Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Complex Dynamics of Multiple Tumbling Ellipsoids[1] ERICH ESSMANN, Univ of Edinburgh, CONOR CLEETON, PRASHANT VALLURI, School of Engineering, The University of Edinburgh, DAVID SCOTT, MARK SAWYER, EPCC, RAMA GOVINDARAJAN, ICTS-TIFR, Bangalore — Building on our previous work exploring the complex dynamics of a single immersed ellipsoid, we investigate the dynamics of multiple immersed ellipsoids under inviscid and viscous environments. We use analytical and numerical methods to simulate these multiple body systems in viscous and inviscid environments. Our numerical work uses Gerris (Popinet et al, 2003) augmented with a fully-coupled solver for fluid-solid interaction with 6 degrees-of-freedom (6DOF). For inviscid conditions, we extend Kirchhoffs equations to multiple bodies using Lamb (1932) as a starting point. Using recurrence quantification (Marwan et al, 2007) methods, we characterise chaos and identify regime shifts from being correlated to being anti-correlated in systems with two identical tri-axial ellipsoids. For viscous systems at low Reynolds numbers, we observe that multiple bodies exhibit either hydrodynamic attraction or repulsion depending on their initial separation. In addition, we will present our initial findings on how the relative size, spacing and geometry of two ellipsoids affects their dynamics in the

[1]EC-RISE-ThermaSMART

Erich Essmann
Univ of Edinburgh

Date submitted: 03 Aug 2020 Electronic form version 1.4