Overview

- NGS Mission
- Important of Heights and Vertical Datums
- NGS Products and Services
- Future Plans – New Datums
- More Resources
NGS’ Mission

To define, maintain and provide access to the National Spatial Reference System (NSRS) to meet our Nation’s economic, social, and environmental needs.

Current realization of NSRS:

North American Datum of 1983 (NAD 83)

North American Vertical Datum of 1988 (NAVD 88)

Hybrid geoid model = Geoid 12B
Height Matters
Vertical Datums

Ellipsoidal Datums

WGS 84, NAD 83 (NSRS)
+17 others

Orthometric Datums

(MSL)
NAVD 88, NGVD 29

Tidal Datums

MHHW, MHW, MTL, DTL, LMSL, MLW, MLLW
NGS Programs, Products & Services

CORS

OPUS

Survey Mark Database

VDatum

Coastal Mapping

Emergency Response Imagery
Continuously Operating Reference Stations (CORS)

- **Enable** accurate positioning
- **Provide** interface between land and ocean observing systems
- **Contribute** to local and global sea-level rise calculations
Online Positioning User Service (OPUS)

- Over 2.8 millions solutions processed since 2002
- Processed automatically on NGS computers
- Solution via email in minutes

Fast, easy, consistent access to NSRS

http://www.geodesy.noaa.gov/OPUS/
More OPUS Products

**OPUS-Static** (OPUS-S)
- 2 to 48 hr (anywhere)

**OPUS-Rapid Static** (OPUS-RS)
- 15 min to 2 hr (per CORS)

**OPUS-Share**
- Share results with others

**OPUS-Projects**
- Network of multi-stations/occupations
NGS database includes more than 1 million positioned points, which are part of the NSRS.
Transformation Tools

VDATUM
- NGS collaborates with Office of Coast Survey and CO-OPS
- Transform between ellipsoidal, orthometric, and tidal datums

NGS Geodetic Toolkit
- NADCON, VERTCON, GEOCON, and more...

BETA Toolkit
- New interface
- XYZ and lat/lon transformations
Coastal Mapping Program

NGS produces the Nation’s shoreline to define territorial limits.

Up-to-date shoreline:
- is an integral component of NOAA Nautical Charts
- supports wide range of coastal applications

To survey the shoreline, NGS uses remote sensing technologies (imagery, lidar, radar, etc.) from various sources (aircraft, satellites) and continually assesses new technologies and workflows.
Emergency Response Imagery

To support NOAA national security and emergency response requirements, NGS collects high-resolution, geo-referenced imagery of the effects of disasters such as hurricanes, tornados, and earthquakes.

http://storms.ngs.noaa.gov/eri_page/index.html
New Datums Are Coming in 2022!

- Both a new **geometric** and a new **geopotential** (vertical) datum will be released in **2022**.

- The realization of the new datums will be through **GNSS receivers**.

- **NGS will provide the tools** to easily transform between the new and old datums.
Modernizing the NSRS

Repairing NAD 83

• Align with international reference frame and bordering countries
• Better account for land velocities

Repairing NAVD 88

• Cross-country error/bias
• Subsidence, uplift, freeze/thaw invalidates bench mark elevations
Gravity for the Redefinition of the American Vertical Datum (GRAV-D)

Project to collect gravity data to redefine the U.S. vertical datum by 2022 (at current funding levels)

**Target:** 2-centimeter accuracy relative to sea level (orthometric heights) using GPS/GNSS and a geoid model.
Fig. 1 shows the xGEOID15B model that covers the area from 5 to 85 degrees latitude and 170 to 350 degrees longitude. The white boxes correspond to the regions where GRAV-D airborne gravity data were included based on their suitability as of August, 2015.
How will the new datums affect you?

The **new geometric datum** will change latitude, longitude, and ellipsoid height by between **1 and 2 meters**.

The **new vertical** (geopotential) **datum** will change heights on average **50 cm (20'')**, with a **1-meter (39'') tilt** towards the Pacific Northwest.
New Datums: What to do now

- **Require/provide complete metadata for all mapping contracts.** How did they get the positions/heights? Document it!

- **Move to newest realizations.**
  NAD 83(2011) epoch 2010.00
  USGG12 (gravimetric geoid) / GEOID12B (hybrid geoid)

- **Move from NGVD 29 to NAVD 88.**
  Understand the accuracy of VERTCON in your area.

- **Move away from passive marks to GNSS.**
  Especially, move away from classical passive control.

- **Keep original (“raw”) GNSS observation files**
  Improve quality of future transformations.
NGS Workshop, Conference, and Training Opportunities

- Training Classes
- Workshops and Conferences
- NGS Online Learning Resources

http://www.geodesy.noaa.gov/web/science_edu/training/

NOS Online Learning Resources cover NGS programs and more.

http://oceanservice.noaa.gov/multimedia/
The **NGS Geodetic Advisor Program** places NOAA employees around the country.

Geodetic advisors **guide and assist** the state’s geodetic and surveying programs.

Advisor program is **transitioning** to a regional approach for more coverage but fewer advisors.
Online Education Resources

[Website Link]

**NGS Webinar Series**
- **Second Thursday** of every month, **2:00-3:00 p.m.** East Coast time.
- Contact: NGS.Webinar@noaa.gov

**Educational Videos**
- NGS has partnered with **The COMET Program** to develop **nine educational videos.**

**Online Lessons**
- Topics will include Heights & Vertical **Datums**; **GPS** Positioning; and Basics of **Gravity.**
Sign up for the NGS ListServe

http://www.geodesy.noaa.gov/

Instructions for Subscribing to the NGS News Mail List

Choose the email account you would like to use for your incoming email subscription. From that email account, send an email to the NGS News mailing list at ngs.news-join@list.woc.noaa.gov

Use the following as your subject line: subscribe NGS.news

Shortly after sending your “subscribe NGS.news” message, you will receive an automated reply from the mailing list service with a subject line similar to: Subscribe NGS.news Confirm 111111 (where 111111 is a random number assigned to your request). The email will instruct you to confirm your request by replying to the confirmation message.

You will receive one final message welcoming you to the NGS News mailing list. The email will include a help message explaining how to get help and how to unsubscribe from the list.
Questions?

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Constituent Resource Manager, NGS
Back-up slides
Determining Heights

- 1.211 m above mean high water
- 2.421 m (NAVD 88)

Coordinates:
- 33 39 28.1532 N
- 078 55 07.0648 W

National Spatial Reference System
GPS Derived Orthometric Heights
GPS-Derived Heights

\[ H \approx h - N \]

- Ellipsoidal height, \( h \)
- Geoid height, \( N \)
- Orthometric height, \( H \)
- Earth surface
- Mean sea level
- Ellipsoid
- Geoid
Improving Tools

Coordinate Conversion

Choose a location to generate projected coordinates

Enter decimal degrees or drag map marker

Lat: 37.39330000

Lon: 92.45904000

or degrees-minutes-seconds

Lat: N 37-23-35.880000

Lon: W 092-27-32.544000

Choose a datum

- NAD83
- NAD27/Old H/PR 40/AS 62/GU 63
GRAV-D Data Collection Scope

- Entire U.S. and territories
  - Total Square Kilometers: 15.6 million
  - ~200 km buffer around territory or shelf break if possible
  - Initial target area for 2022 deadline