

Cyclone/anticyclone activity over the Caspian Sea basin

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Variations of the hydrological cycle in the Caspian Sea basin, including precipitation over the Volga River basin and the Caspian Sea level (CSL), are among the strongest regional variations during the last century (Arpe et al., 1999; Arpe et al., 2000). They are related to variations of cyclonic activity in the basin (Mokhov et al., 1995; Mokhov and Semenov, 1997). In particular, the statistically significant tendency of increase of cyclonic activity over the Caspian Sea basin during 1980s is related with a strong increase of CSL.

We analyzed seasonal cyclone and anticyclone activity over the Caspian Sea basin (40–60° E) for the periods of the CSL rise (1979–1995 - II) and drop (1950–1978 – I and 1996–2016 - III). Cyclone and anticyclone characteristics were calculated from 6-hourly mean data for sea level pressure from NCEP/NCAR reanalysis. Figure 1 shows the latitudinal distribution of cyclone and anticyclone frequency (per season) in winter and summer for the different periods.

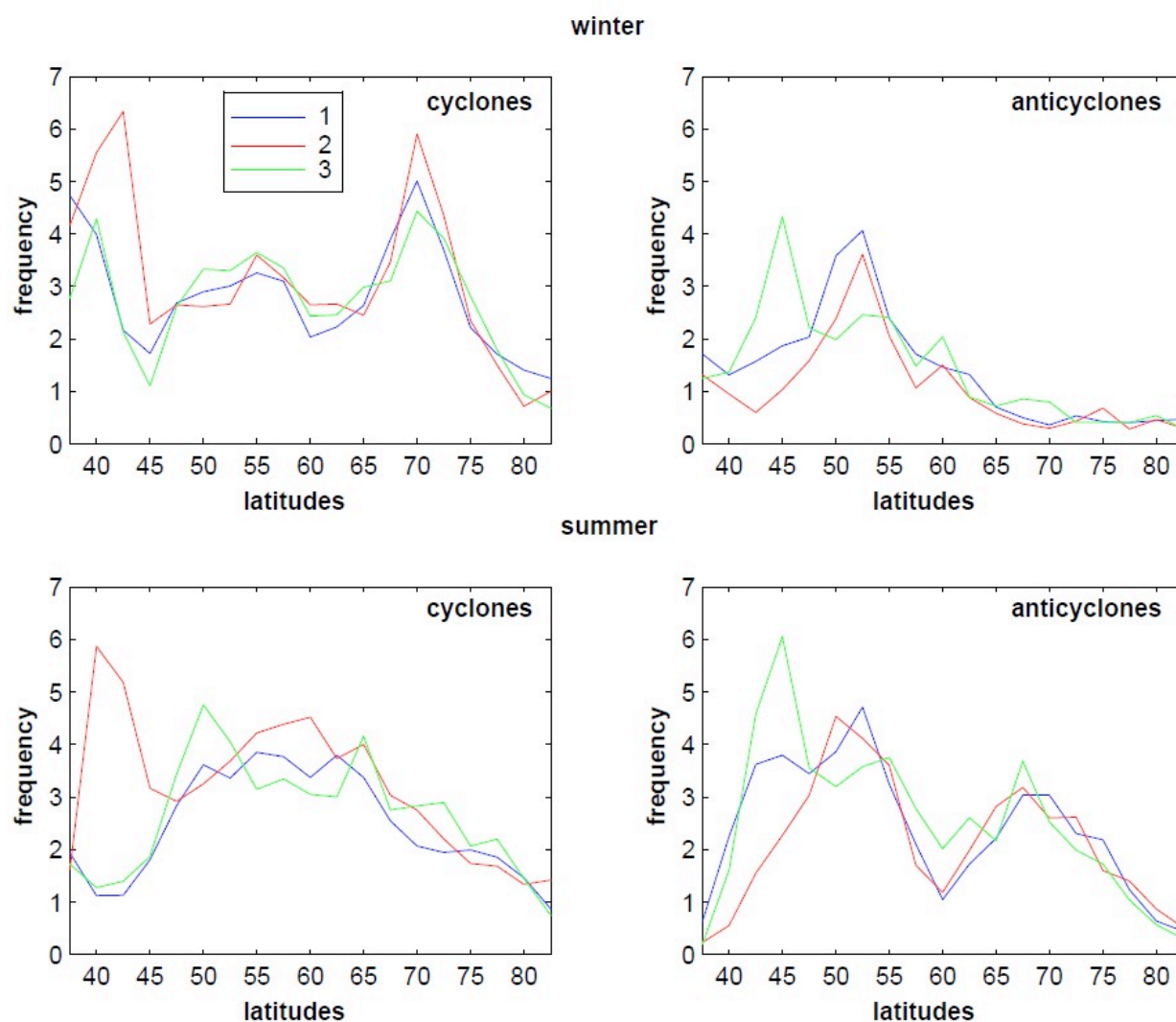


Fig. 1. Latitudinal distribution of cyclone and anticyclone frequency (per season) in winter and summer for different periods: 1 – 1950–1978, 2 – 1979–1995, 3 – 1996–2016.

Meridional distributions of cyclone/anticyclone frequency on Fig. 1 are very different in winter and in summer. Frequency of cyclones in winter shows two remarkable maxima near 70°N and near 40°N while in summer cyclone frequency is decreasing from middle latitudes to high and low latitudes (except period II). Frequency of anticyclones shows maximum values between 45°N and 58°N in both seasons with higher frequencies in summer. Anticyclone frequency has an additional maximum in summer in high latitudes (near 67°N).

The strongest variations in cyclone/anticyclone frequency are noted in the Caspian Sea region (between 37-47° N) in both seasons. The cyclone frequency is higher in this region during the period of the CSL rise and lower for the periods of the CSL drop with the opposite sign variations for frequency of anticyclones. The most significant variations are noted in summer.

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References

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