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The influence of Indian summer monsoon on the climatic regime of Eastern Mediterranean

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In a previous study, composite analysis demonstrated that there are significant differences in the atmospheric circulation over the greater Mediterranean region at the upper and lower levels between strong and weak monsoon years. More specifically, in the lower atmosphere the geopotential height anomaly patterns for the extreme Indian summer monsoon (ISM) years indicated the intensification (weakening) of the Azores anticyclone and the Persian trough, which extends from the Asian monsoon towards the Aegean Sea, during strong (weak) ISM years. This further implies that the ISM has an impact on the strong northerly winds blowing over the Aegean Sea, namely “Etesians”, which result from the combined action of the two aforementioned major systems. The accompanied continual cool advection in the area was identified in the negative anomalies of the strong 1000 hPa temperature composite over the region. At the same time, in the 500 hPa ω anomaly field it was found that a pronounced subsidence (upward motion) dominates over Eastern Mediterranean during years of strong (weak) ISM, counteracting the advective cooling in the area.
The objective of this study is to further investigate the ISM impact on the temperature and wind regime of the Eastern Mediterranean region, with the aid of multivariate statistics. For this purpose, the standardized Dynamic Indian Monsoon Index by Wang and Fan (1999) was used for a period of 44 years (1958-2001) along with ERA40 Reanalysis data, including monthly means of surface air temperature and wind at 850hPa with a horizontal resolution of 0.25° latitude x 0.25° longitude. Initially, the correlation maps of the seasonal anomalies of the two variables upon ISM index are computed and subsequently Empirical Orthogonal Function Analysis (EOF) is carried out on individual fields. Under this framework, correlation coefficients between the derived EOF amplitudes and ISM index are calculated and in order to validate the results from the first method, the EOF modes that exhibit high correlation coefficients are compared to the aforementioned correlation patterns. Our results verify that there is correlation between Indian monsoon and the etesian pattern over the Aegean Sea.

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