The role of large scale dynamics on the formation of the Eastern Mediterranean Teleconnection Pattern

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Teleconnection patterns form as preferred modes of low-frequency natural variability of the atmospheric circulation with geographically fixed centres of action (poles). Moreover, they comprise a naturally occurring aspect of the chaotic atmospheric system and primarily a reflection of internal atmospheric dynamics.

In previous studies, in an attempt to investigate possible teleconnection patterns in the Mediterranean region, the Eastern Mediterranean pattern (EMP) was found with the two poles located in North-eastern Europe and Eastern Mediterranean, respectively. This pattern was predominantly identified at the upper troposphere during winter. An index was then defined, based on the exact position of the two poles of the pattern, to represent the strength of the teleconnection pattern and to discriminate its negative and positive phase.

The objective of this study is to investigate the large scale dynamics related to the development of EMP. Datasets of daily geopotential height and horizontal wind components are employed as obtained from the NCEP/NCAR Reanalysis Project for the isobaric levels of the 300, 500, 700, 850 and 1000 hPa. The datasets cover the period 1958 to 2003 on a 2.5˚ x 2.5˚ latitude by longitude grid for the quarter-spherical window extended from 90˚W to 90˚E and 0˚ to 90˚N.

It was found that during the negative phase of the EMP an increased zonal flow is established over the European region. On the contrary, the positive phase is characterised by an intensification of the Atlantic anticyclone resulting in increased meridional flow of northerly component towards central Mediterranean. The relative vorticity distribution at 300 hPa confirms this large scale circulation regime over Europe and North Atlantic area when EMP develops.

Preliminary results indicate that the EM pattern is related to jet stream dynamics and Rossby wave dispersion. Previous studies demonstrated that much of the observed characteristics of the wintertime teleconnection patterns can be attributed to two basic dynamic mechanisms: (i) tropical influence through Rossby wave dispersion and its interaction with the basic-state flow and (ii) extratropical normal mode arising from the barotropically unstable basic-state flow. These two mechanisms are not necessarily mutually exclusive, but often act in concert to produce large extratropical response

initiated by tropical forcing. Most important, both mechanisms are strongly influenced by the strength and location of the wintertime jet stream. Based on these findings, an attempt is made to investigate in depth the mechanism that predominates in the formation of the EMP in relation to jet stream dynamics.

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