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The Modernized U.S. National Spatial Reference System – Aligning National Geospatial Data to the Globe

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> > FIG 2023 Working Week Orlando, FL





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NOAA and NGS

Our Nation's First Civilian Science Agency

1807 - Survey of the Coast established

NOAA

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1836 - U.S. Coast Survey

1878 - U.S. Coast and Geodetic Survey

1970 - NOAA is established



US Standard Datum 1900



Status of Horizontal Control 1983

airborne LIDAR aerial imagery airborne gravimeter

A REAL PROPERTY AND

8

continuously operating reference station

water level gauge

11.

water quality monitorin Y PORTS® visibility sensor

air gap sensor

buoys: ocean chemistry wave sensors water temperature gauge meteorological sensors harmful algal bloom monitorin

single beam sonar multibeam sonar

meteorological station

ATON mounted acoustic doppler current profiler bottom mounted acoustic doppler current profiler



glider or autonomous underwater vehicle

FIG Working Week 2023

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oceanservice, noaa, gov

high frequency

Benefits of Modernizing the NSRS

Why Modernize?

• Current Datums were defined *before* GPS technology and rely on physical survey marks in the ground

Modernization will:

- Improve accuracy, access, and alignment of our positioning systems
- Changes coordinates up to 1-2 meters, depending on location



Global Alignment of the NSRS

- Governance (United Nations)
- Standards (ISO)
- Infrastructure (IAG and IERS)

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International Alignment per the United Nations



Sixty-plath session Agenda item 9

Resolution adopted by the General Assembly on 26 February 2015

[without reference to a Main Committee (A/69/2, 53 and Add 1/]

69/266. A global geodetic reference frame for sustainable development

The General Assembly

Reaffirwing the purposes and principles of the Charter of the United Nations.

Reaffirming also its resolution 54/68 of 6 December 1999, in which it endorsed the resolution entitled "The Space Millennium: Vienus Declaration on Space and Human Development", 1 which included, inter alia, key actions to improve the efficiency and security of transport, search and rescue, geodesy and other activities by promoting the enhancement of, universal access to and compatibility of apace-based navigation and positioning systems, including Global Navigation Satellite systems,

United Nations Resolution 69/266

Global Geodetic Reference Frame



International Geospatial Standards

- Technical Committee 211 Standardization of digital geographic data
- Many standards apply to all users ISO 19161 has specific application to NOAA's NGS
- Nations align national spatial reference systems to the International Terrestrial Reference System (ITRS)



International Terrestrial Reference System

- A world spatial reference system co-rotating with the Earth
- Maintained by the International Association of Geodesy (IAG) and the International Earth Rotation and Reference Systems Service (IERS)
- An ITRF is a realization of that system at a given epoch
- Current realization is **ITRF2020**
- Provides a reference for GNSS satellite and receiver locations

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NSRS Modernization

- Four terrestrial reference frames
- Geopotential datum
 - Time-dependent coordinates
- Updated products and tools



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Terrestrial Reference Frames



Tectonic plate based:

- North America
- Mariana
- Pacific
- Caribbean

+ Guam/CNMI

+ American Samoa

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Geopotential Datum



Federal Governance and Coordination



- Federal Geographic Data Committee (FGDC)
- Organized structure of Federal geospatial professionals and constituents
- Executive direction and oversight for Federal geospatial decisions and initiatives
- Geospatial Data Act of 2018 (GDA)
- Codifies the FGDC duties into law
- Stipulates adoption of international standards such as the ITRS

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Supports Safe and Efficient Commerce









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Improves Resilience







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Empowers Growth





Drone Package Delivery





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Informs Decision Making

- Align critical geospatial data assets within global data inventories
- Enable improved analysis and modeling of climate changes and impacts to society and the environment



NGS@FIG Day Agenda

May 31 Technical Sessions

11:30 - 13:00 Practical implications of National Spatial Reference System (NSRS) Modernization

- Practical impacts of the modernized NSRS
- Canada's implementation of the modernized frames
- Changes Afoot: State Plane 2022 and Retirement of the U.S. Survey Foot
- Preparing for the Modernization of the NSRS
- Q&A

14:30 - 16:00 Update on the NOAA CORS Network and OPUS

- The NOAA CORS Network (NCN) Services
- Updating OPUS-S to Support Multi-GNSS
- OPUS-Projects 5: Supporting RTK for Establishment of Geodetic Control
- OPUS-Projects for Manager's Training Transitioning from Instructor-led to Online, Self-paced instruction
- Augmenting Data exchange formats for OPUS of the future

16:30 - 18:00 Case studies of Surveys NGS does now and how they will change

- Implementing NGS OPUS Projects' GVX feature to align RTK vectors to the NSRS to establish Geodetic Control for FirstNet Indoor Mapping.
- IGLD: A case study for leveraging digital tools to enhance QA/QC on large scale static GNSS observation campaigns
- Geodetic Leveling in the Modernized NSRS
- NGS Field Operations: Modernizing in Many Ways
- Q&A
- Closing Remarks by Director of National Geodetic Survey

June 22 Webinar 14:00 - 15:30 NGS Partner Panel Session: Discussion of the Benefits and Challenges of Transitioning to the Modernized NSRS

(geodesy.noaa.gov/web/science_edu/webinar_series/Webinars.shtml)

• Q&A