Global Model Reduction for Fluid-Structure Interaction in Flapping Flexible Wings[1] MINGJUN WEI, TAO YANG, New Mexico State University — Reduced-order models (ROMs) for fully-coupled fluid-structure interaction problems are desired in many applications (e.g. design of flapping-wing Micro Air Vehicles). Traditional approach is to build ROMs individually for fluid and solid and couple them through the interface. In this work, we suggest an approach to apply model reduction globally on a uniform description of fluid and solid in Eulerian framework. The idea has been made possible by a set of combined fluid-structue equations, where solid properties are presented as extra terms to Navier-Stokes equations. Then, typical Proper Orthogonal Decomposition (POD)/Galerkin projection can be used for model reduction as in most fluid-only problems, with special care of the extra "solid" terms. In the example, we show that one can capture most energy by only a few POD modes. More importantly, the leading POD modes show the signatures of both fluid flow and solid structure.

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