OBSERVED CLIMATE CHANGE IN THE CARIBBEAN:
CURRENT STATUS AND PAST STUDIES

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‘Climate change is an issue of our times – one that Caribbean cannot avoid contending with . . . . . . . . ’
– CSGM 2011
CLIMATE CAN CHANGE

Climate Change

- Distinct changes in measures of climate lasting for a long period of time

<table>
<thead>
<tr>
<th>Natural Variations</th>
<th>Volcanic Eruptions</th>
<th>Human Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in the earth’s orbit</td>
<td>Alter aerosols in the atmosphere (block sunlight) ... not long term effect.</td>
<td>Changing land cover (reflective properties of earth).</td>
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<tr>
<td>Changes in solar intensity</td>
<td>Alter carbon dioxide concentrations (CO2)</td>
<td>Altering aerosol concentrations.</td>
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<tr>
<td>Pre-industrialized era e.g. Ice Age</td>
<td></td>
<td>Post Industrial Revolution (~1750). Burning of fossil fuels and biomass has altered the composition of the atmosphere primarily through the addition of greenhouse gases.</td>
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</tbody>
</table>
CLIMATE CAN CHANGE

IPCC (2007):
It is extremely unlikely (<5%) that the global pattern of warming during the past half century can be explained without external forcing, and very unlikely that it is due to known natural external causes alone.
CLIMATE HAS CHANGED
CLIMATE HAS CHANGED: GLOBAL TRENDS

IPCC (2007):

Temperature
- Rise of $0.74\,{}^\circ C \pm 0.18\,{}^\circ C$ during the period 1906 - 2005
  - 1998 and 2005 were the warmest years
  - More warm days, fewer cold nights
  - Lower diurnal temperature range

Rainfall
- Northern latitudes are wetter, Tropics are drier
  - Droughts more common
  - Heavier rainfall events
  - More intense – dangerous – hurricanes
CLIMATE HAS CHANGED: GLOBAL TRENDS

IPCC (2007):

- Primary factors driving current sea level rise include:
  - the expansion of ocean water caused by warmer ocean temperatures
  - melting of mountain glaciers and small ice caps
  - (to a lesser extent) melting of the Greenland Ice Sheet and the Antarctic Ice Sheet
Climate Has Changed: Global Trends

IPCC (2007):

- Sea Level rise
  - Sea levels have risen across the globe over time
  - Rise is due to thermal expansion and melting of glaciers and ice sheets

- 20th century rate of 4.8 to 8.8 inches per century (1.2-2.2 mm/year)
Climate has changed

Caribbean Trends

Trends presented are for the mean Caribbean
CLIMATE HAS CHANGED: CARIBBEAN TRENDS

Peterson et al (2002):

- 1950-2000
- More warm days, More warm nights
- Fewer cool days, Fewer cool nights
CLIMATE HAS CHANGED: CARIBBEAN TRENDS

Peterson et al (2002):

- 1950-2000
- Intra-Annual extreme temperature range (ETR) is steadily decreasing.

ETR = warmest maximum temperature minus coldest minimum temperature reading for year
CLIMATE HAS CHANGED: CARIBBEAN TRENDS

- Maximum number of consecutive dry days is decreasing (Peterson, et al. 2002)
- dry day = day where precipitation is less than 1 mm
- Highly variable
- Greatest 5-day rainfall total is increasing.
  i.e. more heavy rains and flooding
- Increased frequency of droughts (Taylor et al. 2007)
Climate Has Changed: Caribbean Trends

- Simple daily intensity is decreasing.
- Trend is not statistically significant.
- Percent of total annual rainfall coming from heavy rainfall events is increasing.
- Trend is not statistically significant.
CLIMATE HAS CHANGED: CARIBBEAN TRENDS

CSGM (2011):

- Tropical storm and hurricane frequencies vary considerably from year to year, but evidence suggests increases in intensity and duration since the late 1990s.
CLIMATE HAS CHANGED: CARIBBEAN TRENDS

Sea Level Rise (SLR)

- Most of the Pacific and Atlantic basins are experiencing average to above-average sea level rise (IPCC 2007)

- Caribbean sea level rise appears to be near the global mean (Church et al. 2004)

- Not uniform across the Caribbean Basin (Hendry 1993, Gamble 2009)
Rainfall distribution shows greatest intensity in easternmost and westernmost parishes, and lowest across the southern plains.

Change since 1992 has been greatest in wettest areas:
  - East seems to be drying as west gets wetter.
JAMAICA: TEMPERATURE

- Apparent warming trend - from airport temperature data
JAMAICA:
SEA-LEVELS AT PORT ROYAL 1955 – 1971
(REDRAWN FROM CAMBRAY 1973, LINEAR TREND INSERTED)

Mean annual sea levels-
• Fluctuation maximum at 88 mm, and minimum at 3 mm
• Trend line indicates mean rise for 1955-1971 is 15 mm

Courtesy of The Marine Geology Unit, UWI Mona
CLIMATE HAS CHANGED: CARIBBEAN TRENDS - SUMMARY

- Caribbean Climate has changed
- General tendency between 1950-2000 is:
  - Hotter
  - Drier
    - Longer dry spells
    - More intense rainfall events
  - More intense hurricanes with longer durations
  - Rising sea levels
THANK YOU