Meteorite accumulation surfaces in Oman: Main results of Omani-Swiss meteorite search campaigns, 2001-2006.

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After the recognition of the meteorite potential of Oman in 1999 by private collectors the Omani-Swiss meteorite search project was initiated to study in detail the unique meteorite accumulation in Oman and increase the awareness for this natural heritage of Oman. Five search campaigns confirmed that the central Oman desert is an extremely suitable area for meteorite revcovery due to the uniformity of the surface: Marine and lacustrine Miocene limestones are covered by a bright soil consisting of limestone fragments and windblown silt, providing excellent contrast to usually dark meteorites (Fig. 1). Main questions addressed in our project are the weathering of meteorites related to their terrestrial age, the abundance of meteorite types, the abundance of meteorites on different surfaces, a statistical comparison of the Oman meteorite collection with observed falls and other hot and cold desert populations, and the detailed investigation of rare meteorites.

Five search campaigns (~600 man days) yielded >4400 numbered meteorite samples (many more fragments) with a mass of 3500 kg. These samples represent about 300 fall events. Three newly discovered strewnfields contribute largely to the total mass. We typically recovered 0.7 meteorites per km^2 (strewnfields not included). This is in general agreement with an assumed density of ~4 meteorites/ km^2 fallen during the last 50 kyr.

In agreement with the known overall abundance of different meteorite types, the majority of finds are ordinary chondrites (92.5% by mass). Rare meteorite types were also found, including a mesosiderite (strewnfield), carbonaceous chondrites, an iron meteorite (Al-Kathiri et al. 2006), a Martian (Gnos et al. 2002) and a Lunar (Gnos et al. 2004) meteorite. Lunar meteorite Sayh al Uhaymir 169 is unique, representing a sample of Mare Imbrium impact breccia highly enriched in incompatible elements. The unique composition allowed the definition of the source area on the Moon. The terrestrial ages of the majority of 75 ^{14}C-dated samples are <50 kyr, with a so far unexplained under-representation of young (<10 kyr) samples. A detailed study of the weathering of ordinary chondrites (Al-Kathiri et al. 2005) demonstrated the correlation of weathering parameters with terrestrial age, but modes of final destruction remain uncertain, as there are only 4 samples (5%) with a terrestrial age >50kyr.

Within the last seven years, Oman has yielded a significant proportion (~16%) of the world's meteorites: 1437 finds with a mass of 3107 kg were published in 2000-2005. The Oman meteorite accumulation surfaces are comparable in number of

specimens, variety of finds and mass to the other major recent sources, Antarctica and “Northwest Africa”. The Oman case is unique, however, because all meteorite locations are well documented. Oman has yielded an unusually high proportion of rare meteorites, most notably 13 of the currently known 41 Lunar meteorites (30%).

Even though permission is required by Omani law to explore for and export rocks and minerals, numerous private meteorite hunters were active over the past few years. This project helped to guide Omani authorities towards a sensible management of this unique extraterrestrial scientific resource. Currently plans are under way to preserve certain large meteorites in situ in the field, and to establish an Omani center for the curation and possibly exhibition of meteorites.

Meteorites are a unique scientific resource. Common as well as rare meteorites have enormously increased our knowledge about the origin of the solar system and provide an extension of missions to the moon. In the case of Mars, meteorites will remain the only and highly important source of material information for at least a decade to come. The Oman meteorite accumulation surfaces play thus an important role in increasing the understanding of the solar system, and also in learning how to recognize other potential meteorite accumulation surfaces.

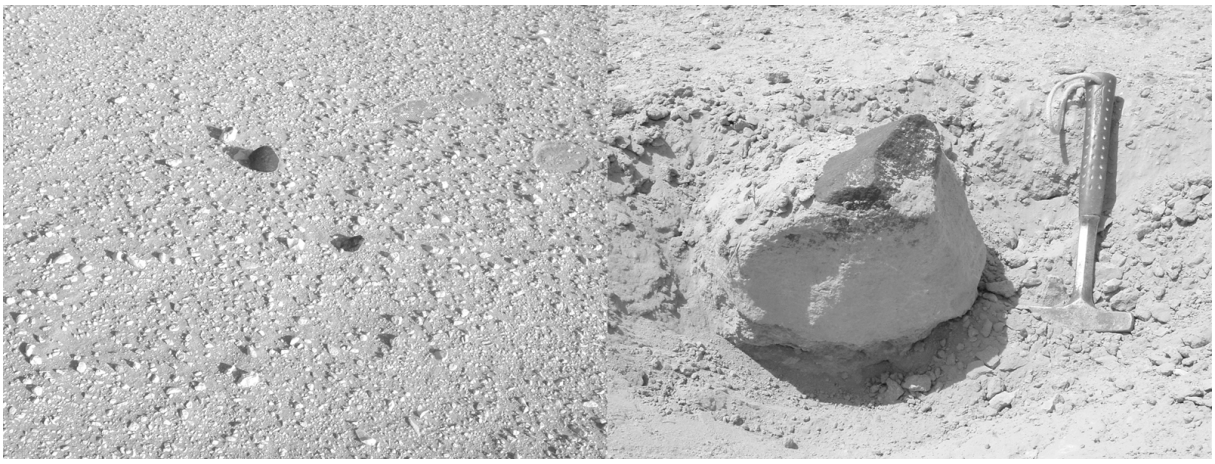

Figure 1. Field aspect of meteorites in the Oman desert. Left: Desert surface with two meteorite fragments (larger: 6 cm). Right: Some meteorites are largely buried in the soil, indicating the presence of a reservoir of invisible meteorites.

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