

Vortex Dynamics in the Sphere Wake at Moderate Re

Paul V. Matyushin, Valentin A. Gushchin

ICAD RAS, Moscow, Russia

For the investigation of the formation mechanisms of vortices in the sphere wake for different fluid flow regimes (for $270 < Re < 3000$) the direct numerical simulation and the Hussain's $-\lambda_2$ vortex-eduction technique have been used. Two different types of the formation mechanisms of vortices for $270 < Re < 400$ and for $Re > 400$ are demonstrated. For $270 < Re < 400$ a periodical separation of the hairpin-shaped vortices is observed only from one edge of the cylindrical shear layer (surrounding the recirculating zone of the sphere wake) and the time-average lift/side and torque moment coefficients are not equal to zero. For $Re > 400$ the periodical separation of the hairpin-shaped vortices is observed from opposite edges of the shear layer alternatively and the time-average lift/side and torque moment coefficients are equal to zero. In addition the regular and irregular rotation of the cylindrical shear layer are observed for $360 < Re < 400$ and for $Re > 600$ correspondingly. All stages of the extraction of the hairpin-shaped vortices from the recirculating zone of the wake are shown in detail.

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