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Baroclinic vorticity production in spherical density interfaces

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In order to measure the generation of baroclinic vorticity at two sides of a density interface,
the evolution of a spherical gaseous interface accelerated by a plane weak shock wave has been investigated in a square cross section shock tube via a high speed shadowgraph diagnostic. Different gases are use to produce different local Atwood numbers, i.e., helium, nitrogen, and krypton, were introduced in air at atmospheric pressure in order to study the Richtmyer-Meshkov instability in the spherical geometry for negative, close to zero, and positive initial density differences across the interface, and thus change the baroclinic production of vorticity. We show that the bubble distortion is strongly different for the three cases and we present the experimental velocity and volume of the developed vortical structures. We prove that at late times the bubble velocities reach constant values but the topology of the complex flows, the gas bubble motion and shape are mainly influenced by vorticity distributions and have a long memory.