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Suppressing Rayleigh-Taylor Instability with rotation[1] MATTHEW SCASE, RICHARD HILL, KYLE BALDWIN, University of Nottingham — The stabilizing effects of rotation upon many instabilities are well known. We demonstrate how the Rayleigh-Taylor instability (RTI) in a two-layer fluid may be stabilized by rotating the fluid, and present a critical rotation rate for such stabilization. We show that, in contrast to non-rotating RTI, there is a fundamental difference between placing heavy fluid above a light fluid (unstable arrangement) and simply accelerating a stable arrangement (light above heavy) at a rate greater than gravity vertically downwards. We propose to show novel experiments, conducted using high-powered superconducting magnets (18.7 T), supporting the theoretical predictions. We believe these to be the first experiments to investigate the effects of rotation upon RTI and they exploit the use of the magnetic field that removes the need for a physical barrier when initializing the experiment. Potential applications for the research lie not only in fundamental fluid mechanics, but also in astrophysical applications where RTI is observed (e.g. Crab Nebula) and other strategic applications.

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