and transmission, essential tools for strengthening local research capacity.

The strategic value of this collaboration was also underlined by Italy's Ambassador to Denmark, Stefania Rosini, and by the Special Representative for the Arctic of the Ministry of Foreign Affairs, Agostino Pinna, who reiterated Italy's commitment to fostering new cultural, scientific, and industrial initiatives.

Greenland is reaffirmed as a natural laboratory of global significance, where cooperation between Italy and local partners opens important prospects for understanding environmental dynamics and developing sustainable solutions (ANSA)

Picture 1. Nuuk city (Greenland). Credits: Renato Colucci

NEWS FROM DIRIGIBILE ITALIA

Mauro Mazzola

The second half of the 2025 summer season at the Dirigibile Italia station featured a rich calendar of scientific missions with the participation of numerous Italian and international research institutes, confirming the central role of Ny-Ålesund as a hub for Arctic climate change studies. Among the projects carried out, CNR-IRET completed the Beyond Soil mission (Picture 1), dedicated to studying microbial dynamics and the carbon and nitrogen cycles in the tundra, with particular focus on the effects of large herbivores. The same institute also assumed management of the experimental site REMUS, part of the international ITEX network, devoted to long-term manipulation experiments investigating the impacts of climate change on Arctic vegetation.

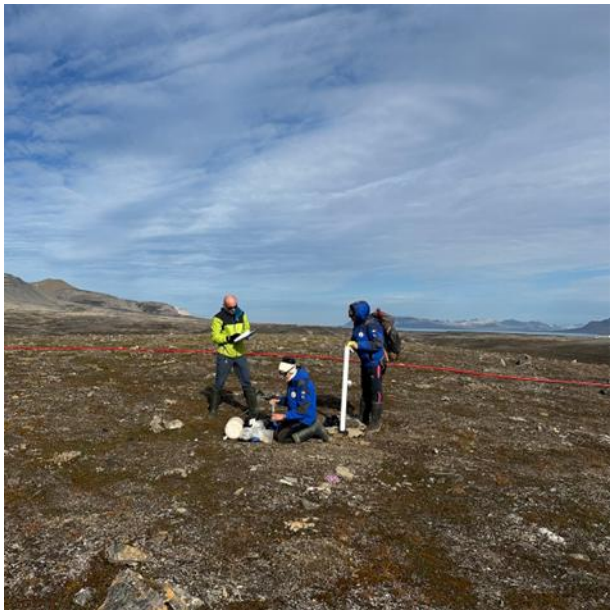
In parallel, research on the behavior of the fin whale continued with the second mission of the Sedna project, led by CNR-IAS, based on acoustic surveys, drone observations, and the collection of environmental data. The UNDER project (Picture 2) also successfully concluded its summer campaign, dedicated to the interactions between surface and groundwater in glacial and non-glacial environments, while CNR-IGG conducted new measurements of CO_2 fluxes and primary productivity in the Bayelva catchment, providing essential data to better understand the role of vegetation in the global carbon balance.

Freshwater ecosystems also received great attention. The CYANACTALP project (SUPSI, Picture 3) investigated the effects of lake-shore "greening" on cyanobacteria presence, while EcoClimate (Sapienza University of Rome) continued to study the impacts of climate change on Arctic lakes and the ecosystem services they provide, carrying out innovative real-time measurements of greenhouse gas emissions.

Picture 1. Field activities for the BEYONDSOIL project. Credits: Carlotta Volterrani

On the marine front, the FishMICRO project (CNR-IRBIM) conducted new sampling campaigns to analyze the microbiomes of key fish species such as the shorthorn sculpin and Atlantic cod, aiming to assess the consequences of climate change on Arctic marine ecosystems. Finally, the BRISMIC (Picture 4) project (CNR-IRET) further investigated the interactions between plants, microorganisms, and soils in permafrost polygons, examining both the risks associated with the release of ancient

carbon and the potential protective effects of increased vegetation cover.



Picture 2. Field activities for UNDER project. Credits: Ilaria Baneschi

The overall assessment of the season highlights not only the variety of research themes addressed – from permafrost dynamics to hydrological processes, from biogeochemical cycles to marine communities – but also the importance of collaboration among institutions, polar stations, and researchers of different nationalities.

Picture 3. Field activities for CYANACTALP project. Credits: Camilla Capelli

These activities were made possible, as always, thanks to the dedicated work of the station staff and the support of the SAGF of the Guardia di Finanza, whose presence ensured safety and efficiency even at the height of the summer season. In the final weeks of September and the beginning of October, further missions will take place, mainly to check the instruments installed at the CCT and at the station itself. After that, the season can be considered closed for this year, with only the routine monitoring activities at Gruvebadet continuing under the care of our station leaders.

Picture 4. Field activities for BRISMIC project. Credits: Stefano Ventura

The new ISP projects supported by the National Antarctic Research Program (PNRA)

SPREAD: Traces of Pollution and Antibiotic Resistance in Antarctic Snow

Angelina Lo Giudice

Even the most remote places on Earth are not immune to the impact of human activity. Antarctica, once considered a pristine natural laboratory, is now showing tangible signs of environmental disturbance — even in its snow. The research project SPREAD "Unraveling environmental and anthropogenic factors ShaPing the snow microbiome and antibiotic REsistome At Dome C (Antarctica)", coordinated by the Institute of Polar Sciences of the CNR (CNR-ISP) in collaboration with the University of Pisa and the Anton Dohrn Zoological Station, investigates the link between human-induced pollution and the development of antibiotic resistance in polar regions — highly sensitive ecosystems and key indicators of global change. Snow, in this context, is not only an exceptional climate archive but also an environmental "catalyst," capable of trapping pollutants such as microplastics, personal care products (sunscreens, detergents, cosmetics), and pharmaceutical residues (including antibiotics, anti-inflammatories, and antidepressants). The project involves a year-long snow sampling campaign around Concordia Station, at Dome C, one of the most isolated areas of Antarctica. The samples will be analyzed to assess contamination levels and to study the composition of the antibiotic resistome — the genes that confer resistance to antibiotics. The first sampling mission is scheduled during the austral summer, starting in early December, while in the colder months, the project will rely on the valuable support of the overwintering personnel, essential for collecting samples under extreme conditions. The expected results will provide an insight into how antibiotic resistance can emerge and spread even in extreme and seemingly untouched environments — a stark reminder that no place is truly beyond the reach of human impact. The project is funded by the National Antarctic Research Program (PNRA).

Picture 1. Concordia Base on the Antarctic Plateau. Credits: Warren Raymond Lee Cairns

PASSPORT: Microplastics, plastic additives and plastisphere in Antarctic continental Snow: transport mechanisms and biotransformations study

Elisa Scalabrin

The PNRA PASSPORT project (Picture 1), led by ISP-Venice and Rome in collaboration with IRSA and Ca' Foscari University of Venice, will soon begin its activities, aimed at comprehensively investigating plastic contamination in the Antarctic plateau. While microplastics have been detected in nearly every corner of the planet, the Antarctic Plateau, particularly the remote area of Dome C, remains largely unknown.

Picture 1. PASSPORT project logo. Credits: Greta Palombella

The PASSPORT project is the first to aim to create a comprehensive temporal dataset on the presence of microplastics, their chemical additives (PAs), and the "plastisphere" consisting of the microbial communities that colonize the plastic in the snow of this region. The goal is to study the sources (local and long-range), transport, and environmental fate of these pollutants, analyzing their degradation products and the interactions between microplastics and microbial communities. The additives will be studied using both targeted and untargeted techniques to highlight the presence of both compounds already known, many of which however have not previously been detected at Dome C, and other unknown pollutants.

Picture 2. Preparation of the project first sampling campaign in the Clean Room Laboratory at Ca'Foscari University-CNR ISP. Credits: Elisa Scalabrin

The first sampling campaign (Picture 2) will be carried out during the XLI Italian Expedition 2025/26 to Dome C, which will involve Andrei Munteanu, a PhD student at Ca'Foscari University of Venice.

POSTCARDS FROM …… "FIELD"

16-17 September 2025
CNR- Headquarter

The CNR hosted the visit of **Dr. Maria Grigoratou**, Executive Secretary of the **European Polar Board (EPB)**.

The two days of institutional and scientific meetings, attended by the CNR delegation (Dir. Francesco Petracchini and Dir. Giuliana Panieri) together with representatives of the Ministry of University and Research (Dr. Silvia Martuscelli, Dr. Michele Mazzola and Dr. Flavia Nunziata) and the Ministry of Foreign Affairs (Amb. Agostino Pinna), strengthened international cooperation in polar research and Italy's role in the Arctic and Antarctic.

Greetings from the CNR Day 'Knowledge as the Key for Protection', Italian Pavilion, Expo 2025, Osaka.

The event, organised on September 19, 2025, by the DSSTTA of CNR, was a bilateral meeting between Italian and Japanese scientists on five key environmental themes – biodiversity, the sea, polar regions, climate change, and natural hazards – highlighting how scientific knowledge, grounded in memory and data, is essential to understanding environmental changes and strengthening resilience to global challenges.

For the CNR-ISP, Tommaso Tesi and Chiara Venier took part in the session dedicated to the polar regions, presenting respectively marine observation activities in the Arctic and ice core drilling operations in Antarctica. The exchange took place through a sharing of experiences with Japanese colleagues Takashi Kikuchi, Kenji Kawamura, and Ayako Abe-Ouchi.

Credits: Courtesy of Italy Pavilion Expo 2025 Osaka

EVENTS

- Polar Data Forum VI (PDF VI) – 20-24 October 2025, Hobart, Tasmania, Australia. PDF is a place where polar data holders get together and make more use of data. The Forum has two main components: the Conference, where the border between funding, policy and data is explored through presentations and posters; and Workshop Sessions & Hackathons, where the Polar Data Community opens the dialogue to make progress on their shared objectives. Registration is now open

- Svalbard Science Conference 2025 - 28-29 October 2025 at Quality Hotel Expo, Fornebu (Oslo). Svalbard as an Arctic hotspot for climate change and international cooperation. Register for the conference here.

- 1st ACM SIGSPATIAL International Workshop on Polar Data Science (PolDS 2025) – 3 November 2025, Minneapolis, Minnesota, USA. The workshop aims to connect the polar science community with the spatial computing community to foster convergent approaches that will address significant questions in the Arctic and Antarctic regions.

- 10th International Conference on Polar and Alpine Microbiology 12-16 January 2026, Copenhagen, Denmark. The meeting will build upon the success of the previous nine editions of the conference series. The goal is to bring together global researchers to explore various aspects of microbial diversity, function, and activity of cold-adapted microorganisms in polar and alpine environments. The conference will provide a platform for discussing the latest developments in the field, fostering the exchange of ideas and experiences on an international scale. Registration will open end September 2025.