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## Sea-level rise impacts on the tides of the European Shelf: mechanisms analysis

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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). Idier et al. (2017) 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 defences 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%). These changes are generally proportional to SLR, as long as SLR remains smaller than 2 m. Depending on the location, they can account for  $\pm 15\%$  of regional SLR. Changes in high tide levels are much less proportional to SLR when flooding is allowed, in particular in the German Bight. However, some areas (e.g., the English Channel) are not very sensitive to this option, meaning that the effects of SLR would be predictable in these areas, even if future coastal defence strategies are ignored.

In the present work, we focus on the mechanisms driving these tide changes, especially the bed friction damping, the resonance properties and the reflection at the coast, i.e., local and non-local processes. Additional simulations are done to quantify the effect of these mechanisms on tide changes.

Reference: Idier D., Paris F., Le Cozannet G., Boulahya F., Dumas F. (2017) Sea-level rise impacts on the tides of the European Shelf. *Continental Shelf Research*, 137, 56-71.

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