

REGISTRATION OF TRACES OF ELECTROPHONIC FIREBALLS IN THE “UNIFIED CHURYUMOV NETWORK”. G.N. Dashkiev¹, A.P. Vidmachenko^{2,3}, A.F. Steklov^{1,2}, E.A. Steklov¹, P.V. Nevodovskyi². ¹Interregional Academy of Personnel Management, Str. Frometivska, 2, Kyiv, 03039, ²Main Astronomical Observatory of National Academy of Sciences of Ukraine, Str. Ak. Zabolotnogo, 27, Kyiv, 03143, ³National University of Life and Environmental Sciences of Ukraine, Str. Heroyiv Oborony, 12, Kyiv, 03041. dashkiev@i.ua.

Especially “Sounding” fireballs, the intrusion of which is accompanied by acoustic phenomena, were called “electro-phonetic”. The flight of bright meteors [2-6] is often accompanied by electromagnetic disturbances, abnormal sounds, interference at television broadcasting, radio noise. Also, simultaneously with the flight of an electro-phonetic bolide (EB), - the occurrence of induced static electricity on the surface of the Earth and on some objects is often registered.

Geologist P. Drawerth proposed the term “electro-phonetic fireballs” to denote this unusual phenomenon. Investigators such as I. Astapovich, V. Bronshten, P. Grebennikov, N. Diggelen, D. Lamar, M. Romig, etc. made a significant contribution to the study of EB. As early as 1951 I. Astapovich compiled the first catalog of electro-phonetic fireballs. He noted several cases of changes in the nature of sound during the flight of fireball: the transition of the whistle at the beginning of the visible flight into a hiss, and toward the end of the flight, an increase in pitch.

In many cases, the sound has the greatest intensity not when the brightness bolide was maximum, and when the maximum increase in its brightness was observed. I. Astapovich also drew attention to the fact that abnormal sounds were heard at distances from 10 to 420 km from the place span of the bolide. At the braking of bolides with slightly inclined trajectories in the Earth's atmosphere, their color changed from bluish to white, yellow, orange and red.

It is proved that sounds produce both stone and iron meteorites. Now there are catalogs in which more than 1000 specific cases of observations of “sounding” fireballs have been cataloged.

Within the framework of the “Unified Churyumov Network” we fulfilled the numerous observations of tracks of day and twilight fireballs invasions [17-20] into the atmosphere over Kiev and the region in 2013-2017 [7-10, 16]. Several of these phenomena were electro-phonetic.

Repeatedly we noted a panic flight of flocks of birds away near from the zone of the bolide's invasion. Statistical study of fireballs indicates a clear correlation between sound and such phenomena as flares, explosions, sparking, the appearance of a long-lived track [1, 14, 15], etc.

At the end of July 2013, a bright track of the twilight bolide over Kiev was photographed by Churyumov K.I., who noted a special sound “echo” of the phenomenon [4].

In August 2014 between Kiev and Zhitomir, Steklov A.F. photographed invasion into the Earth's atmosphere of massive and loose body. This bolide was also an electro-phonetic because dozens of bird flocks (only on the images we received) flew away in panic from the invasion track. Total along the invasion track, we received up to a thousand images of this bolide, and of birds flying away from the track (Fig. 1).



Fig. 1. Alarmed birds near the track of the bolide's invasion.

During the daily and twilight observations of traces of all types of dangerous intrusions [11-13], we registered much more often than at night the mysterious “electrophone” phenomena of the fireballs, as well as the reaction of birds and people to their appearance (Fig. 2).



Fig. 2. An image of the invasion trace of space debris, which was accompanied by electrophonic effects.

References: [1] Churyumov K.I., et al. (2016) *AstSR*, 12, 1, 72-76. [2] Churyumov K.I., et al. (2015) *AstSR* 11, 2, 99-102. [3] Churyumov K.I., et al. (2016) *5IntSConf.AstPr, Ukraine*, 33-37. [4] Churyumov K.I., et al. (2016) *Meteoroids 2016, Noordwijk*, 63. [5] Churyumov K.I., et al. (2015) *17ysc.conf, Kyiv, Ukraine*, 84-85. [6] Churyumov K.I., et al. (2014) *CAMMAC 2014, Ukraine*. 98-108. [7] Churyumov K.I., et al. (2015) *NEA-2015, Terskol-M.: Yanus-K.*, 156-159. [8] Churyumov K.I., et al. (2014) *AstSR*, 10, 1, 37-42. [9] Churyumov K.I., et al. (2013) *8Conf.Meteoroids2013. Poznań, Poland*, 077. [10] Churyumov K.I., et al. (2015) *NEA-2015, Terskol, Publishing KBSC RAS*, 30-31. [11] Dashkiev G.N., et al. (2017) *48LPSC, LPI No 1964*, id.1135. [12] Grudiniv B.A., et al. (2017) *6IntSConf.AstPr, Ukraine*, 68-78. [13] Kruchynenko V.G., et al. (2017) *19ysc.conf, Ukraine*, 60-61. [14] Spurny P. and Porubčan V. (2002) *ACM-2002, Berlin, Germany (ESA-500)*, 269-272. [15] Steklov A.F., et al. (2017) *19ysc.conf, Ukraine*, 73-75. [16] Steklov E.A., et al. (2017) *48LPSC, LPI No. 1964*, id.1327. [17] Vidmachenko A.P. and Vidmachenko H.A. (2007) *AstAlm*, 53, 195-207. [18] Vidmachenko A.P. (2015) *AstAlm*, 62, 228-249. [19] Vidmachenko A.P. and Morozhenko O.V. (2014) *MAO NASU, NULESU. Kyiv, PH Profi*, 388. [20] Vidmachenko A.P. and Steklov A.F. (2013) *AstSR*, 9, 2, 146-148.