

Resource Exploration using Interferometric Synthetic Aperture Radar Measurement Technology

*Shuichi Rokugawa¹, Takako Nakamura¹

1. The University of Tokyo

InSAR using synthetic aperture radar (SAR) is a technology that enables the detection of the earth surface deformation without any observation points on the ground. The L-band SAR mounted on ALOS / PALSAR-2 is effective even in the vegetated areas because of relatively long wavelength of the sensor. InSAR has the potential to be used in the various technical applications. This technique has been primarily used to analyze fluctuations due to natural disasters and large-scale deformations such as crustal movement caused by earthquakes and volcanic eruptions. However, the extraction of the small deformation is also possible by continuously monitoring the ground deformation. Compared with the leveling and global navigation satellite system, InSAR provides the advantage of wide range observation capability. However, accumulating a certain amount of data is required for this kind of analysis. In this study, the second largest oil field in Kuwait and East Kanto gas field in the Chiba prefecture, were analyzed as case study fields. InSAR data from 2004 to 2010 are applied to derive the surface deformation. The results of the detailed analysis confirmed remarkable ground deformation mainly at four locations in Kuwait. It was confirmed that each of these four points coincided with the positions of the Burgan, Minagishu, Umm Gudair and the Wafra oil fields, respectively. Therefore, it was discovered that InSAR can accurately grasp the ground deformation near the oil production wells. Moreover, these results reveal that there was a linear correlation between the influence range of the oil and the production amount of the oil field. A high correlation was also observed between the subsidence amount of the oil field and the actual production amount. Therefore, it is established that the InSAR analysis results can be applicable in production management, as well. Similarly, in Chiba prefecture, the InSAR time series analysis was conducted to grasp the spatial distribution of the ground change in time series. It also demonstrate the possibility of the tools for monitoring and management of the actual oil/gas fields.

Keywords: InSAR, ALOS/PALSAR-2, oil/gas fields