

## **Defining “Long Term” with respects to TR A6.5**

Researched and submitted by South Africa

Action Item 4.10.3 of the 2<sup>nd</sup> TWLWG Meeting.

1. South Africa was tasked to review the wording of the Technical Resolution 6/1932, as amended, (A6.5) “Study of Mean Sea Level”, here after referred to as TR A6.5, with respect to clarifying “long term”.

STUDY OF MEAN SEA LEVEL	6/1932 as amended	26/1965	A6.5
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1. It is recommended that the IHB encourage Member States to carry out systematic, long-term tidal observations, in view of the importance of monthly and secular variations of mean sea level in connection with tidal prediction.

2. It is recommended that Member States make such data available for publication by the Permanent Service for Mean Sea Level of the International Council of Scientific unions, since that service publishes regularly monthly and annual values of mean sea level for tidal stations throughout the world.

As the original query to clarify the definition of “long term” was posed by Brazil, South Africa requested Brazil’s input with the above mentioned action item.

2. Searches of the following documents/ websites were of no help in the endeavor, as the term “long term” is not defined at all, not even in conjunction to MSL.

1. <ftp://ikikai.soest.hawaii.edu/islp/README>
2. <http://ilikai.soest.hawaii.edu/uhsic/products.html>
3. [http://www.psmsl.org/train\\_and\\_info/training/reading/books.php](http://www.psmsl.org/train_and_info/training/reading/books.php)
4. <http://www.psmsl.org/data/longrecords/>
5. NOAA Glossary- Tide and Current Glossary
6. NTC Glossary 2010 Tidal Terminology

The IHO Hydrographic Dictionary (S-32) (Part 1, Volume1 English, Fifth Edition) does not contain a definition for “long, medium or short term” in any capacity. Various publications do however have various definitions for this term. These definitions are generally amended to suit the purpose of the final research. This then begs the question: How exactly is “long term” defined and is this definition interchangeable depending on the requirements?

3. It is South Africa’s opinion that before any consensus on the definition of “long term” can be reached; the TR A6.5 needs to be looked at in terms of its context. The TWLWG members need to specifically look at the words “Mean Sea Level” (MSL) and

decide if the study of MSL is the investigation of the mean level of the ocean (monthly, annually and over the lunar nodal cycle) or if it is the investigation of global sea level rise?

4. If the context of TR A6.5 “Study of Mean Sea level” is that of the investigation of the mean level of the ocean, then the following definitions would be acceptable to use for developing a definition of “long term”:

- a. *The Admiralty Manual of Hydrographic Survey, Volume 2, Chapter 2, Tides and Tidal Streams* states “...The best results cannot be obtained from the observations which do not extend over a period of at least 18.6 years (one cycle of the moon’s nodes)... In non-tidal waters a long period of observations is no less important.”<sup>1</sup>
- b. *American Practical Navigator* defines MSL as “... the average height of the surface of the sea for all stages of the tide over a 19-year period.”<sup>2</sup>

This begs the question, In regards to tides, is 19 years worth of data considered as a long period or would 36 years a better representation of the Lunar Nodal cycle, thus defining “long term” as 36 years or more?

5. If the context of TRA6.5 “Study of Mean Sea level” is that of the investigation of global sea level rise, then the following definitions would be acceptable to use for developing a definition of “long term”:

- a. An extract from a paper written by Philip Woodworth, “*The Need for GPS to Provide Information on Vertical Land Movements at Tide Gauges with Long Records.*” States: “...suggests making use of tide gauges with at least 40-60 year records...”<sup>3</sup> This is in line with the GLOSS practices.
- b. If I now look at the Global Sea Level Observing System (GLOSS) Implementation Plan, 1997 pages 17 and 18, the following with regards to the term “long term” is stated: “...GLOSS-LLT: *Tide Gauges for Long Term Sea Level Trends...*Section 5.1.2 stressed the fact that many well-maintained long record tide gauge sites have the potential to contribute to long term sea level change studies. In such investigations at present, records of typically 40-60 years or longer are employed to establish reliable trends with a “statistical” error lower than about 0.5mm/year...”  
  
“... Clearly, the list can be made more geographically representative by selection of sites with shorter records from regions with lower recording density. Suggested GLOSS sites with medium length records (i.e. typically 20-30 years) from Brazil, Africa, Western Indian Ocean and Antarctica are also included in Annex IV and Figure 5.6. Annex IV can

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<sup>1</sup> The Hydrographer of the Navy, Taunton, Somerset. 1969. *The Admiralty Manual of Hydrographic Survey, Volume 2, Chapter 2, Tides and Tidal Streams.* Page 13. para 2

<sup>2</sup> Nathaniel Bowditch LL.D, Defense Mapping Agency Hydrographic Centre 1977. *American Practical Navigator, an epitome of navigation, Volume 1* page 769 para 3

<sup>3</sup> IGS-PSMSL, Pasadena California USA, March 17-18 1997. *Workshop on Methods for Monitoring Sea Level,* Page 42

*also be extended eventually by means of 'data archeology and rehabilitation' re-analyses of historic data (Section 7.4)..."*

6. From para 5, for the purposes of MSL research done by GLOSS, Brazil has suggested that the term "long term tidal observation" be defined as records with a length of 40-60 years or longer for the study of MSL and that it should include secular variations as well. As well as a period of 20-30 years should be considered as a definition of "medium term tidal observations."

7. Brazil has therefore suggested that the text of Technical Resolution 6/1932, as amended, (A6.5) "Study of Mean Sea Level (MSL)", be amended to read as follows:

**Quote**

STUDY OF MEAN SEA LEVEL	6/1932 as amended	26/1965	A6.5
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1. It is recommended that the IHB encourage Member States to carry out systematic, long-term tidal observations (*records of typically 40-60 years or longer*), in view of the importance of monthly and secular variations of mean sea level in connection with tidal prediction.

2. It is recommended that Member States make such data available for publication by the Permanent Service for Mean Sea Level of the International Council of Scientific unions, since that service publishes regularly monthly and annual values of mean sea level for tidal stations throughout the world.

**End quote.**

*Note: amendments to the above text are indicated in red text.*

8. It is South Africa's opinion that the context in which TR A6.5 is intended is the same as that of para 4 above and thus it is recommended that the definition of "long term" be 36 years or longer so as to include at least two lunar nodal cycles. And "medium term" could be considered as 19 years (18.6years) to cover one lunar nodal cycle.

In conclusion, in South Africa's opinion, defining the term "long term", specifically with regards to Technical Resolution 6/1932, as amended, (A6.5) still requires further discussion amongst the members of the TWLWG.