Abstract Submitted
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Koopman analysis of vortex dynamics[1] KE-CHU LEE, SAM KAUFMAN-MARTIN, SAMANEH SADRI, POORVA SHUKLA, IGOR MEZI, PAOLO LUZZATTO-FEGIZ, University of California, Santa Barbara — Vortex dynamics plays an important role in transitional and turbulent flows, where instabilities play a fundamental role. Instabilities are usually understood through the lens of linear stability analysis (LSA), which is centered around equilibria. However, one often needs to understand dynamics starting from an unsteady flow field, found from simulation or experiment. Here we explore the ability of Koopman mode decomposition (KMD) to provide such an analysis. We examine the dynamics of like-signed vortex pairs with different initial area ratios. We find that KMD reliably detects the distinctive phases of vortex merger. We quantify the eigenvalues as a function of flow geometry, and compare eigenvalues and eigenmodes from KMD to those from LSA. These results suggest a path forward towards using KMD for data-driven modeling of vortex flows.

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