

Is there a "weekend effect" in precipitation and lightning activity during winter thunderstorms over the Tel-Aviv, Israel metropolitan area?

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There is numerous evidence that show changes of lightning frequency above and around (especially downwind of-) major urban areas compared with their rural surroundings. For example, Bell et al. (2009) reported a weekly cycle in lightning frequency in the south-east of the USA, but only a weak signal over major cities. There was a clear midweek increase in storm intensity, indicating that increases in aerosol levels lead to invigoration of storms in regions where convective instability and humidity are high. A similar weekday-weekend difference was reported for the Atlanta, Georgia metropolitan area by Stallins et al. (2012) and by Farias et al. (2009) in Sao-Paulo, Brazil.

We report the analysis of 10 years of winter-time (DJF) pollution, precipitation and lightning data over the Tel-Aviv metropolitan area, Israel's largest and densest urban environment. The region has an area of 2291 km² and a population of 3.854 million people, and hosts 1 million cars per day during weekdays (Sunday-Thursday) and the overflights of hundreds of airplanes landing at the Ben-Gurion international airport. Hourly aerosol concentrations (PM2.5 and PM10) were obtained from several automatic air-quality stations operated by the Ministry for Environmental Protection. The daily precipitation amounts at the Bet-Dagan Meteorological Center were analyzed on a decadal basis and exhibit a weekend effect with a varying maximum during weekdays. Lightning data obtained from the Israeli Lightning Detection Network (ILDN) for the period showed a similar pattern with enhanced activity during mid-week, with maximum on Wednesday and Thursday. These results suggest that increased activity of lightning during week-days (as compared with the weekend) is caused by increased levels of pollution due to traffic and economic activity. The increased amounts of particles tend to prolong the life-time of storms and their total lightning amounts and change their intracloud/cloud-to-ground flash ratios.

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DJF Amount of lightning

