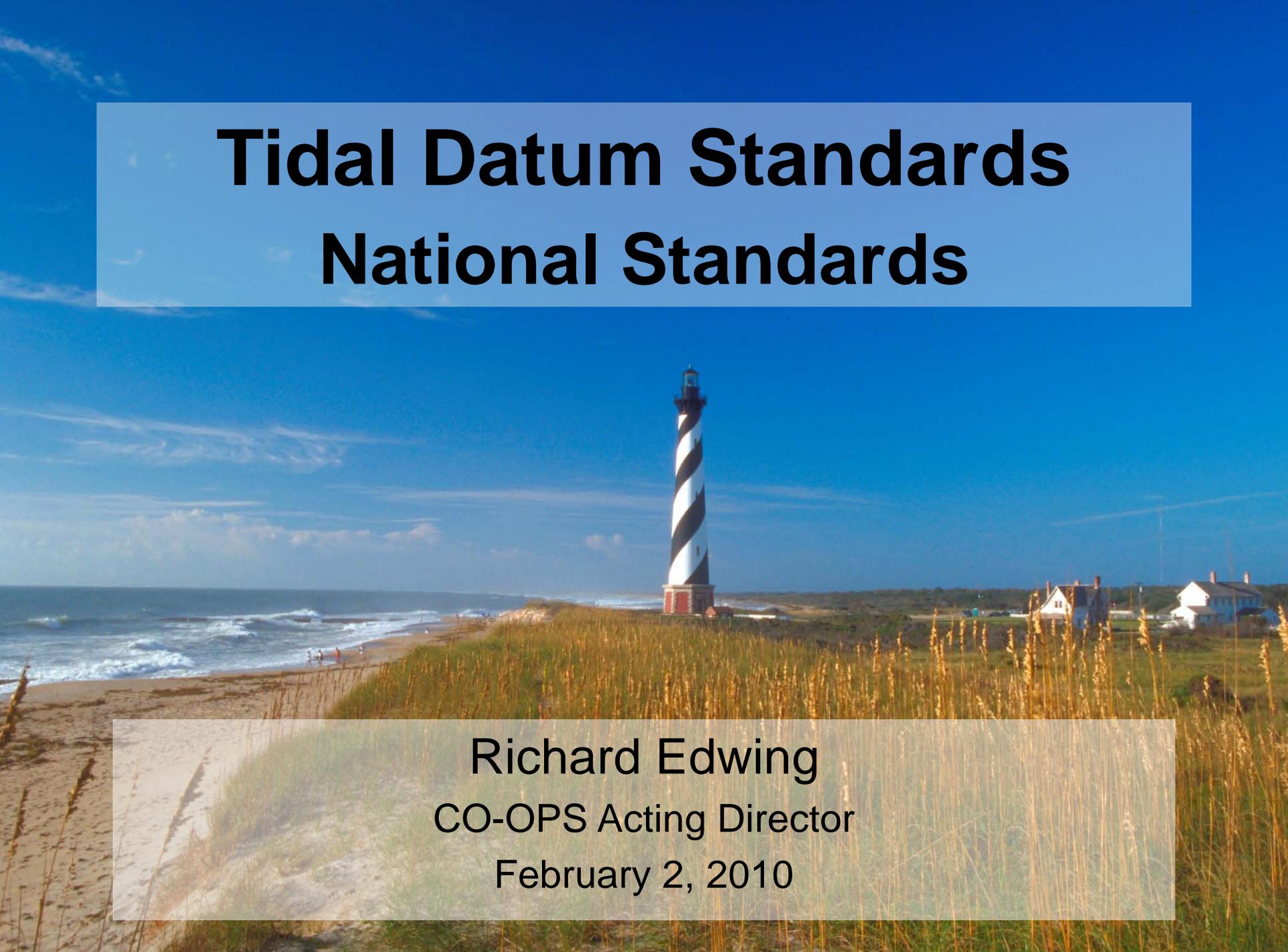


Tidal Datum Standards National Standards



Richard Edwing
CO-OPS Acting Director
February 2, 2010



Background

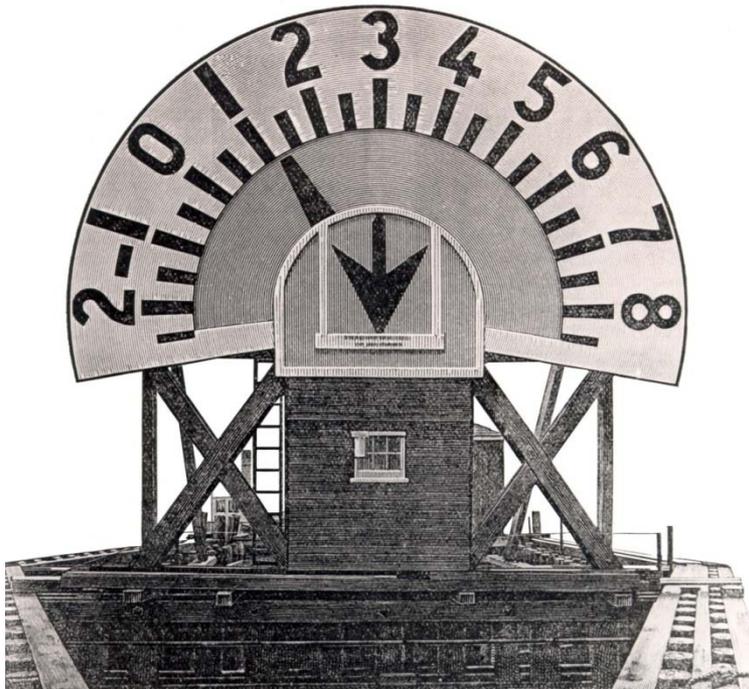
- NOAA is responsible for establishing and maintaining the National Spatial Reference System
 - Geodetic
 - NAD 83
 - NAVD 88
 - Water Level
 - Coastal – tidal datums
 - Great Lakes – International Great Lakes Datum





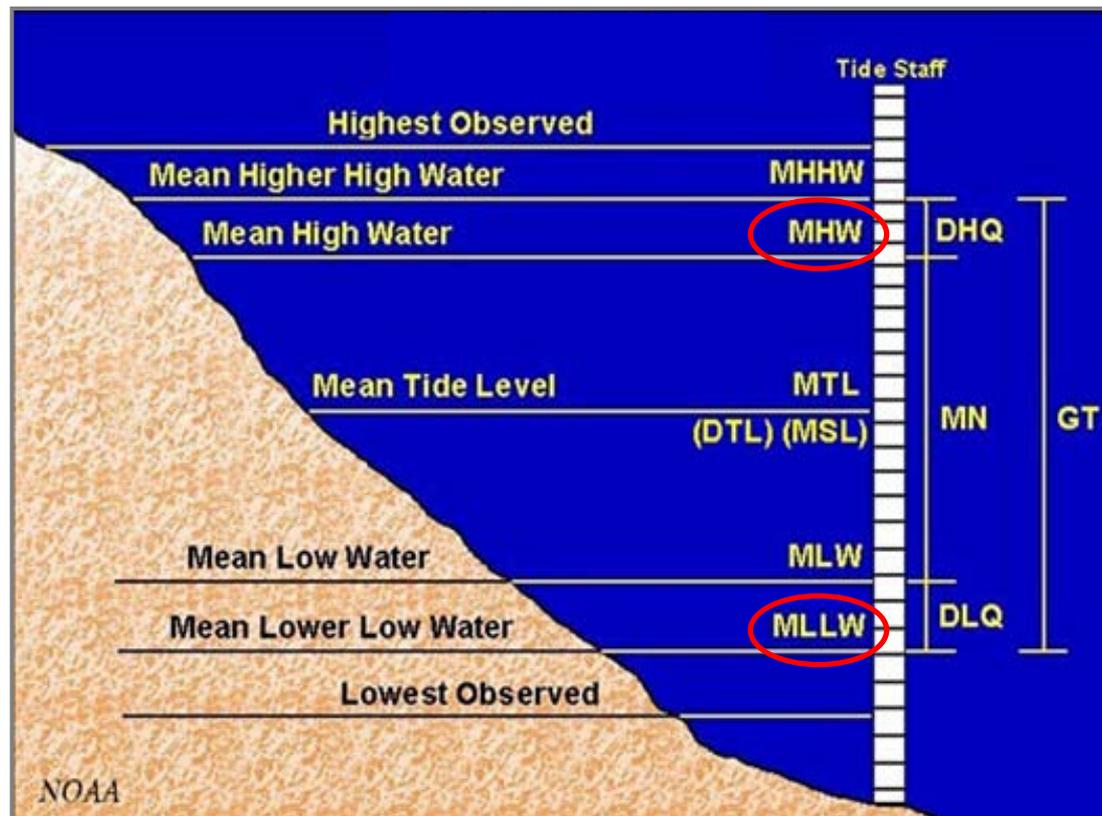
Water Level Authorities

- **1807 MISSION** – Establishing sea level reference frame for Charting, Shoreline and Marine Boundaries.
- **1936 Borax, Ltd v. City of Los Angeles U.S. Supreme Court case** – Use of 19-year tidal datum epoch concept in legal context
- **United States v California, 332 U.S. 19, 26 (1947)** – Established use of ordinary low water mark as baseline for offshore submerged lands as defined and determined by Coast and Geodetic Survey.
- **National Tidal Datum Convention of 1980** – Authorized the NOAA definitions of MHW, MHHW, MLW and MLLW as the official policy of the U.S. Government.



Tidal Datums

- **Datum of Mean Sea Level (Local):** a derived mean from 19 years of observations at a tide station and referenced to a specific national tidal datum epoch.

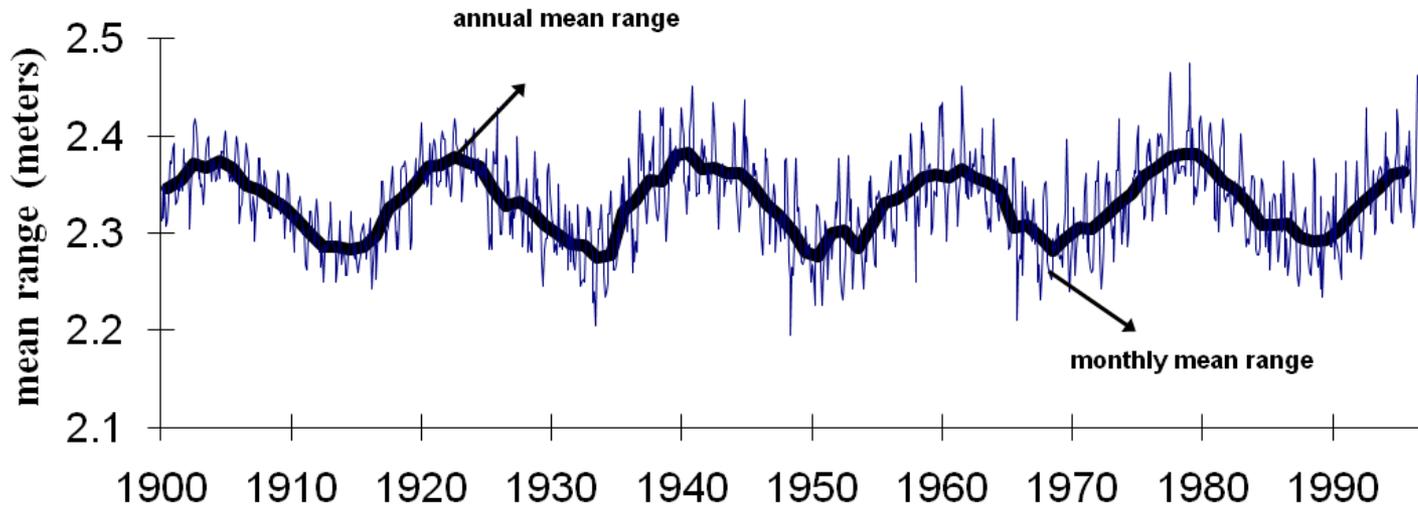


WHY A 19-YEAR MEAN FOR TIDAL DATUMS?

The Metonic Cycle: 18.6 -Year Regression Of The Moon's Nodes



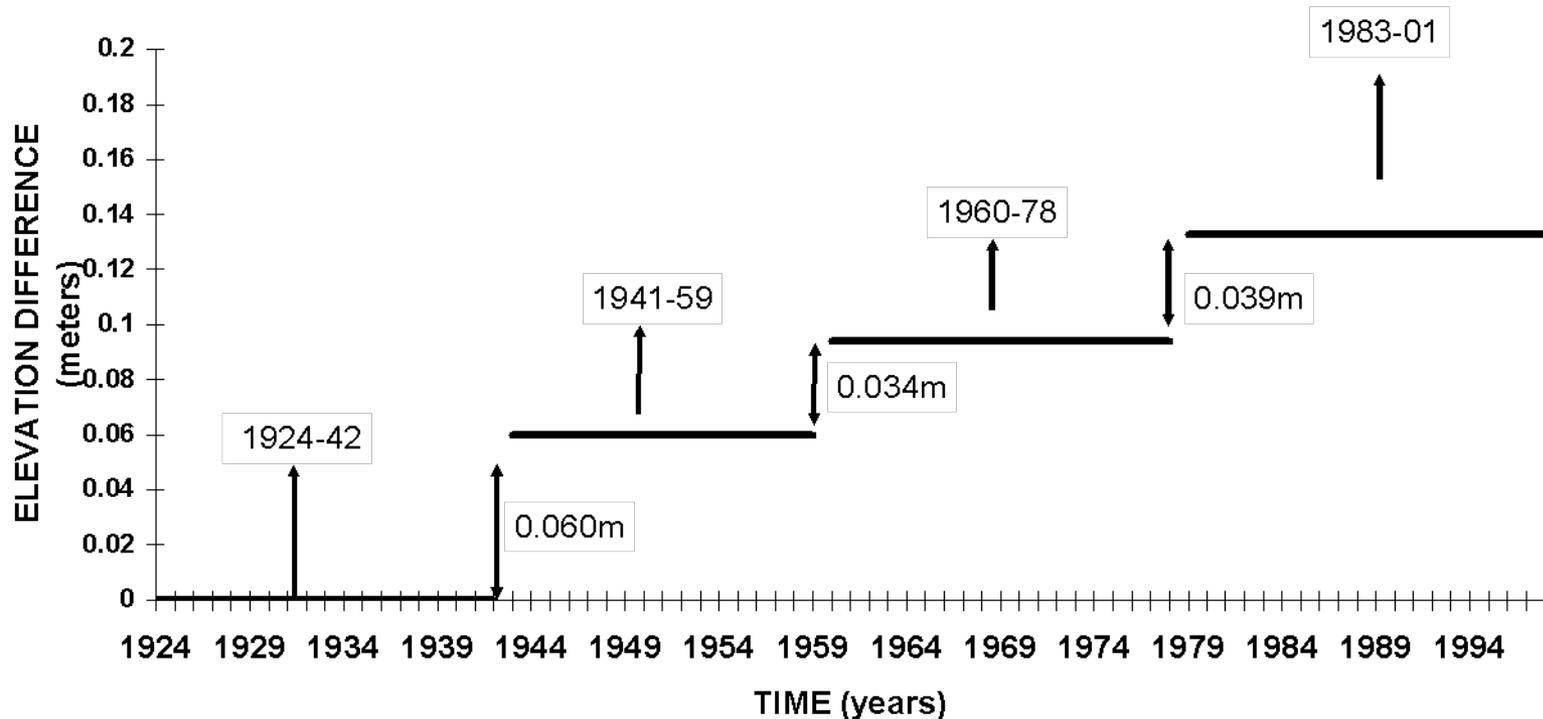
Seattle, WA: Long term variation of mean range of tide: 1900 - 2000



NATIONAL TIDAL DATUM EPOCH (NTDE)

A common time period to which tidal datums are referenced

AVERAGE DIFFERENCES IN 19-YEAR MSL BETWEEN EPOCHS
USING 32 LONG TERM STATIONS

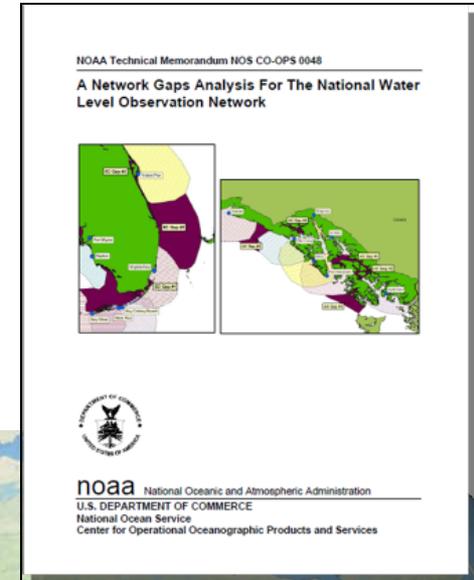


- A specific 19-year period that includes the longest periodic tidal variations caused by the astronomic tide-producing forces.
- Averages out seasonal meteorological, hydrologic, and oceanographic fluctuations.



NOS National Water Level Program

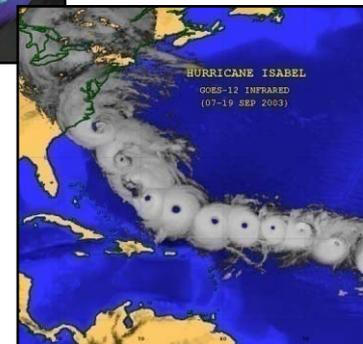
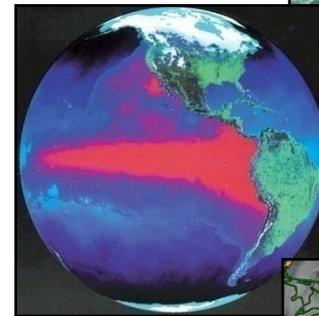
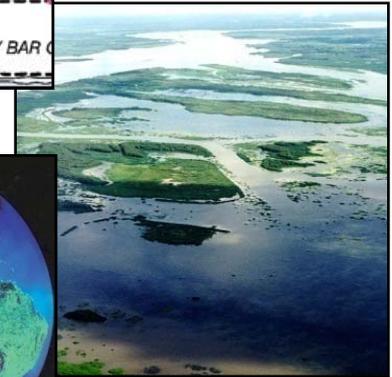
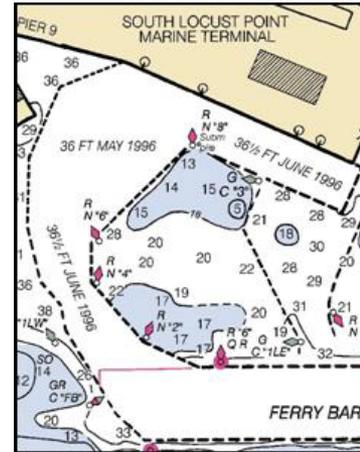
- Continuous Station Operation
- Vertical Datum Reference
 - Vertical stability is paramount
 - Connected to national geodetic datum (NAVD 88)
- Routine verified tide and water level products
 - Water levels relative to latest tidal datum epoch



NWLON - 210
stations

Applications of Tidal Datums

- Reference system
 - Charting and mapping shorelines (Chart datum)
- Marine boundaries
 - Offshore leases, property
- Coastal infrastructure
 - Civil works projects
 - Habitat restoration
- Monitoring sea level trends
- Coastal Hazards
 - Storm surge, tsunami

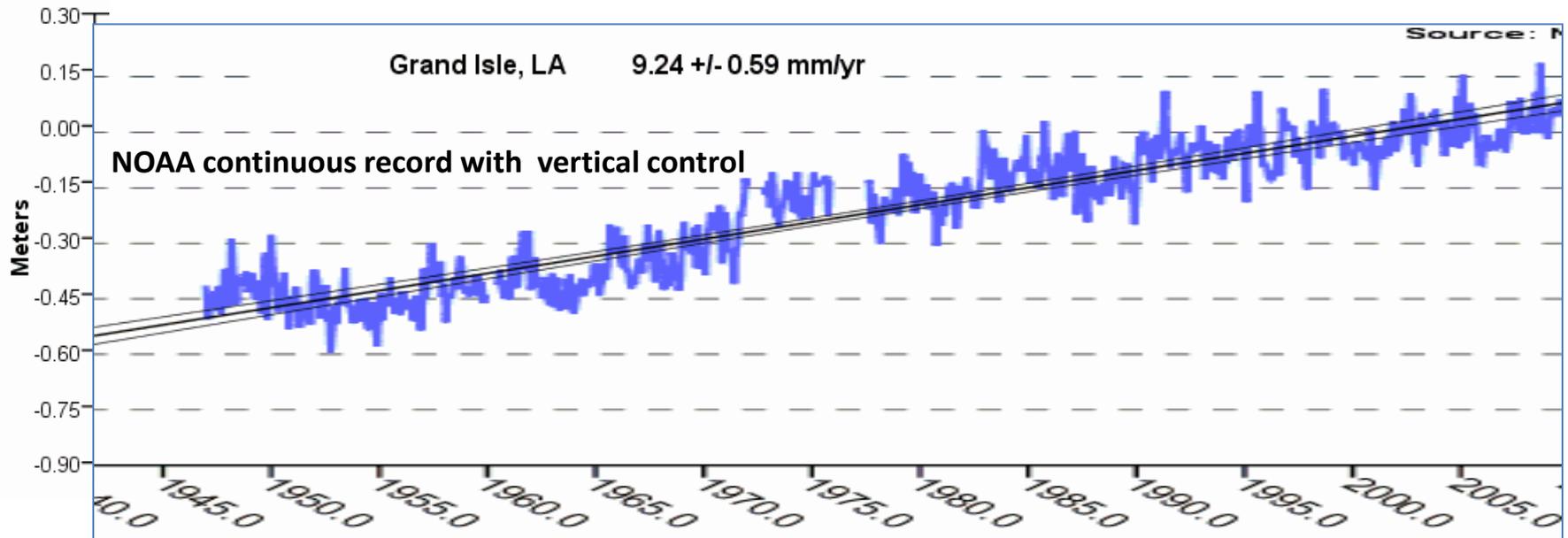
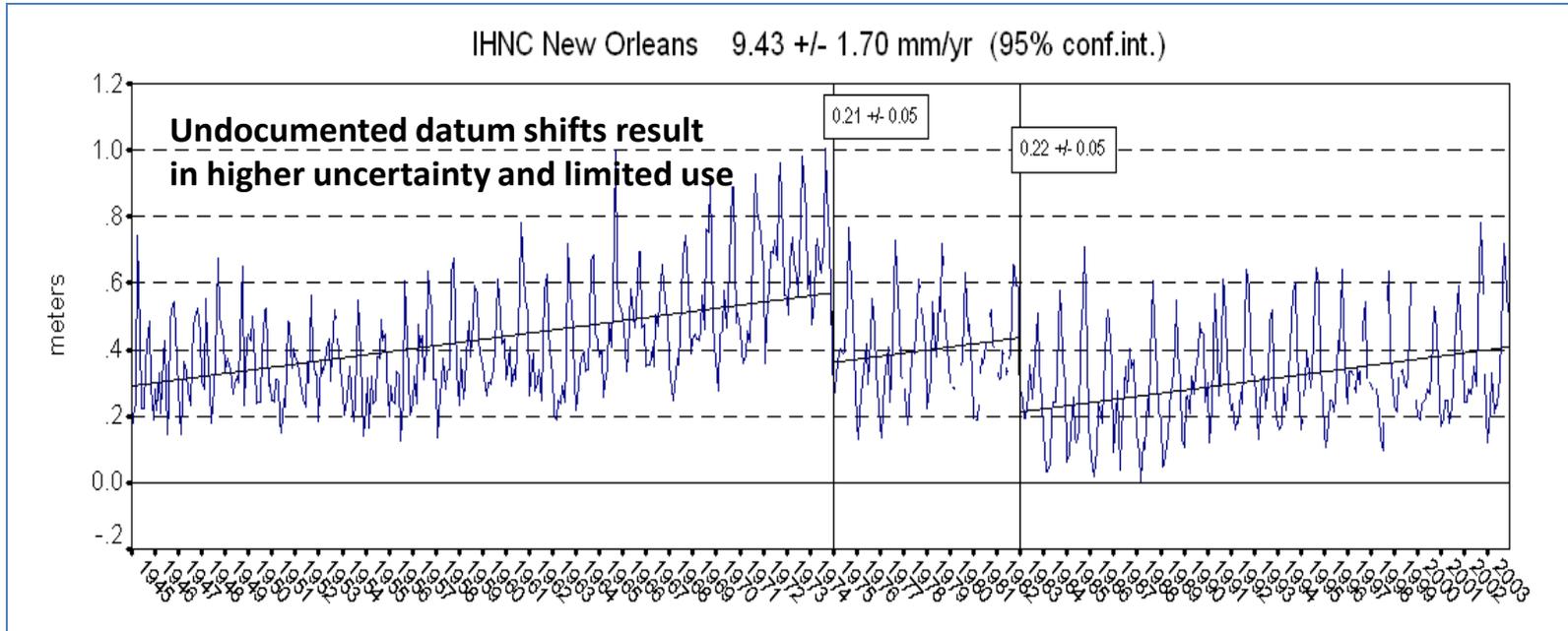


**Elevation Difference, Relative to Local Mean Sea Level:
North American Vertical Datum of 1988 (NAVD88)
National Geodetic Vertical Datum of 1929 (NGVD29)**



Local Mean Sea Level Datum 1983-2001 NTDE

The Importance of Vertical Control for Data and Datum Continuity Application to Determination of Relative Sea Level Trends





NOAA and USACE Collaboration

- Common vertical reference framework
- Incorporating sea level change
 - Civil works projects
 - Restoration



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

ER 1110-2-8160

CECW-CE
CECW-CO
CECW-P

Regulation
No. 1110-2-8160

1 March 2009

Engineering and Design
POLICIES FOR REFERENCING PROJECT ELEVATION GRADES
TO NATIONWIDE VERTICAL DATUMS

1. **Purpose.** This regulation establishes U.S. Army Corps of Engineers (USACE) policies for referencing project elevation grades to nationwide vertical datums established and maintained by the U.S. Department of Commerce. Its purpose is to ensure that controlling elevations and local datums on USACE projects are properly and accurately referenced to nationwide spatial reference systems used by other Federal, state, and local agencies responsible for flood forecasting, inundation modeling, flood insurance rate maps, navigation charting, and topographic mapping.

Department of the Army
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EC 1165-2-211

CECW-CE

Circular
No. 1165-2-211

1 July 2009

EXPIRES 1 JULY 2011
WATER RESOURCE POLICIES AND AUTHORITIES
INCORPORATING SEA-LEVEL CHANGE CONSIDERATIONS
IN CIVIL WORKS PROGRAMS

1. **Purpose.** This circular provides United States Army Corps of Engineers (USACE) guidance for incorporating the direct and indirect physical effects of projected future sea-level change in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Recent climate research by the Intergovernmental Panel on Climate Change (IPCC) predicts continued or accelerated global warming for the 21st Century and possibly beyond, which will cause a continued or accelerated rise in global mean sea-level. Impacts to coastal and estuarine zones caused by sea-level change must be considered in all phases of Civil Works programs.



NOAA and USACE Collaboration

- Datum adoption
 - Short term surveys to NOAA standards
 - Existing networks working toward NOAA standards
- SLR policy (interim to long term)
 - Collaborative projects to assess impacts of SLR (Poplar Island)





Summary

Common Standards and Datums

- Enable data integration into broader applications (storm surge, sea level rise, restoration, etc.)
- Enable leveraging observing system infrastructure
- Provide a legally defensible reference system

NOAA's National Ocean Service

Center for Operational Oceanographic Products and Services



Questions

Visit the CO-OPS Website at
<http://tidesandcurrents.noaa.gov/>

Background

NGVD29

- **Sea Level Datum** of 1929 was renamed the National Geodetic Vertical Datum (NGVD29) after May 10, 1973. It was defined by observed heights of mean sea level at 26 tide gauges adjusted to a national leveling network of benchmarks.
- This geodetic datum was not a mean sea level, the geoid, or any other equipotential surface, hence this was the reason it was renamed in 1973.

NAVD88

- The North American Vertical Datum of 1988 is the vertical datum established in 1991 by the minimum adjustment of the Canadian-Mexican-U.S. leveling observation. It held fixed the height of local mean sea level at Father Point/Rimouski, Quebec, Canada.

TIDAL DATUMS

- **Datum of Mean Sea Level (Local):** a derived mean from 19 years of observations at a tide station and referenced to a specific national tidal datum epoch.

National Water Level Observation Network



- Water Level
- Wind Speed/Direction
- Barometric Pressure
- Air Temperature
- Water Temperature
- Conductivity



Marine Boundaries In The U.S.

