Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Symmetry breaking in 3D wake of a bluff body generates rotation and drift UGIS LACIS, NICOLAS BROSSE, SHERVIN BAGHERI, FREDRIK LUNDELL, Linne Flow Centre, KTH Mechanics, 10044 Stockholm, Sweden, ANDREA MAZZINO, STEFANO OLIVIERI, INFN and CINFAI Consortium, Genova Section, 16146, Genova, Italy, HAMID KELLAY, Centre de Physique Moleculaire Op- tique et Hertzienne (UMR 5798 CNRS), Universite Bordeaux I, 33405 Talence, France — Bluff body wakes have historically been important for understanding nature and aiding industry. For Reynolds numbers above approximately Re $\approx$ 10, a recirculation bubble develops behind the bluff body. If a solid or elastic appendage is attached to the bluff body, it may exert a torque and a side force on the body. Previously we have used theory, numerical simulations and experiments to investigate and explain this phenomenon in two dimensions. Now we advance our investigation to three dimensional objects. More specifically, we consider a sphere and attach a sheet of given shape behind it for Re = 200. We investigate the problem using numerical simulations and extend our theoretical model developed in two dimensions. Then we complement our findings with water tank experiments of freely falling cylinder with sheet of various mass behind it. We show that the torque and side force can be greatly changed if the density of the sheet is different compared to the cylinder. Finally we discuss the possibility of optimal configurations for propulsion generation.

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Date submitted: 31 Jul 2014 Electronic form version 1.4