

**ON THE POSSIBILITY OF A LATE PLEISTOCENE EXTRATERRESTRIAL IMPACT: LA-ICP-MS ANALYSIS OF THE BLACK MAT AND USSELO HORIZON SAMPLES.**

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**Introduction:** A dark layer of organic-rich material contemporaneous with the onset of the Younger Dryas (YD) cooling (12.9 ka) has been identified in North America (black mat; BM) and Western Europe (Usselo Horizon; UH). The following main hypotheses on the origin of this layer exist: a) it formed by water-transported organic material; b) it is the result of a heavy deposition of algae in a shallow fresh-water reservoir; c) it formed in response to periods of spring-fed stream activation when groundwater oxidized organic material; d) it resulted from wood fires and decomposition of charred wood; or e) it resulted from the impact of a comet or asteroid [1,2]. Most BM sequences contain a thin (2-5 cm) basal pitch-black layer likely corresponding to the lower YD boundary (LYDB). The UH sequences are represented by dark charcoal-rich layers within aeolian sands [3].

**Discussion:** Trace element concentrations in the BM (Arizona) and UH (Holland and France) samples were studied using LA-ICP-MS. Trace element compositions of the LYDB layers which directly underlie the BM, and the BM itself are different: the BM displays trace element concentrations similar to the average continental crust, while the LYDB layers are strongly enriched in REE (up to 800xCI chondrite) and relatively depleted in Ta, Nb, Zr, and Hf (down to 30xCI). Such a difference in compositions can point to a sharp change in the conditions of sedimentation just before LYDB layer deposition. LYDB, BM and UH samples display 2-5 times higher concentrations of PGEs than the sediments underlying BM sequences. Additionally, LYDB samples display a positive correlation between Ni and Ir accompanied by an Os-to-Ir ratio of 1:1 and overall higher concentrations of both Os and Ir. In contrast, UH samples do not display any correlation between Os and Ir, and BM samples have an Os-to-Ir ratio of 1:2, which is more typical for terrestrial sediments [4]. Overall, UH samples display trace element characteristics that are a mixture between those typical of the BM and the LYDB. Trace element distributions and relations for samples of LYDB may be consistent with incorporation of the material of ET origin and could, therefore, support the hypothesis that an impact occurred shortly before the beginning of the YD cooling 12.9 ka.

**References:** [1] Firestone R.B. et al. 2007. *Proceedings of the National Academy of Science* 104:16016-16021. [2] Haynes C.V. et al. 2010. *Proceedings of the National Academy of Science* 107:4010-4015. [3] Kaiser K. et al. 2009. *Boreas* 38:591-609 [4] Agiorgitis G. and Wolf R. 1984. *Chemical Geology* 42:277-286.