Provide Safety, Security, and Comfort

Preparing for disaster with technologies that "watch out" for people's safety every minute, every second

Disaster preparedness is a priority social issue. The Mitsubishi Electric Group contributes to disaster prevention and mitigation efforts in Japan with technologies that interconnect things in the system and accurately monitors them in real time.

Tsunami radar monitoring support technologies

Contributing to disaster prevention and mitigation in coastal areas with radar-based tsunami monitoring

In recent years, the occurrence of tsunamis triggered by large earthquakes has become a concern in the coastal areas of Japan. To ensure efficient evacuation and response to such tsunamis, it is necessary to detect them as quickly as possible before they reach the coast. Mitsubishi Electric has developed a tsunami monitoring technology that uses ocean surface radar capable of monitoring tsunamis by observing ocean currents from a distance beyond what a human can see (Fig. 1).
Mitsubishi Electric's ocean surface radar has been in use since around 2000 to monitor currents in the open ocean. However, in the aftermath of the Great East Japan Earthquake of March 2011, studies for its application to tsunami monitoring began, and a commercial radar system was developed in just over three years.
The radar uses shortwave frequencies (3 – 30 MHz), and can monitor long distances ranging from 30 to 200 km from the coast. If, for example, a tsunami in waters at an average depth of 300 m can be detected more than 30 km offshore, that information can be obtained 10 to 15 minutes before the arrival of the tsunami.
One focus in developing the radar was how to visualize the tsunami. Tsunamis caused by an earthquake lose their speed in deep offshore waters, and travel at around 10 cm per second, so it was difficult to distinguish them from regular ocean currents and tides. Therefore, a visualization technology was developed that predicts and eliminates the movement of regular currents, and extracts only the tsunami component (Fig. 2).
In the future, we hope to go beyond the scope of tsunami monitoring and realize/enhance technologies for predicting the arrival of tsunamis, to make an even greater contribution to regional disaster prevention initiatives.

Fig. 1 Image of ocean surface radar transmission and receiving antennas

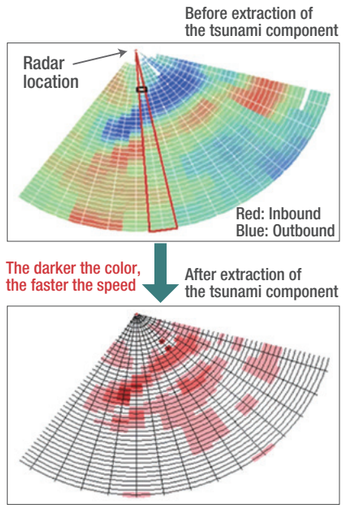
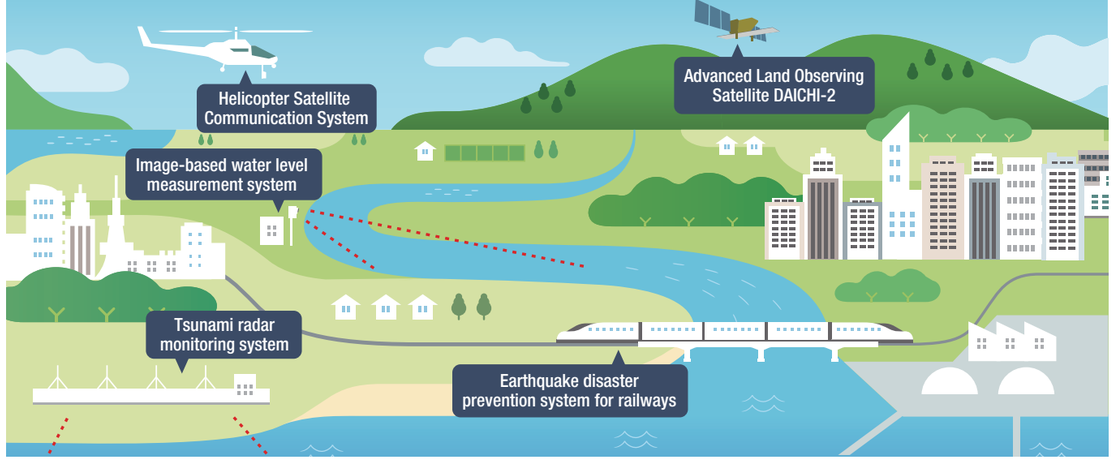


Fig. 2 Visualization scheme

VOICE Developer of the tsunami monitoring technology

Tomoyuki Koyanagi
No. 4 Systems Dept.
Electronic Information Systems Div.
Communication Systems Center
Mitsubishi Electric Corporation

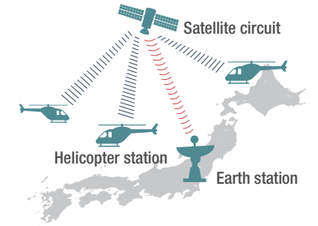
I use my experience in ocean surface radar research to develop the radars and support their operations.
We faced many difficulties and there were many technical challenges that had to be cleared as we introduced this radar system. For example, because the radar was to be installed near the sea, we lowered the antenna to prevent it being affected by the sea breeze, and took measures to ensure high earthquake resistance. Both of these are crucial properties of a tsunami monitoring device. Furthermore, even after delivering the device, we provided essential maintenance on a continuous basis to ensure continued precision.
When faced with a disaster like a tsunami, disaster countermeasure technologies can have a huge effect on people's lives. I strongly feel that we can play a role in developing these technologies, owing to people's strong trust in and expectations of Mitsubishi Electric's high-precision, high-quality products. To respond to that trust, we will continue to make steady, ongoing efforts to contribute to disaster countermeasures.



Distribution of real-time disaster information

Helicopter Satellite Communication System

The world's first helicopter satellite communication system, developed by Mitsubishi Electric, transmits aerial images taken from a helicopter in real time. Conventional systems could not connect the helicopter to a satellite, because the blades of the helicopter had gotten in the way. Thus, Mitsubishi Electric developed an intermittent transmission technology synchronized with the rotation of the blades. As a result, it has become possible to transmit real-time information stably, without any disruptions caused by tall objects or buildings.
This system has been delivered to central governmental agencies and local governments since 2013. Today, it plays an important role throughout Japan in providing relief to disaster-stricken areas in the face of volcanic eruptions, earthquakes, and other disasters.

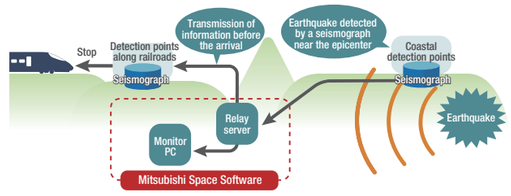


Helicopter Satellite Communication System

Ensuring railway safety in the event of an earthquake

Earthquake disaster prevention system for railways

When an earthquake occurs, a seismograph near the epicenter detects the earthquake and transmits the information about it to a relay server. Within this process, Mitsubishi Space Software Co., Ltd. undertakes an important role in assisting in the determination of the operational control of railways using earthquake data analysis technology. The difference in the propagation speed of earthquake P-waves (small tremors) and S-waves (large tremors) is utilized to provide an instantaneous estimation of the epicenter location and magnitude of the earthquake. By stopping or decelerating moving railcars before a large earthquake strikes, potential earthquake damage is minimized.



Earthquake disaster prevention system for railways

Early assessment of flooding caused by torrential rains

Image-based water level measurement system

In recent years, torrential rains bringing downpours that overwhelm the sewage system are causing extensive flood damage. Since floods, particularly in cities, have a huge impact on people's lives and properties, technology for the efficient assessment of flooding has been in demand. Seeing this, Mitsubishi Electric has harnessed its strengths in image processing to develop an image-based water level measurement system. The system utilizes image processing technology to simultaneously collect water level data and onsite camera images at practically the same quality level as visual confirmation, night or day.
Through this data and image verification technology, Mitsubishi Electric is committed to helping create more resilient cities.

Playing a role in assessing disaster situations

Second Advanced Land Observing Satellite DAICHI-2

Mitsubishi Electric has undertaken the development of the Japan Aerospace Exploration Agency (JAXA)'s second advanced land observing satellite DAICHI-2. The satellite has a wide-ranging mission, including the creation of maps, regional monitoring, and exploration of resources, but plays a particularly important role in the assessment of disaster situations and prevention.
When a major earthquake or other disaster occurs, DAICHI-2 can immediately assess the situation, the state of damage, and the need for restoration and countermeasures. It is also instrumental in monitoring volcanic activities and sea ice in the Sea of Okhotsk during winter.