

Marine to Riverine

The Role of the Modernized NSRS in Navigation Data Harmonization

Jeff Jalbrzikowski, P.S., GISP
Appalachian Regional Advisor
National Geodetic Survey

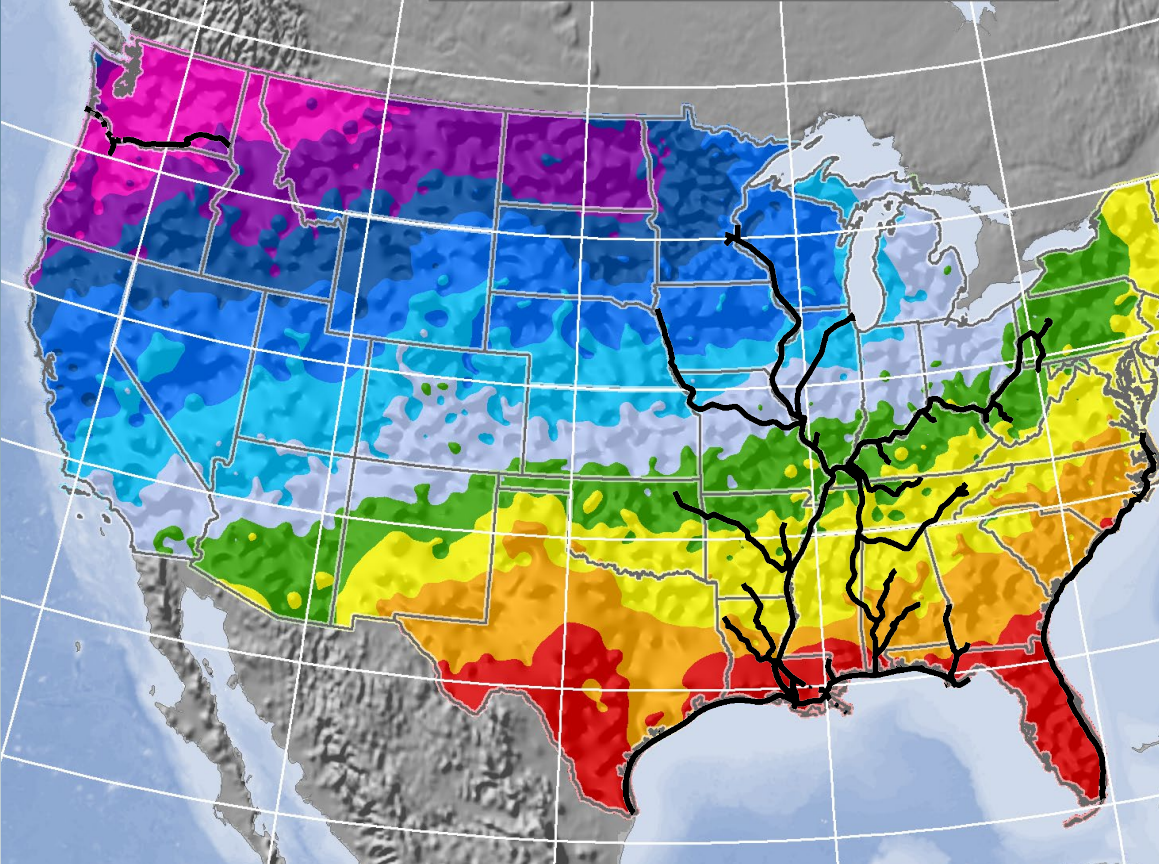
Hydrographic Services Review Panel Virtual Meeting
March 10, 2022



NOAA's National Geodetic Survey

- National Spatial Reference System (NSRS)
 - Current Vertical Datum = NAVD 88
 - Forthcoming = NAPGD2022
 - Impact? → heights are going to **change**
 - Not a simple “add half a foot”
 - Varies geographically

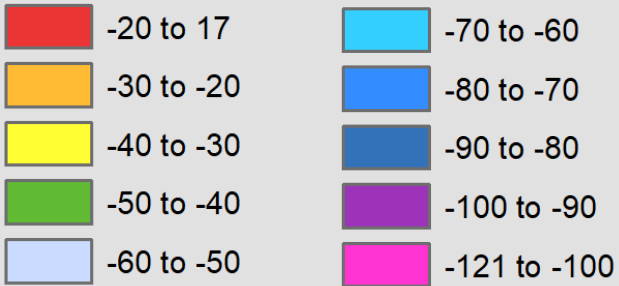




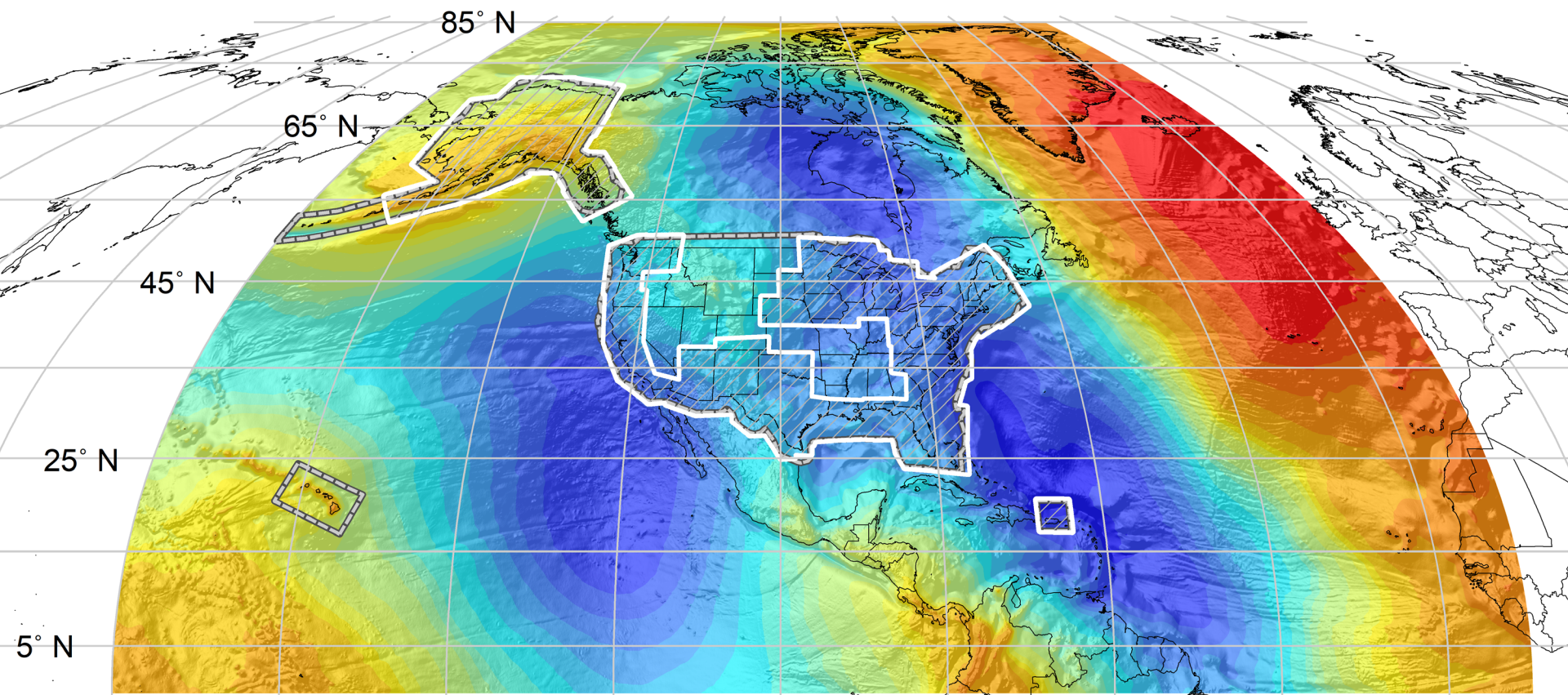
Note the color shading stops at the shoreline.

So too does the geodetic vertical datum (NAVD 88).

Colors approximate the shift from NAVD 88 to NAPGD2022 (in centimeters)
Ranges from -0.6 to -3.9 feet



Inland Waterways System overlaid with Vertical Datum Shift

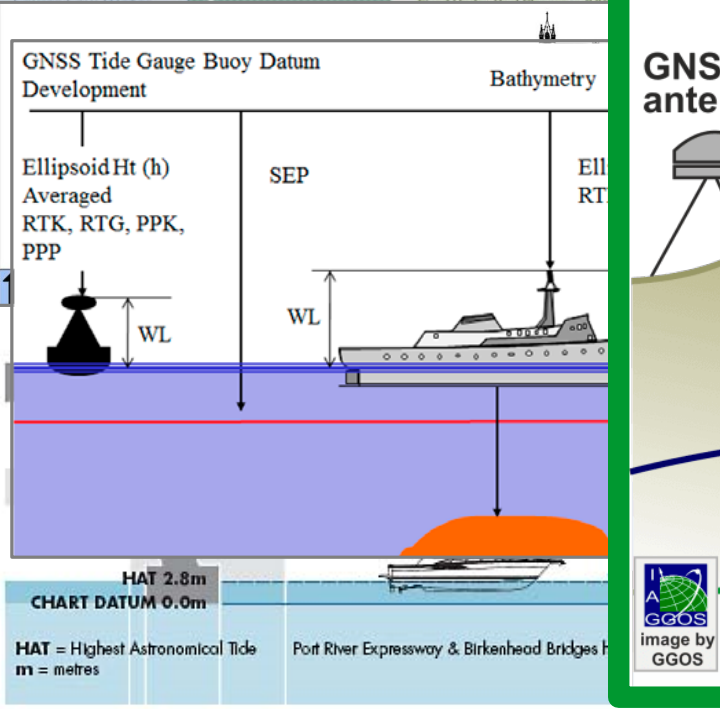
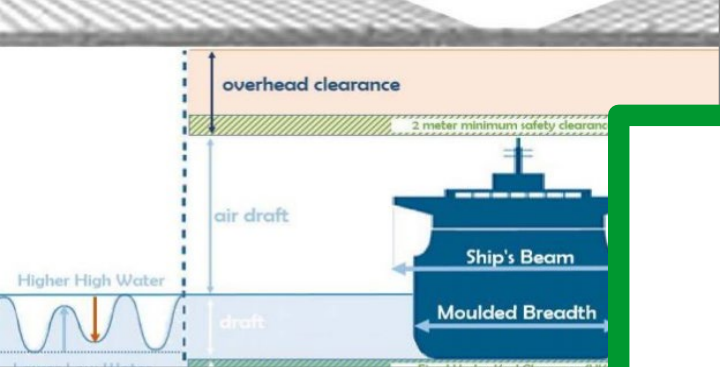


Color shaded area illustrates coverage of NAPGD2022 geoid.

Part of its value lies in its broader applicability (e.g. Pacific Islands)

What's the issue at hand?

- Published data are referenced to various datums
 - NOAA ENC – MLLW
 - USACE IENC – MLLW, Project Pool, Normal Pool
 - USCG Light List – MLW; above... normal pool, navigation pool, upper navigation pool, minimum pool, flat pool, pool stage, zero gauge, LWD, high water, low water
 - “above 1937 high water”
 - “above elevation 157.0 feet MSL”
 - “above 2% flowline elevation 576.5 feet msl”
 - “above zero on W.B. gauge at Caruthersville”

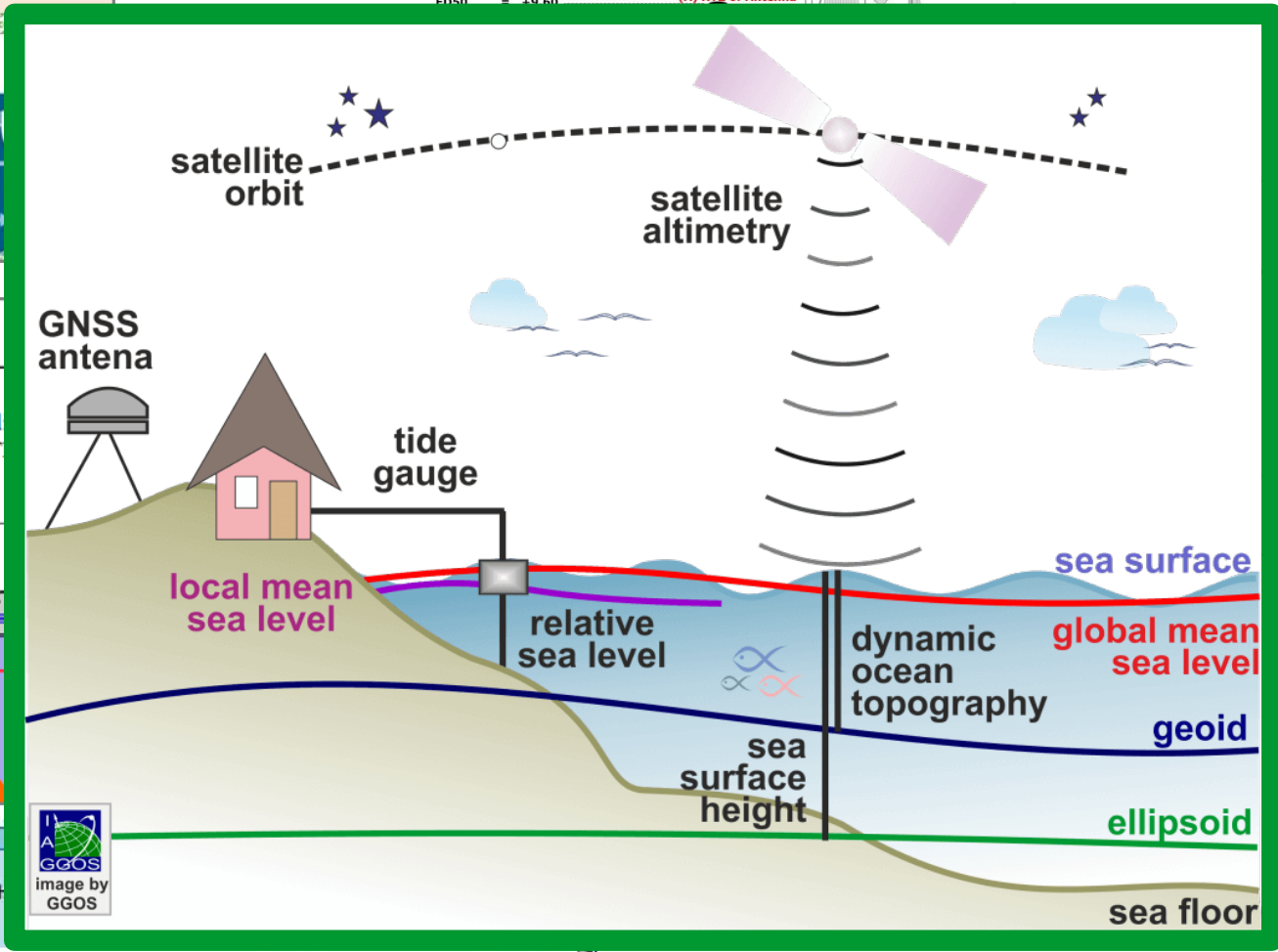


Accurate GNSS Antenna Height
 WGS 84 = +55.78
 ED50 = +9.60

(A) XYZ of Antenna

3D Positioning - Accurate height status

HADR = Height above draft reference

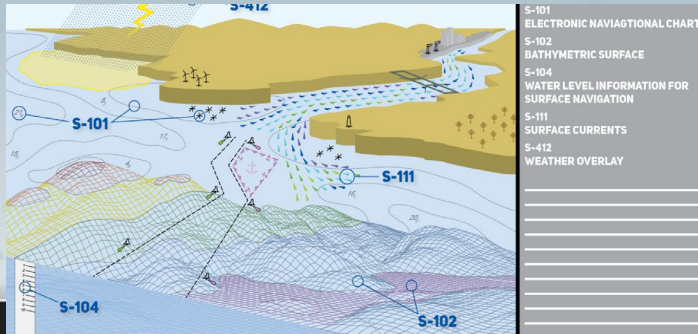
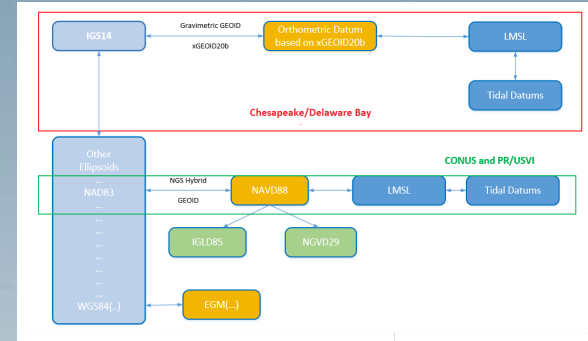


At first glance...

- Easy answer!
 - Everyone use the ellipsoid as reference surface
 - Everyone convert to the same vertical datum
- Not easy to implement!
 - Sparse data coverage → conversion from ellipsoid suffers
 - Inconsistencies due to differing operational needs
 - Subsidence in Gulf, Chesapeake, and elsewhere

Possibility

- Yes, the technology and standards exist
 - NOAA VDatum
 - Move bathymetric data to the same datum
 - IHO S-100 Standard
 - S-102 – Bathymetric Surface (soundings)
 - S-104 – Water Level Surface (gauge data)



Plausibility?

- Not plausible *with existing resources*
- VDatum is a big part of the answer
 - But has a very small team
 - Joint product of NGS, OCS, CO-OPS
 - ...the small team is stretched among those 3 offices
 - Sparse data coverage in some areas
 - Subsidence is reality (*slow... but steady*)

Closing Thoughts

- Opening talk → ECDIS/user systems see liabilities
 - Datum harmonization before data dissemination
- “...we are calculating bridge heights the same way the Egyptians did.”
 - shallow draft wooden skiffs vs. 50ft draft Post-Panamax ships
- Government hydro/bathy data need a common reference surface
 - Already have one... ellipsoid heights via GNSS

NOAA Blue Economy Strategic Plan 2021-2025

Goal 1 - Advance NOAA Contributions to Marine Transportation

Objective 1.2 - Optimize the *safety and utility* of the nation's marine highway infrastructure

- Huge investments in the physical infrastructure (MRSC≈\$160m)
 - What about investments in the “invisible infrastructure”?
- Support for VDatum and related models/products
 - GNSS on Tidal BMs, Improved TSS modeling, Monitoring of VLM
 - Altogether increase accuracy