Faster than Lyapunov decays of classical Loschmidt echo

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We show that in the classical interaction picture the echo-dynamics, namely the composition of perturbed forward and unperturbed backward hamiltonian evolution, can be treated as a time-dependent hamiltonian system. For strongly chaotic (Anosov) systems we derive a cascade of exponential decays for the classical Loschmidt echo, starting with the leading Lyapunov exponent, followed by a sum of two largest exponents, etc. In the loxodromic case a decay starts with the rate given as twice the largest Lyapunov exponent. For a class of perturbations of symplectic maps the echo-dynamics exhibits a drift resulting in a super-exponential decay of the Loschmidt echo.

References

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