PRECISE MULTI-INSTRUMENT DATA ON 45 FIREBALLS RECORDED OVER CENTRAL EUROPE IN THE PERIOD 2006-2008. P. Spurný, J. Borovička, Z. Ceplecha and L. Shrbený, Astronomical Institute of the Academy of Sciences, Fričova 298, CZ-251 65 Ondřejov Observatory, Czech Republic, spurny@asu.cas.cz

Introduction: Photographic recordings of fireballs provide an excellent means of examining the physical and structural properties, as well as temporal and spatial distribution of larger meteoroids. The detailed study of this component of interplanetary bodies also yields very valuable information about their parent bodies, asteroids and comets. One of the most efficient systems for fireball observations are so-called fireball networks. We present data on 45 precisely determined fireballs recorded by the European Fireball Network (EN), especially in the Czech part of the EN which is the longest continuously operated network and the most developed part of the EN.

Instruments and data processing: In the last several years the Czech part of the European Fireball Network has been entirely modernized [1]. Original manually operated fish-eye cameras, which provided us with only photographic recordings were gradually replaced with new generation cameras, the modern and sophisticated completely autonomous fireball observatories (AFO), which were recently developed in the Czech Republic. The observatories include also high speed radiometer and sound detector. AFO's are currently deployed at all 10 Czech and one Slovak stations of the EN. After two years of full operation of this new observing system, the efficiency of observations and the number of recorded fireballs have significantly increased. Along with this new modern instrument we also developed new software for positional and photometric measurement of photographic records which makes this time consuming work much more efficient, easier, and even more precise. This observing system based on AFO's, provides us with a much more complex, complete and precise dataset on fireballs than has previously been possible. Average absolute positional accuracy for the presented fireballs is about 15m for each point on a fireball trajectory.

Results: To demonstrate this fact, we present complete and precise data on atmospheric trajectories, orbits, light curves and dynamics for 45 selected EN fireballs recently recorded by our network. The vast majority of the presented fireballs were recorded only by Czech cameras but for a few of the cases we used also images taken by cameras located in Slovak and German parts of the EN. Although a significant number of the recorded fireballs in the given period belong to known meteor streams, with only three exceptions, the data we present here are only on fireballs belonging to the sporadic background. For some of the most precise cases, such as the EN300706, EN221006 and EN300807 fireballs, we present a complete MFM solution [2] describing the whole fragmentation history of atmospheric flight of these meteoroids and providing us with the most precise information about their initial masses and other physical properties. According to their orbits and physical properties 33 of the fireballs presented here are of asteroidal origin, and only 12 have a cometary origin. The EN070807 fireball is exceptional in two aspects. Firstly, it was a very rare Earth-grazing fireball, which means that some part of its initial mass survived its collision with Earth; and secondly its initial orbit belonged to the rare Aten type. Special attention is given to the study of very detailed light curves from AFO's radiometers for all the presented cases. Thanks to the high time resolution of these light curves we see sudden short term changes and fluctuations of brightness as well as some peculiarities of light curve shapes (see Fig.1). The combination of all data enabled us to develop a more detailed classification of fireballs reflecting structural properties of individual meteoroids and physical processes accompanying their flight in the atmosphere.

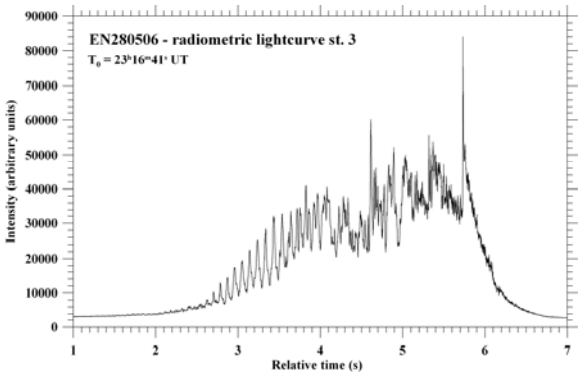

Fig.1 Radiometric lightcurve of the fireball EN280506 recoded by the AFO at the Czech station 3 Růžová.

References: [1] Spurný P. et al. (2006), *Proceedings IAU Symposium No.236*, 121-130 [2] Ceplecha, Z. and ReVelle, D.O. (2005), *Meteoritics and Planetary Science* 40, 35-54.

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