Geophysical Research Abstracts
Vol. 20, EGU2018-1726, 2018
EGU General Assembly 2018

Synoptic and large-scale scenarios responsible for dry spells during the winter in the Levant

Baruch Ziv (1), Hadas Saaroni (2), Tzvi Harpaz (1,2), and Judith Lempert (1)

(1) The Open University of Israel, Department of Natural Sciences, Ra'anana, Israel (zivbaruchana@gmail.com) , (2) Tel Aviv University, School of Geosciences, Geography and the Human Environment, Tel Aviv, Israel (saaroni@post.tau.ac.il)

Dry spells during the rainy season have been classified into three types; the 'subtropical', associated with an expansion of the subtropical high over most of the Mediterranean Basin (MB); 'baroclinic', induced by a pronounced stagnant ridge, a part of Rossby wave over the Eastern Mediterranean (EM) and 'polar', associated with blocking high over Eastern Europe, which pushes lower-level dry polar air toward the Levant. The types' identification is based on quantitative indices developed by Saaroni et al. (2015).
The present study analyzes dry days and spells (events), based on the above classification. First, an alternative, automatic, classification of the dry days, using K-mean technique, was performed. When dividing into 3, the clusters identified automatically resemble well the patterns defined subjectively. The analysis reveals the dominance of 'baroclinic' events and the tendency of 'subtropical' and 'polar' types to transform and become 'baroclinic'. Maps of cyclone tracks, derived for days belonging to each of the above types, show distinct distributions. For 'subtropical' days the entire MB is poor with tracks, the European cyclone track is densely populated and dominated by eastward propagation. For the 'baroclinic' days, the western and central MB are rich with tracks, the eastern part is nearly empty and the tracks over Europe are dominated by northward propagation. During 'polar' days, minimal tracks appear over the EM and entire Europe, whereas the eastern Atlantic is densely populated with cyclone tracks, presumably because they are blocked from entering Europe.
The evolutions of dry spells are studied through composite maps of 500-hPa GPH anomalies, derived for the days preceding the onset of events belonging to each type, down to their 3rd days. Prior to the onset of the 'subtropical' event, a widespread negative anomaly covers North Europe and North Asia, a second positive anomaly covers Greenland and eastern Canada and another positive anomaly covers the western and central Mediterranean. Toward the onset of the event, the latter moves and expand toward its eastern part. Together with a large negative anomaly over Europe, it constitutes a dipole in a zonal pattern, resembling an expansion of the subtropical high toward the Mediterranean. During the beginning of the 'subtropical' spells, this dipole rotates anticlockwise, and becomes meridional. This implies that the apparent shift of the subtropical high during the onset of 'subtropical' events may reflects just temporary constructive interference of Rossby waves of different speeds and lengths. Prior to the onset of a 'baroclinic' event, a meridional regime dominates the Mediterranean, and intensifies. A positive center over the EM, responsible for the dry conditions there, slowly becomes quasi-stagnant. This explains the tendency of 'baroclinic' events to be the longest dry spells. As in the 'subtropical' type, a pronounced stationary positive anomaly dominates Greenland and eastern Canada. Prior to the onset of a 'polar' event, a pronounced negative anomaly is found over the Levant, together with a pronounced positive anomaly over the majority of Europe, resembling a blocking high. This pattern propagates slowly eastward during the onset of a 'polar' event.