The use of GPS in seismology[1]

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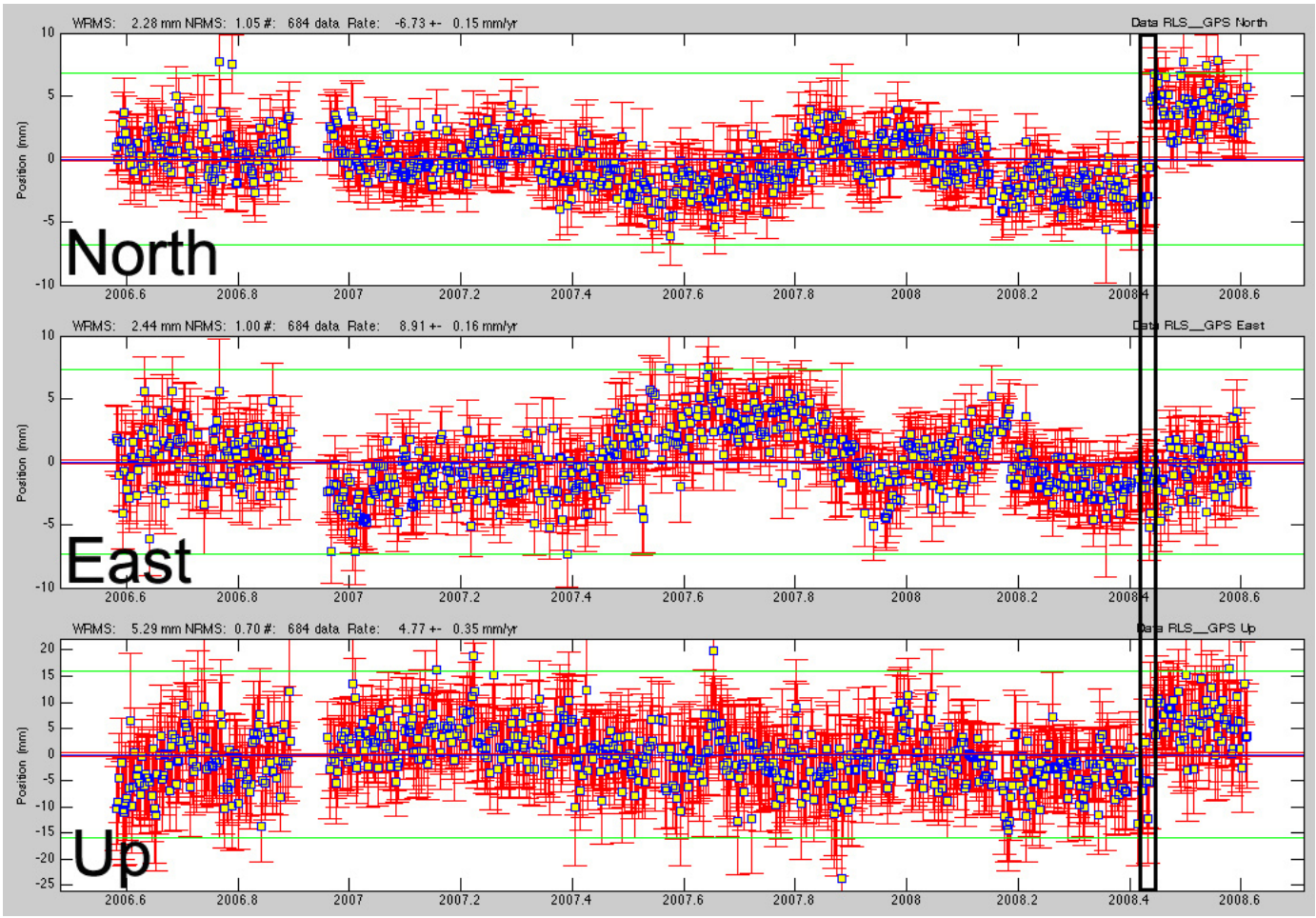
GPS is a mature, space technology that is rapidly developing across the globe. What GPS is capable of providing is a) precise estimate of current fault slip rates, b) velocity vectors of tectonic plates c) high-resolution static and dynamic displacements of stations in the vicinity of strong earthquake epicenters. For example, during the last ten years several GPS records for large earthquakes (M>6.3-6.4) indicate that GPS is an excellent instrument for measuring large displacements near earthquake ruptures. Where possible, combining high-rate GPS data with recordings from seismometers significantly expands the observable frequency and amplitude range of ground motion. Using these data together could greatly improve rapid assessment of tsunami threat, extent of ground failure, size of fault sources and warning of volcanic activity. Also, in recent years GPS data sampled at 1 Hz or greater have provided valuable constraints in a variety of crustal deformation studies and demonstrated the operational capability of GPS networks for monitoring as part of volcano and tsunami warning systems.
This talk will present current capabilities and future directions for effectively using high-rate GPS data in these contexts, especially, but not limited to, their use in combination with seismic observations. 30-s GPS data can be also used to understand fundamentals of fault mechanics as a) how do faults slip – inversion (e.g. L'Aquila) b) patterns of slow deformation or modes of locking in subduction zones (Hellenic Arc, large faults) c) inter-seismic kinematics of ground motion (subsidence - uplift) d) what is the relationship between stress and strain in the lithosphere e) how do plate boundaries evolve (NAT – NAF). Furthermore, I will present results from scientific investigations using GPS data, that assess the contribution of GPS data to such studies, or that propose new applications for these observations.



The Static Displacement of Riolos GPS station in Western Greece following the 8/6/2008 strike slip earthquake (Ganas, A., Serpelloni, E., Drakatos, G., Kolligri, M., Adamis, I., Tsimi, Ch. and Batsi, E. (2009) 'The Mw 6.4 SW-Achaia (Western Greece) Earthquake of 8 June 2008: Seismological, Field, GPS Observations, and Stress Modeling', Journal of Earthquake Engineering, 13:8, 1101 — 1124. To link to this Article: DOI: 10.1080/13632460902933899).

1) Abstract for keynote talk – for European Seismological Commission 32nd General Assembly will take place in Montpellier, France, September 6-10, 2010.