The challenge of providing metadata for a 200 year long global mean sea level dataset

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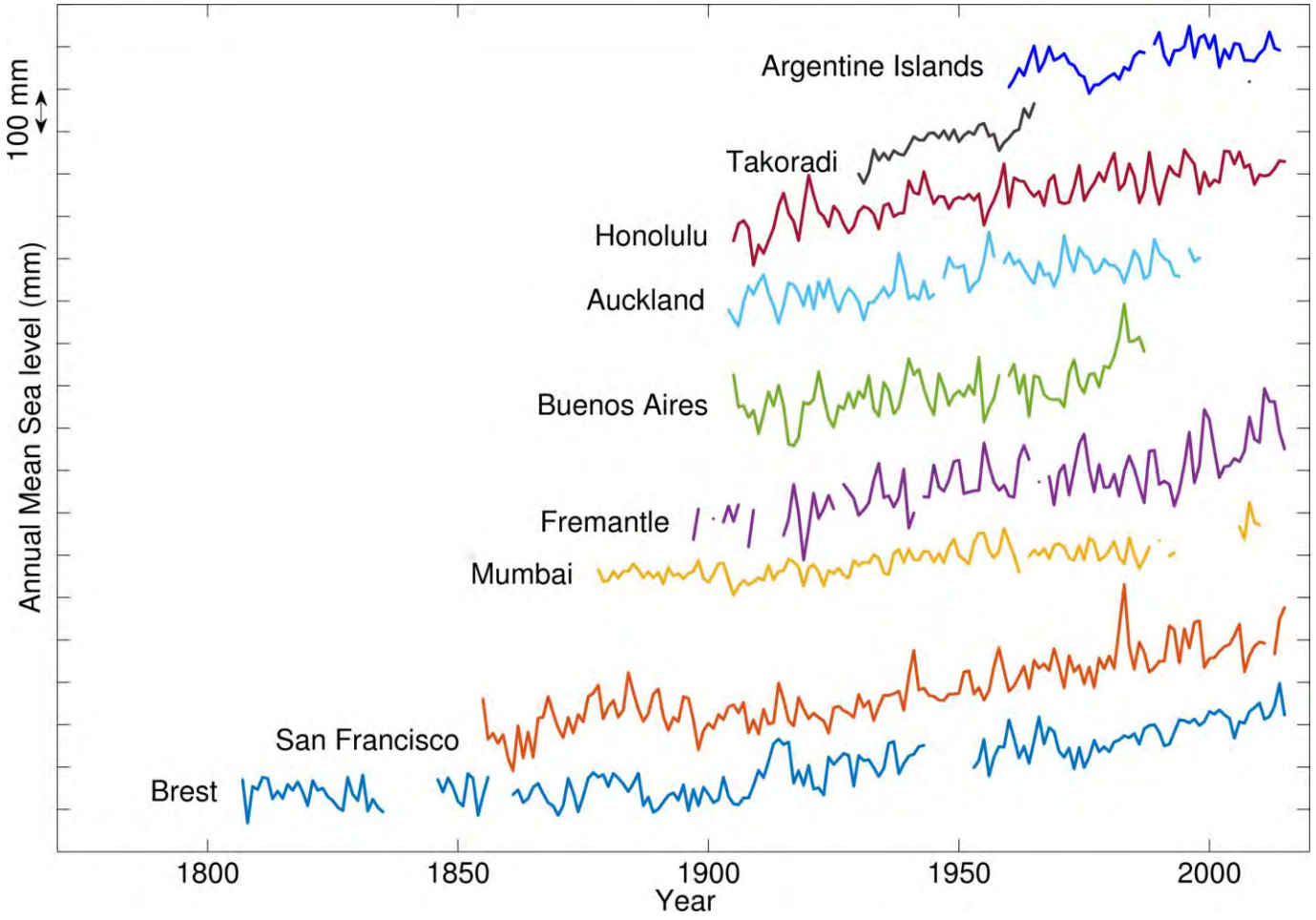
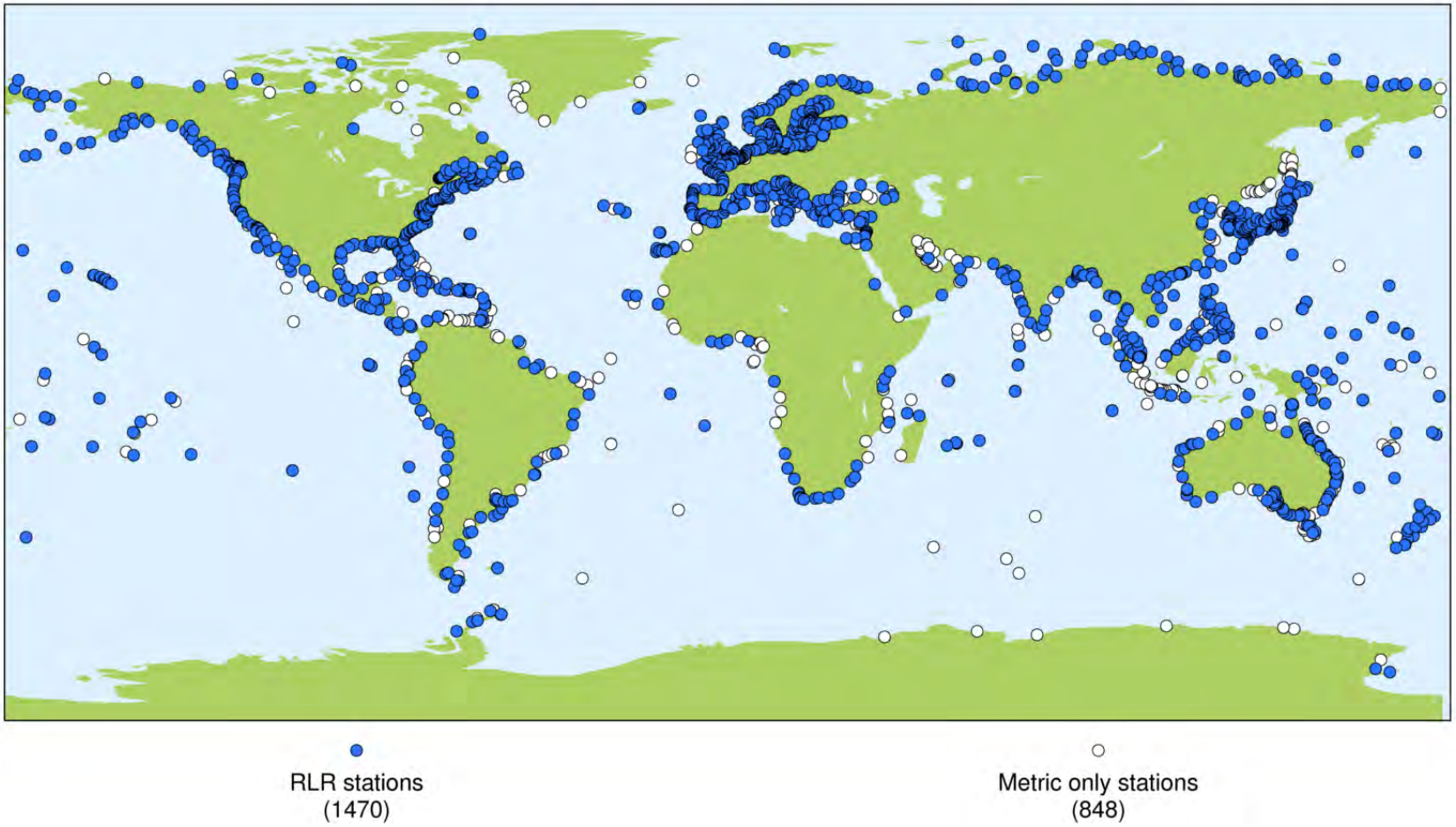
The Permanent Service for Mean Sea Level (PSMSL)

- Internationally recognised data bank for long term sea level change information from tide gauges.
- Origins in the 5th General Assembly of the International Union of Geodesy and Geophysics (IUGG) in 1933.
- Supply monthly and annual mean sea levels from tide gauges across the world. First release was in 1940.
- Operate under the auspices of the International Council for Science (ICSU) and are a regular member of ICSU's World Data System.
- A data centre of UNESCO's Global Sea Level Observing System (GLOSS) – part of JCOMM.
- Part of the UK's National Oceanography Centre (NOC), which is a component of the UK Natural Environment Research Council (NERC).

Long PSMSL Time Series

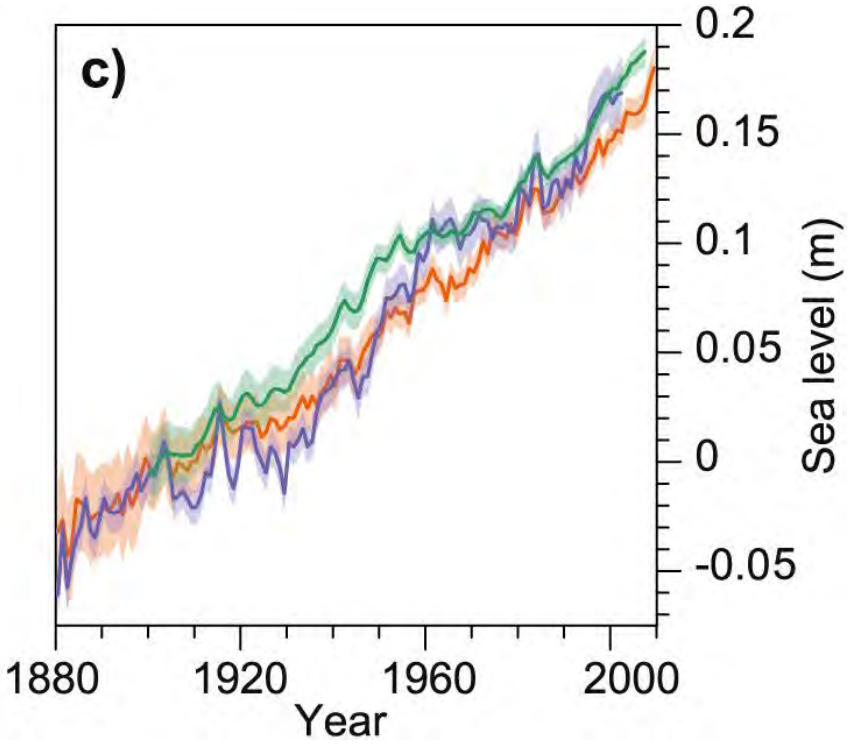


Global distribution of records



The use of PSMSL data

- Central to the study of sea level rise - major contribution to IPCC
- Changes in ocean currents
- Vertical land movement
- Freely available for use of scientists, industry, governments, members of the public etc.
- Download from our website: www.psmsl.org



Global Mean Sea Level reconstructions created using PSMSL data

Distributing the metadata

NEWLYN

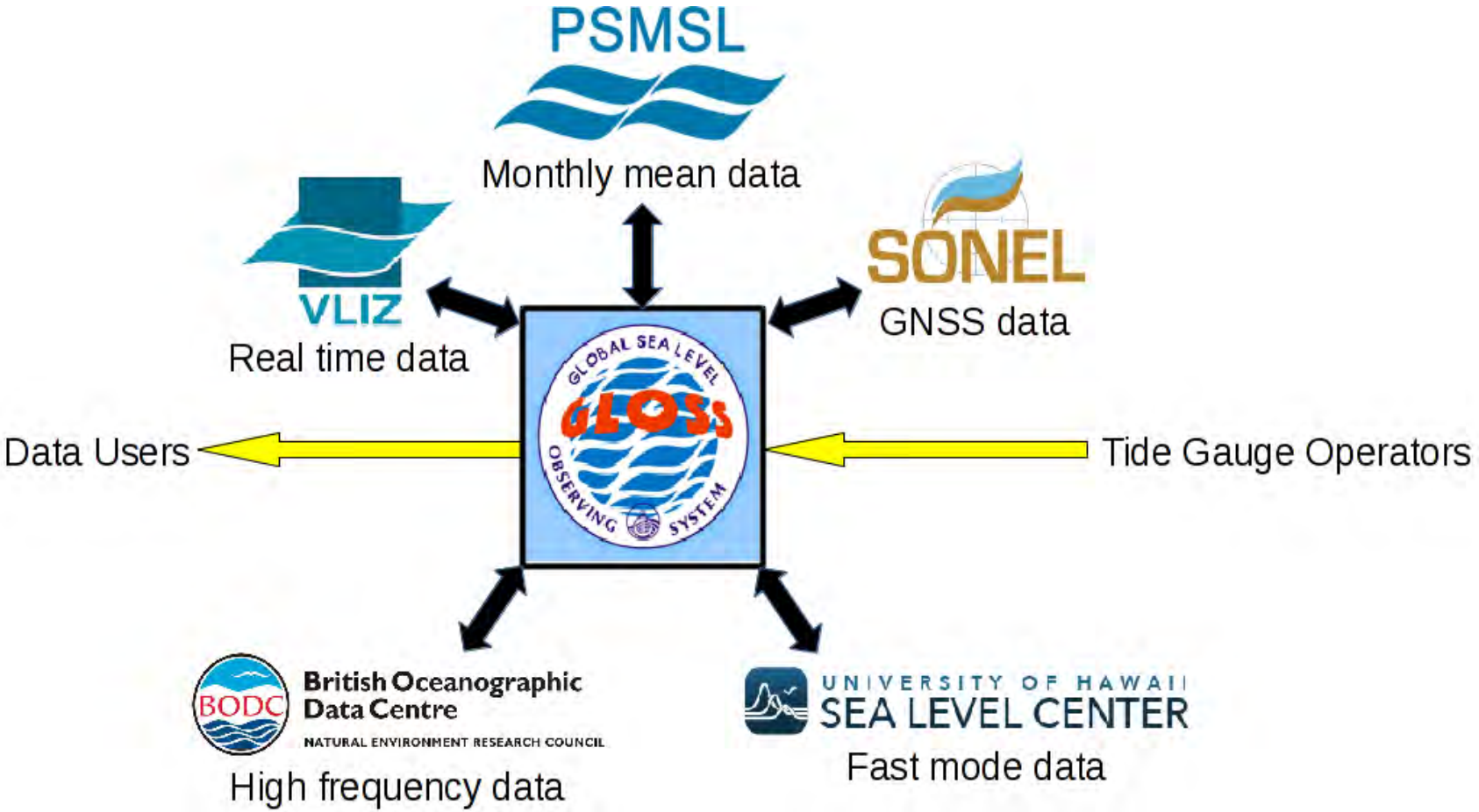
Station Information

Station ID:	202
Latitude:	50.103
Longitude:	-5.542833
GLOSS ID:	241
Coastline code:	170
Station code:	161
Country:	UNITED KINGDOM
Time span of data:	1915 – 2014
Completeness (%):	99
Frequency Code:	24
Date of last update:	06 May 2015

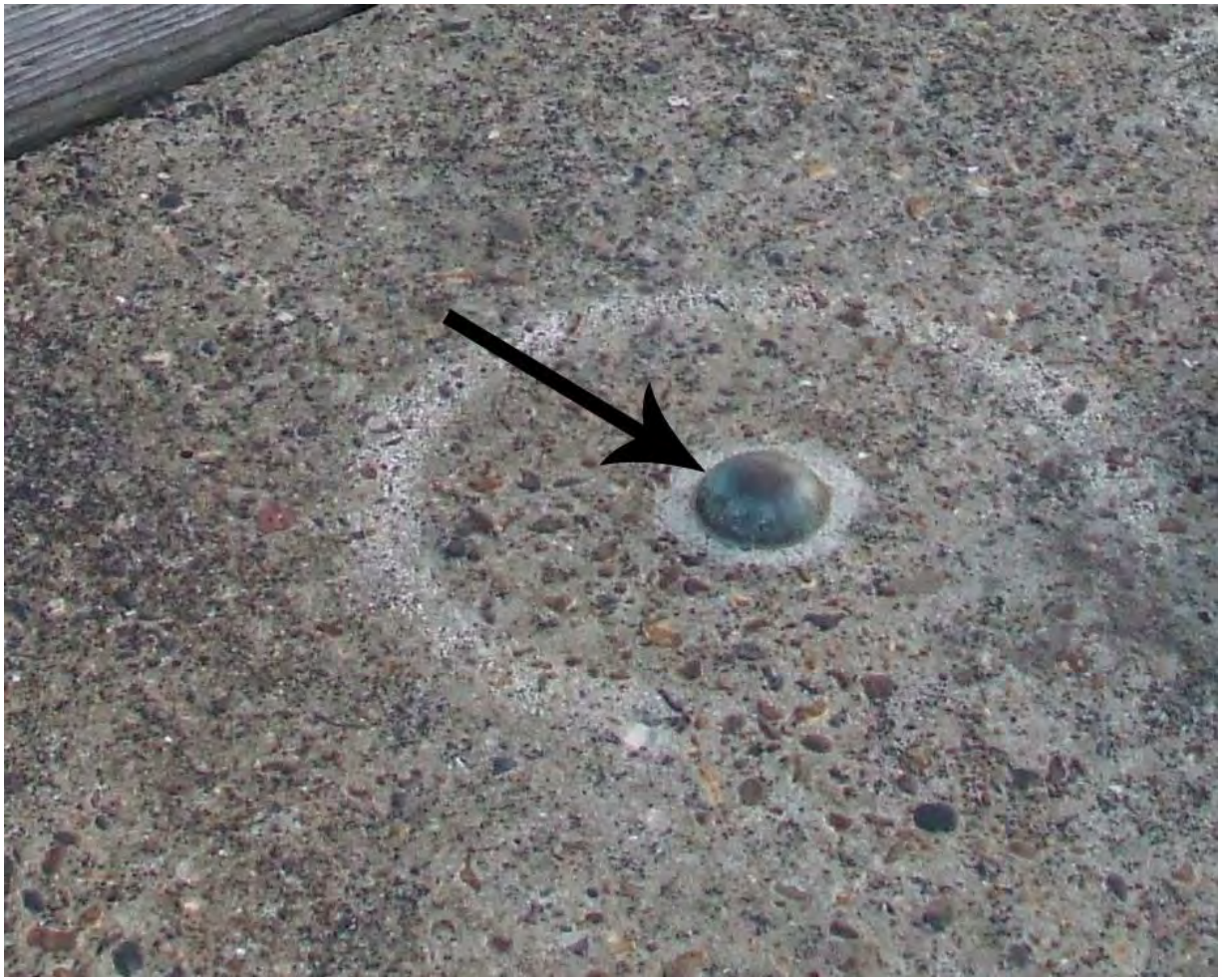
Green Arrow:	Current Station
Yellow Marker:	Neighbouring RLR Station

Please note: In many cases, the station position in our database is accurate to only one minute. Thus, the tide gauge may not appear to be on the coast.

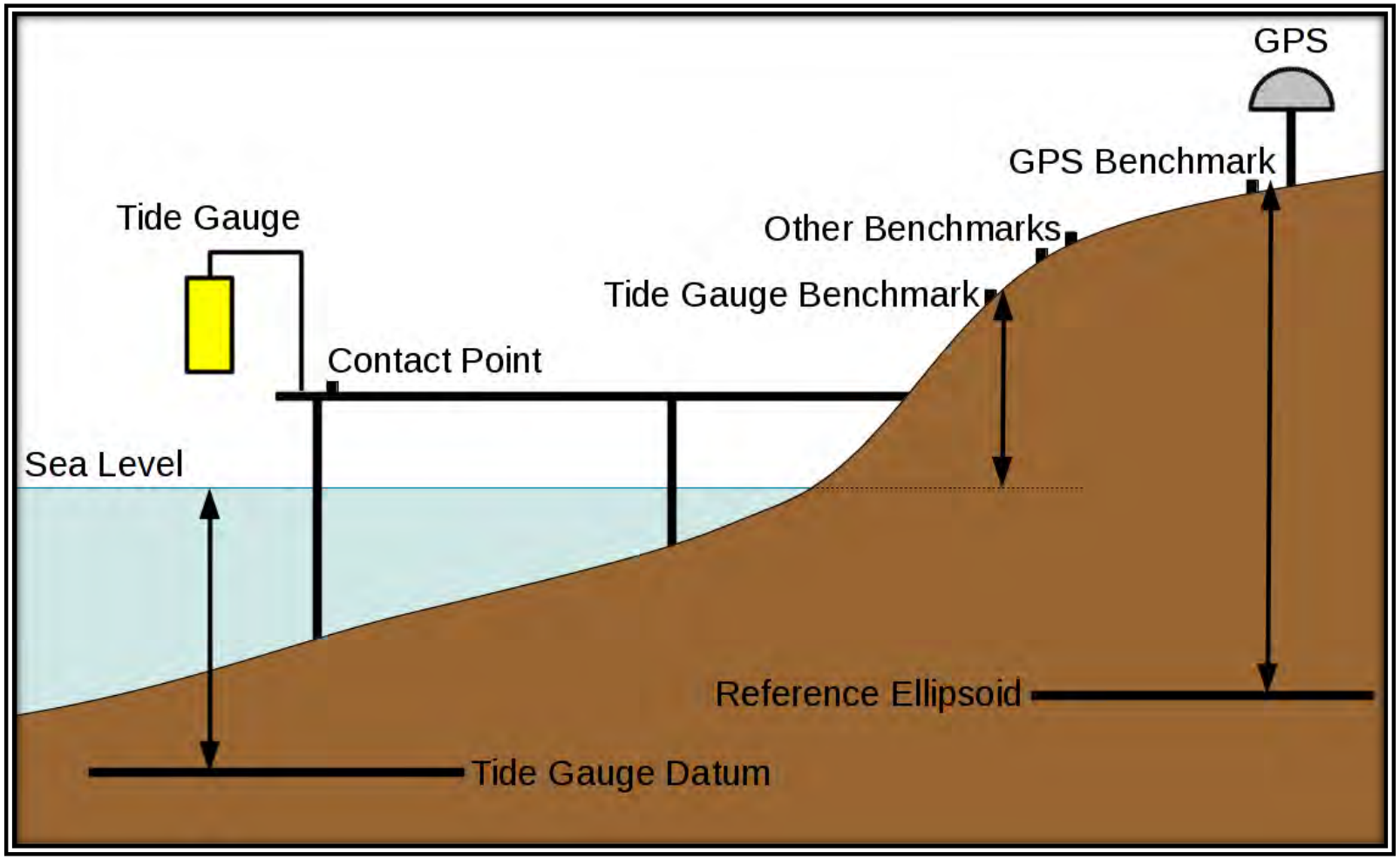
Metadata exchange



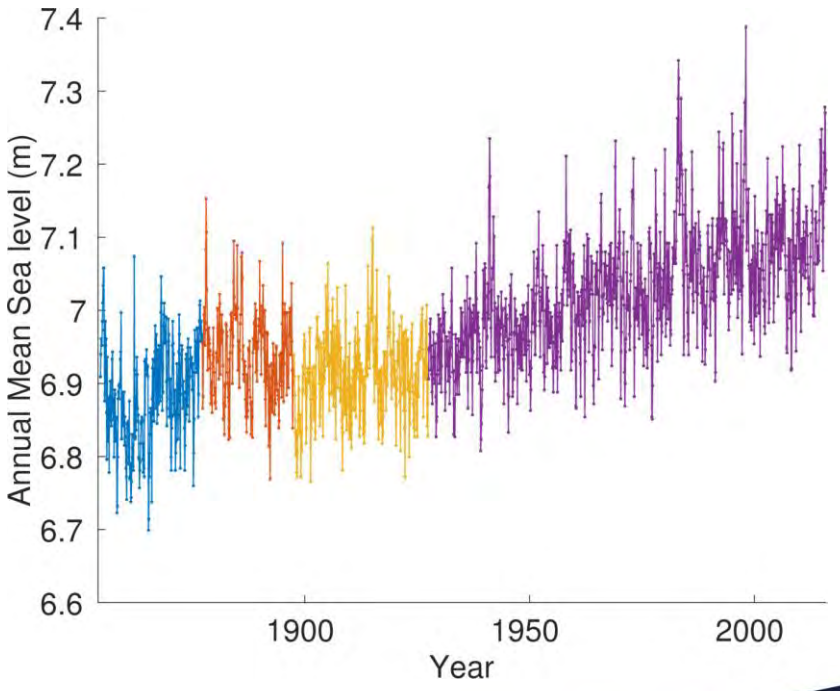
What is a tide gauge?



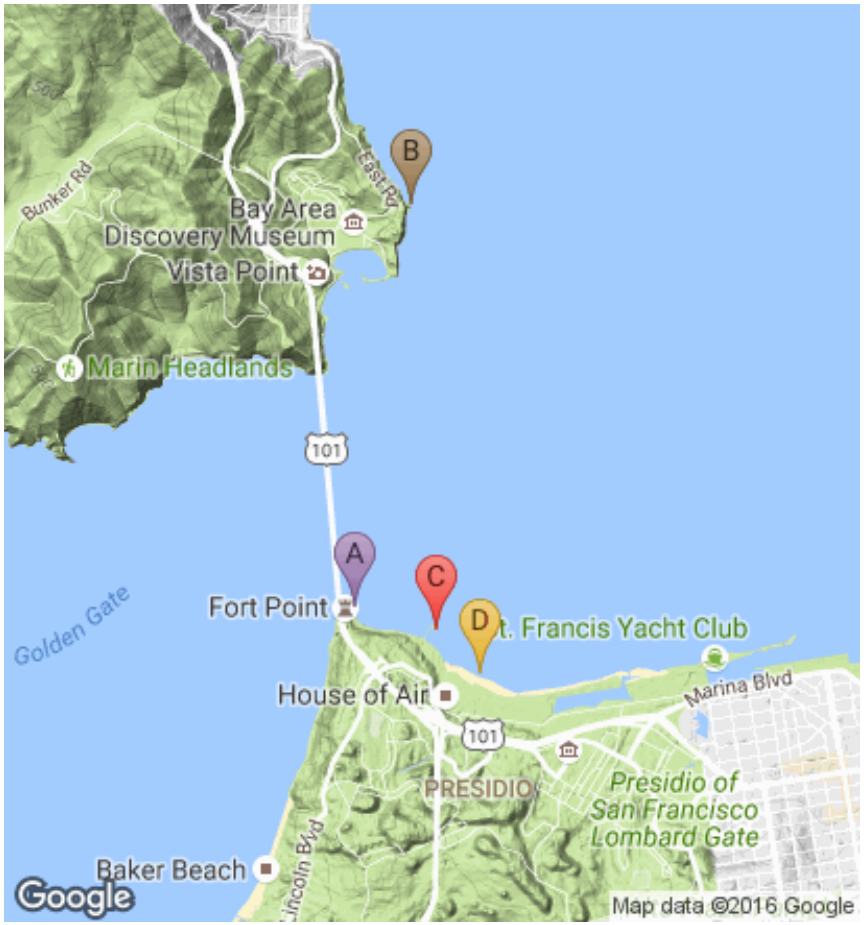
A typical tide gauge



Changing metadata case study: San Francisco



San Francisco Tide Gauge History



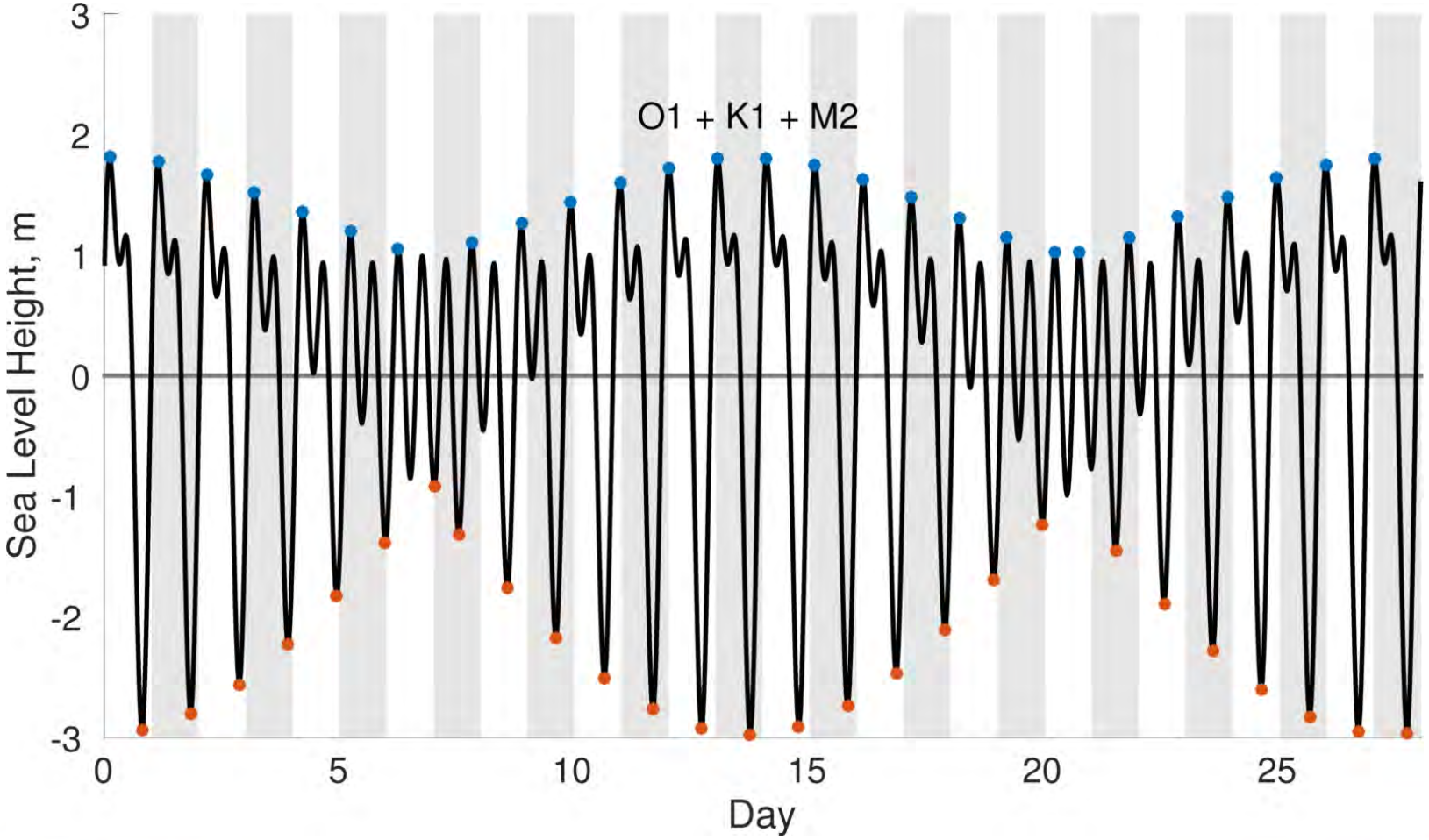
A: Fort Point
1854-06-30 to 1877-11-27

B: Sausalito
1877-02-27 to 1897-09-01
(moved 1881-10-12)

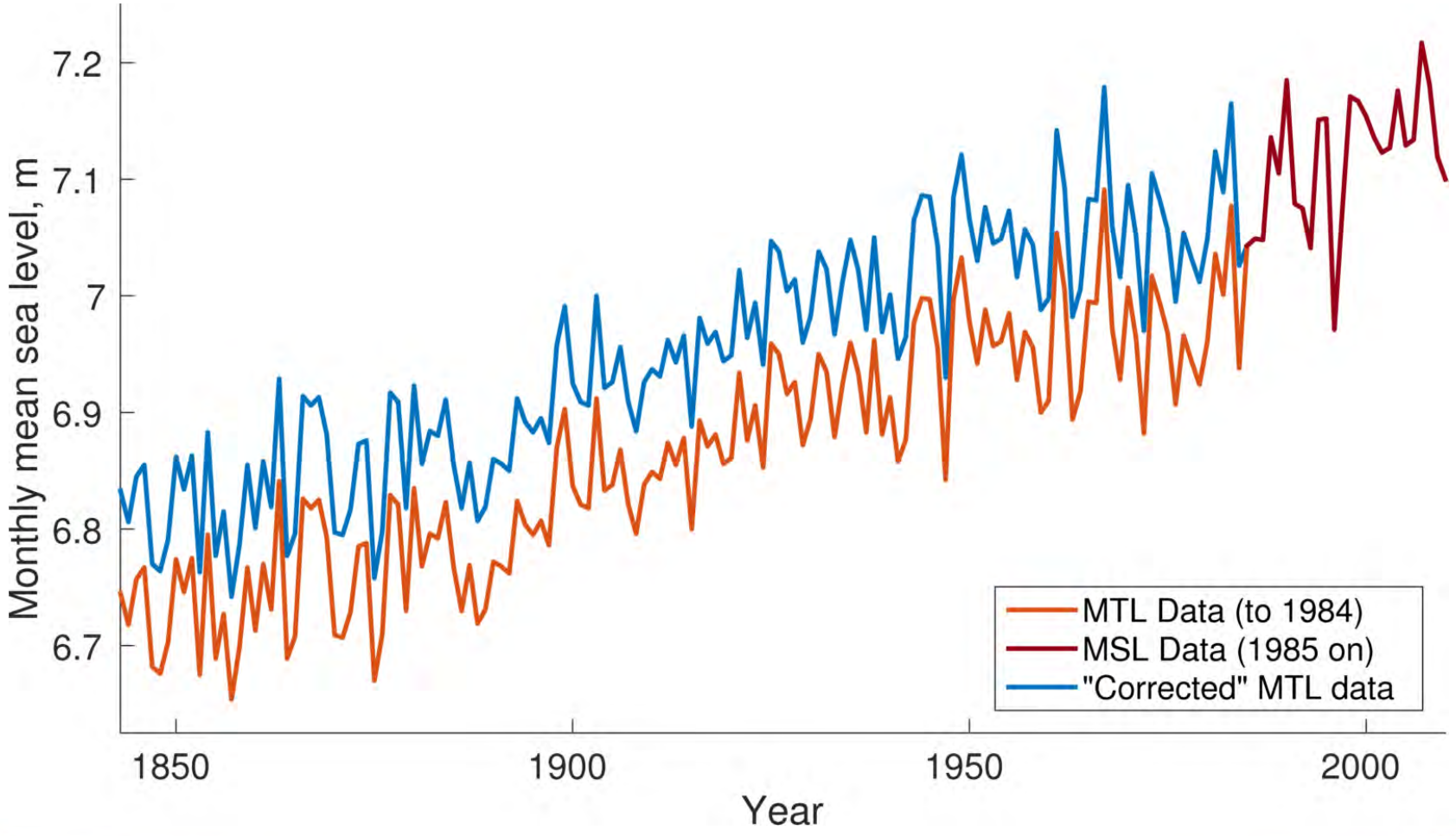
C: Presido I
1897-07-15 to 1927-07-26

D: Presido II
1927-07-26 to date

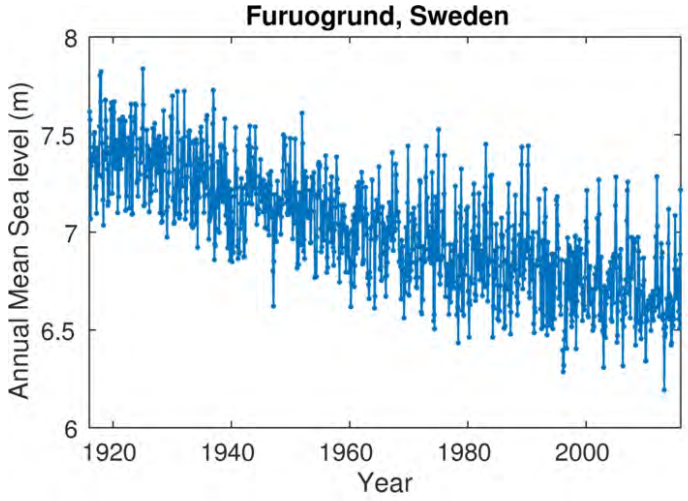
Effect of processing procedures
Mean Tide Level Data

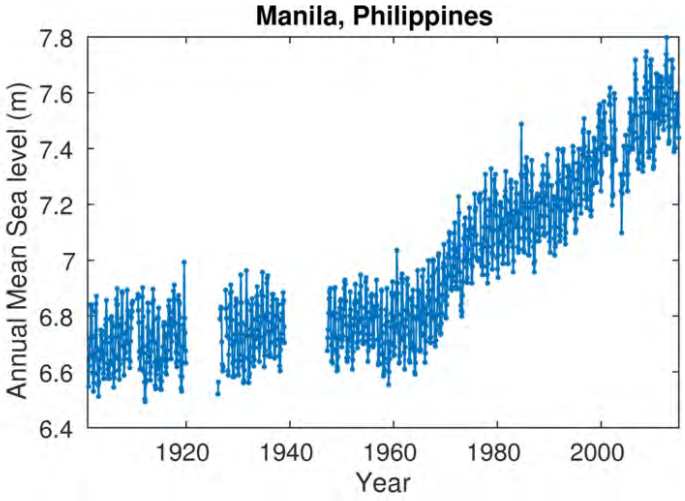


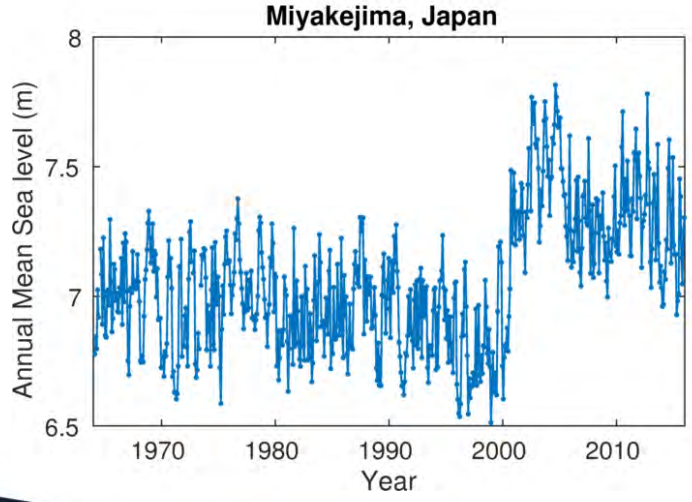
Mean Tide Level data from Cuxhaven

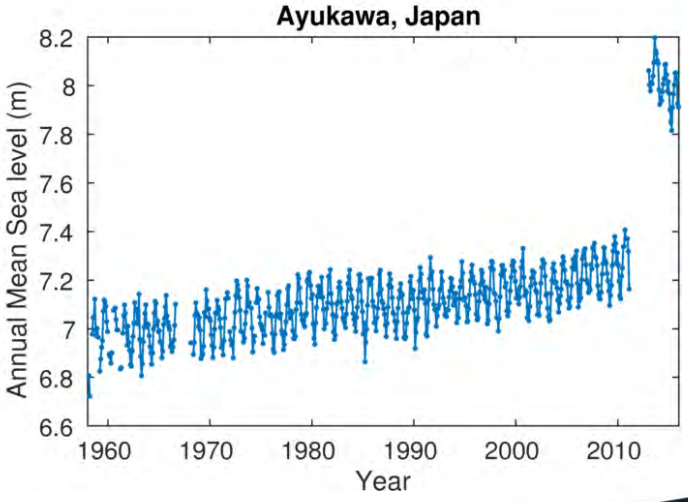


Land Movement Issues









The start of a solution

- ISO standards for time (ISO 8601) and country names (ISO 3166)
- Redesigned database to enable structured metadata
- netCDF implementing CF conventions coming soon
- Incorporate OCG standards (e.g. GML) into existing XML metadata exchanges for discovery metadata.
- Begin to develop a SensorML schema (or something similar) to exchange sensor information between tide gauge operators and data centres.

Conclusions

- Need to distribute metadata that accurately describes how and where sea level is measured
- But “how” and “where” change over time
- Sometimes “how” and “where” are uncertain

- Is there a trade off between data curation and ease of use?

- Metadata should tell a coherent story of how measurements are taken and have changed over the course of time.
- Metadata should warn users of potential issues with the data.
- Metadata should be adopt commonly used standards to increase interoperability