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# FIRST RESULTS OF A FIREBALL FLUX MEASUREMENT WITH THE ALLSKY7 FIREBALL NETWORK

**Michael Frühauf[1], Detlef Koschny[1], Yannic Heidegger[1]**
[1]*Technical University of Munich, Lise-Meitner-Str. 9, 85521 Ottobrunn, Germany*
*m.fruehauf@tum.de, d.koschny@tum.de, yannic.heidegger@tum.de*

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**In 2007, the meter-sized asteroid of the Carancas event fully penetrated through the atmosphere to the ground and only years later in 2013, the Chelyabinsk asteroid with a size of tens of meters caused significant damage on infrastructure and humans. Independent of the real hazard, acoustical or optical phenomena by meteoroids or small asteroids, might distract vehicle drivers, cause fear, or can occur in politically sensitive regions (Koschny & Frühauf, 2022). Such impacts from small objects happen in timescales of a human life or even more frequently. Thus, meteoroids and small asteroids in the order of meters and tens of meters cannot be ignored for Planetary Defence.**

**In this work, we determined a value for the meteor flux density. The concept of using not only double station cameras, but using a network of stations to constrain the fireball flux density, was already applied in the past by Halliday, Griffin, & Blackwell (1996). We used data from the AllSky7 fireball network (Hankey, Perlerin, & Meisel, 2020), which is mostly located in Germany and Hungary, but it is continuously expanding throughout Europe (Molau, Knöfel, Strunk, & Kempf, n.d.).**

**In total, we used 59 AllSky7 stations. A proper magnitude computation is not yet available for AllSky7 cameras. Based on single measurements, we here assume an absolute magnitude of appx. 2 mag as the minimum detectable magnitude. To de-bias the data, we computed the time-depended observation area of the whole network in 1 hour time steps and 0.1° longitude and latitude steps. Only the area, which was covered by at least two stations, was considered. We assumed that meteors appear at an altitude of 80 km and estimated the minimum observation elevation of the stations to be 30°. Stations that were switched off and stations during daytime (civil dawn until dusk with −5° elevation) were marked as inactive and thus excluded. With the help of the EUMETSAT Cloud Mask (Koschny, et al., 2022) (EUMETSAT, 2015), the cloud cover of the whole observation area was determined and the effective area was reduced accordingly. We used events from more than 7,400 hours of observation of the year 2022. Only meteors, which were detected by at least two active stations, were further considered, leading to more than 45,000 events. The average area of observation was computed to appx. 174,000 km$^2$. Thus, our estimate for a cumulative meteor number is $9.7\times10^{-15}$ m$^{-2}$ s$^{-1}$. To compare our calculation with the literature (Koschny, et al., 2017) in Figure 1, we converted the magnitude to a meteoroid mass (Weryk & Brown, 2013), using a velocity of 17 km s$^{-1}$. Due to the uncertain limiting magnitude, we get a large mass uncertainty. The uncertainty in the cumulative number is strongly influenced by the uncertainty by the minimum observation elevation.**

**We have shown that with AllSky7 data and some reasonable estimates, we can obtain a fireball flux density that is in the region of the literature values. For future work, we will include the magnitude dependence of the observation area, improve the cloud cover estimate and derive a magnitude depended flux density.**

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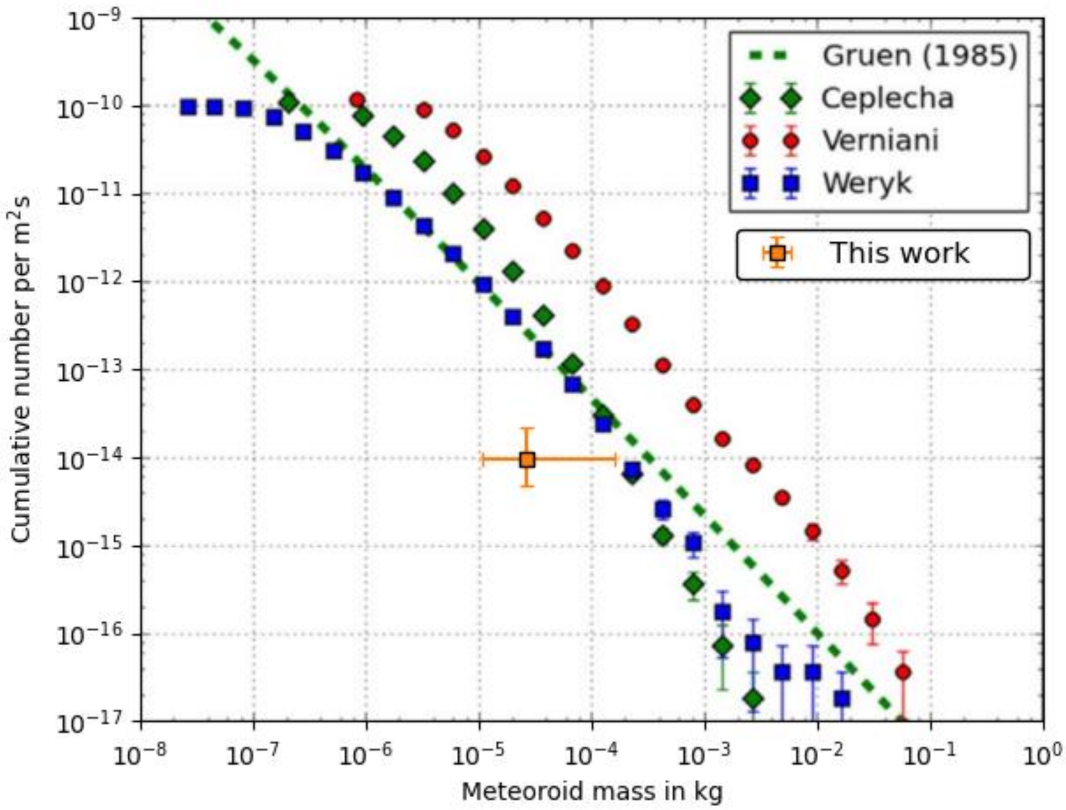


**Figure 1: Literature data for the cumulative number of meteors per m²s (Koschny, et al., 2017). This work is shown as single point with error bars in orange colour.**


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