HAITI

HISTORICAL AND FUTURE CLIMATIC CHANGES

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Michael A. Taylor, Christina Douglas, Jayaka D. Campbell, Jhordanne Jones, Alrick Brown, Tannecia S. Stephenson.

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Abbreviations

AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
ASO	August-September-October
DJF	December-January-February
GCM	Global Climate Model
IPCC	Intergovernmental Panel on Climate Change
JJA	June-July-August
MAM	March-April-May
MJJ	May-June-July
MSD	Mid Summer Drought
NAH	North Atlantic High
NDJ	November-December-January
PPE	Perturbed Physics Experiment
PRECIS	Providing Regional Climates for Impact Studies
RCM	Regional Climate Model
RCP	Representative Concentration Pathway
SLR	Sea Level Rise
SON	September-October-November
SRES	Special Report on Emissions Scenarios

Executive Summary

Climate Trends and Projections for Haiti at a Glance

Historical Trend	Projection
Temperatures	
• Maximum and minimum temperatures show upward (linear) trend. • Recent records (1982-2010) suggest +0.10oC/decade for maximum temperatures and +0.12 oC/decade for minimum temperatures. • Daily temperature range has decreased.	• Min, max and mean temperatures increase irrespextive of scenario through the end of the century. • The mean country temperature increase (in degrees Celsius) from the GCMs will be up to 0.8 oC for the 2020s; 1.1 oC for the 2030s, 1.9 oC for the 2050s and 3.3 oC for the end fo century (2081-2100). • RCMs suggest higher magnitude increases for the downscaled grid boxes. • Temperature increases across all seasons of the year.
Rainfalls	
• Significant year-to-year variability due to the influence of phenomenon like the El Nino Southern Oscillation (ENSO). • Insignificant upward trend • Strong decadal signal	• GCMs suggest a drying trend in the mid-2020s with 3 to 4 % less rainfall in the annual mean. The 2030s will be up to 6% drier. By the end of the century the country may be up to 20% drier for the most severe scenario. • The GCMs suggest that change in summer rainfall is the primary driver of the drying trend. • RCM projections reflect the onset of a drying trend from the mid-2020s which continues into the 2030s. • The decreases are higher for the grid boxes in the RCM than for the GCM projections for the entire country.
Sea Levels	
• A regional rate of increase of 0.18 ± 0.01 mm/year between 1950 and 2010. • Higher rate of increase in later years: up to 3.2 mm/year between 1993 and 2010. • Caribbean Sea level changes are near the global mean.	• The combined range for projected rise over all scenarios spans 0.26 to 0.82 m by 2100 relative to 1986-2005 levels. The range is 0.17-0.38 for 2046 – 2065. • Other recent studies suggest an upper limit for the Caribbean of up to 1.5 m under RCP8.5
Hurricanes	
• Dramatic increase in frequency and duration of Atlantic hurricanes since 1995. • Increase in category 4 and 5 hurricanes and in rainfall intensity, associated peak wind intensities, and mean rainfall for same period	• No change or slight decrease in frequency of hurricanes. • Shift toward stronger storms by the end of the century as measured by maximum wind speed increases of +2 to +11%. • +20% to +30% increase in rainfall rates for the model hurricane's inner core, with a smaller increase (~10%) at radii of 200 km or larger. • An 80% increase in the frequency of Saffir-Simpson category 4 and 5 Atlantic hurricanes over the next 80 years using the A1B scenario.

1. Layout of document

In this document we present historical and future climate profiles for Haiti both from available literature and from available station, gridded and modelled data. The document is sequenced according to climate variable with temperature considered first and then rainfall. Sea level rise and hurricanes are also considered, though more in a regional context than specific to Haiti. For each considered variable, the historical picture is presented first followed by future projections. In presenting both pictures we also follow the general outline below:

- For temperature and rainfall a discussion on climatology is presented first. This is followed by an analysis of historical trends as gleaned from existing literature or as could be calculated from available historical data. There is a dearth of available historical climate data of sufficient quality for Haiti which limits the analysis possible. The datasets used are discussed in Section 2.
- For both temperature and rainfall, future projections are provided as gleaned from climate models. Information from both global climate models (GCMs) and a regional climate model (RCM) are presented. GCMs and RCMs are explained in greater detail in Section 3 as well as how future projections are acquired using scenarios.
- GCM results are presented for Haiti as whole due to the scale of the GCMs. RCM results are presented for specific grid boxes over Haiti as requested (see also Section 2 and Figure 1). Future projections are presented in the form of Tables of values, plots and ranges.
- The future projections are presented for the 2020s, 2030s, 2050s and for the end of century.
- Though the data is presented by climatic variable, the Appendix also collates the data presented by grid box.
- For sea level rise and hurricanes, historical and future projections for the Caribbean region are gleaned from a survey of the latest literature. Where possible historical trends for Haiti are also provided for comparison with the regional data.

The immediately following sub-sections provide brief overviews in order to aid the reader with interpreting the data. This includes an overview of (i) the data sources (ii) climate models - both GCMa and RCMs – including those used in the results presented, and (iii) scenarios – including those used in the results presented. The remainder of the document presents the results in the briefest and most concise way, with, as indicated above, each variable/component presented in a different section.

2. About the Data

Multiple sources are used in compiling the data on which the narrative is based. Table 1 below shows the primary data sources which are relied upon and the respective usage made of each source.

Table 1: Data Sources

		Historical Data		
Temperature	Climatology	Station Data	http://www.weatherbase.com	Online repository for climatological station data
	Trends	Gridded Dataset	CRU TS 3.10: fully interpolated dataset with high resolution (0.5°). Monthly gridded fields based on monthly observational data, which are calculated from daily or sub-daily data by National Meteorological Services and other external agents.	University of East Anglia Climatic Research Unit; Jones, P.D.; Harris, I. (2013): Retrieved from KNMI Climate Explorer http://climexp.knmi.nl/plot_atlas_form.py
Rainfall	Climatology	Station Data	Station data analysis of Moron et al. (2014)	Analysis based on rain gauge data from CNIGS (Centre National de l'Information Géo-Spatiale—National Center for Geospatial Information), CHEMONICS, and CNSA (Coordination Nationale pour la Sécurité Alimentaire—National Committee for Food Security).
	Trends	Gridded Dataset	CRU TS 3.10: fully interpolated dataset with high resolution (0.5°). Monthly gridded fields based on monthly observational data, which are calculated from daily or sub-daily data by National Meteorological Services and other external agents.	University of East Anglia Climatic Research Unit; Jones, P.D.; Harris, I. (2013): Retrieved from KNMI Climate Explorer http://climexp.knmi.nl/plot_atlas_form.py
		Future Data		
Temperature & Rainfall	GCM Data	Gridded Dataset	CMIP5 (IPCC AR5 Atlas subset) This is the dataset used in the IPCC WG1 AR5 Annex I "Atlas". Only a single realisation from each of over 20 models is used. All models are weighed equally, where model realisations differing only in model parameter settings are treated as different models.	Retrieved from KNMI Climate Explorer http://climexp.knmi.nl/plot_atlas_form.py
	RCM Data	Gridded Dataset	PRECIS Perturbed Physics experiments performed for the Caribbean.	Available from the Caribbean Community Climate Change Centre

Additional information on the model data is provided in Section 3.

The future downscaled data is provided for selected grid boxes on request. The PRECIS model grid 25 km boxes over Haiti are as shown in Figure 1 below. Projections for grid boxes 12 -14, 16, 17, 23, 24, 35, 36, 41- 43, 47- 50, 54- 57, 61-65 are provided. Table 2 shows the latitude and longitude of each grid box. Grid boxes have also been grouped into 5 blocks; A, B1. B2. B3 and C as shown in Table 2.

Figure 1: PRECIS 25 km model grid boxes over Haiti.

Table 2: Reporting Blocks and Grid box Coordinates

Block	Grid Box No.	Longitude (°W)	Latitude (°N)
A	47	72.25	19.5
	48	72.25	19.25
	54	72	19.5
	55	72	19.25
B 1	35	72.75	19.25
	36	72.75	19
	41	72.5	19.5
	42	72.5	19.25
	43	72.5	19
B 2	49	72.25	19
	50	72.25	18.75
	56	72	19
	57	72	18.75
B 3	61	71.75	19.5
	63	71.75	19.25
	64	71.75	19
	65	71.75	18.75
C	12	73.75	18.5
	13	73.75	18.25
	14	73.75	18
	16	73.5	18.5
	17	73.5	18.5
	23	73.25	18.5
	24	73.5	18.25

3. Obtaining Future Projections from Models:

3.1. GCMs

Global Circulation Models (GCMs) are useful tools for providing future climate information. GCMs are mathematical representations of the physical and dynamical processes in the atmosphere, ocean, cryosphere and land surfaces. Their physical consistency and skill at representing current and past climates make them useful for simulating future climates under differing scenarios of increasing greenhouse gas concentrations (Scenarios are discussed further below).

GCM projections of rainfall and temperature characteristics for Haiti are extracted from the subset of CMIP5 models used to develop the regional atlas of projections presented as a part of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) (IPCC 2013). Data from in excess of 20 GCMs were analyzed and projected annual change extracted for the GCM grid boxes over Haiti. It is a single country average which is generated from the GCM data. This provides a context within which to interpret other sub-country scale projections derived from the RCM. Projections through the end of the century are generated, but specific emphasis is placed on projections for the 2020s and 2030s as requested. Extraction was done for the four Representative Concentration Pathways (RCPs) (see following subsection on scenarios). The projections are presented in Figures and summary Tables.

3.2. RCMs

An inherent drawback of the GCMs, however, is their coarse resolution relative to the scale of required information. The size of Haiti versus the grid spacing of the GCMs on which data are reported means that Haiti is represented by at most a few grid boxes, and there is a need for downscaling techniques to provide more detailed information on a sub-country level. The additional information which the downscaling techniques provide do not however devalue the information provided by the GCMs especially since (1) to a large extent Haiti's climate is driven by large-scale phenomenon (2) the downscaling techniques themselves are driven by the GCM outputs, and (3) at present the GCMs are the best source of future information on some phenomena e.g. hurricanes.

Statistical and dynamical downscaling are the two methods normally applied to achieve finer resolution information. It is the results of dynamical downscaling that are reported on in this study. Dynamical downscaling employs a regional climate model (RCM) driven at its boundaries by the outputs of the GCMs. Like GCMs, the RCMs rely on mathematical representations of the physical processes, but are restricted to a much smaller geographical domain (the Caribbean in this case). The restriction enables the production of data of much higher resolution (typically < 100 km). Available RCM data for Haiti were obtained from the PRECIS (Providing Regional Climates for Impact Studies) model (Taylor et al. 2013) run at a resolution of 25 km.

The PRECIS RCM was developed by the Hadley centre (UK) to facilitate the generation of high-resolution climate change information for as many regions of the world as possible. PRECIS is made freely available to groups of developing countries in order that they may develop climate change scenarios at national centres of excellence, simultaneously building capacity and drawing on local climatological expertise. http://www.metoffice.gov.uk/precis/intro. PRECIS is a hydrostatic primitive equations grid point model. It contains 19 levels in the vertical and has horizontal resolutions of 0.44°x0.44° (~50 km) and 0.22°x0.22° (~25 km). Initial and lateral boundary forcing are taken from reanalysis or from outputs of GCMs. The sea surface temperatures (SSTs) and sea-ice fractions surface boundary conditions are from a combination of monthly HadISST1 dataset and weekly NCEP observed datasets. Observed values of greenhouse gases are also fed into the model. PRECIS utilises a relaxation technique across a four point buffer zone at each vertical level. Dynamical flow, the atmospheric sulphur cycle, clouds and precipitation, radiative processes, the land surface and the deep soil are also described in the model. A full description of the model's physics is found in Jones et al. (2004).

Validation of the PRECIS Model for the Caribbean is offered in a number of papers including Campbell et al. (2011) and Taylor et al. (2013). Campbell et al. (2011) 'compared PRECIS's modeled patterns of temperature and precipitation with reanalysis datasets and available observations. They showed the mean Caribbean climatologies to be generally captured by the model, with the relative timing of temperature and precipitation maxima and minima being reproduced. This included the model's reproduction of the Caribbean midsummer rainfall minimum, which is a significant feature of many of the larger Caribbean islands. There was, however, also a general underestimation of rainfall amounts across the main Caribbean basin during the wet season and a simulation using temperatures that were too warm over the Caribbean islands but too cold over Central America and northern South America' (Taylor et al. 2013).

The PRECIS RCM results used in this study are derived from PRECIS driven perturbed physics experiments (PPE). The PPE's were created using the A1B SRES scenario (see following section on scenarios) and provide an alternative to using several driving GCM boundary conditions (McSweeney et al 2012). PRECIS PPEs comprise a 17 member ensemble (HadCM3Q0-Q16), however for the purposes of this study a subset of (i) 6 members representative of the overall range of key climate features were available for projections through to 2050, and (ii) 3 members were available for end of century projections (2080-2098). The available ensemble members were Q0, Q1, Q3, Q9, Q10, and Q11. Only Q0, Q1, and Q9 were available for the later projections.

Figure 1 showed how Haiti is represented by the PRECIS RCM. Ensuing results will seek to detail temperature (mean, maximum and minimum) and rainfall changes associated with the grid boxes noted in Table 2. For each of these variables the average of the 6 or 3 perturbations is presented as well as the minimum and maximum change on seasonal and annual time scales for each future time slice.

3. 3. Emission Scenarios

The GCMs and RCM were run using either the Special Report Emission Scenarios (SRES) (Nakicenovic et al. 2000) or Representative Concentration Pathways (RCPs).

Each SRES scenario is a plausible storyline of how a future world will look. The scenarios explore pathways of future greenhouse gas emissions, derived from self-consistent sets of assumptions about energy use, population growth, economic development, and other factors. They however explicitly exclude any global policy to reduce emissions to avoid climate change. Scenarios are grouped into families according to the similarities in their storylines as shown in Figure 2.

The RCM results presented in the following section are for the A1B scenario using the Perturbed Physics Ensembles (PPE) approach. The A1B scenario is characterized by an increase in carbon dioxide emissions through mid-century followed by a decrease (Figure 3). A1B is often seen as a compromise between the A2 (high emissions) and B2 (lower emissions) scenarios.

In the IPCC Fifth Assessment Report (AR5), outcomes of climate simulations use new scenarios (some of which include implied policy actions to achieve mitigation) referred to as "Representative Concentration Pathways" (RCPs) (Figure 4). These RCPs represent a larger set of mitigation scenarios and were selected to have different targets in terms of radiative forcing of the atmosphere at 2100 (about 2.6, 4.5, 6.0 and 8.5 W/m2). They are defined by their total radiative forcing (cumulative measure of human emissions of greenhouse gases from all sources expressed in Watts per square metre) pathway and level by 2100. i.e. RCP2.6. RCP4.5, RCP6.0 and RCP8.5. The scenarios should be considered plausible and illustrative, and do not have probabilities attached to them.

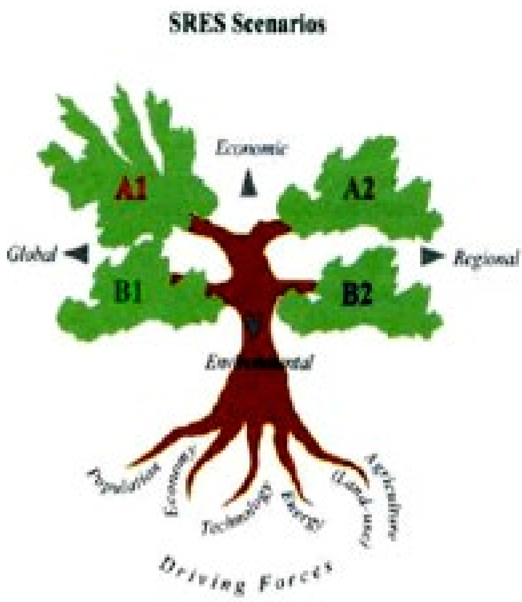


Figure 2: Special Report on Emission Scenarios (SRES) schematic and storyline summary (Nakicenovic et al, 2000).

- **A1** storyline and scenario family: a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and rapid introduction of new and more efficient technologies.
- **A2** storyline and scenario family: a very heterogeneous world with continuously increasing global population and regionally oriented economic growth that is more fragmented and slower than in other storylines.
- **B1** storyline and scenario family: a convergent world with the same global population as in the A1 storyline but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies.
- **B2** storyline and scenario family: a world in which the emphasis is on local solutions to economic, social, and environmental sustainability, with continuously increasing population (lower than A2) and intermediate economic development.

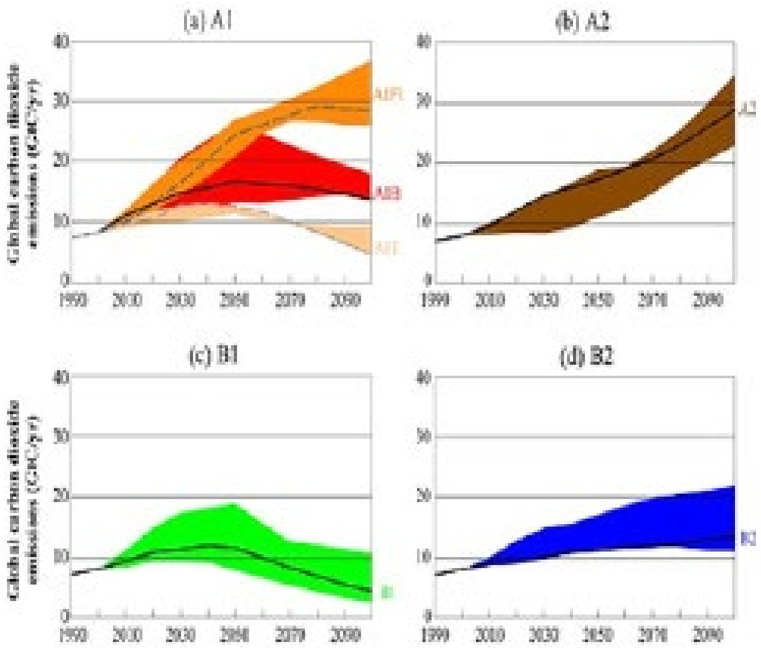


Figure 3: Total global annual CO2 emissions from all sources (energy, industry, and land-use change) from 1990 to 2100 (in gigatonnes of carbon (GtC/yr) for the families and six SRES scenario groups (Nakicenovic et al, 2000).

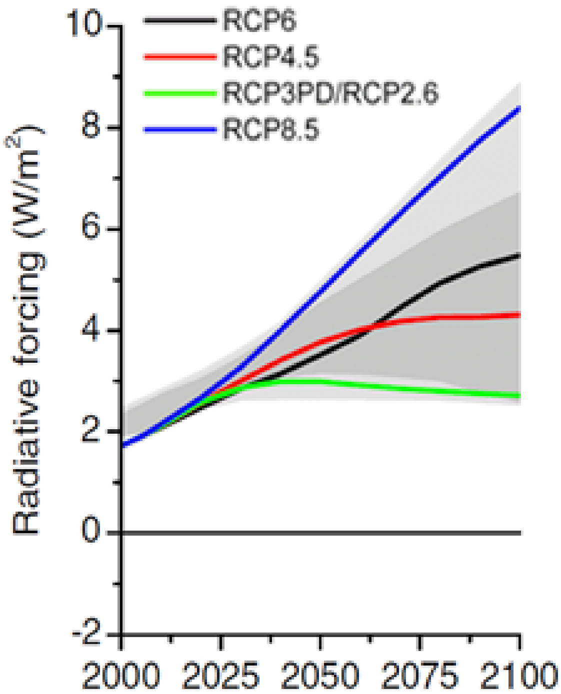


Figure 4: Radiative Forcing of the Representative Concentration Pathways. Taken from van Vuuren et al (2011). The light grey area captures 98% of the range in previous IAM scenarios, and dark grey represents 90% of the range.

RCP	Comments	Radiative Forcing Behaviour
RCP 2.6	Lowest	Peaks at 3 Wm^{-2} and then declines to approximately 2.6 Wm^{-2}
RCP 4.5	Medium - low	Stabilization at 4.5 Wm^{-2}
RCP 6	Medium - high	Stabilization at 6 Wm^{-2}
RCP 8.5	Highes	RF of 8.5 Wm^{-2} by 2100 but implies rising RF beyond 2100

It is to be noted that whereas the SRES scenarios resulted from specific socio-economic scenarios from storylines about future demographic and economic development, regionalization, energy production and use, technology, agriculture, forestry and land use (IPCC, 2000), the RCPs are new scenarios that specify concentrations and corresponding emissions, but not directly based on socio-economic storylines like the SRES scenarios. These four RCPs include one mitigation scenario leading to a very low forcing level (RCP2.6), two stabilization scenarios (RCP4.5 and RCP6), and one scenario with very high greenhouse gas emissions (RCP8.5). The RCPs can thus represent a range of 21st century climate policies, as compared with the no-climate policy of the Special Report on Emissions Scenarios (SRES) used in the Third Assessment Report and the Fourth Assessment Report (Figure 2). It is to be noted that many do not believe RCP2.6 is feasible without considerable and concerted global action.

The GCM results presented in the following section are for the four RCPs.

3. 4. Perturbed Physics Experiments

Perturbed Physics Experiments (PPEs) are designed by varying uncertain parameters in the model's representation of important physical and dynamical processes. PPEs are used to capture some major sources of modelling uncertainty by running each member using identical climate forcings. It provides an alternative to using GCMs developed at different modelling centres around the world (e.g. a multi-model ensemble, MME), like those in the CMIPs (Coupled Model Intercomparison Projects). The Hadley Centre's PPE includes 17 members which are formulated to systematically sample parameter uncertainties under the A1B emissions scenario – this is referred to as the QUMP (Quantifying Uncertainties in Model Projections) ensemble. The QUMP ensemble was designed for use in the UK's own climate projections and is described in detail in the UKCP report available online at http://ukclimateprojections.defra.gov.uk/content/view/944/500/. Globally, and for many regions and variables, the range of climate futures projected by the QUMP PPE is equivalent or greater than those based on the CMIP MME. The PPE systematically samples the parameter uncertainties, exploring a wider range of possible variation in the formulation of a single model, leading to a wider range of physically plausible future climate outcomes than the MME. It is important to remember that PPE (similarly for MME) does not account for all of the sources of model uncertainty.

As noted previously, for projections through 2050, ensemble members Q0, Q3, Q4, Q10, Q11, and Q14 are evaluated, while for the end of century projections only ensemble members Q0, Q3, Q4 are evaluated (due to data availability). All evaluated ensemble members were run at 25 km and from 1960. For each experiment the deviation of a future decade e.g. 2020s, 2030s from the experiments baseline (1960-1990) was determined. The ensemble results are summarised and presented in Tables for the 2020s, 2030s, 2050s and for the end of century (2080-2098).

1. Portions of the narrative are adapted from narrative on the PRECIS webpage http://www.metoffice.gov.uk/precis/qump

3.5. Presenting the Future RCM Data

Future change data from the RCMs are provided for five variables. For four of the five variables the data are provided as absolute change. These variables are: minimum temperature (ºC), maximum temperature (ºC), mean temperature (ºC) and 10 m wind speed (m/s). Percentage change is provided for precipitation. Data are averaged for over three month seasons: November-January (NDJ), February-April (FMA), May-July (MJJ) and August–October (ASO), roughly consistent with the Caribbean dry season (November – April) and wet season (May – October) (Taylor et al. 2002). The mean annual change is also given. The change for each variable and for each period is calculated for the 2020s, 2030s, 2050s and for the end of the century (2080-2098) for each member of the ensemble. The minimum, maximum and mean values of the ensemble are also provided.

4. Temperatures

4.1. Climatology

Surface temperature in the Caribbean is largely controlled by the variation in the earth's orbits around the sun which gives rise to variations in temperatures. The climatological (mean annual) temperature patterns for the Haiti are shown in Figure 5 for two stations (Port-au-Prince in red and Cap Haitien in blue). Lines for maximum (top), mean (middle) and minimum (bottom) temperatures are shown. Cooler months occur in northern hemisphere winter (December-February) and warmer months in summer (July – August). Temperatures peak in July-August and the mean annual range between coolest and warmest months is 3-4 degrees. The size of Haiti allows for latitudinal variation in mean monthly temperatures as indicated by the differences between the climatological plots for both locations which are located approximately a degree apart. Occasional surges of cooler air from continental North America from October through early April during the passage of cold fronts contribute to minimum temperatures that can fall below 20 degrees, particularly for northern portions of the island.

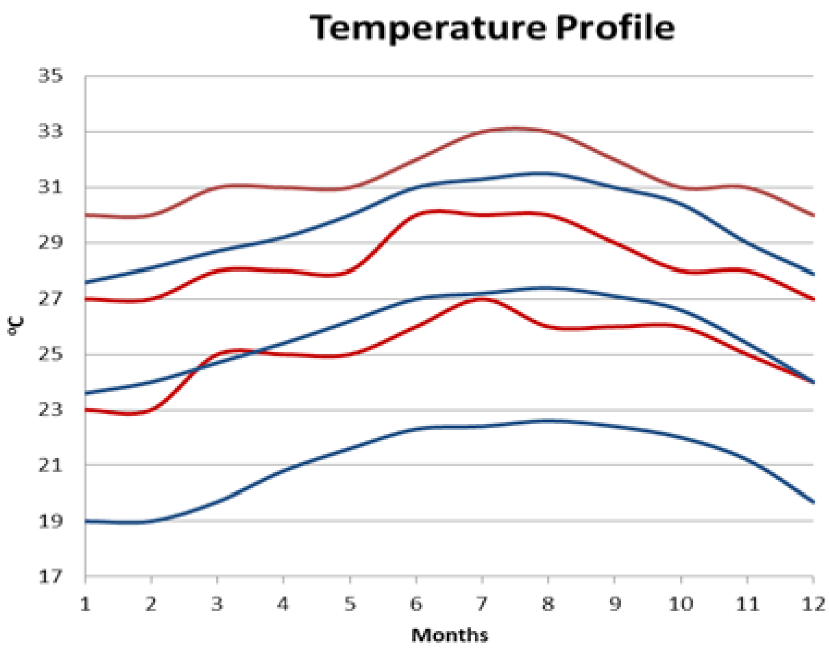
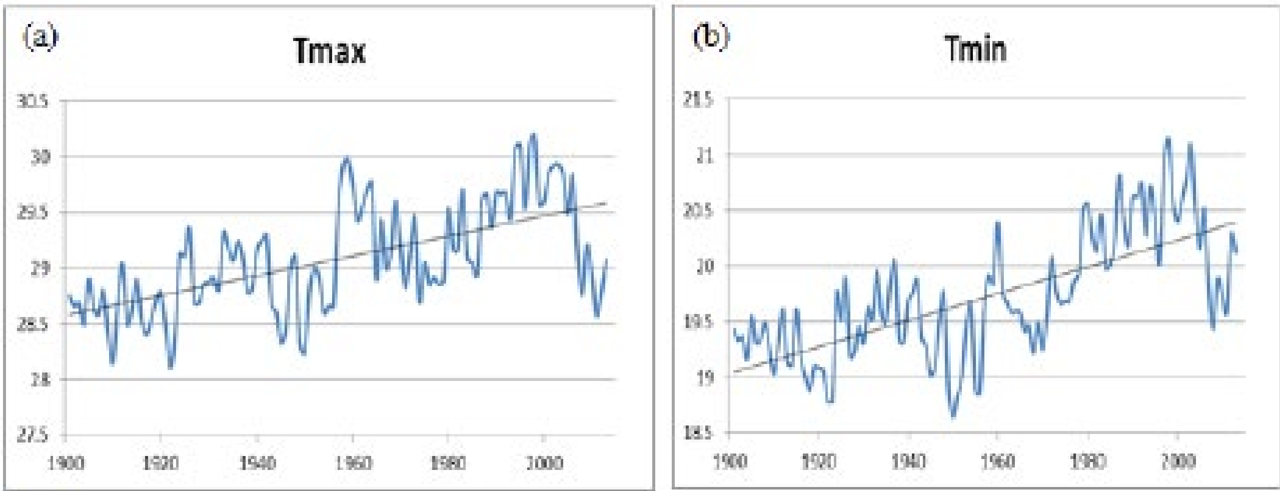


Figure 5: Temperature climatology of Haiti. Red lines represent maximum (top) mean (middle) and minimum (bottom) temperatures for Port-au-Prince (18 34N, 72 18W). Blue lines follow the same pattern but are for Cap Haitien (19 45 N, 72 12 W). 20 years and 112 years of data re used respectively. Data source: weatherbase.com

4.2. Historical Trends

Global mean surface temperatures have increased by 0.85 °C ± 0.20°C when a linear trend is used to estimate the changeover 1880-2012 (IPCC, 2013). Average annual temperatures for Caribbean islands have similarly increased by just over 0.5 °C over the period 1900 – 1995 (IPCC, 2007). The annual mean of day time temperatures for the Caribbean region also shows a significant increase of 0.19 ºC/decade over the period 1961-2010 (Stephenson et al. 2014). This is however, smaller than the increase in mean night time temperatures of 0.28 ºC/decade over the same period. The result is a decrease in the mean annual daily temperature range over the period.

The CRU gridded data for Haiti (Figure 6) likewise show a warming trend for the country. When calculated for the period 1901-2013, minimum temperatures are observed to be increasing slightly faster (~0.12 ºC/decade) than maximum temperatures (~0.10 ºC/decade), which is consistent with the idea of a decrease in daily temperature range. Mean temperatures are increasing at a rate of 0.09 ºC/decade over the 112 year period.



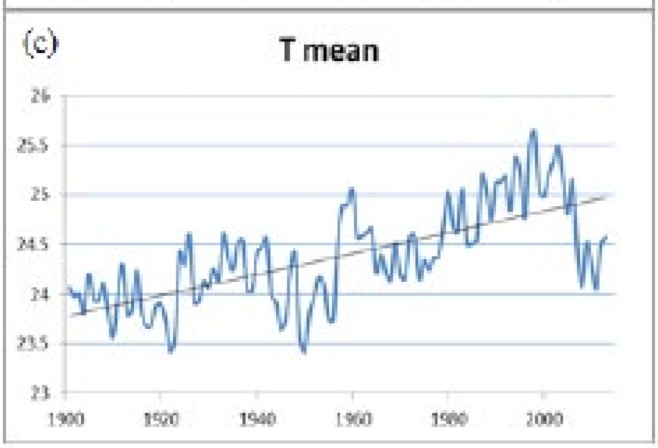
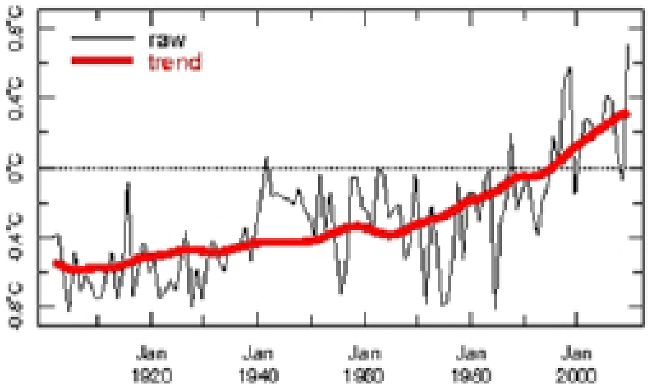


Figure 6: Annual (a) maximum (b) minimum and (c) mean temperatures for Haiti 1901-2013. The linear trend line is inserted. Data source: CRU TS 3.10.

Importantly, the plots of Figure 5 show that for temperatures there is a marked linear trend which dominates the time series. The dominance of the global warming signal in the historical temperature data is true for the entire Caribbean where the linear trend accounts for approximately half of the variability seen (Figure 6). From Figure 6, the linear trend accounts for between 55 and 60% of the temperature time series for Haiti during July-October. Figures 5 also clearly shows strong evidence of decadal variability (groups of years which are warmer or colder) and significant interannual variability (swings between one year and another). These two timescales of variations, however, account for less of the explained variance in the time series (Figures 5 and 6).



Trend	54%
Decadal	17%
Inter- Annual	29%

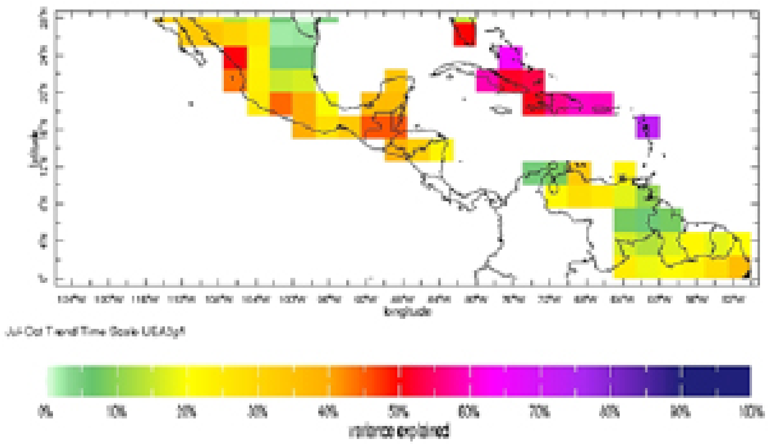


Figure 7: (a) Average July-October temperature anomalies over the Caribbean from the late 1800s with trend line imposed. Box Inset: Percentage of variance explained by trend line, decadal variations > 10 years, interannual (year - to - year) variations. (b) Percentage variance in July-October temperature anomalies (from late 1800s) accounted for by the "global warming" trend line for gridboxes over the Caribbean. Data source: CRU data. Acknowledgements: IRI Mao Room.

4.3. Projections

Data are presented for both GCM and RCM derived projections as maps and tables. Major summary points are:

- From the GCMs, mean annual temperatures are projected to increase irrespective of scenario through the end of the century.
- The mean country temperature increase (in degrees Celsius) from the GCMs will be 0.66-0.78 for 2020s; 0.80-1.11 for 2030s, 0.92-1.86 for the 2050s and 0.87-3.32 for 2081-2100.
- Increases will be of the same approximate magnitude for maximum temperatures and minimum temperatures.
- The RCMs suggest higher magnitude increases for the downscaled regions than those determined from the CMIP5 GCM ensemble. This is expected since the GCM ensembles average across the entire country. The summarised annual increases for mean, maximum and minimum temperatures over the grid boxes in the defined Blocks are as below.

Block	2020s			2030s			2050s			End of Century 2081 - 2100		
	Tmin	Tmean	Tmax	Tmin	Tmean	Tmax	Tmin	Tmean	Tmax	Tmin	Tmean	Tmax
A	1.51 1.54	1.38 1.40	1.39 1.59	1.91 1.80	1.77 1.96	1.78 2.02	2.56 2.65	2.42 2.53	2.53 2.69	3.77 3.84	3.63 4.02	3.86 4.02
B1	1.21 1.57	1.19 1.42	1.16 1.73	1.54 1.97	1.49 1.79	1.45 1.79	2.06 2.67	1.99 2.49	2.06 2.67	2.96 3.91	2.82 3.62	2.68 3.62
B2	1.56 1.68	1.37 1.43	1.42 1.76	1.96 2.07	1.74 1.81	1.77 2.13	2.51 2.70	2.41 2.89	2.46 2.56	3.63 4.01	3.57 4.11	2.68 3.83
B3	1.40 1.55	1.36 1.42	1.16 1.45	1.74 1.95	1.70 1.80	1.53 1.87	2.32 2.62	2.35 2.52	2.55 2.70	3.36 3.80	3.47 3.70	3.81 4.05
C	1.23 1.54	1.17 1.38	1.08 1.43	1.55 1.92	1.47 1.72	1.38 1.76	2.28 2.67	1.99 2.42	2.16 2.76	3.32 3.71	2.91 3.42	3.12 3.72

- Minimum temperatures show slightly higher increases than for mean and maximum temperatures.
- There is some spatial variation (across the country and even within Blocks) with coastal regions generally showing slightly smaller increases in temperature variables than interior regions to their east.
- Temperature change is generally uniform across all three month seasons. August-September-October (ASO) has negligibly higher values than other times of the year.

GCMs

Table 3: Mean annual absolute temperature change for Haiti with respect to 1986-2005. Change shown for four RCP scenarios. Source: AR5 CMIP5 subset.

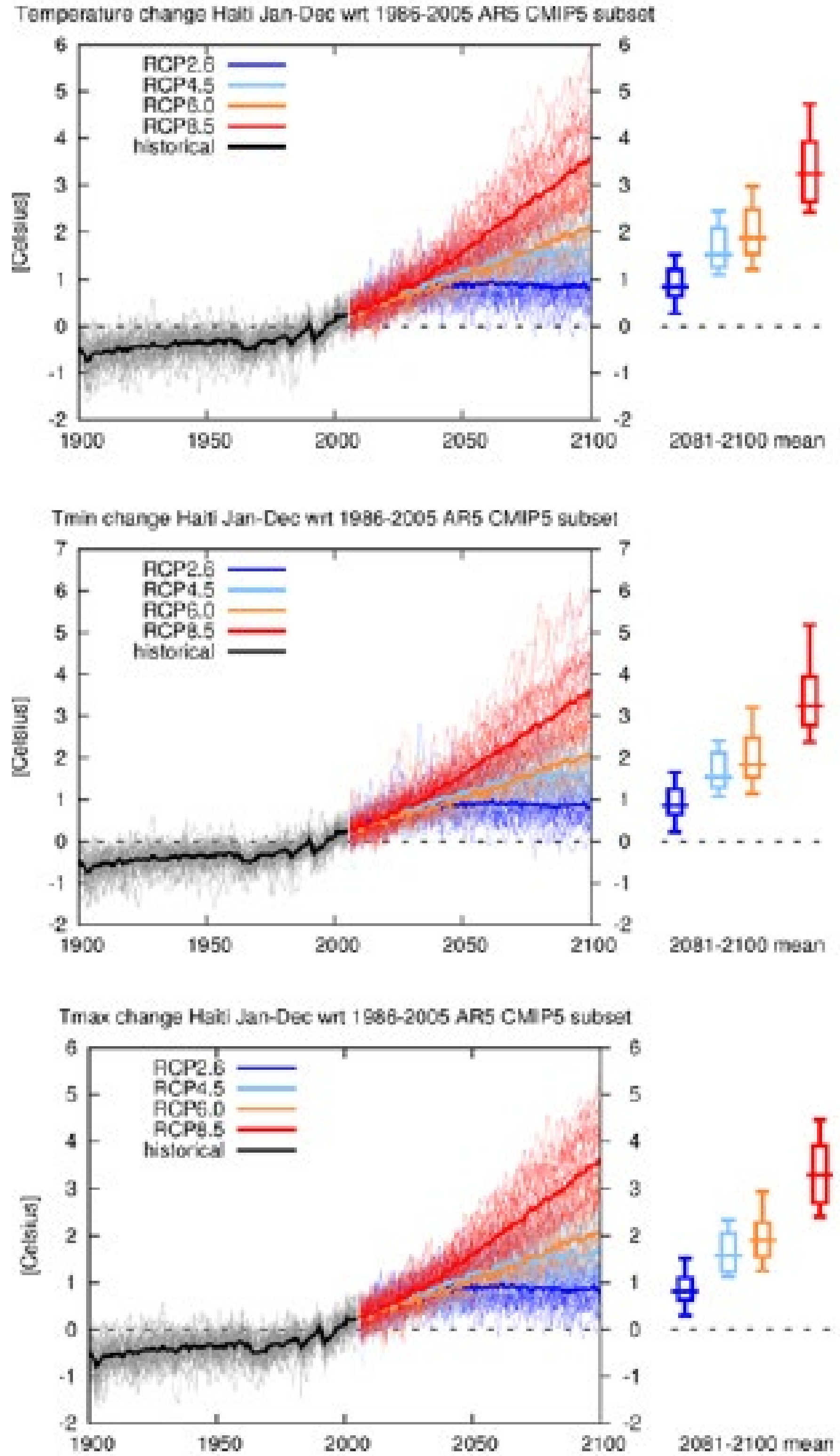
	Tmean											
Centered on **Averaged over**	**2025** **2016 - 2035**			**2035** **2026 - 2045**			**2055** **2046 - 2065**			**End of Century** **2081-2100**		
	min	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**
rcp26	0.39	0.66	1.17	0.39	0.80	1.42	0.47	0.92	1.70	0.09	0.87	1.79
rcp45	0.43	0.68	1.02	0.59	0.90	1.28	0.81	1.29	1.87	0.87	1.65	2.52
rcp60	0.40	0.65	1.13	0.52	0.81	1.30	0.88	1.19	1.78	1.18	1.98	3.04
rcp85	0.52	0.78	1.18	0.78	1.11	1.60	1.34	1.86	2.57	2.37	3.32	5.00
Range of mean:	0.66 - 0.78			0.80 - 1.11			0.92 - 1.86			0.87 - 3.32		

Table 4: Mean annual minimum temperature change for Haiti with respect to 1986-2005. Change shown for four RCP scenarios. Source: AR5 CMIP5 subset.

	Tmin											
Centered on **Averaged over**	**2025** **2016 - 2035**			**2035** **2026 - 2045**			**2055** **2046 - 2065**			**End of Century** **2081-2100**		
	min	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**
rcp26	0.38	0.68	1.37	0.37	0.82	1.63	0.45	0.93	1.74	0.03	0.89	1.81
rcp45	0.41	0.68	1.04	0.63	0.90	1.27	0.79	1.29	1.89	0.81	1.68	3.27
rcp60	0.49	0.61	1.55	0.54	0.82	1.64	0.86	1.19	1.87	1.11	1.99	3.24
rcp85	0.52	0.79	1.17	0.74	1.13	1.74	1.35	1.89	32.77	2.35	3.36	5.37
Range of mean:	0.68 - 0.79			0.82 - 1.13			0.93 - 1.89			0.89 - 3.36		

Table 5: Mean annual maximum temperature change for Haiti with respect to 1986-2005. Change shown for four RCP scenarios. AR5 CMIP5 subset.

	Tmax											
Centered on **Averaged over**	**2025** **2016 - 2035**			**2035** **2026 - 2045**			**2055** **2046 - 2065**			**End of Century** **2081-2100**		
	min	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**
rcp26	0.39	0.65	1.12	0.42	0.79	1.37	0.49	0.93	1.66	0.14	0.86	1.76
rcp45	0.44	0.69	1.03	0.55	0.90	1.37	0.85	1.31	1.99	0.92	1.65	2.58
rcp60	0.39	0.61	1.07	0.51	0.78	1.29	0.89	1.17	1.79	1.23	1.95	2.01
rcp85	0.52	0.78	0.80	1.11	1.59	1.59	1.31	1.87	2.59	2.35	3.32	4.49
Range of mean:	0.65 - 0.78			0.79 - 1.11			0.93 - 1.87			0.86 - 3.32		



(a)

(b)

(c)

Figure 8:

(a) Mean annual temperature change (ºC)

(b) Mean annual minimum temperature change (ºC)

(c) Mean annual maximum temperature change (ºC) for Haiti with respect to 1986 - 2005 AR5 CMIP5 subset. On the left, for each scenario one line per model is shown plus the multi-model mean, on the right percentiles od the whole dataset: the box extends from 25% to 75%, the whiskers from 5% to 95% and the horizontal line denotes the median (50%).

RCM

Mean Temperatures

2020s

2030s

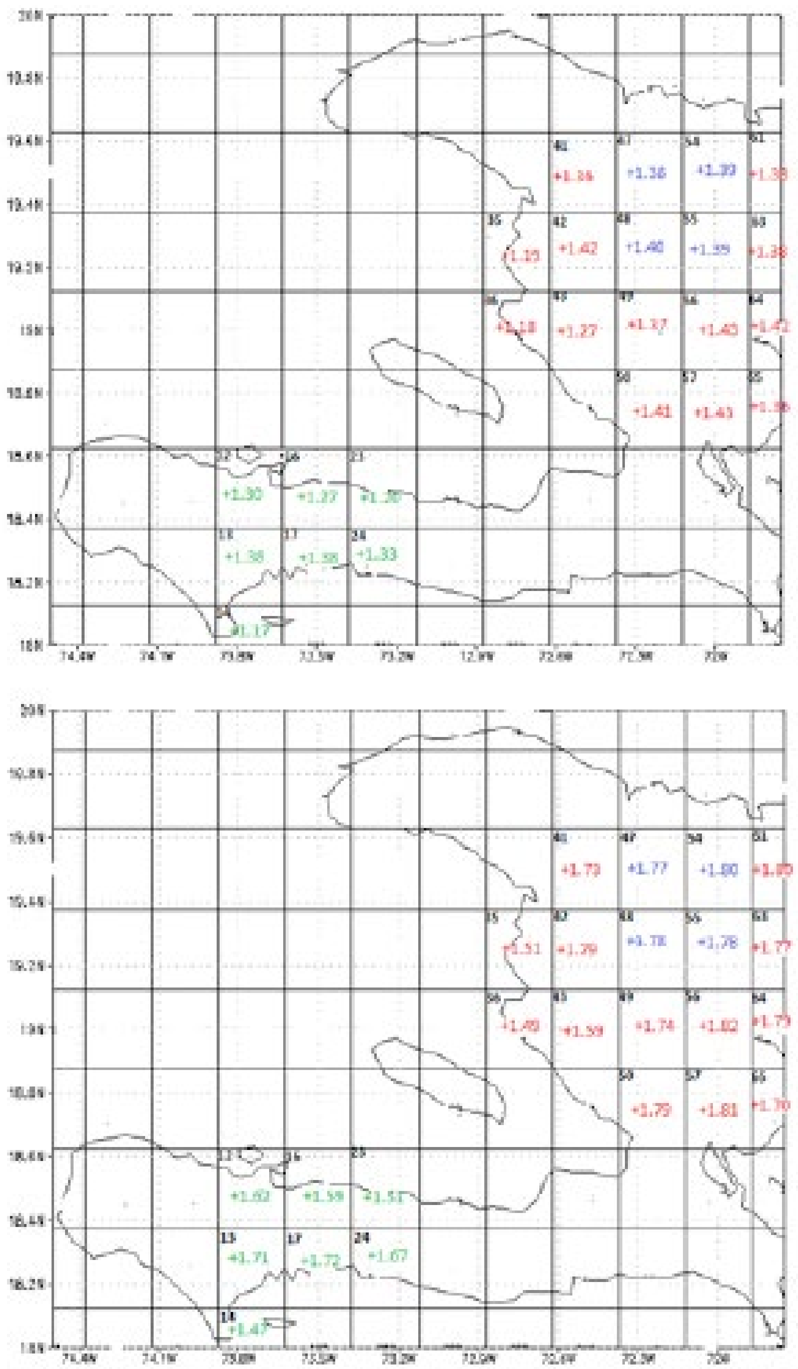
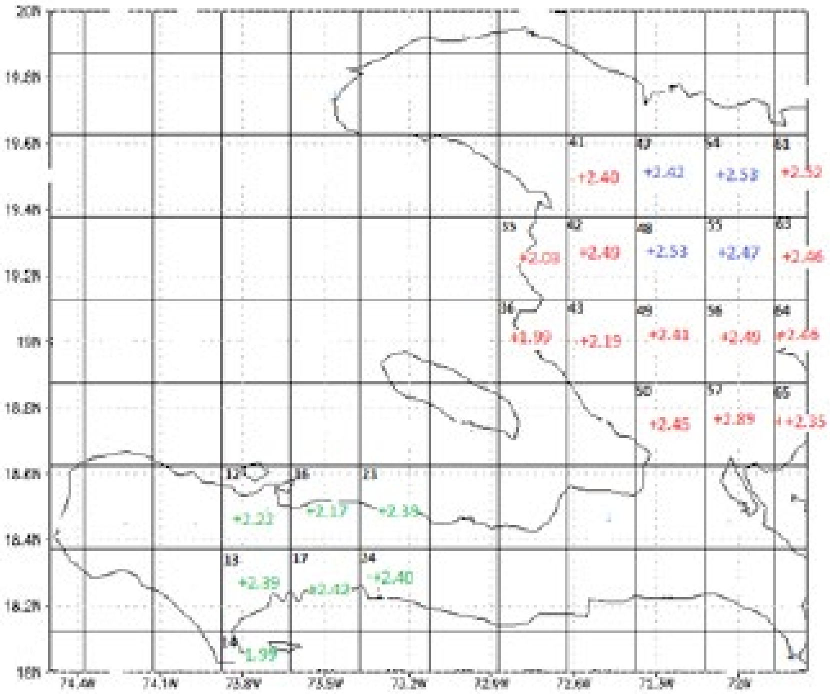


Figure 9a: Summary map showing absolute change per grid box of annual Mean Temperature (ºC) for the 2020's (top panel) and 2030s (bottom panel). Source: PRECIS RCM PPE.

2050s



End of century

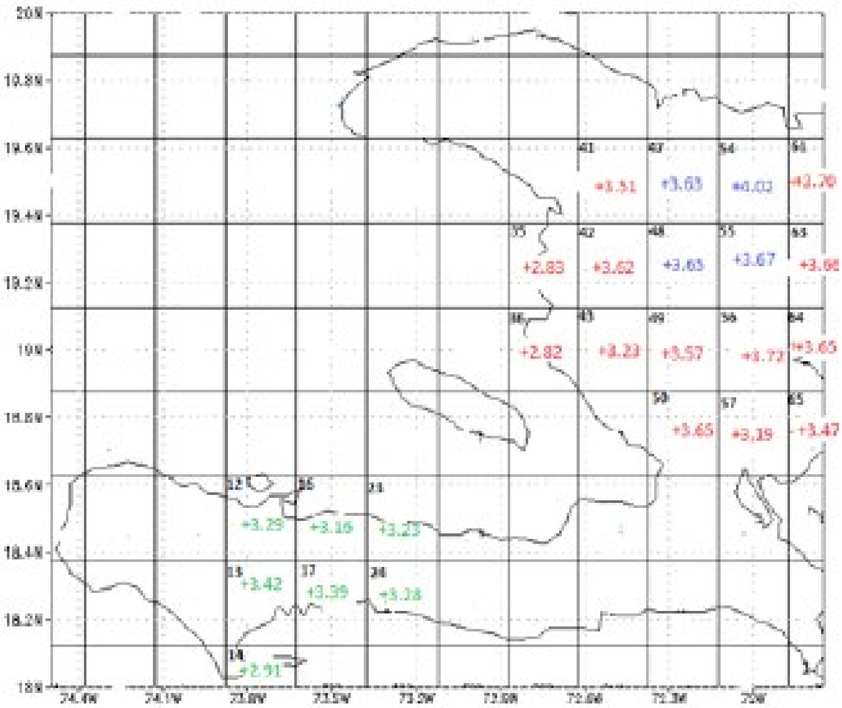


Figure 9b: Summary map showing absolute change per grid box of annual Mean Temperature (ºC) for the 2050's (top panel) and end of century (2080 - 2098) (bottom panel). Source: PRECIS RCM PPE.

Table 6-10: Projected absolute change in mean temperature (ºC) for the 2020s, 2030s, 2050s and end of century (2080-2098) relative to the 1960-1990 baseline. Data presented for minimum, maximum and mean value of a five member ensemble. Values are for 25 km grid boxes shown in Figure 1. Tables arranged by Blocks.

Table 6 : Absolute Change in Mean Temperatures (ºC) - Block A												
2020s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.23	1.39	1.54	1.21	1.40	1.56	1.23	1.40	1.54	1.18	1.39	1.54
FMA	1.19	1.37	1.52	1.18	1.38	1.54	1.19	1.37	1.52	1.15	1.37	1.52
MJJ	1.19	1.38	1.54	1.17	1.40	1.56	1.19	1.39	1.53	1.14	1.38	1.53
ASO	1.21	1.40	1.54	1.19	1.41	1.56	1.22	1.41	1.54	1.16	1.40	1.54
ANN	1.20	1.38	1.53	1.19	1.40	1.56	1.21	1.39	1.53	1.16	1.39	1.53
2030s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.46	1.77	1,97	1.43	1.78	1.98	1.47	1.80	2.01	1.41	1.78	1.97
FMA	1.46	1.75	1.98	1.43	1.76	1.98	1.46	1.78	2.01	1.40	1.76	1.97
MJJ	1.46	1.78	2.00	1.45	1.79	1.99	1.49	1.81	2.04	1.43	1.79	1.99
ASO	1.46	1.79	2.00	1.45	1.80	2.00	1.50	1.82	2.04	1.43	1.80	2.01
ANN	1.47	1.77	1.99	1.44	1.78	1.99	1.48	1.80	2.02	1.42	1.78	1.98
2050s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.12	2.42	2.69	2.40	2.52	2.72	2.36	2.53	2.72	2.22	2.46	2.72
FMA	2.14	2.44	2.72	2.41	2.54	2.74	2.38	2.55	2.75	2.24	2.49	2.75
MJJ	2.13	2.43	2.69	2.42	2.54	2.72	2.38	2.55	2.73	2.24	2.48	2.73
ASO	2.11	2.40	2.66	2.39	2.51	2.69	2.36	2.51	2.70	2.21	2.45	2.69
ANN	2.13	2.42	2.69	2.41	2.41	2.72	2.37	2.53	2.73	2.23	2.47	2.72
End of Century (2080-2098)												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	3.07	3.63	4.02	3.04	3.65	4.11	3.87	4.01	4.08	3.01	3.66	4.20
FMA	3.07	3.64	4.04	3.04	3.66	4.12	3.89	4.03	4.10	3.01	3.68	4.21
MJJ	3.07	3.64	4.03	3.04	3.66	4.12	3.89	4.02	4.09	3.02	3.68	4.21
ASO	3.07	3.62	4.01	3.04	3.64	4.10	3.86	4.00	4.07	3.01	3.66	4.19
ANN	3.07	3.63	4.03	3.04	3.65	4.11	3.88	4.02	4.08	3.01	3.67	4.20

Table 7: Absolute Change in Mean Temperatures (°C) – Block B1

2020s

Grid Box	35			36			41			42			43		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.03	1.20	1.34	1.01	1.19	1.32	1.19	1.37	1.53	1.24	1.43	1.59	1.07	1.27	1.41
FMA	1.00	1.17	1.31	0.97	1.17	1.29	1.16	1.35	1.51	1.20	1.41	1.57	1.04	1.25	1.38
MJJ	1.01	1.19	1.33	0.98	1.18	1.31	1.16	1.37	1.53	1.20	1.42	1.58	1.04	1.26	1.39
ASO	1.03	1.21	1.35	1.01	1.20	1.32	1.18	1.38	1.54	1.22	1.43	1.59	1.06	1.28	1.40
ANN	1.02	1.19	1.33	0.99	1.18	1.31	1.17	1.36	1.53	1.22	1.42	1.58	1.05	1.27	1.39

2030s

Grid Box	35			36			41			42			43		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.24	1.51	1.68	1.18	1.49	1.65	1.43	1.73	1.94	1.45	1.79	2.01	1.24	1.59	1.79
FMA	1.25	1.50	1.67	1.19	1.48	1.65	1.43	1.71	1.95	1.46	1.77	2.01	1.24	1.58	1.78
MJJ	1.26	1.51	1.68	1.20	1.49	1.66	1.45	1.74	1.96	1.48	1.80	2.03	1.26	1.60	1.80
ASO	1.25	1.52	1.68	1.20	1.49	1.66	1.45	1.75	1.97	1.47	1.81	2.03	1.26	1.60	1.80
ANN	1.25	1.51	1.68	1.19	1.49	1.65	1.44	1.73	1.95	1.46	1.79	2.02	1.25	1.59	1.79

2050s

Grid Box	35			36			41			42			43		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.84	2.02	2.13	1.77	1.98	2.12	2.20	2.39	2.57	2.29	2.48	2.67	1.95	2.19	2.40
FMA	1.85	2.03	2.14	1.79	1.99	2.13	2.22	2.41	2.60	2.31	2.50	2.70	1.97	2.20	2.42
MJJ	1.86	2.03	2.14	1.80	1.99	2.12	2.22	2.41	2.58	2.31	2.50	2.68	1.97	2.20	2.40
ASO	1.84	2.02	2.13	1.78	1.98	2.11	2.20	2.38	2.55	2.29	2.47	2.65	1.95	2.18	2.38
ANN	1.85	2.03	2.14	1.78	1.99	2.12	2.21	2.40	2.57	2.30	2.49	2.67	1.96	2.19	2.40

End of Century (2080 - 2098)

Grid Box	35			36			41			42			43		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.38	2.83	3.06	2.33	2.82	3.11	2.98	3.50	3.84	3.09	3.62	3.96	2.68	3.23	3.64
FMA	2.37	2.84	3.07	2.33	2.82	3.12	2.98	3.51	3.85	3.09	3.63	3.98	2.68	3.23	3.65
MJJ	2.37	2.84	3.07	2.32	2.82	3.13	2.98	3.51	3.85	3.09	3.63	3.97	2.67	3.23	3.65
ASO	2.37	2.83	3.06	2.32	2.81	3.11	2.98	3.50	3.83	3.08	3.61	3.96	2.67	3.22	3.64
ANN	2.37	2.83	3.07	2.33	2.82	3.12	2.98	3.51	3.84	3.09	3.62	3.97	2.68	3.23	3.64

Table 8: Absolute Change in Mean Temperatures (°C) – Block B2												
2020s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.17	1.38	1.53	1.19	1.42	1.57	1.21	1.43	1.60	1.22	1.44	1.61
FMA	1.13	1.35	1.50	1.16	1.40	1.55	1.18	1.41	1.58	1.18	1.41	1.59
MJJ	1.13	1.37	1.52	1.16	1.41	1.57	1.17	1.43	1.59	1.18	1.43	1.61
ASO	1.16	1.38	1.53	1.18	1.43	1.58	1.20	1.44	1.60	1.21	1.45	1.62
ANN	1.15	1.37	1.52	1.17	1.41	1.57	1.19	1.43	1.59	1.20	1.43	1.61
2030s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.37	1.74	1.95	1.39	1.79	2.01	1.41	1.82	2.03	1.42	1.81	2.03
FMA	1.37	1.72	1.94	1.38	1.77	1.99	1.41	1.80	2.02	1.41	1.79	2.02
MJJ	1.39	1.75	1.96	1.40	1.79	2.02	1.43	1.83	2.04	1.43	1.82	2.04
ASO	1.39	1.76	1.96	1.41	1.80	2.03	1.44	1.84	2.05	1.44	1.83	2.04
ANN	1.38	1.74	1.95	1.39	1.79	2.01	1.42	1.82	2.03	1.42	1.81	2.03
2050s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.17	2.40	2.65	2.25	2.45	2.68	2.25	2.49	2.74	2.28	2.87	3.65
FMA	2.19	2.42	2.67	2.27	2.47	2.71	2.27	2.51	2.77	2.30	2.91	3.68
MJJ	2.18	2.42	2.65	2.25	2.46	2.69	2.26	2.50	2.74	2.29	2.89	3.69
ASO	2.17	2.39	2.62	2.24	2.43	2.66	2.24	2.47	2.71	2.27	2.87	3.66
ANN	2.18	2.41	2.65	2.25	2.45	2.68	2.26	2.49	2.74	2.29	2.89	3.67
End of Century (2080-2098)												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.96	3.57	4.04	3.07	3.65	4.11	3.06	3.71	4.23	2.33	3.18	4.16
FMA	2.96	3.58	4.05	3.08	3.66	4.12	3.07	3.73	4.25	2.35	3.19	4.18
MJJ	2.97	3.57	4.05	3.08	3.66	4.11	3.07	3.72	4.24	2.35	3.19	4.17
ASO	2.96	3.56	4.03	3.07	3.64	4.10	3.06	3.71	4.23	2.32	3.18	4.15
ANN	2.96	3.57	4.04	3.07	3.65	4.11	3.06	3.72	4.24	2.34	3.19	4.16

Table 9: Absolute Change in Mean Temperatures (°C) – Block B3												
2020s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.20	1.39	1.54	1.13	1.38	1.52	1.17	1.42	1.60	1.11	1.36	1.54
FMA	1.16	1.36	1.51	1.09	1.36	1.51	1.13	1.40	1.58	1.07	1.34	1.51
MJJ	1.16	1.38	1.53	1.09	1.38	1.52	1.13	1.42	1.60	1.08	1.36	1.54
ASO	1.19	1.40	1.54	1.12	1.39	1.52	1.16	1.43	1.61	1.11	1.37	1.55
ANN	1.18	1.38	1.53	1.11	1.38	1.52	1.15	1.42	1.60	1.09	1.36	1.54
2030s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.44	1.80	2.01	1.38	1.76	1.95	1.38	1.79	1.99	1.35	1.70	1.90
FMA	1.42	1.77	2.00	1.37	1.74	1.95	1.38	1.77	1.99	1.34	1.68	1.90
MJJ	1.46	1.81	2.03	1.40	1.78	1.97	1.40	1.80	2.00	1.36	1.70	1.91
ASO	1.47	1.82	2.04	1.41	1.79	1.99	1.41	1.81	2.02	1.37	1.71	1.92
ANN	1.45	1.80	2.02	1.39	1.77	1.96	1.39	1.79	2.00	1.36	1.70	1.91
2050s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.34	2.52	2.72	2.20	2.45	2.69	2.21	2.46	2.67	2.12	2.34	2.53
FMA	2.36	2.54	2.75	2.22	2.48	2.73	2.23	2.48	2.70	2.14	2.36	2.58
MJJ	2.36	2.54	2.73	2.22	2.47	2.70	2.22	2.47	2.67	2.14	2.36	2.55
ASO	2.33	2.50	2.70	2.19	2.43	2.66	2.20	2.44	2.64	2.12	2.33	2.51
ANN	2.35	2.52	2.72	2.21	2.46	2.69	2.22	2.46	2.67	2.13	2.35	2.54
End of Century (2080-2098)												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	3.09	3.70	4.11	2.99	3.66	4.21	2.98	3.65	4.15	2.80	3.47	3.95
FMA	3.09	3.71	4.13	3.00	3.67	4.22	2.98	3.66	4.17	2.80	3.47	3.97
MJJ	3.10	3.71	4.12	3.00	3.67	4.22	2.98	3.65	4.16	2.80	3.47	3.96
ASO	3.09	3.69	4.11	2.99	3.65	4.20	2.98	3.64	4.15	2.80	3.46	3.95
ANN	3.09	3.70	4.12	2.99	3.66	4.21	2.98	3.65	4.15	2.80	3.47	3.96

Table 10: Absolute Change in Mean Temperatures (°C) – Block C												
2020s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.05	1.30	1.44	1.20	1.38	1.53	0.92	1.17	1.29	1.08	1.27	1.42
FMA	1.03	1.29	1.43	1.18	1.36	1.52	0.88	1.14	1.27	1.05	1.26	1.41
MJJ	1.03	1.30	1.45	1.18	1.38	1.54	0.90	1.16	1.29	1.05	1.27	1.43
ASO	1.05	1.31	1.45	1.20	1.39	1.55	0.92	1.18	1.31	1.07	1.28	1.44
ANN	1.04	1.30	1.44	1.19	1.38	1.53	0.90	1.17	1.29	1.06	1.27	1.43
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	1.23	1.38	1.54	0.95	1.20	1.38	1.20	1.33	1.49			
FMA	1.23	1.37	1.52	0.95	1.18	1.36	1.19	1.32	1.47			
MJJ	1.24	1.38	1.55	0.96	1.20	1.39	1.19	1.33	1.50			
ASO	1.26	1.39	1.57	0.97	1.21	1.40	1.21	1.34	1.51			
ANN	1.24	1.38	1.54	0.96	1.20	1.38	1.20	1.33	1.49			
2030s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.30	1.62	1.85	1.51	1.70	1.95	1.12	1.47	1.58	1.34	1.59	1.80
FMA	1.30	1.60	1.85	1.52	1.69	1.96	1.13	1.45	1.54	1.34	1.58	1.80
MJJ	1.32	1.62	1.87	1.53	1.71	1.97	1.14	1.47	1.56	1.36	1.60	1.82
ASO	1.32	1.63	1.86	1.53	1.72	1.96	1.12	1.48	1.59	1.36	1.61	1.81
ANN	1.31	1.62	1.86	1.52	1.71	1.96	1.13	1.47	1.57	1.35	1.59	1.81
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	1.60	1.72	1.96	1.32	1.51	1.73	1.52	1.67	1.90			
FMA	1.59	1.71	1.98	1.33	1.50	1.73	1.53	1.65	1.91			
MJJ	1.62	1.73	1.99	1.34	1.52	1.74	1.55	1.68	1.92			
ASO	1.62	1.74	1.98	1.33	1.52	1.74	1.55	1.69	1.92			
ANN	1.61	1.72	1.98	1.33	1.51	1.73	1.54	1.67	1.91			

Table 10: Absolute Change in Mean Temperatures (°C) – Block C

2050s

Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.10	2.21	2.33	2.37	2.38	2.40	1.56	1.98	2.19	2.04	2.16	2.31
FMA	2.13	2.23	2.37	2.37	2.40	2.44	1.59	2.00	2.21	2.06	2.19	2.34
MJJ	2.13	2.23	2.36	2.38	2.41	2.44	1.60	2.00	2.21	2.06	2.19	2.33
ASO	2.11	2.20	2.31	2.35	2.38	2.41	1.58	1.98	2.18	2.04	2.16	2.30
ANN	2.12	2.22	2.34	2.36	2.39	2.42	1.58	1.99	2.20	2.05	2.17	2.32

	17			23			24		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.37	2.41	2.45	2.37	2.39	2.41	2.37	2.40	2.45
FMA	2.37	2.43	2.49	2.37	2.40	2.43	2.37	2.41	2.49
MJJ	2.38	2.43	2.50	2.38	2.41	2.43	2.38	2.42	2.50
ASO	2.34	2.40	2.46	2.34	2.37	2.40	2.34	2.38	2.46
ANN	2.36	2.42	2.48	2.36	2.39	2.42	2.36	2.40	2.48

End of Century (2080-2098)

Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.87	3.29	3.54	3.10	3.42	3.66	2.21	2.92	3.34	2.72	3.16	3.41
FMA	2.88	3.30	3.56	3.10	3.42	3.65	2.21	2.92	3.33	2.72	3.17	3.43
MJJ	2.87	3.29	3.55	3.09	3.42	3.65	2.21	2.92	3.33	2.71	3.16	3.42
ASO	2.86	3.28	3.54	3.08	3.41	3.64	2.20	2.91	3.32	2.71	3.16	3.41
ANN	2.87	3.29	3.55	3.09	3.42	3.65	2.21	2.91	3.33	2.72	3.16	3.42

	17			23			24		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	3.08	3.39	3.65	3.08	3.24	3.39	3.08	3.29	3.65
FMA	3.09	3.40	3.65	3.09	3.25	3.40	3.09	3.30	3.65
MJJ	3.08	3.38	3.63	3.08	3.23	3.38	3.08	3.28	3.63
ASO	3.05	3.37	3.62	3.05	3.21	3.37	3.05	3.26	3.62
ANN	3.08	3.39	3.64	3.08	3.23	3.39	3.08	3.28	3.64

Table 11-15: Projected absolute change in maximum temperature (C°) for the 2020s, 2030s, 2050s and end of century (2080-2098) relative to the 1960-1990 baseline. Data presented for minimum, maximum and mean value of a five member ensemble. Values are for 25 km grid boxes shown in Figure 1. Tables arranged by Blocks.

Table 11: Absolute Change in Maximum Temperatures (°C) – Block A

2020s												
Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.36	1.39	1.47	1.38	1.45	1.57	1.35	1.60	2.41	1.07	1.41	1.58
FMA	1.33	1.38	1.44	1.35	1.44	1.55	1.31	1.58	2.41	1.05	1.40	1.57
MJJ	1.34	1.39	1.46	1.34	1.45	1.57	1.33	1.59	2.43	1.03	1.41	1.58
ASO	1.38	1.40	1.46	1.36	1.46	1.57	1.36	1.61	2.42	1.06	1.42	1.58
ANN	1.36	1.39	1.46	1.36	1.45	1.56	1.34	1.59	2.42	1.05	1.41	1.57
2030s												
Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.62	1.78	1.98	1.60	1.83	2.02	1.62	2.01	3.01	1.31	1.81	2.12
FMA	1.60	1.75	1.96	1.59	1.80	2.02	1.60	1.98	3.02	1.29	1.78	2.07
MJJ	1.66	1.80	2.00	1.62	1.84	2.05	1.64	2.03	3.06	1.32	1.83	2.11
ASO	1.67	1.81	2.01	1.62	1.86	2.06	1.66	2.05	3.07	1.34	1.84	2.16
ANN	1.63	1.78	1.98	1.61	1.83	2.04	1.63	2.02	3.04	1.32	1.82	2.11
2050s												
Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.33	2.53	2.77	2.55	2.69	2.80	2.53	2.67	2.81	2.53	2.69	2.93
FMA	2.33	2.55	2.80	2.57	2.71	2.84	2.56	2.69	2.84	2.54	2.71	2.97
MJJ	2.33	2.55	2.77	2.58	2.70	2.80	2.57	2.68	2.81	2.53	2.70	2.93
ASO	2.31	2.50	2.72	2.52	2.66	2.76	2.50	2.64	2.77	2.51	2.65	2.88
ANN	2.33	2.53	2.76	2.56	2.69	2.80	2.54	2.67	2.81	2.53	2.69	2.93
End of Century (2080-2098)												
Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	3.42	3.86	4.16	3.34	3.88	4.26	3.48	3.92	4.23	3.40	4.02	4.51
FMA	3.43	3.87	4.18	3.34	3.89	4.27	3.47	3.93	4.25	3.42	4.04	4.52
MJJ	3.43	3.87	4.17	3.34	3.88	4.26	3.45	3.92	4.23	3.41	4.03	4.51
ASO	3.40	3.84	4.15	3.32	3.86	4.25	3.46	3.90	4.22	3.39	4.01	4.50
ANN	3.42	3.86	4.16	3.33	3.88	4.26	3.46	3.92	4.23	3.41	4.02	4.51

Table 12: Absolute Change in Maximum Temperatures (ºC) – Block B1												
2020s												
Grid Box	**35**			**36**			**41**			**42**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.00	1.16	1.29	1.11	1.26	1.39	1.29	1.56	2.45	1.29	1.74	3.02
FMA	0.98	1.14	1.27	1.08	1.24	1.36	1.26	1.55	2.46	1.29	1.72	2.99
MJJ	1.00	1.16	1.29	1.09	1.26	1.38	1.25	1.56	2.47	1.31	1.73	3.00
ASO	1.00	1.18	1.30	1.12	1.27	1.40	1.27	1.57	2.46	1.31	1.75	3.02
ANN	1.00	1.16	1.28	1.10	1.26	1.38	1.27	1.56	2.46	1.30	1.73	3.01
2030s												
Grid Box	**35**			**36**			**41**			**42**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.22	1.45	1.60	1.32	1.56	1.73	1.52	1.91	2.97	1.70	2.08	3.23
FMA	1.24	1.44	1.60	1.34	1.55	1.73	1.52	1.88	2.96	1.66	2.05	3.24
MJJ	1.26	1.45	1.60	1.34	1.56	1.74	1.55	1.92	2.99	1.68	2.09	3.27
ASO	1.25	1.46	1.61	1.33	1.57	1.74	1.55	1.94	3.00	1.70	2.10	3.27
ANN	1.24	1.45	1.60	1.33	1.56	1.74	1.54	1.91	2.98	1.69	2.08	3.25
2050s												
Grid Box	**35**			**36**			**41**			**42**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.76	1.92	2.01	1.87	2.05	2.15	2.37	2.44	2.54	2.32	2.43	2.54
FMA	1.77	1.93	2.03	1.89	2.07	2.17	2.38	2.45	2.57	2.33	2.45	2.57
MJJ	1.78	1.94	2.02	1.89	2.07	2.16	2.38	2.45	2.54	2.33	2.44	2.54
ASO	1.77	1.92	2.00	1.87	2.04	2.13	2.36	2.41	2.50	2.32	2.41	2.50
ANN	1.77	1.93	2.02	1.88	2.06	2.15	2.37	2.44	2.54	2.32	2.43	2.54
End of Century (2080-2098)												
Grid Box	**35**			**36**			**41**			**42**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.25	2.68	2.93	2.43	2.88	3.13	3.19	3.59	3.84	3.12	3.55	3.79
FMA	2.24	2.68	2.93	2.43	2.89	3.13	3.18	3.60	3.86	3.12	3.56	3.81
MJJ	2.23	2.68	2.93	2.41	2.89	3.13	3.16	3.58	3.85	3.10	3.56	3.81
ASO	2.23	2.67	2.92	2.41	2.88	3.12	3.16	3.57	3.84	3.09	3.54	3.79
ANN	2.24	2.68	2.93	2.42	2.89	3.13	3.17	3.58	3.85	3.11	3.55	3.80

Table 13: Absolute Change in Maximum Temperatures (°C) – Block B2												
2020s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.31	1.44	1.56	1.30	1.42	1.58	1.35	1.74	2.97	1.28	1.76	3.04
FMA	1.28	1.42	1.55	1.27	1.41	1.56	1.32	1.73	2.97	1.29	1.74	3.00
MJJ	1.29	1.44	1.57	1.27	1.42	1.59	1.31	1.74	2.98	1.31	1.76	3.00
ASO	1.32	1.45	1.57	1.30	1.44	1.59	1.34	1.76	2.97	1.31	1.78	3.04
ANN	1.30	1.43	1.56	1.29	1.42	1.58	1.33	1.74	2.97	1.30	1.76	3.02
2030s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.52	1.81	2.01	1.51	1.77	1.99	1.56	2.12	3.49	1.71	2.12	3.24
FMA	1.52	1.78	2.01	1.51	1.74	1.98	1.55	2.10	3.49	1.67	2.10	3.24
MJJ	1.56	1.82	2.04	1.52	1.77	2.01	1.58	2.13	3.51	1.69	2.13	3.26
ASO	1.56	1.83	2.04	1.53	1.79	2.02	1.59	2.15	3.52	1.71	2.14	3.27
ANN	1.54	1.81	2.02	1.52	1.77	2.00	1.57	2.13	3.50	1.69	2.12	3.25
2050s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.37	2.54	2.78	2.35	2.45	2.62	2.40	2.56	2.77	2.35	2.47	2.64
FMA	2.38	2.57	2.81	2.36	2.48	2.67	2.42	2.58	2.81	2.37	2.50	2.69
MJJ	2.38	2.56	2.78	2.35	2.47	2.63	2.41	2.58	2.78	2.36	2.49	2.65
ASO	2.36	2.52	2.74	2.34	2.43	2.59	2.39	2.53	2.74	2.34	2.45	2.61
ANN	2.37	2.55	2.78	2.35	2.46	2.63	2.40	2.56	2.77	2.36	2.48	2.65
End of Century (2080-2098)												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	3.22	3.81	4.24	3.15	3.66	4.01	3.25	3.84	4.28	3.12	3.66	4.04
FMA	3.23	3.82	4.25	3.15	3.67	4.03	3.24	3.85	4.30	3.13	3.68	4.06
MJJ	3.22	3.81	4.25	3.14	3.66	4.03	3.22	3.83	4.29	3.12	3.67	4.05
ASO	3.20	3.79	4.23	3.13	3.64	4.01	3.23	3.82	4.27	3.11	3.65	4.04
ANN	3.22	3.81	4.24	3.14	3.66	4.02	3.23	3.83	4.28	3.12	3.66	4.05

Table 14: Absolute Change in Maximum Temperatures (°C) – Block B3												
2020s												
Grid Box	61			63			64			65		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.30	1.37	1.43	1.33	1.45	1.54	1.11	1.16	1.60	1.26	1.43	1.63
FMA	1.26	1.35	1.42	1.31	1.44	1.53	1.13	1.14	1.58	1.23	1.41	1.60
MJJ	1.28	1.37	1.44	1.28	1.45	1.54	1.13	1.16	1.61	1.25	1.43	1.64
ASO	1.34	1.39	1.44	1.31	1.46	1.54	1.12	1.17	1.61	1.28	1.45	1.65
ANN	1.30	1.37	1.42	1.31	1.45	1.54	1.12	1.16	1.60	1.26	1.43	1.63
2030s												
Grid Box	61			63			64			65		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.60	1.80	2.04	1.59	1.87	2.12	1.59	1.53	1.97	1.54	1.77	2.00
FMA	1.58	1.76	1.97	1.57	1.83	1.05	1.60	1.50	1.90	1.52	1.74	1.99
MJJ	1.66	1.83	2.04	1.60	1.88	2.11	1.62	1.54	1.96	1.57	1.78	2.01
ASO	1.67	1.85	2.08	1.62	1.90	2.17	1.63	1.56	2.01	1.59	1.80	2.03
ANN	1.62	1.81	2.03	1.60	1.87	2.11	1.61	1.53	1.96	1.56	1.78	2.00
2050s												
Grid Box	61			63			64			65		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.53	2.66	2.83	2.54	2.70	2.93	2.39	2.54	2.74	2.42	2.54	2.74
FMA	2.56	2.68	2.86	2.55	2.72	2.98	2.40	2.57	2.78	2.43	2.57	2.80
MJJ	2.58	2.67	2.83	2.55	2.71	2.94	2.39	2.56	2.75	2.43	2.56	2.76
ASO	2.50	2.62	2.78	2.52	2.66	2.89	2.38	2.52	2.70	2.41	2.52	2.70
ANN	2.54	2.66	2.82	2.54	2.70	2.93	2.39	2.55	2.74	2.42	2.55	2.75
End of Century (2080-2098)												
Grid Box	61			63			64			65		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	3.37	3.91	4.28	3.41	4.05	4.57	3.22	3.83	4.27	3.17	3.81	4.25
FMA	3.38	3.93	4.30	3.42	4.07	4.58	3.22	3.83	4.28	3.18	3.81	4.27
MJJ	3.38	3.92	4.28	3.42	4.06	4.57	3.19	3.82	4.27	3.17	3.81	4.25
ASO	3.35	3.89	4.27	3.39	4.03	4.56	3.20	3.81	4.26	3.15	3.79	4.24
ANN	3.37	3.91	4.28	3.41	4.05	4.57	3.22	3.83	4.27	3.17	3.81	4.25

Table 15: Absolute Change in Maximum Temperatures (°C) – Block C												
2020s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.10	1.25	1.37	1.16	1.29	1.43	0.88	1.09	1.23	1.13	1.43	2.19
FMA	1.09	1.24	1.36	1.16	1.28	1.42	0.85	1.06	1.21	1.14	1.42	2.18
MJJ	1.10	1.25	1.38	1.15	1.28	1.45	0.87	1.08	1.23	1.15	1.43	2.16
ASO	1.10	1.26	1.37	1.16	1.29	1.45	0.90	1.10	1.25	1.15	1.43	2.18
ANN	1.10	1.25	1.37	1.16	1.29	1.44	0.87	1.08	1.23	1.14	1.43	2.18
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	1.12	1.26	1.41	1.05	1.18	1.31	0.96	1.21	1.38			
FMA	1.14	1.25	1.40	1.06	1.16	1.29	0.98	1.21	1.36			
MJJ	1.15	1.26	1.43	1.07	1.17	1.32	0.99	1.21	1.40			
ASO	1.15	1.27	1.43	1.07	1.18	1.32	0.99	1.22	1.40			
ANN	1.14	1.26	1.42	1.06	1.17	1.31	0.98	1.21	1.39			
2030s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.36	1.60	1.86	1.44	1.62	1.87	1.07	1.39	1.56	1.38	1.76	2.52
FMA	1.35	1.58	1.87	1.44	1.61	1.89	1.09	1.36	1.53	1.37	1.75	2.52
MJJ	1.38	1.61	1.89	1.47	1.63	1.90	1.09	1.38	1.54	1.39	1.77	2.54
ASO	1.38	1.62	1.87	1.46	1.64	1.87	1.07	1.39	1.58	1.39	1.78	2.54
ANN	1.37	1.60	1.87	1.45	1.62	1.88	1.08	1.38	1.55	1.38	1.76	2.53
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	1.40	1.59	1.84	1.39	1.49	1.65	1.39	1.53	1.84			
FMA	1.40	1.57	1.86	1.36	1.48	1.67	1.36	1.51	1.85			
MJJ	1.43	1.60	1.87	1.39	1.49	1.68	1.40	1.54	1.87			
ASO	1.42	1.61	1.85	1.39	1.50	1.66	1.40	1.54	1.85			
ANN	1.41	1.59	1.85	1.39	1.49	1.66	1.40	1.53	1.85			

Table 15: Absolute Change in Maximum Temperatures (°C) – Block C												
2050s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.12	2.25	2.36	2.25	2.44	2.78	2.09	2.75	-	2.04	2.15	2.21
FMA	2.13	2.28	2.39	2.24	2.46	2.83	2.11	2.77	-	2.05	2.18	2.25
MJJ	2.15	2.28	2.39	2.26	2.46	2.82	2.10	2.77	-	2.06	2.17	2.23
ASO	2.10	2.23	2.36	2.22	2.42	2.79	2.06	2.74	-	2.02	2.13	2.20
ANN	2.12	2.26	2.37	2.24	2.44	2.80	2.09	2.76	-	2.04	2.16	2.22
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	2.18	2.28	2.41	2.18	2.23	2.28	2.18	2.25	2.41			
FMA	2.17	2.29	2.45	2.17	2.23	2.29	2.17	2.26	2.45			
MJJ	2.18	2.29	2.46	2.18	2.24	2.29	2.18	2.27	2.46			
ASO	2.14	2.26	2.42	2.14	2.20	2.26	2.14	2.23	2.42			
ANN	2.17	2.28	2.43	2.17	2.22	2.28	2.17	2.25	2.43			
End of Century (2080-2098)												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	3.10	3.37	3.53	3.39	3.51	3.65	3.11	3.73	4.70	2.81	3.12	3.32
FMA	3.12	3.38	3.54	3.40	3.51	3.64	3.12	3.72	4.69	2.82	3.13	3.32
MJJ	3.11	3.37	3.53	3.39	3.50	3.63	3.11	3.72	4.67	2.81	3.12	3.31
ASO	3.09	3.36	3.52	3.38	3.50	3.63	3.10	3.71	4.68	2.80	3.11	3.30
ANN	3.11	3.37	3.53	3.39	3.51	3.64	3.11	3.72	4.68	2.81	3.12	3.31
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	3.00	3.23	3.50	3.00	3.11	3.23	3.00	3.17	3.50			
FMA	3.00	3.23	3.50	3.00	3.11	3.23	3.00	3.17	3.50			
MJJ	2.98	3.21	3.47	2.98	3.09	3.21	2.98	3.15	3.47			
ASO	2.97	3.20	3.47	2.97	3.09	3.20	2.97	3.14	3.47			
ANN	2.98	3.22	3.49	2.98	3.10	3.22	2.98	3.15	3.49			

Table 16-20: Projected absolute change in minimum temperature (ºC) for the 2020s, 2030s, 2050s and end of century (2080-2098) relative to the 1960-1990 baseline. Data presented for minimum, maximum and mean value of a five member ensemble. Values are for 25 km grid boxes shown in Figure 1. Tables arranged by Blocks.

Table 16: Absolute Change in Minimum Temperatures (ºC) – Block A

2020s

Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.21	1.53	1.77	1.18	1.51	1.75	1.22	1.55	1.78	1.16	1.53	1.75
FMA	1.17	1.51	1.75	1.14	1.49	1.73	1.18	1.52	1.76	1.12	1.50	1.73
MJJ	1.18	1.53	1.78	1.15	1.51	1.74	1.19	1.54	1.78	1.13	1.52	1.74
ASO	1.20	1.54	1.79	1.17	1.52	1.76	1.21	1.56	1.79	1.15	1.54	1.76
ANN	1.19	1.53	1.77	1.16	1.51	1.74	1.20	1.54	1.78	1.14	1.52	1.74

2030s

Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.50	1.93	2.16	1.45	1.91	2.12	1.50	1.96	2.21	1.43	1.93	2.15
FMA	1.50	1.92	2.16	1.46	1.90	2.12	1.50	1.95	2.20	1.44	1.92	2.15
MJJ	1.53	1.94	2.17	1.48	1.92	2.13	1.53	1.97	2.22	1.46	1.94	2.15
ASO	1.53	1.95	2.17	1.48	1.92	2.13	1.53	1.98	2.22	1.46	1.94	2.16
ANN	1.51	1.93	2.16	1.47	1.91	2.13	1.51	1.96	2.21	1.45	1.93	2.15

2050s

Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.14	2.55	2.85	2.36	2.62	2.85	2.35	2.64	2.89	2.23	2.59	2.88
FMA	2.17	2.57	2.88	2.39	2.64	2.88	2.38	2.66	2.91	2.26	2.61	2.90
MJJ	2.17	2.57	2.86	2.39	2.64	2.87	2.38	2.66	2.90	2.26	2.61	2.89
ASO	2.15	2.54	2.84	2.36	2.62	2.85	2.35	2.64	2.88	2.23	2.59	2.87
ANN	2.16	2.56	2.86	2.37	2.63	2.86	2.36	2.65	2.90	2.25	2.60	2.88

End of Century (2080-2098)

Grid Box	47			48			54			55		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	3.09	3.77	4.23	3.04	3.77	4.29	3.15	3.84	4.29	3.04	3.81	4.40
FMA	3.09	3.79	4.25	3.04	3.78	4.31	3.15	3.85	4.32	3.05	3.82	4.41
MJJ	3.09	3.79	4.24	3.04	3.78	4.31	3.15	3.85	4.31	3.04	3.82	4.41
ASO	3.09	3.77	4.22	3.03	3.76	4.29	3.14	3.83	4.29	3.04	3.80	4.39
ANN	3.09	3.78	4.24	3.04	3.77	4.30	3.15	3.84	4.30	3.04	3.81	4.40

Table 17: Absolute Change in Minimum Temperatures (°C) – Block B1															
2020s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.05	1.27	1.44	0.97	1.22	1.37	1.20	1.53	1.77	1.23	1.57	1.80	0.99	1.29	1.48
FMA	1.01	1.24	1.41	0.94	1.19	1.33	1.16	1.51	1.75	1.20	1.55	1.78	0.96	1.27	1.45
MJJ	1.03	1.26	1.43	0.94	1.21	1.35	1.17	1.53	1.77	1.20	1.57	1.80	0.96	1.29	1.46
ASO	1.05	1.28	1.45	0.97	1.22	1.37	1.20	1.54	1.78	1.23	1.58	1.80	0.99	1.30	1.48
ANN	1.04	1.26	1.43	0.96	1.21	1.35	1.18	1.53	1.77	1.22	1.57	1.79	0.98	1.29	1.47
2030s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.28	1.61	1.79	1.17	1.54	1.71	1.46	1.92	2.16	1.49	1.96	2.21	1.19	1.63	1.82
FMA	1.29	1.60	1.80	1.17	1.53	1.70	1.47	1.91	2.16	1.49	1.95	2.21	1.19	1.62	1.82
MJJ	1.30	1.62	1.80	1.18	1.54	1.71	1.49	1.93	2.17	1.51	1.97	2.22	1.21	1.64	1.83
ASO	1.29	1.62	1.80	1.18	1.55	1.71	1.49	1.93	2.18	1.51	1.98	2.22	1.21	1.64	1.83
ANN	1.29	1.61	1.80	1.17	1.54	1.71	1.48	1.92	2.17	1.50	1.97	2.22	1.20	1.63	1.83
2050s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.90	2.14	2.30	1.79	2.06	2.24	2.23	2.55	2.79	2.34	2.66	2.93	1.88	2.20	2.44
FMA	1.92	2.16	2.31	1.81	2.07	2.25	2.25	2.58	2.82	2.36	2.69	2.96	1.90	2.22	2.45
MJJ	1.93	2.16	2.31	1.82	2.07	2.25	2.25	2.58	2.81	2.36	2.68	2.94	1.91	2.22	2.44
ASO	1.91	2.15	2.30	1.80	2.06	2.24	2.23	2.55	2.78	2.34	2.66	2.92	1.88	2.20	2.43
ANN	1.92	2.15	2.30	1.81	2.06	2.24	2.24	2.57	2.80	2.35	2.67	2.94	1.89	2.21	2.44
End of Century (2080 - 2098)															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.49	3.02	3.30	2.39	2.96	3.33	3.08	3.74	4.14	3.21	3.90	4.38	2.61	3.25	3.73
FMA	2.49	3.03	3.32	2.40	2.96	3.34	3.08	3.75	4.17	3.21	3.92	4.40	2.62	3.26	3.74
MJJ	2.49	3.03	3.32	2.39	2.96	3.34	3.07	3.75	4.16	3.20	3.91	4.39	2.61	3.26	3.74
ASO	2.49	3.02	3.31	2.39	2.95	3.33	3.07	3.73	4.14	3.20	3.90	4.37	2.61	3.25	3.73
ANN	2.49	3.02	3.31	2.40	2.96	3.34	3.08	3.74	4.15	3.21	3.91	4.38	2.62	3.26	3.74

Table 18: Absolute Change in Minimum Temperatures (°C) – Block B2												
2020s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.13	1.69	2.64	1.21	1.58	1.78	1.21	1.59	1.81	1.21	1.57	1.78
FMA	1.09	1.66	2.60	1.18	1.56	1.75	1.17	1.57	1.79	1.16	1.54	1.75
MJJ	1.10	1.68	2.65	1.18	1.58	1.77	1.18	1.59	1.81	1.17	1.56	1.77
ASO	1.13	1.70	2.68	1.21	1.59	1.79	1.21	1.60	1.82	1.21	1.58	1.79
ANN	1.11	1.68	2.64	1.19	1.58	1.77	1.19	1.59	1.81	1.19	1.56	1.77
2030s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.37	2.07	2.94	1.43	1.99	2.23	1.45	2.00	2.23	1.41	1.96	2.19
FMA	1.37	2.06	2.93	1.43	1.98	2.21	1.45	1.99	2.22	1.41	1.95	2.18
MJJ	1.39	2.08	2.95	1.45	2.00	2.23	1.47	2.01	2.23	1.43	1.97	2.19
ASO	1.39	2.08	2.96	1.46	2.01	2.24	1.47	2.01	2.24	1.44	1.98	2.20
ANN	1.38	2.07	2.94	1.44	2.00	2.23	1.46	2.00	2.23	1.42	1.96	2.19
2050s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.16	2.50	2.75	2.37	2.70	2.99	2.32	2.67	2.94	2.31	2.63	2.86
FMA	2.19	2.52	2.77	2.40	2.72	3.01	2.35	2.70	2.96	2.35	2.65	2.88
MJJ	2.18	2.51	2.76	2.39	2.71	3.00	2.34	2.69	2.95	2.34	2.64	2.87
ASO	2.16	2.50	2.74	2.36	2.69	2.98	2.32	2.67	2.93	2.32	2.62	2.84
ANN	2.17	2.51	2.76	2.38	2.70	2.99	2.33	2.68	2.95	2.33	2.64	2.86
End of Century (2080-2098)												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.97	3.68	4.21	3.27	4.01	4.60	3.17	3.95	4.55	3.13	3.87	4.46
FMA	2.97	3.69	4.23	3.27	4.02	4.62	3.18	3.96	4.57	3.13	3.89	4.47
MJJ	2.97	3.69	4.22	3.27	4.02	4.61	3.17	3.96	4.56	3.12	3.88	4.46
ASO	2.96	3.67	4.21	3.26	4.00	4.60	3.16	3.94	4.55	3.12	3.87	4.45
ANN	2.97	3.68	4.22	3.27	4.01	4.61	3.17	3.95	4.56	3.13	3.88	4.46

Table 19: Absolute Change in Minimum Temperatures (°C) – Block B3												
2020s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.19	1.54	1.77	1.12	1.51	1.72	1.17	1.56	1.78	1.07	1.40	1.60
FMA	1.15	1.51	1.75	1.08	1.48	1.70	1.13	1.53	1.75	1.02	1.37	1.56
MJJ	1.16	1.53	1.77	1.09	1.51	1.72	1.14	1.55	1.78	1.04	1.40	1.59
ASO	1.19	1.55	1.78	1.12	1.52	1.74	1.18	1.57	1.80	1.08	1.42	1.61
ANN	1.17	1.53	1.77	1.10	1.50	1.72	1.15	1.55	1.78	1.05	1.40	1.59
2030s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	1.46	1.94	2.19	1.40	1.90	2.10	1.39	1.94	2.16	1.25	1.73	1.95
FMA	1.45	1.93	2.18	1.41	1.89	2.10	1.40	1.93	2.18	1.25	1.73	1.96
MJJ	1.48	1.95	2.20	1.43	1.91	2.11	1.42	1.95	2.18	1.27	1.74	1.96
ASO	1.49	1.96	2.20	1.43	1.92	2.12	1.42	1.95	2.17	1.28	1.75	1.96
ANN	1.47	1.95	2.19	1.42	1.90	2.11	1.41	1.94	2.17	1.26	1.74	1.95
2050s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	2.32	2.61	2.84	2.18	2.54	2.81	2.25	2.58	2.79	2.04	2.31	2.46
FMA	2.35	2.63	2.87	2.22	2.57	2.83	2.28	2.60	2.81	2.06	2.33	2.49
MJJ	2.35	2.63	2.86	2.21	2.57	2.83	2.28	2.60	2.80	2.06	2.33	2.48
ASO	2.32	2.61	2.83	2.18	2.54	2.80	2.25	2.58	2.78	2.04	2.31	2.45
ANN	2.34	2.62	2.85	2.20	2.56	2.82	2.26	2.59	2.79	2.05	2.32	2.47
End of Century (2080-2098)												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	3.11	3.80	4.24	2.97	3.73	4.32	3.02	3.76	4.31	2.71	3.36	3.81
FMA	3.11	3.81	4.27	2.98	3.74	4.34	3.03	3.78	4.33	2.71	3.37	3.82
MJJ	3.10	3.81	4.26	2.97	3.74	4.34	3.02	3.77	4.32	2.70	3.37	3.82
ASO	3.10	3.79	4.24	2.97	3.73	4.32	3.02	3.76	4.31	2.70	3.36	3.80
ANN	3.11	3.80	4.25	2.97	3.74	4.33	3.02	3.77	4.32	2.71	3.36	3.81

Table 20: Absolute Change in Minimum Temperatures (°C) – Block C

2020s

Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.05	1.39	1.58	1.27	1.52	1.69	0.97	1.23	1.37	1.07	1.37	1.56
FMA	1.01	1.37	1.56	1.23	1.49	1.68	0.93	1.20	1.34	1.03	1.35	1.54
MJJ	1.03	1.40	1.59	1.24	1.52	1.69	0.95	1.22	1.38	1.05	1.37	1.57
ASO	1.06	1.41	1.60	1.27	1.53	1.71	0.98	1.24	1.40	1.07	1.38	1.58
ANN	1.04	1.39	1.58	1.25	1.51	1.69	0.96	1.23	1.37	1.05	1.36	1.56

	17			23			24		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.33	1.54	1.72	1.06	1.33	1.51	1.26	1.48	1.66
FMA	1.30	1.52	1.69	1.02	1.31	1.48	1.23	1.46	1.62
MJJ	1.31	1.54	1.73	1.04	1.33	1.51	1.24	1.48	1.66
ASO	1.33	1.55	1.75	1.06	1.34	1.53	1.26	1.50	1.68
ANN	1.32	1.54	1.72	1.04	1.33	1.51	1.25	1.48	1.65

2030s

Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.25	1.71	1.94	1.55	1.86	2.12	1.19	1.55	1.69	1.29	1.69	1.91
FMA	1.26	1.70	1.93	1.55	1.85	2.13	1.20	1.54	1.66	1.30	1.68	1.90
MJJ	1.27	1.72	1.94	1.58	1.88	2.14	1.22	1.55	1.69	1.32	1.70	1.91
ASO	1.27	1.73	1.95	1.57	1.88	2.13	1.21	1.56	1.71	1.31	1.71	1.91
ANN	1.26	1.71	1.94	1.56	1.87	2.13	1.20	1.55	1.69	1.31	1.70	1.91

	17			23			24		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	1.64	1.92	2.18	1.30	1.66	1.85	1.56	1.86	2.09
FMA	1.64	1.90	2.18	1.30	1.64	1.85	1.56	1.85	2.10
MJJ	1.67	1.93	2.20	1.32	1.66	1.86	1.59	1.87	2.11
ASO	1.68	1.94	2.19	1.31	1.67	1.86	1.59	1.88	2.11
ANN	1.66	1.92	2.19	1.31	1.66	1.86	1.58	1.87	2.10

Table 20: Absolute Change in Minimum Temperatures (°C) – Block C												
2050s												
Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.01	2.28	2.46	2.34	2.51	2.61	2.32	2.34	2.37	1.99	2.27	2.48
FMA	2.03	2.30	2.49	2.37	2.53	2.62	2.33	2.36	2.39	2.01	2.29	2.50
MJJ	2.04	2.30	2.48	2.38	2.53	2.62	2.34	2.37	2.39	2.01	2.29	2.50
ASO	2.02	2.28	2.45	2.35	2.51	2.60	2.31	2.34	2.37	1.99	2.27	2.47
ANN	2.02	2.29	2.47	2.36	2.52	2.61	2.33	2.35	2.38	2.00	2.28	2.49
	17			23			24					
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX			
NDJ	2.63	2.67	2.71	2.63	2.65	2.67	2.63	2.66	2.71			
FMA	2.65	2.68	2.70	2.65	2.66	2.68	2.65	2.67	2.70			
MJJ	2.65	2.69	2.71	2.65	2.67	2.69	2.65	2.67	2.71			
ASO	2.62	2.66	2.69	2.62	2.64	2.66	2.62	2.64	2.69			
ANN	2.64	2.67	2.70	2.64	2.65	2.67	2.64	2.66	2.70			
End of Century (2080-2098)												
Grid Box	12			13			14			16		
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX
NDJ	2.78	3.34	3.70	3.05	3.56	3.83	3.07	3.32	3.47	2.70	3.28	3.64
FMA	2.79	3.35	3.73	3.06	3.57	3.83	3.07	3.33	3.47	2.70	3.29	3.67
MJJ	2.77	3.35	3.72	3.04	3.56	3.84	3.06	3.32	3.48	2.69	3.29	3.66
ASO	2.77	3.33	3.70	3.04	3.55	3.83	3.06	3.32	3.47	2.69	3.28	3.64
ANN	2.78	3.34	3.71	3.05	3.56	3.83	3.06	3.32	3.47	2.70	3.38	3.65
	17			23			24					
	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX			
NDJ	3.38	3.74	3.94	3.38	3.56	3.74	3.38	3.60	3.94			
FMA	3.39	3.74	3.94	3.39	3.57	3.74	3.39	3.60	3.94			
MJJ	3.38	3.73	3.94	3.38	3.56	3.73	3.38	3.60	3.94			
ASO	3.37	3.72	3.93	3.37	3.55	3.72	3.37	3.59	3.93			
ANN	3.36	3.71	3.91	3.36	3.54	3.71	3.36	3.58	3.91			

5. Rainfall

5.1. Climatology

The annual cycle of rainfall in the northwest Caribbean arises primarily as a result of latitudinal and longitudinal shifts of the North Atlantic subtropical High (Azores high), the intensity of trade winds on its equatorward edge as well as the annual cycle of sea surface temperatures (SSTs). In tandem these drivers yield a rainy season roughly spanning April-November with peaks in May-June and September –November. There is a mid-summer drought (MSD) that usually occurs in July-August which is associated with the strengthening of the Azores high, the intensification of trade winds and strong vertical shear.

Moron et al. (2014) use rain gauge data to analyse the rainfall climatology for Haiti. They suggest that, as expected for mountainous islands, the rainfall variations are very large and are approximately between 509-2434 mm (Figure 10). There is less rainfall on the flat northern peninsula, the western valleys and coastlines and the southern section of the country. The wettest areas tend to be where there is a prevalence of mountainous terrains. The southern peninsular is particularly wet, which may be due to the fact that mountain and sea breezes converge.

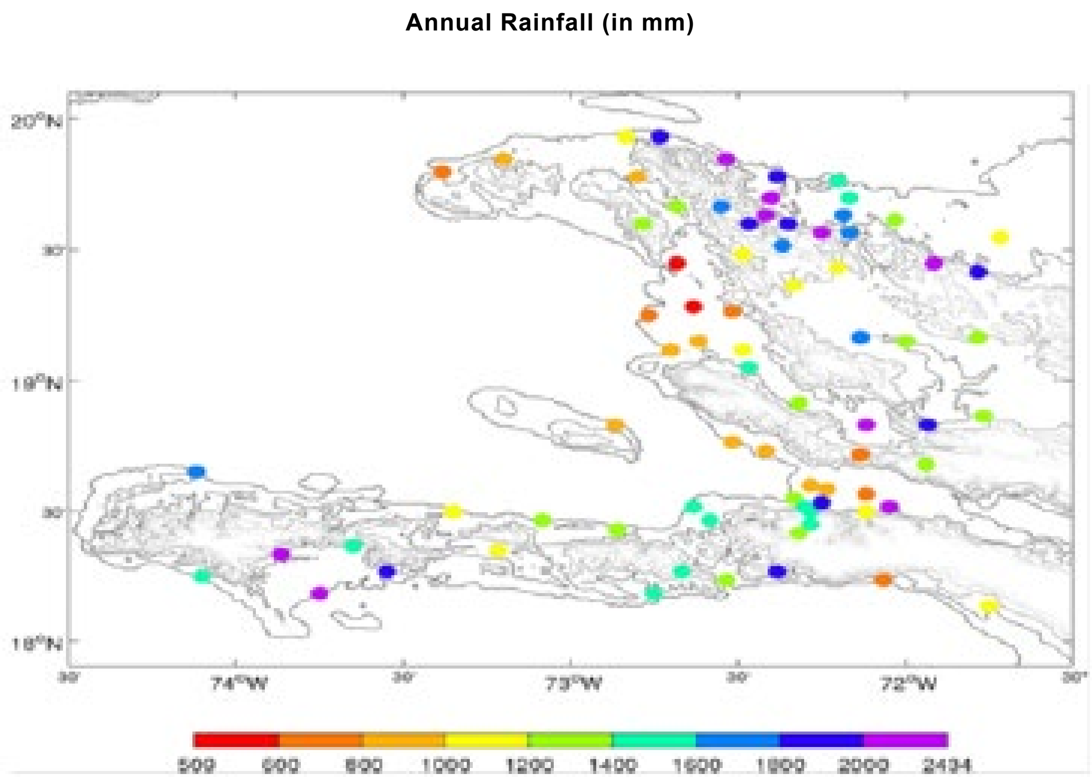


Figure 10: Mean monthly rainfall amount in mm computed from the available years in 1922 - 1968. Source: Moron et al. (2014)

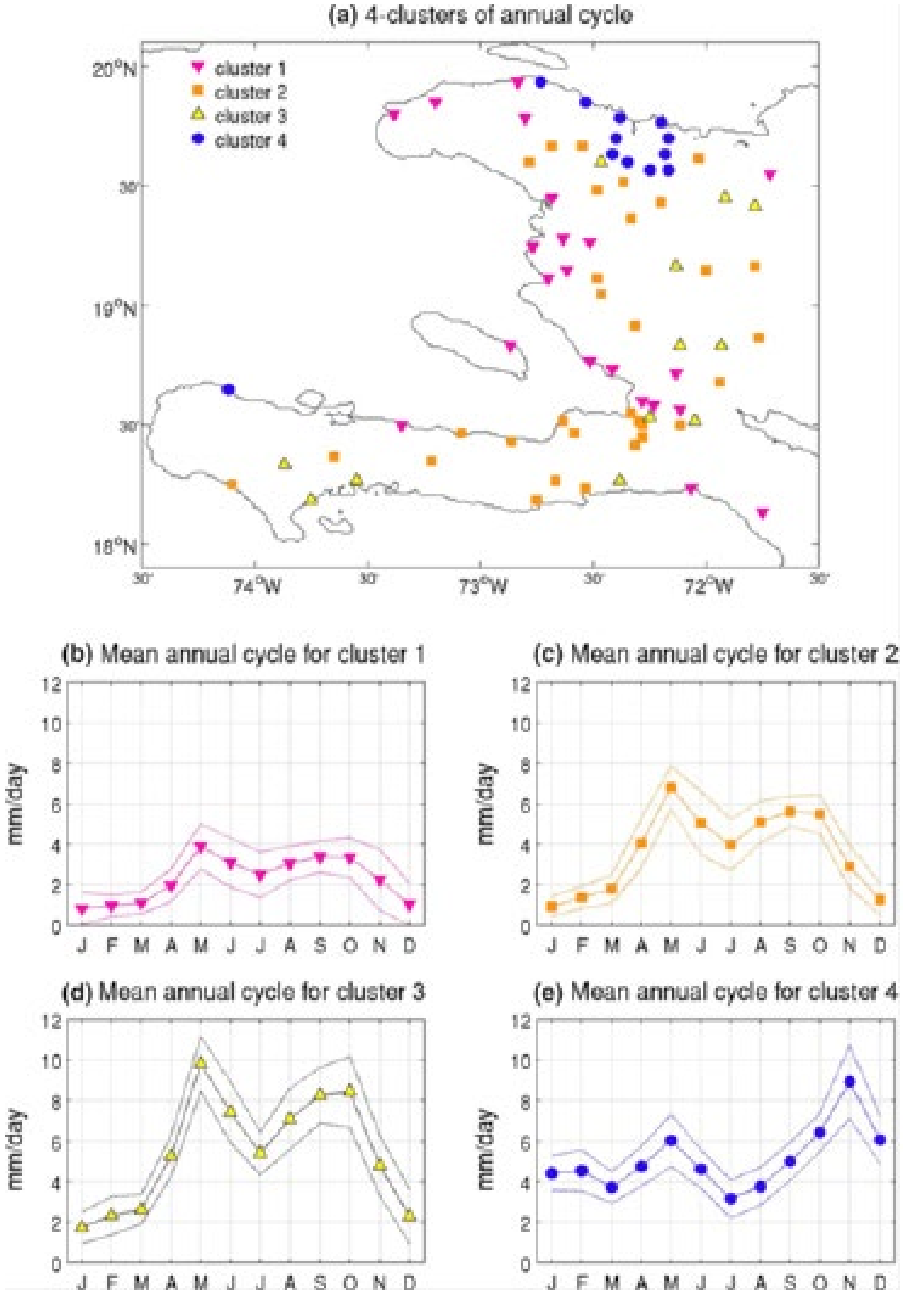


Figure 11: Annual cycle of rainfall for four rainfall clusters. Source: Moron et al. (2014)

The annual cycle of rainfall generally mirrors that noted for the northwest Caribbean with the bimodality (double peak) being the most pronounced and significant feature. Figure 11 shows the climatology for four rainfall zones as deduced by Moron et al. (2014). For all four zones there is an initial peak of rainfall in May during an early rainfall season which generally spans April-June. This peak is related to SST warming and the tendency of the low level winds to progressively veer from ENE in boreal winter to ESE in late boreal spring. The midsummer drought is very pronounced and occurs in July and then there is a second peak in rainfall in September –October (which continues to November–December in NE Haiti). The late rainfall season is related to the lowest sea level pressures and an eastward retreat of the Azores high, while the SSTs are still greater than 28◦C. Tropical easterly waves are significant climate features as well. The waves travel from the west coast of Africa and through the Caribbean between June and November. Their significance arises not only because of the rain that accompanies their passage over the island, but also because the waves often develop into tropical depressions, storms and hurricanes under conducive conditions. The dry season (December to March) is not entirely dry, particularly in the north, as the passage of mid-latitude cold fronts early in the year often brings rain.

In summary, Moron et al. (2014) note that the climatological mean, annual, and monthly rainfall in Haiti is a complex function of fixed factors including the topography and shape of the country, as well as the annual cycle of regional-scale oceanic and atmospheric factors.

5. 2. Historical Trends

Interannual variability is a dominant part of the Haiti rainfall record. Figure 13 shows the annual rainfall anomaly from the beginning of the twentieth century as gleaned from the CRU gridded data. Unlike the temperature time series there is no linear trend in the rainfall data but, rather, the record is dominated by interannual (year to year) and decadal variability. This dominance of the interannual timescale in the rainfall time series is generally true of Caribbean rainfall (Figure 14).

The short term variability is in part due to the El Niño/La Niña phenomenon which is a significant driver of interannual climate variability in the Caribbean. El Niño events tend to occur every 3 to 5 years, though increases in the frequency, severity and duration of events have been noted since the 1970s. Because an El Niño represents a significant influence on Caribbean climate it is not unusual to find its timescale of variability (i.e. 3 to 5 year cycles) in regional rainfall and temperature records. During an El Niño event, the Caribbean tends to be ***drier*** and ***hotter*** than usual in the mean, and particularly during the ***late wet season*** from August through November. There is also, by extension, a tendency for reduced hurricane activity during El Niño events. Meteorological droughts occurring over the Caribbean in 1997-1998 and 2010 coincided with El Niño events. However, during the ***early rainfall season*** (May to July) in the year after an El Niño (the El Niño + 1 year), the Caribbean tends to be ***wetter*** than usual. The El Niño also has an impact on the Caribbean dry period as it tends to induce opposite signals over the north and south Caribbean i.e. with strong drying in the southern Caribbean, but a transitioning to wetter conditions over regions north of Jamaica. In general, a La Niña event produces the opposite conditions in both the late wet season (i.e. wetter conditions) and the dry season (i.e. produces a wetter south Caribbean).

Moron et al. (2014) note that the most important driver of Haitian rainfall is the low-level zonal component of the wind that flows over the Caribbean Sea. A wetter anomaly in Haiti is due to the fact that the westerly anomaly decreases the low-level jet while a drier than normal anomaly in Haiti is as a result of the easterly increasing the low level jet. The low level jet is strongly controlled by SST gradients between the Pacific and Atlantic which are in turn modulated by El Niño/La Niña events.

Figure 12 also shows some decadal variance, with wet anomalies in the 1900s, 30s, early 40s, 60s, and mid to late 2000s. Dry anomalies are evident in the 1910s, 20s, and almost every year between 1967 and 2002 (except 1978–1979, 1981, 1994, 1996, 1999). The last three decades were especially dry with multi-year droughts between 1975–1977 and 1985–1993 (Moron et al. 2014). Moron et al. (2014) note that in summary, variations of annual rainfall in Haiti combine irregular multi-decadal variability with insignificant quasiperiodic variations, usually for 3 or 7–9 years.

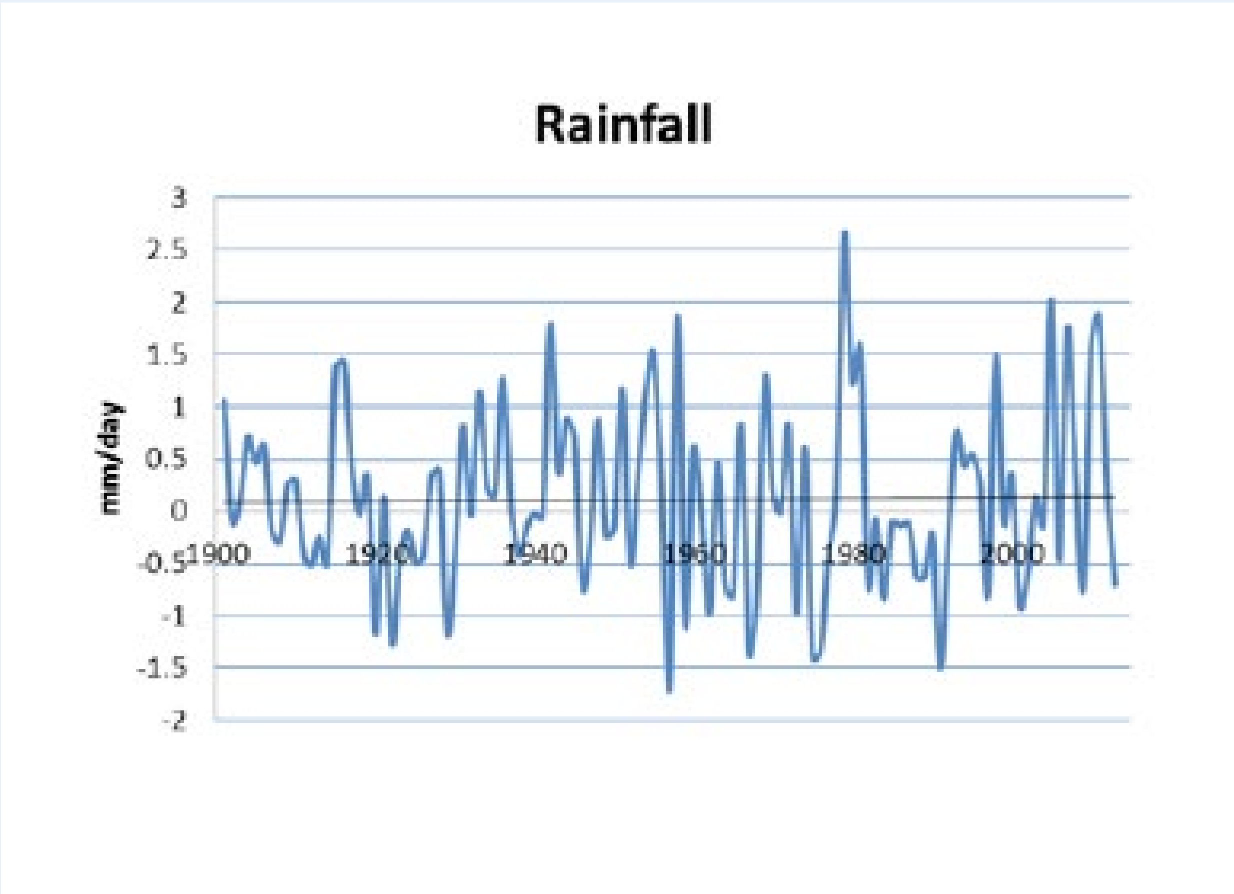
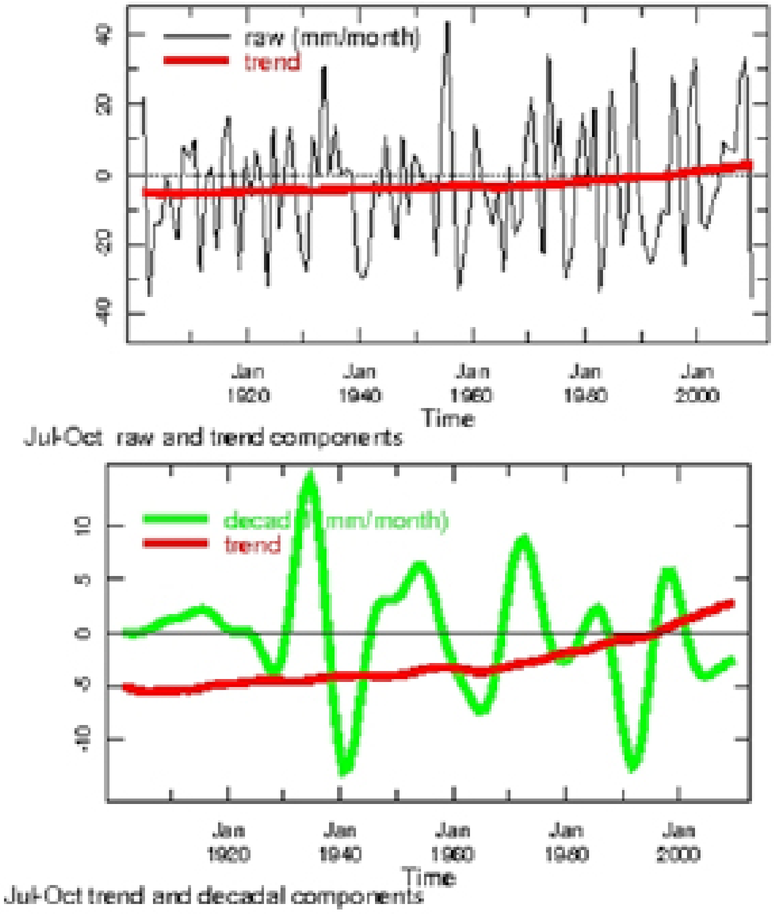


Figure 12: Annual rainfall anomaly for Haiti 1900-2013. Anomaly with respect to 1986-2005 baseline. Trend line (black) inserted. Data source: CRU TS3.22



Trend	1%
Decadal	8%
Inter- Annual	88%

Figure 13:

(a) Average July-October rainfall anomalies over the Caribbean from the late 1800s with trend line imposed.

(b) Trend and decadal components of the average July-October rainfall anomalies over the Caribbean from the late 1800s. Data source: CRU data. Acknowledgements: IRI Map Room

5.3. Projections

Data are presented for both GCM and RCM derived projections as maps and tables. Major summary points are:

- From the GCMs, the scenario means suggest that a drying trend sets in from as early as the mid 2020s with 3 to 4 % less rainfall in the annual mean. The 2030s will be up to 6% drier, the 2050s up to 17% drier, while by the end of the century the country as a whole may be up to 20% drier for the most severe RCP scenario (RCP8.5).
- The GCMs suggest that change in summer rainfall is the primary driver of the drying trend noted. By the mid 2030s summer rainfall has decreased by 3-5%, while by the end of the century the mean decrease is 3-20%.
- Dry season rainfall generally shows small increases or no change. Mean Increases are consistently between 4-6% across all time slices examined. Given the small amounts of rainfall received at this time, the increases are not enough to offset the overall drying pattern.
- RCM projections reflect the onset of a drying trend from the mid 2020s which continues into the 2030s.
- The percentage decreases (over the grid boxes) for annual rainfall in the defined Blocks are as summarised below.

	2020s	2030s	2050s	End of Century (2081 - 2100)
A	-1.14 to -5.35	-2.75 to -8.05	-8.8 to -13.5	-15.2 to -20.6
B1	0.67 to -8.96	0.30 to -10.6	-1.32 to -18.4	-15.2 to -31.2
B2	-0.81 to -4.14	-2.28 to -5.96	-1.85 to -7.48	-12.4 to -17.6
B3	-0.63 to -4.19	-0.64 to -6.38	-3.40 to -11.7	-6.68 to -17.2
C	0.38 to -5.39	0.54 to -9.14	-6.88 to -28.2	-17.8 to -40.1

GCMs

Table 21: Mean percentage change in rainfall for Haiti with respect to 1986-2005. Change shown for four RCP scenarios. AR5 CMIP5 subset.

	Annual Rainfall											
Centered on	**2025**			**2035**			**2055**			**End of Century**		
Averaged over	**2016 - 2035**			**2026 - 2045**			**2046 - 2065**			**2081-2100**		
	min	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**
rcp26	-19.2	-3.13	12.4	-19.5	-2.43	13.4	-34.4	-2.49	30.2	-41.2	-1.26	18.6
rcp45	-25.4	-3.89	13.2	-21.3	-5.30	9.23	-55.8	-13.3	27.8	-47.4	-9.23	19.9
rcp60	-22.5	-3.01	17.1	-19.0	-3.46	13.2	-34.0	-8.89	17.4	-52.4	-12.2	20.8
rcp85	-27.3	-4.62	17.4	-20.2	-5.91	16.0	-85.4	-16.8	19.2	-73.1	-19.9	26.8
Range of mean:	-3.01 to -4.62			-2.43 to -5.91			-2.49 to -16.8			-1.26 to -19.9		

Table 22: Mean percentage change in summer (August-November) rainfall for Haiti with respect to 1986-2005. Change shown for four RCP scenarios. AR5 CMIP5 subset.

	Summer Rain											
Centered on	**2025**			**2035**			**2055**			**End of Century**		
Averaged over	**2016 - 2035**			**2026 - 2045**			**2046 - 2065**			**2081-2100**		
	min	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**	**min**	**mean**	**max**
rcp26	-32.6	5.25	39.7	-33.8	-2.63	34.2	-18.9	-0.92	12.6	-39.4	-3.49	29.4
rcp45	-39.9	2.78	53.5	-30.8	-3.68	30.2	-18.2	-1.00	25.4	-45.5	-10.5	27.3
rcp60	-39.4	0.21	37.0	-31.5	-3.58	32.6	-15.2	-2.80	19.9	-52.7	-13.8	35.3
rcp85	-53.4	-1.59	63.7	-29.9	-4.94	29.2	-14.4	-0.54	19.8	-78.2	-19.9	53.0
Range of mean:	-1.59 to 5.25			-2.63 to -4.94			-0.92 to -2.80			-3.49 to -19.9		

Table 23: Mean percentage change in dry season (December-March) rainfall for Haiti with respect to 1986-2005. Change shown for four RCP scenarios AR5. CMIP5 subset.

	Dry Season Rainfall											
Centered on	**2025**			**2035**			**2055**			**End of Century**		
Averaged over	**2016 - 2035**			**2026 - 2045**			**2046 - 2065**			**2081-2100**		
	-30.3	**4.71**	**44.8**	**-22.0**	**3.97**	**30.9**	**-22.7**	**4.25**	**48.6**	**-32.6**	**5.25**	**39.7**
rcp26	-36.3	2.70	37.5	-34.1	2.91	39.1	-30.5	1.94	47.8	-39.9	2.78	53.5
rcp45	-29.1	5.15	56.4	-19.2	6.24	58.7	-24.5	3.69	39.3	-39.4	0.21	37.0
rcp60	-31.7	-0.32	44.4	-26.5	2.99	40.5	-39.1	1.69	48.1	-53.4	-1.59	63.7
rcp85	-0.32 to 4.71	2.91 to 6.24	1.69 to 4.25	-1.59 to 5.27	-5.91	16.0	-85.4	-16.8	19.2	-73.1	-19.9	26.8
Range of mean:	-3.01 to -4.62			-2.43 to -5.91			-2.49 to -16.8			-1.26 to -19.9		

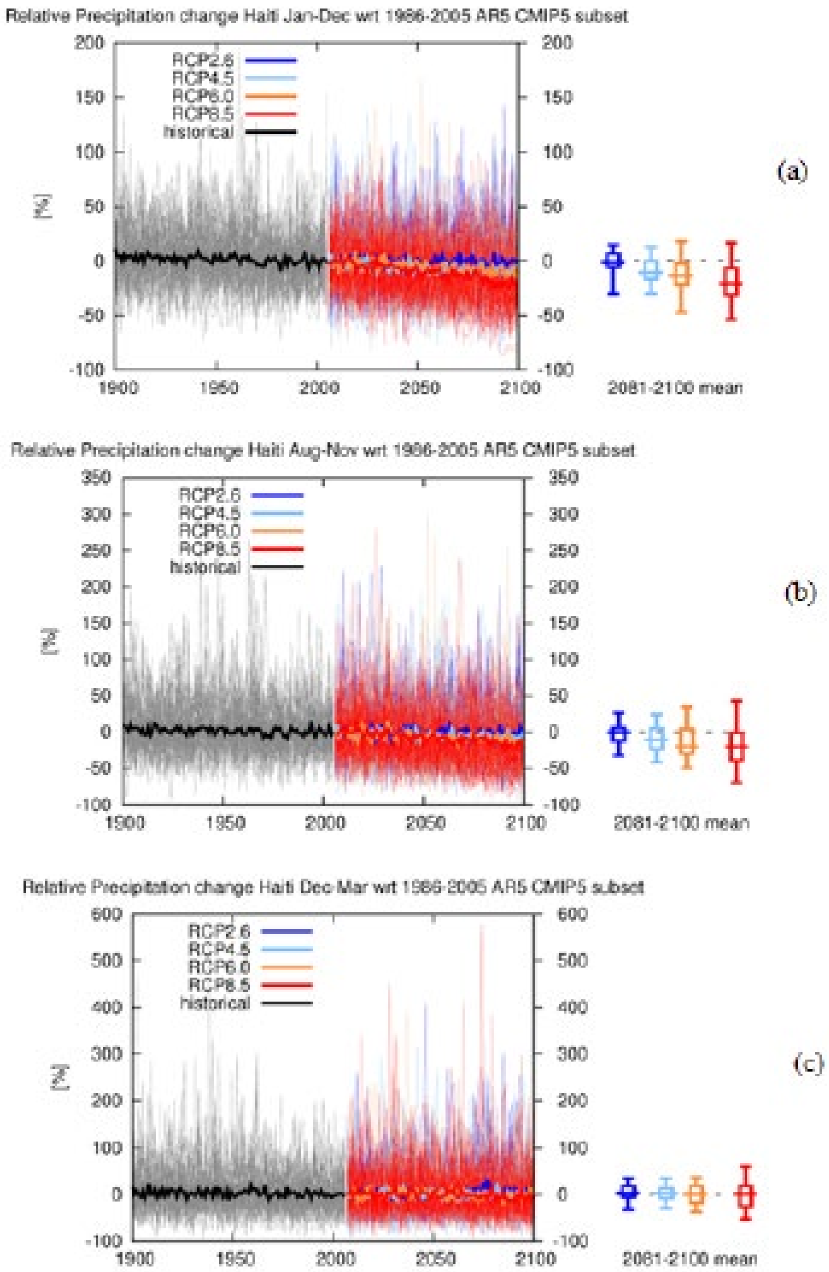


Figure 14: (a) Relative Annual Precipitation change (%) (b) Relative August-November Precipitation change (%) (c) Relative December-March Precipitation change (%) for Haiti with respect to 1986-2005 AR5 CMIP5 subset. On the left, for each scenario one line per model is shown plus the multi-model mean, on the right percentiles of the whole dataset: the box extends from 25% to 75%, the whiskers from 5% to 95% and the horizontal line denotes the median (50%).

RCM

Rainfall

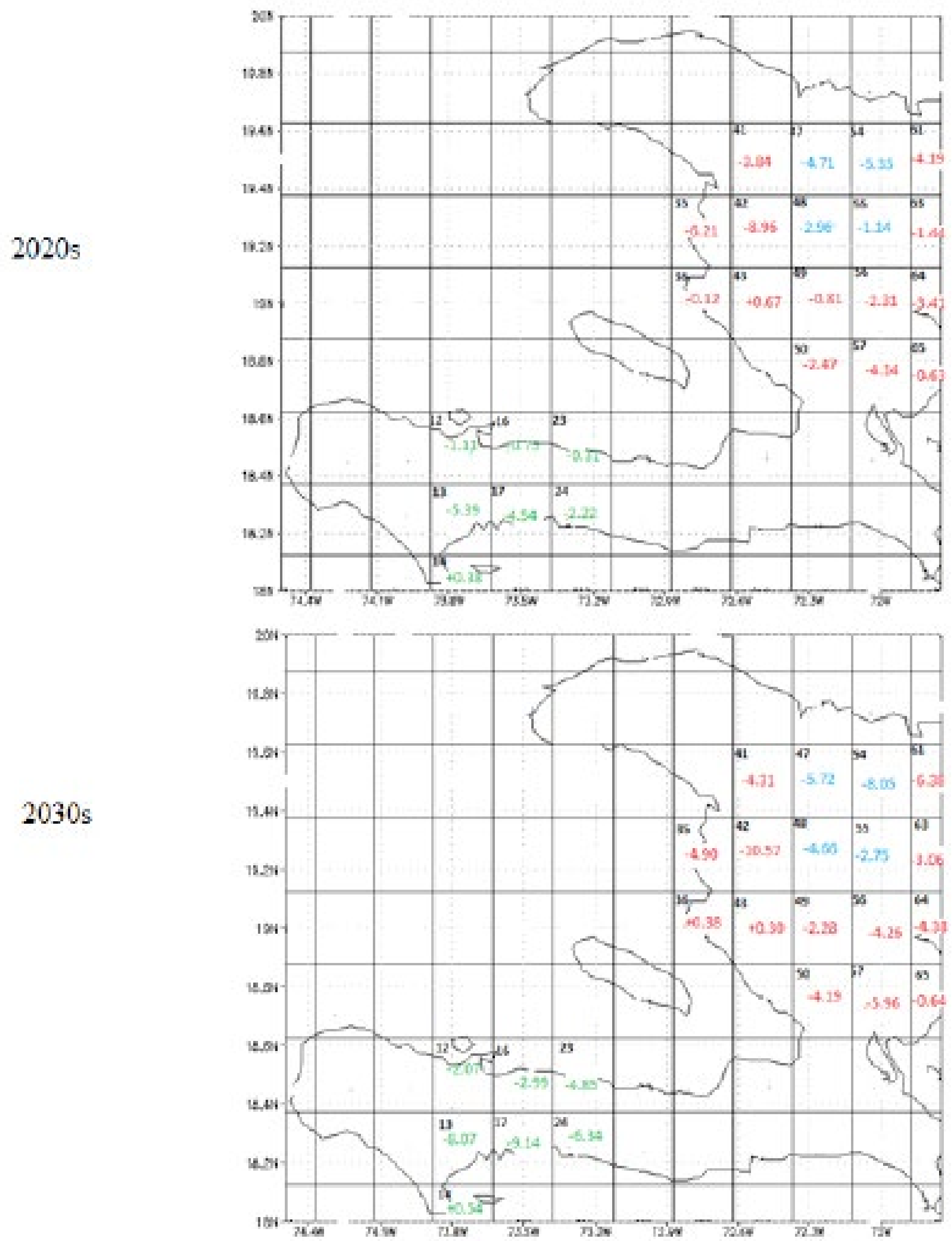


Figure 15a: Summary map showing percentage change per grid box of annual rainfall for the 2020's (top panel) and 2030s (bottom panel). Source: PRECIS RCM PPE

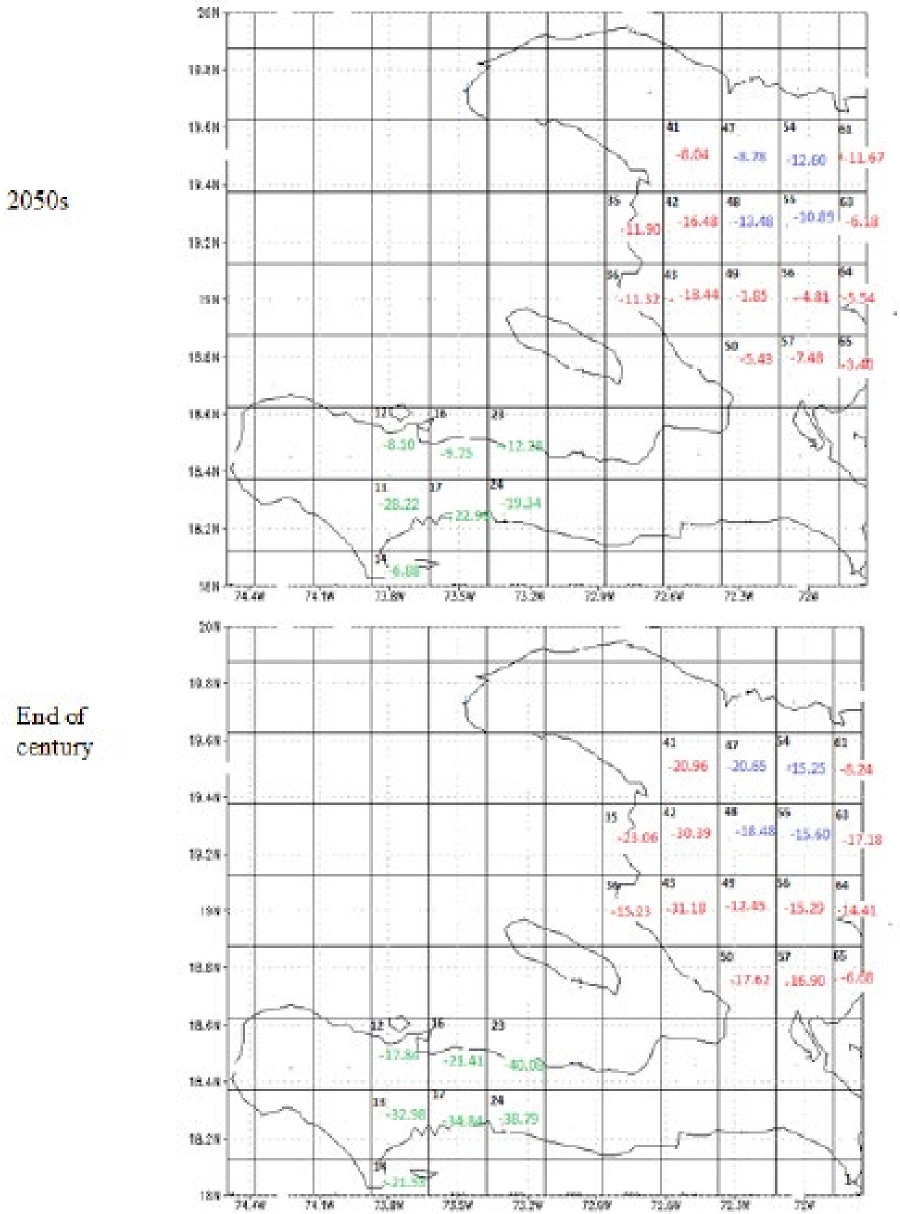


Figure 15 b: Summary map showing percentage change per grid box of annual rainfall for the 2050's (top panel) and end of century (2080-2098) (bottom panel). Source: PRECIS RCM PPE.

Table 24 - 28: Projected percentage change in annual rainfall for the 2020s and 2030s relative to the 1960-1990 baseline. Data presented for minimum, maximum and mean value of a five member ensemble. Values are for 25 km grid boxes shown in Figure 1. Tables arranged by Blocks

Table 24: Percentage Change in Annual Rainfall – Block A												
2020s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-10.7	-5.38	-1.23	-7.13	-3.54	-2.11	-13.3	-5.93	-3.80	-5.78	-1.68	-0.14
FMA	-11.0	-5.46	-0.22	-6.96	-3.71	-0.59	-13.6	-5.96	-2.36	-5.89	-1.93	1.43
MJJ	-10.6	-4.32	2.03	-6.54	-2.41	1.56	-13.0	-4.81	-0.22	-5.43	-0.61	3.43
ASO	-10.0	-4.12	0.39	-6.24	-2.22	0.00	-12.6	-4.69	-2.11	-5.12	-0.35	1.89
ANN	-10.9	-4.71	1.14	-6.72	-2.96	-0.24	-13.1	-5.35	-2.14	-5.55	-1.14	1.65
2030s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-13.8	-6.43	-3.74	-12.0	-5.33	-2.88	-17.3	-8.73	-5.29	-10.5	-3.42	-0.95
FMA	-10.2	-4.92	-1.73	-8.75	-4.03	-1.17	-13.2	-6.73	-3.03	-7.23	-2.05	0.33
MJJ	-11.1	-5.73	-3.40	-9.50	-4.37	-2.42	-14.7	-8.05	-5.41	-8.07	-2.52	-0.65
ASO	-13.4	-6.21	-3.07	-11.8	-4.94	-2.87	-17.2	-8.69	-5.08	-10.2	-3.03	-0.28
ANN	-12.4	-5.72	-2.82	-10.5	-4.66	-2.49	-15.6	-8.05	-4.90	-9.00	-2.75	-0.41
2050s												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-19.3	-9.25	-3.09	-15.2	-13.8	-11.9	-22.0	-13.1	-8.23	-20.8	-11.3	-1.91
FMA	-19.6	-8.86	-1.86	-15.5	-13.6	-11.7	-22.2	-12.8	-7.20	-20.5	-11.1	-0.76
MJJ	-18.2	-8.40	-2.07	-14.2	-13.2	-11.5	-20.8	-12.2	-7.19	-20.2	-10.4	-0.63
ASO	-18.2	-8.60	-3.11	-14.5	-13.3	-11.0	-20.7	-12.3	-8.06	-20.1	-10.8	-1.89
ANN	-18.8	-8.78	-2.53	-14.8	-13.5	-11.5	-21.4	-12.6	-7.67	-20.4	-10.9	-1.30
End of Century (2080-2098)												
Grid Box	**47**			**48**			**54**			**55**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-33.0	-20.8	-11.9	-30.0	-18.6	-11.1	-37.2	-15.5	11.8	-27.0	-15.7	-9.38
FMA	-32.7	-20.8	-11.9	-29.7	-18.7	-11.3	-36.8	-15.4	12.0	-26.7	-15.8	-9.55
MJJ	-32.4	-20.5	-11.7	-29.5	-18.3	-10.8	-36.5	-14.9	12.6	-26.4	-15.4	-9.19
ASO	-32.8	-20.5	-11.5	-29.9	-18.4	-10.8	-37.0	-15.2	12.3	-26.9	-15.5	-9.06
ANN	-32.7	-20.6	-11.8	-29.8	-18.5	-11.0	-36.9	-15.2	12.2	-26.7	-15.6	-9.30

Table 25: Percentage Change in Annual Rainfall – Block B1															
2020s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-10.6	-7.00	-2.98	-2.69	-0.55	1.23	-11.2	-4.36	1.58	-12.9	-9.50	-7.18	-1.99	0.29	2.21
FMA	-11.2	-6.86	-1.10	-3.05	-0.95	0.81	-12.1	-4.78	2.34	-12.9	-9.54	-6.59	-0.99	-0.21	1.10
MJJ	-9.82	-5.74	-1.28	-2.52	0.40	2.83	-11.4	-3.35	4.85	-12.5	-8.48	-5.19	0.01	1.13	2.40
ASO	-8.85	-5.76	-2.21	-1.84	0.80	2.58	-10.4	-2.89	3.33	-12.0	-8.34	-6.17	-0.25	1.48	3.16
ANN	-10.3	-6.21	-1.47	-2.52	-0.12	1.56	-11.3	-3.84	3.03	-12.6	-8.96	-6.59	-0.47	0.67	2.22
2030s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-16.4	-5.41	3.80	-8.53	-0.25	3.90	-12.9	-4.91	1.36	-18.9	-11.2	-7.84	-6.34	-0.26	2.49
FMA	-12.7	-4.24	6.45	-5.12	0.74	4.72	-9.14	-3.50	3.67	-15.2	-9.84	-6.39	-3.43	0.50	3.18
MJJ	-13.7	-5.10	3.64	-5.66	0.89	4.54	-9.91	-4.22	1.05	-16.1	-10.4	-7.90	-3.83	0.74	3.23
ASO	-16.4	-5.40	2.96	-8.41	0.32	4.63	-12.4	-4.62	1.36	-18.9	-10.9	-7.80	-6.23	0.23	3.34
ANN	-15.8	-4.90	4.03	-6.93	0.38	4.45	-11.1	-4.31	1.86	-17.3	-10.6	-7.48	-4.96	0.30	3.06
2050s															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-23.6	-12.3	-5.37	-8.22	-1.62	3.37	-17.3	-8.45	-3.36	-25.5	-16.8	-11.5	-46.4	-18.7	1.62
FMA	-23.8	-11.7	-3.96	-9.38	-1.62	3.51	-17.9	-8.22	-3.37	-25.9	-16.4	-11.2	-45.6	-18.6	0.83
MJJ	-22.2	-11.3	-3.52	-7.05	-0.82	3.12	-16.5	-7.70	-3.23	-24.5	-16.0	-11.4	-45.4	-18.1	2.55
ASO	-23.1	-12.2	-5.42	-7.13	-1.21	3.53	-16.3	-7.78	-2.37	-24.8	-16.6	-11.1	-46.6	-18.3	2.87
ANN	-23.2	-11.9	-4.57	-7.95	-1.32	3.38	-17.0	-8.04	-3.09	-25.2	-16.5	-11.3	-46.0	-18.4	1.97
End of Century (2080 - 2098)															
Grid Box	**35**			**36**			**41**			**42**			**43**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-35.3	-23.3	-12.5	-26.4	-15.3	-7.97	-32.3	-21.2	-14.9	-41.4	-30.5	-23.6	-50.45	-31.3	-16.8
FMA	-35.1	-23.5	-12.6	-26.2	-15.6	-8.60	-32.0	-21.1	-14.7	-40.9	-30.6	-23.7	-50.4	-31.4	-16.5
MJJ	-34.8	-22.7	-11.4	-25.7	-14.9	-7.75	-31.7	-20.7	-14.4	-40.7	-30.1	-23.0	-49.9	-30.9	-16.1
ASO	-35.3	-22.8	-11.7	-26.3	-15.1	-7.60	-32.2	-20.8	-14.2	-41.1	-30.3	-23.2	-50.1	-31.1	-16.7
ANN	-35.1	-23.1	-12.1	-26.2	-15.2	-7.98	-32.1	-21.0	-14.6	-41.0	-30.4	-23.4	-50.2	-31.2	-16.5

Table 26: Percentage Change in Annual Rainfall – Block B2												
2020s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-2.42	-1.20	0.59	-5.95	-3.16	-1.22	-5.58	-2.92	-1.20	-6.17	-4.75	-1.77
FMA	-2.87	-1.44	-0.33	-5.89	-2.76	0.50	-5.54	-2.76	-0.67	-6.36	-4.11	-0.99
MJJ	-1.94	-0.20	1.00	-6.12	-2.08	1.66	-5.44	-1.81	0.94	-6.43	-3.80	-0.78
ASO	-1.53	0.01	1.55	-5.39	-2.04	0.12	-5.04	-1.73	-0.13	-5.83	-3.89	-0.78
ANN	-2.58	-0.81	-0.10	-5.84	-2.47	0.19	-5.40	-2.31	-0.69	-6.13	-4.14	-1.08
2030s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-8.59	-2.74	-0.29	-12.5	-4.84	-1.29	-11.7	-4.86	-1.23	-14.9	-6.50	-2.27
FMA	-5.83	-1.79	0.94	-9.85	-3.51	-0.41	-9.18	-3.65	-0.32	-12.5	-5.22	-1.10
MJJ	-6.40	-1.85	0.35	-10.7	-4.03	-0.66	-9.84	-4.05	-0.58	-13.3	-5.88	-1.79
ASO	-8.50	-2.35	0.50	-12.6	-4.56	-0.85	-11.6	-4.48	-0.77	-14.9	-6.26	-1.90
ANN	-7.89	-2.28	-0.39	-11.4	-4.19	-0.80	-10.6	-4.26	-0.73	-13.9	-5.96	-1.76
2050s												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-8.17	-2.18	1.56	-11.0	-5.70	-0.40	-10.7	-5.15	-1.53	-10.8	-7.61	-3.15
FMA	-8.86	-2.12	1.36	-11.4	-5.68	-0.86	-11.0	-5.02	-1.81	-11.3	-7.80	-3.74
MJJ	-7.29	-1.39	1.76	-10.4	-5.01	-0.48	-9.99	-4.30	-1.10	-10.4	-7.14	-3.25
ASO	-7.33	-1.72	2.31	-10.5	-5.34	0.26	-10.2	-4.75	-0.84	-10.2	-7.36	-2.81
ANN	-7.91	-1.85	1.75	-10.8	-5.43	-0.37	-10.5	-4.81	-1.32	-10.7	-7.48	-3.24
End of Century (2080-2098)												
Grid Box	**49**			**50**			**56**			**57**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-22.9	-12.5	-6.16	-27.7	-17.6	-10.9	-25.2	-15.3	-10.0	-24.7	-16.7	-11.6
FMA	-22.6	-12.7	-6.67	-27.3	-17.8	-11.4	-24.9	-15.5	-10.6	-24.5	-17.0	-12.1
MJJ	-22.2	-12.2	-6.06	-27.1	-17.4	-10.9	-24.8	-15.1	-10.2	-24.4	-16.8	-11.9
ASO	-22.5	-12.4	-6.03	-27.8	-17.7	-10.8	-25.3	-15.3	-10.1	-24.9	-17.0	-11.9
ANN	-22.6	-12.4	-6.23	-27.5	-17.6	-11.0	-25.1	-15.3	-10.2	-24.6	-16.9	-11.9

Table 27: Percentage Change in Annual Rainfall – Block B2												
2020s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-13.3	-4.80	-2.15	-7.09	-2.06	0.17	-5.42	-3.96	-2.12	-4.66	-1.05	2.59
FMA	-14.1	-5.00	-1.15	-7.55	-2.10	2.14	-5.43	-3.55	-2.00	-4.62	-0.61	4.39
MJJ	-13.6	-3.79	1.07	-7.19	-1.02	3.57	-5.46	-3.10	-1.33	-4.63	-0.45	4.14
ASO	-12.9	-3.62	-0.54	-6.80	-0.82	2.09	-4.86	-3.04	-1.26	-3.79	-0.39	3.95
ANN	-13.8	-4.19	0.22	-7.16	-1.44	2.33	-5.23	-3.41	-1.81	-4.42	-0.63	3.16
2030s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-14.6	-7.24	-3.14	-10.9	-3.81	-1.61	-12.9	-5.03	1.02	-10.9	-1.34	3.82
FMA	-10.4	-5.00	-1.17	-7.51	-2.21	0.37	-10.4	-3.73	2.18	-8.23	0.14	4.27
MJJ	-11.9	-6.48	-2.10	-8.51	-3.04	-1.50	-11.2	-4.22	1.73	-9.39	-0.53	4.32
ASO	-14.5	-7.24	-3.04	-10.5	-3.44	-0.83	-12.8	-4.56	1.52	-11.0	-0.84	5.39
ANN	-13.2	-6.38	-2.09	-9.36	-3.06	-1.12	-11.8	-4.38	1.61	-9.88	-0.64	4.45
2050s												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-18.9	-12.2	-7.67	-10.9	-6.61	-2.17	-8.89	-5.79	-3.57	-8.29	-3.57	3.37
FMA	-19.1	-11.8	-7.81	-11.3	-6.50	-2.64	-9.60	-5.93	-4.03	-7.39	-3.84	2.79
MJJ	-17.7	-11.2	-7.40	-10.1	-5.76	-2.07	-8.36	-5.03	-3.31	-6.79	-3.13	3.14
ASO	-17.6	-11.4	-6.96	-9.8	-5.84	-1.30	-8.04	-5.41	-3.19	-8.63	-3.08	3.94
ANN	-18.3	-11.7	-7.46	-10.5	-6.18	-2.05	-8.72	-5.54	-3.52	-7.66	-3.40	3.31
End of Century (2080-2098)												
Grid Box	**61**			**63**			**64**			**65**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-32.9	-8.17	7.00	-26.9	-17.3	-12.0	-22.8	-14.3	-9.90	-15.3	-6.49	-1.71
FMA	-32.8	-8.71	6.21	-26.7	-17.3	-12.4	-22.6	-14.6	-10.6	-15.3	-6.89	-2.43
MJJ	-32.4	-8.08	6.94	-26.4	-17.0	-12.0	-22.4	-14.2	-9.82	-14.9	-6.56	-1.98
ASO	-32.8	-8.01	7.01	-26.9	-17.1	-12.0	-22.9	-14.5	-10.0	-15.5	-6.76	-1.91
ANN	-32.7	-8.24	6.79	-26.7	-17.2	-12.1	-22.7	-14.4	-10.1	-15.2	-6.68	-2.01

Table 28: Percentage Change in Annual Rainfall – Block C												
2020s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-8.56	-1.74	8.23	-14.3	-6.24	7.43	-10.6	-0.44	16.6	-9.11	-1.40	11.0
FMA	-9.77	-2.23	6.82	-16.7	-6.52	5.37	-13.5	-0.45	15.6	-10.3	-1.59	10.1
MJJ	-8.36	-0.92	9.32	-13.7	-4.43	9.39	-11.6	1.34	18.7	-8.81	-0.15	12.7
ASO	-7.94	-0.62	10.1	-13.1	-4.37	10.41	-11.9	1.08	19.0	-8.38	0.13	13.4
ANN	-7.99	-1.11	8.44	-14.4	-5.39	8.15	-11.4	0.38	17.3	-9.10	-0.75	11.8
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	-17.3	-5.71	11.5	-8.98	-1.19	15.6	-14.8	-3.01	11.5			
FMA	-19.2	-6.33	9.11	-11.0	-1.13	15.0	-16.6	-3.33	14.8			
MJJ	-16.6	-4.30	13.2	-11.0	0.35	17.6	-14.0	-1.43	17.4			
ASO	-16.0	-3.91	14.9	-9.78	0.72	18.3	-13.5	-1.11	15.1			
ANN	-16.4	-4.54	12.6	-10.2	-0.31	16.6	-14.7	-2.22	13.7			
2030s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-12.5	-2.93	10.6	-27.7	-8.77	15.8	-22.7	-0.38	37.6	-16.5	-3.57	10.5
FMA	-10.9	-1.50	11.8	-24.5	-7.42	16.3	-22.5	1.35	36.6	-13.3	-2.04	11.8
MJJ	-11.4	-2.30	10.6	-25.3	-7.97	14.8	-22.3	0.66	35.2	-14.7	-2.98	10.6
ASO	-12.1	-2.64	10.9	-27.6	-8.11	15.8	-22.0	0.55	36.7	-17.2	-3.36	10.8
ANN	-11.1	-2.07	10.7	-26.3	-8.07	15.7	-22.2	0.54	36.5	-15.4	-2.99	10.9
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	-31.0	-10.2	15.7	-21.7	-5.33	4.90	-29.2	-6.98	19.1			
FMA	-27.6	-8.69	16.6	-18.1	-3.72	6.12	-25.4	-5.17	19.3			
MJJ	-28.7	-9.77	15.1	-19.9	-4.89	5.16	-26.6	-6.45	18.6			
ASO	-30.1	-9.14	16.3	-20.7	-4.85	5.42	-27.7	-6.34	19.3			
ANN	3.36	3.71	3.91	3.36	3.54	3.71	3.36	3.58	3.91			

Table 28: Percentage Change in Annual Rainfall – Block C												
2050s												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-17.6	-8.22	2.84	-34.4	-27.9	-22.8	-22.3	-7.17	3.90	-17.2	-9.90	2.59
FMA	-17.3	-8.75	2.05	-36.3	-29.2	-23.9	-23.5	-7.34	2.95	-16.5	-10.3	2.20
MJJ	-16.9	-8.26	1.89	-35.3	-28.2	-23.3	-22.1	-6.97	3.42	-16.1	-9.76	1.83
ASO	-17.5	-7.16	4.48	-34.6	-27.5	-22.7	-20.8	-6.05	4.46	-17.1	-9.05	3.76
ANN	-17.3	-8.10	2.82	-35.2	-28.2	-23.2	-22.2	-6.88	3.68	-16.7	-9.75	2.60
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	-32.9	-23.4	-7.85	-20.7	-12.4	-1.73	-27.7	-19.5	-4.38			
FMA	-33.4	-24.0	-7.23	-22.5	-12.8	-2.03	-27.6	-19.8	-4.12			
MJJ	-33.0	-23.7	-7.98	-20.2	-12.0	-2.58	-27.0	-19.2	-4.38			
ASO	-32.6	-22.9	-7.00	-19.4	-11.8	-1.26	-28.2	-18.9	-3.46			
ANN	-32.2	-23.0	-6.18	-20.7	-12.3	-1.90	-27.6	-19.3	-4.08			
End of Century (2080-2098)												
Grid Box	**12**			**13**			**14**			**16**		
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**
NDJ	-22.9	-18.0	-11.1	-43.6	-33.5	-22.9	-41.2	-22.2	3.07	-31.3	-21.5	-13.9
FMA	-22.5	-18.1	-11.5	-43.1	-33.0	-22.5	-40.5	-21.5	4.20	-31.0	-21.6	-14.3
MJJ	-21.8	-17.5	-10.9	-42.5	-32.4	-21.9	-39.9	-20.9	4.69	-30.4	-21.1	-13.7
ASO	-22.6	-17.7	-10.8	-43.3	-33.1	-22.2	-40.6	-21.5	4.55	-31.1	-21.4	-13.7
ANN	-22.5	-17.8	-11.1	-43.1	-33.0	-22.4	-40.6	-21.5	4.13	-30.9	-21.4	-13.9
	17			**23**			**24**					
	MIN	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**	**MIN**	**MEAN**	**MAX**			
NDJ	-45.2	-35.5	-29.5	-45.2	-40.4	-35.5	-45.2	-39.1	-29.5			
FMA	-44.7	-35.3	-29.5	-44.7	-40.0	-35.3	-44.7	-38.8	-29.5			
MJJ	-44.5	-34.8	-28.8	-44.5	-39.7	-34.8	-44.5	-38.5	-28.8			
ASO	-45.1	-35.5	-29.4	-45.1	-40.3	-35.5	-45.1	-39.1	-29.3			
ANN	-45.3	-34.8	-28.5	-45.3	-40.1	-34.8	-45.3	-38.8	-28.5			

6. Sea Levels

6.1. Historial Trends

Globe

It is estimated that between 1901–2010 global mean sea level rose by 0.19 ± 0.02 m (IPCC 2013).

Table 29: Mean rate of global averaged sea level rise.

Period	Rate (mm/year)	Information source	
1901 and 2010	1.7 ± 0.2	Tide gauge	IPCC (2013)
1993 and 2010	3.2 ± 0.4	Satellite Altimeter	IPCC (2013)

Caribbean

Rates of sea-level rise are not uniform across the globe and large regional differences exist. Estimates of observed sea level rise from 1950 to 2000 suggest that sea level rise within the Caribbean appears to be near the global mean (Church et al. 2004).

Table 30: Mean rate of sea level rise averaged over the Caribbean basin.

Period	Rate (mm/year)	Information source	
1950 and 2009	1.8 ± 0.1	Palanisamy et al. (2012)	IPCC (2013)
1993 and 2010	1.7 ± 1.3	Torres & TSimplis (2013)	
1993 and 2010	2.5± 1.3	Torres & TSimplis (2013), after correction for Global Isostatic Ajustment (GIA)	IPCC (2013)

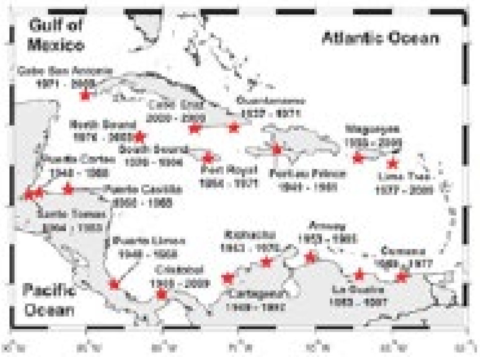
*GIA describes the slow part of the response of the earth to the redistribution of mass following the last deglaciation.

Haiti

Table 31 from Torres and TSimplis (2013) shows the rates of sea level rise for a number of locations (Figure 16) from tide gauges in the Caribbean. The tide gauge coverage in the Caribbean islands is poor with only 7 gauges having data >30 years between 1950 and 2009. All values suggest an upward trend for the period of record available.

Haiti has one gauge in the historical record (Port-au-Prince) with a short time series from 1949 to 1961. The trend for the station is high (10 mm/year) compared to the basin trend (2 mm/year) but the short data period is to be borne in mind.

Interannual sea-level variability accounts for one third of the total sea-level variability and can be partly explained by the influence of El Niño-Southern Oscillation at different time and spatial scales (Palanisamy et al. 2013; Torres & TSimplis 2013). Palanisamy et al. (2013) observe that Interannual sea-level variability in the north Caribbean is higher than for the southern Caribbean and strongly correlated with El Niño.



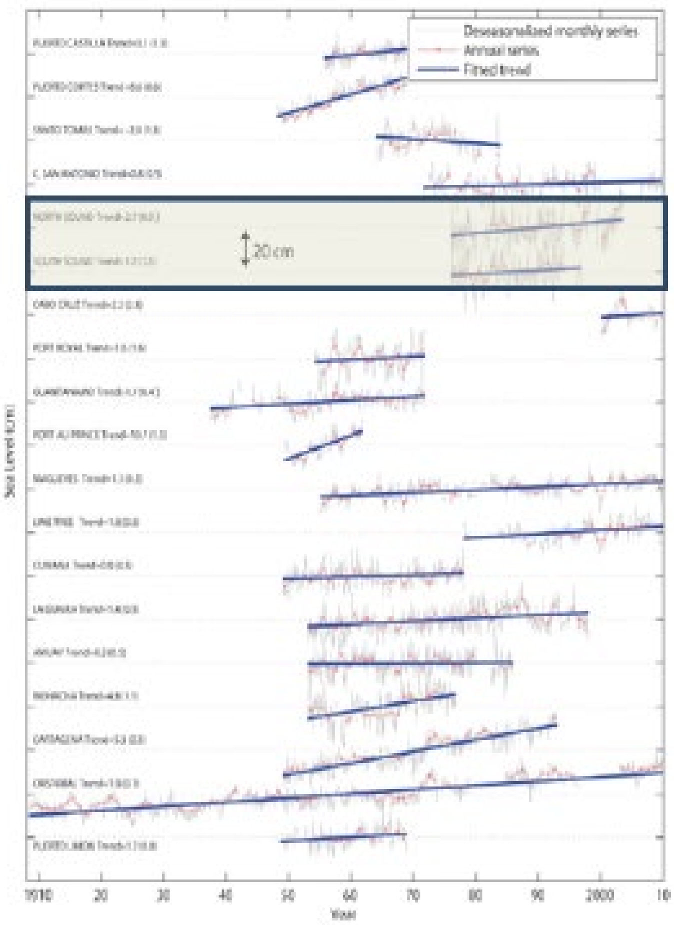


Figure 16:

(a) Location of tide gauge stations and time series start and end year.

(b) Tide gauge observed sea-level trends computed from all available data (Table 1). Monthly time series after the removal of the seasonal cycle (gray), the linear trend (blue), and the annual series (red) are also shown. The trends (and 95% error) in mm/yr. From Torres & TSimplis (2013)

Table 31: Tide gauge observed sea-level trends for Caribbean stations shown in Figure 16. Computed using all available data. From Torres & TSimplis (2013)

	Lat (N)	Lon (W)	Span years	% of data	Trend	Months	Gauge corrected
P. Limon	10	83	20.3	95.1	1.76±0.8	216	2.16±0.9
Cristobal	9.35	79.9	101.7	86.9	1.96±0.1	566	2.86±0.2
Cartagena	10.4	75.6	44	90	5.36±0.3	463	5.46±0.3
Riohacha	11.6	72.9	23.8	95.8	4.86±1.1	273	4.86±1.1
Amuay	11.8	70.2	33	93.4	0.26±0.5	370	0.26±0.5
La Guaira	10.6	66.9	45	98.9	1.46±0.3	534	1.56±0.3
Cumana	10.5	64.2	29	98.6	0.96±0.5	331	0.76±0.6
Lime Tree	17.7	64.8	32.2	81.9	1.86±0.5	316	1.56±0.5
Magueyes	18	67.1	55	96.2	1.36±0.2	635	1.06±0.2
P. Prince	18.6	72.3	12.7	100	10.76±1.5	144	12.26±1.5
Guantanamo	19.9	75.2	34.6	89.9	1.76±0.4	258	2.56±0.6
Port Royal	17.9	76.8	17.8	99.5	1.66±1.6	212	1.36±1.6
Cabo Cruz	19.8	77.7	10	90	2.26±2.8	108	2.16±2.8
South Sound	19.3	81.4	20.8	87.6	1.76±1.5	219	1.26±1.5
North Sound	19.3	81.3	27.7	89.2	2.76±0.9	296	2.26±0.9
C. San Antonio	21.9	84.9	38.3	76.7	0.86±0.5	353	0.36±0.5
Santo Tomas	15.7	88.6	20	85.4	2.06±1.3	205	1.76±1.3
P. Cortes	15.8	87.9	20.9	98	8.66±0.6	224	8.86±0.7
P. Castilla	16	86	13.3	100	3.16±1.3	160	3.26±1.3

6. 2. Projections

Table 32 provides a range of estimates for end-of-century sea level rise globally and in the Caribbean Sea under a number of scenarios. The values are taken from the IPCC's Fourth Assessment Report. The future rise in the Caribbean is not significantly different from the projected global rise.

The combined range over all scenarios spans 0.18-0.59 m by 2100 relative to 1980-1999 levels. A number of other studies (e.g. Rahmstorf, 2007; Rignot and Kanargaratnam, 2006; Horton et al., 2008) including the recently released Summary of the Fifth Assessment Report (IPCC 2013) suggest that the upper bound for the global estimates in Table 32 are conservative and could be up to 0.98 m, with a rate during 2081–2100 of 8 to16 mm/ year. Diagrams from Perret et al. (2013) suggest the same for estimates for the Caribbean Sea i.e. a higher upper bound of up to 1.5 m by the end of the century.

Table 32: Projected changes in temperature per grid box by 2090s from a regional climate model.

Scenario	Global Mean Sea Level Rise by 2100 relative to 1980 – 1999	Caribbean Mean Sea Level Rise by 2100 relative to 1980 – 1999 (± 0.05m relative to global mean)
IPCC B1	0.18 – 0.38	0.13 – 0.43
IPCC A1B	0.21 – 0.48	0.16 – 0.53
IPCC A2	0.23 – 0.51	0.18 – 0.56
Rahmstorf, 2007	Up to 1.4m	Up to 1.45 m
Perret et al., 2013		Up to 1.50 m

The AR5 does not provide projections for the Caribbean separate from that for the Global mean. Nonetheless, the same assumption of SLR being similar for the region as for the globe is taken. Projections for the globe under the four RCPs are provided in Table 33. Through mid century the mean increase is similar for all RCPs. Distinctions arise toward the end of the century. For Haiti the assumption is also that rise will be near the global mean.

Table 33: Projected increases in global mean sea level (m). Projections are taken from IPCC (2013) and are relative to 1986-2005.

Variable	Scenario	Mean	Likely range	Mean	Likely range
Global Mean Sea Level Rise (m)	RCP2.6	0.24	0.17 – 0.32	0.40	0.26 – 0.55
	RCP4.5	0.26	0.19 – 0.33	0.47	0.32 – 0.63
	RCP6.0	0.25	0.18 – 0.32	0.48	0.33 – 0.63
	RCP8.5	0.30	0.22 – 0.38	0.63	0.45 – 0.82

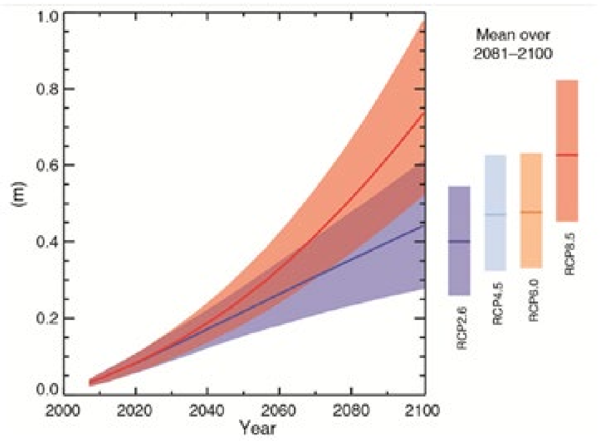


Figure 17: Projections of global mean sea level rise over the 21st century relative to 1986–2005 from the combination of the CMIP5 ensemble with process-based models, for RCP2.6 and RCP8.5. The assessed likely range is shown as a shaded band. The assessed likely ranges for the mean over the period 2081–2100 for all RCP scenarios are given as coloured vertical bars, with the corresponding median value given as a horizontal line. From IPCC (2013)

6.3. Sea Level Extremes

Adapted from IPCC (2013)

Higher mean sea levels can significantly decrease the return period for exceeding given threshold levels. Hunter (2012) determined the factor by which the frequency of sea levels exceeding a given height would be increased for a mean sea level rise of 0.5 m for a network of 198 tide gauges covering much of the globe. (Figure 18). The AR5 repeats the calculations using regional sea level projections and their uncertainty under the RCP4.5 scenario. The multiplication factor depends exponentially on the inverse of the Gumbel scale parameter (a factor which describes the statistics of sea level extremes caused by the combination of tides and storm surges) (Coles and Tawn, 1990). The scale parameter is generally large where tides and/or storm surges are large, leading to a small multiplication factor, and vice versa. Figure 18 shows that a 0.5 m MSL rise would likely result in the frequency of sea level extremes increasing by an order of magnitude or more in some regions. The multiplication factors are found to be slightly higher, in general, when accounting for regional MSL projections. In regions having higher regional projections of mean sea level the multiplication factor is higher, whereas in regions having lower regional projections of mean sea level the multiplication factor is lower.

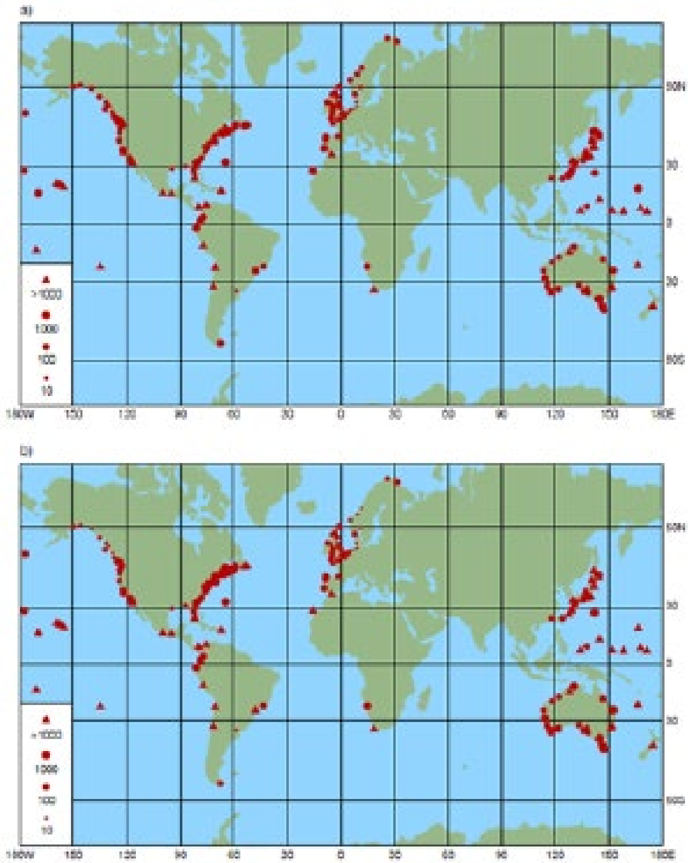


Figure 18: The estimated multiplication factor (shown at tide gauge locations by red circles and triangles), by which the frequency of flooding events of a given height increase for (a) a mean sea level rise of 0.5 m (b) using regional projections of mean se level for the RCP4.5 scenario. The Gumbel scale parameters are generally large in regions of large tides and/or surges resulting in a small multiplication factor and vice versa. IPCC (2013)

7. Hurricanes

7.1. Historical Trends

Atlantic

Most measures of Atlantic hurricane activity show a substantial increase since the early 1980s i.e. when high-quality satellite data became available (Bell et al. 2012; Bender et al. 2010; Emanuel 2007; Landsea and Franklin 2013). These include measures of intensity, frequency, and duration as well as the number of strongest (Category 4 and 5) storms. Though the historic record of Atlantic hurricanes dates back to the mid-1800s, and indicates other decades of high activity, there is considerable un¬certainty in the record prior to the satellite era (early 1970s). The abil¬ity to assess longer-term trends in hurricane activity is therefore limited by the quality of available data.

The recent increases in activity are linked, in part, to higher sea surface temperatures in the tropical Atlantic. PDI is an aggregate measure of hurricane activity, combining frequency, intensity, and duration of hurricanes in a single index. Both Atlantic sea surface temperatures (SSTs) and Atlantic hurricane PDI have risen sharply since the 1970s (There is also evidence that PDI levels in recent years are higher than in the previous active Atlantic hurricane era in the 1950s and 60s. There is little consensus that the increases in hurricane activity is attributable primarily to global warming, especially since other modulators of SST such as the AMO are in a positive (enhancement) phase.

The El Niño-Southern Oscillation phenomenon also plays a significant role in modulating hurricane activity in the North Atlantic from year to year i.e. notwithstanding long term trends. El Niño contributes to fewer Atlantic hurricanes while La Niña contributes to more Atlantic hurricanes. El Niño produces upper level westerly wind anomalies and lower level easterly wind anomalies across the tropical Atlantic which together result in higher vertical wind shear. El Niño and La Niña also influence where the Atlantic hurricanes form. During El Niño events fewer hurricanes and major hurricanes develop in the deep Tropics from African easterly waves. During La Niña more hurricanes form in the deep Tropics from African easterly waves. These systems have a much greater likelihood of becoming major hurricanes, and of eventually threatening the U.S. and Caribbean Islands (Figure 19).

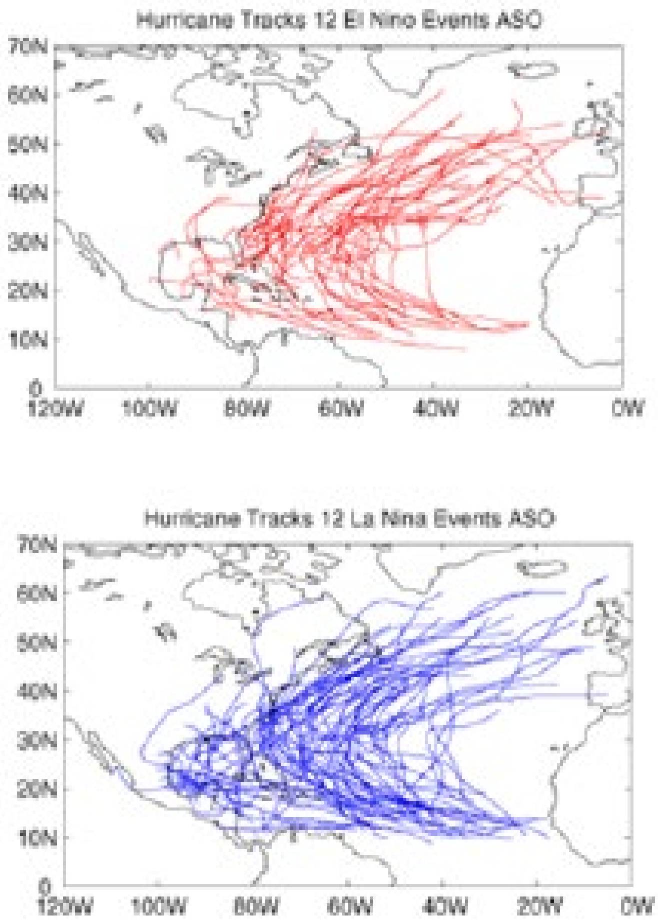


Figure 19: Tracks of Atlantic hurricanes August to October 1959-2001 for El Niño years (top) and La Niña years (bottom). Source: http://iri.columbia.edu/climate/ENSO/globalimpact/TC/Atlantic/track.html

Haiti

Figure 20 shows the historical paths associated with all hurricanes in the tropical Atlantic between 1950 and 2014 (panel a) and those passing within 200 km of Haiti (panel b). Panel c reflects the paths of tropical depressions and tropical storms only. The panels show that the preferred path of hurricanes that impact Haiti is from the southeast to northwest, with the majority approaching from south of the island. This makes the south coast of Haiti more susceptible to highest wind, rain and surge events associated with hurricane passage. This susceptibility is captured in Table 34 which shows the number of times a grid box was impacted by a hurricane (including category) over the period 1950-2014, as determined by a count of the number of hurricanes whose center passed within 100km of the center of the grid box. The grid boxes along the southern peninsula (grid boxes 12 -18, 23 and 24) experience more (up to two times) storm centers than those to the north.

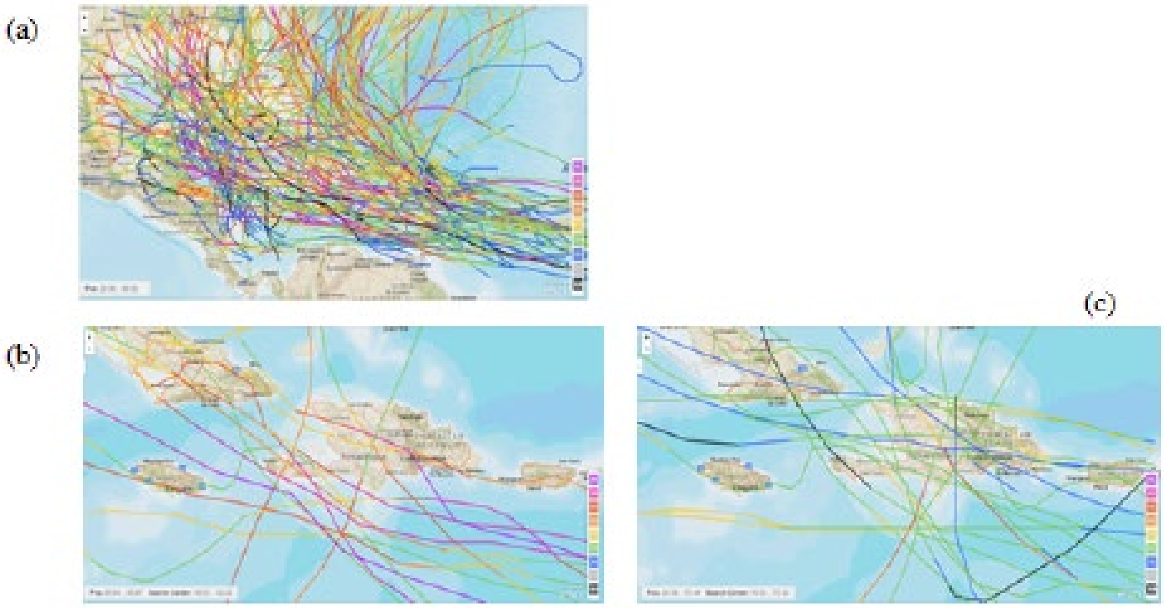


Figure 20: (A) All hurricanes impacting the Caribbean basin between 1950 and 2014. (B) Hurricanes and (C) Tropical Depressions and Tropical Storms whose center of circulation passed within 200 Km of Haiti.

(D) Hurricanes and (E) Tropical Depressions and Tropical Storms whose center of circulation passed within 200 Km of Hati.

Table 34: Total number and category of Hurricanes impacting particular grid boxes shown in Figure 1 (and repeated as Figure 21 below) at a range of 100 km for 1950 – 2010.

	GRID BOX																								
	12	13	14	16	17	18	23	24	35	36	41	42	43	47	48	49	50	54	55	56	57	61	63	64	65
1	3	3	4	3	3	3	3	3	2	2	2	1	1	1	2	2	3	2	2	2	2	2	2	2	1
2	1	1	1	2	2	2	2	2	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	1
3	1	1	2	0	0	0	0	0	0	1	0	1	2	1	1	2	3	1	1	1	3	1	1	1	2
4	2	2	2	2	2	2	2	2	1	3	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	8	10	8	8	8	8	8	3	7	5	3	4	4	3	4	6	3	3	3	5	3	3	3	4
	NUMBER OF HURRICANES IMPACTING GRID BOX																								

Figure 21: PRECIS 25 km model grid boxes over Haiti.

Table 35 shows the named storms which came within 200 km of Haiti by decade. Through the 1980s at least four named storms per decade fell within the radius band. It is very noticeable that since the 2000s that number has increased to 11.

Table 35: By decade, the named storms which came within 200km of radius 18.53° N, 72.33° W. The table also shows the category of the storm while within the radius and whether the storm made landfall with Haiti.

Decades	Year	Name	Highest Category in 200km radius	Landfall with Haiti
1950 - 1959	1954	Hazel	2	y
	1955	Katie	3	y
	1958	Ella	2	y
	1958	Gerda	0	y
1960 - 1969	1963	Flora	4	y
	1964	Cleo	4	y
	1966	Inez	4	y
	1967	Beulah	1	n
1970 - 1979	1974	Carmen	0	n
	1975	Eloise	0	y
	1979	David	3	y
	1979	Fredric	0	n
1980 - 1989	1980	Allen	5	n
	1985	Isabel	0	n
	1987	Emily	2	y
	1988	Gilbert	3	n
1990 - 1999	1993	Cindy	0	n
	1998	Georges	1	y
2000 - 2009	2000	Debby	0	y
	2001	Iris	1	n
	2003	Odette	0	n
	2004	Jeanne	0	n
	2005	Alpha	0	y
	2006	Ernesto	1	n
	2007	Noel	0	y
	2007	Olga	0	y
	2008	Fay	0	y
	2008	Gustav	1	y
	2008	Hanna	0	n
2010 - 2019	2011	Emily	0	y
	2012	Isaac	0	y

7. 2. Projections

The IPCC Special Report on Extremes (IPCC 2012) offers five summary statements with respect to projections of future hurricane under global warming which are of relevance to Haiti. They are reiterated below as major conclusions and supported with additional information (where available) specific for the Atlantic basin.

Conclusion 1: There is low confidence in projections of changes in tropical cyclone genesis, location, tracks, duration, or areas of impact.

Tropical cyclone genesis and track variability is modulated in most regions by known modes of atmosphere–ocean variability. The details of the relationships vary by region (e.g., El Niño events tend to suppress Atlantic storm genesis and development). The accurate modelling, then, of tropical cyclone activity fundamentally depends on the model's ability to reproduce these modes of variability i.e. to produce reliable projections of the behaviour of these modes of variability (e.g., ENSO) under global warming, as well as on a good understanding of their physical links with tropical cyclones. At present there is still uncertainty in the model's ability to project these behaviours.

Conclusion 2: Based on the level of consistency among models, and physical reasoning, it is likely that tropical cyclone related rainfall rates will increase with greenhouse warming.

Observed changes in rainfall associated with tropical cyclones have not been clearly established. However, as water vapor in the tropics increases there is an expectation for increased heavy rainfall associated with tropical cyclones. Models in which tropical cyclone precipitation rates have been examined are highly consistent in projecting increased rainfall within the area near the tropical cyclone center under 21st century warming, with increases of 3 to 37% (Knutson et al., 2010). Typical projected increases are near 20% within 100 km of storm centers (see Figure 22). More recent work premised on RCP 4.5 suggest that rainfall rates increase robustly for the CMIP3 and CMIP5 scenarios (Knutson et al. 2013). For the late-twenty-first century, the increase amounts to +20% to +30% in the model hurricane's inner core, with a smaller increase (~10%) at radii of 200 km or larger.

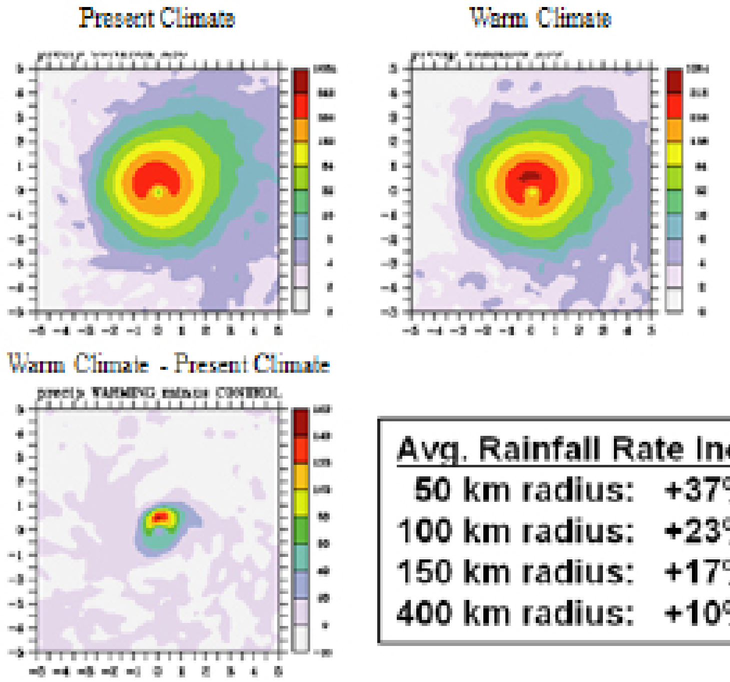


Figure 22: Rainfall rates (mm/day) associated with simulated tropical storms in a) a present climate b) warm climate c) warm minus present climate. Average warming is 1.72 oC. From Knutson et al. (2010).

Conclusion 3: It is likely that the global frequency of tropical cyclones will either decrease or remain essentially unchanged.

Hurricane research done at NOAA's GFDL laboratory using regional models projects that Atlantic hurricane and tropical storms are substantially reduced in number, for the average 21st century climate change projected by current models, but will have higher rainfall rates, particularly near the storm center.

Conclusion 4: An increase in mean tropical cyclone maximum wind speed is likely, although increases may not occur in all tropical regions.

Assessments of projections by Knutson et al. (2010), Bender et al.,2010) and statistical-dynamical models (Emanuel, 2007) are consistent that that greenhouse warming causes tropical cyclone intensity to shift toward stronger storms by the end of the 21st century as measured by maximum wind speed increases by +2 to +11%.

Conclusion 5: While it is likely that overall global frequency will either decrease or remain essentially unchanged, it is more likely than not that the frequency of the most intense storms will increase substantially in some ocean basins.

The downscaling experiments of Bender et al. (2010) project a 28% reduction in the overall frequency of Atlantic storms and an 80% increase in the frequency of Saffir-Simpson category 4 and 5 Atlantic hurricanes over the next 80 years using the A1B scenario. Downscaled projections using CMIP5 multi-model scenarios (RCP4.5) as input (Knutson et al. 2013) still show increases in category 4 and 5 storm frequency, but these are only marginally significant

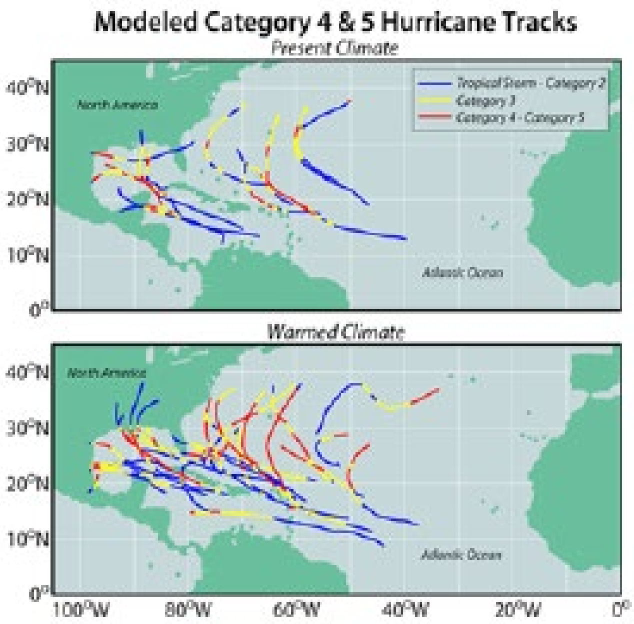


Figure 23: Late 21st century warming projections of category 4and 5 hurricanes in the Atlantic. Average of 18 CMIP3 models. From Bender et al. (2010).

The uncertainty evident in the 5 conclusions suggests that at the very least Haiti should contemplate a future where tropical storm/hurricane genesis, frequency and tracks are similar to what has been experienced in the very recent past (last two decades) but intensities (rainfall rates and wind speeds) are increased.

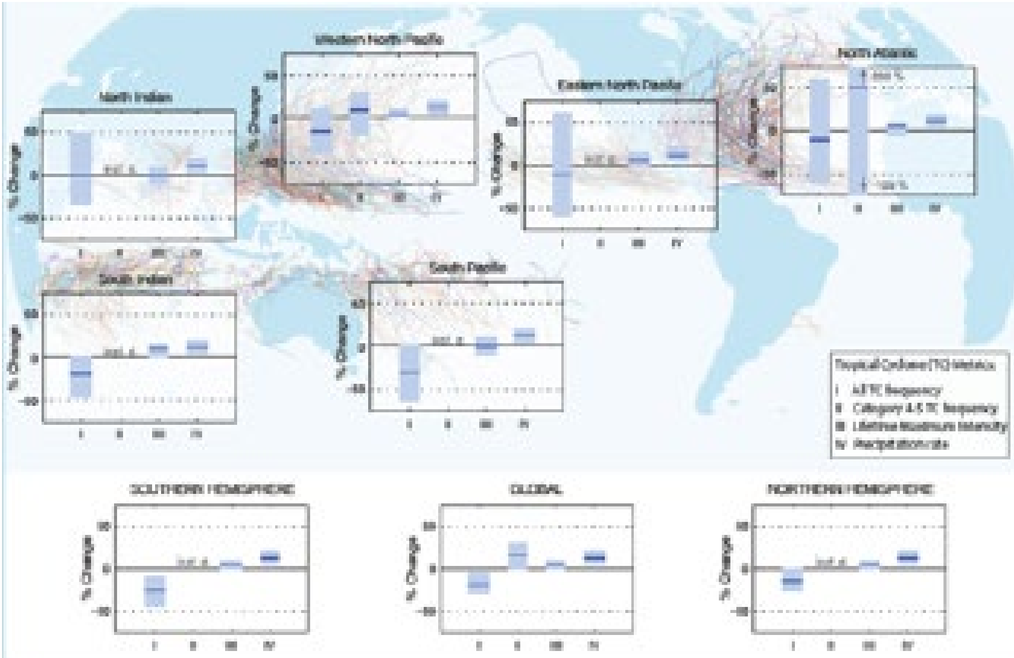


Figure 24: PCC AR5 Summary Diagram

General consensus assessment of the numerical experiments described in IPCC (2013) Supplementary Material Tables 14.SM.1 to 14.SM.4. All values represent expected percent change in the average over period 2081–2100 relative to 2000–2019, under an A1B-like scenario, based on expert judgement after subjective normalization of the model projections. Four metrics were considered: the percent change in (I) the total annual frequency of tropical storms, (II) the annual frequency of Category 4 and 5 storms, (III) the mean Lifetime Maximum Intensity (LMI; the maximum intensity achieved during a storm's lifetime) and (IV) the precipitation rate within 200 km of storm centre at the time of LMI. For each metric plotted, the solid blue line is the best guess of the expected percent change, and the coloured bar provides the 67% (likely) confidence interval for this value (note that this interval ranges across –100% to +200% for the annual frequency of Category 4 and 5 storms in the North Atlantic). Where a metric is not plotted, there are insufficient data (denoted 'insf. d.') available to complete an assessment. A randomly drawn (and coloured) selection of historical storm tracks are underlain to identify regions of tropical cyclone activity.

8. References

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Appendix - Data by Grid Box

Appendix Tables 1: Mean projected absolute change in minimum, maximum, and mean temperature and 10 m wind speed and mean projected percentage change in precipitation for the 2020s and 2030's relative to the 1960-1990 baseline for each 25 km grid box. Data presented for mean value of the five member ensemble. Grid boxes are as shown in Figure 1.

Note: Grey boxes are 2020's and the red boxes are 2030's.

Table 1: Grid Box 47

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.39	1.53	1.39	0.09	-5.38
FMA	1.37	1.51	1.38	0.10	-5.46
MJJ	1.38	1.53	1.39	0.10	-4.32
ASO	1.40	1.54	1.40	0.09	-4.12
Annual	1.38	1.53	1.39	0.09	-4.71

Table 2: Grid Box 47

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.77	1.93	1.78	0.06	-6.43
FMA	1.75	1.92	1.75	0.05	-4.92
MJJ	1.78	1.94	1.80	0.05	-5.73
ASO	1.79	1.95	1.81	0.06	-6.21
Annual	1.77	1.93	1.78	0.05	-5.72

Table 3: Grid Box 48

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.40	1.51	1.45	0.00	-3.54
FMA	1.38	1.49	1.44	0.00	-3.71
MJJ	1.40	1.51	1.45	0.00	-2.41
ASO	1.41	1.52	1.46	-0.01	-2.22
Annual	1.40	1.51	1.45	0.00	-2.96

Table 4: Grid Box 48

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.78	1.91	1.83	-0.04	-5.33
FMA	1.76	1.90	1.80	-0.04	-4.03
MJJ	1.79	1.92	1.84	-0.05	-4.37
ASO	1.80	1.92	1.86	-0.04	-4.94
Annual	1.78	1.91	1.83	-0.04	-4.66

Table 5: Grid Box 54

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.40	1.55	1.60	0.07	-5.93
FMA	1.37	1.52	1.58	0.08	-5.96
MJJ	1.39	1.54	1.59	0.08	-4.81
ASO	1.41	1.56	1.61	0.07	-4.69
Annual	1.39	1.54	1.59	0.07	-5.35

Table 6: Grid Box 54

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.80	1.96	2.01	0.05	-8.73
FMA	1.78	1.95	1.98	0.04	-6.73
MJJ	1.81	1.97	2.03	0.05	-8.05
ASO	1.82	1.98	2.05	0.05	-8.69
Annual	1.80	1.96	2.02	0.05	-8.05

Table 7: Grid Box 55					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.39	1.53	1.41	0.06	-1.68
FMA	1.37	1.50	1.40	0.07	-1.93
MJJ	1.38	1.52	1.41	0.06	-0.61
ASO	1.40	1.54	1.42	0.06	-0.35
Annual	1.39	1.52	1.41	0.06	-1.14

Table 8: Grid Box 55					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.78	1.93	1.81	0.02	-3.42
FMA	1.76	1.92	1.78	0.02	-2.05
MJJ	1.79	1.94	1.83	0.02	-2.52
ASO	1.80	1.94	1.84	0.02	-3.03
Annual	1.78	1.93	1.82	0.02	-2.75

Table 9: Grid Box 35					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.20	1.27	1.16	0.05	-7.00
FMA	1.17	1.24	1.14	0.05	-6.86
MJJ	1.19	1.26	1.16	0.05	-5.74
ASO	1.21	1.28	1.18	0.05	-5.76
Annual	1.19	1.26	1.16	0.05	-6.21

Table 10: Grid Box 35					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.51	1.61	1.45	0.01	-5.41
FMA	1.50	1.60	1.44	0.01	-4.24
MJJ	1.51	1.62	1.45	0.00	-5.10
ASO	1.52	1.62	1.46	0.00	-5.40
Annual	1.51	1.61	1.45	0.01	-4.90

Table 11: Grid Box 36					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.19	1.22	1.26	-0.13	-0.55
FMA	1.17	1.19	1.24	-0.13	-0.95
MJJ	1.18	1.21	1.26	-0.13	0.40
ASO	1.20	1.22	1.27	-0.13	0.80
Annual	1.18	1.21	1.26	-0.13	-0.12

Table 12: Grid Box 36					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.49	1.54	1.56	-0.15	-0.25
FMA	1.48	1.53	1.55	-0.14	0.74
MJJ	1.49	1.54	1.56	-0.15	0.89
ASO	1.49	1.55	1.57	-0.15	0.32
Annual	1.49	1.54	1.56	-0.15	0.38

Table 13: Grid Box 41					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.37	1.53	1.56	0.08	-4.36
FMA	1.35	1.51	1.55	0.09	-4.78
MJJ	1.37	1.53	1.56	0.08	-3.35
ASO	1.38	1.54	1.57	0.08	-2.89
Annual	1.36	1.53	1.56	0.08	-3.84

Table 14: Grid Box 41					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.73	1.92	1.91	0.03	-4.91
FMA	1.71	1.91	1.88	0.02	-3.50
MJJ	1.74	1.93	1.92	0.02	-4.22
ASO	1.75	1.93	1.94	0.03	-4.62
Annual	1.73	1.92	1.91	0.02	-4.31

Table 15: Grid Box 42					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.43	1.57	1.74	0.05	-9.50
FMA	1.41	1.55	1.72	0.06	-9.54
MJJ	1.42	1.57	1.73	0.06	-8.48
ASO	1.43	1.58	1.75	0.05	-8.34
Annual	1.42	1.57	1.73	0.05	-8.96

Table 16: Grid Box 42					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.79	1.96	2.08	0.01	-11.18
FMA	1.77	1.95	2.05	0.01	-9.84
MJJ	1.80	1.97	2.09	0.01	-10.37
ASO	1.81	1.98	2.10	0.01	-10.90
Annual	1.79	1.97	2.08	0.01	-10.57

Table 17: Grid Box 43					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.27	1.29	1.42	0.04	0.29
FMA	1.25	1.27	1.40	0.04	-0.21
MJJ	1.26	1.29	1.42	0.04	1.13
ASO	1.28	1.30	1.44	0.05	1.48
Annual	1.27	1.29	1.42	0.04	0.67

Table 18: Grid Box 43					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.59	1.63	1.76	0.03	-0.26
FMA	1.58	1.62	1.74	0.03	0.50
MJJ	1.60	1.64	1.77	0.03	0.74
ASO	1.60	1.64	1.78	0.03	0.23
Annual	1.59	1.63	1.76	0.03	0.30

Table 19: Grid Box 49					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.38	1.69	1.44	0.05	-1.20
FMA	1.35	1.66	1.42	0.06	-1.44
MJJ	1.37	1.68	1.44	0.05	-0.20
ASO	1.38	1.70	1.45	0.05	0.01
Annual	1.37	1.68	1.43	0.05	-0.81

Table 20: Grid Box 49					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.74	2.07	1.81	0.03	-2.74
FMA	1.72	2.06	1.78	0.04	-1.79
MJJ	1.75	2.08	1.82	0.03	-1.85
ASO	1.76	2.08	1.83	0.03	-2.35
Annual	1.74	2.07	1.81	0.03	-2.28

Table 21: Grid Box 50					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.42	1.58	1.42	0.04	-3.16
FMA	1.40	1.56	1.41	0.04	-2.76
MJJ	1.41	1.58	1.42	0.04	-2.08
ASO	1.43	1.59	1.44	0.04	-2.04
Annual	1.41	1.58	1.42	0.04	-2.47

Table 22: Grid Box 50					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.79	1.99	1.77	0.02	-4.84
FMA	1.77	1.98	1.74	0.03	-3.51
MJJ	1.79	2.00	1.77	0.02	-4.03
ASO	1.80	2.01	1.79	0.02	-4.56
Annual	1.79	2.00	1.77	0.02	-4.19

Table 23: Grid Box 56					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.43	1.59	1.74	0.06	-2.92
FMA	1.41	1.57	1.73	0.06	-2.76
MJJ	1.43	1.59	1.74	0.06	-1.81
ASO	1.44	1.60	1.76	0.06	-1.73
Annual	1.43	1.59	1.74	0.06	-2.31

Table 24: Grid Box 56					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.82	2.00	2.12	0.03	-4.86
FMA	1.80	1.99	2.10	0.04	-3.65
MJJ	1.83	2.01	2.13	0.03	-4.05
ASO	1.84	2.01	2.15	0.03	-4.48
Annual	1.82	2.00	2.13	0.03	-4.26

Table 25: Grid Box 57					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.44	1.57	1.76	0.03	-4.75
FMA	1.41	1.54	1.74	0.02	-4.11
MJJ	1.43	1.56	1.76	0.03	-3.80
ASO	1.45	1.58	1.78	0.03	-3.89
Annual	1.43	1.56	1.76	0.03	-4.14

Table 26: Grid Box 57					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.81	1.96	4.23	0.03	-6.50
FMA	1.79	1.95	4.21	0.03	-5.22
MJJ	1.82	1.97	4.24	0.03	-5.88
ASO	1.83	1.98	4.25	0.03	-6.26
Annual	1.81	1.96	4.23	0.03	-5.96

Table 27: Grid Box 61					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.39	1.54	1.37	0.07	-4.80
FMA	1.36	1.51	1.35	0.07	-5.00
MJJ	1.38	1.53	1.37	0.07	-3.79
ASO	1.40	1.55	1.39	0.07	-3.62
Annual	1.38	1.53	1.37	0.07	-4.19

Table 28: Grid Box 61					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.80	1.94	1.80	0.06	-7.24
FMA	1.77	1.93	1.76	0.05	-5.00
MJJ	1.81	1.95	1.83	0.05	-6.48
ASO	1.82	1.96	1.85	0.06	-7.24
Annual	1.80	1.95	1.81	0.05	-6.38

Table 29: Grid Box 63					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.38	1.51	1.45	-0.01	-2.06
FMA	1.36	1.48	1.44	0.00	-2.10
MJJ	1.38	1.51	1.45	-0.01	-1.02
ASO	1.39	1.52	1.46	-0.01	-0.82
Annual	1.38	1.50	1.45	-0.01	-1.44

Table 30: Grid Box 63					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.76	1.90	1.87	-0.04	-3.81
FMA	1.74	1.89	1.83	-0.04	-2.21
MJJ	1.78	1.91	1.88	-0.05	-3.04
ASO	1.79	1.92	1.90	-0.04	-3.44
Annual	1.77	1.90	1.87	-0.04	-3.06

Table 31: Grid Box 64					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.42	1.56	1.16	0.03	-3.96
FMA	1.40	1.53	1.14	0.03	-3.55
MJJ	1.42	1.55	1.16	0.03	-3.10
ASO	1.43	1.57	1.17	0.03	-3.04
Annual	1.42	1.56	1.16	0.03	-3.96

Table 32: Grid Box 57					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.79	1.94	1.53	0.03	-5.03
FMA	1.77	1.93	1.50	0.04	-3.73
MJJ	1.80	1.95	1.54	0.03	-4.22
ASO	1.81	1.95	1.56	0.03	-4.56
Annual	1.79	1.94	1.53	0.03	-4.38

Table 33: Grid Box 65					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.36	1.40	1.43	0.01	-1.05
FMA	1.34	1.37	1.41	0.00	-0.61
MJJ	1.36	1.40	1.43	0.00	-0.45
ASO	1.37	1.42	1.45	0.01	-0.39
Annual	1.36	1.40	1.43	0.00	-0.63

Table 34: Grid Box 65					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.70	1.73	1.77	0.01	-1.34
FMA	1.68	1.73	1.74	0.01	0.14
MJJ	1.70	1.74	1.78	0.02	-0.53
ASO	1.71	1.75	1.80	0.01	-0.84
Annual	1.70	1.74	1.78	0.01	-0.64

Table 35: Grid Box 12					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.30	1.39	1.25	0.02	-1.74
FMA	1.29	1.37	1.24	0.03	-2.23
MJJ	1.30	1.40	1.25	0.03	-0.92
ASO	1.31	1.41	1.26	0.03	-0.62
Annual	1.30	1.39	1.25	0.03	-1.11

Table 36: Grid Box 12					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.62	1.71	1.60	0.00	-2.93
FMA	1.60	1.70	1.58	0.01	-1.50
MJJ	1.62	1.72	1.61	0.00	-2.30
ASO	1.63	1.73	1.62	0.00	-2.64
Annual	1.30	1.39	1.25	0.03	-1.11

Table 37: Grid Box 64					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.38	1.52	1.29	0.16	-6.24
FMA	1.36	1.49	1.28	0.17	-6.52
MJJ	1.38	1.52	1.28	0.17	-4.43
ASO	1.39	1.53	1.29	0.16	-4.37
Annual	1.38	1.51	1.29	0.17	-5.39

Table 38: Grid Box 13					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.70	1.86	1.62	0.17	-8.77
FMA	1.69	1.85	1.61	0.17	-7.42
MJJ	1.71	1.88	1.63	0.17	-7.97
ASO	1.72	1.88	1.64	0.17	-8.11
Annual	1.71	1.87	1.62	0.17	-8.07

Table 39: Grid Box 14					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.17	1.23	1.09	0.01	-0.44
FMA	1.14	1.20	1.06	0.01	-0.45
MJJ	1.16	1.22	1.08	0.01	1.34
ASO	1.18	1.24	1.10	0.01	1.08
Annual	1.17	1.23	1.08	0.01	0.38

Table 40: Grid Box 14					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.17	1.23	1.08	0.01	0.38
FMA	1.17	1.23	1.08	0.01	0.38
MJJ	1.17	1.23	1.08	0.01	0.38
ASO	1.17	1.23	1.08	0.01	0.38
Annual	1.47	1.55	1.38	0.04	0.54

Table 41: Grid Box 16					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.27	1.37	1.43	0.03	-1.40
FMA	1.26	1.35	1.42	0.04	-1.59
MJJ	1.27	1.37	1.43	0.04	-0.15
ASO	1.28	1.38	1.43	0.03	0.13
Annual	1.27	1.36	1.43	0.03	-0.75

Table 42: Grid Box 16					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.59	1.69	1.76	0.02	-3.57
FMA	1.58	1.68	1.75	0.03	-2.04
MJJ	1.60	1.70	1.77	0.02	-2.98
ASO	1.61	1.71	1.78	0.02	-3.36
Annual	1.59	1.70	1.76	0.02	-2.99

Table 43: Grid Box 17					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.38	1.54	1.26	0.05	-5.71
FMA	1.37	1.52	1.25	0.06	-6.33
MJJ	1.38	1.54	1.26	0.06	-4.30
ASO	1.39	1.55	1.27	0.05	-3.91
Annual	1.38	1.54	1.26	0.06	-4.54

Table 44: Grid Box 17					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.72	1.92	1.59	0.07	-10.24
FMA	1.71	1.90	1.57	0.07	-8.69
MJJ	1.73	1.93	1.60	0.07	-9.77
ASO	1.74	1.94	1.61	0.07	-9.90
Annual	1.72	1.92	1.59	0.07	-9.14

Table 45: Grid Box 23					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.20	1.33	1.18	-0.14	-1.19
FMA	1.18	1.31	1.16	-0.13	-1.13
MJJ	1.20	1.33	1.17	-0.13	0.35
ASO	1.21	1.34	1.18	-0.14	0.72
Annual	1.20	1.33	1.17	-0.14	-0.31

Table 46: Grid Box 23					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.51	1.66	1.49	-0.14	-5.33
FMA	1.50	1.64	1.48	-0.13	-3.72
MJJ	1.52	1.66	1.49	-0.14	-4.89
ASO	1.52	1.67	1.50	-0.14	-5.44
Annual	1.51	1.66	1.49	-0.14	-4.85

Table 47: Grid Box 24					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.33	1.48	1.21	0.04	-3.01
FMA	1.32	1.46	1.21	0.05	-3.33
MJJ	1.33	1.48	1.21	0.05	-1.43
ASO	1.34	1.50	1.22	0.04	-1.11
Annual	1.33	1.48	1.21	0.05	-2.22

Table 48: Grid Box 24					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.67	1.86	1.53	0.06	-6.98
FMA	1.65	1.85	1.51	0.06	-5.17
MJJ	1.68	1.87	1.54	0.07	-6.45
ASO	1.69	1.88	1.54	0.06	-6.74
Annual	1.67	1.87	1.53	0.06	-6.34

Appendix Tables 2: Mean projected absolute change in minimum, maximum, and mean temperature and 10 m wind speed and mean projected percentage change in precipitation for the 2050s and end of century (2080- 2098) relative to the 1960-1990 baseline for each 25 km grid box. Data presented for mean value of the five member ensemble. Grid boxes are as shown in Figure 1.

Note: Grey boxes are 2050's and the red boxes are end of century.

Table 1: Grid Box 47

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.42	2.55	2.53	-0.11	-9.25
FMA	2.44	2.57	2.55	-0.11	-8.86
MJJ	2.43	2.57	2.55	-0.11	-8.40
ASO	2.40	2.54	2.50	-0.11	-8.60
Annual	2.42	2.56	2.53	-0.11	-8.78

Table 2: Grid Box 47

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.63	3.77	3.86	-20.79	-10.24
FMA	3.64	3.79	3.87	-20.78	-8.69
MJJ	3.64	3.79	3.87	-20.47	-9.77
ASO	3.62	3.77	3.84	-20.55	-9.90
Annual	3.63	3.78	3.86	-20.65	-9.14

Table 3: Grid Box 48

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.52	2.62	2.69	0.07	-13.87
FMA	2.54	2.64	2.71	0.08	-13.60
MJJ	2.54	2.64	2.70	0.07	-13.15
ASO	2.51	2.62	2.66	0.07	-13.31
Annual	2.53	2.63	2.69	0.07	-13.48

Table 4: Grid Box 48

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.65	3.77	3.88	-18.58	-5.33
FMA	3.66	3.78	3.89	-18.66	-3.72
MJJ	3.66	3.78	3.88	-18.29	-4.89
ASO	3.64	3.76	3.86	-18.40	-5.44
Annual	3.65	3.77	3.88	-18.48	-4.85

Table 5: Grid Box 54

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.53	2.64	2.67	0.02	-13.08
FMA	2.55	2.66	2.69	0.02	-12.78
MJJ	2.55	2.66	2.68	0.02	-12.22
ASO	2.51	2.64	2.64	0.02	-12.33
Annual	2.53	2.65	2.67	0.02	-12.60

Table 6: Grid Box 54

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	4.01	3.84	3.92	-15.47	-6.98
FMA	4.03	3.85	3.93	-15.40	-5.17
MJJ	4.02	3.85	3.92	-14.93	-6.45
ASO	4.00	3.83	3.90	-15.20	-6.74
Annual	4.02	3.84	3.92	-15.25	-6.34

Table 7: Grid Box 55					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.46	2.59	2.69	-0.04	-11.34
FMA	2.49	2.61	2.71	-0.04	-10.99
MJJ	2.48	2.61	2.70	-0.04	-10.43
ASO	2.45	2.59	2.65	-0.04	-10.80
Annual	2.47	2.60	2.69	-0.04	-10.89

Table 8: Grid Box 55					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.66	3.81	4.02	-15.68	-10.24
FMA	3.68	3.82	4.04	-15.77	-8.69
MJJ	3.68	3.82	4.03	-15.42	-9.77
ASO	3.66	3.80	4.01	-15.53	-9.90
Annual	3.67	3.81	4.02	-15.60	-9.14

Table 9: Grid Box 35					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.02	2.14	1.92	-0.10	-12.30
FMA	2.03	2.16	1.93	-0.10	-11.75
MJJ	2.03	2.16	1.94	-0.10	-11.30
ASO	2.02	2.15	1.92	-0.10	-12.24
Annual	2.03	2.15	1.93	-0.10	-11.90

Table 10: Grid Box 35					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.83	3.02	2.68	-23.30	-5.33
FMA	2.84	3.03	2.68	-23.47	-3.72
MJJ	2.84	3.03	2.68	-22.66	-4.89
ASO	2.83	3.02	2.67	-22.80	-5.44
Annual	2.83	3.02	2.68	-23.06	-4.85

Table 11: Grid Box 36					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.98	2.06	2.05	-0.03	-1.62
FMA	1.99	2.07	2.07	-0.03	-1.62
MJJ	1.99	2.07	2.07	-0.03	-0.82
ASO	1.98	2.06	2.04	-0.04	-1.21
Annual	1.99	2.06	2.06	-0.03	-1.32

Table 12: Grid Box 36					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.82	2.96	2.88	-15.34	-6.98
FMA	2.82	2.96	2.89	-15.57	-5.17
MJJ	2.82	2.96	2.89	-14.88	-6.45
ASO	2.81	2.95	2.88	-15.12	-6.74
Annual	2.82	2.96	2.89	-15.23	-0.03

Table 13: Grid Box 41

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.39	2.55	2.44	-0.04	-8.45
FMA	2.41	2.58	2.45	-0.04	-8.22
MJJ	2.41	2.58	2.45	-0.04	-7.70
ASO	2.38	2.55	2.41	-0.04	-7.78
Annual	2.40	2.57	2.44	-0.04	-8.04

Table 14: Grid Box 55

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.50	3.74	3.59	-21.16	-10.24
FMA	3.51	3.75	3.60	-21.10	-8.69
MJJ	3.51	3.75	3.58	-20.74	-9.77
ASO	3.50	3.73	3.57	-20.84	-9.90
Annual	3.51	3.74	3.58	-20.96	-9.14

Table 15: Grid Box 42

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.48	2.66	2.43	-0.07	-16.83
FMA	2.50	2.69	2.45	-0.07	-16.44
MJJ	2.50	2.68	2.44	-0.08	-16.01
ASO	2.47	2.66	2.41	-0.07	-16.62
Annual	2.49	2.67	2.43	-0.07	-16.48

Table 16: Grid Box 42

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.62	3.90	3.55	-30.51	-5.33
FMA	3.63	3.92	3.56	-30.61	-3.72
MJJ	3.63	3.91	3.56	-30.15	-4.89
ASO	3.61	3.90	3.54	-30.28	-5.44
Annual	3.62	3.91	3.55	-30.39	-4.85

Table 17: Grid Box 43

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.19	2.20	2.45	0.00	-18.75
FMA	2.20	2.22	2.47	0.00	-18.64
MJJ	2.20	2.22	2.47	0.00	-18.09
ASO	2.18	2.20	2.43	0.00	-18.26
Annual	2.19	2.21	2.46	0.00	-18.44

Table 18: Grid Box 43

	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.23	3.25	3.62	-31.30	-6.98
FMA	3.23	3.26	3.63	-31.39	-5.17
MJJ	3.23	3.26	3.63	-30.93	-6.45
ASO	3.22	3.25	3.61	-31.08	-6.74
Annual	3.23	3.26	3.62	-31.18	-0.03

Table 19: Grid Box 49					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.40	2.50	2.54	-0.03	-2.18
FMA	2.42	2.52	2.57	-0.03	-2.12
MJJ	2.42	2.51	2.56	-0.03	-1.39
ASO	2.39	2.50	2.52	-0.03	-1.72
Annual	2.41	2.51	2.55	-0.03	-1.85

Table 20: Grid Box 49					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.57	3.68	3.81	-12.51	-10.24
FMA	3.58	3.69	3.82	-12.71	-8.69
MJJ	3.57	3.69	3.81	-12.18	-9.77
ASO	3.56	3.67	3.79	-12.39	-9.90
Annual	3.57	3.68	3.81	-12.45	-9.14

Table 21: Grid Box 50					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.45	2.70	2.45	0.00	-5.70
FMA	2.47	2.72	2.48	0.01	-5.68
MJJ	2.46	2.71	2.47	0.00	-5.01
ASO	2.43	2.69	2.43	0.00	-5.34
Annual	2.45	2.70	2.46	0.00	-5.43

Table 22: Grid Box 50					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.65	4.01	3.66	-17.58	-5.33
FMA	3.66	4.02	3.67	-17.79	-3.72
MJJ	3.66	4.02	3.66	-17.43	-4.89
ASO	3.64	4.00	3.64	-17.67	-5.44
Annual	3.65	4.01	3.66	-17.62	-4.85

Table 23: Grid Box 56					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.49	2.67	2.56	-0.02	-5.15
FMA	2.51	2.70	2.58	-0.02	-5.02
MJJ	2.50	2.69	2.58	-0.03	-4.30
ASO	2.47	2.67	2.53	-0.03	-4.75
Annual	2.49	2.68	2.56	-0.02	-4.81

Table 24: Grid Box 56					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.71	3.95	3.84	-15.26	-6.98
FMA	3.73	3.96	3.85	-15.49	-5.17
MJJ	3.72	3.96	3.83	-15.13	-6.45
ASO	3.71	3.94	3.82	-15.29	-6.74
Annual	3.72	3.95	3.83	-15.29	-0.03

Table 25: Grid Box 57					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.87	2.63	2.47	0.01	-7.61
FMA	2.91	2.65	2.50	0.02	-7.80
MJJ	2.89	2.64	2.49	0.01	-7.14
ASO	2.87	2.62	2.45	0.00	-7.36
Annual	2.89	2.64	2.48	0.01	-7.48

Table 62: Grid Box 57					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.18	3.87	3.66	0.03	-16.72
FMA	3.19	3.89	3.68	0.03	-17.02
MJJ	3.19	3.88	3.67	0.03	-16.82
ASO	3.18	3.87	3.65	0.03	-17.04
Annual	3.19	3.88	3.66	0.03	-16.90

Table 27: Grid Box 61					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.52	2.61	2.66	0.05	-12.23
FMA	2.54	2.63	2.68	0.05	-11.84
MJJ	2.54	2.63	2.67	0.04	-11.21
ASO	2.50	2.61	2.62	0.04	-11.41
Annual	2.52	2.62	2.66	0.04	-11.67

Table 28: Grid Box 61					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.70	3.80	3.91	-0.77	-8.17
FMA	3.71	3.81	3.93	-0.86	-8.71
MJJ	3.71	3.81	3.92	-0.86	-8.08
ASO	3.69	3.79	3.89	-0.86	-8.01
Annual	3.70	3.80	3.91	-0.84	-8.24

Table 29: Grid Box 63					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.45	2.54	2.70	-0.03	-6.61
FMA	2.48	2.57	2.72	-0.02	-6.50
MJJ	2.47	2.57	2.71	-0.03	-5.76
ASO	2.43	2.54	2.66	-0.03	-5.84
Annual	2.46	2.56	2.70	-0.03	-6.18

Table 30: Grid Box 63					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.66	3.73	4.05	-0.65	-17.28
FMA	3.67	3.74	4.07	-0.79	-17.33
MJJ	3.67	3.74	4.06	-0.78	-17.04
ASO	3.65	3.73	4.03	-0.79	-17.09
Annual	3.66	3.74	4.05	-0.75	-17.18

Table31: Grid Box 64					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.46	2.58	2.54	0.01	-5.79
FMA	2.48	2.60	2.57	0.02	-5.93
MJJ	2.47	2.60	2.56	0.01	-5.03
ASO	2.44	2.58	2.52	0.00	-5.41
Annual	2.46	2.59	2.55	0.01	-5.54

Table 32: Grid Box 64					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.65	3.76	3.83	-0.90	-14.28
FMA	3.66	3.78	3.83	-0.89	-14.65
MJJ	3.65	3.77	3.82	-0.90	-14.25
ASO	3.64	3.76	3.81	-0.90	-14.47
Annual	3.65	3.77	3.82	-0.90	-14.41

Table 33: Grid Box 65					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.34	2.31	2.54	0.04	-3.57
FMA	2.36	2.33	2.57	0.05	-3.84
MJJ	2.36	2.33	2.56	0.04	-3.13
ASO	2.33	2.31	2.52	0.03	-3.08
Annual	2.35	2.32	2.55	0.04	-3.40

Table 34: Grid Box 65					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.47	3.36	3.81	-1.01	-6.49
FMA	3.47	3.37	3.81	-1.00	-6.89
MJJ	3.47	3.37	3.81	-1.00	-6.56
ASO	3.46	3.36	3.79	-1.01	-6.76
Annual	3.47	3.36	3.81	-1.00	-6.68

Table 35: Grid Box 12					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.21	2.28	2.25	-0.04	-8.22
FMA	2.23	2.30	2.28	-0.03	-8.75
MJJ	2.23	2.30	2.28	-0.03	-8.26
ASO	2.20	2.28	2.23	-0.04	-7.16
Annual	2.22	2.29	2.26	-0.03	-8.10

Table 36: Grid Box 12					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.29	3.34	3.37	-1.05	-18.01
FMA	3.30	3.35	3.38	-1.09	-18.08
MJJ	3.29	3.35	3.37	-1.09	-17.54
ASO	3.28	3.33	3.36	-1.09	-17.74
Annual	3.29	3.34	3.37	-1.08	-17.84

Table 37: Grid Box 13					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.38	2.51	2.44	0.07	-27.91
FMA	2.40	2.53	2.46	0.08	-29.24
MJJ	2.41	2.53	2.46	0.08	-28.23
ASO	2.38	2.51	2.42	0.06	-27.51
Annual	2.39	2.52	2.44	0.07	-28.22

Table 38: Grid Box 13					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.42	3.56	3.51	-1.09	-33.50
FMA	3.42	3.57	3.51	-1.10	-32.96
MJJ	3.42	3.56	3.50	-1.10	-32.38
ASO	3.41	3.55	3.50	-1.11	-33.09
Annual	3.42	3.56	3.51	-1.10	-32.98

Table 39: Grid Box 65					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	1.98	2.34	2.75	0.02	-7.17
FMA	2.00	2.36	2.77	0.03	-7.34
MJJ	2.00	2.37	2.77	0.02	-6.97
ASO	1.98	2.34	2.74	0.00	-6.05
Annual	1.99	2.35	2.76	0.02	-6.88

Table 40: Grid Box 14					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.92	3.32	3.73	-1.75	-22.24
FMA	2.92	3.33	3.72	-1.74	-21.51
MJJ	2.92	3.32	3.72	-1.75	-20.88
ASO	2.91	3.32	3.71	-1.75	-21.50
Annual	2.91	3.32	3.72	-1.75	-21.53

Table 41: Grid Box 16					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.16	2.27	2.15	-0.01	-9.90
FMA	2.19	2.29	2.18	0.00	-10.30
MJJ	2.19	2.29	2.17	0.00	-9.76
ASO	2.16	2.27	2.13	-0.01	-9.05
Annual	2.17	2.28	2.16	-0.01	-9.75

Table 42: Grid Box 16					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.16	3.28	3.12	-1.07	-21.55
FMA	3.17	3.29	3.13	-1.06	-21.63
MJJ	3.16	3.29	3.12	-1.06	-21.09
ASO	3.16	3.28	3.11	-1.06	-21.36
Annual	3.16	3.38	3.12	-1.06	-21.41

Table 43: Grid Box 17					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.41	2.28	2.67	0.11	-23.43
FMA	2.43	2.29	2.68	0.12	-23.99
MJJ	2.43	2.29	2.69	0.11	-23.70
ASO	2.40	2.26	2.66	0.10	-22.91
Annual	2.42	2.28	2.67	0.11	-22.98

Table 44: Grid Box 17					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.39	3.23	3.74	-35.55	-33.50
FMA	3.40	3.23	3.74	-35.27	-32.96
MJJ	3.38	3.21	3.73	-34.83	-32.38
ASO	3.37	3.20	3.72	-35.53	-33.09
Annual	3.39	3.22	3.71	-34.84	-32.98

Table 45: Grid Box 23					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.39	2.23	2.65	0.07	-12.44
FMA	2.40	2.23	2.66	0.08	-12.80
MJJ	2.41	2.24	2.67	0.08	-12.05
ASO	2.37	2.20	2.64	0.06	-11.83
Annual	2.39	2.22	2.65	0.08	-12.28

Table 46: Grid Box 23					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.24	3.11	3.56	-40.36	-22.24
FMA	3.25	3.11	3.57	-39.97	-21.51
MJJ	3.23	3.09	3.56	-39.69	-20.88
ASO	3.21	3.09	3.55	-40.33	-21.50
Annual	3.23	3.10	3.54	-40.06	-21.53

Table 47: Grid Box 24					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	2.40	2.25	2.66	0.09	-19.47
FMA	2.41	2.26	2.67	0.10	-19.77
MJJ	2.42	2.27	2.67	0.10	-19.21
ASO	2.38	2.23	2.64	0.08	-18.91
Annual	2.40	2.25	2.66	0.09	-19.34

Table 48: Grid Box 24					
	Mean Temp (◦C)	Min Temp (◦C)	Max Temp (◦C)	Wind (m/s)	Precip (%)
NDJ	3.29	3.17	3.60	-39.14	-21.55
FMA	3.30	3.17	3.60	-38.81	-21.63
MJJ	3.28	3.15	3.60	-38.47	-21.09
ASO	3.26	3.14	3.59	-39.11	-21.36
Annual	3.28	3.15	3.58	-38.79	-21.41

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