

Abstract Submitted
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Three-dimensional Instability in the Wake of an Angulated Cylinder¹ KYUNG-SOO YANG, CHOON-BUM CHOI, Inha University — Floquet stability analysis has been carried out to detect the onset of 3D instability in the laminar flow past a 2D angulated cylinder. The shape of the cylinder cross-section considered here includes a normal flat plate up to a square cylinder as the aspect ratio (AR) varies. As AR decreases, mode B and mode QP vanish and mode A2 and mode QP2 emerge. These modes were not observed in the case of flow past a square cylinder. In a finite range of AR , mode A instability becomes unstable and then returns to be stable again as Re increases. This distinctive phenomenon can be identified by a closed curve in the neutral stability diagram. Three-dimensional simulations of some selected cases were performed for validation, showing good agreement with the current Floquet stability analysis. We also present contours of the streamwise vorticity component obtained from the Floquet analysis, and Q contours based on the DNS to elucidate the 3D vortical structures of the 3D modes. Our results shed light on a complete understanding of the onset of 3D instability in the presence of an angulated cylinder

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Kyung Yang
Inha University

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