

Joint Analysis of GNSS and InSAR for Deformation Monitoring: A Feasibility Study in Johor, Malaysia

Mohd Noor Isa, Azhari Mohamed, Muhammad Asyran Che Amat (Malaysia) and Sowter Andrew (United Kingdom)

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SUMMARY

Information about deformation in an area has become vital not only for safety assessment but also for maintenance of geodetic infrastructures. The latter is necessary to support accurate surveying and mapping applications. This research exploits the complementary features of Global Navigation Satellite System (GNSS) and Interferometric Synthetic Aperture Radar (InSAR) techniques to assess the long-term deformation in Johor, Malaysia, which can be induced by natural and/or anthropogenic activities. Although continuous GNSS offers a complete profile of the surface changes in 3-dimensional view, very often, the technique is limited by the sparse distribution of GNSS stations. The result from InSAR analysis provides essential information for the surrounding area, although the profile is limited to the line-of-sight (LOS) of the satellite. The analysis of five years GNSS data at eight Malaysia Real-Time Kinematic GNSS Network (MyRTKnet) stations revealed deformation that can be explained by plate tectonic movements and earthquakes in the surrounding region. In addition, two LOS velocity maps have been produced from the InSAR time-series to assess the surrounding deformation of Johor. Two sets of ERS-1/2 data, consisting a total of 67 images acquired in two descending tracks (i.e. track 75 and 347), are utilised for the generation of the maps. Moreover, the feasibility of the newly available Sentinel-1 satellites is also tested, which revealed improved coherence owing to their short revisit cycle. Some part of Johor showed subsidence and uplift trends, which also agreed with literature. This information cannot be perceived with the GNSS technique alone due to its limited coverage; hence, further attests to the benefit of their joint analysis. This work is yet another example of the implementation of geospatial information to support effective decision making.

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