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Lightning multiplicity characteristics in Eastern Mediterranean thunderstorms

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Cloud-to-ground lightning flashes consist of one or several strokes coming in very short temporal succession and close spatial proximity. There are several methods for converting stroke data into flashes. In the NLDN (US), the thresholds for determining flash multiplicity are 0.5 seconds and 10 km radius between successive strokes (Cummins et al., 1998). We used location-based algorithm with several spatial and temporal ranges, and analyzed stroke data which were obtained by the Israel Lightning Location System (ILLS) during the period 1.8.2009-31.7.2010. We computed multiplicity, the percentage of single stroke flashes and the geographical distribution of single vs. multiple-stroke flashes for the Eastern Mediterranean region. Results show that for the NLDN thresholds, the percentage of single stroke flashes was 44% and the average multiplicity was 1.6.
Since the average time interval between successive return strokes in a flash is usually only several tens of milliseconds (Saba et al., 2010), a value of 0.2 s may better represent the real multiplicity. Similarly, most video-based studies show a mean range of less than 2.5 km between two ground terminations of the same flash (Stall et al., 2009) and so a spatial range of 10 km may misclassify independent flashes as subsequent strokes of a single flash. This may lead to lower values of flash density than occur in reality (due to the broad clustering criteria). Therefore, we recommend a spatial range of twice the detection error, which for the ILLS is 0.5 km. For the narrower thresholds of 1 km and 0.2 s our data show a multiplicity (for both negative and positive flashes) of 1.1 and a percentage of 86% for single stroke flashes. We find that the land-sea multiplicity distributions are very sensitive to the thresholds used.

Cummins, K. L., Murphy, M. J., Bardo, E. A., Hiscox, W. L., Pyle, R. B. and Pifer, A. E., (1998), A combined TOA/MDF technology upgrade of the U.S. National Lighting Detection Network, J. Geophys. Res., 103(D8), 9035–9044.
Saba, M.M.F., Schulz, W., Warner T.A., Campos, L.Z.S., Schumann, C., Krider, E.P ., Cummins, K. L. and Orville, R. E., (2010), High speed video observations of positive lightning flashes to ground, J. Geophys. Res., 115, D24201, doi:10.1029/2010JD014330.
Stall, C. A., K. L. Cummins, E. P. Krider, J. A. Cramer, (2009), Detecting Multiple Ground Contacts in Cloud-to-Ground Lightning Flashes. J. Atmos. Oceanic Technol., 26, 2392–2402.