

Dexter DAVIS, Trinidad & Tobago
Michael SUTHERLAND, Canada
Sandesh JAGGAN, Trinidad & Tobago

AUGMENTING TIDE GAUGE DATA WITH SATELLITE ALTIMETRY IN THE OBSERVATION OF SEA LEVEL RISE IN THE CARIBBEAN

Dexter DAVIS, UWI , Trinidad & Tobago
Michael SUTHERLAND, C-FOAM, Canada
Sandesh JAGGAN, UWI, Trinidad & Tobago

The XXIV FIG International Congress 2010
Facing the Challenges – Building the Capacity

Introduction

- Warming of the climate is unequivocal.
- Increased sea levels are consistent with global temperature increases.

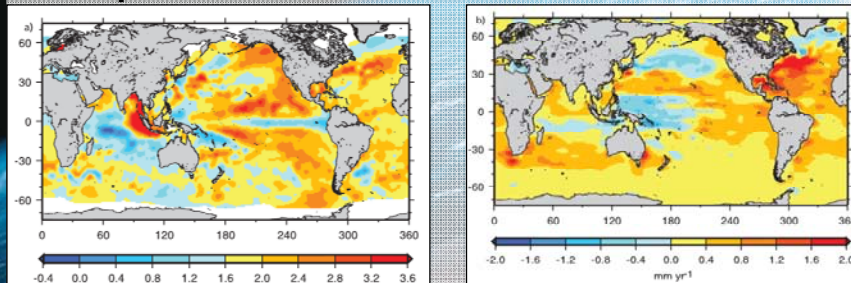


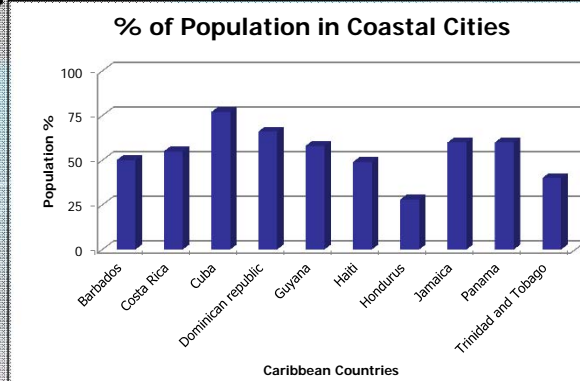
Figure 1 - The geographic distribution of sea level rise trends using tide gauges and satellite altimetry (left) and thermal expansion from 1955 to 2003 (right) (after Bindoff and Willebrand 2007)

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

Sea Level Rise Impacts

- Global sea level rise impacts millions of lives within the coastal zone with small island states most at risk.

Figure 2 -
Percentage of
populations living
in Caribbean &
Central American
coastal cities
(based on UNEP
census data for the
year 2000)



The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

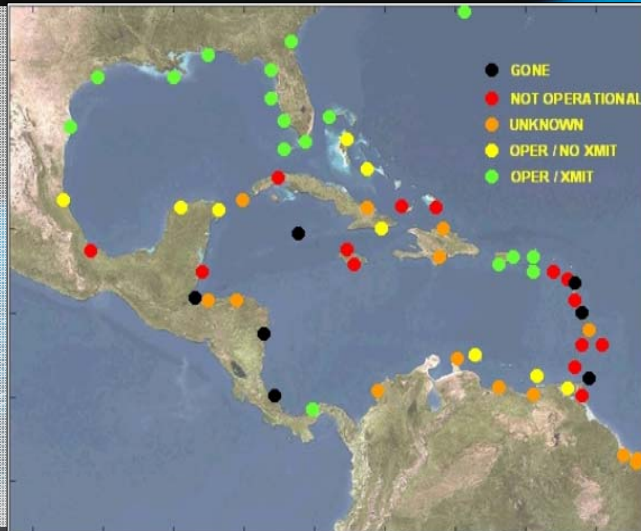
Caribbean SLR monitoring

- Over the past 20 years, some 70 sea level gauge stations have been installed in the Caribbean Sea
 - Caribbean Planning for Adaptation to Global Climate Change (CPACC),
 - RONMAC (Water Level Observation Network for Latin America),
 - NOAA and other locally and internationally-funded programs.
- However, only 44 of these stations have been identified as functioning (2009).

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

Caribbean SLR monitoring

Figure 3 -
Distribution of
Tide gauges in
the Caribbean
region (Henson
2006)



The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

Caribbean SLR monitoring

- Only location where records of suitable length for both sea level and GPS existed to provide a good estimate of absolute sea level change is St. Croix in the U.S. Virgin Islands.
- Using tide gauges as the source of data for sea level rise would require the implementation of a new network, which will serve to provide complete monitoring coverage of the Caribbean.

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

SLR Monitoring Requirements

- The system should ;
 - ✓ be truly regional.
 - ✓ be current.
 - ✓ be sustainable.
 - ✓ offer continuous monitoring.
 - ✓ bring added value.
 - ✓ be globally interoperable.

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

SLR Monitoring Strategy

- Integration of tide gauges and satellite altimetry data with continuous GPS measured CORS points, using Trinidad & Tobago as the initial test site.

Figure 4 - Distribution of CORS stations (left) and tide gauges (right) in Trinidad & Tobago



The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

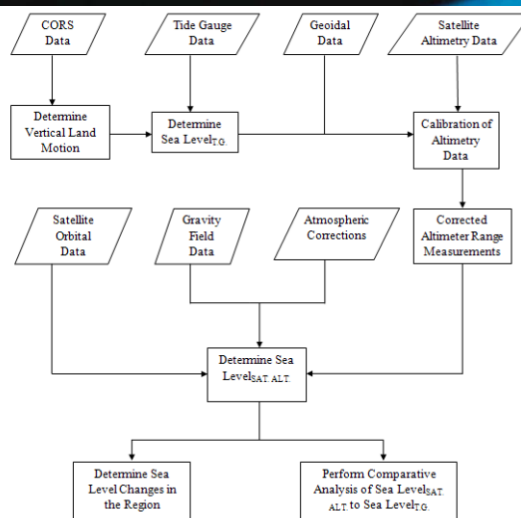
SLR Monitoring Strategy

- Calibration of Jason-2 altimetry data using CORS GPS and tide gauge stations and precise local geoid (Carib 97)
- Meet many of the desired system characteristics. Satellite Altimetry data can provide regional coverage with current and historical data sets.
- The use of satellite data virtually eliminates the need for ongoing maintenance, minimising the institutional requirements as data can be obtained any time via the internet.

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

SLR Monitoring Strategy

Figure 5 - Flowchart showing proposed methodology



The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

Conclusion

- The proposed method of the use of satellite altimetry data to determine sea surface heights will seek to fill the existing voids and resolve the sparse and unreliable network of existing island tide gauges.
- Extend to additional sites in Caribbean to provide for a full and adequate assessment of sea level change in the Caribbean region.

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

THANK YOU

QUESTIONS & FEEDBACK

The XXIV FIG International Congress 2010: Facing the Challenges – Building the Capacity

Dexter DAVIS, Trinidad & Tobago
Michael SUTHERLAND, Canada
Sandesh JAGGAN, Trinidad & Tobago

AUGMENTING TIDE GAUGE DATA WITH SATELLITE ALTIMETRY IN THE OBSERVATION OF SEA LEVEL RISE IN THE CARIBBEAN

Dexter DAVIS, UWI , Trinidad & Tobago
Michael SUTHERLAND, C-FOAM, Canada
Sandesh JAGGAN, UWI, Trinidad & Tobago

The XXIV FIG International Congress 2010
Facing the Challenges – Building the Capacity