Stochastic Stokes equations on the unit sphere

We construct numerical solutions to stochastic Stokes equations on the unit sphere with additive noise. The noise is expanded in a Karhunen–Lo\'{e}ve 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 spectrum of the random noise, a mean square error estimate of
the random solution is given. Numerical experiments are carried out to illustrate the theory.