Stochastic quantization of the spherical model and supersymmetry.
Stochastic Quantization of the Spherical Model and Supersymmetry

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In this work, we reported some results about the stochastic quantization of the spherical model. We started by reviewing some basic aspects of this method with emphasis in the connection between the Langevin equation and the supersymmetric quantum mechanics, aiming at the application of the corresponding connection to the spherical model. An intuitive idea is that when applied to the spherical model this gives rise to a supersymmetric version that is identified with one studied in Phys. Rev. E 85, 061109, (2012). Before investigating in detail this aspect, we studied the stochastic quantization of the mean spherical model that is simpler to implement than the one with the strict constraint. We also highlight some points concerning more traditional methods discussed in the literature like canonical and path integral quantization. To produce a supersymmetric version, grounded in the Nicolai map, we investigated the stochastic quantization of the strict spherical model. We showed in fact that the result of this process is an off-shell supersymmetric extension of the quantum spherical model (with the precise supersymmetric constraint structure). That analysis establishes a connection between the classical model and its supersymmetric quantum counterpart. The supersymmetric version in this way constructed is a more natural one and gives further support and motivations to investigate similar connections in other models of the literature.