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Spectral POD analysis of low Reynolds flow past finite cylinders MATTEO CHIATTO, Department of Industrial Engineering, Universita' di Napoli Federico II, Italy, CAROLINE CARDINALE, JESSICA K. SHANG, Department of Mechanical Engineering, University of Rochester, NY, USA, LUIGI DE LUCA, Department of Industrial Engineering, Universita' di Napoli Federico II, Italy, FRANCESCO GRASSO, DynFluid Laboratory, CNAM-Arts et Metiers ParisTech, France — The need to understand the physics and to control a flow field has led scientists to develop techniques suitable for characterizing the dynamics and the topology of the flow based on simplified equations, and by exploiting experimental and/or numerical data. Major analysis techniques include POD, DMD, Spectral POD (SPOD; Towne et al. JFM 2018, 847). SPOD has the ability to represent structures evolving coherently in space and time, and it is here applied to study the flow past finite oblique cylinders. The study is aimed at investigating shedding regimes at various low Reynolds numbers. The wake behind the cylinder is experimentally investigated by means of a digital visualization technique described by Shang et al. (JFM 2018, 837). The major results consist in extracting the wake dynamics and identifying the eigen-directions associated with the most energetic structures. The wake field is reconstructed by considering just the few selected modes. Such a low dimensional decomposition is able to capture the dominant shedding modes, by comparing both image reconstruction and quantitative shedding Strouhal numbers to previous temporal Fourier transform analysis, at various Reynolds numbers.

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