Title: Stochastic homogenization of high contrast media

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Abstract: We study the homogenisation problem for a divergence type operator A_ε with high-contrast random coefficients. In particular, we are interested in the behaviour of their spectra. We assume that on one of the components (referred to as "stiff"), of the composite described by the operator, the coefficients are "of order one", and on the complementary "soft" component, consisting of randomly distributed inclusions of size ε, the coefficients are of order ε^2, $\varepsilon << 1$.

Our interest in high-contrast homogenisation problems is motivated by the band-gap structure of their spectra. From a mathematically rigorous perspective, these were first analysed in [Zhikov 2000, 2004] for the case of periodic coefficients. It was shown that for both the bounded domain and the whole space settings the spectra of the operators converge in the sense of Hausdorff to the spectrum of a certain homogenised two-scale operator A_{hom}. In the stochastic setting we also consider the case of bounded and unbounded domain that show different behavior. Bounded domain can be analyzed by stochastic two-scale convergence and similarly like in the periodic case the spectra of ε problems converge in the sense of Hausdorff to the spectrum of certain limit operator A_{hom}. In the whole space setting the spectrum of A_{hom} is, in general, a proper subset of the limit set of the spectra of A_ε, which we rigorously describe. This is a joint work with M. Cherdantsev (University of Cardiff) and K. Cherednichenko (University of Bath)