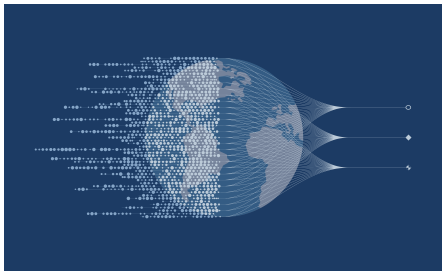

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complex P-wave seismograms from the 28 May 1998 Pakistan explosion

On 28 May 1998, Pakistan detonated its first nuclear explosion. The teleseismic P-waves from this seismic disturbance are complex compared to those typically observed from underground explosions. We observe a spatial correlation between waveform simplicity and take-off angle; with the most simple seismograms being recorded at small take-off angles at the source ($\Delta < 15^{\circ}$) and at stations clustering to the south and southeast of the focal sphere.
The complex P-waves do not seem to be due to source complexity, scattering in the upper mantle and/or crust beneath the receiver or by an aftershock triggered immediately after the explosion. Instead, the most likely mechanisms generating the observed complex waveforms are the geological structures and surface topography in the vicinity of the detonation point.
To model the observations, we couple the global wave-propagation solver AxiSEM3D with an arbitrary three-dimensional solver of choice (in this work we use SW4) and thus embed a heterogeneous three-dimensional domain within a spherically symmetric Earth model around the source. Using these hybrid simulations, we explore the effect of near-source geology and surface topography on the complexity of teleseismic waveforms.

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