

NATIONAL GEODETIC SURVEY

Gravity-Lidar Study for 2006: Refined Gravity Field For the North-Central Gulf of Mexico

Dan Roman
National Geodetic Survey

Jarir Saleh
National Geodetic Survey/Earth Resources Technology



National Oceanic and Atmospheric Administration

Colleagues

- National Geodetic Survey
 - Yan Ming Wang and Jarir Saleh
- Naval Research Laboratory
 - John Brozena and Vicki Childers
- NASA GSFC Laser Remote Sensing
 - David Rabine, Scott Luthcke, and Bryan Blair
- University of Maryland, College Park Campus
 - Sandy Martinka and Michelle Hofton



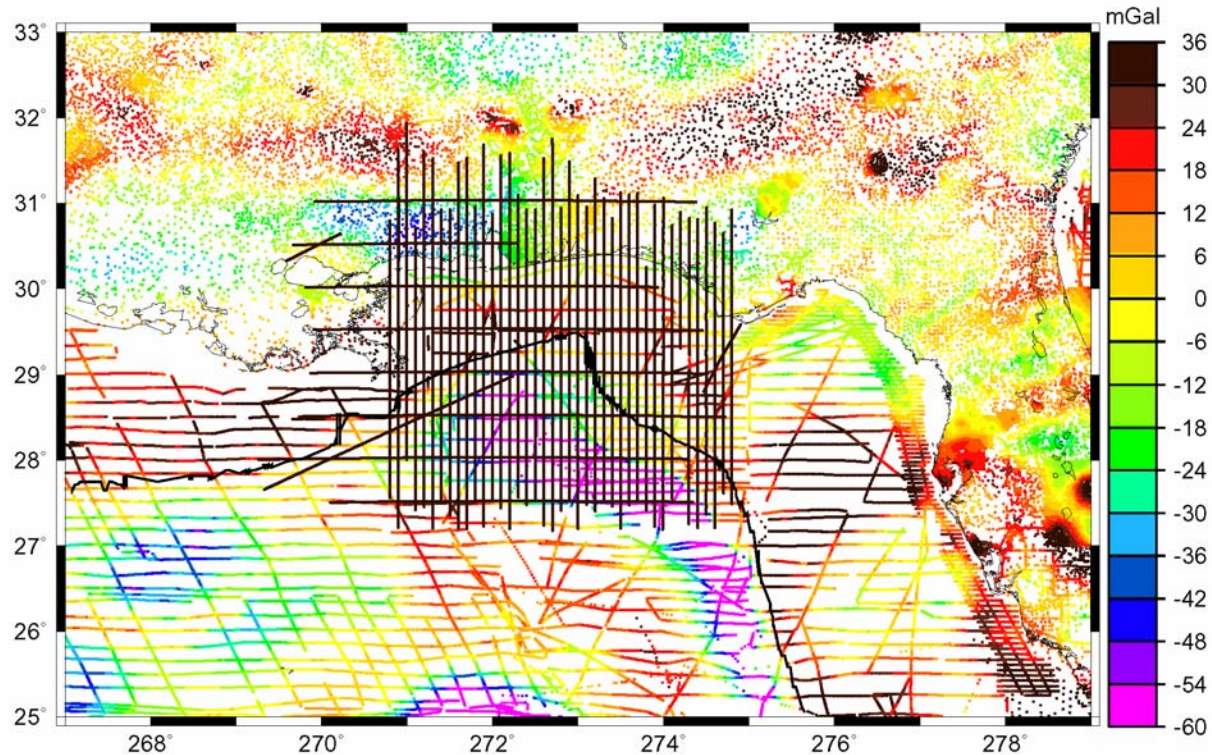
Gravity Lidar Study for 2006 (GLS06)

- AOI: Northern Gulf of Mexico (FL-AL-MS shoreline)
- Equipment: NRL's LaCoste-Romberg Air-Sea II, NASA's LVIS, and NOAA Citation II
- Flights at 10 km elevation and spacing
- To ensure seamless and consistent coverage across the sea-shore boundary
- To reduce geoid uncertainties and better tie in to MSL based on lidar observations
- VDatum model area: tidal and dynamic topography models currently available



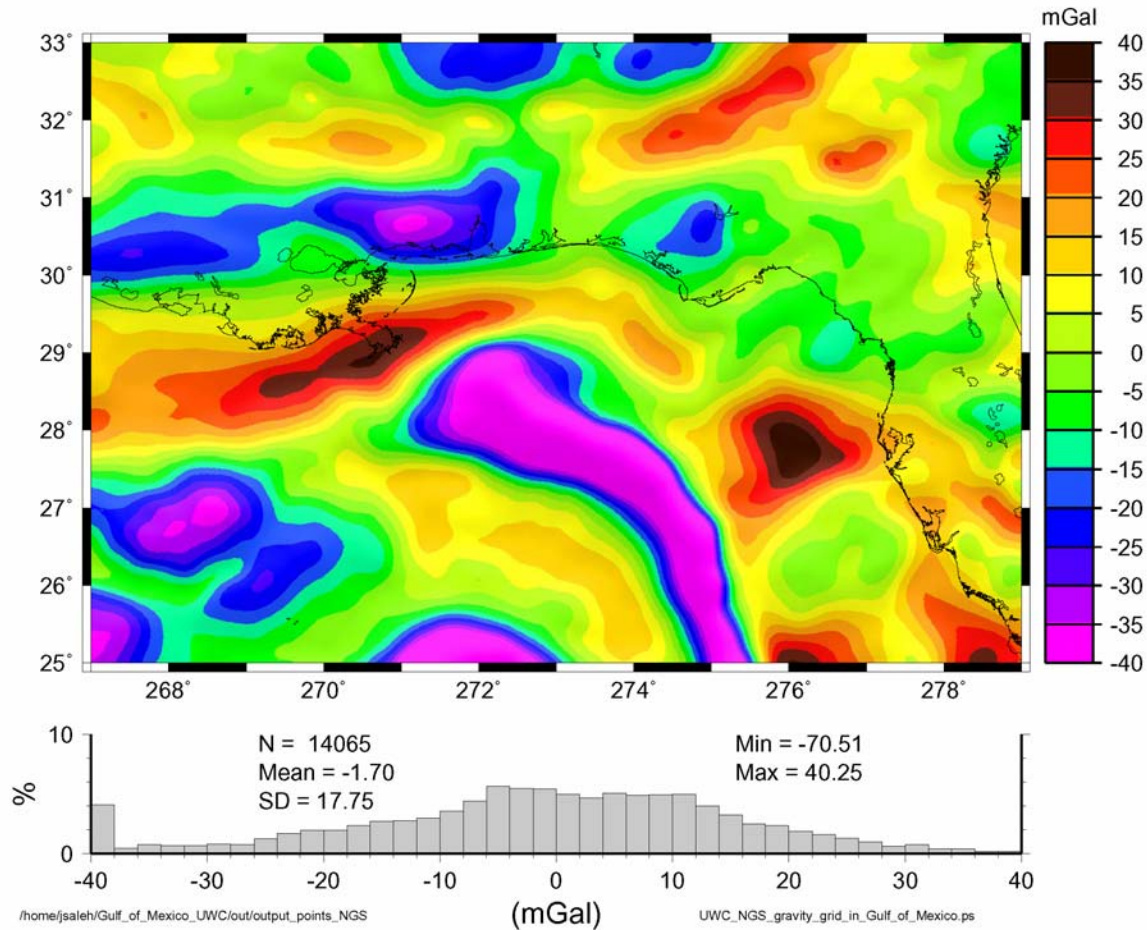
Extent of Gravity and Data Collection Flights

Airborne Tracks and NGS Database Gravity Anomalies Over the Gulf of Mexico



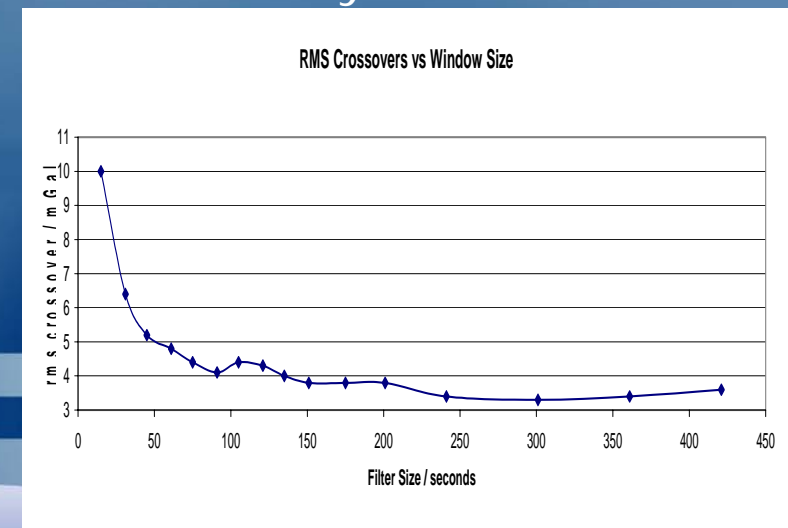
Gravity Map Upward Continued to 10 km

UWC Gravity Anomaly Using NGS 1x1 Minute CONUS Grid



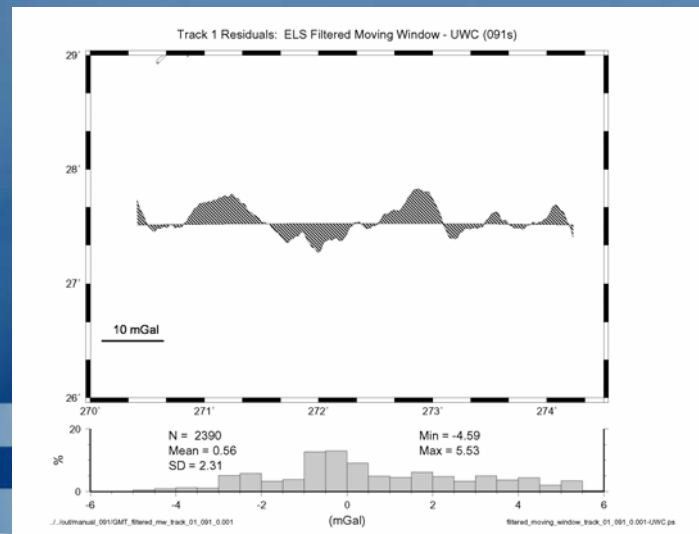
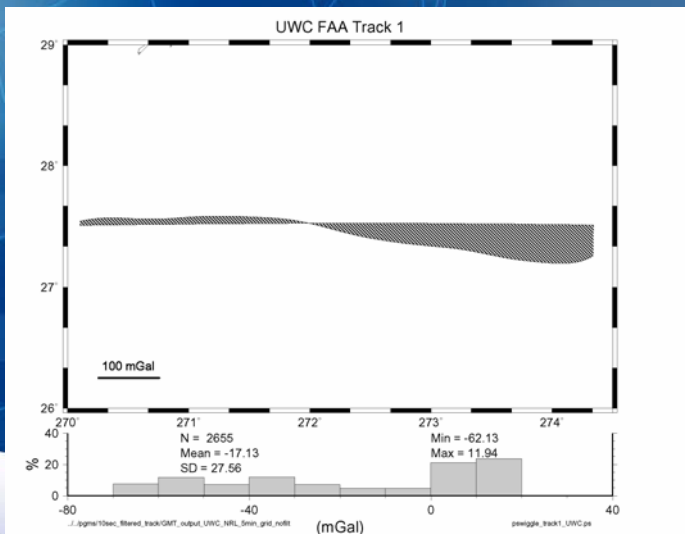
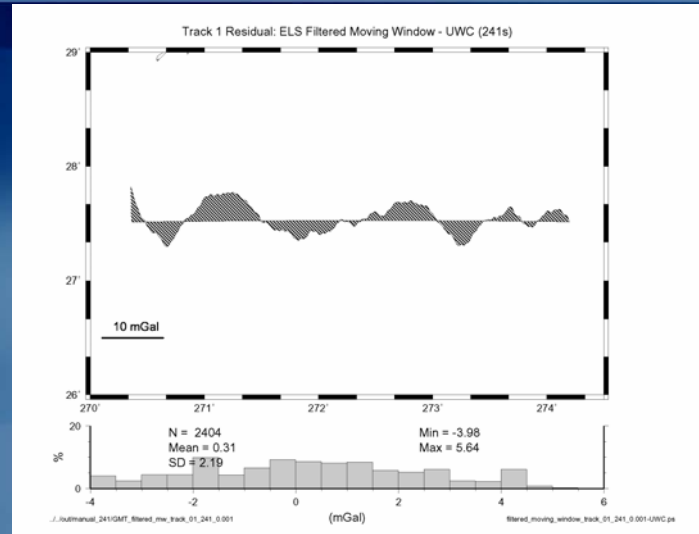
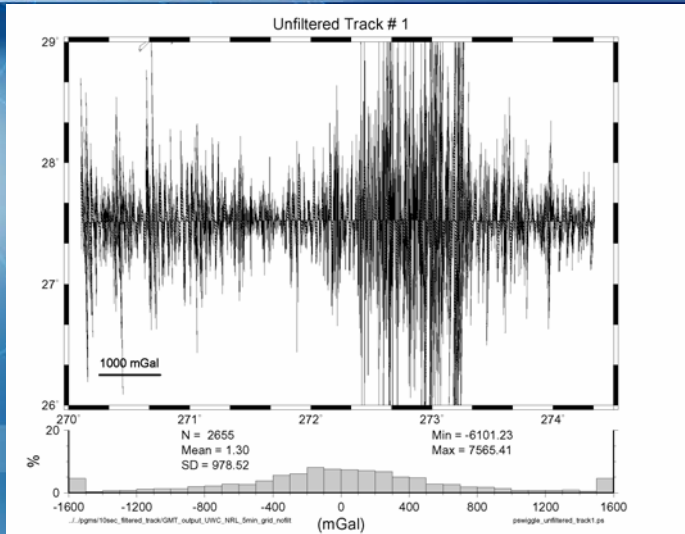
Filter Characteristics

- All corrections (GPS, off level, Etvos, drift, etc) were applied to gravity data – otherwise: unfiltered
- Signal interpolated and provided by NRL
- Some problems with initial filters
- Settled on moving window filter modified by an elastic string filter
- Trade Off-Diagram:
 - Best choices
 - 90s: first minima
 - 240s: lowest minima



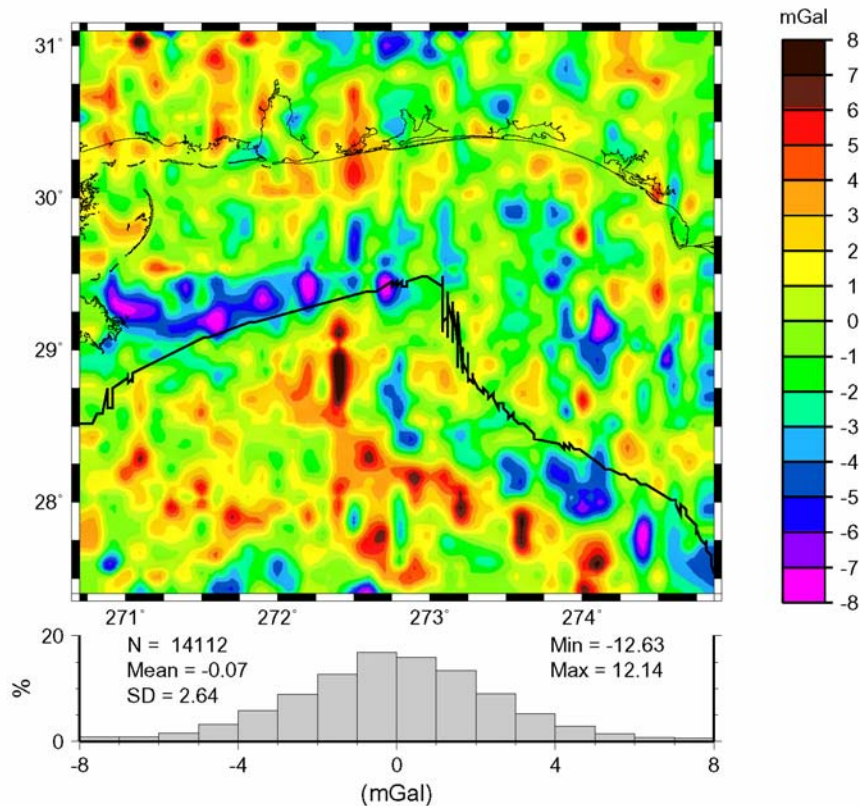
Example Profile #1: Southernmost East-West Track

NATIONAL GEODETIC SURVEY

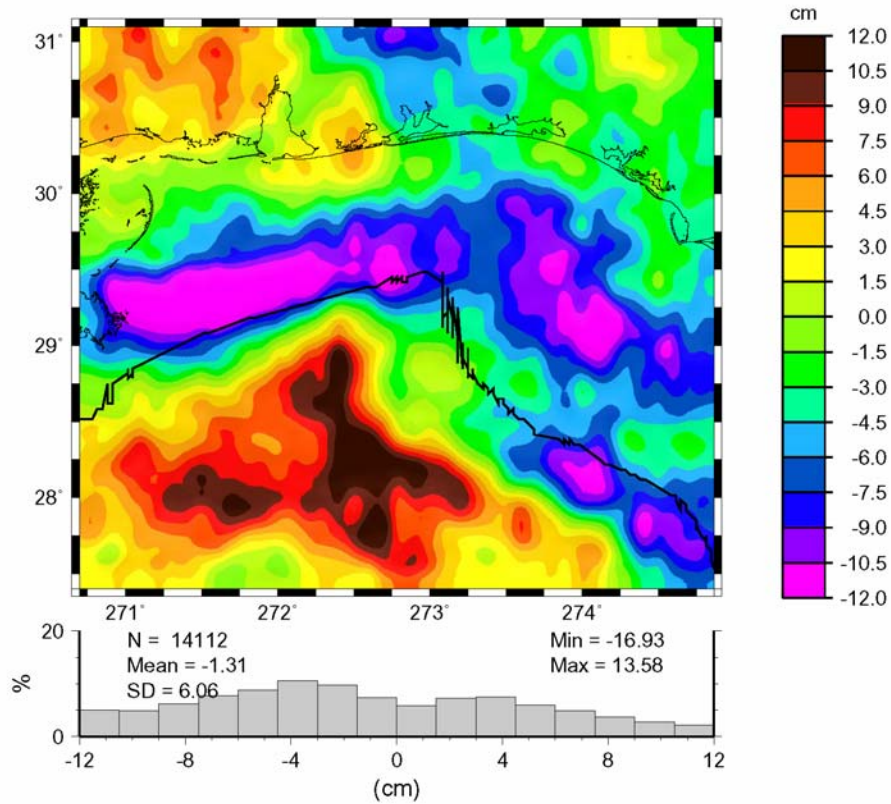


Residual Gravity at 10.5 km with 91s Filter

2'x2' Residuals: Crossover Adjusted NGS 091s filtered - UWC Gravity Anomalies



Equivalent Pseudo-Geoid Signal for 91s Filter

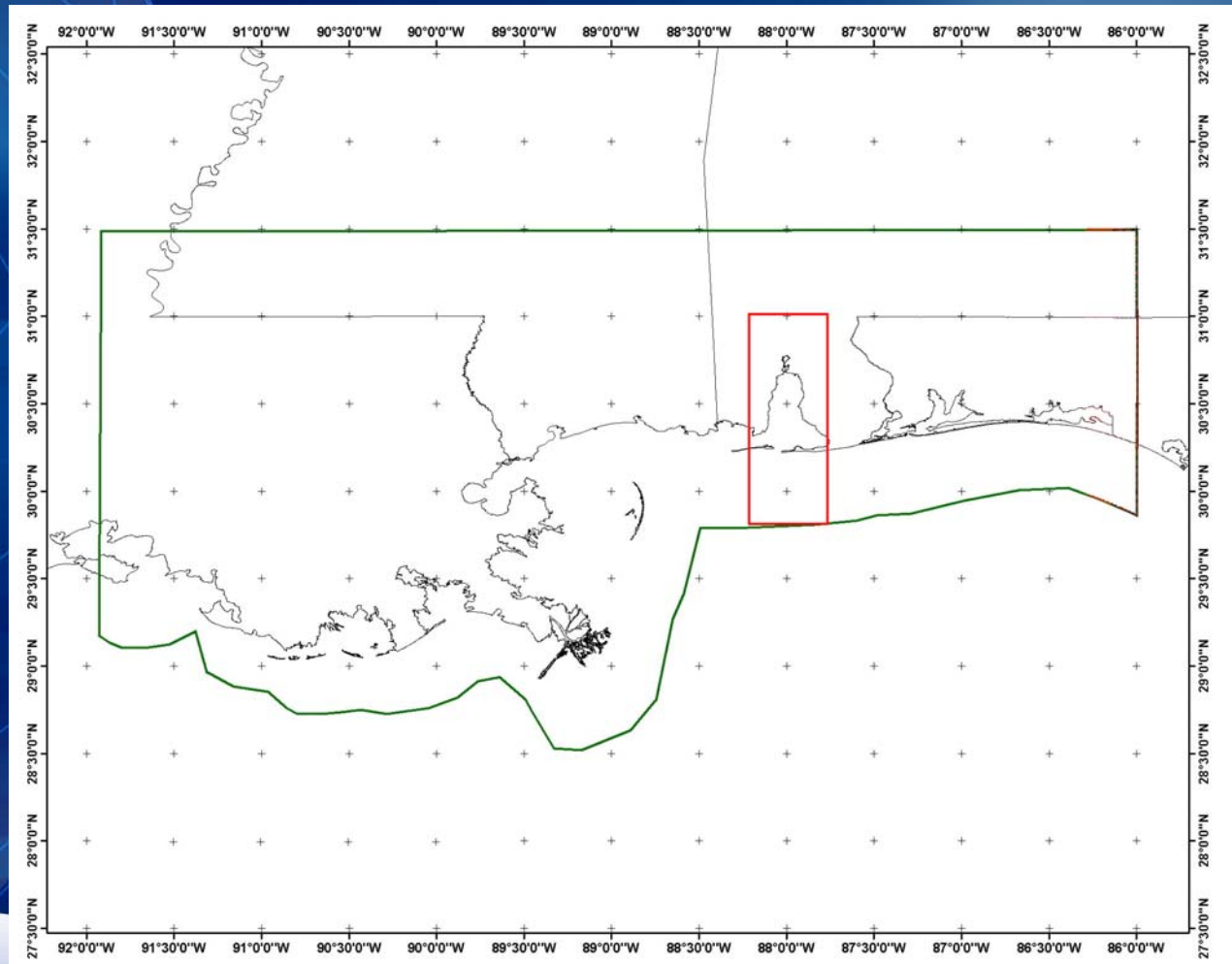


Future Work

- Apply filter during application of corrections (not after!)
- Downward continue these data
- Check against other surface data
- Remove inconsistencies
- create a geoid model and compare to previous models
- Use new geoid model in conjunction with dynamic topography model to compare with lidar observations (LVIS)
- Establish absolute accuracy of gravimetric geoid in Vdatum study area and at tidal bench marks
- Compare GPS-leveling derived from gravimetric geoid to NAVD 88 heights at tidal bench marks
- Compare gravimetric geoid to forthcoming EGM's
- Expand AOI further westward through Louisiana and Texas



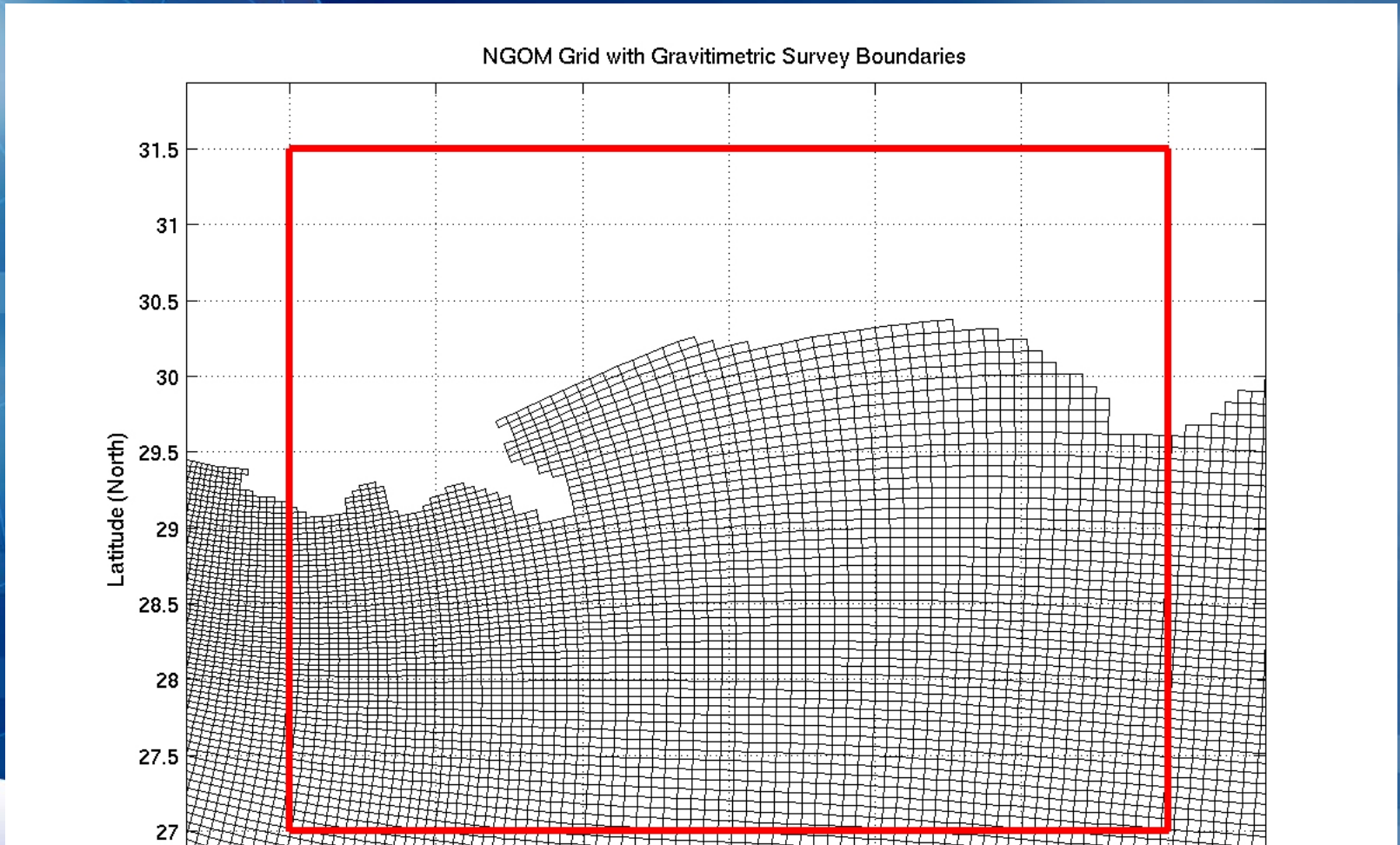
Intermap GPS/INS Coverage



National Oceanic and Atmospheric Administration

Map courtesy of Intermap Technologies, Inc.

Dynamic Topography Coverage



National Oceanic and Atmospheric Administration

From Richard Patchen, NOAA/NOS/Coast Survey Development Laboratory

NATIONAL GEODETIC SURVEY

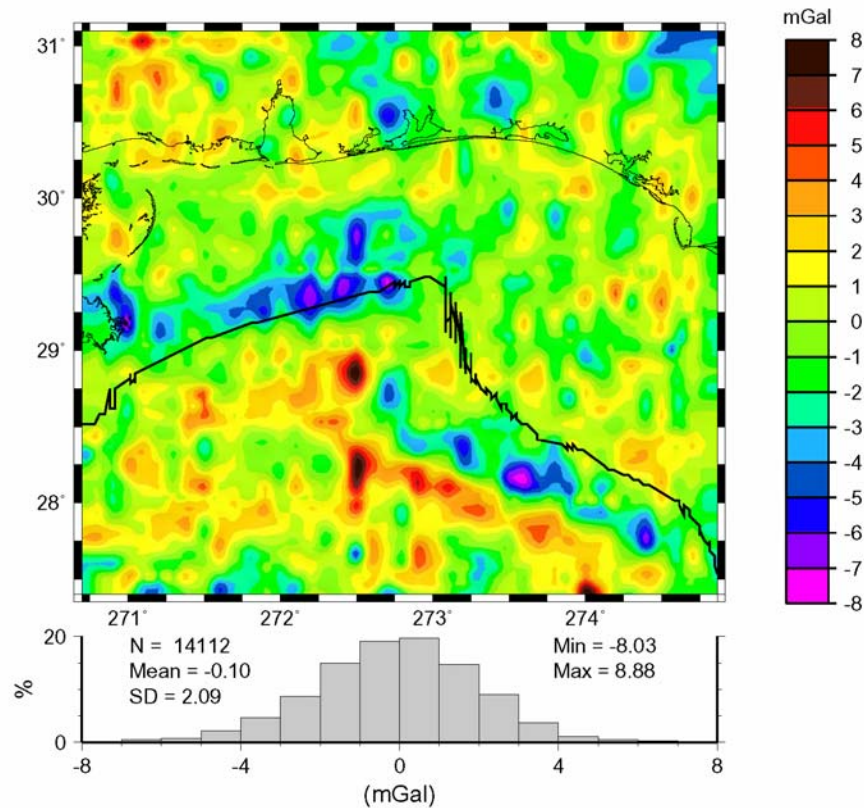
QUESTIONS?



National Oceanic and Atmospheric Administration

Extra Slide: Residual Gravity at 10.5 km with 240s Filter

2'x2' Residuals: Crossover Adjusted NGS 241s filtered - UWC Gravity Anomalies



Extra Slide: Equivalent Pseudo-Geoid Signal for 240s filter

