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Data-driven modeling of chaotic flows with non-Gaussian statistics HASSAN ARBABI, THEMISTOKLIS SAPSIS, Massachusetts Institute of Technology — We present a data-driven framework for modeling chaotic flows in the form of linear stochastic differential equations (SDEs) observed under a nonlinear map. We discover the nonlinear map using the theory of optimal transport for measures, and identify the system of SDEs by matching the spectral density of the optimally transported data. The inclusion of the nonlinear observation map allows us to build models of chaotic systems with moderate dimensions (e.g. 10 and more) that capture non-Gaussian features of the invariant measure including skewness and heavy tails. We demonstrate the application of our framework through a few examples including a high-Reynolds cavity flow and observational climate data.

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