

# MOBILE GRAVIMETER **CHEKAN-AM**

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# Chekan-AM First Airborne Measurements

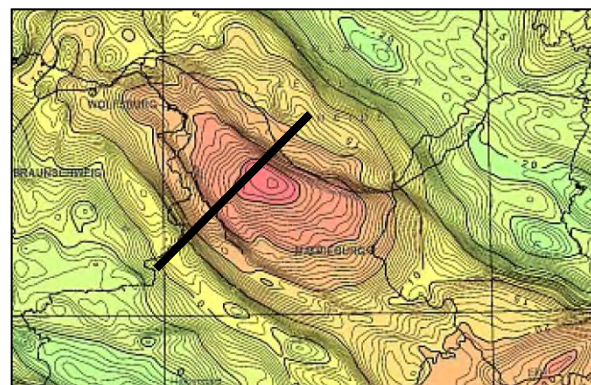
Joint Trials with  
Institute of Flight Guidance,  
Braunschweig, Germany  
February 2007



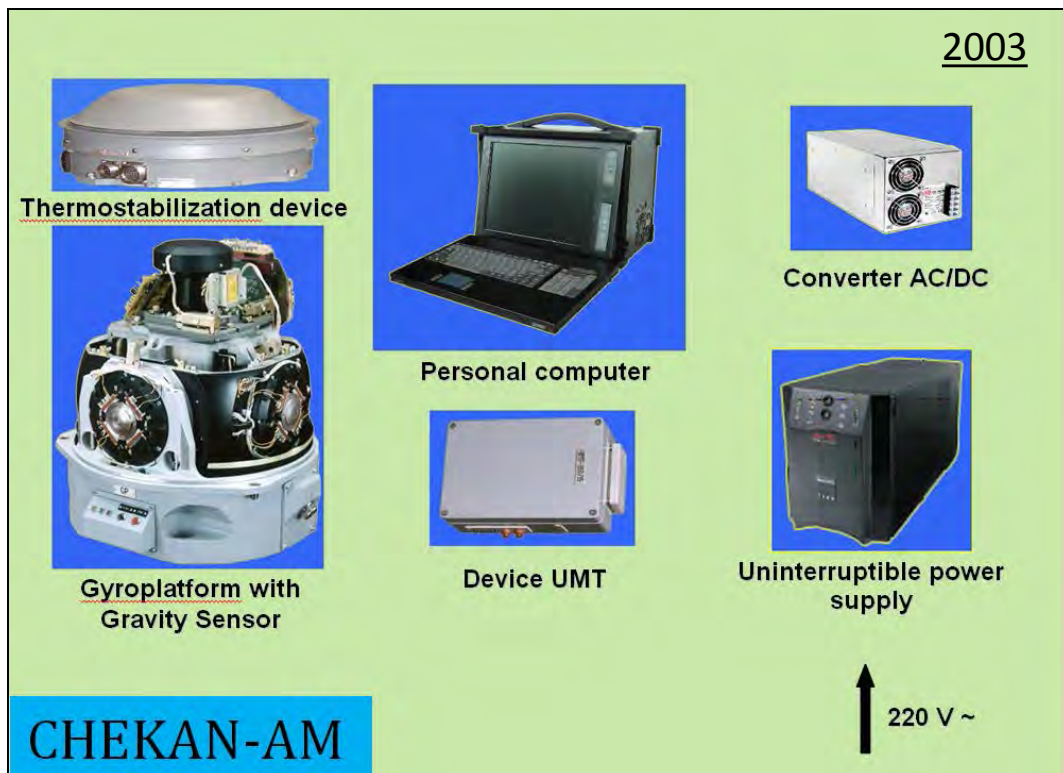
Dornier-128 Aircraft  
Speed 50 m/s. Altitude 300 m



Magdeburg Gravity Anomaly



# Chekan-AM Hardware



## Air-Sea Gravimeter CHEKAN-AM:

- Double quartz elastic system
- Two-axis gyrostabilizer
- Integration with GNSS



## Model SHELF-E. Features:

- High accuracy – 0.4 mGal (RMS)
- Low drift – 0.5 mGal/day
- Low power consumption – 250 W



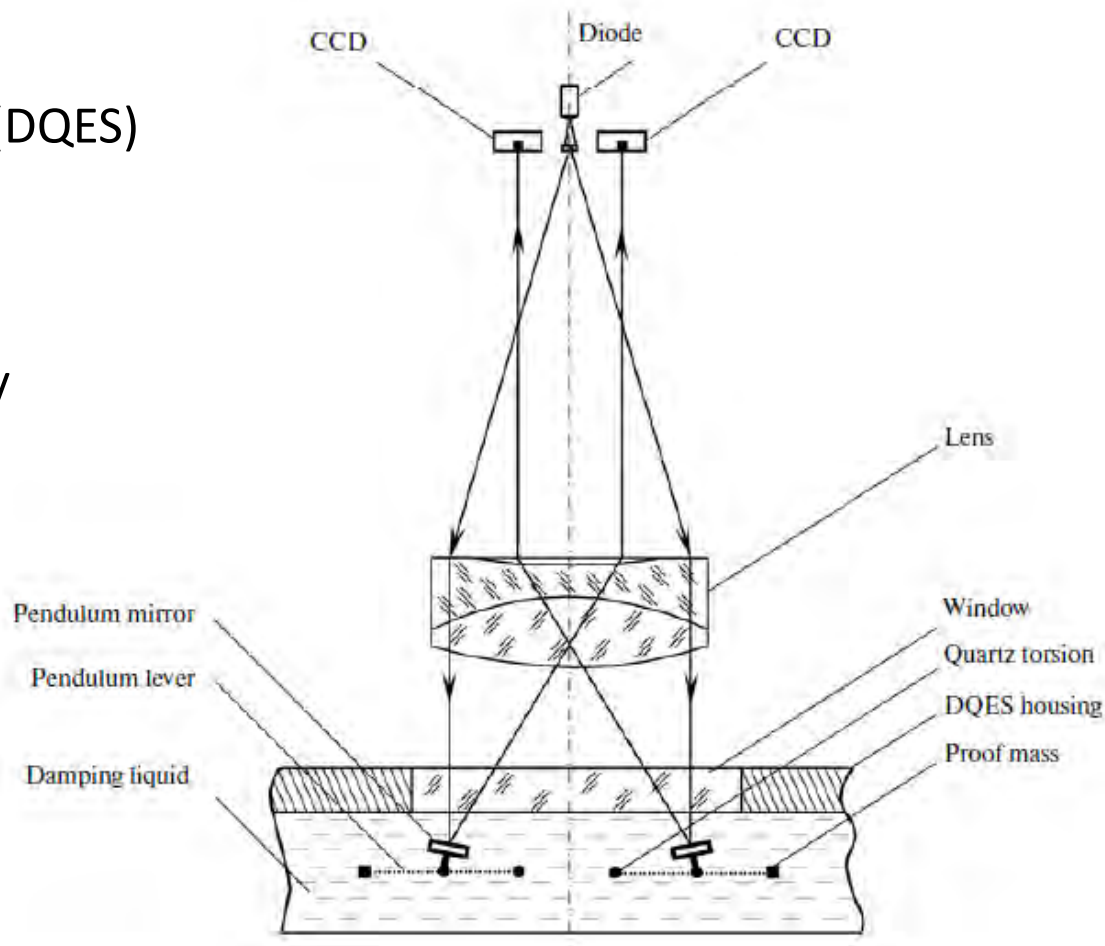
# Gravity Sensor. Principle of Operation

**Double Quartz Elastic System (DQES)**  
in Damping Liquid

Optoelectronic Converter  
with **two CCDs** in Chekan-AM /  
**one CMOS-camera** in Shelf-E

DQES sensitivity:  
0.5 arc sec / mGal

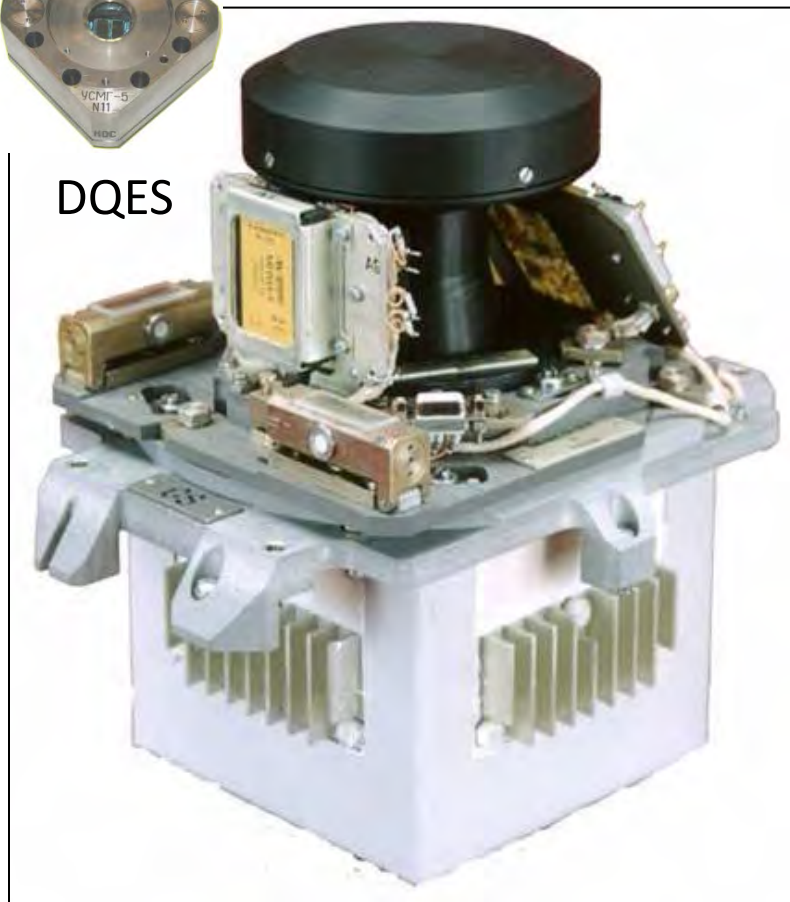
Range:  
10 Gal



# Gravity Sensor



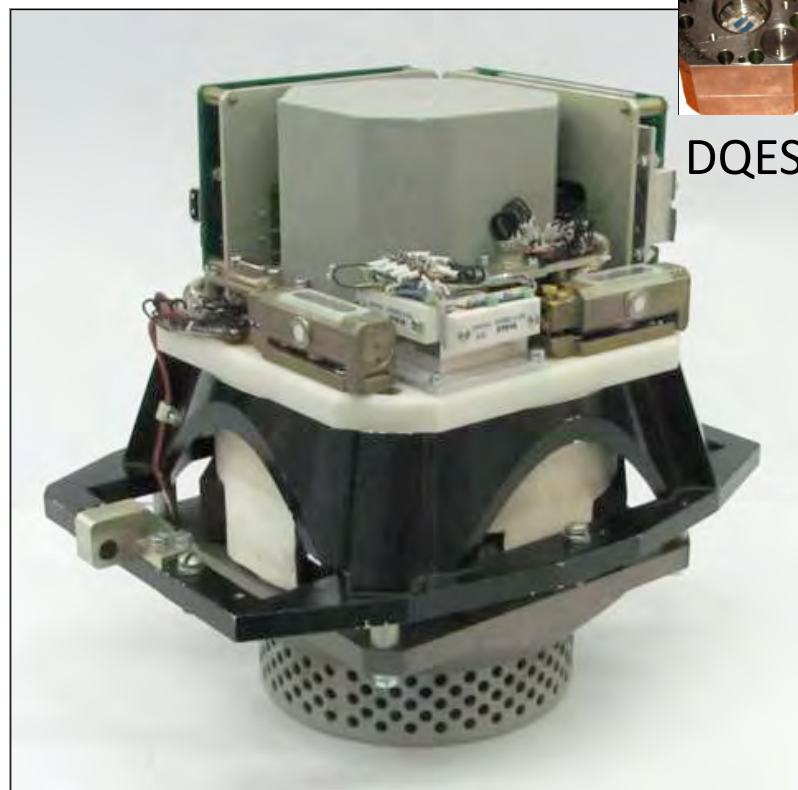
DQES



Chekan-AM

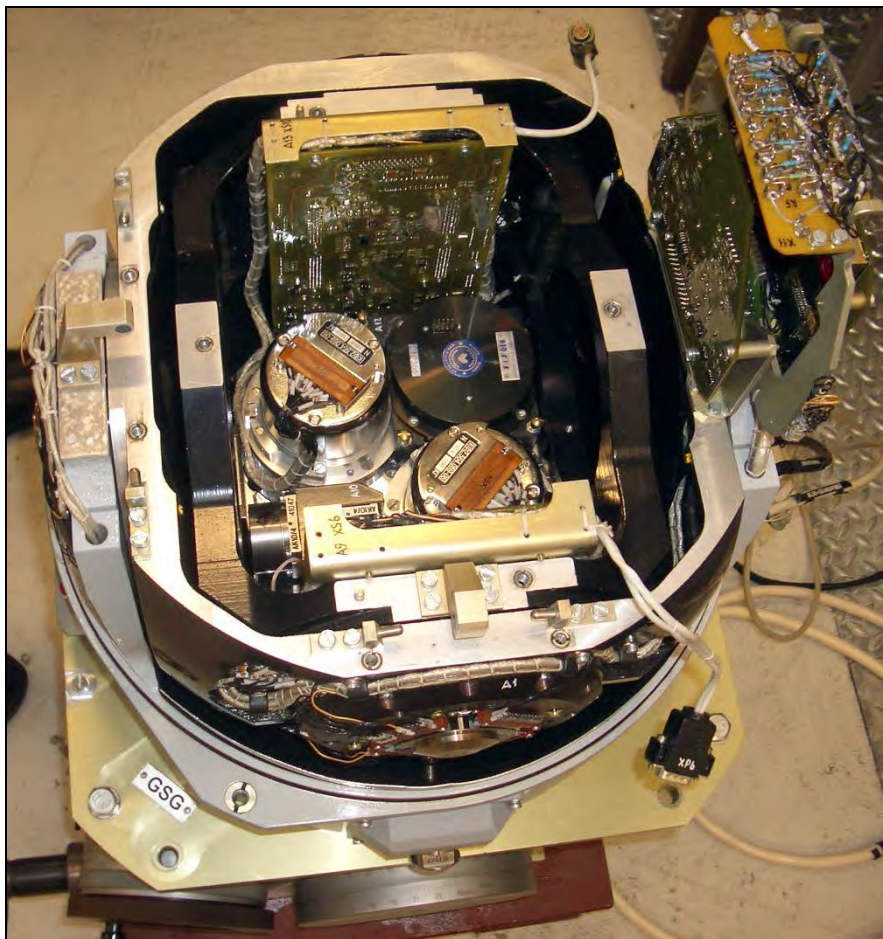


DQES



Shelf-E

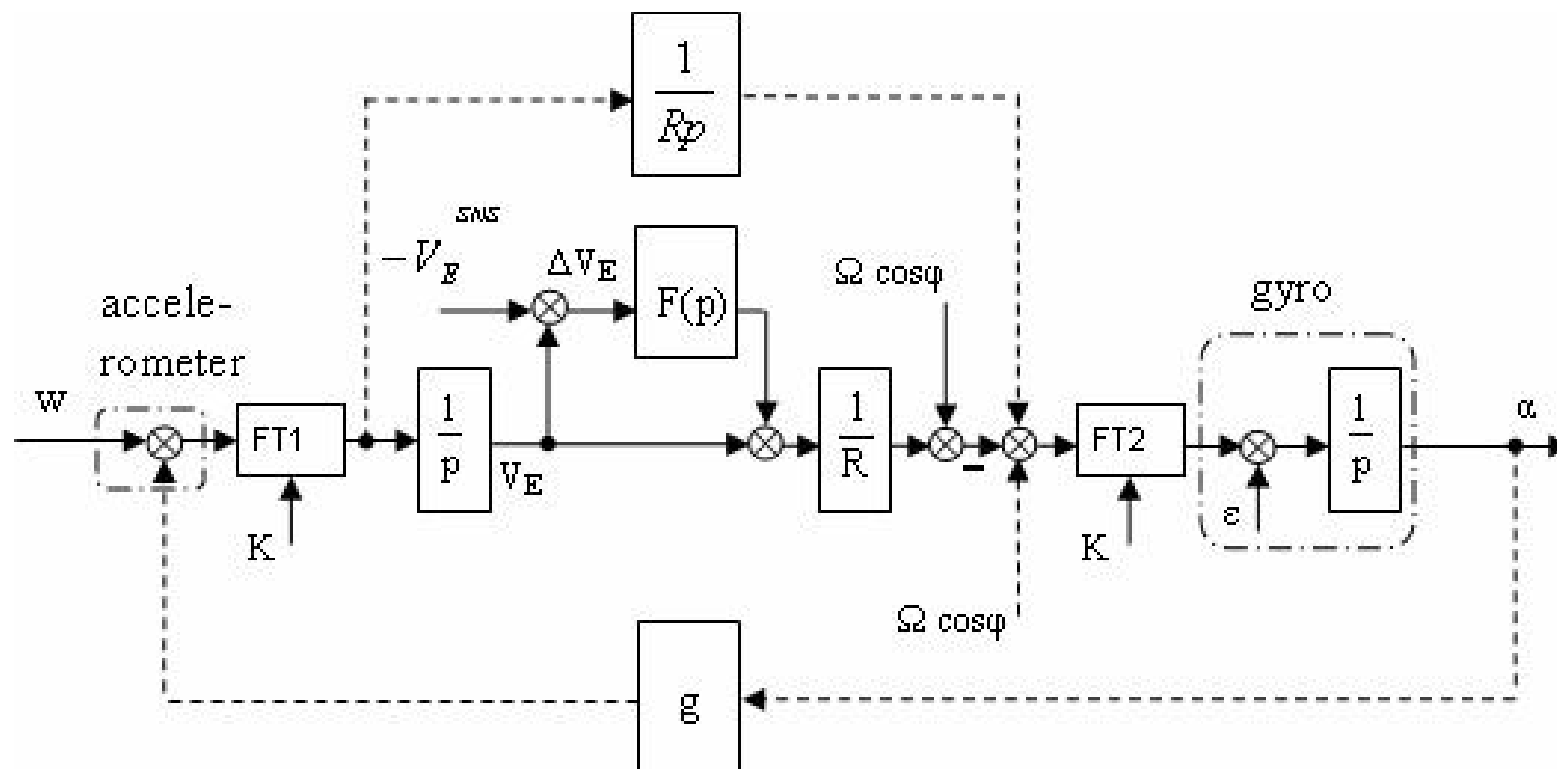
## Two-Axis Gyroplatform



- Two Float-Integrated Gyros
- Two Accelerometers
- Azimuth Fiber-Optic Gyro
- Gearless Servo Drive System
- Digital Controllers



# Gyroplatform Leveling Loop



$g$  – gravity

$R$  – Earth average radius

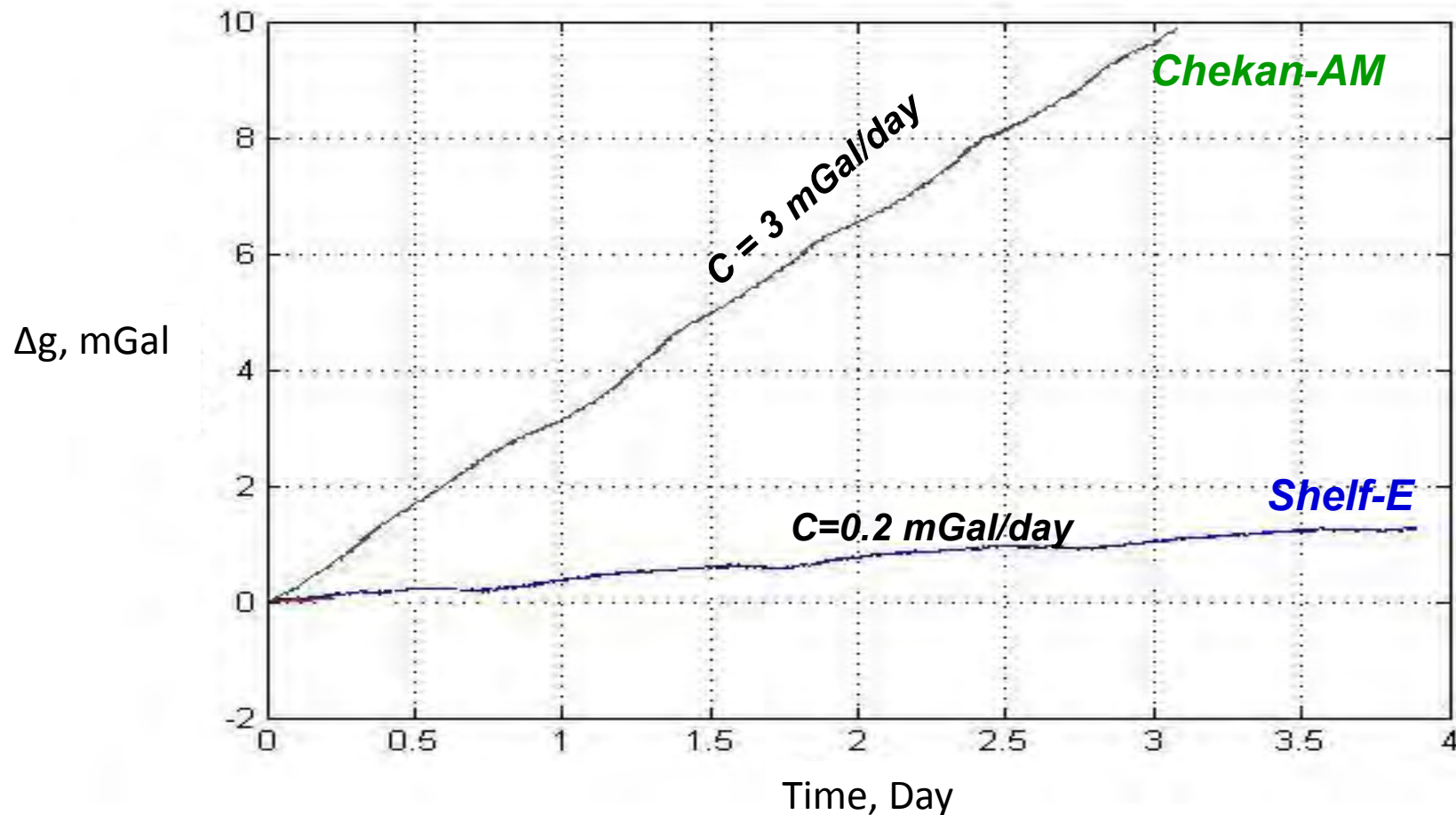
$w$  – horizontal acceleration

$\Omega \cos \phi$  – Earth rotation

$V$  – velocity

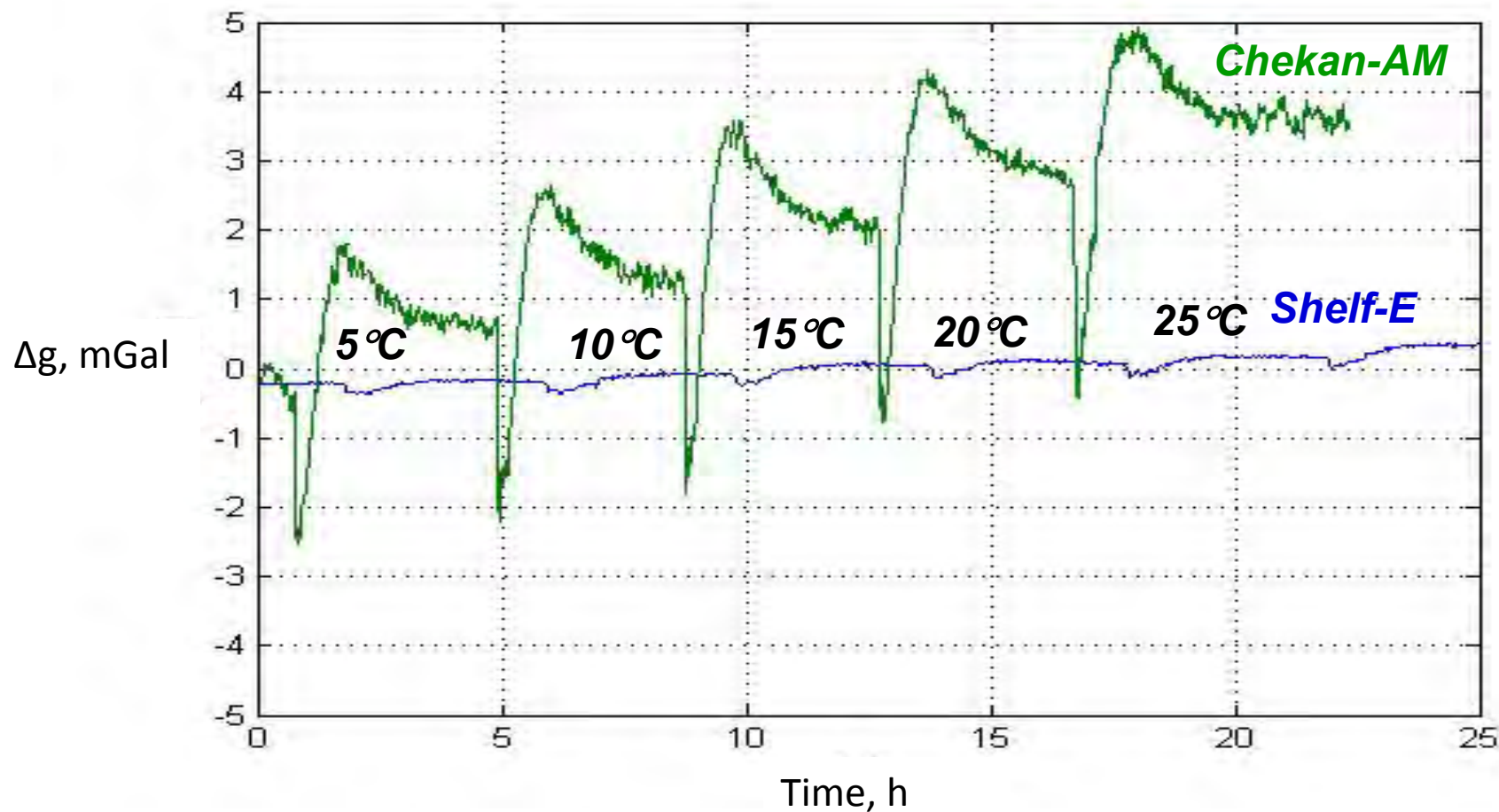
$\alpha$  – stabilization error

## Bench Tests. Drift

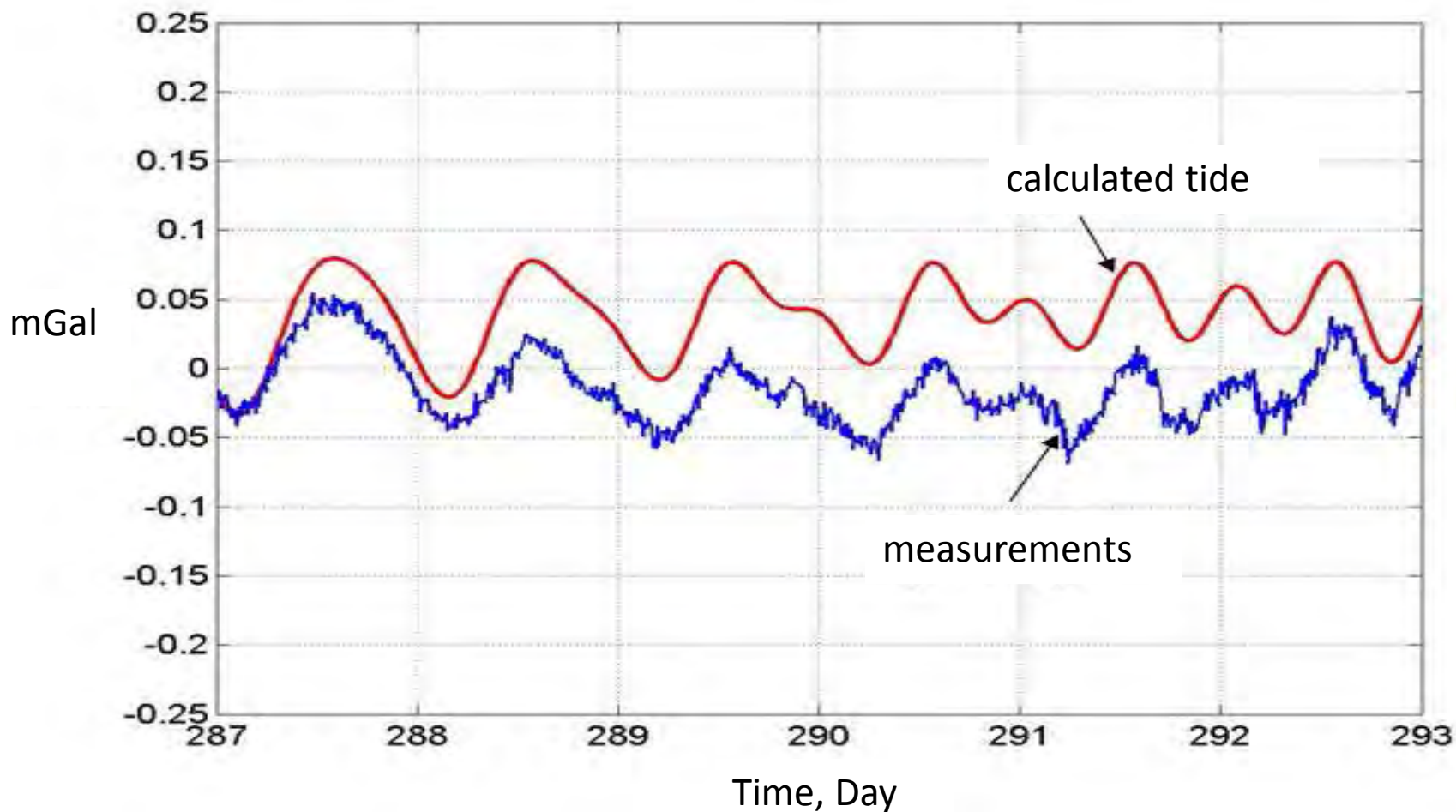




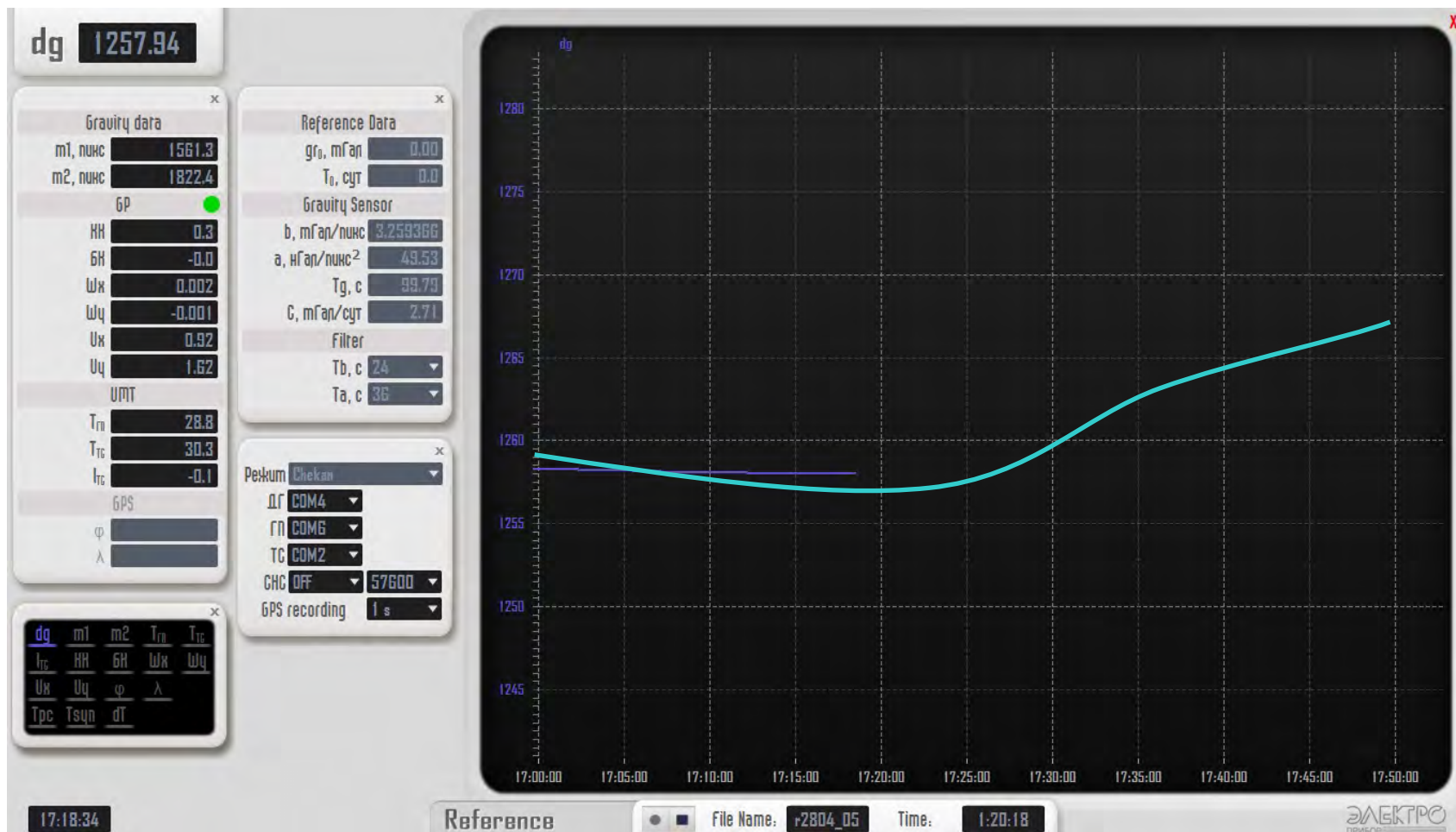
## Bench Tests. Temperature Stability



## Bench Tests. Sensitivity

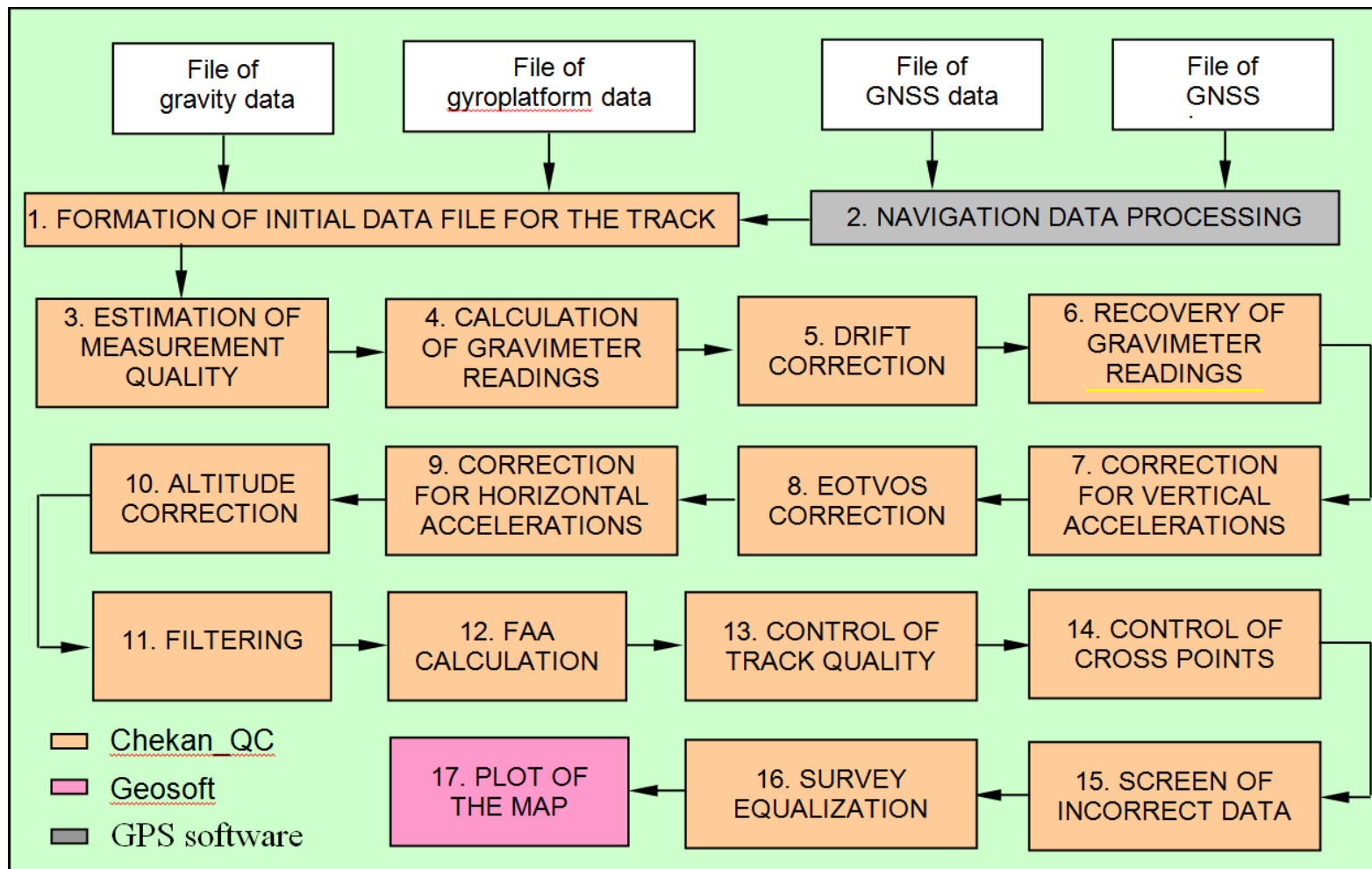


# Real-Time Software

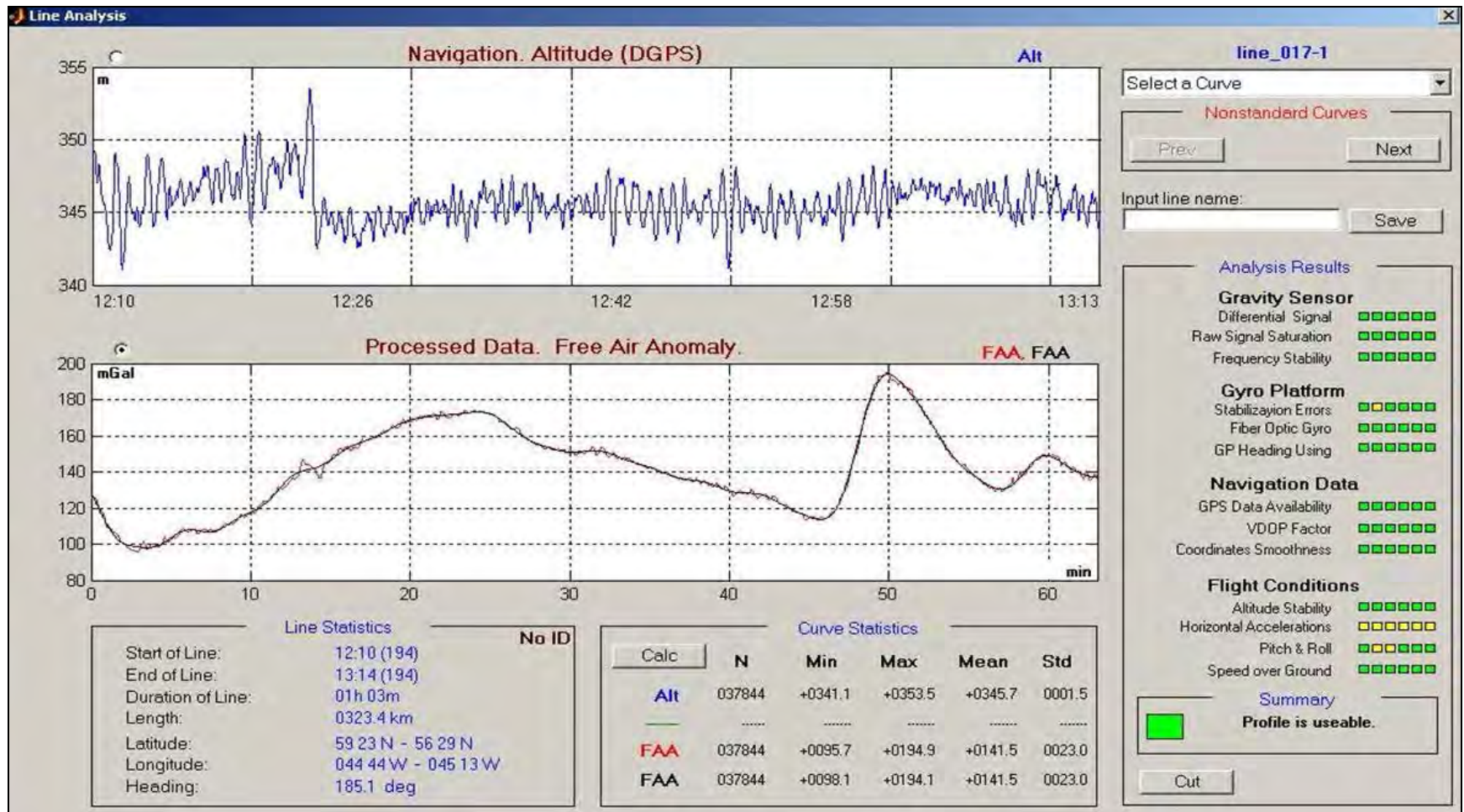




# Flowchart of Data Processing



# Quality Control



# Publications



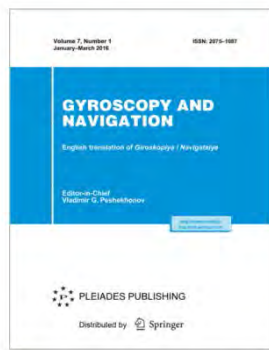
<http://orbit.dtu.dk/en/publications>



<http://www.gfz-potsdam.de/en/section/global-geomonitoring-and-gravity-field/topics/terrestrial-and-airborne-gravimetry/geohalo/>



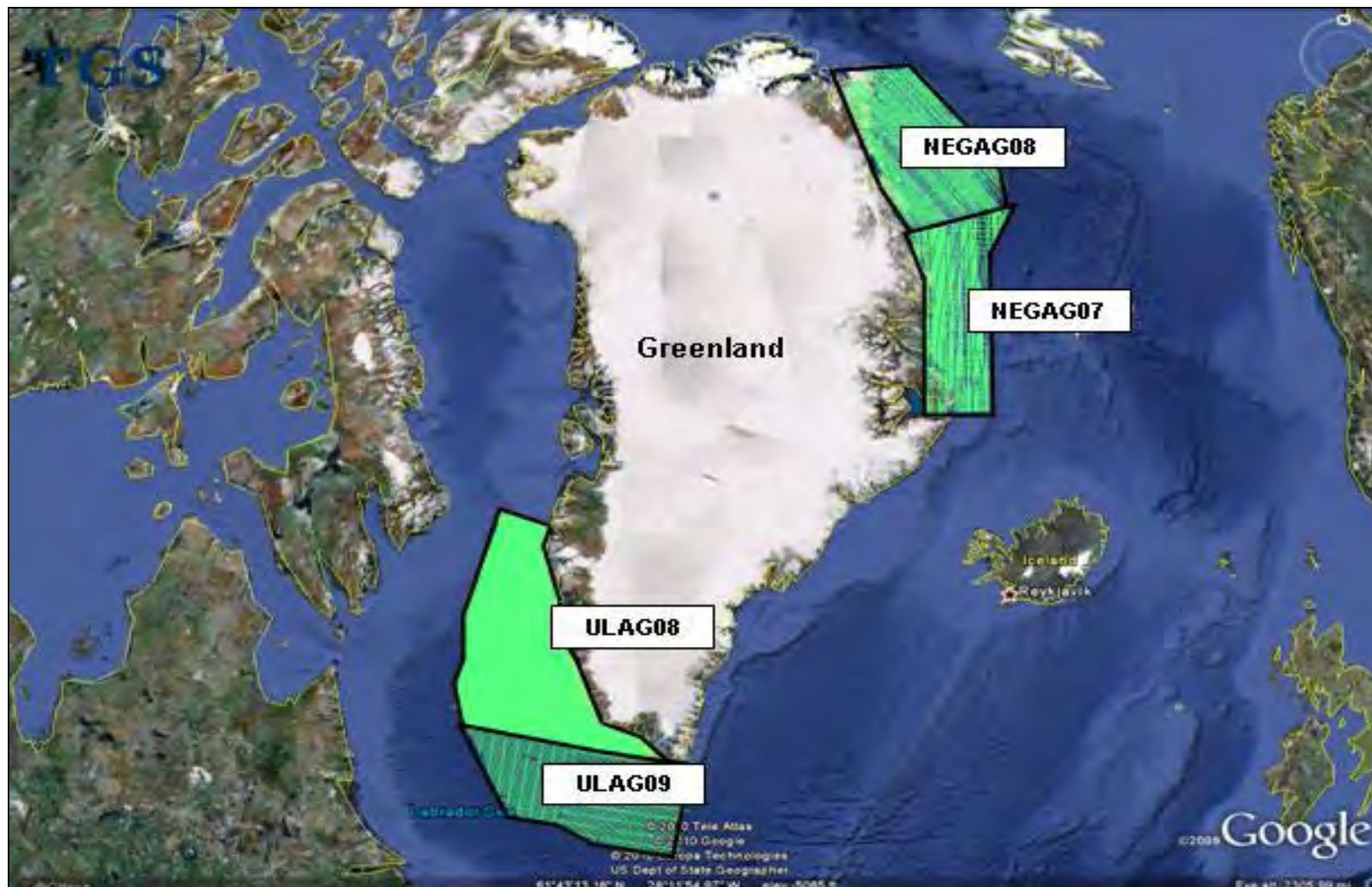
<http://www.gravionic.com/references.html>



<http://www.springer.com/engineering/mechanical+engineering/journal/13140>

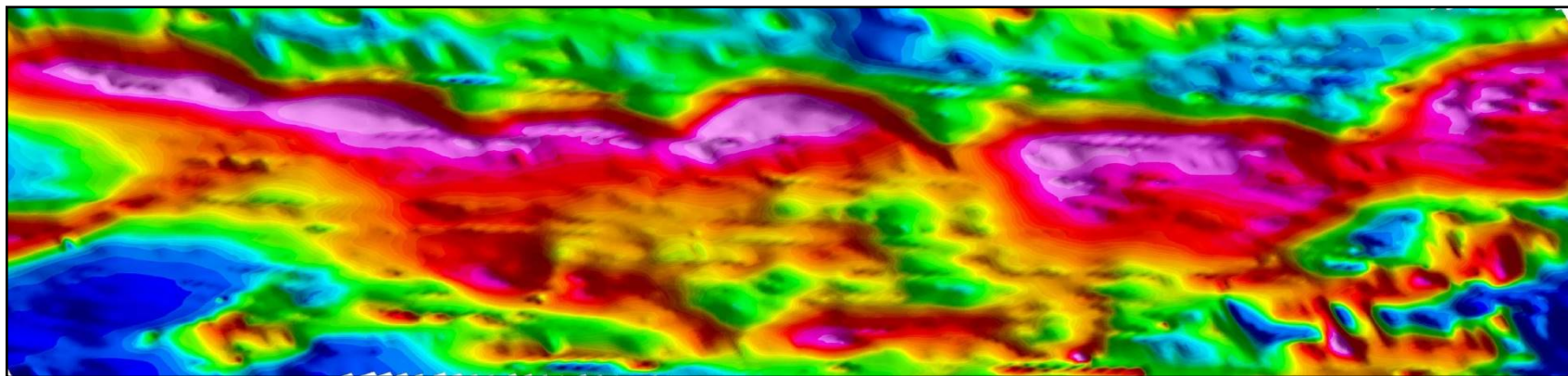


# Surveys Conducted by TGS-NOPEC



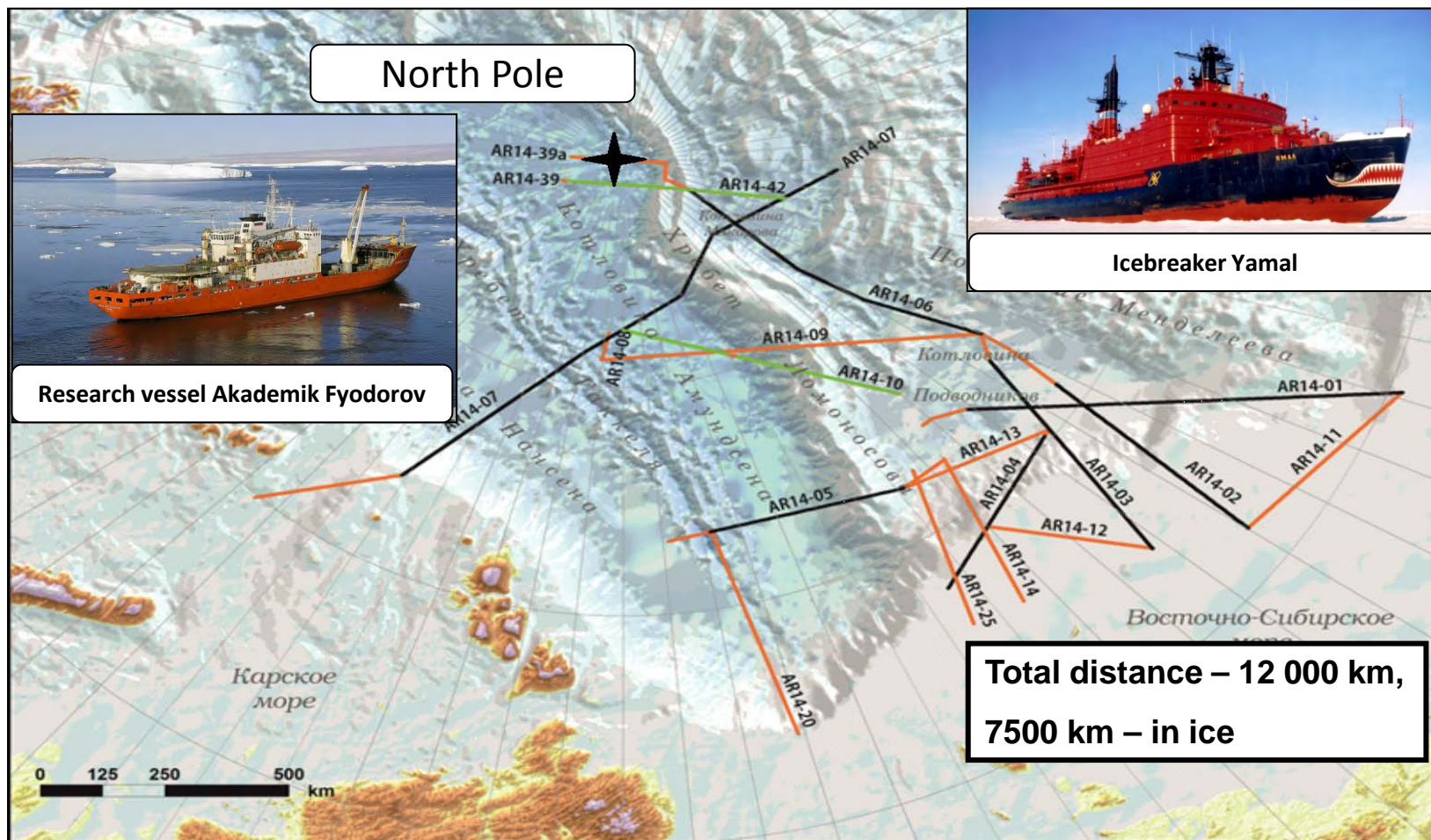
## Surveys Conducted by TGS-NOPEC

| Survey  | Aircraft               | Distance between tracks, km | Total distance, km | Number of cross-points | Spatial resolution | RMS error, mGal |
|---------|------------------------|-----------------------------|--------------------|------------------------|--------------------|-----------------|
| NEGAG07 | Piper Navajo LN-NPZ    | 4 / 20                      | 34319              | 748                    | ~7 km              | 0,87            |
| NEGAG08 | Twin Otter DH-6        | 4 / 40                      | 49776              | >1000                  | ~7 km              | 0,77            |
| ULAG08  | Piper Navajo LN-NPZ    | 4 / 40                      | 50684              | >1000                  | ~7 km              | 0,70            |
| ULAG09  | Beechcraft King Air 90 | 8 / 40                      | 39897              | >2100                  | ~7 km              | 0,70            |



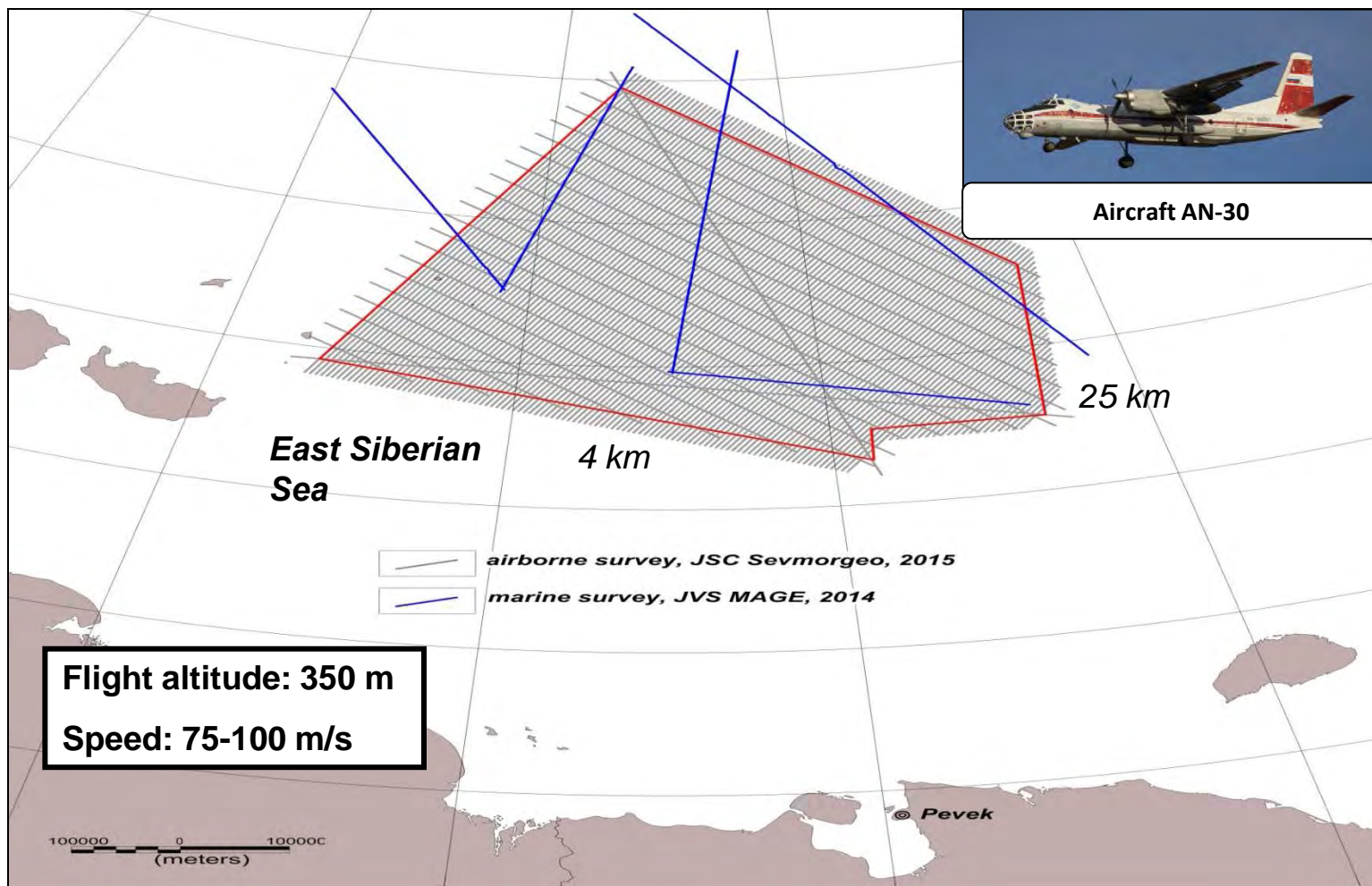


# Shipborne Survey in the Arctic Basin

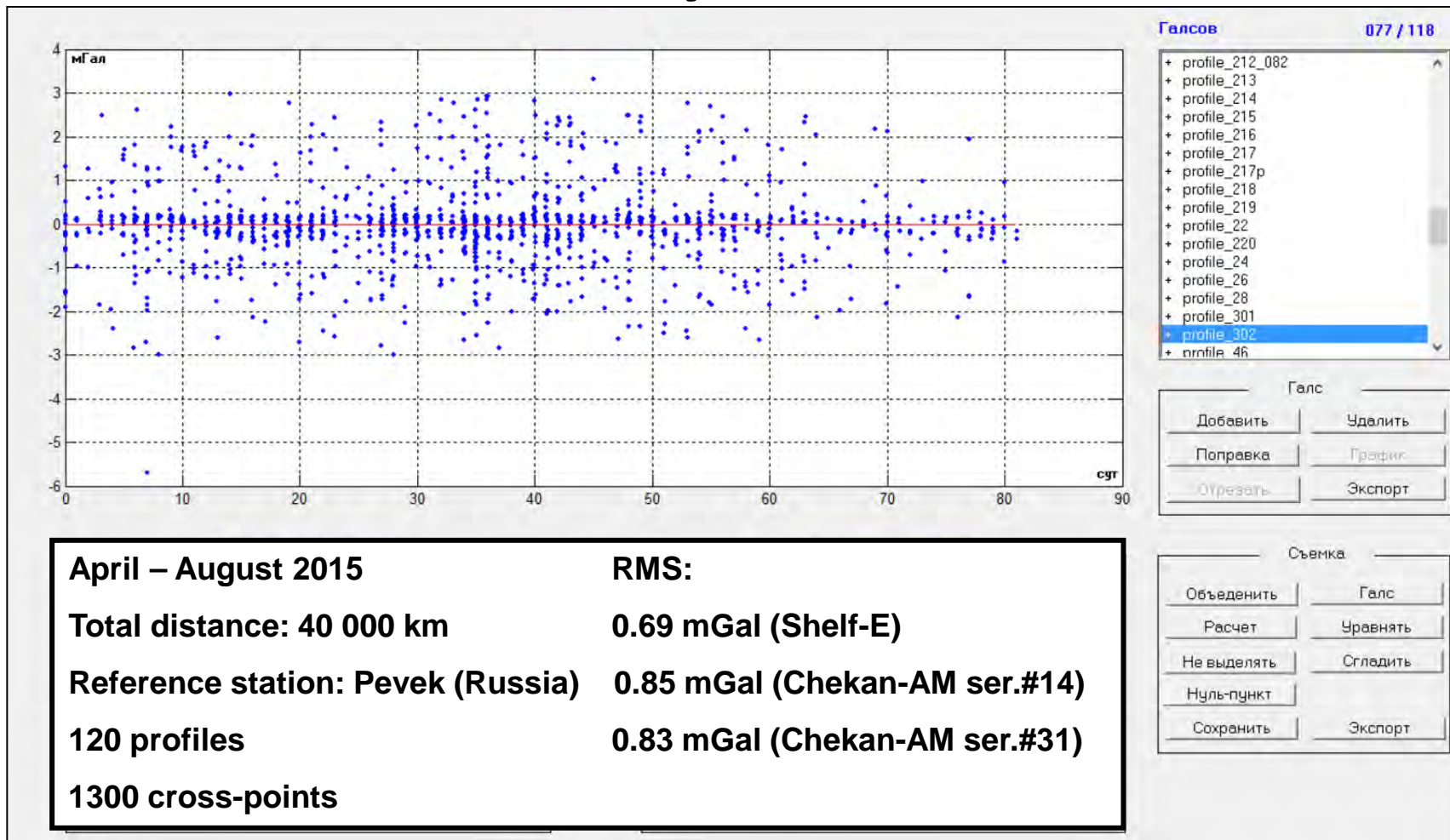




# Airborne Survey in the Arctic Basin

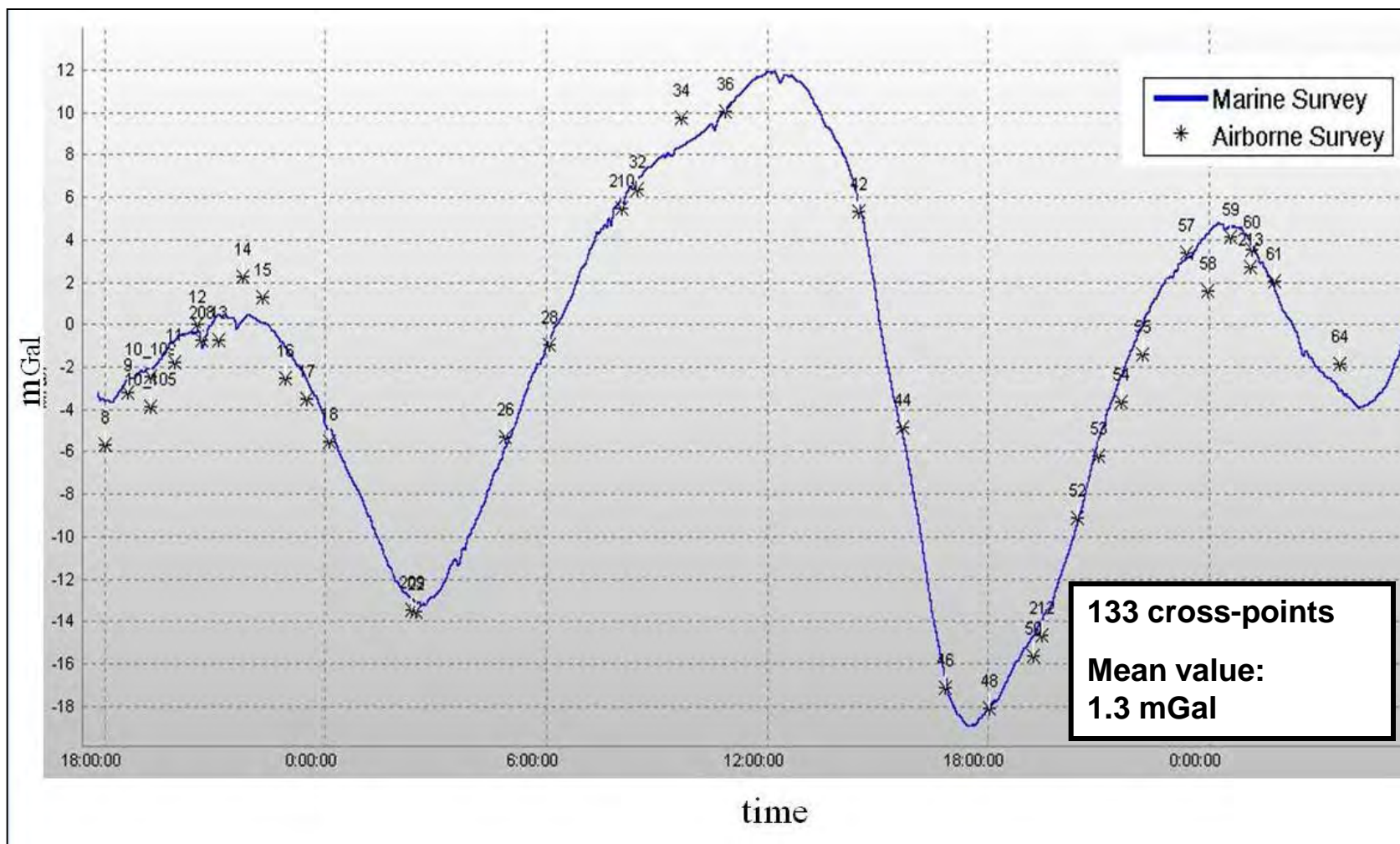


# Airborne Survey in the Arctic Basin





# Survey in the Arctic Basin





# **Thank you for your attention!**

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