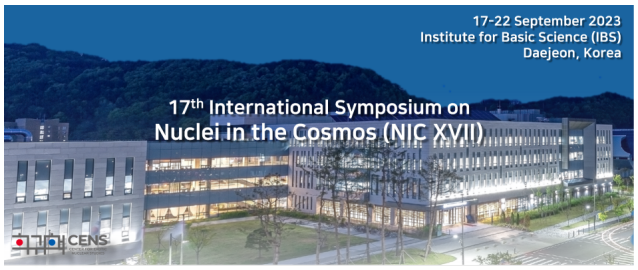

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Proposed Lunar Measurements of r-Process Radioisotopes to Distinguish the Origin of Deep-sea ^{244}Pu

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The astrophysical sites where r-process elements are synthesized remain mysterious: it is clear that neutron-star-mergers (kilonovae, KNe) contribute, and some classes of core-collapse supernovae (SNe) are also possible sources of at least the lighter r-process species. The discovery of ^{60}Fe on the Earth and Moon implies that one or more astrophysical explosions have occurred near the Earth within the last few Million years (Myr), probably SNe. Intriguingly, ^{244}Pu has recently been discovered in deep-sea deposits spanning the past 10 Myr, a period that includes two ^{60}Fe pulses from nearby supernovae. ^{244}Pu is among the heaviest r-process products, and we consider whether it was created in the supernovae, which is disfavored by nucleosynthesis simulations, or in an earlier kilonova event that seeded ^{244}Pu in the nearby interstellar medium that was subsequently swept up by the supernova debris. We discuss how these possibilities can be probed by measuring ^{244}Pu and other r-process radioisotopes such as ^{129}I and ^{182}Hf, both in lunar regolith samples returned to Earth by missions such as *Chang'e* and *Artemis*, and in deep-sea deposits.

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