

METEORITE RECONNAISSANCE IN SAUDI ARABIA.

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Introduction: Hot desert areas including northern Africa, the western U.S., the Nullarbor plain of Australia, the Atacama desert of Chile and the Arabian Peninsula, most notably Oman, have become major sources for meteorites (e.g., [1-3]). In the Kingdom of Saudi Arabia, only 27 meteorites (including four falls) were known until 2008. Most were found during expeditions [4,5] and during oil exploration [6]. Here we describe results of five exploratory meteorite search campaigns between 2008 and 2014, which yielded 83 meteorites. Our main goal is to evaluate the influence of climate and geology on the accumulation and weathering of meteorites.

Results: The sand-free As Summan limestone plateau (40 by 200 km) with the Yabrin oasis (23.3°N 49.0°E) yielded 48 meteorites with an estimated meteorite density of 0.54/km². This is a regolith surface made up of pieces of Tertiary limestone mixed with wind-blown sand. The surface E and S of the plateau is a Pliocene gravel plain showing varying proportions of quartz, limestone and crystalline basement pebbles. This surface yielded a single 13.9 kg stone. In the Rub 'al Khali, 35 meteorites were found in valleys between longitudinal dunes and on Quarternary lake sediments and cemented dune sand in blowouts adjacent to hooked dunes. These surfaces are small with maximum extensions of tens to a few 100 m. The meteorite density in longitudinal dune valleys is 2.5/km², comparable to Oman. However, with 72 meteorites/km² the density is highest in the blowouts. No meteorites were found in the Hafar al Batin area (~28.5°N 45°E) even though the geology and topography is comparable to the As Summan Plateau.

The 83 meteorites recovered represent ~58 falls comprising 42 OC, 4 C, 2 E, 4 ureilites, 3 eucrites, 1 acapulcoite and 1 Lunar meteorite.

Discussion: The As Summan Plateau is comparable to dense meteorite find areas in Oman. The surprisingly high meteorite densities in parts of the 1300 x 600 km Rub' al Khali sand sea are related to Quarternary sediments exposed in blowouts. These sediments are related to more humid climatic periods with high groundwater levels (6-10.5 and 80-125 ka [7]), leading to the development of lake deposits between dunes and cementation of dune sands. These surfaces occur in an area of ~100 by 250 km in the south central Rub'al Khali. The meteorite find density of 72/km² in blowouts is among the highest of the world.

The obvious low meteorite density in the Hafar al Batin region may be related with relatively high precipitation in this area (250 mm/a) as compared with the other search areas (<60 mm/a). In general, our find rates are consistent with the distribution of finds as known before 2008 and demonstrate a high potential for meteorite recovery in Saudi Arabia.

References: [1] Bevan and Binns 1989. *Meteoritics* 24:134-141. [2] Cattaccca et al. 2011. *MAPS* 46:1276-1288. [3] Al-Kathiri et al. 2005. *MAPS* 40:1215-1240. [4] Thomas 1932. Arabia Felix: Across the Empty Quarter of Arabia, Jonathan Cape, London, 1-304. [5] Philby 1933. *The Geographical Journal* 81:1-21. [6] Holm 1962. *American Journal of Science* 12:303-309. [7] Rosenberg et al. 2011. *Geology* 39:1015-1018.