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Towards a More Consistent Geoid Model for North America (9619)

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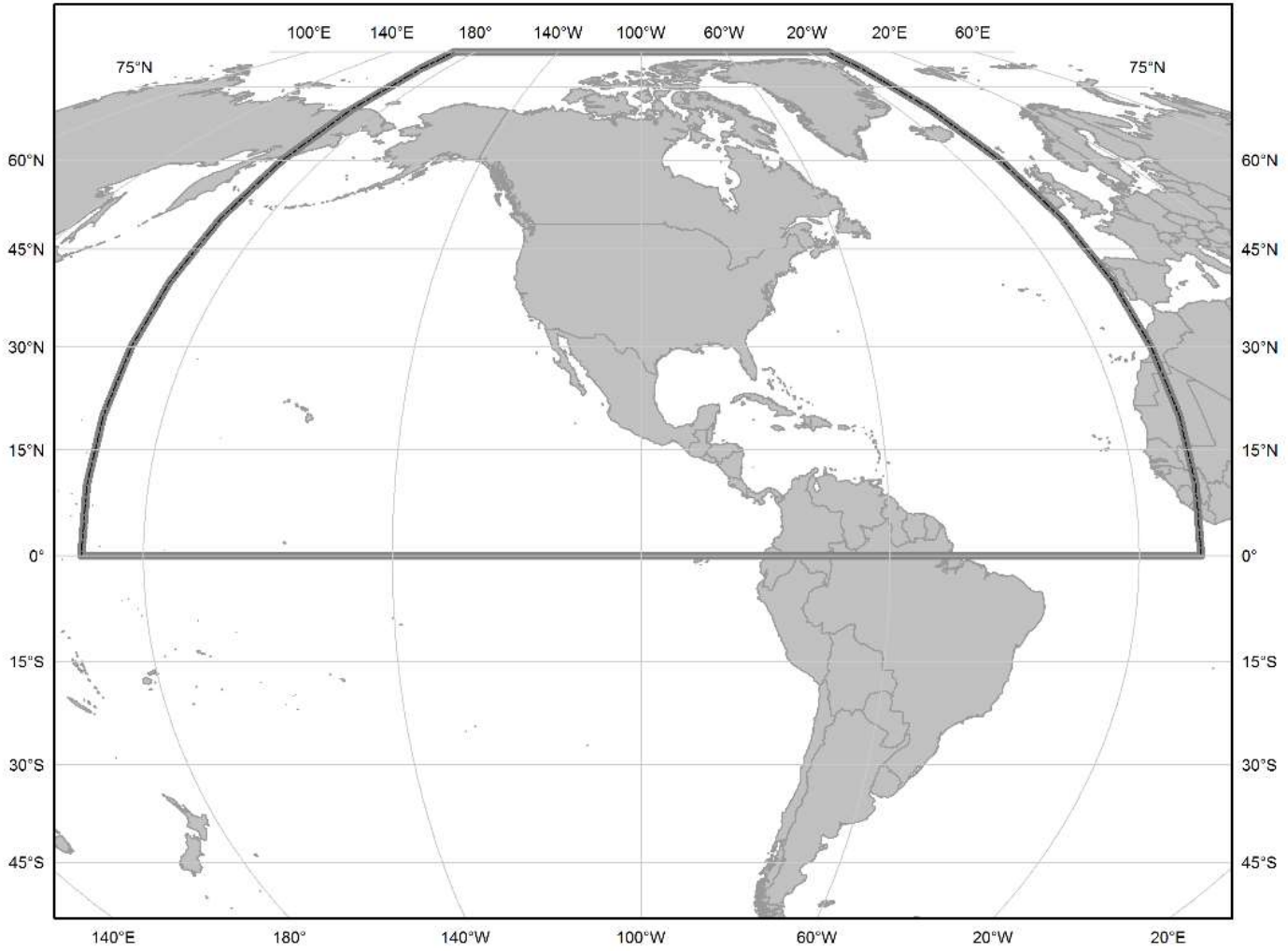
[1]NOAA's National Geodetic Survey

[2]ERT Inc.

GEOID2022


100°E
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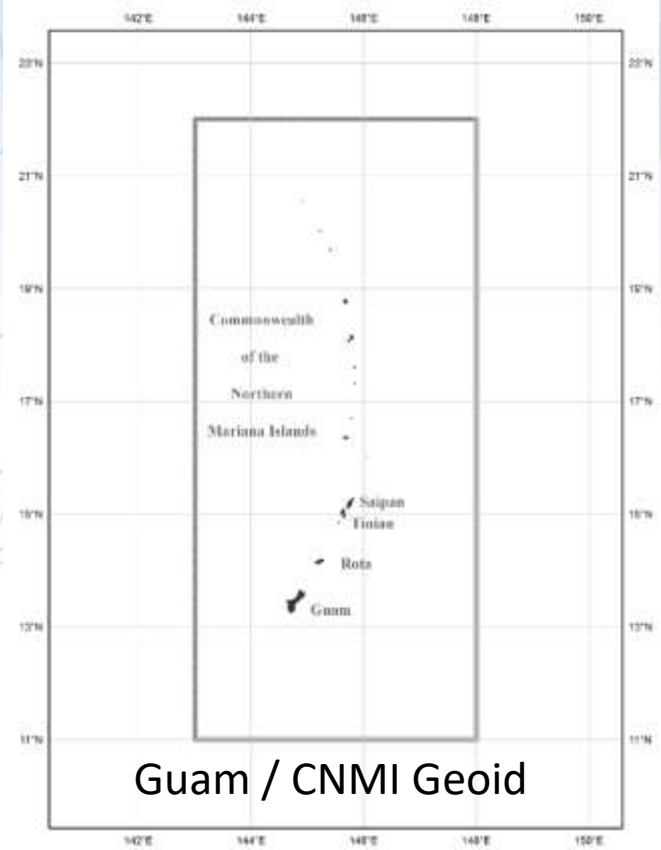
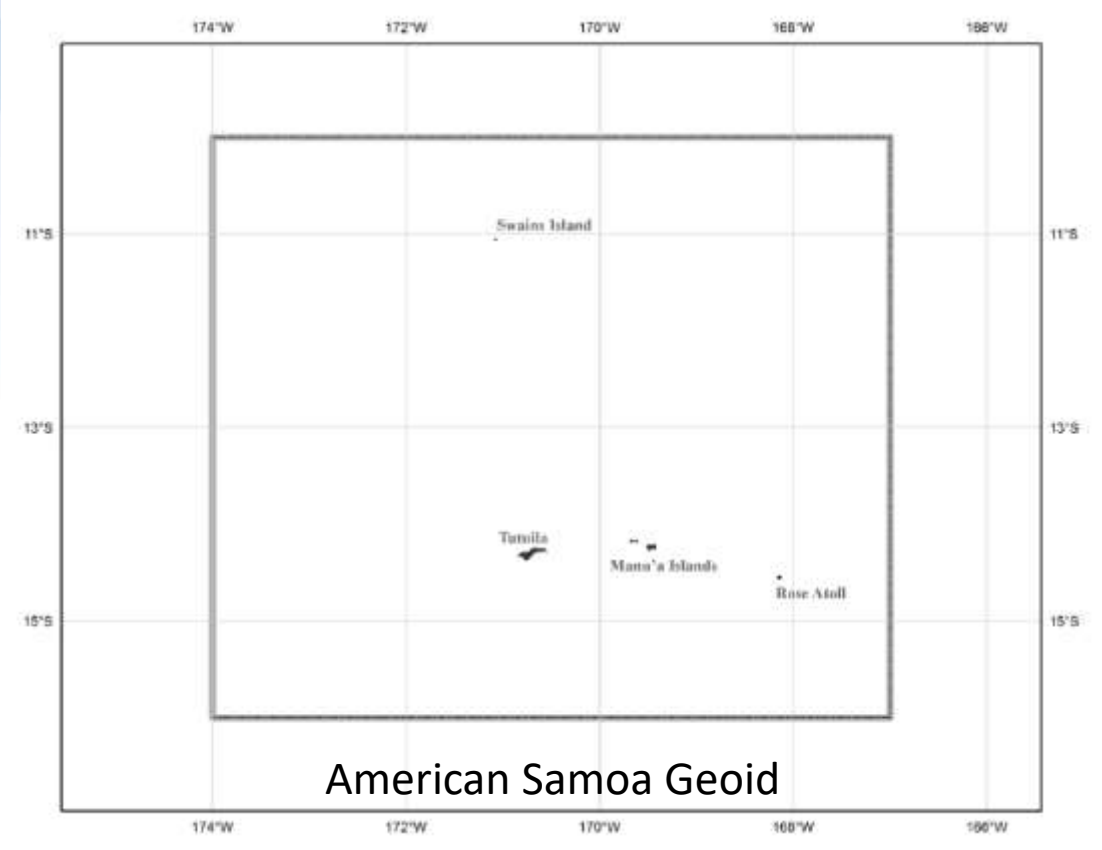
60°W
20°W
20°E

Additional Geoids in US Pacific Islands



Guam / CNMI Geoid

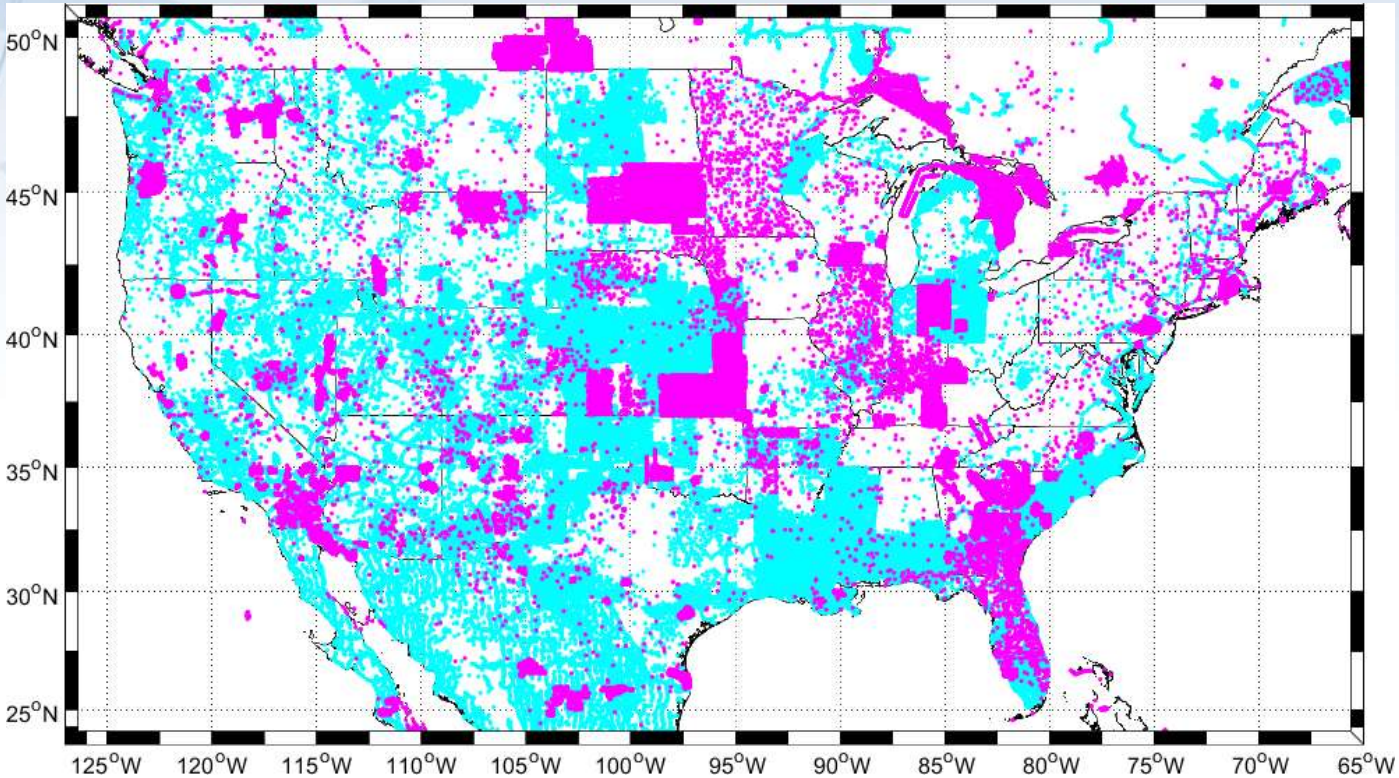


American Samoa Geoid

International Cooperation & Collaboration

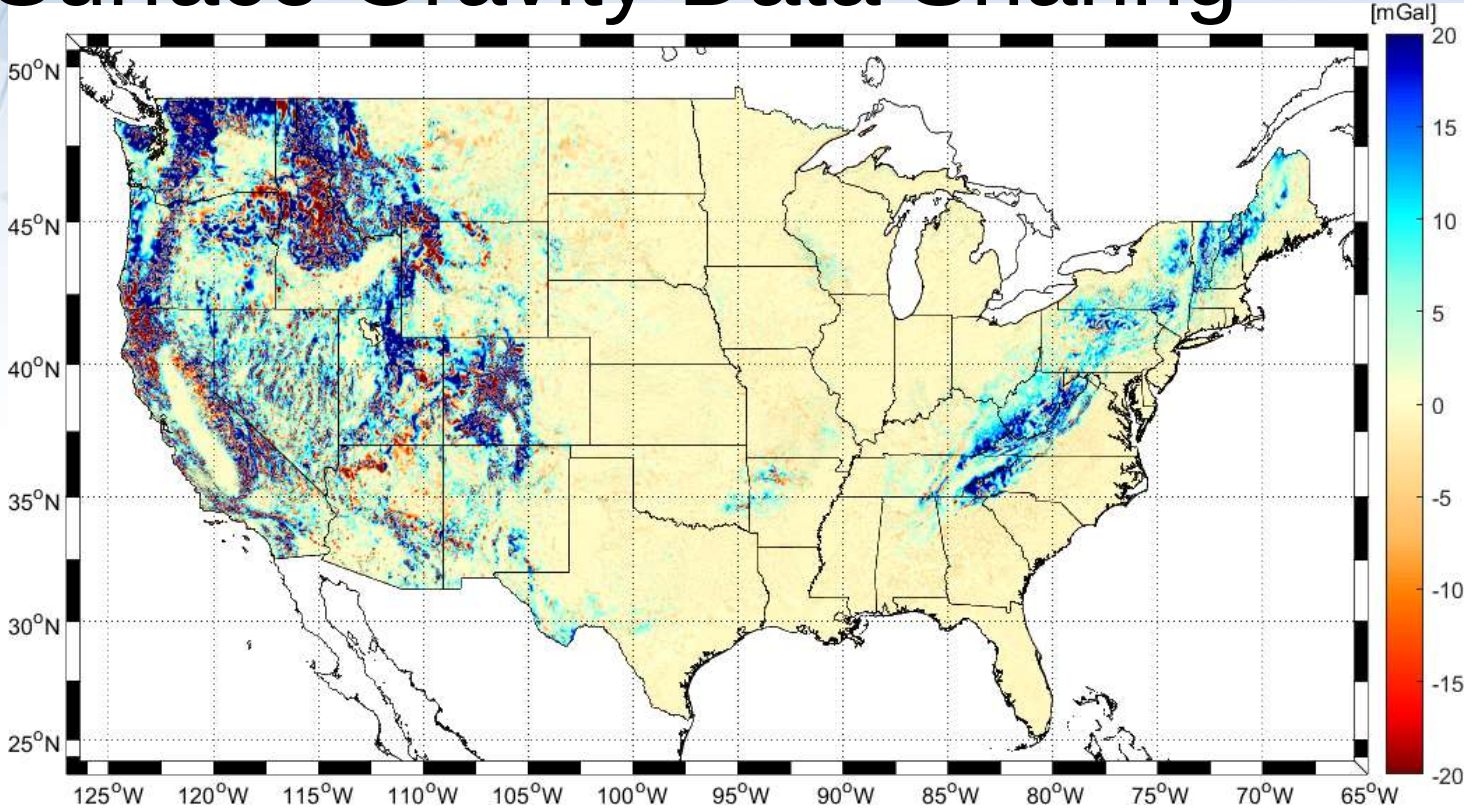
- National Geospatial-Intelligence Agency (NGA)
  - NGA Surface Gravity Data where allowable
  - NGS GRAV-D data
  - NGA Preliminary Geopotential Models (PGMs)
- Geodetic groups within North America
  - Canadian Geodetic Survey (CGS) & Mexico's Instituto Nacional de Estadística y Geografía (INEGI)
- Other Groups
  - Agreements for data from Greenland (DTU), Iceland, etc.

NGA: Surface Gravity Data Sharing



CONUS with Unique Gravity Data from NGA (magenta) and NGS (cyan)

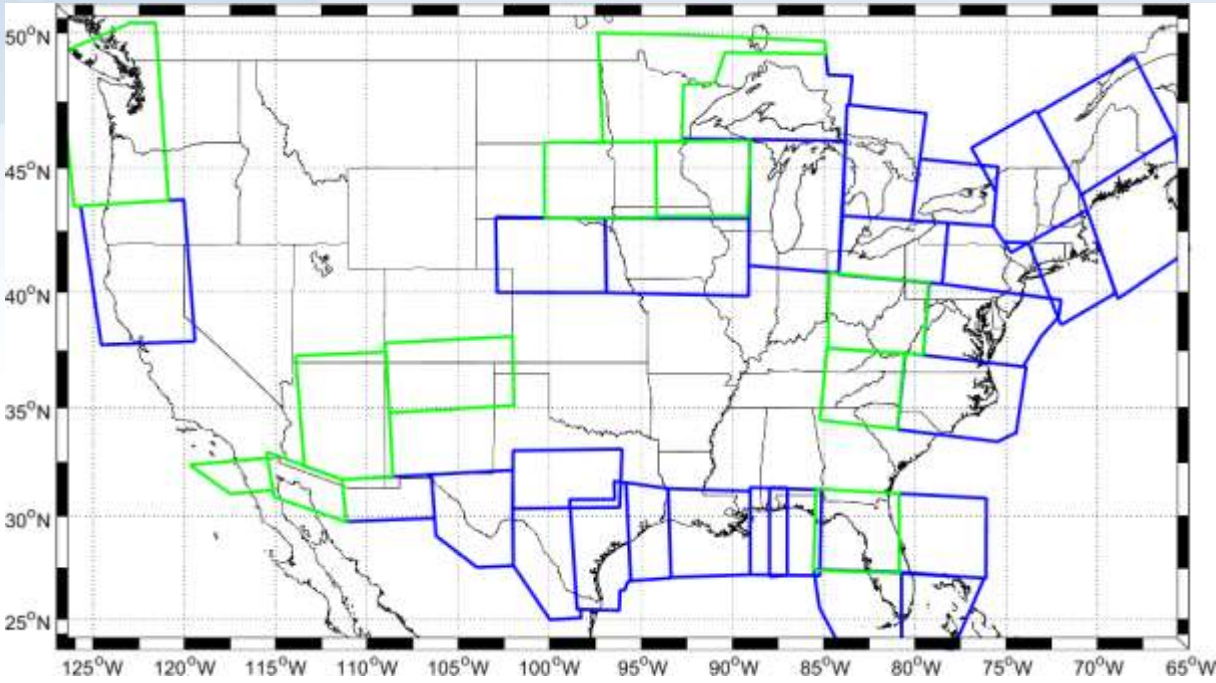
NGA: Surface Gravity Data Sharing



Free-Air Anomaly Difference between NGA data and NGS data at Duplicated Points

NGA: GRAV-D Sharing

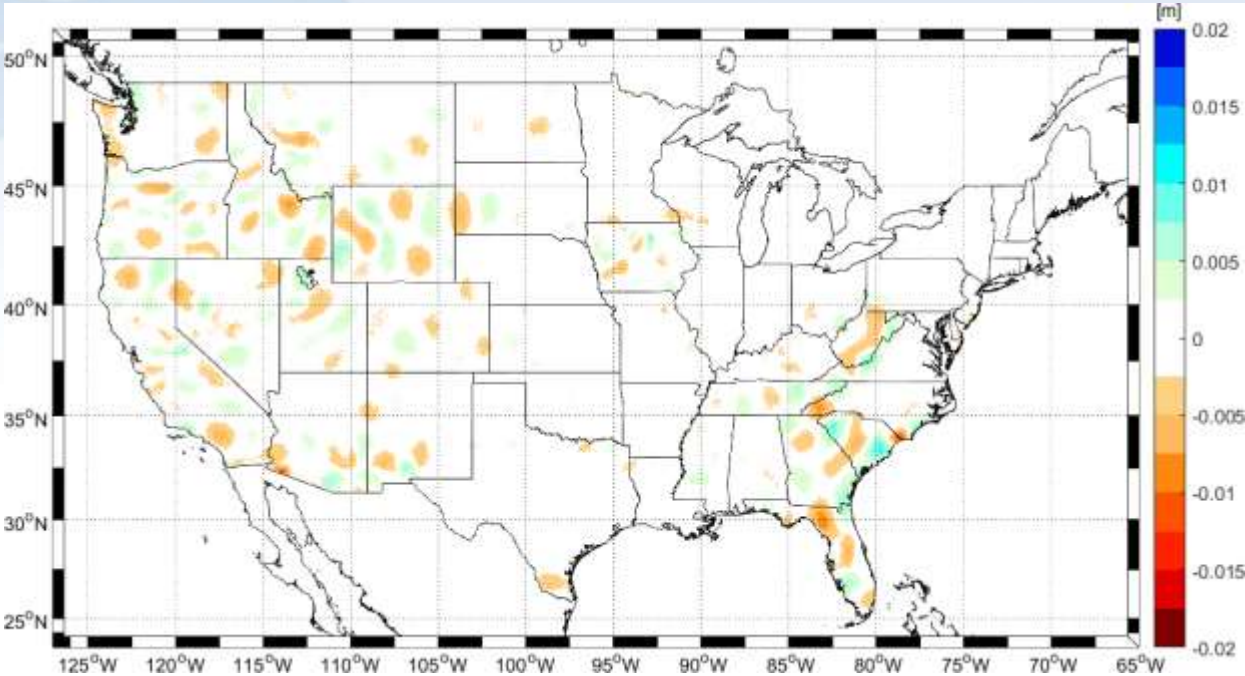
- GRAV-D major source of new data for NGA's EGM2020
- NGS will share 'cleaned' data annually (~June)
- Fits into NGA reference model schedule for EGM2020.



GRAV-D Data Blocks Included in PGM17 (blue) and GRAV-D Data Blocks Ready for PGM18 (green)

NGA: PGM Validation

- EGM2020 release in Dec. 2019
- Annual PGM reference models
- PGM17 released in Dec. 2017
- Nearly identical to NGS REF17B model

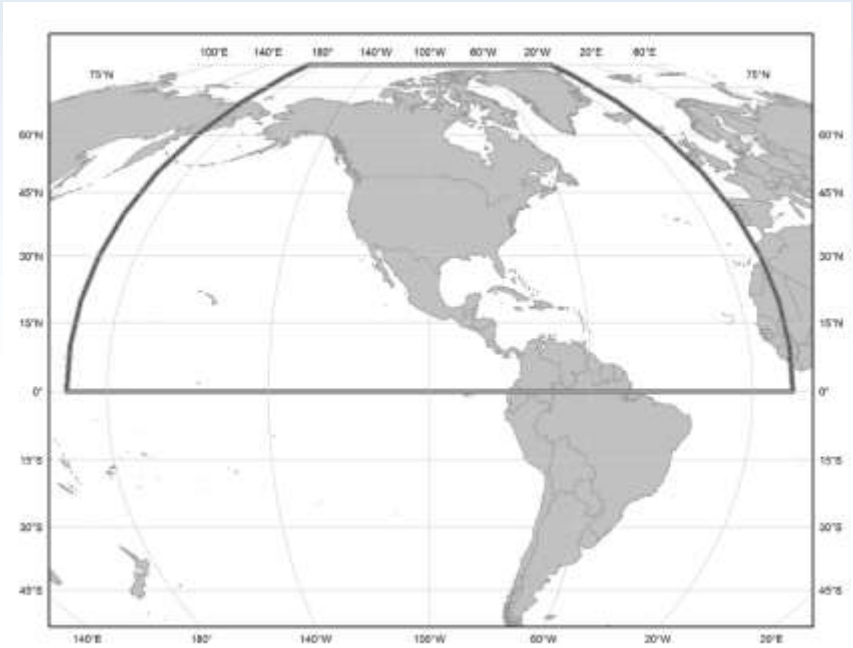


Common Datasets: CGS, INEGI, & NGS

- Differences in North American Geoid Models:
  1) Different modeling (theory)
  2) Different input datasets
- Project initiated to address 2) → Common Datasets
  - Surface gravity data (terrestrial, shiptrack, altimetry)
  - Airborne gravity data (GRAV-D)
  - DEM
  - Satellite gravity model

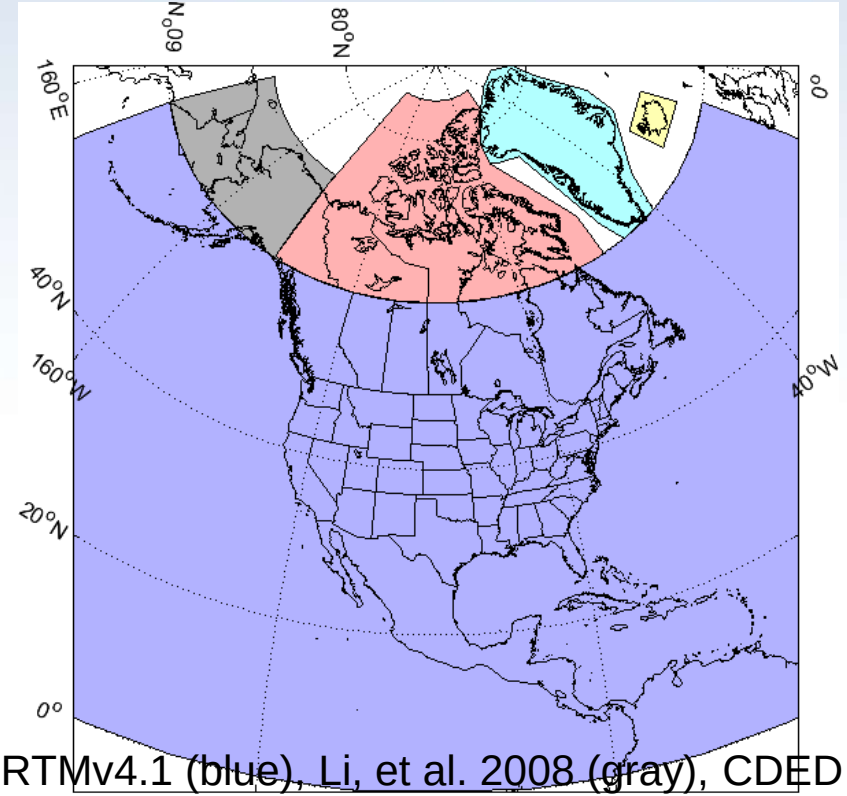
Common Datasets: Terrestrial Gravity

- Each group provide data over their territory
- v1 Completed
- v2 to include supplemental areas (Iceland, South America, Greenland, etc.)
- INEGI: Central & South America
- CGS: Greenland
- NGS: Carribbean



Common Datasets: DEM

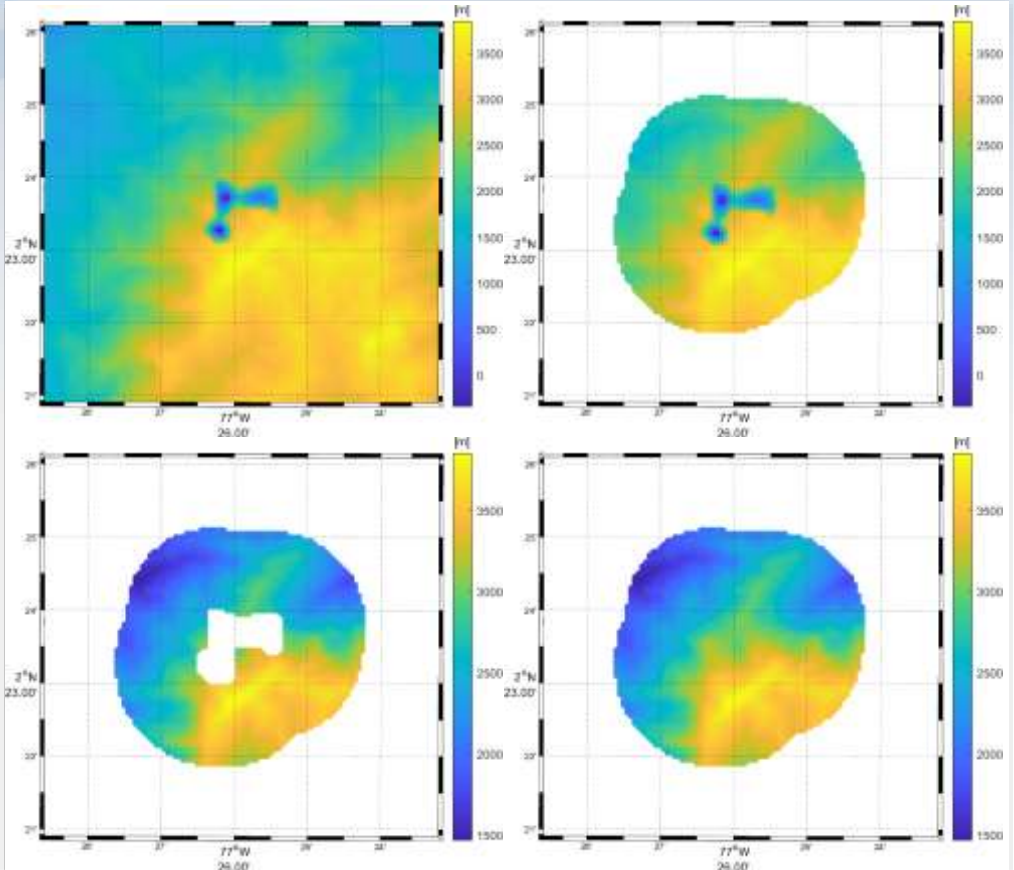
- 3” elevation grid
- Mainly consists of SRTMv4.1 (below 60º N).
- Supplemental grids in other areas
- v1 completed
- v2 completed over the next year to include data over Alaska, Greenland, etc.



DEM Sources - SRTMv4.1 (blue), Li, et al. 2008 (gray), CDED (red), GIMP (cyan), and Iceland National Survey (yellow)

Common Datasets: DEM – Void Fills

- SRTMv4.1 still has areas that are not correct
  - Shadows incorrectly filled
  - Areas in Great Salt Lake, Utah
- Void Filling: (clockwise from upper left)
  - Original DEM
  - 2 km buffer around incorrect area
  - Extraction of cells to fill
  - Biharmonic Spline Interpolation



Common Datasets: Other Groups

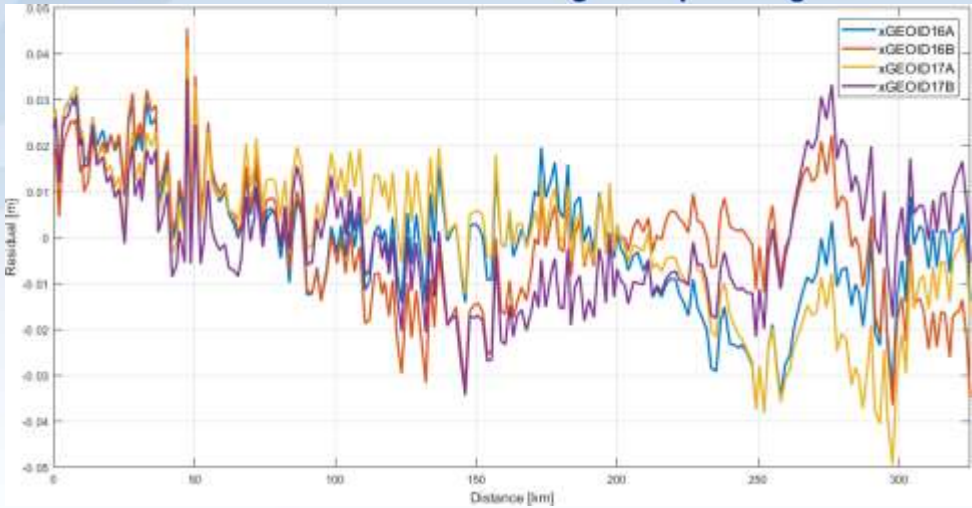
- Invitation to Contribute – through ~2020
  - Central America, South America, Caribbean Islands, W. Africa, Canary Islands, Samoa, Greenland, Iceland.

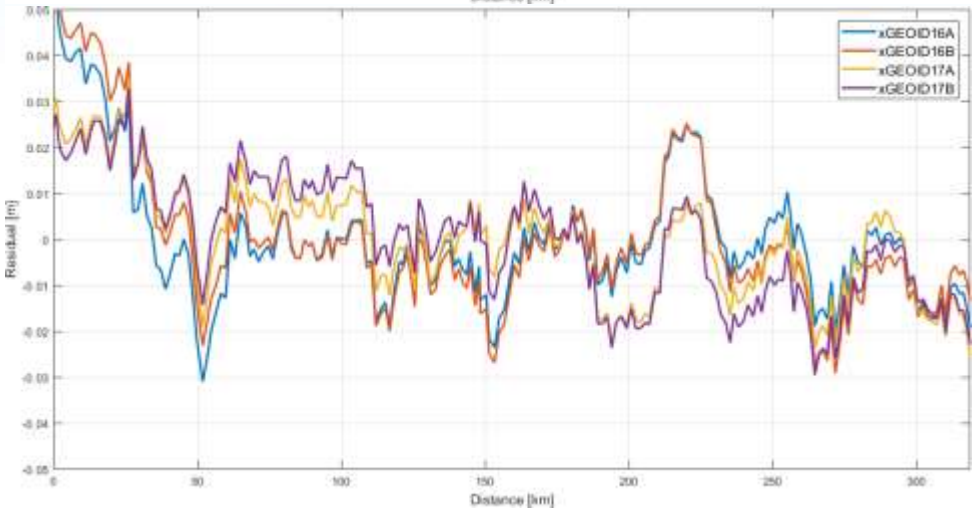
- Greenland (DTU) – gravity data
- Iceland - Landmælingar Íslands – DEM/gravity data

Is it working?

GSVS11 – Texas [meters]	Minimum	Maximum	RMS
xGEOID16A	-0.0381	0.0428	0.015
xGEOID16B	-0.0365	0.0455	**0.015**
xGEOID17A	-0.0494	0.0409	0.017
xGEOID17B	-0.0344	0.0345	**0.014**

GSVS14 – Iowa [meters]	Minimum	Maximum	RMS
xGEOID16A	-0.031	0.053	0.015
xGEOID16B	-0.029	0.058	**0.017**
xGEOID17A	-0.025	0.035	0.013
xGEOID17B	-0.030	0.033	**0.014**





Contact Us:

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International Cooperation & Collaboration