

Model Reduction for Wave Equations and Its Applications to Inversion

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In high resolution seismic imaging or medical imaging, one deals with models or media with large degrees of freedoms. During the inversion process, the forward problem is solved repeatedly using many different inputs, and this process is prohibitively expensive. In this talk, the speaker will present a new model reduction methodology for wave equations in heterogeneous media. The main idea of the proposed approach is to obtain the important scales among all scales within the solution. In the first step, the speaker will construct local snapshots by solving local problems, and the local snapshots represent some features of the solution. This process is also a way to learn about the effect on the media to the solution. In the next step, the speaker will perform a dimension reduction procedure, and construct the dominant modes within the snapshot space. This is achieved by some carefully designed spectral problems. The resulting generalized multiscale finite element method is able to solve wave equations in heterogeneous media with a good accuracy and a reduced computational cost.