

## Passive Seismic Tomography to Explore for Hydrogen and Helium

Nicholas Arndt<sup>1,2,\*</sup>, Laurent Truche<sup>2</sup>, Frederic Donzé<sup>2</sup>, Pierre Boué<sup>2</sup>, Charles Beard<sup>1,2</sup>, Dan Hollis<sup>1</sup>, Richard Lynch<sup>1</sup>

<sup>1</sup> Sisprobe, Grenoble, France [www.sisprobe.com](http://www.sisprobe.com)

<sup>2</sup> ISTerre, University Grenoble Alpes, Grenoble France

Ambient noise surface-wave tomography is an innovative subsurface imaging technology that is finding diverse applications in civil engineering settings and in the exploration for oil & gas, geothermal energy and mineral resources. The technique uses background seismic vibrations generated by natural and human activity (e.g., ocean waves, freight trains) to image the subsurface to depths of tens of metres to many kilometres. The technique has been successfully demonstrated by geophysicists of the Institute of Earth Sciences (ISTerre) of University Grenoble Alpes and the Grenoble-based company Sisprobe in the framework of PACIFIC, a Horizon 2020 program. For example, at mineral exploration test sites in Canada and Sweden, the technique successfully images the lithologies and structures that focus platinum-palladium mineralisation and directly images iron deposits.

Based on these demonstrations, we propose that ambient noise surface-wave tomography can also be used to image the structures that focus the flow of natural hydrogen and helium from their sources deep in the crust or mantle towards the surface. The technique may also be used to image large granitic and alkaline intrusions that may represent source rocks for these gases.

**Mots-Clés :** passive seismic, exploration, crustal structure

\*Intervenant