

Abstract Submitted
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Momentum equations of Newtonian fluids fully in the Eulerian perspective QIFENG LV, SIJING WANG, MORAN WANG, Tsinghua University
— The Navier-Stokes equations are used to describe the flow of Newtonian fluids in the Eulerian perspective. However, we find the right-hand sides of the Navier-Stokes equations were derived not from the Eulerian perspective but rather from the Lagrangian perspective, although this makes the Navier-Stokes equations simple and also valid in the laminar flow. In fact, the Lagrangian Cauchy strain rates were used in the derivation of the Navier-Stokes equations. Thus, here we derive the Cauchy strain rates from the Eulerian perspective. We then find the difference between the Eulerian and the Lagrangian Cauchy strain rates cannot be neglected when in turbulent flows or compressible fluid flows. Thereby, On the basis of the Eulerian Cauchy strain rates, we derive a set of momentum equations for the flow of Newtonian fluids fully in the Eulerian perspective.

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