



## **Multidecadal changes in the Etesians-Indian Summer Monsoon teleconnection along the 20th Century**

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In this work we made use of historical winds record taken aboard ships to reconstruct a series of the prevalent summer northerly winds (Etesian winds) over the Eastern Mediterranean for the entire 20th century. Previous studies have shown a significant link between the frequency and strength of these winds and the strength of the Indian Summer Monsoon (ISM), but this relationship had only been studied in detail for the second half of the 20th century due to the absence of long and continuous series of observed wind in the Eastern Mediterranean for previous periods. In this work, a new climatic index, the so-called “Etesian Wind Index” (EWI), is defined as the percentage of days with prevalent northerly wind (wind blowing from 305° to 35°) in a fixed region [20E-30E, 32N-37N]. By using historical wind observations, we have been able to compute this index for the summer (JJAS) since 1880 and analyze the long term variability of the Etesians, as well as to research into its relation with the ISM at an unprecedented temporal coverage.

A running coverage analysis revealed a strong and significant positive correlation between the EWI and the strength of the ISM for the period 1960-1980, more markedly in July and August. This result is in accordance with other recent studies. However, we have found that the correlation fades out in the first half of the 20th century (1900-1950) and in the period 1980-2012, even showing significant negative values around the subperiod 1920-1950.

Similar indices to the EWI were computed using two different 20th century reanalysis datasets (ERA20C and 20CR-V2C). Despite the fact that both indices show some discrepancies with the EWI before 1950, the correlation analysis with the ISM revealed similar results, pointing out a strong loss of the EWI-ISM correlation in the first half of the 20th century and from 1980 onwards, as well as a marked positive correlated period between 1960 and 1980, specially in August.

In this study, we show that during the period of strong positive correlation between the Etesians and the ISM, the Etesians variability is controlled by two pressure centers, one corresponding to the heat Asian Monsoon low and the other to the low level high pressure center located over central Europe and Western Mediterranean, whereas in a period of non-significant correlation, the central-west Mediterranean high pressure center plays the main role in the Etesians variability.

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