

# EAS 4803/8803 - Obs Seismology

## Lec#4-5: Seismometers and Seismic Networks

• Dr. Zhigang Peng, Spring 2011

Supplementary figures (mostly from the Stein textbook)

Figure 6.6-1: Diagram of a vertical seismograph.

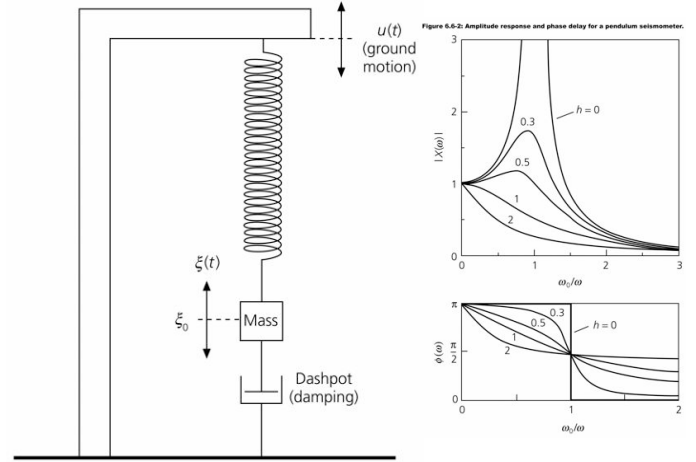
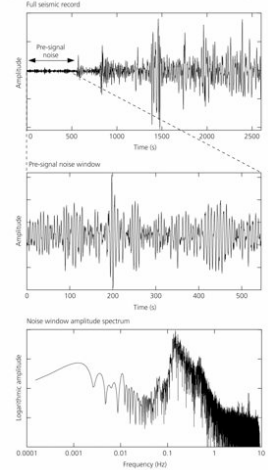


Figure 6.6-3: Demonstration of seismic noise on a broadband seismogram.



1. A microseism is defined as a faint earth tremor caused by natural phenomena, such as winds and ocean waves. (from wikipedia)
2. Thus a microseism is a small and long-continuing oscillation of the ground.
3. The term is most commonly used to refer to the dominant background seismic noise signal on Earth, which arises from wave action in the oceans, i.e. the low-frequency part of the Ambient Vibrations.

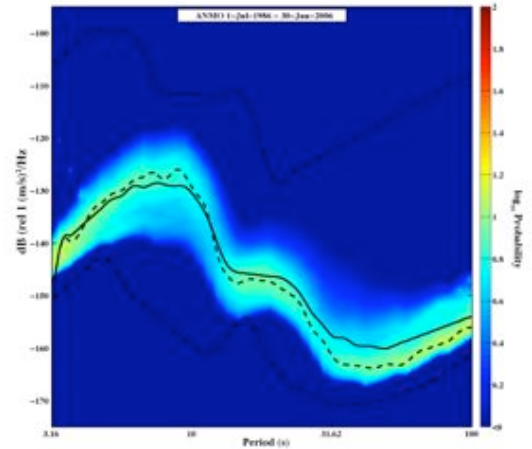


Figure 6.6-4: Examples of seismoscope recordings.

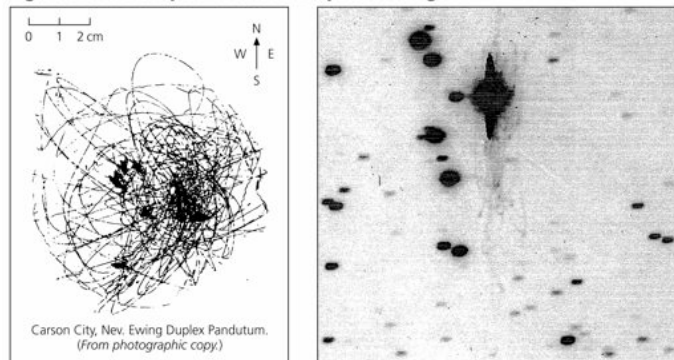
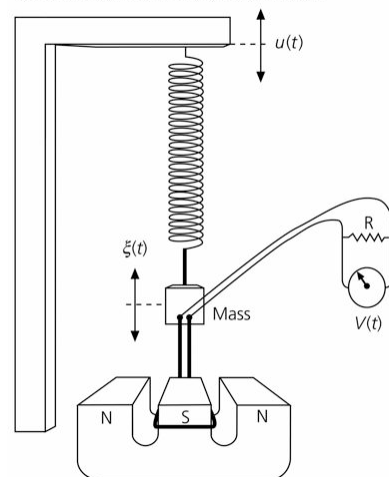
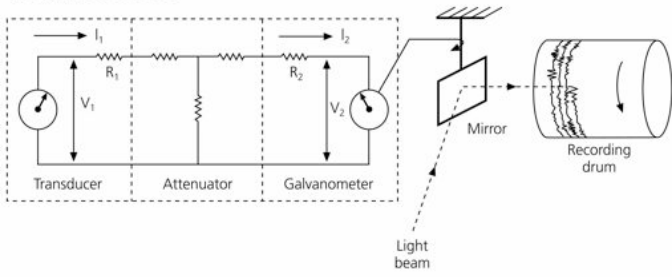


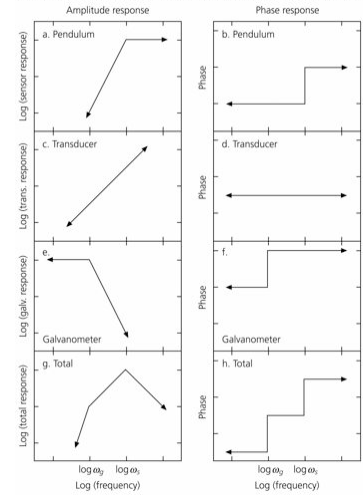
Figure 6.6-5: Illustration of an electromagnetic seismograph.



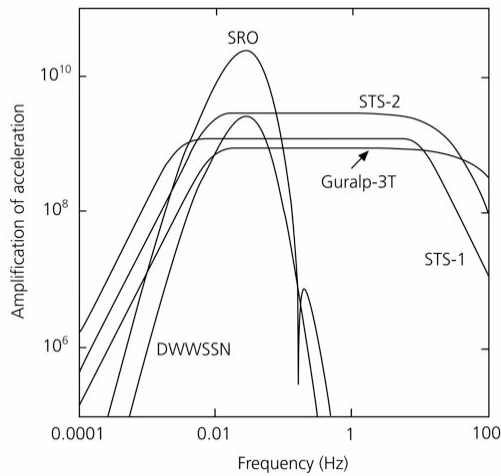
**Figure 6.6-6: Coupling of the transducer of an electromagnetic seismograph to a galvanometer.**



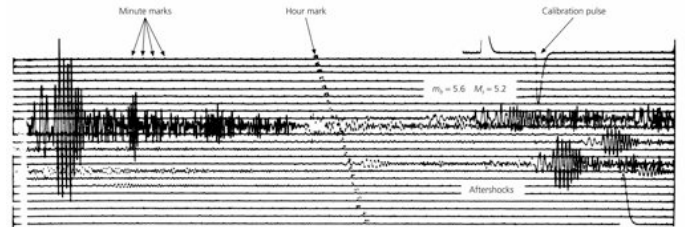
**Figure 6.6-7: Responses of the components of an electromagnetic seismograph.**



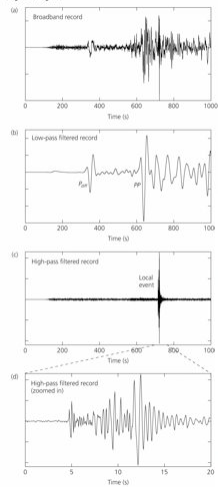
**Figure 6.6-8: Instrument responses for several types of seismometers.**



**Figure 6.6-9: Sample WWSSN long-period vertical-component seismogram for one day.**

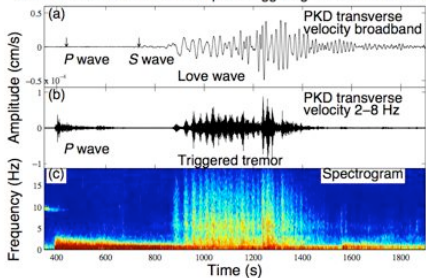


**Figure 6.6-11: Use of filtering to enhance different frequency bands of a single seismogram.**

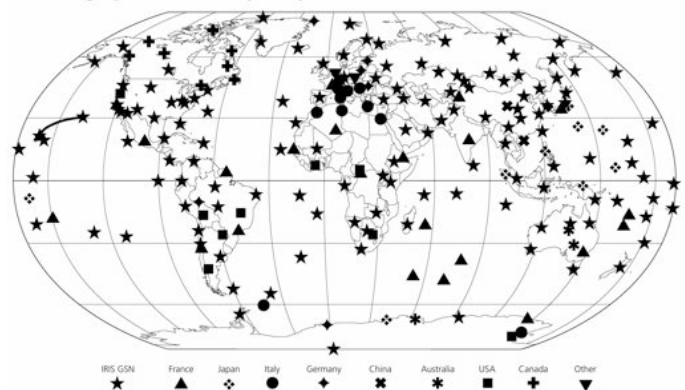


**Examples of broadband recordings with both long-period waves and high-frequency local signals.**

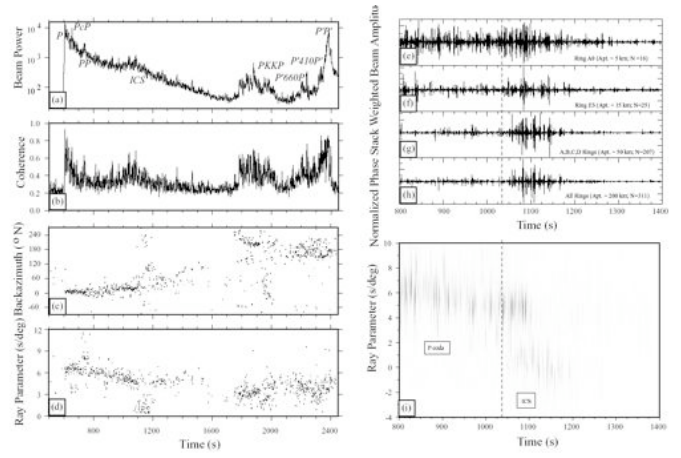
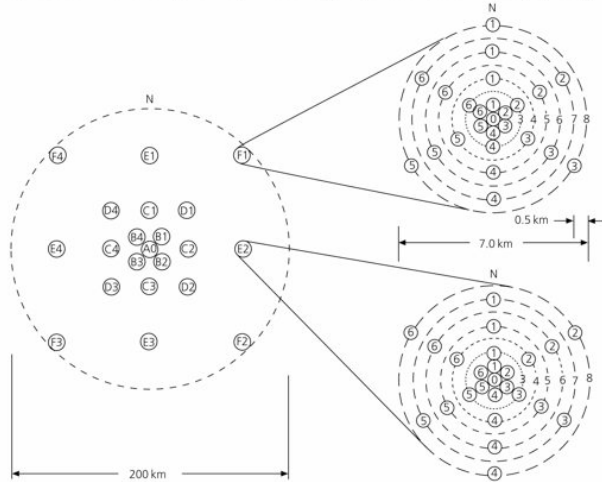
**2002 Mw7.8 Denali Fault earthquake triggering tremor at Parkfield, CA**



**Figure 6.6-16: Station map of the Federation of Digital Broad-Band Seismographic Networks (FDSN).**

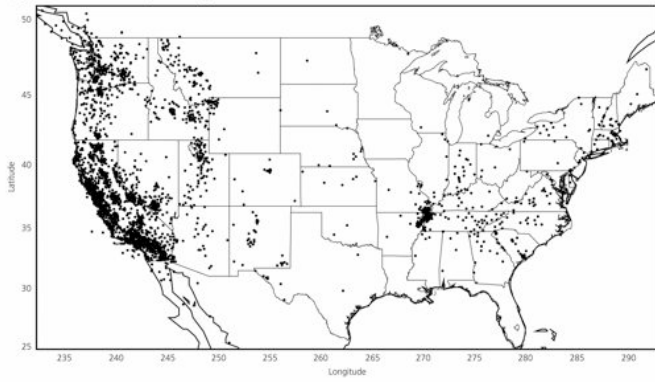


**Figure 6.6-17: Station geometry of the Large Aperture Seismic Array (LASA).**



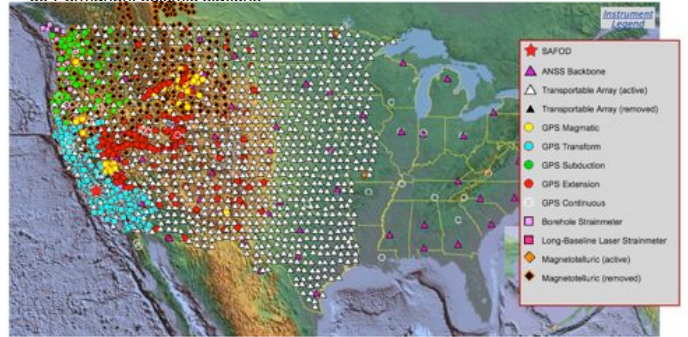
Peng et al. (JGR, 2008)

**Figure 6.6-18: Map of regional network seismometers in the continental USA.**

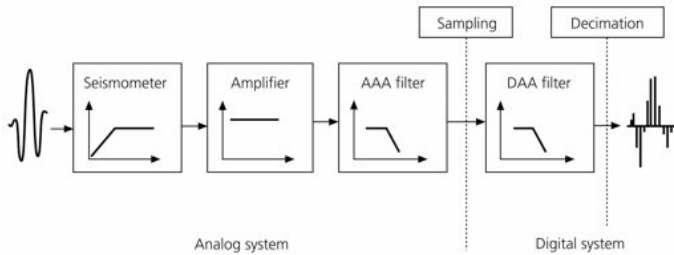


## EarthScope Instrumentation

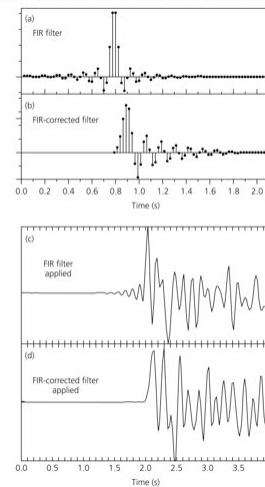
- 3.2 km borehole into the San Andreas Fault
- 875 permanent GPS stations
- 175 borehole strainmeters
- 5 laser strainmeters
- 39 Permanent seismic stations
- 400 transportable seismic stations occupying 2000 sites
- 30 magneto-telluric systems
- 100 campaign GPS stations
- 2400 campaign seismic stations



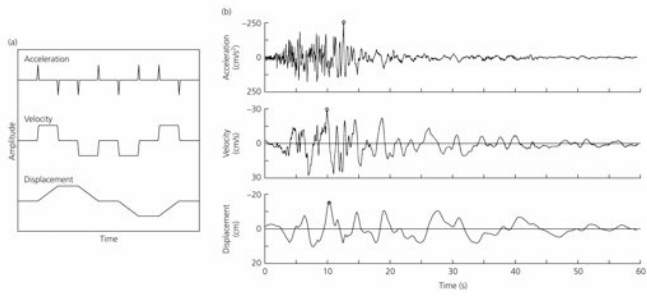
**Figure 6.6-12: Diagram showing the analog-to-digital (ADC) process.**



**Figure 6.6-13: Example of a FIR filter and its effects on a seismogram.**



**Figure 6.6-14: Relation between displacement, velocity, and acceleration in the time domain.**



**Figure 6.6-15: Relation between displacement, velocity, and acceleration in the frequency domain.**

