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Valerio Lucarini* (valerio.lucarini@zmaw.de), Klimacampus, University of Hamburg, Grindelberg 5, 20144 Hamburg, Hamburg, Germany. *Stochastic perturbations to dynamical systems: a response theory approach.*

We study the impact of stochastic perturbations to deterministic dynamical systems using the formalism of the Ruelle response theory. We find the expression for the change in the expectation value of a general observable when a white noise forcing is introduced in the system. The difference between the expectation value of the power spectrum of an observable in the stochastically perturbed case and of the same observable in the unperturbed case is equal to the variance of the noise times the square of the modulus of the corresponding susceptibility. We then extend our results to rather general patterns of random forcing, up to the case of a space-time random field. As a general result, we find, using an argument of positive-definiteness, that the power spectrum of the stochastically perturbed system is larger at all frequencies than the power spectrum of the unperturbed system. We provide an example of application of our results by considering the Lorenz 96 model. These results clarify the property of stochastic stability of SRB measures in Axiom A flows, provide tools for analysing stochastic parameterisations and related closure ansatz to be implemented in modelling studies. (Received September 22, 2011)