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129-I and 247-Cm in meteorites constrain the last astrophysical source of solar r-process elements

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The composition of the early Solar System can be inferred from meteorites. Many elements heavier than iron were formed by the rapid neutron capture process (r-process), but the astrophysical sources where this occurred remain poorly understood. We demonstrate that the near-identical half-lives (~ 15.6 million years) of the radioactive r-process nuclei iodine-129 and curium-247 preserve their ratio, irrespective of the time between production and incorporation into the Solar System. We constrain the last r-process source by comparing the measured meteoritic ratio $^{129}\text{I} / ^{247}\text{Cm} = 438 \pm 184$ with nucleosynthesis calculations based on neutron star merger and magneto-rotational supernova simulations. Moderately neutron-rich conditions, often found in merger disk ejecta simulations, are most consistent with the meteoritic value. Uncertain nuclear physics data limit our confidence in this conclusion.

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