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Hydrodynamics with strength: scaling-invariant solutions for elastic-plastic cavity expansion models JASON ALBRIGHT, SCOTT RAMSEY, ROY BATY, Los Alamos National Laboratory — Spherical cavity expansion (SCE) models are used to describe idealized detonation and high-velocity impact in a variety of materials. The common theme in SCE models is the presence of a pressure-driven cavity or void within a domain comprised of plastic and elastic response sub-regions. In past work, the yield criterion characterizing material strength in the plastic sub-region is usually taken for granted and assumed to take a known functional form restrictive to certain classes of materials, e.g. ductile metals or brittle geologic materials. Our objective is to systematically determine a general functional form for the yield criterion under the additional requirement that the SCE admits a similarity solution. Solutions determined under this additional requirement have immediate implications toward development of new compressible flow algorithm verification test problems. However, more importantly, these results also provide novel insight into modeling the yield criteria from the perspective of hydrodynamic scaling.

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