

# **The rain spells in Israel- major spatial patterns and their synoptic conditions**

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Eastern Mediterranean cyclones are the source of more than 95% of the precipitation amounts in the Mediterranean climate region and the semi arid region of Israel, where the research was conducted. However, the fact that all the research area is affected by the same origin of precipitation, does not mean that the spatial distribution of the rain spells and the annual precipitation amounts resemble the average pattern. There are significant differences in the distribution of the precipitation caused by changes in the fine location and depth of the pressure systems over the EM and the Levant coasts.

In order to analyze these differences, 419 rain spells during 50 rainy seasons between 1954/5 and 2003/4 were clustered into 6 major spatial precipitation patterns. Average synoptic conditions related to each pattern were defined and mapped based on 3 data sets: NCEP-NCAR reanalysis of 1000, 850, 700 and 500 hPa levels, daily sounding data from IMS at Bet Dagan (central coast of Israel) and the EM synoptic systems classification data set of Osetinsky (2006).

The NCEP-NCAR data set was used for mapping the spatial distribution of several synoptic parameters over the EM for each defined pattern, and its anomaly from the average conditions during rain events in Israel. The sounding data were used in order to obtain more accurate information regarding the weather conditions during the rain patterns and served with the synoptic classification data set as a verification tool for the results obtained from the NCEP- NCAR mapping.

The maps process and the analyzed data revealed a strong link between the location of the pressure lows in the lowest troposphere and the distribution of precipitation between northern and southern parts of the study area, caused by changes of the wind direction and its fetch over the Mediterranean. A strong correlation was found as well, between the depth of the pressure lows and the distribution of the rain between the coastal and interior hilly regions due to changes in the wind speed which affects the penetration of the humidity inland and the orography enhancement efficiency.

It is worth noting that although the 500 hPa pressure level is a critical parameter for rain in Israel, its pressure configurations are less important than lower levels in determining the spatial distribution of the rain in the study area.

Other synoptic parameters, not related to the horizontal winds, had only weak (if at all) correlations with the spatial distribution of rain in Israel.