Recent methods for solving the high-frequency Helmholtz equation on a regular mesh
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In this talk I will discuss a recently developed finite difference discretisation of the Helmholtz equation and some solution methods for the linear systems obtained. In high-frequency Helmholtz problems, pollution errors due to numerical dispersion are a main source of error. We will show that such errors can be strongly reduced compared to other schemes, including high-order finite elements, by selecting coefficients for the discrete system that maximise the accuracy of geometrical optics phases and amplitudes. Such low dispersion schemes are of interest by themselves, but can also be used to improve the efficiency of multigrid schemes. Computation times for a solver combining a multigrid method with domain decomposition compare well to those of alternative methods.