MODEL OF UV FLASHES DUE TO GIGANTIC BLUE JETS

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The phenomenon termed Gigantic Blue Jet (GBJ) was discovered by Pasko et al. [2002] when observing a thunderstorm over the Atlantic Ocean. A number of GBJs was observed since from the ground, and from space by the ISUAL optical detector flying on the board of the FORMOSA-2 satellite. Alike blue jets the GBJs have a pencil-like shape, however a trunk of GBJ is crowned with a few prongs which escape into the ionosphere. Moreover the trunk grows slowly with a velocity about 100 km/s, while the prongs propagate much faster, their velocity can reach 40,000 km/s. The total optical energy released by GBJ is about 1 MJ. Current models suggest that a blue jet consists of the bi-leader, and is capped at the top side of the leader by its streamer zone. The opposite polarity leaders grow in opposite directions and supply each other with the charge via the highly conductive channel. Evidently, if the bi-leader is initiated in the anvil, one of the leaders can extend beyond the cloud top. Furthermore, the upward leader transfers the potential from the leader origin upward, thereby providing the long necessary voltage to form long streamers. In the exponential atmosphere long streamers grow preferentially upward, producing a narrow cone. The UV instrument flying on board of microsatellite Tatiana detected a number of intense flashes with duration 1-64 ms originated in the equatorial region of the Earth. The satellite was flying on the height 950 km along the circular orbit. The detector operates in the wavelength rage 300-400 nm. It should be emphasized that both GBJ and UV flashes were detected mainly over oceans and shores where the rate of lightning flashes is low. The detected UV flashes radiate about 0.1 MJ which in the range of the energy of gigantic blue jets. There are two two scales of the flashes duration, 1-4 ms and 10-64 ms. The first one corresponds to the lifetime of individual long streamers (prongs), while the second corresponds to the lifetime of slow moving leader (or the streamer zone of a leader, since a number of individual streamers which form the streamer zone can radiate the UV emission). Therefore we suggest that the UV flashes detected by Tatiana were generated by GBJ. In this paper we present a model of UV flashes due to an individual long streamer. Using earlier developed by us model of upward propagation of long streamer in the exponential atmosphere we will describe the temporal evolution of the UV intensity generated by such streamer in the given spectral range 300-400 nm, and then check the model against the data obtained by Tatiana.