Rainfall frequency and extreme forecasts
–
contextualising precipitation outlooks

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Climate Early Warning - forecasting

NOTE: JJA 2015 outlook predicted 40-50% chance of below-normal rainfall.
BUT: Given that is the wet season, what precisely is going to happen?

- What kind of forecasts best inform Climate Early Warning?
  - **Reliable** = forecast probabilities correspond well with observed frequencies
  - **Timely**
  - **Understandable language**
  - **Salient** = forecast must relate to an outcome of direct interest to the user
  - **Sharp** = probabilities are high enough for effective sectoral resources allocation
  - **Cost-effective and sustainable**

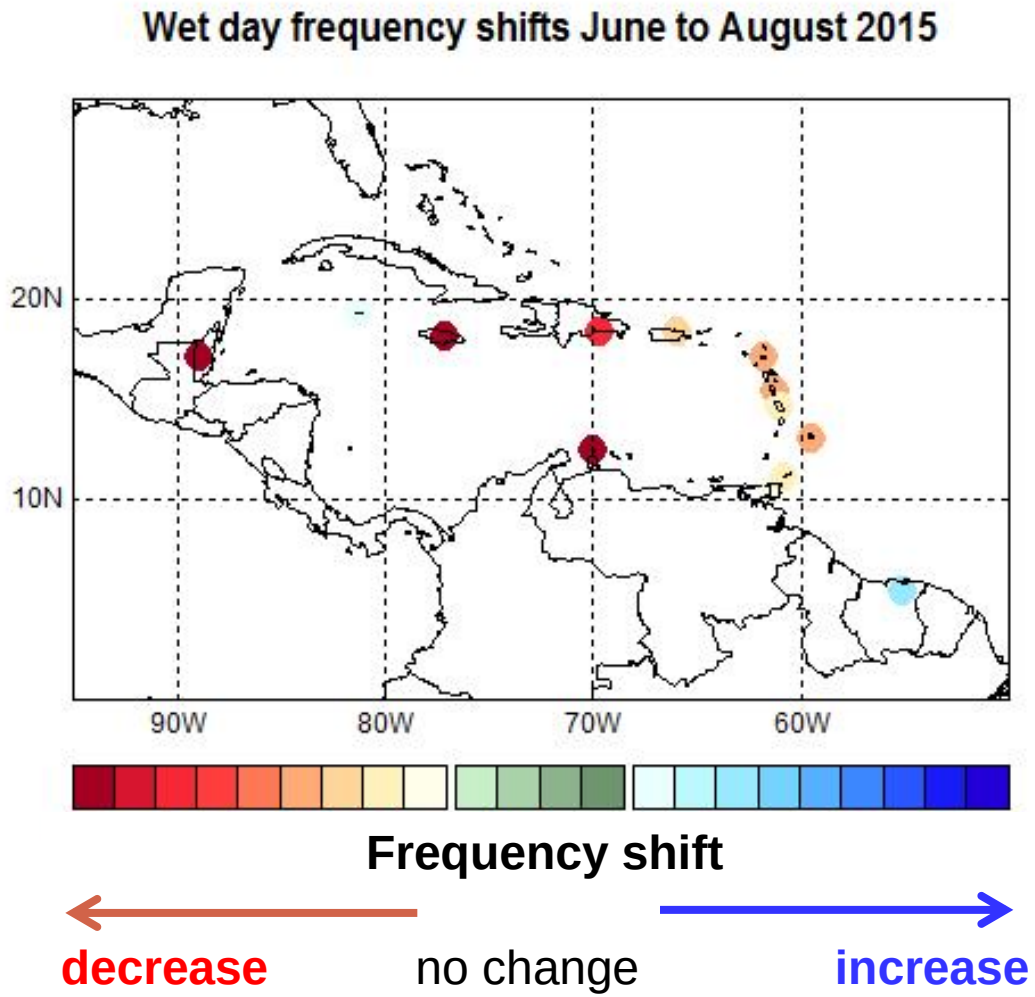
Why introduce rainfall frequency forecasts?

- Learn how to contextualise precipitation outlooks
  - Indicate the risk that climate poses, not so much the (un)likelihood.
  - Predicting rainfall (accumulation) consists of predicting if rain will fall (occurrence) and how much will fall (intensity).
  - Intensity is very hard to predict; occurrence is simpler.

Why introduce rainfall frequency forecasts?

- Learn how to contextualise precipitation outlooks
  - Predictability for occurrence exceeds that of rainfall accumulation, which will lead to higher probabilities.
  - With higher probabilities, users will be more easily convinced to take specific action.
  - Hence a “wetness” or “flood potential” action alert type outlook product may work well.
  - Once we know which frequency and intensity thresholds lead to flood potential, we can start building a flood potential action alert outlook.

Forecasting wet day frequency within a season



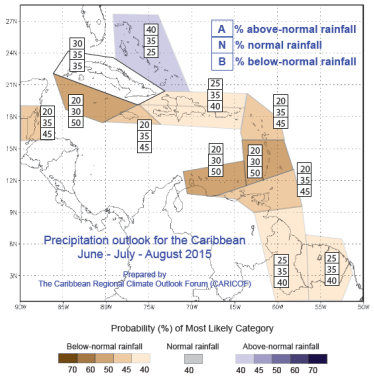
Wet day = day with precipitation of at least 1mm

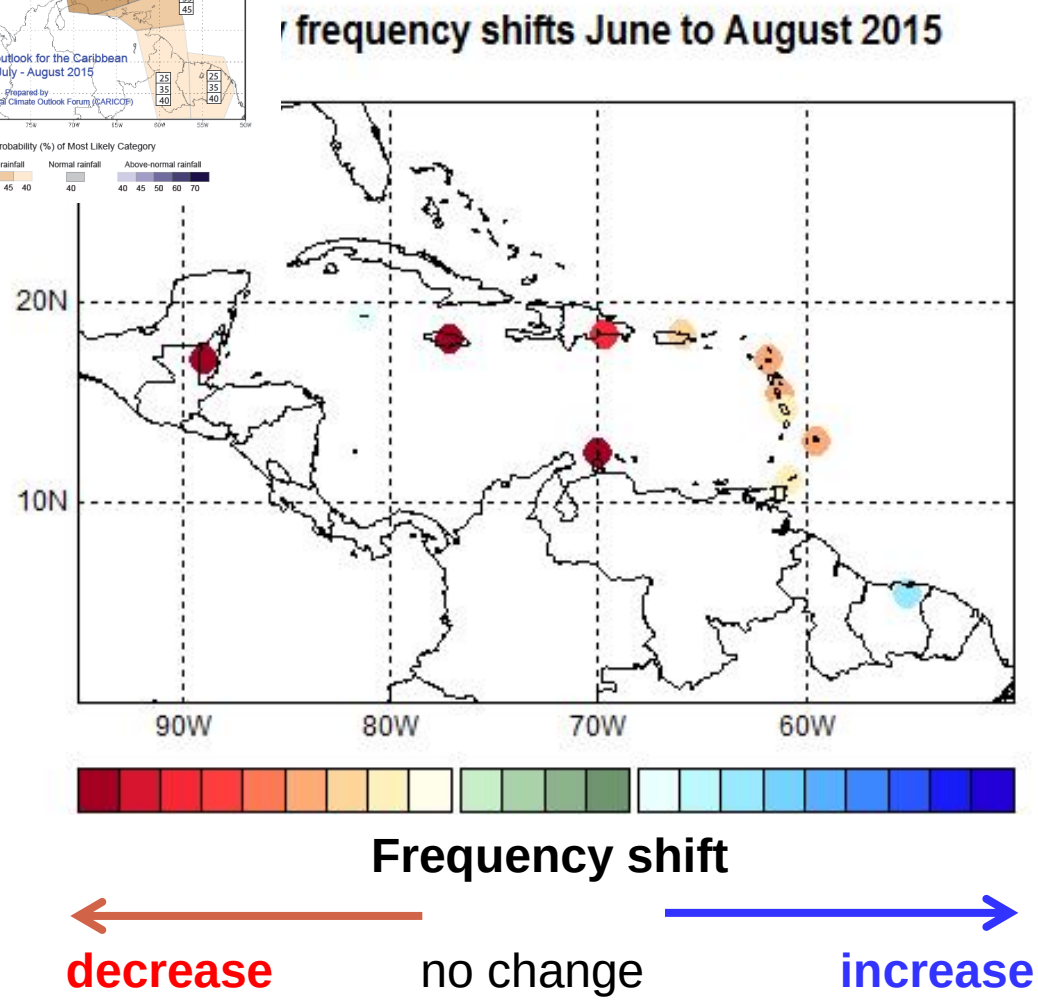
Their frequency (or numbers) within a season indicate whether:

a) rainfall **well spread (high number)** or **concentrated (low number)** if season as a whole is **wet**

b) scant rainfall will be **spread (low number)** or **concentrated (very low number)** if season as a whole is **dry**

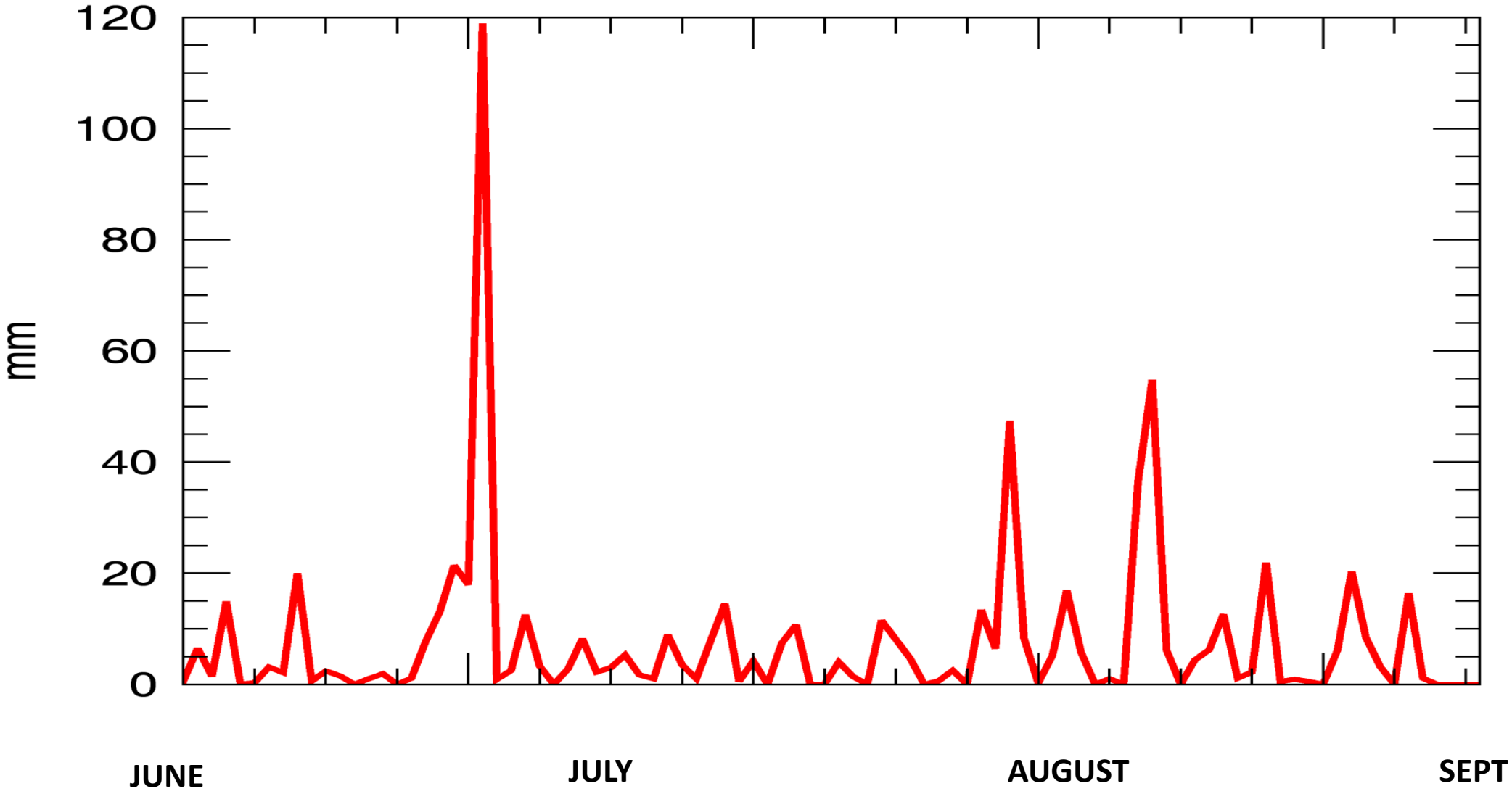
Forecasting wet day frequency within a season



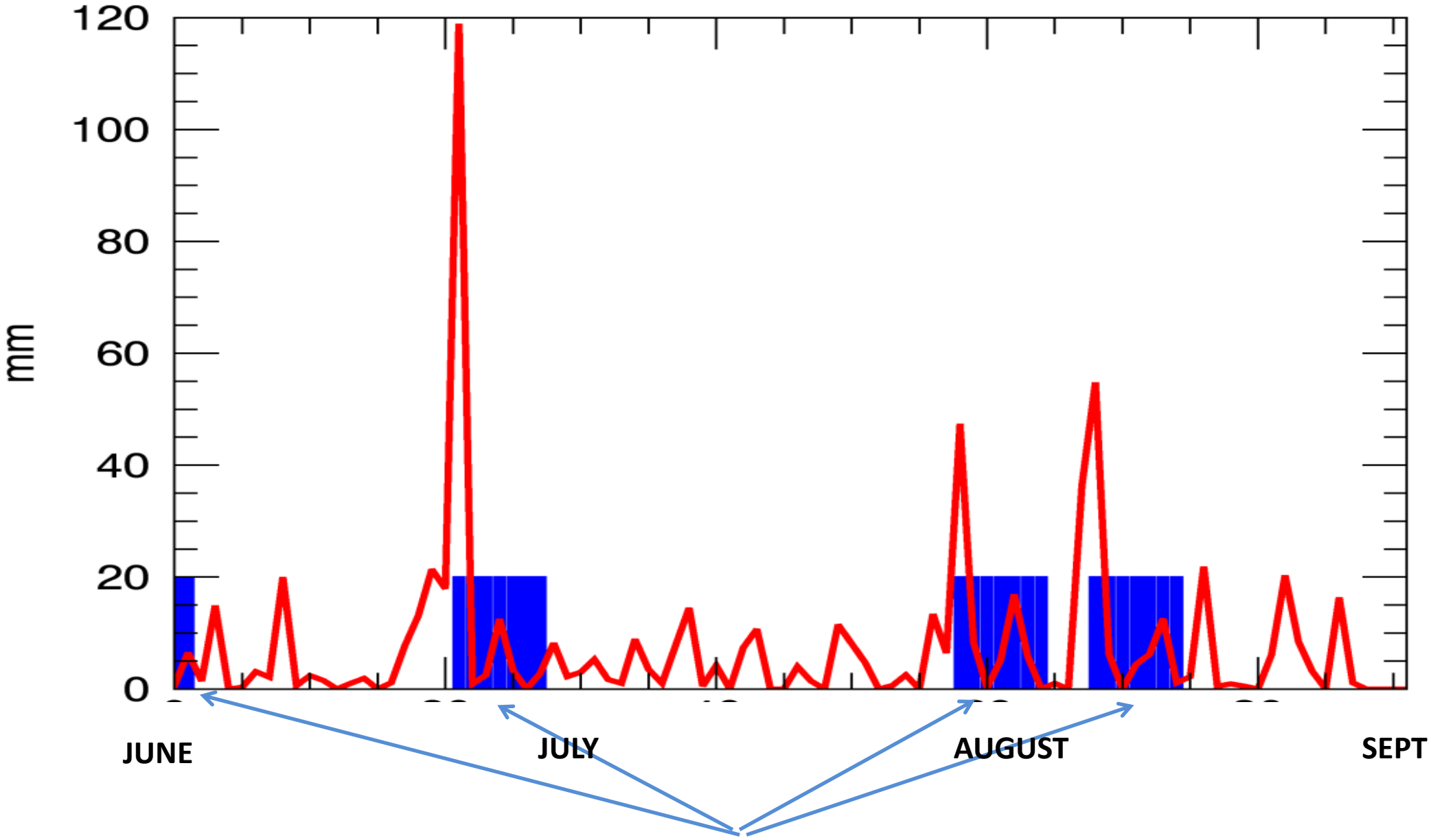


FORECAST: Region-wide, June to August rainfall expected to be below- to normal, with fewer wet days than usual.

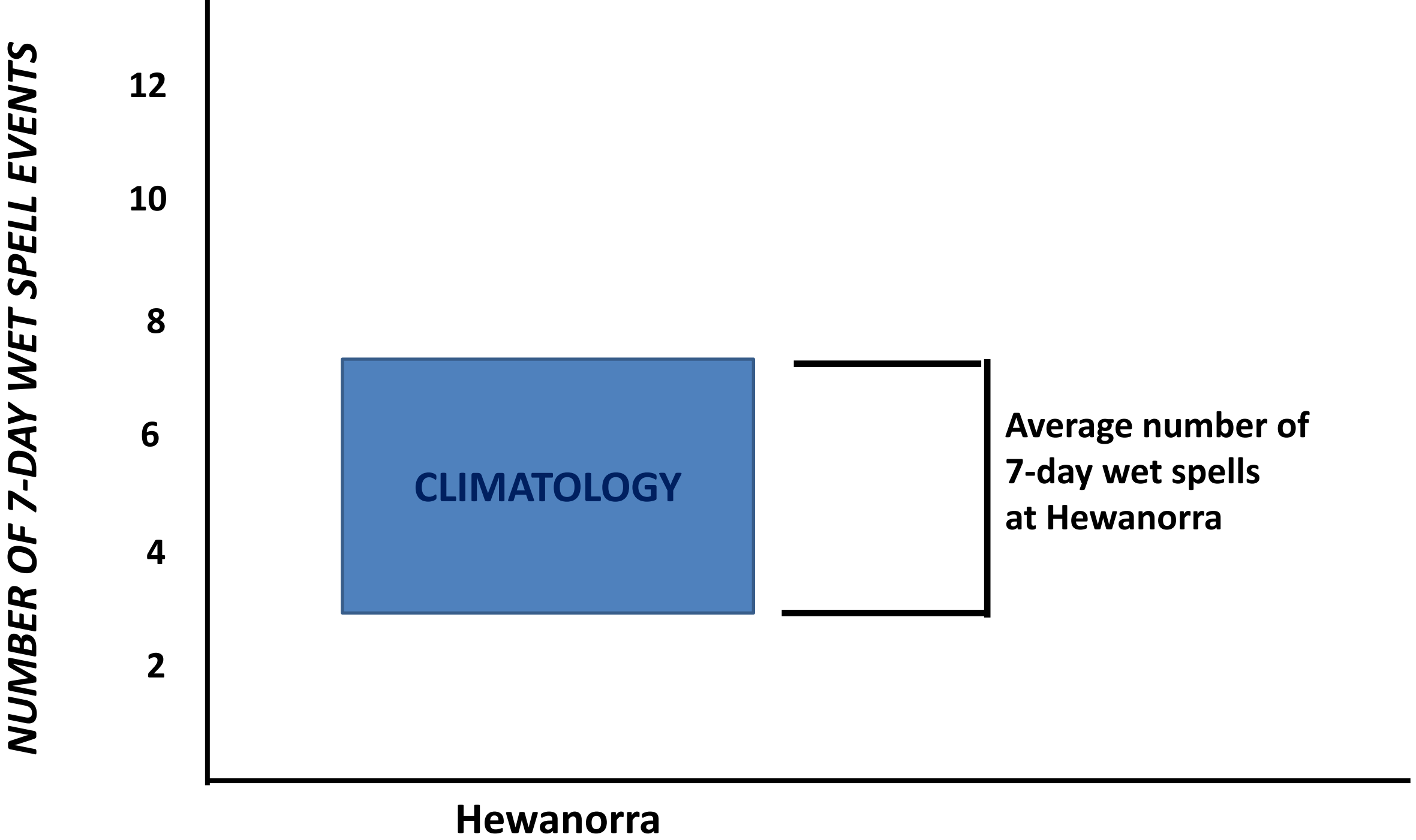
2010 JJA Rainfall at Hewanorra, St. Lucia

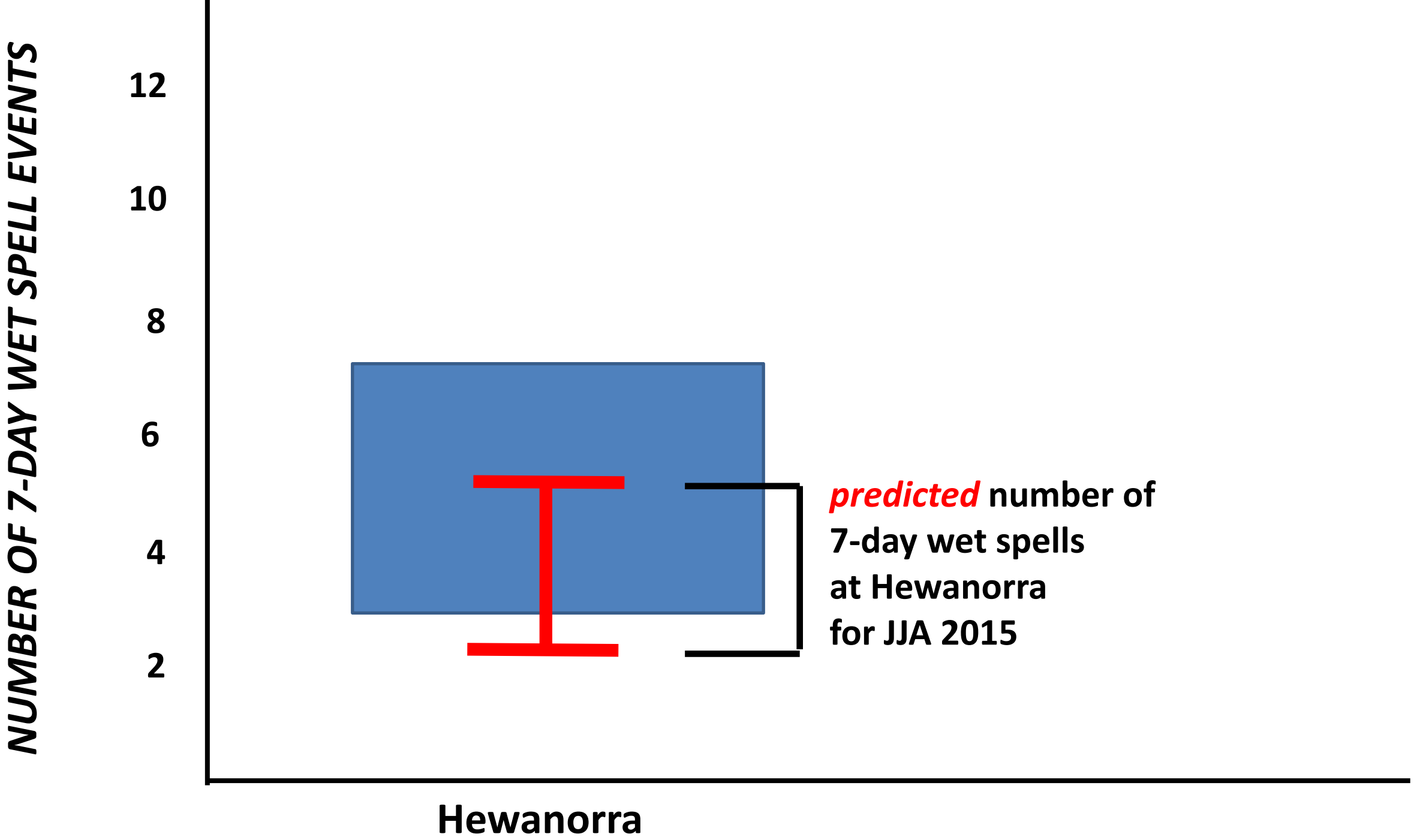


2010 JJA Rainfall at Hewanorra, St. Lucia



7 – day wet spells (20% wettest)


NUMBER OF 7-DAY WET SPELL EVENTS
12
10
8
6
4
2
CLIMATOLOGY
Average number of
7-day wet spells
at Hewanorra
Hewanorra


NUMBER OF 7-DAY WET SPELL EVENTS
12
10
8
6
4
2
predicted number of
7-day wet spells
at Hewanorra
for JJA 2015
Hewanorra

NUMBER OF 7-DAY WET SPELL EVENTS

12

10

8

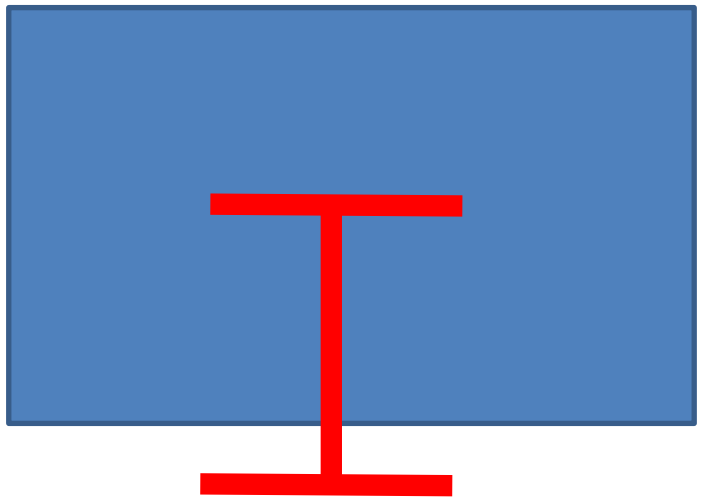
6

4

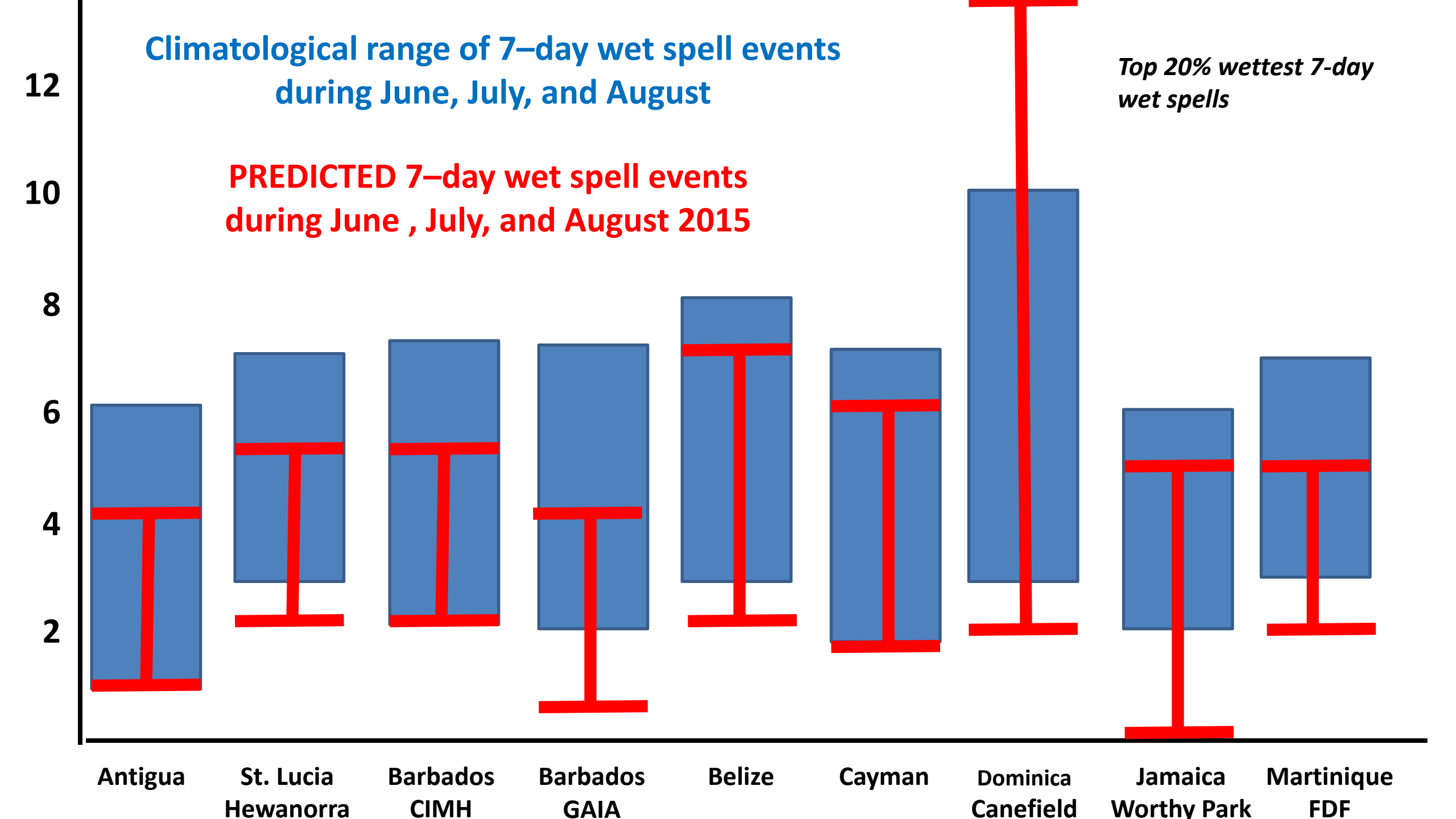
2

Average range of 7-day wet spell events: *3 to 7 events*

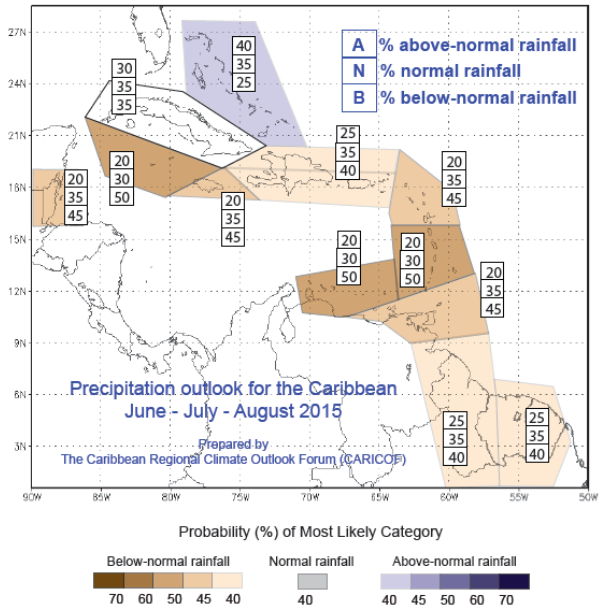
Predicted range of 7-day wet spell events for JJA 2015: *2 to 5 events*



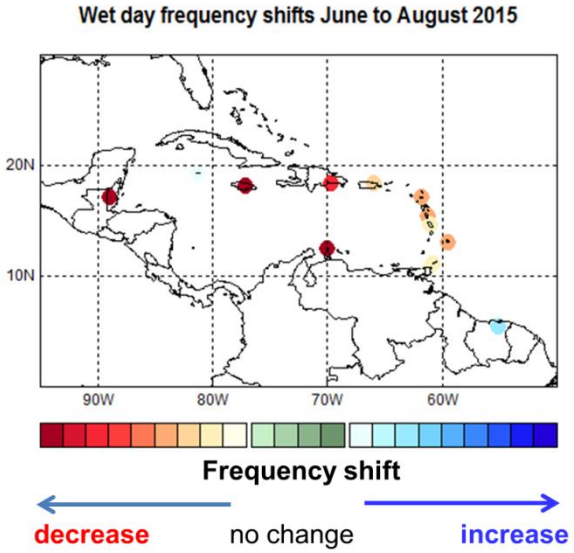
Hewanorra


Climatological range of 7–day wet spell events during June, July, and August
PREDICTED 7–day wet spell events during June , July, and August 2015
Top 20% wettest 7-day wet spells
12
10
8
6
4
2
Antigua
St. Lucia Hewanorra
Barbados CIMH
Barbados GAIA
Belize
Cayman
Dominica Canefield
Jamaica Worthy Park
Martinique FDF

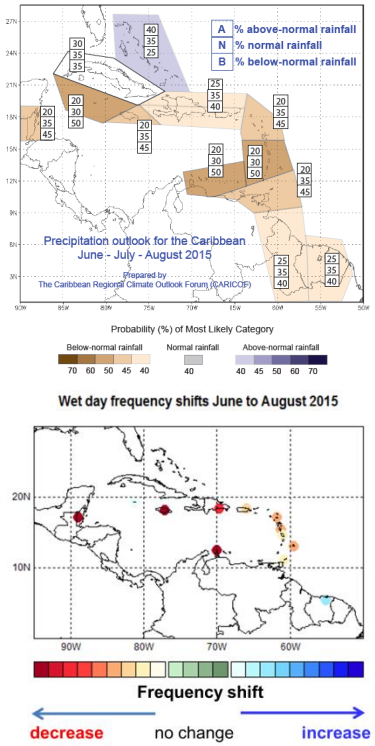
Forecasting shifts in wet spell frequency within a season



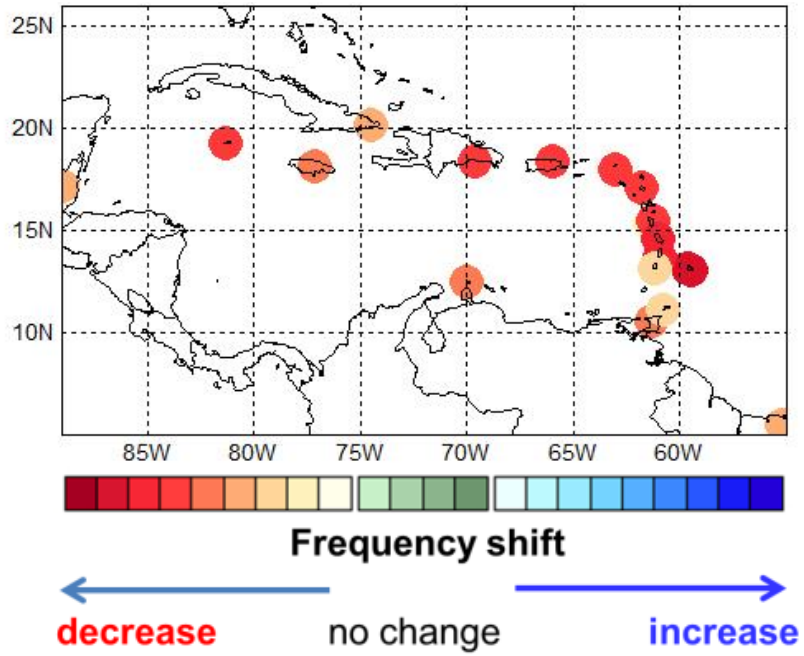
7-day wet spell
= period of 7 consecutive days with precipitation in the **top 20%**



Forecasting shifts in wet spell frequency within a season

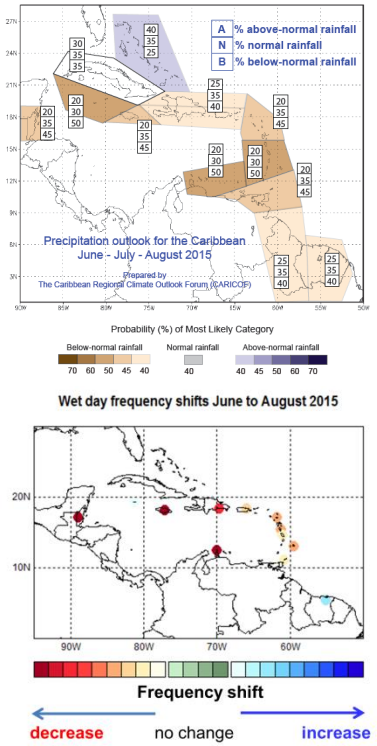


JJA 2015 frequency of 7-day wet spells

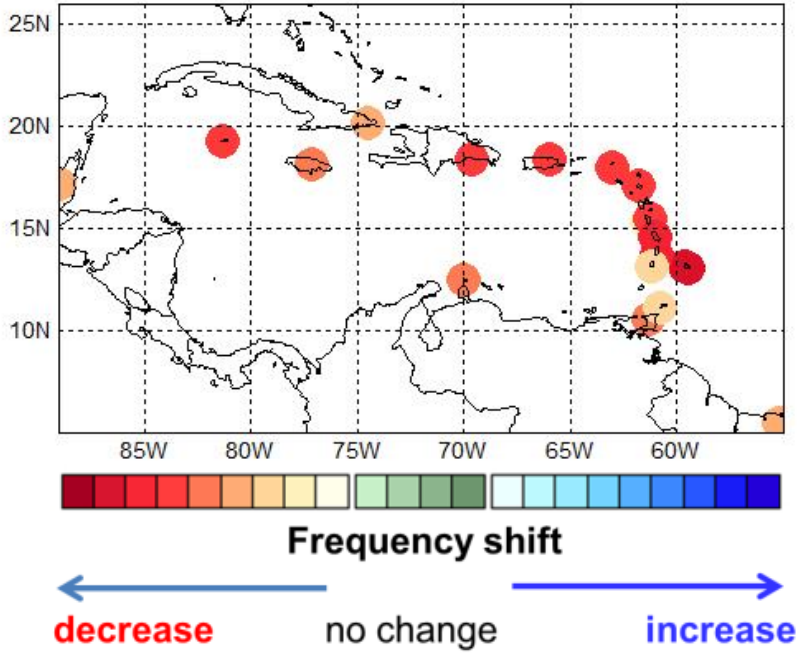


7-day wet spell
= period of 7 consecutive days with precipitation in the **top 20%**

Forecasting shifts in *very* wet spell frequency within a season

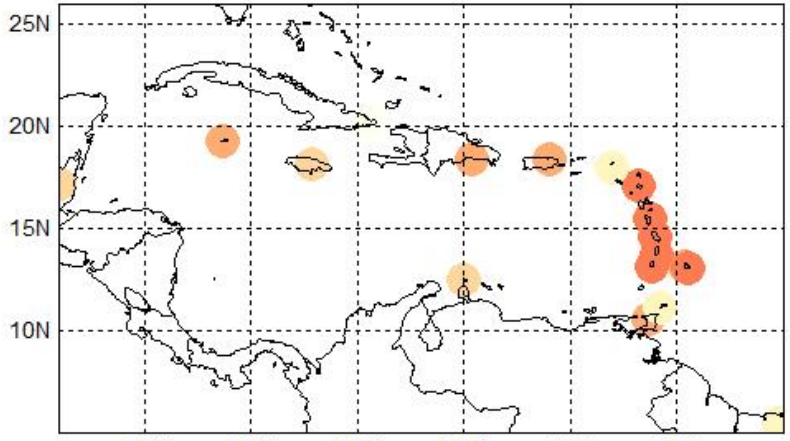


JJA 2015 frequency of 7-day wet spells



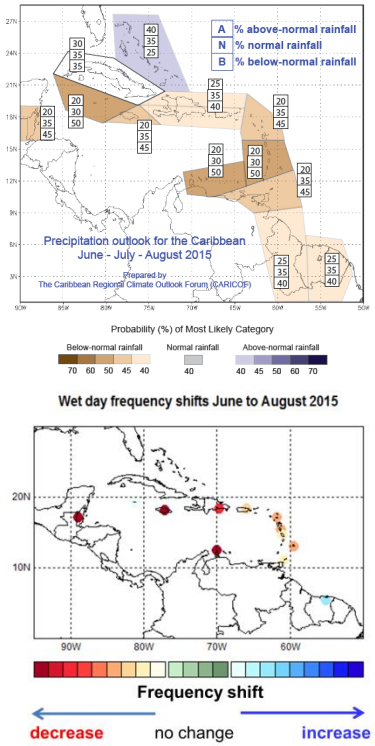
7-day wet spell
= period of 7 consecutive days with precipitation in the **top 20%**

JJA 2015 frequency of 7-day very wet spells

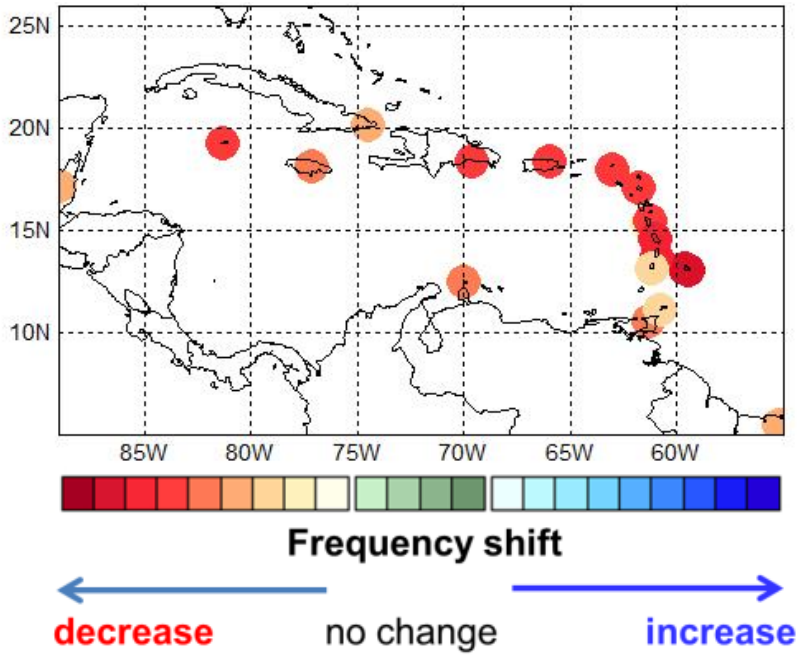


7-day very wet spell
= period of 7 consecutive days with precipitation in the **top 10%**

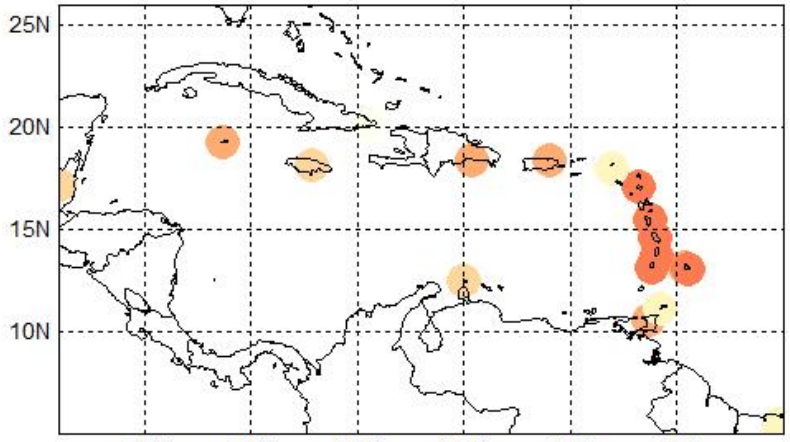
Forecasting shifts in *very* wet spell frequency within a season



JJA 2015 frequency of 7-day wet spells



JJA 2015 frequency of 7-day very wet spells



FORECAST: Region-wide, June to August rainfall expected to be below- to normal, with fewer wet days **and wet spells** than usual.

Reduced flood potential throughout the region (with the exception of the Bahamas)

June to August 2015 Forecast

	Number of **wet days**		Number of **7-day wet spells** (20% wettest)		Number of **7-day very wet spells** (10% wettest)	
	Climatology	**Forecast**	Climatology	**Forecast**	Climatology	**Forecast**
Antigua (VC Bird)	26-41	**23-35**	1-6	**1-4**	0-3	**0-2**
Aruba (Beatrix)	7-17	**3-11**	0-5	**0-3**	0-2	**0-2**
Barbados (CIMH)	34-50	**27-40**	2-7	**2-5**	0-4	**0-3**
Barbados (GAIA)	36-48	**29-43**	2-7	**1-4**	1-4	**0-3**
Belize (C. Farm)	34-52	**26-40**	3-8	**2-7**	1-5	**1-4**
Cayman	27-41	**24-39**	2-7	**2-6**	1-4	**0-3**
Cuba (Punta Maisi)	7-15	**5-12**	0-3	**0-3**	0-2	**0-2**
Dominica (Canefield)	48-66	**43-60**	3-10	**2-14**	1-6	**0-9**
Dominica (Douglas Charles)	53-68	**49-63**	2-6	**1-5**	0-3	**0-2**
Dom. Republic (Las Americas)	19-34	**18-30**	1-7	**0-4**	0-4	**0-3**
Grenada (MBIA)	42-50	**40-51**	NaN	**NaN**	NaN	**NaN**
Jamaica (Worthy Park)	26-38	**18-31**	2-6	**0-5**	1-4	**1-3**
Martinique (FDF Desaix)	48-63	**46-59**	3-7	**2-5**	1-4	**0-3**
Puerto Rico (San Juan)	31-48	**29-48**	2-6	**0-5**	1-4	**0-3**
St. Lucia (Hewanorra)	41-58	**35-46**	3-7	**2-5**	0-4	**0-2**
St. Maarten (TNCM)	30-42	**23-40**	1-6	**0-4**	0-3	**0-3**
St. Vincent (ET Joshua)	55-67	**52-65**	3-8	**2-7**	1-5	**1-5**
Suriname (Zanderij)	52-63	**51-65**	3-7	**2-6**	1-5	**2-5**
Trinidad (Piarco)	53-64	**44-57**	5-8	**3-8**	3-5	**1-4**
Tobago (ANR Robinson)	42-52	**31-46**	3-7	**2-7**	1-4	**1-4**

brown - decrease in numbers, **dark blue** – increase in numbers

Rainfall frequency forecasts

- A proof of concept
  - **YOUR INPUT**: threshold values (e.g. 100mm in 1 week) and duration of interest for wet spells
  - The more extreme, the less predictable.
  - Technical methodology for rainfall frequency prediction can be applied to dry spells and heat waves.

Thank you