

Interactive comments on “Preliminary results from the total lightning detector-cum-mini weather station installed at the Calcutta University” by Midya et al.

We thank the reviewers for their minute scrutiny of the manuscript. We believe that their valuable comments and suggestions will be helpful for further improvements of the quality and credibility of the paper. We have revised the manuscript considering their suggestions. Answers are given below in red. Changes in the revised version of the paper are in bold black font.

Reviewer 1:

The paper presents lightning activity in a region of interest using a lightning detector-cum-mini weather station. The analysis of lightning data includes both IC and CG lightning. The authors emphasized the importance of understanding of the detail characteristics of severe pre-monsoon thunderstorms over Gangetic West Bengal locally known as Nor’westers which bring considerable damages to human lives, properties, agriculture, power grids and electronics devices. The findings of the study could be used for early warning of such kind of thunderstorms. The study necessitates steps toward accurate warning of thunderstorms in the region for mitigation of damages caused by them and also focussed on the possibility of short-term prediction of the severity of the storm. More such studies within a network and long term monitoring could lead to accurate warning.

The paper also presents variation of wet component of atmospheric refractivity to point out onset and removal of monsoon in the region. It is observed that refractivity remains at a higher level with less fluctuations during the period of monsoon but sharply decreases with significant fluctuations at the time of withdrawal of monsoon. This study of monsoon in the region is very relevant and crucial since with the monsoon starts the cultivating season.

Highlights:

- » Initial results from the total lightning detector cum mini-weather station are presented.
- » Total lightning characteristics of two pre-monsoon severe thunderstorms are studied here in details which has not been done before for the region.
- » Total lightning count increased before peak wind and positive CG lightning count increased by 5% for the severe thunderstorm.
- » Study of atmospheric refractivity index reveals monsoon arrival and withdrawal signature.

Comments:

Wind speed shown in Figure 3, whether they are geo-located or measured separately (how far from the thunderstorm cell?).

Ans: Wind speed data are collected from the Regional Meteorology Centre, IMD, Alipore, Kolkata. We have not measured the distance of the IMD station from the thunderstorm cell which produced the peak wind at corresponding times. But from the Figure 4&7, it can be noted the relative position of the lightning cells and IMD station. Important point to note here is the occurrence time of the peak/damaging wind speed after the lightning jumps.

How is the peak wind speed related to lightning?

Ans: The relation between peak wind speed and lightning are not established here as it requires more data (which can be done in future). What we focused here is the occurrence of lightning jumps before damaging winds which can be used as precursors of severe weather.

In the present analysis 17th April is chosen due to the severity of the thunderstorm on that day. According to Figure 2, there were more lightning activity on 22nd, 26th and 30th April. How was the wind character on those days?

Ans: We have analysed and compared the two events here. No wind gust was recorded for thunderstorm on 22nd April, however peak winds produced associated with the thunderstorms on 26th and 30th April were 80 km/hr and 60 km/hr respectively as recorded in IMD stations at Kolkata. But we did not mention these in the manuscript as we have also not analysed those events here. A statistical analysis of all the thunderstorms events of 2018 are being done and will be communicated shortly.

Sharp decline in the refractivity plot is considered in this paper as the withdrawal signature of the monsoon. But the variations of refractivity plot does not indicate onset of monsoon. It is suggested to plot the variations over the whole year. Also, if possible, can include a few year's data for the definitive conclusion of the withdrawal signature.

Ans: TLDWS was operating from July, 2016, so we do not have the data before that. However, we have extended the graph (Figure 9) for the whole year to show the refractivity variation from the IMD station where the monsoon onset part can be seen after June (day number 180). We have also revised the Figure 8 to include the variation of surface temperature, relative humidity and water vapor pressure during July, 2016 to December 2016.

Increase the text size of the labels and titles in the figures from 2 to 6.

Ans: Revised figures with increased (20%) label and titles are included now.

In Figure 3, Top and down panels are slightly overlapped.

Ans: We fixed it in the revised version.

Considering the comments and suggestions of the third reviewer, we have slightly revised the title of the manuscript as following:

“A preliminary study on thunderstorms and monsoon using total lightning and weather data over Gangetic West Bengal”.