Spring 2022

Processing Seismic, Gravity And Magnetic Data Over Diebold Knoll On Juan De Fuca Plate

Md Ariful Islam
University of Nebraska-Lincoln, aislam3@huskers.unl.edu

Irina Filina
University of Nebraska-Lincoln, ifilina2@unl.edu

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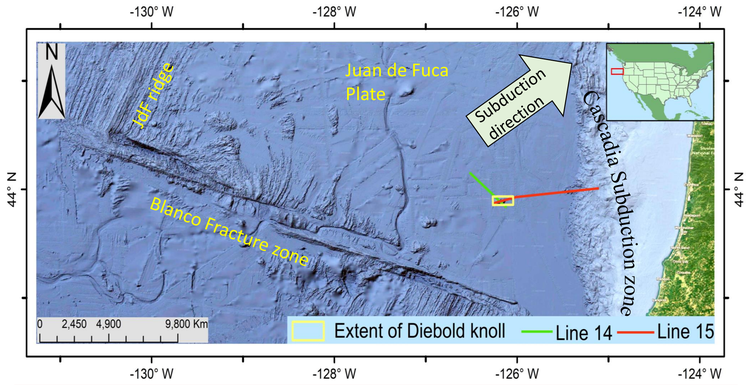
Md Ariful Islam, Irina Filina*

College of Arts and Sciences
DEPARTMENT OF EARTH AND ATMOSPHERIC SCIENCES

Introduction

- The Juan de Fuca (JdF) plate is subducting beneath the North American plate along the Cascadia Subduction Zone (CSZ).
- The CSZ is associated with multiple earthquakes, although compared to other subduction zones, it is less active (Flueh et al., 1998).
- Many studies suggest that subduction will cause major mega-thrust earthquake in near-future, while others oppose this view (Wang and Bilek, 2011).
- This project is focused on the Diebold Knoll on the JdF plate. Various geophysical methods will be integrated to determine its origin and tectonic history.



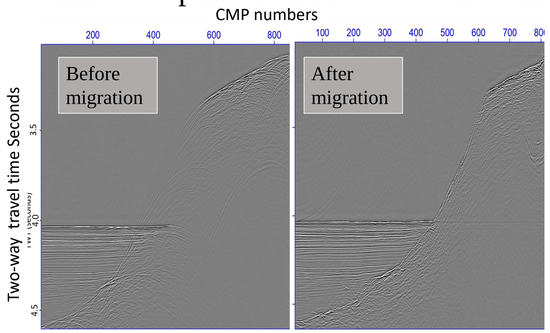
Objectives

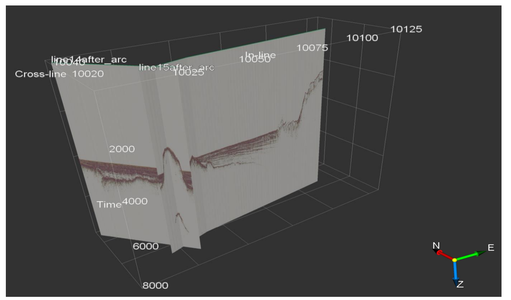
- Determining when and why the seamount formed.
- Derive physical properties (density and magnetic susceptibility) of the seamount and adjacent crust.
- Establish how the seamount's formation affected the surrounding oceanic crust and what were possible sources of magma for the seamount.

Processing seismic, gravity and magnetic data

Seismic Data:

- Two 2D pre-stack seismic reflection profiles from Tominaga et al (2017) over the seamount has been re-processed using open-source processing software SeismicUNIX.
- A simple fixed velocity of 1500m/s was used for NMO correction and migration.
- Seismic refraction data (REF) will be analyzed for seismic velocities of subsurface layers to further improve migration and for conversion from travel-time to depth. OpendTect software will be used for interpretation.

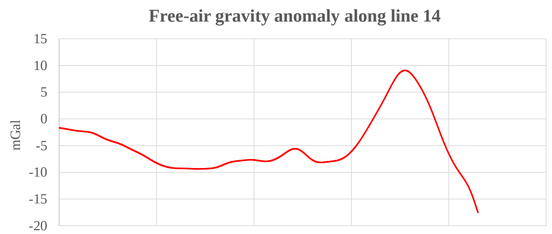




Processed seismic lines 14 & 15 as viewed in OpendTect.

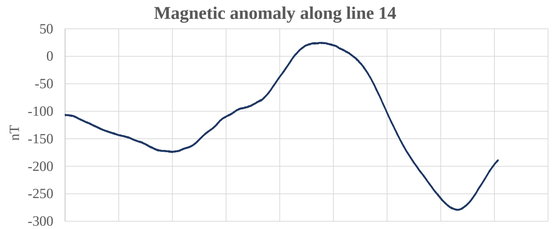
Free-air gravity anomaly:

- Gravity anomaly data from the same survey over the seamount was also processed by applying latitude, eotvos and free-air gravity corrections and consequent filtering.



Magnetic anomaly:

- Theoretical IGRF12 magnetic field was calculated and subtracted from observed magnetic field to determine the magnetic anomaly that will be used to estimate the age of oceanic crust adjacent to the seamount.



Results

- 2D seismic refection data from Tominaga et al. (2017) is processed and will be analyzed.
- Gravity and magnetic anomalies from the same cruise were also processed from raw data and will be used for crustal modelling.
- Ocean drilling data repository of the CSZ is being developed to be used as constraints for geophysical modeling.

Future Research

- Density and magnetic susceptibility as well as structural components of the Diebold Knoll can be used for modelling of subducting seamounts.

References

ADD reference for Refraction

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