Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Interfacial Instability in Spheres by Resonance NEVIN BROSIUS, KEVIN WARD, University of Florida, TAKEHIKO ISHIKAWA, SATOSHI MATSUMOTO, Japan Aerospace Exploration Agency, MIKE SANSOUCIE, NASA Marshall Space Flight Center, RANGA NARAYANAN, University of Florida, UNIVERSITY OF FLORIDA TEAM, JAPAN AEROSPACE EXPLORATION AGENCY COLLABORATION, NASA MARSHALL SPACE FLIGHT CENTER COLLABORATION — When a levitated spherical liquid drop is subjected to continuous periodic forcing at a frequency equal to one of its natural frequencies, it can undergo resonance and form modal structures at the surface. The natural frequencies of a liquid sphere directly depend on the modal structure, the mass of the liquid, and the surface tension. By deliberately resonating a sphere at its natural frequency we can therefore obtain the surface tension. The work presented herein compares the analytical result for natural frequency of a liquid sphere in a "self-gravitational field" by Rayleigh (1879) to experimental observations using levitated water in ambient conditions and molten metals for varying modal structures. The natural frequency of two normal modes are obtained to verify the values of surface tension. Comparisons and contrasts between experiments and theory are explained. A method for the measurement of interfacial tension of high temperature liquid metals is introduced. Acknowledgments: NASA 80NSSC18K1173, NASA NNX17AL27G, FSGC08/NNX15025, UFIC Research Abroad for Doctoral Students Award

Nevin Brosius
University of Florida

Date submitted: 30 Jul 2019

Electronic form version 1.4