



## Sea Level Data Archaeology for the Global Sea Level Observing System (GLOSS)

Elizabeth Bradshaw (1), Andy Matthews (2), Lesley Rickards (2), and Svetlana Jevrejeva (2)

(1) British Oceanographic Data Centre, Liverpool, United Kingdom (elizb@bodc.ac.uk), (2) Permanent Service for Mean Sea Level (PSMSL), Liverpool, United Kingdom (psmsl@noc.ac.uk)

The Global Sea Level Observing System (GLOSS) was set up in 1985 to collect long term tide gauge observations and has carried out a number of data archaeology activities over the past decade, including sending member organisations questionnaires to report on their repositories. The GLOSS Group of Experts (GLOSS GE) is looking to future developments in sea level data archaeology and will provide its user community with guidance on finding, digitising, quality controlling and distributing historic records.

Many records may not be held in organisational archives and may instead be in national libraries, archives and other collections. GLOSS will promote a Citizen Science approach to discovering long term records by providing tools for volunteers to report data.

Tide gauge data come in two different formats, charts and hand-written ledgers. Charts are paper analogue records generated by the mechanical instrument driving a pen trace. Several GLOSS members have developed software to automatically digitise these charts and the various methods were reported in a paper on automated techniques for the digitization of archived mareograms, delivered to the GLOSS GE 13th meeting. GLOSS is creating a repository of software for scanning analogue charts. NUNIEAU is the only publically available software for digitising tide gauge charts but other organisations have developed their own tide gauge digitising software that is available internally. There are several other freely available software packages that convert image data to numerical values. GLOSS could coordinate a comparison study of the various different digitising software programs by:

- Sending the same charts to each organisation and asking everyone to digitise them using their own procedures
- Comparing the digitised data
- Providing recommendations to the GLOSS community

The other major form of analogue sea level data is handwritten ledgers, which are usually observations of high and low waters, but sometimes contain higher frequency data. The standard current method for digitising these data is to enter the values manually, which has been performed by GLOSS countries, including France and Spain. The GLOSS GE is exploring other methods for use in the future as this process is time consuming. Current projects to improve Handwritten Text Recognition (HTR) tend to be working with the written word and so require knowledge of sentence structures and word occurrence probabilities to reconstruct sentences e.g. tranScriptorium (European Union's Seventh Framework Programme funded project). This approach would not be applicable to sea level data, however tidal data by its very nature contains periodicity and predictability. HTR technology could be adapted to take this into account and improve the automatic digitisation of handwritten tide gauge ledgers.

There are many challenges facing the sea level data archaeology community, but it is hoped that improvements in technology can overcome some of the obstacles:

- Faster automated digitisation of tide gauge charts
- Minimal user input
- Automatic transcribing of handwritten ledgers

The GLOSS GE will provide a central location to share software, guidelines for quality controlling data and the GLOSS data archive centres will be the repository of the newly created datasets.