



Cryosphere Initiatives

One Planet - Polar Summit

Paris, 10 November 2023

Polar and glacier international cooperation programs

Many Arctic, Antarctic and glacier countries are cooperating and funding research programs to improve scientific knowledge of the cryosphere. As part of the One Planet - Polar Summit, the first international summit on the poles and glaciers, the Cryosphere Initiatives' main objective is to list these different programs in order to highlight them and create synergies between the different projects and research institutes dedicated to the cryosphere.

Australia

Major partnerships and collaborations of the Institute for Marine and Antarctic Studies (IMAS):

- **Australian Antarctic Program Partnership (AAPS)**

The Australian Antarctic Program Partnership (AAPP) is a program funded by the federal government to the tune of 50 million Australian dollars over 10 years, led by UTAS and including Australian government agencies and research institutions. The three research themes are transdisciplinary and linked to the study of the local cryosphere.

- **Australian Centre for Excellence in Antarctic Science (ACEAS)**

The Australian Centre for Excellence in Antarctic Science (ACEAS) is a consortium of seven Australian universities working in partnership with international partners, notably France

(CNRS and Université de Bordeaux). The program supports research projects from 2021 to 2025 in various regions of Antarctica, with a focus on both the Southern Ocean and the local Cryosphere, with funding of 25 million Australian dollars.

Australian research projects with international resonance:

- **International Collaboration for Exploration of the Cryosphere through Aerogeophysical Profiling (ICECAP-EAGLE)**

The ICECAP-EAGLE project stems from the ICECAP project (International Collaboration for Exploration of the Cryosphere through Aerogeophysical Profiling) involving France, the United States, the United Kingdom and China, initiated by Australia. This airborne geophysics and oceanography project studies the stability of the Antarctic ice cap and the resulting consequences for global sea-level rise.

- **Million Year Ice Core**

The Million Year Ice Core aims to find an ice core containing a million-year record of the Earth's climate and atmospheric composition. The Million Year Ice Core will provide crucial data to better understand how and why the Earth's climate system responds strongly to relatively small changes in solar energy input. The project is a partnership between Australian, European and American teams working in Antarctica.

Austria

Research group - Jakob Abermann:

- **Centennial Climate Drivers of Glacier Changes in Greenland (WEG_RE)**

The WEG_RE project, funded by the Austrian Science Fund FWF, is a collaboration between the University of Graz (Austria), the Know-Center Graz (Austria), the University of Fairbanks (Alaska) and GEUS (Denmark), with the aim of improving our understanding of glacier changes and the underlying climate factors.

- **JOSTICE**

JOSTICE is a research project dedicated to the study of the Jostedalsgreen ice cap, Europe's largest glacier in southern Norway. Its aim is to analyze the glacier's present and future evolution, and to determine its societal impacts on hydroelectric production, tourism and agriculture.

- **LATTICE**

LATTICE is a project by the University of Innsbruck (Austria) to study the ice cliffs of North Greenland, their evolution and their impact on climate. This analysis of the local factors of climate variability contributes to improving our understanding of the relationship between the atmosphere, the cryosphere and the ocean in North Greenland.

- **subMIT**

The University of Graz's subMIT project is dedicated to the categorization of endoglacial and subglacial drilling systems and ice thickness on the Mittivakkat Glacier in East Greenland. The project is funded by EU-INTERACT.

Research group - Wolfgang Schöner:

- **GLIN**

GLIN is a project of the University of Graz (Austria) dedicated to inversion layers in the Arctic, particularly in Greenland, and their impact on climate, atmosphere and flora and fauna in the region. It is funded by the EU-INTERACT program.

- **Snow2Rain**

Snow2Rain is a research program dedicated to the transition between snow and rain and its influence on the quality of life in and around Tasiilaq, Greenland. At the heart of this project, led by the University of Graz in Austria, scientists and local populations in Tasiilaq are working together, linking natural and social sciences.

Research group - Gina Moseley :

- **North Greenland Caves Project**

The North Greenland Caves Project is a program gathering paleoclimatologists, geologists and geo-microbiologists funded by the Austrian Science Fund to explore the caves of North Greenland and collect useful samples for the advancement of climate research.

European Union

The European Union coordinates a large number of projects dedicated to polar research. Today, the number of projects amounts for 139 in the Arctic and 55 in the Antarctic, with budgets of €372 million and €115 million respectively. The projects are distributed under the Horizon 2020 and Horizon Europe programs.

Horizon 2020

- **AI-ARC**

AI-ARC is a research and innovation program funded by the European Union. Its aim is to develop the use of artificial intelligence, in particular the Virtual Control Room (VCR) system, to ensure safety and security in the Arctic by facilitating decision-making and communication capabilities in the region.

Participating countries: Finland, France, Germany, Iceland, Ireland, Italy, Norway, Spain, Sweden, Türkiye, United Kingdom.

- **All-Atlantic Ocean Research and Innovation Alliance (AAORIA)**

The All-Atlantic Ocean Research and Innovation Alliance (AAORIA), a major European ocean science diplomacy tool, includes in its renewed mandate a pole-to-pole dimension which can bring together a large Atlantic community to work for common objectives including polar research and innovation. In the first decade of the Alliance a set of polar projects were supported by the EU with EUR 83M.

Participating countries: Argentina, Belgium, Brazil, France, Germany, Portugal, South Africa, Spain.

- **ArcticPassion**

L'ArcticPassion is a pan-Arctic project whose main objective is the co-creation and implementation of a coherent integrated Arctic observing system: an Arctic-wide Observing System of Systems (AOOS).

Participating countries: Belgium, Canada, Denmark, Finland, France, Germany, Iceland, India, Italy, Japan, Netherland, Norway, Portugal, Russia, South Korea, Sweden, Switzerland, United Kingdom, United States of America.

- **Beyond EPICA**

Beyond EPICA is a European mission aiming at extracting ice cores from the Antarctica in order to study climate evolution since the mid-Pleistocene transition (between 900,000 and 1.2 million years ago) and to understand the causal relationships involved in climate change.

Participating countries: Belgium, Denmark, France, Germany, Italy, Netherland, Norway, Sweden, Switzerland, United Kingdom.

- **CRiceS H2020**

CRiceS (Climate Relevant interactions and feedbacks: the key role of sea Ice and Snow in the polar and global climate system) is a project with the objective to contribute to the study of the role of polar processes, such as oceans, ice and snow, in the climate system. The project brings together 20 international research teams from Europe, Canada, South Africa and India.

Participating countries: Canada, Germany, Finland, France, Iceland, India, Italy, Netherland, Norway, South Africa, Sweden, Switzerland, United Kingdom.

- **FACE-IT**

The mission of the FACE-IT program is to ensure the adaptive management of the socio-ecological ecosystems of the Arctic fjords in the face of accelerating cryospheric collapse and changes in biodiversity in the region. It brings together 14 institutions from 7 different countries.

Participating countries: Canada, China, Denmark, France, Germany, Norway, United States.

- **FORCeS**

FORCeS is a project whose main mission is to understand the impacts of anthropogenic aerosol radiative forcing on climate. The research and data collected by European scientists as part of

the project are communicated to the region's political decision-makers and major stakeholders.

Participating countries: Austria, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Sweden, Swiss, United Kingdom.

- **EU-PolarNet**

EU-PolarNet2 brings together 20 European countries represented by 22 multidisciplinary research institutes to promote science, improve polar infrastructure and create new international partnerships for polar research and operations. The project is funded by the European Union's Horizon 2020 program, and works in close collaboration with the European Polar Board. The project also coordinates the EU Polar Cluster.

Participating countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Faroe Island, France, Germany, Italy, Netherland, Norway, Poland, Portugal, Spain, Switzerland, Türkiye, United Kingdom.

- **INTERACT**

INTERACT is a European infrastructure project operating under the aegis of the EU Polar Cluster. Its aim is to build a shared infrastructure of terrestrial research stations in the Arctic to identify, understand, monitor and predict environmental change in the Arctic, and inform decision-makers about its societal impacts.

Participating countries: Austria, Canada, Czech Republic, Denmark, Faroe Island, Finland, Germany, Iceland, Italy, Netherlands, Norway, Poland, Russia, Sweden, United Kingdom, United States.

- **Multiscales and Critical Transitions in the Earth System (CriticalEarth)**

CriticalEarth is a program funded by the European Union to train 15 young scientists to analyze the risks of climate change. The data collected is used to predict and avoid the irreversibility of climate change. The network of researchers works in close collaboration with multidisciplinary institutions, both governmental and non-governmental.

Participating countries: Belgium, Denmark, France, Germany, Italy, New-Zealand, Norway, Spain, United Kingdom.

- **Nunataryuk**

Nunataryuk is an international research project bringing together 26 partners from 12 countries to understand the impacts of thawing permafrost on global climate as well as on Arctic populations.

Participating countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Italy, Netherland, Norway, Portugal, Sweden.

- **PROTECT**

PROTECT is a project funded as part of the EU Polar Cluster. Its aim is to understand and model the interactions between the atmosphere, ocean and sea ice, in order to improve sea-level rise projections.

Participating countries: Belgium, Denmark, France, Germany, Netherlands, Norway, Switzerland, United Kingdom.

- **Southern Ocean Carbon and Heat Impact on Climate (SO-CHIC)**

The SO-CHIC (Southern Ocean Carbon and Heat Impact on Climate) initiative dedicated to analyzing the physical processes involved in the absorption of anthropogenic carbon emissions by the ocean, and understanding their overall impact on global warming. The initiative is funded by the European Commission for a 4-year period.

Participating countries: France, Germany, Ireland, Italy, Netherland, Norway, South Africa, United Kingdom, Sweden, Switzerland.

- **Tipping Points in Antarctic Climate Components (TiPACCs)**

TiPACCs is a research project, which aim is to understand the contribution of Antarctic sea ice to mean sea level. The mission of European scientists is to analyze the tipping points of different climate components in Antarctica.

Participating countries: Denmark, France, Germany, Norway, United Kingdom.

- **Tipping Points in the Earth System (TiPES)**

TiPES is a project dedicated to analyzing the tipping points at which the Earth's subsystems have been modified, and to improving the modeling of climate transitions. Their study helps in predicting future climate change and identifying its anthropogenic factors.

Participating countries: Belgium, France, Germany, Italy, Netherland, Norway, Portugal, Spain, Switzerland, United Kingdom.

Horizon Europe

- **ACCIBERG**

The Arctic Cross-Copernicus forecast for sea ice and iceBERGs (ACCIBERG) is a project coordinated by the EU Polar Cluster with the aim of improving sea ice and iceberg forecasts in the Arctic using data collected by Copernicus program satellites. The forecasts will be made available to players in various sectors, including fisheries, tourism and local communities.

Participating countries: Denmark, France, Italy, Norway, Türkiye, United Kingdom.

- **Explaining and Predicting the Ocean Conveyor (EPOC)**

EPOC (Explaining and Predicting the Ocean Conveyor) is a project to study the impact of the Atlantic meridional overturning circulation on weather and climate change.

Participating countries: Canada, France, Germany, Norway, United Kingdom, United States.

- **Mission Restore our Ocean and Waters by 2030**

The EU Mission Restore our Ocean and Waters includes a Lighthouse on the Atlantic and the Arctic. It supports a broad mobilisation to protect and restore marine and inland waters biodiversity and ecosystems, reduce pollution, and promote a carbon-neutral blue economy. Horizon Europe already invested more than 350M euros in 2021-23 in this Mission. The Digital Twin of the Ocean including the poles, with an EU prototype announced to be delivered by 2024 as part of this EU Mission, is also a relevant European investment in this context.

Participating countries: Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Faroe Island, Ireland, Israel, Italy, Latvia, Lithuania, Norway, Netherlands, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Türkiye, United Kingdom, Ukraine.

- **OCEAN-ICE**

OCEAN-ICE is a project that will assess the impacts of key Antarctic Ice Sheet and Southern Ocean processes on Planet Earth, via their influence on sea level rise, deep water formation, ocean circulation and climate.

Participating countries: Belgium, France, Italy, Germany, Netherlands, Norway, Sweden.

- **Sustainable Blue Economy Partnership (SBEP)**

The Sustainable Blue Economy Partnership (SBEP) is a partnership between the European Union and national programmes with an investment of 450M euros which also contributes to more sustained and continuous observation and monitoring of maritime activities and of the biological, chemical, physical, geological and hydrological characteristics of ocean ecosystems. Research will address key knowledge gaps that are fundamental to baseline assessments and forward projections of ocean health and mitigation of climate change and ocean acidification. For the first joint transnational call of the SBEP, proposals were also addressing the Arctic Ocean.

Participating countries: Belgium, Brazil, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Faroe Island, Ireland, Iceland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Türkiye.

Finland

- **Sámi Climate Council**

In order to further engage the Sami in Finland, the Government of Finland established a Sámi Climate Council on August 24, 2023. This Council is a new independent expert body, tasked with bringing the knowledge base and perspectives of the Sámi people into the climate policy processes in Finland. The Council is a platform for dialogue between the holders of traditional Sámi knowledge and the scientific community. The purpose of this internationally quite unique national body is to promote the rights of indigenous peoples. The Council has 12 members who represent different fields of science and holders of traditional Sámi knowledge. It will provide statements on climate policy plans and create knowledge base in support of the preparation of climate policy from the perspective of promoting the Sámi culture.

France

- **AIAI**

AIAI (Artificial Intelligence to Improve the Coupling of the Antarctic Ice Sheet with the Ocean/Atmosphere System) is a project whose aim is to improve the integration of the Antarctic ice sheet into a climate model through the use of neural networks at the coupling interfaces.

- **ARCA**

ARCA (Climatology of Atmospheric Rivers in Antarctica) is a project aimed at describing atmospheric rivers (AR) in the polar regions by applying detection algorithms for these events to historical, current and future climate simulations. ARCA will assess the impact of ARs on Antarctic surface mass balance. ARCA will also analyze the extent to which moisture transported by ARs has a particular isotopic and chemical signature, and assess whether these can be found in ice cores.

- **CASPA**

The CASPA project aims at acquiring new fundamental knowledge of the processes governing the formation and distribution of anthropogenic aerosols from local, versus distant, sources in the Arctic, in order to reduce uncertainties in simulations of aerosol impact on Arctic climate. Field data will be analyzed in combination with multi-scale modelling to improve process treatments in Alaskan and Arctic-scale simulations, and better quantify the contributions of local versus distant sources and their radiative effects.

- **CLIMArcTIC**

CLIMArcTIC is a project coordinated by the French "Ocean and Climate" program, funded by France 2030. Using a multidisciplinary approach, its mission is to understand and predict the evolution of physical and biochemical conditions in the Arctic linked to intensifying climate change in the coming years, and its socio-economic impact on local communities.

- **DACOTA**

DACOTA is a project supported by the French Polar Institute and has been part of the GLACIOCLIM-SAMBA program since 2023. It aims at gaining a better understanding of the dynamics of East Antarctic marine outflow glaciers and the relationship between environmental and climatic changes and the evolution of glaciers and ice caps.

- **DELTA**

DELTA (Long-term glacier dynamics in East Antarctica and impact on sea-level rise) is a multi-proxi study based on the acquisition of data on land and at sea, followed by the production of numerical models to study the dynamics of deglaciation in Terre Adélie and predict the future behavior of the East Antarctic Ice Sheet (EAIS).

- **Dim**

In the Arctic Ocean, microalgae are subject to extreme seasonal variations in light levels, from polar night under pack ice to midnight sun in ice-free waters. The aim of the Dim project is to quantify the growth of Arctic microalgae at extremely low light levels, and to identify the regulatory mechanisms of cell metabolism that make this possible.

- **HiPerBorea**

HiPerBorea is a research project coordinated by the Geosciences Environment Toulouse (GET) laboratory and funded by the French National Research Agency (ANR). Its mission is to provide quantitative and predictive modeling of the evolution of hydrosystems in polar and glacier regions facing climate change. The project also focuses on the study of biogeochemical and ecological transformations induced by thawing permafrost.

- **iFROG**

The iFROG (Impact of Future Rain/snow transition height On Glacier mass balance) project whose mission is to refine the glacier evolution scenario (reduce the uncertainty surrounding the future of precipitation in the high mountains and representation of feedbacks between snow and ice albedo in current glaciological models).

- **Mission SEIS-ADELICE**

The SEIS-ADELICE Mission has been coordinated since January 2023 by the Institute of Environmental Geosciences at the University of Grenoble Alpes. Its main objective is to study the dynamics of the Astrolabe Glacier in Terre Adélie by recording glacial seismicity induced by glacier fracturing, sliding and interactions with the ocean.

- **PanArctica**

PanArctica (Phylogenic, ecological and physiological characterization of the pan-genome of Arctic algae) exploits new genomic resources, including environmental sequence data from the

Tara Oceans expedition and the functional physiology of the model diatom species *Phaeodactylum*, to systematically explore the genes that enable different algae to thrive in the Arctic Ocean. The data obtained from this project will provide a better understanding of the functional biology of an important and rapidly evolving ocean habitat.

- **PARI**

PARI is a project supported by the French Polar Institute with the aim of dating paraglacial landslides using a geomorphological approach in the north-western part of Iceland (Westfjords), where numerous landslides have already been mapped.

- **PEACE**

The PEACE project, coordinated by CNRS, aims at understanding the impact of permafrost degradation and vegetation changes induced by climate change on the dynamics and transfers of carbon-nitrogen-phosphorus in Arctic ecosystems. The research covers Canada, Greenland and Sweden.

- **PREVRISK-CC**

PrevRisk-CC (Risk prevention and adaptation to climate change in the Espace Mont-Blanc) is a cross-border project bringing together the French, Italian and Swiss local authorities of the Espace Mont Blanc and coordinated by the Fondation Montagne Sûre. The project aims at deepening the scientific study of natural hazards, organizing a vast awareness and information campaign, and carrying out operational monitoring and adaptation actions in the field.

- **PRISMARCTYC**

PRISMARCTYC is a project funded by the Belmont Forum to better understand the hydrological, geochemical, geomorphological, microbiological and socio-economic impacts of permafrost thaw on soils, surface and groundwater in the Arctic and Subarctic, and their sustainability in a changing climate.

- **Scale-Aware Sea Ice Project (SASIP)**

SASIP is a project to develop a model of Arctic and Antarctic sea ice to improve high-resolution, large-scale forecasts and the propagation of sea-ice related climate feedbacks. The main objective of the project is to better understand the impact of climate change amplification in the polar regions.

- **WISPER**

WISPER is a project aimed at understanding the role of water infiltration in the thermal dynamics of permafrost walls and in triggering rockfalls in high mountains. The aim is to develop numerical models coupling thermal and hydrological processes to help constrain mechanical models, and to introduce new experimental methods, notably geoelectrical, to understand these processes.

Germany

- **Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAic)**

MOSAic (Multidisciplinary drifting Observatory for the Study of Arctic Climate) is an expedition led by the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and funded by the US Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado and the NOAA Physical Sciences Laboratory. The project involved the drifting of an icebreaker trapped in the ice for a year to collect scientific data on the impact of climate change. An effort is currently underway to develop and launch a MOSAic-type campaign for Antarctica.

Japan

- **Arctic Research Vessel Project**

Japan is building an Arctic research vessel with icebreaking capabilities and world-class scientific facilities. This research vessel will promote the importance of Arctic science and work towards sustainable development of the Arctic region. Furthermore, Japan remains committed to developing the next generation of scientists and engineers to utilize this research vessel and plans to develop further and deeper collaborations with our international partners.

- **The Arctic Challenge for Sustainability II (ArCS II)**

ArCS II is a national flagship project for Arctic research. Aiming to foster the realization of a sustainable society, the ArCS II project will promote advanced research to understand the current status and process of environmental changes in the Arctic and to improve

meteorological and climate prediction in order to assess the impact of rapid environmental changes in the Arctic on human society, including Japan, as well as to implement the results of this research into society.

Netherlands

- **Dutch Consortium for Cryosphere and Climate Change**

This project aims to model the changes in the two polar regions and indicate how these changes affect the Netherlands, particularly in terms of sea-level rise and the likelihood of extremely high-water levels. It is the fruit of collaboration between Utrecht University, Groningen University and Delft University of Technology.

- **NWO-NPP**

The Dutch Polar Research Program, managed by the Netherlands Organization for Scientific Research (NWO), supports scientific research at the poles in the NPP (Netherlands Polar Program) project, including regions of the cryosphere. Dutch researchers have taken part in polar expeditions and international collaborative research projects to study glaciers, pack ice and other aspects of the cryosphere.

Poland

- **Cryosphere Integrated Observatory (CRIOS)**

CRIOS (Cryosphere Integrated Observatory - Network on Svalbard) is an automated observation network (with real-time data transfer) for continuous multi-proxy monitoring of glaciers in West Svalbard in partnership with Norway (SIOS-KC).

- **FROST**

FROST is a project whose aim is to record cryo-earthquakes in glacial masses (Svalbard) using a new generation of seismological detectors (optical fibers). The project is supported by the Polish Academy of Sciences, the University of Tromsø (Norway) and the Norwegian research foundation NORSAR.

Spain

- **Bridging the Gap: From Terrestrial to Icy Moons Cryospheres**

Bridging the Gap: From Terrestrial to Icy Moons Cryosphere is an International Space Science Institute project dedicated to the study of the cryosphere at various scales, both terrestrial and extraterrestrial. The project's mission is to collect data, analyze and compare terrestrial cryospheric environments and icy moons.

Participating countries: Czech Republic, France, Germany, Spain, Switzerland, United States.

- **Ice Sheet Model Intercomparison Project (ISMIP6)**

Since its foundation in 2014, ISMIP6 has brought together an international consortium of ice sheet models to understand and study the contribution of Antarctic and Greenland ice sheets to sea level rise.

Participating countries: Belgium, Germany, Japan, Netherland, Norway, United Kingdom, United States.

United States of America

- **International Thwaites Glacier Collaboration**

The International Thwaites Glacier Collaboration is an Anglo-American initiative coordinated since 2018 by the US National Science Foundation (NSF) and the National Environment Research Council (NERC) to study the Thwaites Glacier, one of Antarctica's most unstable glaciers, whose accelerating flow velocity could lead to its total dislocation in the next few years.

- **GreenDrill**

GreenDrill is a drilling program run by Columbia University's Climate School to identify which areas of Greenland are most vulnerable to climate change, which will contribute to rising sea levels, and how quickly these areas will be affected.

- **Greenland Rising**

Greenland Rising is an American-Greenlandic project funded by the US National Science Foundation (NSF) to study three major effects of sea-level rise on the natural, social and built environments of four different local communities from Greenland.

- **Permafrost Pathways**

The Permafrost Pathways project is a monitoring and modeling network dedicated to permafrost and carbon fluxes in the Arctic. The project works in collaboration with local and national decision-makers in the Arctic community, providing them with essential data for the implementation of adaptation and mitigation policies in order to face climate change.

INTERNATIONAL COOPERATION PROGRAMS

Under the aegis of the European Space Agency (ESA)

- **Arctic + Salinity**

The Arctic + Salinity project aims at measuring sea surface salinity and analyzing changes in freshwater flows in the Arctic region.

Participating countries: Norway, Spain, United Kingdom.

- **CIMR L2PAD**

CIMR (Copernicus Imaging Microwave Radiometer) is a mission to observe sea surface temperature, sea ice concentration and sea surface salinity using a microwave radiometer in the Arctic region.

Participating countries: Denmark, Finland, France, Germany, Norway, Netherlands, Spain, United States.

- **Southern Ocean Freshwater (SO-FRESH)**

SO-FRESH is a project funded by the European Space Agency as part of the Polar Cluster Initiative. Its aim is to improve our understanding of sea ice changes, measure the impact of sea ice melt on coastlines, and analyze deep water formation processes.

Participating countries: Spain, United Kingdom.

Under the aegis of the International Association of Cryospheric Sciences (IACS)

- **Randolph Glacier Inventory (RGI)**

The Randolph Glacier Inventory (RGI) gathers space images of terrestrial glaciers for the purpose of studying and collecting annual data on changes in their volume and elevation, and the cryosphere's responses to climate forcing. These data are collected by the working group of the Randolph Glacier Inventory and Infrastructure for Glacier Monitoring, a body of the International Association of Cryospheric Sciences (IACS).

Participating countries: Austria, France, Germany, Japan, Spain, Switzerland, United Kingdom, United States.

Under the aegis of the Scientific Committee on Antarctic Research (SCAR)

- **Antarctic Geospace and Atmosphere Research (AGATA)**

The Antarctic Geospace and Atmosphere Research (AGATA) aims to monitor and study the Antarctic atmosphere and geospace to better understand Sun-Earth interactions and their impact on the polar regions.

Participating countries: Argentina, Belgium, Brazil, Canada, China, Finland, France, Germany, Hungary, Italy, Japan, Norway, Russia, South Africa, South Korea, Sweden, United Kingdom, United States, Ukraine.

- **Antarctic Permafrost and Soils (ANTPAS)**

The Antarctic Permafrost, Soils and Periglacial Environments is a group of experts whose mission is to develop, through international coordination, an online database and observation system for Antarctic soils and permafrost.

Participating countries: Italy, New Zealand, Russia, South Africa, Spain, United States

- **Antarctic RINGS**

RINGS is an action group aimed at collecting accurate topographic data of Antarctic ice flow. The initiative also aims at improving predictions of sea ice retreat, better quantify ice-ocean interactions through improved bathymetric knowledge, and study interglacial hydrology and geology in the region.

Participating countries: Austria, Belgium, China, Denmark, Germany, India, Italy, Japan, New Zealand, Norway, Russia, South Korea, Spain, Switzerland, United Kingdom, United States.

- **ANT-ICON**

The Integrated Science to Inform Antarctic and Southern Ocean Conservation (ANT-ICON) is a program whose mission is to answer fundamental scientific questions concerning the conservation and management of Antarctica and the Southern Ocean. It focuses on research to drive and inform international decision-making and public policy change.

Participating countries: Argentina, Canada, Chile, France, New Zealand, Norway, South Africa, South Korea, Spain, United Kingdom, Uruguay.

- **International collaboration effort for improving paleoclimate research (ICEPRO)**

The mission of the International Collaboration Effort for Improving Paleoclimate Research in the Southern Ocean is to improve our understanding of past interactions between ocean, ice and land by comparing current and past international paleoenvironmental observations and studies through international scientific collaboration and multilateral expeditions to Antarctica.

Participating countries: Australia, France, Germany, India, Italy, Japan, New Zealand, South Korea, Spain, United Kingdom, United States.

- **INSTabilities and Thresholds in ANTArctica (INSTANT)**

The INSTANT program aims to quantify the contribution of the Antarctic Ice Sheet to past and future global sea-level change. It encompasses the geosciences, physical sciences and biological sciences, how interactions between the ocean, atmosphere and cryosphere have influenced ice sheets in the past, and what can be expected in the future, with a focus on quantifying contributions to global sea-level change.

Participating countries: Australia, Bulgaria, Canada, Denmark, France, Germany, Italy, Japan, New Zealand, Norway, Spain, United Kingdom, United States.

- **Near-term variability and prediction of the Antarctic Climate (ANTCLIM NOW)**

AntClim Now is a research program that brings together scientists from around the world to study the prediction of short-term conditions in the Antarctic climate system on time scales

ranging from a few years to several decades with an integrated approach, going beyond climate projections of the physical system to consider the Antarctic environment as a whole.

Participating countries: Australia, Brazil, Chili, China, India, Malaysia, New Zealand, Portugal, South Korea, Spain, United Kingdom.

- **Southern Ocean Observing System**

The Southern Ocean Observing System (SOOS) is a joint initiative of SCAR (Scientific Committee on Antarctic Research) and SCOR (Scientific Committee on Oceanic Research) to create a bridge between these two communities. SOOS is hosted by IMAS, and its main mission is to observe the Southern Ocean. Twenty-nine countries are partners in the initiative, including France (Sorbonne Université). One of SOOS's scientific missions is to understand and quantify the state and variability of the Southern Ocean cryosphere.

Participating countries: Argentina, Australia, Brazil, Chili, China, France, Germany, India, Italy, Japan, New Zealand, Norway, Russia, South Africa, South Korea, Sweden, United Kingdom, United States.