Understanding Climate Sciences and Services in the Caribbean

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Laing ICAS Seminar

Caribbean Low-level Jet

Tropical Upper-Tropospheric Trough (TUTT)

Tropical circulation features expanding poleward

Mean Sea-level Pressure and Winds

January

July

Upper Air

Subtropical Jet

Polar Jet

Surface

Caribbean Low-level Jet

Mean Sea Level Pressure (hPa) and Surface Winds (m s⁻¹) (1981-2010)

Mean Sea-level Pressure and Winds

January

July

Tropical circulation features expanding poleward

Surface

Caribbean Low-level Jet

Mean Sea Level Pressure (hPa) and Surface Winds (m s⁻¹) (1981-2010)

Mean Sea-level Pressure and Winds

January

July

Tropical circulation features expanding poleward

Surface

Caribbean Low-level Jet

Mean Sea Level Pressure (hPa) and Surface Winds (m s⁻¹) (1981-2010)
Caribbean Weather and Climate

- **Semi-permanent features**: ITCZ, Subtropical Ridge, Trade Wind Inversion, Caribbean Low-level Jet

- **Hazardous Weather**: Hurricanes, Tropical waves, Cold fronts/Shear lines, Upper level troughs, Severe thunderstorms/lightning; Tornadoes/Waterspouts, Sea/land breezes, Saharan dust outbreak, Trade Wind Surge, Volcanic ash, Wildfires

- **Climate variability**: Wet/Dry spells, Heat waves, Seasonal and inter-annual droughts, Madden Julian Oscillation (MJO), El Nino Southern Oscillation (ENSO), Atlantic Multi-decadal Oscillation (AMO), North Atlantic Oscillation (NAO)

*Mahoney and Hartmann 2000*
Caribbean Climate Science: Research and Application

- National Meteorological & Hydrological Services – Stewards of climate data, long-term observations, collection, and analysis
- The University of the West Indies (UWI) Climate Studies Group at Mona (CSGM) & UWI Cave Hill
- Caribbean Institute for Meteorology and Hydrology (CIMH), Technical Organ of Caribbean Meteorological Organization (CMO)
- Caribbean Community Climate Change Centre (5Cs)

Examples of Major Research Activities

- Caribbean Climate Modeling Consortium (led by CSGM, includes non-Anglophone Caribbean)
- Pilot Programme for Climate Resilience-Caribbean Regional Track (led by CSGM, funded by IADB, CIF)
- State of Caribbean Climate 2020
- EUREC4A (Elucidating the role of clouds-circulation coupling in climate)-ATOMIC International field study, January-February 2020, based in Barbados (led by Germany and France, CIMH – Caribbean lead)

http://socc.mona.uwi.edu/2020, Funded by CDB For Resilience Building
Daily Temperature Trends

(a) TXmean, (b) TNmean and (c) Daily Temperature Range

- Increase in Daily Max & Min at most stations
- Greater rate of increase in Minimum Temperature
- Reduction in daily temperature range

Stephenson et al. 2014
Ranking of countries based on Caribbean climate change vulnerability scores

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0219250
Vision of the Global Framework for Climate Services (GFCS): “To enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information and prediction into planning, policy and practice on the global, regional and national scale.” (WMO, 2011, 2014)
Weather, Water, Climate Prediction in the Caribbean

UWI CSGM/CCCCC

CIMH/CaricOF

NMHS

(CMO HQ coordinates agreements, international compliance, projects, ...)

Source: UKMO/WMO
Roadmap and Plan of Action 2020-2030

- Strategic, long-term (11-year) approach to regional and national level implementation of the WMO-led Global Framework for Climate Services (GFCS) in the Caribbean;
- Connects regional priorities with existing international frameworks;
- Mechanism for creating an agenda/vision that is directly relevant to Caribbean territories;
- Responds to need for sustainability of national and regional climate-informed sectoral initiatives;
- Promotes regional ownership of climate services agenda; and
- Developed through 2.5 year consultation and collaboration with sectoral, national, regional, donor and other relevant representatives.

Early Warning Information Systems across Climate Timescales (EWISACTs)

Strengthening Climate Services in the Caribbean
Through the
Sectoral Early Warning Information Systems Across
Climate Timescales (EWISACTs)
Regional Roadmap and Plan of Action (RPA) 2020-2030

Prepared by:
The Caribbean Institute for Meteorology and Hydrology (CIMH)
The Caribbean Agricultural Research & Development Institute (CARDI)
The Caribbean Water and Wastewater Association (CWWA)
The Caribbean Disaster Emergency Management Agency (CDEMA)
The Caribbean Public Health Agency (CARPHA)
The Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE)
The Caribbean Tourism Organization (CTO)
The Caribbean Hotel & Tourism Association (CHTA)

10th Meeting in May 2023!
DECEMBER 2020
Co-produced Bulletins (Nov 2022–May 2023)

Operational sector-specific bulletins

- Monthly Agriculture-Climate Bulletin: Vol 6, Issues 7 to 11
- Quarterly Tourism-Climate Bulletin and Health-Climate Bulletin: Vol 6, Issue 4 – Vol 7, Issue 1

How can we downscale sectoral partnership practice to national level?

Courtesy, CIMH RCC
Climate Services at National Level

National Meteorological & Hydrological Services – supported by CIMH, CMO HQ, 5Cs
Among users, NMHSs outperform other major potential providers of climate information in the Caribbean on user interaction

The national context and the NMHS is one of the most impactful levels of investment

Among users, NMHSs outperform all other sources of climate information, for all categories of climate information

Need more Exposure and Training

Courtesy, CIMH RCC
Met Services believe that convening National Climate Forums is an area in need of development.

Only 4 countries have convened NCOFs:
- [Flag]
- [Flag]
- [Flag]
- [Flag]

**Strongly agree**
**Agree**
**Neither agree/disagree**
**Disagree**
**Strongly Disagree**
**Don't know**
**Not applicable**

Convening of national climate outlook forums

11/7/2023
Laing/CMO, CRM 2023
Intra-ACP Climate Services and Related Applications Programme (ClimSA): Four-year project funded through the European Union (EU) African, Caribbean, Pacific (ACP) Secretariat and being implemented by CIMH on behalf of CMO.

Advancing climate services value chains in the:

- **health** sector of Dominica,
- **water** sector of Jamaica and
- **agriculture and food security** sector of Guyana
March 2023, IPCC released Synthesis Report

**Impacts of climate change felt through water:**
- more intense and frequent droughts
- more extreme flooding
- more erratic seasonal rainfall

Large adverse impacts observed in many locations and communities in Small Islands, including the Caribbean
January 2023

**MONTHLY RAINFALL SUMMARY**

**HIGHLIGHTS FOR JANUARY**

- Twelve (12) of thirteen (13) parishes received below-normal rainfall during January.
- Eleven (11) parishes recorded meteorological drought conditions.
- Near-normal rainfall is forecast for March to May 2023.
- Near-normal to above-normal temperatures are expected for March to May 2023.

**What Happened: November 2021 – January 2022**

Based on analysis (image to the right) very dry conditions were noted in sections of Trelawny, St. Ann, St. Mary, St. Thomas, St. Catherine and Clarendon. Sections of St. James, St. Elizabeth and Portland were experiencing mild levels of wetness.

The below-normal rainfall received across the island, during the early months the dry season (December, January) has resulted in continued dry conditions in many farming communities especially in central parishes.
Seamless Precipitation Forecasting

Seasonal Rainfall Outlook

Probability of Most Likely Category of Rainfall February to April 2023

Dryness/Drought Indicator Outlook

February to April 2023

Extended Precipitation Forecast for week 3 ahead
National Frameworks: Weather, Water, Climate Services

CMO HQ & WMO Project

- **Strategic Plans, including National Frameworks for Weather, Water, and Climate Services** in 2021: Anguilla, Antigua and Barbuda, Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis and St. Vincent and the Grenadines

- In 2023, **Strategic Plans, including National Frameworks for Weather, Water, Climate, and Ocean Services** in Turks and Caicos Islands and Cayman Island

CIMH RCC

- **3 National Roadmaps for Climate Services, 2022-2026:** Grenada, Saint Lucia, St. Vincent and the Grenadines

Developed in collaboration with CIMH RCC

Sponsored by Climate Risk and Early Warning Systems (CREWS) & Environment and Climate Change Canada
Model Hydro-Meteorological Bill and Meteorology Policy (Anglophone Caribbean)

- Endorsed by CMO Members States in June 2021
- Institutional strengthening
- Legal mandate, with well-defined roles, responsibilities, adequate human & technical resources, and interactions with other agencies and stakeholders
- Drafted national legislation for Anguilla, Antigua and Barbuda, Belize, Grenada, Jamaica, Saint Lucia, St Kitts & Nevis, St Vincent & the Grenadines, and Barbados
UN Early Warnings for All: by 2027, for climate adaptation

“National Meteorological and Hydrological Services (NMHSs) and Disaster Risk Management agencies, as the relevant authoritative providers, will be central for enabling implementation at the national level.”

*Executive Action Plan, delivered at COP27, WMO 2022*
### CREWS: CMO HQ Strengthening Hydro-Meteorological and Early Warning Services

<table>
<thead>
<tr>
<th>Component</th>
<th>1. Development of a regional strategy and roadmap for early warning systems</th>
<th>2. Institutional strengthening and streamlining of early warning and hydro-met services</th>
<th>3. Support for piloting high-priority activities at national level with regional involvement, also regional level, informed by regional strategy</th>
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<tr>
<td>Project</td>
<td>Strategic Roadmap for Advancing Multi-Hazard Early Warning Systems in the Caribbean 2020-2030</td>
<td>Building Resilience to High-Impact Hydro-meteorological Events through Streamlining MHEWS in Small Island Developing States (SIDS) in the Caribbean (Lead)</td>
<td>Development of a Prototype Multi-Sensor Precipitation Grid (Coordination Lead) Ultimate goal: Regional grid using Radar Network</td>
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| Activities & Updates | CMO - Participant in Regional Early Warning Systems Consortium (led by CDEMA), Contributed to its development of the Strategic Roadmap | Meteorological Legislation and Policy  
  - Model Bill & Policy endorsed in June 2021  
  - 8 Bills & Policies adapted in 2021-2022  
  - 1 in 2022-2023 | URLs: [https://mspg.cimh.edu.bb/#/home](https://mspg.cimh.edu.bb/#/home)  
[https://www.cimafoundation.org/mspg/#/home](https://www.cimafoundation.org/mspg/#/home) |
|          | National Strategic Plans, Frameworks for Weather, Water & Climate Services, with Action Plans  
  - 8 Strategic Plans developed in 2020-2021  
  - 2 more, with ocean services in 2022-2023 | Common Alerting Protocol Workshops  
  - Belize and Turks and Caicos Island, 2023 EUREC4A-SWFP workshop  
Severe Weather Case Catalogue Database  
- Supporting Severe Weather Forecasting, Monitoring loss and damages  
Marine Meteorology Services workshop  
- Supporting user-oriented products & services | Planning and Coordination of seven-part Webinar series on Impact-based Forecasting and Weather Ready Nations in 2022  
Input and Review of Regional Alerting System study & Integrated Flash Flood guidance, 2022-2023 |
Thank you!

Celebrating 50th Anniversary of CMO

Special Event
15 November 2023, Port of Spain

In conjunction with 65th Caribbean Meteorological Council and Related Meetings, 13-17 November 2023

Hosted by Ministry of Public Utilities, Port of Spain