Abstract

More than 15MM gravity and magnetic data points were collected in Alaska between 1960 and 1996. These potential field data were collected by public agencies, academic groups, and industry in multiple areas during multiple campaigns. Multiple permittees collected marine gravity, marine magnetic, aeromagnetic, and/or aerogravity data (collectively, potential field data) in nearly 100 permits across all 15 Alaska Outer Continental Shelf (OCS) planning areas. After collection, much of the data acquired by industry in the OCS under permits were selected by BOEM (previously the MMS and USGS - Conservation Division). Much of the public data were released by the USGS, and the academic data are available from various sources. However, the data collected by industry under the OCS permitting process and held by BOEM has not previously been assembled into a complete dataset or made available publicly. The potential field data previously collected in the Alaska OCS were identified, collected, preprocessed, and loaded to a GIS system. This enabled comparison of adjacent data from different permits (surveys), highlighting different processing assumptions between surveys, as well as varying interpretation methodologies. Data fields varied greatly for each permit, with some datasets having only limited values (i.e. only Bouguer corrected density values) while others were nearly complete, with original field data, Eötvös corrected, Free Air, and Bouguer values. Processing assumptions applied to the data also vary significantly between permit datasets; wherever possible, raw (field) data were used to integrate each permit dataset into the greater, regional dataset. An iterative process was applied to organizing and preprocessing the data, using learnings from permit data supplied by the same permitee in a similar timeframe to attempt to reconstruct as much information as possible. These data were then merged to minimize mistakes between permit datasets and create a regional OCS dataset. This OCS dataset was then integrated with the public on-shore potential field datasets to create an Alaska-wide, regional set of gravity, magnetic, and aeromagnetic data. Under federal regulation (30 CFR 551.14), such data are available for release 25 years after issuance of the permit authorizing their collection. This regional integration of potential field data from multiple permits will provide a framework for further exploration and scientific study in the Alaska OCS and the Arctic.
Who is BOEM?

- **Agency of the Department of the Interior**
- **Manage the Outer Continental Shelf (OCS)**
  - Oil and Gas
  - Renewable Energy
  - Mineral Resources
- **Ensure environmental and economic E&P**
  - Responsible Stewardship
  - Science-Informed Decisions
  - Integrity and Ethics
We oversee

- Lease Management
- Exploration Plans
- Environmental Science
- Environmental Analysis
- Resource Evaluation

More than 1B acres in 15 separate planning areas

- 47°N to 75°N (3,100 km)
- 130°W to 167°E (4,200 km)
BOEM AK Resource Evaluation

- **Responsible for**
  - Regulating the collection of geological & geophysical data
  - Assessing Resource potential
  - Ensuring Fair Market Value

- **Since 1964**
  - 716 permits
  - 906 data types
OCS Data Lifecycle

Permitted → Collected & Processed → Inspected → Selected → Retained → Released to Public

Interpreted → Scientific Publications → Opportunity Identification → Basin Reports → Fair Market Value → National Assessment

25 years

Permit Count per Alaska Planning Area by Year

Count of Permitting Area

Year:
Focus of this talk is the ‘Weird Data’

- Gravity, Magnetics, Aeromagnetic and Refraction data (G-MAR)

Over the past 15 years, Alaska Region MMS/BOEM has released a series traditional 2D seismic datasets

- Now we are moving forward in releasing the G-MAR data

These data are key to generating new ideas in basin formation, basin structure, seismic imaging and tectonic models
The metadata are organized by permit number
- Year, Permittee, Planning Area

Went through data stores
- Permit Files
- Contract Files
- Paper on Shelves
- Disk Drives
to determine what data were Selected, and media type & location of data & metadata
G-MAR Data Acquired

- 137 permits with Gravity, Magnetic, Aeromagnetic or Refraction data
Types of data and Information

- Lots of analog data and information
- Many of these data have never been integrated
  - Lack of tools
  - Lack of staff

Aeromagnetic Interpretation

Seismic Refraction Surveys

(Werner Deconvolution)
Case Study Introduction – Lower Cook Inlet

- **Upper Cook Inlet**
  - Has been producing since 1950s
    - 1.3 BBO/7.5T FCG
  - Similar rocks in LCI

- **Dataset includes**
  - Aeromag (2D horizontal)
  - One well (1D high res)
  - Refraction Data (1D low res)
  - Poor quality 2D (2D vertical)

- **Want to analyze basin potential**
  - First-order structure
  - Kitchen presence
  - Reservoir quantity
    - Velocity as gross proxy for porosity
Shelikof Strait Refraction Data

Data from USGS OFR 78-0368, interpretation by Unger
Shelikof Strait Isovelocity Model

Data from USGS OFR 78-0368, interpretation by Unger
Aeromag Integration

**SB77-23**
- Aeromag Bsmnt 4,500'
- Aeromag ShlwEvnt 2000'
- SW NE

**SB77-25**
- SB77-26
- 200km
- WB
- 1.89
- 1.92
- 2.18
- 3.16
- 2.86
- 5.12

**SB77-28**
- Aeromag Bsmnt 4,500'
- Aeromag ShlwEvnt 5000'
- WB
- 1.95

**SB77-29**
- Aeromag Bsmnt 10,000'
- Aeromag ShlwEvnt 2000'
- WB
- 1.68
- 2.47
- 3.25
- 2.92
- 2000m

**SB77-30**
- 3000m
- 4000m
- 5000m
- 5.03
- 3.86
- 5.72
Next Steps

- Focus on specific areas to develop workflows
  - Cook Inlet
  - Beaufort
  - Chukchi

- Basin scale integration
  - Container shape
  - Fill attributes
    - Density
    - Magnetic Field
    - Velocity

- Crustal-scale integration
  - Crustal structure
    - Density
    - Velocity
    - Magnetic field
  - Tectonic models
  - Heat flow (crustal material)
Conclusions

- Significant quantities of G-MAR data collected and selected
- Many of these data have not been recently examined or integrated
- These data can be applied to develop new ideas and opportunities
  - Basin Formation
  - Basin Infill
  - Petroleum System analysis

Looking for partners to work with these data…