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Historical sea level data rescue to assess long-term sea level evolution: Saint-Nazaire observatory (Loire estuary, France) since 1863.

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Nowadays, the study of the global sea level rise is a strong societal concern. The analysis of historical records of water level proves to be an ideal way to provide relevant arguments regarding the observed trends. In France, many systematic sea level observations have taken place since the mid-1800s. Despite this rich history, long sea level data sets digitally available are still scarce. Currently, only the time series of Brest, Marseille and recently the composite one of the Pertuis d'Antioche span periods longer than a century and are available to be taken into account in studies dealing with long term sea-level evolution. In this context, an important work of "data archaeology" is undertaken to rescue the numerous existing analog historical data that is part of the French scientific and cultural heritage.
The present study is focused on the measurements carried out at the sea level observatory of Saint-Nazaire, located on the French Atlantic coast in the Loire estuary mouth area. Measurements were automatically performed with the use of float tide gauges from 1863 to 2007, but include some important gaps between 1920 and 1950. Since 2007, the Saint-Nazaire observatory is part of the French RONIM network operated by SHOM, and the old mechanical tide gauge has been superseded by a radar tide gauge (operated by "Grand Port Maritime" of Nantes-Saint-Nazaire). In total, the covered period is up to 150-year-long, including at least 125 years of continuous sea level measurements.
With the reconstruction of this new data set, we aim at improving our knowledge on trends in sea level components on the Atlantic coast on large scale and on the coast vulnerability at more local scale. Moreover, because of the location of the station, it should be possible as well to study the influence of the Loire River on water level since the 19th century. It has been shown that the tidal range was strongly modified during the last century because of the anthropogenic influence along the river (dredging, coastal structures, etc.). This is particularly remarkable in upstream areas such as Nantes, but the impact in downstream locations such as Saint-Nazaire is still not completely quantified.
As a first and primordial step, this study implies the inventory and the digitalization of existing ledgers and tidal charts. This time-demanding work induces to check the data quality and to make these data consistent over time in terms of vertical reference and time systems, which both evolved during the studied period. Preliminary analyses assess the high quality of the measurements.
Once the final time-serie has been checked and rendered coherent, it will be made available in existing national databanks and websites: REFMAR for high-frequency data (hourly) and SONEL for the corresponding mean sea levels (daily, monthly and yearly).