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Radiative emissions of the blue starters, blue jets, and gigantic jets

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On 22 July 2007 12:18∼14:35 UTC, 37 blue jets/starters and 1 gigantic jet occurring over a thunderstorm in the Fujian province of China were observed from the Lulin observatory on the central mountain ridge of Taiwan. Among these events, a short burst of 33 blue jets/starters occur in a 5 minute window around 12:35 UTC in the mature phase of this thunderstorm. In addition, three sprites occurred during the decaying phase of the thunderstorm about 80 minutes after the blue jets/starters.

Three sight-aligned WATEC 100-N cameras (passing band: 400-775 nm at 50% maximum) were deployed to simultaneously monitor the jet-producing storm. One camera is equipped with a red-band filter (570∼2700 nm), another is with a blue-band filter (380∼500 nm), and the other one equipped with no filter. The blue emissions from these jets are not discernible, since these events are ∼400 km away from the observation site the blue emissions suffered severe atmospheric scattering. However, images taken with red-band filter show clear red emissions from the luminous bodies of blue starters and blue jets.

Among these events, an upward discharging jet series begins with a blue starter, about 100 ms after a blue jet occurs at the same cloud top and then develops into a gigantic jet ∼50 ms later. This GJ was classified as a type II GJ [Chou et al. 2010]. The brightness ratio for the upper region of the blue starter and the blue jet, between the image data taken with no filter and red-band filter, is found to be ∼5; while the same ratio computed for a single streamer is ∼6. Therefore, the red emissions from blue starters/jets are mainly from nitrogen first positive band (1PN2). Also the images taken by ISUAL/FS2 through the 1PN2 band filter show clearly discernible emissions from blue starters/jets [Chou et al. 2010, Figure 3]. The spectral properties of these events will be studied as well. In addition, the radiative emissions from gigantic jets occurred near the Typhoon Lionrock on 31 August 2010 will also be reported.