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Cosmogenic radioisotopes in Gebel Kamil meteorite

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Recently a small (45 m in diameter) and very young (< 5,000 years) impact crater was discovered in Egypt (Folco et al., 2010, 2011); it was generated by an iron meteorite named Gebel Kamil (Meteoritical Bulletin No. 98, Weisberg et al. 2010). During systematic searches, many specimens were found in the area surrounding the crater. We present the gamma-activity measurement of a 672 g fragment using a highly selective Ge–NaI spectrometer operating at Monte dei Cappuccini Laboratory (IFSI, INAF) in Torino, Italy. This apparatus allows to reveal the radioisotope activity generated by cosmic rays in the meteoroids as they travel through the interplanetary space before falling on the Earth.

From the ^{26}Al activity measurement and its depth production profiles, we infer (i) that the radius of the meteoroid should be about 1 m, constraining to 30–40 ton the range of pre–atmospheric mass previously proposed and (ii) that the fragment should have been located deeply inside the meteoroid, at a depth > 0.7 m. The ^{44}Ti activity is under the detection threshold of the apparatus; using the depth production profiles of this radioisotope and its half-life $T_{1/2}$ = 59.2 y, we deduce an upper limit to the date of fall.

References

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