Plenary-13

Imaging Earth's Interior through Noise Interferometry

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Traditional seismic imaging of large-scale structures within Earth's interior is based on observations of surface displacements following earthquakes or human-caused explosions. These methods measure body and surface wave travel times as well as whole waveforms typically following earthquakes. Such measurements are inverted to reveal the isotropic and anisotropic variation of compressional (Vp) and shear (Vs) wave speeds in Earth's crust, mantle, and core that are then interpreted in terms of temperature, composition, and fluid content. The ability of earthquake-based methods to resolve structural features within the Earth degrades during the propagation of the wave over long distances. Over the last decade, a new method known as seismic or wavefield interferometry has revolutionised the approach to image Earth's interior. Here we use ambient seismic noise – seismic waves caused by wind, ocean waves, rock fracturing and anthropogenic activity. Somewhere within its complex wavefield, ambient seismic noise also contains similar information about the Earth's subsurface. Naturally occurring, ambient seismic waves form an ever-present source of energy that is conventionally regarded as unusable since it is not impulsive. As such it is generally removed from seismic data from subsequent analysis. Seismic interferometry can be used to extract useful information about the Earth's subsurface from the ambient noise wave field. The method has an edge over conventional approach because : it does not require any kind of source, provides uniform illumination of the study region , can be used in the region without earthquakes and is highly economical. The lateral and vertical resolution depends on the design of experiment and is controlled. I present here theory and application of the method to image Earth's interior in varied conditions and scale.