

READING JOURNAL ARTICLES

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RESEARCH LETTER
10.1029/2018GL079807

Key Points:
• Precipitation variability is projected to increase globally
• Northern hemisphere midlatitudes are a key region for worsening pluvials
• Drying regions may see more pluvials that are longer and stronger

Supporting Information:
• Supporting Information S1

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Martin, E. R. (2018). Future projections of global pluvial and drought event characteristics. *Geophysical Research Letters*, 45, 11,913–11,920. <https://doi.org/10.1029/2018GL079807>

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Future Projections of Global Pluvial and Drought Event Characteristics

E. R. Martin^{1,2}

¹School of Meteorology, University of Oklahoma, Norman, OK, USA, ²South Central Climate Adaptation Science Center, Norman, OK, USA

Abstract This study assesses projections from 24 CMIP5 models of number, duration, and severity of pluvial and drought events utilizing 6-month standardized precipitation index. Increased variability of standardized precipitation index is projected globally. More frequent, longer lasting, and stronger pluvials are projected in wet regions, and the same for droughts in dry regions. Worsening pluvials and droughts are most apparent in the Northern Hemisphere midlatitudes and the Americas, respectively. Uniquely, this study investigates pluvials and droughts in locations where the precipitation trend is of the opposite sign. In drying regions, 40% of grid points project an increase in number and 65% project an increase in duration of severe pluvials. Projections for severe drought events in wetting regions show similar projections. As precipitation trends alone do not provide information about pluvial and drought characteristics this study has important implications for planning and resilience.

Plain Language Summary The variability of precipitation is projected to increase globally in the future, which has a multitude of impacts including on water resources, agriculture, public health, and fire outbreaks. This study uses future projections from global climate models to evaluate how the number, duration, and severity of extended wet periods (pluvials) and dry periods (drought) will change in the future for the first time. More frequent, longer lasting, and stronger pluvials are projected in wet regions of the world, and the same for droughts in dry regions. The Americas, including Central America, the Caribbean, and the Amazon, are a hot spot for worsening droughts, and northern North America and Europe are hot spots for worsening pluvials. Uniquely, this study investigates pluvials and droughts in locations where the precipitation trend is of the opposite sign. For the most severe pluvial events, almost half of locations with a drying trend showed an increase in number of pluvials and 65% of locations showed an increase in duration. Projections for severe drought events in wetting regions show similar projections. As mean precipitation trends alone do not provide information about pluvial and drought characteristics this study has important implications for planning and resilience.

1. Introduction

Pluvial and drought events have large socioeconomic impacts around the world. Impacts from excessive rainfall, or pluvials, include human and agricultural losses from flooding, waterborne disease outbreaks, and the buildup of vegetation that can be a fire hazard in later seasons (e.g., Auld et al., 2004; Bronstert, 2003; Govender et al., 2006). Impacts from drought include reduced surface and ground water resources, crop failure, and tree mortality (e.g., Anderegg et al., 2013; Epule et al., 2014; Li et al., 2009). With increased precipitation variability in a warmer climate (e.g., Pendergrass et al., 2017; Räisänen, 2002; Rind et al., 1989), changes in characteristics of pluvial and drought events (e.g., number, duration, and severity) might be expected. In order to increase resilience to these events, it is necessary to understand how these wet and dry periods will change in the future.

Much prior work has focused on changes in drought characteristics. Recent studies, including those using models from the Coupled Model Intercomparison Project Phase 5 (CMIP5; Taylor et al., 2012), show increasing drought frequency, especially for the most extreme droughts in subtropical regions (e.g., Cook et al., 2014; Dai & Zhao, 2017; Hunt, 2011; Orłowsky & Seneviratne, 2013; Touma et al., 2015). However, there has been much less focus on how the characteristics of extended wet periods, or pluvials will change in the future. While we expect the most intense rain events to increase (e.g., O’Gorman & Schneider, 2009), it is not known if this will

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Overview of Strategy

1. SKIM

Get the “big picture” by reading the title, key words and abstract carefully; this will tell you the major findings and why they matter

- Quickly scan the article without taking notes; focus on headings and subheadings
- Note the publishing date; current research is more relevant
- Note any terms and parts you don’t understand for further reading

2. RE-READ

Read the article again, asking yourself questions such as:

- What problem is the study trying to solve?
- Are the findings well supported by evidence? Were assumptions made?
- Are the findings unique and supported by other work in the field?
- Is the study repeatable?
- What factors might affect the results?
- What questions are still unanswered? What were the limitations?
- Draw influences based on your own experience and knowledge.

If you are unfamiliar with key concepts, look for them in the literature

3. INTERPRET

- Examine figures and tables carefully
- Try to interpret data first before looking at captions
- When reading the discussion and results, look for key issues and new findings
- Make sure you have distinguished the main points. If not, go over the text again.

4. SUMMARISE

- Take notes on the key findings, methods and issues; it improves reading comprehension, helps you remember key points and prepares you for thesis/dissertation/paper writing
- If you have a printed version, highlight key point and write on the article. If it’s on screen, make use of markers and comments. Do this AFTER reading and interpreting the article.

Summary template

Complete citation. Author(s), Date of publication, Title (book or article), Journal, Volume #, Issue #, pages:

If web access: url; date accessed:

Key Words:

General subject:

Specific subject:

Hypothesis/Outstanding problem to solve:

Methodology:

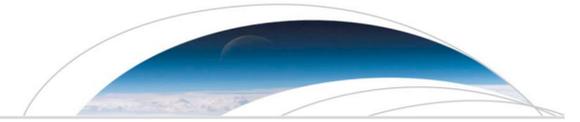
Result(s):

Summary of key points:

Context (how this article relates to other work in the field; how it ties in with key issues and findings by others, including yourself):

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number):



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SKIM

- Take **5-minutes** to SKIM the paper

1. SKIM

Get the “big picture” by reading the title, key words and abstract carefully; this will tell you the major findings and why they matter

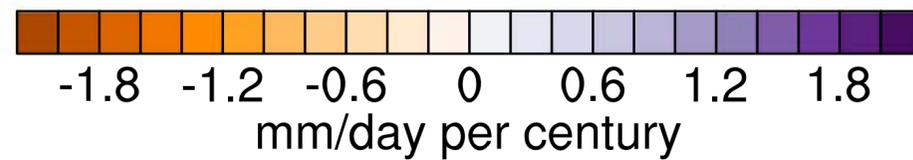
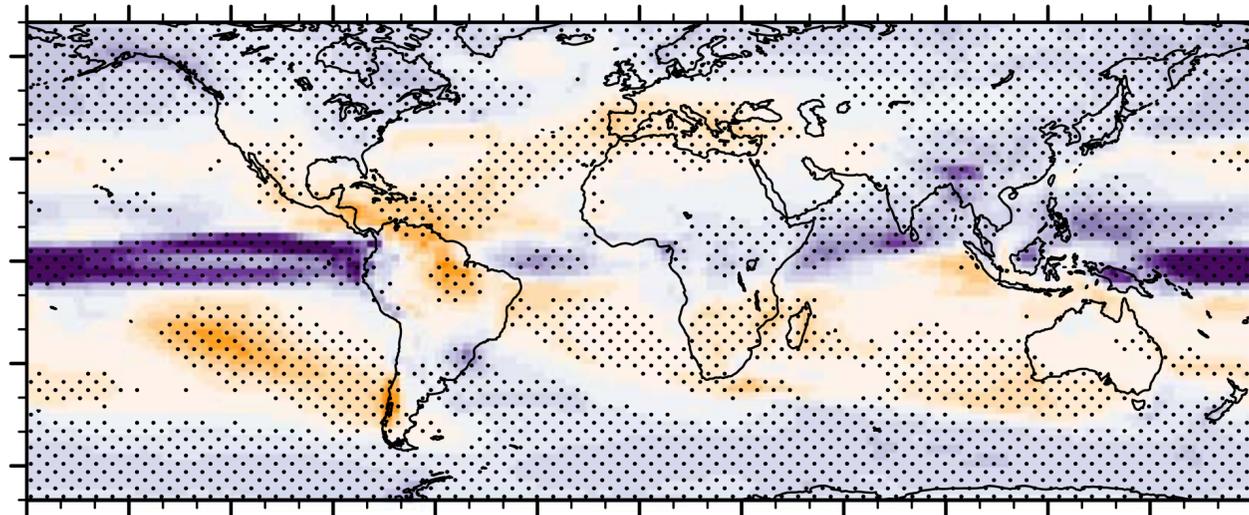
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FIGURE PRACTICE

a) Precipitation



b) SPI Standard Deviation

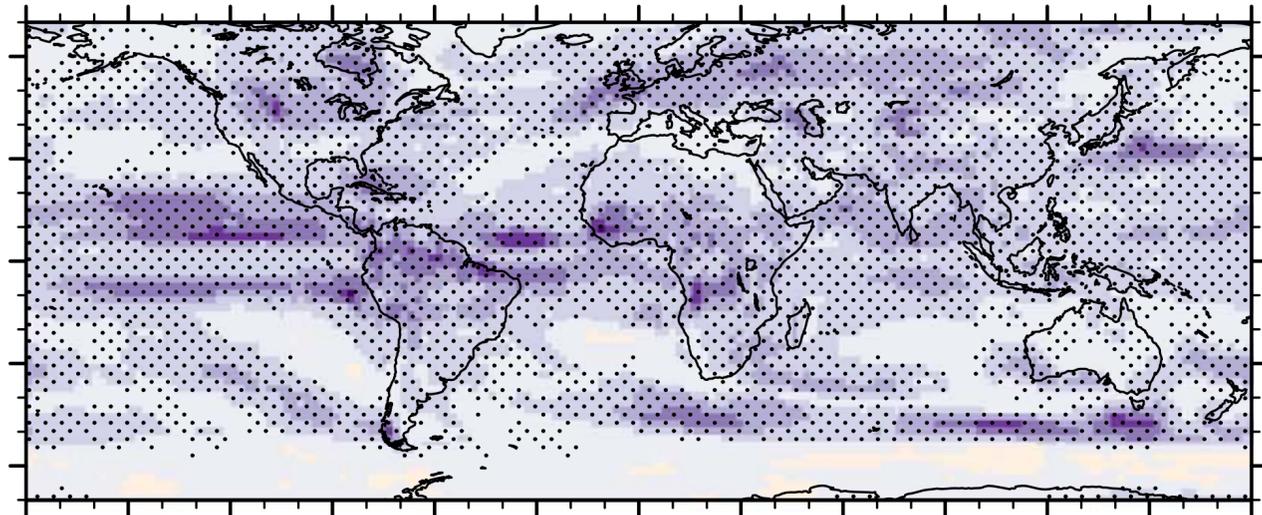


Figure 1. Multimodel mean trends (RCP8.5 2006–2100) in (a) precipitation and (b) 9-year running standard deviation in SPI. Stippling indicates regions where at least 18 of the CMIP5 models agree on the sign of the trend. SPI = standardized precipitation index; RCP = representative concentration pathway; CMIP5 = Coupled Model Intercomparison Project Phase 5.

RE-READ

- Time to re-read
- Spend 15-minutes reading with the questions in mind
- ACTIVE reading
- Make notes
- You likely won't finish it, that's okay - this is practice

2. RE-READ

Read the article again, asking yourself questions such as:

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IN PAIRS/THREES

- Discuss and interpret the paper with the aim of answering the questions
- 10 minutes

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SUMMARIES

- Use the remaining time to practice writing a summary of this paper using the template
- Not everyone will have the same notes - that is okay!!
- Ask questions!!

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