NOAA Tidal Analysis Datums Calculator FAQs

Frequently Asked Questions

1. First Reduction (FRED) or 19-year equivalent datum by MMSC or TBYT? Why or Why not?
2. How to choose a control station?
3. What are the uncertainties associated with tidal datums?
4. What if my data file contains gaps? Any QA/QC tips for my data?

1. First Reduction (FRED) or 19-year equivalent datum by MMSC or TBYT? Why or Why not?

A 19-year equivalent datum provides the user with the historic perspective of your data associate with the last 19 years. For instance, if tidal datums at a short-term station are computed by simultaneously comparing to a control station on 1983-2001 National Tidal Datum Epoch (NTDE), tidal datums at the short-term station are tied to the sea level condition in the middle of 1983 and 2001, which is 1992.

Keeping your data independent from NTDE will generate a different result from 19-year equivalent datums. However, uncoupling your data from NTDE may give you a better picture of more recent conditions verses what has happened over the last two decades. It should be noted that depending on how long your data record, short term episodic events like storms can have a significant effect on the computed sea level. Tying your data to the NTDE will average out short-term meteorological, hydrologic and oceanographic fluctuations.

Looking at both results may be the best option, when trying to gain perspective on how your site has responded to past and recent tidal and meteorological conditions.

2. How to choose a control station?

In order to choose the best control station for a short-term station, a comparison of tidal characteristics between several potential controls and the short-term station is recommended. Generally, the best control station will have tidal characteristics such as number of tides per day, range of tide, time of highs and lows, etc., that most closely resemble the subordinates characteristics, including during periods of greater non-tidal influences such as weather events. Control stations nearby that are within the same bay, inlet, or similar geographic and hydrodynamic environments as the short-term station (i.e., having the same parcels of water flowing past them both as the tides move in and out), are the best choices to start with for plotting.

Using CO-OPS ODIN Map to locate potential stations, choose 3 or 4 nearby active stations with / symbol. Click the / symbol and select “Water Levels” from the listed links. Then choose the date, units, time zone and datums about the data that you want to download. Plot the downloaded data at control stations with the data at the short-term station to compare.

3. What are the uncertainties associated with tidal datums?

a). 19-year equivalent datums: The accuracy of tidal datums depends largely on the length of the water level data series analyzed. If tidal datums are calculated from a 19-year continuous water level data series (i.e .a NOAA NWLON station), the datum error is considered to be 0. Generalized accuracies for datums computed at short-term stations for the length of the record are summarized in Table 1 (Swanson, 1974). These values were calculated using control stations with 19-year tidal datums. The accuracies of the short-term datums can be interpreted as known to within plus or minus the appropriate value in Table 1. That is, the values in Table 1 are the confidence intervals for the tidal datums based on the standard deviation.

Table 1. Generalized accuracy of tidal datums for East, Gulf, and West Coasts when determined from short series of record and based on +/- sigma (Swanson, 1974).

Series Length (months)	East Coast		Gulf Coast		West Coast	
	(cm)	(ft)	(cm)	(ft)	(cm)	(ft)
1	4.26	0.13	5.91	0.18	4.26	0.13
3	3.28	0.10	4.92	0.15	3.61	0.11
6	2.30	0.07	3.94	0.12	2.62	0.08
12	1.64	0.05	2.95	0.09	1.97	0.06

For datums calculated from data series greater than one year but less than 19 years, the uncertainty is a linear interpolation between 1 year and 19 year datum. As an example, if a 12-month datum S12M equals 0.06 feet, then the accuracy for a 5 year data series (S60M) at the same subordinate station, compared with the same control station, would be:

$$S60M = 0.06 \frac{19 \text{ yr.} - 5 \text{ yr.}}{18 \text{ yr.}} = 0.05 \text{feet}$$

As shown above, having local tidal datums computed using 1-year or more of data greatly increases the accuracy in the tidal datum elevations.

b). First Reduction datums (Michalski, et al., 2014) : Statistics indicate that with 1 month of data, one-sigma standard error is 11.5cm (0.38ft), and with 12 months of data it is 4.0cm (0.14ft), which represents a significant improvement in accuracy (7.5m (0.25ft)). After 12 months, the slope is much more gradual, with only a 2.1cm (0.07ft) difference between the 12-month series and the 60-month series, indicating a smaller increase in accuracy for additional increments of data beyond 12-months. The difference between 12-month series and the 228-month series showed an improvement in the vertical accuracy for MTL of only 3.2cm (0.11ft).

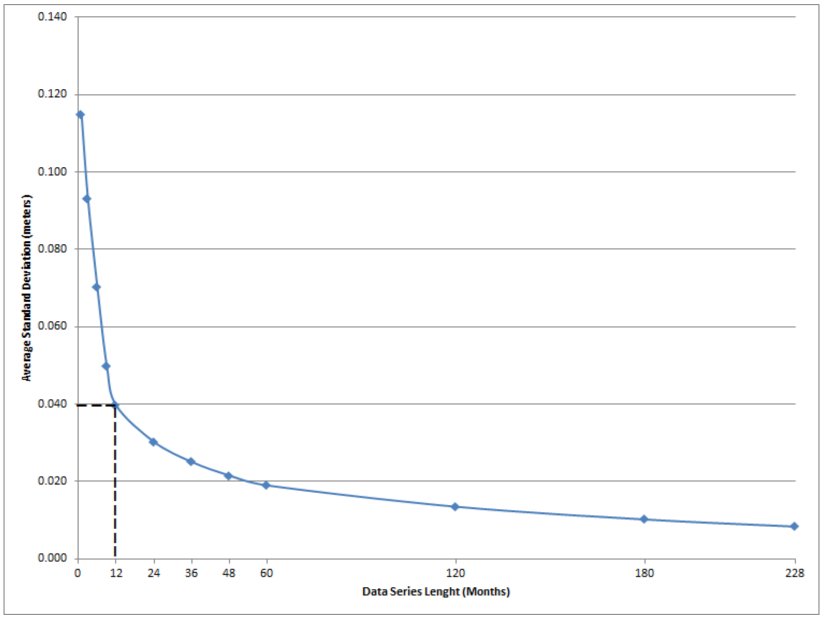

Figure 1. Average standard deviation (FRED datum error) along the coast of Alaska.

The above datum errors are estimated based on the data length and computation methods. The total datum errors are also impacted by the uploaded water level data quality (accuracy of sensor, stability, time intervals, etc.) and could be higher than the generalized errors mentioned above.

5. What if my data file contains gaps? Any QA/QC tips for my data?

The datum calculator will fill in all gaps less than 3 hours. For any gaps more than 3 hours, the datum calculator treat them as separated time segments and only compute tidal datums for the longest continuous time segment.

QA/QC tips before you load data into the tool:

Gaps in Data Record- Check for data gaps. When using the tidal datums tool, gaps greater than three hours will cause the tool to compute separate datums results for the periods before and after the break. If a gap exists in your data consider ways to fill in data gaps using the tidal record from the days before the gap occurred.

Shifts/Jumps in Data- Shift or jumps in the data record demonstrate sensor instability. Leveling to benchmarks annually can help you determine sensor stability.

Flat lining at low tide – Flat lining at low tide indicates sensor placement should be reconsidered in order to capture the full datums perspective from MHHW to MLLW.

Weather effects – When processing data consider the season/annual variations potential impact on datum computation.

Have Suggestions & Feedback? Try our **Feedback and Suggestions** box.

References:

Michalski, M., L. Huang and G. Hovis, 2014. Error Analysis Procedures Used by the National Ocean Service to Compute Estimated Error Bounds for Tidal Datums in the Arctic Ocean. NOAA Technical Report NOS CO-OPS 070.
https://www.tidesandcurrents.noaa.gov/publications/NOAA_Technical_Report_NOS_COOPS_070.pdf

Swanson, R.L., 1974. Variability of Tidal Datums and Accuracy in Determining Datums from Short Series of Observations, NOAA Technical Report NOS CO-OPS 064, Silver Spring, MD.