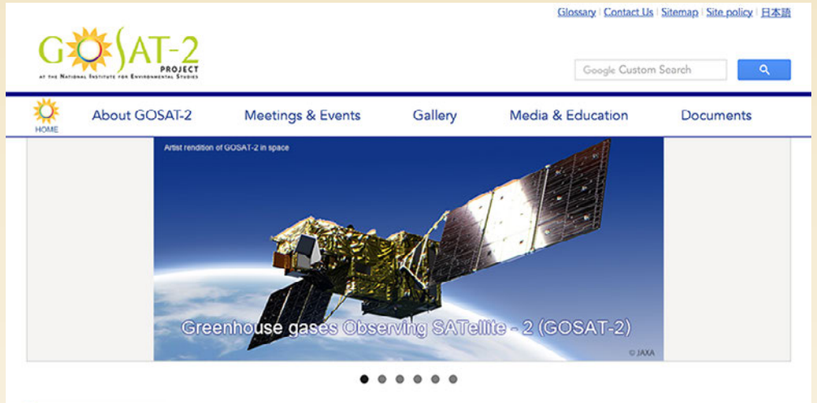
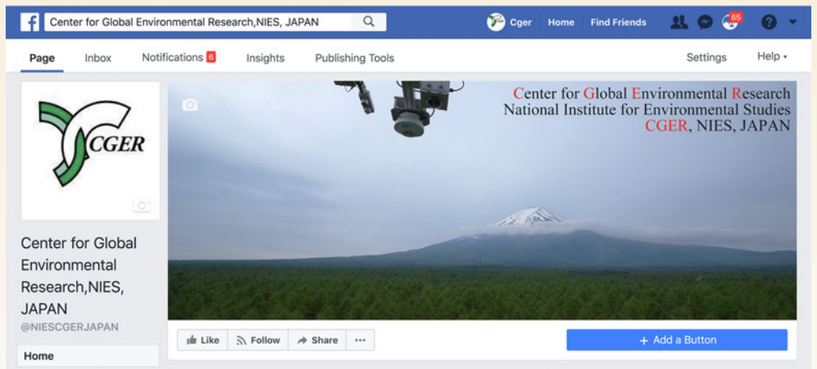
NIES, Japan

http://db.cger.nies.go.jp/portal/?lang=eng



http://www.gosat-2.nies.go.jp



https://www.facebook.com/NIESCGERJAPAN

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Center for Global Environmental Research

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E-mail to: www-cger@nies.go.jp

Space

Greenhouse Gases Observing Satellite GOSAT "IBUKI"

Launch of Ibuki (January 2009)

GOSAT continues observing CO_2 concentrations from space

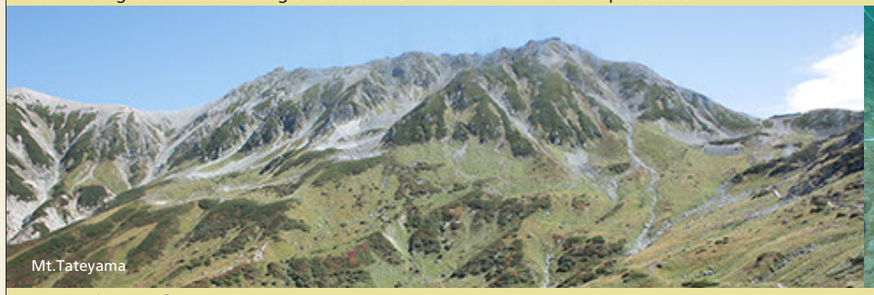
Sky

Measuring Greenhouse Gases by Commercial Airlines (Contrail Project) and Aircraft Monitoring over Siberia

Global Environmental Monitoring by CGER, NIES

Center for Global Environmental Research

Monitoring of Global Warming Effects on Marine Environment and Alpine Zone



Mt.Tateyama

Coral reef in Tatsukushi, Kochi

Land Surface

Ground-based GHG Monitoring

Tokyo Sky Tree

Cape Ochiishi, Hokkaido

Top of Mt. Fuji

Hateruma Island, Okinawa

CO_2 Flux in Forests

Terrestrial CO_2 Flux Monitoring

Teshio, Hokkaido

Northern foothills of Mt.Fuji

Ocean

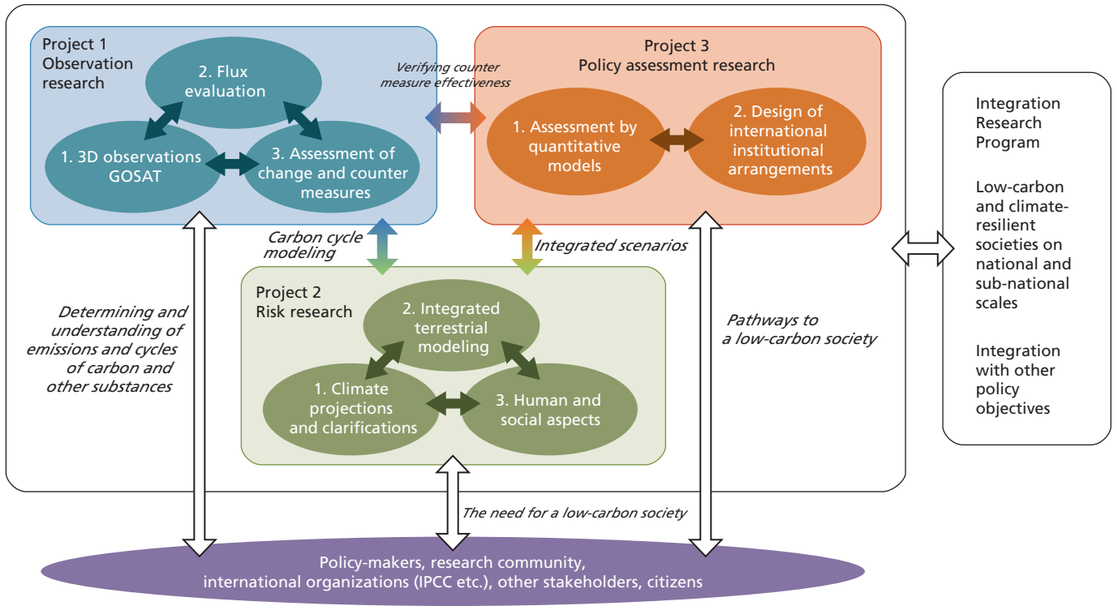
Ship-based GHG Monitoring

Trans Future 5 (TOYOFUJI SHIPPINGCo.,LTD.)

Low-carbon research program

A global-scale approach aimed at achieving a low-carbon and climate-resilient society

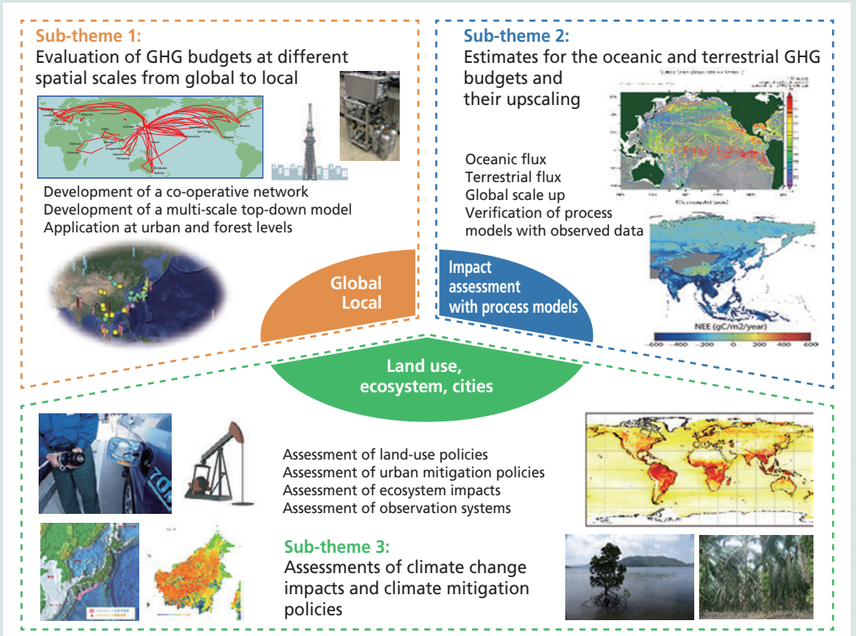
In order to help achieve the internationally shared long-term vision, the so called 2°C reduction target, or at least the 1.5°C reduction commitment, we quantify in this research program GHG emission routes using scientific methods, and provide information which are necessary for preparing climate policies, such as global mitigation and adaptation policies, aiming at long-term reduction of GHG emissions.
By these activities we contribute to the implementation of a low-carbon society.



Project 1

Study on multi-scale evaluation system for GHG variation and mitigation

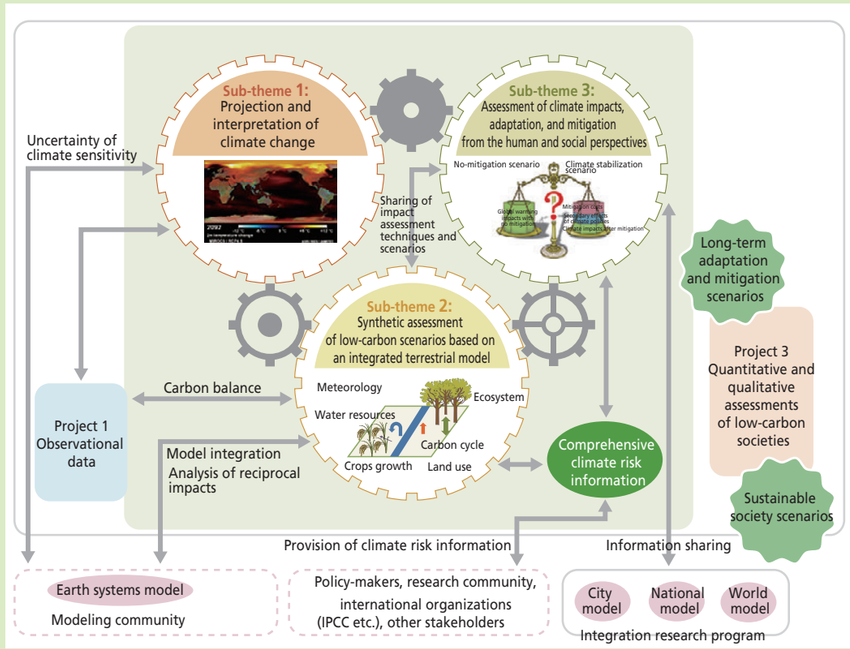
We are pursuing explanatory research on global phenomena including climate change feedbacks in order to elucidate the effects of global warming based on the latest scientific knowledge.
Furthermore, to scientifically assess mitigation/adaptation policies and the impacts of anthropogenic emissions during the next 20 years with the 2°C reduction target in mind, we develop global and regional multi-scale observational systems of GHG concentrations around the world, and assess observations and models of flux change responses taking climate change impacts into account.



Project 2

Research on global climate risks based on integrated assessments of climate projections, impacts and policies

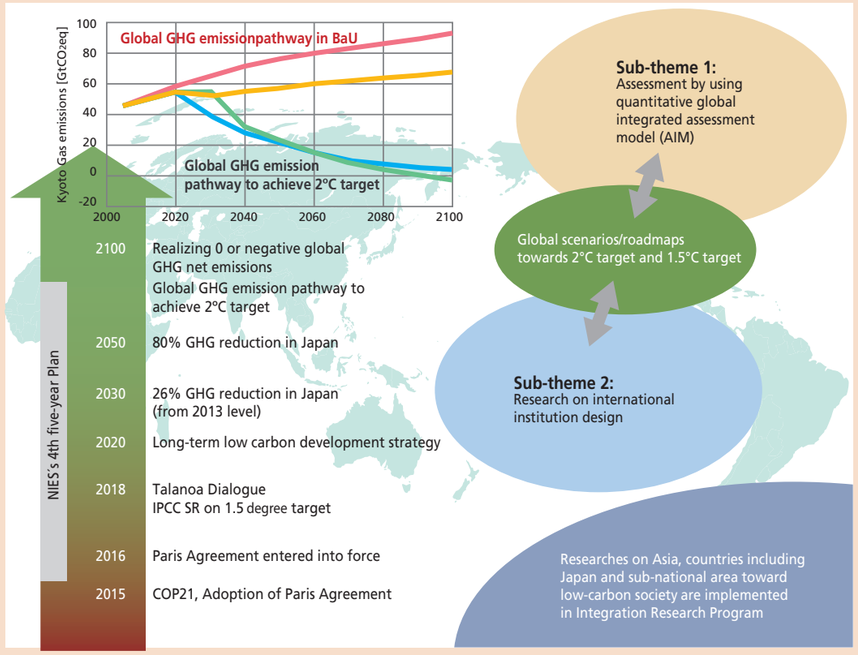
In this project, we create a comprehensive system of model research that better connects global climate projections (earth system models), human and terrestrial impact projections (integrated models of land use, water resources and ecosystems) and socio-economic scenarios and policy assessment (integrated assessment models). Based on this, we propose integrated climate risk scenarios that take into account the interrelationship between natural and human/social systems including the effects of countermeasures.



Project 3

Roadmap development and its empirical research towards the achievement of a global low-carbon society

We develop policy roadmaps and pathways to achieve the 2°C and 1.5°C targets of the Paris Agreement, and analyze their implementation toward a low-carbon society. For those purposes, we improve the global integrated assessment models, and based on the improved models, we assess climate mitigation policies and provide our results to international research projects.
In addition, we design policies and international institutions towards climate stabilization.
By providing knowledge and information obtained through our research to various stakeholders, we contribute to the establishment of a low-carbon society.



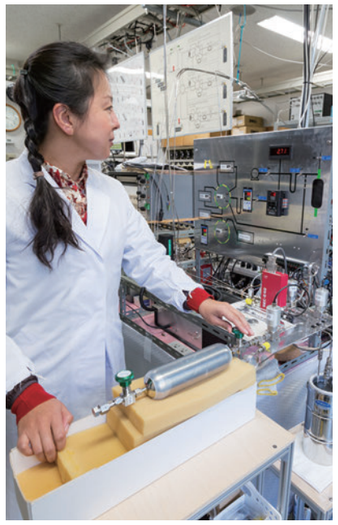
Global environmental monitoring

CGER conducts not only ground-based monitoring, but also uses ships and aircraft to monitor the atmosphere and ocean, forest ecosystems and carbon balance, thus collecting a large variety of data. Through this activity, CGER greatly contributes to the elucidation of the factors that influence global environmental change.

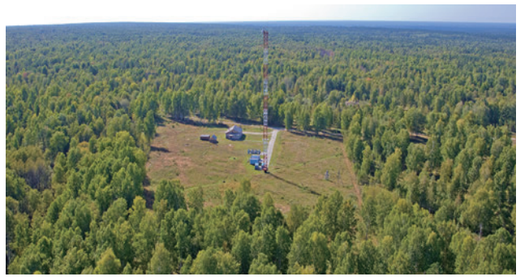
Sky

Aircraft monitoring of greenhouse gases over Siberia

In order to clarify the role that the vast terrestrial ecosystem in Siberia plays in the global carbon cycle, we monitor the vertical profiles and temporal variations of greenhouse gases using aircraft (3 sites) and monitoring towers (6 sites).

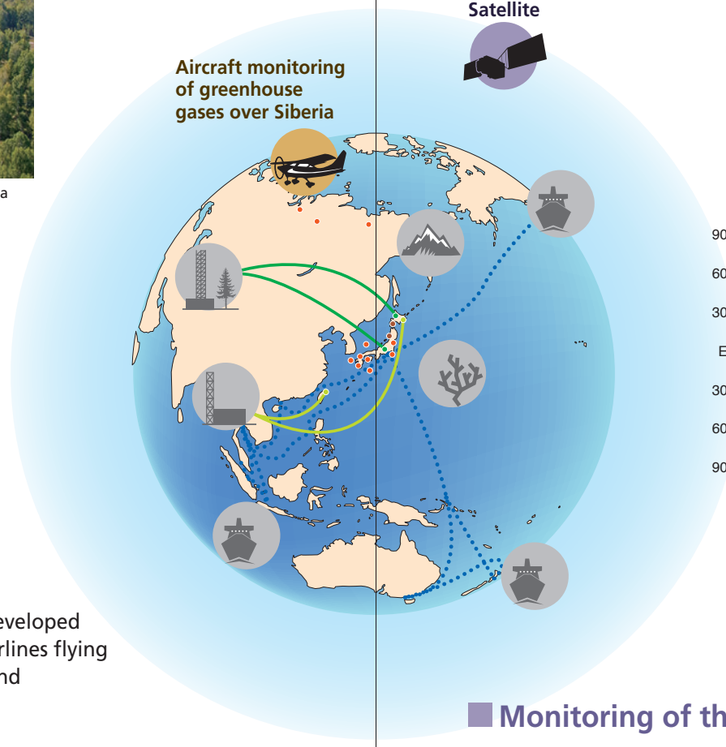


In our laboratory at NIES, we carry out high-precision measurements of GHG concentrations in air samples collected from various sites in Siberia



Observation tower measuring GHG concentrations in the Siberian taiga

Maintenance of the tower observation system in Siberia



CONTRAIL (Comprehensive Observation Network for Trace Gases by Airliner) project

We observe CO_2 concentrations in the upper air by installing measuring equipment, developed jointly by our research institute, on board commercial airlines. By using commercial airlines flying regularly all over the world, we have been able to drastically improve the frequency and geographical coverage of our observations.

Observation routes

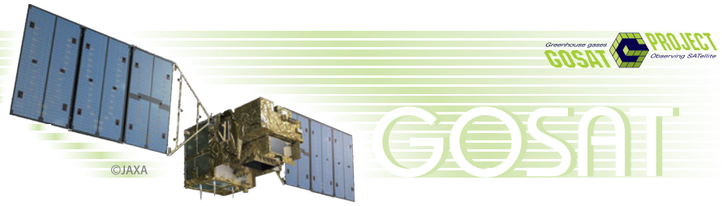
Image of aircraft carrying our observation equipment (by curtesy of Japan Airlines)

Sampling air by MSE (Manual Sampling Equipment) in the cockpit (by curtesy of Japan Airlines. Picture taken after full confirmation of flight safety.)

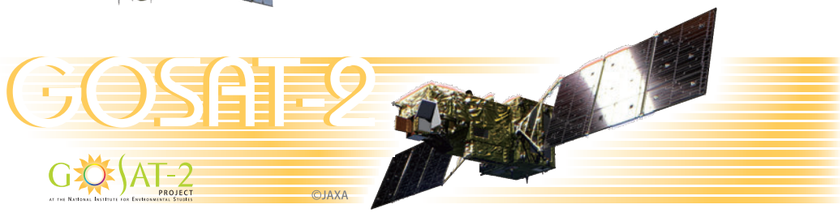
Space

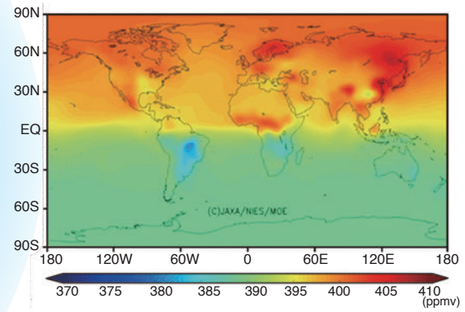
Satellite monitoring

GOSAT is a satellite which measures the concentrations of greenhouse gases from space at 666 km above Earth surface. Operating for more than 9 years after its successful launch with the collaboration of partner organizations, GOSAT measures the distribution of GHG concentrations as well as the regional emissions and absorptions of carbon dioxide and methane. Its successor, GOSAT-2, is planned to be launched in FY 2018.

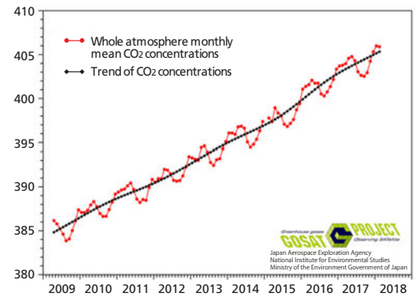


Satellite





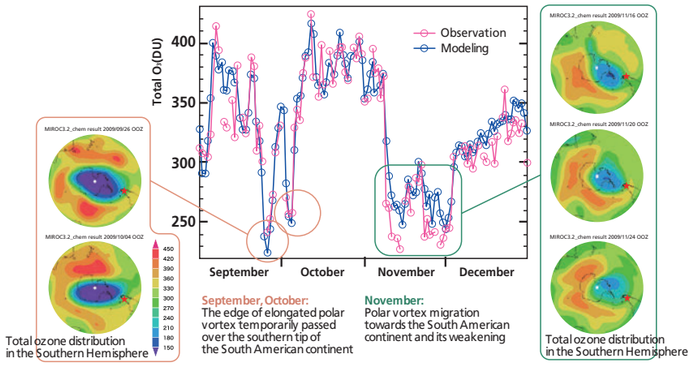
Global distribution of CO_2 concentrations near ground surface (ppm) (April 2015)



Whole atmosphere monthly mean CO_2 concentrations and their trend

Monitoring of the ozone layer

Using NIES chemical transport model, we simulate the movement of the ozone hole from the Antarctic to South America and the dramatic ozone depletion as a result.



Validation of GHG observations by satellite are conducted using ground-based Fourier Transform infrared Spectrometers (FTS)
(photo:Rikubetsu Stratospheric General Observatory)

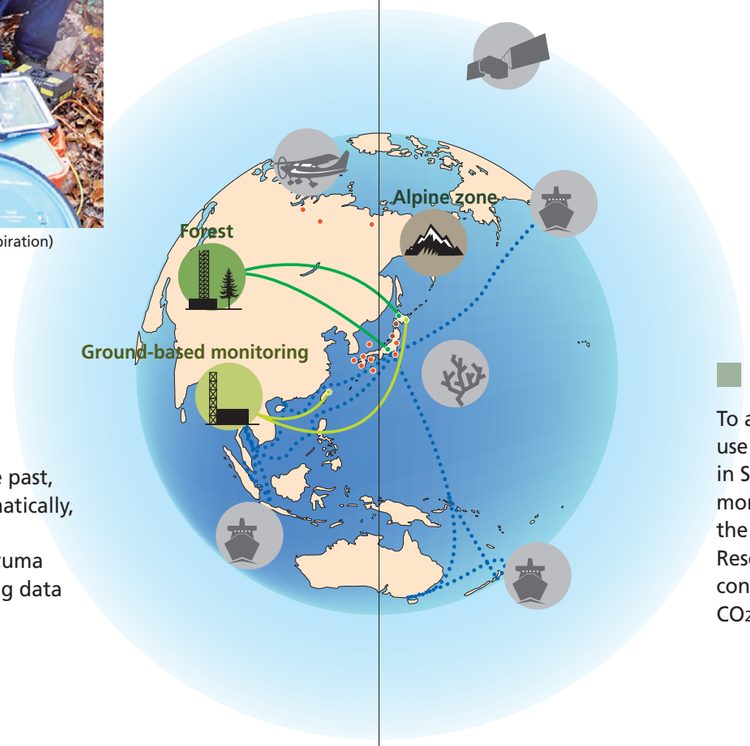
Land Surface

Carbon balance monitoring in forest ecosystems

We conduct monitoring of CO_2 and other greenhouse gas fluxes in forest ecosystems at the Teshio, Tomakomai, Shirakami and Fuji Hokuroku monitoring sites. We also monitor the carbon cycle process in forest ecosystems by means of various direct and indirect observation methods. Furthermore, by standardizing observation methods and facilitating data distribution, we contribute to the strengthening of the Asian monitoring network.

Installing an automated chamber system to measure soil respiration in Teshio, Hokkaido

Measuring CO_2 emission from soil (soil respiration) in Shirakami, Aomori

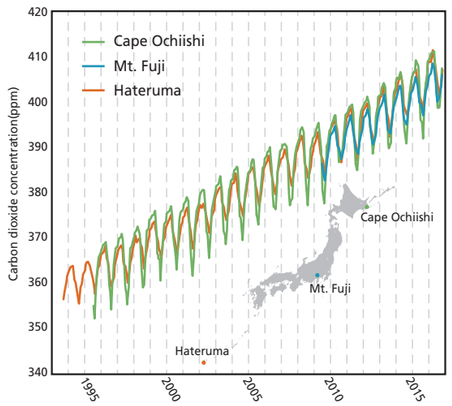


Ground-based monitoring

Atmospheric CO_2 concentrations used to be 280ppm for more than 10.000 years in the past, but since the second half of the 18th century, CO_2 concentrations have increased dramatically, and they have now exceeded 400ppm. At CGER, we conduct monitoring of the concentrations of greenhouse gases such as CO_2 at Cape Ochiishi, Hokkaido and Hateruma Island, Okinawa, analyze the variations in GHG concentrations, and provide monitoring data on our website.

Maintenance of the monitoring tower, Hateruma

Monitoring station, Cape Ochiishi



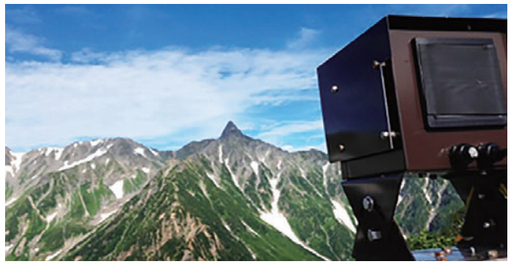
Annual variation in CO_2 concentrations

Monitoring of climate change impacts on the Alpine zone

We monitor and assess how climate change affects the seasonal change and the spatial distribution of alpine flora using automatic time-lapse cameras placed in alpine areas and aerial pictures.
We also devise methods to enable the public to access these up-to-date pictures on our website by smart phones and tablets in order to raise public awareness.

Alpine monitoring mobile site

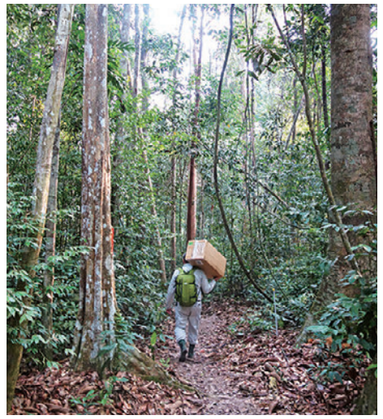
Assessing flora at Mt. Asama (Nagano Pref.)



Time-lapse camera monitoring Mt. Yarigatake installed at Hyutte Nishidake, Japanese Northern Alps

Pasoh tropical forest (Malaysia)

To assess the effects of climate change and land use change on carbon cycle of tropical ecosystems in Southeast Asia, we conduct long-term monitoring of tree census and soil respiration in the lowland tropical forest of Pasoh Forest Reserve. We also measure the vertical CO_2 concentration profiles to clarify the strength of CO_2 uptake in the tropical region.



Carrying continuous CO_2 measuring equipment to be installed in tropical rain forests

Mt. Fuji (3776 m)

On the top of Mt. Fuji, we are conducting continuous monitoring of background CO_2 concentrations in the East Asian region where data on CO_2 concentrations have, up to now, not been available.

Special regional climate monitoring station on the top of Mt. Fuji

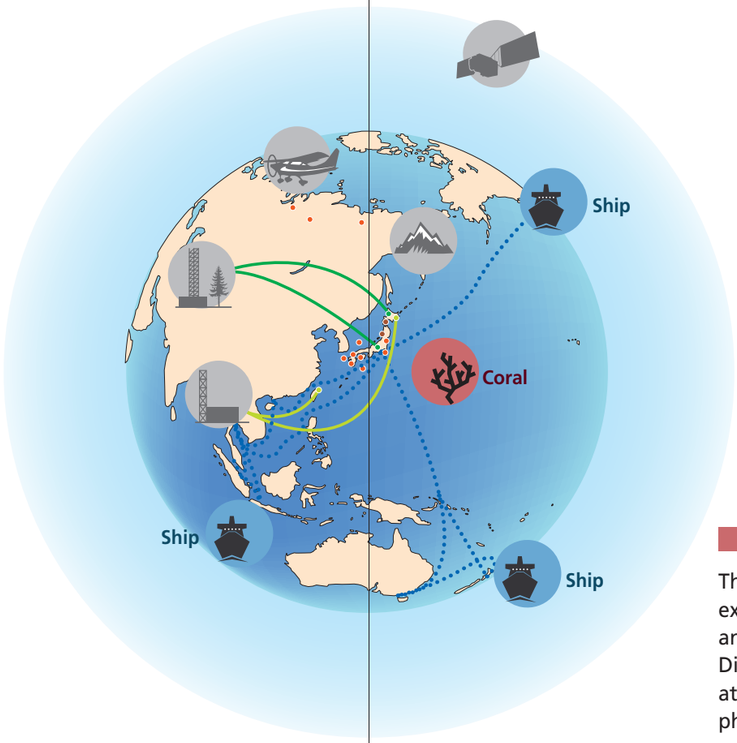
Measuring site for soil CO_2 and CH_4 fluxes in Malaysia

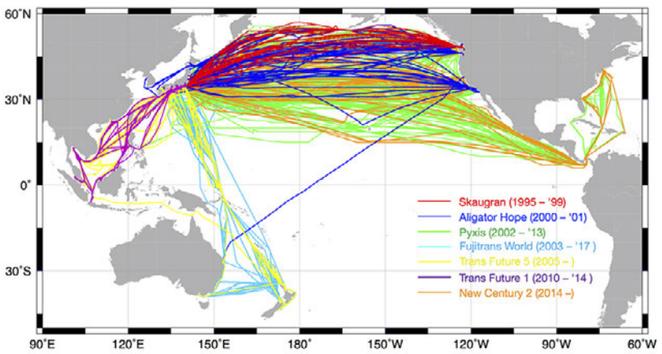
Ocean

Ship-based monitoring

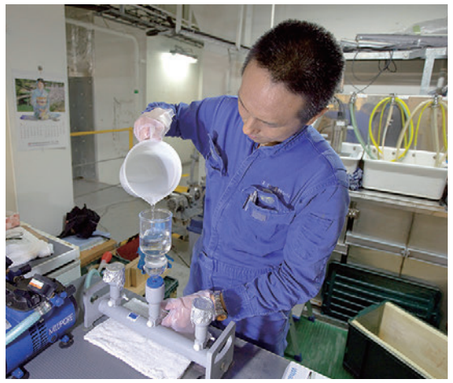
For future projections of climate change, it is important to monitor and clarify the sea-air CO_2 flux distribution of the ocean. Through monitoring of the partial pressure of CO_2 (pCO_2) in the sea surface water on the North Pacific and Japan-Oceania routes, we clarify the distribution and long-term variation of pCO_2 between the ocean and the atmosphere. Parallelly, we also carry out atmospheric observations of the longitudinal distributions and temporal variations of GHGs and related species. In addition, on the Asian route, we investigate the distribution and temporal variation of atmospheric tracer gas emissions from Asian countries.

M/S Trans Future 5 (Toyofuji Shipping Co., Ltd.)



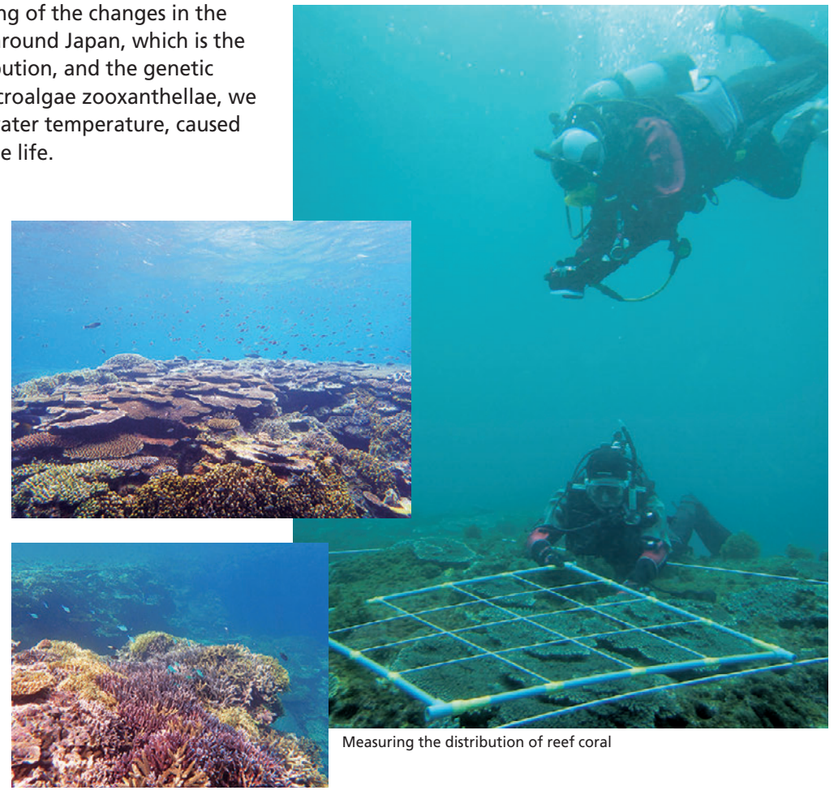


Observation routes


Technician filtering sea water onboard M/S Trans Future 5

Monitoring of global warming effects on coral

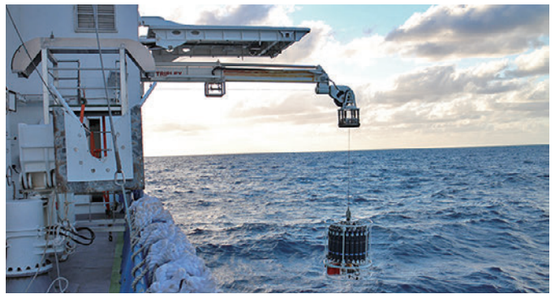
Through long-term monitoring of the changes in the distribution of coral species around Japan, which is the northern limit of coral distribution, and the genetic change of their symbiotic microalgae zooxanthellae, we assess the impacts of rising water temperature, caused by global warming, on marine life.


Measuring the distribution of reef coral

Marine ecosystems and climate change

The amount of organic compounds produced from phytoplankton in the seawater is extremely small, but they play an important role in the biochemical system of the ocean, and because they are emitted into the atmosphere, they also affect Earth's climate. Dimethyl sulfide (DMS) is one such compound. Once DMS is emitted into the atmosphere, it is oxidized to sulfur dioxide, sulfuric acid, and sulfate aerosols by photochemical reactions. These acidic compounds influence atmospheric chemistry, and contribute to the formation of cloud condensation nuclei. In recent years, we have been able to conduct continuous field observations of organic compounds dissolved in the seawater, thus getting a clearer picture of the impacts of marine ecosystems on the atmosphere and climate.


Our researcher analyzing the organic compounds on board the research vessel (courtesy of ABC)


Sampling sea water on board the research vessel

Outline

The Center for Global Environmental Research (CGER) was established in 1990 as the focal point of environmental research in Japan, with the aim to scientifically clarify the impact humankind has on the global environment, and to build the foundation for accurate environmental protection measures. CGER is the center for climate change research at the National Institute for Environmental Studies (NIES).

Furthermore, CGER promotes research on low-carbon societies and supports global environmental research by developing environmental monitoring databases, making available its supercomputer, and arranging data processing and analysis environments.

- Director
  - Deputy Director
  - Deputy Manager
    - Observation Management Group I
    - Observation Management Group II
    - Information and Public Relations Group
    - Support Group
  - Concurrent members
- Global Carbon Cycle Research Section
- Global Atmospheric Chemistry Section
- Satellite Remote Sensing Section
- Biogeochemical Cycle Modeling and Analysis Section
- Climate Modeling and Analysis Section
- Climate Risk Assessment Section
- Office for Atmospheric and Oceanic Monitoring
- Office for Terrestrial Monitoring
- Office for Global Environmental Data Integration and Analytics
- Collaborative Research Group on Data-Model Fusion Planning
- Collaborative Research Group on Emission Inventory
- Global Carbon Project (GCP) Tsukuba International Office
- Greenhouse Gas Inventory Office (GIO) of Japan
- Satellite Observation Center

Related research project collaboration division

- Climate Change Strategy Collaboration Office/Office for Coordination of Climate Change Observation (OCCCO)
- Social Dialogue and Co-production Office

Affiliated offices

Greenhouse Gas Inventory Office of Japan (GIO)

GIO engages in the preparation of Japan's national greenhouse gas (GHG) inventory, as well as assists developing countries in Asia primarily by capacity building activities and by improving their national GHG inventories.

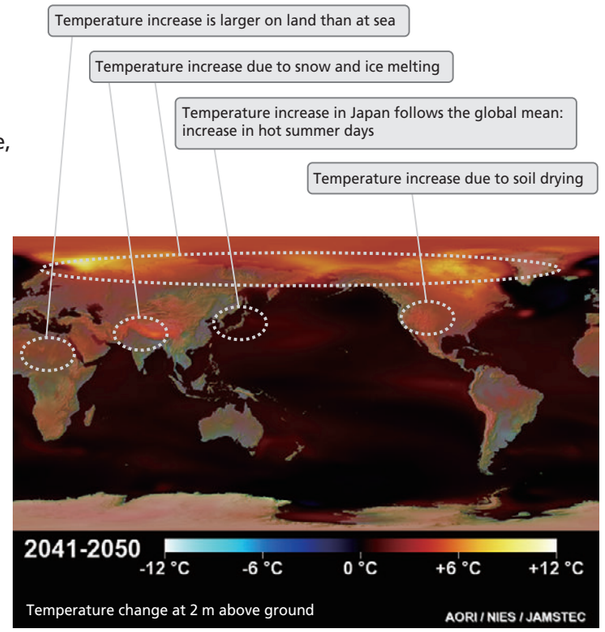
Global Carbon Project (GCP) Tsukuba International Office

The GCP is engaged in developing an international research network and program on carbon cycle research and carbon management. http://www.cger.nies.go.jp/gcp/

NIES supercomputer system

We operate a supercomputer system in cooperation with the Environmental Information Division at NIES to perform large-scale model calculations to predict global environmental changes such as climate change, and make the computer system available for use by researchers both within and outside NIES.

Supercomputer NEC SX-ACE, in operation since June 2015



Example of Supercomputer output: RCP8.5 ("Business-as-usual") scenario

Global Environmental Database

CGER develops and maintains the Global Environmental Database(GED) , in which various information on the global environment is collected, processed and archived. GED provides a unified search system, a quick data visualization tool and data analysis tools to provide easy-to-use data to researchers as well as to the general public.

Global Environmental Database (GED) http://db.cger.nies.go.jp/portal/

Dissemination of research results

Through its website, research reports and other publications, and by organizing events such as Open House and seminars, CGER facilitates the efficient dissemination of research results, promotes collaboration among environmental researchers, and contributes to raising awareness about environmental issues among the public.

Research collaboration talk event at NIES Summer Open House 2017

CGER News (published monthly) http://www.cger.nies.go.jp/cgernews and environmental flip-manga