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Urban Effects on Lightning Flash Density in the Coastal Region of Israel

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Lightning in the coastal region of Israel occurs mostly in the December-February period, with an average flash density of $\sim$1.2 flashes/km2/year, increasing from south to north and reaching a maximum near the port city of Haifa and the near-by Carmel Mountain. Based on lightning data from the LPATS system, obtained during the winter seasons of 2004/5-2006/7, we mapped flash density by using high-resolution Google-earth visualization tools. We note that maximum lightning activity occurs just west of the coastline above the Mediterranean Sea and decreases over land. The urban complex of the metropolitan Tel-Aviv area shows a clear increase in lightning density compared to more rural regions to its north and south. A second maximum is present near Haifa and its surrounding industrial complex. An increase in positive-ground flash density is present downwind from the Tel-Aviv urban area. A clear mid-week effect is also apparent in the flash density of positive ground flashes with peak currents > 50 kA north-east of the Tel-Aviv metropolitan area. Considering the Urban-Heat Island (UHI) effect, we can explain this as a dynamic consequence driven by wind-shear pushing the upper positive charge center eastward relative to the lower part of convective thunderstorms.