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## FOREWORD



The National Institute of Polar Research (NIPR) is an inter-university research institute that conducts comprehensive scientific research and observations in polar regions. As one of the research institutes constituting the Research Organization of Information and Systems (ROIS), NIPR plays a major role in Japanese Antarctic research programs, while pursuing cutting-edge studies in collaboration with research communities relating to the earth, the environment, life, space and other fields. The third mid-term program of ROIS started in FY2016. NIPR is promoting cutting-edge interdisciplinary studies with state-of-the-art technology and modern modeling methods to reveal the Earth system and global environmental changes.

As demonstrated by the rapid decrease of the Arctic sea ice cover in recent years, research in the polar region is becoming important for monitoring Earth's environment. NIPR is involved in a wide range of activities in Arctic and Antarctic research programs and is using advanced methods, long-term monitoring observations and field and ocean observations over extensive areas. After the Arctic Climate Change Project as one of the Green Network of Excellence (GRENE) programs (FY2011-2015), the Arctic Challenge for Sustainability project (ArCS) has been implemented in collaboration with various research communities. In addition, the Arctic Environmental Research Center (AERC) of NIPR is collaborating with the Arctic Research Center of Hokkaido University and the Institute of Arctic Climate and Environment Research in the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) to establish the Japan Arctic Research Network Center (J-ARC Net) at Hokkaido University in FY2016.

While elucidating future trends in Earth's environment through detailed analyses of polar research data is a big task for NIPR, it continues to further develop research in other areas of polar science.

These studies are planned and implemented under international frameworks. Having participated in activities of the Scientific Committee on Antarctic Research (SCAR), the International Arctic Science Committee (IASC), the Asian Forum for Polar Sciences (AFoPS) and international joint research programs, NIPR plays an important role in international global observations. In April 2015, Japan hosted the "Arctic Science Summit Week 2015", where various international Arctic research organizations mutually discussed current and future research programs through information exchange.

The training of researchers at the institute is also important. As a parent institute of the Graduate University for Advanced Studies (SOKENDAI), NIPR accommodates a 5-year doctoral course for graduate students in the Department of Polar Science, School of Multidisciplinary Sciences and is involved in the guidance of promising researchers with high-level research capabilities and skills necessary for field science. Utilizing the findings of observations and research in polar regions, NIPR promotes outreach activities for schools using the INTELSAT satellite communication system. In addition, the Polar Science Museum at the Tachikawa campus and exhibitions and lectures in various Japanese cities are used as a means of disseminating information about polar research and its achievements.

We ask for your continued support of our research activities.

**Dr. Kazuyuki SHIRAISHI**

Director-General, National Institute of Polar Research



# Activities of the National Institute of Polar Research (NIPR)

## Serving as Japanese key institution for scientific research and observation in polar regions

The National Institute of Polar Research (NIPR) maintains monitoring stations in Antarctica and the Arctic, and conducts comprehensive polar research based on observations. As an inter-university research institute, NIPR provides researchers throughout Japan with the necessary infrastructure for North and South Pole monitoring and observation, and works for the advanced polar science by soliciting proposals for collaboration projects and furnishing researchers with materials and information.

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## A leader in implementing Antarctic monitoring programs

The Institute formulates and implements plans for observation of the Antarctic region. From the 58th Antarctic observation onward, primarily research and observations focus on the theme of "Global changes and movements on Earth system through Antarctic". Currently NIPR is running phase 9 of "six-year Antarctic research program". In addition to maintaining and administering monitoring and observation stations, NIPR organizes Antarctic research expeditions. NIPR conducts all planning as core institute: various forms of training, supplying for monitoring programs, shipping plans; collects and stores materials obtained from observations.

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## A leader in implementing Arctic research programs

Arctic research has been carried out at the observation bases in Svalbard, Greenland, northern Scandinavia, Iceland, and entails observation of the atmosphere, ice sheets, the ecosystem, the upper atmosphere, the aurora, and Earth's magnetic field. In addition, observations of the marine ecosystem and atmosphere are carried out in the Arctic Ocean and sub-Arctic seas. NIPR has promoted the Arctic Challenge for Sustainability (ArCS) project as the core institute of the project.

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## As a center for young researchers development

NIPR accommodates a 5-year doctoral course for graduate students as a parent institute of the Graduate University for Advanced Studies (SOKENDAI). The Department of Polar Science, School of Multidisciplinary Sciences provide students opportunity to practice international, open minded, and cutting edge researches.





### Aims of the Research Organization of Information and Systems (ROIS)

ROIS seeks to re-examine complex phenomena from the perspective on information and systems, in areas such as life science, the earth, the natural environment and human civilization which are fundamental to our survival and prosperity in the 21st century. By doing so, the Organization seeks to promote integrated research that transcends the boundaries of individual fields. (extract from Guide to the Research Organization of Information and Systems (ROIS) )

The Research Organization of Information and Systems (ROIS) was launched in April 2004.

Research Organization of Information and Systems



# National Institute of Polar Research Organization Chart





## Collaboration Projects

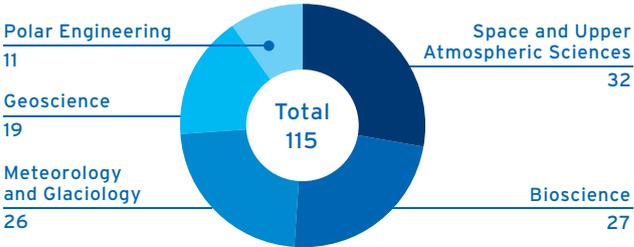
### Research projects

These are projects are led by NIPR faculty in cooperation with universities and research institutions to promote polar science in a focused and planned manner. Approximately 250 researchers from NIPR and other organizations are involved in 11 other project research.

### General Collaboration Projects

This refers to Collaboration Projects conducted through an open call for applications. NIPR researchers serve as research team leaders for these projects which are the foundation of the Institute's research. The Research Groups within NIPR correspond to the fields of general Collaboration Projects. In FY2016, approximately 300 outside researchers will participate in 115 research tasks.

General Collaboration Projects tasks by field



### Collaboration Projects based on agreements

In an effort to advance research and education and cultivate human resources, NIPR has concluded agreements with several research institutes in Japan. The Institute conducts Collaboration Projects with these partners to ensure the mutual exploitation of R&D capabilities and resources and close, effective execution.

Institutions with which NIPR has agreements
Institute of Low Temperature Science, Hokkaido University
Tokyo University of Marine Science and Technology
Kitami Institute of Technology
Research Institute for Sustainable Humanosphere, Kyoto University
Faculty of Pure and Applied Sciences, Tsukuba University
Graduate School of Science and Faculty of Science, Tohoku University
Graduate School of Science, Kyoto University
International Center for Space Weather Science and Education, Kyushu University

# Links between space and the Earth observed by remote-sensing techniques



Leader Akira KADOKURA

The target of the Space and Upper Atmospheric Sciences Group ranges from the stratosphere (above 10 km) to the interplanetary space of the solar system.

## Study on aurora and the link between solar wind, magnetosphere, and ionosphere

Auroras, the most majestic and beautiful phenomenon in the polar region, remain puzzling and of great interest to researchers. An aurora is excited by electrons and protons precipitating from space near the Earth (geospace) to the polar atmosphere along the geomagnetic field lines and reflects variations in the geospace environment, which changes dynamically due to interaction between the solar wind, the magnetosphere and the ionosphere.

We have been conducting ground-based network observations in the Antarctic and Arctic regions with radars, magnetometers, and auroral imagers. Such observational data are used to study the mechanisms of various auroral phenomena and solar wind-magnetosphere-ionosphere coupling.

## Study on middle and upper atmosphere

The transient region between the middle (10-100 km) and the upper (100 km -) atmosphere is a boundary region between space and the Earth. The upper atmosphere is partially ionized and acts as plasma particles, whereas conditions



Polar mesospheric cloud (PMC) observed at Syowa Station (Y. Takeda)

are more like fluid and neutral in the middle atmosphere. In contrast to the aurora in the upper atmosphere, notable phenomena in the polar middle atmosphere are the ozone hole, polar stratospheric clouds (PSC) and polar mesospheric clouds (PMC). In order to precisely measure the polar middle and upper atmosphere, which vary in response to meteorological disturbance from below, solar activities from above, and global meridional circulations of the atmosphere, we are carrying out various ground-based measurements in the Arctic and the Antarctic regions.

Aurora observed above Iceland, which is the geomagnetic conjugate point of Syowa Station



# We study the climate and environmental system of the Earth from the polar regions

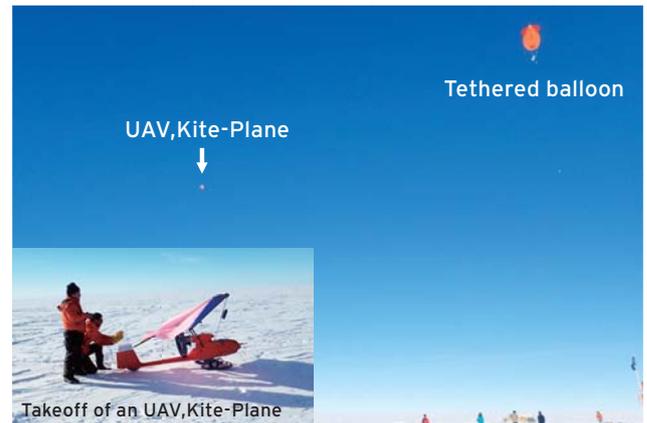


Leader Hideaki MOTOYAMA

### Climate change in the polar regions: past, present and future

Most of the fresh water on the Earth exists in the polar regions in the form of snow and ice. These regions also play an important role in the global water cycle and sea level changes. The sea ice area undergoes considerable seasonal fluctuations, and sea ice contributes to the exchange of heat and energy between the atmosphere and the ocean.

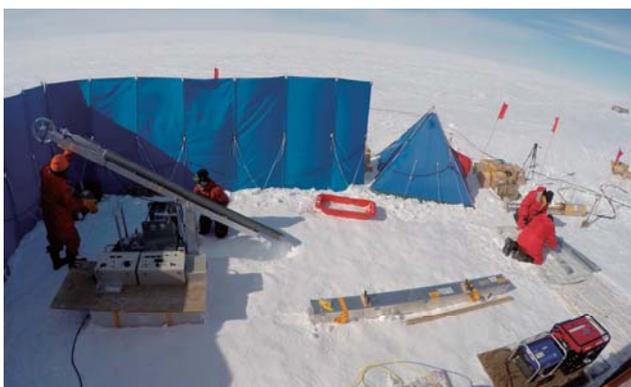
The Meteorology and Glaciology Group conducts research on topics from the fields of atmospheric science, meteorology, glaciology, sea ice, oceanography, and paleoclimatology; in particular, the group studies the atmosphere (i.e., the troposphere and stratosphere), cryosphere, and ocean in the polar regions. What phenomena are taking place now? How did the global climate and environment appear in the past? Studies on change mechanisms of the Earth's system to clarify the future are conducted mainly by field observation and



Atmospheric observation above the Antarctic ice sheet with unmanned aerial vehicle (UAV) and tethered balloon



Multi-year ice observation near Syowa Station



ice core drilling at the Antarctic ice sheet

remote sensing. In Antarctica, in particular, the influence of human activity is extremely low. Therefore, changes in the Earth's systems can be studied from this remote area.

Research for clarifying phenomena and mechanisms of the atmosphere in polar regions: atmosphere and aerosols; trace gases; geochemical and water circulation; radiation property of aerosols; the influence of aerosols on climate; radiation budget; continuous observation of the greenhouse gases, including carbon dioxide and methane in the polar regions; and surface and aerological observations.

Study of the polar cryosphere: paleoenvironmental study based on ice cores of ice sheets and glaciers (for example, two deep ice cores at Dome Fuji, Antarctica, provided in-depth information on global environment change over the past 720,000 years). An ice core study of the Greenland ice sheet, located in the northern hemisphere is important for understanding the global climate and environmental change mechanisms. In addition, study of ice sheet dynamics and surface mass balance and depositional mechanisms along with interdisciplinary observations of the Arctic and Antarctic cryosphere are being conducted.

Study of polar oceans: the formation mechanism of polynyas and Antarctic Bottom Water; sea ice growth and melt processes; the influence of sea ice on marine-boundary layer structure and circulation; sea ice and climate change; the influence of fast ice and ice shelves on ocean; carbon dioxide exchange between atmosphere and ocean in the polar regions; and ocean acidification.

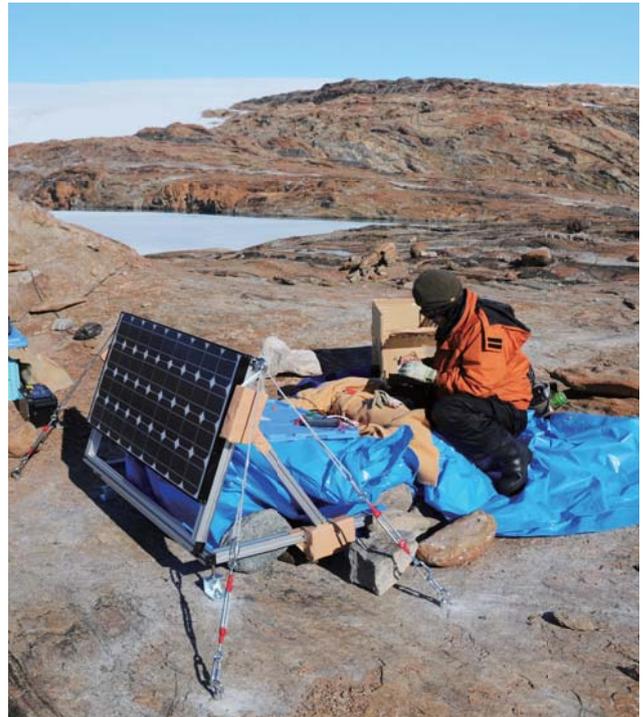
# Study of the evolution of the Earth for 4.6 billion years

Leader Hideyasu KOJIMA

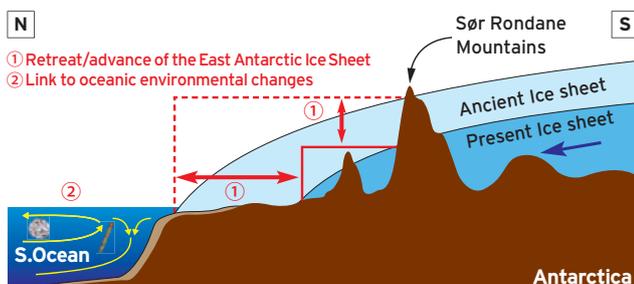


## From advanced study of geology, geomorphology and solid earth geophysics

The Antarctic Continent, which is mostly covered by the Antarctic ice sheet, is comprised of a substratum that formed over a period of 4 billion years. The face of this rock is exposed on the outer edges of the ice sheet. The exposed rock and surrounding sea areas contain glacial geomorphology and deposits that hold records of the retreat and advance of the ice sheet. The land mass and ice sheet interact with each other, allowing the observation of unique solid earth geophysics phenomena. Traces of the Gondwana supercontinent breakup can be found on the seafloor of the Antarctic Ocean and the Indian Ocean that surround the Antarctic continent. Moreover, meteorites containing clues to the creation of our solar system can be found in the Antarctic ice sheet. These events and phenomena are studied with geology, mineralogy, geomorphology, quaternary research, geodesy and solid earth geophysics to reveal the history of the universe, changes in the historical evolution of the Earth's crust, and changes in the quaternary environment accompanying the retreat and advancement of the ice sheet, as well as changes in the Earth's crust and sea surface today.



GPS observation on the rock areas



Geomorphological and geological surveys of the Sør Rondane Mountains. Our objectives are to reconstruct a detailed history of the retreat/advancement of the East Antarctic Ice Sheet based on geomorphological and geological surveys, and to understand its response to the Southern Ocean and changes in the global climate.



EMPA, analytical tools of geology and petrology

# Study of the present and past to identify future changes in polar ecosystems



Leader Tsuneo ODATE

## Biological research in three fields

The fundamental task of this group is to establish how organisms have adapted and survived in the extremely harsh environments of the polar regions. It also studies the

sensitive response mechanisms of marine and terrestrial communities to global environmental changes. Its studies extend to the production process in marine lower trophic levels, behavior of marine predators and terrestrial biology.

1

### Biological oceanography

Research focuses on mechanisms of ecosystem variability in association with environmental change in the Antarctic Ocean using in situ and satellite observations. With particular focus on plankton variability in the Indian Sector, we have been conducting corroborative research on analysis of long-term data with Australian scientists.



Plankton sampling in the pack ice

2

### Vertebrate ecology

Research focuses on the behaviour and ecology of polar marine animals, especially seabirds and marine mammals. We have been developing small data loggers with sensors (GPS, camera, acceleration etc.) that can be attached to animals. Using these instruments, we obtain detailed information about at-sea behaviour and ecology that is critical to assessing the effects of environmental changes on the animals.

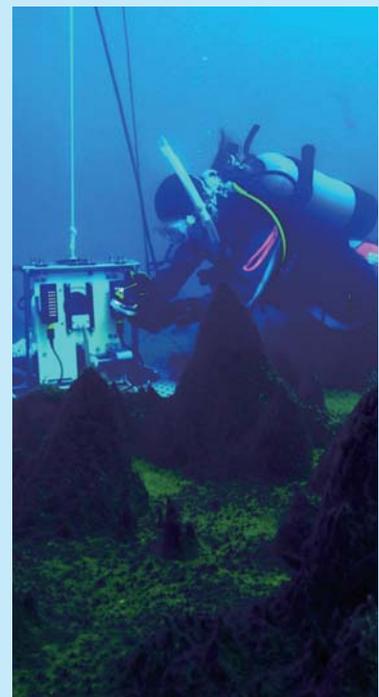


Adélie penguin with data logger

3

### Terrestrial biology

Research focuses on the origins and establishment of Antarctic lake biota, paleo-environmental reconstruction from lake sediment samples and response mechanisms in lake ecosystems to global environmental change. Research on the Arctic ecosystem in particular has been conducted for more than ten years and accumulated ecophysiological data on soil microbial respiration and photosynthetic production.



Limnological survey in an Antarctic lake

# Follow-up of supporting technology for polar science observation

Leader Yoichi MOTOYOSHI



## Function of Polar Engineering Group

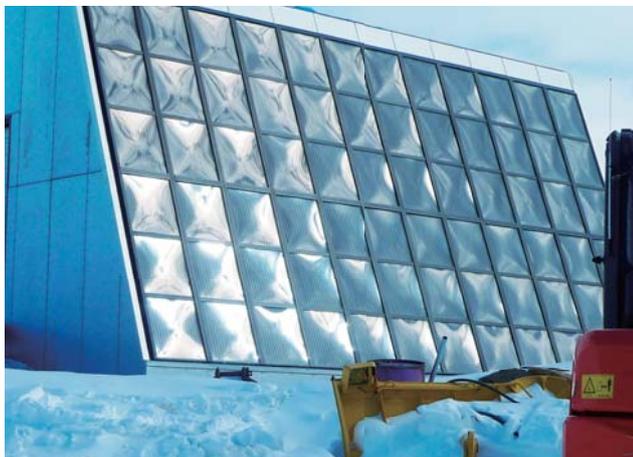
There are many technical challenges to overcome when we implement some researches in polar region. Also it is very important to use limited fuel, food, material etc. effectively because the means of transportation is hampered in polar zone. Nowadays it is required to reduce the impacts on the environment. In our group we address technical challenges associated with scientific observation and logistic activities.

### Study of logistical problems for future inland operations

To carry out inland operations in the Antarctic, we need to solve several logistical issues, such as transporting large quantities of goods, ensuring safe transport routes, minimizing the physical vibration in transportation of precision equipment, and building and construction on the ice sheet etc. one by one. To do so, information collection and test development through the introduction of new policies and technology are essential, in addition to taking advantage of accumulated data and experience.

### Investigation for on-site energy production

The fuel consumption at Syowa Station is increasing year after year due to expansion of the station and scientific observations. Hereafter, the stockpile of fuel is expected to be shaky as a tightrope because there is a limit on fuel transportation by ship. In order to improve that situation,



Solar panels for room heating installed on the wall of a building at Syowa Station

we are making efforts to increase production of renewable energy like wind and solar power without depending only on fossil fuels. As part of the study, investigations like effective array and surface deterioration of PV panels are carried out.

### Study on interconnected power system between diesel and renewable energy

The electricity generated by wind turbine and PV is fluctuant depending on wind speed and insolation condition. Technologies of interconnected power system between diesel and renewable energy are of great interest, and we are exploring the methods considering conditions of polar region.

### Study on storage and utilization system of surplus power

When we obtain surplus power derived from renewable energy, we could harness the energy effectively if the redundant energy was not racked up and stocked. Organic hydride is one of the method of hydrogen storages and an appropriate technology for polar region because the substance is stocked hydrogen as an antifreeze liquid. On the other hand, heat storage technologies of sustainable energy are developed and close to practical use in the nation. We are searching those technologies in cooperation with researchers of universities and private companies.

### Study on making water

Snow melting is employed for domestic water supply at Syowa Station now, but requires an enormous amount of energy. On the other hand, employment of reverse osmosis membrane method by utilizing sea water near Syowa Station offers two big benefits. The energy consumption decreases and work force of casting snow blocks into water tank is excluded. Studies on temperature control of water pipeline and sea water pumping are conducted.

### Development of unmanned observation system

The unmanned operations save impact of CO2 and energy in polar region compared with manned operation. We have developed high reliability robot observation system based on satellite system. We will try to use unmanned aerial vehicle and small energy generator systems.

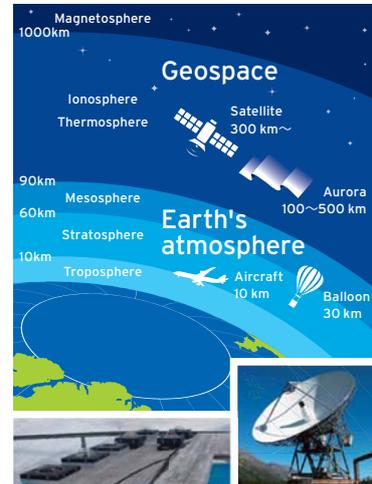
## Understanding the linkage among the Sun, geospace and Earth's atmosphere

Principal Investigator Hiroshi MIYAOKA



### Mechanism of the solar-terrestrial system variation clarified from both polar regions.

This project aims for studying the coupling processes among the Sun, geospace and Earth's atmosphere in polar regions. For this purpose, we strengthen national and international collaborative studies using facilities in both polar regions, such as the innovative Antarctic atmospheric radar (PANSY) at Syowa Station, the European Incoherent Scatter (EISCAT) radars in northern Scandinavia and Svalbard, the SuperDARN HF radar network, and ground-based networks of optical imagers and magnetometers. In addition to collaborative studies with modeling and simulation of the solar-terrestrial coupling system, we are also working toward developing new observation systems using optical imagers, lidars, and the next-generation geospace/atmospheric radar called 'EISCAT\_3D'. Based on these remote-sensing/ satellite observations and theoretical/simulation studies, we will pursue quantitative understanding and future prediction of the coupling processes among the Sun, geospace and Earth's atmosphere.



Earth's atmosphere and geospace studied in this project, with pictures of EISCAT radar and optical domes for imagers.

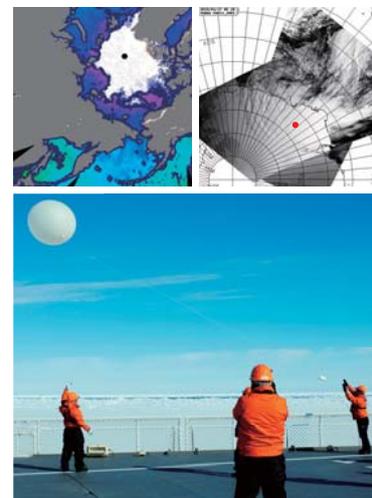
## Detect climatic changes in the polar regions and specify the mechanisms

Principal Investigator Naohiko HIRASAWA



### Diagnose the current climatic states of the polar regions to obtain a better future trajectory

The rapid decrease in sea ice and the retreat of the Greenland ice sheet are progressing in the Arctic region, and the West Antarctic warming proceeds at a higher pace than the global average. On the other hand, warming has not been detected clearly in East Antarctica, but large amounts of snowfall and warming events, which may relate to global warming, were observed in the last decade. This study diagnoses the current climatic states of the polar regions based on synoptic-scale atmospheric systems, meteorological and glaciological surface processes, precipitation and moisture circulation, and radiative processes, involving aerosols, clouds and greenhouse gases, and then offers a view of the future trajectory of the polar climate. To achieve the goal of this study, in situ observation such as comprehensive radiosonde campaigns and long-term employment of automatic weather stations in a wide range of areas are planned in combination with numerical modeling, satellite data analyses, and laboratory experiments.



Comprehensive in-situ observation to study the current climatic states of the polar regions.  
Upper left photo: ©NIPR/JAXA

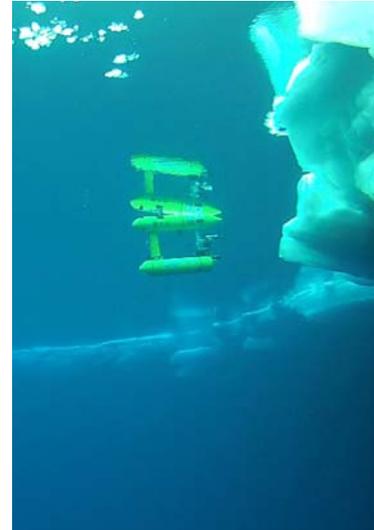
## Research of Ocean-ice BOUNDary INteraction and Change around Antarctica (ROBOTICA)

Principal Investigator Takeshi TAMURA



### For a better understanding of the Antarctic climate system

Antarctica and the surrounding Southern Ocean are changing. Acceleration of ice mass loss and warming of the coastal ocean in West Antarctica are problems that substantially impact the global climate system. In East Antarctica, which has been considered stable and has attracted relatively less attention, regional characteristics of interactions among climate subsystems have been recently revealed, and evidence of variations on different time scales from decades to millennia has been accumulating. Despite the growing awareness on the importance of ice-ocean interaction and long-term variabilities off the East Antarctic Coast, quantitative descriptions and understanding of the mechanisms are still insufficient. Given the global impact of the coastal variability through the bottom water export, investigations of the mechanisms and variabilities in East Antarctica are indispensable.



Ocean under the ice:  
uninvestigated research area

## Promotion of International Collaborative Study on Arctic Environmental Change

## New approaches to Arctic Environmental Research

Principal Investigator Hiroyuki ENOMOTO



### Looking at the Arctic problem from various perspectives

The Arctic has been experiencing rapid environmental changes. Monitoring these changes and more precise forecasting of future changes are strongly requested internationally. The Arctic Environment Research Center (AERC) is working for involvement in international research planning and cooperative efforts. AERC will continue its atmospheric monitoring and meteorological research, and attempt to establish new Arctic research activities through collaborative efforts with different research groups. Atmospheric monitoring at Ny-Ålesund provides new knowledge on long-term trends and also on seasonal variations. Clouds and aerosols observations at Ny-Ålesund will provide useful information on aerosol conditions and changing cloud properties. The Arctic Data archive System (ADS) will validate the synoptic background conditions of weather, sea ice and ocean by visualizing satellite information. AERC hopes to expand its research collaborations through discussion of relationships between air-ocean- sea ice and marine/terrestrial ecosystems. AERC also seeks new research possibilities through discussions on the connections between the troposphere and middle-upper atmosphere.



Cloud observation by all-sky camera  
at Ny-Ålesund research station.

## Reconstruction of the past climate and environment from Antarctic and Arctic ice cores



Principal Investigator **Kumiko GOTO-AZUMA**

### Uncovering the mechanisms of climatic and environmental changes

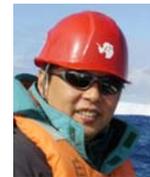
Snow deposited onto ice sheets/ice caps in Antarctica and the Arctic endures summers without melting, and accumulates over countless years. By drilling through ice sheets/ice caps, the past snow and atmosphere preserved within the ice cores can be retrieved. To reconstruct climatic and environmental changes that have happened during the past decades to hundreds of thousand years, we plan to analyze the ice cores obtained from different sites, such as Dome Fuji in Antarctica and Greenland in the Arctic. The information retrieved from the ice cores will greatly contribute to improving projections of the future climate and environment. The ice cores will be analyzed with cutting-edge analytical methods developed at the Ice Core Research Center, National Institute of Polar Research. Furthermore, we plan to participate in an international deep ice coring project in Greenland and to carry out a new deep ice coring project near Dome Fuji aimed at retrieving the oldest ice core in the world.



Ice-core processing and analyses in Greenland

## Evolution and response of solid earth in polar regions

## Investigation of changes in solid earth and surface environment from the polar regions



Principal Investigator **Yoshifumi NOGI**

### To elucidate changes in solid earth with various time and space scales from the polar regions

Phenomena in solid earth span various timescales, from the present time to several billions of years, and space scales, as the coupling of the surface environment changes, and amalgamation and fragmentation of continents. In the polar regions, a wide range of solid earth phenomena can be observed, such as the present crustal movement controlled by changes in ice sheet mass, and the formation and dispersion of continents. The polar regions are, therefore, ideal areas for understanding the evolution and response of solid earth based on the integrated research of diverse disciplines related to solid earth science and multidisciplinary studies concerning environmental changes to Earth's surface..

This project aims to investigate: (1) the response of solid earth related to environmental changes to Earth's surface ranging from the present to several million years ago, and (2) the evolution of solid earth over a geological timescale, from several million to billion years, based on the scientific research in polar regions.



Geomorphological and geological surveys in the central Dronning maud land to explore changes in solid earth.

## Formation and evolution of planetesimals and planet in the early Solar System

Principal Investigator Akira YAMAGUCHI



### Petrologic and geochemical study of Antarctic meteorites and micrometeorites

Approximately 70% of meteorites have been recovered from Antarctica. Moreover, micrometeorites (tiny meteorites < 1-2 mm) have been found on snow, ice sheets and moraines. Meteorites and micrometeorites are derived from hundreds of asteroids and comets, which are remnants of planetesimals. Small numbers of meteorites came from the Moon and Mars. Thus, the study of Antarctic meteorites helps us understand the origin of the solar system and the evolutionary history of planets. We perform mineralogical, petrological, geochemical and experimental studies of meteorites and micrometeorites to better understand the geological history of planets and planetesimals existing in the early Solar System.



A meteorite on ice

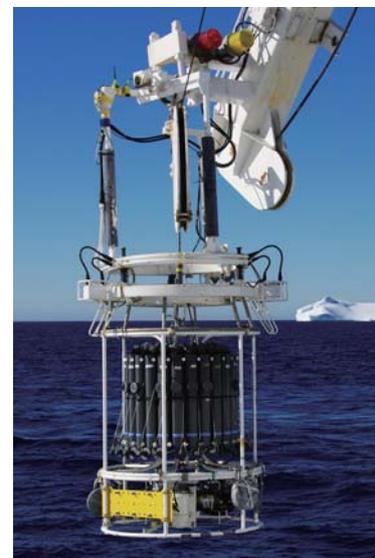
## Focusing on how the Indian sector of the Southern Ocean is changing and implications for the global system

Principal Investigator Tsuneo ODATE



### Process study involving cooperation with several survey ships

Monitoring of the Antarctic Ocean is necessary in order to detect signs of change in the global environment and evaluate the effects of the change on the Antarctic marine ecosystem. Because accessing West Antarctica is easier, most systematic approaches aimed at detecting changes in the environment have been taken in that region, especially in the Antarctic Peninsula region. The results of these studies indicate that the climate is changing rapidly and that the amount of winter sea ice has been decreasing around the Antarctic Peninsula region. However, the Japanese Antarctic Research Expedition has routinely conducted oceanographic and biological surveys on the way to and from Syowa Station of East Antarctica during every austral summer since 1972. It also cooperates with survey ships from Japan and other countries, and carries out process studies concerned with environmental change in the Indian sector of the Antarctic Ocean. The aim of this project is to promote analysis of samples and publication of observational data that were acquired from such observations, with a view to clarifying the features of the Indian sector of the Southern Ocean.



Mysteries of east Antarctica

## Ecological processes of organisms in response to the environmental change in polar regions



Principal Investigator **Satoshi IMURA**

### Intensive field-based research on polar ecosystems

In polar regions, limited numbers of flora and fauna such as mosses, lichens, and tardigrades, live in the harsh terrestrial environment, and some marine animals including seals and penguins breed on land. These simple but unique ecosystems are home to organisms adapted to the extreme environment of the regions with low temperature, desiccation, intense ultraviolet rays, etc. The aim of this project is to understand how the organisms in these regions respond to the changing environment and thus how the ecosystems will be altered. The biodiversity and material cycle in the terrestrial ecosystem, and behavior ecology of marine animals are the principal targets of this project.



Sediment core sampling at the bottom of an Antarctic lake

## Technical issues with polar observations and proposed solutions

Research Project KZ31

### Resolution of technical issues to support polar observations



Principal Investigator **Yoichi MOTOYOSHI**

### Feedback on research results to the observation sites

To successfully carry out observations in the polar regions, we need to solve a variety of technical issues. We also need to create a safe and efficient environment on the station, which is a platform for expeditioners' daily life. In recent years, promoting the introduction of renewable energy and minimizing the use of fossil fuels have also been important. In this project, we set the following themes as the immediate tasks, and are attempting to find solutions by gathering information, developing and testing ideas, and researching ways to provide feedback on the results to the observation sites in polar regions. Themes for the immediate future: 1) proposal of an efficient snow melting method at Syowa Station, 2) research on the smart energy system at Syowa Station, 3) development of an effective sewage treatment method at Syowa Station, 4) solving issues regarding transportation, construction, communication, and sharing information for future inland operations. These challenges will be met proactively by polar researchers and engineers thanks to the collaboration with private companies.



20kw wind turbine installed at Syowa Station

## Exploring the improvement of medical care in extreme environments of the Antarctic program



Principal Investigator **Giichiro OHNO and Kentaro WATANABE**

### Study on measures and medical care system of Syowa

Expedition personnel conduct field surveys and logistics projects in harsh conditions in Antarctica. They endure large seasonal variations of the day-night rhythm, including polar nights and 10-month long physical isolation from society. It is not uncommon that expedition personnel experience abnormalities in their diurnal rhythm and experience physical and mental disorders and stress under these extreme conditions. Because of the relatively high incidence of dental disease seen during overwintering, medical doctors have initiated attempts to improve the oral hygiene of expedition personnel as a part of health management to prevent dental diseases. On the other hand, the medical care system of Syowa Station is quite poor, with a limited supply of materials delivered once a year, a medical staff comprising only two doctors, and no medevac available from March to November. This study aims at improving the medical care system of Syowa Station that will contribute to better health management of expedition personnel, by examining the current medical care system, and exploring ways to improve the health of expedition personnel.



Collection of house dust at Syowa Station (upper image) and investigation of seasickness aboard Shirase with exhaust CO<sub>2</sub> gas measurement. (lower image)



Terminus of Monaco Glacier, Spitsbergen Island

# Linking up Antarctic observations between Japanese and international communities

Director Yoshifumi NOGI



The Center for Antarctic Programs (CAP) came into being in 2009 by merging research staff group and administrative/technical staff group in order to support every operations and activities of the Japanese Antarctic Research Expedition (JARE) go smoothly and efficiently. CAP covers such tasks as arrangements of planning and projects with research communities, maintenance of Antarctic stations, recruitment and nomination of expedition members, preparation of medical examination and training, transportation to Antarctica, and issues of environmental protection, etc.

JARE invites foreign scientists from many countries every year to perform scientific collaboration in Antarctica. Recently, Asian Forum for Polar Science (AFoPS) was established, in which Japan, Korea, China, India, Malaysia organize annual meeting every year to exchange information among member countries and to encourage other Asian countries' involvements in polar research.

In addition to the sea borne transport by "Shirase", JARE recently installed an air network system DROMLAN (Air consortium supported by 11 countries working in Dronning

Maud Land) to organize chartered flights to Novolazarevskaya Station, and Troll Station from Cape Town, and feeder flights covering other stations and activity areas in Antarctica. In the Southern Ocean, "Shirase" and "Umitaka-maru" of Tokyo University of Marine Science and Technology conduct collaborative observations on marine sciences. Such air and sea operations contribute to expand the activity area of JARE in the Antarctic.

### ● Syowa Station

Syowa Station was established on East Ongul Island, Lützow-Holm Bay, on January 29 in 1957 by the 1st Japanese Antarctic Research Expedition. At present, it also acts as an observation site for world meteorological network in addition to various scientific observations. 30 members spend whole year to conduct observations and maintain facilities there.

### ● Dome-Fuji Station

Dome-Fuji Station was established in January, 1995 to conduct deep ice-core drilling at the highest dome of Dronning Maud Land, some 1000 km away from Syowa Station. After completing 3035 m deep drilling, the station is being closed temporarily.

### ● Mizuho Station

Mizuho Station was established in July, 1970 on the Mizuho Plateau, 270 km south-east of Syowa Station. The station is being closed temporarily at present.

### ● Asuka Station

Asuka Station was established in March, 1985 in Dronning Maud Land, 670 km southwest of Syowa Station. The station is being closed temporarily at present.



Dome-Fuji Station

Syowa Station



# As a bridge of Japanese and international Arctic researches



Director **Hiroyuki ENOMOTO**

The Arctic Environment Research Center (AERC) was established in June 1990 at NIPR to promote the study of sea ice, oceanography, marine ecology, terrestrial ecology, atmospheric sciences, glaciology, and upper atmospheric sciences. AERC managed the GRENE-Arctic project that ran from 2011 to 2015. Since April 2015, AERC has experienced greater involvement in international research planning and cooperative efforts. AERC is gathering and providing information on Arctic observations and arranging for cooperative use of Arctic observation facilities. AERC manages the Arctic observatory in Ny-Ålesund, which is open for cooperative research, and an office at the University Centre in Svalbard (UNIS) in Longyearbyen, Spitsbergen Island. AERC assists researchers by supporting registration, providing base information, and implementing safety measures. AERC also assists in international cooperation for polar observations, such as the Antarctic-Arctic aurora conjugate observation point in Iceland, the European incoherent scatter (EISCAT) radar project and the East Greenland Ice Core Project (EGRIP).

### ● Ny-Ålesund Research Station

NIPR operates a research station at Ny-Ålesund on Spitsbergen Island, Svalbard Archipelago (79° N, 12° E), with support from the Norwegian Polar Institute (NPI) since 1991. The station has engaged in the observations of clouds, aerosols, radiation, greenhouse gases, vegetation distributions and ecosystem studies within the international cooperative observation system in Ny-Ålesund.

### ● Implementation of the Arctic Challenge for Sustainability project (ArCS)

NIPR is a core institute of the ArCS project. In this project, AERC is responsible for establishing research and observation stations, dispatching experts to Arctic-related international meetings, public relations, as well as implementing some international collaborative research efforts. AERC is also collecting and storing observational and model simulation datasets to make them available for studies on the Arctic Data archive System (ADS), which was launched as part of the GRENE-Arctic project.

### ● Japan Arctic Research Network Center (J-ARC Net)

AERC is working with Arctic Research Center at Hokkaido University and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) as partners of the Japan Arctic Research Network Center, J-ARC Net. Established in April 2016, J-ARC Net seeks to strengthen interdisciplinary studies on the environment and human activity, and to find approaches for solving problems through the collaborative efforts of industry, government and academia. AERC also provides facilities for researchers.

### ● Japan Consortium for Arctic Environmental Research (JCAR)

JCAR was established in May 2011 as a nationwide network for promoting Arctic environmental research. The JCAR office is located in AERC. JCAR coordinates future research plans by means of the 'Long-term Plan for Arctic Environmental Research' (<http://www.jcar.org/english/longterm/>), the development of research infrastructure, and the promotion of early career development. JCAR also gathers and distributes information on domestic and international activities and research on the changing Arctic environment. JCAR supports the International Symposium on the Arctic Research (ISAR), and co-organized the Arctic Science Summit Week (ASSW), held in Toyama, Japan, in April 2015.

Ny-Ålesund Research Station



# Integrate Arctic Environmental Study with Social and Human Sciences

## New Arctic Science Project of Japan

Worldwide attention on changes in the Arctic is growing. One reason is the fact that the Arctic plays a special role in the global climate. Other reasons include the prospect of an Arctic passage and new exploitation of natural resources. Given these circumstances, how do scientists studying the Arctic engage the public? How do they disseminate the information obtained through their research? With this in mind, a new Arctic science project "Arctic Challenge for Sustainability (ArCS)" was launched in September 2015. NIPR, as a core institute, leads the project with JAMSTEC and Hokkaido University. The ArCS project aims to elucidate the changes in the climate and environment, clarify their effects on society, and provide accurate projections and environmental assessments for internal and external stakeholders so they can make appropriate decisions on sustainable development of the Arctic region.

## Four Programs of the ArCS

### ● Program for Overseas Visits by Young Researchers

ArCS supports the development of young researchers by sending them to overseas research organizations promoting Arctic studies. This will advance our expertise on Arctic research through the acquisition of techniques and the co-production of knowledge.

### ● Dispatch of Experts to Arctic-related Meetings

ArCS dispatches experts in the natural and social sciences to Arctic-related international frameworks and meetings.

### ● Establishing Research and Observation Stations

ArCS promotes closer international cooperation through securing research and observation sites for Japanese researchers and students conducting observation or monitoring on a long-term basis.



### ● International Collaborative Research

ArCS engages in international collaborative research based on the following eight study themes. The unique feature of this program is that it includes a theme for humanities and social sciences in order to clarify the social and economic impact from changes occurring in the Arctic.

- Theme 1 Predictability study on weather and sea-ice forecasts linked with user engagement
- Theme 2 Variations in the ice sheet, glaciers, ocean, climate and environment in the Greenland region
- Theme 3 Atmospheric climate forcers in the Arctic
- Theme 4 Observational research on Arctic Ocean environmental changes
- Theme 5 Study on Arctic climate predictability
- Theme 6 Response and biodiversity status of the Arctic ecosystems under environmental change
- Theme 7 People and Community in the Arctic: Possibility of Sustainable Development
- Theme 8 Arctic Data archive System (ADS)

## GRENE Arctic Climate Change Research Project (July 2011 - March 2016)

### "Green Network of Excellence" (GRENE) Program Arctic Climate Change Research Project "Rapid Change of the Arctic Climate System and its Global Influences"

The GRENE Arctic Climate Change Research Project was conducted by NIPR as the core institute together with over 300 scientists from 39 institutions in Japan. The mechanism and the seasonal trend of warming amplification in the Arctic were clarified. The trend of major greenhouse gas and CO2 budget within the last ten years were also revealed. Impacts of sea ice reduction on the atmospheric circulation, extreme weather in Japan, and future fisheries have been recognized. The seasonal projection of sea ice distribution was developed to be precise so it could contribute to predicting the availability of Arctic sea routes. The ArCS project has been launched as a successor.



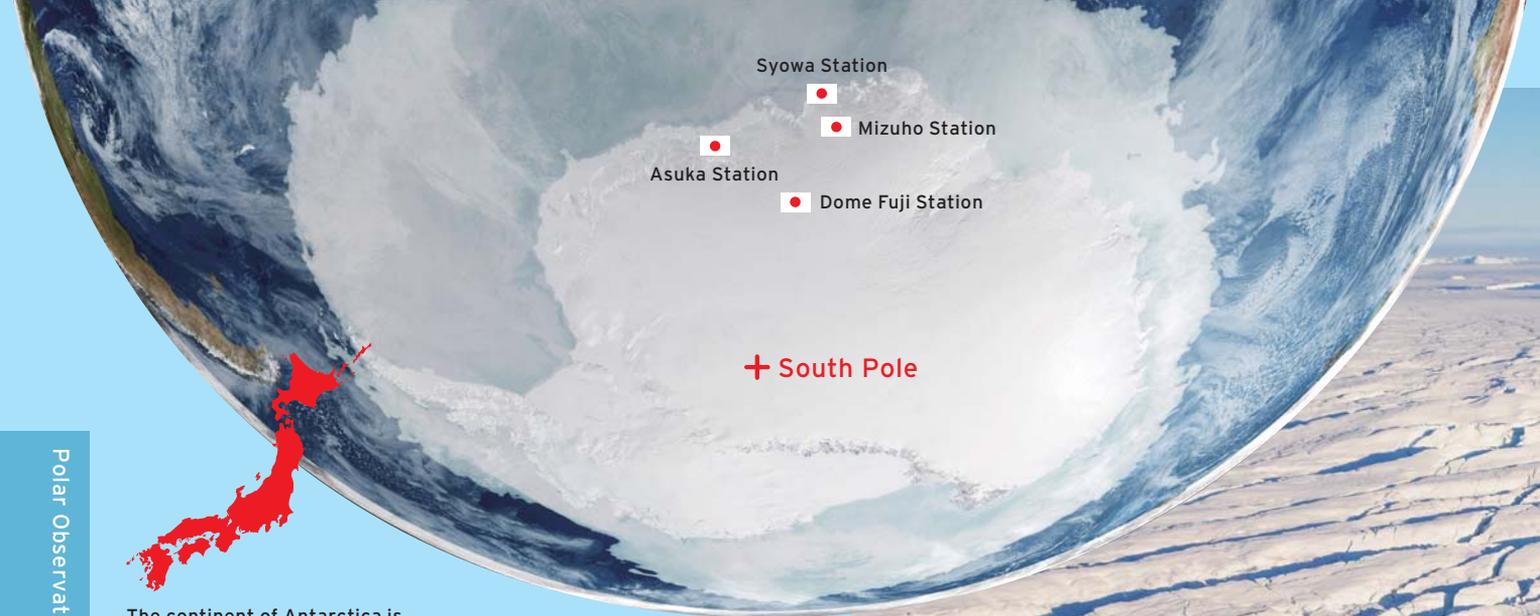
The projection of the summer sea ice distribution in 2015 was very precise, with a difference of only 2% between the forecast and actual sea ice area during the minimum extent. Sea ice distribution from AMSR-2 on the "Shizuku" satellite on September 11, 2015 at the minimum (white) and the ice edge in the first report predicted in May that year (green line).

# Antarctic

## **Japanese Antarctic Research Expedition: To explore systems and dynamics of the earth and space**

Japan commenced its scientific activities in Antarctica in 1956, which was marked by the voyage of “Soya” with the 1st Japanese Antarctic Research Expedition (JARE) on board. This project was a part of the International Geophysical Year (IGY), and Japanese Syowa Station was established on Ongul Island in Antarctica in 1957. Since then, Japan has performed various observations at Syowa Station and the surrounding areas, and resulted in outstanding scientific outcome such as findings of ozone hole and Antarctic meteorites, recovery of climate change in the past through analyses of ice core, understanding of aurora generation mechanism, unexpected finding of puzzling ecosystems in Antarctic lakes, and findings of evidence of Gondwana, etc.

After the current “Japanese Antarctic Research Project Phase VIII” expires at the end of fiscal year 2015 (FY2015), the next six-year scheme, “Japanese Antarctic Research Project Phase IX”, will start from FY2016. Within this scheme, a project entitled “Global changes and movements on Earth system through Antarctic observations” has been launched as the main theme of the Prioritized Research Project for Phase IX, and we are aiming to promote advanced scientific research from a global view of the Earth and space by combining other research categories, including the ordinary research projects, explanatory research projects, monitoring, and routine observations. The project is also designed to meet social demands and international research trends with respect to global environmental issues.



The continent of Antarctica is approximately 37 times the size of Japan.

# Antarctica

Antarctica is an isolated continent surrounded by the Antarctic Ocean. Snow accumulation would hardly melt all year long. Those becomes compressed ice covering the continent. The Antarctic ice cap, a massive sheet of ice, has an average thickness of approximately 1860m. The continent and ice shelves together makes a size approximately 37 times of Japan.

Located far from civilization, Antarctica functions as both an environmental monitoring center that allows us to assess the impact of human activity on the planet, and a time capsule that gives us a glimpse into the global environment of the past.

### ● Data on Antarctica

- Area: 13,880,000 km<sup>2</sup> (Approximately 37 times the size of Japan)
- Average ice thickness: approximately 1860 m
- Maximum ice thickness: 4776 m
- Average temperature at the South Pole: -49.4°C
- Lowest recorded temperature: -89.2°C (at Russia's Vostok Station)

### ● Syowa Station

Construction of Syowa Station was begun by the 1st JARE on 1957. It is the mother station for JARE activities.



### ● Seals

Five species of seals live on Antarctica. It includes the Weddell seal. Their habitat is south boarder of mammal.



These are 30 overwinter members of the 57th JARE. They have been researching at Syowa Station (69° S)



Weddell seal



Hamuna Icefall (Photo: Iuko TSUWA, JARE51)

● **Icebergs**

Icebergs are formed when parts of the ice cap or ice shelves are pushed into the sea and breaking off from its mass.



An astonishing site of iceberg near Syowa Station

● **Midnight Sun / Polar Night**

The Antarctic and Arctic regions hold two extreme phenomena. The midnight sun: The sun remains visible for 24 hours. The polar night: The night lasts for 24 hours.



Midnight sun: The sun drops down until just above the horizon at nightfall. It keeps about the same height all night long. And it will rise up in the morning.

● Reindeer

Length: 1.2 ~ 2.2 m

Distribution: Northern parts of Eurasia and North America



Reindeer

● Sea Ice

The sea ice area in the Arctic is changing. In winter it expands by freezing, and shrinks with the summer temperature. Sea ice is carried by the wind and ocean currents, and the floes overlap each other to form hill-like sites.



Sea ice observation



Fireweed growing in the floodplain of a meltwater river from the No. 2 Glacier (Ellesmere Island, Canada) Photo: Masaki UCHIDA, NIPR

## ● Indigenous Peoples

Arctic is a home of indigenous people. They live in severe natural environments. They developed their own diverse and original culture.



© Norway Tourist Board

Sami women dressed in traditional costumes.

## ● Ny-Ålesund

NIPR research station located at Ny-Ålesund(North latitude 79°) since 1991. It is an observation station.



The International Arctic Research Stations

# Arctic

The North Pole refers to a point at 90 degrees north, and the region above 66.5 degrees north latitude is called the Arctic Region. There is no land at the North Pole. The Arctic Ocean and marginal sea area is surrounded by the Eurasian, North American continents and Greenland. They covers an area of about 12 million km<sup>2</sup>. There are inhabited with many settlements within the Arctic Circle. The region has more vegetation than Antarctica. The Arctic is one of the most sensitively affected area on the Earth by the global warming.

## ● Data on the Arctic

[Ny-Ålesund, Svalbard] (from the Norwegian Meteorological Institute data)

The average air temperature

Annual (2014-2015)	-3.5°C (-6.3°C <1961-1990>)
February 2016	-27.4°C (-14.6°C <1961-1990>)
July 2015	+0.05°C (+5.4°C <1961-1990>)

8 Countries with territory above 66.5 degrees north: United States of America, Canada, Denmark (Greenland), Iceland, Norway, Sweden, Finland and Russia



North Pole  
Svalbard

Japanese Observation facilities  
Ny-Ålesund Research Station  
and an office at the University  
Centre in Svalbard(UNIS)  
in Longyearbyen

## Arctic research fosters new international collaborations and a project

Research activity around Ny-Ålesund research station focuses on clouds, aerosols, radiation, greenhouse gases, vegetation and soil microbiology.

Studies on the atmospheric circulation related to sea ice change in the Arctic, and the optimization of Arctic atmospheric data assimilation, influences to mid-latitude weather and Arctic weather predictability are also strengthened.

Ice cores were obtained from the Greenland Ice Sheet and analyzed in hopes of revealing past Arctic and global environmental changes. A new project that will provide insight into ice flow instability under the past environment is now underway.

Upper atmosphere studies in the mesosphere, thermosphere, and ionosphere are carried out. AERC has joined international observation activities using the European incoherent scatter (EISCAT) radar. Atmospheric and aurora observation facilities are used as bases for upper atmosphere observations in Svalbard and Northern Scandinavia.

Simultaneous observations of auroral phenomena have been carried out at an observation facility in Iceland in conjunction with observations at Syowa Station, Antarctica.

In the North Atlantic and around Greenland, atmospheric gas fluxes and marine ecosystems have been investigated. Marine ecosystem observations are expanding to the Pacific sector, Arctic Ocean, Chukchi Sea and Bering Sea.

# Arctic

# Science information infrastructure and data base for the polar sciences

Director Akira KADOKURA



Collaborative Research

## Sharing the polar science data with worldwide community

Various observations on a range of research fields are now being carried out both in the Antarctic and Arctic regions. Many of the data obtained by the observations are transferred via a network and stored in digital form. The quality and amount of the data are continually growing, as the observation methods and technologies become more sophisticated and network speed grow faster. The Polar Data Center (PDC) in the National Institute of Polar Research (NIPR) has two main tasks. One is to operate science infrastructure for observations and data, and the other is to construct a database for scientific data.

At present, NIPR and Syowa Station in Antarctica are constantly networked via an Intelsat satellite link, and the data from Syowa are directly transferred to NIPR through this network via a high-speed LAN in the station.

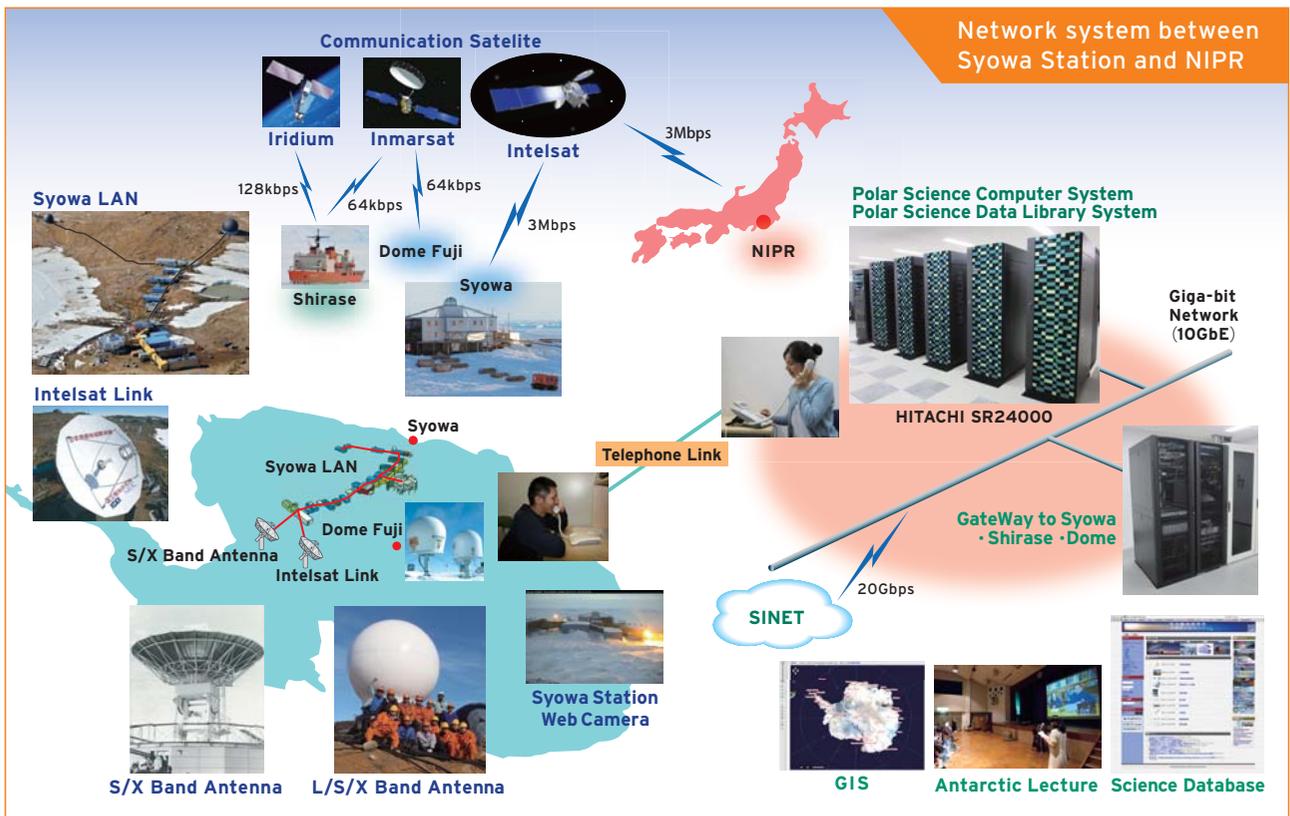
The "Multipurpose Satellite Data Receiving System" at

Syowa is operated by PDC, and data from various earth observation satellites are received and transferred to NIPR.

The transferred data from Syowa are stored in the "Polar Science Data Library System (POLARIS)" in NIPR, and transferred to researchers in collaborating universities and institutes via the Science Information Network (SINET). Many of the observation data in the Arctic region are also transferred to NIPR directly via an Internet connection.

The "Polar Science Supercomputer System" is also operated in PDC for processing and analyzing observation data and for doing large-scale numerical modelings and simulations for polar sciences.

Information on data and observations (metadata) are archived in the "Science Database". Databases both for observation data themselves (actual data) and for general information about research and management in NIPR (general data) are also constructed by PDC.



# Scientific resources from polar regions -Key materials to uncover the global changes and mystery of Earth's evolution

Director Yoichi MOTOYOSHI



### Antarctic Meteorite Research Center

The main task of the center is curation of Antarctic meteorites recovered since 1969, which includes naming and initial classification of meteorites, allocation to researchers, permanent storage, and overall management of Antarctic meteorites. Annually, the center publishes the classification of meteorites in the Meteorite Newsletter.



The Yamato 790448 meteorite classified into LL3, which is one of the unequilibrated ordinary chondrites.

### Rock Specimen Archive

The Rock Specimen Archive has collected and preserved some 20,000 rock and mineral specimens since the first Japanese Antarctic Research Expedition (JARE). The archive stores rocks and minerals not only from Antarctica but also Sri Lanka, India and Africa as part of its international scientific research. Its collection is important for geological correlations and studies of the earth's crust and mantle materials constituting the Gondwana supercontinent. Specimens are organized according to year and region of collection and are updated in a database.



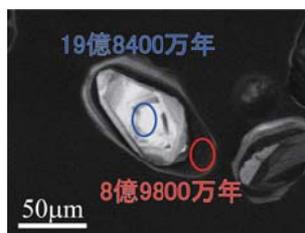
Ruby crystals (red) found around Syowa Station in Antarctica.

### SHRIMP Laboratory

The laboratory maintains and operates 2 sets SHRIMP (sensitive high resolution ion microprobe) as inter-university collaborative research infrastructure for isotopic analyses and dating of earth and planetary materials.



Sensitive high resolution ion microprobe (SHRIMP) for age dating of minerals.



Results of age dating on zircon. The blue circle at the center yields 1984 million years old, and the red circle at the outer rim yields 898 million years, respectively.

### Biological Specimen Archive

NIPR collects and manages biological specimens obtained from scientific studies in polar regions. These specimens are provided for research or exhibitions. Approximately 40,000 plant specimens (mainly moss) and 2,500 animal specimens are archived. Searches for archived specimens can be made through the 'Database of Polar Biodiversity' in the NIPR website.



Biological specimen



# Uncovering the history of climate change from ice cores

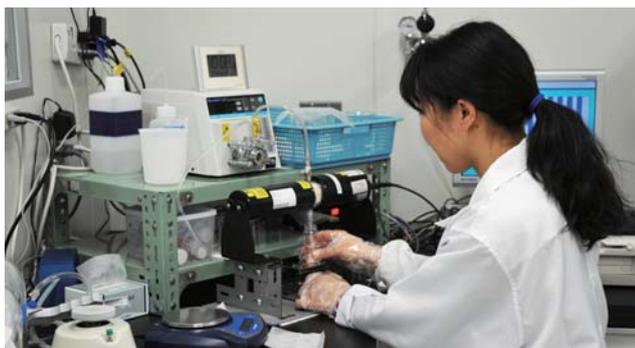


Director Kumiko GOTO-AZUMA

### Ice core drilling and analyses

Ice sheets such as the Antarctic ice sheet and the Greenland ice sheet are composed of strata of snow accumulated over as long as hundreds of thousands of years. When we sample such ice by taking ice cores, we use drills designed for ice sampling, and by analyzing the cores, we can get a picture of the past environmental conditions of the Earth when the snow was deposited. Ice core research provides very important data for predicting future climatic changes. The Ice Core Research Center was established in the National Institute of Polar Research to reinforce and promote ice core research comprehensively over the long-term.

NIPR holds cutting-edge ice drilling equipment. NIPR has conducted very deep ice coring twice at Dome Fuji, located on an inland plateau of East Antarctica, and has succeeded in recovering ice cores from depths of up to 3035 m (covering more than 700,000 years). NIPR has also conducted shallow ice core drilling at many sites in Antarctica and the Arctic. For these reasons, NIPR is characterized by its distinguished abilities in ice core research and ice core drilling. In addition, NIPR has set up laboratories where we can rapidly produce high-quality ice core data by using a number of advanced analytical instruments. Under the lead of the Ice Core Research Center, we aim to further advance interdisciplinary ice core research domestically and internationally. NIPR will acquire substantial data and publish research papers on ice cores. NIPR also plays an organizing/planning role in future ice coring projects. We expect the Ice Core Research Center to be utilized by many researchers and serve as the center for inter-university research collaborations.



Chemical analysis of ice cores in a clean room.



Pre-processing for ice core analysis in the cold room.



Ice drilling site at Dome Fuji station, Antarctica.

### ● Guide to cold room facilities

NIPR has modern facilities for cold rooms, for measurements and analyses, to promote scientific research, and advanced technology related to polar research. The cold room facility has nine rooms that serve as low temperature laboratories, six rooms that serve as low temperature storage rooms, and two rooms that serve as room-temperature laboratories. These facilities are available to researchers who require a low temperature environment for their experimental studies. The Ice Core Research Center is in charge of managing these cold room facilities. For a more detailed description of the facilities and information on application/approval procedures for research use, please visit our website.

# Developing international research collaborations in polar regions



Head **Kentaro WATANABE**

## International exchange office for polar research

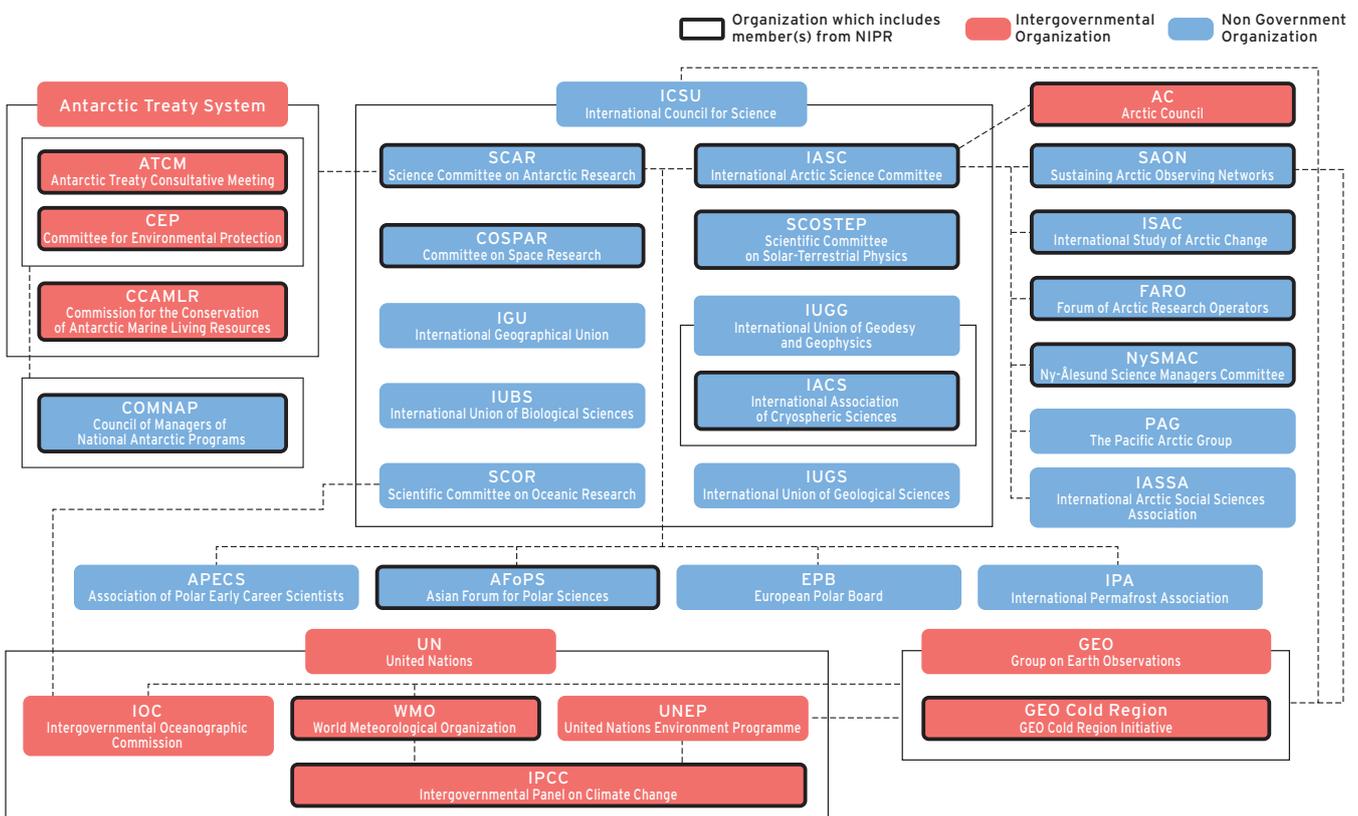
The International Affairs Section deals specifically with international issues relevant to scientific research in polar regions. Any matters relating to (1) international treaties and conferences, (2) cooperative research and scientific agreements with overseas institutions, and (3) international research exchanges are handled by the Section with the assistance of the International Affairs Committee in NIPR. Because polar research is conducted overseas, international frameworks are indispensable. The Section prepares reports on the Japanese Antarctic Research Expedition that are required by the Antarctic Treaty in collaboration with governmental bodies and relevant scientists. It also deals with issues and deposits documents relating to CCAMLR as well as various international bodies, such as SCAR, COMNAP, IASC and AFoPS (refer to the figure below for the full names of the acronyms).

Currently, NIPR conducts collaborative projects for polar

research and logistics by implementing MOUs with overseas polar research institutions and universities in Australia, Belgium, Chile, China, Denmark, Finland, France, Germany, Iceland, South Korea, Malaysia, Norway, Russia, Sweden, Thailand and U.S.A. Today, there is a growing need for international exchange among scientists and activation of research, with greater emphasis placed on the globalization of research institutes. The Section offers assistance in these areas by working together with relevant organizations and scientists.



The XXXVII Antarctic Treaty Consultative Meeting, held in Brasilia.



Research Support

## Our Polar Collection is one of the best collections in the world



Library Director **Tsuneo ODATE**

NIPR Library has one of the best Polar Collections in the world. Our Polar Collection includes expedition records, essays, and research reports that do not exist in any other library in Japan.

The Library also contains many scholarly books and journals written in several languages (Japanese, English, Russian, and so on). These collections included in the Polar Collection can be searched via the NIPR Online Public Access Catalog (OPAC).



Book shelves in the library

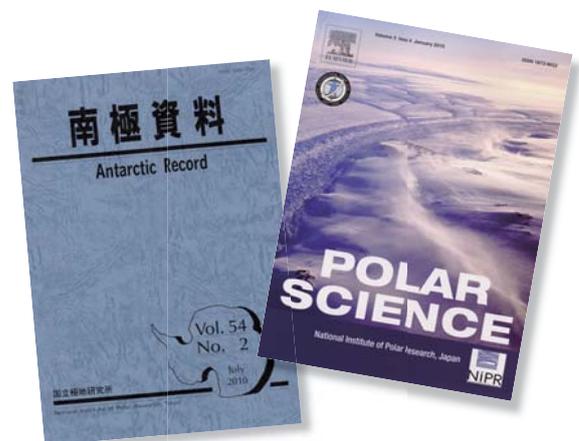
Collections		Number	Total
Books	Japanese	9,878	27,049
	Other languages	17,171	
Booklet	Japanese	1,947	3,560
	Other languages	1,613	
Bound journals	Japanese	3,595	27,544
	Other languages	23,949	
Digital Data		9,846	9,846
Total			67,999

As of April 1, 2016

### ● Publications

The Library publishes two scholarly journals, “Antarctic Record” and “Polar Science”. Articles to be accepted cover all fields of polar science. These journals have a strong reputation internationally.

The Library also publishes “JARE Data Reports” and “NIPR Arctic Data Reports”, which are obtained from Arctic and Antarctic observation. “Antarctic Record”, “JARE Data Reports”, and “NIPR Arctic Data Reports” are available for download (free) from our website: <http://nipr.repo.nii.ac.jp/>



### ● Facilities

The Library is located on the ground floor (first floor) of a six-story building. The floor is composed of four areas and one room: the reading area, book area, bound journal area, current journal area, and rare book room. There are reading tables in each area, equipped with power supply. You can use our networked PCs (for study and research purposes) and copy machine. For more information, please visit our website: <http://www.nipr.ac.jp/library/en/index.html>

- Antarctic Record (Japanese and English)
- Polar Science (English) (Distributed for a charge)
- Memoirs of National Institute of Polar Research
- JARE Data Reports
- NIPR Arctic Data Reports
- Antarctic Geological Map Series
- Special Map Series

# Our goal is to intensify research activity and output

Director **Takuji NAKAMURA**



As an Inter-University Research Institute Corporation, the National Institute of Polar Research is required to intensify research activities in a way similar to that of universities. Created in April 2014, the Research Development Office (RDO) has two research administrators who work in close cooperation with the head office of the Research Organization of Information and Systems (ROIS). The RDO aims to reinforce research activities as secretariat of the "Research Strategy Meeting," which is chaired by the Director General. The RDO will work to strengthen both international research cooperation and publicity, build research strategies, and increase the research budget. The NIPR is characterized by polar observations and related international collaboration, which will be used to the full extent to intensify research and foster the next generation of young scientists.

as research management personnel, and has established a URA station at the head office (Figure). Two URAs from among the team for supporting research field strengthening at the station are assigned to the NIPR.

### ● Activities of the Research Development Office (RDO)

The RDO is a team comprising two URAs as well as the teaching and administrative staff. One of the URAs has experience with field research in the Arctic, while the other has participated in an Antarctic wintering observational expedition. The RDO is expecting to work closely with researchers. The URAs belong to the URA station and are working on reinforcing research activities to fulfill the ROIS's 5- and 10-year targets. The RDO is also cooperating with the International Affairs Section and the Arctic Environment Research Center to bolster international collaboration, and with the Public Relations Section to strengthen academic public relations. With URAs, the RDO is serving to connect administrations and researchers.

### ● Project for Promoting the Reinforcement of Research Universities and URAs

From FY 2013, the ROIS is taking part in the "Project for Promoting the Reinforcement of Research Universities," which aims to enhance the research capabilities of our country through the reinforcement of its research institutions. This project supports reform of the research environment and the securing of human resources for research management. The ROIS has employed University Research Administrators (URAs)

#### Support for performance improvement of researchers

Acquisition of external funds, publicity of research results.

#### Strengthening the international cooperation

Cooperation with the Arctic Environmental Research Center, the International Affairs Section.

#### Strengthening the academic publicity

Cooperation with Public Relations Section.



### The goals of the project

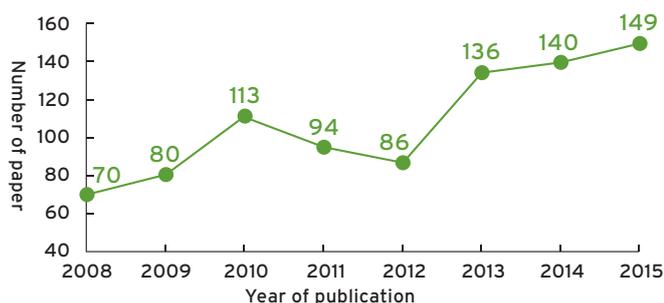
#### The goal of the 5th year

- 1 Establishment of best practice by the data-centric scientific research foundation and transdisciplinary research integration.
- 2 20% increase in total number of peer-reviewed paper in the entire organization (Ratio to five years before FY2012).
- 3 20% increase in number of inter-university use and research collaboration, increase in (international) Partnership Agreement.
- 4 17% or more female faculty, 30% or more younger faculty, 10% or more foreign faculty.

#### The goal of the 10th year

- 1 Establishment of a new research community, by the acceptance of data-centric research in the wide range of academic disciplines.
- 2 30% increase in total number of peer-reviewed paper in the entire organization (Ratio to five years before FY2012).
- 3 30% increase in number of inter-university use and collaboration projects, increase in (international) Partnership Agreement.
- 4 20% or more female faculty, 30% or more younger faculty, 12% or more foreign faculty.

Number of publications (peer-reviewed paper)



Collaboration with universities by Japanese Antarctic Research Expedition (Distribution of universities in collaboration)



## Intellectual Property Section

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### Protecting intellectual property rights arising from research results



Head **Hiroyuki ENOMOTO**

The Intellectual Property Section was established in April 2008. The section mainly deals with discoveries and research results, in other words, intellectual property, acquired through polar expeditions, Collaboration research activities and other projects.

Its duties include filing patent and trademark registration applications for claiming and utilizing research results as well as releasing and publicizing intellectual properties and their copyrights.

## Archives Section

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### Documents and records that tell the history of JARE and NIPR



Head **Tsuneo ODATE**

The Archives Section was established in April 2010 when the National Institute of Polar Research (NIPR) moved to the Tachikawa Campus. The materials collected, arranged, and kept in the section's custody include non-official documents (documents that are no longer in official use),

publications, photographs, figures, audio materials, films, digital records, instruments, equipment, clothing, and personal items. Such records support historical evaluation of institutional activities and help NIPR fulfill its social responsibilities.

## Office of Female Researcher Development

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### Supporting development of female researchers maintaining a balance between life events and work.



Head **Takuji NAKAMURA**

As an organization supported by the "Project of Supporting Activities for Female Researchers" of the Ministry of Education, Culture, Sports, Science & Technology (MEXT), the Research Organization of Information and Systems (ROIS) has inaugurated the "ROIS Program of Female Researcher Progress" and tasked it with the mission of supporting life events and research activities of female researchers. Within this project, ROIS and four underlying institutes have established the "Office of Female

Researcher Development (OFRD)". National Institute of Polar Research's OFRD, which opened in April 2015, with six members. More specifically, a vice director-general (head), the director of administrative office, a URA (University Research Administrator), and three supporting staff members (two project professors and a project researcher). We encourage and support female researchers because their development and advancement is very important to the future of our country.

# Providing the public with information on polar science and polar research findings



Head Yoichi MOTOYOSHI

The Public Relations Section conducts a wide range of public relations and sending information of activities to public.

### ● Classes from Antarctic

"Teachers' Antarctic Expedition" program: Active teachers have special lectures from Antarctic to their own school in Japan. Overwinter Antarctic expedition members have lectures from Syowa station. About 20 lectures held annually.



Classes from Antarctic. The questions from students never stops and this special class is filled with a joyous atmosphere.

### ● Junior High and High School Polar Science Contest and Arctic Antarctic Junior Forum

The Junior High and High school Polar Science Contest invites research and experimental proposals from junior high and high school students. The most outstanding proposals are carried out by researchers in the field. Their results and findings are feed-backed to the students who made the proposals.

At the Antarctic/Arctic Junior Forum. Their prizes are given to the students. They give oral/poster presentations of their proposal. Also, Antarctic team report of their research here in live.

It is original and unique collaboration among cutting-edgy polar researchers in the field, students and instructors.



Antarctic / Arctic Junior Forum

### ● Public lectures in Tachikawa

Collaborating with the city of Tachikawa, we offer the series of public lectures on Earth environment from the front line of polar research.

### ● Open House

Open House is held once a year. We present the latest polar research activities and findings to the public.



### ● National Institute of Polar Research Polar Science Museum

See the details of information on polar science and polar research today. → p. 36

The Museum has a great number of science and natural history museums as partners. We have the will and intention to practice opening to the public understandings and deeper wisdom of polar science and Antarctic observation.

#### Our partner organizations

Wakkanai Youth's and Children's Science Museum
Rikubetsu Space Science Museum
The Shirase Antarctic Expedition Memorial Museum
Tsukuba Expo Center
Nagoya City Science Museum
Uemura Naomi Memorial Museum
Ehime Prefectural Science Museum
Saga Prefectural Space and Science
Tateyama Caldera Sabo Museum
Nishibori Eizaburo Memorial Explorer Museum
Tamarokuto Science Center
Port of Nagoya Public Aquarium / Fuji Antarctic Museum
WNI WxBunka Foundation

### ● Kyoku (Poles) magazine

Kyoku (Poles) is published by NIPR, a few issues annually. This Magazine of the National Institute of Polar Research provides explanations of polar science and research findings. It's written for public. The friendly contents include JARE history in manga, essay etc....



Kyoku (Poles) magazine

### ● Off-site lectures and providing Antarctic materials

We support former Antarctic expedition members to off-site lectures. Photos, movies and other materials are rented and /or provided for the exhibitions of science and natural history museums all around Japan.

NIPR researchers are sent upon request for lectures on polar science and expeditions.

[Contact] National Institute of Polar Research, Public Relations Section

Tel: +81-42-512-0655 E-mail: kofositu@nipr.ac.jp

# Providing the public with information and topics on "An

The National Institute of Polar Research Polar Science Museum provides information on historical as well as current state-of-the-art research activities and results in an easy-to-understand forum. Here, visitors can touch and experience objects from 4.6 billion years ago to the present day. Brief descriptions on our more popular exhibits are provided below.

## History Heading for Antarctica

In 1910, Nobu Shirase launched his expedition with the aim of reaching the South Pole. Forty-six years later, the first Japanese Antarctic Research Expedition (JARE) party left for Antarctica aboard the icebreaker Soya and landed on Ongul Islands on January 29, 1957. The expedition named the surrounding area as "Syowa Station". This marked the beginning of JARE.



"KD604 Snow Vehicle", employed for Japanese South Pole Expedition in 1968, and certified as a Mechanical Engineering Heritage in 2014.

## Atmosphere & Ice

Exploring the earth's environment

Antarctica is covered by ice sheet made of snow. Buried within this ice is a record of the earth's climate and environment in the distant past.

The impacts of man living on are so small in Antarctica, that this area is an ideal location to study global environments in the past and present.



Drilling into deep layers of the ice sheet.

## Bronze Statues of Sakhalin Dogs

They have worked for the First JARE(1956-1958) and Left at Syowa Station

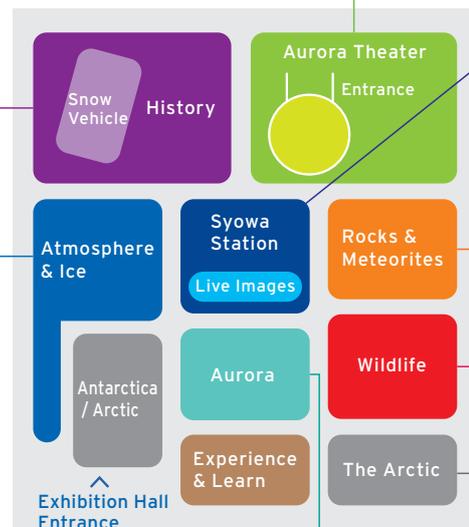


## Aurora Theater

The theater shows full-color images of auroras filmed in Antarctica and the Arctic on a four-meter-diameter domed screen. Experience the wonder of auroras dynamically dancing across the whole sky for yourself.



Here is the world's only permanent exhibition featuring images of Arctic and Antarctic auroras!



## Aurora Exploring the wonders of mysterious lights

Why does an aurora glow? Are the auroras in the Antarctic and the Arctic the same? Where can we see auroras? Auroras are not only beautiful, but full of wonder and mystery. Plenty of information about the universe is contained in their colors, shapes and movements.



# Antarctic and Arctic Research Today

## Syowa Station

Established in 1957 on East Ongul Island, Syowa Station started with 11 expedition members overwintering in four buildings that were little more than mountain lodges. A half-century later, Syowa Station has become a world leading scientific station made up of more than 60 buildings with internet connections, floor heating, private bedrooms, bathrooms, and flush toilets.



Look at live images from Syowa Station.

## Rocks & Meteorites

Exploring the solar system's 4.6 billion-year history

Meteorites are rocks fallen to earth from outer space. Meteorites can be discovered in Antarctica and many have been collected by JARE. Rocks, unlike meteorites, are formed here on earth. Studying rocks can tell us how the continents were formed and provide information about environmental changes in the past.



## Wildlife

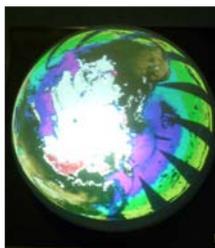
Exploring life and ecology in extremely low temperatures

Polar marine ecosystems are very rich. In addition to ice algae growing in sea ice, there are krill, fish, birds, and mammals living in Antarctic waters. The environments on land are much harsher than those in the sea. Plants such as moss and lichen, as well as tardigrada and other microorganisms, live in special habitats where liquid water can be obtained. Let's explore this mysterious life surviving in such hard environments.



## The Arctic

This is a visualization of the Earth created with geoscience data. At this exhibit, visitors can rotate the Earth's image by themselves using a trackball in order to see the ozone layer hole and other changing Earth features.



Also, there are exhibits for children such as "Become a Polar Researcher!" as well as special exhibitions and live video-talk with the Antarctic base.



Live video-talk with Antarctic base



Become a Polar Researcher!



Museum hours : 10:00-17:00 (no entry after 16:30)  
Closed : Sun. / Mon. / National holidays /  
New Year's  
Admission : Free  
<http://www.nipr.ac.jp/science-museum/>

# Utilizing Research results to return something back to society

NIPR holds symposia, research workshops and public lectures for researchers and the general public and produces publications in a range of fields pertaining to polar science.

### ● Symposia

NIPR began hosting the interdisciplinary Symposium on Polar Science in 2010 in an effort to communicate polar science research results worldwide. This symposium is held concurrently with the annual symposia on Antarctic Meteorites, Space and Upper Atmospheric Sciences, Polar Meteorology and Glaciology, Polar Geosciences and Polar Biology to discuss the situation surrounding the latest research and field activities in these disciplines.

NIPR also hosts the Symposium on Antarctic Facilities, where proposals concerning Antarctic research base operations are issued and discussed (Topics include natural energy, the environment, information and communications, inland bases, transportation etc.).

Furthermore, NIPR sponsored the Final Symposium on the GRENE Arctic Climate Change Research Project.

### ● Research Workshops

As part of its efforts to promote polar science research, NIPR holds research workshops to examine research policies, methodologies and results. In FY2016, the Institute plans to issue a public call for research on 19 topics and hold workshops for each.

### ● Research Roundtable Discussions

NIPR is constantly striving to hold discussions on polar science research. To deepen mutual understanding among a variety of disciplines, NIPR holds roundtable discussions where experts from both inside and outside the Institute can present research outcomes and deliberate topics they are working on. 26 sessions were held in FY2015.

### ● Public Lectures and Science Cafe

In conjunction with Tachikawa City, NIPR hosts a public lecture called the "Polar Science Research Series". Six lectures are scheduled for FY2016.

Science Cafe is an event for the general public. Researchers give easy talks on their latest research and topics. Four sessions are scheduled for FY2016.

### ● Science Database

The compiled metadata include several kinds of observed data, such as long-term monitoring from IGY period (1957-58), short-term project, corrected by both Arctic and Antarctic regions including JARE activities.

[http://scidbase.nipr.ac.jp/?ml\\_lang=en](http://scidbase.nipr.ac.jp/?ml_lang=en)

### ● Academic Publications

There is many kinds of publications issued/edited by NIPR, including but not limited to academic articles, on a wide range of research topics. For details: Library, p32



KYOKUCHIKEN Library' series (Only in Japanese)  
(See: <http://www.nipr.ac.jp/library/NIPR-library/index.html>)

Participants at the Symposium on Polar Science



# Developing field scientists for the next generation of polar research

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### Graduate Education

NIPR accepts students for 5-year full-term and 3-year second-term doctoral courses through the Department of Polar Science in the School of Multidisciplinary Sciences of SOKENDAI The Graduate University for Advanced Studies. Twenty students are currently enrolled in the course. The objective of the Department of Polar Science is to identify the primary causes of individual environmental changes within Earth's overall system and the interactions between them. The department fosters researchers who have the ability to carry out a broad range of earth science studies in a flexible and creative way, especially as the field scientists.

SOKENDAI was established in October 1988 as Japan's first national graduate school to exclusively offer doctoral courses. Juxtaposed 5-year doctoral courses were added in 2006. The university currently consists of 6 schools that receive the assistance of 19 parent institutes.

### Special Collaborative Research Fellows

In accordance with the Article 29-1-3 of the National University Corporation Law, the Inter-University Research Institute Corporation accepts graduate students at the request of universities and cooperates with university education.

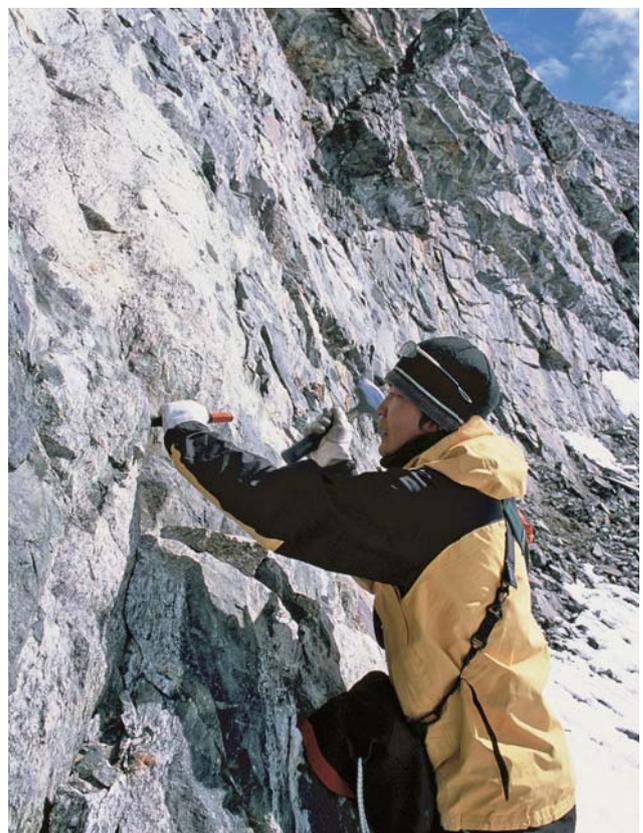
Every year since 1981, NIPR has accepted graduate students in polar science and related fields as special collaborative research fellows. In 2015, NIPR accepted nine students.

### Joint Graduate School

In 2006, NIPR and Kyushu University entered into the Agreement on Partnership and Cooperation in Education and Research. The two institutes have joined hands in offering graduate education in the field of polar environment studies.



Sampling of zooplankton in the Antarctic Ocean



Collecting rock sample in Brattnipene, Sør Rondane Mountains, Antarctica

# Organization

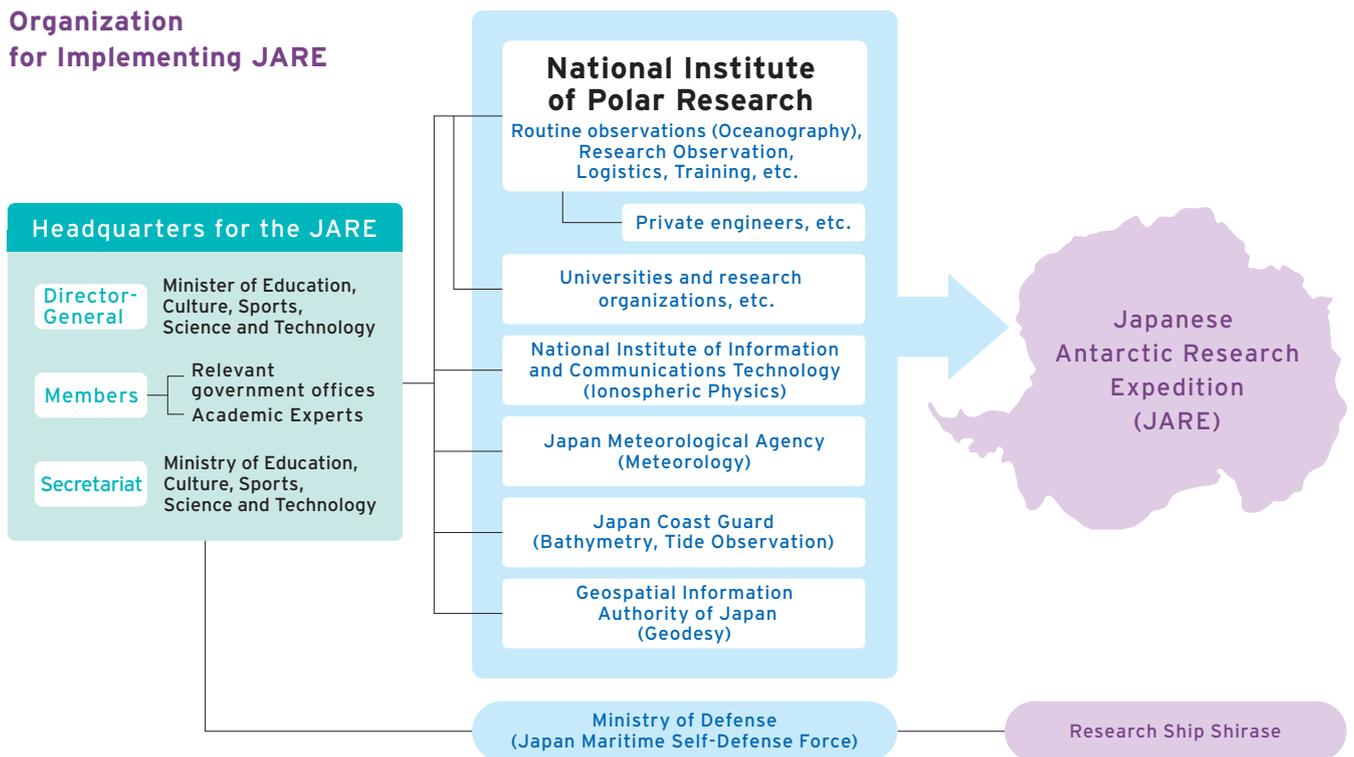
## Organization(As of July 1, 2016)

Director-General	Kazuyuki SHIRAISHI	Arctic Environment Research Center	Director	Hiroyuki ENOMOTO	
Vice Director-General	Takuji NAKAMURA		Deputy Director	Hiroshi MIYAOKA	
	Hiroyuki ENOMOTO	Polar Science Resources Center	Director	Yoichi MOTOYOSHI	
	Yoshifumi NOGI	Ice core Research Center	Director	Kumiko GOTO-AZUMA	
Division for Research and Education	Space and Upper Atmospheric Sciences Group Leader	Akira KADOKURA	Polar Data Center	Director	Akira KADOKURA
	Meteorology and Glaciology Group Leader	Hideaki MOTOYAMA	Public Relations Section	Head	Yoichi MOTOYAMA
	Geoscience Group Leader	Hideyasu KOJIMA	Library	Director	Tsuneo ODATE
	Bioscience Group Leader	Tsuneo ODATE	International Affairs Section	Head	Kentaro WATANABE
	Polar Engineering Group Leader	Yoichi MOTOYOSHI	Intellectual Property Section	Head	Hiroyuki ENOMOTO
Center for Antarctic Programs	Director	Yoshifumi NOGI	Archives Section	Head	Tsuneo ODATE
	Deputy Director (for Research)	Gen HASHIDA	Research Development office	Head	Takuji NAKAMURA
	Manager of Planning Unit	Makoto TSUMURAYA	Project of Supporting Activities for Female Researchers	Head	Takuji NAKAMURA
	Manager of Logistics Unit	Yutaka KATSUTA	NIPR/ISM Joint Administration Office	Director	Kazuhiko HASEGAWA
			Director of General Service Center	Katsunori NOUZUMI	
			Head of Planning Section (NIPR)	Yuki OHYAMA	

## Advisers

Takao HOSHIAI	Prof. emeritus, NIPR	Zenkichi HIRAYAMA	Prof. emeritus, Nihon University
Atumu OHMURA	Prof. emeritus, Swiss Federal Institute of Technology Zurich	Takeo HIRASAWA	Prof. emeritus, NIPR

## Organization for Implementing JARE



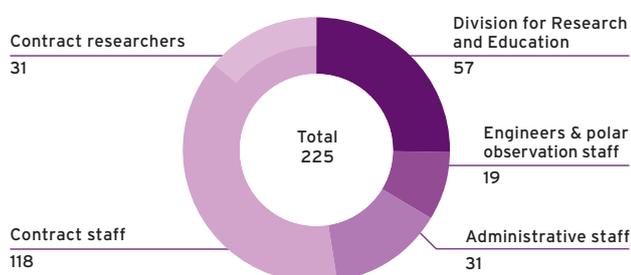
**Research Organization of Information and Systems, National Institute of Polar Research.  
Administrative Council member. Term of office: April 1, 2016 - March 31, 2017 (As of April 1, 2016)**

Name	Institution	Title
Shuji AOKI	Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University	Professor
Mitsuo UEMATSU	The University of Tokyo	Director of Center for International Collaboration, Professor of Atmosphere and Ocean Research Institute
Naoto EBUCHI	Hokkaido University	Director-General / Professor
Toshio TAKEUCHI	Tokyo University of Marine Science and Technology	President
Keisuke SUZUKI	Shinshu University	Professor
Toshitaka TSUDA	Research Institute for Sustainable Humanosphere, Kyoto University	Director-General / Professor
Hiroko NAGAHARA	Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo	Professor
Yoichi FUKUDA	Kyoto University Graduate School of Science and Faculty of Science	Professor
Toshio FUKUSHIMA	National Astronomical Observatory of Japan	Director / Professor
Kazuo SHIOKAWA	Institute for Space-Earth Environmental Research, Nagoya University	Professor
Ken FURUYA	The University of Tokyo	Director / Vice-President
Hajime YAMAGUCHI	Department of Ocean Technology, Policy and Environment Graduate School of Frontier Sciences, University of Tokyo	Professor
Takuji NAKAMURA	National Institute of Polar Research	Professor / Vice Director-General / Head of Research Development Office / Head of Project of Supporting Activities for Female Researchers
Hiroyuki ENOMOTO	National Institute of Polar Research	Professor / Vice Director-General / Director of Arctic Environment Research Center / Head of Intellectual Property Section
Yoshifumi NOGI	National Institute of Polar Research	Professor / Vice Director-General / Director of Center for Antarctic Programs
Yoichi MOTOYOSHI	National Institute of Polar Research	Professor / Vice Director-General / Director of Polar Science Resources Center / Head of Public Relations Section
Tsuneo ODATE	National Institute of Polar Research	Professor / Library Director / Head of Archives Section
Akira KADOKURA	National Institute of Polar Research	Professor / Director of Polar Data Center
Satoshi IMURA	National Institute of Polar Research	Professor / Dean of School of Multidisciplinary Sciences, SOKENDAI
Kumiko GOTO-AZUMA	National Institute of Polar Research	Professor / Director of Ice core Research Center
Kentaro WATANABE	National Institute of Polar Research	Professor / Head of International Affairs Section

**Institute Data**

**Number of employees**

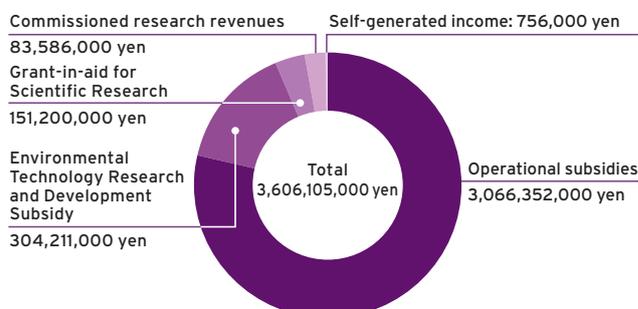
(as of April 1, 2016; including prospective polar observation staff)



**Facilities (as of April 1, 2016)**

Site Area	62,450 m <sup>2</sup>
Total floor area	54,071 m <sup>2</sup>
• Exclusive area for NIPR	17,336 m <sup>2</sup>
• Shared area	11,112 m <sup>2</sup>

**Funding for operations (as of April 1, 2016)**



## Research Staff (As of July, 2016)

### Director-General

Kazuyuki SHIRAIISHI Geology

### Division for Research and Education Space and Upper Atmospheric Sciences Group

Professor	Takuji NAKAMURA	Atmospheric Dynamics
Professor	Akira KADOKURA	Magnetospheric Physics
Professor	Hiroshi MIYAOKA	Plasma Physics
Associate Prof.	Masaki TSUTSUMI	Atmospheric Physics
Associate Prof.	Akira YUKIMATU	Magnetospheric Physics
Associate Prof.	Masaki OKADA	Plasma Physics
Associate Prof.	Ryuhō KATAOKA	Space Physics, Solar Terrestrial Physics
Associate Prof.	Yoshihiro TOMIKAWA	Middle Atmosphere Science
Associate Prof.	Yasunobu OGAWA	Ionospheric Physics
Assistant Prof.	Mitsumu EJIRI	Upper Atmosphere Physics
Assistant Prof.	Takanori NISHIYAMA	Upper Atmosphere Physics
Project Prof.	Natsuo SATO	Aurora Physics
Project Associate Prof.	Koji NISHIMURA	Instrumentation Engineering
Project Lecturer	Katsuhiko TSUNO	Cosmic Ray, X-ray Astronomy, Space Engineering
Project Assistant	Yasuhiro MINAMOTO	Geomagnetism, Atmospheric Electricity
Project Assistant	Yuko SUZUKI	Atmospheric Electricity
Project Researcher	Yuka SATO	Magnetospheric Physics, Ionospheric Physics
Project Researcher	Toru TAKAHASHI	Upper Atmosphere Physics

### Division for Research and Education Meteorology and Glaciology Group

Professor	Hideaki MOTOYAMA	Snow Hydrology, Glaciology
Professor	Kumiko GOTO-AZUMA	Glaciology
Professor	Hiroyuki ENOMOTO	Glaciology, Climatology, Remote Sensing Engineering
Associate Prof.	Shuki USHIO	Polar Oceanography
Associate Prof.	Shuji FUJITA	Glaciology, Ice Core Studies, Remote Sensing, Applied Physics
Associate Prof.	Kenji KAWAMURA	Paleoclimatology
Associate Prof.	Gen HASHIDA	Polar Marine Biogeochemistry
Associate Prof.	Masataka SHIOBARA	Atmospheric Physics
Associate Prof.	Jun INOUE	Polar Meteorology
Assistant Prof.	Naohiko HIRASAWA	Climatology
Assistant Prof.	Teruo FURUKAWA	Glaciology
Assistant Prof.	Takeshi TAMURA	Polar Oceanography
Assistant Prof.	Daisuke GOTO	Atmospheric Physics

Assistant Prof.	Yutaka TOBO	Atmospheric Physics and Chemistry
Project Researcher	Fumio NAKAZAWA	Glaciology
Project Researcher	Ikumi OYABU	Glaciology
Project Researcher	Toshimitsu SAKURAI	Laser Technology, Physics and Chemistry of Ice
Project Researcher	Daisuke HIRANO	Physical Oceanography
Project Researcher	Kyohei YAMADA	Radiation and Climate Physics

### Division for Research and Education Geoscience Group

Professor	Hideyasu KOJIMA	Meteoritics
Professor	Yoichi MOTOYOSHI	Geology
Professor	Yoshifumi NOGI	Solid Earth Geophysics
Associate Prof.	Koichiro DOI	Geodesy
Associate Prof.	Keiji MISAWA	Cosmochemistry
Associate Prof.	Tomokazu HOKADA	Geology
Associate Prof.	Masaki KANAO	Seismology, Solid Earth Geophysics
Associate Prof.	Hideki MIURA	Quaternary Geology
Associate Prof.	Akira YAMAGUCHI	Meteoritics
Assistant Prof.	Yuichi AOYAMA	Geodesy
Assistant Prof.	Naoya IMAE	Meteoritics
Assistant Prof.	Hiroshi KAIKEN	Mineralogy, Meteoritics
Assistant Prof.	Yusuke SUGANUMA	Quaternary Geology, Paleomagnetism, Rock magnetism
Assistant Prof.	Kenji HORIE	Isotopic Geochemistry
Assistant Prof.	Jun'ichi OKUNO	Geophysics
Assistant Prof.	Masakazu FUJII	Marine Geology and Geophysics, Rock Magnetism
Project Researcher	Mami TAKEHARA	Isotope geology
Project Researcher	Genevieve HUBLET	Geochemistry/Cosmochemistry

### Division for Research and Education Bioscience Group

Professor	Tsuneo ODATE	Biological Oceanography
Professor	Kentaro WATANABE	Marine Ecology
Professor	Satoshi IMURA	Plant Ecology
Associate Prof.	Sakae KUDOH	Aquatic Ecology
Associate Prof.	Akinori TAKAHASHI	Animal Ecology
Associate Prof.	Yuuki WATANABE	Marine Zoology
Associate Prof.	Masaki UCHIDA	Microbial Ecology
Assistant Prof.	Kunio TAKAHASHI	Marine Ecology
Assistant Prof.	Nobuo KOKUBUN	Marine Ecology
Assistant Prof.	Yukiko TANABE	Plant Eco-physiology, Limnology
Assistant Prof.	Kozue SHIOMI	Animal Behavior
Assistant Prof.	Ryosuke MAKABE	Biological Oceanography, Marine Ecology

Assistant Prof.	Shintaro TAKAO	Ocean Optics, Satellite Oceanography
Project Researcher	Jean Baptiste Pierre Marie Dominique THIEBOT	Marine Ecology
Project Researcher	Megumu TSUJIMOTO	Ecology
Project Researcher	Masaharu TSUJI	Mycology, Fungal Ecophysiology

### Division for Research and Education Polar Engineering Group

Professor	Yoichi MOTOYOSHI	Geology
Assistant Prof.	Masayuki KIKUCHI	Plasma Physics

### Center for Antarctic Programs

Professor	Yoshifumi NOGI	Solid Earth Geophysics
Professor	Hideaki MOTOYAMA	Snow Hydrology, Glaciology
Associate Prof.	Sakae KUDOH	Aquatic Ecology
Associate Prof.	Koichiro DOI	Geodesy
Associate Prof.	Masaki TSUTSUMI	Atmospheric Physics
Associate Prof.	Gen HASHIDA	Polar Marine Biogeochemistry

### Arctic Environment Research Center

Professor	Hiroyuki ENOMOTO	Glaciology, Climatology, Remote Sensing Engineering
Professor	Hiroshi MIYAOKA	Plasma Physics
Professor	Kumiko GOTO-AZUMA	Glaciology
Associate Prof.	Yasunobu OGAWA	Ionospheric Physics
Associate Prof.	Masataka SHIOBARA	Atmospheric Physics
Associate Prof.	Jun INOUE	Polar Meteorology
Associate Prof.	Masaki UCHIDA	Microbial Ecology
Assistant Prof.	Daisuke GOTO	Atmospheric Physics
Project Prof.	Masao FUKASAWA	
Project Prof.	Yutaka KONDO	Global Atmospheric
Project Prof.	Tetsuo OHATA	Glaciology
Project Associate Prof.	Yuji KODAMA	Glaciology
Project Associate Prof.	Hironori YABUKI	Glaciology
Project Researcher	Takeshi TERUI	Marine Ecosystem
Project Researcher	Takeshi SUGIMURA	Numerical Fluid Dynamics
Project Researcher	Takuya NAKANOWATARI	Physical Oceanography
Project Researcher	Kazutoshi SATO	Meteorology
Project Researcher	Jun UETAKE	Glacier Microbiology
URA	Tetsuo SUEYOSHI	Glaciology, Paleoclimatology

### Polar Science Resources Center

Professor	Yoichi MOTOYOSHI	Geology
Professor	Hideyasu KOJIMA	Meteoritics
Professor	Satoshi IMURA	Plant Ecology
Professor	Atsushi TANIMURA	Polar Marine Ecology
Associate Prof.	Akinori TAKAHASHI	Animal Ecology
Associate Prof.	Tomokazu HOKADA	Geology
Associate Prof.	Akira YAMAGUCHI	Meteoritics
Assistant Prof.	Naoya IMAE	Meteoritics
Assistant Prof.	Kenji HORIE	Isotopic Geochemistry
Project Prof.	Yoshikuni HIROI	Geology, Petrology

### Polar Data Center

Professor	Akira KADOKURA	Magnetospheric Physics
Associate Prof.	Masaki OKADA	Plasma Physics
Associate Prof.	Masaki KANAOKA	Seismology, Solid Earth Geophysics
Assistant Prof.	Yuichi AOYAMA	Geodesy
Assistant Prof.	Masayuki KIKUCHI	Plasma Physics
Assistant Prof.	Naohiko HIRASAWA	Climatology
Project Associate Prof.	Yoshimasa TANAKA	Upper Atmosphere Physics

### Ice Core Research Center

Professor	Kumiko GOTO-AZUMA	Glaciology
Professor	Hideaki MOTOYAMA	Snow Hydrology, Glaciology
Associate Prof.	Shuji FUJITA	Glaciology, Ice Core Studies, Remote Sensing, Applied Physics
Associate Prof.	Kenji KAWAMURA	Paleoclimatology
Project Researcher	Fumio NAKAZAWA	Glaciology
Project Assistant	Motohiro HIRABAYASHI	Analytical Chemistry
Project Assistant	Remi DALLMAYR	Engineer / Technological development

### Public Relations Section

Professor	Yoichi MOTOYOSHI	Geology
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### Library

Professor	Tsuneo ODATE	Biological Oceanography
Project Prof.	Takashi YAMANOUCHI	Atmospheric Science

### International Affairs Section

Professor	Kentaro WATANABE	Marine Ecology
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## Research Staff (As of May 1, 2016)

### Intellectual Property Section

Professor	Hiroyuki ENOMOTO	Glaciology, Climatology, Remote Sensing Engineering
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### Archives Section

Professor	Tsuneo ODATE	Biological Oceanography
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Project Prof.	Takashi YAMANOUCHI	Atmospheric Science
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### Research Development Office

Professor	Takuji NAKAMURA	Atmospheric Dynamics
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URA	Tetsuo SUEYOSHI	Glaciology, Paleoclimatology
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URA	Yasuko ISONO	Atmospheric Science
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### Office of Female Researcher Development

Professor	Takuji NAKAMURA	Atmospheric Dynamics
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URA	Yasuko ISONO	Atmospheric Science
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### Visiting Staff

Visiting Prof.	Giichiro OHNO	Antarctic Medical
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Visiting Prof.	Naomasa NAKAI	Astronomy
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Visiting Prof.	Kaoru SATO	Atmospheric Dynamics, Middle Atmosphere Sciences
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Visiting Prof.	Makoto ABO	Laser Remote Sensing
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Visiting Prof.	Mitsuru EBIHARA	Analytical Chemistry, Cosmochemistry
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Visiting Prof.	Seiji TSUBOI	Seismology
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Visiting Prof.	Hiroyuki KONISHI	Precipitation Physics
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Visiting Prof.	Takashi ICHIKAWA	Astronomy
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Visiting Prof.	Hitoshi FUJIWARA	Upper Atmosphere Physics
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Visiting Prof.	Masahiko HAYASHI	Meteorology
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Visiting Prof.	Makoto KIMURA	Environmental Science Meteoritics, Mineralogy
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Visiting Prof.	Makoto TAGUCHI	Planetary Atmosphere Physics
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Visiting Prof.	Shinya OBARA	Energy System, Microgrid, Cold Region Energy
----------------	--------------	---

Visiting Prof.	Hiroshi TANAKA	Atmospheric Science, Meteorology, Climatology, Atmospheric General Circulation
----------------	----------------	--

Visiting Prof.	Jouta KANDA	Marine Biochemistry
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Visiting Prof.	Dapeng ZHAO	Seismology
----------------	-------------	------------

Visiting Prof.	Masayuki YAMAMOTO	Upper Atmosphere Physics, Ionospheric Physics
----------------	-------------------	--

Visiting Prof.	Tetsuo IWAMI	Ichthyology, Marine Ecology
----------------	--------------	-----------------------------

Visiting Prof.	Yutaka WATANUKI	Marine Ecology
----------------	-----------------	----------------

Visiting Prof.	Shogo NISHIKAWA	Power and Energy
----------------	-----------------	------------------

Visiting Prof.	Shinji MORIMOTO	Atmospheric Science
----------------	-----------------	---------------------

Visiting Prof.	Hiroyasu HASUMI	Physical Oceanography, Ocean Modeling
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Visiting Prof.	Taro ICHII	Marine Ecology
----------------	------------	----------------

Visiting Prof.	Takayuki NAKATSUBO	Plant ecology, Ecosystem ecology
----------------	--------------------	----------------------------------

Visiting Prof.	Hajime YAMAGUCHI	Naval Architecture and Ocean Engineering
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Visiting Associate Prof.	Ayako ABE	Paleoclimatology, Climate and Ice Sheet Modeling
--------------------------	-----------	---

Visiting Associate Prof.	Yasunobu MIYOSHI	Middle-Upper Atmosphere Physics, Upper Atmosphere Physics
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Visiting Associate Prof.	Masato MOTEKI	Ichthyology
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Visiting Associate Prof.	Satonori MOZAWA	Upper Atmosphere Physics
--------------------------	-----------------	--------------------------

Visiting Associate Prof.	Toru HIRAWAKE	Satellite Oceanography, Marine Optics
--------------------------	---------------	--

Visiting Associate Prof.	Tomoyuki HOMMA	Diffraction Physics, Physical Metallurgy, Strength in Materials Science, Light Metals
--------------------------	----------------	--

Visiting Associate Prof.	Makoto KOIKE	Atmospheric Chemistry and Physics
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Visiting Associate Prof.	Takanobu SAWAGAKI	Physical Geography, Glacial Geology
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Visiting Associate Prof.	Shigeru AOKI	Polar oceanography
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### JSPS Postdoctoral Fellow

Project Researcher	Naoko NAGATSUKA	Glaciology
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# Partnership Agreements

NIPR concludes research agreements and memoranda of understanding with foreign universities and research institutes for the sake of promoting collaboration projects, academic exchange and graduate university education.



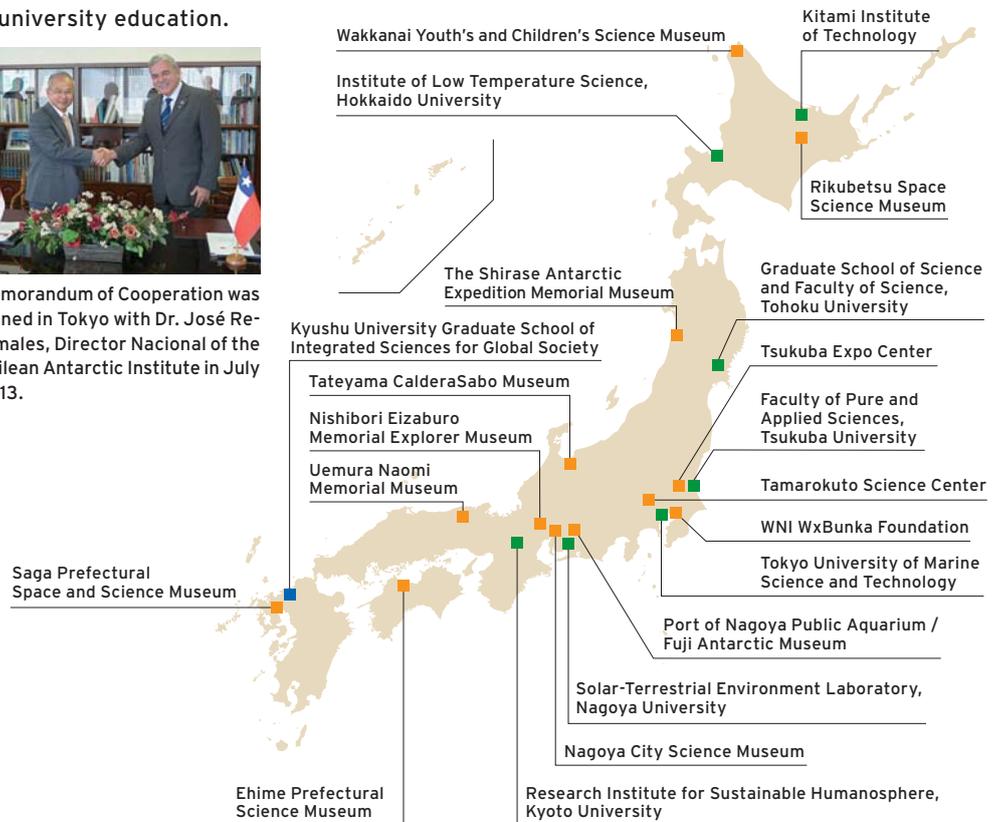
President of Helmholtz Association of German Research Centres, Prof. Mlynek and his delegation visited NIPR and Director of Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Prof. Lochte signed a renewed agreement on co-operation in research and logistic operation in the Arctic and Antarctic in October 2013.



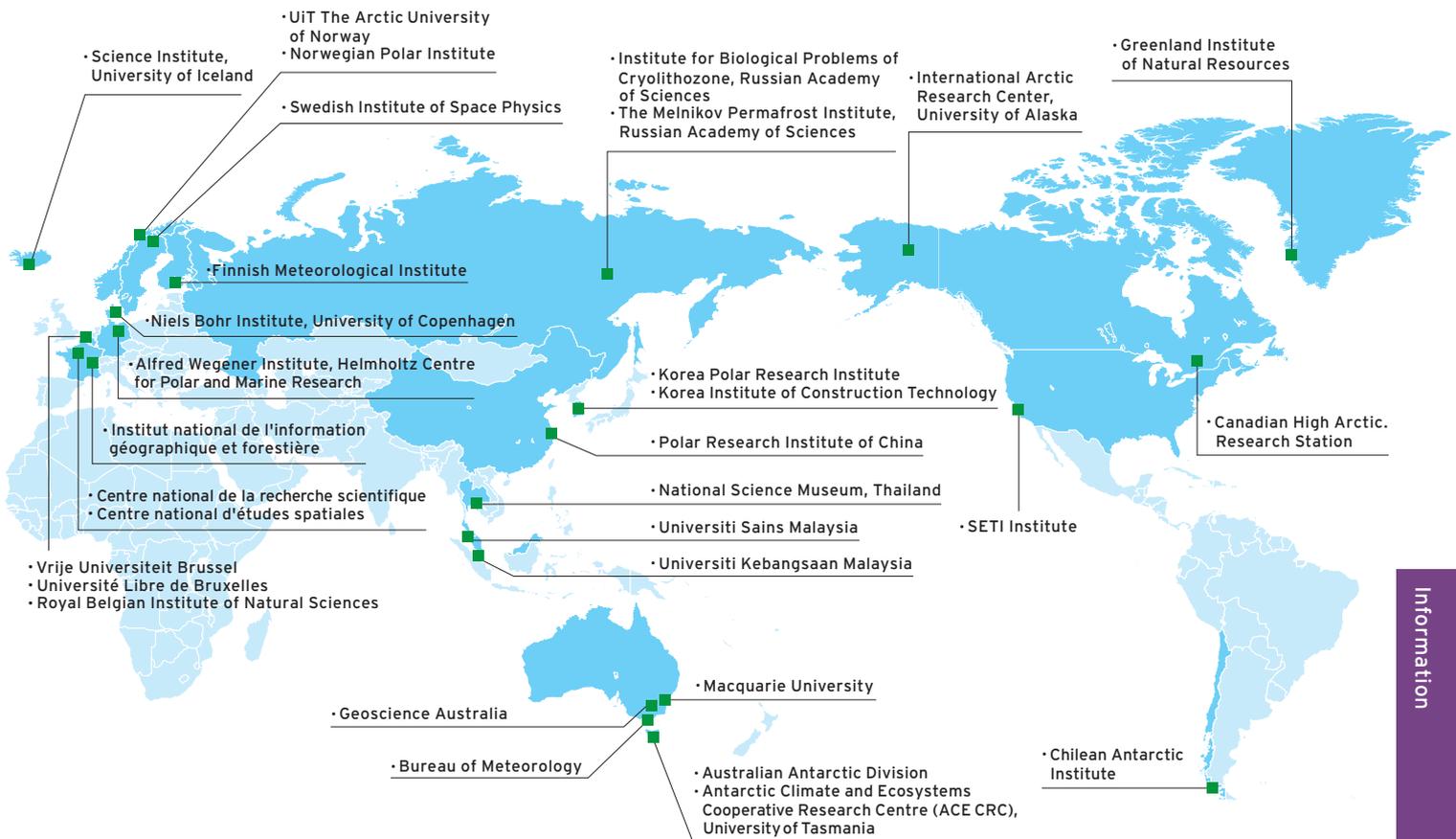
Memorandum of Cooperation was signed in Tokyo with Dr. José Retamales, Director Nacional of the Chilean Antarctic Institute in July 2013.

## Domestic partner institutions

- Collaboration Projects
- Graduate school education
- NIPR Polar Science Museum



## International exchange agreements



The national Institute of Polar Research established

September 29, 1973

At 1-9-10 Kaga Itabashi-ward Tokyo



Number of employees **225**

Faculty / researcher **88**

Administers / engineers **118**

Engineers & polar observation staff **19**

(As of April 1, 2016)



SOKENDAI has become base research organization

April, 1993

Department of Polar Science in The Graduate University for Advanced Studies, School of Multidisciplinary Science

Number of enrolled students **20** Number of degree recipients **65**

(As of April 1, 2015)



Polar Science Museum

Opened on

July 24, 2010

Total number of the visitors **155,446** (As of April 1, 2016)



Open house of NIPR 2015

It was held on

August 8, 2015

Number of the visitors **1,978**



The Fifth Polar Science Symposium

Participants

November 16-19, 2015

**510** (includes oversea **63** participants)



# History

## History of the National Institute of Polar Research

- December 1959 Japan joined the Antarctic Treaty
- May 1961 The Science Council of Japan advised the establishment of the "Institute of Polar Research" (tentative) to the government
- (April 1962) ("Polar Department" of the National Science Museum established)
- (April 1970) ("Polar Department" reorganized as "Polar Research Center")
- September 29, 1973 The National Institute of Polar Research established
- April 1993 NIPR became an infrastructure institute of the Graduate University for Advanced Studies (SOKENDAI)
- July 1998 Antarctic Environmental Protection Law became effective
- April 2004 The Inter-University Research Institute Corporation Research Organization of Information and Systems NIPR established
- May 2009 NIPR relocated to new campus in Tachikawa-shi, Tokyo
- August 2009 "Open house" of NIPR started
- July 2010 NIPR Polar Science Museum opened
- September 2013 40th anniversary since the establishment of NIPR
- February 2014 Over 100,000 visitors recorded at Polar Science Museum

## History of Antarctic Expeditions

- January 1912 Mr. Shirase Antarctic Expedition team reached in lat. 80°C
- November 1956 First Antarctic expedition team departed with the ice-breaker ship "Soya"
- January 1957 "Syowa Station" established
- February 1962 "Syowa Station" closed temporarily
- November 1965 Research vessel "Fuji" launched
- January 1966 "Syowa Station" reopened
- February 1969 Round-trip to the South Pole achieved
- December 1969 First Antarctic meteorite discovered
- February 1970 First observation by rocket
- June 1970 "Mizuho Station" (observation base) established
- October 1979 Large number of Antarctic meteorites collected
- October 1982 "Ozone hole" was discovered
- November 1983 Research vessel "Shirase" launched
- March 1985 "Asuka Station" (observation base) established
- February 1989 Multifunctional antenna installed
- February 1995 "Dome Fuji Station" established
- December 1996 Polar ice sheet drilled down until 2,503 m
- January 1999 Large number of Antarctic meteorites collected
- January 2001 Large number of Antarctic meteorites collected
- February 2002 Specialized ship was added for South Pacific expedition
- February 2004 Intelsat satellite communication system came alive
- January 2005 Aircraft observation base established on the land of Antarctica
- 2006-2007 50th anniversary of Antarctic research project
- January 2007 Polar ice sheet drilled down until 3,035 m
- November 2009 New "Shirase" launched
- 2010 "Umitaka-Maru" Tokyo University of Marine Science and Technology's training ship joined Antarctic research project
- February 2010 Over 17,000 of Antarctic meteorites has collected
- March 2011 "PANSY" large-scale atmospheric radar started recording data
- August 2014 Snow Vehicles Type-KD60 has certified as Mechanical Engineering Heritage
- 2016 Japanese Antarctic Research Project Phase IX has started

## History of Arctic Researchers

- June 1990 Arctic Environment Research Center established
- January 1991 Joins International Arctic Science Committee (IASC)
- April 1991 Ny-Ålesund Research Station established
- April 1996 Joins European Incoherent Scatter Scientific Association (EISCAT)
- March 1998 Japanese-German airborne Arctic expedition
- April 2004 Arctic Environment Research Center reorganized
- April 2008 North Greenland Eemian Ice Drilling (NEEM) began
- July 2011 GRENE - Arctic Project started
- April 2015 Arctic Environment Research Center reorganized to enhance international collaborations
- "Arctic Science Summit Week" was held in Toyama
- September 2015 ArCS (Arctic Challenge for Sustainability) Project has started
- March 2016 GRENE - Arctic Project closed



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National Institute of Polar Research

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