



Towards the development of a methodology for vertical separation models in the Caribbean

Dr. Dexter Davis, Cassandra Nanlal and Dr. Michael Sutherland

OVERVIEW

- Introduction
- Vertical Separation Models
- Methodology
- Project Site
- Benefits
- Conclusion

INTRODUCTION

- Small Island Developing States (SIDS) are ecologically and economically fragile and vulnerable. For SIDS the ocean and coastal environment is of strategic importance and constitutes a valuable development resource.
- There is increased pressure on coastal environments with rapid changes in the global climate and coastal population increase.

INTRODUCTION

- The implementation of coastal zone management, monitoring and defence mechanisms are at a critical stage of development in the Caribbean.
- These initiatives require the modelling and integrating of datasets across the land-sea interface.
- A major obstacle that presents itself, is the lack of a consistent vertical datum across the land-sea interface.

INTRODUCTION

- Elevation datasets cannot be compared or integrated unless the same vertical datum is used, and considerations are made for spatial and temporal variations.
- Different vertical datums are used at sea and on land. No simple seamless means of transforming between them.
- The development of a separation model would be beneficial to the afore mentioned initiatives and be a crucial part of decision support.

VERTICAL SEPARATION MODELS

- Types of vertical surfaces commonly used include
 - ✓ Tidal – MLS, Chart Datum
 - ✓ Ellipsoidal – WGS84, GRS80
 - ✓ Equipotential – Geoid
- Separation models define the relationship between different vertical reference surfaces

VERTICAL SEPARATION MODELS

- Although the conditions in the Caribbean are unique, this vertical datum problem exists all over the world.

- Separation models have been developed in
 - ✓ Canada (*O'Riley, 1996*),
 - ✓ the UK (*Ziebart et al 2007*) – VORF,
 - ✓ the US (*Myers et al 2005*) – VDatum and
 - ✓ Australia (*Martin and Broadbent, 2004*).

VERTICAL SEPARATION MODELS

- | | |
|--|--|
| <ul style="list-style-type: none">➤ MODEL DESIGN IS DEPENDENT ON:<ul style="list-style-type: none">• Intended use• Scale of project• Available resources | <ul style="list-style-type: none">➤ MODEL ACCURACY IS SENSITIVE TO:<ul style="list-style-type: none">• Accuracy and currency of data used• Accuracy of interpolation techniques applied |
|--|--|

METHODOLOGY

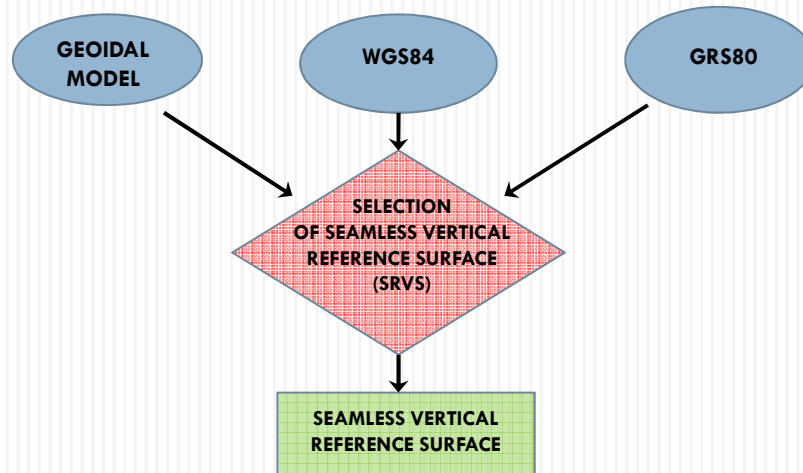
- In developing the methodology for the Caribbean, several considerations are taken into account
- **Coverage:** total area to be covered, onshore/offshore
- **Resources Available:** lack of long term tidal data, little data available, equipment
- **Required Accuracy:** >5cm

METHODOLOGY

- **Intended Use:** Coastal engineering and planning projects
- **Maintenance:** ease of maintaining and updating the system
- **Applicability/ Scale:** Methodology created for implementation along coastlines or small areas where conditions are relatively uniform.

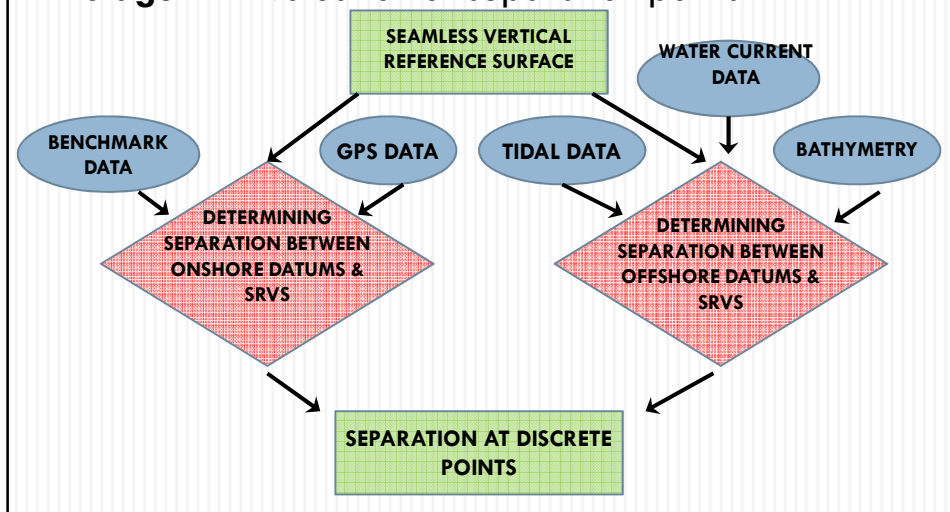
METHODOLOGY

> Stage 1 – Seamless vertical reference surface



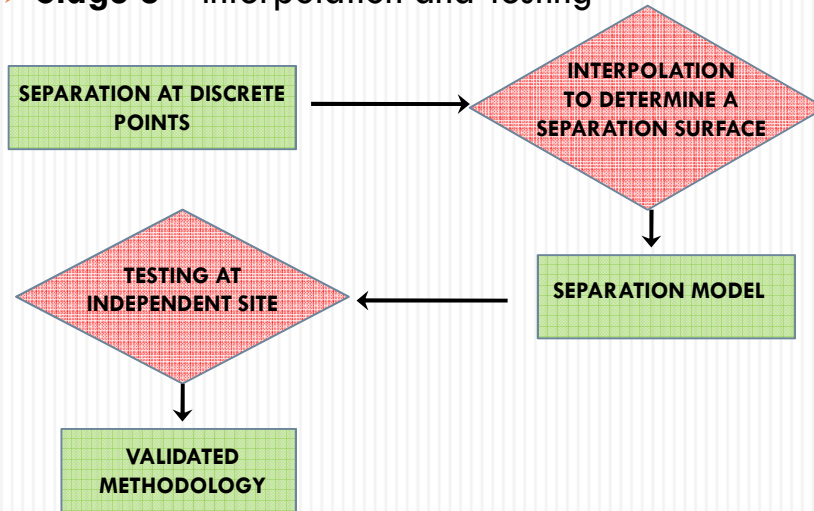
METHODOLOGY

> Stage 2 – Evaluation of separation points

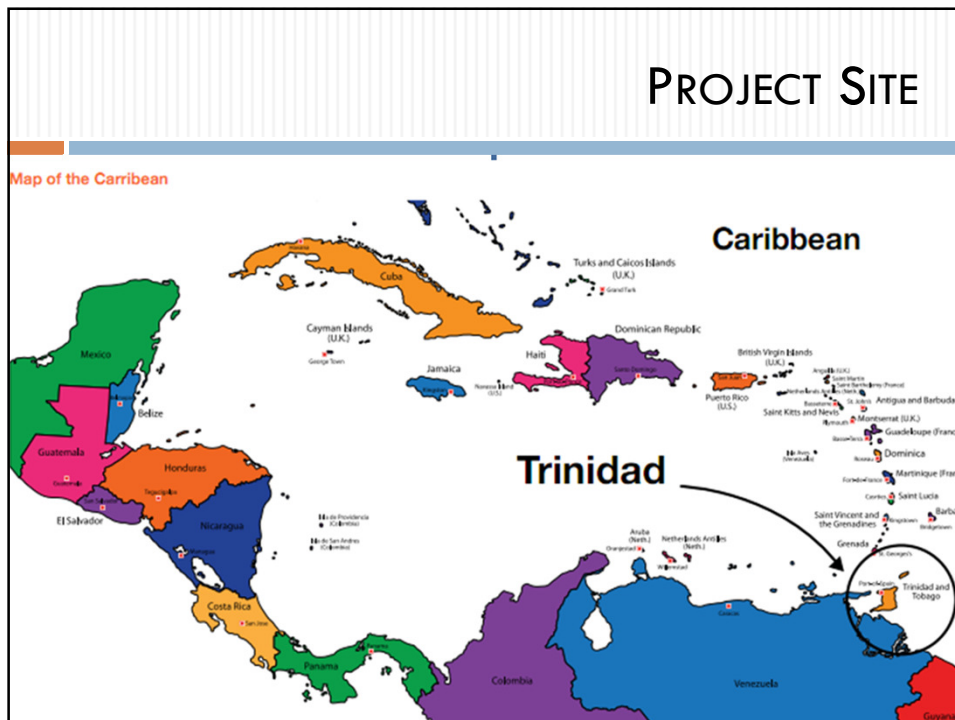


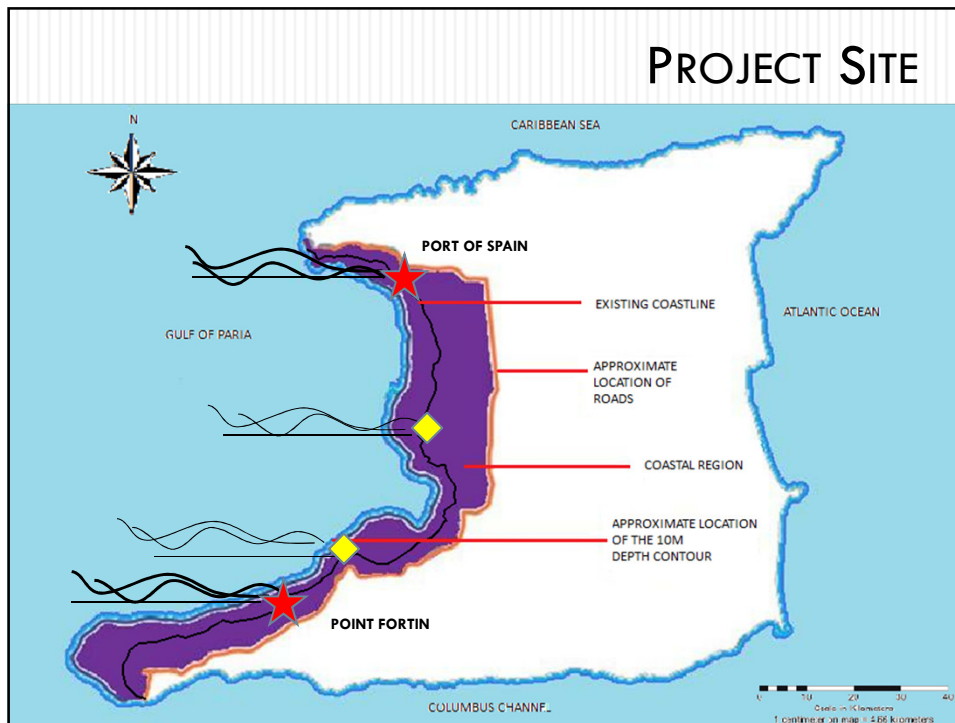
METHODOLOGY

Stage 3 – Interpolation and Testing



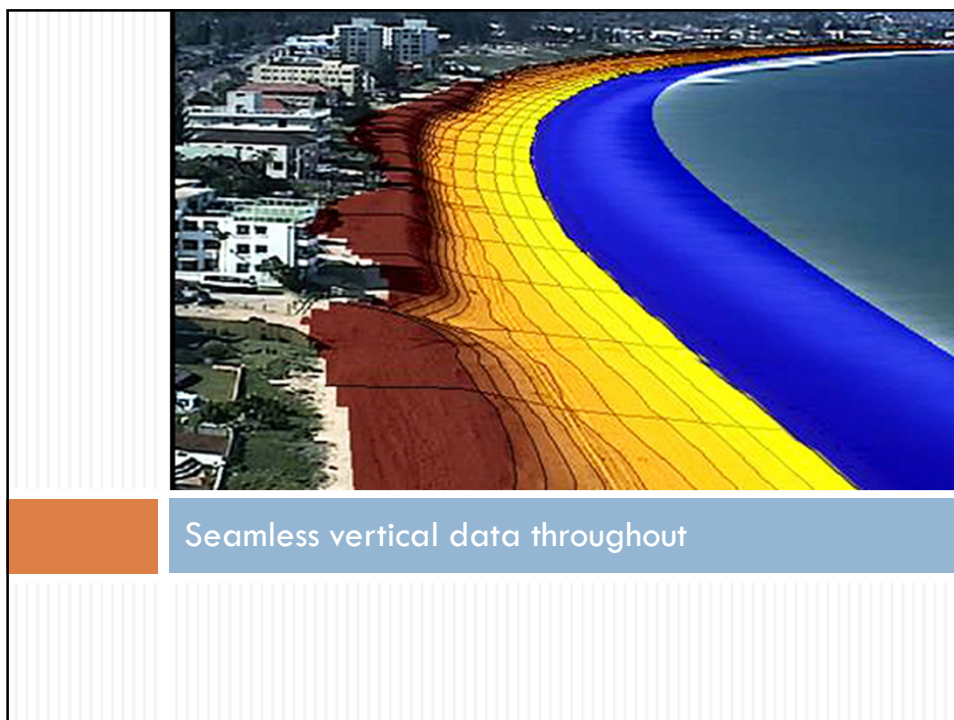
PROJECT SITE





BENEFITS

- More accurate coastal data, which leads to more sound coastal engineering and planning.
- More efficient bathymetric and topographic surveys in the coastal zone.
- Allow for the use of modern technology in hydrographic surveys.
- Allow for the use of a wider range of datasets.
- Establish the needed connection between MSL and the CORS network in Trinidad.



CONCLUSION

- The lack of a consistent vertical datum across the land-sea interface has to be addressed in order to facilitate the seamless amalgamation of land and sea data.
- For the coastal zone and the Caribbean at large this could lead to better decision making and support better policies.

CONCLUSION

- With global climate change, increasing advances in surveying technology and the need for integration and amalgamation of survey data from across the land-sea interface and across regions, it is the opportune time for such a development.