

The second joint Italian – Iranian expedition to Dasht-e Lut for meteorite recovery

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Abstract

After the first expedition in 2017 a second field trip in the Lut Desert has been realized in April/May 2018 by the University of Florence, the Italian Institute for Space Astrophysics and Planetology-INAF and the Shahid Bahonar University of Kerman.

1. Introduction

Dasht-e Lut is a large salt desert located in south-eastern Iran (Fig. 1), with an area of ~52,000 km². Being part of the Afro-Asian desert belt, the area is considered as one of the driest (annual rainfall less than 50 mm) and hottest places (surface temperatures of 70°C or more) in the world. The central part of the desert has been wind-sculpted into a series of parallel ridges, troughs, ravines, and sinkholes, while the eastern part is an extended area of sand, containing dunes that reach heights of 300 m. Previous expeditions in this area, including the first joint Italian-Iranian expedition during last year (3,67 Kg of samples), have confirmed that it is suitable for meteorite conservation and recovery [1-4]. According to the international agreement signed between the University of Florence and the Shahid Bahonar University of Kerman, a second field trip to Lut Desert -and the related fieldwork for searching and collecting meteorites- has been realized from April 27 to May 7, 2018.



Figure 1: Map of Iran, the star indicates the location of the Dasht-e Lut.

2. The 2018 field campaign

The explored area is located in the Kalut desert (Fig. 2), which is the north-western part of the Dasht-e Lut. This area is characterized by the presence of 50-100 meters high ridges consisting of loess deposits. These reliefs have been modeled by the action of wind forming long channels oriented northwest to south-east.



Figure 2: Trail of the field trip in the Lut desert.

During this expedition some specimens (Fig. 3) of meteorites and several doubtful stones have been recovered in the field.



Figure 3: Meteorite samples recovered during the 2018 campaign.

3. Preliminary characterization of meteorites collected during the 2017 campaign

As concerns the 2017 expedition a long time occurred for the authoritative procedure needed for releasing the samples and shipping them to Italy. After the samples arrival they have been analyzed following a procedure which started from the weight and density measurement, polyester resin mount preparation, optical microscope and SEM analysis. An essay of each sample has been analyzed and photographed by means of a Zeiss Axioplan metallographic microscope. After this they have been analyzed by means of a Zeiss EVO 15 Scanning Election Microscope to determine the major phases composition. Preliminary results appear interesting: 146 fragments belonging to 42 separate specimens of meteorites and 11 doubtful stones have been recovered. The weight of the samples ranges from few grams to one kilo with a total amount of 3670 grams. The density measurement allowed discriminate terrestrial rocks from true meteorites and, for meteorites, to single out three separate clusters of values in the range 3.2-3.4 g/cm³. Moreover two separate specimens with values of 3.5 and 3.6 g/cm³ have been evidenced. The analytical results are reported in table 1.

4. Summary and Conclusions

Most of the small samples appear to belong to the L5 group of ordinary chondrites, while larger samples can be assigned to other 5 groups of ordinary chondrites. Moreover the largest sample (LE26), provisionally assigned to the H4 group, displays very interesting characteristics that need more detailed analyses, like the presence of chondrules with a zoned phase distribution.

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Field label	Frag. #	Weight	Density (g/cm ³)	Met (Y/N)	Lat (N)	Long (E)	Classification (provisional)
LE1	1	52.2	3.322	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE2	1	10.2	3.323	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE3	5	6.8	3.333	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE4	1	14.8	3.354	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE5	1	35.6	3.342	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE6	1	23.0	3.317	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE7	1	20.6	3.377	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE8	15	51.9	3.287	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE9	8	9.9	3.224	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE10	1	19.9	3.334	Y	30° 46' 25"	57° 47' 45"	OC(H5)
LE11	1	28.8	3.379	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE12	1	16.7	3.298	Y	30° 46' 25"	57° 47' 45"	OC(H5)
LE13	5	14.5	3.307	Y	30° 46' 25"	57° 47' 45"	OC(L5)
LE13/2	1	6.9	3.051	N	30° 46' 25"	57° 47' 45"	Terrestrial
LE14	1	50.5	2.564	N			Terrestrial
LE15	1	14.2	2.687	N			Terrestrial
LE16	1	10.6	3.426	Y	30° 44' 9"	57° 48' 50"	OC(L5)
LE17	2	5.5	3.310	Y	30° 44' 9"	57° 48' 50"	OC(L5)
LE17/2	1	1.6	2.670	N	30° 44' 9"	57° 48' 50"	Terrestrial
LE18	1	1.6	3.262	Y	30° 43' 21"	57° 49' 18"	OC(L5)
LE19	1	13.2	3.253	Y	30° 45' 33"	57° 48' 36"	OC(L5)
LE20	45	106.3	3.200	Y	30° 45' 33"	57° 48' 36"	OC(L5)
LE21	1	4.0	3.324	Y	30° 46' 27"	57° 47' 45"	OC(L5)
LE22	1	2.5	3.344	Y	30° 46' 27"	57° 47' 45"	OC(L5)
LE23	1	58.1	2.619	N	30° 43' 21"	57° 49' 18"	Terr.
LE24	1	9.9	3.346	Y	30° 44' 25"	57° 48' 31"	OC(L5)
LE25	1	229.0	3.455	Y	30° 39' 59"	57° 50' 20"	OC(H5)
LE26	1	954.9	3.232	Y	30° 42' 25"	57° 49' 24"	OC(H4)
LE27	1	134.7	3.315	Y	30° 40' 40"	57° 50' 34"	OC(L5)
LE27b	2	4.3	3.404	Y	30° 35' 27"	57° 52' 23"	OC(L5)
LE27b/2	1	1.2	2.620	N	30° 35' 27"	57° 52' 23"	Terrestrial
27b/3	1	0.5	3.576	N	30° 35' 27"	57° 52' 23"	Terrestrial
LE28	3	230.5	3.361	Y	30° 40' 40"	57° 50' 34"	OC(L4)
LE29	1	404.6	3.396	Y	30° 39' 51"	57° 50' 56"	OC(L4)
LE29b	1	3.5	3.297	Y	30° 39' 51"	57° 50' 56"	OC(L4)
LE30	1	88.6	3.315	Y	30° 46' 14"	57° 48' 11"	OC(L5)
LE31	1	207.2	3.379	Y	30° 46' 14"	57° 48' 11"	n.a.
LE32	1	125.4	3.648	Y	30° 46' 14"	57° 48' 11"	OC(H4)
LE32b	4	70.7	3.390	Y	30° 46' 14"	57° 48' 11"	OC(L5)
LE32c/6	1	4.7	2.723	N	30° 46' 14"	57° 48' 11"	Terrestrial
LE32c	3	16.6	3.276	Y	30° 46' 14"	57° 48' 11"	OC(L5)
LE32/t	1	76.9	n.a.	Y	30° 47' 17"	57° 47' 52"	n.a.
LE33	1	8.6	3.362	Y	30° 35' 31"	57° 51' 48"	OC(L5)
LE34	5	14.6	3.367	Y	30° 46' 24"	57° 49' 10"	OC(L5)
LE35	1	255.0	3.360	Y	30° 39' 59"	57° 58' 9"	OC(L5)
LE36	1	31.2	3.372	Y	30° 46' 11"	57° 47' 28"	OC(L5)
LE37	1	68.9	3.358	Y	30° 45' 53"	57° 47' 31"	OC(L5)
LE38	1	13.2	3.354	Y	30° 45' 50"	57° 47' 35"	OC(L5)
LE39	1	9.1	3.311	Y	30° 45' 51"	57° 47' 33"	OC(L5)
LE40	14	90.7	3.386	Y	30° 45' 33"	57° 47' 44"	OC(L5)
LE41	2	54.0	3.410	Y	30° 45' 22"	57° 47' 43"	OC(L5)
LE42	3	4.7	3.250	Y	30° 45' 22"	57° 47' 43"	OC(L5)
LE45	1	31.1	2.652	N			Terrestrial
LE46	2	13.2	2.695	N			Terrestrial
LE47	1	17.0	3.312	Y	30° 32' 44"	57° 45' 56"	OC(L5)
Total	157	3670.8	///	///	///	///	///

Table 1: Summary of provisional results obtained from the analyses performed on the 2017 Lut Expedition meteorite samples.

References

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