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**Effects of small noise on the DMD/Koopman spectrum**[1] SHERVIN BAGHERI, Linne Flow Centre, KTH Mechanics, Stockholm — Koopman modes and Dynamic Mode Decomposition (DMD) have quickly become popular tools for extracting coherent structures associated with different frequencies from both (nonlinear) numerical and experimental flows. It is often expected (see Rowley et al, JFM, vol 641, 2009) that all the eigenvalues have zero growth rate (e.g. that they are located on the unit circle). However, in practice parabolic shapes and branches are observed in nearly all DMD spectra, and it is often the case that the tails of the parabolas are sensitive to the quality of the data set. In this talk, we provide a theoretical explanation for this parabolic form of the spectrum, and show that it arises due to the presence of noise. We show analytically that the presence of noise induces a damping on the eigenvalues, which increases quadratically with the frequency, and linearly with the non-normality of the linearized (Floquet) system. Thus the location of Koopman eigenvalues in the complex plane varies depending on the amount of noise in the environment, and one cannot expect any variant of the Dynamic Mode Decomposition algorithm to be fully robust to noise.

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