Homogenization Approach to Linear Problems on High-Frequency Waves in Nonperiodic Media with Rapidly Varying Characteristics

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Homogenization is a broad term covering a variety of methods for reducing the solution of equations with rapidly varying coefficients to the solution of those with slowly varying ones. A vast majority of these methods are devised for equations with coefficients periodic in the fast variables (e.g., equations describing periodic media) and hence do not apply to problems like those on the propagation of long waves in the ocean, where there is no reason to assume that the coefficients are periodic in the fast variables or even that the separation of slow and fast variables makes any sense. One possible homogenization method recently developed for dealing with such problems uses local averaging by convolution with certain delta-like kernels, one of the main requirements being that the coefficients of the equation belong to some algebra of locally averageable functions (i.e., rapidly oscillating functions whose averaging is slowly varying). While averageability is easy to verify in practice, belonging to such an algebra is certainly not (even though this assumption is very convenient when constructing the general theory). In specific examples, however, the latter assumption is superfluous, because we only need some products of coefficients and their derivatives, rather than all possible ones, to be averageable. In the talk, we focus on a specific class of equations and present weaker assumptions (admitting practical verification) under which homogenization in this class of equations proves to be possible.

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