

Abstract: Wave propagation in inhomogeneous media with quasi-Trefftz methods

Prof Lise-Marie Imbert-Gerard

Abstract: Wave propagation in inhomogeneous media with quasi-Trefftz methods

PDE models for wave propagation in inhomogeneous media are relevant for many applications. We will start by introducing two particular applications: waves in plasma for nuclear fusion, and noise propagation around planes, and discuss the corresponding models. Next we will discuss numerical methods tailored for tackling problem governed by these variable-coefficient PDEs.

Trefftz methods rely, in broad terms, on the idea of approximating solutions to Partial Differential Equation (PDEs) via Galerkin methods using basis functions which are exact solutions of the PDE, making explicit use of information about the ambient medium. But wave propagation in inhomogeneous media is modeled by PDEs with variable coefficients, and in general no exact solutions are available.

Quasi-Trefftz methods have been introduced, in the case of the Helmholtz equation with variable coefficients, to address this problem: they rely not on exact solutions to the PDE but instead of high order approximate solutions constructed locally. We will discuss the origin, the construction, and the properties of these so-called quasi-Trefftz functions. We will also discuss the consistency error introduced by this construction process.