

Changes in storminess and shoreline evolution along the northern coast of France during the second half of the 20th century

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Summary. Analyses of wind data collected at Dunkirk (northern coast of France) from 1956 to 2000 revealed two distinct periods of higher storminess: 1956-1962 and especially 1972-1977. These two periods represent 57% of the total observations of winds with velocities ≥ 16 m s⁻¹. Storm frequency was lower during the last two decades of the 20th century, but a long-term trend in storminess could not be confidently established from this 45 year-long wind record characterized by significant decadal variations. Shoreline evolution between 1949 and 2000 was determined using series of geometrically rectified aerial photographs, showing a high temporal and spatial variability and no clear relationship with storminess in most cases. During the 1960s and 1970s, the shoreline significantly advanced seaward at several sites, although 1972-1977 corresponds to the period of maximum storm activity in our data set. Conversely, shoreline retreated at most sites during the late 1980s and 1990s while storm activity considerably decreased. The analysis of tide gauge data recorded in Dunkirk harbour between 1956 and 2000 showed that the relative frequency of high water levels that reached the upper beach zone and coastal dunes during storms increased significantly after 1983, although the annual number of storm events was lower, which may explain the more rapid coastal retreat at several locations during the late 1980s and 1990s. Long-term coastal dune erosion and shoreline retreat are apparently not primarily determined by storm frequency and intensity, because periods of higher storminess did not result in more rapid retreat or more general coastal erosion, but appear to be more likely related to occurrences of high water levels and variations in sediment budget.