Stochastic Homogenization on Randomly Perforated Domains

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We study the existence of uniformly bounded extension and trace operators for $W^{1,p}$-functions on randomly perforated domains, where the geometry is assumed to be stationary ergodic. Such extension and trace operators are important for compactness in stochastic homogenization. In contrast to former approaches and results, we use very weak assumptions on the geometry which we call local (δ, M)-regularity, isotropic cone mixing and bounded average connectivity. The first concept measures local Lipschitz regularity of the domain while the second measures the mesoscopic distribution of void space. The third is the most tricky part and measures the "mesoscopic" connectivity of the geometry. In contrast to former approaches we do not require a minimal distance between the inclusions and we allow for globally unbounded Lipschitz constants and percolating holes. We will illustrate our method by applying it to the Boolean model based on a Poisson point process.