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# Is lunar dust producing the late Eocene $^{3}$He anomaly, 36 Ma ago? New insights from extraterrestrial $^{3}$He in iridium poor marine sediments.

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Near the Eocene-Oligocene transition, the two largest recent craters (Popigai 100 km diameter; Chesapeake Bay 40 km) formed. This event yields a 2 Ma enduring $^{3}$He anomaly in sedimentary records of the Northern Hemisphere [1]. The origin of the $^{3}$He rich dust particles [1-3], and the global occurrence of this $^{3}He_{ET}$ signature is still debated. Therefore, we produced a new record of the flux of $^{3}He_{ET}$ and ET iridium (Ir) from a deep marine core located on Maud Rise in the Southern Ocean.

The micro-fossil ooze form ODP 689B core contains very low terrigenous mineral content and very low iridium background (5-15 pg/g [4]). These Ir concentrations are close to the expected 9 pg/g $Ir_{ET}$ as calculated using sedimentation rate (0.62 cm/ka), dry density (0.7 g/cm$^{3}$) and current global/annual $Ir_{ET}$ flux (4 pg Ir cm$^{2}$/ka). At the CRPG Nancy noble gas laboratory, we measured 23 samples following the standard protocol for helium analysis [1,5]. Decarbonized aliquots were degassed at 1600°C in the ultra-high vacuum induction furnace system [6]. After gas purification, $^{3}$He and $^{4}$He abundances were measured with the home-tuned CRPG Split Flight Tube mass spectrometer [5,7]; data shown in Fig. 1.

The $^{3}$He-flux (Fig. 2) supports that the $^{3}He_{ET}$-anomaly is a worldwide phenomenon. The $^{3}$He concentrations increase by a factor of 4 whereas the Ir concentrations [4] remain at very low background values never exceeding 20 pg/g Ir. To constrain the $^{3}$He/Ir ratio during the anomaly, highly siderophile element concentration will be measured in sample aliquots.

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Figure 1: Measured $^{3}$He/$^{4}$He vs 3He in the non-carbonate fraction of the sediment core IODP 689B.

Figure 2: $^{3}He_{ET}$ flux across the Eocene - Oligocene transition.

**References:** [1] Farley, K.A., et al. 1998. *Science* **280**, 1250-1253. [2] Fritz, J., et al., 2007. *Icarus* **189**, 591-594. [3] Fritz, J., 2012. *Icarus* **221**, 1183-1186. [4] Montanari, A., et al. 1993. *Palaios* **8**, 420-437. [5] Blard, P-H., et al. *EPSL*, in revision [6] Zimmermann, L., et al. 2018. *Chemical Geology* **480**, 86–92. [7] Blard, P-H., 2021, *Chemical Geology*, **586**, 120543.