Antarctic Research

What is Japan monitoring in Antarctica?

NiPR
National Institute of Polar Research

To understand Antarctica is to decipher the Earth's future.

State of Conservation in Antarctica

Antarctic observations have been conducted under the fundamental policy to protect the precious natural environment. Based on the Antarctic Treaty and the Protocol on Environmental Protection to the Antarctic Treaty, various environmental measures have been taken around the globe and restrictions have been placed on human activity in Antarctica. Regions of the continent that are extremely environmentally valuable are designated as Antarctic Specially Protected Areas, and entry without permission is prohibited. The Treaty also prohibits the introduction of non-native plants and animals to Antarctica, so the dog sleds once necessary for conducting observations can no longer be used. Extreme caution is exercised to protect Antarctica's natural environment. Not only is it illegal to transport plants, animals and minerals out of Antarctica, there are also restrictions on animal approach distances.

Permanent Research Stations and Japan's Research Stations in Antarctica (as of 2009)

Jezek,K.,and RAMP Product Team.2002.RAMP AMM-1 SAR Image Mosaic of Antarctica.
Fairbanks,AK: Alaska Satellite Facility, in association with the National Snow and Ice Data Center,Boulder,CO.Digital media.

The Future of Antarctica is the Future of Humankind.

Antarctica. Nearly two centuries have passed since humans first set foot on this icy continent. In the past, Antarctica was an explorer's dream, a stage where nations put their pride at stake, and at times, the subject of territorial disputes. Now, with the help of humankind, researchers are exploring the continent's natural phenomena to both learn about the Earth's past and attempt to forecast its future. Because of almost no human activity, Antarctica is a rare place where the Earth's environment can be accurately monitored. The countries of the world must cooperate with each other to conduct observations and research and monitor the global environment based on the results of these efforts. To do this, Antarctica has to be preserved as a common heritage of humankind that belongs to no one.

Antarctica: The Borderless Continent.

In 1957 and 1958, 66 countries joined forced to launch the International Geophysical Year (IGY) project. Japan's participation marked the beginning of its Antarctic observations. Several of these countries reaffirmed the importance of Antarctica with this international campaign and

came together to sign the Antarctic Treaty, an agreement that deemed Antarctica as a common heritage of humankind, deferred all territorial claims on the continent and banned military operations there. Based on this, a system allowing scientists to freely conduct observations and research at any time was created. Since signing the Antarctic Treaty as one of the original signatories, Japan has played a major role in promoting scientific research, international cooperation and environmental conservation in Antarctica.

As of 2010, 28 countries maintain research stations on Antarctica, and it is a commonplace for scientists to visit each other bases freely and conduct in joint research. The environmental data observed in Antarctica does not only affect certain countries, it contributes to all of the countries and all of the people on the Earth. Antarctica may be a faraway frozen continent, but the research activity there is closely linked to our daily lives in Japan.

Data on Antarctica

Area:	About 13.88 million km^2 (37 times the size of Japan)	Avg. ice thickness:	1,860m
Avg. altitude:	2,010m	Max. ice thickness:	4,776m
Highest point:	4,892m	Ice volume:	About 25.4 million km^2 (90% of Earth's ice)
Avg. temp.:	-10.5°C (Syowa Sta./annual avg.)	Precipitation:	50mm/year at South Pole (same as a desert)
Lowest temp.:	89.2°C (at Russia's Vostok Station)	Distance from Japan:	About 14,000km

The flags of the original signatories of the Antarctic Treaty are a symbol of peace on the continent (at South Pole).

Regular international meetings are held in accordance with the Treaty.

Antarctic Treaty and Environmental Protocol

Applied to all of the land and ice shelves south of 60° S latitude, the Antarctic Treaty was initially ratified in 1959 by 12 signatories — Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union (now Russia), the United Kingdom and the United States — before going into effect in 1961. It comprised 14 articles, including the following four:

Article 1: Limit of usage to peaceful purposes (military usage prohibited)
Article 2: Freedom of scientific investigations and promotion of international cooperation
Article 4: Suspension of territorial sovereignty claims
Article 5: Prohibition of nuclear explosions and disposal of radioactive wastes

The Treaty reached its initial 30-year expiration date in 1991, but no country has demanded it be revised or abolished. As of 2010, the number of member states stands at 48.

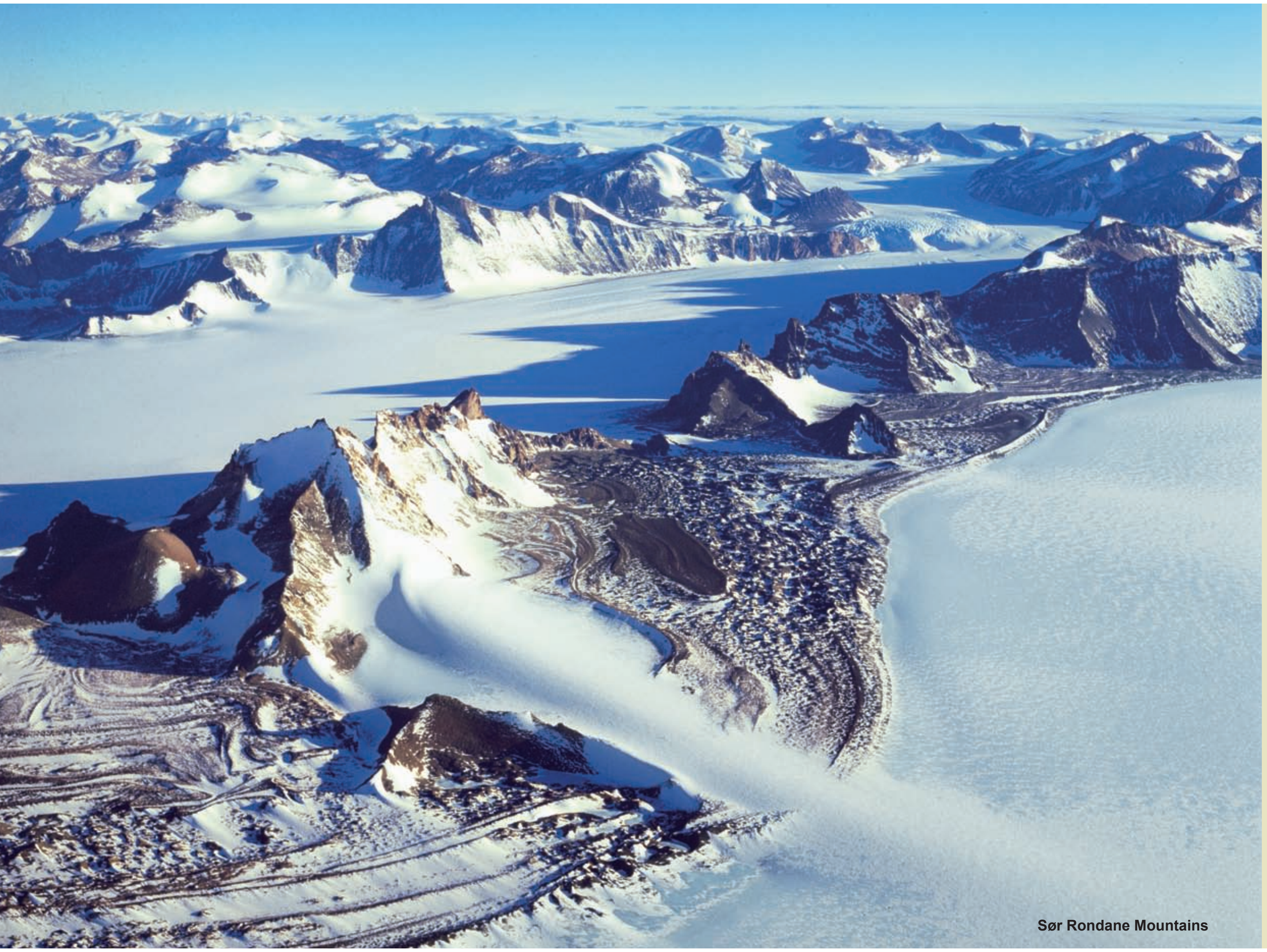
Antarctica holds many clues to understand how the Earth has evolved since its born

Volcanic smoke from Mt. Erebus

Diverse Natural Environment in Antarctica

The icy continent's natural environment is rich with diversity. One case in point are its volcanoes. Two of the most well-known volcanoes are Mt. Erebus (3,794m) and Deception Island. The United States' McMurdo Station and New Zealand's Scott Base are located at the foot of Mt. Erebus, and they have been observing the volcano since 1957.

Deception Island, a submarine volcano, is a breeding ground for penguins. The island is a horseshoe-shaped caldera that wraps around a bay which is also home to hot springs. Deception Island last erupted in 1970, and today only plumes of volcanic smoke can be seen on occasion. It is also a famous tourist attraction.



Sør Rondane Mountains

Evidence of the Ancient Continent of Gondwana

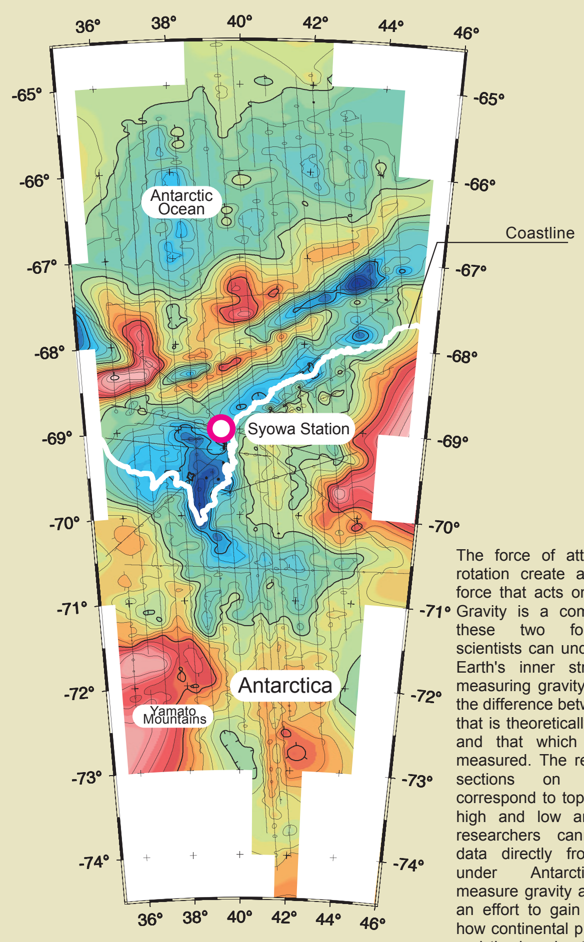
Approximately 200 million years ago, Antarctica was part of Gondwana, a supercontinent that incorporated present-day Africa, South America, Australia, India and other land fragments. Gondwana began to break up about 180 million years ago. At that time, Antarctica was warm, forest-covered land near the Equator where dinosaurs roamed. There are massive coal-bearing strata in the Transantarctic Mountains which are proof of the existence of large forest at one time.

Secrets of Gondwana under the Ice and the Ocean

How did the supercontinent of Gondwana form and break apart? The answers to these questions lie deep under Antarctica's thick ice. Since scientists cannot directly explore the bedrock under the ice, they explore the internal structures of the Antarctic continent and the Antarctic Ocean by beaming radio waves from aircraft and generating artificial earthquakes to analyze gravity anomalies.

Antarctica still holds many clues to understand how the Earth has evolved.

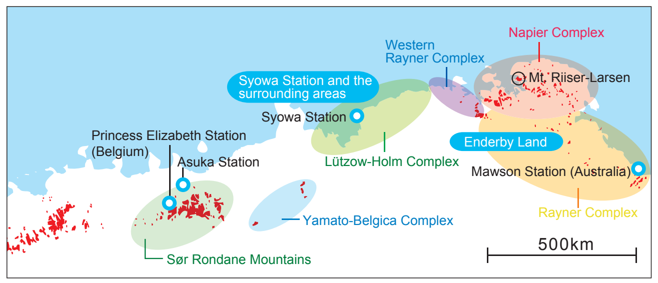
Gravity Anomalies Around Syowa Station



The force of attraction and rotation create a centrifugal force that acts on the Earth. Gravity is a combination of these two forces, and scientists can understand the Earth's inner structures by measuring gravity anomalies, the difference between gravity that is theoretically calculated and that which is actually measured. The red and blue sections on the map correspond to topographically high and low areas. Since researchers cannot extract data directly from the ice under Antarctica, they measure gravity anomalies in an effort to gain insight into how continental plates shifted and the ice sheets fluctuated in the past.

Geological Diversity in Antarctica

Geology in Antarctica is truly diverse, ranging from 3.8 billion year Archean terrain to currently active volcanoes. The oldest rocks occur in the Napier Complex, located about 600km east of Syowa Station. Containing rocks formed about 3.8 billion years ago, the Complex provides researchers with an invaluable opportunity to explore how the Earth's crust initial formed. The Rayner Complex, which encircles the Napier Complex, and the Lützow-Holm Complex, which includes the area around Syowa Station, both contain rocks formed between 500 million years and one billion years ago. There two complexes are still young when compared to the Napier Complex.



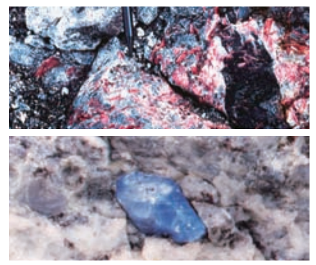
Geological distribution near areas where Japan conducts observations.

Exposed rocks are marked in red.

Rubies and Sapphires from Antarctica

If Antarctica was connected to the other continents at one time, then there is nothing unreasonable for scientists to find similar rocks and minerals from different continents. The illustration on the right is a reconstruction of Gondwana. About 200 million years ago, Syowa Station would have been right next to southern India and Sri Lanka. These two countries are renowned for the gem minerals they produce, and in fact, rubies and sapphires have been found near Syowa Station as well. In fact, the stones from each of the regions are extremely similar. Traces of tectonic movements from hundreds of millions of years ago can still be found in the geological formations of Antarctica.

Reconstruction of Gondwana (200 Ma)



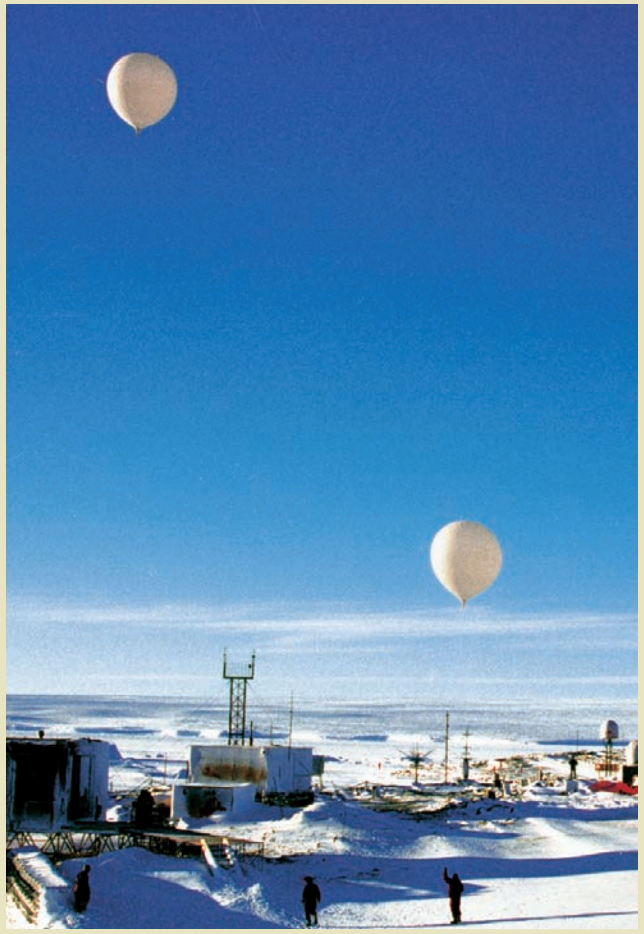
Rubies (top) and sapphires (bottom) found near Syowa Station

Antarctic observations help us understand how the Earth's environment has changed.

Ice sheet in the Sør Rondane Mountains

History of the Antarctic Ice Sheet

Due to sediments carried by glaciers, the continental shelf around Antarctica contains a record of how the Antarctic ice sheet grew and shrank in size over the years. The Antarctic ice sheet first reached the size of the entire continent in the Cenozoic era about 34 million years ago. Then, with having passed through several growing and shrinking phases, the present Antarctic ice sheet appeared approximately 14 million years ago. There are two scenarios suggested, which explain how the Antarctic ice sheet has been formed. In the first one, the ice sheet was formed on the Antarctic continent during its travel toward the south after its break-up from Gondwana which occupied over lower latitudes. The other scenario suggestes that the ice sheet was formed due to cooling by a decrease in concentration of the greenhouse gas CO_2.



The tropospheric and stratospheric atmosphere over Syowa station has been monitored for long time by using sondes balloon-borne meteorological instruments.

The Discovery of the Ozone Hole and the Regulation of CFCs

Through its Antarctic observations, Japan has played a key role in understanding of global environmental changes, including the discovery of the ozone hole in 1982. This discovery attracted the attention of the world, and led to the banning of certain ozone-depleting chlorofluorocarbons (CFCs). In the stratosphere, the ozone layer plays an important role by absorbing most of the sun's ultraviolet rays. The ultraviolet rays hitting Antarctica have the potential to damage the natural environment and harm human health.

Japan was the first country in the world to detect the ozone hole because it had accumulated a wealth of data on ozone having monitored it continuously since 1961. More recently, Japan has been monitoring many atmospheric minor constituents that affect the Earth's climate, and its activities include internationally collaborated observations in Antarctica to predict the future of the ozone layer and launching massive balloons to collect air samples.

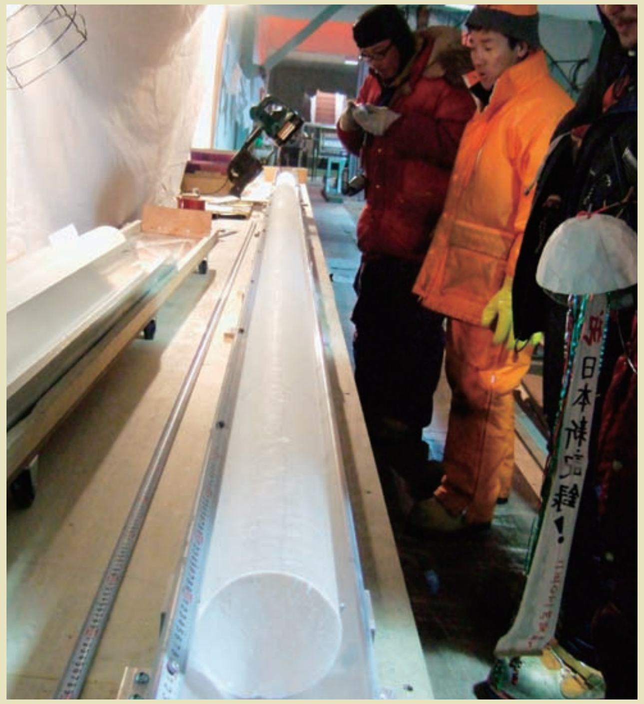
The reason why the ozone hole appears over the Antarctic region is because polar stratospheric clouds (PSCs) — a specific type of clouds in which reactions conducive to ozone depletion occur in spring— are generated during the extreme cold of winter.

Exploring Mysteries Locked in Ice

In 1995, Japan expanded its Antarctic research area with the opening of Dome Fuji Station which is located on a summit of the Antarctic ice sheet of the elevation of 3,810 m with the ice thickness more than 3000 m on the continental bedrock.

The purpose of the activities at Dome Fuji Station is for the exploration of changes in the global environment and climate from the ancient past until today. We bore into the ice sheet and take samples called ice cores with 10cm in diameter. At a summit such as where Dome Fuji Station is located, the ice sheet does not flow horizontally. The falling snow has been accumulated together with atmospheric minor constituents and atmosphere itself on the previous snowfall one after another for a long time such as tens of thousands of years. Consequently, a series of the ice cores derived at Dome Fuji Station is like a time capsule that has carefully preserved information on the Earth's past. By analyzing the ice as well as the air and aerosol particles trapped in the ice, we are starting to reveal a history of the environmental changes during alternating 100,000 year glacial and interglacial cycles. We have also confirmed that CO_2 has increased at unprecedented rates over the past 200 to 300 years.

In 2007, Japan successfully drilled the full 3,035m from the surface of the ice sheet to the bedrock. Expectations are high that new facts on the global environment will be revealed.

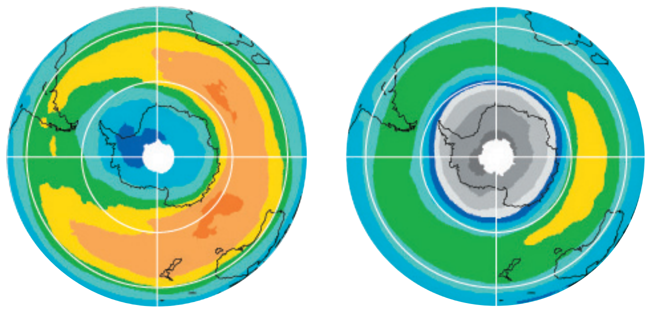


Ice core drilling at Dome Fuji Station where the average annual temperature is -54.4°C.

The Expanded Ozone Hole

The ozone hole appears over Antarctica in the Spring (September) and disappears in the Summer (December). While the size of the hole differs from year to year, one of the biggest loss of ozone was recorded in 2006 when the hole grew to twice the size of Antarctica. The hole's expansion seems to have stopped recent years, but it still remains very large. The image on the right compares the ozone layer of September 1979 with that of September 2006. There was no ozone hole in 1979, but by 2006, the hole (the gray portion of the image) had grown to cover the entire continent.

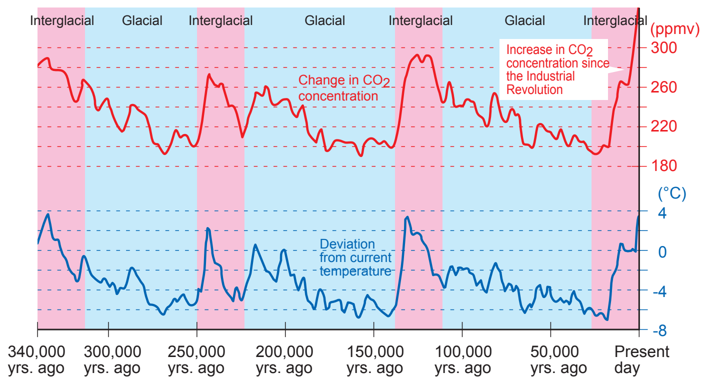
* The white portion at/around the south poleis an unmeasurable area.



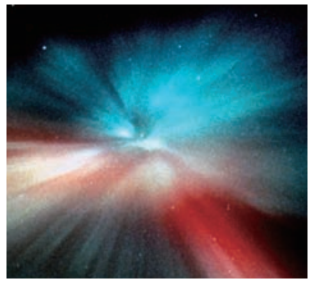
1979 2006 © JMA

Using Ice Cores to Understand Glacial and Interglacial Cycles

The graph on the right hand side show the changes in temperature and CO_2 concentrations over the past 340,000 years determined from the analysis of air trapped in ice cores. This shows how the Earth's climate has fluctuated during alternating 100,000 year glacial and interglacial cycles. Of particular interest is the concentration of atmospheric CO_2 represented by the red line. One can see how changes in CO_2 levels have coincided with temperature changes over the past 340,000 years, but concentrations since the Industrial Revolution in the 18th centuryare the highest on record.



Antarctica is Earth's window to outer space.



Corona aurora

Curtain-shaped aurora

Ray-band aurora

The Colors and Shapes of Auroras

Depending on the altitude where they originate, auroras can be divided into three main colors: red, greenish white and pink. Curtain-shaped auroras will often be red at the top and greenish white in the middle. This difference is due to the differing energy ranges of the aurora particles and the types and densities of atoms and molecules that occur at different altitudes.

Japan: One of the World's Biggest Holders of Meteorites

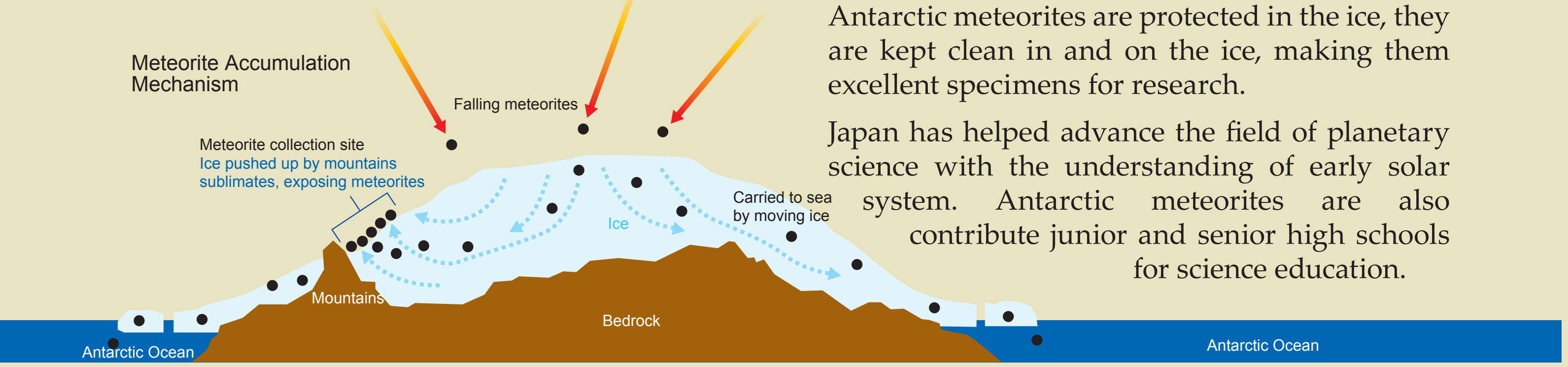
One of the biggest contributions of JARE is collecting the large number of Antarctic meteorites. Antarctica is a treasure-house of meteorites. Following is a reason why Antarctica is a prime collecting side for meteorites, and it was Japanese scientists who discovered the mechanism.

Meteorites that strike Antarctica are preserved in the ice which transports them, over tens and hundreds of thousands of years, toward the sea. However, when the ice reaches the inland mountains, it is damed up and sublimated by the wind and the sun. Meteorites preserved in the ice can be gathered on the side once they break through the surface for long time. Based on this idea, Japanese scientists have recovered about 16,800 meteorites through 2010. Since the Antarctic meteorites are protected in the ice, they are kept clean in and on the ice, making them excellent specimens for research.

Japan has helped advance the field of planetary science with the understanding of early solar system. Antarctic meteorites are also contribute junior and senior high schools for science education.

The JARE searches for meteorites in the Sør Rondane Mountains.
The stripes in the background of the sky due are a crevasse.

Meteorite Accumulation Mechanism



Mysterious Auroras: When Solar Wind Meets the Earth's Magnetic Field

Japan has made significant contributions to the field of space science with its aurora observations. Some people may wonder what connection there is between ethereal auroras and space science, but auroras are actually discharge phenomena caused when solar wind and the Earth's magnetic field work together as a dynamo and generates electric power. In other words, they are upper atmosphere phenomena, not meteorological phenomena like rainbows.

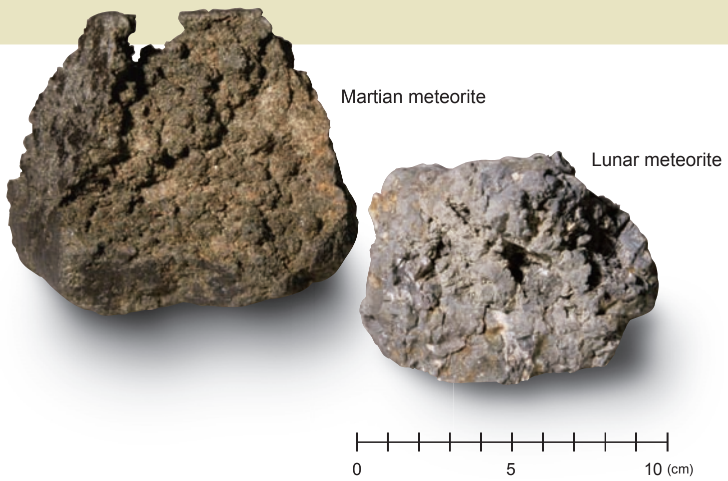
There are many unsolved mysteries in the auroral phenomena. To shed some light on auroras, Japanese researchers use special cameras, radars and satellites to engage in continuous monitoring from various aspects. One of the tools used for aurora observations is the monochromatic all-sky imager and the on-line color digital camera developed by National Institute of Polar Research (NIPR) in Japan. These instruments have been installed at Syowa Station, Chinese Zhongshan Station and United States' Amundsen-Scott Station, and joint observations have been conducted by scientists in these countries. Furthermore, Japan is one of 11 countries involved with SuperDARN, a network of about 30 radars used for international joint auroral observations.

Scientists of the world have joined forces to pursue research into the mechanisms of how solar wind and magnetosphere interaction create auroras and what effects this may have on our environment.

Large antennas of Syowa Station SuperDARN radars.

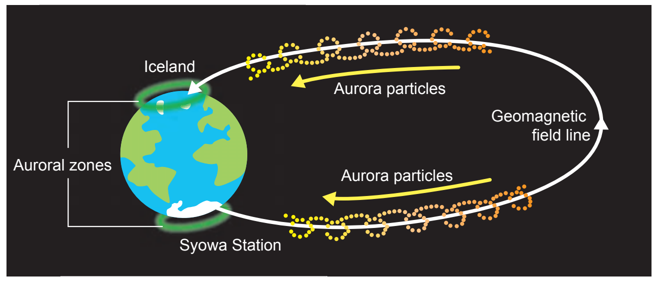
The Many Types of Meteorites

There are many different types of meteorites in Japan's mete onite collection, including nine lunar and 11 Martian meteorites. We humans have access to moon rock samples brought back by lunar missions such as Apollo, but we first realized that rocks from the moon had been projected to Earth when lunar meteorites were discovered in Antarctica. Some of the lunar meteorites found in Antarctica are from the few side of the moon opposite to where the Apollo missions touched down. JARE will continue to actively collecting meteorites in order to advance the field of planetary science.



Syowa Station—On the Front Line of Aurora Observation

Auroras occur around both magnetic poles of the Earth in areas called as the auroral zones. Syowa Station is located directly under the southern auroral zone, making it the ideal spot for observing auroras. Taking advantage of this location, Japan has always stood at the forefront of aurora research.
In 1983, NIPR established an observation facility in Iceland, the geomagnetic conjugate point of Syowa Station, and it continues to observe northern and southern auroras simultaneously. These two facilities constitute almost the only conjugate (a pair of points connected by a geomagnetic field line) on Earth where auroral observations can be steadily conducted.



Schematic illustration of conjugate aurora observation

Southern Ocean: an exciting and challenging field for Marine Life Science!

Southern Ocean Ecosystem and Global Environmental Change

The pelagic environment is the water column away from the bottom or the shore. Plankton and nekton are major components of organisms that live suspended in their liquid medium. Generally, plank- ton is by far the most abundant organism in the ocean and they form the key flow of the pelagic food chain.

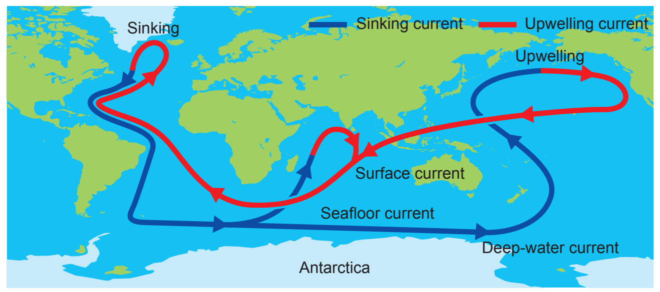
The plankton represent over the 95 % of the biomass of the Southern Ocean ecosystem. It comprises of phytoplankton and zooplankton including krill. Phytoplankton as well as a complex microbial loop comprising bacteria, viruses, microzooplankton and dissolved organic material (DOM) that recycle carbon and package material into large particles. Phyto-plankton fix inorganic carbon and nutrients using light energy in the surface waters by photosynthesis and contribute to the movement of CO_2 between atmosphere and ocean.

Crustaceans are also important members of zoo-plankton in Southern Ocean. Particularly, copepods and Antarctic krill are key groups in terms of biomass with often aggregate into huge and dense swarms. They feed on phytoplankton and other parts of the microbial loop, and form the essential link between microbial production and higher predators. All the plankton components (phytoplankton, zooplankton and microzooplankton) play key roles in the uptake of CO_2, formation calcium carbonate and the vertical flux of these compounds to the deep ocean. They also regulate the production and release of the climate-activity gas, dimetylsulphide (DMS). Any substantial changes in the plankton composition, function or abundance will have significant impacts on the ecosystem function, as well as flow on effects to resources such as krill, fishes, squids and also for the survival of iconic Antarctic marine mammals and birds.

Antarctica and its surrounding waters are expected to be particularly sensitive and vulnerable to environmental change. There are potential impacts on the Southern Ocean ecosystem for environmental change, e.g. global warming, sea ice-reduction, UV exposure, harvesting impact, invasive species and ocean acidification.

Plankton is particularly sensitive to changes in their environment. They are short live, grow and mature rapidly and thus have rapid turnover in their populations. Furthermore, phytoplankton is directly sensitive to change in oceanic and atmospheric conditions through nutrient input, circulation, wind-driven mixing, irradiance, etc. Due to the significance of plankton in the Southern Ocean Ecosystem, their sensitive, to environment, and the potential impact of changes in the plankton on higher trophic levels, as well as ecosystem service such as CO_2 uptake, the efficiency of the biological pump and DMS production etc., it is essential that we can identify impacts of climate change on them. The effects of climate change on Southern Ocean ecosystem cannot be predicted without a detailed understanding of the plankton. Based on this policy, Japan has maintained a long term Plankton Monitoring Program on JARE Voyages for nearly 40 years.

Plankton sampling on research vessel



Ocean water takes about 2,000 years to circulate around the Earth.

The Antarctic Ocean: Driving Force of Ocean Circulation

The Antarctic Ocean drives global ocean circulation. When the ocean freezes in winter, salt is squeezed out of the ice, thereby increasing the concentration of salt in the seawater below. This water, which is heavier than normal seawater, sinks to the ocean floor to become deep water, and it flows in the deepest parts of the ocean. This process generates global ocean circulation.

Scientists believe it takes about 2,000 years for ocean water to circulate around the globe once. Since this circulation acts as a heat transfer system for the entire ocean, it is an extremely important factor in the planet's long-term climate control.

Hidden Animal Ecosystems Revealed by Penguin-attached Cameras

By attaching tiny cameras to penguins, researchers observed the vertical distribution of krill — the main food of penguins — as well as the penguins' hunting success A survey conducted by the Japanese research team in 2006 found that Gentoo penguins have about a 25% chance of finding krill when they dive 5m or deeper.

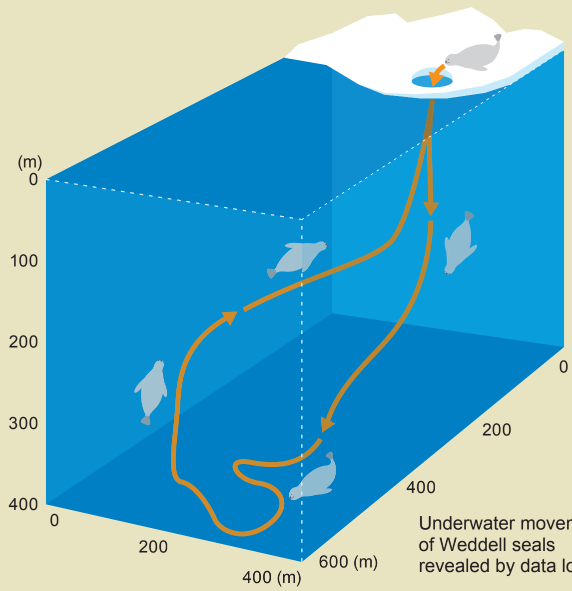
Antarctica: New Era in Marine Biology

Since penguins and seals spend most of their time in the sea, it is difficult to study their ecology, and the research has lagged behind the study of terrestrial animals. To solve this problem, researchers have been developing small tracking devices called data loggers and applying them to seals and penguins in Antarctica since 1980s.

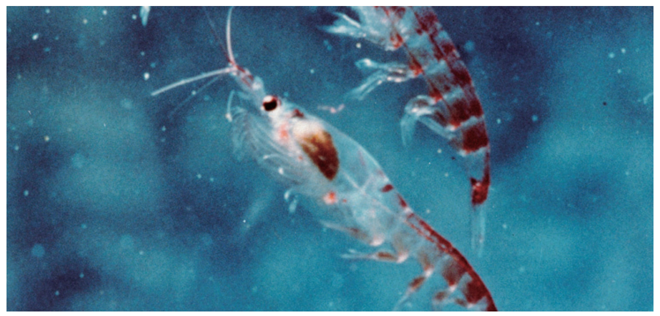
Data loggers revealed that emperor penguins can dive up to 564 m and that Weddell seals can dive up to 741 m and stay underwater for up to 67 minutes. The hidden world of marine mammals has started to be revealed. Furthermore, geomagnetic data loggers have revealed the detailed swimming pathways of marine animals.

Research using data loggers has taught us other things as well. Animals equipped with recently developed camera loggers are now providing researchers with new information about the underwater environments that humans were never able to see before. Using camera loggers attached to Weddell seals, the Japanese research team found the rich fauna underside of the Antarctic ice shelves, some of which are 150m thick. Collapse of ice shelves may have large impact on the distribution of this fauna.

The camera loggers, originally developed for the Antarctic research, are now used around the world. Many animals equipped with camera loggers are now being used as autonomous ocean observers



Underwater movements of Weddell seals revealed by data loggers



Key Species: Antarctic Krill

Euphausiid crustaceans are conspicuous members of Southern Ocean plankton community. Collectively, they are referred as "krill". Among them, 6-cm long shrimp-like Antarctic krill (*Euphausia superba*) is reputed to have the largest biomass as a single metazoan species on planet, playing a key role in the structure and function of Southern Ocean ecosystem.

Antarctic krill serve as prey of every kind of larger predators such as fishes, squids, penguins, seals and whales and as consumers of phytoplankton. This is why it is said to be a key species in Southern Ocean ecosystem. Standing stock of Antarctic krill has been to order of 10^9 ton in Southern Ocean. However, it is considered that annual sustainable yields are ultimately not to exceed 10^5 ton.

Advanced Japanese technology supports the Japanese Antarctic Research Expedition.

Japan's first prefab building was used by the first expedition.

Making Japan Comfortable with Technology from Antarctica

Construction on Antarctica is limited to a six-week period in summer. This led to the birth of prefab buildings—structures which can be assembled in a short period of time. An airtight building can be built just by connecting panels full of good insulation together. To ensure the effective use of limited fuel supplies, cutting-edge energy efficiency technology was adopted in Antarctica early on. Co-generation systems that collect excess heat from generators to make hot water have been used by every research team since the first expedition.

Syowa Station was opened in 1957 with four prefab buildings, but now it is a state-of-the-art research facility with 60 buildings.

Syowa Station: "Mother Station" of the Japanese Antarctic Research Expedition.

Advanced Japanese Technology on the Front Lines of Antarctic Research

Antarctic expeditions cannot conduct their research without icebreakers to carry them, along with supplies and fuel, to Antarctica. In 2009, Shirase (AGB-5003) was commissioned as the successor of the former Shirase (AGB-5002), an icebreaker that supported the Japanese Antarctic Research Expedition for 25 years. To help prevent marine pollution, the new Shirase was equipped with double-hulled fuel tanks, and trash processing and wastewater purification facilities were installed to bolster the conservation of Antarctica's environment.

The snow vehicles and sleds at Syowa Station, which are used for inland traverse to Dome Fuji Station, are also packed with advanced Japanese technology. Not only can the SM-100 large snow vehicle, which is used for trips to Dome Fuji Station, be driven in temperatures as low as -60°C, it is made of steel that can withstand temperatures as low as -100°C and has rubber caterpillar treads that maintain their elasticity even at -60°C.

In 2004, a satellite communications system was installed, thereby giving Syowa Station access to e-mail and internet as well as an extension telephone line to the National Institute of Polar Research in Tokyo.

All of these technologies have been refined are are now used to make our lives more comfortable.

The SM-100 large snow vehicle is used for inland traverse

INTELSAT satellite communications system

Wastewater treatment building (Photo taken during construction)

Maximum cargo weight: 1,100t
Shirase can carry 100t more than its predecessor and is equipped with two large helicopters.

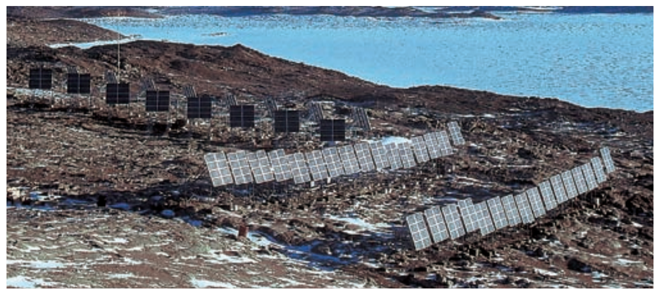
Shirase: Made with the Latest Japanese Shipbuilding Technology

In today's world, ships are typically built with a specific purpose in mind, be they tankers, cruise liners or marine research vessels, but the icebreaker for the Japanese Antarctic Research Expedition must possess many functions and perform at the highest level. Measuring 138m in length and 29m wide with a load displacement of 20,000t, the second generation Shirase is a world-class icebreaker that can advance through 1.5m-thick ice continuously. The latest Japanese shipbuilding technology was poured into making this vessel.

Antarctic Observation and Environmental Protection

To ensure that the damage caused to the Antarctic environment is kept to the bare minimum, the Japanese Antarctic Research Expedition conducts a wide array of environmental protection measures in compliance with the Protocol on Environmental Protection to the Antarctic Treaty. For example, the wastewater from Japanese research stations is processed in septic tanks and purified to a level on par with that of Tokyo's municipal water before being discharged. The remaining sludge is taken back to Japan for processing. Furthermore, all solid waste is carried back to Japan.

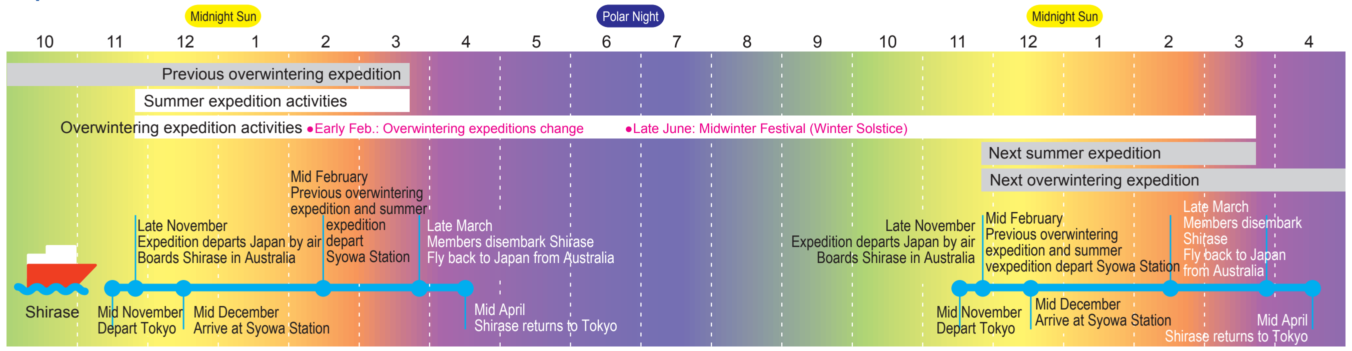
Renewable energy is being used at the stations as well. Currently, there is a 55kW solar power generation facility operating at Syowa Station and a 10kW wind turbine is being tested. Japan aims to use more renewable energy in the future, and plans are in the works to upgrade the current facilities.



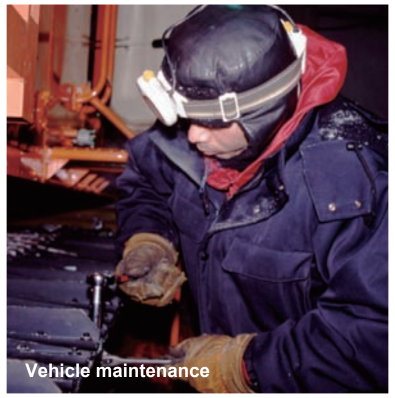
Solar power generation facilities

You can join us in an Antarctic research expedition!

Expedition Calendar




Electrical work


Vehicle maintenance

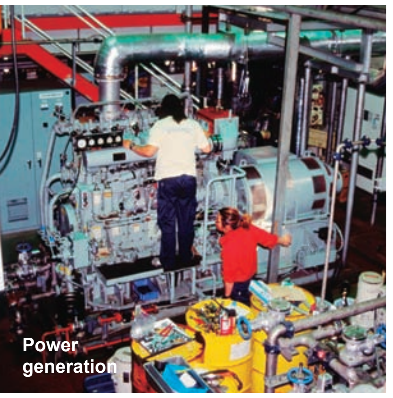

Construction and civil engineering


Communications


Environmental conservation


Monitoring observation


Medicine


Power generation


Cooking


Equipment, outdoor, safety management


Administrativel work

Experts from Many Fields Work Together in Antarctica.

Antarctic observations are promoted on a government-wide basis under the supervision of the Japanese Antarctic Research Expedition Headquarters (Director: Minister of MEXT).

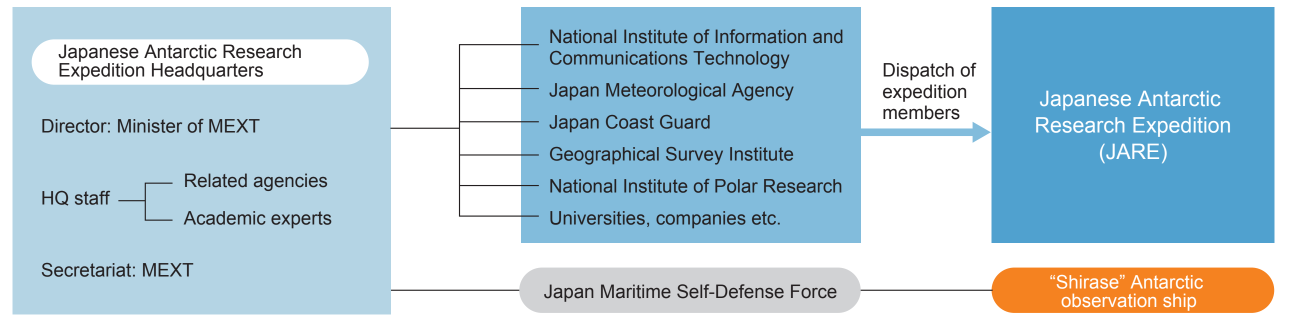
The National Institute of Polar Research serves as the core organization for Antarctic observations. It conducts research observations in cooperation with numerous researchers from universities and research institutes and manages Syowa Station and Japan's other facilities on Antarctica.

The National Institute of Information and Communications Technology, the Japan Meteorological Agency, the Japan Coast Guard and the Geographical Survey Institute all conduct routine observations. Shirase, the vessel used by the Japanese Antarctic Research Expedition, is operated by the Japan Maritime Self-Defense Force.

Antarctic expeditions are divided into two groups: the summer expedition and the overwintering expedition. Summer expeditions conduct observations for three months (December - February) during the Antarctic summer, while the overwintering expedition conduct observations for a full year. Expeditions consist of observation members who handle the research and routine observations and logistics staff who maintain the stations and day-to-day activities. In order to conduct observations and day-to-day activities with limited manpower, each expedition members must be experts in their field.

Today, many experts work together in Antarctica to pursue research with an eye on the Earth's future.

Framework for Japanese Antarctic Research Expedition



JARE Members *May differ annually

Expedition leader				
Observa-tions	Routine observations	Ionosphere: NIICT / Meteorology: JMA / Seafloor and tidal research: JCG / Geodesy: GSI		
	Research observations	Project-based research / Monitoring: NIPR, university researchers and technicians		
Logistics	Machinery: Electricians, vehicle mechanics, maintenance engineers, power generation technicians	Communications: Radio operators Cooking: Cooks Medicine: Physicians Environmental Conservation: Syoervusirs	General Logistics: Antenna technicians, INTELSAT operators, construction engineers, equipment/outdoor/safety managers, Administratives	

JARE Recruitment Guidelines

Research expedition members are selected from among experts recommended by partner institutions and from public recruitment. If you are passionate and have expertise and experience that can assist Japanese Antarctic Research Expedition, you, too, can join us.

1. Open positions

Public recruitment is typically adopted for the following positions. (This way change from year to year)

- ◎Cook
- ◎Physician
- ◎Equipment/outdoor/safety managers
- ◎Environmental supervisor
- ◎Construction Engineers
- ◎Monitoring researchers

2. Application period

You can apply every year between early November and mid-December from the NIPR homepage.

3. Application requirements

- ●Must possess the required experience and expertise
- ●Must be mentally and physically health and able to work as a team
- ●Must recognize your responsibility as an expedition member for a national project.

Please direct any inquiries on Antarctic research expedition member recruitment to:

National Institute of Polar Research
10-3 Midoricho, Tachikawa, Tokyo 190-8518
www.nipr.ac.jp
042-512-0655