Contribution ID: **102** Type: **Poster**

Analyzing the Transition to Buffeting of a 2D Airfoil using the Dynamic Mode Decomposition

Monday, July 27, 2020 7:30 PM (1 hour)

The Dynamic Mode Decomposition (DMD) algorithm was first introduced in the fluid mechanics community for analyzing the behavior of nonlinear systems. DMD processes empirical data and produces approximations of eigenvalues and eigenvectors ("DMD modes") of the linear Koopman operator that represents the nonlinear dynamics. In fluid dynamics, this approach has been used to both analyze constituent flow patterns in complex flows, and to design control and sensing strategies. In this work, we focus on predicting the transition to buffeting of a 2D airfoil in a transonic regime. Buffeting is a vibration that occurs as the angle-of-attack increases and the interactions between the shock and flow separation induce limit-cycle oscillations. We demonstrate that this bifurcation can be predicted by tracking the eigenvalue with the greatest real part across a range of parameter values α, which is the airfoil's angle. We evaluate the performance of our approach on a synthetic Hopf-bifurcation flow and both pseudo-time simulations of a standard 2D airfoil. As part of the next stage of this research analysis for the time-resolved simulations of a standard 2D airfoil is carried out.

Primary author: Mr DIAS, Sathsara (Clarkson University)

Co-authors: Dr BUDIŠIC, Marko; Dr PIPERNI, Pat; Dr HELENBROOK, Brian

Presenter: Mr DIAS, Sathsara (Clarkson University)

Session Classification: Posters 1