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# Supporting Online Material for

## The Kamil Crater in Egypt

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**This PDF file includes:**

**Supporting Online Material**

**The 2010 Italian-Egyptian geophysical survey (February 18 - 25) carried out within the "2009 Italian-Egyptian Year of Science and Technology".**

*Differential Global Positioning System (DGPS).* A DGPS survey was carried out in order to obtain a high resolution digital elevation model of the Kamil Crater area, namely a ca. 800 x 500 m area with the crater at centre. We used the GPS 4000SSI equipment to set a reference station. We employed a RTK 5700 instrument to collect topographic data with a <1 cm resolution. The collected data were processed using the GPS Processing Program Trimble Geomatic Office to obtain the coordinates of the investigated area. These coordinates are referenced to the Ellipsoid, the projection used was UTM (Universal Transverse Mercator) Zone 35N, the Datum is WGS 84 (World Geodetic System 1984), and the Geoidal Model is EGM96 (Earth Geopotential Model 1996). Part of the digital elevation model is shown in Fig. S1.

*Ground Penetrating Radar (GPR).* A GPR survey was carried out to obtain stratigraphic information in the Kamil Crater area, with particular attention to the lithological units in the crater. A GSSI (Geophysical Survey System Inc.) Sir 2000 instrument, equipped with 400 and 200 MHz monostatic antennas, was used. GPR measurements were acquired along northwest-southeast and northeast-southwest profiles running through the crater. Time to depth conversion was made by both hyperbola analysis and common midpoint measures (by means of a bistatic 80 MHz antenna). The B-B' radargram was carried out at 400 MHz central frequency allowed the recognition of the true crater floor (Fig. S2).

*Geomagnetic survey.* The geomagnetic survey covered an area of ca. 250 x 250 meters, centered on the impact crater. The survey was carried out after systematic searches for meteorites larger than 10 g, in order to explore the possible occurrence of buried masses of the impactor, and mini-to-micro-sized impactor debris. The measurements were taken in north-south profile-lines about 1.5 meters apart in the area

outside the crater, for a cumulative distance of 38 km and 62000 magnetic stations. The crater area was covered with the rover magnetometer attached to a wire stretched across the rim and it was moved from side to side by polling ropes. This way the magnetic data were acquired at stations on nearly flat surface coherently with the ground area outside the crater.

The geomagnetic survey was conducted using a GSM19 Overhauser Magnetometer (GEM system, Canada) with integrated internal GPS. The sensor was kept close to the ground surface (about 20 – 30 cm high) to investigate the possible presence of microscopic meteoritic debris. In the meanwhile, a base station was installed nearby for diurnal correction using proton precession magnetometer. The data were acquired at 0.5 second rate for the rover unit, and every 30 seconds at the base station. Data are shown in Fig. S1.

*Systematic searches for meteorites.* Systematic searches for meteorites were conducted by a team of seven persons within a 450 x 450 m area with the crater at centre, which was preliminarly subdivided into 50 x 50 m cells to optimize operations. Due to the large amount of meteorites we focused on specimens ca. >10 g. A total of 3634 shrapnel and one individual for a total of ca. 1.2 tons were collected within this area. Subsequently, systematic searches were conducted along a number of concentric and radial traverses up to 1.7 km from the crater. In this istance, 1544 meteorite specimens were found, weighed (total mass of 0.5 tons) and left in the field after recording their position. No spalled meteorite fragments were found. Field data allowed us to estimate that searches covered 50% of the meteorite-bearing surface, which constrains that the total mass of the impactor present in the area in the form of > 10 g specimens to ca. 4 tons. No meteorites were found during long range (up to 5 km from the crater) surveys. No additional craters were observed in the QuickBird satellite images (2005, October 22; courtesy of Telespazio) and Cosmo-SkyMed 1 satellite images (2009, March 13) of the region.

*Systematic searches for microscopic magnetic particles.* In order to study the distribution of microscopic particles associated with the impactor, the < 5 mm magnetic

extract of the soil was sampled along eight radial traverses (one every 45°) extending for up to 1.3 km from the crater rim, at incremental distances. Each sample was obtained from a 30 x 30 x 5 cm soil volume. A total of 44 samples was collected, washed in deionized water and subsequently dry-sieved and weighed prior to petrographic investigation. The concentrations of microscopic particles in 10 representative samples were used to constrain the total mass of the impactor present in the area in the form of microscopic particles to some tons.

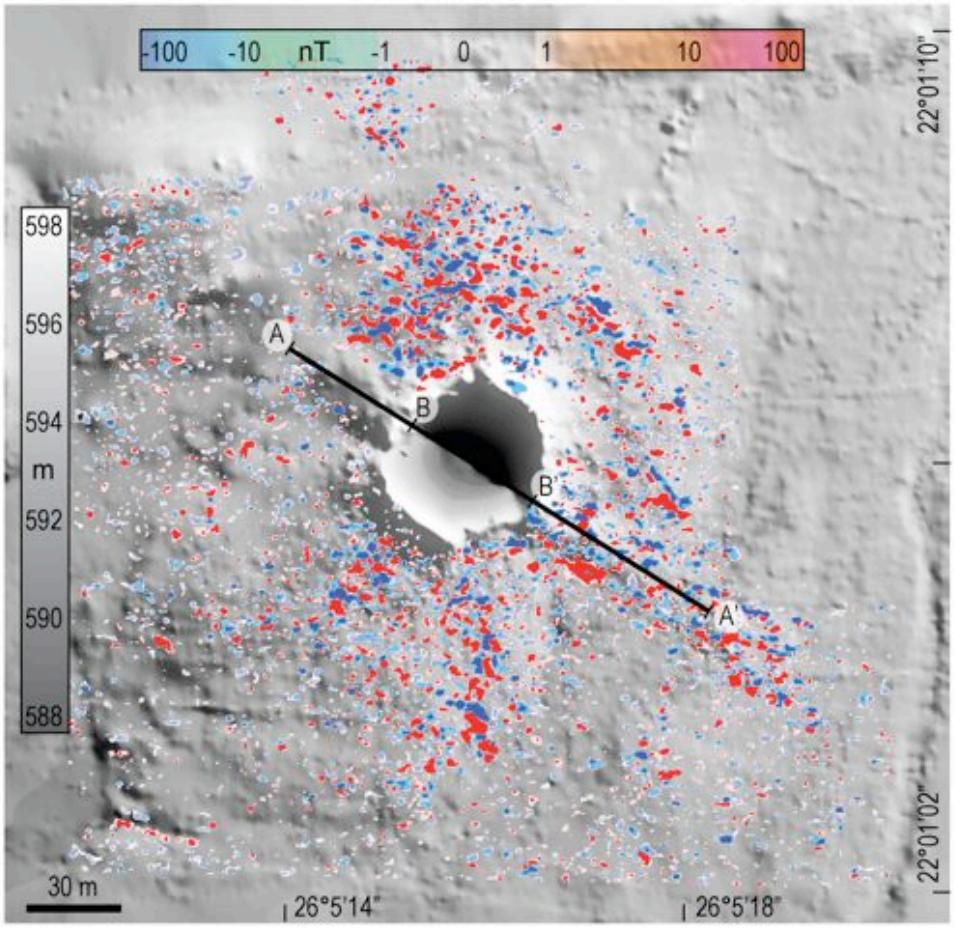


**Fig. S1.** Digital elevation model of the Kamil Crater with superimposed magnetic anomaly map detected after systematic searches and collection of meteorites >10 g. Maxima are localized along the northern, southeastern and southwestern ejecta rays, where abundant microscopic melt particles of the projectile are interspersed within the ejecta blanket.

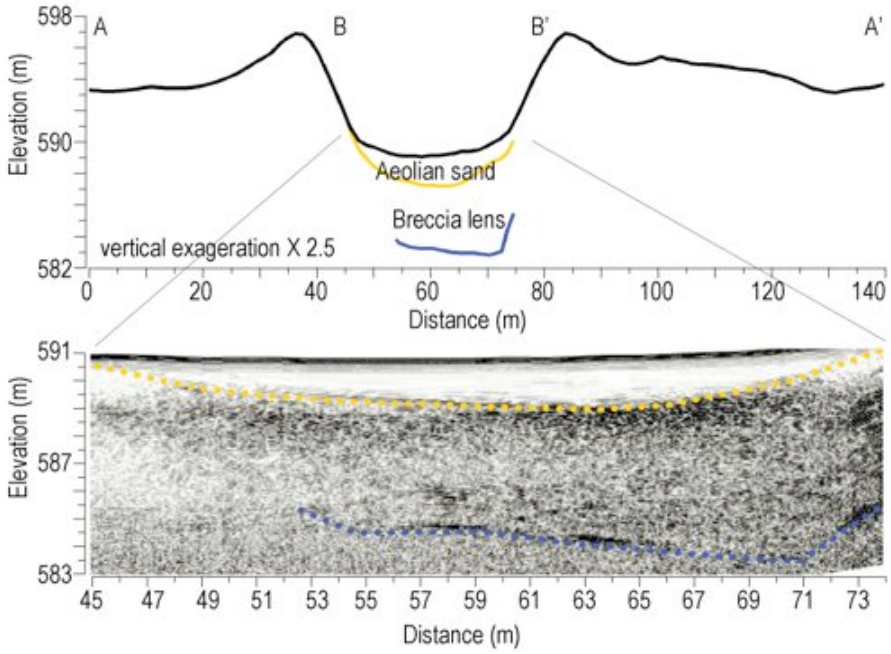


**Fig. S2.** A representative section of the crater (upper panel; see Fig. S1 for trace) based on the digital elevation model and ground penetrating radar survey of the crater floor (lower panel) and featuring some of the main morphometric parameters described in the text.


**Fig. S3.** Field photograph of the impact glass associated with Kamil Crater.

**Fig. S4.** An 83 kg meteorite specimen found 230 m due north of the crater showing regmaglypts.

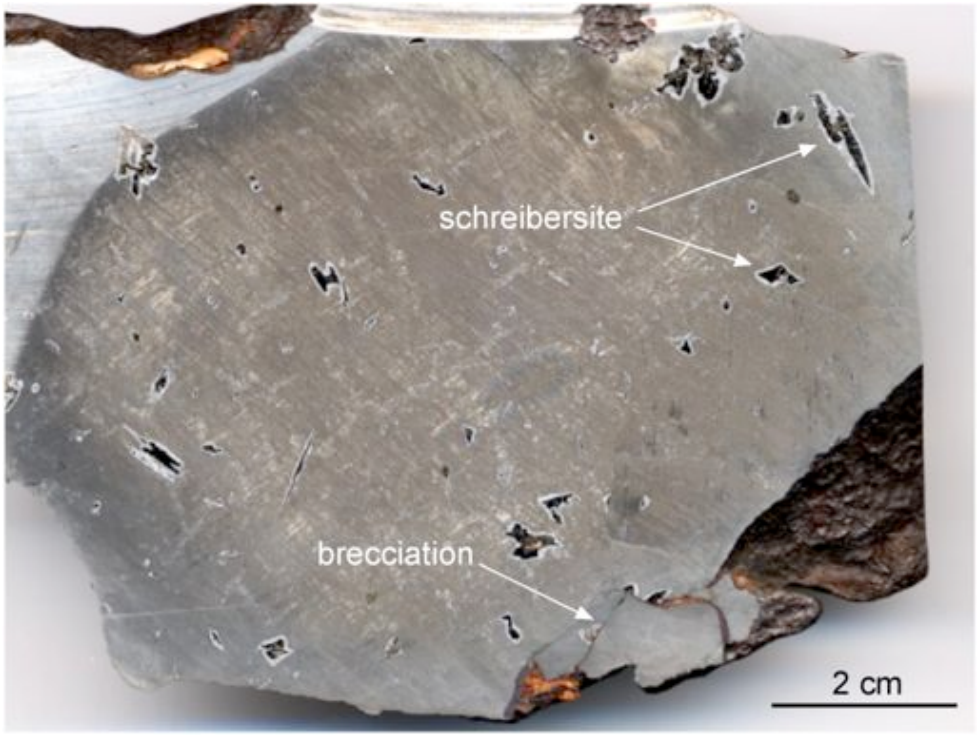


**Fig. S5.** A polished and etched internal surface of a shrapnel showing ataxitic texture speckled with schreibersite inclusions.