

# Alaska Local Tidal Datums

## An introduction for non-experts

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# What is a vertical datum?

A vertical datum is a reference surface that can be used to measure heights in a uniform way.



How much taller is Sally?

Need to know how tall the hill is!

... you cannot compare heights that are measured from different surfaces.

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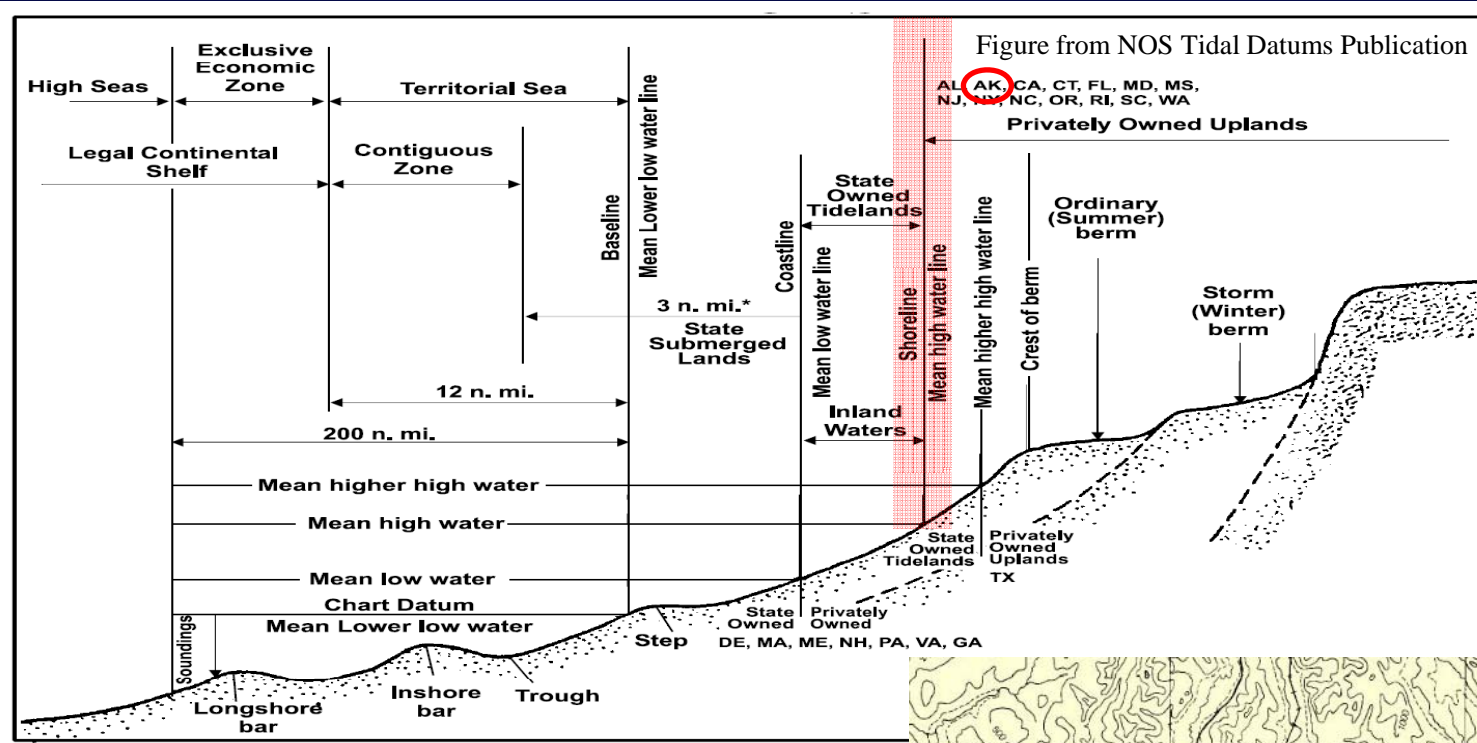
How much taller is Sally?

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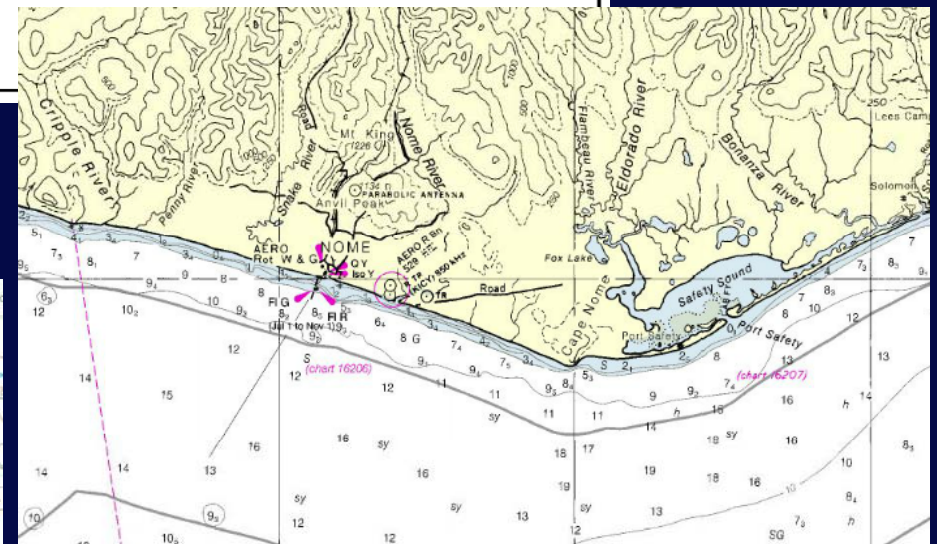
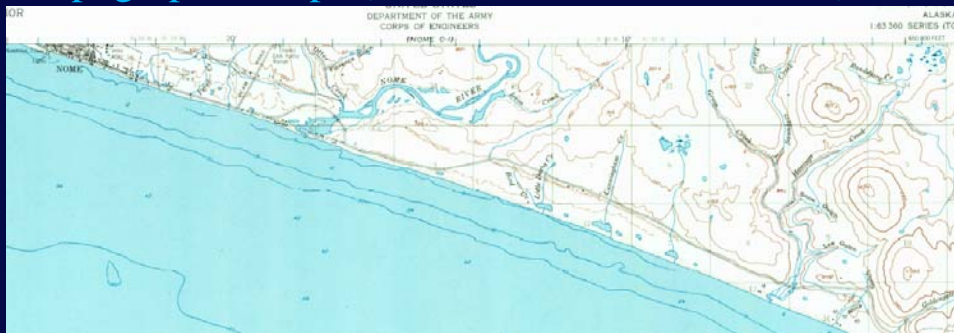
... you cannot compare heights that are measured from different surfaces.

# Examples of vertical datums at the coast

Land  
Ownership



Topographic Maps (“NVGD29” or “NAVD88”)



Nautical Charts (MHW elevations, depths in MLLW)

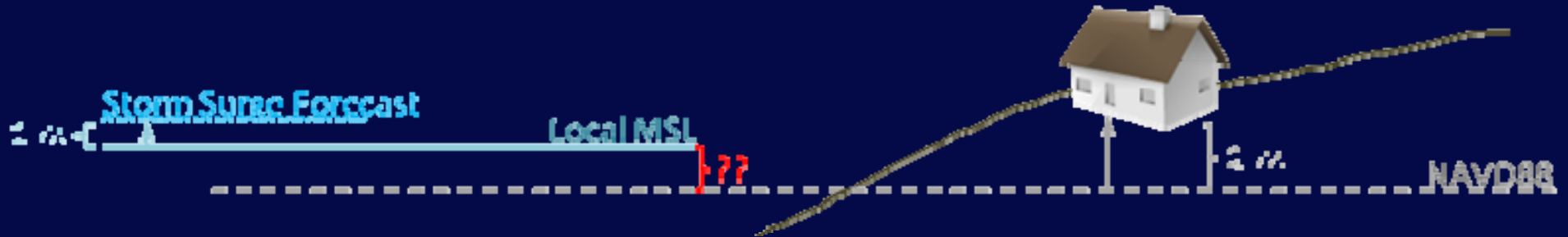
# Why are datums important to me?

## Tidal Datums

(standardized local sea levels)

## Geodetic Datum

(NAVD88 = current standard in U.S.)



## Scenario

You own a house at a published elevation:

2 meters above the NAVD88 reference plane

The National Weather Service issues a forecast  
for a storm surge that will be:

1 meter above your local Mean Sea Level

If your local Mean Sea Level is higher (1.5 m for example) than NAVD88 you may need to take action!

~~

Understanding this relationship in coastal areas is necessary for:  
flood warnings, inundation mapping, design elevations



# What is 'NGVD88' and where does it come from?

History Lesson:

First standardized vertical datum in US was 'NGVD29'

"Sea Level Datum of 1929"

26 tide stations in US and Canada

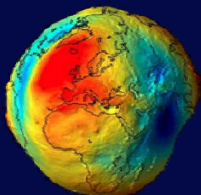
NAVD88 (1988)

ONE tide station is used as the reference MSL →



Why does local MSL differ?

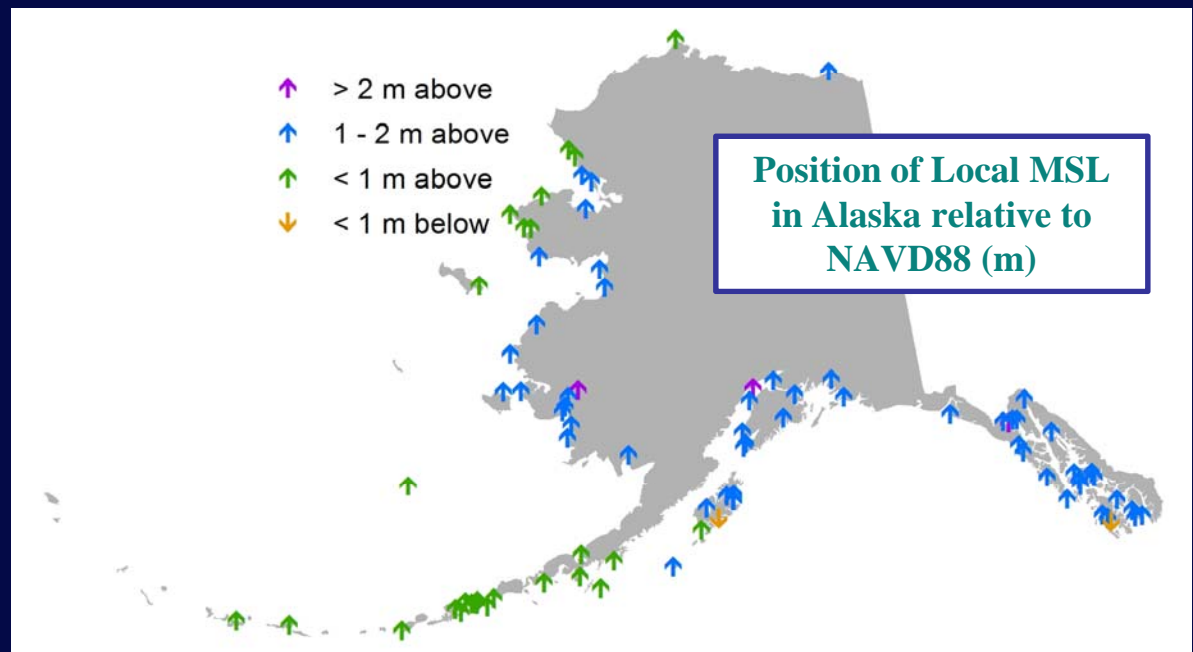
- Incomplete map of earth's gravity field = GEOID12A



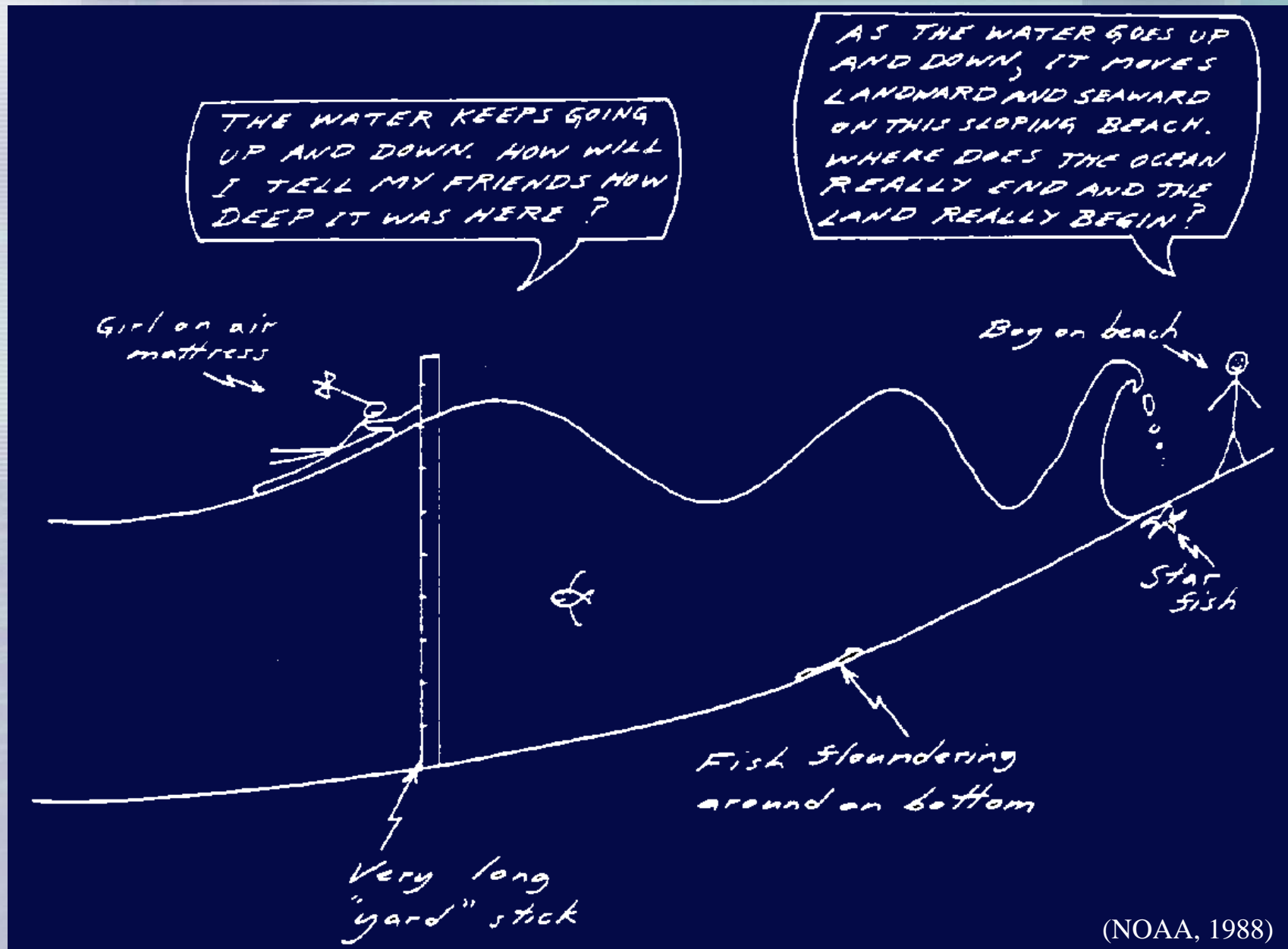
- Sea surface topography is driven by oceanographic and atmospheric effects

**NAVD88 "MSL" ≠ Local MSL**

Please spread the word!



## How are tidal datums determined?

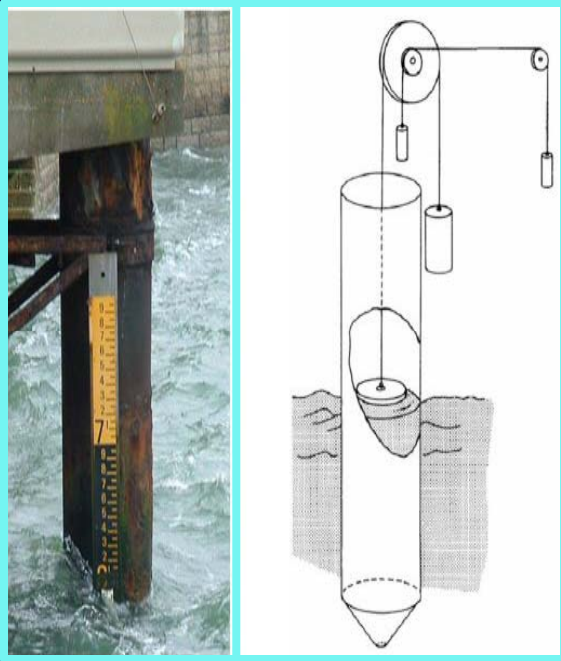


(NOAA, 1988)

# Water level measurement at tide gauges

## Tide Stations

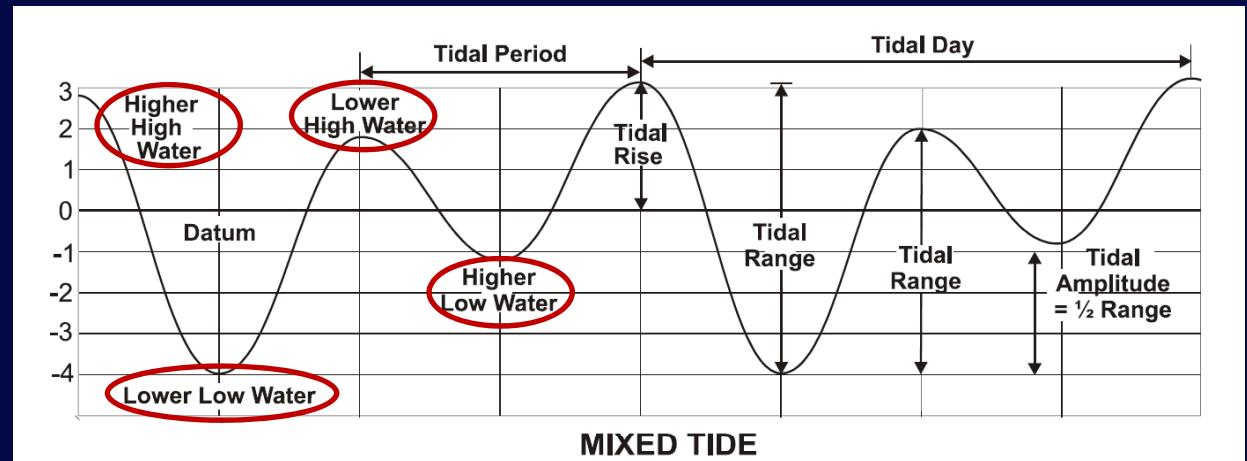
### Older methods:



The official network of tide stations for the United States is maintained by  
**NOAA's Center for Operational Oceanographic Products and Services (CO-OPS)**

### Modern Methods:

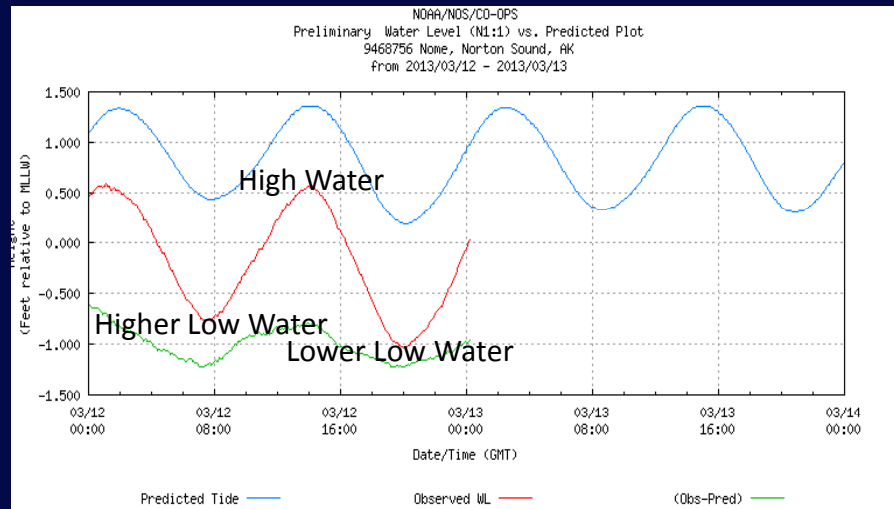
- Bubbler Gauge
- Pressure Transducer
- Acoustic Gauge
- Radar Gauge



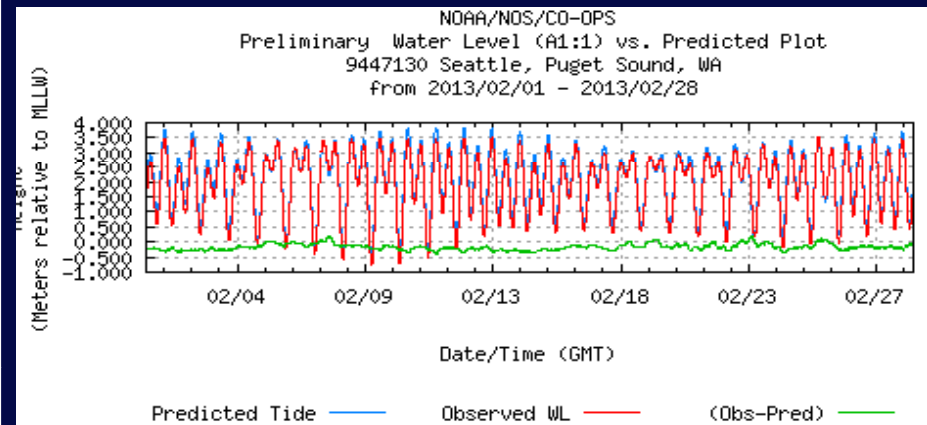


# Real tide station records

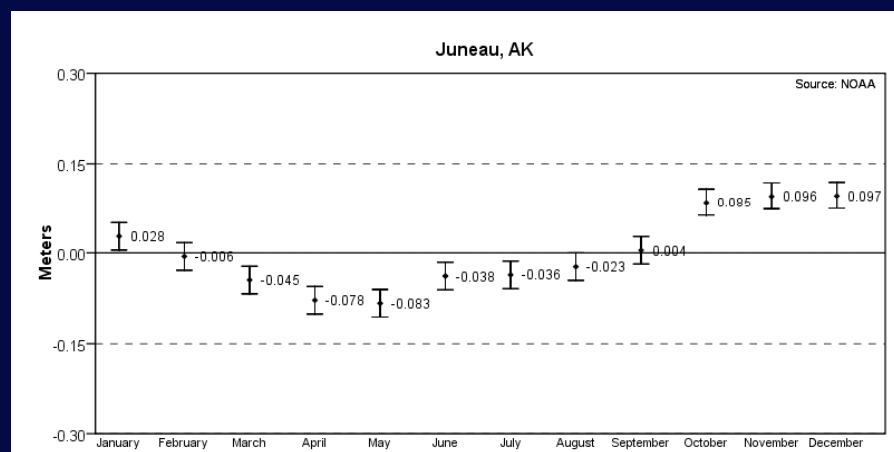
## Day



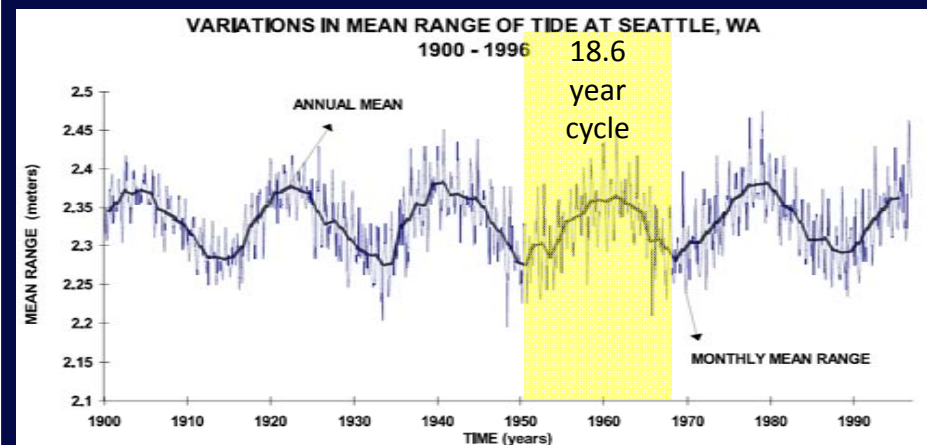
## Month



## Year



## Century



Tide records include: Wave & wind effects - Ocean & river currents - Temperature and salinity – Atmospheric pressure

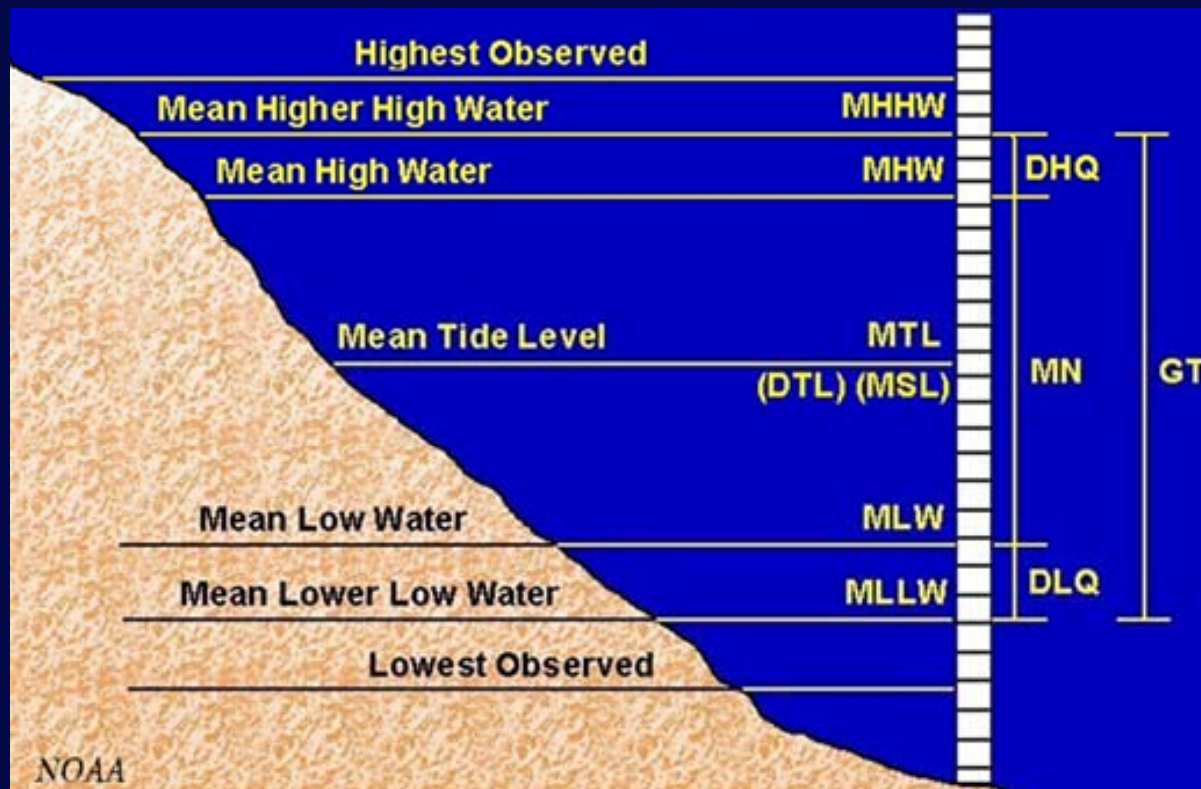
# Long-term averaging = Tidal Datums

## Tidal Datums

Examples:

**Local MHW** - Average of the high water levels at a location over a 19-year period (1983-2001)

**Local MSL** - Average of hourly water level measurements over a 19-year period



# Datum Conversion

## In most of USA

NOAA's VDatum tool

Uses a continuous sea surface grid (TSS)  
to make transformations

Available in all contiguous states, Puerto  
Rico and the US Virgin Islands

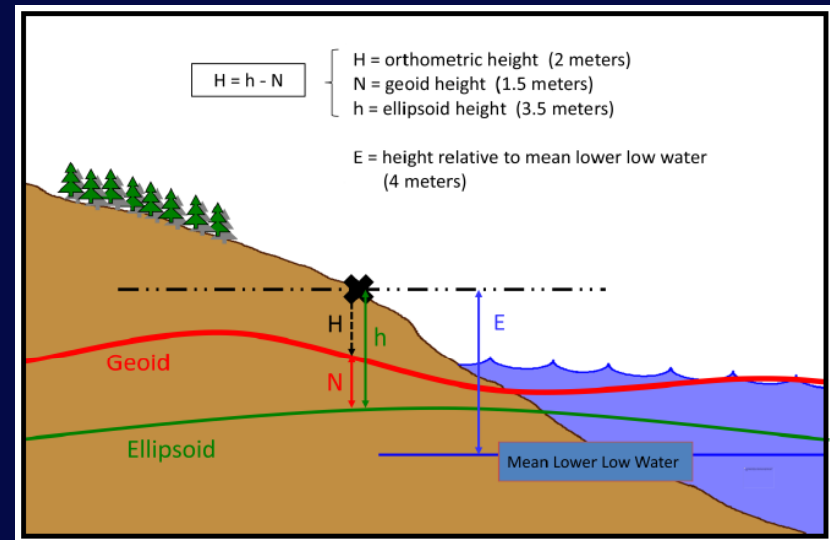
The screenshot shows the NOAA's Vertical Datum Transformation - v3.1 window. It has two main sections: 'Horizontal Information' and 'Vertical Information'. The 'Horizontal Information' section includes dropdowns for 'Datum' (NAD83(2011/2007/CORS96/HARN) - North Am...), 'Coord. System' (0 - Geographic (latitude, longitude)), 'Unit', and 'Zone'. The 'Vertical Information' section includes dropdowns for 'Datum' (NAVD88/GUVD04/NMVD03/ASVD02/PRVD02/V...), 'Unit' (meter (m)), and radio buttons for 'Height' and 'Sounding'. There are also checkboxes for 'GEOID model'. At the bottom, there are 'Point Conversion' and 'File(s) Conversion' tabs, with input fields for 'Longitude', 'Latitude', and 'Height', and 'Convert' and 'Reset' buttons.

## In Alaska

Sole-station offset transformations

Require:

- Tidal Datums (19-year averages)
- Tidal Benchmarks w/ published geodetic heights



**NOTE:** elevations obtained using this method are  
only valid in the immediate vicinity of the  
original tide station

Alaska Department of Natural Resources  
Division of Geological & Geophysical Surveys **search**

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## Alaska Tidal Datum Portal

The Alaska Division of Geological & Geophysical Surveys (DGGs) has a coastal community geohazards evaluation and geologic mapping program that is funded through the federal Coastal Impact Assistance Program (CIAP). Since this program was launched in 2010, fieldwork has been conducted in seven coastal communities and includes field efforts to rapidly document the impacts of severe storms on Alaska's coastline. Accurate vertical datums in the coastal environment are critical to the evaluation of natural hazard vulnerability in support of local and regional planning. Appropriate tidal data must be considered in the siting, design, construction, and operations of development projects to ensure protection of human life, property, and the coastal environment.

The values in this conversion calculator were last updated January 2013.

Location: Geodetic Elevation:  (meters) NAVD88(GEOD12A), Orthometric Local Tidal Elevation:  (meters) MLLW 

A summary of relevant information, including links to all of the published values included in this calculator, can be found in the [reference table document](#). The table includes all Alaska tide stations with published local datums as of January 2013, however, tidal benchmarks or NAVD88(GEOD12A) tidal benchmark elevations are not available for all locations.

[+ About the Alaska Tidal Datum Portal](#)[+ Frequently Asked Questions \(FAQ\)](#)[+ The Alaska Tidal Datum Calculator](#)[+ Recommended External Resources](#)

*The development of this site was partially funded with qualified outer continental shelf oil and gas revenues by the Coastal Impact Assistance Program, Fish & Wildlife Service, and U.S. Department of the Interior. The views and conclusions contained herein are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. government.*

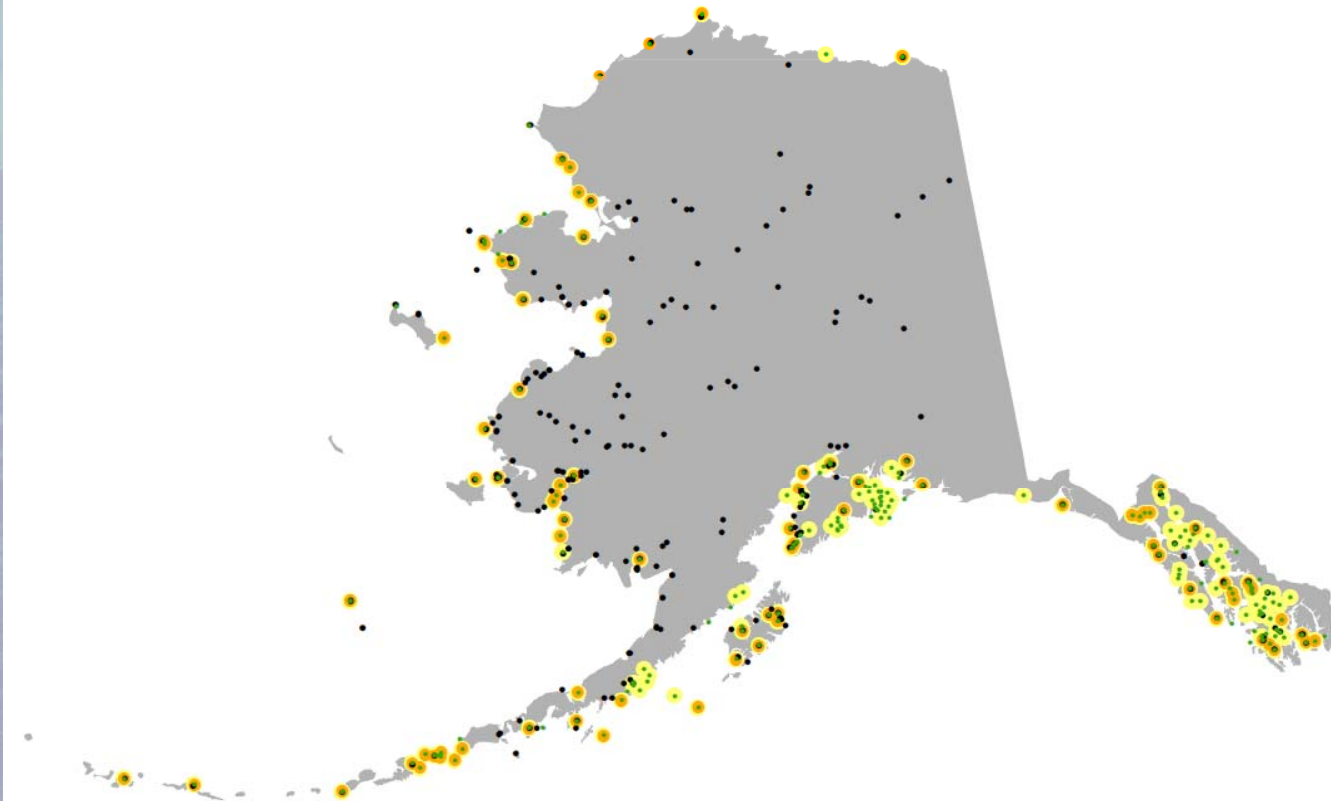
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# January 2013 Status of Local Tidal Datums in Alaska

- Populated Places
- Established Tidal Datums (n=209)
- Published Geodetic Elevations (n=89)
- Published Tidal Benchmark Sheets (n=172)

**These are the only  
areas that can be  
included in online  
conversion tool**





# Surrogate Tidal Datum Estimates

Temporary Tide Gauge



Measurement of Foreshore Features

For example:

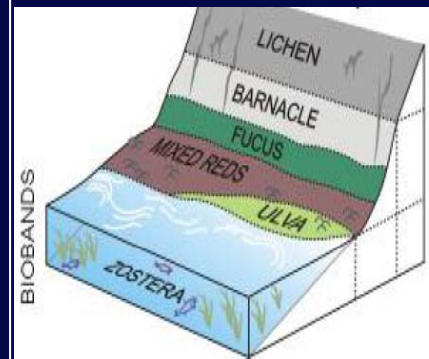
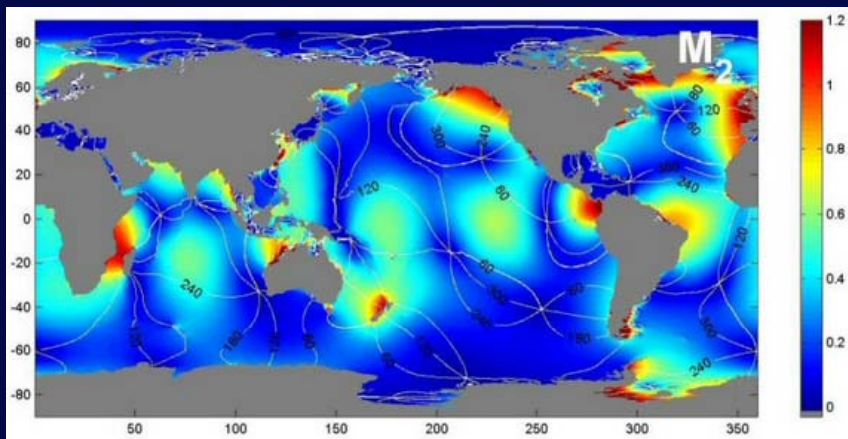
Strandlines – debris lines



Biological bands



Modeled Value



**For more information or to make conversions visit:  
[www.dggs.alaska.gov/sections/engineering/ak-tidal-datum-portal/](http://www.dggs.alaska.gov/sections/engineering/ak-tidal-datum-portal/)**

**In conclusion:**

- **Any time you encounter an elevation or height (3 feet for example) be sure to ask “3 feet above *WHAT?*”**

**If the answer is height above ‘Mean Sea Level’, is it:**

- 1. The National Standard Sea Level (NAVD88)**
- 2. Local Mean Sea Level (based on tide gauge)**
- 3. Local Mean Sea Level (based on something else)**

**→ If it is Local Mean Sea Level, when was it calculated?**

- **Different ‘types’ of Mean Sea level can vary by up to 7 feet in Alaska.**

**Thank You!**