Phases of the Western Mediterranean Oscillation index (WeMOI)

- The WeMOI is a regional teleconnection index defined within the western Mediterranean basin. WeMOI values are computed using surface pressure data from San Fernando (SW Spain) and Padua (NE Italy) weather stations. The reference period considered is 1961-1990.

WeMOI calendars

- We computed daily WeMOI values for the 1950-2016 study period and constructed a WeMOI calendar (intraannual variability) based upon the mean values obtained for 10-day periods.
- The lowest (most negative) WeMOI values are detected in autumn, during the second 10-day period of October (from the 11th to the 20th of October).
- We also constructed WeMOI calendars for two subperiods: 1950-1982 (33 years) and 1983-2016 (34 years), observing an overall decrease in WeMOI values, particularly as from the second 10-day period of November to the second 10-day period of December.
- We added the frequency of the torrential episodes to the WeMOI calendars in order to detect intraannual changes in these events.

Main results and discussion

- Most of the episodes (61%) took place in an extreme (≤-2) WeMOI value. 23% of the episodes occurred in a negative (≤-1) WeMOI phase. The remaining events (16%) took place in a slightly negative (≤-1, 0) WeMOI value. No extreme torrential episode presenting a positive WeMOI value occurred in Catalonia.
- In Catalonia, the frequency of extreme torrential events is almost 1 case per year. The Catalán littoral is a territory characterised by a high temporal concentration of precipitation, but other parts of Iberia are even more torrential (the Valencia Region, eastern Spain, almost 2 cases per year and several episodes >500 mm).
- The wettest month in most of the Catalán littoral and prelittoral is October, when the lowest WeMOI values of the year are recorded (humid easterly flows from the Mediterranean Sea are usually expected). In consequence, the highest accumulation of extreme torrential episodes is from 1st to 20th October.
- Referring to the calendars by subperiods, we observed an overall decrease in WeMOI values throughout the year, but only an increase in 3 episodes. However, a sharp drop in the WeMOI is observed at the very end of autumn, which might indicate a shift in seasonality of the extreme torrential period from Sep-Oct to Oct-Nov.
- The present research confirms these findings in previous studies, as well as the use of the WeMOI at daily resolution as an effective tool for analysing the occurrence of episodes of torrential rainfall over eastern Spain.