

Volume-preserving exponential integrators

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This talk is about the volume-preserving property of exponential integrators in different vector fields. We derive a necessary and sufficient condition of volume preservation for exponential integrators, and with this condition, volume-preserving exponential integrators are analysed in detail for four kinds of vector fields. It turns out that symplectic exponential integrators can be volume preserving for a much larger class of vector fields than Hamiltonian systems. On the basis of the analysis, novel volume-preserving exponential integrators are derived for solving highly oscillatory second-order systems and extended RKN integrators of volume preservation are presented for separable partitioned systems. Moreover, the volume preservation of RKN methods is also discussed.