Abstract Submitted for the DFD16 Meeting of The American Physical Society

Evaluating the accuracy of the dynamic mode decomposition¹ HAO ZHANG, SCOTT DAWSON, CLARENCE ROWLEY, Princeton University, ERIC DEEM, LOUIS CATTAFESTA, Florida State University — Dynamic mode decomposition (DMD) is a practical way to extract dynamic information about a fluid flow directly from data. As a data-driven method, DMD can suffer from error, which can be difficult to quantify without knowledge of an exact solution, free from noise or external disturbances. Here we propose an evaluation metric for the accuracy of DMD results (eigenvalues, modes, and eigenfunctions), by exploiting a connection between DMD and the Koopman operator, a linear operator acting on functions of the flow state. In particular, a DMD mode is considered "accurate" if the corresponding eigenfunction closely approximates a Koopman eigenfunction. With this definition, we can assess the accuracy of any individual DMD mode directly from data, without requiring the direct calculation of the Koopman operator. We demonstrate the use of this criterion with a range of examples including synthetic, numerical, and experimental data.

¹Supported by AFOSR grant FA9550-14-1-0289

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Date submitted: 01 Aug 2016

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