NITROGEN, NEON AND ARGON ISOTOPES IN HYPATIA, A DIAMOND BEARING PEBBLE FROM THE LYBIAN DESERT GLASS STREWNFIELD, SW EGYPT.

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Introduction: Harold Urey suggested in 1957 that tektites originated from the impact of cometary bodies onto Earth, based on their continent-scale distribution on the one hand, and on the absence of impact craters of related sizes on the other [1]. Kramers et al. [2] reported recently the unique nature and chemistry of a diamond-bearing pebble, nicknamed Hypatia. The stone was found by Aly A. Barakat in in December 1996 at 25°30 E and 25°20 N, in the southwestern part of the Lybian desert glass (LDG) strewnfield. This carbon-rich, amorphous C material is rich in sub-µm diamonds and presents $\delta^{13}C$ signatures (-3‰), low $^{40}Ar/^{36}Ar$ ratios down to 40 (atmosphere : 298) that attest its extraterrestrial origin. Kramers et al. proposed that Hypatia is fragment of a cometary nucleus that impacted the Earth's surface 28.5 Ma ago, at the origin of the LDG strewnfield. Here we present new N-Ne-Ar isotope data for this extraordinary sample.

Analytical: Five aliquots of Hypatia weighing 0.6-2.8 mg were analyzed at CRPG-Nancy by static mass spectrometry. Samples were loaded in a laser cell where they were stepwise heated using a CO_2 laser with up to 11 extractions. Sequentially purified gases were analyzed by static mass spectrometry. An aliquot was also analyzed for C and N isotopes, by static mass spectrometry for the latter at IPG Paris (France)..

Results: We confirm an ET origin for this material. Most $^{40}Ar/^{36}Ar$ ratios are below 10 down to 0.4, and $^{20}Ne/^{22}Ne$ ratios range from 8.1 to 10.9. $\delta^{15}N$ values are mostly negative between -90 and -119‰, with less negative values being observed during the lower temperature step release, consistent with mixing of a light N component with contaminant N of terrestrial origin. The N and C isotope signatures together with the abundance of sub-µm diamonds in this C-rich phase suggest an affinity with carbon-rich veins hosting primordial noble gases found in ureilites [3-5].

References: [1] Urey H. 1957. *Nature* 179, 556-557. [2] Kramers J.D. et al. 2013. *EPSL* 392, 21-31. [3] Grady et al. 1985. *GCA*. 49, 903-915. [4] Yamamoto et al., 1998. *MAPS* 33, 857-870. [5] Rai et al., *MAPS* 37, 1045-1055.