



Safeguarding

Protecting national land of Japan

Acquiring and disseminating disaster information using surveying technologies

GSI, Designated Government Organization (DGO) under the Disaster Countermeasures Basic Act, is promoting disaster response-related policies and measures against frequent natural disasters, employing the survey and cartographic techniques to protect the nation's land and people's lives and properties.

The information collected through emergency photography and surveying is analyzed and interpreted to acquire data necessary to understand the disaster situation and provide the data as quickly as possible. This information is useful for disaster response, restoration and reconstruction measures carried out by government agencies and local governments, as well as disaster prevention activities by the public.



Latest state of GSI disaster response

Strengthening observations of crustal deformation in the Noto district of Ishikawa Prefecture

In the Noto district of Ishikawa Prefecture, active seismic activity has continued since around December 2020, and along with this seismic activity, continuous crustal deformation have been observed at the GNSS CORS in the Noto region. Therefore, in July 2022, we newly installed a Removable GNSS Monitoring System, REGMOS, in an area with active seismic activity in order to understand crustal deformation in greater detail. During the 2024 Noto Peninsula Earthquake that occurred on January 1, 2024, the "M Suzu Noroshi" REGMOS observed movement of approximately 1.1m in the west-northwest direction. In addition to reporting these results to meetings of government-related organizations, we are helping to elucidate the causes of crustal deformation.



Identifying submergences using SNS (Producing Provisional Inundation Depth Maps)

"Provisional Inundation Depth Maps" are maps that estimate the flood area and water depth by determining the waterfront position from information such as SNS images and aerial photographs when flooding occurs, as well as from digital elevation data. The water depth is expressed in shading. It is used to assess damage in the early stages of a disaster, perform rescue operations, and formulate plans for deploying drainage pump vehicles. After a disaster occurs, we work to quickly provide information to related organizations.



Provisional Inundation Depth Maps based on torrential rains starting from 3 July 2020

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SGDAS and REGARD

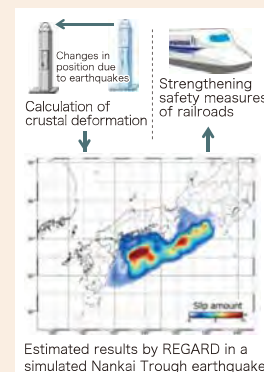
Immediately after an earthquake occurs, GSI automatically distributes information from two systems to support the initial response systems of disaster prevention-related organizations. The Seismic Ground Disaster Assessment System (SGDAS) estimates the occurrence of ground disasters in areas where seismic motion has been observed, using a vast amount of topographical and geological data and estimated seismic intensity distribution maps released by the Japan Meteorological Agency. This information is provided to disaster prevention related organizations.

The real-time GEONET analysis system for rapid deformation monitoring (REGARD) analyzes observation data from GNSS CORS in real time and estimates the magnitude of a huge earthquake based on crustal deformation field in just a few minutes.

In December 2022, we concluded an industry-academia-government collaboration agreement with Tohoku University and Central Japan Railway Company to provide information on REGARD. This helps to improve the accuracy of real-time tsunami flood damage predictions and consider how to handle railway operations.



Estimated results by SGDAS and locations of landslide occurrence (The 2024 Noto Peninsula Earthquake)





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GSI's Disaster related

Activities and Responses

Disaster
Breaks Out

step1 / Daily Operations

As part of daily preparations, maps and surveying technologies are used to observe crustal movements, and to prepare and distribute geospatial information that can also help to prevent and mitigate disasters.

Monitoring by GNSS CORS



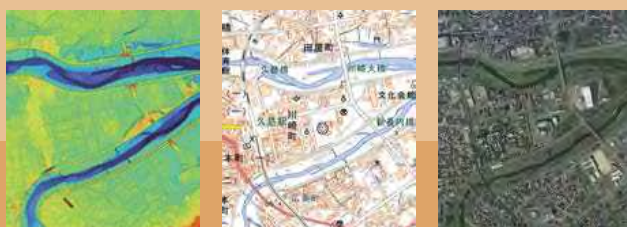
Crustal deformation is monitored at about 1,300 GNSS CORS distributed throughout Japan.

Producing active fault maps



Active fault map showing detailed locations of active faults in Japan. It is useful for earthquake disaster prevention.

Updating geospatial information



Accurate geospatial information is absolutely essential information to have when formulating disaster prevention and mitigation plans. In addition, when a disaster occurs, it can be useful for understanding the state of damage by making comparisons of conditions before and after the disaster.

Monitoring crustal deformation by satellite SAR



Crustal and ground deformation for all over Japan is monitored by analyzing JAXA's satellite SAR data.

Maintenance of Landform Classification Map for Flood Control



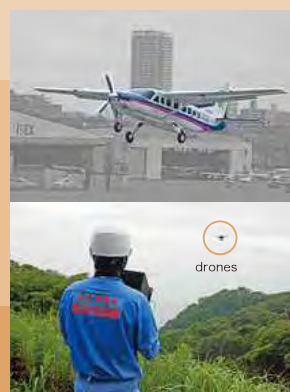
This is a thematic map that displays river topography and river structures for the purpose of flood control measures. It is useful for understanding the risk of natural disasters such as floods.

Crustal deformations observed by GNSS CORS (The 2011 off the Pacific coast of Tohoku Earthquake)



The GNSS CORS network monitors crustal deformations related to earthquakes and volcanic activity.

Emergency photography



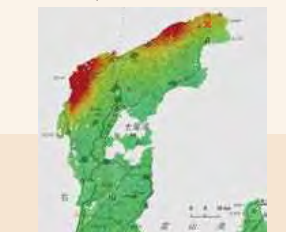
Emergency photography of affected sites is conducted using surveying aircrafts and UAVs (drones) to accurately verify the state of damage.

step2 /

Data collection/Interpretation and analysis

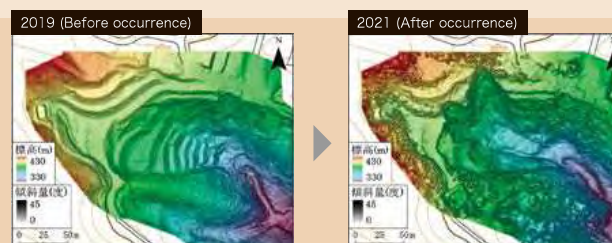
Information is quickly obtained from emergency photos, etc. By interpreting and analyzing various types of information, we can get a multi-faceted understanding of disaster conditions, etc.

Crustal deformation observed by satellite SAR (The 2024 Noto Peninsula Earthquake)



The changes of ground surface is detected with high spatial resolution by analyzing satellite SAR data.

Calculating elevational changes using airborne laser surveys (Torrential rains that began on 1 July 2021)



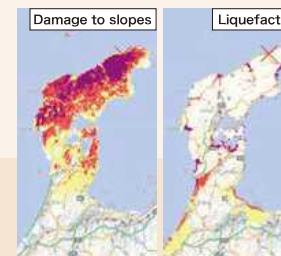
Comparing highly precise elevation data for before and after the occurrence of a disaster helps analysts to quickly understand the state of damage.

Creating distribution maps of slope failure and sedimentation (The 2024 Noto Peninsula Earthquake)



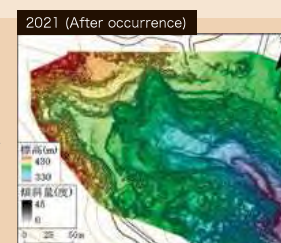
Aerial photos are interpreted to identify topographical deformation such as slope failure and accompanying sedimentation, etc.

Estimating ground damage (SGDAS) (The 2024 Noto Peninsula Earthquake)



When an earthquake occurs, the state of ground damage is quickly estimated.

Calculating elevational changes using airborne laser surveys (Torrential rains that began on 1 July 2021)



Creating Provisional Inundation Depth Maps (Typhoon Hagibis, 2019)



The area and depth of inundation are estimated by combining SNS images and aerial photographs, etc., with digital elevation data.

step3 / Information Distribution

Information is collected and analyzed is quickly distributed to relevant organizations to contribute to response work and rapid recovery.

Information distribution to organizations concerned



Regional Survey Departments play a major role in providing acquired data and analysis results to organizations engaged in disaster response operations on site.

Aerial photos before and after a disaster (Split display of GSI Maps) (Typhoon of July 2019)



Collected disaster information is provided not only to relevant organizations, but also to the public via GSI home page.

Producing/providing maps for emergency restoration and reconstruction measures (The 2016 Kumamoto Earthquake)



Detailed maps are produced and distributed after the occurrence of a disaster for use with restoration and reconstruction measures.