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## «CHURYUMOV UNIFIED NETWORK»: NEW, IMPORTANT TASKS FOR ASTRONOMICAL OBSERVATORIES TO PROTECT SOCIETY IN THE ERA OF MODERN HYBRID WARS

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**ABSTRACT.** Authors created and provided the operation of the first version of the "Bolide Network of Churyumov" for continuous recording of twilight and daytime traces of aerial and aerospace intrusions over Kiev and Kiev district during 2013-2016. A total of more than 36000 copyright photos was obtained, their classification was carried out and the first database was created. The authors recorded typical space invading meteoroids, comets nucleus fragments and traces of aerial intrusions, signs of which, as a rule, are observed at lower altitudes comparing with typical space invasions.

**Keywords:** Twilight Bolide: Comets nucleus: Space invasions: Meteoroids

We live in a very difficult time when in different parts of the globe, in different countries due to different reasons and different goals the so-called hybrid wars are provoked from the outside, break out and last for years.

The phenomenon of "hybrid war" has many definitions, but its main characteristics and key elements are the following:

1. War is clearly there, but legally it is absent.
2. The real external aggression is masked as some conflict within civil society.
3. Financial resources and often manpower, military technical systems are provided by external sources.
4. Long before the hot phase of the hybrid wars permanent active invasion of different services, systems, forces and facilities are initiated by states, geopolitical and global economic associations which are interested in conflict.
4. The hybrid wars, as a rule, cover only cover specific regions having concentrated social, economic, industrial and/or military strategic interests of the parties.

In any case, at the same time, the role of the light aviation (Churyumov et al., 2014b, d) for special purposes (e.g. drones, quadcopters) is dramatically increased. It should be emphasized that a number of the leading states have recently successfully created and tested ultra-light drones which use self-destruction function after performing a secret aggressive mission of secret invasion. This allows the aggressor state to mask his aerial aggression as "natural" invasion of fragments of disintegrated nuclei of

comets, meteoroids and even as aerospace invasion of space debris items (Brown et al., 2002, Churyumov et al., 2014e, f, 2015a, Spurny et al., 2002, Vid'Machenko, 1995, Vidmachenko et al., 2013a, b).

Realizing the danger of the above stated, the team of authors of this brief communication created and provided the operation of the first version of the "Churyumov Unified Network" for continuous recording of twilight and daytime traces of aerial and aerospace intrusions over Kiev and Kiev district during 2013 - 2016 years (Churyumov et al., 2013, 2015c, d, 2016a, b, c, d, e, f). A total of more than 36000 copyright photos were obtained, their classification was carried out and the first database was created. The authors recorded typical space invading meteoroids, comets nucleus fragments and traces of aerial intrusions, signs of which, as a rule, are observed at lower altitudes comparing with typical space invasions (Churyumov et al., 2016g).

We also managed to fix the origin and development of local, but powerful, atmospheric vortexes, which were previously not typical for Ukraine, and therefore it confirms the dangerous trends in climate evolution. Very large, long plumes of dust, aerosol emissions of Kiev enterprises are registered that may be the subject of harsh penalties. It was also obtained a large series of photos of summer fires, explosions of tank farms and even traces of special air operations during periods of hybrid escalation of the war. In created database there is also a considerable number of "footprints in the sky" over Kiev, which we have not yet managed to classify and identify (Churyumov et al., 2014a, c 2015b).

A successful and fruitful experience of authors in the grim years of Maydan, ATO and hybrid war of 2013-2016 years, clearly requires a sharp intensification of efforts of all astronomical observatories of Ukraine regarding the development and improvement of the "Churyumov United Network" for continuous recording of twilight and daytime traces of aerospace, aerial and suborbital intrusions (Churyumov et al., 2016c, e).

The operation of such a network is of prime importance for The State Emergency Service of Ukraine, Security Service of Ukraine, Ministry of Defense of Ukraine and many other departments and ministries, which should finance the creation of hybrid photo recorders for the network,



Figure 1: On the left – photo by Steklov A.F., right – photo by Dashkiev G.N.



Figure 2: Bolide trace over Kiev June 31, 2013. Photo by Churyumov K.I.

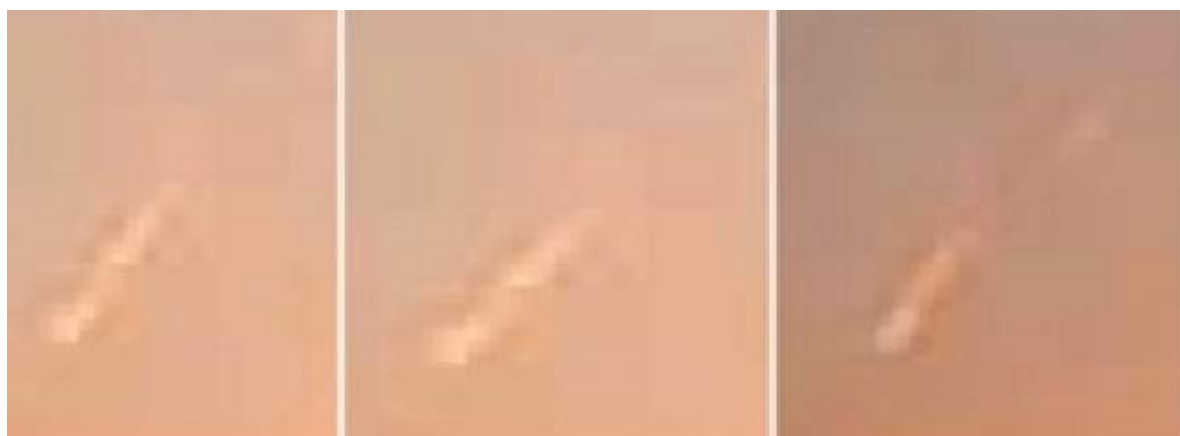


Figure 3: Variations of bolide trace over Kiev Region. July 08 2016. From left to right: UT 19.26.24, 19.26.26, 19.27.30. Photos by Steklov A.F.



Figure 4: Variations of bolide trace over Kiev Region. July 08 2016. From left to right: UT 19.27.46, 19.27.57, 19.28.28. Photos by Dashkiev G.N.

which combine the properties of modern wide-angle comet seeker and features cutting-edge video recorders. The "Churyumov Unified Network" should be supported by all astronomical, meteorological and geodetic observatories, National Academy of Sciences of Ukraine, National Academy of Pedagogical Sciences, the Academy of Sciences of Higher School, "The Planetary Society" of Ukraine; academician, universities, educational and other (national, private, amateur) observatories. Full-scale deployment of the "Churyumov United Network" requires the creation of trusted panoramic cameras, video surveillance systems with a maximum recording resolution, maintaining compression format, allowing for adequate reality color shooting in low-light conditions, in the presence of a large (long) and small (short) tracks (objects). Systems should have their own computing facility, web server, the ability to stream video over a wireless network to support transmission of multiple video streams in the required compression formats.

Our network cameras need to have not only the possibility of wired and wireless connectivity to a single and multi-channel network video servers, but also rely on the work of four-wheel drive IP-based cameras with sufficient (18x?) zoom having features of progressive scan sensor and, at the same time, multi-channel decoders should allow to connect to a large number of cameras with progressive scan technology to improve image quality. Very desirable is implementation of modes of daytime, twilight and night scenes. And so on.

The challenges that our turbulent times poses on astronomical observatories are very complex, but interesting and, finally, astronomers of Ukraine, creating systems and networks for continuous photographic twilight and daytime traces aerial, aerospace and suborbital intrusion, can take on a new critical role in the protection of society and the state in the era of hybrid wars.

In Fig. 3 (left) shows an image of "a trace in the sky", results in about a half a minute after the start of combustion body, which has flown into the atmosphere (Kruchynenko, 1995, 1997, 2004, Kruchynenko et al., 2011). Trace was observed just near the horizon. At falling this body is becoming stronger flared. Combustion occurs with elements of splashing of a yellow-orange flame. This flight-combustion continued no more than ten seconds. The object burned down and left by the Sun illuminated trail. In Fig. 3 and 4 shows the dynamics of changes in the trace form. This trace about 40 minutes was illuminated by the Sun. And then a few tens of minutes could be seen as a diffuse dark cloud against the evening sky, which is illuminated by the Moon. During this time, were obtained a few tens of trace photos, before full it's scattering in the atmosphere. The distance between the two points of observation was 25.8 km

And advanced "Churyumov Unified Network" will be only one of our responses to the challenge of time. Our other answers already in the works.

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