A hybrid multigrid-domain decomposition method for the Helmholtz equation

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Fast Helmholtz solvers are of interest in forward and inverse modelling problems, like for example those from exploration seismology. In such computations often the same equation is solved for many right hand sides. Recently the author and others have developed double sweep domain decomposition methods that lead to a (near-) linear cost per solve. So far those methods appear quite memory intensive. In this talk we will address this using a second recent innovation, the dispersion optimised multigrid method. In this method the number of grid points in the coarse grid is reduced to a number close to the Nyquist limit for the oscillatory solutions, while retaining small iteration numbers for convergence to the solution. The combined method, the double-sweep multigrid method, leads to a substantial reduction of the memory use and the computational cost compared to the individual methods.