Current status of operations of Regional Climate Centre for the Caribbean

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WEATHER CLIMATE WATER
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WMO OMM
World Meteorological Organization
Organisation météorologique mondiale

WMO International Workshop on Global Review of RCC Operations, Pune, India, 12 – 14 November 2018

RCC background

- ***Target region – Caribbean, islands from Trinidad and Tobago in the south to The Bahamas in the north as well as the mainland Guianas and Belize.***
- ***Coordinating Institution – The Caribbean Institute for Meteorology and Hydrology (CIMH)***
- ***The Board of Governors of the Caribbean Meteorological Organization (CMO) governs CIMH including its technical departments (including the RCC)Partnerships***
- ***Entered Demonstration Phase – March 2013***
- ***Designated Caribbean RCC –May 2017***
- ***Climate context*** *– one wet season, one dry season per year (except in the northern portion of the Guianas that experiences two wet and two dry seasons per year associated with the passage of the ITCZ)*
- ***Major Climate Drivers*** *– (i) El Niño Southern Oscillation (ENSO) and the gradient in sea surface temperature (SST) between the Pacific and the Atlantic, (ii) North Atlantic Oscillation (NAO) and North Atlantic High Pressure cell, (iii) Madden Julian Oscillation (MJO), (iv) Caribbean Low-Level Jet, (v) Saharan Air layer*
- ***Funding Sources*** *– (i) Member States of CMO/CIMH form core budget; (ii) international donor support, including through projects – NOAA, USAID, ECCC, WMO, PPCR, CDB*
- *Climate products (LRF and monitoring) updated monthly, with delivery by 20th of the month*

RCC Operations: Mandatory Functions

1. Operational Data Services

- *CIMH an archive for regional meteorological data since 1967*
- *For CIMH Member States most parameters, but rainfall and temperature most prevalent. Also through CariCOF non-CMO Caribbean member States - rainfall and temperature entered in CAROGEN*
- *Quality controlled by NMHSs, but additionally QC for RCC products of rainfall and temperature using ClimPACT2*
- *With recent completion and release of the CIMH customised database transfer of data between NMHSs and CIMH easier. Online link to database will be made available for potential data users to view data availability*
- *Concern: Non rainfall and temperature data not routinely sent to CIMH by some countries*
- *Concern: Some stations have gaps in data*

RCC Operations: Mandatory Functions

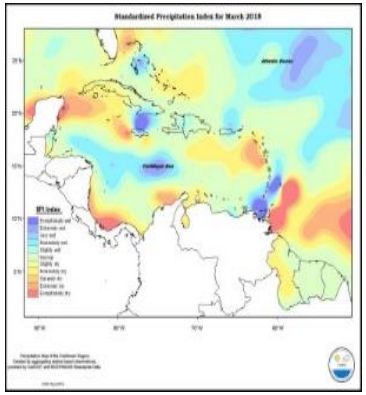
2. Climate Monitoring

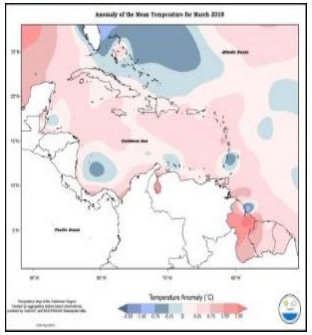
- *Information on variability, extremes and records are available on CAROGEN for rainfall and temperature (http://carogen.cimh.edu.bb/);*
- *Products delivered by the Caribbean RCC on a monthly basis utilizing a customized, in-house built software. These include monthly rainfall totals, mean temperatures, 1-, 3-, 6-, 12- and 24 month SPI and SPEIs, and the month to month relative changes of both the SPI and SPEI for each time interval, also and deficits (and excesses) in accumulation of rainfall (these are experimental)*
- *Reference climatologies (1981-2010) available for Caribbean stations on RCC web page, but monthly updated climatologies for entire data series of rainfall and temperature available for each station*
- *Climate watches are provided every month in CariCOF Newsletter (for NMHSs and other physical scientist), in sector (agriculture, health and tourism) bulletins*
- *Data availability is a constraint, including untimely sharing for on-time delivery of products*

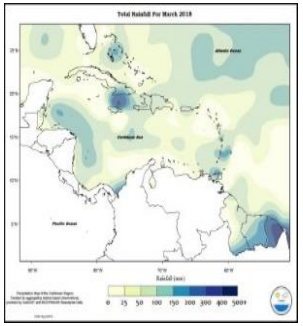
Climate Monitoring product suite

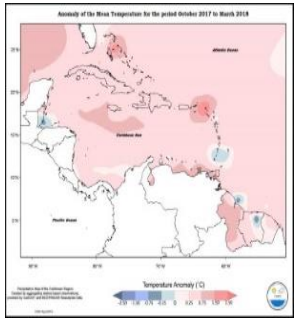
Drought and rainfall, temperature

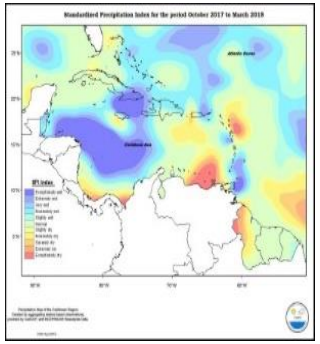
Supports our regional Climate Watch

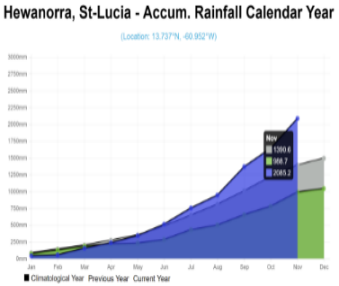


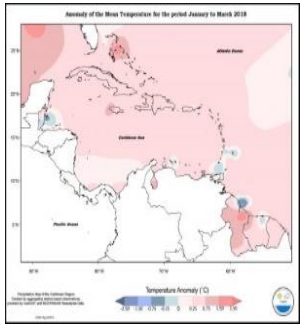


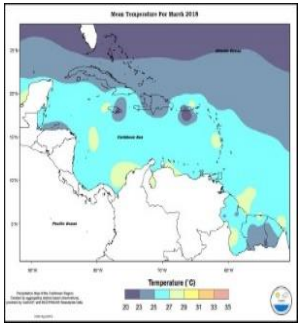


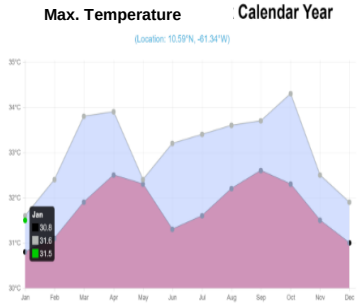


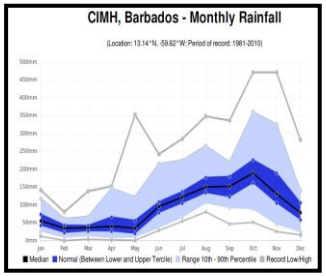


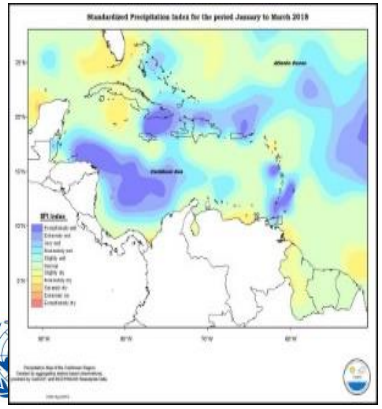


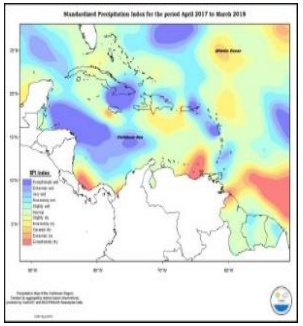


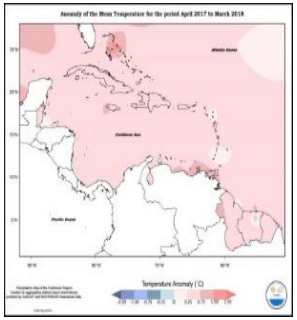


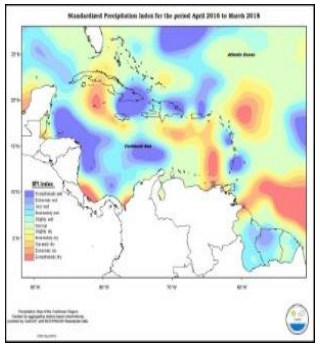












Produced through two in-house-built tools

Caribbean Climate Monitor

CariCOF Outlook Generator

Reference Climatologies

https://rcc.cimh.edu.bb/caribbean-climatology/1981-2010/

RCC Operations: Mandatory Functions

3. Long Range Forecasting

- *A statistical downscaling approach using the Climate Predictability Tool (CPT) to prepare tercile-based, probabilistic seasonal precipitation and temperature forecasts, 0-month and 3-month lead, mainly objective with limited consensus forecast maps are produced*
- *Non tercile tailored LRF products (1) drought outlook based on the SPI for short- (SPI6) and long-term, (SPI12 with drought alert maps, (2) wet days and wet spells outlooks – implications for flooding (3) experimental heat outlooks and seasonal heatwave days frequency outlooks for a period of 1 to 6 months – implications for heat stress; (4) experimental 7- and 15-day dry spell outlooks, - implications for agriculture water availability;*
- *Outlooks are assessed against GPC and IRI model guidance ;*
- *Consensus statements prepared monthly, twice per year at CariCOF and via teleconference the other 10 months;*
- *Monthly verification of rainfall and temperature routine;*
- *Feedback on products is gained in multiple ways (CariCOF and other workshops, surveys and focus groups, emails) and analysed. These help to enhance products, trigger the development of new ones, more relevant for decision making. Some of the analysis being prepared for peer reviewed journals.*
- *Timely data sharing a challenge*

CCA experiments

example from zero month lead time

1) Predictor is observed SST over the tropical Atlantic and Pacific over July (data source: NOAA ERSSTv3b, obtained from the IRI data library)

2) Predictor is observed SST over the tropical North Atlantic over July

3) Predictor is predicted SST over the tropical Atlantic and Pacific over SON (data source: NOAA CPC CFSv2 , July initialisation)

4) Predictor is predicted SST over the tropical North Atlantic

5) Predictor is predicted rainfall totals over the Caribbean (data source: ECHAM4.5 ensemble24, obtained from the IRI data library)

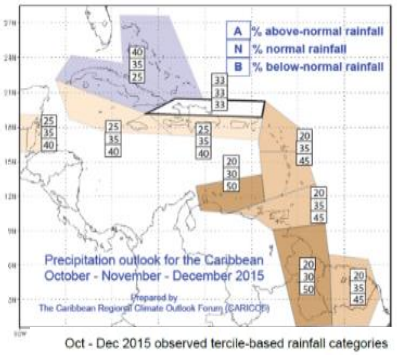
example from three month lead time

1) Predictor is observed SST over the tropical Atlantic and Pacific over Aug(data source: NOAA ERSSTv3b, obtained from theIRI data library)

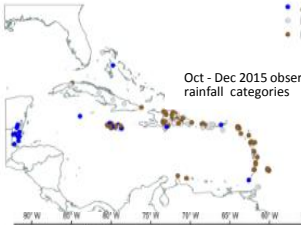
2) Predictor is predicted SST over the tropical Atlantic and Pacific over JFM (data source: NOAA CPCFSv2,Sep(initialisation)

Besides the major control of ENSO (here represented by Pacific tropical SST anomalies) and tropical north Atlantic SSTs on Caribbean rainfall variability, these experiments take the contrast between Pacific and Caribbean/trop. N Atlantic SSTs into account, as those factors are regarded as the most important drivers of rainfall throughout the Caribbean.

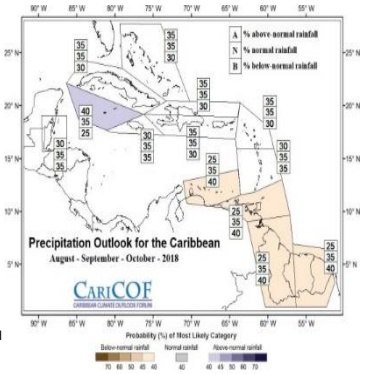
Climate Forecasts product suite



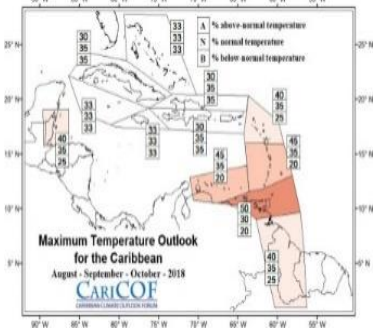
Oct - Dec 2015 observed tercile-based rainfall categories

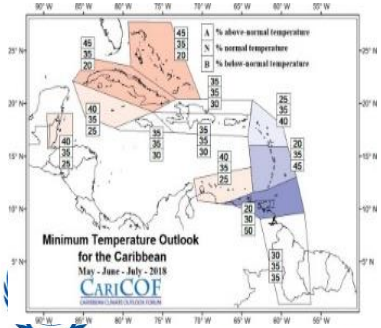


Oct - Dec 2015 observed tercile-based rainfall categories

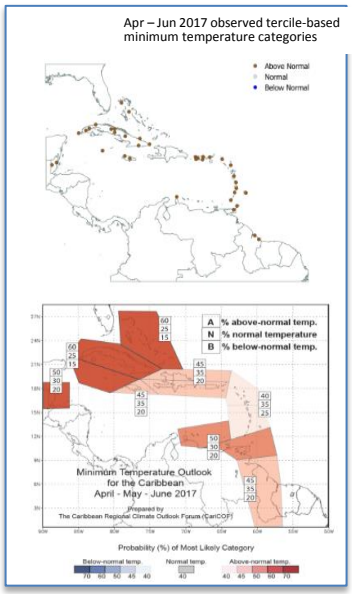


0-/3-ml Tercile-based precip. and temp. outlooks + verification





Apr – Jun 2017 observed tercile-based minimum temperature categories



Climate Products
Partnering with the NMHSs

Seasonal forecasts up to 3-6 month ahead

Rainfall totals Mean, maximum and minimum temperature

More meaningful: Drought – alerting system

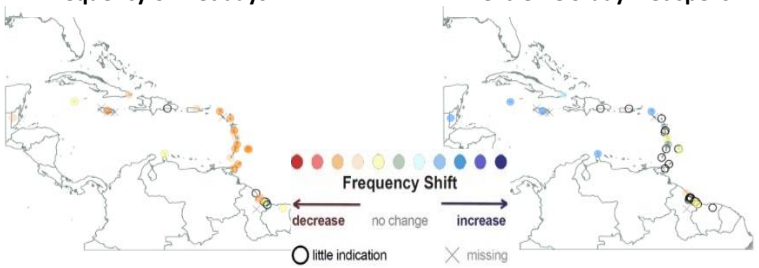
Wet days

(Extreme) wet spells

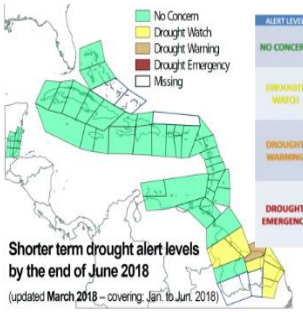
Coral bleaching

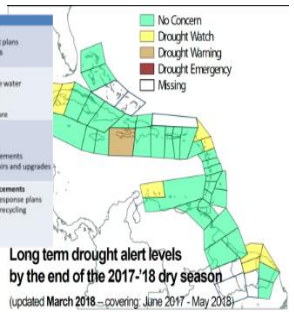
MJJ 2018 Frequency of wet days

MJJ 2018 frequency of extreme 3-day wet spells

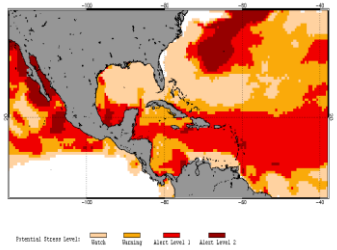


Thematic / hazard-specific outlooks

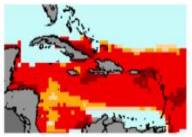




Coral bleaching thermal stress for Aug. to Nov. 2017



Coral bleaching alert levels (0-/4--ml)

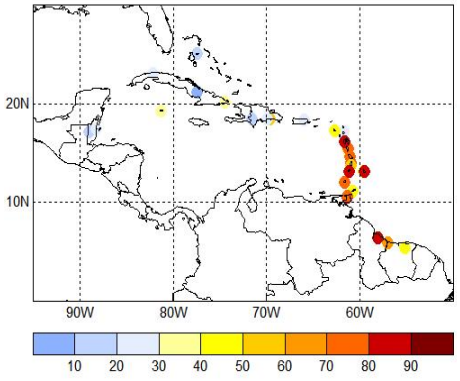


Experimental forecast and monitoring products

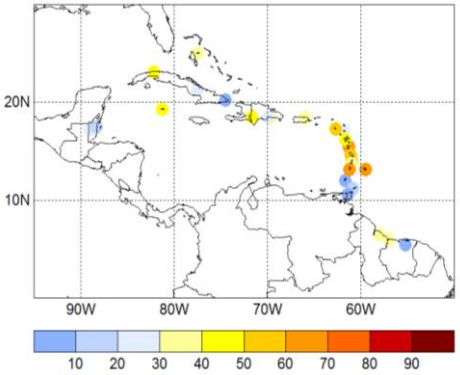
Gathering stakeholder feedback

Seasonal heatwave frequency outlooks (up to 6 months)

Probability of at least 14 heatwave days between Jun. & Sep.

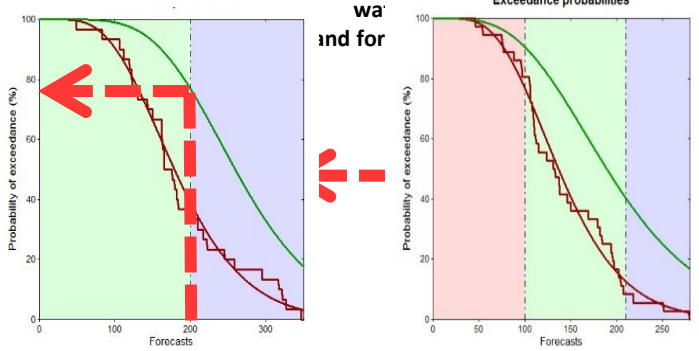


Probability of at least 60 heatwave days between Jun. & Nov.



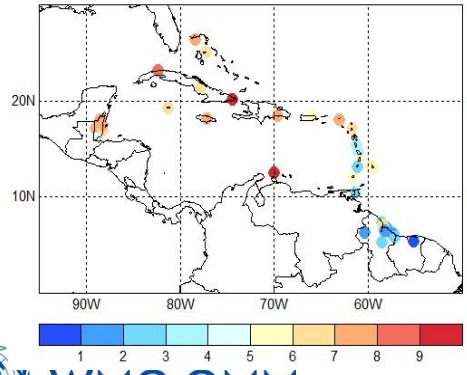
Seasonal rainfall exceedance outlooks for crop water demand (3 months)

Probability of meeting water demand for sweet potato

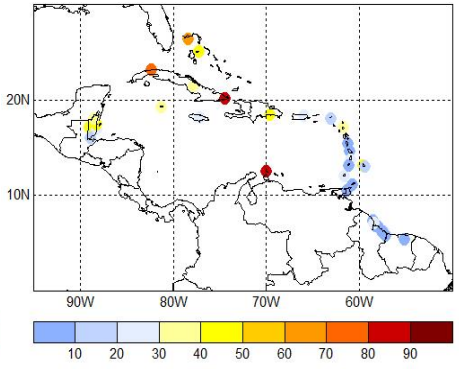


Seasonal dry spells frequency outlooks (3 months)

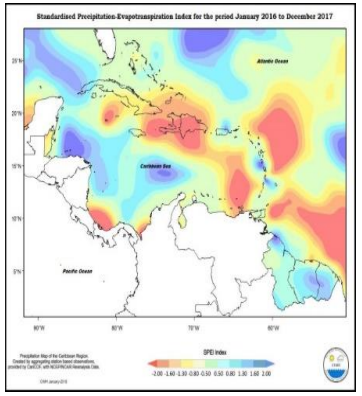
MAX. number of 7-day dry spells
7d max MJJ2018

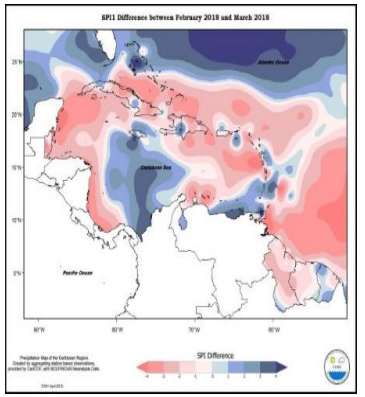


Probability of at least ONE 15-day dry spell between May & Jul.



Drought monitoring products (SPEI, SPI change)





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RCC Operations: Mandatory Functions

4. Training/Guidance in the use of RCC products

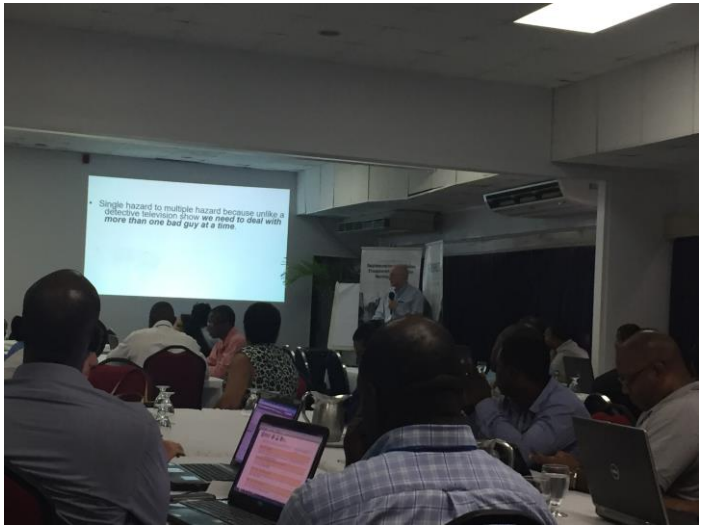
- *Regular training of meteorologists and climatologists within the Caribbean NMHSs in climatological practice, including data management and quality control, climate science, operational climate prediction and climate products and services development*
- *Training twice per year, preceding the CariCOF. In addition, climate literacy is being enhanced in the public and private sectors, including public services, media, and climate-sensitive socio-economic sectors (the 5 GFCS priority areas and tourism) during CariCOF Forums. When project funding permits, topical training courses are also offered to NMHSs and, where relevant, practitioners from target sectors on specific climate information (e.g. agricultural extension officers, farmers, hydrologists, water managers, disaster managers, health practitioners), or members of the media when dealing with climate communication.;*
- *Guidance manuals are to be prepared under a current initiative;*
- *Funding for face to face training a constraint*

RCC Operations: Highly Recommended Functions

- *Assessment of GPC products, including sea surface temperatures, done on a monthly basis as part of CariCOF LRF products consensus building process;*
- *Being an archive for regional data, particularly for Member States of CIMH; supporting data rescue, managing regional data and providing training on various data management platforms in the past (including the current CIMH customised database has been significant support for maintaining historical data in NMHSs;*
- *Data quality assurance training has been led by CIMH for decades; in most recent times, training ClimPACT2 and its QC enhanced national and regional databases*
- *CIMH and its RCC coordinates regional climate activity including CariCOF, national sector workshops, training in development and use/interpretation of climate products at national and regional scales; and resource mobilisation and implementation of projects to support national and regional product development, including tailored products.;*
- *Awareness building of media houses and enhanced communication of NMHS staff*
- *Promotion of sector targeted products and services*
- *Mobilise resources for countries for instrument procurement, computer hardware and software resources.*
- *Lead and assist in both climate (and applications) and relevant social sciences research.*
- *Supported rollout of the CST regionally and nationally in the Caribbean at the 2017 Dry Season CariCOF, and continued this training for now 3 NMHSs with a fourth to come later this month*
- *Human and financial resources are a constraint in how many more highly recommended functions can be operationlised*

Role in CariCOF

- *The RCC mobilises resources*
- *Plans and organises the Caribbean Climate Outlook Forum twice per year.*
- *Lead in the production and presentation of seasonal outlooks at CariCOF,*
- *In-house development of CAROGEN.*
- *Lead in training in climate products delivery of both LRF and monitoring*
- *The RCC prepares draft forecast products, and leads and facilitates the video conference consensus forecast discussion that follows in the 10 months between the face-to-face CariCOFs*



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User Engagement

- With small island states and small economy states, with limited human capacity, the Caribbean RCC sees it users as the NMHSs and other stakeholders (particularly climate sensitive socio-economic sectors)
- Sector engagement triggers the development of new products and amendments to existing products to tailor more to sector use.
- Engagement takes place at CariCOFs, national and regional stakeholder workshops orgainsed and led by RCC, webinars
- Regional sector partners (including the regional provider CIMH) work co-produce and co-deliver sector-targeted (agriculture, health, tourism)– (also coral reef and drought) bulletins under EWISACTs consortium
- Other bulletins of importance to many users include the Caribbean Drought Bulletin and the Caribbean Coral Reef Watch (co-produced with NOAA)
- The above engagement activity is used as means for feedback…
- But also surveys, interviews, focus- group discussions are also conducted at the face to face meetings

RCC Website

https://rcc.cimh.edu.bb/

- Publicly accessible online platform for climate information, services and programmes hosted by the Caribbean RCC at CIMH
- The RCC have two staff, whose duties include maintenance and enhancement of the RCC web page
- "One-stop shop" for all:

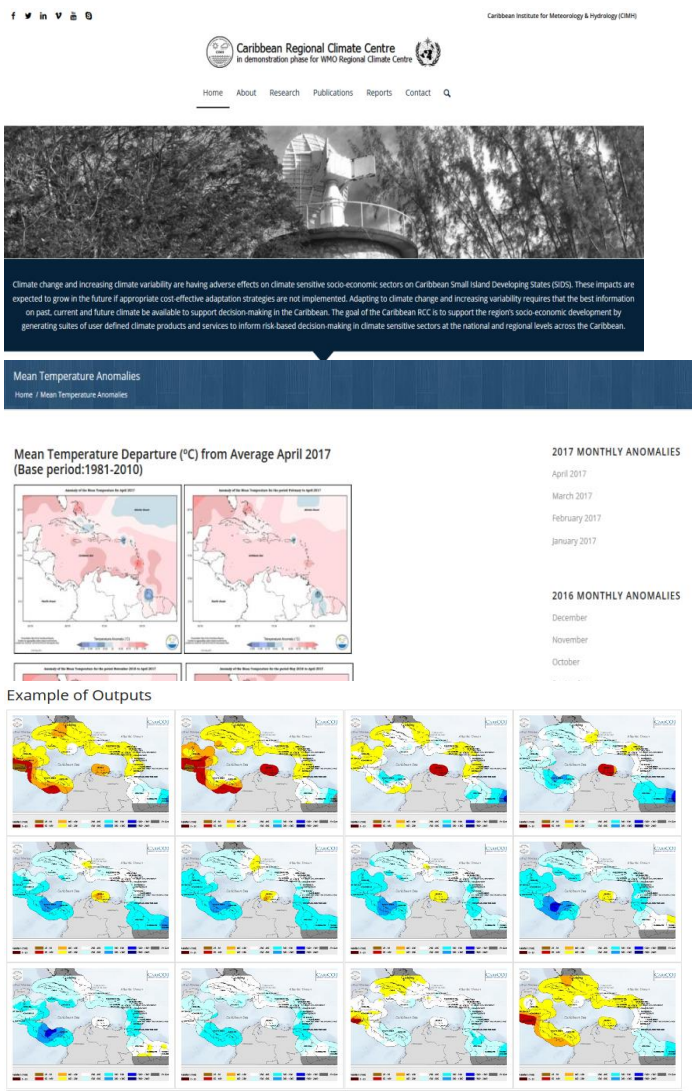
– General information about the RCC
- Objectives, research areas, lists of publications

– Climate products
- Research and information products
- Operational products and services: Monitoring and forecasts

– Bulletins

– Data services
- Weather summaries, climate impacts database, climate database

– Programme information on BRCCC, CariCOF, ECCC
- Goals, reports
- Some links in need of updates (particularly under programmes), but this is at times due to human constraints. However, the RCC makes ensures that information products are up to date



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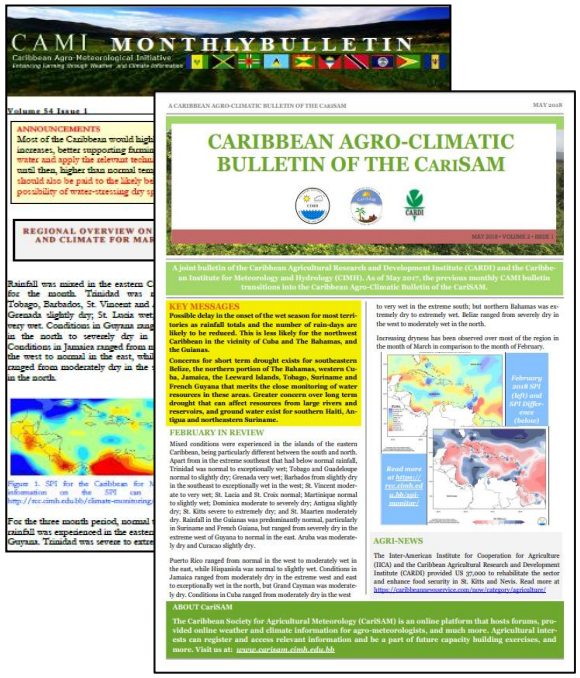
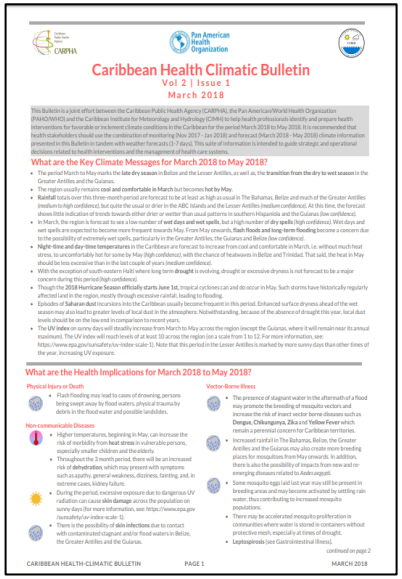
Co-development of Sectoral Bulletins

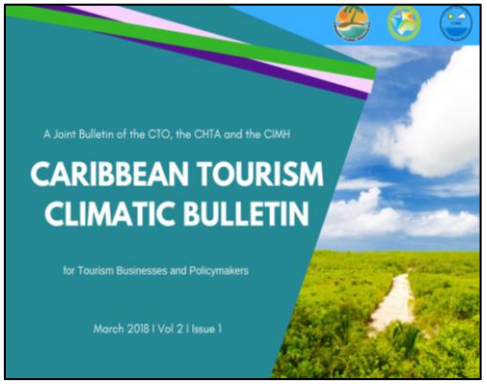
The first major results of the CONSORTIUM partnership



Regional CAMI Bulletin (since 2011), now the Caribbean Agro-Climatic Bulletin of the CariSAM



New Health-Climatic Bulletin (since May 2017)



New Tourism-Climatic Bulletin (since May 2017)

- Key messages – quick information
- Recent related news and weather and climate related impacts
- Climate Smart Advisories – implications of the climate information – how to reduce risk of loss and disaster

Health focus group (2016 Dry Season COF. Photo credit: IRI

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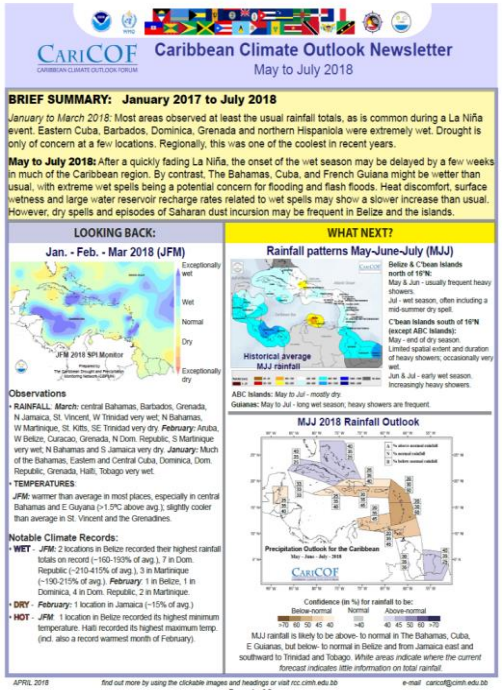
Key regional mechanism to champion co-design, co-development and co-delivery of tailored sectoral climate products and services

CSIS Dissemination Newsletters/Bulletins


CariCOF
Caribbean Climate Outlook Newsletter
May to July 2018

BRIEF SUMMARY: January 2017 to July 2018

January to March 2018: Most areas observed at least the usual rainfall totals, as is common during a La Niña event. Eastern Cuba, Barbados, Dominica, Grenada and northern Hispaniola were extremely wet. Drought is only of concern at a few locations. Regionally, this was one of the coolest in recent years.

May to July 2018: After a quickly fading La Niña, the onset of the wet season may be delayed by a few weeks in much of the Caribbean region. By contrast, The Bahamas, Cuba, and French Guiana might be wetter than usual, with extreme wet spells being a potential concern for flooding and flash floods. Heat discomfort, surface wetness and large water reservoir recharge rates related to wet spells may show a slower increase than usual. However, dry spells and episodes of Saharan dust incursion may be frequent in Belize and the islands.

LOOKING BACK:

Jan. - Feb. - Mar 2018 (JFM)

JFM 2018 SPI Monitor

Exceptionally wet / Wet / Normal / Dry / Exceptionally dry

Observations

- RAINFALL: *March:* central Bahamas, Barbados, Grenada, N Jamaica, St. Vincent, W Trinidad very wet; N Bahamas, W Martinique, St. Kitts, SE Trinidad very dry. *February:* Aruba, W Belize, Curacao, Grenada, N Dom. Republic, S Martinique very wet; N Bahamas and S Jamaica very dry. *January:* Much of the Bahamas, Eastern and Central Cuba, Dominica, Dom. Republic, Grenada, Haiti, Tobago very wet.
- TEMPERATURES: *JFM:* warmer than average in most places, especially in central Bahamas and E Guyana (>1.5ºC above avg.), slightly cooler than average in St. Vincent and the Grenadines.

Notable Climate Records:

- WET - *JFM:* 2 locations in Belize recorded their highest rainfall totals on record (~160-193% of avg.), 7 in Dom. Republic (~210-415% of avg.), 3 in Martinique (~190-215% of avg.). *February:* 1 in Belize, 1 in Dominica, 4 in Dom. Republic, 2 in Martinique.
- DRY - *February:* 1 location in Jamaica (~15% of avg.)
- HOT - *JFM:* 1 location in Belize recorded its highest minimum temperature. Haiti recorded its highest maximum temp. (incl. also a record warmest month of February).

WHAT NEXT?

Rainfall patterns May-June-July (MJJ)

Historical average MJJ rainfall

Belize & C'bean islands north of 16°N: May & Jun - usually frequent heavy showers. Jul - wet season, often including a mid-summer dry spell.

C'bean islands south of 16°N (except ABC Islands): May - end of dry season. Limited spatial extent and duration of heavy showers; occasionally very wet. Jun & Jul - early wet season, increasingly heavy showers.

ABC Islands: *May to Jul - mostly dry.*

Guianas: May to Jul - long wet season; heavy showers are frequent.

MJJ 2018 Rainfall Outlook

Precipitation Outlook for the Caribbean

Confidence (in %) for rainfall to be: Below-normal / Normal / Above-normal

MJJ rainfall is likely to be above- to normal in The Bahamas, Cuba, E Guianas, but below- to normal in Belize and from Jamaica east and southward to Trinidad and Tobago. *White areas indicate where the current forecast indicates little information on total rainfall*

APRIL 2018 — find out more by using the clickable images and headings or visit rcc.cimh.edu.bb — e-mail caricof@cimh.edu.bb

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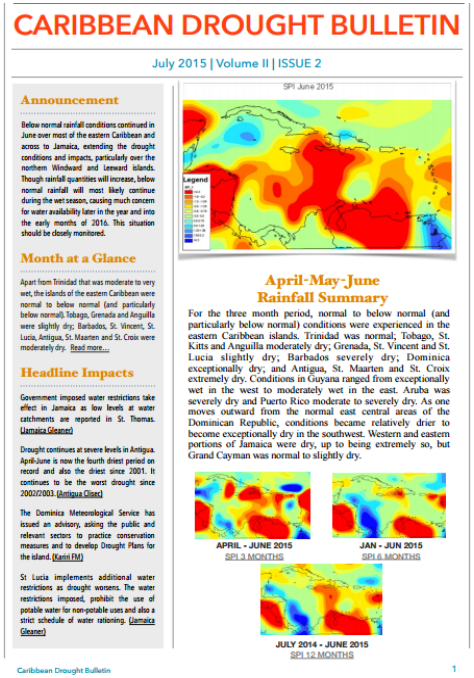
Monthly CariCOF newsletter

Partnering with NMHSs in CariCOF


CARIBBEAN DROUGHT BULLETIN

July 2015 | Volume II | ISSUE 2

Announcement

Below normal rainfall conditions continued in June over most of the eastern Caribbean and across to Jamaica, extending the drought conditions and impacts, particularly over the northern Windward and Leeward islands. Though rainfall quantities will increase, below normal rainfall will most likely continue during the wet season, causing much concern for water availability later in the year and into the early months of 2016. This situation should be closely monitored.

Month at a Glance

Apart from Trinidad that was moderate to very wet, the islands of the eastern Caribbean were normal to below normal (and particularly below normal). Tobago, Grenada and Anguilla were slightly dry; Barbados, St. Vincent, St. Lucia, Antigua, St. Maarten and St. Croix were moderately dry. Read more...

Headline Impacts

Government imposed water restrictions take effect in Jamaica as low levels at water catchments are reported in St. Thomas. (Jamaica Gleaner)

Drought continues at severe levels in Antigua. April-June is now the fourth driest period on record and also the driest since 2001. It continues to be the worst drought since 2002/2003. (Antigua Clise)

The Dominica Meteorological Service has issued an advisory, asking the public and relevant sectors to practice conservation measures and to develop Drought Plans for the island. (Kaieo FM)

St Lucia implements additional water restrictions as drought worsens. The water restrictions imposed, prohibit the use of potable water for non-potable uses and also a strict schedule of water rationing. (Jamaica Gleaner)

SPI June 2015

April-May-June Rainfall Summary

For the three month period, normal to below normal (and particularly below normal) conditions were experienced in the eastern Caribbean islands. Trinidad was normal; Tobago, St. Kitts and Anguilla moderately dry; Grenada, St. Vincent and St. Lucia slightly dry; Barbados severely dry; Dominica exceptionally dry; and Antigua, St. Maarten and St. Croix extremely dry. Conditions in Guyana ranged from exceptionally wet in the west to moderately wet in the east. Aruba was severely dry and Puerto Rico moderate to severely dry. As one moves outward from the normal east central areas of the Dominican Republic, conditions became relatively drier to become exceptionally dry in the southwest. Western and eastern portions of Jamaica were dry, up to being extremely so, but Grand Cayman was normal to slightly dry.

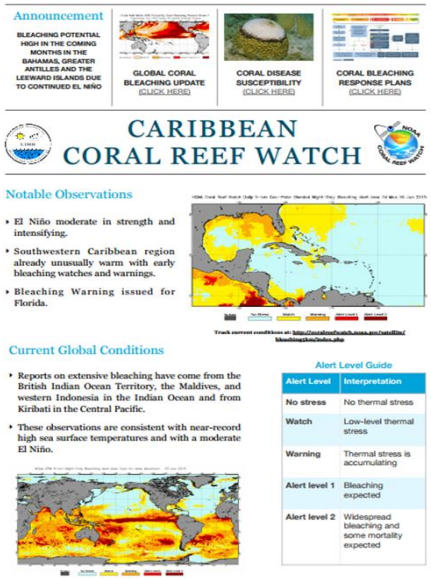
APRIL - JUNE 2015 SPI 3 MONTHS

JAN - JUN 2015 SPI 6 MONTHS

JULY 2014 - JUNE 2015 SPI 12 MONTHS

Caribbean Drought Bulletin 1

Monthly Bulletin of the Caribbean Drought and Precipitation Monitoring Network


Announcement

BLEACHING POTENTIAL HIGH IN THE COMING MONTHS IN THE BAHAMAS, GREATER ANTILLES AND THE LEEWARD ISLANDS DUE TO CONTINUED EL NIÑO

GLOBAL CORAL BLEACHING UPDATE (CLICK HERE)

CORAL DISEASE SUSCEPTIBILITY (CLICK HERE)

CORAL BLEACHING RESPONSE PLANS (CLICK HERE)

CARIBBEAN CORAL REEF WATCH

Notable Observations

- El Niño moderate in strength and intensifying.
- Southwestern Caribbean region already unusually warm with early bleaching watches and warnings.
- Bleaching Warning issued for Florida.

Track current conditions at: http://coralreefwatch.noaa.gov/satellite/bleachingalert/index.php

Current Global Conditions

- Reports on extensive bleaching have come from the British Indian Ocean Territory, the Maldives, and western Indonesia in the Indian Ocean and from Kiribati in the Central Pacific.
- These observations are consistent with near-record high sea surface temperatures and with a moderate El Niño.

Alert Level Guide

Alert Level	Interpretation
No stress	No thermal stress
Watch	Low-level thermal stress
Warning	Thermal stress is accumulating
Alert level 1	Bleaching expected
Alert level 2	Widespread bleaching and some mortality expected

Monthly Caribbean Coral Reef Watch (May to December)

Partnering with NOAA, USA

WMO OMM

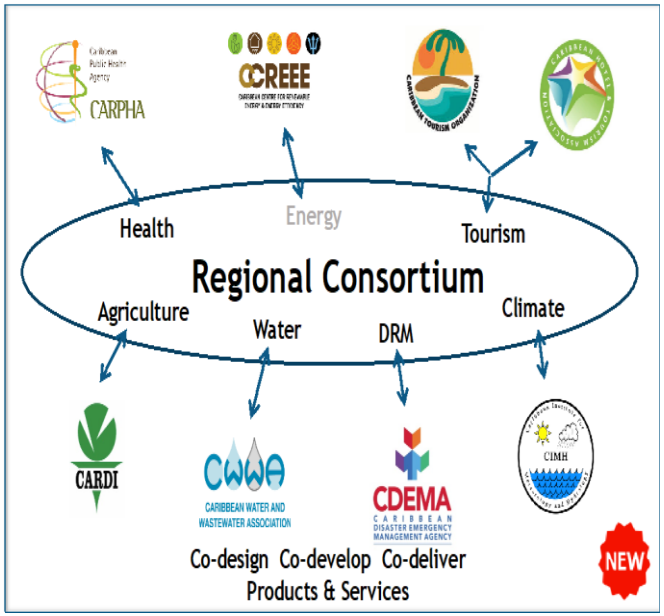
SWOT analysis

- Strengths – (i) tailored products, some of which (bulletins) are sector targeted, (ii) CAROGEN, Monitoring R script and customised database are in-house developed software that has made product development and data sharing easier and in the case of the former two, lessened the pressure on human resources (iii) embracing the media through awareness building (particularly at CariCOF) enhanced the visibility of the RCC to the public through numerous media articles
- Weaknesses – (i) limited availability of sufficiently long and quality, weather records for non- rainfall and temperature variables, (ii) There is the need for more engagement of the private sector, including from the financial and energy sectors, (iii) inability to illustrate the economic value of the climate products and services

WMO OMM

SWOT analysis

- Opportunities – (i) anticipated further expansion of the RCC's range of climate monitoring and prediction products and services at sub-seasonal to inter-annual timescales is expected to further increase recognition of RCC, (ii) With a recently provided video-conferencing facility at the Caribbean RCC, capacity building can be more frequent, (iii) The involvement of Consortium partners in integrated research initiatives that support the development of more complex sector-specific products that integrate climate and sectoral variables is an evolving opportunity
- Threats – (i) sustaining the level of human and financial resources are at times uncertain, (ii) continued timely data sharing between NMHS and RCC for all of its monitoring products and services are at times under threat



Way Forward

- The RCC will continue to contribute to Caribbean Climate Science in terms of technical research and publications (also fill IPCC void from Caribbean)
- Continue objective LRF through the standardized and objective SCFs coming out of CAROGEN - subjective component of SCFs now is limited to small modifications of the objective ensemble forecasts; where there may be known caveats in the model
- Impacts-based/hazard prediction at weather, sub-seasonal and seasonal to interannual climate timescales for the Caribbean
- Caribbean sectoral outcome prediction using intra- and extra- regional climate drivers
- Quantifying the value of climate services to Caribbean societies
- Enhance the feedback process by finalising and using a template to routinely harvest information from NMHS staff on a bi-annual basis (at each CariCOF) regarding national level progress on the implementation of the GFCS across its five pillars
- Utilise video-conferencing facilities and online-training mechanisms more, reducing the need for some travel for face to face training

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Thank you
Merci

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World Meteorological Organization
Organisation météorologique mondiale