



Cyclones producing positive and negative sea level extremes along the coast of the Mediterranean Sea

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Cyclones, because of their associated sea level pressure minimum and strong winds, cause frequently storm surges at coastal locations. There is, consequently, a well-known relation between cyclones and sea level maxima (with eventually flooding of land areas). This study shows that in many stations along the coast of the Mediterranean Sea also sea level minima are associated to cyclones (and not to high level pressure conditions as it might be expected). This study is based on a 44 year long hindcast of storm surges in the Mediterranean sea and on a set of observed hourly sea level time series. The association of negative sea levels with cyclones is not explained just by the action of an offshore wind, but is caused by the effect of the position of the cyclone center on the Mediterranean sea level. In a semi-enclosed basin such as the Mediterranean Sea, a cyclone, by depressing the sea level in the area around its minimum, can actually cause its increase in a different location. Two examples with opposite characteristics are Toulon and Dubrovnik. In Toulon, where the sea level pressure gradient produces more than 90% of the surge level, a cyclone over the Mediterranean basin produces a negative surge and a cyclone over the west Atlantic coast produces a positive surge. In Dubrovnik, where the sea level pressure gradient produces about two thirds of the surge level, positive surges are clearly produced by a cyclone over the western Mediterranean Sea and negative surges by high pressure over the Adriatic.