Investigating correlation of lighting activity and precipitation in an Eastern Mediterranean island

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This study examines conditions under which lightning activity and precipitation events can be correlated in an Eastern Mediterranean island climate. As a first step, the activity within a predefined area of 50km radius around the gauge station is examined, given the temporal evolution of rain accumulation at an hourly time step. Then the lightning activity is grouped in time-space clusters and for each lightning-cluster precipitation recordings of 10 minutes time step from nearby gauges are searched in an area of variable radius ranging from 10 to 100km. The number of clusters is decided according to the g-means algorithm in which the number of clusters is increasing until the data of all clusters follow the Gaussian distribution. For different durations, number of lightning events and radius the proportion of the corresponding precipitation events for the given radius around the lightning-clusters is investigated. The methods are tested in the case study of the island of Crete. Precipitation data from 22 gauging stations over Crete and lightning data from the Global Lightning Network (GLN) are examined for the investigation of possible associations in a period of almost two years (09/2012-07/2014). For the first approach, for half of the stations rain accumulations over 10mm/h (90th percentile of rain) are recorded up to a day after lightning activity occurrence. According to the second approach, lightning-clusters of smaller duration (up to 5 hours) and more lightning flashes (more than 100) are highly associated with rain events. The optimal radius from the center of the lightning-cluster, according to the proportion of rain events, is found to be 30km. The results establish a better understanding of the relations between lightning and precipitation and could provide valuable information to the now-casting of flash flood events triggered by severe thunderstorms.