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# Recent Developments In Stochastic Singular Perturbation Theory

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Singular perturbation theory has long played an important role in applied analysis and is the appropriate setting for the study of physical systems exhibiting multiple spatial and temporal scales. In particular, many models in geophysical fluid dynamics may be investigated in this framework. Given the ubiquity of stochastic elements in geophysical systems, the development of unified mathematical tools to deal with randomly driven perturbation systems will be useful for future work in the analysis of climate models.

Among the perturbation methods that may be employed to address the problem of time-scale separation, we present here some recent mathematical and numerical developments based on the renormalization group technique of Chen Goldenfeld and Oono which we have adapted to the stochastic context. In the first part of the work, we consider some analytical and numerical results for finite time intervals based partially on previous joint work between NGH and M. Ziane. The second part of the talk addresses the problem asymptotic validity within the framework of Random Dynamical System (RDS) as developed by L. Arnold and his Bremen group.