

What We Know From Deformation Data

Linear Elasticity Holds

Surface measurements DO tell us about deep deformation.

Before earthquakes the largest changes are:

- Tides
- Teleseisms
- **Steady** tectonic accumulation

Postseismic **much larger** than preseismic (eg El Mayor)

Very small preseismic leads to **small nucleation zones**.

Current Deformation Data

- **1.** GPS (about 1990 on) -- 10-100 km spacing
- **2.** InSAR (1992 on) - 100 m spacing (roughly)
- **3.** Longbase strainmeters and tiltmeters - 100's of m
- **4.** Shortbase strainmeters and tiltmeters - 1 m and less

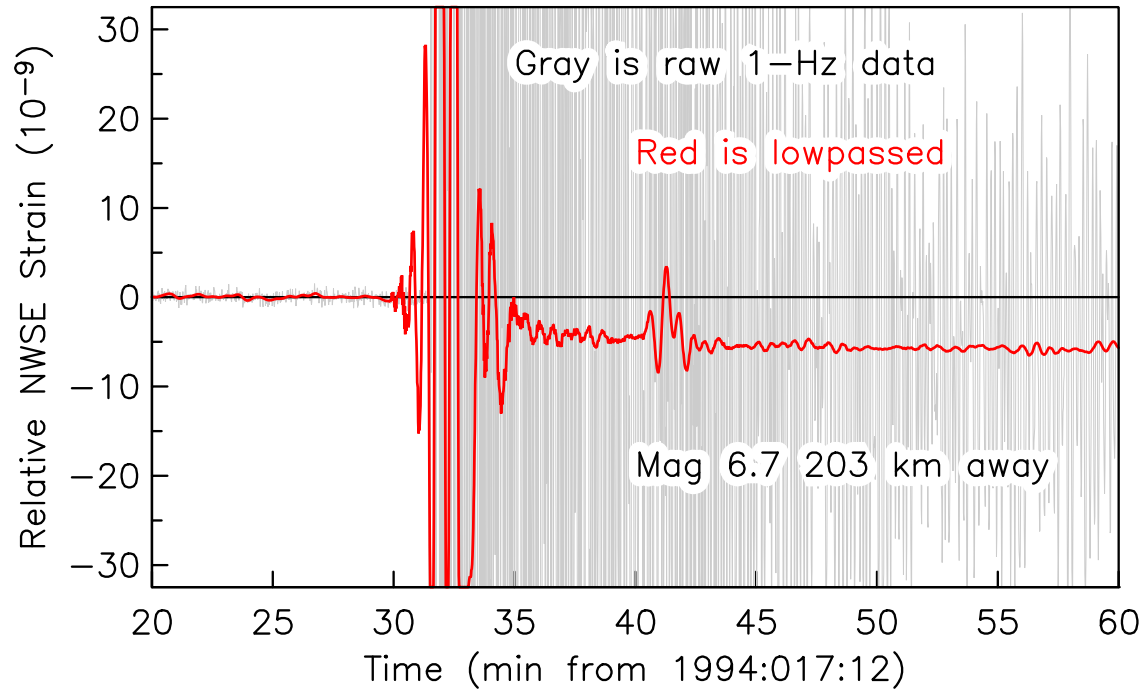
Evidence that the Earth Behaves as a [Layered] Elastic Medium

- **Tides (including loading):** **1** and **3** consistent over space and with each other. 10^{-9} — 10^{-8} (Japan, Italy, California)
- **Seismic waves:** **1**, **3**, and **4** consistent over space and with each other (and seismometers) 10^{-10} — 10^{-6} (everywhere)
- **Coseismic strains:** **1**, **2**, **3**, **4**, consistent with dislocation models. 10^{-9} — 10^{-5} (California, China, Iran, South America,.....)

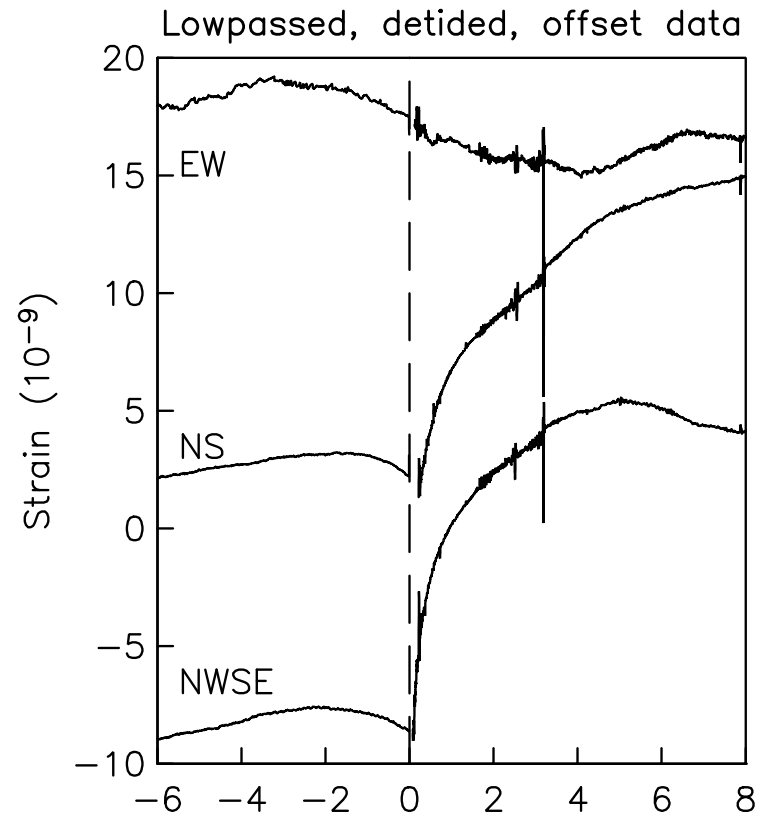
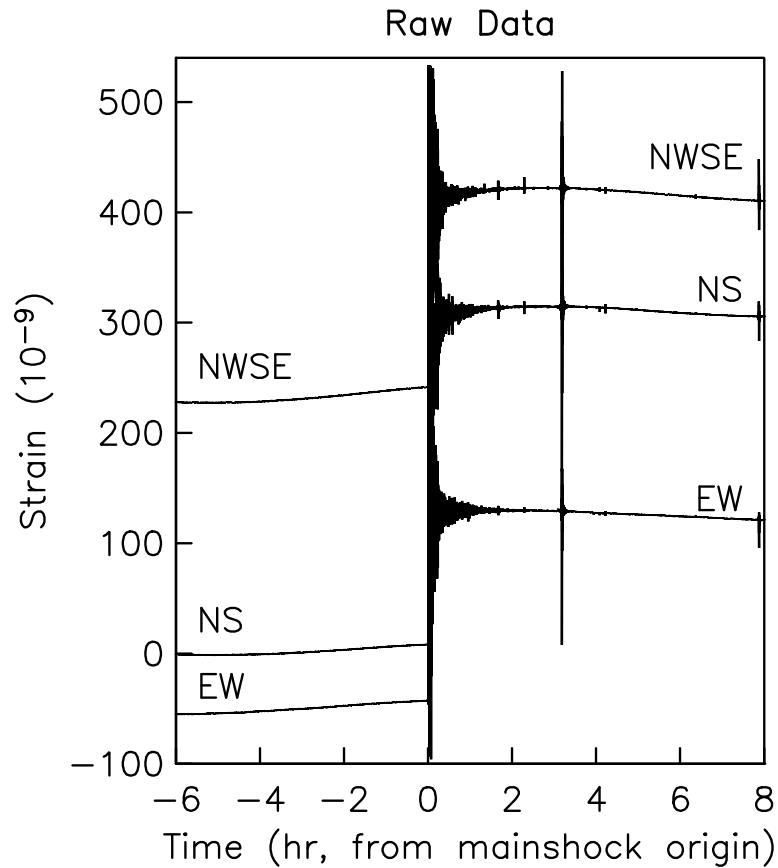
Annual strain changes are less than 10^{-7}yr^{-1}

An Example: Northridge

Longbase Strain: Northridge Earthquake at PFO



Another Example: Hector Mine



Older Data

Measurements got **much better** around 1990; data look **much smoother**

EITHER:

- Earth changed in 1990
- Older data had systematic errors

Almost any paper published **before about 1985** about deformation, (other than coseismic changes) should be viewed as we now view papers about canals on Mars.

Forecasts and Predictions

This word "**Forecast**" seems to have been used for the reason that it expressed a less degree of precision and certainty than the more usual words "**Predict**" or "**Foretell**".

Whether the reason is a sound one may be doubted. The use of vague phraseology has a tendency to make those who use it satisfied with uncertain conclusions.

Francis Galton (1866), commenting on the weather forecasts of Robert FitzRoy.

(Page 16 of 'Report of a Committee to consider certain questions relating to the Meteorological Department of the Board of Trade', Parl. Papers 1866 [3646] LXV.329).