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Detecting non-linear sea-level variations in tide gauge records: a study case along the Dutch coast.

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Tide gauges are the main source of information about sea-level changes in the Industrial Age. When looking at global mean values, century-long reconstructions produce rates between 1-2 mm/yr, while estimates over the last three decades reveal a much faster rise of about 3 mm/yr, as also indicated by satellite altimetry observations. In spite of this evidence for a recent acceleration, its quantification remains a challenging and relevant task, because results are highly dependent on the length of the record and on the reconstruction technique, whereas decision makers require clear proof to legitimise action.

While global mean results are very important to understand climate change, regional to local variations are more relevant for the purpose of planning mitigation and adaptation measures. However, mainly due to natural variability, looking at individual tide gauge stations hampers the accurate determination of linear and non-linear trends.

We analyse tide gauge records along the Dutch coast by means of advanced statistical techniques, with the main objective of determining whether and under which conditions it is possible to detect departures from secular trends. We particularly focus on how to handle noise in the natural system, which for the Dutch coast is mainly represented by local atmospheric effects and by variability in ocean dynamics in the NE Atlantic.