GROUND DEFORMATION IN CEPHALONIA ISLAND (W. GREECE)

The area of the central Ionian Sea in Greece is tectonically very active. Large earthquakes (M>7) and associated intense co- and post-seismic ground motion have taken place in the past. It is the area of Europe which has the highest seismic energy release with the most recent large earthquake centred near Lefkas Island, north of Cephalonia, on a major fault which continues southwards just to the west of Cephalonia. A detailed study using Persistent Scatterer Interferometry (PSI) covering the islands Cephalonia-Ithaca, has contributed to a greatly improved understanding of the tectonic behaviour and regime of the broader area, helping to identify a possible pre-earthquake deformation process. This case study focuses on Cephalonia Island, and confirms a dramatic change in tectonic behaviour during 2005.

Technically, the PSI products for Cephalonia were based on 39 descending images from the ERS satellite covering the period 1992-2000, and 21 ENVISAT images for the period 2003-2008. More than 860,000 persistent scatterers in descending geometry were identified. Each of these points acts, effectively, like a GPS station (principally for vertical movements) giving an accuracy of better than 1mm/yr. Together, they provide a high density network mapping millimetric movements across the island over many years. The ERS PSI products revealed a linear velocity history up to the year 2000. Then, strong deviation from linearity was observed in the ENVISAT PSI product of Cephalonia-Ithaca, signalling a change in the regional tectonic regime of the area during 2005. The ENVISAT data confirmed ground motion change, first indicated by the DGPS observations that were resulted by remeasurement campaigns of the GPS network established since 2001. Based on the acceleration field of the PSI products, it was also possible to identify the *increasing* or *decreasing rate* of the ground deformation (uplift or subsidence).

The PSI and DGPS data, combined with the seismicity pattern analysis and the strain field deduced by the repeat DGPS measurements, have defined a seismically critical area south and SW of Cephalonia, identifying a possible pre-earthquake deformation process in a region which has the highest seismic energy release. Recognition of this possible precursor tectonic activity may prove to be a landmark result in the use of PSI & GPS data to improve the understanding of seismic hazard, and contribute to the research for the forecasting of large magnitude earthquakes.