Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Dynamic Mode Decomposition Bio-Markers for Left Ventricle Flow MARIA BORJA, MAE Department, UC San Diego, La Jolla 92093 CA, PABLO MARTINEZ-LEGAZPI, YOLANDA BENITO, RAQUEL YOTTI, FRANCISCO FERNANDEZ-AVILES, JAVIER BERMEJO, Hospital Gregorio Maranon, Madrid 28040, Spain, JUAN C. DEL ALAMO, MAE Department, UC San Diego, La Jolla 92093 CA — Dynamic mode decomposition (DMD) is a tool used in the fluid community to extract a set of modes that describe the underling fluid dynamics in a set of flow fields generated experimentally or by numerical simulations. Despite advances in medical imaging, characterization of some cardiac dysfunctions has remained a challenge and diagnosis is often subjective. This study presents a novel DMD method to objectively characterize left ventricular (LV) flow in healthy volunteers and patients with dilated cardiomyopathy (DCM) and hypertrophic cardiomyopathy (HCM). Our approach is based on assessing temporal evolution dependent mode structures from two-dimensional velocity fields, obtained experimentally using echocardiographic color Doppler velocimetry, and defined with a common unit normal moving LV coordinate system. Using the mode structures as a basis, we reconstruct the flow field, determine the key contributing modes, and obtain a reduce order model. Using 20 healthy volunteers, 20 DCM patients and 20 HCM patients, our results show quantitative and qualitative differences between healthy and in the DCM and HCM patients. This study suggests that temporal evolution dependent modes can be used as bio-markers to asses in-vivo LV flow.

Maria Borja
MAE Department, UC San Diego, La Jolla 92093 CA

Date submitted: 03 Aug 2016 Electronic form version 1.4