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Synergy of ASAR and RADARSAT-2 ultra-fine acquisitions for ground deformation monitoring by means of DInSAR and PSI

Panagiotis Elias (1), Pierre Briole (2), and Olga Sykioti (1)

(1) Institute for Space Applications and Remote Sensing, National Observatory of Athens, Athens, Greece, pelias@space.noa.gr, (2) Laboratoire de Géologie, Ecole Normale Supérieure, Paris, France, pierre.briole@ens.fr

The Gulf of Corinth study area has been long identified as a site of major importance due to its intense past geophysical activity. It is one of the world's most rapidly extending continental regions and it has one of the highest seismicity rates in the Euro-Mediterranean region, having produced a number of earthquakes with magnitude greater than 5.8: Alkyonides (1981, M=6.7), Aigio (1995, Mw=6.1), and Galaxidi (1992, Mw=5.8). Moreover, the geodetic studies conducted, which were based on GPS observations and InSAR calculations, revealed north – south extension rates across the gulf of up to about 1.5 cm year-1 during the last 20 years. Moreover the south coast of the Corinth rift is uplifting whereas the north part is subsiding. The rifting mechanism observed is crucial for the stability of the region as it can lead to submarine slope failures and possible damaging tsunamis. On land, the same fault system causes landslides.

The area or the Gulf of Corinth that presents a major scientific and/or socio-economic interest is Patras broader area, the Psathopyrgos fault zone which is considered to be a presently active structure, the Rion-Patras fault zone, the city of Patras and the Rion-Antirion bridge. Psathopyrgos fault zone acts as a transfer zone between the Corinth and Patras rift. Recently on June 8th, 2008 a Mw=6.4 earthquake occurred in NW Peloponnesus, western Greece, at a distance of 17km southwest of the city of Patras. This event is the largest strike-slip earthquake to occur in western Greece during the past 25 years. The days following the main shock, the seismicity were propagating northward towards the city of Patras. Static (Coulomb) stress transfer analysis indicates loading of faults near the city of Patras.

Patras is the third most populated city in Greece with more that 200,000 citizens. The bridge of Rion-Antirion is 2,880m long (its width is 28m) and connects the eastern and western Greece. The bridge has been designed and constructed taking into consideration the raised seismisity of the area.

The Psathopyrgos fault zone as well as the Rion-Patras transfer fault zone are investigated for any detectable ground deformations that could be indications/precursors or inter-seismic accumulation processes before a main event. The city of Patras are investigated for any detectable ground/buildings deformation due to human interventions or geophysical processes. The potential of Rion-Antirion bridge monitoring for any detectable deformation as well as the surrounding ground on the two edges of it, are also investigated and assessed.

The study area presents major difficulties for DInSAR/PSI applications, due to its intense vegetation coverage and high topography presenting various facets, varying high slopes and shadowing effects. Moreover its intense topography in conjunction with its location between Aegean and Ionian seas is leading to high precipitation rates and extend cloud coverage. All these characteristics of the study area contribute to high decorrelation of the interferometric products. For the estimation of the ocuured deformations a series of ASAR/ENVISAT (image swath 2) data are processed by means of PSI and DInSAR techniques, but RADARSAT-2 (ultra-fine beam mode) data are processed only by means of DInSAR technique due to its lack of historical data. The processing will be carried out exploiting commercial and in-house software. The medium and high ground resolution added value products of the acquired data are combined in the thematic level.