A Simple POD-Galerkin Model Based on Computational or Experimental Data of Flows with Moving Boundaries MINGJUN WEI, BOLUN XU, HAOTIAN GAO, Kansas State University, JOHN HRYNUK, Army Research Lab — POD-Galerkin projection has been popular as a systematical approach for model order reduction of a complex dynamic system such as a fluid flow described by Navier-Stokes equations. However, the classical POD-Galerkin projection is derived only in a fixed domain, which limits its application on many fluid-structure interaction problems featuring moving boundaries or morphing domains. We have developed a simple modification to allow an easy implementation accounting for structural effects to extend the application of POD-Galerkin projection to a broad range of flows with moving boundaries. Recently, the modified approach was further improved to achieve better accuracy near the moving solid boundaries. The improved approach has been applied not only to direct numerical simulation data but also to experimental data. The experimental data includes the PIV measurement of the flow field for a rotating ellipse with incoming flow in a closed-loop wind tunnel.

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