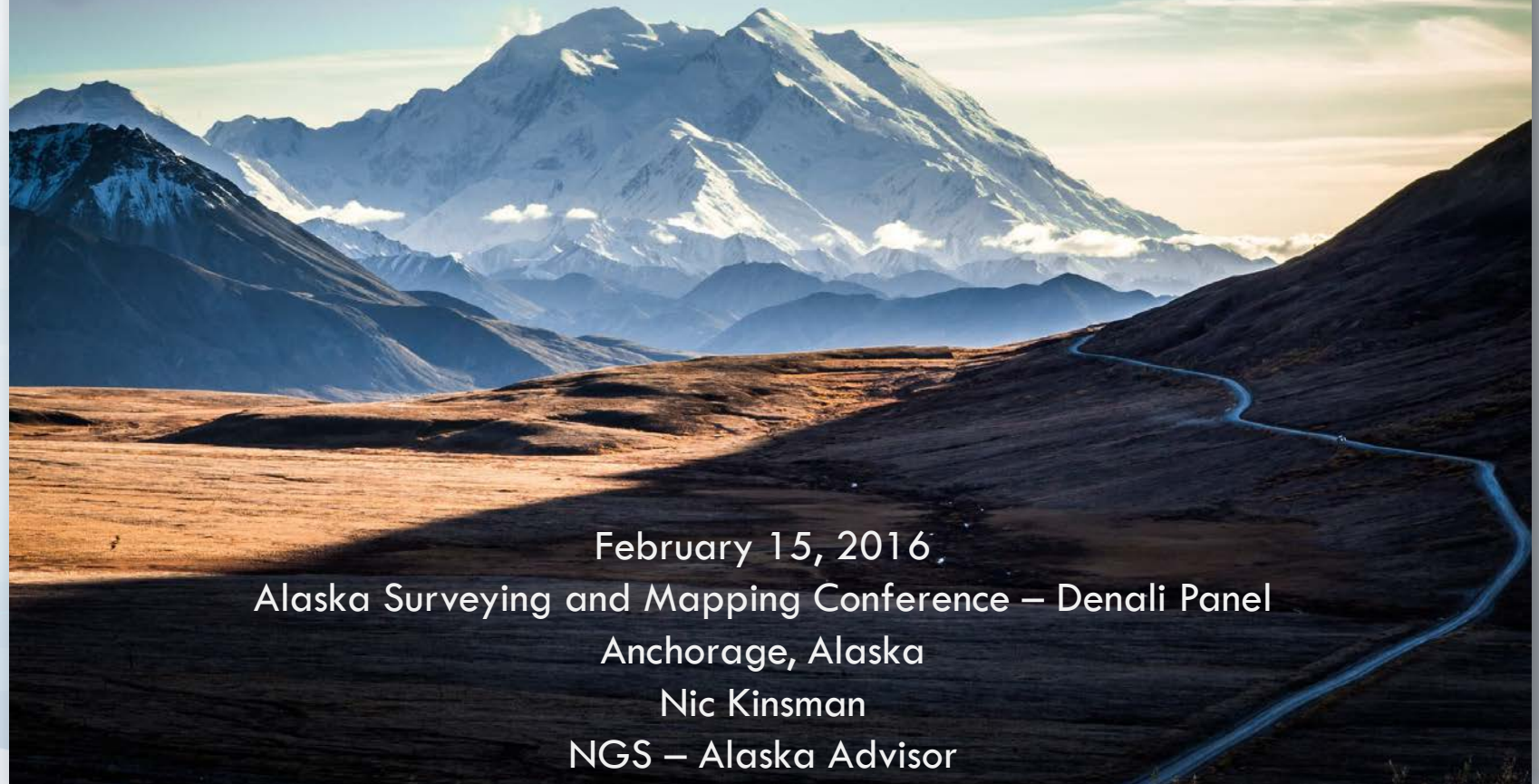


# Moving Mountains...



February 15, 2016

Alaska Surveying and Mapping Conference – Denali Panel

Anchorage, Alaska

Nic Kinsman

NGS – Alaska Advisor

(Photo by Todd Paris, UAF)



National Oceanic and Atmospheric Administration

# GPS Height:



6206.561 m (20,363 ft)

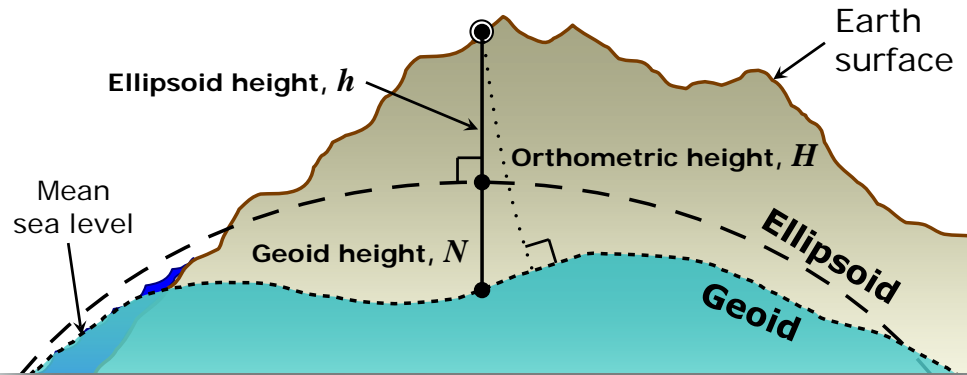
Reference Ellipsoid



National Oceanic and Atmospheric Administration

(from NGS Minkel & Doyle, 2011)

$$H \approx h - N$$



~~6206.561 m~~  
6190.461 m (20,310 ft)

$$H = h - N$$

Orthometric height = Ellipsoid height - Geoid height  
Height above 'Sea Level' = 6206.561 m (GPS) - 16.1 m

16.1 m

GEOID12B

Reference Ellipsoid

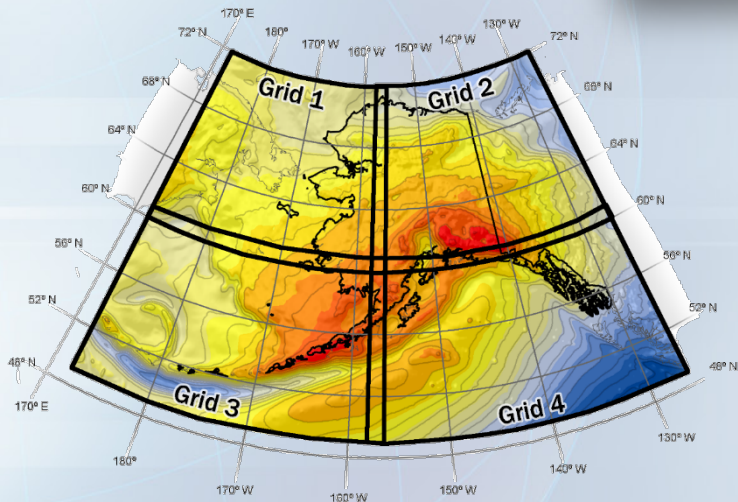


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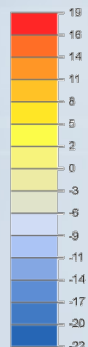
# Reference System Modernization (2022) & Evolving Geoids...



**ORTHOMETRIC  
1-D**

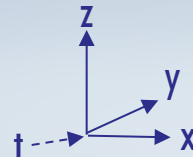


**GEOID12**  
Geoid Height (m)

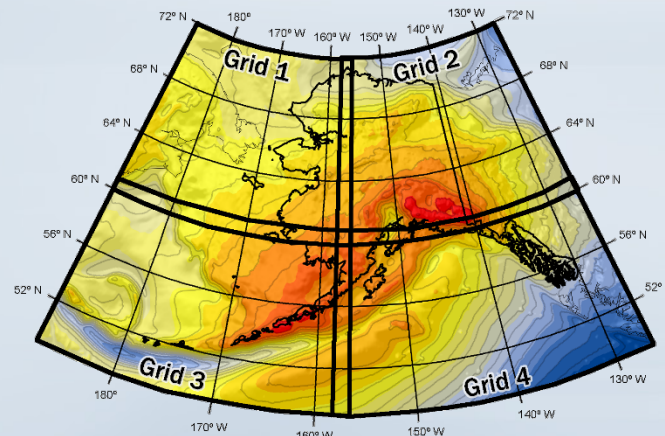
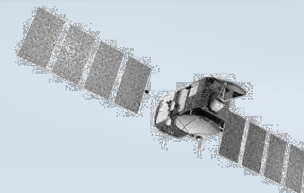


**Hybrid or Composite (GEOID12B)**

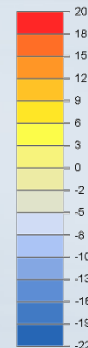
Adjusted/warped to align with the NAVD88  
vertical datum



**GEOMETRIC  
4-D**



**USGG2012**  
Geoid Height (m)



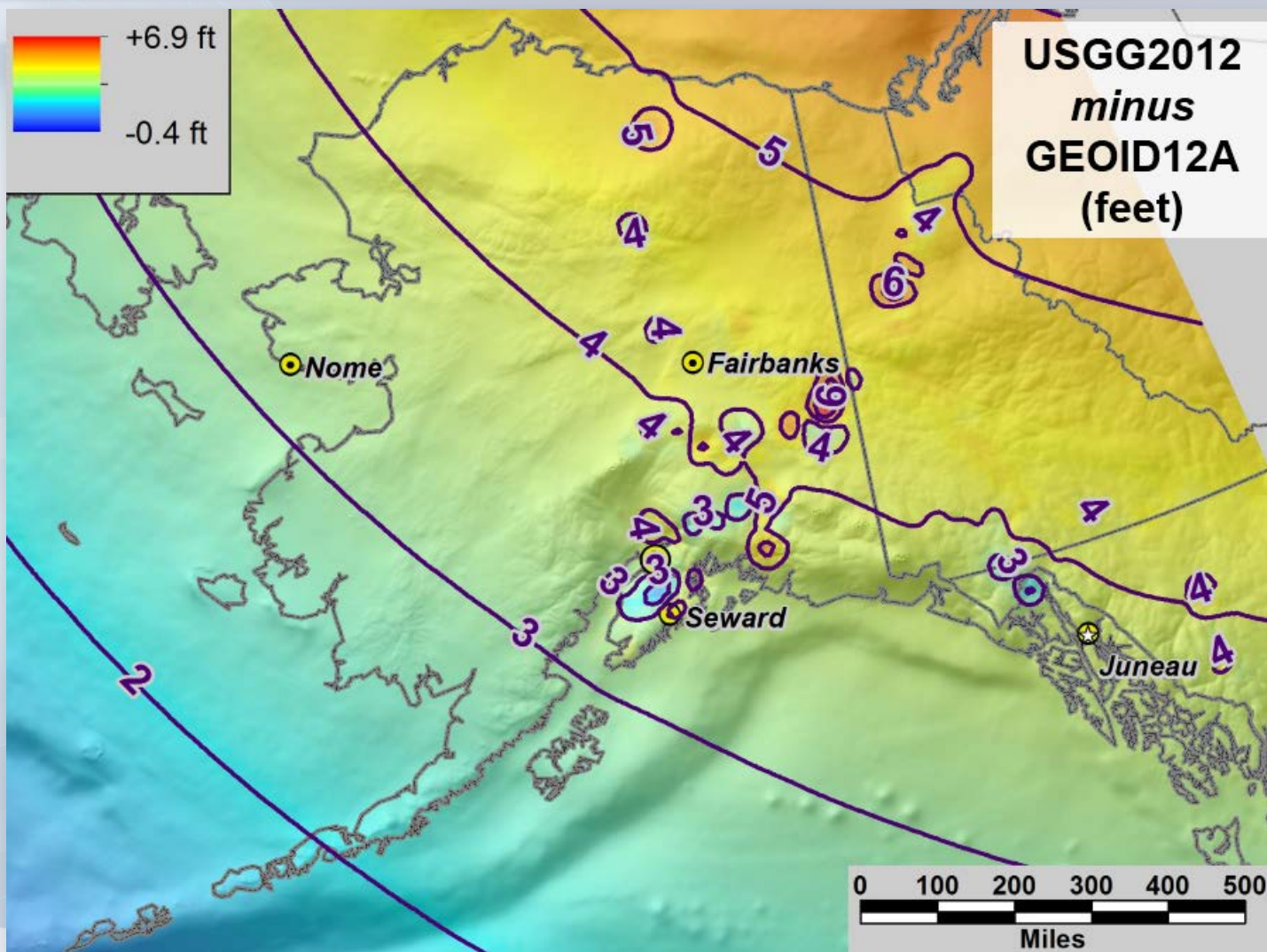
**Gravimetric (USGG2012)**

Based purely on gravimetric measurements



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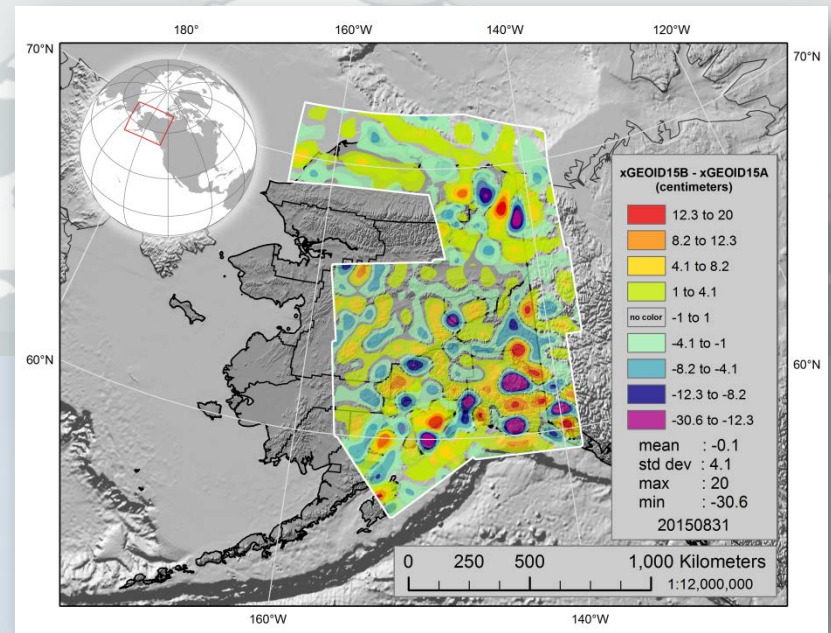
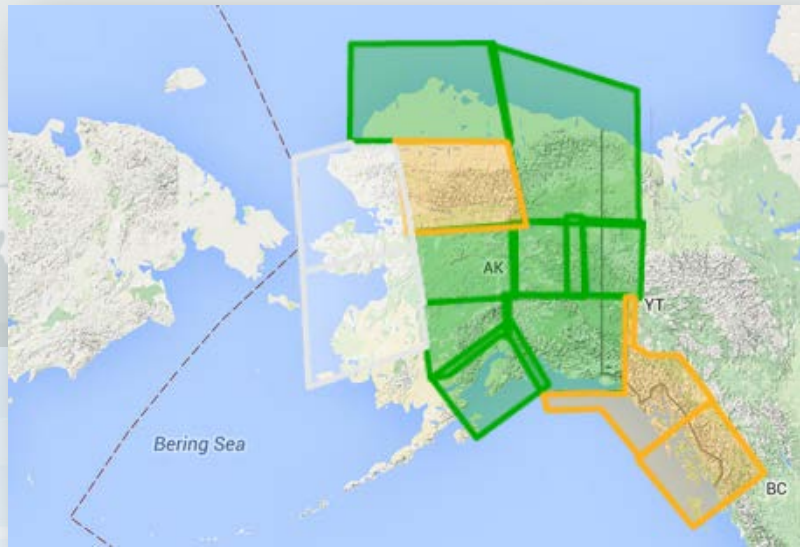
# Gravimetric vs. Hybrid Geoid



National Oceanic and Atmospheric Administration

M. Dennis, 2014

# GRAV-D

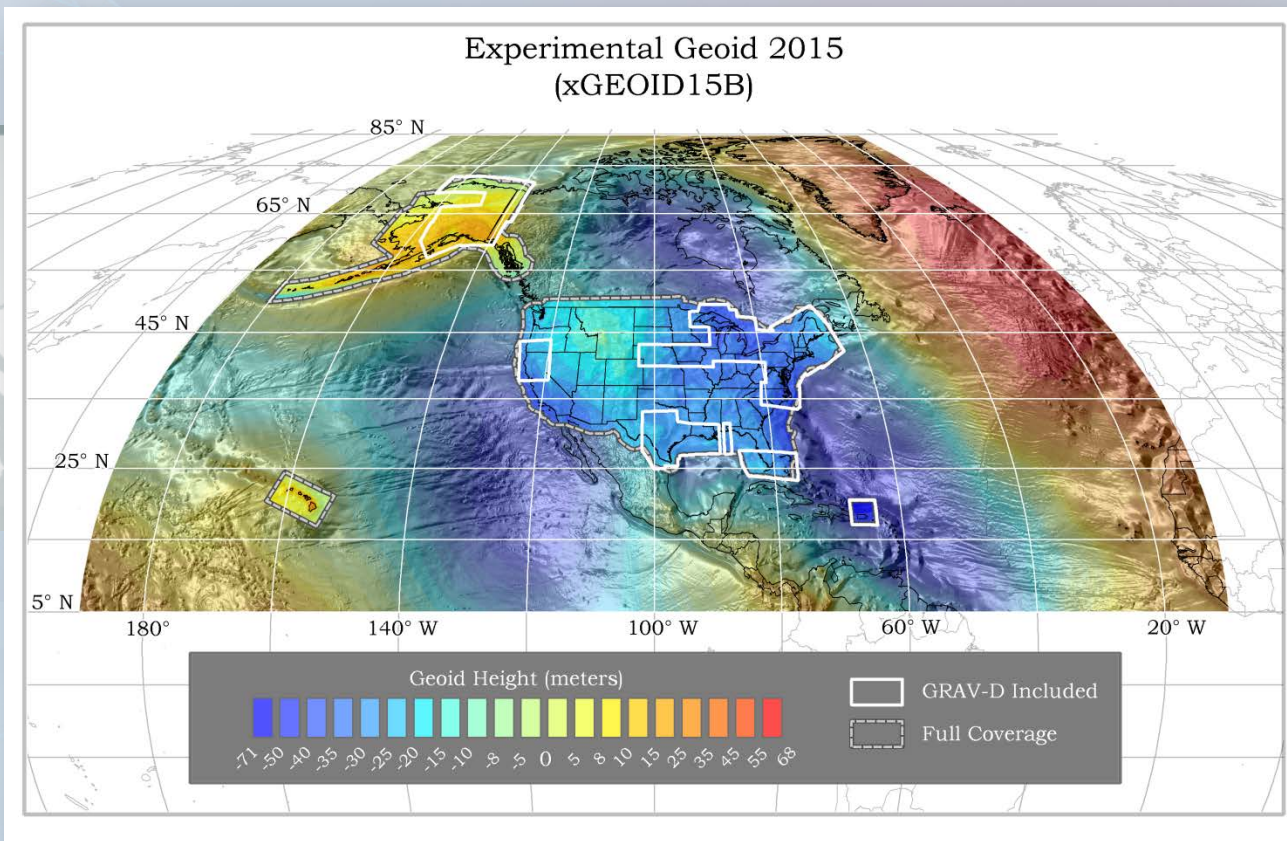


GEOID12B 

Reference Ellipsoid



National Oceanic and Atmospheric Administration



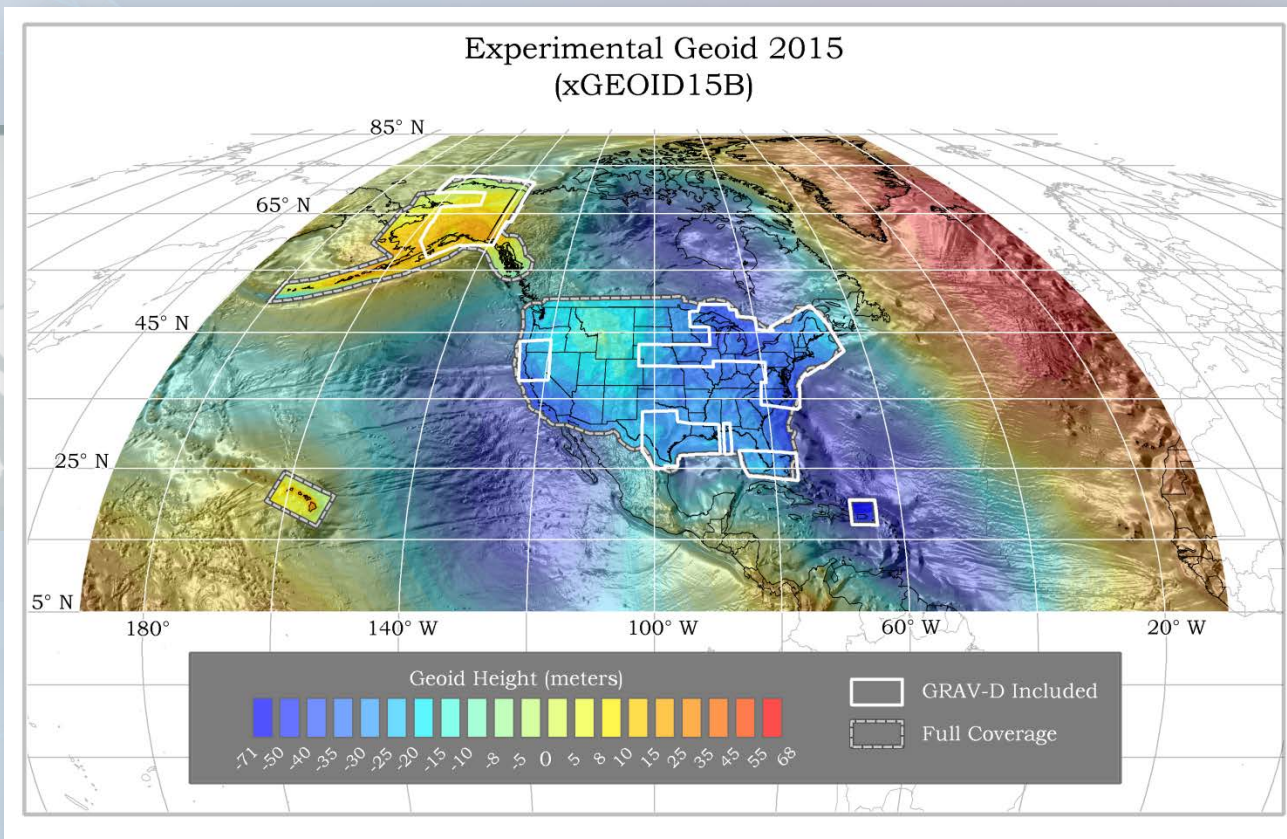
**GEOID12B**

**Reference Ellipsoid**

**Includes best available satellite, airborne, and surface gravity data; represents a significant step toward defining a new regional vertical datum and contributing to a world height system**



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xGEOID15B

GEOID12B

Corresponding Reference Ellipsoid

+ 1.105 m (~3.6 ft)



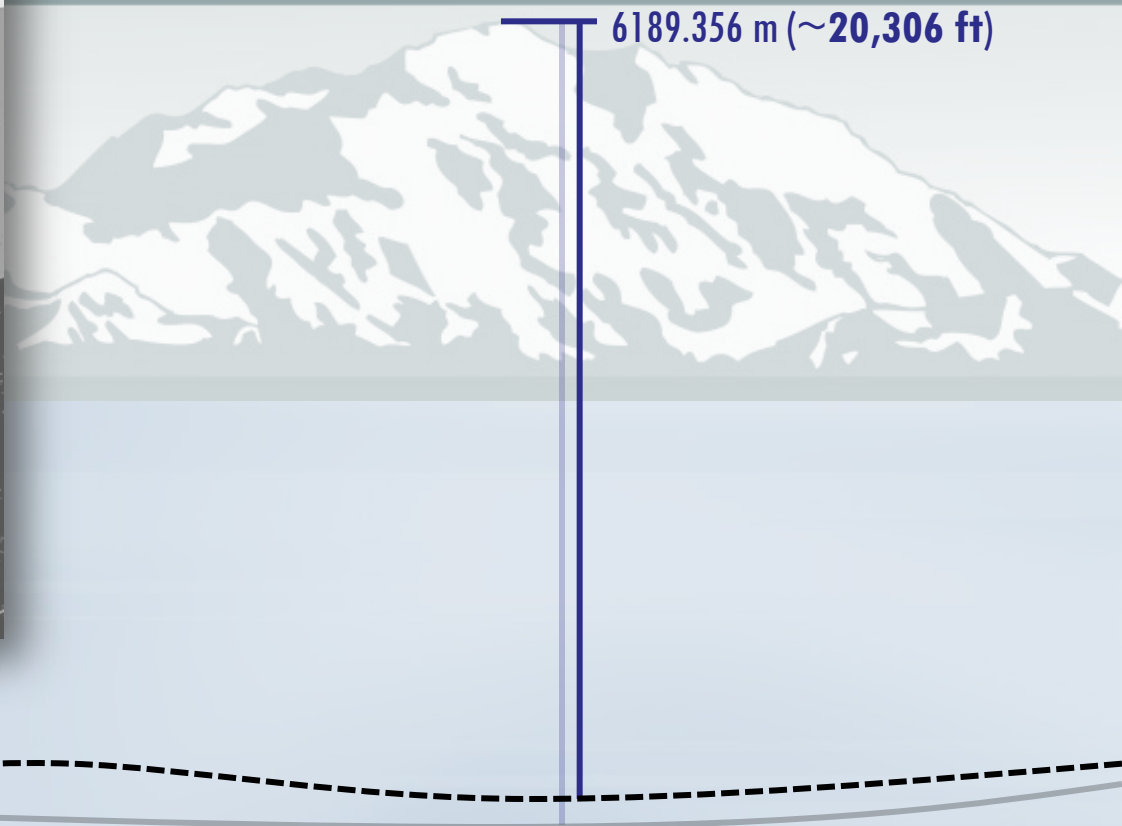
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2022



6189.356 m (~20,306 ft)



xGEOID15B

GEOID12B

Corresponding Reference Ellipsoid



National Oceanic and Atmospheric Administration



# BETA

This is a BETA Release Site

## xGEOID15 Evaluation Computation

National Geodetic Survey

### Longitude Hemisphere

West  East

### Coordinates Datum

NAD83 (2011)  NAD83 (PA11)  IGS08

63.069131941, 151.0065069167, 6206.102, Denali

Your input in NAD83 (2011)/GRS80 Ellipsoid:

Latitude	Longitude	Ellipsoid Height	Station
63.069131941	151.0065069167	6206.102	Denali

Your Result in IGS08/GRS80 Ellipsoid:

Latitude	Longitude	Ellipsoid Height
63 04 8.87496	151 00 23.51860	6206.561

Geoid Model	Geoid Height (m)	Ortho Height (m)
GEOID12B	16.100	6190.461
USGG2012	17.231	6189.330
xGEOID14A	17.162	6189.399
xGEOID14B	17.163	6189.398
xGEOID15A	17.203	6189.358
xGEOID15B	17.205	6189.356

### Model Height Diff

xGEOID14B - GEOID12B	106.3	-106.3
xGEOID14B - USGG2012	-6.8	6.8
xGEOID14B - xGEOID14A	0.1	-0.1
xGEOID15B - GEOID12B	110.5	-110.5
xGEOID15B - xGEOID15A	0.2	-0.2

### Geoid Height (cm)

### Ortho Height (cm)

Submit Coordinates

Clear Input

Sample Data



National Oceanic and Atmospheric Administration

<http://beta.ngs.noaa.gov/GEOID/xGEOID15/>

# Learn More!

*NGS Afternoon Session*

*1:30 – 5:00 pm Today*

Dru Smith & Vicki Childers

- NGS Update on GRAV-D
- Lessons Learned for Geoid Modeling
- Accessing the New Reference Frames
- Height Modernization: Future Directions



National Oceanic and Atmospheric Administration

# Thank You!