

NGS Selected Topics/Projects/Questions Update

OGUG Meeting - January, 2010

Mark L. Armstrong, NGS Oregon Advisor



NGS Oregon Advisor contact information

ODOT Geometronics Unit webpage

- <http://www.oregon.gov/ODOT/HWY/GEOMETRONICS/index.shtml>

Advisor webpage

- http://www.oregon.gov/ODOT/HWY/GEOMETRONICS/ngs_advisor.shtml
- Email – mark.l.armstrong@noaa.gov
- Office Phone – 1.503.986.3775
- Cell Phone – 1.202.306.6716

Stakeholders Feedback

- **NGS outreach**

- Customer satisfaction survey questionnaire popup...

- <http://www.ngs.noaa.gov>

- Website improvements?
 - Satisfaction with data/downloading?
 - Usefulness of services?
 - CORS questions/comments?
 - Geodetic tools (software)?
 - Corbin Training Center?

- <http://www.ngs.noaa.gov/corbin/>

NGS Corbin Training Center

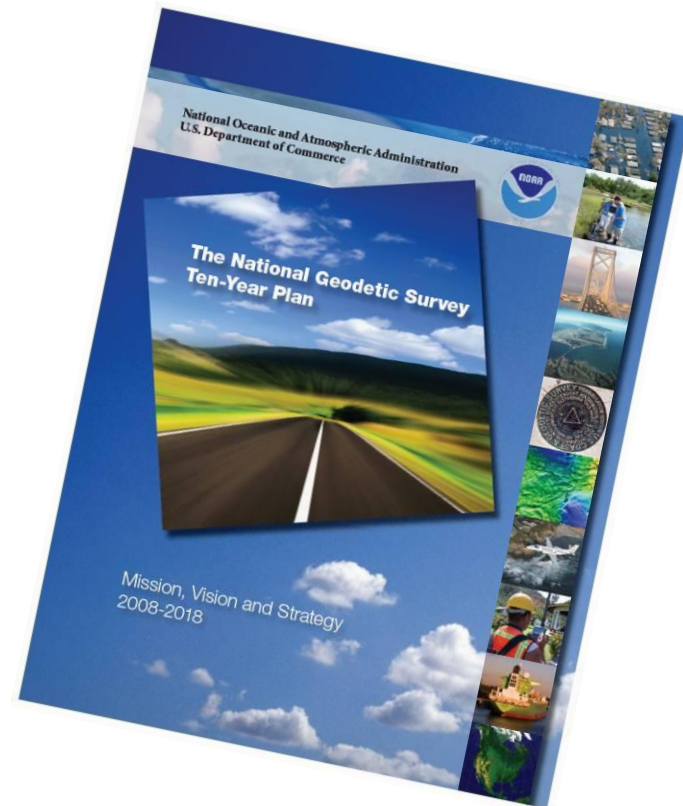
- <http://www.ngs.noaa.gov/corbin/>
 - Online webinars
 - GPS Derived Heights
 - Fundamentals of the NSRS
 - Training at Corbin, Va. Center
 - Some classes open to the public
 - Contact - Phone: (540) 373-1243

Answers from the NGS

- Please call or email me to discuss anything relevant... and if we need special expertise I will reach out to others at the NGS.
- Report back on a regular basis with updates to current NGS projects.
- Work to promote future NGS projects in Oregon
 - GNSS Derived Heights
 - Height Modernization
 - Gravity campaigns
 - Precise leveling workshops
 - Help NOAA and NOS with their mission

NGS 10 year plan

- Approved on 8 January, 2008
- Refines mission, vision, and strategy for the future of NGS actions.
- **Emphasis is on building outside capacity.**
- Includes:
 - Modernize the Geometric (“Horizontal”) Datum
 - Modernize the Geopotential (“Vertical”) Datum
 - Migrate the Coastal Mapping Program Toward IOCM (Integrated Ocean & Coastal Mapping)
 - Evolve Core Capabilities
 - Increase Agency Visibility

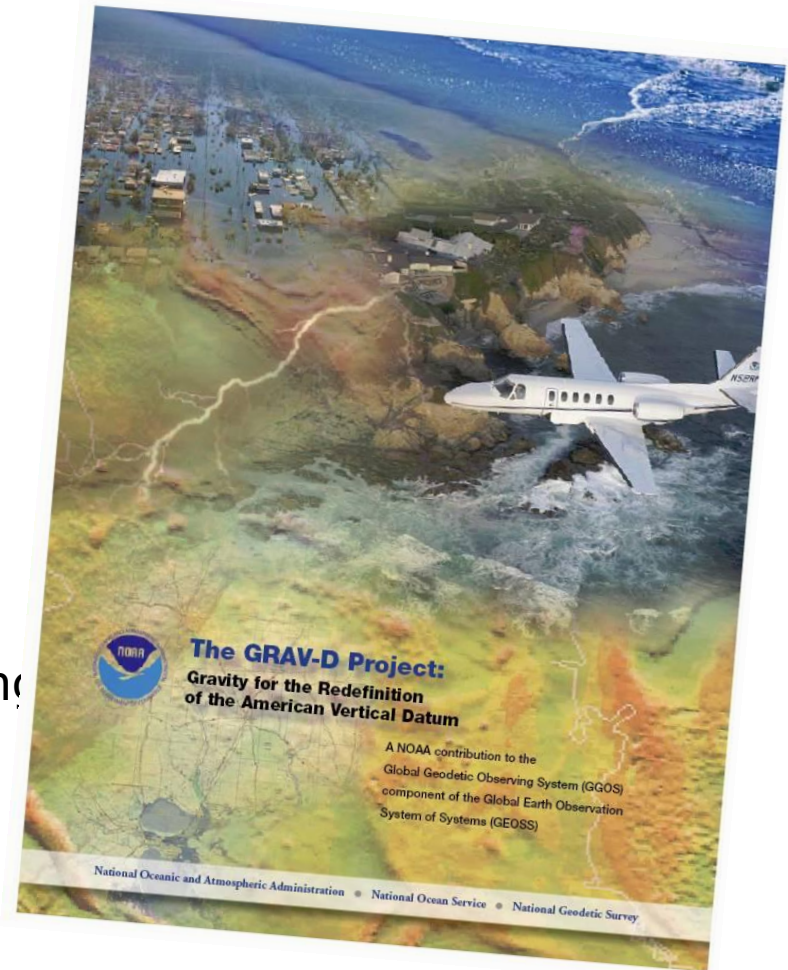


The draft of that plan is available on the National Geodetic Survey's home page: <http://www.ngs.noaa.gov>

The Future of Height Mod: GRAV-D

Gravity for the Redefinition of the American Vertical Datum

- GRAV-D
 - Airborne gravity survey (10 years)
 - Gravity monitoring into the future
 - Coastal areas surveyed first
 - All USA states and territories
 - www.ngs.noaa.gov/GRAV-D
- 2018-2022 Targets:
 - Orthometric heights (“elevations” on maps) good to 2 cm anywhere, anytime from GNSS technology
 - Height changes easily monitored using new vertical datum
- Gravity for the Nation’s benefits
 - Imagery for the Nation
 - Lidar for the Nation
 - Elevation for the Nation



Ten-Year Milestones (2018)

- 1) NGS will compute a pole-to-equator, Alaska-to-Newfoundland geoid model, preferably in conjunction with Mexico and Canada as well as other interested governments, with an accuracy of 1 cm in as many locations as possible.
- 2) NGS redefines the vertical datum (NAVD) based on GNSS and a gravimetric geoid.
- 3) NGS redefines the national horizontal datum to remove disagreements with the ITRF

NGS Strategic Plan (3 Years)

STRATEGIC GOALS AND TACTICAL MILESTONES LOOKING FORWARD 3 YEARS

National Geodetic Survey: 2009 Strategic Plan
"Strategic Goals and Tactical Milestones Looking Forward 3 Years"

NGS Mission:

To define, maintain, and provide access to the National Spatial Reference System to meet our nation's economic, social, and environmental needs"

Strategic Goal #1: Modernize the 3-D Geometric Reference System:

Promote the capability for users to easily obtain accurate values for latitude, longitude, ellipsoid height, and other related geometric coordinates.

Finalize and announce (in 2010) the definition of new geometric reference system for the United States in preparation for its adoption for official use by in 2018.

Prepare the user community before, during, and after implementation of the new geometric datum, providing outreach and education, tools, specifications, and guidelines.

Determine and disseminate a consistent set of 3-D coordinates and velocities for all Continuously Operating Reference Stations (CORS) in a global reference frame by reprocessing relevant GPS data collected since 1994.

Define the foundation CORS system (2009), develop a plan for its implementation (2009) and begin executing that plan (2010).

Provide users with tools and education to obtain accurate geometric positional coordinates in all three dimensions and to deal with coordinate changes due to crustal motion.

Write a plan outlining the level of service NGS will provide in low latency GNSS data distribution.

Develop guidelines for both the administration and use of real-time GNSS networks and especially for ensuring that these networks are compatible with the NSRS.

Create models to predict the 3-D crustal velocity at any location in the United States.

Develop the capability to process all types of current GNSS data.

Implement process to produce predicted GPS orbits once every six hours.

Strategic Goal #2: Modernize the Geopotential ("Vertical") Datum:

Provide easier access to accurate elevation data.

Finalize and announce (in 2009) the definition of new datum in preparation for re-definition in 2018.

Prepare the user community before, during, and after implementation of the new vertical datum through a combined effort of the NGS's National Height Modernization Program with outreach and education, tools, specifications, and guidelines.

Complete two-fifths of all GRAV-D (Gravity for the Redefinition of the American Vertical Datum) areas, including flights, data processing and merging with existing terrestrial data and storage.

Establish and publish the geoid theory necessary to achieve <1 cm absolute accuracy, for all non-mountainous regions of the United States, allowing for rock density unknowns in the mountains, and with unknowns not exceeding 1 cm at the coast.

Make the online leveling adjustment tool (LOCUS) fully operational (2010).

Strategic Goal #3: Migrate the Coastal Mapping Program Toward Integrated Ocean and Coastal Mapping (IOCM):

Serve a wider range of coastal customers and geospatial data needs by implementing the IOCM vision and leveraging collaborative partnerships and technological innovation.

Develop and enhance collaborative partnerships with Federal and state agencies, academia, and the private sector to streamline operations, improve efficiencies, develop common standards, stimulate innovation in ocean and coastal mapping, and deliver a metric for GRAV-D and its application to improve the GEOID.

Continue to develop and support the vertical datum in the continental United States including tying to local tidal and water level datums.

Test and evaluate remote sensing platforms, sensors, and data products.

Complete and evaluate IOCM demonstration projects and transition results to operations.

Develop and test standards, specifications, and workflows for new coastal geospatial products, including orthomosaics and lidar data.

Strategic Goal #4: Maintain and Develop Core Capabilities:

Anticipate changing customer needs, leverage emerging science and technology, and address other opportunities or threats.

Implement a system to define and adjust NGS' core capabilities, e.g., aeronautical surveys.

Formalize a system and a process for understanding existing and evolving customer requirements, including emerging non-traditional requirements, (such as those of the FAA), and align products and services to suit their needs.

Support, as possible, student internships, visiting scientists, and training of existing employees.

Assign a mentor to every new hire beginning in 2009.

Develop the core values of NGS and encourage leadership according to these values.

Strategic Goal #5: Increase Agency Visibility

Expand our customer base to reach all those who may benefit from NGS products and services.

Develop an NGS culture that embodies and demonstrates a customer focus, with a broadened definition of "customer."

Design and implement strategic training and outreach programs to anticipate and satisfy customer and partner needs.

Leverage internal NOAA partnerships to reach a broader customer base, and adjust our suite of products and services to ensure a customer focus and product usability.



NGS Strategic Plan (3 Years)

Strategic Goal #1 – Modernize the 3D Geometric Reference System

Strategic Goal #2 – Modernize the Geopotential (Vertical) Datum

Strategic Goal #3 – Migrate the Coastal Mapping Program to the Integrated Ocean and Coastal Mapping (IOCM) Program

Strategic Goal #4 – Maintain and develop core capabilities

Strategic Goal #5 – Increase agency visibility

What's else is going on.....

- **GRAV-D:** [G](#)ravity for the [R](#)edefinition of the [A](#)merican [V](#)ertical [D](#)atum
- **NSRS2007:** Re-adjustment of ~70,000 passive marks completed and published. [\[includes datasheet updates to Oregon HARN points – NAD83\(2007\). Older Oregon projects from 86, & 91 not included\]](#) [See NSRS2007 webpage](#)
- **Multi-Year CORS:** Re-define the ITRF & new realization of NAD83(CORS?)Epoch2010? Better orbits (reprocessed 16years) – Velocities refined
- **OPUS DB:** The NGS needs your submittals`
» [Especially in Oregon](#)

What else is going on.....

- **NGS Publications** (Currently in draft version)
 - Bill Henning (lead)
 - **Real Time (RTK) Positioning Guidelines** – Includes RTK single baseline methodology and practical application.
 - **Real Time Network (RTN) Guidelines** – Includes real time network setup, installation of stations, process, practical application.

GEOID09 (Hybrid geoid model)

- Released for these regions:
 - CONUS
 - Alaska
 - Hawaii (Hybrid only contains NAD83 shift)
 - Guam and CNMI
 - American Samoa

As of Nov.2, 2009, Geoid09 is now the default choice in OPUS-S. Geoid03 is an alternate choice (under options pick).

- USGG2009 is the underlying gravimetric geoid
 - Exists for all of the above + PRVI

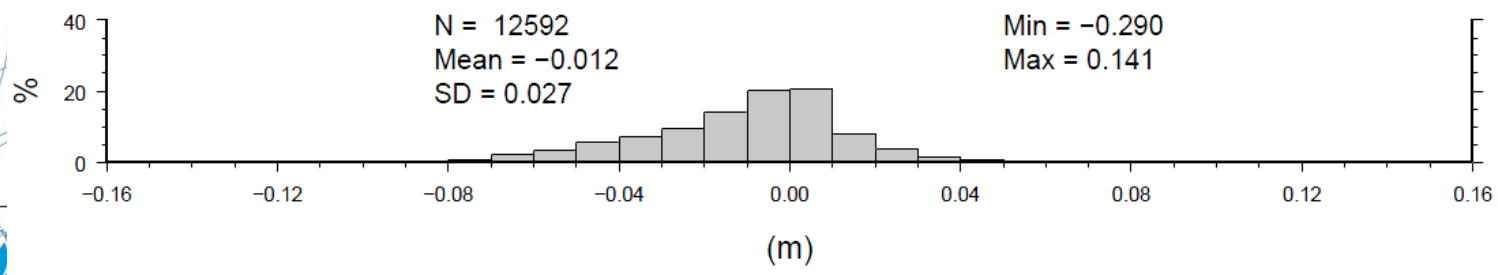
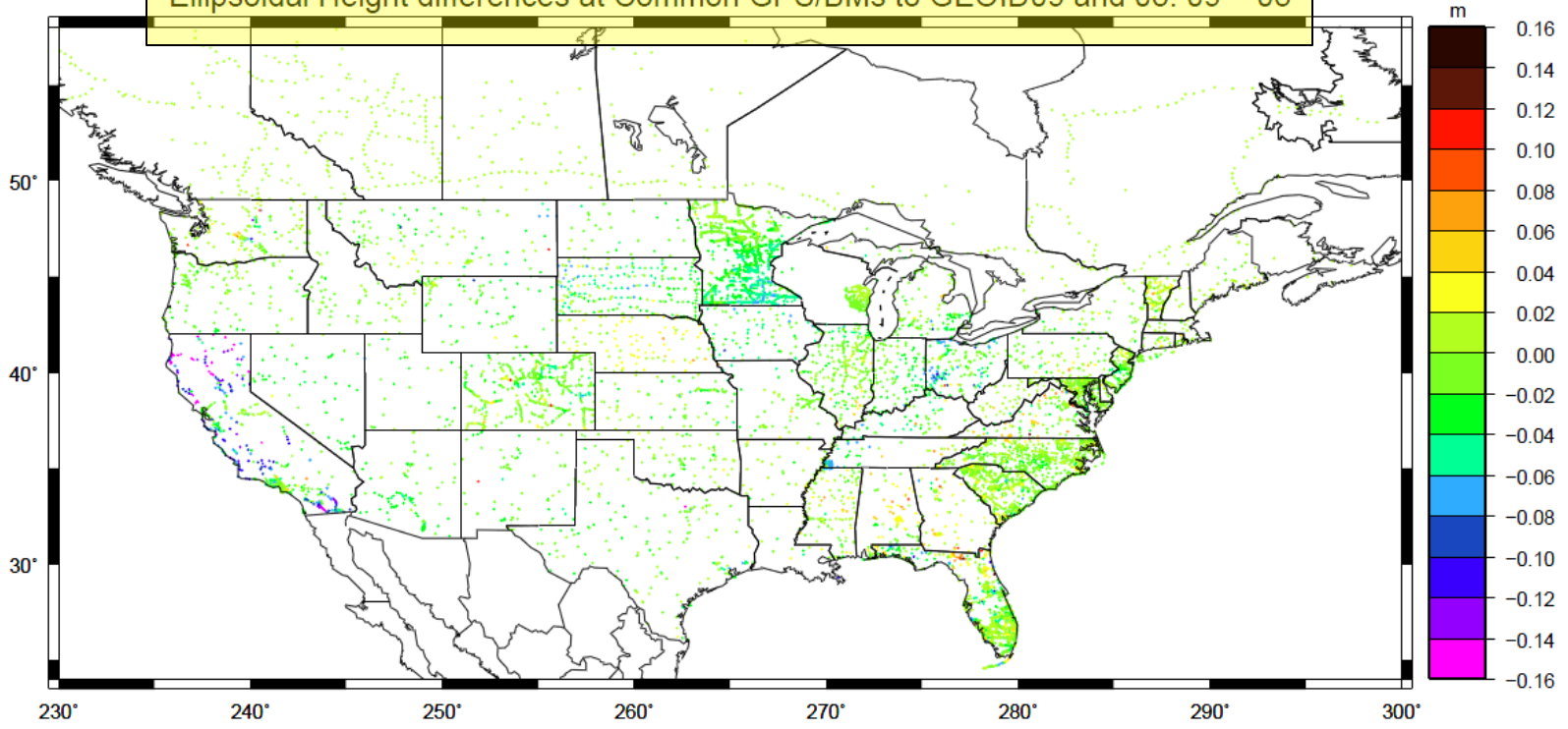
GEOID09 vs GEOID03 (conus)

- Changes due to:
 - Δh due to NSRS2007
 - ΔH due to re-leveling in MN and WI
 - New gravimetric geoid computations
 - EGM08 (2008 Earth Gravity Model)
 - Satellite gravity

Not much change in Oregon

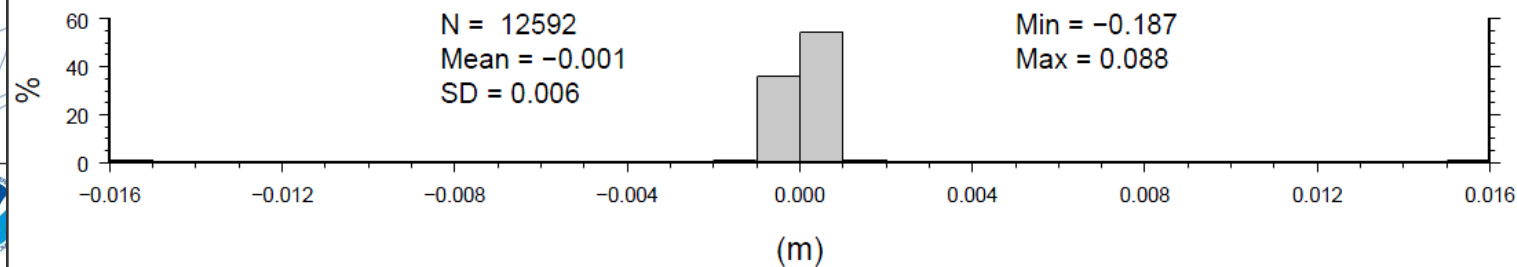
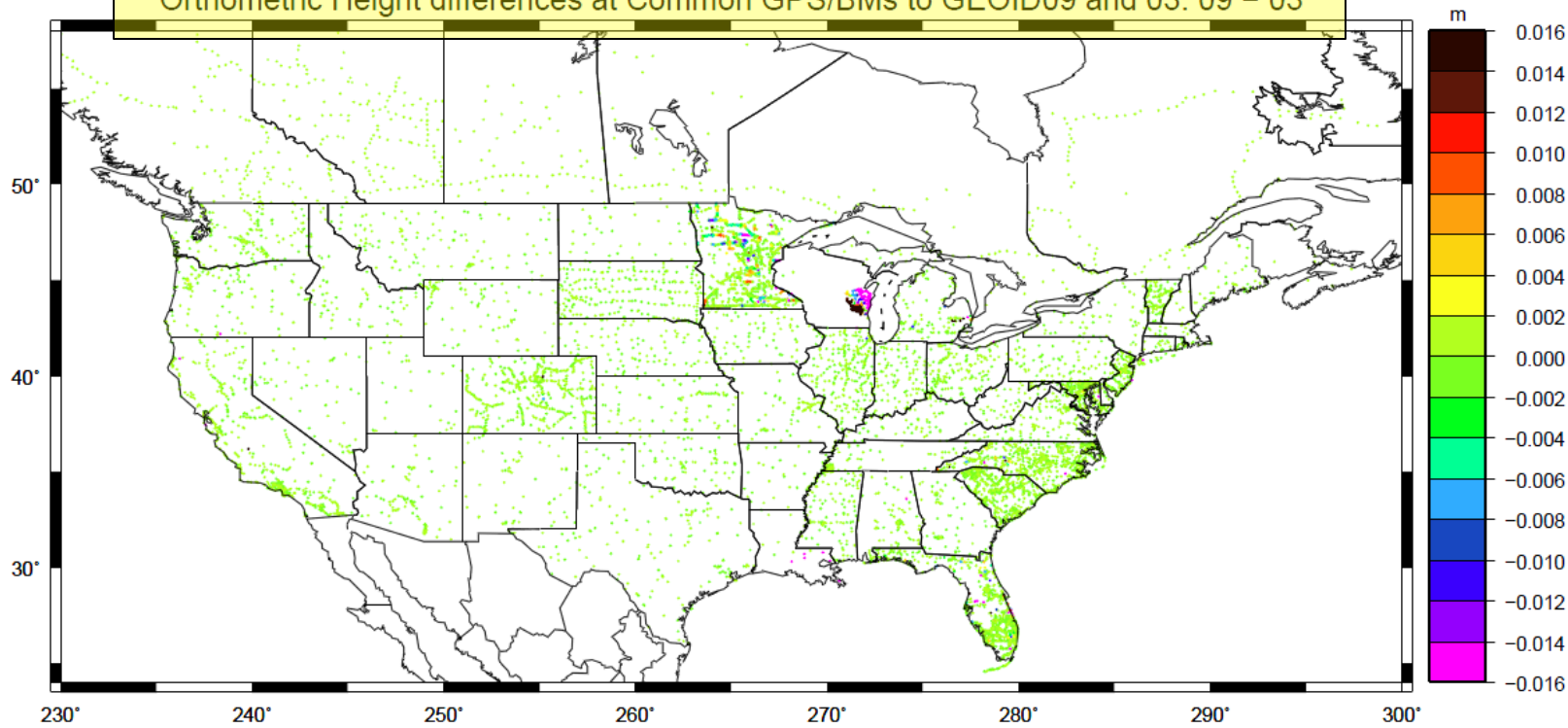
GEOID09 vs GEOID03

Ellipsoidal Height differences at Common GPS/BMs to GEOID09 and 03: 09 - 03



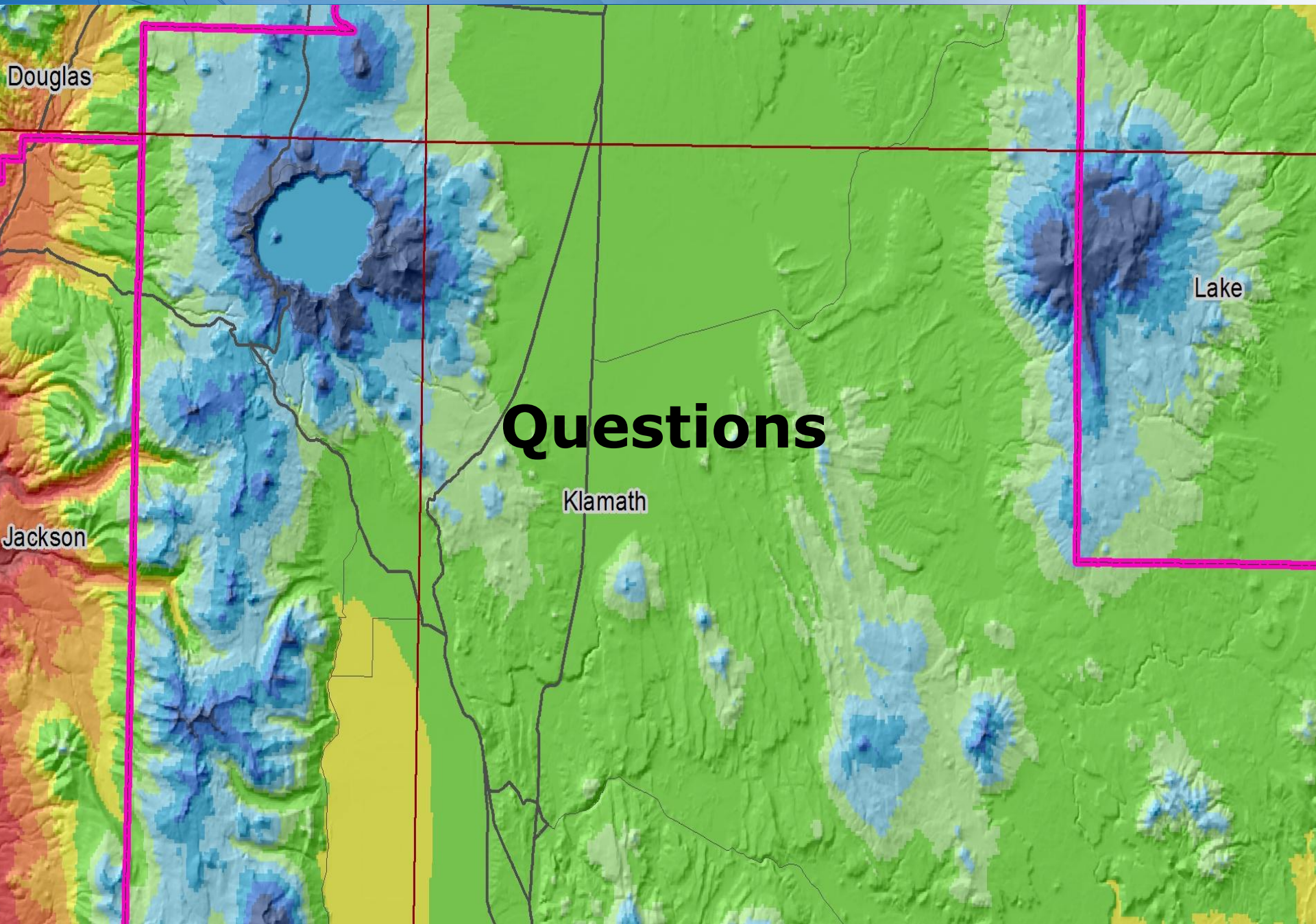
GEOID09 vs GEOID03

Orthometric Height differences at Common GPS/BMs to GEOID09 and 03: 09 - 03



Other Considerations

- CORS at tide gages – relate local velocities
- Leveling to CORS – popular by many states
- OPUS DB – GPS observations on bench marks
- World Height System – EGM08 possible reference
- FEMA pilot project(s) – LiDAR w/ gravity model



Douglas

Jackson

Klamath

Lake

Questions