PSMSL
(Permanent Service for Mean Sea Level)

Including recovered data in the PSMSL global sea level dataset: opportunities and challenges

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Who are the PSMSL?

Global Databank for Mean Sea Level data measured at tide gauges

Provide advice on collection, distribution and use of sea level data
Uses of PSMSL data

- PSMSL data forms the core of our understanding of sea level rise over the past couple of centuries (satellite altimetry records start in 1992).

- PSMSL data central to Global Mean Sea Level reconstructions as used in IPCC Sea Level assessments (see left from AR5).

- Also important to our understanding of currents, and land movement.

*Global Mean Sea Level reconstructions created using PSMSL data*
Evolution of the global tide gauge network

1860s

1910s

1960s

2010s
So, we need to recover data, but…
Datum control in the PSMSL: a typical site
PSMSL Data Categories

• RLR (Revised Local Reference)
  Developed by Rossiter in late 1960s
  Relates everything to a datum a fixed distance below a stable benchmark
  Defined so Mean Sea Level is about 7 m
  Avoids negative numbers, can express millimetre precision in 4 digits
  But – can’t compare RLR values between sites

• Metric
  Everything else – no complete levelling records
  Cannot guarantee a consistent horizontal reference frame
  Name is confusing: an accident of history (vs Imperial)
Calculating RLR – Spikarna, Sweden
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Tide Gauge Benchmark

8.9 m
3.388 m

9.998 m

Station Datum

1.485 m

New Station Datum

6.997 m

RLR
Calculating RLR – Spikarna, Sweden

Graph shows historical supplied data over years from 1970 to 2020. The graph illustrates the changes in RLR over time, with a line chart showing fluctuations in data. The diagram explains the relationship between different datums and benchmarks, including Tide Gauge Benchmark, RH2000 (National Datum), Station Datum, Sea Level, and New Station Datum. The vertical distances and labels indicate the relative heights of these datums and benchmarks, with specific measurements such as 3.388 m, 2.2 m, 1.485 m, 8.9 m, 9.998 m, and 6.997 m.
Issues with recovered data
e.g. Talke et al (2018): Boston, USA

Corrections due to unstable primary benchmark
Up to 26 mm

Uncertainty in datum connection between old and new data
Hogarth et al (in press): re-examining UK records
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Monthly record from Immingham (deseasonalised)
Remove effects due to weather by subtracting data from a tidal and storm surge model
Coherent at low frequency, so maybe remove a “common mode” (average of all stations)?
Hogarth et al (in press): re-examining UK records
So, how should PSMSL include these records?

There’s two competing principles:

• Curation:
  Preserve the original data, for integrity, openness, repeatability.

• Usability:
  Distribute data that it’s easy to use.

A possible solution?:
Create a new category of data for ‘recovered’ records.
Recovered Data Category

- Outputs of data recovery exercises
- Same format as main data, so easy to use
- Include links to other categories, so you know there’s a reprocessed record available.
- Flag and / or document possible issues in the corresponding RLR record

But – some issues:

- Do we allow for reprocessed data, as well as recovered data?
- What gets included? Do we set some ‘minimum standards’?
- What if there’s two competing versions at one site?
Thank You

Please give us your feedback
psmsl@noc.ac.uk
Processing Issues: Mean Sea Level or Mean Tide Level?

![Graph showing sea level height over days with labeled peaks at O1, K1, and M2](image-url)
A real-life example: Cuxhaven
A real life example – after correction
Talke (2018): recovery of 19th century data from Boston, USA
But, uncertainties in the connection between the old and new data
Recovery of metadata and other information

IUGG Publication Scientifique No. 5 (1940)

Tide Gauge Maintenance Report

Dublin data submissions to PSMSL