NORTHWEST AFRICA 2968/3329: DUNITIC AND DIOGENITIC PEBBLES FROM THE SAME MESOSIDERITE FALL?

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NWA 2968 consists of 270 g of dark brown fragments collected by nomads in Algeria, and purchased in Erfoud. This rock is particularly interesting because it was the first dunite with affinities with HED meteorites [1]. Subsequently, a bag containing similar fragments assumed to be collected from the same location, was purchased by F. Kuntz from a Moroccan dealer in El-Rachidia. Some of the fragments contained in this second bag are identical to NWA 2968. The remainders were believed to be from a distinct lithology, and classified as a diogenite, with the number NWA 3329. We have reexamined some of the stones contained in the second bag, and prepared 4 new polished thick sections of these lithologies. The NWA 2968-like fragments are certainly paired to NWA 2968 (same texture, same composition for all the phases). Two of the NWA 3329-like lithologies comprised a dunite and a large orthopyroxene fragment with a composition in perfect agreement with the "official" NWA 3329 diogenite. We have no doubt that both these samples were collected from the same location (similar macroscopic aspect of the two NWA 3329 lithologies, weathering…). We have analyzed 3 samples of NWA 3329 for trace elements by ICP-MS and 2 (dunite and orthopyroxene fragments) for O isotopes by laser fluorination. For trace elements, the samples were strongly leached in hot HCl in order to remove all the weathering phases. Two dunites give basically the same results. They are poor in incompatible trace elements (e.g., 8 and 12 ng/g for Yb) but contain significant amounts of P (P_2O_5=0.04 wt%), and display a marked light-REE enrichment (La_n/Sm_n=5.5), which are well explained by traces of phosphates. Moreover, their Ni (1005 and 1872 µg/g) and Co (80 and 142 µg/g) contents are high. The diogenitic pyroxene displays the same REE features as some other diogenites (e.g., A-881839 [2]), but is Ni-rich (Ni 45 µg/g and Co 10 µg/g). The two fractions analyzed for oxygen isotopes were both leached in a solution of ethanolamine thioglycollate to remove weathering products. The $\Delta^{17}O$ values of both lithologies are virtually indistinguishable, i.e. –0.25±0.01‰ (2σ).

Are these lithologies from the same fall or from distinct meteorites? Dunitic and diogenitic lithologies have already been observed together in a same mesosiderite [3]. Oxygen isotopes [4] and trace elements are in agreement with this interpretation and we suggest that NWA 2968 and 3329 are different fragments of the same fall.

References: [1] Bunch T. E. et al. 2006. *Meteoritics & Planetary Science* 41:A31. [2] Barrat J. A. et al. 2008. *Meteoritics & Planetary Science* 43: 1759-1775. [3] Mittlefehldt D. W. 1980. *Earth and Planetary Science Letters* 51: 29-40. [4] Greenwood R. C. et al. 2006. *Science* 313: 1763-1765.