LUT DESERT (IRAN): A HIGH - POTENTIAL AREA FOR FINDING METEORITES

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Introduction: Preservation of meteorites depends mainly on climate. In temperate and tropical climates, unrecovered meteorites are destroyed by weathering on a time scale that is relatively short compared with their rate of infall. However, in persistently dry climates, meteorites may be preserved from thousands to millions of years after their fall [1,2].

Hot desert meteorite finds that amount to about 25% of the total number of known meteorites, are the second source of meteorites after Antarctica. The latter provides about 70% of the total (Meteoritical Bulletin Database, http://www.lpi.usra.edu/meteor/).

Many concentrations of meteorite finds have been found in hot and cold desert regions of the world. The sites include the deserts of Northern Africa [3-5], the Western U.S.A. [6], Australia [7], Atacama desert [8], and the ice fields of Antarctica [9]. In the recent years, there have been reports of meteorite finds from deserts of Middle East such as those of United Arab Emirates [10], Oman [11], Saudi Arabia [12] and Iran.

Although Iran hosts vast arid desert areas (e.g., Dasht-e Kavir, deserts of Yazd and Tabas, Rige Jenne desert and Lut), not much attention has been paid to the potential of Iranian deserts for hosting meteorites. Three recent short field trips to the central Lut desert led to the collection of several meteoritic fragments, which points to large concentrations of meteoritic materials in the area.

Lut desert: Lut desert extends in an area of about 8000 km^2 in the south – east of Iran between 28° 21' - 32° N and 57° 30' - 59° 55' E (Fig. 1). High temperature, very little precipitation rate (less than 50mm/year [13]) and high amounts of evaporation are some of the main properties of Lut Desert [13-16]. Based on available data, the De Martonne aridity index [17] (as a classic indicator of dryness which uses temperature and rainfall data, A_m= P/T+10, where P represents mean annual precipitation expressed in millimeters and T=Temperature in ^oC) of central Lut is less than 1 and for margins of the desert is 2-4 [15]. Data from *Aqua*/MODIS Climate Model Grid (CMG) shows that Lut desert has been the hottest area of the earth in the years 2004, 2005, 2006, 2007 and 2009 with temperatures of 68.0, 70.7, 68.5, 69.0 and 68.6 ^oC, respectively (Fiq. 2) [18]. Such crietira, in addition to the existence of very large hamada type areas and playas, suggest that Lut desert can be considered as an area with a high potential for preserving and finding meteoritic materials [1-12, 19,20].

Meteorites from Lut: The first official report of a meteorite from Lut desert is for Shahdad meteorite with mass of 1074g that was recovered from Shahdad desert camp (30° 33.23' N, 57° 47.05' E) in 2005 as a "curious stone" and further works revealed it's extra-terrestrial origin [21].

In August 2011, a meteorite with a mass of 9406g was found by a group of adventurers in their path to the central Lut. This is classified as a H5 chondrite by Dr. B. Hofmann (University of Bern). In their second trip to the region (November 2011), the same group found 53 pieces of meteorites located about 1.7 km away from the first one(30° 18.14' N, 59° 12.10' E)(Fig. 3), that was reported to the Meteoritical Bulletion by J. Hassanzadeh and H. Pourkhorsandi as a H5 chondrite (submitted to MB, but not approved yet). And this is highly probable that the first one and all of the second trip's samples are paired (studies are in progress)[22].

Third trip to the Lut in March 2012, led to collection of another meteorite sample(30° 20' 23.16" N, 59° 09' 02.24" E). Studies on this ~40g specimen at the Department of Geology, University of Tehran show that it is a L3 chondrite (Fig. 4) that has undergone moderate weathering (submitted to MB, not approved yet).

In addition to the meteorites from central Lut, we collected two other chondrites from Daghe-e Robaat playa in northern Lut in June 2012. Studies on this meteoritic samples is undergoing.

Conclusion: Climate and surface conditions in Lut desert makes it a high-potential region for preserving large concentrations of meteorites. Field trips to this area in the recent years has also led to the discovery of several fragments of meteorites.

We have commenced a systematic search for meteorites in Shahdad region of central Lut, the outcomes of which will be announced in the near future. Meteorite search in Lut desert will be very resultful, and demands cooperation with international research teams.

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Fig 1. Lut desert extends in an area of about 8000 km^2 in the south – east of Iran. (www.theworldatlas.net)

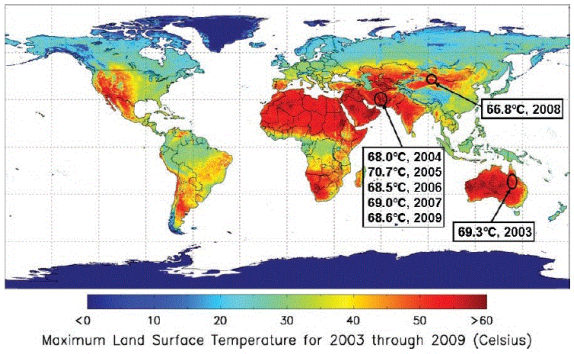

Fig 2. Global map of annual maximum LST based on high-resolution satellite data. From Mildrexler D.J. et al. [18]

Fig 3. Fragments of a H5 chondrite in the field. The scale cube has 1cm each side.

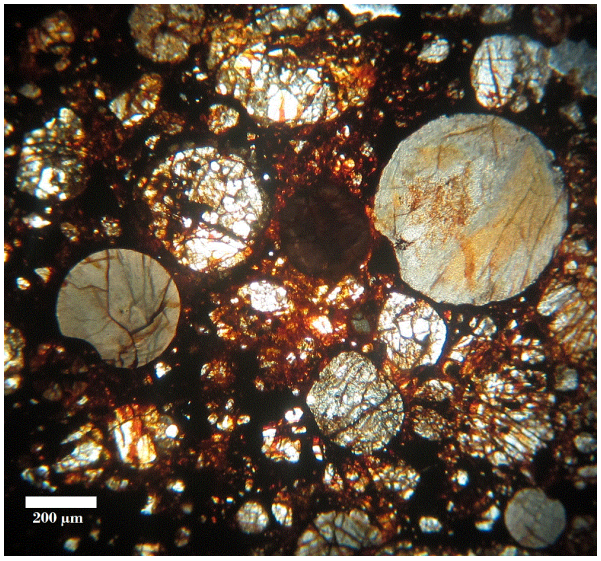

Fig 4. Photomicrograph of an ordinary(L3) chondrite (Open nicol). Various types of chondrules seen in this specimen; Note cratered and partly weatherd chondrules.