4D-Var identification of POD Reduced-Order Models[1] LAURENT CORDIER, GILLES TISSOT, BERND R. NOACK, Institute PPRIME, France — A reduced-order modelling (ROM) strategy is crucial to achieve model-based control in a wide class of flow configurations. In turbulence, ROMs are mostly derived by Galerkin projection of first principles equations onto the proper orthogonal decomposition (POD) modes. These POD ROMs are known to be relatively fragile when used for control design. In this communication, a four-dimensional variational assimilation approach (4D-Var) is used to identify the coefficients of the POD ROM. Essentially, data assimilation combines imperfect observations, a background solution and the underlying dynamical principles governing the system under observation to determine an optimal estimation of the true state of the system. The methodology will be illustrated for a cylinder wake flow on two datasets of increasing dynamical complexity: i) a DNS at $Re = 200$, and ii) PIV measurements at about $Re = 40000$.

Laurent Cordier
Institute PPRIME, France

Date submitted: 13 Aug 2012   Electronic form version 1.4