Pacific-Australia Climate Change Science and Adaptation Planning program

International CLIMATE CHANGE ADAPTATION Initiative

Kiribati

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Current and Projected Future Climates of Kiribati

1. Introduction

Kiribati is located near the equator in the Pacific Ocean. The country has 32 low lying atolls (e.g., Fig. 1a), most of which are no more than 3-4 m above sea level, and one raised limestone island of Banaba. The islands span an extensive space divided into 3 main groups which are Gilbert, Phoenix and the Line Islands (Fig. 1b). The distance between the most westerly situated and the most easterly situated islands is about 4,000 km. The total land area of Kiribati is approximately 811 km². In this poster, we examine some current climate variables of Kiribati and their projected future changes due to global warming.

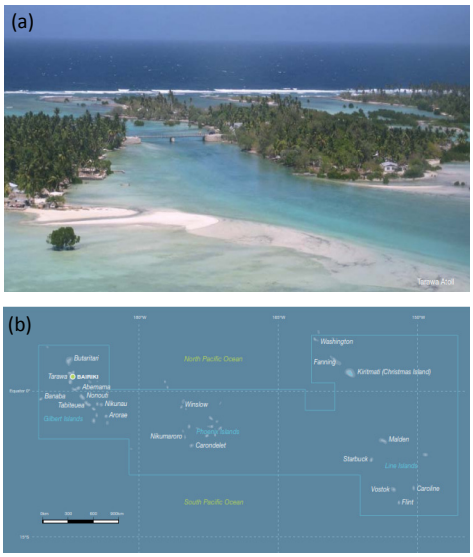

Fig. 1 (a) Tarawa atoll, and (b) the three main island groups of Kiribati - Gilbert, Phoenix and the Line Islands.

2. Seasonal climatology

Kiribati has a hot and humid tropical climate. In Tarawa, for example, maximum and minimum air temperatures are very consistent throughout the year (Fig. 2). However, some variations exist in the seasonal cycle between islands because of the extensive spread of geographical locations and due to differences in the degree of modulation by the major climate drivers such as the Intertropical Convergence Zone (ITCZ) that mainly affects islands north of the equator such as Kiritimati, and the South Pacific Convergence Zone (SPCZ) that affects southern islands.

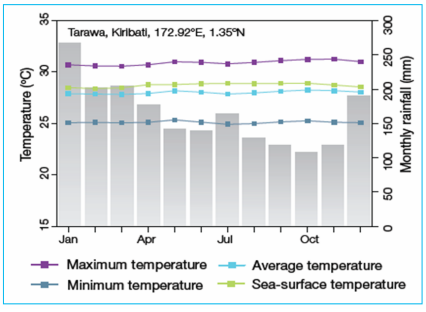

Fig. 2 Mean annual cycle of rainfall (grey bars) and daily minimum and maximum air temperatures, as well as the sea surface temperature, for Tarawa.

3. Climate variability and trends

The climate of Kiribati has high year-to-year variability, particularly for rainfall (e.g., Fig. 3). Most of this variability is primarily driven by the El Niño Southern Oscillation (ENSO) phenomenon. Kiribati also experiences occasional severe droughts, which are often associated with La Niña events. Positive annual rainfall trends are also noticed, for example, in Tarawa and Kiritimati - the increasing rainfall trend is statistically significant in the latter (Fig. 3b). A substantial positive trend in the mean air temperature is also found in Kiribati (not shown).

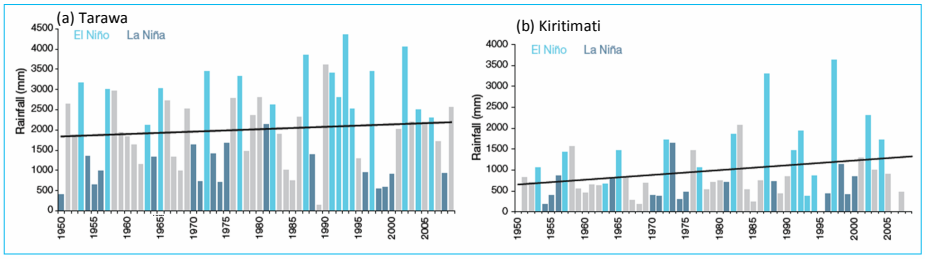

Fig. 3 Annual rainfall for (a) Tarawa atoll, and (b) Kiritimati. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively. Solid dark line indicates annual trend in rainfall.

4. Future climate projections

Methods

The 21st century climate projections for Kiribati are derived using the 18 Global Climate Model data obtained from the International Coupled Model Inter-Comparison Project phase 3 (CMIP3) experiments. Results presented here are based on three greenhouse emissions scenarios, B1 (low), A1B (medium), and A2 (high). Note that these projections do not represent a value specific to any particular location such as a town or a city in Kiribati. Instead they refer to an average change over a broad geographic region encompassing the islands of Kiribati and the surrounding ocean.

Summary of projections for Kiribati

- **Surface air and sea surface temperatures** are projected **to continue to increase** (*very high confidence;* e.g., Fig. 4a).
- **Annual and seasonal mean rainfall** is projected **to increase** (*high confidence*).
- The **intensity** and **frequency** of **days of extreme heat** are projected **to increase** (*very high confidence*).
- The **intensity** and **frequency** of **days of extreme rainfall** are projected **to increase** (*high confidence*).
- **Mean sea-level rise** is projected **to continue to increase** (*very high confidence;* e.g., Fig. 4b).

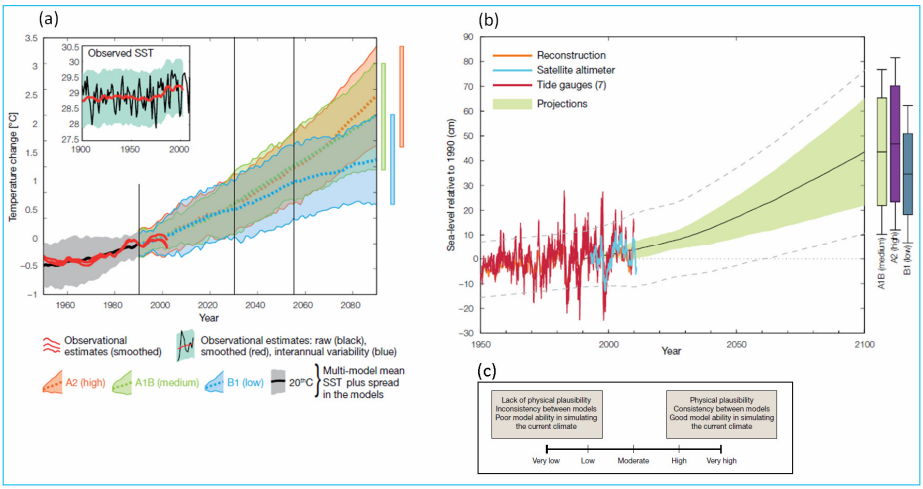

Fig. 4 (a) Historical and simulated mean sea surface temperature for Gilbert Islands, (b) observed and projected relative sea-level change near Tarawa, and (c) a description of confidence intervals associated with climate projections.

5. Conclusions

- Kiribati has a hot and humid tropical climate. Seasonal variability is mainly influenced by large-scale drivers such as the ITCZ and SPCZ, whereas ENSO modulates year-to-year climate variability.
- Over the course of the 21st century, mean rainfall, air temperature, sea surface temperature and the frequency and strength of extreme events are projected to increase. Mean sea-level is also projected to continue to increase during the 21st century. These changes are likely to have a large impact on various sectors such as food and agriculture.

Acknowledgement

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