



10-14 December 2007, Monday-Friday
Moscone West, 800 Howard Street
Moscone South, Howard Street (between 3rd and 4th streets)
San Francisco, CA, USA

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S19: Multiple Wave Scattering Across Length Scales in the Earth

Sponsor: Seismology

CoSponsor: Near Surface Geophysics
SPA-Magnetospheric Physics

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Description: As geophysicists strive to extract more detailed information from the subsurface, waves with shorter and shorter wavelengths need to be understood and interpreted. For Earth heterogeneity on the order of the size of the wavelength, multiple wave scattering must be accounted for to explain the late-arriving seismic coda.

Multiply-scattered waves require new tools for their analysis as well as a different outlook for what questions they can ultimately answer. For instance, information derived from multiply-scattered waves is inherently statistical, giving an idea of the distribution of the Earth's microstructure.

How can we properly synthesize this statistical information with the deterministic information provided by traditional approaches (e.g., tomography) to address relevant questions in earth science?

In the field of seismology, initial progress on the subject of multiple wave scattering was driven in large part by the late Keiiti Aki. The work of Aki and his collaborators introduced the seismological community to the concepts of wave diffusion and radiative transfer, among many other concepts, such as coda Q. These ideas have evolved from the early work and have proven effective for analyzing scattered seismic energy in the mantle, for instance.

Furthermore, recent studies, including some of Aki's final work in volcano seismology, suggest that the wave diffusion picture may not always be correct. Thus, questions surrounding the basic understanding of the physics of coda waves persist.

Other applications of multiply-scattered waves depend on the fact that they sample the subsurface well, by definition. Thus, multiply-scattered waves can be exploited to monitor changes in the subsurface or to extract Green's functions between receivers. Of particular interest is the use of coda waves for Green's function retrieval, since most of the recent examples of this technique have emphasized the use of oceanic microseisms instead of coda waves. This is in spite of the fact that the first demonstrations of Green's function retrieval employed multiply-scattered waves.

This session aims to bring together geoscientists working on wave propagation in heterogeneous media, including -- but not limited to -- volcano and global seismology, high-resolution near surface seismics, ground penetrating radar, and time-domain electromagnetics.