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Linear response of the Lyapunov exponent to small external perturbations

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We present a new approach to predict the response of the largest Lyapunov exponent of a dynamical system to small external perturbations of different types. The connection between the external perturbation and the change in the largest Lyapunov exponent is approximately represented through the corresponding response operator, computed for the original unperturbed system. The theory for the response operator of the largest Lyapunov exponent is based on the well-known Fluctuation-Dissipation theorem. We also compute the response prediction for a simple model of chaotic nonlinear dynamics, and compare it against the actual response of the largest Lyapunov exponent computed by directly perturbing the system, for a simple constant forcing perturbation.