SPDEs on the sphere

We introduce three models of stochastic fields generated by partial differential equations on the unit sphere. Then we concentrate on one of these models determined by a hyperbolic diffusion equation and study the Cauchy problem with random initial conditions. The exact solution in terms of a series expansion is given. An approximation to the solution is provided and analysed by finitely truncating the series expansion. The upper bounds for the convergence rates of the approximation errors are derived. Smoothness properties of the solution and its approximation are investigated. It is demonstrated that the sample Holder continuity of these spherical fields is related to the decay of the angular power spectrum. Numerical studies of approximations to the solution and applications to real data are presented to illustrate the theoretical results.

The presentation is based on recent joint results with P.Broadbridge, A.D.Kolesnik and N.Leonenko.