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Lightning Characteristics in Israel and the Eastern Mediterranean

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This study presents 5-year climatology of the spatial and temporal distributions of cloud-to-ground (CG) lightning flashes over Israel and the eastern Mediterranean region, for the period 2004 to 2010. We used LPATS data obtained by the Israeli Electrical Company: the system covers Israel and up to a range of ∼500km. Annual and monthly flash densities in both polarities as well as numbers of lightning days, peak current and spatial distribution were analyzed using ArcGIS software. Regional and local effects were both detected including the effect of the warm sea, orographic and urban factors.

The data holds 608,510 flashes in 817 lightning days for the studied period. Throughout the study region roughly 3% and 16% of the lightning days account for 50% and 90% of lightning production, respectively. Maximum flash densities are found above the warm Mediterranean Sea and the coastal region with a pronounced decrease from north to south. We found that 75% of the flashes were observed above the sea, which constitutes only 40% of the total area of the study region. The majority of lightning (90%) were produced during autumn and winter, i.e. October to February. October has the highest number of flashes, 40%, an anomaly related to the high atmospheric instability associated with two synoptic systems, the Red Sea Trough (RST) and Cyprus Low. The average percentage of positive CG flashes is 6%, with a large inter-monthly variability. The incidence of winter positive CG flashes was found to be approximately 3 times higher than autumn positive CG flashes (10% vs. 3.5%). This fact can be explained by the finding that the daily percentage of positive flashes decreases with the increase in the total number of daily flashes and the abundance of events with a high daily number of lightning flashes found in October.

To study flash multiplicity we applied an algorithm defining the number of strokes per flash, using thresholds of 0.2s between consecutive flashes occurring within a 1 km range around the location of the first stroke. It was found that 90% of the flashes are single stroke, with large variation between land and sea. The average peak current of CG flashes was found to be larger above sea water.