Non Newtonian Flow Past 2D Cylinder

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Abstract

This case study focuses on the numerical investigation of laminar and transient flow of non-Newtonian fluids past a two-dimensional (2D) circular cylinder using the open-source CFD software OpenFOAM. The simulations are performed using the solver `nonNewtonianIcoFoam` to study and compare the behaviour of two commonly used non-Newtonian fluid models, namely the Power Law and Carreau models. Important flow parameters such as drag coefficient (C_d), lift coefficient (C_l), and Strouhal number are evaluated from the simulations and validated against benchmark results available in the literature. For this purpose, reference datasets reported by Patnana *et al.* for the Power Law model [2] and Pantokratoras *et al.* for the Carreau model [1] are used. This comparison helps in assessing the accuracy and reliability of the numerical setup and the suitability of the different rheological models for simulating non-Newtonian flow past a circular cylinder.

Keywords: Non-Newtonian fluids; Power-law model; Carreau model;

References

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