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The effect of gravity-induced pressure gradient on bubble luminescence OUTI SUPPONEN, Ecole Polytechnique Fédérale de Lausanne, DANAIL OBRESCHKOW, University of Western Australia, PHILIPPE KOBEL, NICOLAS DORSAZ, Ecole Polytechnique Fédérale de Lausanne, MARC TINGUELY, Imperial College London, MOHAMED FARHAT, Ecole Polytechnique Fédérale de Lausanne — The violent collapse of a bubble can heat up its gaseous contents to temperatures exceeding those on the sun's surface, resulting in a short luminescence flash. Occurring at the very moment of the collapse, luminescence must be highly sensitive to the bubble geometry at the preceding final stage. This represents an important feature as any pressure anisotropy in the surrounding liquid will result in a deformation of an initially spherical bubble, inducing a micro-jet that pierces the bubble and makes it experience a toroidal collapse. We therefore present these as complementary phenomena by investigating the link between jets and luminescence of laser-generated single bubbles. Through ultra-high-speed imaging, the micro-jet formation and evolution of a single bubble are observed with unprecedented detail, whilst the bubble light emission is analyzed by means of a spectrometer. The bubble energy and the micro-jet size are controlled by adjusting the laser-pulse and by varying the gravity level aboard ESA parabolic flights, respectively. We here provide systematic evidence on how bubble-jets suppress luminescence in a considerable manner, even in normal gravity where the jet is barely observable. We conclude that gravity must be accounted for in accurate models of luminescence.

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