



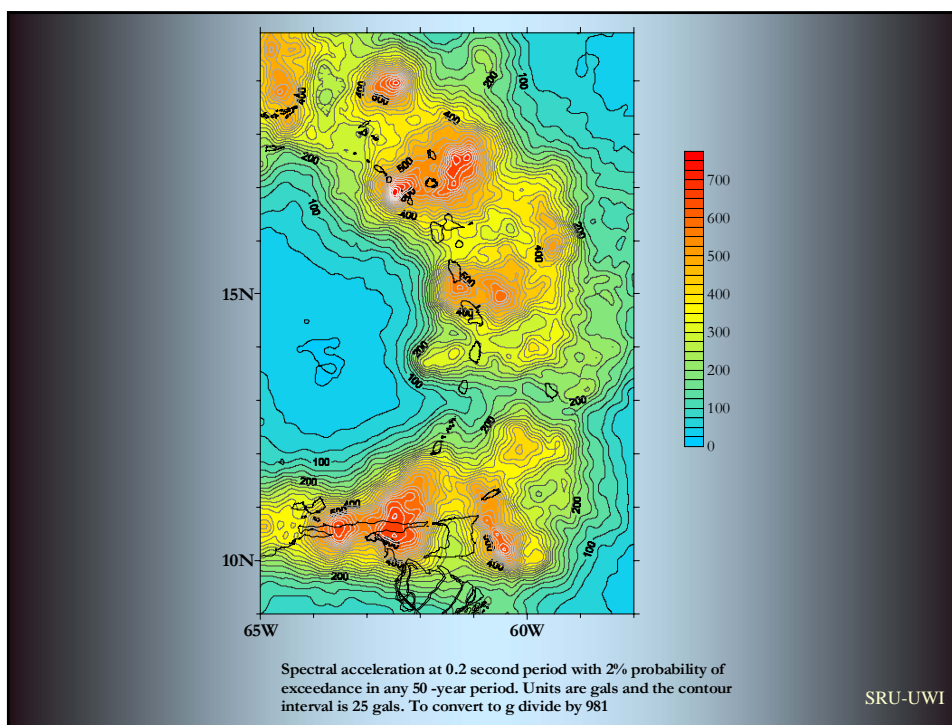
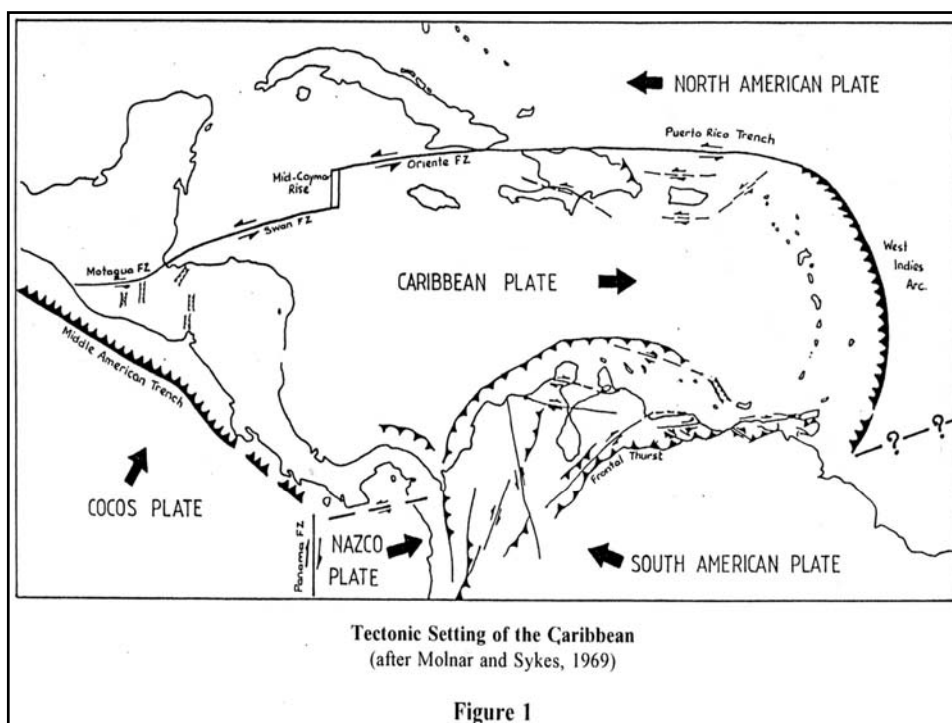
Health Facilities in the Caribbean: How vulnerable are they?

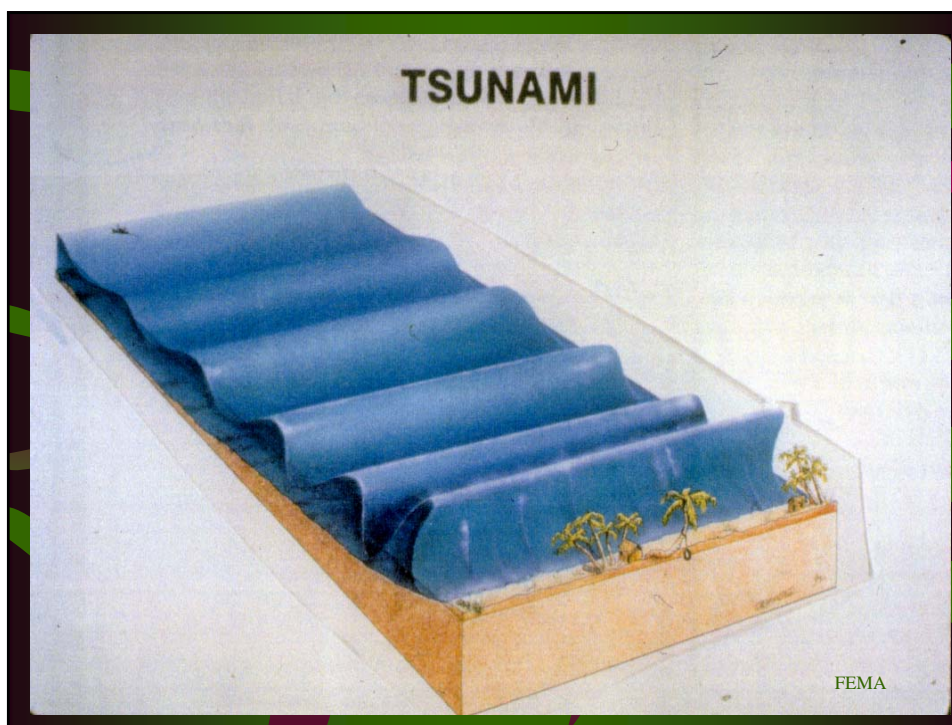
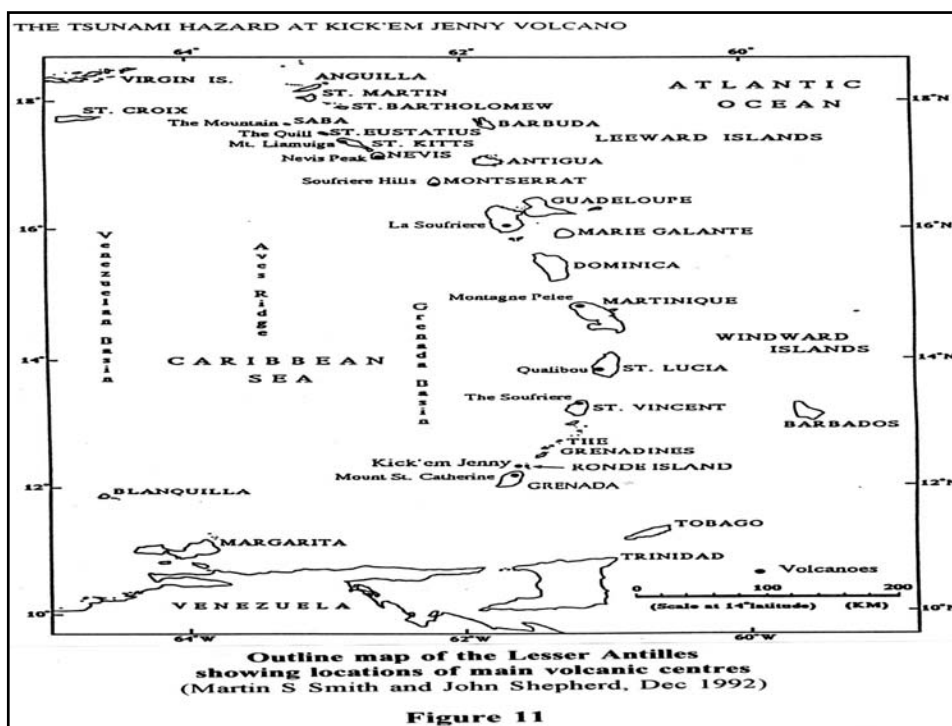
Tony Gibbs
Consulting Engineers Partnership Ltd

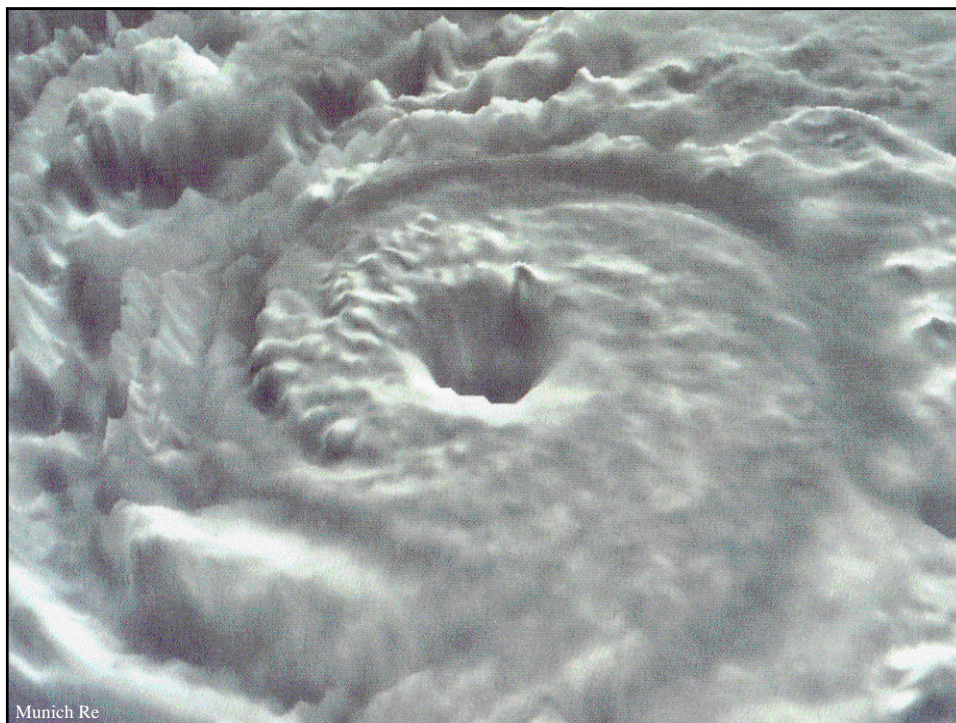
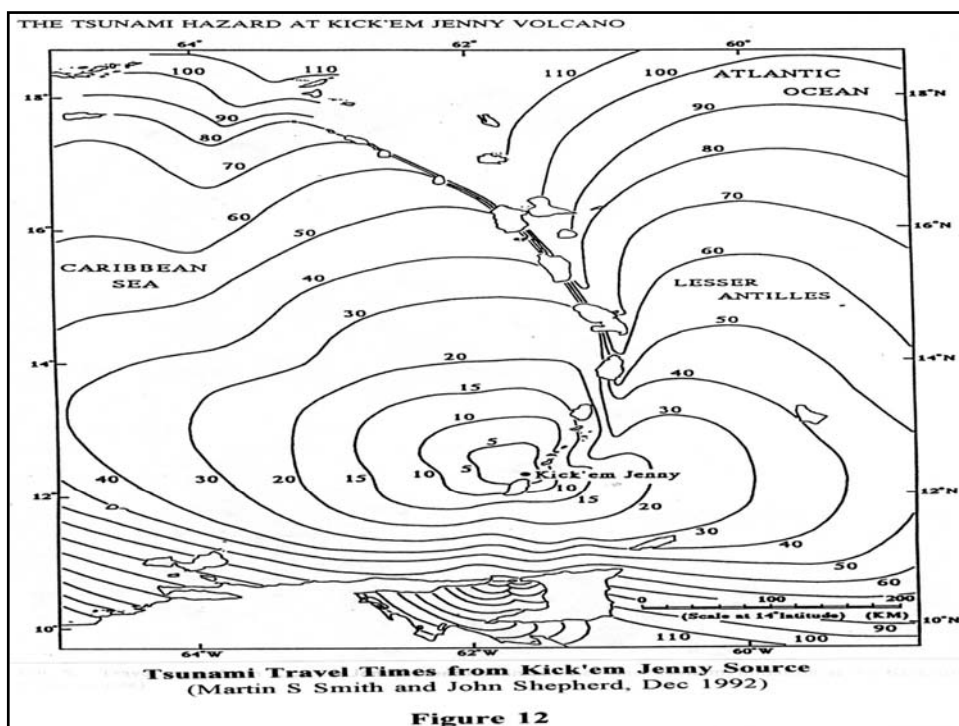


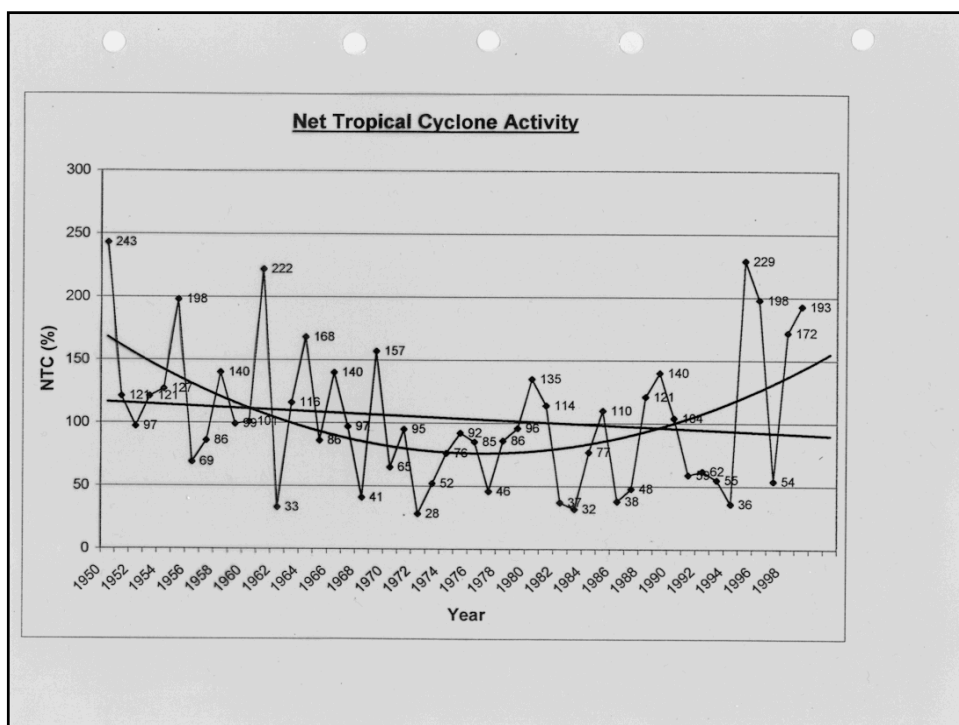
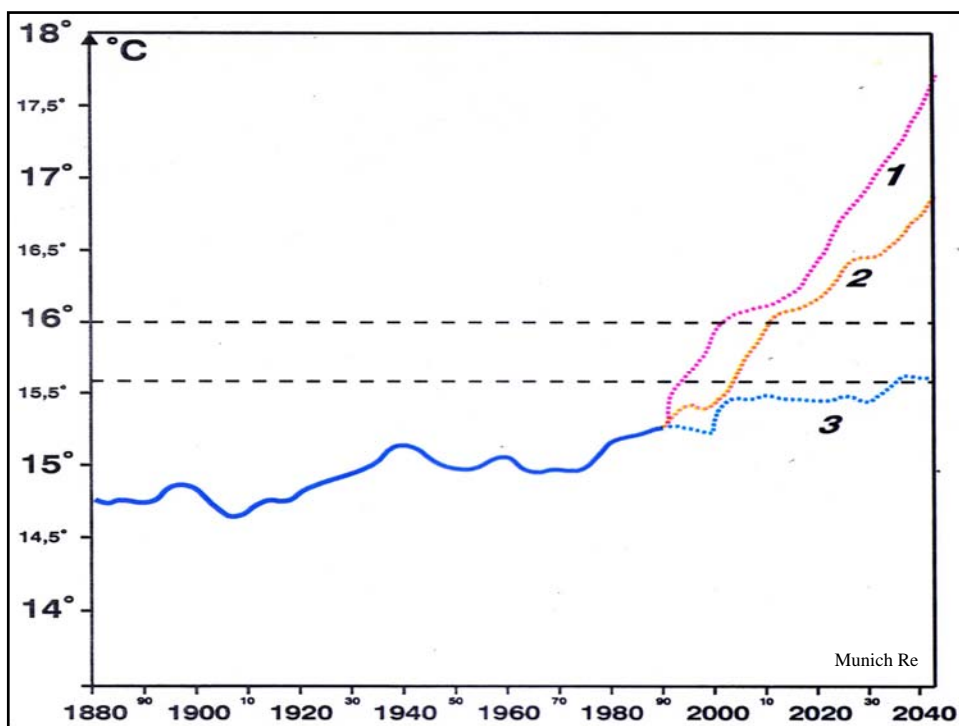
Natural Hazards in the Caribbean

Earthquakes
Volcanic activity
Tsunamis
Hurricanes
Storm surge and wave action
Torrential rains

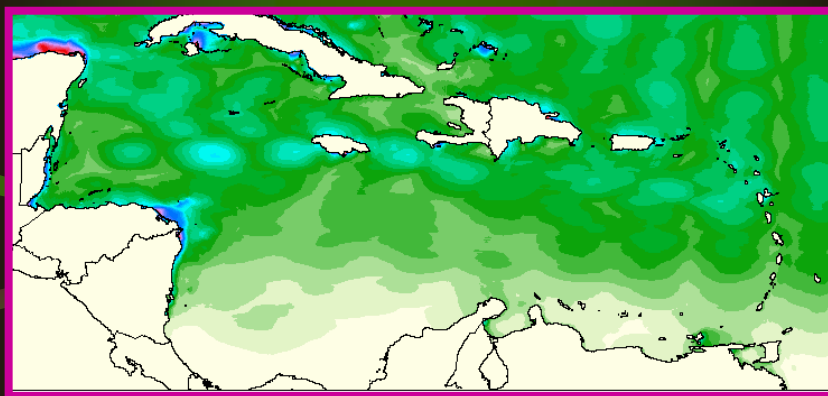








Maximum Storm Surge (50-year return)



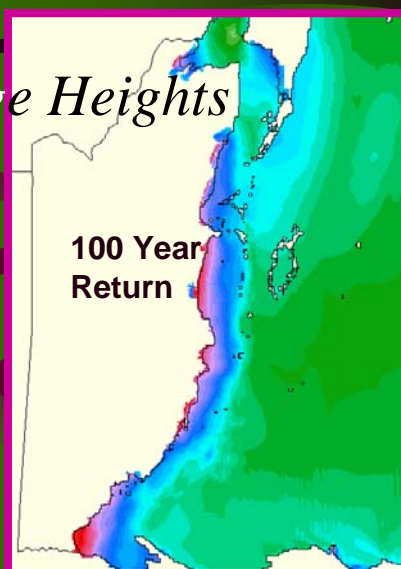
USAID-OAS

Surge Heights

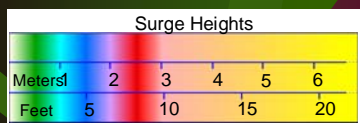


Belize Surge Heights

The many low Cays of Belize are quite vulnerable to waves and surge, and the low coast of the northern half of the country is easily flooded.

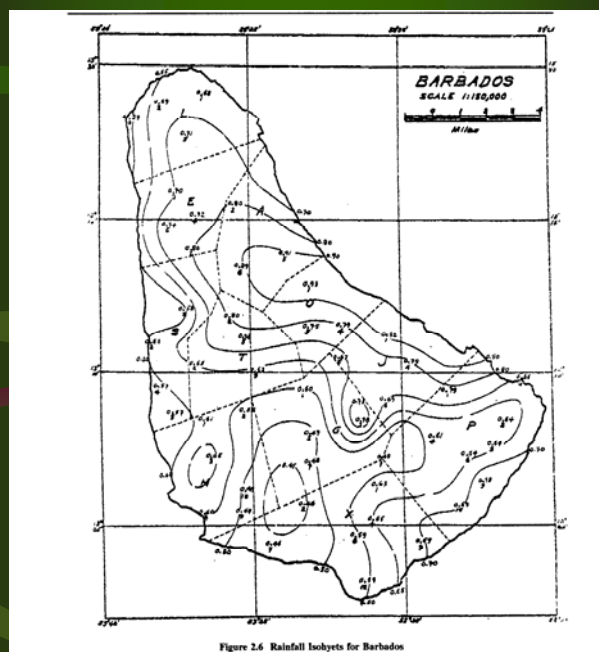
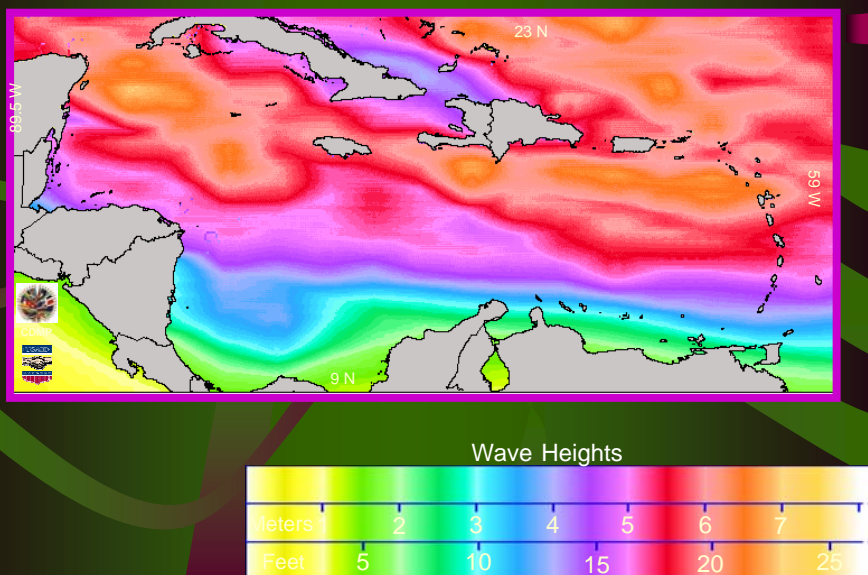


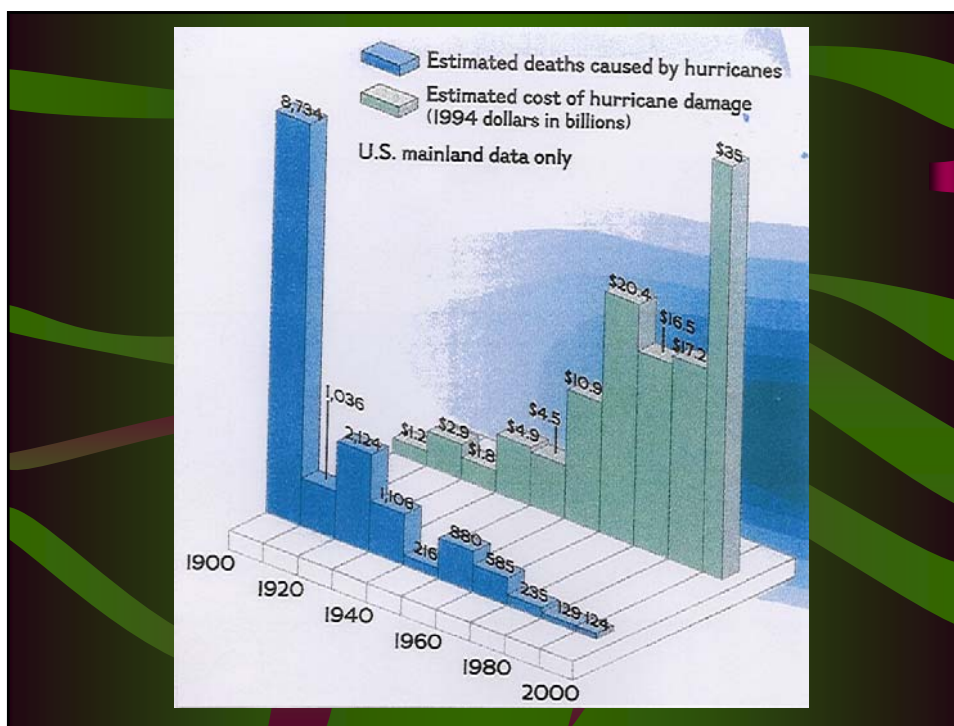
100 Year
Return

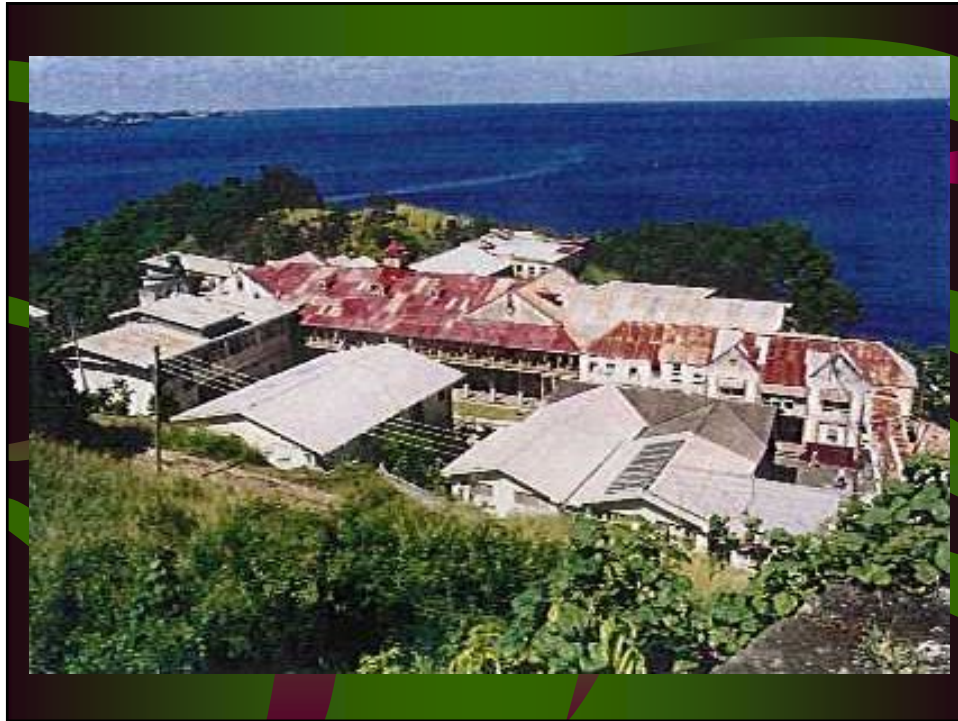


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Maximum Wave Heights (50-year return)





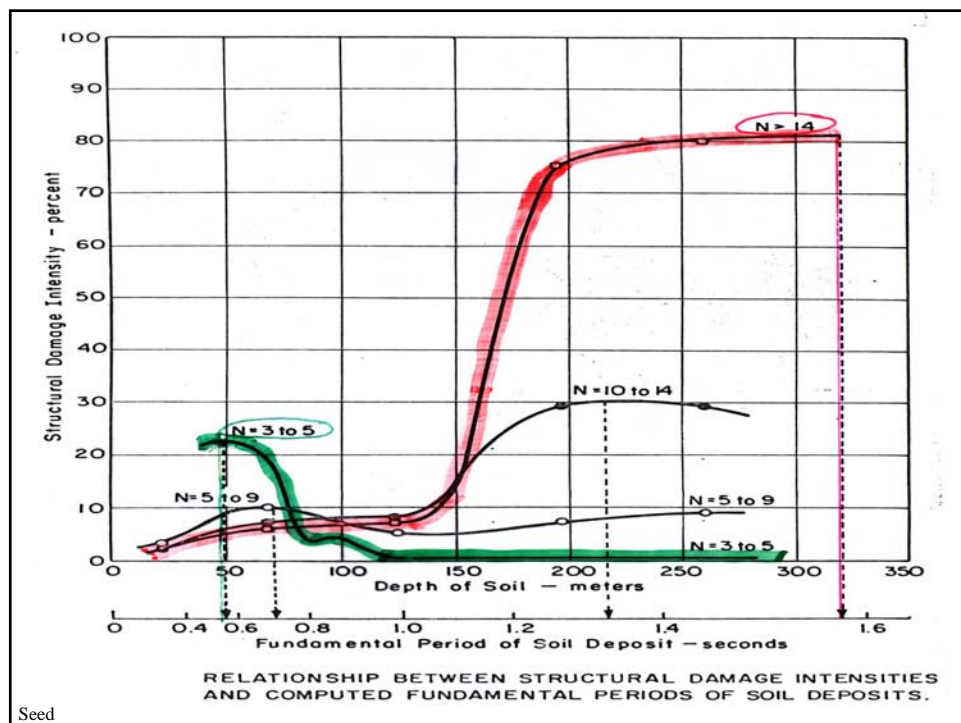
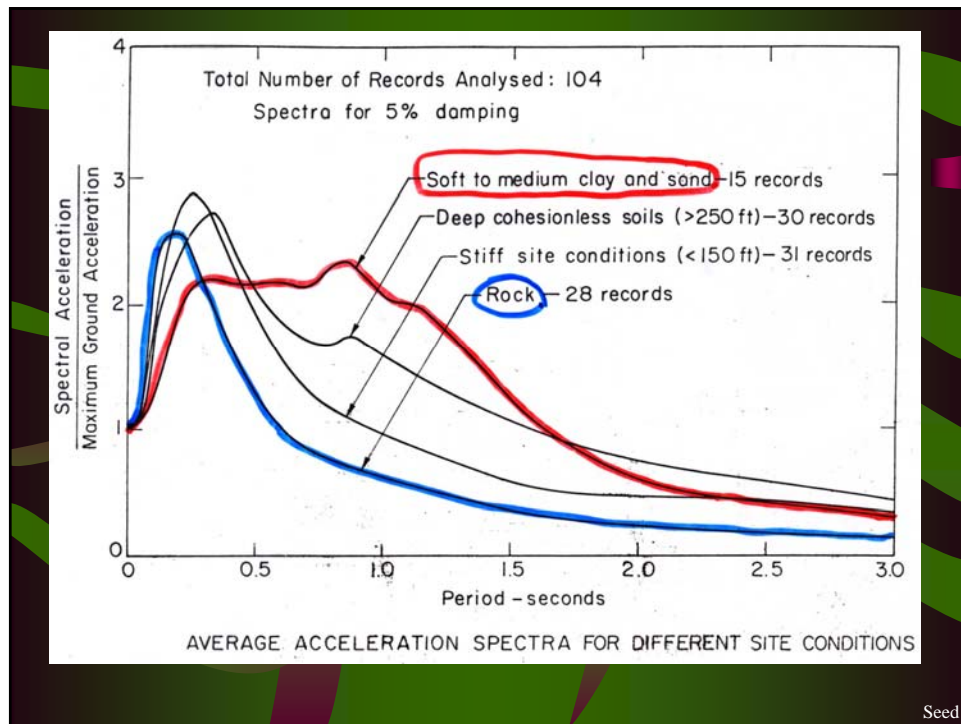






“On account of the fact that there is no glory in the *foundations*, and that the sources of success or failure are hidden deep in the ground, building *foundations* have always been treated as stepchildren; and their acts of revenge for lack of attention can be very embarrassing.”

Prof Karl Terzaghi (birthday 02 October)



Liquifaction and differential settlement lead to catastrophic losses.



NOAA, National Geophysical Data Center

Hospital with irregular plan shape (PAHO CD-ROM)



O. D. Cardona, 1998

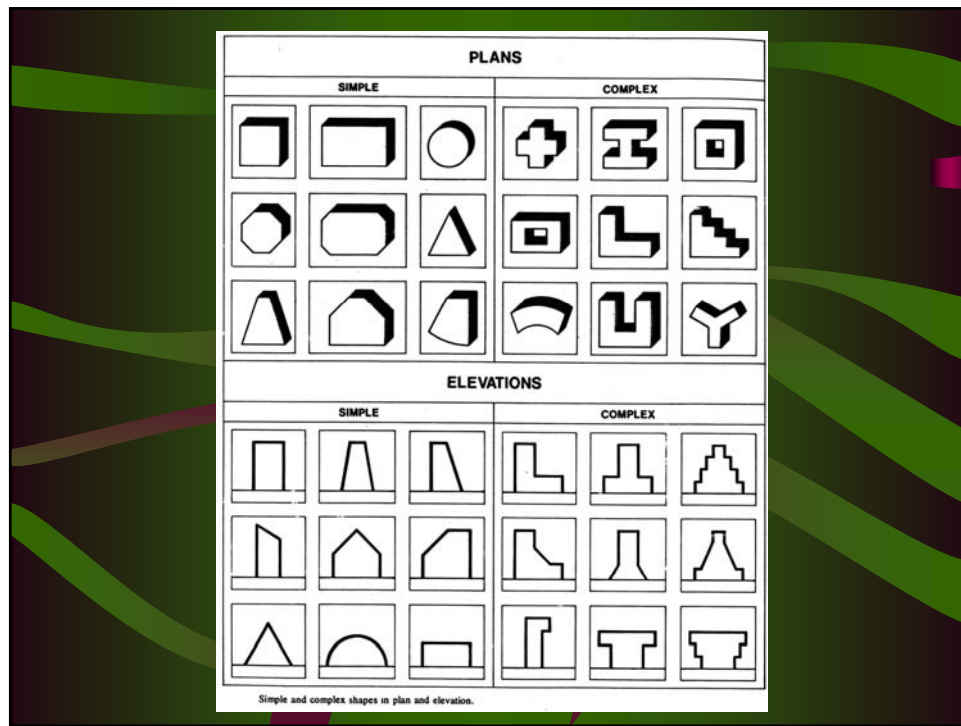


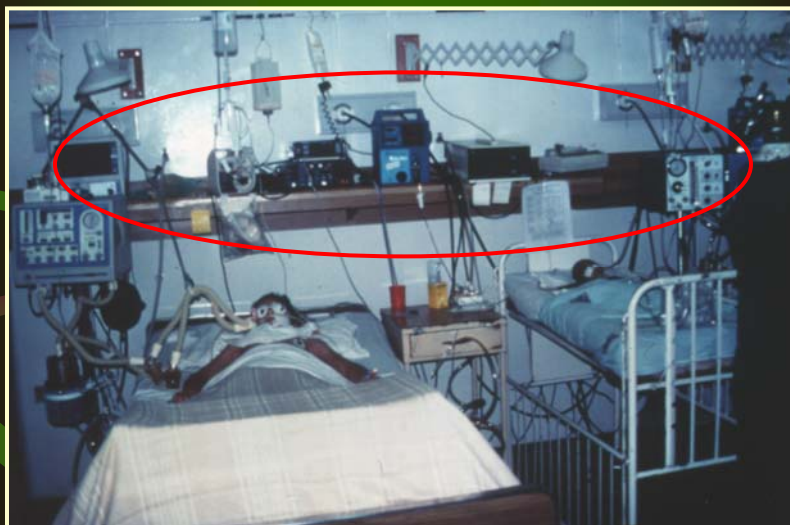


Photo 31 - Chemistry and Haematology
High-level cupboards left open
Contents are vulnerable in the event of an earthquake.



Photo 32 - Microbiology
High-level cupboards kept closed to protect contents in the event of an earthquake.

Essential equipment should be securely fixed to ensure continuous functioning during earthquakes. (PAHO CD-ROM)



The lives of patients may depend on the continuing functioning of medical equipment immediately after an earthquake. (PAHO)



If the wrong word is used sufficiently often, it (regrettably) becomes the correct word. That is how language evolves. The word “*damages*”, up to now, is a legal term meaning a sum of money claimed or awarded in compensation for a loss or injury.

The currently correct word that should be used when talking about harm or injury impairing the value or usefulness of something is “*damage*”, a collective noun.















Waterproof membrane removed



Roof deck removed

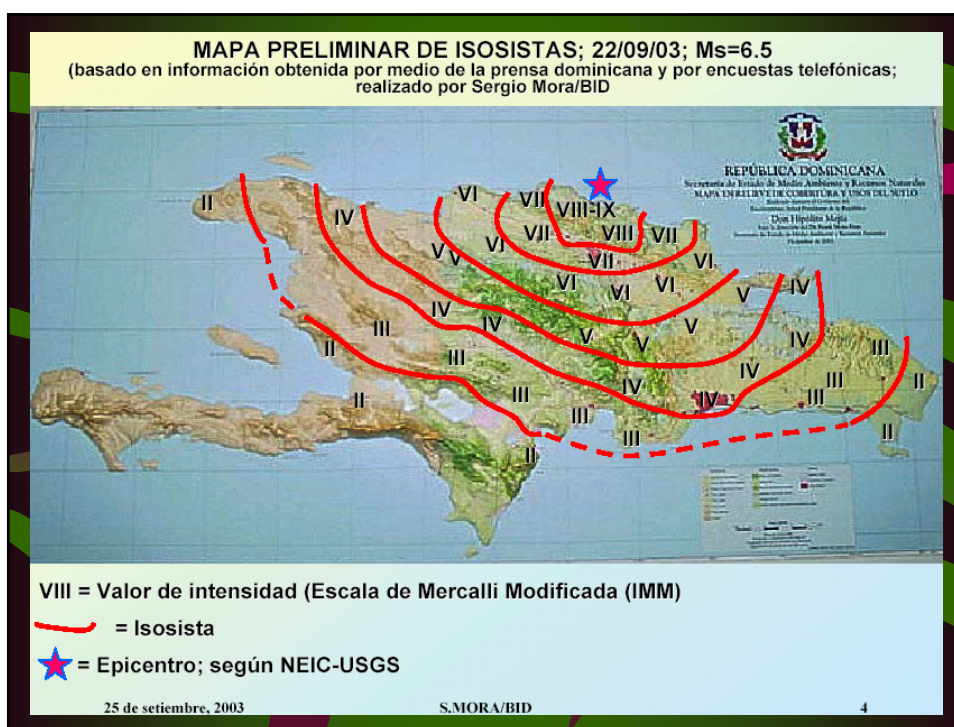


Structure lost in spite of clips



Paediatric ward

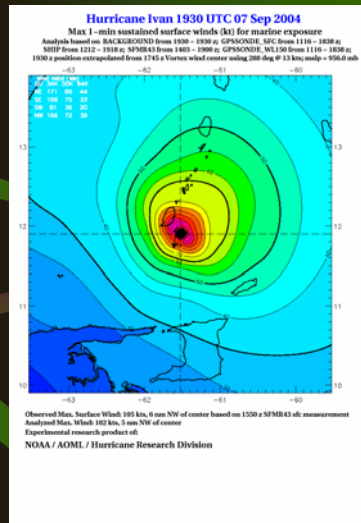






**Healthcare Facilities
in
Grenada, Grand Cayman and Dominica
as impacted by
Hurricane Ivan and the Earthquake of 21 Nov '04**

*H*WIND Hurricane Ivan Windfield*



Hurricane Ivan Just Before Striking Grenada

Central Pressure 956 mbar
 Radius to Maximum Winds ~ 15 km
 Max Winds over Water ~ 115 mph
 (sustained)
 Peak Gust Wind on Land ~ 135 mph

100 Year 1 minute wind over water
 (CUBIC)
 ~ 95 mph

Supplied by Peter Vickery



Fallen power lines in Morne Rouge
 pose problems for ground transport.



AT&T Cellular Tower at Richmond Hill
EOC in background



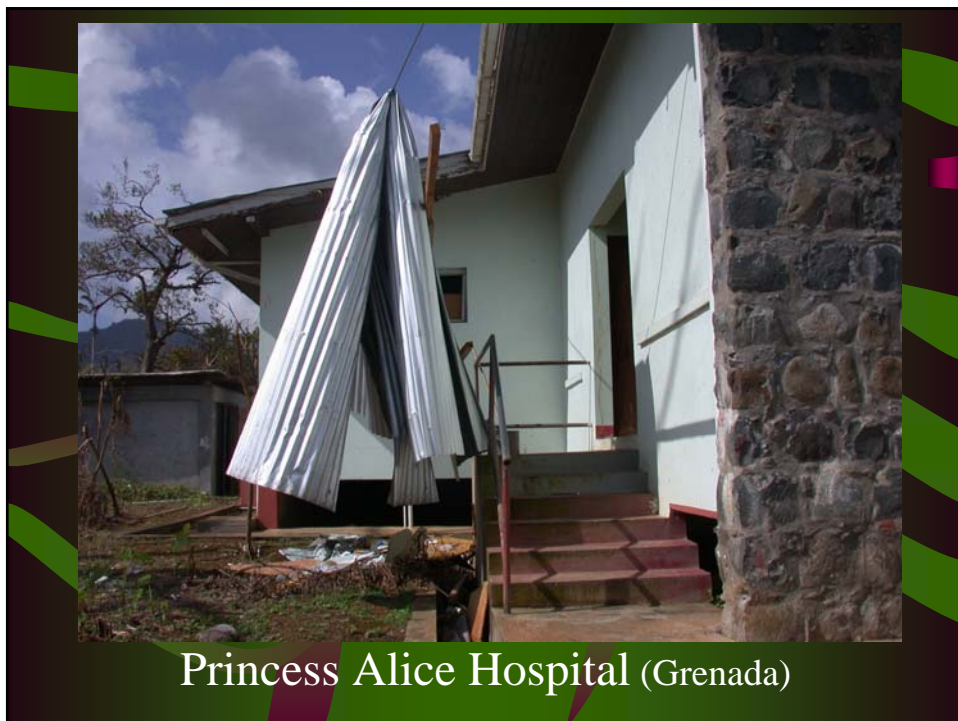
Princess Alice Hospital — Photo Bubb



Princess Alice Hospital, Access



Princess Alice Hospital



Princess Alice Hospital (Grenada)



Princess Alice Hospital



Princess Alice Hospital



Princess Alice Hospital, Doctor's Residence



Princess Alice Hospital, Doctor's Residence



Princess Alice Hospital, Doctor's Residence



Grand Anse Health Centre



Grand Anse Health Centre



St George's Health Centre (Grenada)



St George's Health Centre (Grenada)



Richmond Home — Photo Bub



Richmond Home (Grenada)



Richmond Home (Grenada)



Richmond Home (Grenada)



Richmond Home (Grenada)



My former family home – Carlton House



Carlton House (Grenada)



Carlton House (Grenada)



Medical Stores (Grenada)



Medical Stores (Grenada)



The Duncan Ward
the retrofit roof performed well



The Duncan Ward
retrofit shutters broke



New (background) and old (foreground) buildings at the hospital



The New Hospital – Roofing Damage



Broken Windows in the Plant Room at the New Hospital



Damaged ceilings and glazing at the New Hospital



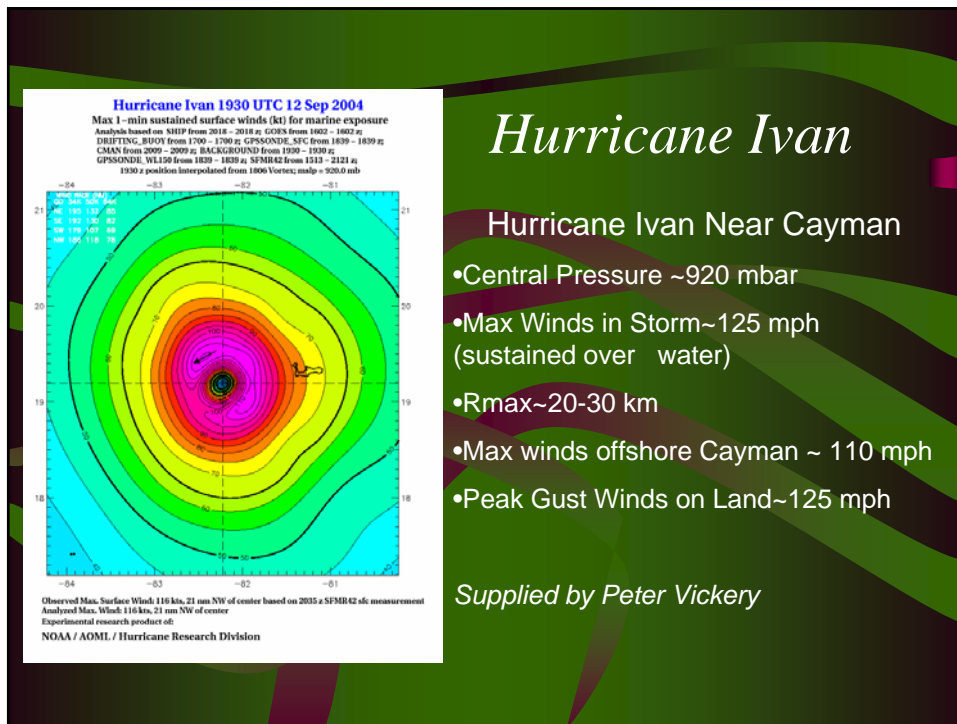
Broken door at the New Hospital



Solar water heater panels intact at the New Hospital



Ivan -- NOAA





Grand Cayman, Prestressed Concrete Pole



Grand Cayman, Prestressed Concrete Pole



Grand Cayman, West Bay Clinic



Grand Cayman, East End Clinic



Grand Cayman, East End Clinic



Grand Cayman, Bodden Town Clinic



Grand Cayman, Disturbed Graves



Grand Cayman, General Hospital



Grand Cayman



Grand Cayman



Grand Cayman



Grand Cayman





Grand Cayman



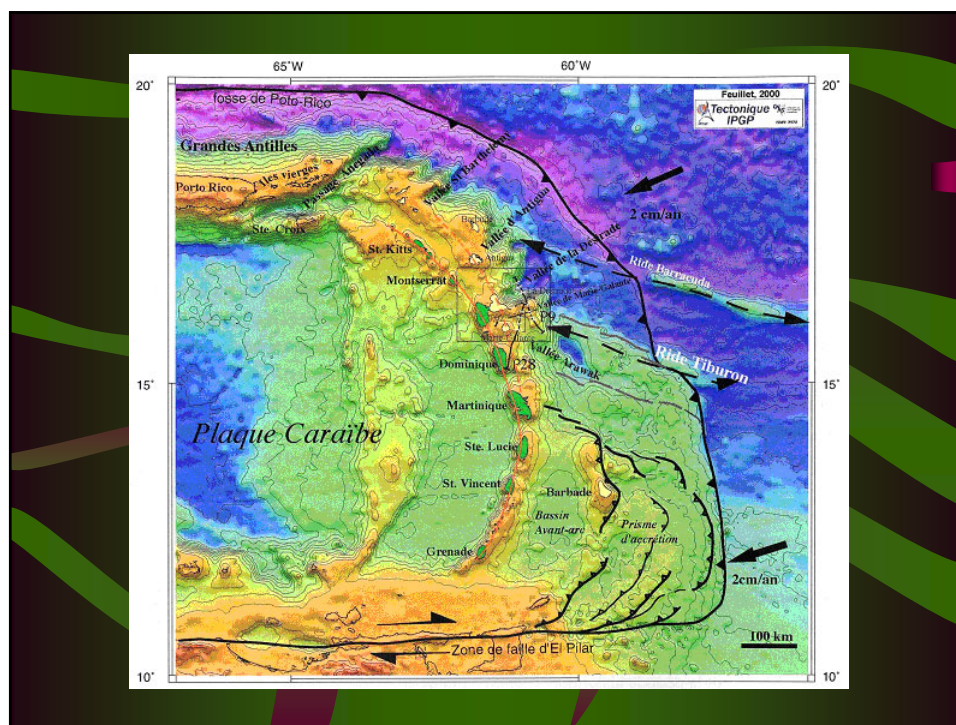
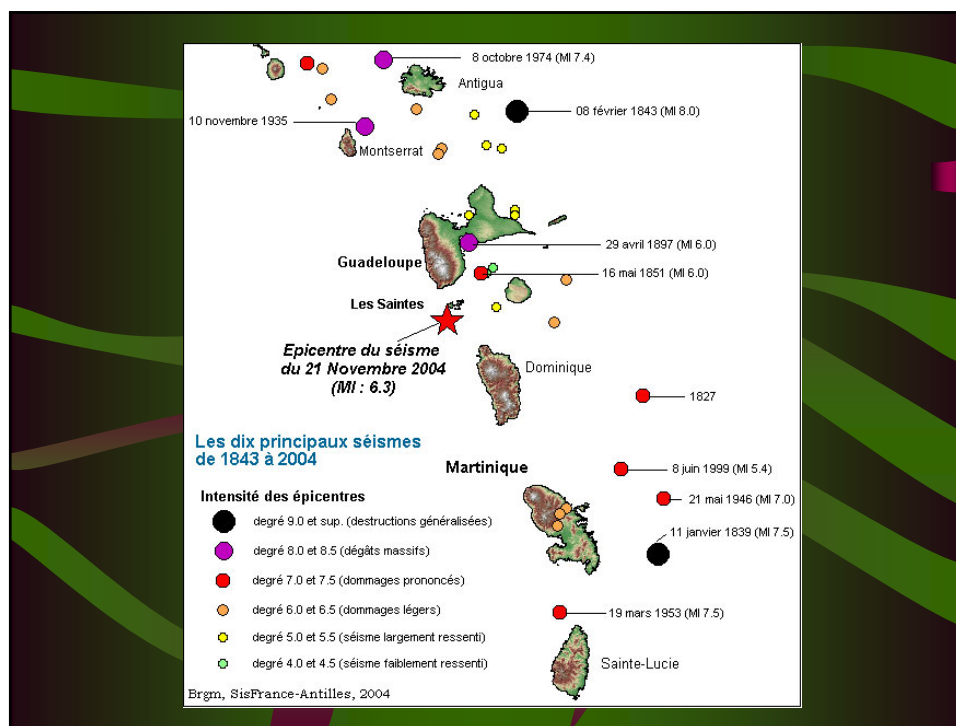
Grand Cayman

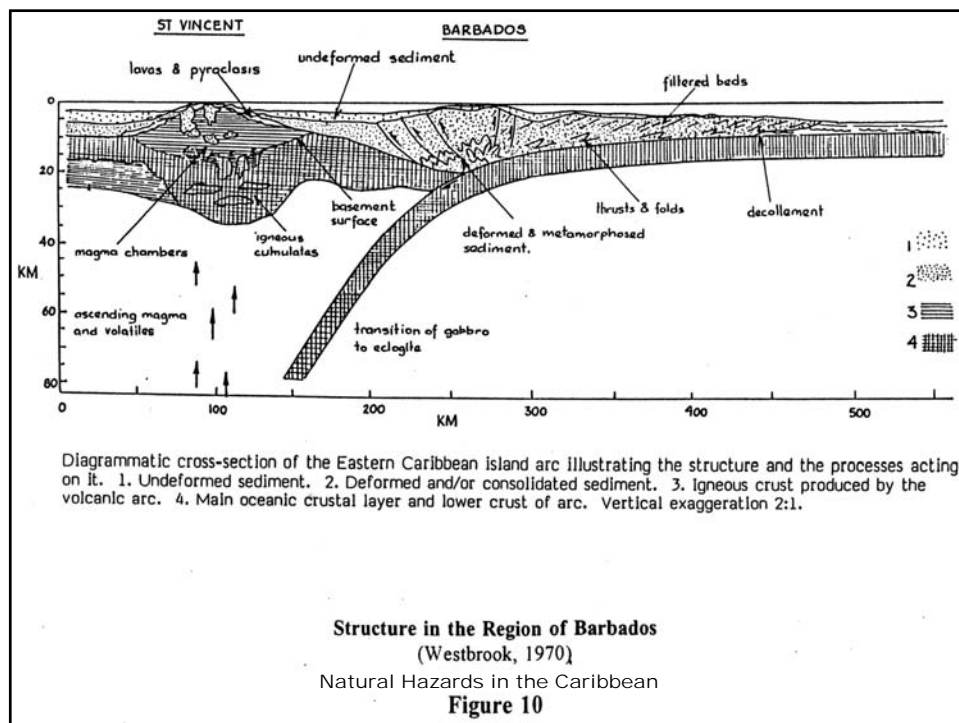
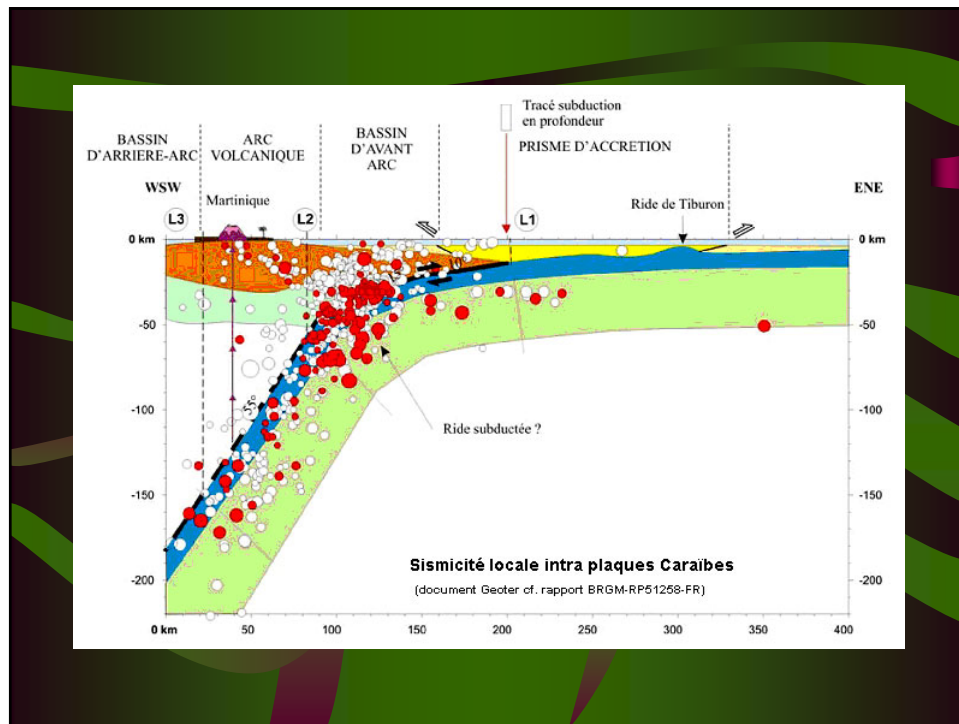


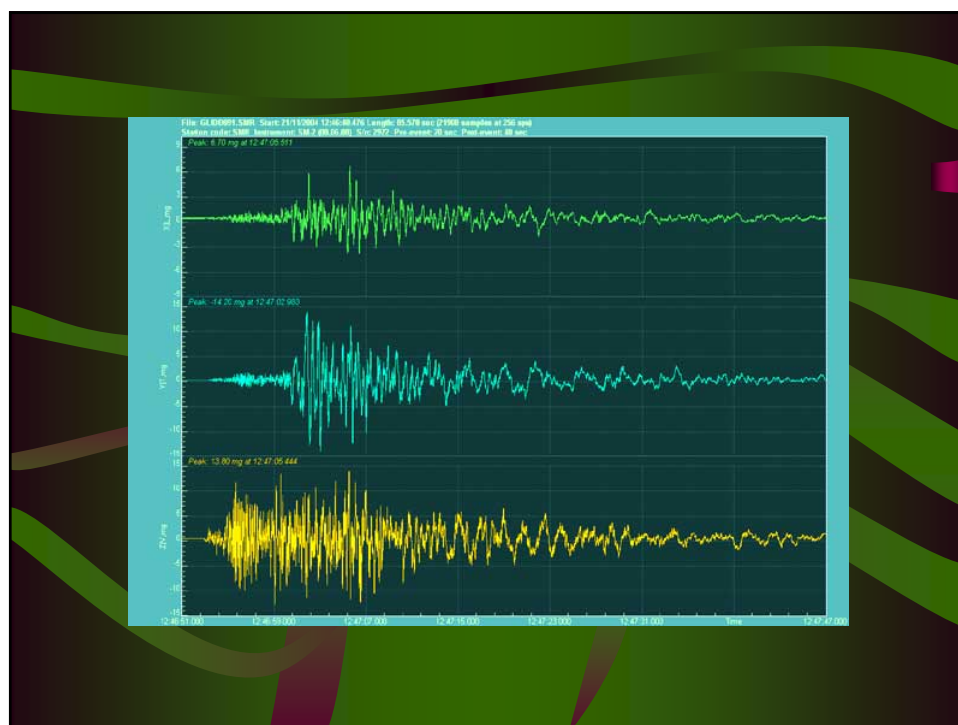
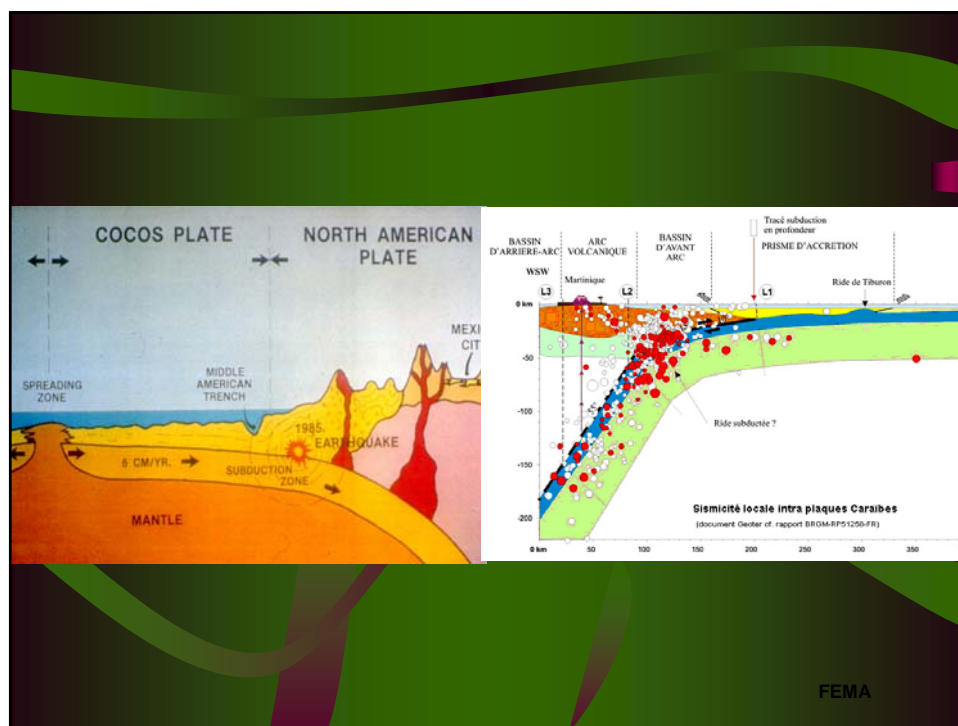
Grand Cayman

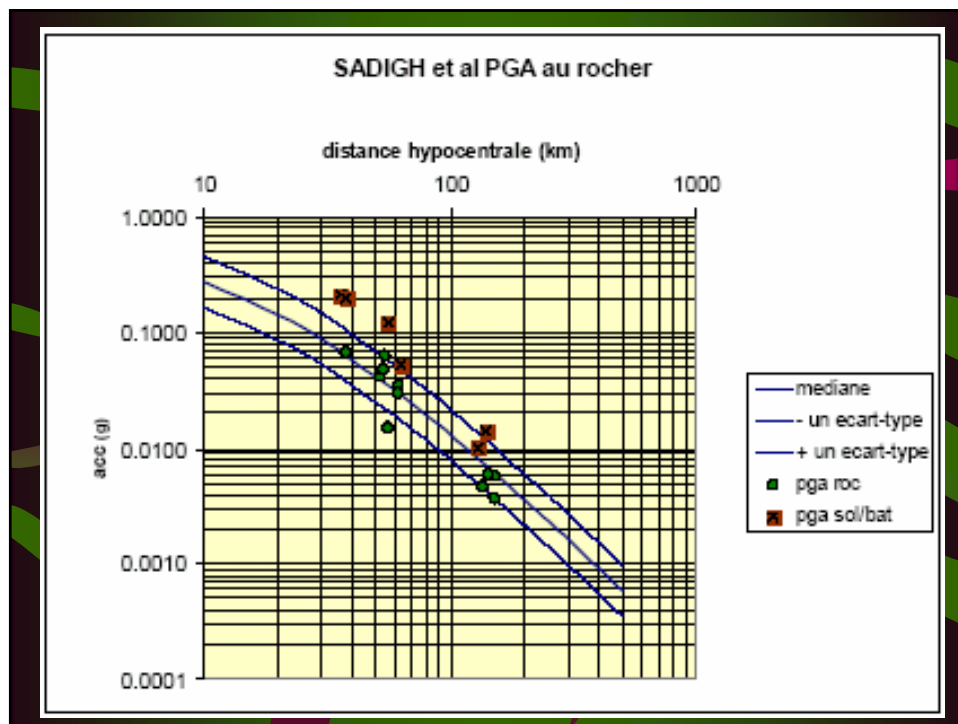


Grand Cayman, Safe Envelopes



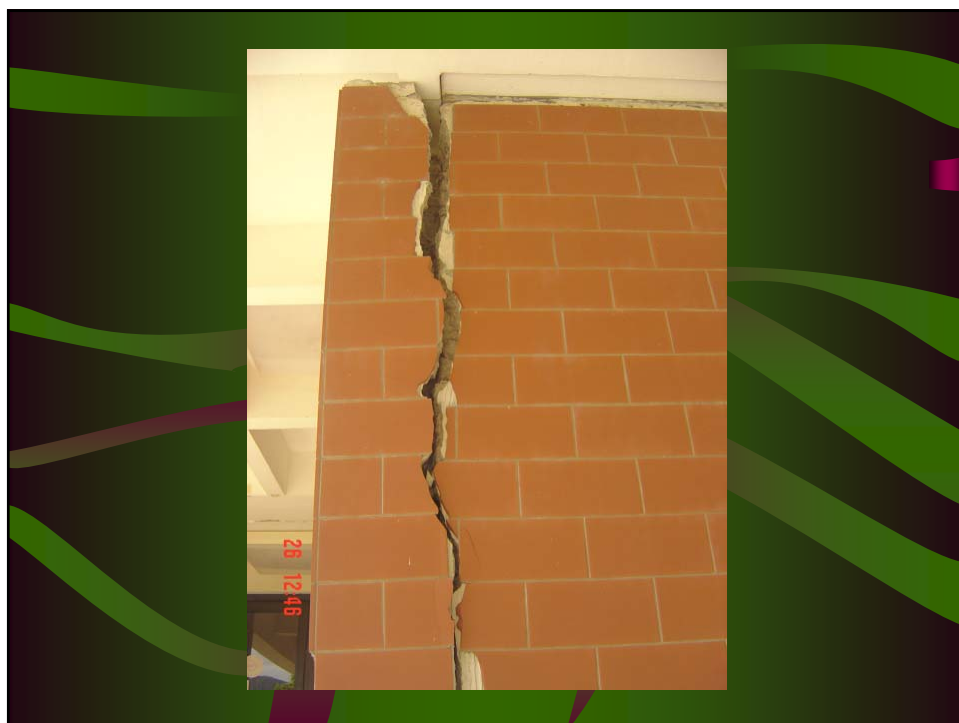














*“Speak through the
earthquake,
wind, (water)
and fire
O still small voice of calm!”
— Whittier/Gibbs —*

The Lessons:

- o Redress the balance.*
- o Allocate more resources to the prevention of disasters and the reduction of damage from natural hazard events.*
- o Prevention and reduction are at least as important as preparedness and response.*

Disaster Mitigation for Health Facilities

Guidelines for Vulnerability Appraisal and Reduction in the Caribbean - 2000

Adobe Acrobat Reader required for all files

Free Download



Disaster Mitigation for Health Facilities (Full Text)

Sections:

Introduction

Annex I - Checklist for Vulnerability Surveys (Wind)

Annex II - Illustrations (Wind)

Annex III - Checklist for Vulnerability Surveys (Earthquakes)

Annex IV - Illustrations (Earthquakes)

Annex V - Checklists for Maintenance Operators

Bibliography