



FTG & 2D Seismic Integration in Assam Arakan Fold Thrust & Foreland Belt

*Sulagna Mitra**, Anindya Bandopadhyay, Venkat Kola, Utkarsh Shukla, Priyabrata Chatterjee, Sudhir Mathur,
& Biswanath Ghosh

Cairn Oil & Gas, Vedanta Limited, Sulagna.Mitra@cairnindia.com

Keywords

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Abstract

Assam Arakan basin is one of the major onland producing basins of India. Commercial hydrocarbons are known to occur in Tipam, Barail, Kopili and Sylhet formations, mostly in large structural traps.

Assam Basin is a complex fold thrust-Foreland set up with multiple phases of structural evolutions. The basin is divided into three broad tectonic units such as Assam Foreland basin, Assam-Arakan fold thrust belt and Mikir Hills & Shillong plateau. Assam foreland basin is the sandwiched part mostly covering Brahmaputra and Dhansiri river valley between major thrusts like Himalayan thrust in north, Naga thrust in south, and Mismi thrust in NE. Assam-Arakan fold belt is the thrust-fold system east and south-east of Naga Thrust. Mikir Hills & Shillong Plateau, are two basement uplifts present within the Assam foreland basin in front of the Himalayas, mostly composed of Precambrian granitic and metamorphic rocks.

Considering the complex structural architecture of the Basin & accessibility issues it is critical to evaluate the Basin holistically using pan basin data to identify large structural features tying with outcrop & limited seismic for regional and at times for prospect level work.

Cairn Oil & Gas, Vedanta Limited. has 12 exploration blocks in Assam Arakan Basin, covering an area of >7500 Sq km. Significant part of the area is covered by hills and forests. Thus, acquiring extensive seismic data for exploration over such vast areas within a short span of time has been a challenge. To address the problem, extensive air-born Full Tensor Gradiometry (FTG) & Magnetic survey was carried out by Cairn Oil & Gas in collaboration with Bell Geo across the NE India acreages, during

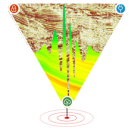
the year 2019 & the same was integrated with all available data including outcrop, available 2D & 3D seismic for regional geological model building, seismic planning & prospect de-risking.

Introduction

The Airborne Gravity data, coupled with acquired and existing 2D Seismic data provided valuable insights in early-stage hydrocarbon exploration. These two geophysical methods, when cumulatively used, helped delineate some major structural features. Although FTG and 2D seismic data focus on capturing different physical properties of the subsurface, when cumulatively interpreted these two datasets, create a more comprehensive subsurface model, combining both density and acoustic/elastic property information. The correlation of FTG anomalies with seismic reflections provided a more accurate interpretation of the geometry of various structural features. Combining Airborne Gravity and seismic data allowed for a more thorough evaluation of prospects and aided in greater level of de-risking

Theory and/or Method

FTG method measured the variations in the gravitational field in all three dimensions i.e. the tensor components at a specific location on the Earth's surface. In FTG, measurement is not restricted only to vertical component of gravity field instead it measures all 9 gravity tensors or 3 components in each coordinate direction (x, y, z). It uses six pairs of accelerometers to measure the rate of change of the gravity field in all three directions in high resolution. The instrument consists of twelve accelerometers with four accelerometers located on each of three slow spinning disks mounted on an airborne system. Each pair of accelerometers measures the rate of



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change in acceleration converse to conventional gravity survey which measures acceleration.

Around 12,000 lkm of FTG data was acquired covering an area of about ~8000 sq. km in the Assam Basin of India. Being a non-invasive geophysical method, FTG did not require direct contact with the subsurface and hence helped in fast-tracking reconnaissance exploration in difficult terrains.

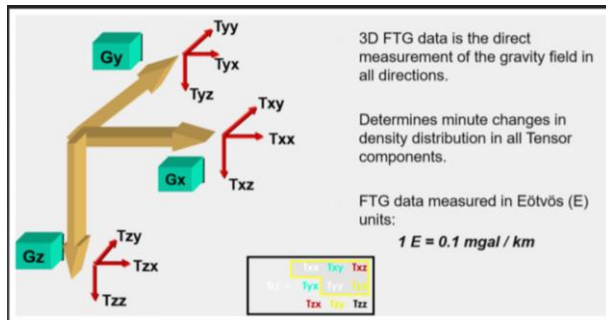


Figure-1: FTG Tensor description

Interpretation & Examples

Processed & spectral filter applied to different components of FTG data show quite considerable match with structural pattern (fold thrust belt) & available seismic in this area.

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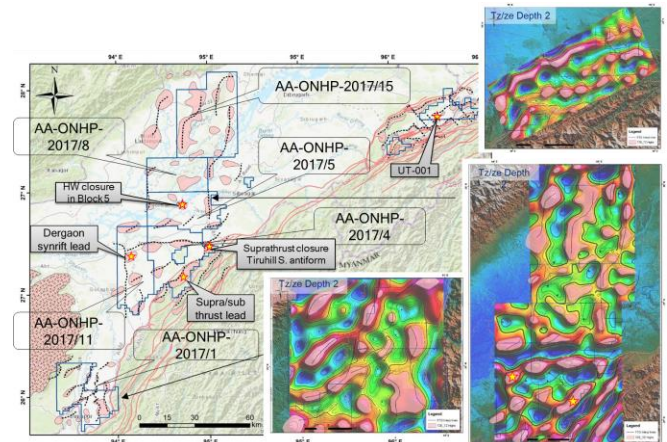


Figure-2: Regional Study results from FTG with possible gravity/structural highs (?)

Conclusions

Airborne Gravity survey fast-tracked the exploration life cycle in Assam basin as targeted seismic acquisition was planned based on Airborne Gravity data to de-risk the prospects to drill ready stage. Correlation of FTG data with available seismic data not only reduced the API cycle by 12-18 months but also helped prioritize larger structural leads in the basin specially in Fold-thrust belt structures and Jorhat strike slip area.

Acknowledgments

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Reference

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