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An high-resolution relative sea-level record from the Morbihan Golfe, France: an integrated instrumental and geological approach

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One of the most debated topics in current geological science regards future coastal evolution in response to high-frequency sea-level changes induced by the global warming of atmosphere and oceans. Despite of the potential devastating consequences on coastal areas of future accelerated sea-level rise, induced by the anthropogenic warming of the atmosphere (IPCC, 2007),the complex relationship existing between climate and sea-level is still poorly understood. The necessity to fill this knowledge gap induced an increasing interest toward Late Holocene sea level trend because the last few thousands of years represent the natural framework against which we can compare historical and present-day oscillations in relative sea-level rise (RSL) and measure the additional sea-level rise that has occurred in the last 200-150 years. Salt marsh sedimentary sequences represent a powerful tool to improve and expand Late Holocene sea-level record through the development and application of foraminiferal transfer functions.

We developed foraminiferal-based transfer functions using a unimodal-based technique known as WA-PLS (weighted averaging partial least squares) performed on a modern database composed of 23 species and 43 samples collected along two modern transects from the Kréagan and Sins marsh sites, Morbihan Gulf, France. Using component two, the observed versus foraminifera-predicted elevation relationship is robust (r2jack = 0.86) and precise reconstructions of former sea levels are possible. We applied the transfer function to the fossil foraminiferal assemblages of a 1 m-long fossil core sequence recovered from the St Goustan marsh, in close proximity to the Sins site, to reconstruct past sea-level trends. The foraminiferal-based reconstructions were placed into a temporal framework to produce a RSL curve, where the chronology is established from the 137Cs and 210Pb-derived sediment accumulation rates. The resulting RSL curve spanning the last $\sim$200 years is in good agreement with the Brest tide gauge data indicating a rate of relative sea-level rise of approximately 2 mm yr$-$1 for the 20th century. We provide evidence of an acceleration of RSL rise during the past 100 years respect to the long-term trend of the last 800-1000 years from the western margin of the North Atlantic. Timing of this acceleration is indicative of a link between recent sea-level changes and human-induced increase of greenhouse gas concentration in the atmosphere.