

### URFU METEORITE EXPEDITION TO THE ATACAMA DESERT (CHILE).

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**Introduction:** Systematic search for meteorites in the Atacama Desert (Chile) have been taking place since 1986. This territory is of particular interest for meteorite research due to its aridity and geological stability, which has been shown to contribute to the accumulation of meteoritic matter [1, 2]. The expedition to the Atacama Desert organized by the Ural Federal University (URFU) carried out 11-27 October 2017. The search for meteorites was carried out taking into account the authors' experience of field work in the Lut Desert (Iran) in January 2017 [3].

**Methods and Areas of Search:** The expedition was conducted by four URFU employees. During the expedition, two off-road vehicles were used to search for meteorites across different areas of the desert. The main criteria for selecting the material were the presence of dark brown or black colour exterior (as a possible indication of rust traces), fusion crust and magnetic properties. A visual search was carried out mainly from the vehicles at a speed of 5-15 km/h, with stops being made to inspect samples resembling meteorites. A visual search on foot was undertaken in those places where either the terrain factors impeded the movement of vehicles or where large accumulations of rock dark shade debris were noticed. The meteorite search took place across three regions located in the northern part of the Atacama Desert. The first search area is located 8 km to the south of the highland village of Chiu-Chiu (22°23'S, 68°36'W), Calama area. Geologically, this is a stony mountain desert located at 2500-2700 m a.s.l. and primarily composed of sedimentary rocks having white or light brown colour. During a five-day field works, over 40 meteorite samples were found, with one specimen weighing 14 kg. The second search area is located 8 km to the west of Calama city (22°30'S, 69°01'W). This area bounded by up-to-50m deep canyons from the north and the south, is characterized by sedimentary rocks of a grey colour. A one-day search resulted to finding of 2 meteorite samples. The third search area is located on the Mejillones Peninsula, 25 km to the north of the city of Antofagasta (23°13'S, 70°28'W). This area is characterized by pebbles and shell rock formations showing various degrees of weathering and mostly having light shade colours. A two-day field works for meteorites in this area failed to produce any results; this was likely due to the great popularity of this area among meteorite search teams.

**Result and Discussion:** During the expedition, a significant amount of extraterrestrial matter (20 kg) was collected; half of this was delivered to the URFU NANOTECH Centre for further investigation. The 10-kg fragment of the abovementioned large meteorite (now Calama 009) was left for further study at the Catholic University of the North in Antofagasta. According to their cleavage structure and magnetic susceptibility, most of specimens correspond to chondrites. Only one specimen weighing 590 g is likely to be an eucrite achondrite. The specimens exhibit various weathering grade, which may be a result of either their different terrestrial age or different environmental conditions during their terrestrial residency. The specimens may have come from individual falls or meteor showers. Those from meteor showers have a similar smooth streamlined dark brown surface with cracks and exhibit approximately the same weathering grade. At present day we studied in detail three chondrites found during the URFU expedition in the Calama dense collection area. These meteorites were confirmed in April-May 2018 by the Meteorite Nomenclature Committee under the designations Calama 008 (L6S2W2), Calama 009 (L6S3-4W1-2) and Calama 010 (H6S2W2-3). In general, we found all primary paragenesis minerals common of ordinary chondrites (chondrules and matrix): olivine, orthopyroxene, diopside, albite, chromite, merrillite, chlorapatite (rarely fluorapatite), troilite and Fe-Ni-metals (kamacite, taenite, tetrataenite). In addition Calama 009 contains ilmenite and copper. Chondrules are rare and very poorly delineated with sizes mostly varying from 0.1 to 1 mm (sometimes up to 2-3 mm). They have porphyritic or barred texture, and consist of Ol+Pl, Opx+Pl, Ol+Opx+Cpx+Pl±Crt or Opx+Cpx+Pl±Crt. Matrix is coarse-middle recrystallized. Weathering products (goethite and other Fe-Ni-hydroxides, rarely Fe-Ni-Cl-hydroxide and gypsum) occur as veins and *in situ* partial-to-complete alteration of Fe-Ni-metals and troilite as well as filling all microfractures in minerals from matrix and chondrules.

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