Comet C/1917 F1 (Mellish) meteor shower complex

M. Hajdukova[1] and L. Neslusan[2]

[1]Astronomical Institute, Slovak Academy of Science, Dubravska cesta 9, 84504 Bratislava, Slovakia
[2]Astronomical Institute, Slovak Academy of Science, 05960 Tatranska Lomnica, Slovakia

In this study, we mapped the whole meteor complex of the long-period comet C/1917 F1 (Mellish), using a procedure of proven reliability when investigating the 96P/Machholz and 2003 EH1 streams (Neslusan et al., 2013a; 2013b). For five perihelion passages of the comet C/1917 F1 in the past, we modeled associated theoretical streams, each consisting of 10000 test particles, and followed their dynamical evolution until the present. Subsequently, we analyzed the orbital characteristics of the parts of a stream that approach the Earth's orbit. These particles were used to predict the corresponding meteor showers. The predicted showers were searched for in the databases of actually observed meteors.

According to our modeling, the meteoroid stream of the comet Mellish can be split into 4 filaments (F1 to F4), with 4 distinct radiant areas. The most numerous shower that originates in the comet nucleus of C/1917 F1 corresponds to theoretical filament F3. The meteoroids of this filament approach to the Earth's orbit relatively soon after their ejection from the nucleus. We identified this filament as the December Monocerotids (No. 19 in the IAU MDC list of the established showers). In the phase space of orbital elements, the shower occurs in the vicinity of another established shower, 250 November Orionids. However, shower No. 250 is obviously not related to C/1917 F1 since no single theoretical particle, in all five models, is in an orbit similar to the mean orbit of this shower.

Filament F1 might be identified to 348 April rho-Cygnids, the meteoroid stream that was recently discovered by the Canadian Meteor Orbit Radar (Brown et al., 2010). In our models, this filament is numerous and, hence, the shower is well predicted. The particles of filament F1 and, therefore, the real April rho-Cygnids originating in C/1917 F1 can approach the Earth's orbit and collide with our planet not earlier than about 20 millennia after their release from the parent-comet nucleus. Despite this relatively long evolutionary period, we found a minor shower corresponding, in a more or less degree, to 348 in the radar data. A "trace" of the shower can also be discerned in the video data. The similarity of mean characteristics of the predicted and real showers is, however, vague.

The filaments F2 and F4 occur only in the models corresponding to the orbital evolution of particles lasting 40 and 50 millennia, in which their prediction is made from a relatively low number of particles. Some real meteor associations corresponding to the predicted showers seem to exist in the video and radio data. However, they are present neither in the IAU MDC list of established nor in that of working showers.

To summarise the above data, we have confirmed the relationship between the studied parent comet C1917 F1 (Mellish) and 19 December Monocerotids, as noticed earlier (Porter, 1952; Hasegawa, 1962; McCrosky and Posen, 1961; Lindblad, 1971; Kresakova, 1974; Drummond, 1981; Olson-Steel, 1987; Ohtsuka, 1989; Lindblad and Olson-Steel, 1990; Veres et al., 2011), and suggested its possible relationship to the 348 April rho-Cygnids.

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