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INFLUENCE OF TELECONNECTION PATTERNS ON THESIGNIFICANT WAVE HEIGHT DISTRIBUTION IN THE MEDITERRANEAN SEA

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This study analyzes the link between the SWH (Significant Wave Height) distribution in the Mediterranean Sea during the second half of the 20th century and the Northern Hemisphere teleconnection patterns. SWH distribution is computed using the WAM (WAve Model, WAMDI 1987) forced by the surface wind fields provided by the ERA-40 (Simmons and Gibson, 2000), reanalysis for the period 1958-2001. The time series of mid-latitude teleconnection patterns (Barnston and Livezey, 1987, available at http://www.cpc.ncep.noaa.gov/data/teledoc/telecontents.shtml) are downloaded from the NOAA web site. Results shown considers the West Pacific Pattern (WP), Pacific/ North American Pattern (PNA), East Atlantic Pattern (EA), Scandinavia Pattern (SCA), North Atlantic Oscillation (NAO), East Atlantic/West Russia Pattern (EA/WR) and East Pacific/ North Pacific Pattern (EP/NP)).

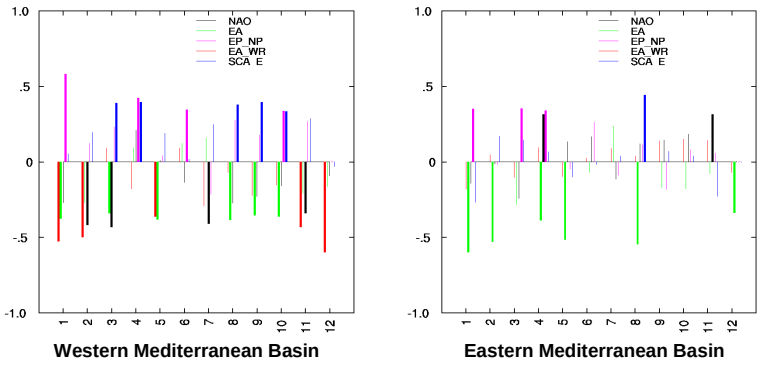

Fig.1 Annual cycle (calendar months on the x-axis) of the correlation between monthly average SWH field and teleconnection pattern indexes. Only NAO, EA, EP/NP, EA/WR, SCA are shown. Other patterns have smaller and less relevant correlation value. Thick bars denote value significant at the 95% confidence level. The two panels refer to the western and eastern part of the Mediterranean.

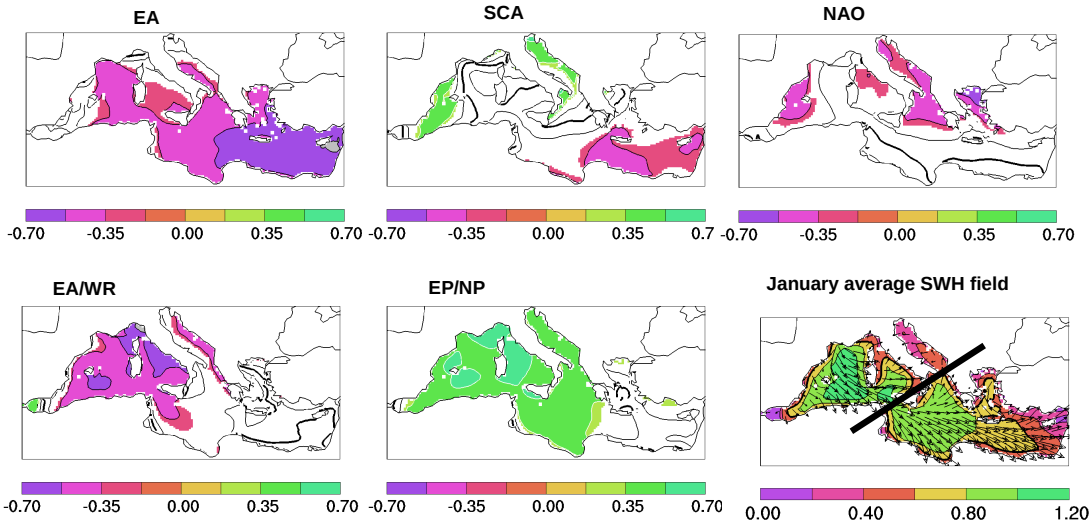

Fig.2: Spatial distribution of the correlation between SWH and teleconnection patterns in January. Top row: East Atlantic Pattern (EA), Scandinavia Pattern (SCA), North Atlantic Oscillation (NAO). Bottom row: East Atlantic/West Russia Pattern (EA/WR) and East Pacific/ North Pacific Pattern (EP/NP). Values are statistically significant and the 95% confidence level in the shaded areas. The right-bottom panel shows the average SWH in January. The thick line marks the division between west and East Mediterranean used for the computation of Fig.1.

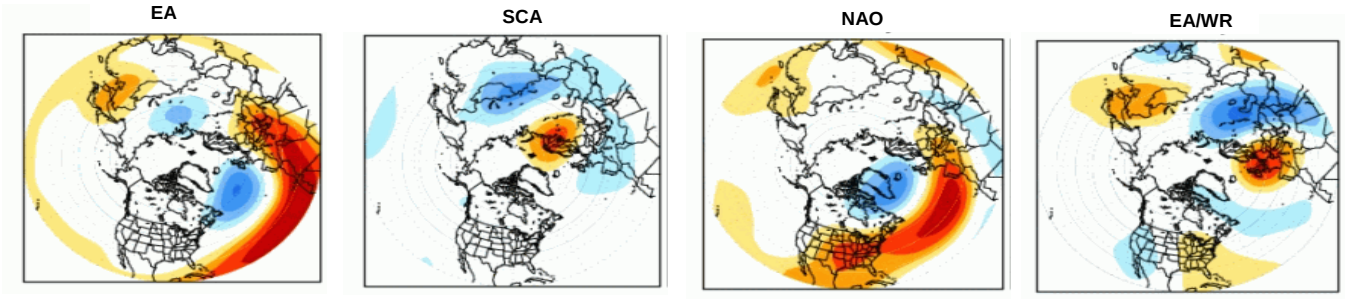

Fig.3 Maps of teleconnection patterns in January (from http://www.cpc.ncep.noaa.gov/data/teledoc/telecontents.shtml)

Results show a different behavior of west and east Mediterranean, with the western part being much more strongly influenced by northern hemisphere teleconnections. A dominant pattern is EA, strongly and negatively correlated with SWH for most of the year in both western and eastern Mediterranean. This is possibly due to reduced atmospheric circulation in the Mediterranean due to the subsidence associated in this region with positive EA phase. The EA/WR pattern exerts its influence only in winter and in the western Mediterranean, but in this case is the most important pattern. In fact, the presence of a high pressure over western Europe attenuates the north-westerly flow, which causes most waves in winter west Mediterranean. NAO, though important, appears to play a smaller role than other patterns. Sca favors positive SWH in summer and spring, mostly in the west. A puzzling effect of the EP/NP is detected in winter-spring, pointing at an incorrect attribution or large scale teleconnection of the mean atmospheric circulation.

Refs:
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