# GPS STRAIN MEASUREMENT SPECTRUM AND POTENTIAL BENEFIT oh" COLLOCATION WITH MODERN BROADBAND SEISMOGRAPHIC NETWORKS

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The temporal and spatial distributions of strain accumulation and release involved in **the** earthquake p rocess can be inferred from high-pmi sion geodetic measurements of surface deformation. Successful detection of deformation signals, over a given spatial extent, is dictated by the spectrum of the deformation in relation to that of the measurement noise.. in this regard, continuously recording Global Positioning System (GPS) monitoring stations can be deployed in a manner analogous to that of a lalgc-scale local to regional strainmeter. Simple, power spectral density (1'S1 )) relationships derived from strainmeter measurements are reviewed and applied to strain estimates derived from continuous GPS geodetic measurements. Various spectral relationships between strainmeters and GPS measurements are illustrated, Temporal PSI) models of noise in GPS and high-quality strainmeter measurements of crustal deformation suggest that GPS may be preferable for shcmt-term signals in under 6 months of continuous observations over distances up to 1()() km, assuming a G]% geodetic precision of ().1 to 1 .() cm in horizontal base.line components. 'J he possible correlation of estimated strain with short period tropospheric path delays in GPS measurements, associated with the dynamical behavior of the troposphere, is investigated from the perspective of obscuring short-period strain signals, if they exist, which may be associated with precursory and postseismic deformation phenomena. The point is made that strainmeter and Gl 'S measurements are complementary due to differences in.the.ir temporal noi se spectra and ranges of spatial application. Comprehensive mode.ting of fault deformation requires the integration of measurements with overlapping deformation response, with near-field strain measurements, hig h-resolution local and regional geodetic data, and broadband seismic data. In particular, high-resolution global geodetic measurements overlap the. bandwidth of long-period seismic data. The potential advantages of a global space-based geodetic net work arc. presented. The capabilities of permanent GPS monitoring networks are addressed, as arc. the benefits of collocating some GPS geodetic site.s with seismographic stations employing modern digital broadband instruments. The theoretical models presented are tested with available continuous GPS fault monitoring data.

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