

Non-uniform finite element meshes defined by ray dynamics for Helmholtz problems

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The question of how quickly the meshwidth h must decrease with the wavenumber k to maintain accuracy as k increases has been studied since the work of Babuska and Ihlenburg in the 1990s. In particular, the fact that the criterion " hk sufficiently small" (i.e., a constant number of points per wavelength) is not enough to maintain accuracy is the so-called "pollution effect".

Up till now, the (large) body of work quantifying how quickly h must decrease with k has considered uniform meshes, i.e., where h is the same function of k everywhere in the domain.

Here we consider non-uniform meshes, where h is a different function of k in different parts of the domain, where these functions and parts of the domain are specified based on the ray dynamics.

This is joint work with Martin Averseng (Angers) and Jeff Galkowski (University College London).