We would like to express our cordial thanks to the reviewer for the valuable comments and constructive suggestions. We appreciate the input of the reviewer and hope to make sure that we are incorporating his or her significant inputs to strengthen our analysis. We went through all the comments thoroughly and revised the manuscript accordingly.

This paper reports what could be a chance coincidence, at ~ 18.30 UT on 25 September 2021. This is a relation between sprites (which are known to perturb the ionospheric D-region above them - references to that should be given) and claimed Schumann resonance (SR) signal changes observed on the CSES satellite. This is in a Sun-synchronous orbit at ~ 500 km altitude. The strength of SR signals at such a height needs to be estimated using magnetoionic theory. The SR changes shown are dramatic, from the first two harmonic signals, at 8 and 14 Hz, to a broadband signal. How this might happen needs justification.

1. The units of the signal strengths shown in Fig. 3 and 4 are incorrect. If squared, the units in Fig. 4b would be correct, I think.

Reply: Thanks for your valuable comment. The units we used for the electric and magnetic field signal strengths in Figure 3 and 4 are those originally provided by the China Seismo-Electromagnetic Satellite (CSES) database. We compared the previous references, (such as 'Satellite observations of Schumann resonances in the Earth's ionosphere' (Simões et al., 2011), and 'Electric field signatures of the IAR and Schumann resonance in the upper ionosphere detected by Chibis-M microsatellite' (Dudkin et al., 2014)), and found they also use the Schumann resonance signal unit of $\mu V*m^{-1}*Hz^{-1/2}$. The Schumann resonance strengths in the data from the CSES are consistent with the Schumann resonance strengths in these references. Therefore, we have to keep the data unit provided by CSES to characterize the intensity of Schumann resonance. The electric field in ULF, electric field in VLF and magnetic field in VLF provided by CSES can be accessed through the official website of https://leos.ac.cn/#/dataService/dataDownloadList.

2. The fractional hop whistlers shown in Fig. 4 do not have a characteristic "L" shape - see the monograph by Helliwell (1965). What is the duration of the record shown in Fig. 4? How many seconds?

Reply: Thanks for your valuable comment. Due to the large sampling intervals, the resolution of the graph is low. However, if we shorten the time of the plot, we can see very wide 'L'-shaped whistling waves as shown in Figure 1* below. It can be found that a 2s-whistling wave occurring at 18:31:36 UT, and a 1s-whistling wave occurring at 18:31:38 UT. The durations of the whistle waves in the Figure 1* are about 1-2 s, which is consistent with the typical characteristics of single-hop and two-hop whistle waves. Since the result is consistent with the duration of whistling waves studied by previous researchers, we believe that there is a lightning whistling wave phenomenon generated near the Hainan Island. We will redraw the time-frequency diagrams of the whistling waves in the main text.

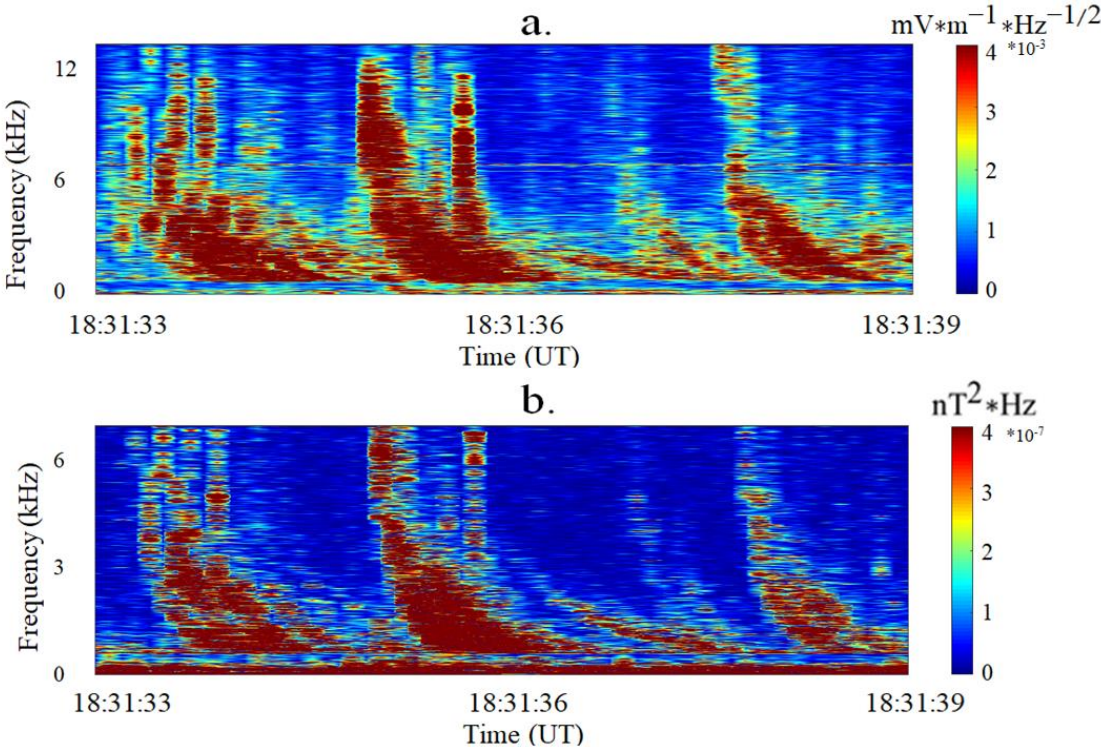


Figure 1*. The lightning whistling wave in obvious "L" form displayed during the NO. 20239 orbit, observed on 18:31:36 UT at 16.6°N.

3. What is the bandwidth of the filters used to generate Fig. 5. What determined the central frequencies used? Why are these values shown to two decimal places? These are ELF signals, not ULF.

Reply: Thanks for your valuable comment. We use the filter bandwidth provided by the satellite data with sampling frequency of 0.5 Hz. The central frequency of the electric field signal can be also obtained through calculation based on the satellite sampling time. The ULF band frequencies in the paper correspond to the frequencies of the electric field level 2 data provided by the CSES, which can be accessed through the CSES data website (https://leos.ac.cn/#/dataService/dataDownloadList).

The CSES database defines the signal of 0-20 Hz as ULF, the signal of 100-2000 Hz as ELF, and the signal of 2k-24k Hz as VLF. As a results, in this paper, such frequency classification is used to avoid confusions caused by different definitions of the ULF band by other standards and researchers.

4. In Section 3, much of the discussion is too general and vague.

Reply: Thanks for your valuable comment. We have modified section 3 carefully and added some discussions of the results.

We have replaced lines 116-128 with this revised and more detailed texts:

‘Taking the SR as the signal and the non-SR as the noise, the variations of SNR with latitude can be calculated. Through evaluation and analysis, the first mode of SR is selected to be 6.5 Hz, while accordingly 3 Hz and 8 Hz are adopted as the upper and lower bands. The second mode of SR is selected to be 13 Hz, and 10 Hz and 16 Hz as the upper and lower noise bands, respectively. According to the SNR calculation method from Eq. 1, the background SNR is shown in Figure 2a, 2d, 2c and 2f. In comparison, the SNR for orbit NO. 20239 is given by Figure 2b and 2e. The red, green and blue circles indicate SNR > 5, 2.5 < SNR < 5, and SNR< 2.5, respectively. Figure 2a, 2d, 2c, and 2f demonstrate that the background SR has SNR above 2.5, with many of the sampling points even above 5, when there is no disturbance. Figure 2b and 2e show the SR’s first and second modes for the NO. 20239 orbit, respectively. The decrease of SNR is mainly concentrated in the area between 10 ~ 22°N, shown as the blue circles. This region is close to the lightning area near the Hainan Island, with the point at 18°N located just over the thunderstorms. Accompanied by the occurrence of a large number of lightnings and TLEs, the SNR is significantly reduced to below 2.5, with the first mode of 1.9 and second mode of 1.2, respectively. It can be found that in the presence of lightnings and TLEs, the SNR of the selected SR is generally reduced below 2.5. This result indicates under the influence of lightnings and TLEs, the SR signal of the ionospheric electric field will become unstable, and its SNR could reduce by half.'

In order to describe the whistling wave we observed, we have added statements around line 144 as: 'The whistling waves recorded by CSES range from 16-20°N, which coincides with the distribution area of the lightning activities. The whistling wave durations are within 1-2 s, and the frequencies are generally in the range of 3-10 kHz, which is in consistent with a typical whistling wave phenomenon (Bayupati et al., 2012; Carpenter and Anderson, 1992; Holzworth et al., 1999).'

Since the frequency of the Alfvén wave is close to the ULF band, the Alfvén wave generated by the lightning may also cause a perturbation of the electric field. In order to eliminate the Alfvén wave, we have added statement around line 170 as: 'The lightnings will also produce Alfvén waves, which are close to the two modes of SR, and may interfere with the ionospheric SR (Beggan et al., 2018; Dudkin et al., 2014). Therefore, we analyzed the time-frequency characteristics of the interference patterns between Alfvén wave and the Schumann resonance, comparing with the electric field disturbance. The interference is generally manifested as a fingerprint shape. However, the SR anomaly in Fig.3 is quite different from this interference characteristics. Thus, we still believe that this anomaly is not caused by Alfvén wave.'

Furthermore, in order to make the background data more perfect, we excluded the influence of solar flares and cosmic rays, we state around line 166: 'In order to exclude the influence of other factors, we examined the possible influence of solar activity and high-energy proton events. The data showed that the solar activity was relatively calm during these days, and there were no high-energy particle events.'

We hope the modified Section 3 is sufficiently or adequately improved.

5. The three main conclusions need to be redrafted.

Reply: Thanks for your valuable comment. We revised the conclusion as follows:

1. A huge lightning and TLEs event co-occurred on September 25, 2021, penetrated the bottom of the ionosphere and caused electric field disturbance in the upper satellite orbit region. During the large lightning activity, the horizontal range of this disturbance can reach hundreds of kilometers.

2. The lightning and TLEs will increase the PSD energy of the ionospheric electric field and reduce the signal-to-noise ratio of the first and second modes of Schumann resonance. Comparing the Alfvén wave with the SR interference phenomenon, it is likely that this disturbance is caused by the electric field originated from lightnings, instead of the Alfvén wave.

3. When the SR disturbance occurs in the ULF band of the electric field, the whistler wave signal is detected in the VLF band. The whistler wave indicates that the electric field energy generated by the lightning and TLEs can cause the disturbance to altitudes as high as the CESE's satellite orbit.

6. To be pedantic, a satellite does not fly; it is in orbit, or it travels in an orbit.

Reply: Thanks for your valuable comment. We revised the statement describing the satellite orbit in the text. We have revised line 109 to say: 'The CSES's orbital position passed near the Luoding station at around 18:33 UT, located on the west side with a horizontal distance of about 200 km. From September to October, around the same orbital positions, i.e., the repeat of the satellite's orbit around Luoding after every five-day cycle, were selected for the background data. The appropriate CSES satellite orbits were found on both September 20 and October 15. No TLEs were captured on October 15. And on September 20, TLEs were only photographed during the 13-15 UT period, with no TLEs appeared when CSES traveled overhead Luoding station at 18:00 UT. The lightnings on September 20 and October 15 were also shown in Figure 2a and 2c. It can be observed that no large-scale thunderstorm area on September 20 and October 15'. We hope the revised description is describing the orbital motion of the CSES's satellite better now.

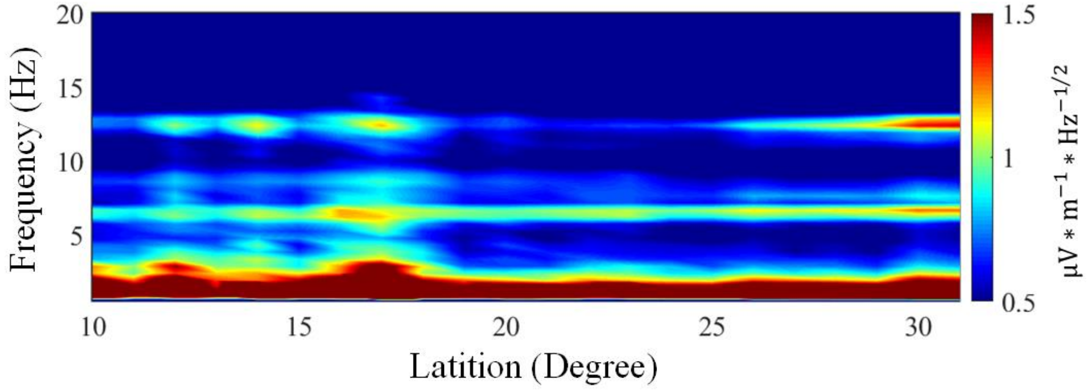
7. I consider that much more study is required before a paper can be written on this matter.

Reply: Thanks for your valuable comment. In this research, we have found more cases of TLEs affecting the ionospheric electric field. When we chose the satellite orbit within 500 km from the Luoding ground station, there are two cases on May 3 and 23, 2021 that can meet the conditions of this study. A large number of TLEs occurred in the vicinity of Luoding on the two nights, while the satellite orbit was at a horizontal distance of about 200 km from Luoding. The ionospheric Schumann resonance was significantly perturbed in these two cases, and the signal-to-noise ratio decreased with the increase of the electric field energy in a similar way to the present study case. However, we lacked the lightning data near Luoding station at that time, and could only speculate that the parent lightning was about 200 km away from Luoding based on the shooting angle. And unfortunately, some other cases may have no comparison for the same orbit. Due to the limited length of the article, we did not put all the study cases in the main text. We have added the information on more TLEs in the supplementary material (see below), and we hope the reviewer could possibly re-assess our case studies again.

Thanks again for all your comments and questions. We have learned a lot from these valuable suggestions. We have tried our best to express our answers to the critical comments. At the same time, we are mindful that there are a whole lot of works, both observational and theoretical, to be done. We also think that our modest effort to summarize our understanding with the special emphasis on our hard-earned observational measurements is an improvement in the understanding of the subject of Transient Luminous Events. This is why we are still hoping that our manuscript can be published in ACP with the consent of the referee.

Supplementary materials

1. The background SR of local ionosphere:



Luoding station is located on the northern edge of the thunderstorm’s center in South Asia-Southeast Asia region. Thunderstorm activity increases from April to September each year. Ionospheric SR energy enhancement is observed. We selected the background data calculation from April to September. This graph represents the mean of ionospheric SR. From the diagram we can find the SR 1mode and 2mode. We cautiously use it as a background for the SR in 2021. As solar activity intensifies, ionospheric SR appears to be obscured by the strong electric fields (Zhu et al. 2023).

2. Some additional TLEs cases and parameters studied/examined in this research

TLEs are difficult to monitor. Some TLEs occur in clusters, and some TLEs occur sporadically at different times. In 2021, a total of 14 cases of TLEs were monitored at the Luoding Station, including 9 cases in May, 1 case in June, 1 case in August, 2 cases in September, and 1 case in October. The CSES satellite orbit travels and passes overhead around this area twice every day at 6:00 UT and 18:00 UT. In addition to the case on 25 September 2021, we obtained 6 cases of TLEs that occurred near Luoding around the time of 18UT. The 6 cases are shown and summarized in the table below. The time and number of photographed TLEs are documented in the table. 'TLE cases' represents the days when these cases appeared in the Luoding station, 'TLE count' represents the total number of TLEs observed around the station, 'Distance' represents the minimum horizontal distance between Luoding station and CSES’s satellite orbit, and 'Anomaly range' represents the approximate range of anomalies in satellite orbits.

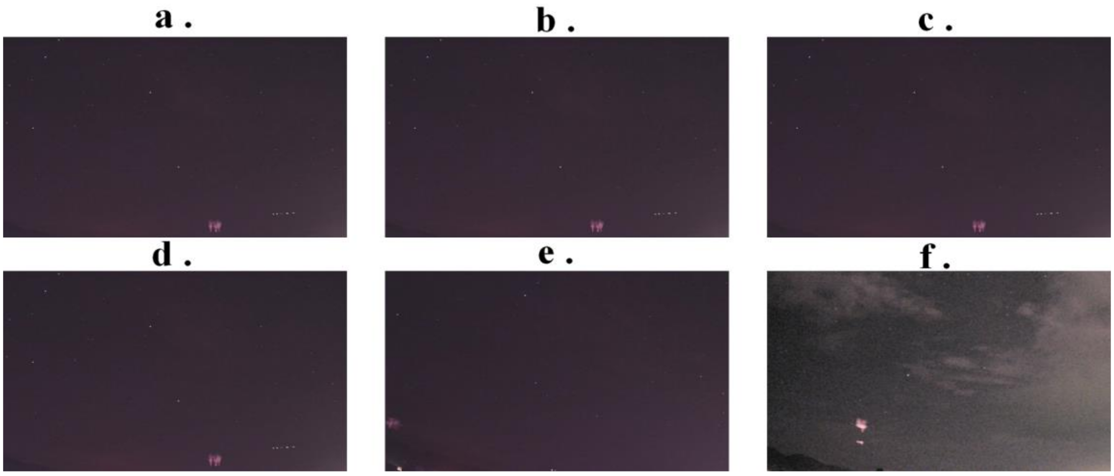
Finally, we attach specific information on all 6 cases of TLEs.

TLEs cases and parameters:

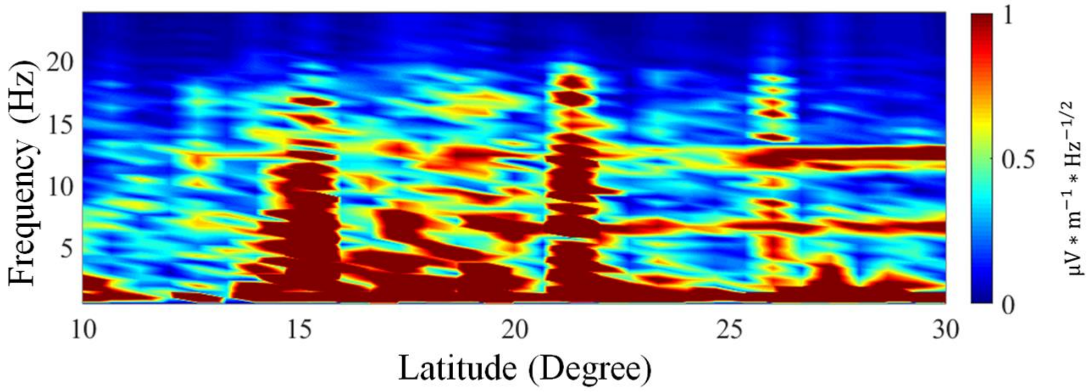
TLE cases	TLE count	Distance (km)	Anomaly range
May 3, 2021	27	300	13°N-20°N
May 10, 2021	90	1800	10°N-25°N
May 11, 2021	65	1300	10°N-30°N
May 12, 2021	26	800	10°N-16°N
May 23, 2021	16	300	17°N-22°N
June 5, 2021	20	1300	17°N-22°N

The details of the TLEs:

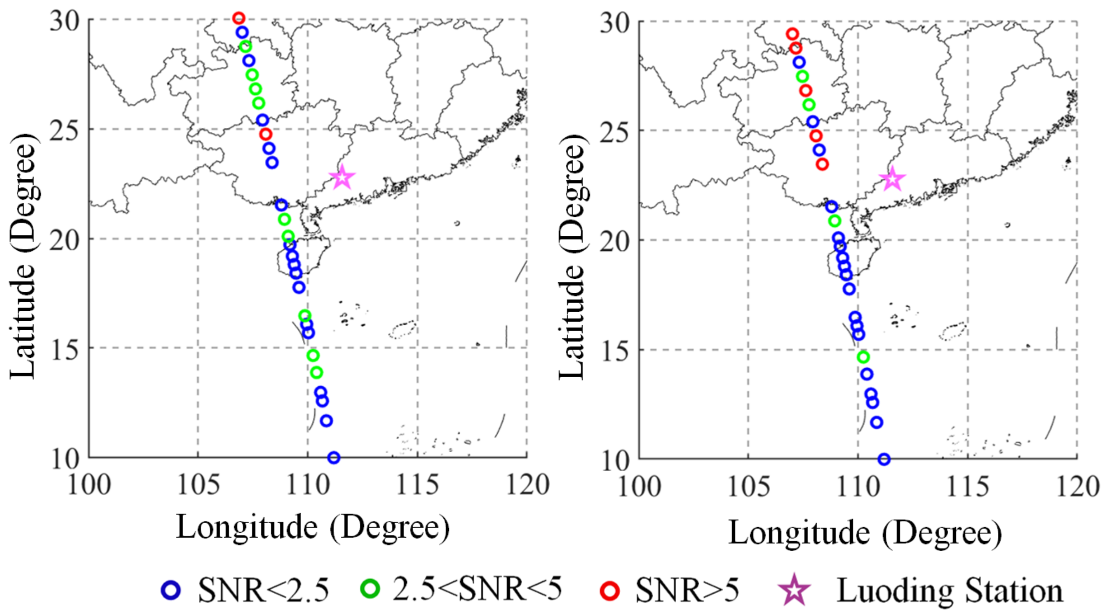
(1). TLEs on May 3, 2021



Some TLE cases photographed on May 3, 2021

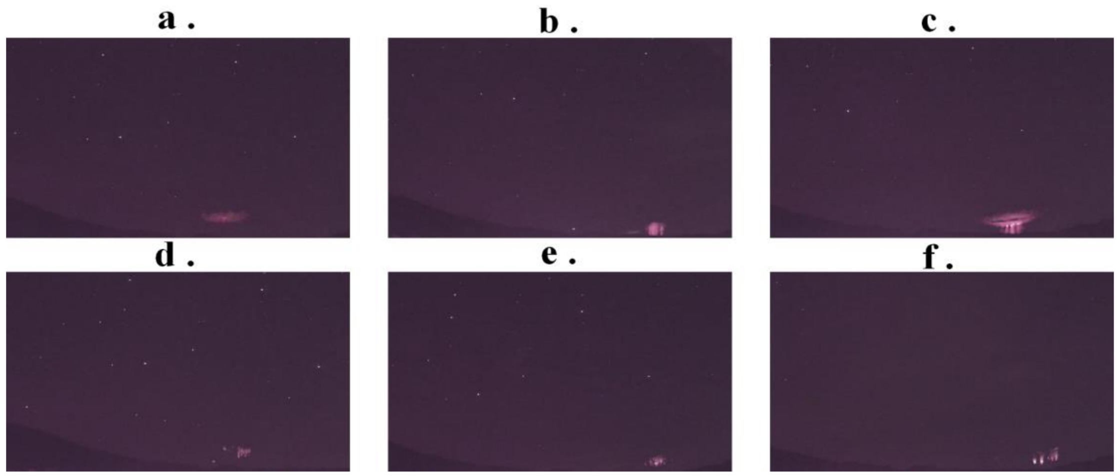


The PSD of ULF electric field

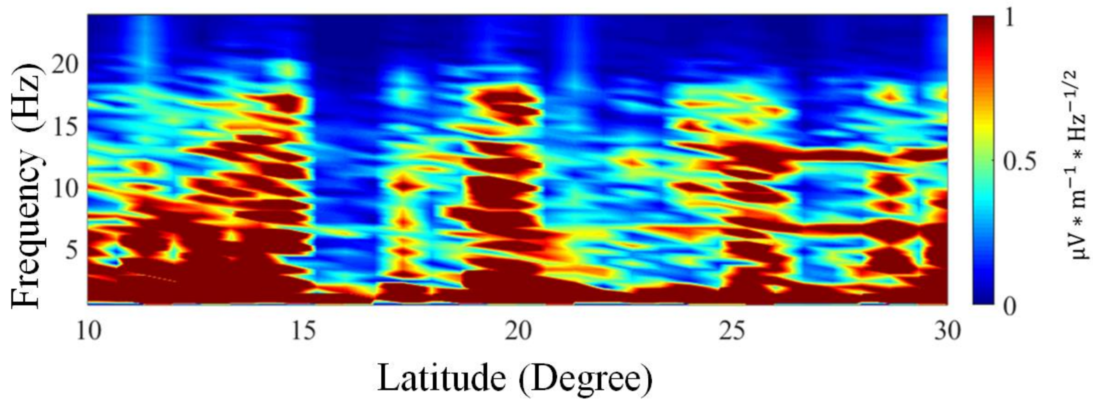


The SNR of SR 1mode (left) and 2mode (right)

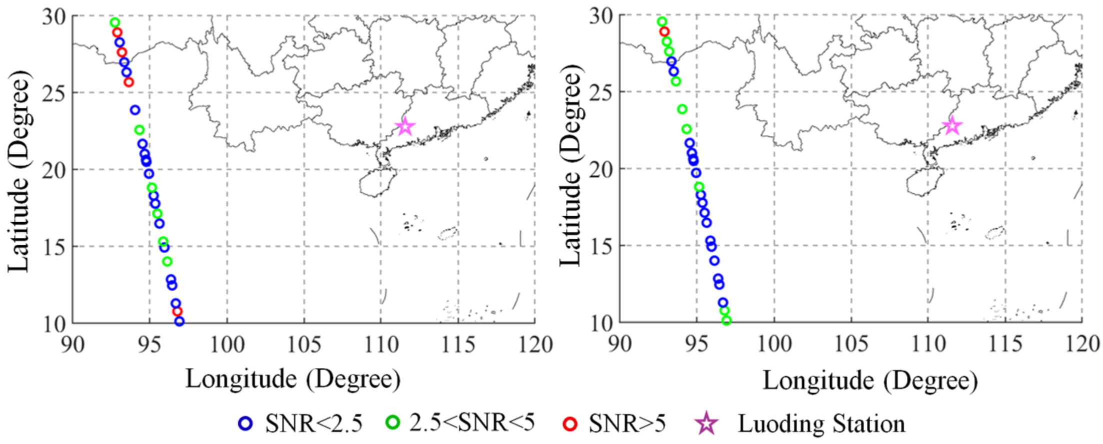
(2). TLEs on May 10, 2021



Some TLE cases photographed on May 10, 2021

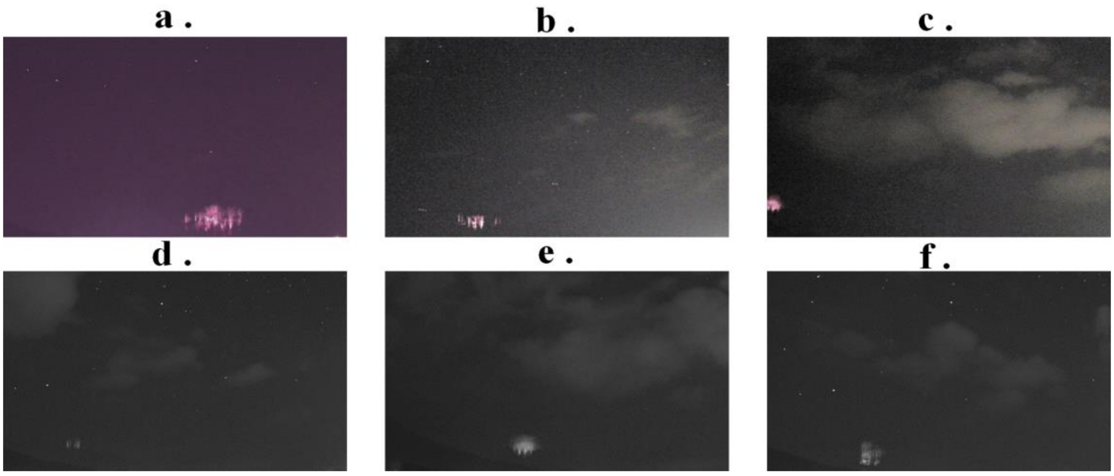


The PSD of ULF electric field

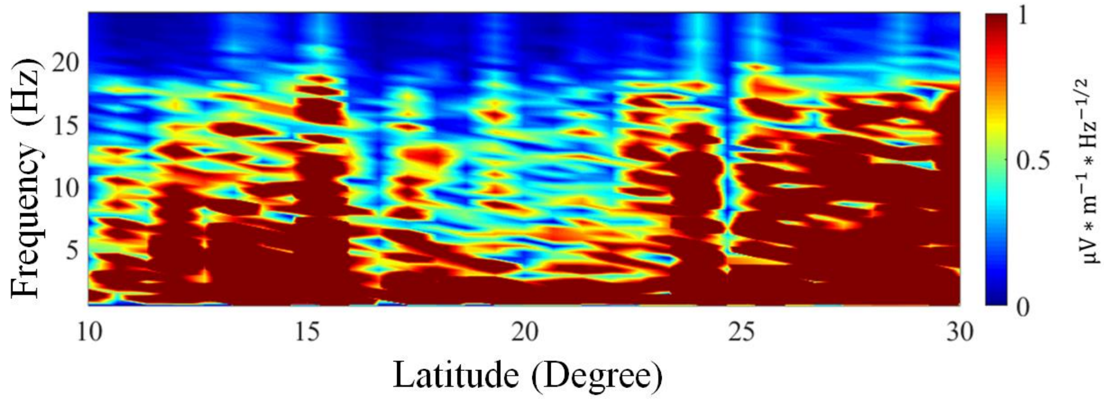


The SNR of SR 1mode (left) and 2mode (right)

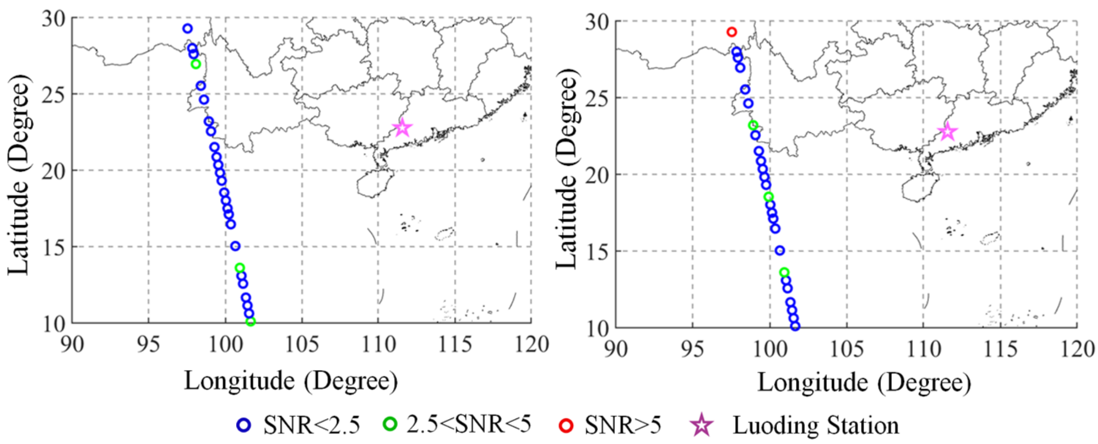
(3). TLEs on May 11, 2021



Some TLE cases photographed on May 11, 2021

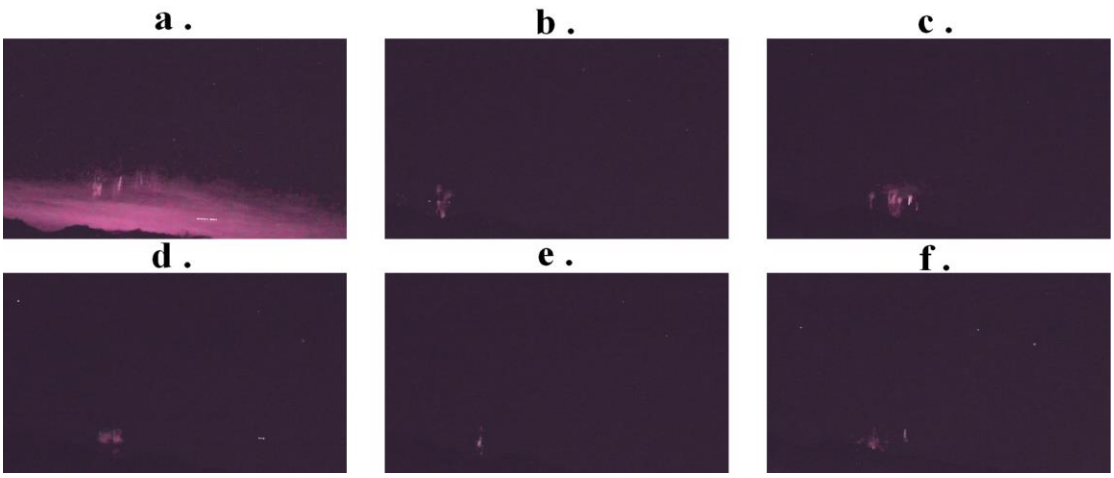


The PSD of ULF electric field

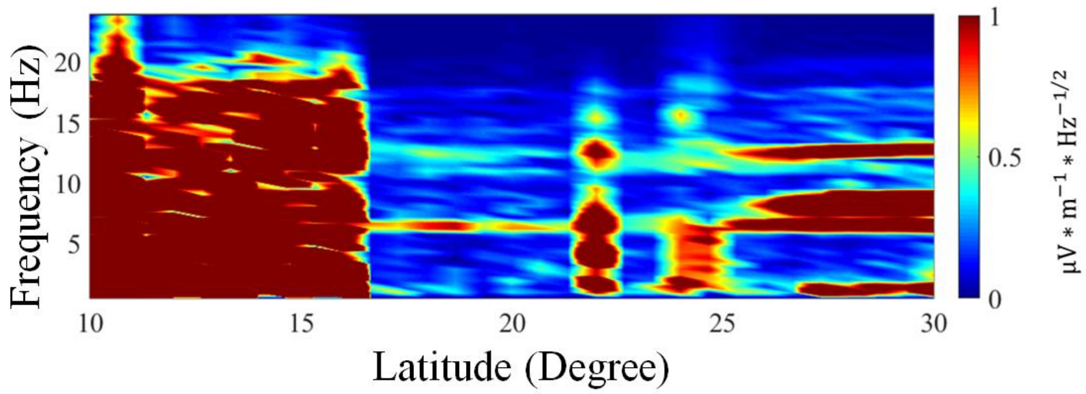


The SNR of SR 1mode (left) and 2mode (right)

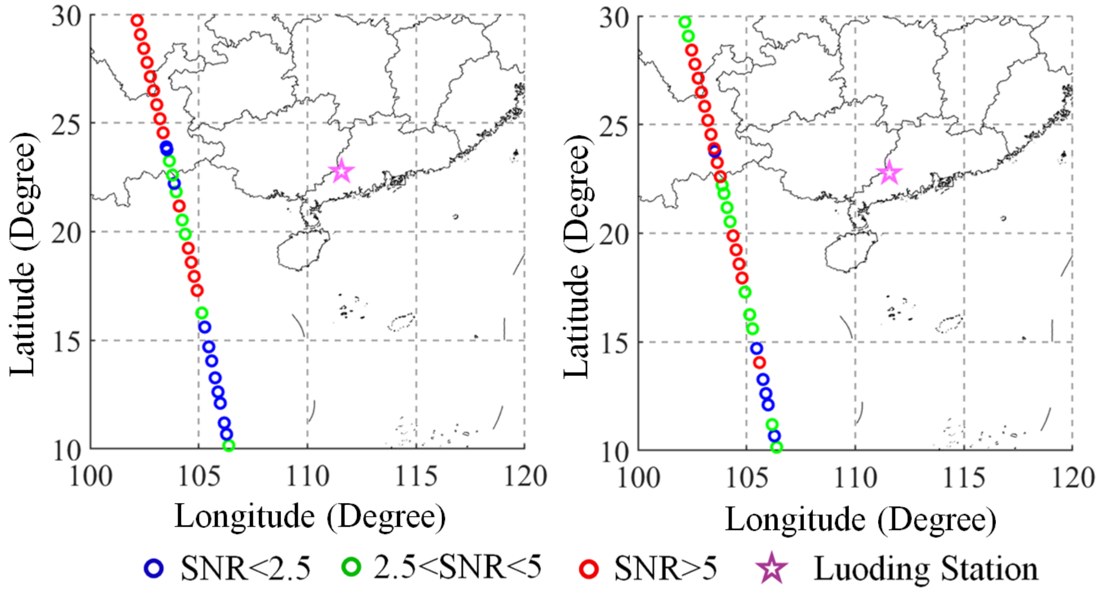
(4). TLEs on May 12, 2021



Some TLE cases photographed on May 12, 2021

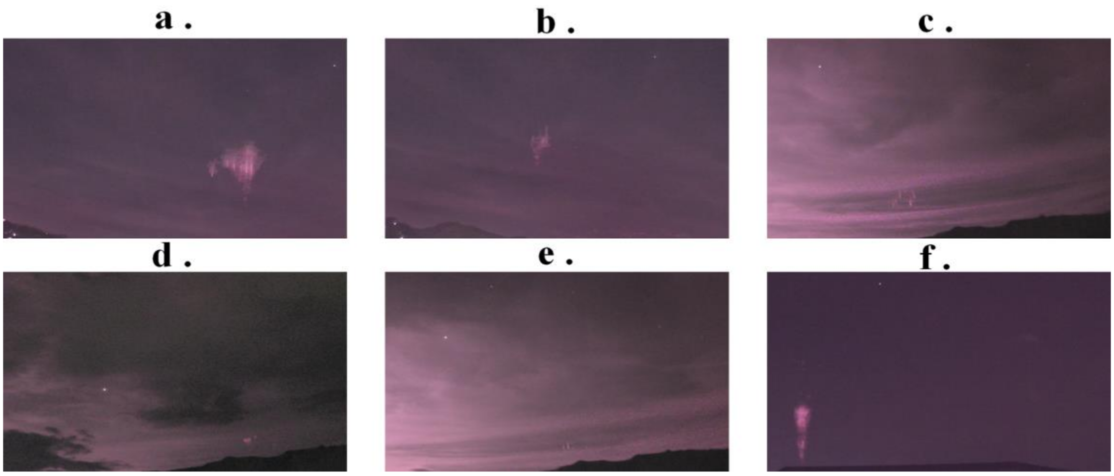


The PSD of ULF electric field

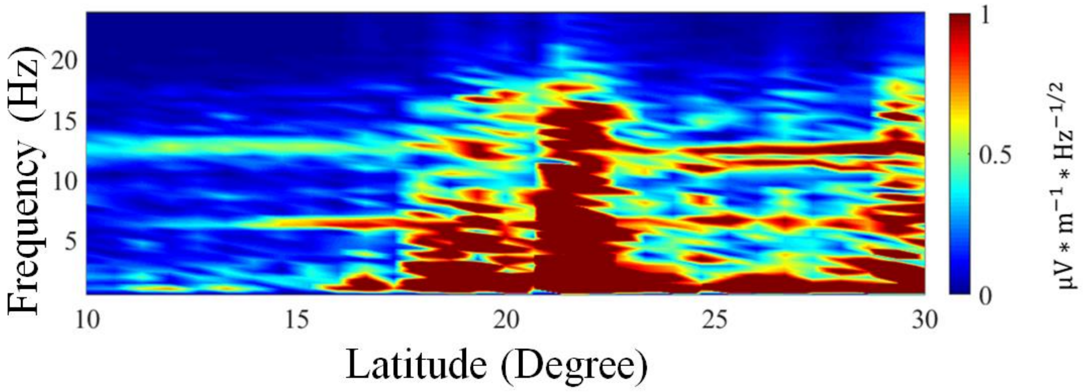


The SNR of SR 1mode (left) and 2mode (right)

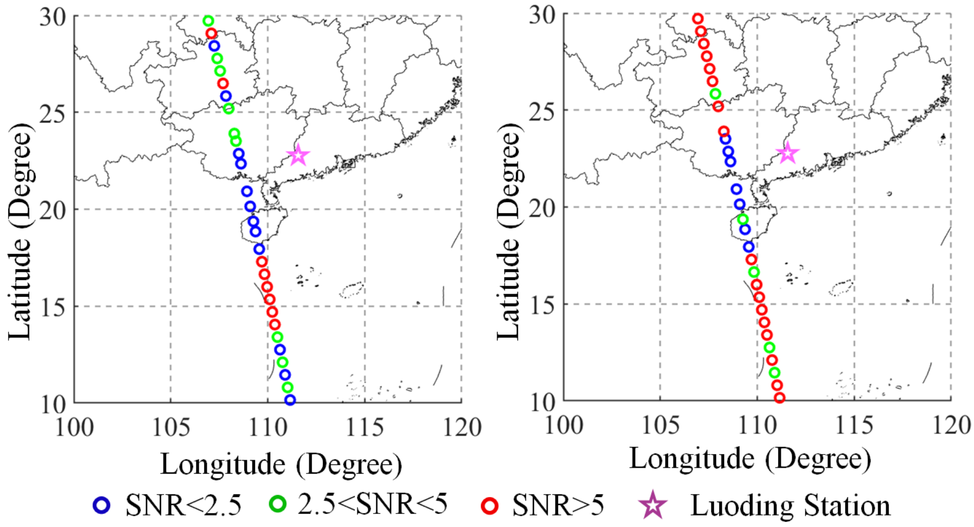
(5). TLEs on May 23, 2021



Some TLE cases photographed on May 23, 2021

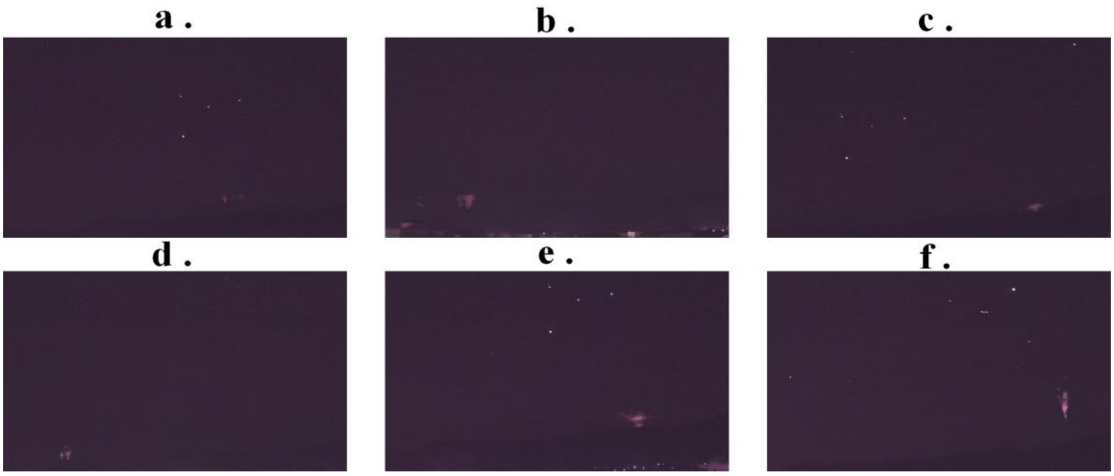


The PSD of ULF electric field

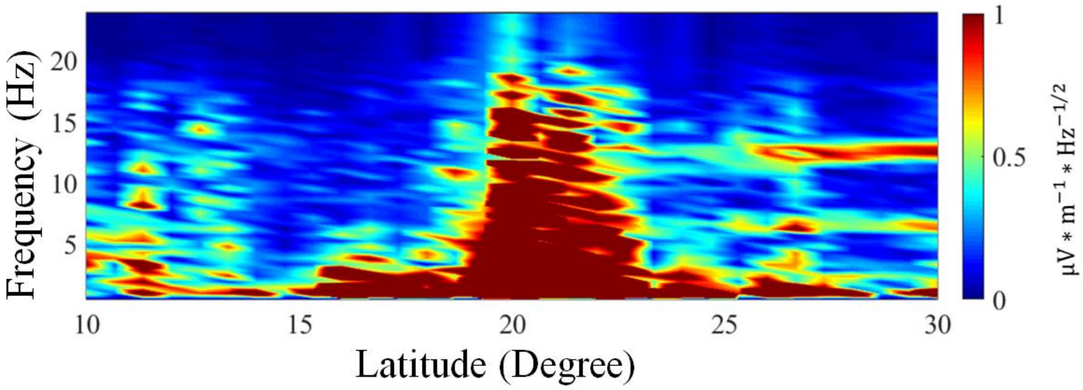


The SNR of SR 1mode (left) and 2mode (right)

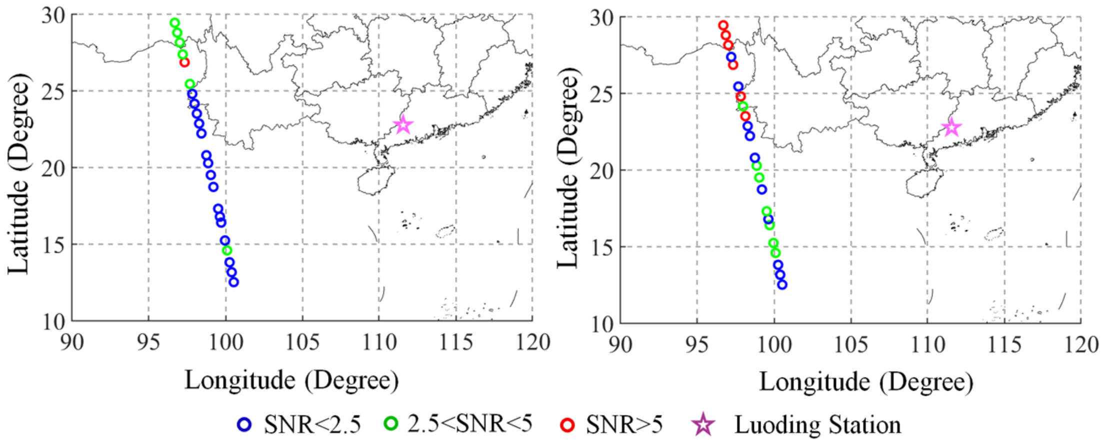
(6). TLEs on June 5, 2021



Some TLE cases photographed on June 5, 2021



The PSD of ULF electric field



The SNR of SR 1mode (left) and 2mode (right)

Reference of this supplementary materials:

Zhu, K., Yan, R., Xiong, C., Zheng, L., Zeren, Z., Shen, X., Liu, D., Guan, Y., Liu, C., Xu, S., Lv, F., Guo, F., Zhou, N.: Annual and semi-annual variations of electron density in the topside ionosphere observed by CSES. *Frontiers in Earth Science*, 11, https://doi.org/10.3389/feart.2023.1098483, 2023.