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# Elasticity: Application to Resolve the Stress-Field Orientation from Ambient Seismic Noise

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Crustal rocks containing cracks and other internal flaws are characterized by nonlinear elasticity, a phenomenon that can be observed in laboratory experiments under applied stress. Stress sensitivity of elastic moduli is associated with opening/closing of cracks under applied stress. In this study we emulated rock laboratory protocols by measuring elastic wave speed using empirical Green's functions (probe) at different points of earth tidal strain cycle (pump) in natural pump-probe experiment to infer the orientation of SHmax in the crust, independently from borehole measurement and earthquake mechanisms. We validated the approach using large data set in the Northern Alpine Foreland region where SHmax orientation is well-known. The approach is then applied to the Central Eastern Alps to understand contemporary stress pattern. We confirm that the method can be applied in large scale seismic arrays. For the validation area it resolves NNW-SSW to N-S directed SHmax which agree with conventional methods and recent crustal stress model. Furthermore, our results show rotation of SHmax orientation from NW-SE in the southwest of Central Eastern Alps to N-S in the east of the Central Eastern Alps. The approach can also be applied to nuclear test sites, provided that there are continuous seismic stations in the region.

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## Promotional text

One of the basic properties of a site is the pertaining regional stress. We show that we can infer its orientation using ambient seismic noise (probe) and earth tidal strain (pump) in a natural pump-probe experiment, inspired by laboratory protocols.

## Oral preference format

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