A spectral method for the stochastic Stokes equations on the sphere

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Abstract

We construct numerical solutions to a stochastic Stokes equation on the unit sphere with additive isotropic noise. The noise is expanded in a Karhunen-Loève expansion in terms of the Hodge decomposition of tangential vector fields on the sphere. The approximation of the noise will give rise to a high dimensional approximation problem. Under certain assumptions on the angular power spectrums of the random noise, a mean square error estimate of the random solution is given. Numerical experiments are carried out to illustrate the theory.