

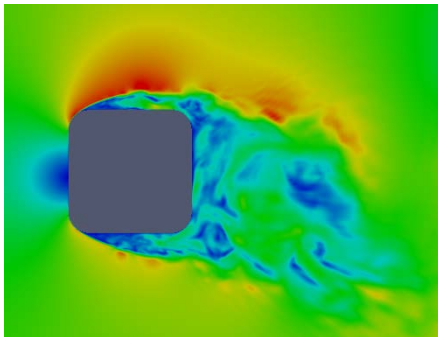
LES study of very-high-Re flow past a square cylinder with rounded corners

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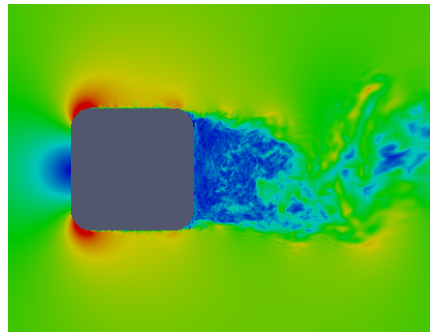
Background: Square cylinders are the commonly simplified shapes of high-rise buildings. Square cylinders with sharp corners are often regarded to be independent of Reynolds number. But the flow information of square cylinders with rounded corners at very high Re close to reality is unknown, which definitely impose the safety uncertainty to the prediction of aerodynamic forces on structures.

Objectives: To investigate Reynolds-number effects of flows past a square cylinder with rounded corners from $Re=O(10^4)$ to $O(10^6)$

Results: Strong Re effects are found in aerodynamic characteristics of this configuration. In particular, the flow separates completely from the frontal corner at the subcritical Re. However, the free stream flows along the cross section of the cylinder, and eventually separates from the leeward corners at the supercritical Re. A turbulent boundary layer is developing on the side faces.



Subcritical



Supercritical

Computer: SX-ACE
Vector ratio: 99%
Memory used: 60 GB
Parallel: 1 node