Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Bifurcations beneath the bluff body instability modes AMALENDU SAU, Gyeongsang National University — A new family of Hopf bifurcations is detected in a cylinder wake. Besides widely known streamwise bifurcations, our study reveals a new route to wake transition via cross-stream flow undulations and a class of previously unknown spanwise bifurcations along von Karman vortex cores; leading to an improved understanding of wake transformation and the transitional flow physics. It shows, alternate vortex shedding generates significant cross-stream momentum transfer, which facilitates self-sustained spanwise wake oscillation and growth of sequence of bifurcations along Karman corelines. The study shows how spanwise oscillation of pressure/velocity/KE keep growing with Re, and influence onset of "Mode A" and "Mode B" instabilities. It reports two distinct stages of wake undulation for $125 \leq Re \leq 240$. While weakly subcritical periodic-oscillation of pressure/velocity/vorticity along Karman corelines and the uniform/wider length-scale bifurcations dominate during "Mode A" instability, the transition to "Mode B' is prompted following eruption/swapping of significantly smaller variable length-scale bifurcations, and the spanwise flow irregularity. Onset of a secondary frequency in the flow appeared crucial for transition to "Mode B."

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Date submitted: 22 Jul 2015 Electronic form version 1.4