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TerraSAR-X による仙台平野湛水域モニタリング
TerraSAR-X based monitoring over Sendai plain inundated by the tsunami

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The massive tsunami caused by the 2011 off the Pacific coast of Tohoku Earthquake that occurred at 14:46 on March 11, 2011 brought the great damage in the Pacific coastal area between Aomori and Chiba.

The tsunami reached at from the shore the range of approximately 6 kilometers on the plains of Soma city, Fukushima from Matsushima of Miyagi in particular, and a wide area was flooded. Because the area consists of low flat topography, the flooded situation had been continued.

It was urgent issues to carry out efficient and effective drainage measures, and therefore it was necessary to monitor the change of the inundation range continuously to push forward the restoration of the stricken area.

Earth observing satellite is suitable for regional monitoring. Above all, the synthetic aperture radar (SAR) can observe the surface of the earth regularly because its microwave penetrates a cloud regardless of the night and day and the expectation of SAR for the practical use in disaster prevention has been rising recently.

Imageries acquired by TerraSAR-X were utilized for the monitoring of the flooded area. TerraSAR-X is a synthetic aperture radar satellite developed and operated under Public-Private Partnership (PPP) of German aerospace center (DLR) and EADS Astrium affiliated with European aerospace company EADS.

A SAR image consists of backscattering intensity of the specified microwave. The backscattering intensity depends on the land cover/use and the topography. For example, in the city area where the building crowds, strong backscattering is often provided by multiple scattering. On the other hand, the backscattering becomes relatively weak on the smooth road or surface of the water because specular scattering excels on such smooth surface.

The monitoring utilizing TerraSAR-X was implemented from March 13, 2011 just after the earthquake to April 4. In addition, the image of October 21, 2010 before the disaster was referred.

A comparison of the image acquired on March 13, 2011 just after the earthquake with the image of October 21, 2010 before the disaster clearly showed the inundation caused by the tsunami in a wide area.

Image acquisition was carried out continuously for the Sendai plain. 18 times of acquisition were carried out from March 13 until the morning of April 4. In other words, the acquisitions were carried out at the frequency once in approximately 1.3 days. During this period, a total area of approximately 120,000 square kilometers at the coast between Hokkaido and Chiba including Sendai plain was captured.

In addition, the extraction analysis of the flooding range and the exhibition in the web site from images was completed in about less than 24 hours because time required for the data acquisition is shortened to perform down-link in a domestic receiving station.

It is difficult to determine flooding area where dense and strong scatterers exist, such as in a city area, but it is thought that an advantage of the satellite-borne SAR was shown as means to grasp the inundation damage over the wide area immediately.

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