



INSTITUTE OF POLAR SCIENCES

Overview

[Maurizio Azzaro](#)

The CNR-ISP in Messina has a centennial history in a millenary place, epically narrated in Homer's Odyssey (VIII century BC). The main building of the former Thalassographic Institute, built in 1916 next to the recurring whirlwind of Cariddi, has become a secondary headquarters of the ISP since 2019, shared with IRBIM. Researchers from Messina, the cradle of marine bacteriology in Italy, began carrying out activities at the Poles since the second half of the 1980s as part of the PNRA, conducting a series of pioneering studies on demersal resources and marine microbiology. The entry of young recruits in the last twenty years has helped to strengthen knowledge of the polar marine and terrestrial environments and, since 2009, experimental activities have also been conducted concerning the northern hemisphere, in various sites of the Arctic Circle. Current studies address four main bio-ecological aspects in the polar marine and terrestrial ecosystem: Biodiversity and adaptation, Response to natural and anthropogenic forcings, Biotechnologies and astrobiological implications. To date, the staff consists of a research director, a senior researcher, ten researchers, two technicians and

three young promises. The site is increasingly becoming a point of reference for scholars in the field of polar biology and boasts seven associates from Italian and foreign universities and research institutions. Several Messina researchers are included in working and polar governance groups, both nationally and internationally. The balance of activities in 2021 saw the Headquarters involved in thirty national and international scientific projects and seven researchers were involved in missions to the two Poles. The Headquarters is certainly an attraction for young Messina undergraduates and a dissemination program of our activities is about to be launched to penetrate more and more into the social and cultural fabric of the city.

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TOP STORIES

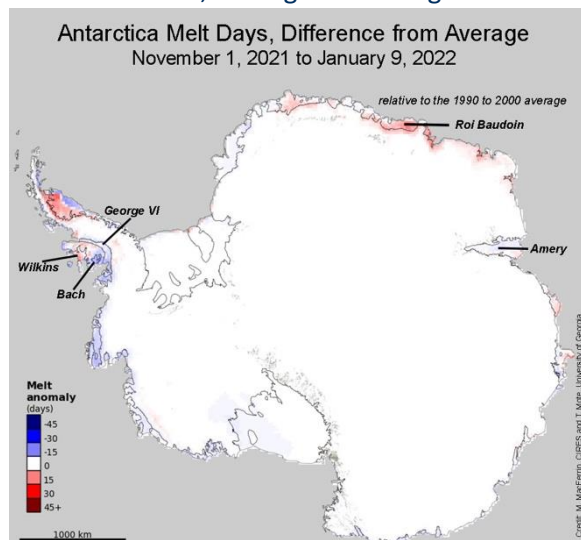
After a warm summer, a severe Föhn Storm disintegrated the Antarctic Larsen B Ice shelf in a couple of days

[Renato R. Colucci](#)

Continuously present for the past more than 10 years, landfast sea ice in the Larsen B embayment broke out again. Between January 16 and the 21st, sea ice linked to the Antarctic Peninsula crumbled and disintegrated (Figure 1). This breakup is the

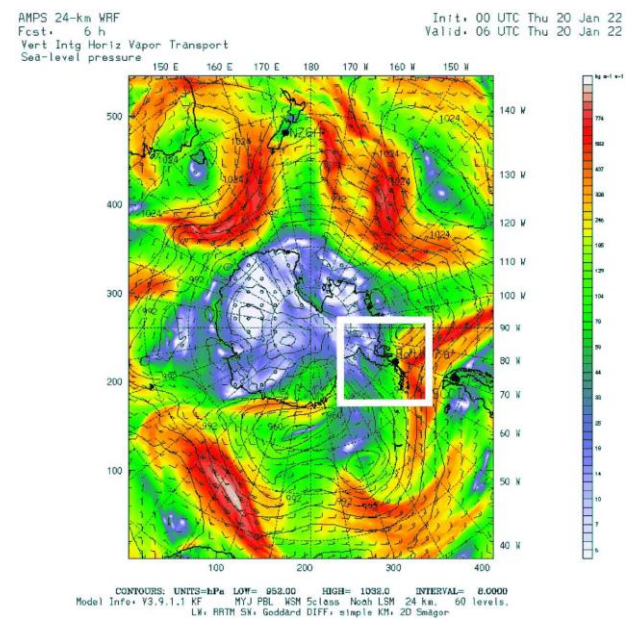


latest in a series of remarkable events in the Larsen B embayment over the past twenty years, the largest occurred in March 2002. Summer in Antarctica was definitely warmer this year. As a direct consequence, in February Antarctic sea ice was the lowest ice extent in the 44-year record. The summer weather pattern has seen a strong Amundsen Sea Low and a high positive Southern Annular Mode (SAM) so far bringing snow and windy conditions to the southwestern side of the Antarctic Peninsula. On the contrary, the northern part of the Antarctic Peninsula experienced the most significant surface melting. Strong and warm winds recursively flowed east and downslope on the eastern side, forcing the melting.



Nevertheless, the primary input it is certainly to be searched in the extremely warm temperatures recorded in the northern part of the Antarctic peninsula. Coastal areas here recorded above-average surface melting (Figure 2).

Early clearing of seasonal sea ice along the Antarctic Peninsula confirms that the austral summer has been indeed warm and wet. Evidence further suggests that föhn winds, influenced by a large atmospheric river in the form of a low-level jet, helped the destabilization of the ice pack (Figure 3).



Föhn is known for being a warm, dry, downslope wind descending the lee side of the European Alps as a result of synoptic-scale, cross-barrier flow over the mountain range. The air in the near-surface flow originates at or above the main crest of the Alpine barrier and achieves its warmth and dryness as a result of adiabatic descent. Over the Larsen B ice shelf, melt days were between 15-30 higher than the climatology. Here, a series of windstorms have resulted in several brief early-season melt events due to the frequent föhn events. On the other side, this pattern brought snow and windy conditions to the southwestern side of the Peninsula. The strongest Antarctic Peninsula föhn event has occurred just before the break-up with the highest wind speed recorded between January 18-19.

HERE DIRIGIBILE ITALIA

[Mauro Mazzola](#)

The research activities at our base are about to fully resume, after a beginning of the year dedicated to the usual monitoring of atmosphere and snowpack, as always by our acting station leaders and PhD students for their internships.

The first measurement campaign is in progress just as we write by Donato Giovannelli and his group at the University of Naples Federico II, within the PRA project "MeltingICE". The activity consists in the collection of samples through short surface cores and in the measurement of greenhouse gases released from the soil and from the extremophile micro-organisms that populate it.

But there are about thirty projects submitted in response to the 2022 Activity Call, after two years of pandemic that also forced our community to postpone many of the planned activities. The projects cover all scientific disciplines assured by the base, from atmospheric physics and chemistry to marine geology, marine and terrestrial biology, and the study of the cryosphere. Especially the summer period will see many research activities taking place, in this case related to the seasonality of Arctic flora and fauna development.

In particular, activities will be carried out related to the PRA financed projects: "ICEtoFLUX" led by CNR-IGG and dedicated to the study and quantification of Arctic hydrological processes, "Eco-Climate" led by the University La Sapienza

and dedicated to the study of nutrient cycling and decomposition of organic matter in the ecosystems of Arctic lakes and "MICROTRACER" led by CNR-ISP and dedicated to the quantification and identification of microplastics and their impacts on wildlife.

In the first week of March the official visit of the CNR President Maria Chiara Carrozza and the Minister of University and Research Maria Cristina Messa was scheduled at our base, but the worrying international events and the recrudescence of the covid19 pandemic have advised to cancel the event. President Carrozza will however make a brief visit from April 4 to 7.



(Credits: Jacopo Pasotti)

RESEARCH HIGHLIGHTS

Pharmaceutical residues in Arctic ecosystems

[Francesca Spataro](#) e [Jasmin Rauseo](#)

Arctic regions are an arena for public discussion on human interactions with nature and the planetary risks associated with the expansion of the Anthropocene. The effects of climate change are occurring much faster in the Arctic than anywhere else on our planet. Multiple factors have influenced the chain of events termed "Arctic amplification", allowing for the development of fishing, tourism and resource extraction activities, but reflecting also an increase in local contaminant inputs. Recent studies have confirmed that the number of chemicals of emerging concern (CEC, not yet regulated) in Arctic ecosystems is continuously increasing. Among these, pharmaceuticals and antibiotics have been identified.

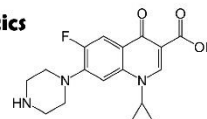
Being associated with anthropogenic activities, pharmaceuticals are mainly found near primary emission sources (e.g., hospitals, municipal discharges and wastewater treatment plants) and their spread in the fragile Arctic ecosystems is raising particular concern. Drugs are complex

molecules and include numerous compounds belonging to different therapeutic classes (e.g., antibiotics, antidepressants, anti-inflammatories, etc.). After administration, drugs are only partially metabolised in organisms, while a large amount is excreted unchanged or as active metabolites, reaching the environment. Pharmaceuticals, including antibiotics, are specifically engineered bioactive molecules, which can impair the structure and function of natural microbial communities, depending on their mode of action, environmental concentration, physicochemical properties (e.g., water solubility, lipophilicity, vapour pressure) and abiotic environmental factors (temperature, pH, incident radiation). These effects at the microbial level can also be reflected on the entire food network through bioaccumulation/biomagnification processes. The occurrence of antibiotics into the environment can increase the spread of antibiotic-resistant genes and bacteria, with obvious impacts on human health. Antibiotic resistance is a "One Health" problem, as human health is closely connected with animal and environmental health. This is particularly relevant considering that following the COVID-19 pandemic, antibiotic consumption has increased on a global scale.

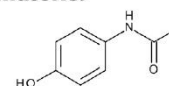


Main pharmaceuticals found in Arctic regions

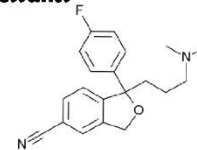
Antibiotics



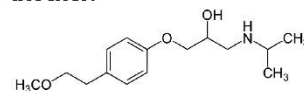
Anti-inflammatories



Antidepressants



β-blockers



THE COMMENT

Covering glaciers: solution or problem?

Jacopo Gabrieli

The glaciers are dying, and the geotextile sheets tried to cover them with risk becoming a plastic shroud which, instead of conserving them enhances what is killing them: greenhouse gas emissions. These geotextile sheets can certainly help slow down melting of glaciers, in the past they seemed to be a form of adaptation to climate change, saving the economic activities that take place on them.



Presena Glacier (credits: Italian Glaciological Committee)

But we must be very clear, this is not a viable way to save our glaciers: the only way to do it is to stop emitting greenhouse gases into the atmosphere. In an open letter written by numerous scientists, the contradictions of a practice that aims to protect these ecosystems are listed: from the impact of fuel to feed the piste groomers, to that of the production of the plastic materials used to make these tarpaulins, up to the consequences of the release of plastic fibers and the "suffocation" of plants and animals that are already moving towards higher altitudes. An engineered glacier is no longer an ecosystem but a mere artificial accumulation of water in a solid state, isolated, inaccessible, and impassable. Are these really the glaciers we want to save for future generations? But, worse and riskier than the action itself, is the narrative that accompanies it. In fact, more and more often these are presented as sustainable

interventions, real solutions to the adverse effects of climate change. One of the consequences,



Presena Glacier (from www.sciaremag.it)

therefore, of what is called the business of sustainability. In short, an attempt at greenwashing which, as glaciologists and climatologists write, risks creating confusion and compromising the environmental sensitivity that has been consolidating with difficulty in recent years. Carrying out impactful procedures to maintain economic activities that, due to the same climate changes, will be increasingly unsustainable is therefore the opposite of adaptation, it is persistence. What are the alternatives then?



Marmolada Glacier (credits: Legambiente)

Glaciers can only be saved by stabilizing the planet's climate, there are no shortcuts. Because, if on the one hand the failure to reduce greenhouse gas emissions will lead to the almost total disappearance of Alpine glaciers by the end of the century, on the other hand, the containment of the increase in temperatures by 2° C would save 40% of the ice today present in the Alps.

POSTCARDS FROM THE FIELD

Greetings from the Antarctic Peninsula where we went for the PNRA "[MicroPolArS](#)" project, whose objectives are the determination of pollutants and the study of microbial communities in polar lake systems. Thanks to the Spanish Polar Committee and the logistics of the Gabriel de Castilla and Juan Carlos I research bases who hosted us!

Maria Papale

Carmen Rizzo



Greetings from the Antarctic Peninsula



Credits: Maria Papale e Carmen Rizzo - PNRA

Gaia Blu, the new research vessel of CNR, has arrived at the port of Naples after 7 days of navigation from Vigo in Spain. **Falkor**, the former name of the vessel, was donated to CNR on March 14 by the [Schmidt Ocean Institute](#), a philanthropic foundation established by Eric and Wendy Schmidt in 2009. SOI has operated **Falkor** for over 10 years hosting more than 1000 scientists from around the world and conducting research in physical and chemical oceanography, marine biology and geology and climate change. With its 82.9-meter in length, **Gaia Blu** will conduct multidisciplinary research in the Mediterranean Sea and the world's ocean and will serve the entire Italian scientific community within Italian, European and international projects.

Paolo Montagna



The research vessel docked at the port of Naples



The research vessel arriving to the port of Naples



Research vessel Falkor

Credits: Marco Cuffaro	Credits: Katrin Schroeder
	Credits: Schmidt Ocean Institute

POLAR CHRONICLES

[Nicoletta Ademollo](#) e [Marco Vecchiato](#)

The impact of the anthropic activities in Antarctica is a concerning and in-depth scrutinized issue. However, we still have little knowledge about two main aspects about the future trends of the contamination in the polar regions: on one hand the consequences and the impacts of the pollutants on the ecosystem are unknown in a perspective of climate change, on the other hand we don't know the role of the next-generation of contaminants in Antarctica and of the related transport processes.

Two ISP researchers, Marco Vecchiato e Nicoletta Ademollo, just returned from the XXXVII Antarctic Campaign at the Italian Mario Zucchelli Station, where they followed two PNRA projects aimed to study these aspects.



Credits ©PNRA

The main objective of the [ROSS'n'ROLL](#) (ROSSs Sea ecosystem aNd emeRging cOntaminants: new chaLLenges and potential threats in a changing

world - PNRA18_00097) project is the long-term study of the persistent organic and inorganic pollutants in the abiotic (water, ice and sediments) and in the marine communities (benthic and cryopelagic communities and migratory and resident seabirds), focusing on legacy and emerging contaminants. The results will provide information on the correlation between the contaminants, the ecosystemic processes and the climate change, allowing to deepen the knowledge on the distribution of the pollutants and their impact on the marine ecosystem.



Credits ©PNRA

The main aim of the ECO AS:TRA (Emerging Contaminants in Antarctic Snow: sources and TRANsport - PNRA18_00229) project is to identify the sources, the distribution and the long-range transport processes of the emerging contaminants in the Antarctic environment. We collected snow samples from the internal plateau areas to the coastal regions along the extension of the Ross Sea. The results of the analyses will identify the temporal trends of the pollution deriving from the atmospheric deposition, together with the seasonal melting fluxes of the contamination towards the marine environment.

The ultimate purpose of both these projects is the maintenance of a good environmental state of the Antarctic ecosystems, which is a priority of the sustainable development of our planet (13 e 14 [Sustainable Development Goals](#)).



UPCOMING EVENTS

- [Arctic Science Summit Week \(ASSW\) 2022](#) - The ASSW intend to provide opportunities for coordination, cooperation and collaboration between the various scientific organizations involved in Arctic research. The conference is planned in a hybrid format, both in-person and online attendance and it will be from 26 March - 1 April 2022 in Tromsø, Norway. Registration Information [here](#).
- [C⁴ "Climate Change and Carbon Cycle"](#) -The overarching goal of the international workshop C⁴ is to foster novel opportunities for collaborations within the scientific communities interested in Global Changes, Climate System and Carbon Cycle through time. The workshop will be held in person in Pisa (Italy) from 22-24 June 2022; the deadline to [submit abstracts](#) is 30th April 2022
- [The Cryosphere in a changing climate](#) - A scientific symposium in memory of Koni Steffen. The event will be held in person. June 22-24, 2022, Davos, Switzerland. Deadline for [the registration](#) is 31 May 2022.
- [10th SCAR Open Science Conference](#): the conference will be held **online** from 1-10 August. The theme of the conference is "Antarctica in a Changing World". The [Abstract Submission Portal](#) has opened; the deadline to submit abstracts is 1st June 2022.
- [Cryosphere2022](#): an International Symposium on Ice, Snow and Water in a Warming World. August 21–26, 2022, Reykjavík, Iceland. To register for the conference, click [here](#).
- The [Year of Polar Prediction \(YOPP\)](#) is the flagship activity of the WWRP Polar Prediction Project, with the aim of enabling a significant improvement in environmental prediction capabilities for the polar regions and beyond, by coordinating a period of intensive observing, modelling, verification, user-engagement and education activities. The YOPP Final Summit will be held in Montréal, Canada from 29 August - 1 September, 2022. [Registration](#) for the YOPP Final Summit is open!
- [EMS Annual Meeting 2022](#) - 4-9 September 2022, Bonn, Germany. The call for abstracts is now open. The deadline for submitting abstracts is 26 April 2022. UP2.4 [The cryosphere and cold region processes in the climate system](#).
- [Ice Core Science at the three Poles](#), the 3rd IPICS Open Science Conference - October 2 – 7, 2022, Crans-Montana (Switzerland). Ice cores provide information about past climate and environmental conditions as well as direct records of the composition of the atmosphere on timescales from decades to hundreds of millennia. The [call for abstracts](#) is open. The deadline for submitting abstracts is April 30, 2022.

STAY IN TOUCH:



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<https://www.isp.cnr.it/index.php/en/> - E-mail: isp-gdl-comunicazione@isp.cnr.it

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