Welcome and approval of agenda

Gary Mitchum, President of CMSLT, was not able to attend meeting. However, he had prepared agenda (Annex I ) and short report on CMSLT (Annex II). Gary Mitchum had in advance asked that Thorkild Aarup chair the session.

Thorkild Aarup welcomed participants. [List of Participants is available in Annex V].

No additional items were proposed for the agenda and it was approved as given in Annex I.

Review of the Permanent Service for Mean Sea Level

A comprehensive report (24 pages) from PSMSL had been submitted to CMSLT. The executive summary is provided in Annex III. Andy Matthews provided an overview of the report. The meeting appreciated the report and work of the PSMSL and endorsed the suggested areas of future PSMSL activities. There was some discussion on question 3 concerning protocols on how to incorporate sea level data recovered from historical records and the general sense was that this should be examined by a working group.

Reconstitution of the Commission

Denise Smythe-Wright reminded the meeting about the historic context for the Commission and the service provided by the Permanent Service for Mean Sea Level (PSMSL) (see Annex IV). She underlined that the Commission via its service provides an important contribution to the community and ultimately for society.

She and others noted that there had been a decline in activity of the Commission. There was general support to the view, as also expressed in Gary Mitchum’s report, that it would be appropriate to reconstitute the Commission and reflect on its activities.

This process will formally be initiated by the parent body, IAPSO/IAPSO President, and in consultation with Gary Mitchum.

A reconstitution of the Commission could potentially include development of a set of new activities. Suggestions from the meeting included: Tides, Extremes, Data archaeology, sea level technology and GPS/GNSS datums. A reconstitution would also entail renewing membership and exploring with persons that could have interest in the CMSLT portfolio of activities.

Establish working group on GPS/GNSS datums

It was decided to await the reconstitution of the Commission before forming any new working groups.
Annex I

Agenda for the IAPSO Commission on Mean Sea Level and Tides meeting
Saturday, July 13, 12:00-13:30 in the IAPSO Office (Room 521A, Floor 5)

1. Review of the Permanent Service for Mean Sea Level
2. Reconstitution of the commission
3. Establish working group on GPS/GNSS datums

Please see the following report to IAPSO for additional information about these items.
The Commission on Mean Sea Level and Tides (CMSLT) has one standing obligation, which is to review the Permanent Service for Mean Sea Level (PSMSL). The last review was in 2015 and the next will occur at this meeting. In the last review the primary advice from the CMSLT to the PSMSL was to better track usage of the PSMSL data via publications that cite these data, in keeping with trends on how funding agencies in all countries are making decisions. We have heard that this advice was taken to heart and we know that the usage data are very complimentary to the PSMSL. Although the current review has not been conducted, we look forward to hearing more about this and expect a very positive outcome for the review. Conducting this review is the first item on the agenda for our meeting.

At the last IAPSO meeting we raised two issues for future consideration by the CMSLT. First, we noted that it had been a very long time since the membership of the committee had been renewed and the President said that he would like to ask the current members if they would like to continue and to replace members that did not. A message was sent and one member asked to be relieved, but overall there were very few responses, meaning that there has been no real change to the committee membership. We are very concerned about this. The result of what amounts to a freezing of the membership for a decade or more is that we have at least one generation, perhaps two, of young sea level scientists who are not represented. Also, as times have changed, we also suspect that not only are younger scientists underrepresented, but there are likely other important groups that should be included. In the second agenda item for our meeting, the President will ask permission to essentially reconstitute the committee with an eye towards generational, geographical and gender balance.

The second issue raised at the last meeting was that the CMSLT needed to find a mission (or two) beyond serving as the review body for the PSMSL, and finding possible missions has been a priority since the last report to the IAPSO. In past years the CMSLT has served as the organizing group for studies that were of interest to the larger community and involved people that were not members of the CMSLT, and we need to return to these types of activities. At the last meeting we said that we would consider an activity to evaluate efforts to incorporate tides, both barotropic and baroclinic, into global ocean circulation models. We are still considering this possibility, but have in the interim settled on another possibility, which in a fashion has the CMSLT returning to its roots.

About 30 years ago the CMSLT organized a workshop (and another later) concerned with the geodetic fixing of tide gauge benchmarks, which resulted in the famous “Carter” reports. At that time we were discussing absolute gravity, VLBI, etc., and were only just beginning to consider the use of the relatively new GPS (now GNSS) system. At the end of the day, GPS/GNSS became the tool of choice for fixing the height and vertical motion rates of the tide gauge benchmarks, and for decades now continuous GPS/GNSS have been the accepted method of estimating datum height and stability. But we are now seeing differences between different GPS/GNSS solutions that are large enough to affect our estimation of global mean sea level rise; i.e., the global mean sea level rates depend on who computes the datum change rates. These issues have already been discussed at two international meetings; one convened by the US National Academies of Science and another at the most recent GLOSS Group of Experts meeting. Depending on the results of our discussion at the CMSLT meeting, we might propose to convene a group to examine these differences, with the results to be discussed at a workshop held in conjunction with the next GLOSS Group of Experts meeting in 2021. We would ask for IAPSO support for this workshop.
Annex III

PSMSL Summary Report to CSMLT, July 2019

Lesley Rickards, Elizabeth Bradshaw, Andy Matthews and Kathy Gordon

The Permanent Service for Mean Sea Level (PSMSL) is the internationally recognised global sea level data bank for long-term sea level change information from tide gauges and also provides a wider service to the sea level community. The PSMSL continues to be responsible for the collection, publication, analysis and interpretation of sea level data. PSMSL is part of the National Oceanography Centre (NOC), Liverpool, with funding provided by the UK Natural Environment Research Council (a component of UK Research and Innovation). PSMSL operates under the auspices of the International Science Council (ISC) and in 2015 was accredited as a regular member of its World Data System. In 2018, PSMSL celebrated its 85th anniversary by hosting an international meeting. The “Sea Level Futures” Conference, attended by over 100 delegates from 65 international organisations, was dedicated to examining the current state-of-knowledge and future of sea level research.

The primary aim of the PSMSL is provision of the global data bank for long-term sea level information from tide gauges. PSMSL has continued to increase its efforts in this regard and over the last four years almost 10000 station-years of data were entered into the PSMSL database, increasing the total PSMSL data holdings to over 70000 station-years. In addition, the PSMSL, together with the British Oceanographic Data Centre (BODC), are responsible for the archive of delayed-mode higher-frequency sea level data (e.g. hourly values and higher frequency) from the Intergovernmental Oceanographic Commission's Global Sea Level Observing System (IOC’s GLOSS) core network.

New and updated products have been made available over the last four years. These include:

- an improved relative sea level trends product by adding maps showing estimated seasonal cycles and number of years required to obtain a sea level trend of a given uncertainty;
- working with Système d’Observation du Niveau des Eaux Littorales (SONEL) to offer information about the geocentric height and rate of vertical movement of some tide gauges;
- updating some of the longest time series to account for the differences between Mean Tide Level (MTL) and mean sea level and adding a flag to indicate occurrence of MTL values;
- making data available from in situ ocean bottom pressure recorders from all possible sources;
- enhanced de-drifting code for ocean bottom pressure recorders added to website;
- development of automatic quality control software for tide gauge data.

PSMSL staff have continued to be active in a variety of international meetings, working groups, conferences and workshops over the last 2 years including those organised by the Global Geodetic Observing System (GGOS), IOC GLOSS, European Geophysical Union (EGU), EuroGOOS, and International Marine Data and Information Systems (IMDIS). In addition, PSMSL has answered many enquires relating to sea level and have appeared on radio and television discussing aspects of sea level change. PSMSL staff have also co-organised and contributed to tide gauge and sea level training courses. Annually statistics are collated on the number of peer-reviewed published papers that use the PSMSL dataset. Over the last six years there are over 400 papers in 116 distinct journals, and the number of citations has increased to around 70 citations per year.
Summary and forward look

PSMSL has continued to be active over the last four years with regard to important workshops and conferences, and busy with regard to data acquisition and analysis. The functions provided by the PSMSL are in as much demand as ever, and new products continue to be developed and activities have expanded. Future plans include:

- Improved integration of the mean sea level data set with sources of higher frequency data and improving the quality of accompanying metadata;
- Continued development of interoperable metadata formats for tide gauge data;
- Assess whether PSMSL follows FAIR data principles (Findable, Accessible, Interoperable, Reusable), and improve areas where we do not;
- Keeping contact with data suppliers (the trend being to acquire data from websites rather than direct supply) and ensuring that data made available in real-time are also contributed to PSMSL;
- Mint a digital object identifier (DOI) for the PSMSL dataset (in collaboration with BODC);
- Development of protocols concerning how sea level data recovered from historical records can be incorporated into the PSMSL dataset;
- Continue collaboration with SONEL (IAG TIGA Working Group data centre) and with GGOS;
- More information on the website about links between tide gauge datums and national datums and ellipsoids - available in both human and machine readable formats, using internationally agreed standards;
- Plan incorporation of sea level records measured using GNSS reflectometry into the PSMSL
- Contribute to ISC World Data System metadata catalogue and training pages
- Creation of software for automatic first level quality control of high frequency data
- Redesign and update of the content on the PSMSL website;
- Further develop data archaeology with the Group of Experts on GLOSS.

Comments / Questions

1. Any overall comments / questions about the report?
2. Our primary aim will continue to be to develop, maintain and add new data to the global data bank for long-term sea level information from tide gauges, but there are a number of other activities listed above that are planned. We would like to invite views on which should be the top priority items.
3. We need to develop protocols to incorporate sea level data recovered from historical records into the PSMSL dataset. These data are not to RLR standard and have been more speculatively corrected, but nonetheless are valuable data, filling in gaps or extending the time series. What would you advise?
4. However, there are many possibilities and we would be interested in CMSLT views on additional activities or products, activities that are missing, that could be developed and their relative priority. Could you suggest 2 or 3 activities?
5. We are also interested in your long-term vision for PSMSL: where do you think PSMSL should be in 10 years’ time?
Services

The Permanent Service for Mean Sea Level (PSMSL)

The internationally recognised global sea level data bank for long-term sea level change information from tide gauges and also provides a wider service to the sea level community.

Instigated by Rolf witting and Joseph Proudman in 1933 with the name IUGG Mean Sea level Committee.

Proudman set about collecting monthly and annual values of mean sea level and the collections were published in special volumes from 1940.

Became a permanent service in 1958. Hosted by the Tidal Institute of University of Liverpool in the UK. Set up a global network of sea level stations and to engage in research.

It holds 70000 station years of global information with more than 300 records that are 60 or more years or longer.

Nobody knew when it was set up how useful this long-term data set was to become in addressing climate change impacts.

(The slide comes from the 2019 IUGG Union presentation “The Ocean Frontier: the role and history of IAPSO” by Denise Smythe-Wright.)
Annex V List of Participants

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