

Abstract Submitted
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Inertial particle dynamics: Coherent structures in the presence of the Basset–Boussinesq memory term MOHAMMAD FARAZMAND, GEORGE HALLER, ETH Zurich — We present an equivalent formulation of the Maxey–Riley equation in the presence of the Basset–Boussinesq memory term. A physical advantage of this formulation is that it reveals drag- and pressure-type forces within the memory term. The computational advantage of the new form is that it turns the Maxey–Riley equation from an implicit differential equation into an explicit one, enabling the use of classic numerical schemes in its solution. We further simplify the Maxey–Riley equation for small particles by deriving its reduction to its attractor. The reduced equation obtained in this fashion reveals that the memory term is asymptotically of the order of $St^{3/2}$, with St being the Stokes number. This explains recent numerical findings on the relative importance of the Basset–Boussinesq term. Finally, we compute inertial Lagrangian coherent structures (ILCS) for vortex shedding behind a cylinder. The reduced ILCS closely capture the full inertial dynamics while providing significant savings in computational cost and complexity.

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