



GEOLOGICAL SURVEY OF JAPAN

NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY

Geological Survey of Japan

The Geological Survey of Japan (GSJ), established in 1882 as the Geological Survey, is Japan’s only national institution dedicated to geological surveys. In accordance with national development policies, GSJ develops geological information covering the Japanese archipelago and its surrounding maritime areas.

Geological information forms an essential foundation for daily life and for enhancing Japan’s industrial competitiveness. As part of the national intellectual infrastructure, GSJ develops, manages, disseminates, and promotes the use of geological information. It also advances research on hazard-reduction technologies for a disaster-resilient society, stable supply of subsurface resources, and the sustainable use and conservation of the environment.

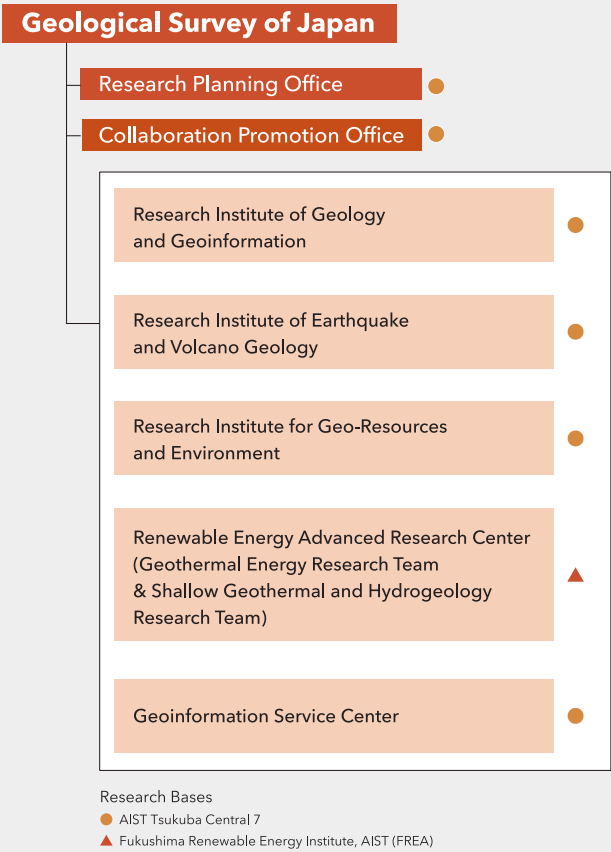
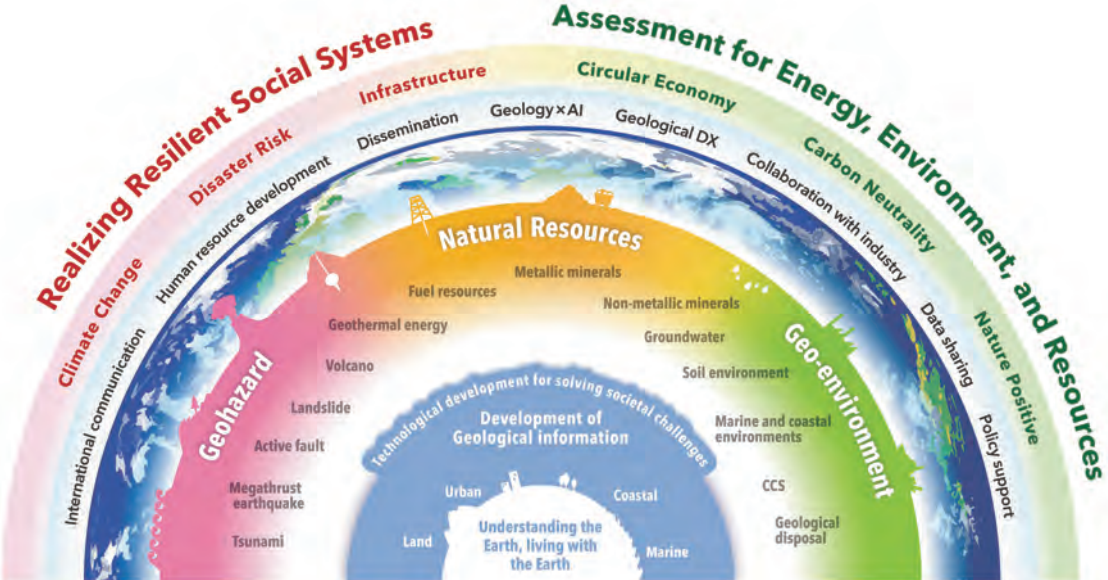
GSJ’s Role in Addressing Societal Challenges

Based on geological information for Japan’s land and surrounding marine areas, GSJ helps address AIST’s key societal challenges: building a resilient society and responding to energy, environmental, and resource constraints.

To support a resilient society, GSJ conducts research and develops technologies to mitigate geological hazards, including active faults, tsunamis, volcanic activity, landslides, etc.

To address energy, environmental, and resource challenges, GSJ develops technologies that contribute to a stable supply of energy and mineral resources while promoting the sustainable use and protection of the environment. Its research encompasses energy and mineral resources, groundwater, soil, marine and coastal environments, carbon capture and storage (CCS), and the geological disposal of radioactive waste.

Organization chart

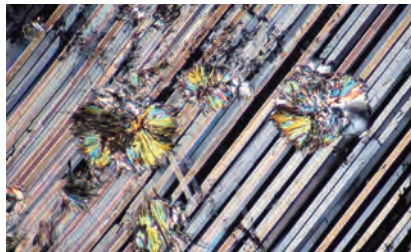


GSJ's Outputs

GSJ conducts a wide range of geological research and develops technologies for geophysical exploration and mineral resource utilization. The results are published as geological maps and various databases.

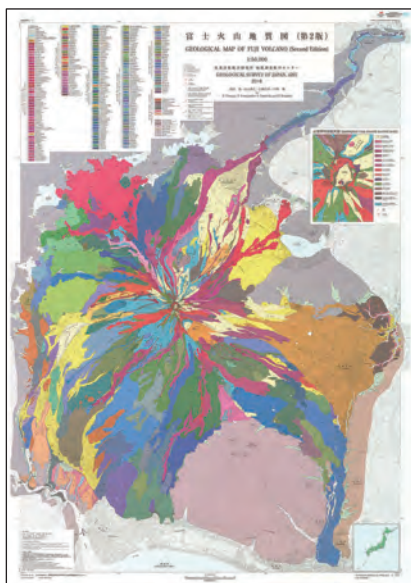
● Rock and Mineral Thin Sections

A thin section of sericite polished to a thickness of 30 μm using a specialized technique.
(Geoinformation Service Center)



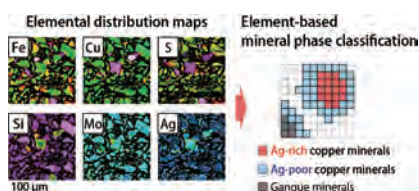
● Geological Map of Fuji Volcano

Detailed eruptive history map for the past 100,000 years. (Research Institute of Earthquake and Volcano Geology)



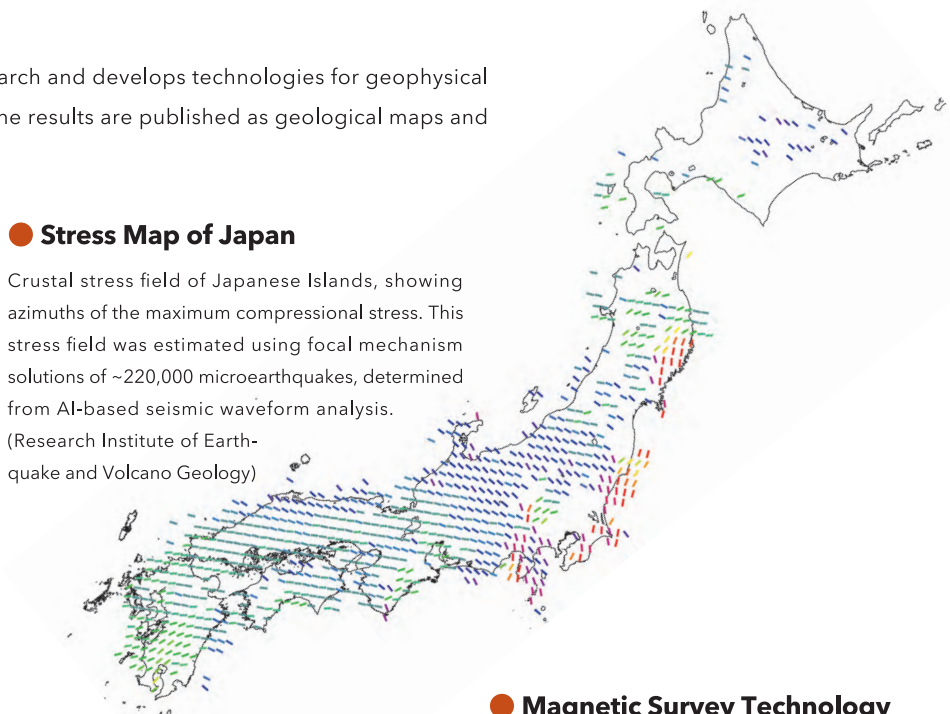
● Imaging Technology

A new particle characterization technique applies image processing algorithms to LA-ICP-MS analytical data. This technique identifies dominant mineral species and evaluates trace element deportment, including mineral liberation at the single-particle level. (Research Institute for Geo-Resources and Environment)



● Stress Map of Japan

Crustal stress field of Japanese Islands, showing azimuths of the maximum compressional stress. This stress field was estimated using focal mechanism solutions of ~220,000 microearthquakes, determined from AI-based seismic waveform analysis.
(Research Institute of Earthquake and Volcano Geology)



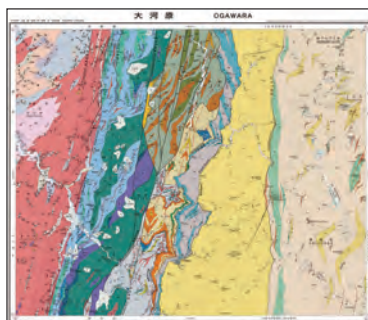
● Active Fault Database of Japan

Search interface of the active fault database. This database comprehensively compiles information on active faults in the Japanese Islands, including their locations, activities, and future occurrence probabilities. (Research Institute of Earthquake and Volcano Geology)



● 1:50,000 Geological Map of Ogawara

As part of our core research activities, we publish Geological Maps. In particular, the 1:50,000 Geological Map of Japan (Quadrangle Series) is issued with explanatory reports on strata, lithology, and geological structures. (Research Institute of Geology and Geoinformation)



● Magnetic Survey Technology Using Drones

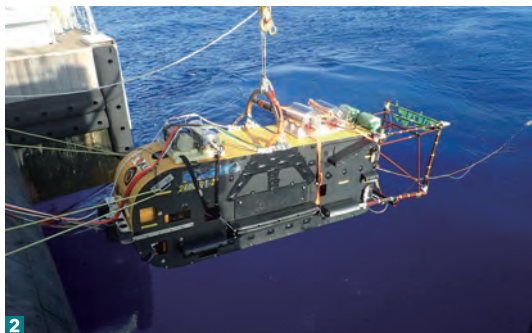
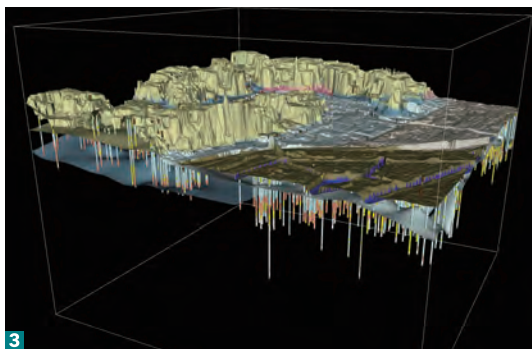
We advance subsurface exploration technologies traditionally used in resource exploration and active fault investigations. Using high-resolution magnetic surveys conducted by drones, we identify three-dimensional subsurface alteration zones and assess factors contributing to landslide susceptibility. (Research Institute of Geology and Geoinformation)



● HASClay

HASClay is synthesized based on naturally occurring nanocapsules and nanotubes. HASClay is being developed as a functional material used for dehumidification, thermal storage, air conditioning, and carbon dioxide capture. (Research Institute for Geo-Resources and Environment)





1 Geological field survey: measuring the thickness, orientation and extent of strata, identifying rock types, and collecting samples as needed for chemical analysis and fossil extraction.

2 IGG developed the Advanced Integrated Sensors Towing System for High-resolution Geo-survey (AISTs) that enabled exploration near the seafloor.

3 3D Geological Map of central Tokyo.

We conduct geological research and survey of Japan and the surrounding seas to better understand the land and the seafloor. The data we collect is organized and shared as a useful knowledge base. We also work to combine land and marine data and provide easy-to-understand information for the public. In addition, we produce geological information that helps mitigate natural hazards and protect the environment, especially in coastal areas. We also conduct research on how to better integrate and use geological data with satellite information.

Geological Survey and Geoscience Maps of Japan

As fundamental information on the national land, we develop geological maps (at 1:50,000 and 1:200,000 scales), the Seamless Digital Geological Map of Japan, and geophysical and geochemical maps, based on the latest scientific knowledge. We also work to develop marine geological maps and related databases for the seas around Japan, as well as fundamental information on seafloor resources and the marine environment.

Geological and Environmental Information for Coastal Urban Areas

Coastal urban areas require reliable fundamental information because of their importance to economic activity and disaster risk reduction. For densely populated urban areas, we develop three-dimensional geological maps that visualize the characteristics and distribution patterns of subsurface strata. These maps support disaster risk assessment and the efficient development of urban infrastructure. We also develop seamless geological information covering marine, coastal, and terrestrial areas.

Satellite Data

We develop quality-controlled satellite data and distribute them as part of the national geoscientific information infrastructure. By integrating satellite data with geological data, we also develop fundamental information for a wide range of applications, such as resource exploration, monitoring geological hazards, and environmental monitoring.

Geological Information for Landslide Susceptibility Assessment

Our research focuses on developing methods for thematic maps that identify areas susceptible to slope instability based on geological conditions. We compile and analyze various types of geological information related to factors that predispose slopes to failure, including the distribution of cataclinal and anacinal slopes, variations in the thickness of volcanic ash layers, and the distribution and physical properties of hydrothermal alteration zones.

Research Planning Office

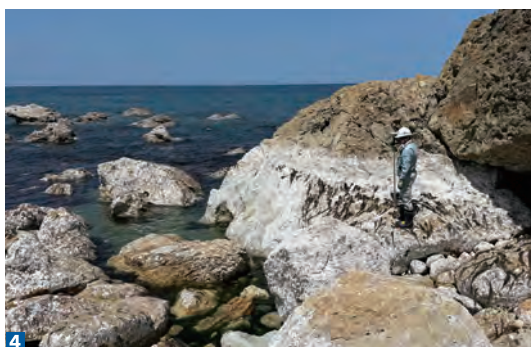
Serving as GSJ's headquarters, the office addresses key issues and agendas in coordination with relevant ministries and agencies, prepares press releases, and develops personnel capable of handling such situations. When an earthquake or volcanic eruption occurs, it gathers and provides information to support emergency response teams.

Collaboration Promotion Office

We promote collaborative efforts to make GSJ's information and technologies widely available for the benefit of society. We also conduct outreach activities to raise awareness of GSJ's research findings and the importance of geology, serving as the national center for geological survey to collaborate with domestic and international related organizations.



The Research Planning Office and the Collaboration Promotion Office support GSJ in achieving its mission, creating high-quality research outcomes, and expanding its domestic and international presence.



4 Emergency survey of the 2024 Noto Peninsula earthquake (the uplifted coastline appears white)

5 Investigation of ejecta following the 2018 eruption of Shinmoedake (Kirishima volcano)

6 Collection of hydrothermal and gas samples at Owakudani, Hakone

To mitigate disasters, we investigate active faults and their interactions, develop related databases, and advance technologies for predicting ground deformation. Studies are conducted on the paleoseismological history of megathrust earthquakes and on forecasting Nankai Trough earthquakes based on observations such as crustal deformation. For volcanoes, research based on investigations of eruption histories and mechanisms is conducted to develop prediction methods and produce geological map of volcanoes. Furthermore, technologies are being developed to assess long-term changes in geological phenomena and subsurface environments associated with radioactive waste disposal.

Earthquakes

Active faults in onshore and coastal areas are investigated through trenching surveys and other methods to clarify their seismic activity histories. Nationwide databases of active faults are being developed. More advanced evaluations of active faults are underway, along with surveys and technological developments aimed at predicting ground shaking and surface fault displacement during earthquakes. For megathrust earthquakes, research is ongoing to reconstruct their occurrence histories and magnitudes using geomorphological and geological investigations. Studies are conducted to predict the next Nankai Trough megathrust earthquake in the short- to medium-term by observing groundwater and crustal deformation.

Volcanoes

To develop methods for assessing and forecasting volcanic activities, investigations of eruption histories and studies on eruption mechanisms are conducted. Specifically, based on geological surveys, the development history of volcanoes and temporal changes in eruption frequency and magnitude are clarified, while improvements in dating techniques are pursued to better understand past volcanic activities. Geochemical and petrological analyses of volcanic materials, together with observations of volcanic gases, are used to advance modeling of eruption processes and the evolution of hydrothermal systems. Volcanic geological maps and volcanic databases are being developed as part of the fundamental geological information infrastructure.

Geological Dynamics

Technological development is advancing to enable the evaluation of topographic changes, fault movements, and hydrothermal activities driven by geological phenomena over timescales of hundreds of thousands of years. These are considered in safety regulations for the disposal of radioactive waste. These efforts also address associated changes in deep subsurface environments, including groundwater flow.

● Social Coordination Group

We conduct outreach activities, including the Geological Information Exhibition and GSJ Symposium, for audiences ranging from the general public to specialists. We also provide geological consultation services and share GSJ's expertise with industry and government.

13 Geological Information Exhibition

Geological Information Exhibition presents regional geology, recent advances in geoscience, and the mechanisms behind earthquakes, tsunamis, and geohazards to the general public across Japan.



● International Coordination Group

GSJ has research cooperation agreements with many overseas geological surveys and research institutions, promoting joint research, researcher exchange, and other collaborative activities.

GSJ also participates in international frameworks such as CCOP, contributing to global geological information infrastructure and human resource development.

14 Group photo at a field training of the CCOP-GSJ international program. This training focused on the geology of the Mt. Tsukuba area, with discussions of differences in geological environments compared with those in participants' home countries in Southeast Asia.

Research Institute for Geo-Resources and Environment (GREEN)

https://unit.aist.go.jp/georesenv/index_en.html



7 Field survey in the Kushiro Sedimentary Basin (left) and field survey of weathered granite in Southeast Asia (right)

8 Hydrogeological map and coastal groundwater surveys

9 Magnetotelluric (MT) survey at an open-pit mine

Activities include surveys, research, and technological development aimed at securing natural resources such as fuels, minerals, and groundwater that support industry and society. These promote sustainable and stable energy use in the geosphere and promote its conservation to ensure public safety and security. Geological information is also developed and disseminated as intellectual infrastructure that supports these activities.

Investigation and Research on Geo-resources

Research covers the genesis and resource potential of metallic and non-metallic mineral deposits, particularly those of rare metals, such as rare earth elements. It also includes research and information development for the exploration and effective use of fuel resources, including methane hydrates and natural gas, as well as technological development for groundwater use and management suited to regional conditions.

Investigation and Research on Geo-environment

To improve survey technologies for subsurface environments, including the geological disposal of radioactive waste, by developing methods to investigate large-scale and long-term groundwater flow. Research is also being conducted to enhance CO₂ capture and storage (CCS); we evaluate reservoir mechanical behavior during CO₂ injection and develop advanced numerical analysis methods. In addition, information infrastructure and evaluation techniques for soil and groundwater contamination are being developed.

Databases on Geo-resources and Geo-environment

Surveys and research on geological resources and the geosphere environment contribute to the development of databases on soil environments, groundwater, mineral resources, and energy resources, as well as resource and environmental maps. Related technologies are also standardized, contributing to the intellectual infrastructure that provides fundamental information on the national land.

Renewable Energy Advanced Research Center

<https://www.aist.go.jp/fukushima/>



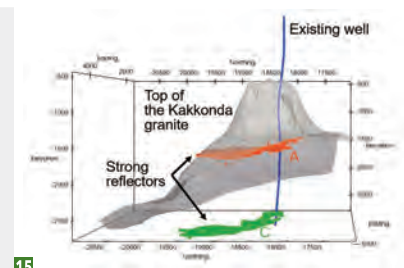
At the Renewable Energy Advanced Research Center (READ) of the Fukushima Renewable Energy Institute, AIST (FREA), research is conducted primarily in collaboration with two other GJS research units: GREEN and IGG. These efforts focus on the large-scale deployment of renewable energy, including the development of technologies for the proper use of geothermal energy, as well as studies on potential assessment and optimization technologies for shallow geothermal heat utilization systems.

Advancing the Use of Geothermal Energy

The Geothermal Energy Research Team conducts research to promote appropriate geothermal development based on subsurface conditions and local social circumstances. This includes the development of technologies to evaluate the distribution and potential of geothermal resources, simulation technologies for subsurface phenomena, and environmental monitoring technologies, as well as research aimed at advancing scientific understanding of geothermal systems through these technologies. Furthermore, the team is leading collaborative research with relevant domestic institutions on supercritical geothermal power generation, an approach that aims to dramatically increase geothermal power output and is expected to be implemented around 2040.

Saving Energy through the Smart Use of Ground Heat

The Shallow Geothermal and Hydrogeology Research Team develops shallow geothermal heat potential maps based on geological and hydrogeological surveys and simulation analyses, and evaluates the suitability of shallow geothermal heat utilization in different regions. By assessing the performance of various heat exchange methods across different hydrogeological settings, the team advances optimization technologies for shallow geothermal heat utilization systems tailored to regional subsurface characteristics. Furthermore, the team promotes research for the wider adoption of shallow geothermal heat through active collaboration with private companies and local governments.



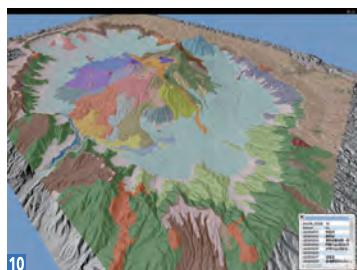
15 Seismic reflectors interpreted as indicating a possible supercritical geothermal reservoir, Kakkonda geothermal field, Iwate. Adapted from Okamoto et al. (2024).

Geoinformation Service Center

https://unit.aist.go.jp/gsc/index_en.html



Serving as a hub between research and society, the Geoinformation Service Center provides reliable and impartial geological information to the public in close collaboration with GSJ research units. As a public asset for effective land use, disaster countermeasures (such as earthquakes and volcanoes), resource security, and environmental issues, we integrate geological information so that anyone can use efficiently when needed, thereby improving its convenience.



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10 Example of a 3D visualization using vector data from the Geological Map of Aso Volcano

11 Collection of geological maps are available for research and public use in the Geological Map Library

12 Special exhibition in the entrance hall of the Geological Museum

Preparation and Enhancement of Accessibility of Geological Information

We organize and maintain geological information produced as research outputs. In particular, we promote their digitization and standardization to enable more advanced utilization of these data and promote the integration, collaboration, and fusion of various types of information. We also aim to provide geological information in a more accessible and user-friendly manner through initiatives such as vectorizing geological maps, enhancing websites and databases, and developing data distribution services.

Publication and Dissemination of Geological Information

We provide high-quality geological information through the GSJ website as research publications. These publications are also issued in various formats, including printed materials and online journals. This information is provided to research institutions and government agencies both in Japan and internationally, as well as to the general public.

Archive of literature, Specimens, and Research Data

We collect and manage materials such as geological maps and related literature, which we made public in the library (including the Geological Map Library), as well as disseminate information via a geological literature database (GEOLIS). We also manage a large number of geological specimens (including rocks, minerals, and fossils) obtained during the research process, and reuse them for research and outreach activities. In addition, primary research data are accumulated and managed to ensure the quality of GSJ's published research outputs.

Dissemination and Research Support

We operate the Geological Museum as a center for outreach activities to promote understanding of GSJ's research outputs. The Geological Museum plans and conducts various events, including educational programs and hands-on learning activities related to the earth sciences. Furthermore, the Geological Sample Preparation Group supports research by producing high-quality thin sections of rock, mineral, and fossil samples collected domestically and internationally using advanced polishing techniques.

Geological Museum

<https://www.gsj.jp/Muse/en/>



Japan's Leading Permanent Exhibition on Earth Sciences

The Geological Museum provides easy-to-understand explanations of topics related to the history of the Earth, the mechanisms of natural phenomena such as earthquakes and volcanoes, various natural resources, and the geological characteristics of Japan. It also displays valuable geological specimens, including rocks, minerals, and fossils, collected both domestically and internationally, organized by theme. We also have an exhibition showcasing the latest research findings from GSJ, including those related to geological disasters.

Outreach & Museum Goods

The Geological Museum contributes to popularizing Earth science for the general public by planning and implementing various events, such as special exhibitions that introduce GSJ's research themes, public lectures, and hands-on learning activities. Furthermore, to make our research findings more engaging and easier to understand, we have planned and are selling a range of original goods featuring geological specimens, such as mineral playing cards and fossil towels.



16

16 A facility showcasing GSJ's achievements through Earth science exhibits, outreach programs, and geological collections.

[Opening hours] 9:30–16:30, from Tuesday to Sunday
Closed on Monday except for National Holidays (closed on the next weekday instead), and from December 28 to January 4.

[Admission] Free

TEL : +81-29-861-3750

GSJ Website

<https://www.gsj.jp/en/>

The website is the one-stop portal for GSJ research outputs.



Catalogue of Geological Maps

https://www.gsj.jp/Map/index_e.html

This website provides a centralized source of information on the latest research results from the Geological Survey of Japan.



GSJ Database

<https://www.gsj.jp/en/database/db-portal/>

Please select a database or system for your purpose.



GeomapNavi

<https://gbank.gsj.jp/geonavi/?lang=en>

Geological maps are available for fast viewing directly in a web browser.



NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY Geological Survey of Japan



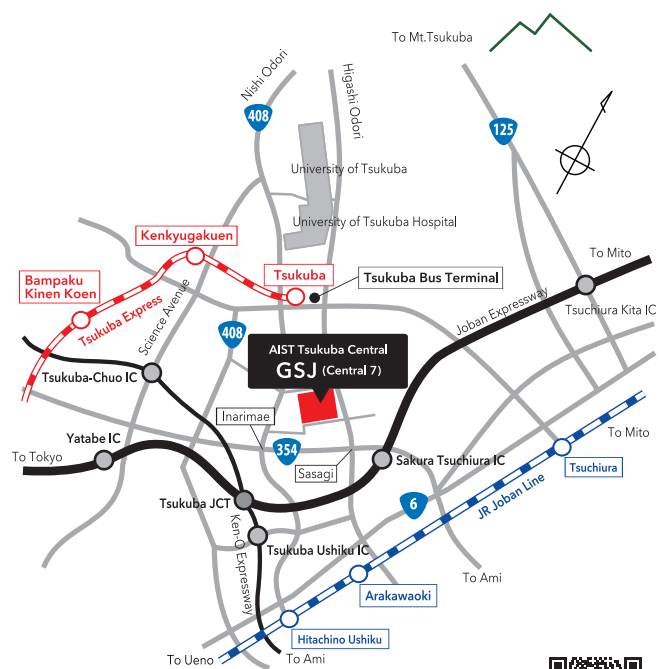
AIST Tsukuba Central 7, 1-1-1 Higashi, Tsukuba, 305-8567, Japan
TEL / FAX +81-29-861-3540
<https://www.gsj.jp/en/>



● AIST 25th Anniversary Special Website

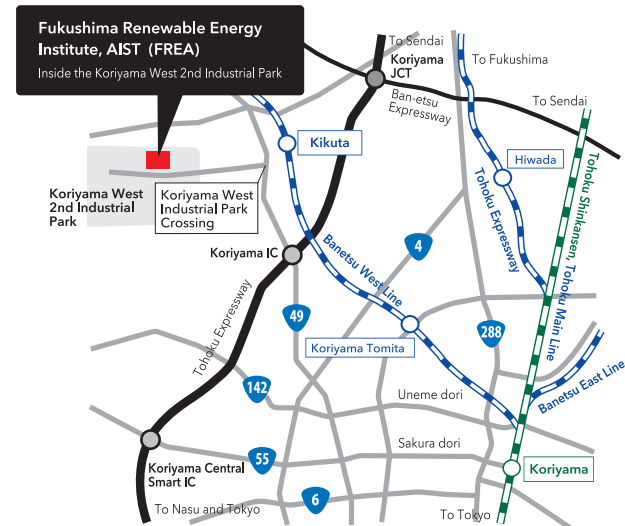
Only available in Japanese
<https://www.aist.go.jp/sc/25th/>

Access



Visit our website for more information.

https://www.aist.go.jp/aist_e/guidemap/tsukuba/tsukuba_map.html



Visit our website for more information.

https://www.aist.go.jp/aist_e/guidemap/frea/



2001 to 2026 and Beyond.
AIST 25th Anniversary

