

# Structure-preserving Runge-Kutta methods for Stochastic Hamiltonian equations with additive noise

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## Abstract

There has been considerable recent work on the development of energy conserving one-step methods that are not symplectic. Here we extend these ideas to stochastic Hamiltonian problems with additive noise and show that there are classes of Runge-Kutta methods that are very effective in preserving the expectation of the Hamiltonian, but care has to be taken in how the Wiener increments are sampled at each timestep. Some numerical simulations illustrate the performance of these methods.

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