



## **Linear response for slow variables of deterministic or stochastic dynamics with time scale separation**

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Many real-world numerical models are notorious for the time-scale separation of different subsets of variables and the inclusion of random processes. The existing algorithms of linear response to external forcing are vulnerable to the time scale separation due to increased response errors at fast scales. Here we develop a linear response algorithm for slow variables in a multiscale deterministic or stochastic dynamical system, which has improved numerical stability and reduced computational expense.