

## **Model reduction of large-scale wave propagation via phase-preconditioned rational Krylov subspaces**

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The computational cost of full wavefield inversion algorithms is dominated by evaluating forward models for multiple source/receiver locations for a given frequency or time interval. Parallelization of multiple sources and frequencies is straightforward; however, classical wavefield solvers are hard to parallelize and scale poorly with respect to the number of spatial unknowns. Model order reduction aims to reduce the computational cost associated with forward solves. In this talk we combine rational Krylov subspaces with asymptotic methods to obtain a projection based model order reduction method that can handle strong scatterers as well as long travel times. The resulting method shifts the computational cost from the poorly scalable forward solvers to the evaluation of large inner products which are embarrassingly parallelizable. We show that incorporating asymptotic methods into a projection based framework relaxes the spatial discretization required and allows sub-Nyquist sampling in the frequency domain.