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Dynamic modeling of a turbulent axisymmetric bluff-body wake GEORGIOS RIGAS, AIMEE MORGANS, JONATHAN MORRISON, Imperial College London — En route to chaos the stable laminar wake past axisymmetric bluff bodies undergoes two well-documented transitions by increasing the Reynolds number: a steady bifurcation of the m = 1 azimuthal mode followed by an unsteady bifurcation with  $m = \pm 1$ , the latter giving rise to periodic shedding of vortices with opposite signs, known as vortex shedding. In this study we present experimental evidence that these structures persist far from the critical points at high Reynolds numbers  $(Re = 2 \times 10^5)$ . We show that a low-order model based on the normal form describing the codimension-two bifurcation captures accurately the dynamic behavior of the large-scale coherent structures associated with the destabilized modes, if noise is appropriately accounted for in the model. The model is validated based on simultaneous aerodynamic force measurements on the base of an axisymmetric bullet-shaped body and Time-Resolved Stereo PIV in the near wake. Finally, we extend the model to include external forcing when periodic blowing and suction is applied at the base below the point of separation.

> Georgios Rigas Imperial College London

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