

# Lut Desert (IRAN) Meteorites: Distribution, Classification and Weathering

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## BACKGROUND & OBJECTIVE

Owing to their dry climate and low chemical weathering rates, hot deserts are suitable places for meteorite preservation and concentration. Different surface abundance, weathering degree and terrestrial age distribution is observed for meteorites from different hot deserts. These factors are mainly controlled by the climate, geology and the geomorphology of the region. Studies on the mentioned factors have been used to investigate the extraterrestrial material flux and the palaeoclimate of different hot desert [1-3]. Lut desert (Iran) is a suitable place for preservation of meteorites [4]. Fruitful field missions and the high number of meteorites found recently in Lut are in accordance with the mentioned suggestion. Here we report the preliminary data on their distribution, classification and weathering of some of these meteorites. The majority of these meteorites have been found by private meteorite hunters.

## LUT DESERT

According to [4], approximately 50 percent of Iran's total surface (~1,625,000 km<sup>2</sup>) is covered by desert and semi-desert, having a precipitation of less than 50 mm/yr and 50-100 mm/yr, respectively. Lut desert, a depression surrounded by mountain ranges, extends over an area of about 80,000 km<sup>2</sup> (between latitudes of 28°21' - 32° N and longitudes of 57°30' - 59°55' E and covers 4.9% of the total surface area of the country) (Figure 1). With an annual precipitation of ≤ 28 mm/yr (in the marginal regions) and maximum temperature of up to 70 °C (inside the desert) [5] along with the increasing number of meteorite finds [6], Lut in Iran has the characteristics of a suitable place for preserving meteorites.



Figure 1: Central region of the Lut desert comprises three distinct parts: mega-yardangs, hamadas and sand dunes.

## RESULTS & DISCUSSION

So far 45 meteorites from Lut desert have been approved by the Nomenclature Committee of the Meteoritical Society and about 70 new samples will be submitted very soon. The majority of the recovered meteorites are from the Kalout region (western sector of Lut desert). The main reason is the accessibility of this region and also the low abundance of meteorite-sized terrestrial rock fragments in the Kalout. All the recovered meteorites are ordinary chondrites (mostly H and L) (Figure 2).

Weathering degree of Lut desert OCs varies between W2-W4 and the majority show high weathering degrees (W3 to W4) (Figure 3). Contrary to meteorites from Atacama desert which magnetic susceptibility tends to decrease for higher weathering degrees, the Lut meteorites do not show the same behavior and in higher weathering degrees magnetic susceptibility increases. This observation can be explained by the formation of ferromagnetic minerals such as magnetite during the terrestrial weathering. This observation can be explained by the formation of magnetic Fe oxide in heavily weathered meteorites. In most of the meteorites from Lut desert, troilite is transformed to pyrite/marcasite instead of iron oxy/hydroxides like in other hot deserts (Figure 4). High abundances of Sr, Cs, Tl and LREEs, which are the main chemical features of the studied meteorites, could have been developed during the hot desert weathering. Total C content of Lut OCs varies between 0.072-0.0328 percent which is much higher than the measured contents for two Atacama and one Moroccan OCs in this work. meteorites. The Sr/Ba ratio is <1 for Atacama, near 1 or slightly larger for Saharan and Omani and >>1 for meteorites from Lut desert.

Based on the abundance of the recovered meteorites in the relatively small region of the Lut deserts, a very high number of meteorite fragments are expected to report in the near future.

The number of recovered meteorites from Lut desert are increasing and the recent field works in the Kalout region have been successful in finding about 60 meteorites (ordinary chondrites). Pairing is currently investigated but it will not drastically reduce this number. The study on the characteristics of Lut desert meteorites will get insights into the flux of extraterrestrial matter, meteorite weathering process and the paleoclimte of the region.



Figure 2: a) A fully crusted LL chondrite, 2) Fragments of an H5 chondrite and c) A big piece of H5 chondrite found in the mega-yardang region of the desert (known as Kalouts).

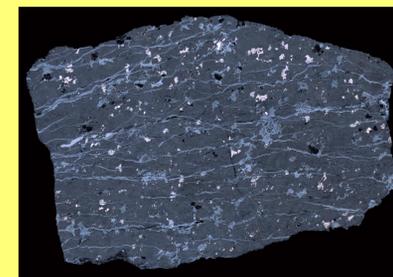


Figure 3: Mosaic picture of Kerman 001, an H5 chondrite prepared in reflected polarized light shows the high degree of weathering in this meteorite.



Figure 4: Kerman 002, an H5/6 chondrite represents primary opaque mineral phases and their weathering products. The image prepared in reflected polarized light

## REFERENCES

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