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- ensemble techniques
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The summer Etesian circulation in the eastern Mediterranean and the Middle East: influence of the South Asian Monsoon and mid-latitude dynamics.

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The aim of this study is the investigation of aspects of the summer circulation in the eastern Mediterranean and the Middle East (EMME) where a persistent low level northerly flow (etesian) is observed, which serves as a ventilating system for the whole region. In parallel, large scale subsidence dominates over the central and eastern Mediterranean that inhibits convection but leads to adiabatic warming of the tropospheric column. In this study, the ERA40 data set is used for the preparation of measures of the monsoon intensity, the etesian flow and Mediterranean subsidence. The use of indices describing the etesian flow in the EMME region allowed the compilation of a climatology of this phenomenon and the study of its interannual variability, as well as the detailed investigation of the influence of the monsoon on the EMME climate.

The etesian flow and the pronounced subsidence in the eastern Mediterranean acquire a maximum during July and August and their seasonal cycle is found to be strikingly synchronous to that of convective activity, especially over the Bay of Bengal. Detailed investigation of the seasonal evolution of the thermodynamic state of the troposphere in the area suggests that the deep convection causes tropopause lifting and stratification reduction over South Asia, leading to highly sloping isentropes in the western and northern periphery of the monsoon area and establishing a large scale background state. Subsidence occurs predominantly in areas where topographically induced circulation patterns enhance the northwesterly flow and force the air to slide down the isentropes. More importantly, the identification of ‘etesian outbreaks’ provides evidence that the influence of mid-latitude synoptic disturbances causes the high frequency variability of the observed subsidence in the eastern Mediterranean. Wave activity, which originates in the North Atlantic, amplifies the monsoon-induced background state. Consecutive pulses of southeastward moving air masses travel down the isentropes leading to sharp tropopause folds and intense stratospheric intrusions.