Using citizen science to rescue sea level data

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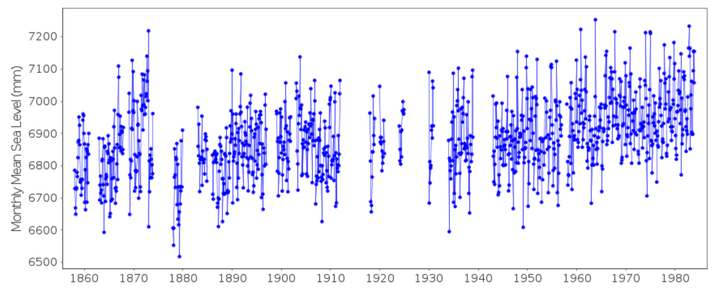
We need long sea level records to study climate change and sea level rise and one way we can extend the records we hold and fill in the gaps in the global dataset is to recover historical data.

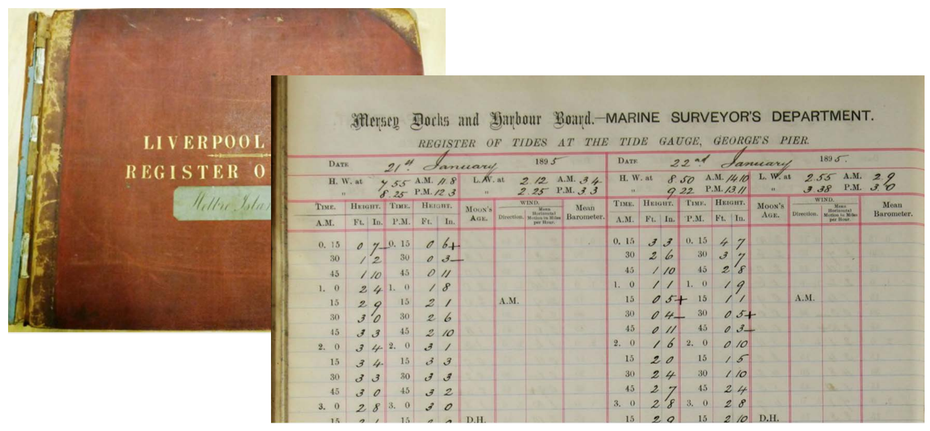
Liverpool is one of the UK's longest sea-level records, but the only digital record from the 1800s is hand-calculated monthly mean data, with many gaps.

The high frequency (15 minute) records contain much more information, including tides and storm surges but are only available in handwritten ledgers.

Zooniverse.org hosts citizen science projects from identifying galaxies and birds to reading historical letters. In January 2021 we launched our UK Tides citizen science project and just over a year later the last data point was digitised. Using the Zooniverse platform, over 3800 volunteers have transcribed over 315000 columns of tide gauge data, including repeats, which are used to cross-check entries. At over 6000 classifications per week the volunteers worked at the rate of about five full time experts. They rescued about 100 station-years of 15-minute data from Hilbre Island and George's Pier in the North West of England, covering 1853-1903.

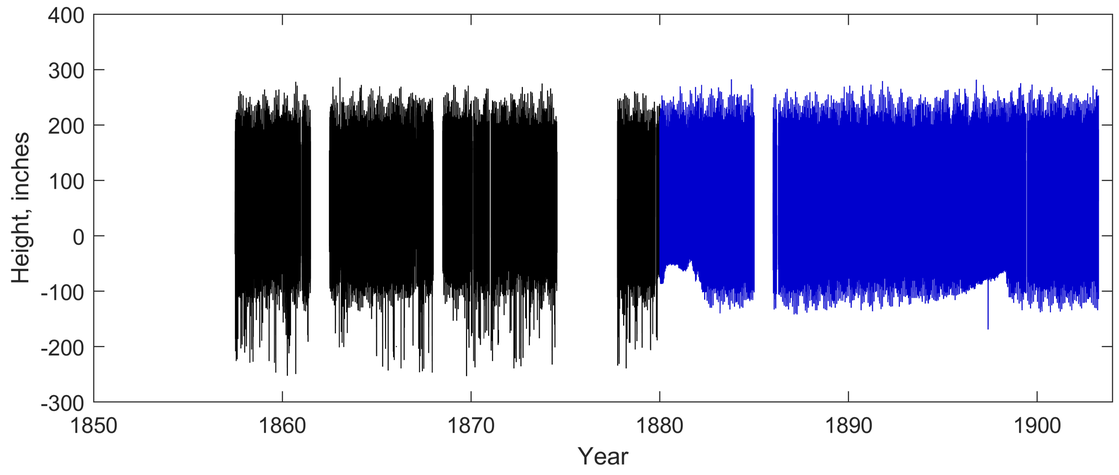


Monthly Mean Sea Level,
Liverpool Georges and Princes Piers,1858 – 1983

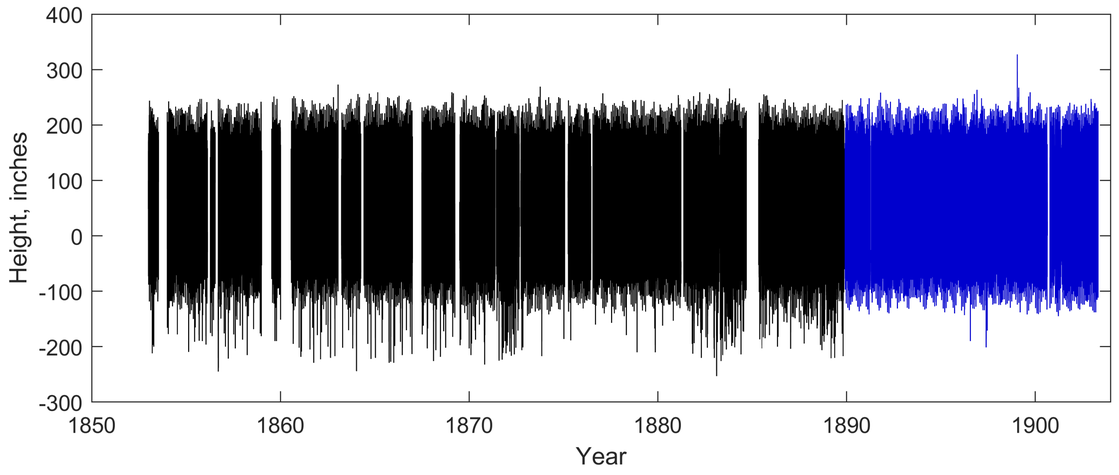


Handwritten ledgers from Hilbre and George's Pier

Tide staff, Hilbre, used for calibration
(©A. Matthews)

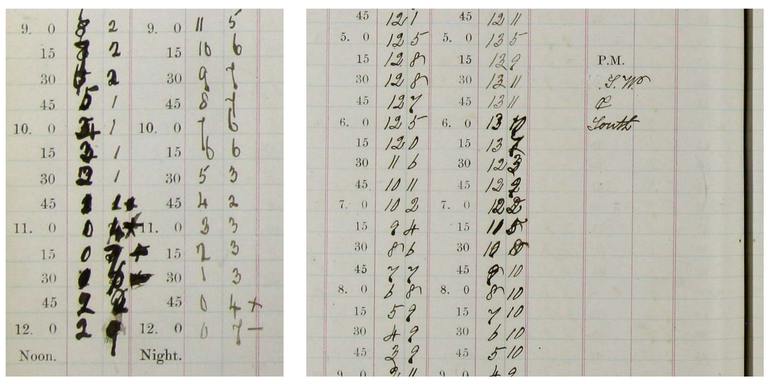


Digitised 15 minute data for George's pier
(preliminary quality control shown in blue)



Digitised 15 minute data for Hilbre
(preliminary quality control shown in blue)

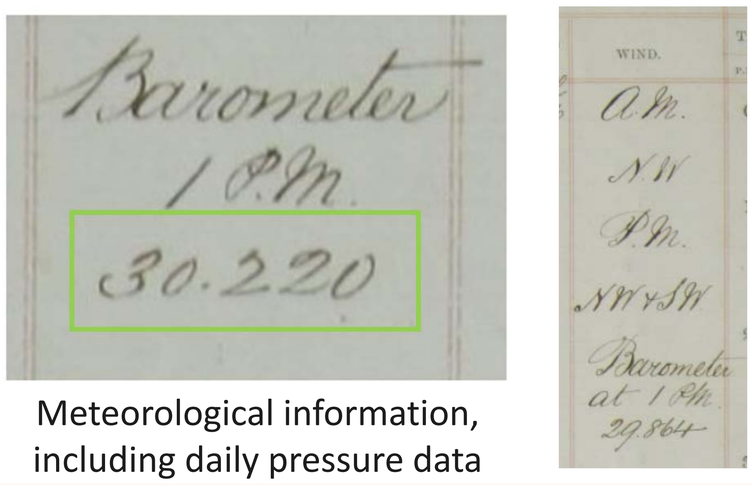
There have also been some interesting challenges with handwriting, which shows why using machine learning may still need a little help from people for a while to come. In situations like these, we have relied on the most frequently input values, but also looked at the images and plotted the data.



Examples of obscured handwriting

The next step is to quality control the digitised data. We'll compare the two sites with each other and with computed tidal predictions and then the data will be archived and made available for analysis.

Between 1857 and 1863 the atmospheric pressure was recorded every day at 1pm. This additional information is very valuable in building an accurate picture of the weather in the past and will help to give us a better understanding of why particular storms caused flooding.



Meteorological information,
including daily pressure data

National Oceanography Centre

https://www.zooniverse.org/projects/psmsl/uk-tides

noc.ac.uk

The scanning of the ledgers was funded through the JISC Content programme 2011-13, Strand B: Mass Digitisation.