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PSea-level rise impacts on the tides of the European Shelf

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Abstract

Sea-level rise (SLR) can modify not only total water levels, but also tidal dynamics. Several studies have investigated the effects of SLR on the tides of the western European continental shelf (mainly the M2 component). We further investigate this issue using a modelling-based approach, considering uniform SLR scenarios from -0.25 m to +10 m above present-day sea level. Assuming that coastal defenses are constructed along present-day shorelines, the patterns of change in high tide levels (annual maximum water level) are spatially similar, regardless of the magnitude of sea-level rise (i.e., the sign of the change remains the same, regardless of the SLR scenario) over most of the area (70%). Notable increases in high tide levels occur especially in the northern Irish Sea, the southern part of the North Sea and the German Bight, and decreases occur mainly in the western English Channel. These changes are generally proportional to SLR, as long as SLR remains smaller than 2 m. Depending on the location, they can account for +/-15% of regional SLR. High tide levels and the M2 component exhibit slightly different patterns. Analysis of the 12 largest tidal components

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