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Deterministic Behaviour in Stochastic Collective Hamiltonian Systems

We consider stochastic perturbations of Hamiltonian systems by noise arising from collective Hamiltonians. We show that these perturbations typically preserve many symmetry-related features of the deterministic system even though the stochastic differential equations governing the dynamics are not symmetric in general. When the deterministic Hamiltonian is symmetric under a free, proper and canonical Lie group action, we show that the projection of a solution of the stochastic system onto the reduced space evolves deterministically. This is joint work with Tanya Schmah (University of Ottawa) and Cristina Stoica (Wilfrid Laurier University).