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Identifying apparent velocity changes in cross correlated microseism noise data

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Currently there is a strong interest of using cross correlation of ambient noise to retrieve Green's functions. These are usually used to calculate the seismic wave velocity of the subsurface and therefore can be used for subsurface imaging or monitoring of various geological settings where we expect rapid velocity changes (e.g. reservoirs or volcanoes). The assumption of this method is that the wavefields which are correlated must be diffuse. This criterion is fulfilled if the ambient noise sources are uniformly distributed or the scattering in the medium is high enough to mitigate any source directivity. The location of the sources is usually unknown and it can change in time. These temporal and spatial variations of the microseism noise sources may lead to changes in the retrieved Green's functions, and so, to the apparent changes in seismic wave velocities.

To further investigate the apparent changes in Green's functions we undertook an active seismic experiment in Tenerife lasting three months. A small airgun was used as an active source and was shooting repeatedly every 15 minutes. The shots and the microseism noise were recorded at several seismic stations at the same time.
That data set gives us the opportunity to compare the changes in seismic wave velocity recovered through cross correlation of ambient noise and changes we measure through active shots from the airgun. The aim is to distinguish between apparent seismic velocity changes and seismic velocity changes caused by changes in the medium.
We also use the data set to track the direction of the microseism noise sources to see if changes which are only recovered through cross correlation can be related to temporal and spatial variations of the microseism noise sources.