



جابتن اوکور  
SURVEY DEPARTMENT  
MINISTRY OF DEVELOPMENT  
BRUNEI DARUSSALAM



BRUNEI INSTITUTION OF GEOMATICS  
BRUNEI DARUSSALAM

# Continuous Professional Development (CPD) Seminar

- IN CONJUNCTION WITH -



23 SYA'BAN 1443H / 26 MARCH 2022

DEWAN INDERA PAHLAWAN, MINISTRY OF DEVELOPMENT

Jointly organised by:

Survey Department, Ministry of Development

&

Brunei Institution of Geomatics



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# Continuous Professional Development (CPD) Seminar

23 SYA'BAN 1443H / 26 MARCH 2022

DEWAN INDERA PAHLAWAN, MINISTRY OF DEVELOPMENT

TIME	PROGRAM
7.45 – 8.15 am	Arrival of Participants & Registration
8.15 am	Arrival of Yang Mulia, Heads of Department, Yang Mulia, Director General of Public Works, Yang Mulia, Deputy Permanent Secretaries and Yang Mulia, Permanent Secretaries of Ministry of Development, Brunei Darussalam
8.25 am	Arrival of the Guest of Honour Yang Mulia, Dato Seri Paduka Ar. Awang Haji Marzuke bin Haji Mohsin Deputy Minister of Development Brunei Darussalam
8.30 am	Recital of Surah Al-Fatihah & Doa Selamat
8.35 am	Welcoming remarks by the President of B.I.G. Yang Mulia, Haji Ali Bakar bin Haji Kasim
8.45 am	Speech by the Guest of Honour
9.00 am	<b>The Potential of Using Satellite Altimetry for Sea Level Study in Brunei Darussalam</b> Haji Muhammad Hifney bin Haji Abdul Rahman
9.25 am	<b>Assessment of Local Geoid in Brunei Darussalam</b> Muhammad Abdul Hadi Bin Haseri
9.50 am	<b>Where am I?</b> Mark Beloeil-Smith
	Question & Answer Session
	B.I.G. Diploma Presentation
	Recital of Surah Al-Asr
	Group Photo
	End of Event

## Our line of speakers...



### ***The Potential of Using Satellite Altimetry for Sea Level Study in Brunei Darussalam***

#### **Haji Muhammad Hifney bin Haji Abd Rahman**

- Senior Surveyor, Cadastral Section, Survey Department
- MSc in Geospatial & Mapping Science
- B.I.G. Professional Member
- Secretary of Land Surveying & GIS Mapping Section (2021-2023)



### ***Assessment of Local Geoid in Brunei Darussalam***

#### **Muhammad Abdul Hadi bin Haseri**

- Surveyor, Geodetic Section, Survey Department
- BSc in Surveying & Mapping Science
- *Applying as a B.I.G. member*



### ***Where am I?***

#### **Mark Beloeil-Smith**

- Head of Geomatics & Metrocean, Brunei Shell Petroleum Sdn. Bhd
- MSc in Hydrography
- MBA (Master of Business Administration),
- CAT 'A' Surveyor
- BSc (HONS) in Surveying & Mapping Science
- Fellow, Royal Institute of Chartered Surveyors (2012)
- *Applying as a B.I.G. member*

## Moderator for the Q & A Session...



### **Abang Mohammad Syazwan bin Abang Abas**

- Surveyor, Survey Department
- Head of the Temburong District Survey Branch
- BSc in Surveying & Mapping Science
- B.I.G. Graduate Member



## ***The Potential of Using Satellite Altimetry for Sea Level Study in Brunei Darussalam***

Haji Muhammad Hifney bin Haji Abd Rahman

*He has presented this paper during the FIG Working Week in Hanoi, Vietnam in 2019 and the 15<sup>th</sup> South East Asia Survey Congress 2019 in Darwin, Australia where he was awarded the Best Abstract Award SEASC 2019 by the Surveying and Spatial Sciences Institute, Remote Sensing & Photogrammetry Commission.*

### **Abstract**

The rise of the global sea level due to the global warming has caused concerns to the Earth's population, especially in the coastal zone. According to experts, the global mean sea level is expected to continuously rise at a certain rate which makes it important to understand the amount of sea level rise globally and regionally for future planning such as erosion and flood mitigation for coastal management. Brunei is one of the countries that will be affected by the sea level rise due to its geographical location. Currently, the sea level determination of Brunei only depends on the installed tide gauges. With such limitation in terms of knowledge and study of the satellite altimetry in Brunei makes this project an important research and development for the country.

This project aims to investigate the potential of using the satellite altimetry data for the study of the sea level change in Brunei. Jason-1 and Jason-2 satellite altimetry mission data near the Brunei coastline were used in this project investigation and the sea level trend with time series sea level anomaly were then plotted by using Python programming software for further analysis. The altimetry data was processed by using the DTU15MSS model which is the latest release model for global high resolution mean sea surface and the sea level trend of each point from the satellite track was computed by using the Robust Regression method. From the results of the satellite mission between 2002-2016 shows that the sea level trend in the Brunei coastline was rising approximately at the rate of 5.5 mm/year and it is expected to continue to rise in the future. There were previous studies that were done in the same study area which do agree with the with the rate of the sea level rise.

The results from this project, however, had some limitations based on the satellite tracks where the tracks were not exactly located at the Brunei coastline which urged the author to perform a further study by using other available satellite mission that covers the Brunei coastline is essential in the future. Other further studies such as data validation by making a comparison with the tide gauge data will be useful to understand if the sea level rise is affected by the vertical land motion. The results from this project will be useful for Brunei coastal management to properly plan for erosion and flood risk in the near future.



## ***Assessment of Local Geoid in Brunei Darussalam***

Muhammad Abdul Hadi bin Haseri

### **Abstract**

Brunei State Datum 88 (BSD88) is the vertical datum of Brunei Darussalam providing elevations referenced to Mean Sea Level (MSL) derived empirically from several tide gauges. In 2009, the country transitioned into a geocentric horizontal datum. In addition, a local geoid was developed to modernise heights therefore elevations are referenced to the geoid using GNSS. The geoid and MSL is said to coincide with each other hence the need to assess the local geoid and is derived through different approaches. This assessment will enable the country to unify the vertical and horizontal network thus providing a reliable 3D reference frame network (Figure 1). GNSS levelling is the preferred approach to densify GNSS observations on benchmarks therefore computing the datum offset between BSD88 and the local geoid.

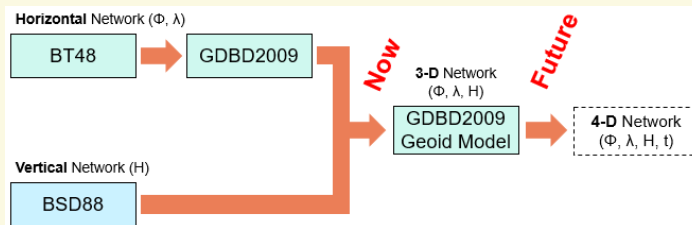


Figure 1. Unification of horizontal and vertical networks

The data is analysed for the whole of Brunei through mathematical equations represented in Root Mean Square (RMS) in particular, the observation residuals and surface accuracy of the local geoid. This observation residual is also known as the Sea Surface Topography (SST) as using actual observations gives a measure of misfit. Surface accuracy is essentially how well fitted is the local geoid is to MSL. Results from both analyses are as expected, relatively acceptable however large variance separation of MSL and geoid is detected in Temburong which is unanticipated. The geoid model is found to be fitted bias towards Brunei Muara, Tutong and Kuala Belait during the modernisation of heights in 2009.

In conclusion, vertical control in Brunei Darussalam are indefinite as multiple height systems are being referred to different equipotential surface. The densification of GNSS on benchmarks is integrated in the new spatial reference system and are essential in monitoring crustal movements. Moving forward, further adjustments of the local geoid is necessary specifically to include Temburong district hence paving way for promising future geodetic applications.



## ***Where am I?***

Mark Beloeil-Smith

### **Abstract**

Knowing 'where am I?' is fundamental to all Geomaticians. Even better, to know where you are AND in which coordinate reference framework. Without the knowledge of this, the value of the measurement made is quickly eroded.

Working on land gives us tangible reference points – be they relative (a building corner, a benchmark etc) and position localisation is clearer. On water, these clues are no longer present, and the geomatician needs to be sure the elements that form that position fix are precise.

Modern positioning techniques are abundant – GNSS positioning in smart phones gives us access to instantaneous position at our fingertips. When I first worked offshore, we carried a sextant, theodolite and other tools to help us fix position. I am still more comfortable measuring a sun azimuth with a sextant than other tools.

It is true that, in the course of the history of navigation, precision was not important. Seafarers were better navigators when the 'longitude' problem was solved with more precise clocks. Now we are looking for precision in a world where the ground-based coordinate systems move and the GNSS reference frame remains fixed. Modern geodesy has helped us understand the dynamic nature of our positional demands – and positions in x,y,z are now globally possible to a level of precision 30 years ago were thought impossible.

Let me take an example from Brunei. Positioning a Drilling Rig, that displaces 11,500m<sup>3</sup> of water in the correct position offshore in water depths of 70m requires several checks, verifications and measurements to achieve the required precision. The position of the rig comes from the position derived of the antenna in ITRF. That position is 'corrected' using reference stations many hundreds of kilometres away. That position is translated to the rotary table of the rig, some 50+ metres away using the gyrocompass and a measured offset. The gyrocompass derives an azimuth relative to True North – grid convergence is needed. The gyrocompass also needs a correction to align it to the rig centreline – a sun azimuth needs to be observed to correct for misalignment. The measurement from the antenna to the rotary table needs to be measured, but there is never line-of-sight.

None of these steps are difficult, and most surveyors know the process. But a misstep can be difficult to spot and can potentially mean the target is missed. The consequences can be catastrophic – financially, exposure to the people on the rig and the environmental fall out too.


Rig moves are these days controlled from onshore by people not on the rig. The age of gaming is slowly coming into the offshore survey world. I am undecided if this is a good or bad thing.


What I am sure about is this: basic knowledge, understanding how a position is formed and knowing how to confirm and validate the 'where' allows us to do the 'why' more readily. Surveyors can never become complacent in their knowledge – CPD and knowing what you know must be the bedrock of their career.



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