



Earthquakes



Volcanoes



Tsunamis



SEISMIC  
RESEARCH  
CENTRE

# REDUCING GEOLOGIC RISK IN THE EASTERN CARIBBEAN

Mitigation of seismic and volcanic hazards and the engagement of local communities in the Eastern Caribbean





# WHO WE ARE



SEISMIC RESEARCH CENTRE

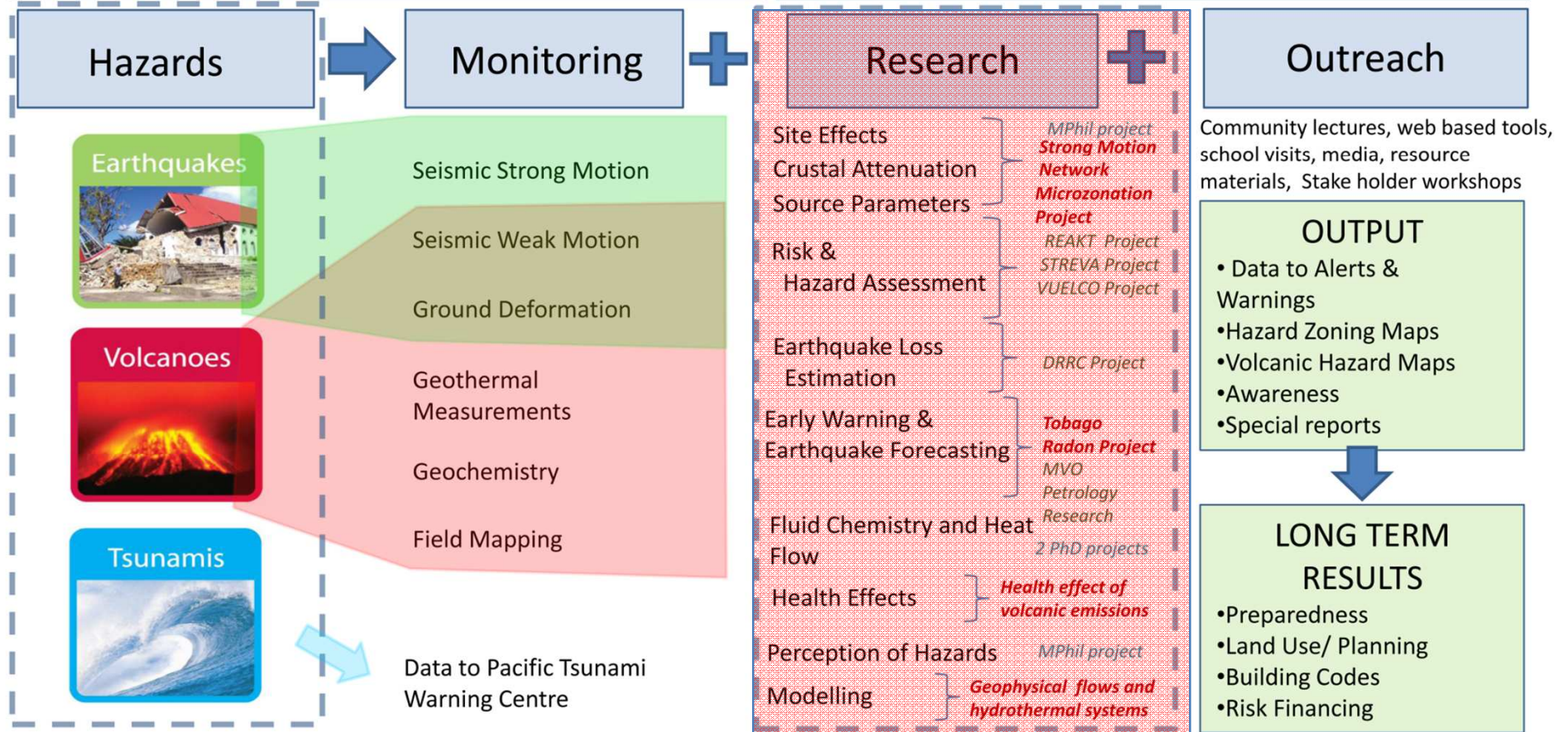
# WHAT WE DO

## Vision

To be the leading agency in the Eastern Caribbean for earthquake, volcano and tsunami monitoring and for the dissemination of information to reduce risk, deaths, injuries, property damage and economic loss.

## Mission

To monitor and study earthquakes, volcanoes and tsunamis in the Eastern Caribbean and provide advice and information for emergency response, public safety and loss mitigation.





# RESEARCH AGENDA

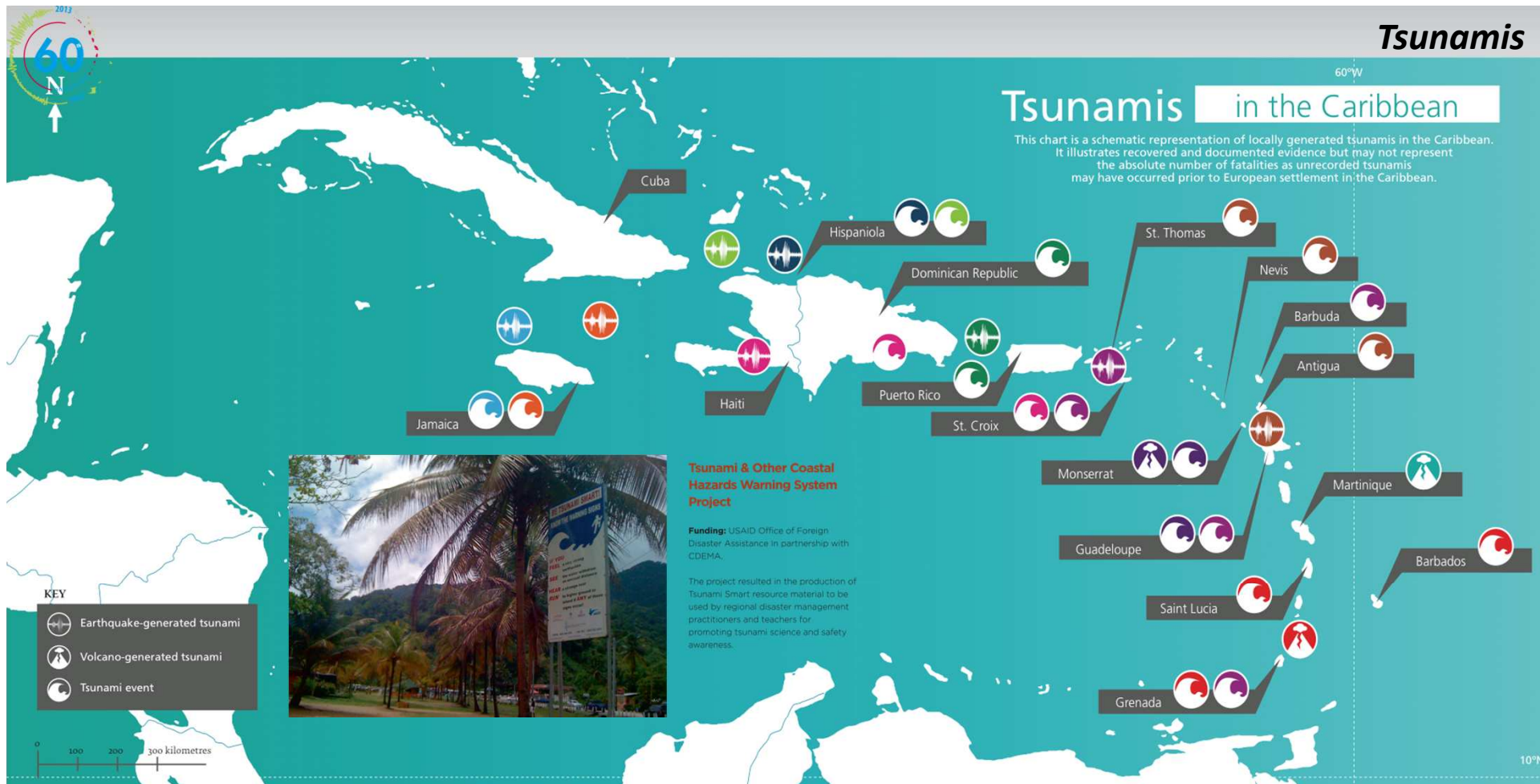
## Demand-driven science

Improve understanding of geologic processes to reduce risk & promote sustainable development



## Tsunamis in the Caribbean

This chart is a schematic representation of locally generated tsunamis in the Caribbean. It illustrates recovered and documented evidence but may not represent the absolute number of fatalities as unrecorded tsunamis may have occurred prior to European settlement in the Caribbean.



### Tsunami & Other Coastal Hazards Warning System Project

**Funding:** USAID Office of Foreign Disaster Assistance in partnership with CDEMA.

The project resulted in the production of Tsunami Smart resource material to be used by regional disaster management practitioners and teachers for promoting tsunami science and safety awareness.



1690 April 6	1692 June 7	1842 May 7	1867 Nov 18	1902 May 5 & 7	1907 Jan 14	1918 Oct 11	1939 July 24	1946 Aug 4	1997 Dec 26	2010 Jan 12
Magnitude: 7.5-7.8 Earthquake near Antigua and Nevis believed to have triggered landslides into the sea from Nevis which then generated tsunami waves. These waves were observed in St. Thomas, Nevis and Antigua.	Magnitude: 7.5 The intense shaking generated by the earthquake caused massive liquefaction and coastal subsidence in Port Royal, Jamaica. The water that flowed in to replace the sunken land mass set up waves that were observed in Kingston harbour. The earthquake also caused landslides on the north coast which produced a small tsunami.	Magnitude: 8.3 Tsunami waves up to 2 m were reported on the north coast of Hispaniola. 200-300 lives were lost by the tsunami. The earthquake led to at least 5,000 deaths	Magnitude: 7.5 Earthquake and associated landslide in the Virgin Islands generated a tsunami with 4.5-6 m waves, inundating 76 m inland. At St. Croix waves swept 91 m inland damaging 20 houses. Waves were also observed in Puerto Rico, British Virgin Islands, Saba, Saint Martin, Antigua, and Guadeloupe.	Volcanic eruption of Mt Pelée, Martinique generated a local tsunami - 4-5 m in height when a pyroclastic flow entered the sea. Waves are reported to have impacted the town of St. Pierre killing 100 people.	Magnitude: 7.5 Earthquake off north coast Jamaica triggered associated with submarine landslides. Waves up to 2.5 m affected the north coast.	Magnitude: 7.5 Earthquake near Puerto Rico and Dominican Republic triggered tsunami waves 6.1 m. Western Puerto Rico experienced extensive damage with inundation of 100m inland claiming 29 lives. Waves were also observed in the Virgin Islands and the Dominican Republic.	Eruption of Kick 'em Jenny submarine volcano generated numerous tsunami waves with maximum heights up to 2 m observed in northern Grenadines, the southern Grenadines and Barbados.	Magnitude: 8.1 Earthquake devastated the Dominican Republic, Virgin Islands and Haiti, generated a 2.5 m tsunami that impacted the northeast coast of Hispaniola. Loss of life occurred at Mantanzas (Matancitas), Dominican Republic.	Volcanic eruption Soufriere Hills Volcanic eruption of Soufriere Hills Volcano, Montserrat sent a major debris avalanche into the ocean generating tsunami waves that inundated up to 80 m inland. Run-up was also reported in Guadeloupe.	Magnitude: 7.0 Devastating earthquake 25km SW of Port au Prince, Haiti (-222,570 fatalities). 4 people killed by a local tsunami in the Petit Paradis area near Leogane. Recorded wave heights (peak-to-trough) of 12 cm at Santo Domingo, Dominican Republic and 2 cm at Christiansted, US Virgin Islands. Investigations are continuing for this event. (USGS)

[www.uwiseismic.com](http://www.uwiseismic.com)  
 [www.weready.org](http://www.weready.org)  
 [www.cdema.org](http://www.cdema.org)  
**TSUNAMI AND OTHER COASTAL HAZARDS WARNING SYSTEM PROJECT (2010)**

Source: See Teacher Education Resource Kit Appendix.



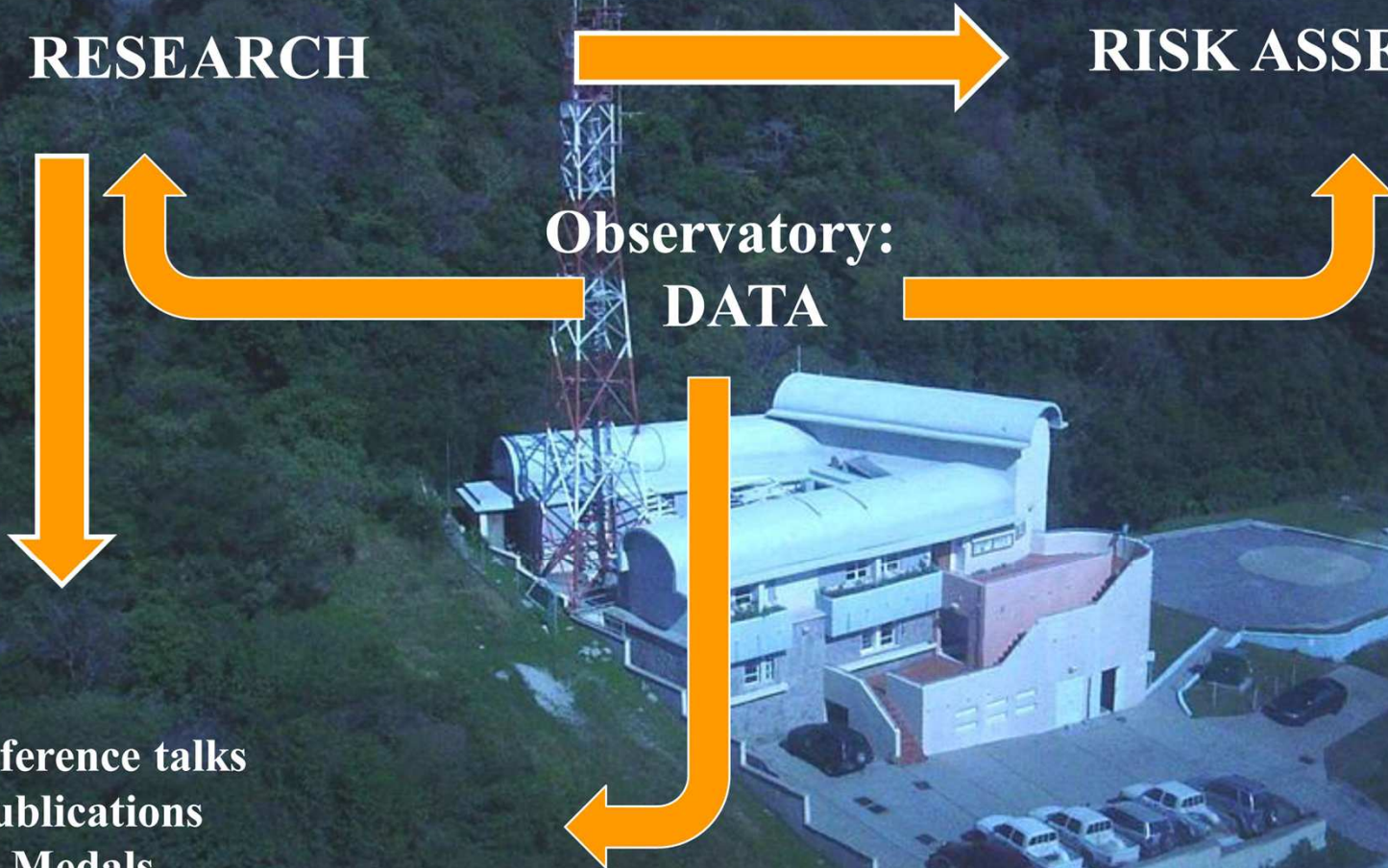


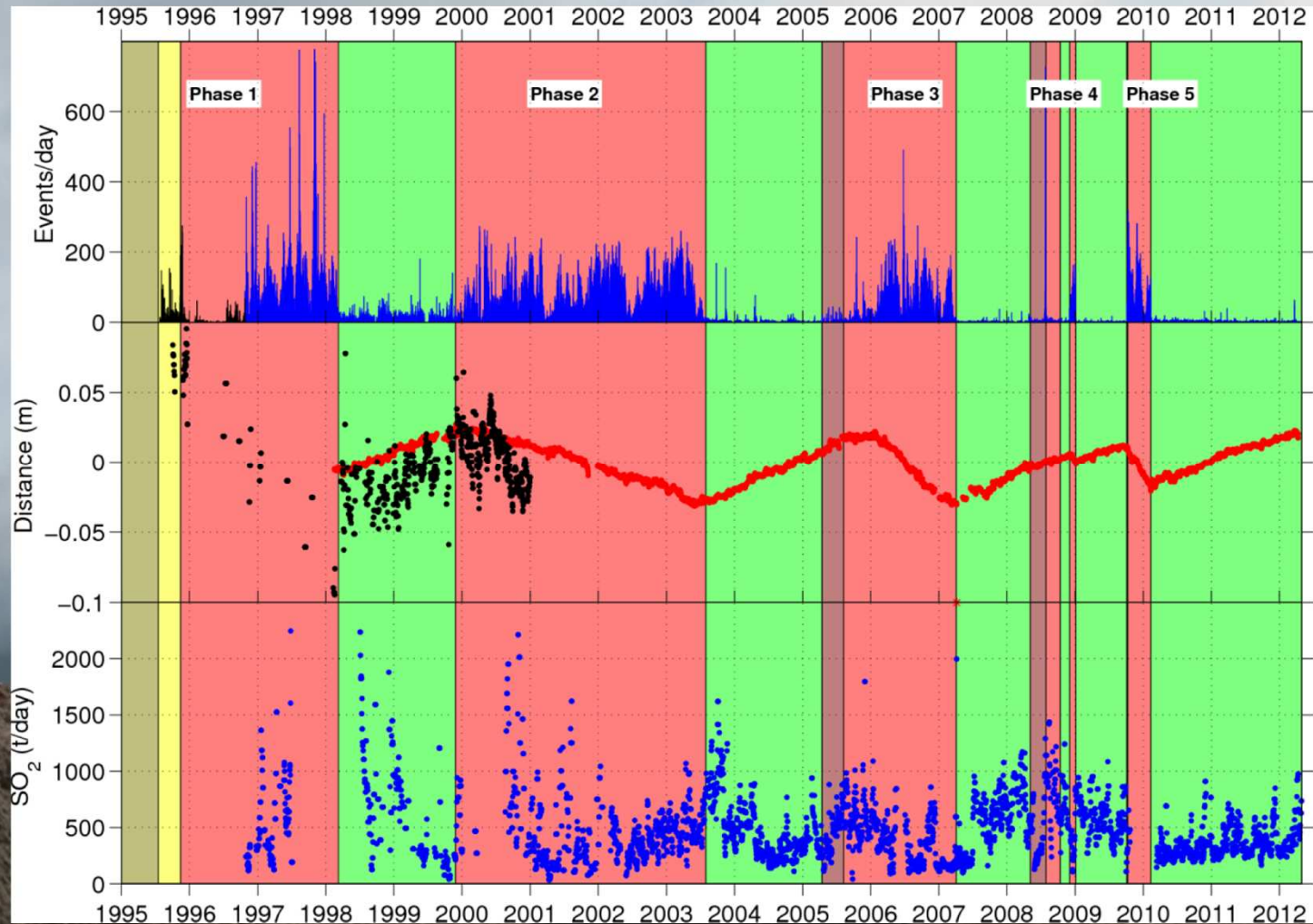
**RESEARCH**

**RISK ASSESSMENT**

**Observatory:  
DATA**

**Conference talks  
Publications  
Medals  
Fame**



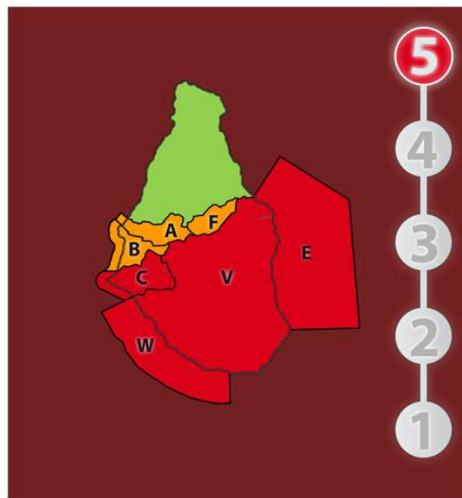
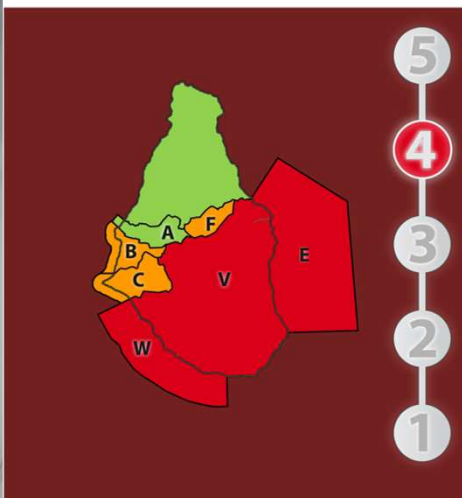
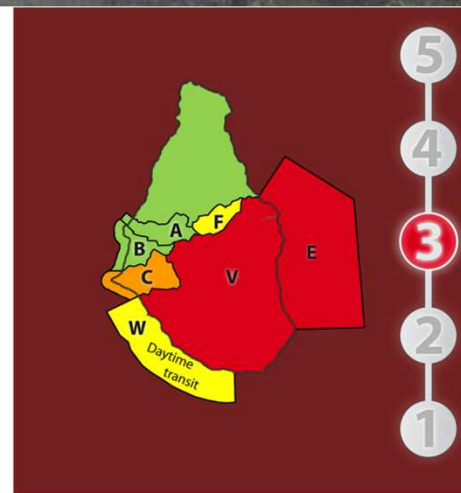
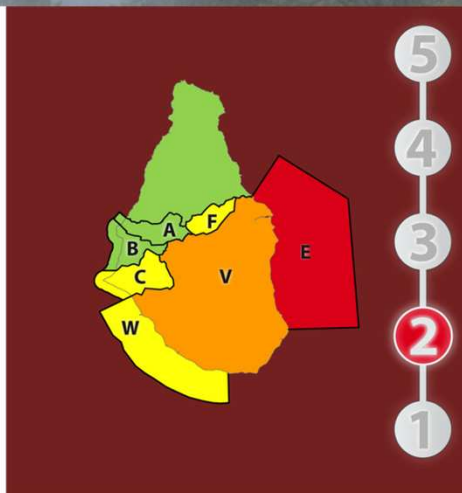


# MEGA-PLOT

Seismic, GPS and SO<sub>2</sub> monitoring data for the Soufriere Hills Volcano for the period 1 January 1995 – 30 April 2012



# Volcanoes



Access Restrictions	
Unrestricted	Ashfall and lahars can be significant hazards in all areas, and require appropriate precautions.
Daytime access	Access is permitted from 6:30 am until 5:30 pm. Access gates will be locked at all other times.
Daytime access to some areas	Areas will be defined depending on state and location of the volcanic activity.
Daytime transit	Boats permitted to travel through the MEZ without stopping from 6:30 am until 5:30 pm.
Controlled access	No access without approval from NDPRAC. Approval considered on a case-by-case basis. Gates will be locked at all times.
Essential workers	No access apart from MVO and associated staff. Access for essential maintenance only with approval from NDPRAC. Gates will be locked at all times.



Further information: [www.mvo.ms](http://www.mvo.ms)

# MONTSERRAT ALERT LEVEL SYSTEM

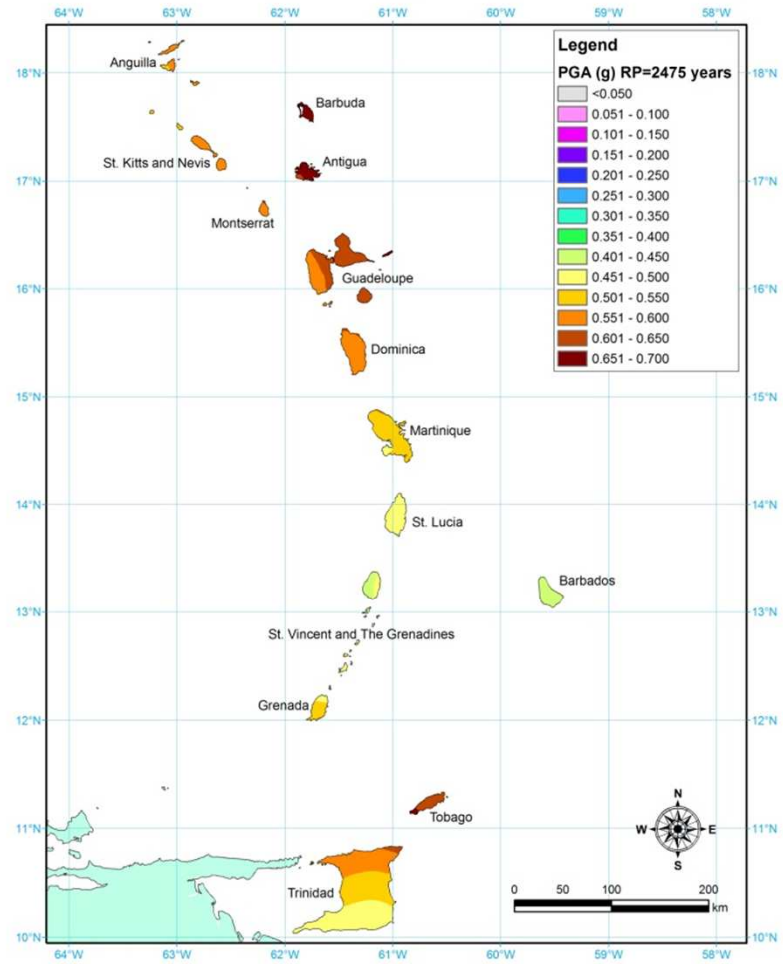
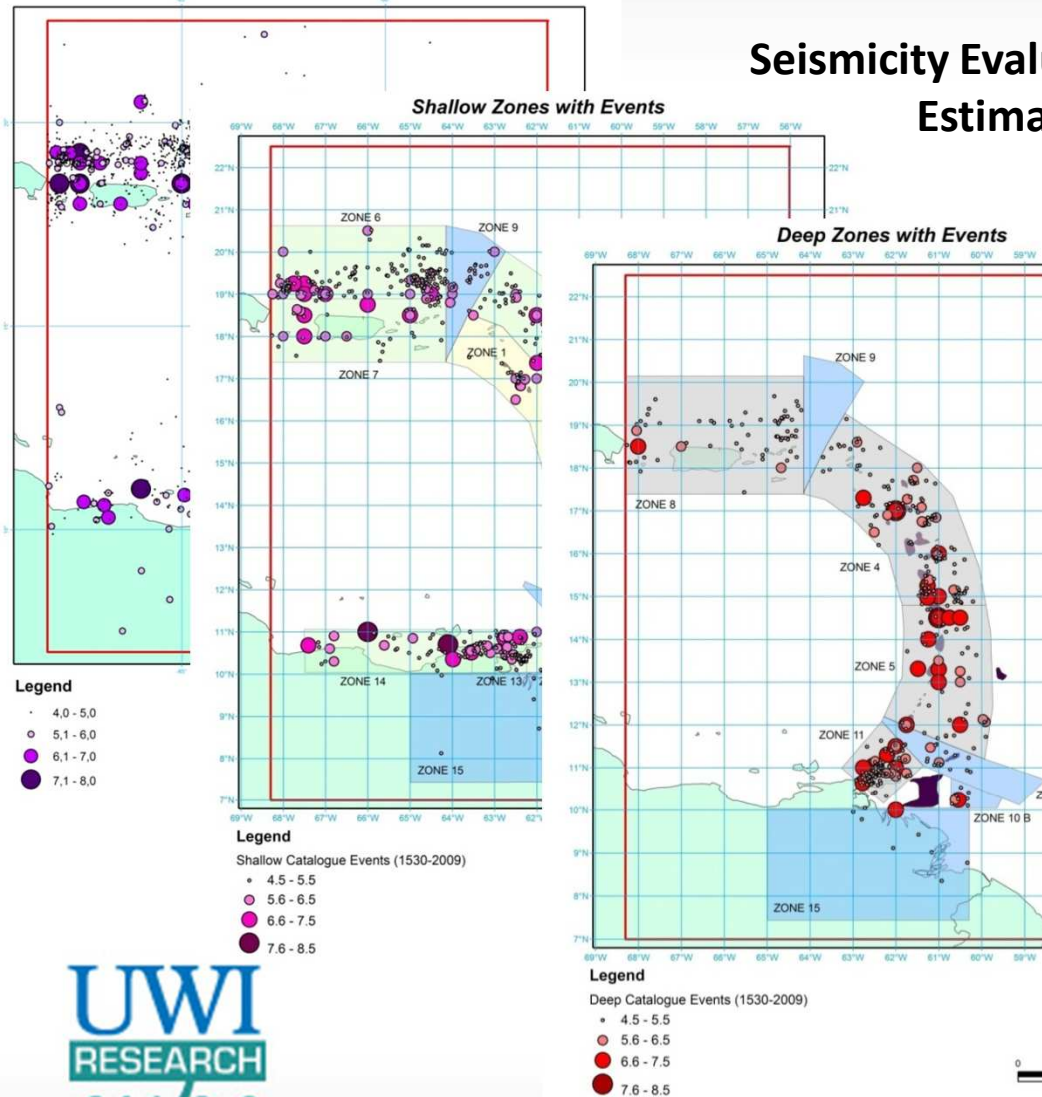
## Soufriere Hills Volcano, Montserrat: Hazard Levels and Access Controls



# Probabilistic Seismic Hazard Maps

Catalogue Events 1530-2009

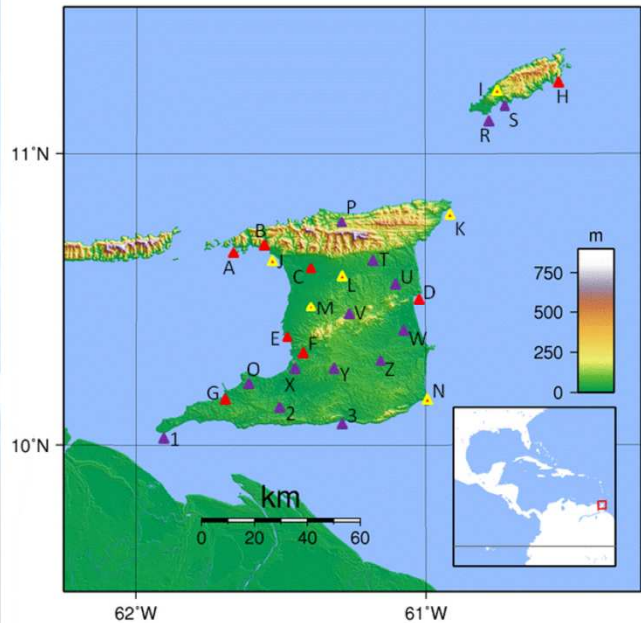
Seismicity Evaluation + Strong Ground Motion Estimation => Seismic Hazard





# Strong Motion Studies

## Trinidad and Tobago Strong Motion Network



- Existing Stations** ▲
- A – Tetron
  - B – Diego Martin
  - C – St. Augustine
  - D – Brigand Hill
  - E – Couva
  - F – Point-a-Pierre
  - G – Point Fortin
  - H – Speyside

- Under Construction** ▲
- I – Moriah
  - J – EWFC, POS
  - K – Toco
  - L – Anima
  - M – Chaguanas
  - N – Galeota

- Desired** ▲
- O – La Brea
  - P – Blanchisseuse
  - R – Cove
  - S – Scarborough
  - T – Valencia
  - U – Sange Grande
  - V – Talparo
  - W – Biche
  - X – San F’do
  - Y – Princes Town
  - Z – Rio Claro
  - 1 – Cedros
  - 2 – Siparia
  - 3 – Laroda



## New Partnership to Improve Mitigation of Risk from Earthquakes in the Caribbean

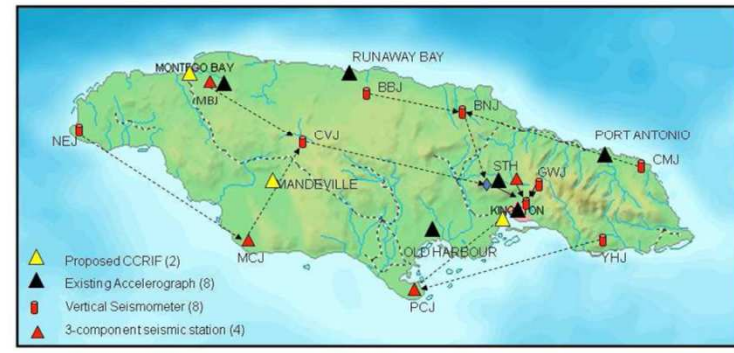
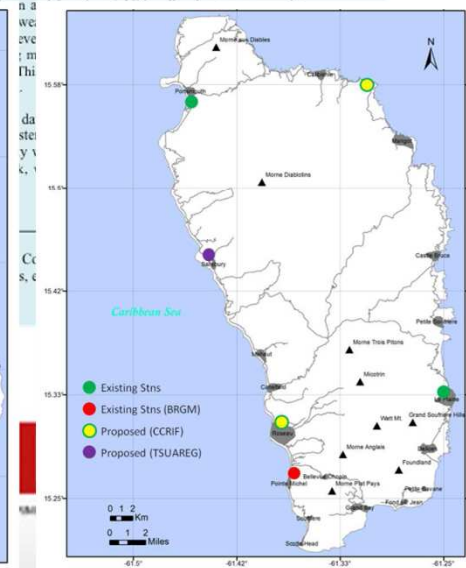
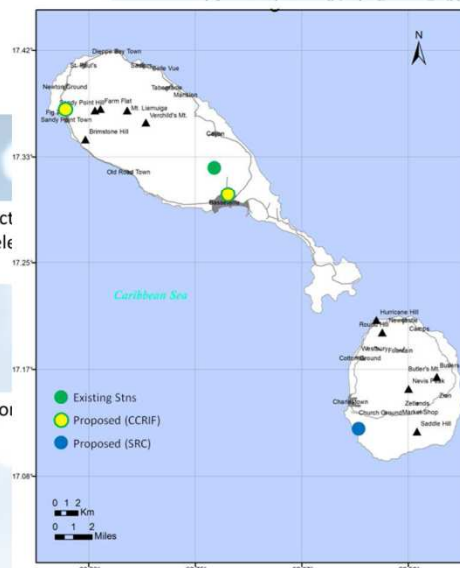


Fig. 2 – (above) Shows the current and project composition of the Trinidad and Tobago accel network.



Fig. 3 – (left) Shows a modern digital accelerometer.





## Trinidad & Tobago Seismic Microzonation Project

**Funding:** Government of Trinidad & Tobago

The first such study in the English-speaking Caribbean, this research project aims to produce maps subdividing the country into zones based upon how strongly the ground may shake at a specific site within a given city or town. The maps may be used by disaster managers, engineers, insurance companies and land use planners in selecting sites for essential facilities and estimating impact on existing facilities such as schools and lifelines.



## A New Volcanic Emissions Monitoring Network

**Funding:** The UWI - Trinidad & Tobago Research & Development Impact Fund

The project will establish a network for monitoring volcanic emissions (water and gas) at Sulpur Springs in Saint Lucia. The first of its kind in the region, this pilot study promotes community engagement in emissions monitoring and health hazard management that may be adopted in other islands particularly those which promote volcano tourism.



UWI

Seismic Research Centre



Connect with the SRC  
[www.uwiseismic.com](http://www.uwiseismic.com)



Thank You for Listening!

