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3D Flow Transition Behind a Heated Cylinder

Maosheng Ren, **Camilo C.M. Rindt**, Anton A. van Steenhoven

Eindhoven University of Technology, the Netherlands

In the present study the 3D transition behind a **heated** cylinder subjected to a horizontal cross-flow is investigated at low Reynolds numbers: $Re = O(100)$. For a Richardson number $Ri \geq 1.0$, the 3D transition manifests itself in the form of escaping thermal plumes, which have a spanwise distance of around 2d (d is the cylinder diameter). To understand the flow structures observed from the experiments, Spectral Element calculations are carried out, providing more detailed insight into the occurrence of the 3D transition. For $Re = 85$ and $Ri = 1.0$, pairs of counter-rotating vortices appear close behind the cylinder. The counter-rotating vortices also have a spanwise distance of around 2d. A detailed study on the origin and evolution of the counter-rotating vortices in the near wake and the thermal plumes in the far wake will contribute to a better understanding of 3D transition behind heated bluff bodies.

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