

## Controlling seismic waves thanks to transformation optics

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### **Résumé**

This invited lecture is an introduction to the topical subject of transformational optics and geophysics. Applied physicists have used geometric transforms for a long while when dealing with unbounded or thin domains in computational electromagnetism [1]. For instance, so called perfectly matched layers deduced from a geometric transform, which consist of anisotropic heterogeneous and absorptive media, are required to accurately estimate leaky modes in twisted photonic crystal fibres [2]. There are actually countless examples of geometric transforms applied to computational physics, not only in electromagnetics, but also in acoustics, hydrodynamics (for instance the Joukowski transform, which is a conformal map used in airfoil design), and elastodynamics. However, it was only ten years ago that two independent groups of physicists led by Ulf Leonhardt [3] and Sir John Pendry [4] realized that geometric transformations could also have potential applications in metamaterials' engineering, and their proposals of invisibility cloaks [3,4] fuelled the interest in so-called transformational optics [3,4] and platonics [5] until now.

The plan of the lecture is as follows: we will first give an overview of practical realizations of metamaterial invisibility cloaks for microwaves, water waves and sound waves. We will then discuss a preliminary field test of a cloak for seismic waves [6], and on-going research on meta-cities [7] and ancient seismic metamaterials [8].

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