Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Galerkin POD Model Closure with Triadic Interactions by the Maximum Entropy Method[1] NICOLAS HÉROUARD, School of Engineering and Information Technology, The University of New South Wales, Northcott Drive, Canberra, ACT, 2600., ROBERT K. NIVEN, School of Engineering and Information Technology, The University of New South Wales, Northcott Drive, Canberra, ACT, 2600, Australia., BERND R. NOACK, LIMSI, CNRS, Paris, France., MARKUS W. ABEL, Ambrosys GmbH, Institute for Physics and Astrophysics, Potsdam University, Potsdam, Germany., MICHAEL SCHLEGEL, Institut für Strömungsmechanik und Technische Akustik, Technische Universität Berlin, Berlin, Germany — The maximum entropy method of Jaynes provides a method to infer the expected or most probable state of a system, by maximizing the relative entropy subject to physical constraints such as conservation of mass, energy and power. A maximum entropy closure for reduced-order models of fluid flows based on principal orthogonal decomposition (POD) is developed, to infer the probability density function for the POD modal amplitudes. This closure takes into account energy transfers by triadic interactions between modes, by extension of a theoretical model of these interactions in incompressible flow (Noack et al, JNET, 2008). The framework is applied to several incompressible flow systems including the cylinder wake, both at low and high Reynolds number (oscillatory and turbulent flow conditions), with important implications for the triadic structure and power balance (energy cascade) in the system.

[1]Australian Research Council Discovery Projects grant DP140104402

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Date submitted: 03 Aug 2016 Electronic form version 1.4