

# **Climate and climate changes over the Eastern Mediterranean – a synoptic systems classification approach**

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The Eastern Mediterranean (EM) climate changes for 1948 - 2004 have been studied via the regional daily surface synoptic systems. They were classified by the originally developed semi-objective method (Alpert et al., 2004). At the manual stage, the input included the daily sea level pressure and 500-hPa charts for one year. At the automated stage, every daily vector for 1948/1/1 - 2004/12/31 was presented by the  $2.5^\circ \times 2.5^\circ$ -gridded fields of geopotential height, temperature, and two horizontal wind components, a total of 100 values. All input data were taken from the NCEP/NCAR reanalysis ([//www.cdc.noaa.gov](http://www.cdc.noaa.gov)). In total, 19 various EM synoptic systems, joining in 5 seasonally distinctive big groups of synoptic systems - Red Sea Troughs (RST), Winter Lows, Persian Troughs, Sharav Lows, and Highs - have been considered. The classification results allowed: (a) re-definition of the EM seasons, according to the changes in the regional weather phenomena, based on the seasonal course of the synoptic systems' frequency of occurrence; (b) new approval of the concept of "calendarities" - keeping the calendar dates for the maxima in the synoptic systems occurrences; (c) new insight in the EM climate trends via trends in the synoptic systems' occurrences that were found to be consistent with the historical climatic EM data. E.g., the drought of 1955 - 1962 and the wet winters of the late 1960s fit the RST days occurrences. They were found to increase from about 40 in the 1960s up to 100-110 in the 2000s that points on drying the EM region; (d) evaluation of the GCMs runs - ECHAM4/OPYC3 and HadCM3: the averaged simulated annual synoptic systems' occurrences were found to be close to the reanalysis; however, neither ECHAM nor HadCM3 depict any increase in the RST trend; (d) some prominent teleconnections between the EM synoptic systems and global indices were found, including an unexpected high correlation of 0.65 between the RST occurrences and Southern Hemisphere average temperature.

Reference: Alpert P, Osetinsky I, Ziv B, Shafir H, 2004: Semi-objective Classification for Daily Synoptic Systems: Application to the Eastern Mediterranean Climate Change. *Int. J. Climatol.* **24**, 1001-1011.