



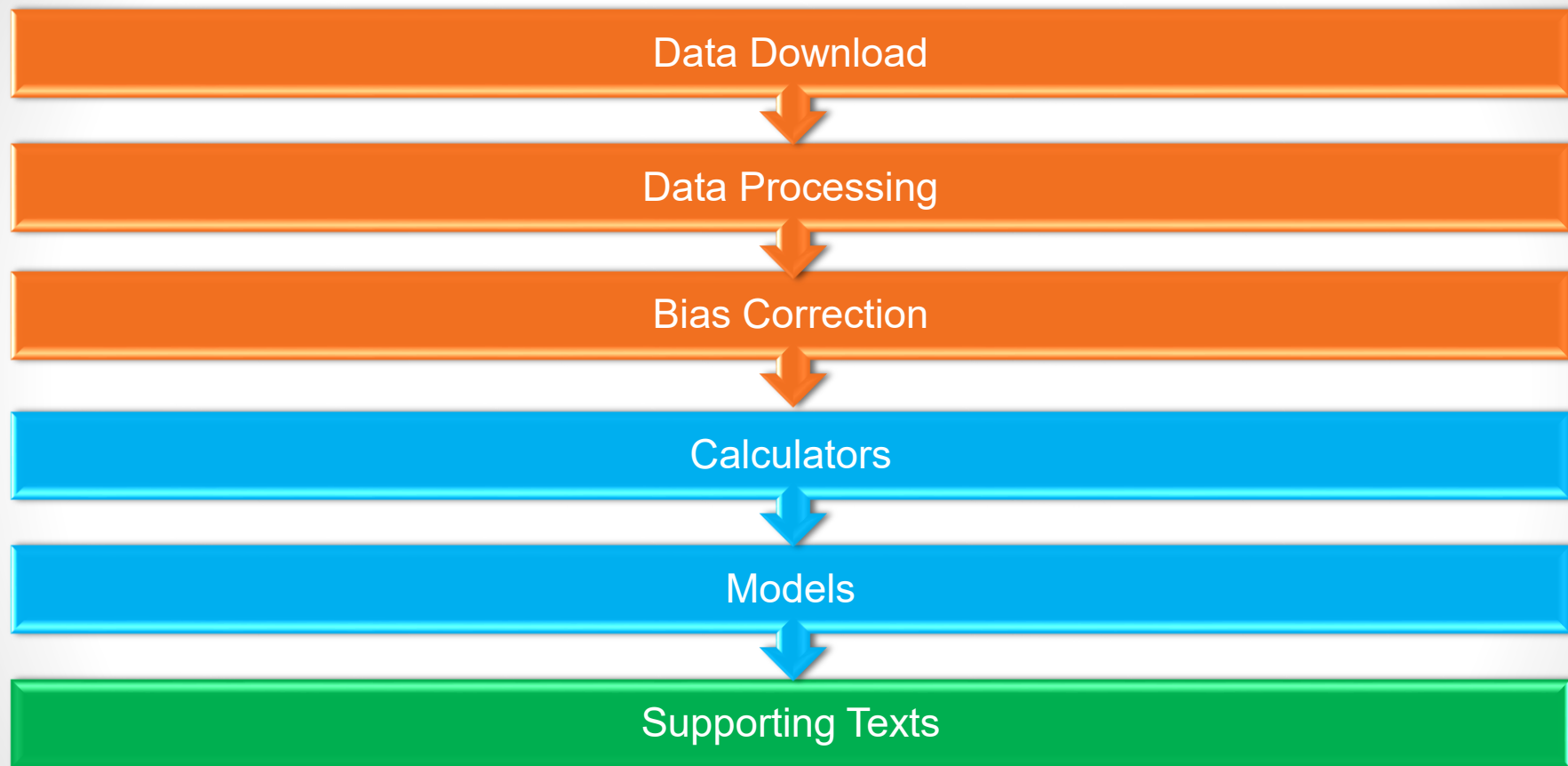
A Programmatic Approach to Enhancing Surface Water Calculations and Climate Data Management

Presenter: Joss Cahill

Location:



- One-Stop shop:
 - Data download
 - Historic Data
 - Modelled Data
 - Future Predictions (CMIP6)
 - Limited Data Processing
 - Time conversions
 - Various prebuilt tools
 - Hydrological
 - Pedological



OTR

Home

- Data Download
- Data Analytics
- Bias Correction
- Hydrological Tools
- Pedological Tools
- General Tools
- Models
- Statistical Tools
- Repository
- Settings

OTR

A Software package to help standardize and perform commonly used tools for hydrologists.

Welcome

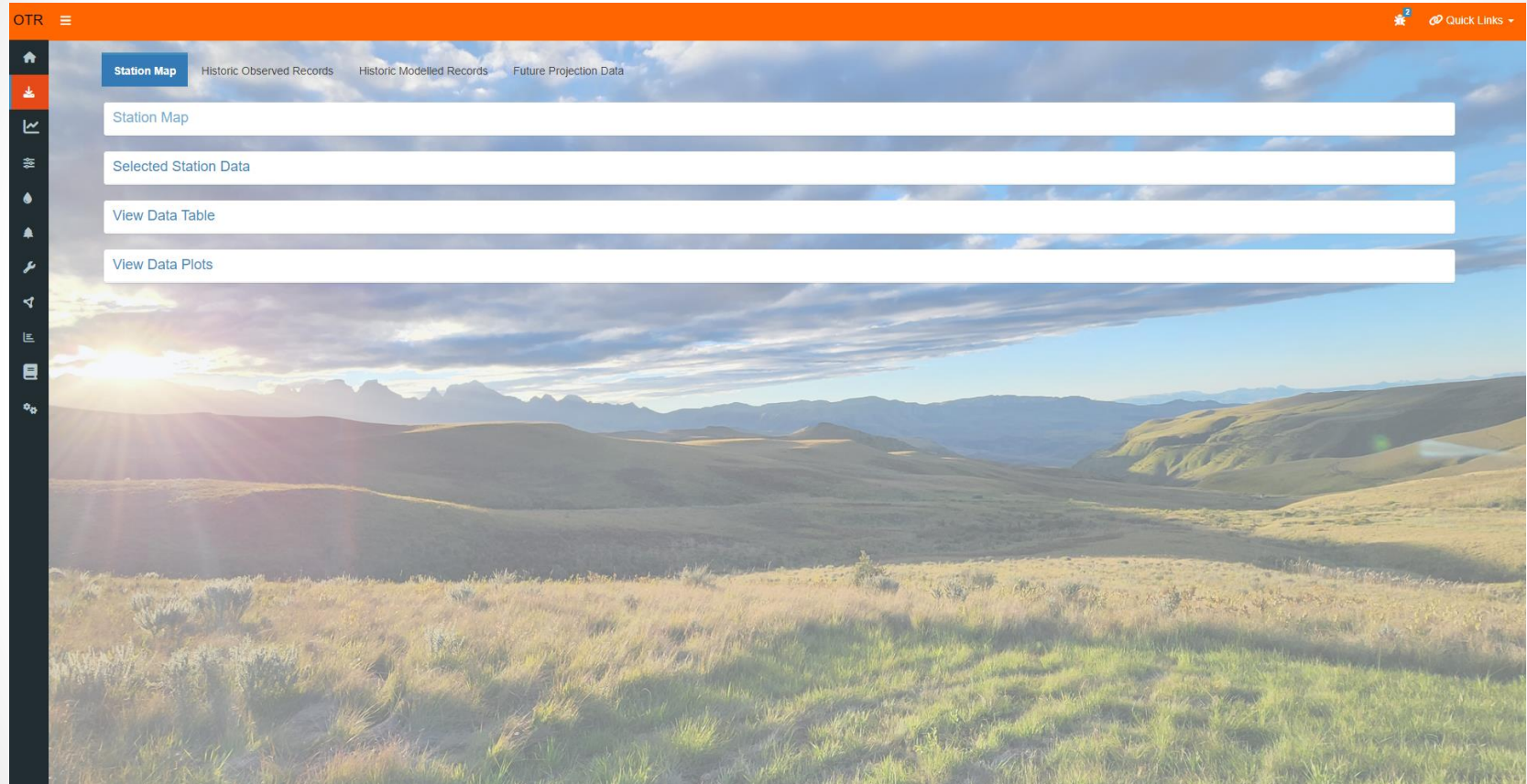
To start using this tool please select the type of operation you would like to perform on the left hand side menu.

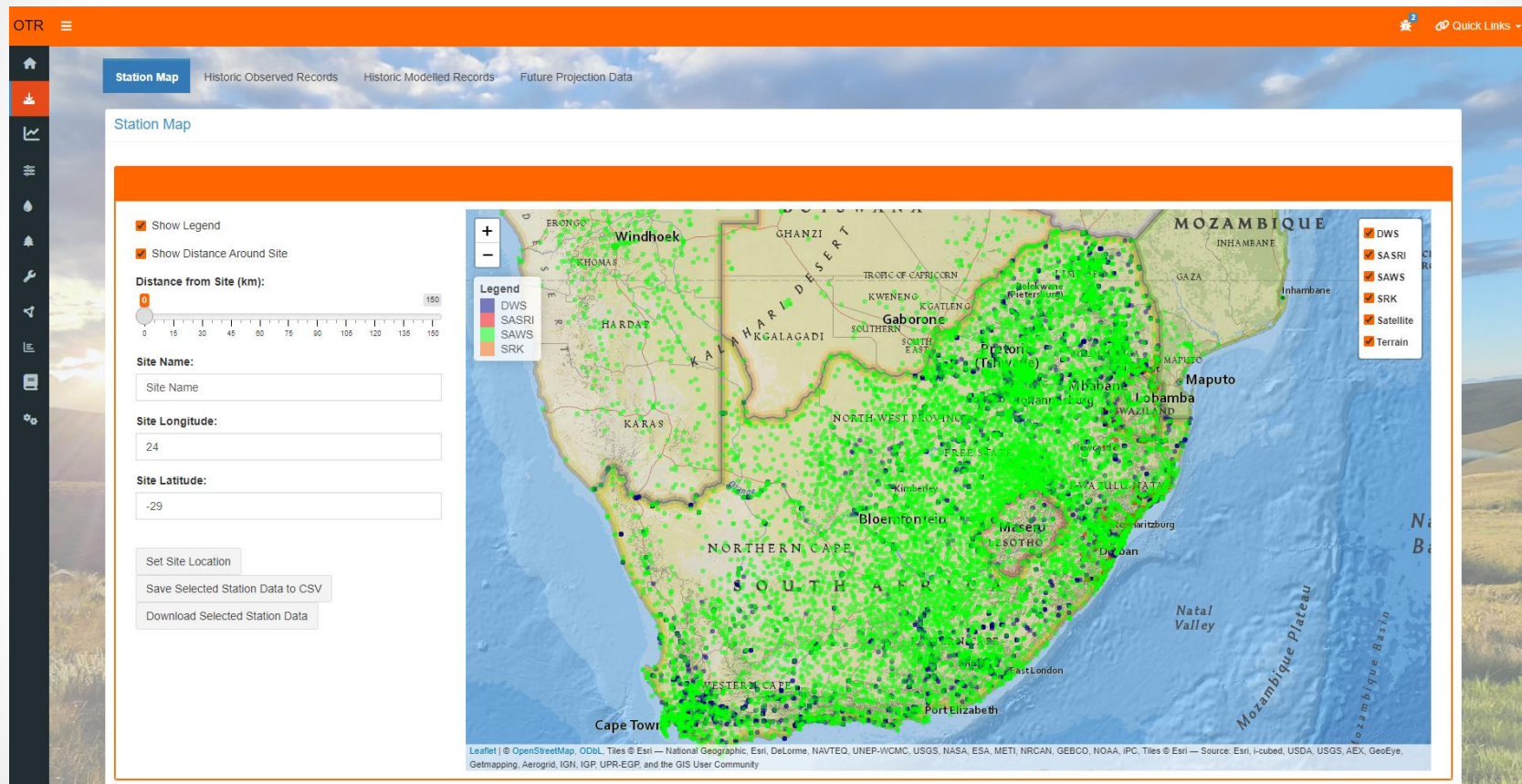
Note if you are accessing this page via the internet and it remains inactive for 15 minutes your session will time out.

For a description of the latest changes see the [CHANGE LOG](#).

For more help and an introduction to the OTR please view the [user-guide](#), or contact the [Development Team] through the bug icon in the top right of the window

Background photo by Joss Cahi







Station Map

Historic Observed Records

Historic Modelled Records

Future Projection Data

Station Map

Selected Station Data

Station ID	Site Type	Catchment Area	Place	Latitude	Longitude	Variable	Start Date	End Date	source	Distance_to_site (km)
SAIMM Test	Site	NA	SAIMM Test	-30.50	24.50	-	-	-	Custom Site	0.00
D3H015	RIV	8266.00000	Seekoel River @ De Eerstespoort	-30.53	24.96	100	1980-06-22	2024-02-08	DWS	44.56
0170005 A	RAIN	NA	LOSKOP	-30.52	24.07	NA	01/1/1994	01/4/2001	SAWS	41.64
0170099 W	RAIN	NA	EBENEZER (WELTEVREDE)	-30.65	24.08	NA	01/1/1878	01/7/2000	SAWS	43.29
0170176 A	RAIN	NA	KETELFONTEIN	-30.60	24.42	NA	01/12/1992	01/4/1998	SAWS	13.67
0170217 W	RAIN	NA	MERINO	-30.63	24.13	NA	01/1/1878	01/7/2000	SAWS	38.16
0170248 W	RAIN	NA	CAROLUSPOORT	-30.63	24.13	NA	01/1/1878	01/7/2000	SAWS	38.16
0170296 A	RAIN	NA	KNAPDAAR	-30.67	24.42	NA	01/7/1992	01/4/1998	SAWS	20.13
0170303 W	RAIN	NA	JAKHALSFONTEIN	-30.57	24.15	NA	01/1/1878	01/7/2000	SAWS	34.39
0170315 W	RAIN	NA	RIETFONTEIN	-30.75	24.18	NA	01/12/1877	01/7/2000	SAWS	41.11
0170368 A	RAIN	NA	WAG-N-BIETJIE	-30.72	24.12	NA	01/11/1994	01/8/2001	SAWS	43.91
0170427 W	RAIN	NA	SLINGERSHOEK	-30.60	24.23	NA	01/1/1878	01/7/2000	SAWS	27.89
0170438 W	RAIN	NA	ROOIKRAAL	-30.80	24.25	NA	01/12/1877	01/8/2001	SAWS	40.99
0170468 A	RAIN	NA	WELTEVREDE	-30.77	24.28	NA	01/1/1996	01/12/2000	SAWS	36.13
0170498 W	RAIN	NA	BRUMMERSDAM	-30.80	24.28	NA	01/12/1877	01/7/2000	SAWS	39.21
0170584 W	RAIN	NA	BURGERVILLE	-30.73	24.33	NA	01/12/1877	01/7/2000	SAWS	30.41
0170601 W	RAIN	NA	WASBANK	-30.52	24.37	NA	01/1/1901	01/6/2000	SAWS	12.93
0170639 W	RAIN	NA	ROOIWAL	-30.63	24.37	NA	01/12/1877	01/10/2001	SAWS	19.55
0170650 W	RAIN	NA	SCHULPAD SKUIL	-30.83	24.37	NA	01/1/1901	01/6/2000	SAWS	39.10
0170885 W	RAIN	NA	STERKFONTEIN	-30.75	24.50	NA	01/12/1877	01/7/2000	SAWS	27.72
0170889 W	RAIN	NA	THEEFONTEIN	-30.82	24.50	NA	01/12/1877	01/7/2000	SAWS	35.11
0171119 A	RAIN	NA	SUNNYDALE	-30.57	24.97	NA	01/1/1994	01/8/2001	SAWS	45.39
0171167 W	RAIN	NA	BOSCHFONTEIN	-30.82	24.58	NA	01/12/1877	01/7/2000	SAWS	36.00

The screenshot displays the OTR web application interface. The top navigation bar is orange and contains the text "OTR" and a hamburger menu icon on the left, and a "Quick Links" dropdown on the right. Below the navigation bar, there is a horizontal menu with four items: "Station Map", "Historic Observed Records" (which is highlighted with a blue background), "Historic Modelled Records", and "Future Projection Data". The main content area is divided into several sections. The first section is "Site Setup". The second section is "Download Data", which contains two orange boxes. The left box is titled "Download DWS Data" and contains a button labeled "Download DWS data". The right box is titled "Download SAWS Data" and contains a button labeled "Download SAWS data". The third section is "View Data Tables". The fourth section is "View Data Plots". The background of the interface is a large image of a grassy field with hills in the distance under a blue sky with clouds.

The screenshot displays the OTR web application interface. The top navigation bar is orange and contains the text 'OTR' and a hamburger menu icon on the left, and a 'Quick Links' dropdown on the right. Below the navigation bar, a horizontal menu shows four options: 'Station Map', 'Historic Observed Records', 'Historic Modelled Records' (which is highlighted with a blue background), and 'Future Projection Data'. The main content area has a background image of a grassy field under a blue sky. It features a 'Site Setup' section at the top, followed by a 'Download Data' section. This section contains six data download options arranged in a 3x2 grid, each with an orange header and a 'Download' button: 'Download MERRA-2 Data', 'Download CHIRPS Data', 'Download ERA5 Data', 'Download ERA5-LAND Data', 'Download PERSIANN Data', and 'Download GPM Data'. Below the download section, there are four white buttons with blue text: 'View Data Tables', 'View Data Plots', 'Uncertainty Analysis', and 'Scenario Comparisons'. A vertical sidebar on the left side of the interface contains several icons for navigation.

OTR

Station Map Historic Observed Records **Historic Modelled Records** Future Projection Data

Site Setup

Download Data

Download MERRA-2 Data
Download MERRA2 data

Download CHIRPS Data
Download CHIRPS data

Download ERA5 Data
Download ERA5 data

Download ERA5-LAND Data
Download ERA5_LAND data

Download PERSIANN Data
Download PERSIANN data

Download GPM Data
Download GPM data

View Data Tables

View Data Plots

Uncertainty Analysis

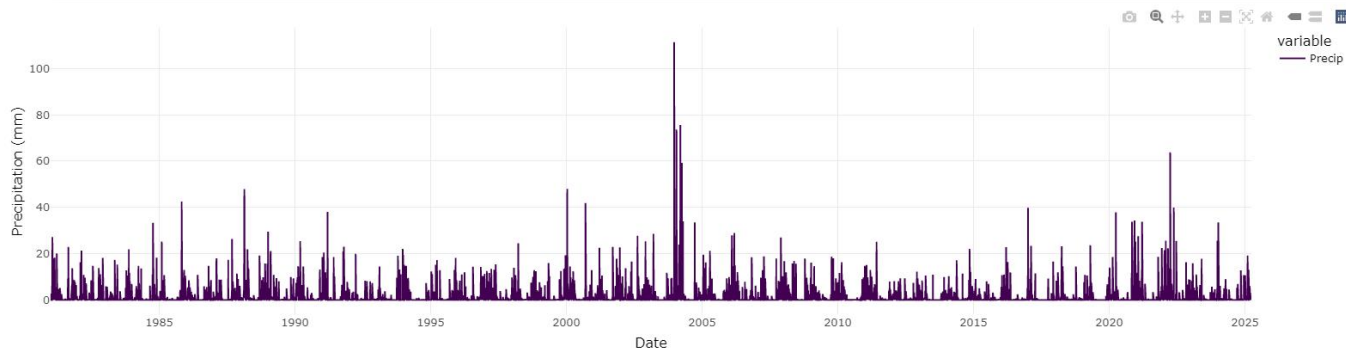
Scenario Comparisons

[Download Data](#)[View Data Tables](#)[View Data Plots](#)

Daily Data Plot

Tab1

Tab2



Yearly Data Plot

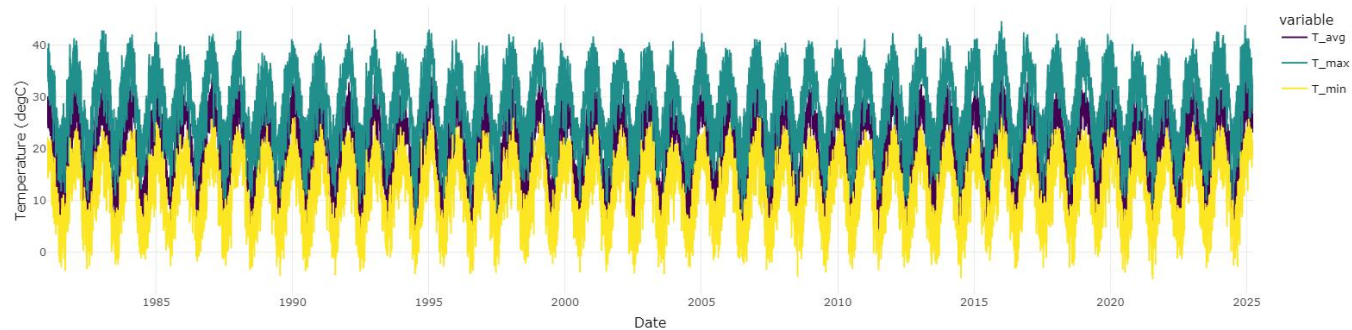
Monthly Data Plot

[Uncertainty Analysis](#)[Scenario Comparisons](#)

[Download Data](#)[View Data Tables](#)[View Data Plots](#)

Daily Data Plot

Tab1 Tab2

[Yearly Data Plot](#)[Monthly Data Plot](#)[Uncertainty Analysis](#)[Scenario Comparisons](#)

Yearly Statistical Analysis

year	Sum	Mean	Median	Min	Max	No._of_Data_Points	Variance	Standard_Deviation	Coefficient_of_Variance	Skewness	Kurtosis	No._values_Greater_than_or_Equal_to_Threshold	No._values_Less_than_Threshold
2001	1697.04	4.65	0.00	0.00	57.86	365.00	119.02	10.91	2.35	2.86	2.86	78	277
2002	2165.98	5.93	0.00	0.00	63.89	365.00	143.27	11.97	2.02	2.26	2.26	96	262
2003	1315.76	3.60	0.00	0.00	155.32	365.00	155.14	12.46	3.46	6.78	6.78	51	306
2004	2019.99	5.52	0.00	0.00	111.73	366.00	170.21	13.05	2.36	3.42	3.42	83	276
2005	1316.96	3.61	0.00	0.00	104.46	365.00	108.11	10.40	2.88	4.80	4.80	61	293
2006	2566.54	7.03	0.00	0.00	112.84	365.00	265.93	16.31	2.32	3.20	3.20	90	269
2007	1667.86	4.57	0.00	0.00	65.56	365.00	111.72	10.57	2.31	3.04	3.04	85	274
2008	1926.36	5.26	0.00	0.00	72.96	366.00	129.00	11.36	2.16	2.60	2.60	90	270
2009	1645.19	4.51	0.00	0.00	217.24	365.00	281.71	16.78	3.72	8.04	8.04	58	299
2010	1510.74	4.14	0.00	0.00	78.23	365.00	112.19	10.59	2.56	3.55	3.55	68	286
2011	2294.34	6.29	0.00	0.00	51.72	365.00	132.84	11.53	1.83	1.93	1.93	111	248
2012	1525.02	4.17	0.00	0.00	114.36	366.00	135.45	11.64	2.79	4.86	4.86	73	283
2013	1835.84	5.03	0.00	0.00	97.53	365.00	136.15	11.67	2.32	3.23	3.23	81	276
2014	1998.65	5.48	0.00	0.00	87.96	365.00	185.99	13.64	2.49	3.04	3.04	73	282
2015	2022.92	5.54	0.00	0.00	150.92	365.00	228.98	15.13	2.73	4.50	4.50	71	288
2016	2195.36	6.00	0.00	0.00	130.06	366.00	210.26	14.50	2.42	3.54	3.54	82	278
2017	2171.42	5.95	0.00	0.00	114.51	365.00	202.11	14.22	2.39	3.68	3.68	87	268
2018	2287.27	6.27	0.00	0.00	82.25	365.00	176.54	13.29	2.12	2.61	2.61	93	262
2019	2662.36	7.29	0.00	0.00	167.66	365.00	323.75	17.99	2.47	4.59	4.59	89	266
2020	2414.06	6.60	0.00	0.00	97.47	366.00	236.91	15.39	2.33	2.93	2.93	85	274
2021	1580.49	4.33	0.00	0.00	178.56	365.00	202.94	14.25	3.29	6.61	6.61	56	302
2022	2512.46	6.88	0.00	0.00	86.63	365.00	235.45	15.34	2.23	2.72	2.72	91	268

Monthly Statistical Analysis

month	Sum	Mean	Median	Min	Max	No._of_Data_Points	Variance	Standard_Deviation	Coefficient_of_Variance	Skewness	Kurtosis	No._values_Greater_than_or_Equal_to_Threshold	No._values_Less_than_Threshold
1	7666.06	11.24	0.00	0.00	83.50	682.00	249.53	15.80	1.41	1.64	5.42	327.00	345.00
2	5712.91	9.20	0.00	0.00	72.96	621.00	183.14	13.53	1.47	1.81	6.67	273.00	342.00
3	8751.37	12.83	0.00	0.00	97.47	682.00	272.51	16.51	1.29	1.40	5.16	337.00	345.00
4	8555.22	12.96	0.00	0.00	217.24	660.00	588.92	24.27	1.87	2.67	14.39	199.00	461.00
5	2704.62	3.97	0.00	0.00	178.56	682.00	223.41	14.95	3.77	8.77	88.75	167.00	509.00
6	293.83	0.45	0.00	0.00	14.63	660.00	2.48	1.58	3.54	4.15	23.28	30.00	606.00
7	281.17	0.41	0.00	0.00	8.62	682.00	1.94	1.39	3.38	3.33	13.15	20.00	624.00
8	226.07	0.33	0.00	0.00	12.79	682.00	1.69	1.30	3.92	4.29	24.10	18.00	636.00
9	308.54	0.47	0.00	0.00	27.32	660.00	3.66	1.91	4.09	7.52	84.95	16.00	602.00
10	857.38	1.26	0.00	0.00	81.56	682.00	29.24	5.41	4.30	8.41	97.88	61.00	608.00
11	2493.58	3.78	0.00	0.00	114.51	660.00	144.27	12.01	3.18	4.07	23.64	78.00	576.00
12	5481.88	8.04	0.00	0.00	114.36	682.00	209.48	14.47	1.80	2.52	12.48	226.00	453.00



Bias Correction Inputs

Graphs

Inputs

Choose the XLSX file

Browse...

No file selected

Site

Open Excel Bias Correction Template

Quantile Mapping

Quantile Mapping

Scaling Method

Scale Method

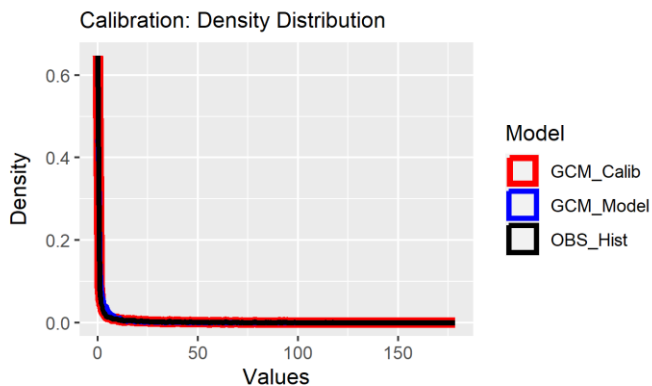
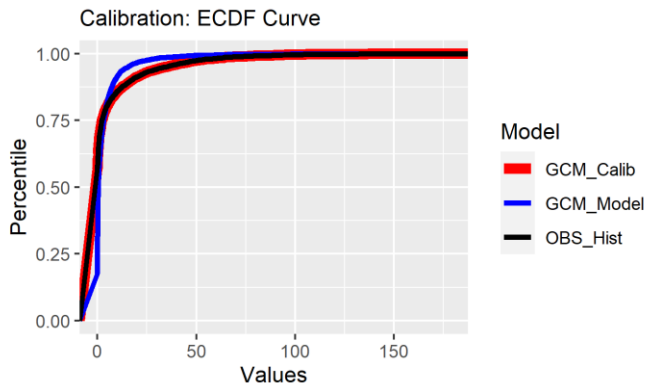
Multiple Linear Regression Method

Multiple Linear Regression

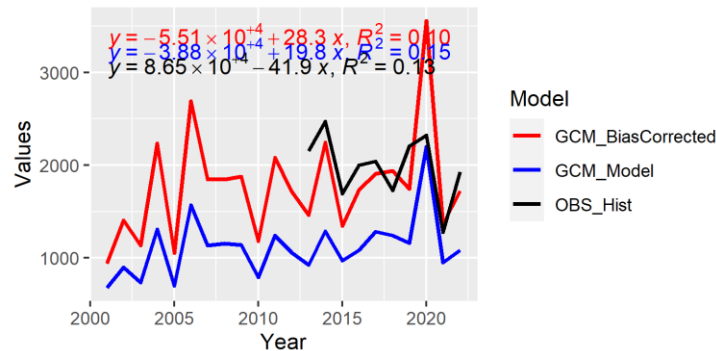
Delta Change Method

Delta change

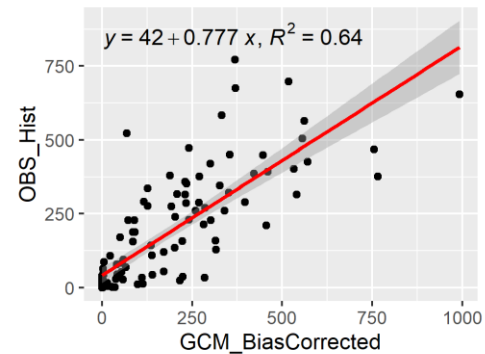
Quantile Mapping Results



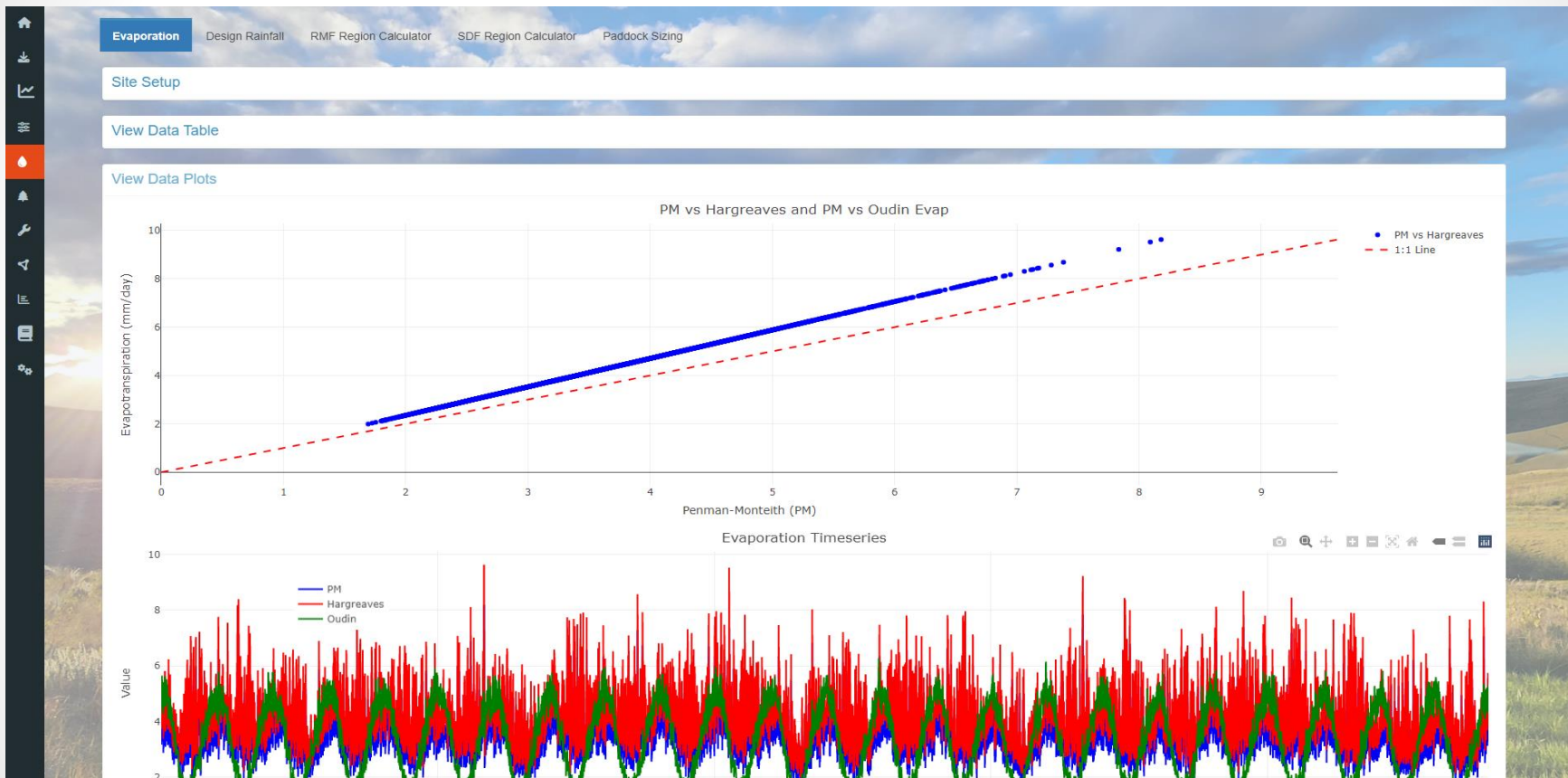
Projection: Annual Comparison

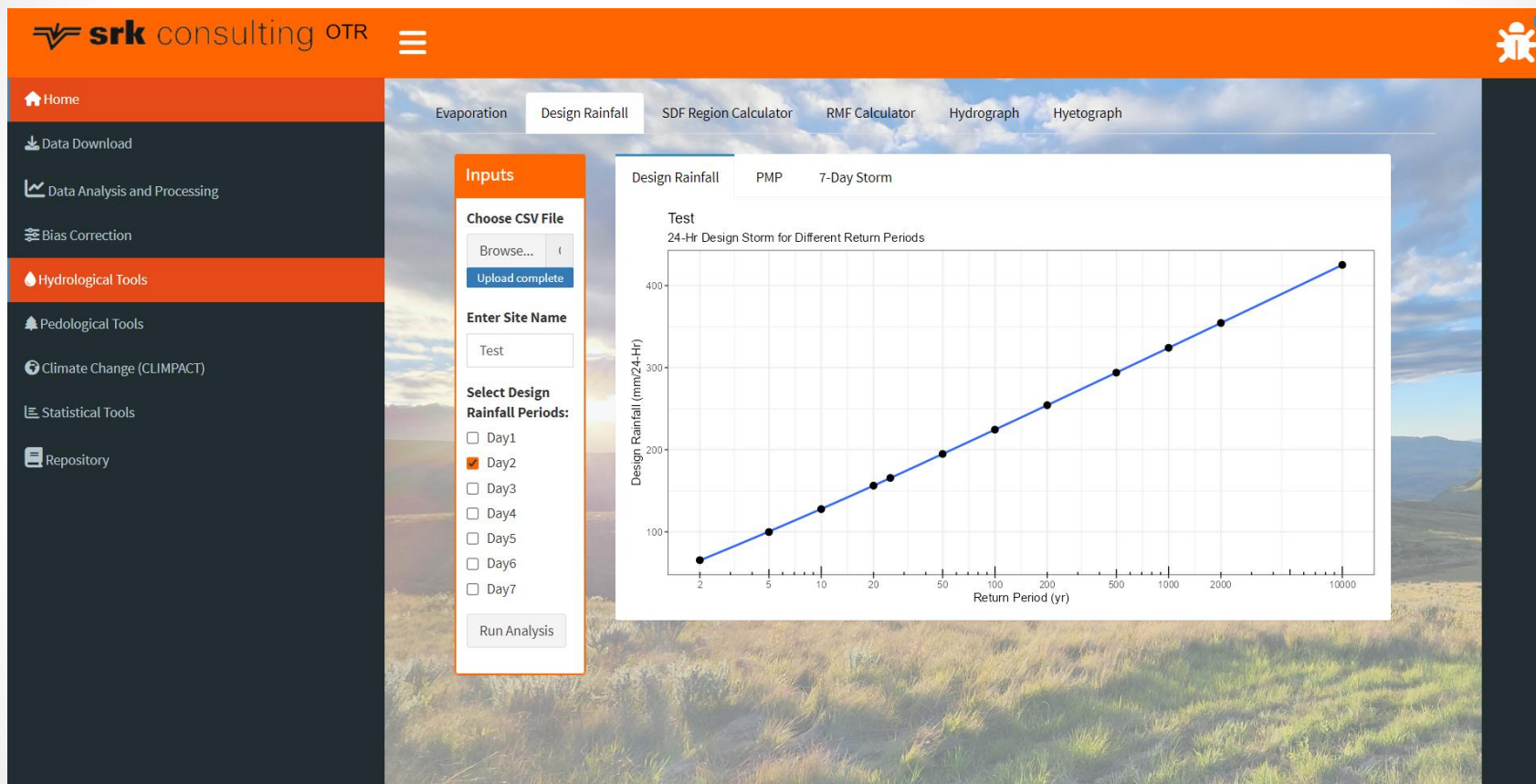


Projection: Monthly Scatter Plot



- Currently Available Tools:
 - Evaporation
 - Design Rainfall and Probable Maximum Precipitation
 - Regional Maximum Flood
- Tools still in Development:
 - Standard Design Flood
 - Paddock Sizing
 - SCS - SA
 - Silt-Trap Design







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Evaporation

Design Rainfall

SDF Region Calculator

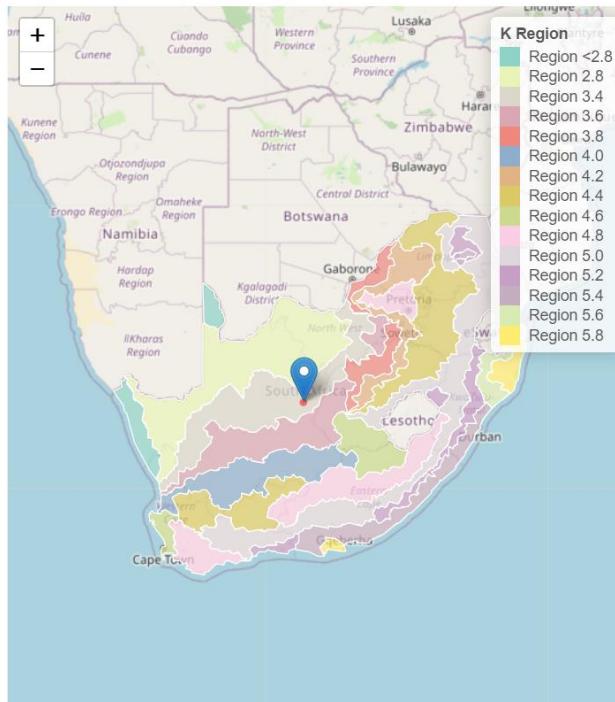
RMF Calculator

Hydrograph

Hyetograph

+

-



K Region

- Region <2.8
- Region 2.8
- Region 3.4
- Region 3.6
- Region 3.8
- Region 4.0
- Region 4.2
- Region 4.4
- Region 4.6
- Region 4.8
- Region 5.0
- Region 5.2
- Region 5.4
- Region 5.6
- Region 5.8

Latitude:

Longitude:

Update Map

Select RMF K Region:

Select Zone:

Select the value of
A (km²):

1

78

500

1

101

201

301

401

500

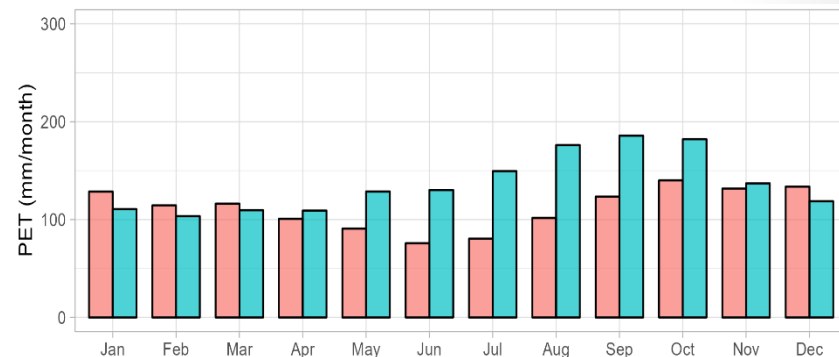
Calculate

RMF (cms) = 19.3

 **srk** consulting

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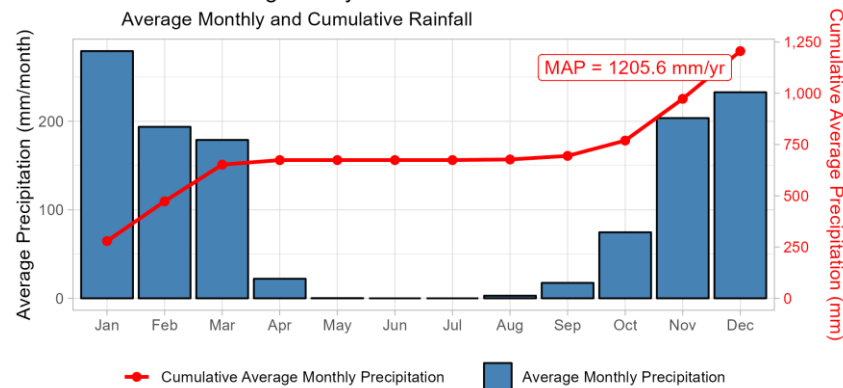
- Indices calculated:
 - Yearly Rainfall
 - Monthly Rainfall
 - Cumulative Rainfall
 - Heatmap – Rainfall
 - Number of rainy days per year
 - Yearly Relative humidity
 - Count of Max and Min Extreme temps
 - Count of Extreme wind speeds
 - Beaufort wind class
 - Yearly Evaporation
 - Monthly Evaporation
 - Various time series

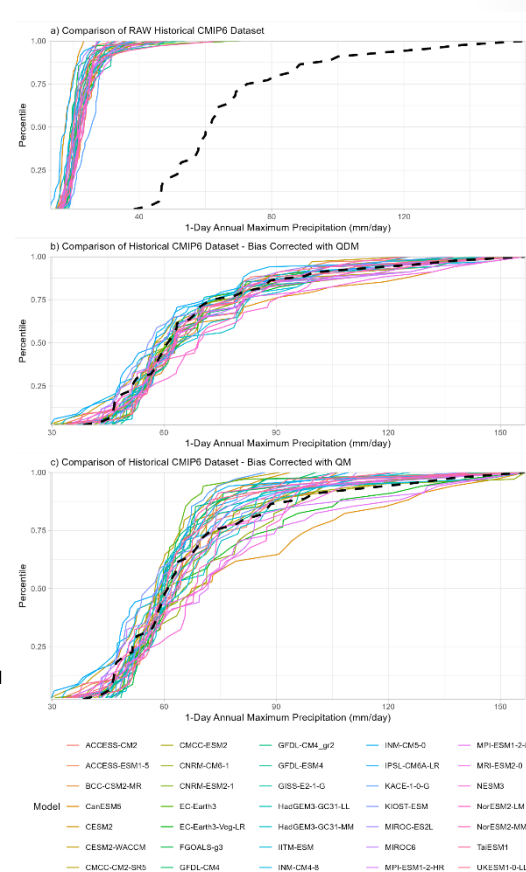
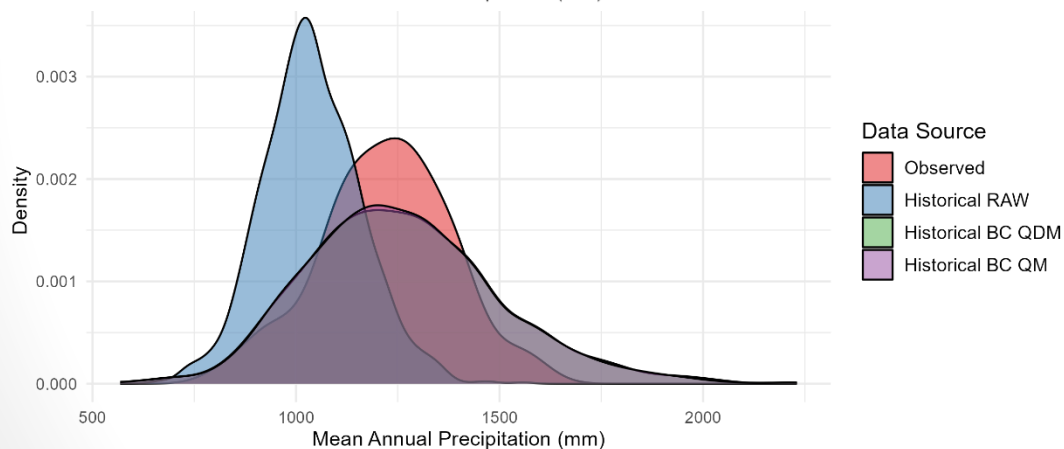


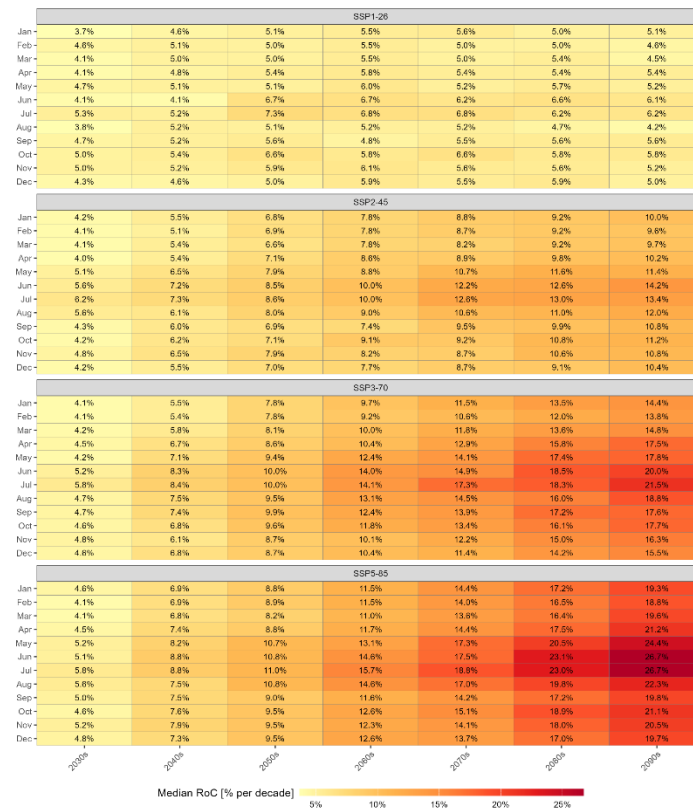
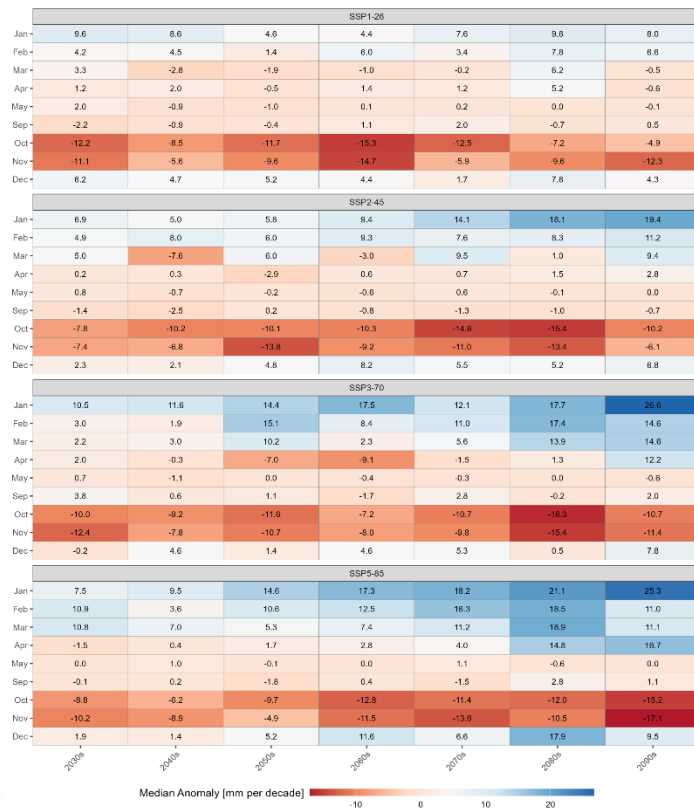
Method ■ Oudin ■ Penman-Monteith

Climate Change Study

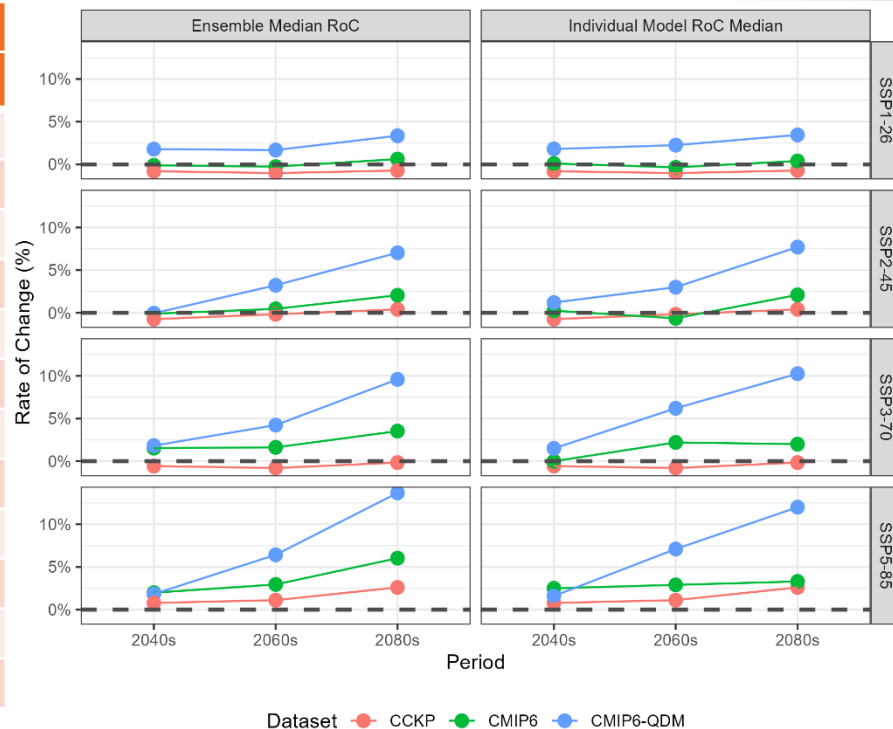
Average Monthly and Cumulative Rainfall

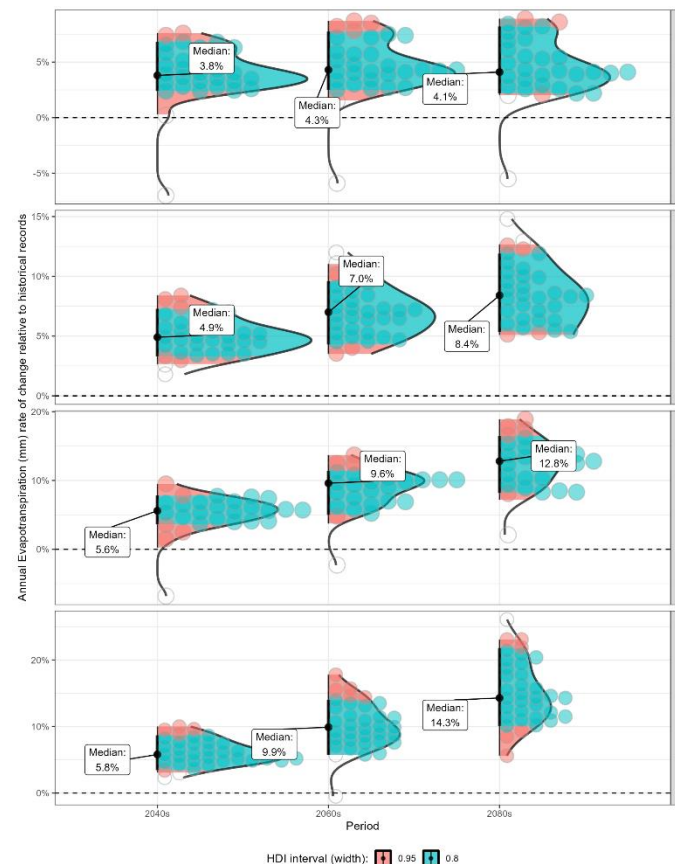
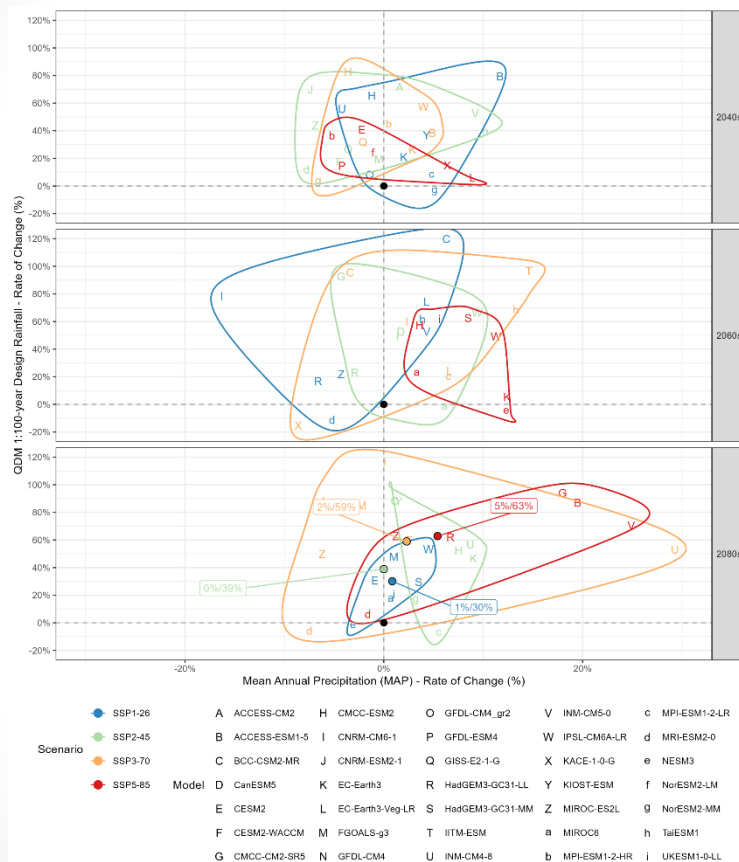






Scenario	Period	Highest Density Interval (HDI)					
		95%L	85%L	Mode	Median	85%H	95%H
SSP1-26	2040s	-20.5%	-19.1%	0.5%	-1.2%	7.8%	12.5%
	2060s	-17.1%	-16.5%	-5.4%	-3.8%	8.4%	18.5%
	2080s	-23.3%	-16.5%	-2.7%	-2.4%	8.2%	15.2%
SSP2-45	2040s	-21.1%	-16.5%	-4.3%	-4.4%	7.9%	8.8%
	2060s	-22.6%	-18.9%	-0.1%	-1.8%	7.5%	10.0%
	2080s	-19.1%	-14.0%	-7.7%	-2.6%	13.2%	17.7%
SSP3-70	2040s	-20.9%	-14.6%	-3.1%	-3.1%	14.8%	14.8%
	2060s	-24.6%	-21.8%	-3.4%	-5.1%	10.0%	21.8%
	2080s	-30.4%	-23.1%	-0.9%	-4.9%	12.0%	21.8%
SSP5-85	2040s	-18.5%	-18.5%	-0.7%	-3.0%	4.6%	11.6%
	2060s	-22.7%	-19.2%	-2.1%	-2.8%	10.8%	19.1%
	2080s	-36.8%	-26.0%	-4.8%	-4.6%	20.9%	25.6%







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- Pedological Tools
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- Climate Change (CLIMPACT)
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BFOTWB

InputsBaseline OutputsCalibration

Upload Data

Upload Data

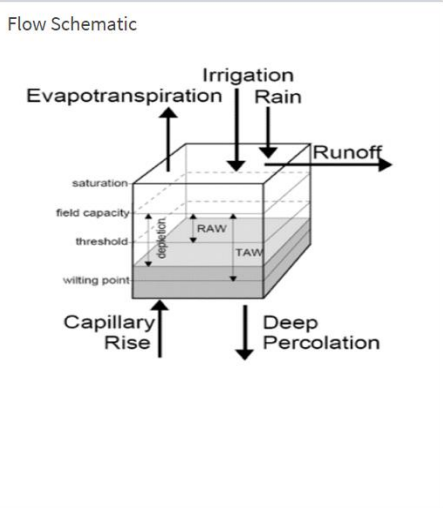
Update Input Parameters

Add/Update Parameters

Run the BFOTWB Model

Run the Model

Flow Schematic



srk consulting OTR

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Baseline Outputs

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Yearly Data

Monthly Data

Daily Data

Hourly Data

Statistics



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[Climate Change \(CLIMPACT\)](#)
[Statistical Tools](#)
[Repository](#)

BFWTb

InputsBaseline OutputsCalibration

Use the sliders to adjust the calibration factors below:

Site Location

Calibration Factor 1

0 50 100

0 10 20 30 40 50 60 70 80 90 100

Calibration Factor 2

0 25 100

0 10 20 30 40 50 60 70 80 90 100

Calibration Factor 3

0 25 100

0 10 20 30 40 50 60 70 80 90 100

Export Calibrated Data

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Climate Change (CLIMACT)

Process single station

Batch process stations

Calculate Gridded Indices

Calculate Gridded Thresholds

Statistical Tools

Repository

127.0.0.1:5633/#shiny-tab-home

Process Single Station

1. Load

2. Check

3. Calculate

4. Compare

1. Load station data and provide metadata

Station data

The dataset **must** use the format described in [Appendix B of the Clim pact User Guide](#).
For a sample dataset look at [sydney_observatory_hill_1936-2015.txt](#)

Browse...

No file selected

Metadata

Station name (used in output file names):

Latitude (decimal degrees e.g. -40.992):

0

Longitude (decimal degrees e.g. 148.346):

0

Base period start year:

1971

Base period end year:

2000

Instructions

Station data

Select a station text file. Clim pact will calculate indices for this data.
The dataset **must** use the format described in [Appendix B of the Clim pact User Guide](#).
For a sample dataset look at [sydney_observatory_hill_1936.txt](#)

Metadata

Specify the station name. Clim pact will attempt to determine this automatically for you based on the uploaded station data file name. This must be some text.

Specify the station latitude and longitude in decimal degrees
e.g. -40.992 or 148.346.
Latitude must be between -90 and 90.
Longitude must be between -180 and 180.

Specify valid values for the base period start year and end year.
These values must be within the limits of the dates in the station data provided.

Next

Click the Next button or the tab labelled '2. Check' to proceed to the next step.

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- This tool will:
 - Will help productivity and efficiency;
 - Provide a platform to aggregate the tools developed
 - Help standardize methods used.
- Open to development.
- Multiple languages can be used for the tools.