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Stabilization of flow past a rounded cylinder[1] RAVI SAMTANEY, WEI ZHANG, King Abdullah University of Science and Technology — We perform global linear stability analysis on low-Re flow past a rounded cylinder. The cylinder corners are rounded with a radius R, normalized as $R^+ = R/D$ where D is the cylinder diameter, and its effect on the flow stability characteristics is investigated. We compute the critical Reynolds number (Re_{cr}) for the onset of first instability, and quantify the perturbation growth rate for the super-critical flows. It is found that *the flow can be stabilized by partially rounding the cylinder*. Compared with the square and circular cylinders, the partially rounded cylinder has a higher Re_{cr}, attaining a maximum at around $R^+ = 0.30$, and the perturbation growth rate of the super-critical flows is reduced for $Re \leq 100$. We perform sensitivity analysis to explore the source of the stabilization. The growth rate sensitivity to base flow modification has two different spatial structures: the growth rate is sensitive to the wake backflow in a large region for square-like cylinders ($R^+ \to 0.00$), while only the near-wake backflow is crucial for circular-like cylinders ($R^+ \to 0.50$). The stability analysis results are also verified with those of the direct simulations and very good agreement is achieved.

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