**Numerical simulations of shockwave self-focusing in collapsing bubbles**

1Nikolaos Bempedelis; 2Fabian Reuter; 2Claus-Dieter Ohl; 3Yiannis Ventikos

*1Imperial College London, Department of Aeronautics, London SW7 2AZ, United Kingdom*

*2Otto-von-Guericke University Magdeburg, Institute for Physics, Department Soft Matter, 39106 Magdeburg, Germany*

*3Monash University, Faculty of Engineering, Clayton Victoria 3800, Australia*

**Abstract**

Cavitation is responsible for material damage in nature and a large number of engineering applications. Recently, it was shown that a shockwave-focusing non-axisymmetric mechanism is responsible for erosive cavitation [Reuter, Deiter & Ohl. Cavitation erosion by shockwave self-focusing of a single bubble. Ultrasonics Sonochemistry, 90, 106131 (2022)]. In particular, for a range of small bubble to wall distances, the collapse of the bubble occurs progressively, and is continuously self-amplified by the shockwaves emitted during this process. In this work, we perform fully three-dimensional simulations of the growth and collapse of a gas bubble in the vicinity of a solid surface using a high-fidelity flow solver and validate the results using high-speed imaging of the collapse process. We explore and discuss the dynamics of the collapse, the emergence and role of the self-focusing mechanism responsible for erosion, and report measurements of the loads exerted on the solid surface at various bubble-to-wall distances.