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Lightning-rainfall relationships in Mediterranean winter thunderstorms based on TRMM measurements

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Space-based instruments on the Tropical Rain Measuring Mission (TRMM) have been used to study rainfall and lightning over the central and eastern Mediterranean Sea. Data from six winters (1998 until 2003) were analyzed. Rainfall amounts increase during the winter months, with the maximum precipitation occurring during December, while lightning activity has a maximum during November. Analysis of seasonal rainfall and lightning activity showed a strong correlation with ENSO events. Instantaneous (90 second) analysis of the rain and lightning in individual storms reveals a strong correlation between rain rate and total flash rate. Monthly and seasonal correlation coefficients between rainfall and lightning were found to vary between 0.81 and 0.98, with the rainfall yield (kg/flash) found to vary between 2.5×10^8 and 9.7×10^8 kg/flash. Due to these high correlations we suggest the possibility to use lightning data over the Mediterranean Sea as a proxy for instantaneous rain rate in thunderstorms.