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The role of the North-Sea Caspian Pattern (NCP) on temperature variability in Europe and the Mediterranean

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The use of teleconnections in atmospheric research is very useful as it reduces the dimensionality of the complexity of the atmosphere into only one single (or two) figures and therefore is often used in statistical downscaling.
The most widely studied teleconnection are the Southern Oscillation (SO) related to the El Niño effect and the North Atlantic Oscillation (NAO) which primarily affects the rainfall regime in Western Europe and Northwestern Africa.
The impact of the upper level (500 hPa) teleconnection between the North-Sea and the Caspian (NCP) on the temperature and precipitation regimes in the Eastern Mediterranean (EM) have been studied and reported. In the present study, The impact of the NCP on the temperature regime over the entire European continent is presented.
An index (NCPI) that measures the normalized geopotential heights' differences between the two poles of this teleconnection was defined and enabled to differentiate between the positive and negative phases of the NCP. The anomaly circulation associated with each of both phases was determined.
During the negative phase, NCP(-), the geopotential heights are lower over the North Sea and higher over the Caspian and vice versa during NCP(+). Therefore, the anomaly circulation related to NCP(-) is counterclockwise around the North Sea and clockwise around the Caspian resulting in an increased southerly (or southwesterly) circulation in all the region between the North Sea and the Caspian. The opposite is true during the NCP(+), when the same region is under an increased northerly (or northeasterly) circulation.
The correlation (Pearson) between temperature and the NCPI has been evaluated, on a monthly basis, over the entire European domain for the 1948-2007 period. The results highlight a significant positive correlation in the north-western area of the domain and a significant negative correlation in the south-eastern one. Similar results were obtained also by comparing the temperature anomalies associated with both phases.
To understand the importance of this sort of temperature bi-pole in the context of temperature variability over Europe, a PCA has been applied to the temperature dataset to verify if it is represented by one of the EOFs and its associated fraction of variance. The temperature bi-pole is associated to the second most important mode of variability, but if the analysis is restricted to the months associated to NCP(+) and NCP(-), it becomes the first mode with 29.2% of associated variance.