



The non-stable influence of the Indian summer monsoon on the Etesian winds through ships' logbooks

F.de Paula Gómez-Delgado (1), Inmaculada Vega (1), David Gallego (1), Cristina Peña-Ortiz (1), Pedro Ribera (1), Ricardo García-Herrera (2), M.Carmen Alvarez-Castro (3), and Pascale Braconnot (3)

(1) University Pablo de Olavide, Physical, Chemical and Nature Processes, Sevilla, Spain (fpgomdel@upo.es), (2) University Complutense, IGEO-CSIC, Madrid, Spain, (3) IPSL-LSCE CEA-Saclay, Gif-sur-Yvette, France

In this work we made use of historical winds records taken aboard sailing ships to reconstruct a series of the prevalent summer northerly winds (Etesian winds) over the eastern Mediterranean since 1880. 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 [20°E - 30°E , 32°N - 37°N]. By using historical wind direction observations, we have been able to compute this instrumental index since 1880 and analyze the long term variability of the Etesians and its relation with the ISM at an unprecedented temporal coverage.

A running correlation analysis revealed a strong and significant positive correlation between the EWI and the strength of the ISM for the period 1960-1980. 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 in August as well as in the first half of the 20th century in the seasonal average (JJAS).

In order to check this result with other databases, an analogous index to the EWI was computed using the ERA-20C reanalysis. Despite the fact that both indices show some discrepancies before 1950, the correlation analysis with the ISM revealed similar results, pointing out a strong loss of Etesians-ISM correlation in the first half of the 20th century and from 1980 onwards and a marked positive correlated period between 1960 and 1980, specially in August and July.

Our analysis suggest that there are two different regimes in the EWI-ISM relation. During the periods of strong positive correlation, the Etesians variability is controlled by two pressure centers, one corresponding to the Asian Monsoon heat low and the other to the low level high pressure center located over central Europe and the Western Mediterranean, in periods of no correlation is, the central-west Mediterranean high pressure center which plays the main role in the Etesians variability. The ability of CMIP5 models in reproducing this varying relationship between the Etesians and the ISM, as well as future trends in this teleconnection, is currently being investigated.