1145-65-948 **Alexander V Mamonov*** (mamonov@math.uh.edu), **Vladimir Druskin** (vdruskin@gmail.com) and **Mikhail Zaslavsky** (mzaslavsky@slb.com). *Inversion and imaging with acoustic waves via model order reduction.*

We introduce a framework for inversion and imaging with acoustic waves based on model order reduction. The reduced order model (ROM) is an orthogonal projection of the wave equation propagator on the subspace of discretely sampled time domain wavefield snapshots. It can be computed entirely from the measured waveform data using block Cholesky factorization. The use of the ROM is twofold.

First, the ROM can be used as a nonlinear "preconditioner" for full waveform inversion (FWI). Instead of conventional minimization of the least squares data misfit we propose to minimize the ROM misfit. Such objective is more convex and thus optimization is much less prone to common issues like getting stuck in local minima (cycle skipping), multiple reflection artifacts, slow convergence, etc.

Second, if a background kinematic model is available, the projected propagator can be backprojected to obtain an image of sound speed discontinuities. The ROM computation implicitly orthogonalizes the wavefield snapshots. This nonlinear procedure differentiates our approach from the conventional linear migration methods (Kirchhoff, RTM). It allows to resolve the nonlinear interactions between reflectors. Consecutively, the resulting image is almost entirely free of multiple reflection artifacts. (Received September 17, 2018)