Activity of Red Sprite and its Occurrence Time

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Abstract:

We have tabulated the occurrence time of red sprites based on the papers published between 1990 and 1997. The result suggests that red sprite is most active around midnight. Hence the window from 23:00 to 01:00, in the local time, would be more preferred for the observation of red sprite.

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   - Red sprite distribution based on the number of papers

I. Introduction:

To maximize the observation efficiency of the ISUAL mission, the pointing direction of the imager and the observation time zone needed to be chosen critically. Unfortunately, there is no published data regarding the daily occurrence time distribution of red sprite. Thus, as requested by the ISUAL mission, we search the published literatures of red sprites and analyze the records of observation. Totally 22 papers\(^{1-22}\), published from 1990 to 1997 and as shown in the list of the referred papers,
have been surveyed. The result indicates that red sprite is most active around midnight. Hence, to have a better observation rate of sprite, the observation window from 23:00 to 01:00 local time, could be more preferred.

II. Results of the Statistics:

The activity distribution of lightning in Fig. 1 indicates that lightning is most active around midnight. As shown in Fig. 2, the activity distribution of red sprites represented by the number of the red sprite events seems also peaks around 1:00 to 2:00 AM. Since the number of events is not reported in all the referred papers, the distributions shown in Fig.1 and Fig.2 could be biased by the few papers which did. To alleviate this possibility, we further sort the observed red sprites occurrence times in the referred papers into time bin of hourly interval. In this sorting scheme, red sprites which were observed in very closed time span was only counted once in each paper. Figure 3 is the paper-number distribution of the observation of red sprites and it indicates that red sprite is most active from PM 23:00 to AM 1:00. This result also agrees with the activity distribution of lightning very well. Thus, based on these data, we conclude that red sprite is most active around midnight and we would like to suggest to coordinate the ISUAL observation accordingly for achieving a better efficiency.

III. The list of referred papers:

Fig. 1 The occurrence time distribution of lightnings
Fig. 2 The occurrence time distribution of the reported red sprites
Fig. 3 The occurrence time distribution of red sprites sorted into hourly bin