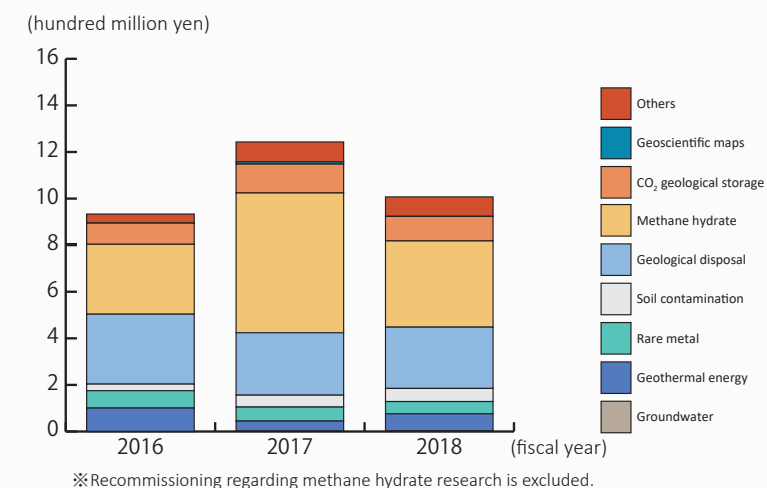


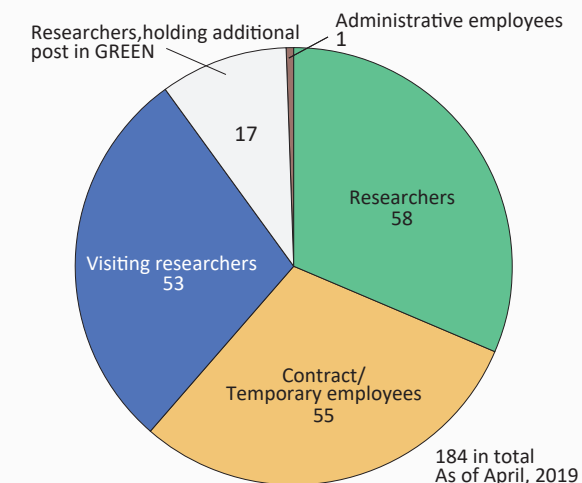
Research Promotion for Further Collaboration

Research Advantages	Future Prospects
Multi-tracer analysis and groundwater monitoring have been carried out toward the understanding of groundwater and subsurface environment.	GREEN contributes to the sustainable society with groundwater utilization by Water Environmental Maps and hydrogeological research.
Field investigation and information collection of mineral resources in Japan and other countries have been carried out and analytical techniques of LA-ICP-MS and other facilities have been developed.	This research group aims to assess a variety of mineral deposits and to contribute to development of mineral resources through the field investigation and laboratory analyses.
Sedimentary basin analysis is being developed using surface geology data, geochemical data, seismic data and sedimentary core samples.	GREEN aims to further develop source rock and reservoir modeling, and subsequently promote new collaboration with industries.
Techniques related to advanced cultivation and analysis have been developed to evaluate diversity, functionality, and activity of subsurface microorganisms; with the ultimate ability to separate and identify useful microorganisms.	GREEN aims to develop biotechnologies that enable efficient production of natural gases and effective remediation of contaminants by stimulating various functions of subsurface microorganisms.
Information on the distribution of water-soluble natural gas (methane) in the Kanto area has been provisioned, and the methods on clay material composition and the examination standardization have been developed.	GREEN aims at development/utilization based on the distribution of natural gas. We also promote application to energy-saving countermeasures of clay materials and establishment of Japanese Industrial Standards regarding the clay materials characteristics.
The high-frequency alternating current electric resistivity data acquisition system measures the subsurface resistivity value without damaging the road surface. From the measured resistivity value, we can investigate water pipe corrosion risk.	We plan to increase the application examples and develop the system to be more practical. We will further spread this technology by encouraging local governments to use our system for water pipe corrosion survey.
The Geophysical Postprocessor is being developed to calculate changes of geophysical observables caused by underground fluid-flow.	GREEN aims to collaborate with professionals involved in fields, such as CCS, and geothermal and groundwater systems, where underground fluid-flow and its monitoring are important.
Techniques are being developed to enable the following: rapid measurement of radioactive and low-concentration Cs in water, contamination purification, and tests of materials with low permeability. These developments are coupled with analyses of underground multiphase-flows and risk assessments.	GREEN positively promotes collaborative research into soil contamination and self-management in office by applying related practical techniques.
Aimed at application in fields such as CO ₂ geological storage, a technique is being developed to assess the stability of fractures/faults by means of coupled THM (heat transferring, fluid-flow, and rock mechanics) analysis.	The technique promotes the collaboration with various fields that are involved with laboratory-scale rock mechanics experiments, coupled THM analysis, and performance evaluations of drill bits such as PDC bits.

External Public Research Fund (FY2016 to FY2018)



Employees

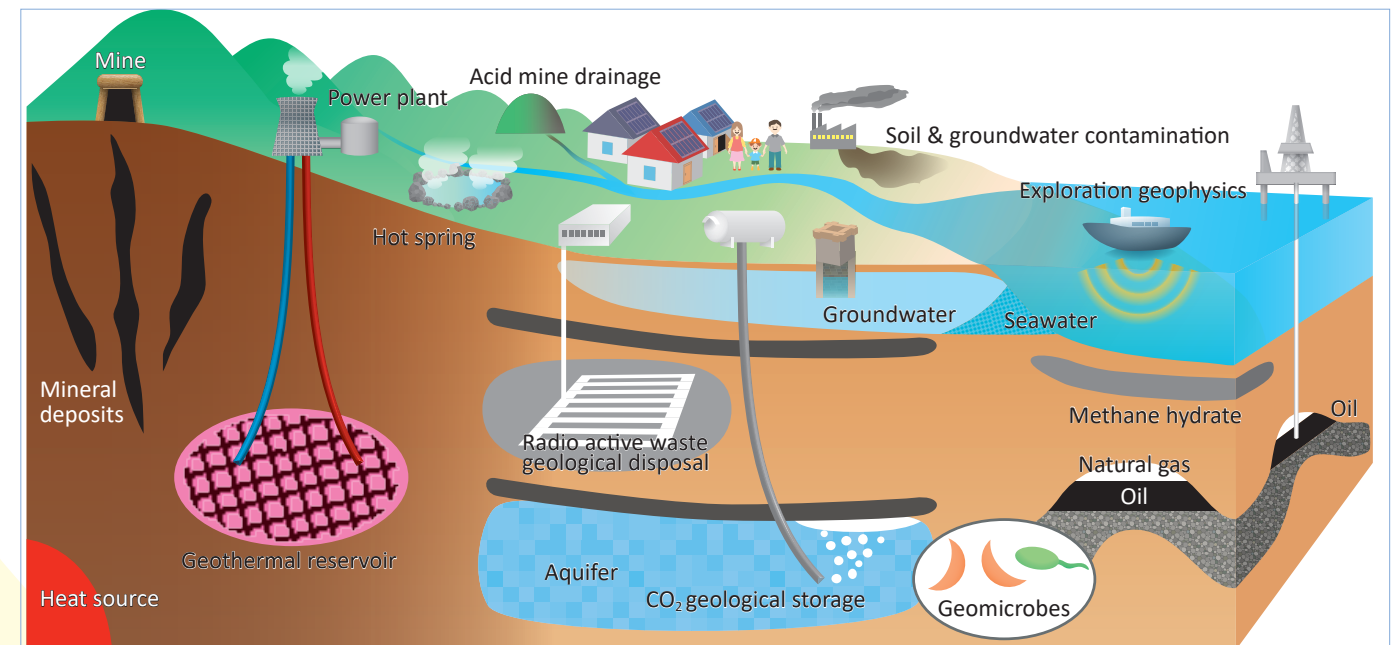


Management Staff

Director	Yuji Mitsuhashi	Research Manager	Tatsuo Maekawa
Deputy Director	Hirofumi Imaizumi	Officer, Tsukuba Central 7 General Affairs Office	Ikuko Takada
Principal Research Manager	Nobukazu Soma		



Research Institute for Geo-Resources and Environment



Overview and Research Subjects

In April 2015, the National Institute of Advanced Industrial Science and Technology (AIST) has been working on the 4th medium- and long-term plans. The Geological Survey of Japan (GSJ), which was also established during the reorganization of the AIST, aims to conduct research with high scientific transparency and enable the steady provision of geological information that can be used effectively for the sustainable development of human society, as a unique research institute for "geological survey" in Japan.

The Research Institute for Geo-Resources and Environment (GREEN) is one of the umbrella research units operating under the GSJ. GREEN aims to make technical developments in quantitative assessments and exploration of natural resources, and utilization and preservation of underground environments, in order to contribute to political decision-making for natural resources and energy and/or the sustainable development of industries. The premise behind the operation of GREEN is that feedback from research supports national policy-making, which ultimately results in contributing to solving global and domestic problems. The particular areas of GREEN's research are as follows:

- ☐ Making quantitative assessments of natural resources, such as minerals and natural gases (including methane hydrate), and deep and shallow geothermal systems.
- ☐ Developing geological-modeling technologies for CO₂ geological storage.
- ☐ Developing risk assessment methods in relation to soil and groundwater environment contamination associated with industrial activities such as natural resource development.

In addition, GREEN collaborates strongly with the Fukushima Renewable Energy Institute, AIST (FREI), in Koriyama city, and propels research on deep geothermal resources and ground-source heatpump systems. Furthermore, GREEN develops databases related to hydro-geological environments, mineral resources, fuel resources, and soil contamination on the basis of the research outputs described above. These databases are ultimately used in the publication of geoscientific maps related to various natural resources and environments. The databases and maps are then dispatched worldwide as information of intellectual infrastructure.

Collaboration between Research Groups for Problem-Solving

Research Groups (RG) \ Priority Research Fields	Natural Resources		Geo-environment Utilization		Geo-environment Preservation	
	Quantitative assessment techniques on Mineral Resources	Quantitative assessment techniques on Fuel Resources	Assessment techniques on CO ₂ Geological Storage	Assessment techniques on Geological Disposal	Assessment techniques on Soil Contamination	Assessment techniques on Groundwater Resources
	Groundwater RG		●	●		●
	Mineral Resources RG	●			●	
	Fuel Resource Geology RG		●			
	Geomicrobiology RG		●		●	
	Resource Geochemistry RG	●	●		●	
	Exploration Geophysics RG	●	●	●	●	●
	CO2 Geological Storage RG			●		
	Geo-Environemtal Risk RG			●		●
Geomechanics RG			●	●		

Groundwater Research Group



The groundwater research group conducts studies to clarify the water cycle of the Earth. To make information easily accessible to all, the water environment map project, CCOP co-operative project, and HLW project are being carried out, also.

- ▶ Groundwater sampling for Water Environment Map (top) and Drilling for studying of deep groundwater flow (bottom).

▲ Leader Isao Machida

Mineral Resources Research Group



This research group conducts an assessment of mineral resource potential and a study of the genesis of metallic ore deposits (e.g., base metals, critical metals) and non-metallic mineral deposits (industrial minerals). We also address information collection of mineral resources and development of advanced analytical techniques and geochemical exploration methods.

- ▶ Facility of laser ablation-inductively coupled plasma mass spectrometry (LA-ICP-MS) used for in-situ chemical analysis (top) and investigation of mineral resource potential in Myanmar (bottom).

▲ Leader Nobukazu Soma

Fuel Resource Geology Research Group



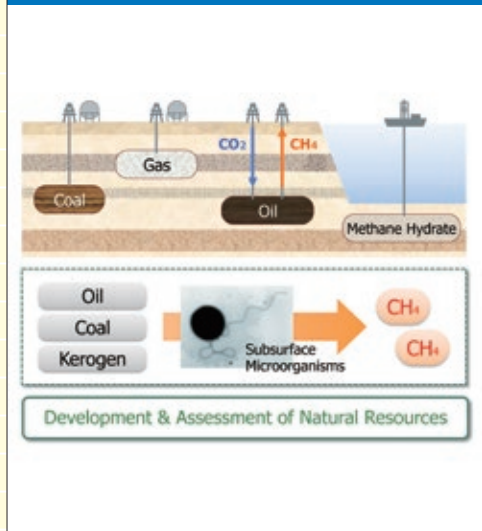
- ▶ Methane hydrate recovered by long PC
- ▶ A formation process of mound/pockmark related to methane hydrate

This group conducts research and exploration for both conventional (e.g. petroleum, natural gas, coal) and unconventional (e.g. methane hydrate) fuel resources. The group is particularly engaged in collaborative programs with petroleum companies on evaluating potential for source rocks and reservoirs, and also in a national program on exploring shallow methane hydrate around Japan.



▲ Leader Takeshi Nakajima

Geomicrobiology Research Group

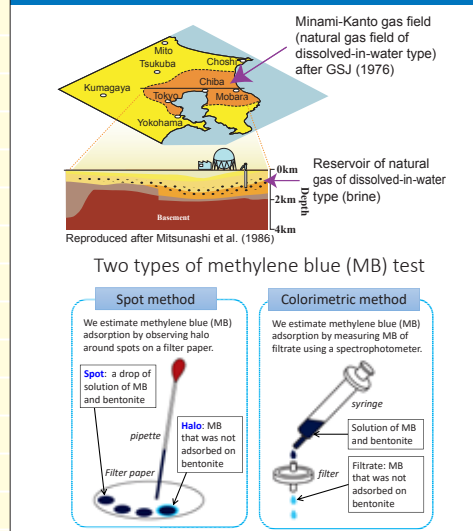


Through estimation of the distribution, diversity, function, and activity of subsurface microbes, the group aims to gain a better understanding of the biogeochemical cycling of elements. Such an understanding will assist in the effective development of fuel resources, and the conservation and wise use of the geosphere.

- ▶ Research on fuel resources targeting subsurface microorganisms

▲ Leader Hideyoshi Yoshioka

Resource Geochemistry Research Group

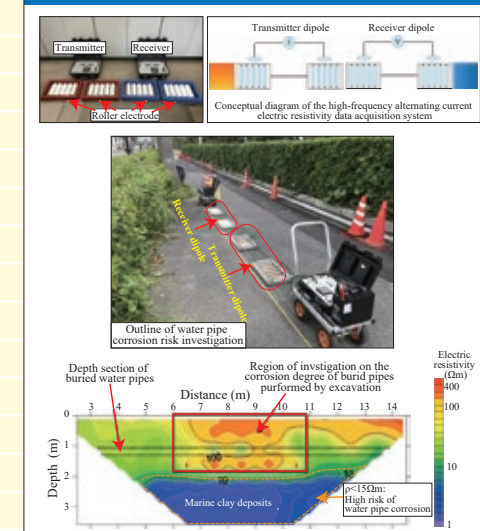


This research group conducts research on crustal fluids (e.g., petroleum, natural gas, hot spring water) and non-metallic minerals (e.g., clay), and clarifies the genesis and geochemical, geological, and mineralogical features. In addition, the group studies their use and methods for their production, and researches on standardization methods.

- ▶ Research on natural gas resource of dissolved-in-water type beneath the Kanto region, Japan (top) and methylene blue adsorption test method in bentonite etc (bottom).

▲ Leader Masaya Suzuki

Exploration Geophysics Research Group



This group conducts research and development of methods for use in geophysical exploration, visualization, and imaging. These methods enable the study of the structures within the Earth's interior for various geological targets, such as the evaluation of resources and associated environments, and geological disaster mitigation.

▲ Leader Toshiyuki Yokota

CO2 Geological Storage Research Group

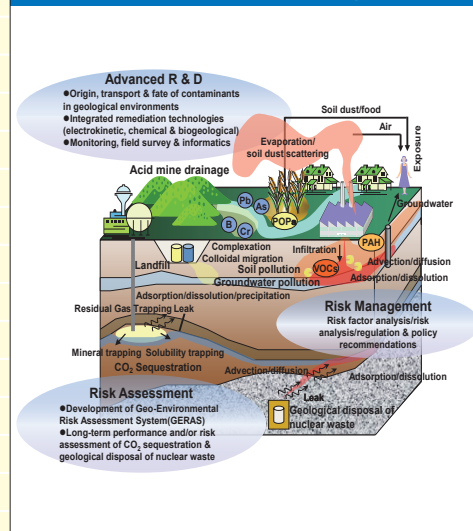


This group aims to elucidate the behavior of underground fluids, and to develop monitoring and modeling technology in relation to subterranean CO₂ geological storage—a promising technology that provides global-warming countermeasures.

- ▶ Gravity monitoring study in large-scale CCS (Carbon dioxide Capture and Storage) demonstration site in Tomakomai

▲ Leader Masao Sorai

Geo-Environmental Risk Research Group

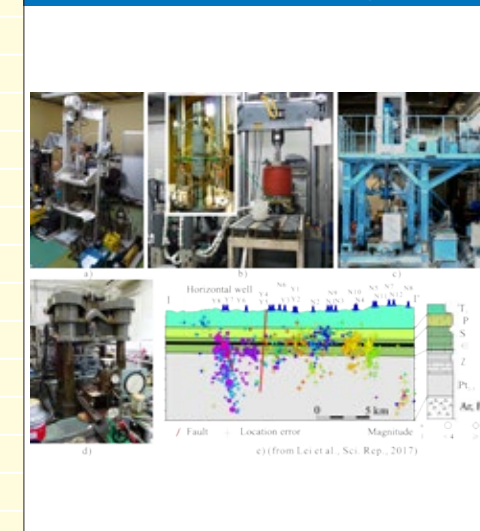


This research group focuses on advanced research and development associated with technologies used in characterization, remediation, and risk assessment of soil and groundwater contamination in terms of practical applications. In addition, the group promotes the publication of geochemical and risk assessment maps of subsurface soils, and the development of industrial standards.

- ▶ Major research subjects related to geo-environmental risk assessment and risk management

▲ Leader Ming Zhang

Geomechanics Research Group



This group conducts integrated research using multi methods (laboratory experiments, field surveys, and numerical simulations) on multi-scales (core- and field-scales, and natural analog) for studies in areas such as geological disposal of CO₂ and other wastes, shale gas, and enhanced geothermal systems. These methods can also be applied to the utilization of subsurface space and drilling technology.

- ▶ Major experimental systems (a-d) and an example of study of injection-induced seismicity in a depleted gas reservoir (e).

▲ Leader Lei Xinglin