

Hassanzadeh, Rahim; Sahin, Besir; Ozgoren, Muammer

Numerical investigation of flow structures around a sphere. (English) Zbl 1271.76131
Int. J. Comput. Fluid Dyn. 25, No. 6-10, 535-545 (2011).

Summary: A numerical investigation of flow around a sphere is performed and compared with previous studies. Here, a second-order accurate, finite volume method is used in order to predict the instantaneous and time-averaged flow characteristics using large eddy simulation (LES) on the multi-block grid system. Namely, the objectives of this article are: (i) the presentation of flow structures in the wake region downstream of the sphere with a wide variety of flow properties such as the distribution of velocity vectors, patterns of streamlines, Reynolds stress correlations, root mean square of velocity components and other time-averaged flow data in order to reveal the vortical flow structures in detail and (ii) to demonstrate the abilities of computational methods in simulation of vortical flow data. Finally, it has been concluded that there are good agreements between the experimental results and numerical predictions.

MSC:

76F65 Direct numerical and large eddy simulation of turbulence
76D05 Navier-Stokes equations for incompressible viscous fluids
76M12 Finite volume methods applied to problems in fluid mechanics

Cited in **2** Documents

Keywords:

[finite volume method](#); [large eddy simulation](#); [sphere](#); [turbulence](#); [vortical flow](#); [wake flow](#)

Full Text: [DOI](#)

References:

- [1] DOI: 10.1017/S0022112072000874 · doi:10.1017/S0022112072000874
- [2] DOI: 10.1017/S0022112074000644 · doi:10.1017/S0022112074000644
- [3] DOI: 10.1115/1.2903813 · doi:10.1115/1.2903813
- [4] DOI: 10.1002/fld.1650211003 · Zbl 0862.76033 · doi:10.1002/fld.1650211003
- [5] Bakic V., Experimental investigation of turbulent flows around a sphere (2002)
- [6] DOI: 10.1017/S0022112093002009 · doi:10.1017/S0022112093002009
- [7] DOI: 10.1023/B:APPL.0000004937.34078.71 · Zbl 1113.76354 · doi:10.1023/B:APPL.0000004937.34078.71
- [8] DOI: 10.1007/s00348-007-0448-2 · doi:10.1007/s00348-007-0448-2
- [9] DOI: 10.1017/S0022112098003206 · doi:10.1017/S0022112098003206
- [10] DOI: 10.1016/S0045-7825(97)00120-5 · Zbl 0916.76034 · doi:10.1016/S0045-7825(97)00120-5
- [11] Kim, D. and Choi, H. Large eddy simulation of turbulent flow over sphere using an immersed boundary method. Paper presented at the third AFSOR international conference on direct numerical simulations and large eddy simulations. August 5–9. pp.735–742. TX: University of Texas Arlington.
- [12] DOI: 10.1063/1.866937 · doi:10.1063/1.866937
- [13] DOI: 10.1016/S0167-6105(01)00160-X · doi:10.1016/S0167-6105(01)00160-X
- [14] Leweke T., *Physics of Fluids* 11 pp 12– (1999) · doi:10.1063/1.4739162
- [15] DOI: 10.1002/(SICI)1097-0363(19981030)28:6<903::AID-FLD746>3.0.CO;2-O · Zbl 0918.76037 · doi:10.1002/(SICI)1097-0363(19981030)28:6<903::AID-FLD746>3.0.CO;2-O
- [16] DOI: 10.1063/1.861328 · doi:10.1063/1.861328
- [17] Ozgoren, M., Sahin, B., Pinar, B. and Akilli, H. Experimental investigation of flow structure around a sphere and cylinder via flow visualization 5. Ankara international aerospace conference. August 17–19. pp.1–18. Ankara: 1. AIAC-2009-012, METU
- [18] DOI: 10.1080/10618562.2011.558010 · Zbl 1271.76149 · doi:10.1080/10618562.2011.558010
- [19] DOI: 10.1080/10618562.2010.495320 · Zbl 1267.76087 · doi:10.1080/10618562.2010.495320
- [20] Rodriguez, I. Direct numerical simulation of turbulent wakes: flow past a sphere at $Re^{\sim} = 5000$. European Conference on Computational Fluid Dynamics. June 14–17. Lisbon, Portugal
- [21] DOI: 10.1016/j.measurement.2008.06.003 · doi:10.1016/j.measurement.2008.06.003

- [22] DOI: [10.1016/j.measurement.2009.10.003](https://doi.org/10.1016/j.measurement.2009.10.003) · [doi:10.1016/j.measurement.2009.10.003](https://doi.org/10.1016/j.measurement.2009.10.003)
- [23] DOI: [10.1115/1.2909415](https://doi.org/10.1115/1.2909415) · [doi:10.1115/1.2909415](https://doi.org/10.1115/1.2909415)
- [24] DOI: [10.1016/S0045-7930\(96\)00040-0](https://doi.org/10.1016/S0045-7930(96)00040-0) · [Zbl 0895.76062](https://zbmath.org/journals/0895-76062) · [doi:10.1016/S0045-7930\(96\)00040-0](https://doi.org/10.1016/S0045-7930(96)00040-0)
- [25] DOI: [10.2514/3.10925](https://doi.org/10.2514/3.10925) · [Zbl 0745.76055](https://zbmath.org/journals/0745-76055) · [doi:10.2514/3.10925](https://doi.org/10.2514/3.10925)
- [26] DOI: [10.1023/A:1001174913609](https://doi.org/10.1023/A:1001174913609) · [Zbl 0911.76069](https://zbmath.org/journals/0911-76069) · [doi:10.1023/A:1001174913609](https://doi.org/10.1023/A:1001174913609)
- [27] DOI: [10.1017/S0022112078000580](https://doi.org/10.1017/S0022112078000580) · [doi:10.1017/S0022112078000580](https://doi.org/10.1017/S0022112078000580)
- [28] DOI: [10.1143/JPSJ.11.1104](https://doi.org/10.1143/JPSJ.11.1104) · [doi:10.1143/JPSJ.11.1104](https://doi.org/10.1143/JPSJ.11.1104)
- [29] Werle H., An album of fluid motion pp 32– (1980)
- [30] DOI: [10.2514/3.11794](https://doi.org/10.2514/3.11794) · [doi:10.2514/3.11794](https://doi.org/10.2514/3.11794)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.