CARIWIG Case Study Report 3

Drought Assessment & Projection for the Eastern Caribbean Using the CARiDRO Tool

Abel Centella[1], Arnoldo Bezanilla[1], Alejandro Vichot[1], Ottis Joslyn[2]

1. Institute of Meteorology, Cuba
2. Community Caribbean Climate Change Center

Keywords: Temperature, Precipitation, SPI drought index, Eastern Caribbean, Drought

Summary

This case study summarizes the results of past and future drought assessment in the Caribbean, particularly in the Eastern Caribbean. The study was developed using the CARiDRO tool and the Regional Climate Model outputs that are embedded in it. The results show that future drought such as observed in 2009-2010 will occur more frequently and will also be more intense and extended in space. This result has strong implications for different sectors including agriculture and water. The tool use here has been recognized as a very useful one but some suggestions are made to improve its utility.

Aim and objectives

This CARIWIG case study was carried out in order to determine the risk of having a drought similar to that which was experienced between October 2009 and April 2010 in the Eastern Caribbean. As described by Farrel et al (2010), the impacts of this drought were significant in a number of different sectors (water, agriculture and food prices) in most of the Caribbean countries. Thus, this event exposed severe deficiencies in the region's ability to cope with drought. In particular the intention of the case study is to:

- Verify certain characteristics of the event: duration and intensity; and
- Determine the potential recurrence of this kind of event between 2011-2070

Which tools were used? How and why?

The tool was the Caribbean Assessment of Regional Drought tool described by Centella et al in the Case-study report No. 1. First, CARiDRO was used for a very brief characterization of the 2009-2010 regional drought event and then to explore the potential to have similar events in the future. The idea to use this tool emerges from its availability and easy use through the web without the need to deal directly with heavy modelling or observed datasets. The CARiDRO tool can address questions such as will drought frequency change over the period 2011 to 2070? Or how do such rare drought events manifest in the future?

First, CARiDRO was run to highlight some important characteristics of the 2009-2010 drought process for the whole Caribbean region and in the Eastern Caribbean in particular and then the tool was used to investigate how more frequent will such droughts be in the future using the seven regional climate model outputs which are available as part of CARiDRO. From the two indexes available in CARiDRO, just SPI was used because it was the index that had been used in previous analysis of the 2009-2010 drought (Farrel et al 2010).

The findings

As described by Farrel et al (2010), the impacts of the 2009-2010 drought were significant in several different sectors (water, agriculture and food prices) in most of the Caribbean countries. This event exposed severe deficiencies in the region's ability to cope with drought. Using the CARiDRO tool, the characteristics of the 2009-2010 drought were verified in terms of intensity and spatial extension (Figure 1) concluding that at the time, it occurrence can be considered as a 1 in 40 years event. This allows us to conclude that the tool reproduces very well the results from previous assessment of the/an event features.

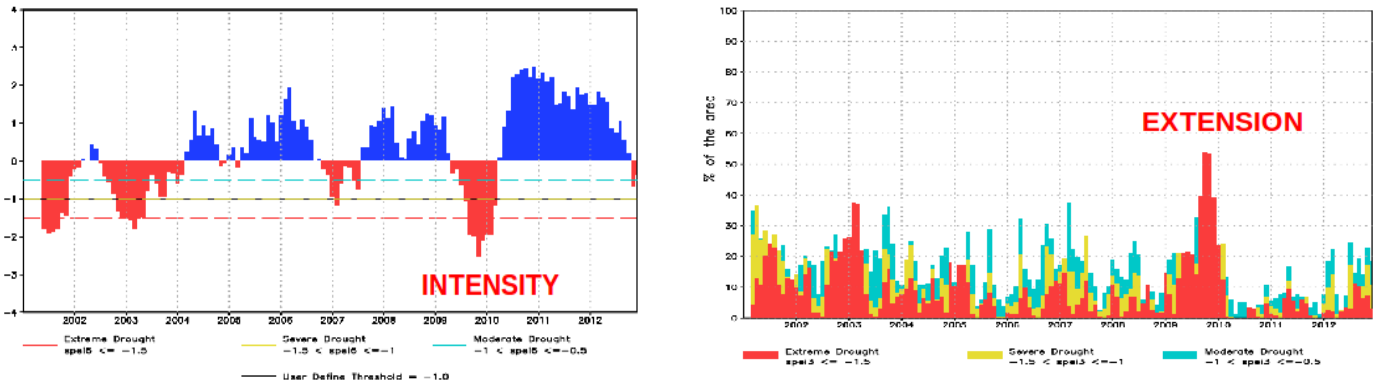

Figure 1. Left: SPI time series for the Caribbean region showing the drought events (red areas) reaching different levels of intensity (bars falling below red, yellow and blue dashed lines indicates extreme, severe and moderate drought respectively). Right: percent of area affected by drought in the entire Caribbean (red, yellow and blue bars indicates extreme, severe and moderate drought respectively)

After running CARiDRO for the seven regional experiments available, a clear signal is evident indicating that future drought events will be more frequent, having a 1 in 5 year recurrence time on average (the seven ensemble member average, with a range across the models of/from 1 in 3 to 1 in 12 years). Also, Figure 2 clearly reflects a common multi-model projection picture in the increase of the area affected by drought after the middle of XXI (21st) Century.

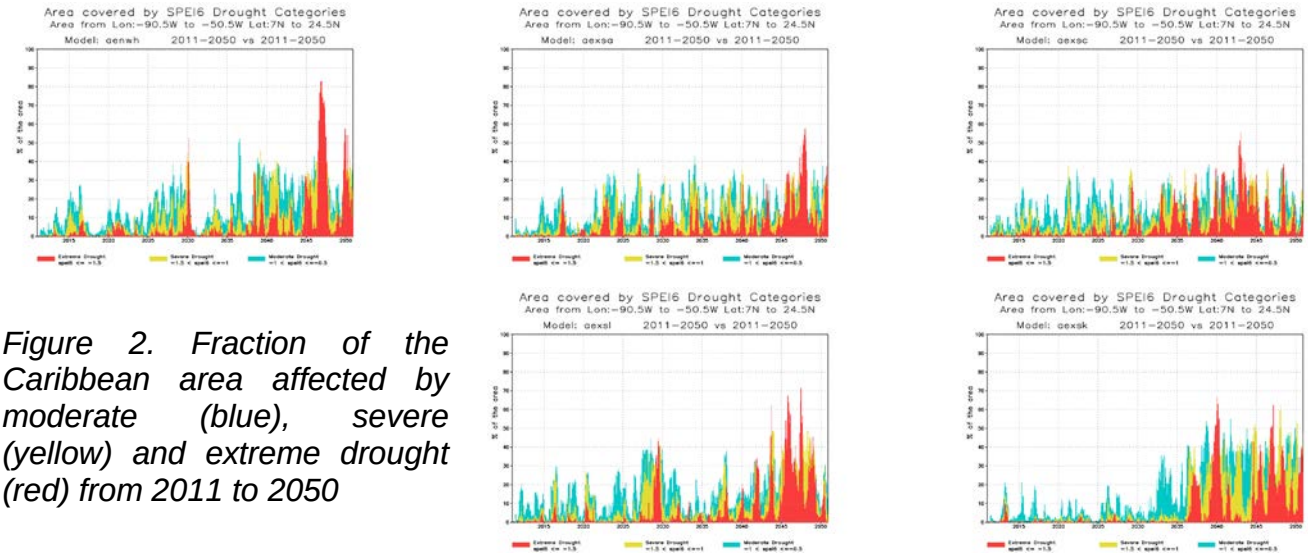

Figure 2. Fraction of the Caribbean area affected by moderate (blue), severe (yellow) and extreme drought (red) from 2011 to 2050

For further information please contact: arnoldo.bezanilla@insmet.cu
www.cariwig.org

Implications for policy and planning

Based on the above findings it is clear that future drought processes should be deeply considered in the planning process in sectors such as water management, agriculture and others. For instance the agriculture sector can optimize investment and research for and focus on existing drought resistant crop varieties. Water managers can improve planning for distribution, integrated watershed management, emphasis on conservation and increased domestic water storage, while emergency response agencies can improve their work on the base of better monitoring and early warning systems. Financial resources should be allocated early to promote such kind of responses.

Feedback on the tools

The CARiDRO tool is very useful to conduct regional drought analysis in a comprehensive way even for local assessments. Its versatility has been demonstrated in several studies within the CARIWIG case studies on drought, and the tool appears as a good system to be used in undergraduate and postgraduate training on drought assessments at regional, national and local scale. The tool should be improved to incorporate more on-line documentation, facilitating a better understanding of the different technical aspects.

What more could be done?

In this study, the future assessment of drought was based on a series of regional climate model outputs that represent a range of the uncertainties associated with climate change model projections. However, it would be good to incorporate more projections in order to take into account other uncertainties sources such as those related with different emission scenarios. Increasing resolution in the model projections can be beneficial when conducting other studies at local scales, facilitating the identification of response actions and adaptation measures with local relevance.

This document is an output from a project commissioned through the Climate and Development Knowledge Network (CDKN). CDKN is a programme funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. The views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of the Climate and Development Knowledge Network, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them.

For further information please contact: arnoldo.bezanilla@insmet.cu
www.cariwig.org