



Supplement of

The Lightning Differential Space framework: multiscale analysis of stroke and flash behavior

Yuval Ben Ami et al.

Correspondence to: Ilan Koren (ilan.koren@weizmann.ac.il)

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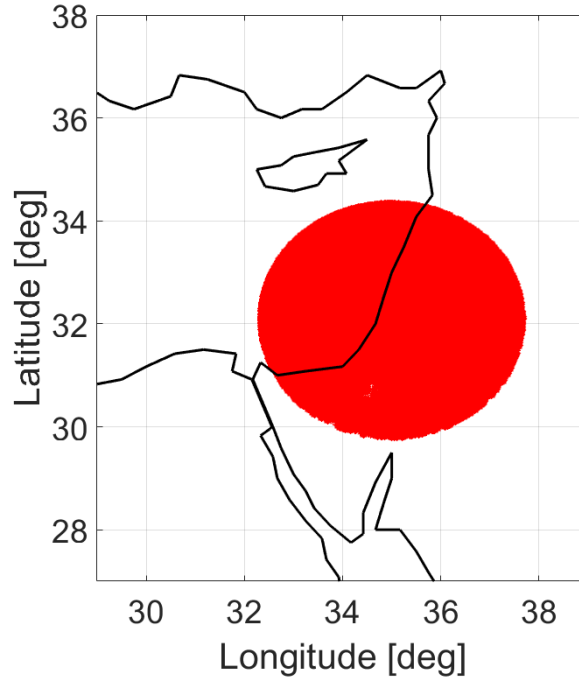


Figure S1: Map marking the study region over the Eastern Mediterranean Sea and the nearby land (red circle), within a distance < 250 km from the ILLS network center, used for the validation analysis, comparing the ENTLN to the ILLS system results (two detection networks).

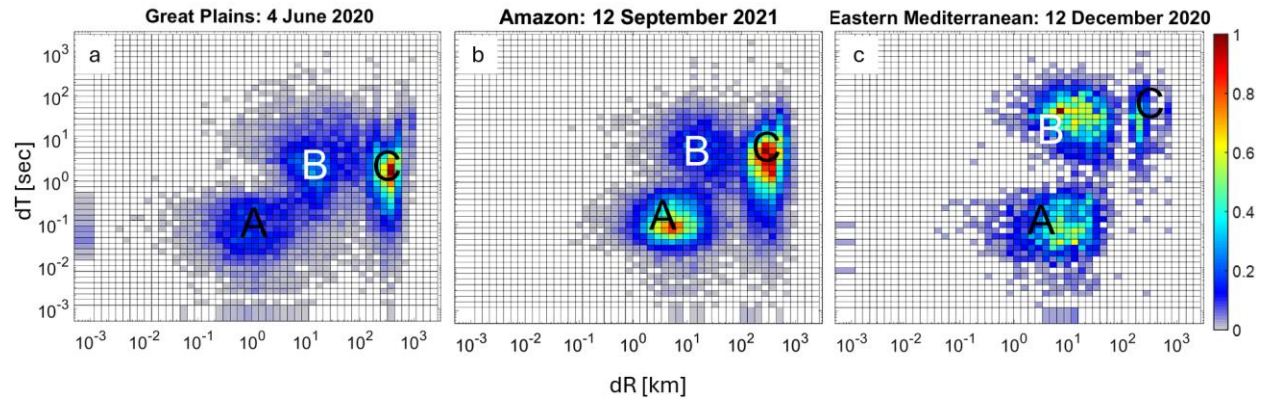


Figure S2: Number Distribution LDS for one day for each ROI. PDF of the dR and dT intervals between consecutive strokes, normalized by the maximal number of counts for the (a) Great Plains (16,887 strokes), (b) Amazon (21,576 strokes), and (c) the Eastern Mediterranean (3,794 strokes). Intervals with PDF < 0.025 are marked in gray. It shows cluster B when analyzing smaller data sets.

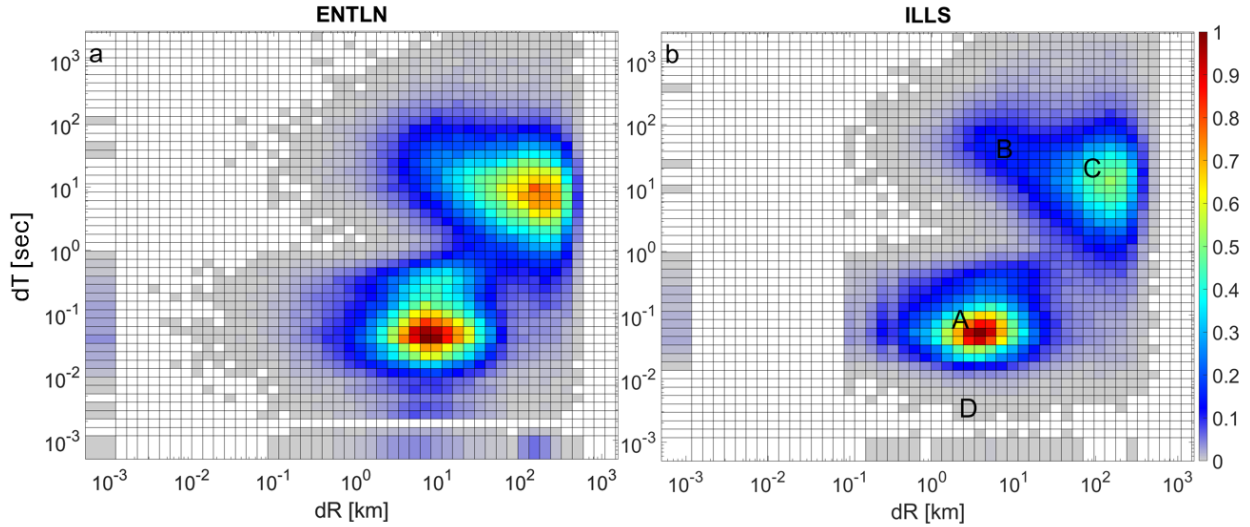


Figure S3: Number Distribution LDS: PDF of the dR and dT intervals between consecutive strokes, normalized by the maximal number of counts for the (a) ENTLN and (b) ILLS data over the Eastern Mediterranean. Intervals with PDF < 0.025 are marked in gray. Both panels represent the analysis of CG strokes over a similar region (including sea and land), at a distance < 250 km from the network center (Fig. S1). (a) includes 272,509 CGs during 75 stormy days in Oct-Dec between 2020-2021. (b) includes 251,393 CGs during 265 stormy days in Oct-Dec, 2004-8, and 2010. The location of clusters A-D is illustrated on panel b.

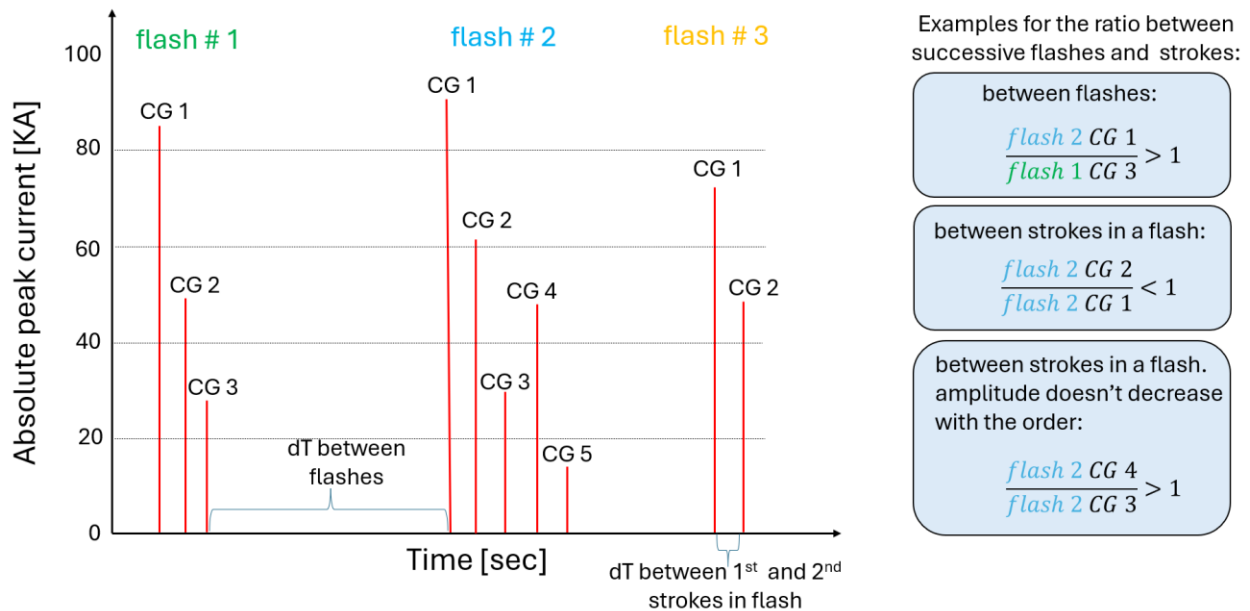
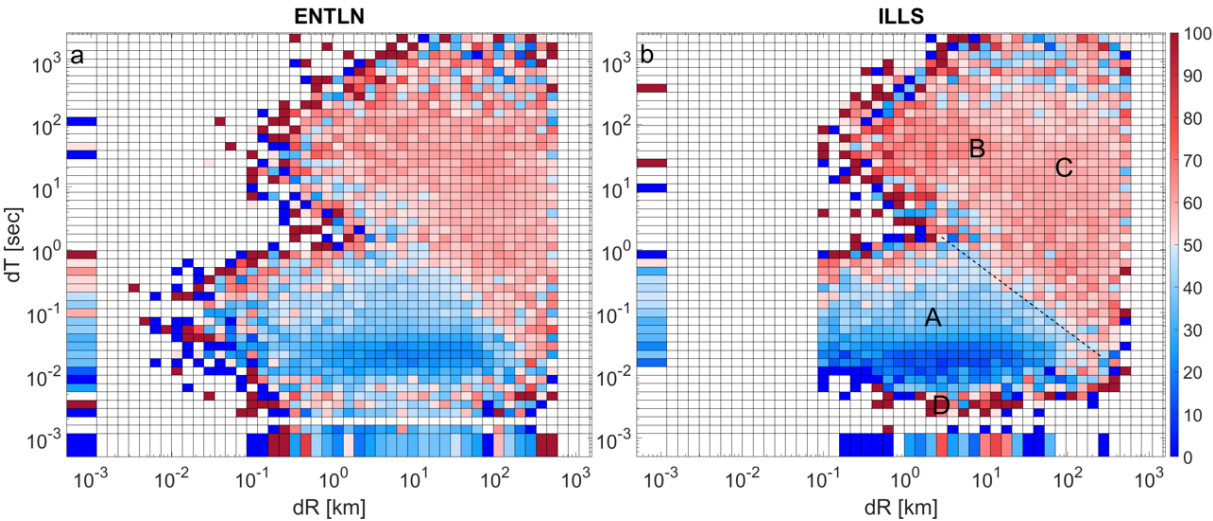


Figure S4: Illustration of the peak current of successive strokes in flashes. The ratio between the initial stroke in a given flash and the last stroke in the preceding flash is expected to be greater than 1. The ratio between a given stroke in a flash and the preceding stroke in the same flash is expected to be smaller than 1. When the absolute amplitude of strokes does not decrease with their order, the ratio will be greater than 1.

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28 Figure S5: Current Ratio LDS (between the absolute current of 2nd and 1st strokes in each pair): The percent of pairs with stronger
29 successive stroke peak current (2nd in pair) for the (a) ENTLN and (b) ILLS data, over the Mediterranean. Both panels are for
30 similar data and spatial range as in Figure S3. Reddish intervals indicate a stronger amplitude of the 2nd stroke in more than 50%
31 of the pairs, while the bluish intervals show the opposite. The location of clusters A-D is illustrated on panel b. The borderline
32 between the main reddish and bluish regions is illustrated by the dashed line on panel b.