Galdi, Giovanni P.
On the problem of steady bifurcation of a falling sphere in a Navier-Stokes liquid.  (English)
J. Math. Phys. 61, No. 8, 083101, 13 p. (2020).

Summary: We study steady bifurcation for the coupled system body-liquid consisting of a sphere freely falling in a Navier-Stokes liquid under the action of gravity. In particular, we show that, under the assumption that for the bifurcating solution, the translational velocity of the sphere is parallel to the gravity, bifurcation takes place, provided that 1 is a simple eigenvalue of a suitable linear operator and the transversality property holds. Moreover, we also give sufficient conditions for symmetry breaking.

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MSC:
76E30 Nonlinear effects in hydrodynamic stability
76D05 Navier-Stokes equations for incompressible viscous fluids
35Q30 Navier-Stokes equations

Keywords:
Galilei number; spectrum; eigenvalue; symmetry breaking; transversality property

Full Text: DOI arXiv

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We use standard notation: $L^q$ is the Lebesgue space with norm $\| \cdot \|_q$, and $W^{1,2}$ is the Sobolev space. Furthermore, $D^\infty_{k,t}$ represent homogeneous Sobolev spaces with semi-norm $\| \cdot \|_{k,t} = k \| D^\infty \cdot \|_{t}$. 

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