Deformation of the southern Aegean from continuous Global Positioning System measurements

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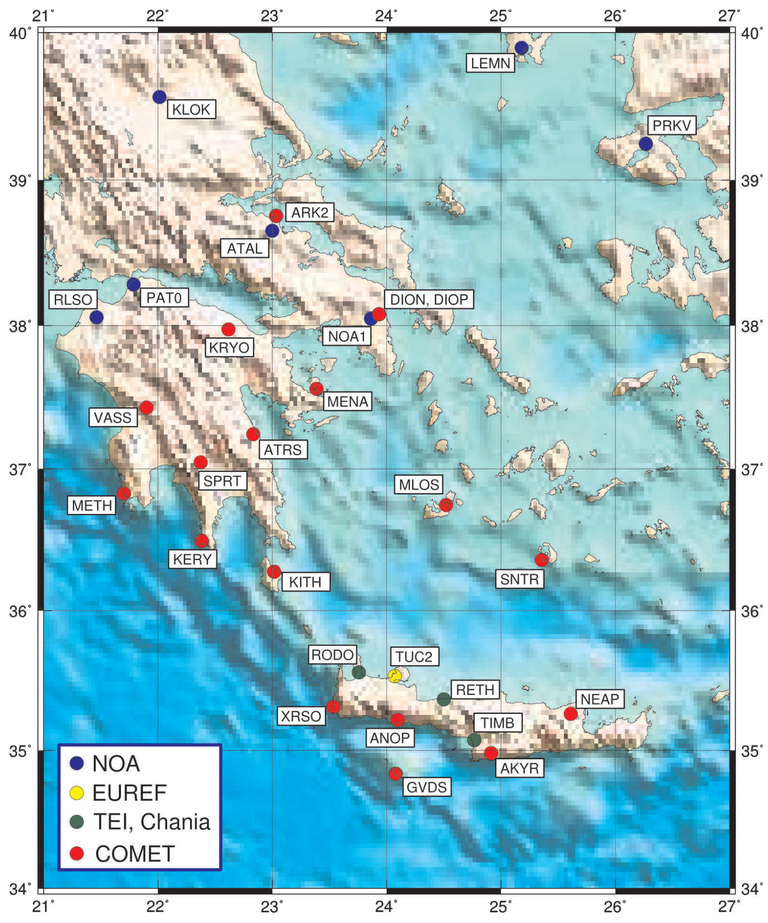


Overview of the network

The installation of continuous GPS network operated now by COMET, University of Oxford, and National Technical University of Athens, started in 2002. By 2009 the network consists of 18 sites. The data are transmitted using modem connection daily to the Analysis and Archivind Centre, three of the sites are equipped with ADSL equipment and the development of the real-time data transmission system is in progress.

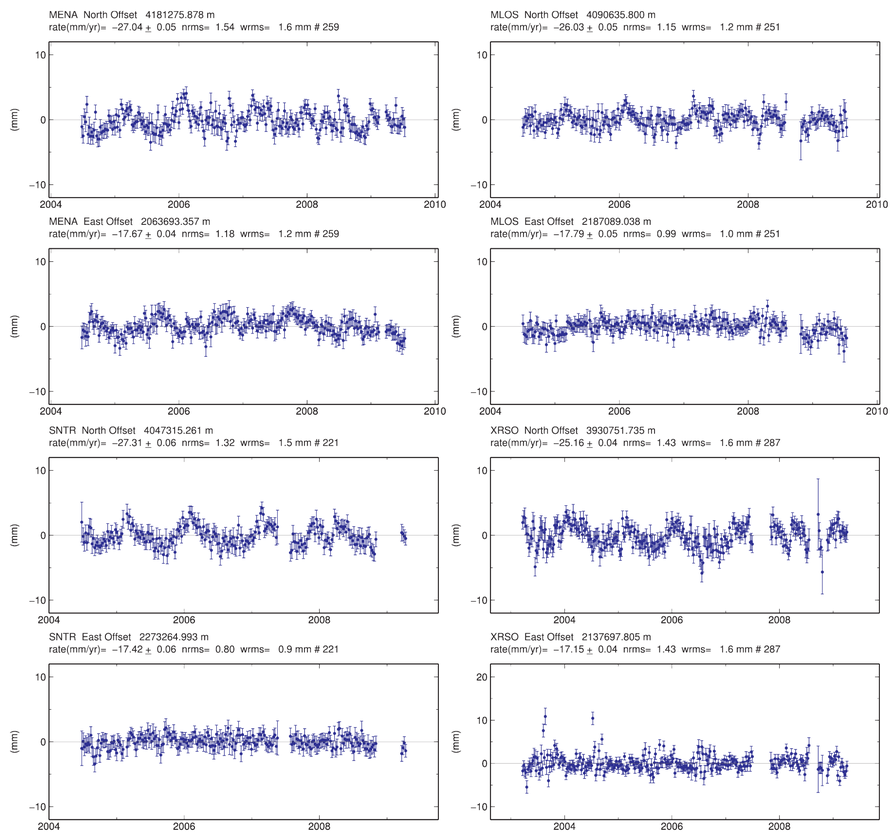
Solutions obtained using GAMIT/GLOBK software show excellent stability, thus allowing us to resolve features of the tectonical settings of the region, that were

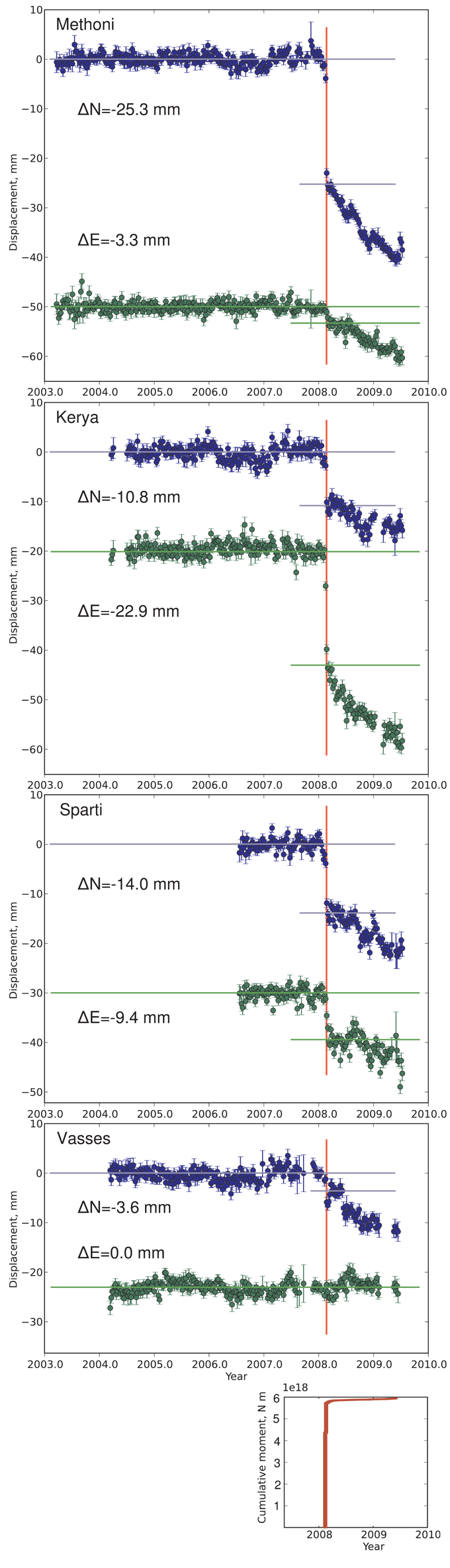
Earthquake of 14 February 2008

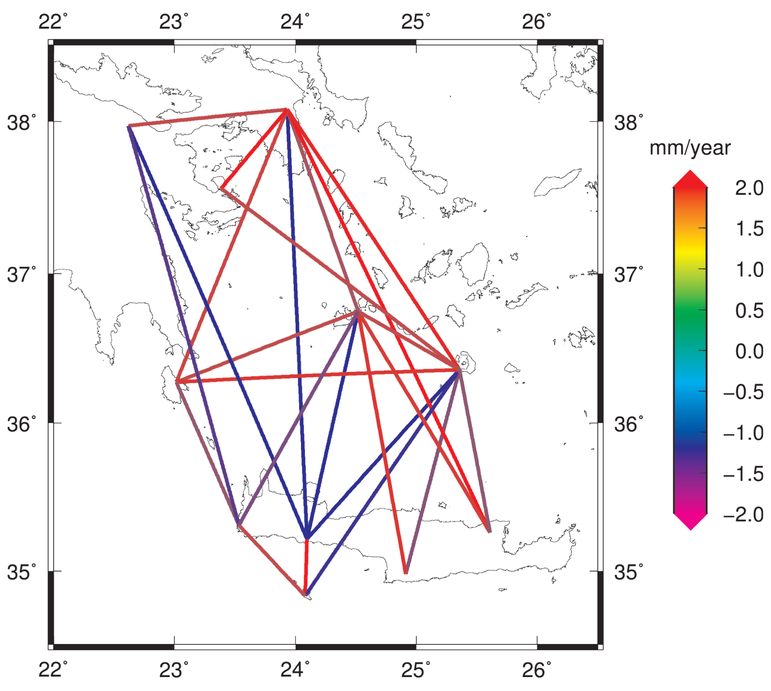
On Thursday 14 February 2008 two large shallow thrust earthquakes, a M_W~6.8 mainshock and, two hours later, a M_W~6.2 aftershock, occurred off south-west Greece. These events were followed by a second M_W~6 strike-slip earthquake on Wednesday 20 February 2008 and, on Tuesday 26 February 2008, a smaller M_W~5.4 high-angle reverse event in the same region.

Four of the CGPS sites showed clear coseismic and postseismic signature. The weekly solutions before the event were used to estimate the pre-seismic site velocities, as well as annual and semiannual compomemts. Trend and the cyclical components were then removed from the whole timeseries.

It is clear that the postseismic displacements can not be explained by the aftershocks, as there were no significant moment release after the main event (see the cumulative moment release from NOA data in the bottom).





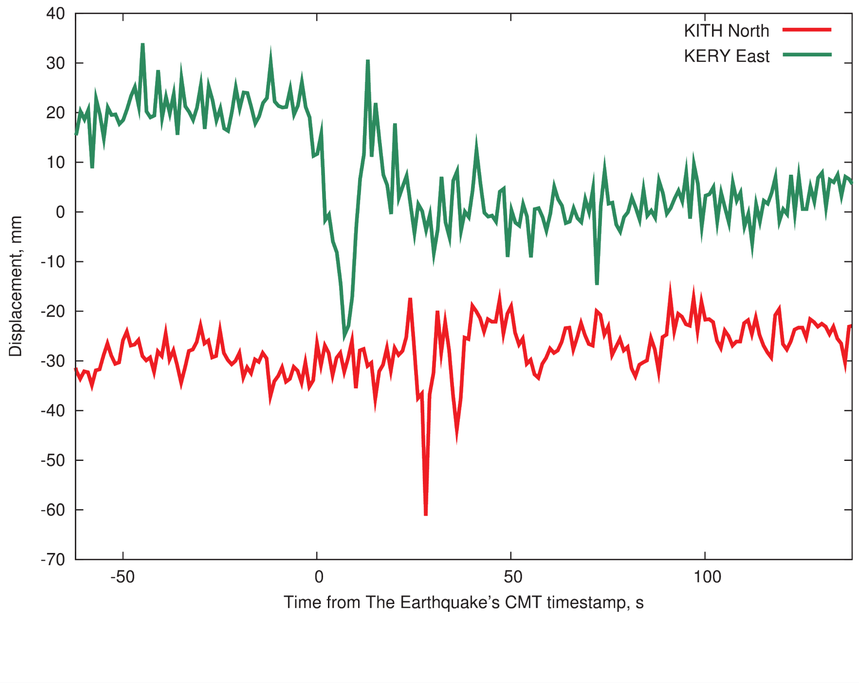


Observed strain rates

Rates of baseline change for some of the baselines in the network are shown above. Most important feature is the shortening of the baselines between sites in SW Crete and along the volcanic arc.

Kinematic detection of the earthquake

The 1-s network kinematic solutions, estimated using GIPSY software are presented. The clear signal suggests that onshore kinematic GPS can be used as a part of future early warning tsunami prediction systems.



Geodetic Inversion

Both the source location and magnitude estimates for the main event of the February 2008 sequence, provided by different analysis centres, have considerable disagreements. Magnitude estimates vary from 6.6 (NEIC), to 6.9 (HCMT), the epicenter locations given by NEIC and HCMT are about 20 km apart.

The coseismic displacement derived from the GPS data were used to obtain estimates of the eqrthquake parameters. Okada model for single rectangular fault was used to model the surface displacements. The fault plane orientation (strike=332°, dip=6°, rake=120°), depth (20 km), and the fault dimensions (15.2×40.0 km) were kept fixed, the slip, latitude and longitude were varied.

Inversion result

	Latitude	Longitude	M_w
HCMT (PDEW)	36.24	28.99	6.8
NEIC	36.501	21.670	6.6
NOA	36.50	23.40	
GPS	36.32	21.79	6.84