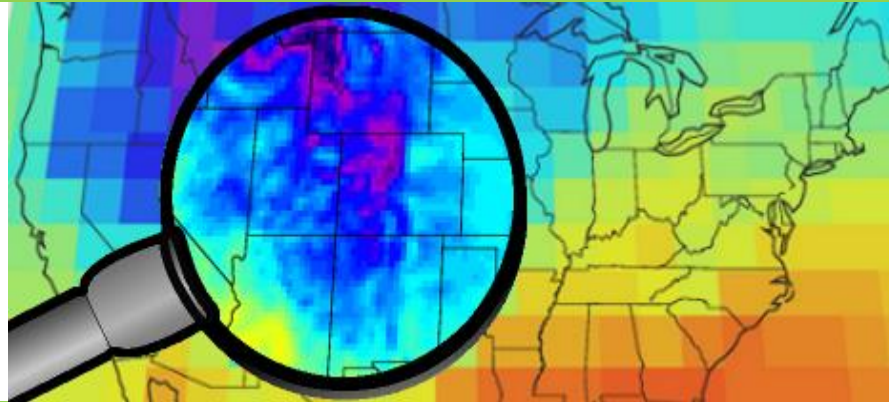


**APCC**  
APEC CLIMATE CENTER

# Hands-on Statistical Downscaling Training (II)

The screenshot shows the APCC AIMS sign-in interface. On the left, there is a blue header with the APCC logo and the text "Welcome to AIMS (APCC Integrated Modeling Solution). This software requires Internet access and user authentication." On the right, there is a white "Sign In" form with fields for "Email address" and "Password", a "Sign in" button, and links for "Sign up" and "Forgot your password?".



**Jaepil Cho**

**2017/10/17**

# Overview

**1. Raw GCM analysis for excluding worst GCMs**



**Selection of  
GCMs**

**2. Analysis of reproducibility and signal changes  
using climate extreme indices**

**2.1 Evaluating reproducibility of climate extreme  
indices for the historical period**

**2.2 Comparing signal changes in climate extreme  
indices before and after downscaling**



**Selection of  
downscaling  
technique**

**3. Evaluating reproducibility of spatial correlations  
among stations using variogram**

**4. Estimating multi-model ensemble (MME) mean  
and providing uncertainty ranges according to  
number of GCMs**

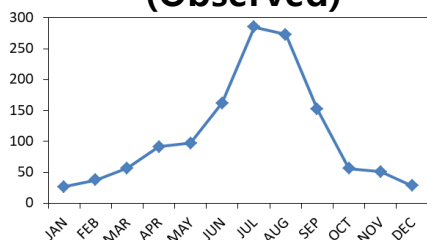


**User-centered  
climate change  
projections**

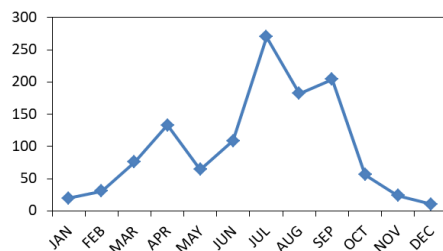
# 1. Raw GCM analysis for excluding worst GCMs

## ❖ Temporal evaluation

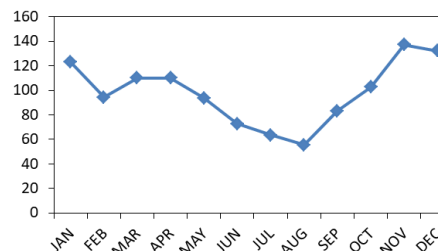
30 year monthly average  
(Observed)



GCM1

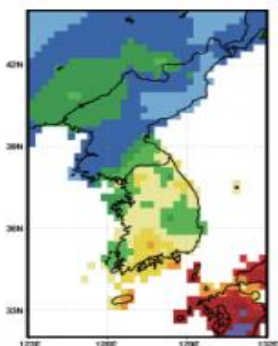


GCM2

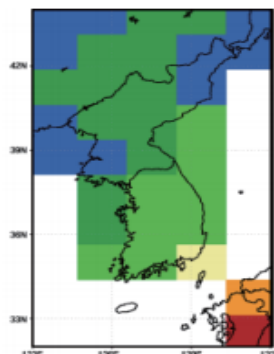


## ❖ Spatial evaluation

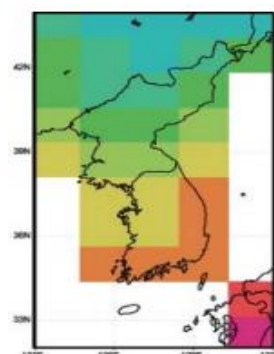
Observed



GCM1



GCM2



# Raw GCM Analysis: algorithm

## ➤ Temporal skill (seasonal cycle)

- For each weather station, correlation coefficient of 36 pairs (10-day) of 30-year average between GCM and local data
- Calculate pass rates compared to critical value of CC

## ➤ Spatial patterns

- For each 10-day period, pattern correlation coefficient of weather stations of 30-year average between GCM and local data
- Calculate pass rates

### Raw GCM Analysis

A general circulation model (GCM) is a type of climate model. It employs a mathematical model of the general circulation of a planetary atmosphere or ocean.

- Precipitation
- Temperature

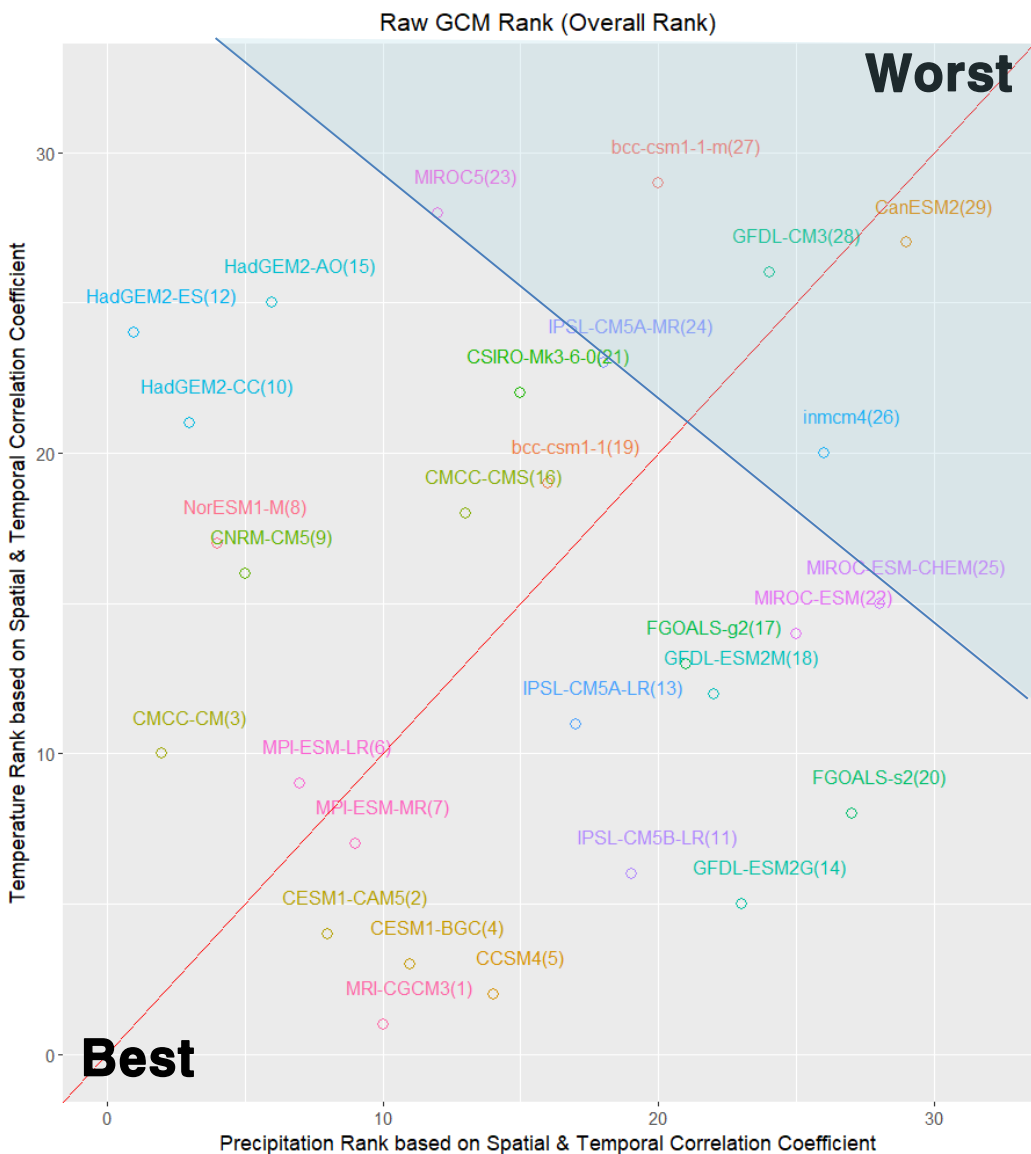
# Raw GCM Analysis: summary table

## *Raw\_GCM\_Rank\_Both(Prcp-Temp).csv*

GCMs/Criteria	Spa_Prcp	Spa_PrcpRate	tem_Prcp	tem_PrcpRate	prcp_Rank	Spa_Temp	Spa_TempRate	tem_Temp	tem_TempRate	temp_Rank	Rank_Total
MRI-CGCM3	0.37	0.64	0.84	1.00	10	0.65	1.00	1.00	1	1	1
CESM1-CAM5	0.36	0.67	0.80	1.00	8	0.65	1.00	0.99	1	4	2
CMCC-CM	0.44	0.83	0.66	1.00	2	0.61	0.97	0.99	1	10	3
CESM1-BGC	0.31	0.61	0.78	1.00	11	0.64	1.00	0.99	1	3	4
CCSM4	0.30	0.58	0.79	1.00	14	0.65	1.00	0.99	1	2	5
MPI-ESM-LR	0.42	0.78	0.66	0.97	7	0.56	1.00	0.99	1	9	6
MPI-ESM-MR	0.49	0.78	0.60	0.87	9	0.62	1.00	0.98	1	7	7
NorESM1-M	0.41	0.81	0.87	1.00	4	0.59	0.86	0.99	1	17	8
CNRM-CM5	0.44	0.78	0.78	1.00	5	0.61	0.89	0.99	1	16	9
HadGEM2-CC	0.48	0.83	0.72	0.98	3	0.50	0.83	0.99	1	21	10
IPSL-CM5B-LR	0.27	0.53	0.81	0.97	19	0.59	1.00	0.99	1	6	11
HadGEM2-ES	0.48	0.86	0.68	0.98	1	0.50	0.81	0.99	1	24	12
IPSL-CM5A-LR	0.27	0.58	0.72	0.97	17	0.59	0.97	0.99	1	11	13
GFDL-ESM2G	0.19	0.44	0.70	1.00	23	0.60	1.00	1.00	1	5	14
HadGEM2-AO	0.47	0.78	0.70	0.98	6	0.48	0.78	0.99	1	25	15
CMCC-CMS	0.50	0.83	0.48	0.77	13	0.55	0.86	0.98	1	18	16
FGOALS-g2	0.22	0.47	0.90	1.00	21	0.56	0.94	0.99	1	13	17
GFDL-ESM2M	0.23	0.50	0.65	0.97	22	0.56	0.94	1.00	1	12	18
bcc-csm1-1	0.29	0.58	0.66	0.98	16	0.50	0.86	0.94	1	19	19
FGOALS-s2	0.09	0.31	0.38	0.62	27	0.57	1.00	0.99	1	8	20
CSIRO-Mk3-6-0	0.36	0.61	0.70	0.97	15	0.55	0.83	0.95	1	22	21
MIROC-ESM	0.14	0.39	0.52	0.97	25	0.55	0.94	0.98	1	14	22
MIROC5	0.31	0.61	0.78	1.00	12	0.55	0.72	0.99	1	28	23
IPSL-CM5A-MR	0.23	0.56	0.75	0.95	18	0.59	0.81	0.99	1	23	24
MIROC-ESM-CHEM	0.16	0.42	0.35	0.40	28	0.53	0.92	0.98	1	15	25
inmcm4	0.13	0.33	0.77	1.00	26	0.57	0.83	0.99	1	20	26
bcc-csm1-1-m	0.20	0.53	0.56	0.97	20	0.54	0.72	0.95	1	29	27
GFDL-CM3	0.29	0.64	0.53	0.80	24	0.48	0.75	0.99	1	26	28
CanESM2	0.21	0.44	0.16	0.27	29	0.42	0.75	0.95	1	27	29

- ❖ Ranks for precipitation and temperature are calculated based on sum of pass rated for both temporal and spatial CC.
- ❖ Total rank is calculated based on sum of precipitation and temperature ranks

# Raw GCM Analysis: summary graph



Do not consider for calculating climate extreme indices

# Check-point

- GCM resolution VS study area
- Which variables are crucial to your study region?
  - PRCP, Temp, or both
- Clear seasonality in your region of interest?
- Spatial climate variability is an essential factor to rank GCMs?
  - Multiple stations
  - Geographical characteristics

# Hands-on: run AIMS using your data



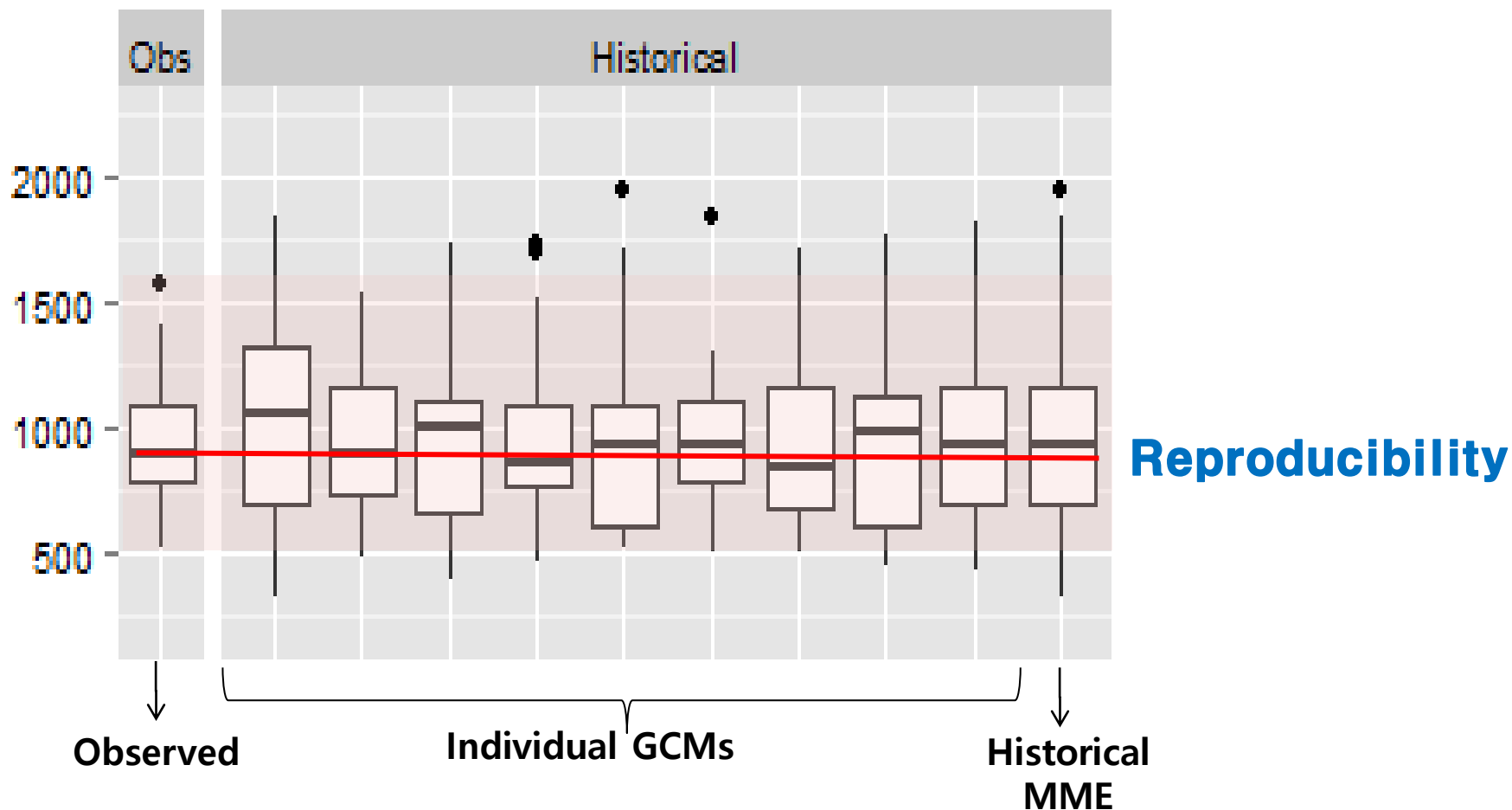
- ❖ Select only 4 stations
- ❖ Select only SQM
- ❖ Select only RCP4.5
- ❖ Select all GCMs

**Go for lunch!**

**Check and share your results.**

## 2.1. Evaluating reproducibility of climate change indices (Historical period)

### Annual total precipitation amount (mm)



# Climate Extreme Indices

- ❖ Expert Team on Climate Change Detection and Indices (ETCCDI)
- ❖ <http://etccdi.pacificclimate.org/>

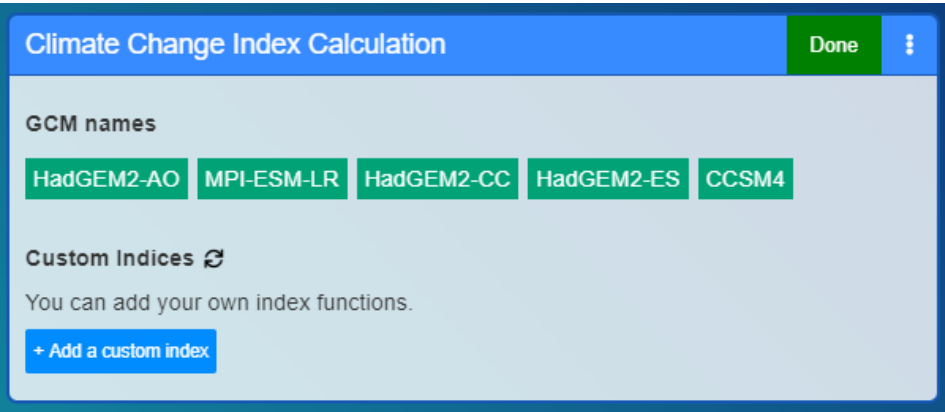
ID	Variable	Description	Unit
CDD	PRCP	Consecutive dry days, PRCP < 1mm	Day
CWD		Consecutive wet days, PRCP ≥ 1mm	Day
PRCPTOT		Annual total PRCP in wet days (daily PRCP ≥ 1mm)	mm
Rx1day		Max 1-day precipitation	mm
Rx5day		Max 5-day precipitation	mm
R95pTOT		Annual total PRCP when daily PRCP > 95 percentile	mm
R99pTOT		Annual total PRCP when daily PRCP > 99 percentile	mm
SDII		Simple daily intensity index	mm/day
rnnmm		Annual count of days when PRCP ≥ nnmm	Day

# Climate Extreme Indices

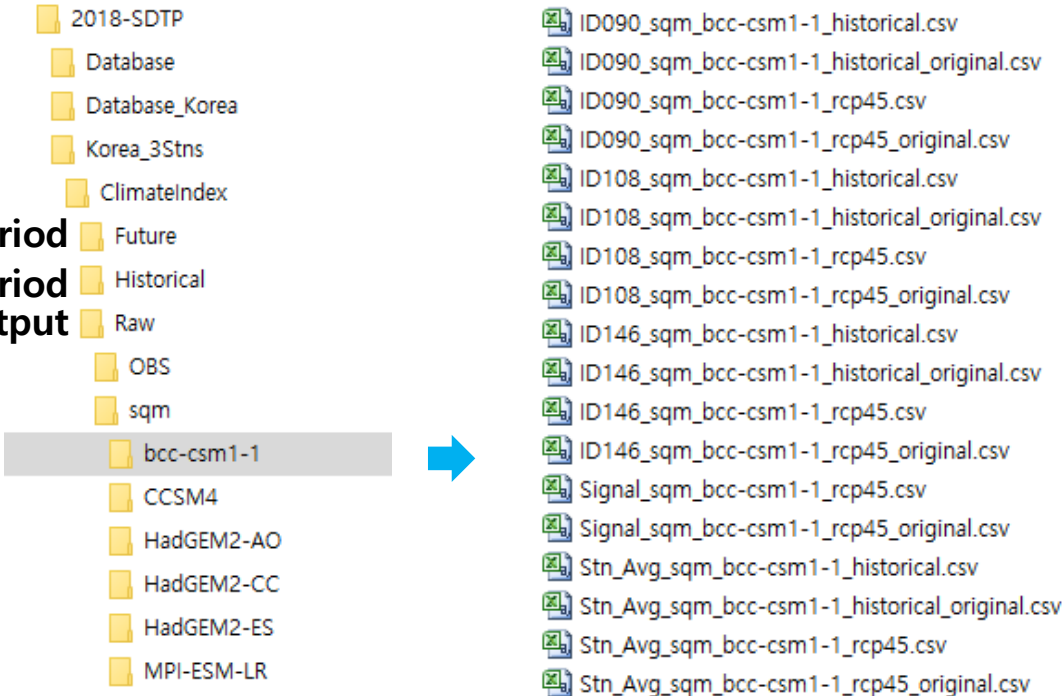
## ❖ ETCCDI related to TMAX and TMIN

ID	Variable	Description	Unit
SU	TMAX	Summer day, TMAX > 25°C	Day
ID		Ice days, TMAX < 0°C	Day
TX <sub>n</sub>		Min TMAX	°C
TX <sub>x</sub>		Max TMAX	°C
TX10p		Cool days, TMAX < 10 <sup>th</sup> percentile	%
TX90p		Warm days, TMAX > 90 <sup>th</sup> percentile	Day
WSDI		Warm spell duration, TMAX > 90 <sup>th</sup> percentile	Day
FD	TMIN	Frost days TMIN < 0°C	Day
TR		Tropical nights, TMIN > 20°C	Day
TN <sub>n</sub>		Min TMIN	°C
TN <sub>x</sub>		Max TMIN	°C
TN10p		Cool nights, TMIN < 10 <sup>th</sup> percentile	%
TN90p		Warm nights, TMIN > 90 <sup>th</sup> percentile	%
CSDI		Cold spell duration, TMIN < 10 <sup>th</sup> percentile	Day
DTR	TMAX & TMIN	Diurnal temperature range	°C
GSL		Growing season length	Day

# Check your output folder



Signal changes in future period  
 Reproducibility in historical period  
 Raw output





# Raw: Individual stations and station average

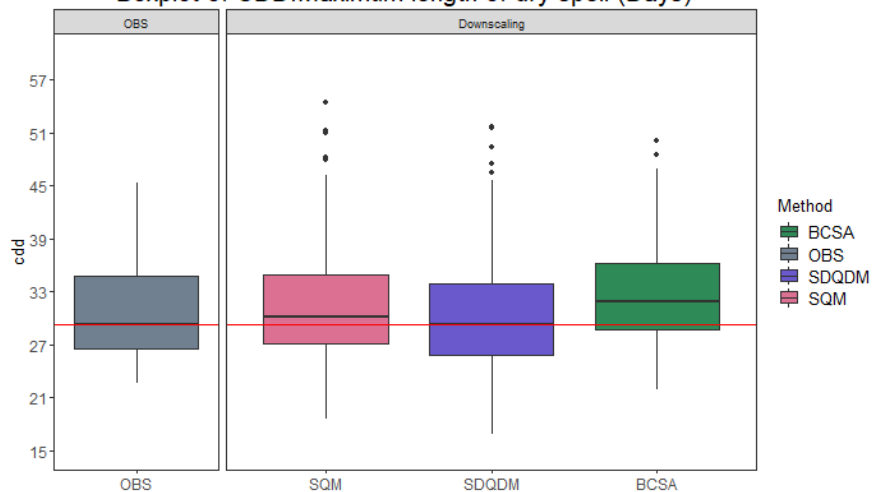
## Indices

Years

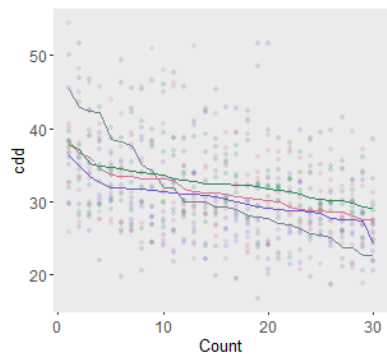
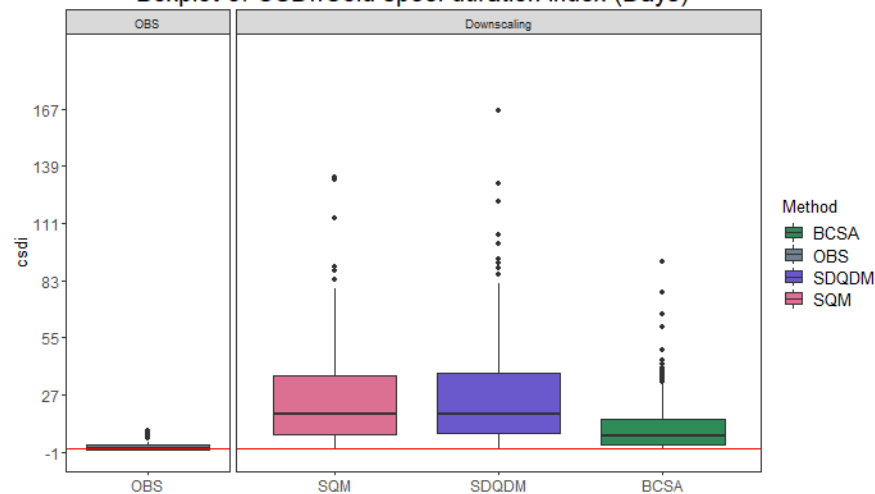
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	year	prcptot	cdd	cwd	r95ptot	r99ptot	rx1day	rx5day	sdi	rnnmm	r10mm	r20mm	su	id	txn	txx	tx10p	tx90p	wsdi	fd	tr	tnn	tnx	tn10p	tn90p	cstdi	dtr	gsl
2	1976	1566	22	6	477.2	0.0	101.9	230.0	18.6	84	45	26	40	20	-6.22	33.32	38.03	0.00	0	91	26	-15.24	26.16	42.40	0.00	66	7.53	254
3	1977	1480	21	7	474.9	155.1	155.1	229.5	17.2	86	40	20	27	10	-2.98	29.78	32.89	0.54	0	75	11	-11.02	22.20	33.53	0.27	61	7.55	275
4	1978	1235	29	11	408.1	235.9	235.9	329.5	15.8	78	28	16	57	9	-4.62	34.85	20.20	0.60	0	63	40	-11.08	27.40	24.42	0.00	33	7.61	293
5	1979	1172	30	7	188.2	0.0	95.7	181.9	14.1	83	27	20	76	9	-2.81	32.02	21.05	0.00	0	68	60	-10.19	25.46	19.06	0.00	37	7.48	270
6	1980	1472	25	11	507.1	167.7	167.7	308.7	19.4	76	30	22	52	2	-0.94	32.69	18.32	0.29	0	66	32	-8.14	24.95	18.96	0.29	28	7.36	268
7	1981	1287	36	4	613.1	486.4	314.2	371.2	22.6	57	26	14	54	10	-6.32	31.01	45.91	0.00	0	103	37	-13.26	23.60	51.05	0.00	115	7.24	249
8	1982	1611	27	5	447.8	0.0	139.0	373.4	19.9	81	41	28	63	9	-3.54	33.80	27.69	0.81	0	69	39	-11.23	26.42	28.40	0.30	25	7.56	297
9	1983	1088	48	9	369.4	295.5	295.5	370.1	13.3	82	27	12	52	9	-2.57	31.54	29.66	0.00	0	93	45	-13.27	24.16	30.35	0.00	29	7.44	241
10	1984	1271	41	7	152.4	0.0	80.2	257.7	14.6	87	40	21	37	27	-5.77	30.57	43.13	0.00	0	109	19	-11.46	23.09	46.76	0.00	89	7.25	246
11	1985	637	20	3	0.0	0.0	52.8	78.9	10.1	63	21	11	76	31	-7.50	36.70	46.03	0.00	0	122	50	-14.70	29.20	50.19	0.00	111	7.94	243
12	1986	1639	33	12	504.8	225.3	225.3	337.5	17.6	93	35	23	52	29	-7.70	32.88	45.62	0.26	0	94	30	-15.60	23.57	49.07	0.00	123	7.77	267
13	1987	1543	19	5	334.5	0.0	91.3	173.6	16.6	93	49	25	37	10	-3.48	30.70	34.83	0.25	0	82	22	-10.62	23.40	37.47	0.27	53	7.37	263
14	1988	1218	31	4	232.9	0.0	85.0	187.6	17.4	70	35	19	59	8	-6.20	30.88	30.63	0.00	0	86	17	-11.60	23.16	35.75	0.00	39	7.66	272
15	1989	974	18	4	0.0	0.0	59.7	83.6	11.3	86	32	16	69	7	-1.90	32.19	19.79	0.47	0	88	44	-12.25	25.35	19.30	0.00	23	7.52	244
16	1990	1506	34	5	299.8	232.8	232.8	343.8	20.9	72	40	26	76	9	-2.46	37.10	25.65	0.00	0	93	51	-9.32	27.50	25.56	0.00	30	7.65	241
17	1991	1776	21	5	721.2	566.0	241.0	321.3	19.1	93	43	20	74	8	-3.97	31.67	20.38	0.28	0	86	30	-10.16	24.10	17.95	0.00	6	7.55	274
18	1992	1258	25	4	533.0	174.5	174.5	218.2	20.0	63	31	18	6	17	-7.50	25.95	58.87	0.23	0	100	1	-14.06	20.29	63.40	0.00	175	7.13	246
19	1993	1215	21	5	397.6	0.0	140.0	178.1	17.9	68	34	17	65	12	-4.90	31.94	28.86	0.00	0	100	30	-11.15	23.67	37.66	0.00	37	7.79	268
20	1994	1857	46	9	694.9	0.0	132.8	336.0	24.1	77	47	26	35	12	-5.18	32.77	43.14	0.00	0	85	19	-13.13	23.45	39.86	0.00	68	7.46	276
21	1995	1372	46	6	420.5	0.0	142.3	303.5	15.4	89	40	21	92	9	-2.86	35.81	11.59	1.35	0	71	64	-9.54	27.27	8.05	1.38	6	7.79	287
22	1996	1848	35	7	694.8	143.9	143.9	416.5	22.5	82	38	29	29	3	-5.79	32.94	35.20	0.00	0	75	11	-12.74	24.86	37.71	0.00	94	7.47	251
23	1997	1920	32	7	663.4	487.9	291.0	563.4	21.3	90	46	26	80	3	-0.79	33.20	12.91	0.54	0	49	50	-10.24	24.56	12.77	0.28	12	7.70	285
24	1998	917	46	4	283.9	187.2	187.2	246.9	13.1	70	20	12	61	1	-0.72	34.73	21.46	0.00	0	55	47	-8.26	25.96	22.24	0.00	23	7.37	252
25	1999	1185	25	9	78.3	0.0	78.3	141.5	12.5	95	35	20	60	0	1.42	32.78	16.92	0.54	0	54	45	-6.49	24.50	15.89	0.00	13	7.52	349
26	2000	1331	20	5	272.6	0.0	98.0	122.2	15.7	85	38	23	70	2	-0.15	36.46	11.10	0.52	0	44	42	-6.46	26.69	9.16	0.00	10	7.62	279
27	2001	1380	24	4	414.3	0.0	129.1	217.0	15.7	88	35	15	89	1	-1.72	32.49	9.59	3.24	0	29	64	-7.81	25.99	8.12	2.61	0	7.62	313
28	2002	1525	23	6	418.3	186.7	186.7	214.1	17.5	87	35	22	104	5	-2.31	35.08	13.55	1.07	0	59	83	-9.39	27.80	12.07	0.20	16	7.85	254
29	2003	1124	26	3	330.5	0.0	105.5	164.1	18.1	62	33	17	66	15	-6.13	35.41	28.26	0.27	0	92	35	-16.20	25.08	29.46	0.00	28	7.95	265
30	2004	1731	36	8	785.8	234.3	234.3	394.4	19.4	89	38	22	89	0	1.30	33.07	10.92	1.36	0	55	44	-9.16	24.13	7.54	1.36	12	7.54	280
31	2005	1442	32	5	346.3	158.0	158.0	204.6	17.4	83	35	23	76	4	-4.28	32.83	10.93	2.70	0	62	39	-11.14	26.29	12.71	1.89	6	7.47	341

# Box-plot for climate indices (Historical)

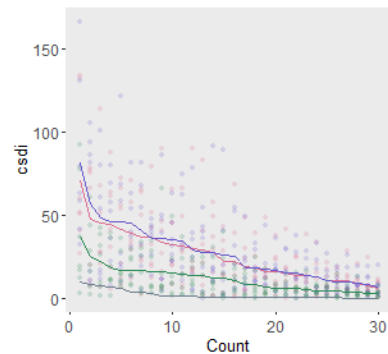
Boxplot of CDD:Maximum length of dry spell (Days)



Boxplot of CSDI:Cold spell duration index (Days)



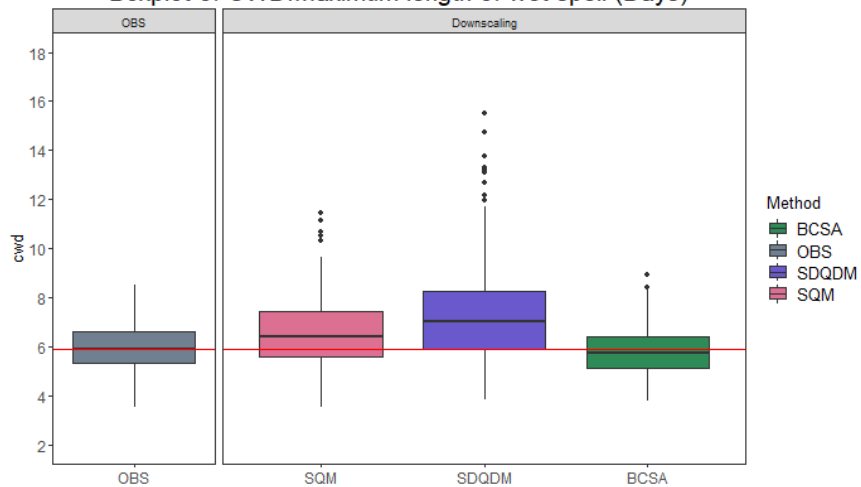
	OBS	SQM	SDQDM	BCSA
Min.	22.67	18.62	16.78	21.93
1st Qu.	26.5	27.14	25.78	28.75
Median	29.23	30.13	29.35	31.84
Mean	31.02	31.44	30.31	32.61
3rd Qu.	34.83	34.95	33.89	36.2
Max.	45.28	54.45	51.68	50.07
NA Count(Year)	0	0	0	0



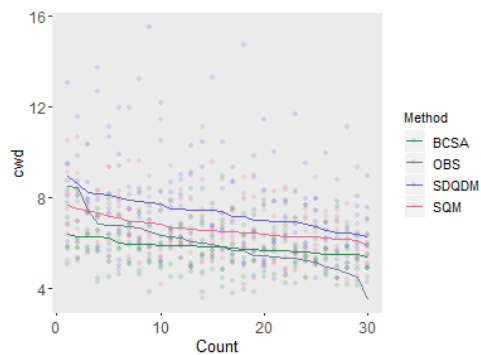
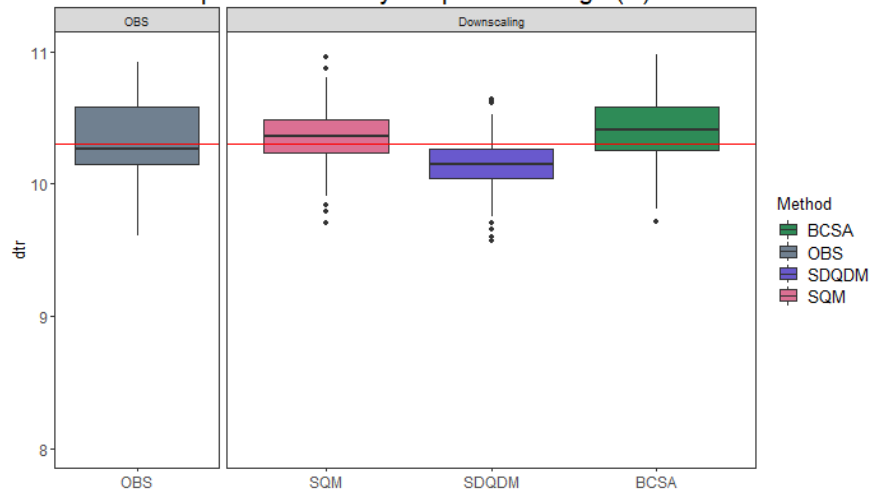
	OBS	SQM	SDQDM	BCSA
Min.	0	0	0	0
1st Qu.	0.33	7.79	7.98	2.75
Median	0.63	17.75	17.93	6.87
Mean	2.05	25.58	27.51	11.66
3rd Qu.	2.6	36.34	37.72	15.05
Max.	9.73	133.85	186.4	92.12
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

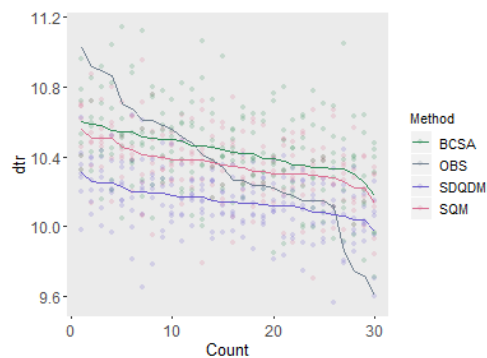
Boxplot of CWD:Maximum length of wet spell (Days)



Boxplot of DTR:Daily temperature range (C)



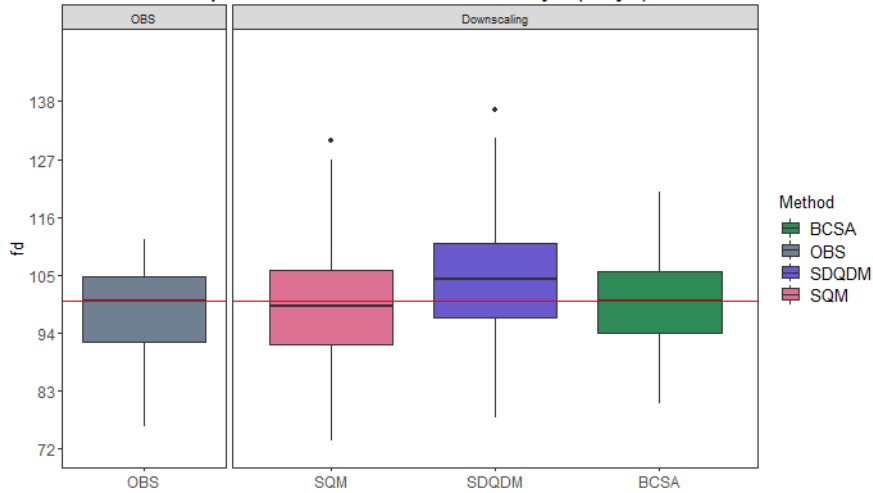
	OBS	SQM	SDQDM	BCSA
Min.	3.52	3.53	3.85	3.8
1st Qu.	5.34	5.6	5.92	5.12
Median	5.91	6.39	7.01	5.74
Mean	5.96	6.65	7.37	5.83
3rd Qu.	6.64	7.48	8.26	6.41
Max.	8.5	11.47	15.53	8.95
NA Count(Year)	0	0	0	0



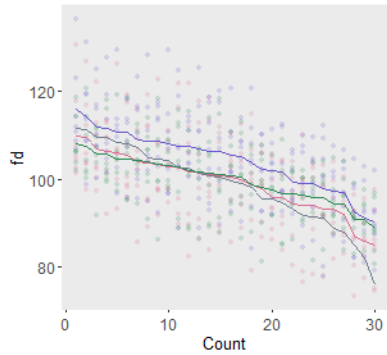
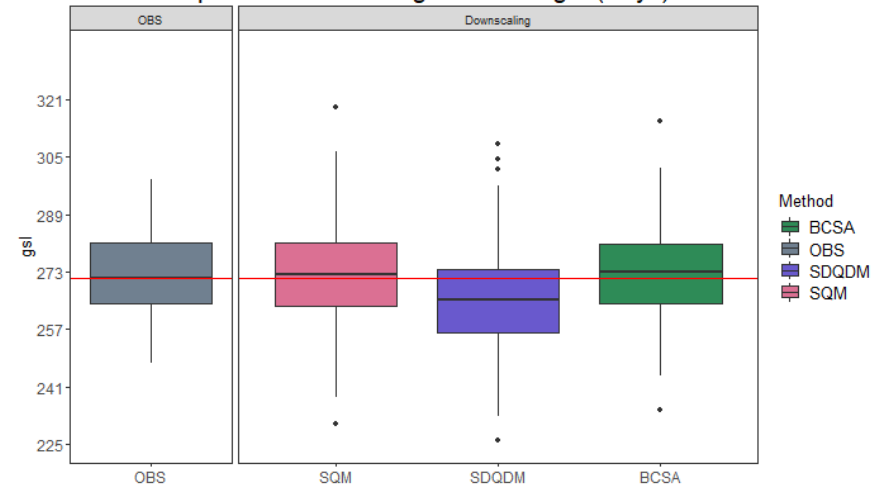
	OBS	SQM	SDQDM	BCSA
Min.	9.61	9.7	9.56	9.71
1st Qu.	10.16	10.24	10.04	10.27
Median	10.3	10.36	10.15	10.42
Mean	10.36	10.36	10.15	10.43
3rd Qu.	10.6	10.49	10.26	10.69
Max.	11.03	10.96	10.64	11.15
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

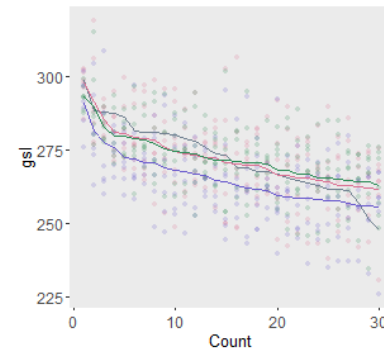
Boxplot of FD: Number of frost days (Days)



Boxplot of GSL: Growing season length (Days)



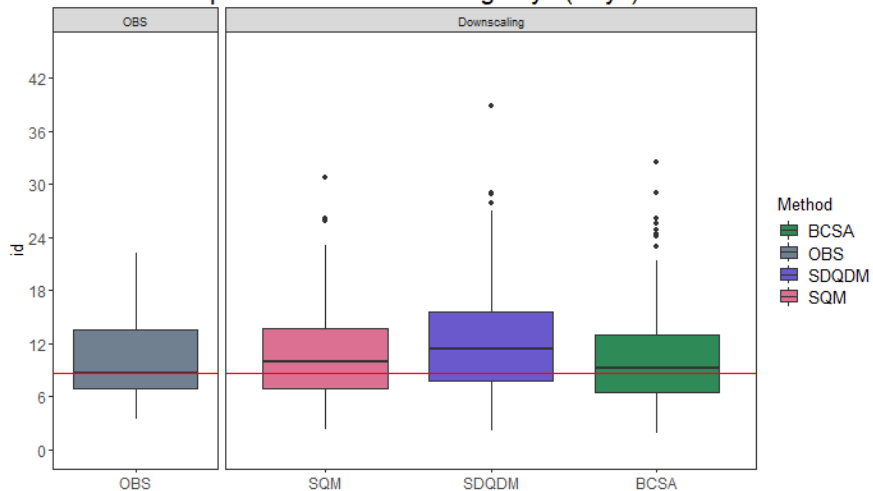
	OBS	SQM	SDQDM	BCSA
Min.	75.98	73.47	77.73	80.57
1st Qu.	92.09	91.71	96.85	93.93
Median	100.13	98.96	104.28	100.13
Mean	98.64	99.19	104.34	99.94
3rd Qu.	104.79	105.9	111.05	105.71
Max.	111.77	130.53	136.52	120.68
NA Count(Year)	0	0	0	0



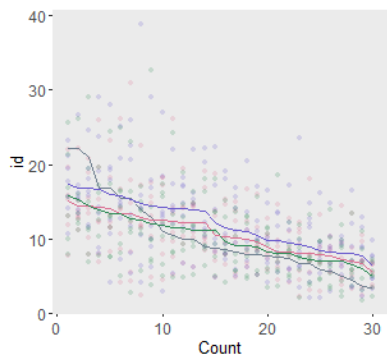
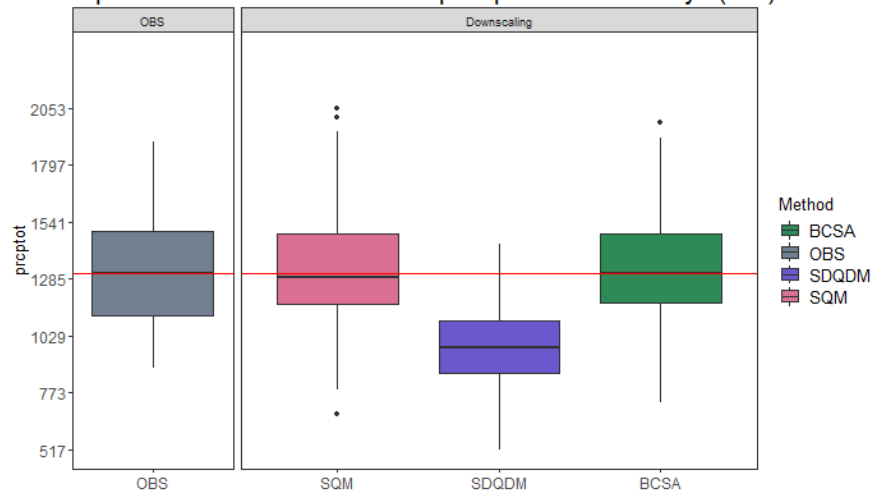
	OBS	SQM	SDQDM	BCSA
Min.	247.68	230.47	226	234.57
1st Qu.	264.06	263.41	256.05	264.2
Median	271.12	272.15	265.17	272.85
Mean	272.36	272.34	265.34	272.6
3rd Qu.	281.06	281.05	273.57	280.91
Max.	298.75	319.05	308.65	314.97
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

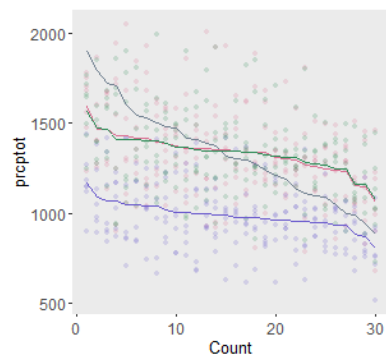
Boxplot of ID: Number of icing days (Days)



Boxplot of PRCPTOT: Annual total precipitation in wet days (mm)



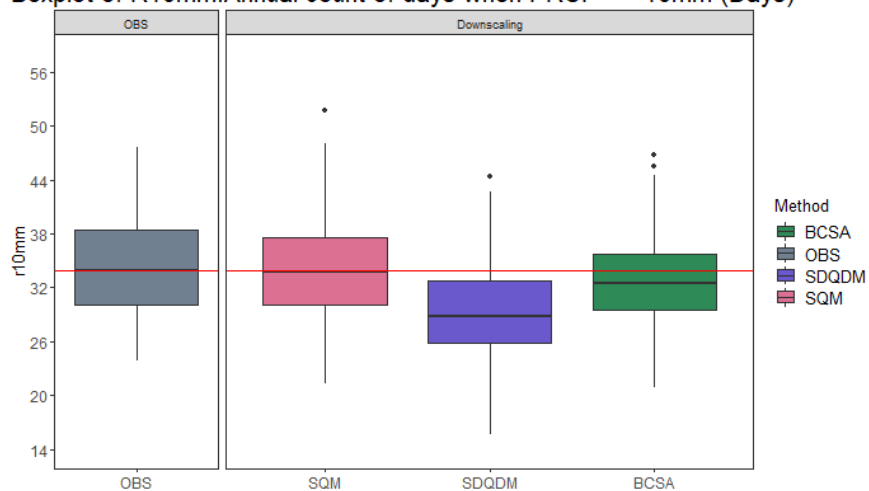
	OBS	SQM	SDQDM	BCSA
Min.	3.47	2.33	2.15	1.78
1st Qu.	6.92	6.94	7.71	6.51
Median	8.68	9.9	11.42	9.23
Mean	10.44	10.68	12.16	10.23
3rd Qu.	13.83	13.85	15.64	13.03
Max.	22.23	30.82	38.82	32.55
NA Count(Year)	0	0	0	0



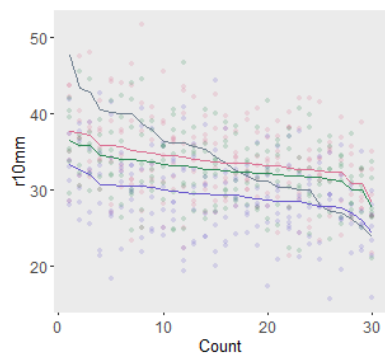
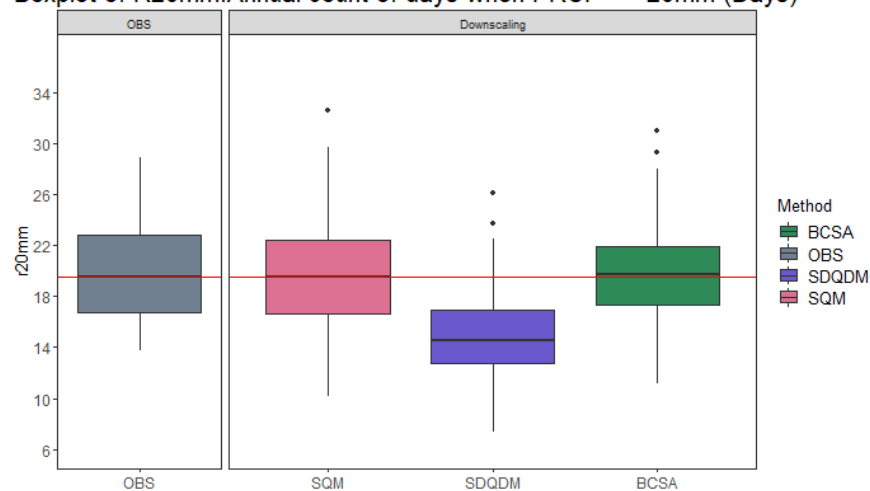
	OBS	SQM	SDQDM	BCSA
Min.	884.98	678.6	518.32	729.82
1st Qu.	1117.05	1169.63	863.04	1176.9
Median	1310.17	1292.38	975.26	1312.02
Mean	1333.36	1336.36	989.32	1336.78
3rd Qu.	1497.35	1490.29	1099.19	1486.93
Max.	1899.58	2051.31	1439.97	1989.55
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

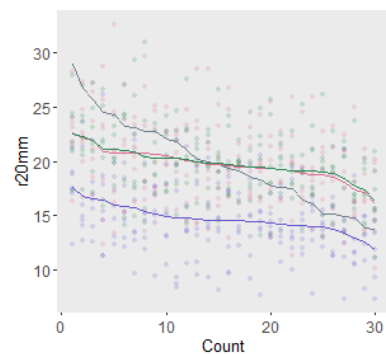
Boxplot of R10mm: Annual count of days when PRCP >= 10mm (Days)



Boxplot of R20mm: Annual count of days when PRCP >= 20mm (Days)



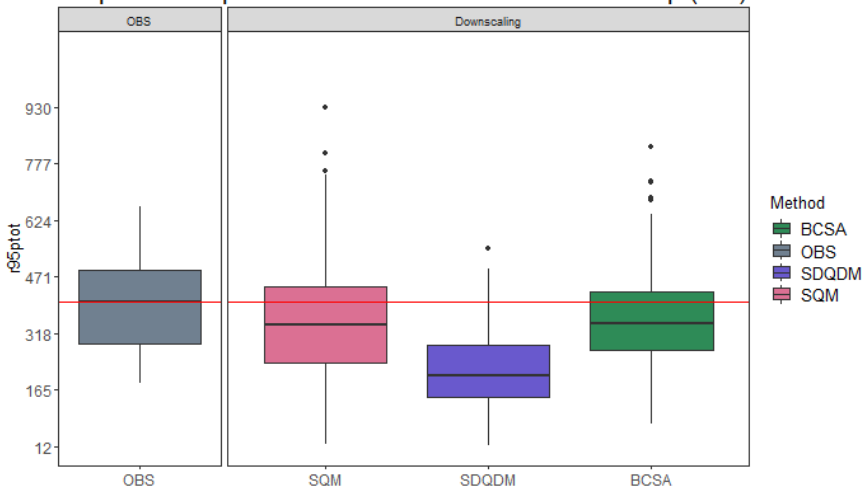
	OBS	SQM	SDQDM	BCSA
Min.	23.83	21.32	15.72	20.93
1st Qu.	30.1	30.07	25.89	29.55
Median	33.95	33.72	28.84	32.55
Mean	34.11	33.85	29.31	32.7
3rd Qu.	38.41	37.58	32.72	35.73
Max.	47.67	51.72	44.42	46.7
NA Count(Year)	0	0	0	0



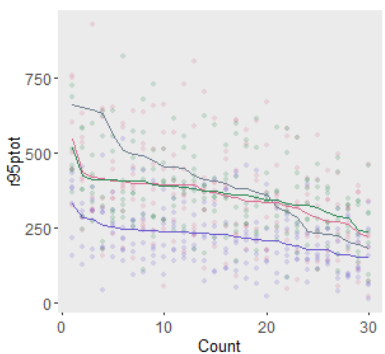
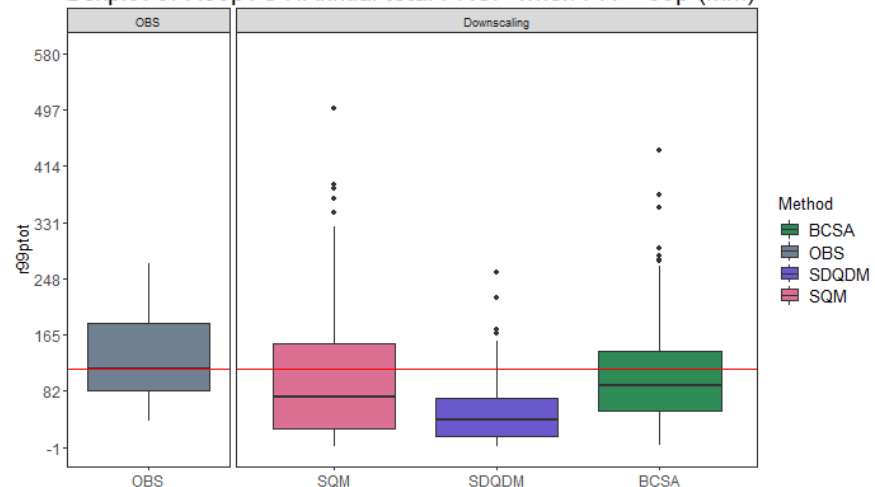
	OBS	SQM	SDQDM	BCSA
Min.	13.7	10.17	7.33	11.13
1st Qu.	16.72	16.65	12.73	17.36
Median	19.54	19.56	14.51	19.76
Mean	19.83	19.71	14.7	19.8
3rd Qu.	22.79	22.41	16.97	21.95
Max.	28.92	32.62	26.1	30.93
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

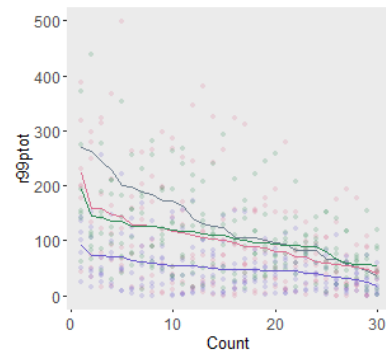
Boxplot of R95pTOT:Annual total PRCP when PR > 95p (mm)



Boxplot of R99pTOT:Annual total PRCP when PR > 99p (mm)



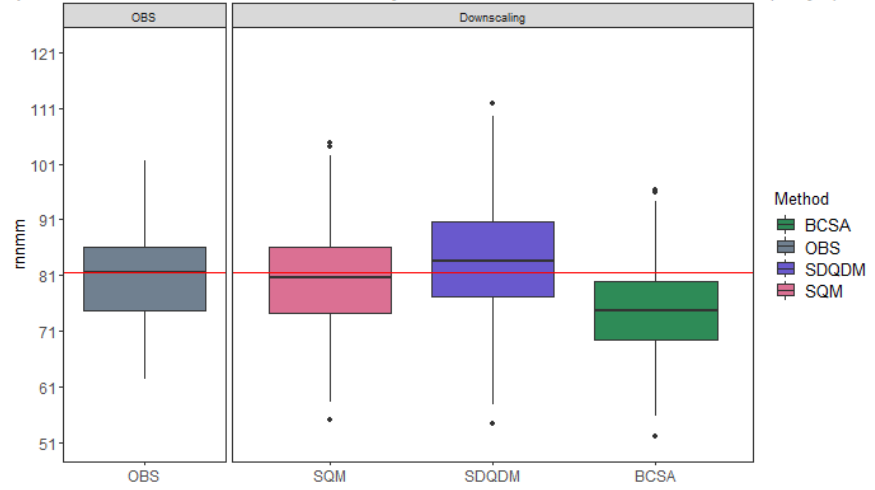
	OBS	SQM	SDQDM	BCSA
Min.	181.33	19.37	13.75	73.8
1st Qu.	289.93	238.2	144.37	272.18
Median	402.22	339.39	203.99	346.03
Mean	400.17	355.64	221.07	361.51
3rd Qu.	488.09	445.64	284.67	429.62
Max.	660.21	928.31	545.7	822.6
NA Count(Year)	0	0	0	0



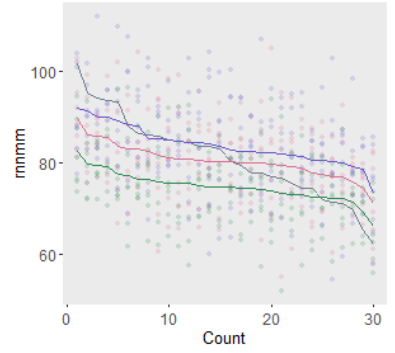
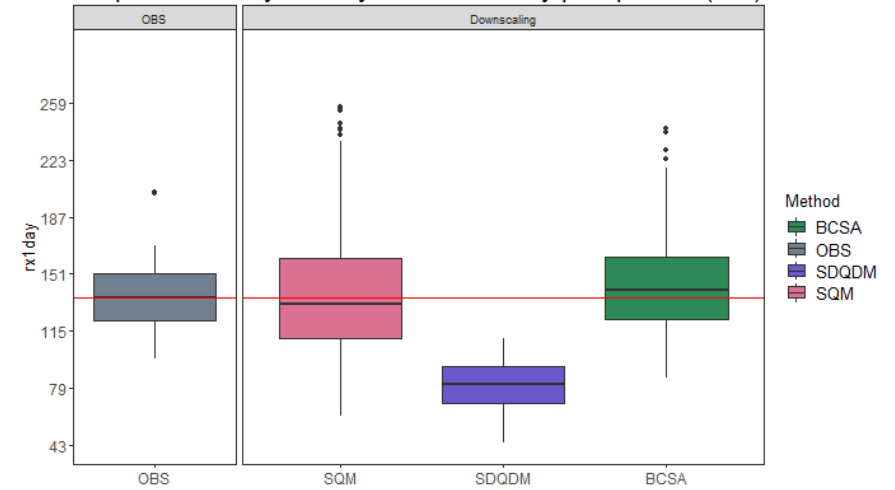
	OBS	SQM	SDQDM	BCSA
Min.	37	0	0	2.19
1st Qu.	82.2	27.43	15.02	53.52
Median	115.09	72.78	39.82	89.98
Mean	133.11	101.16	50.72	105.91
3rd Qu.	182.36	152.01	71.39	141.24
Max.	269.83	498.63	256.84	437.04
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

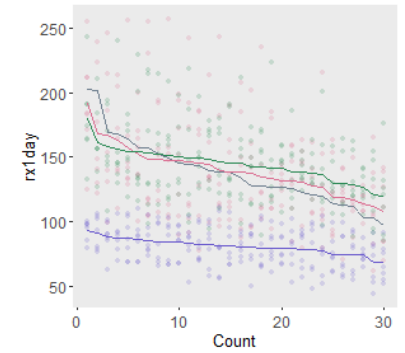
Boxplot of Rnnmm:Annual count of days when PRCP >= nmm, nn is 1 (Days)



Boxplot of Rx1day:Monthly maximum 1-day precipitation (mm)



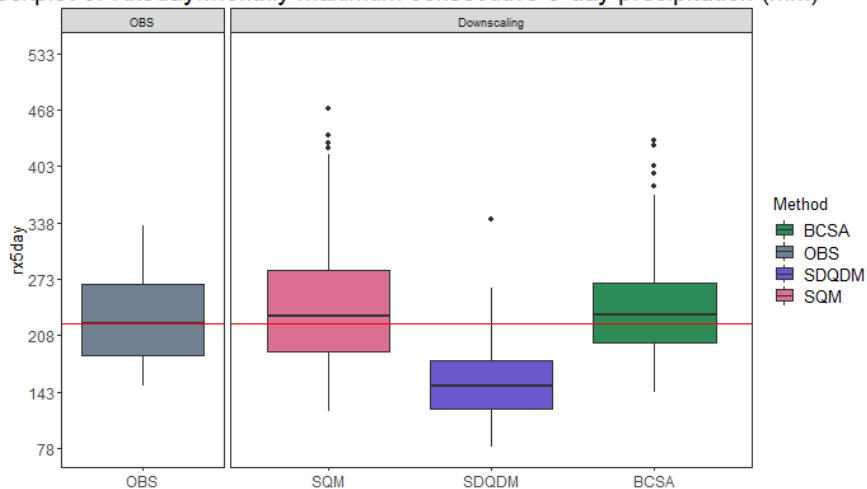
	OBS	SQM	SDQDM	BCSA
Min.	62.32	55.17	54.47	52.05
1st Qu.	74.79	74.2	77.23	69.52
Median	81.6	80.62	83.5	74.58
Mean	81.1	80.41	83.82	74.74
3rd Qu.	86.05	86.06	90.74	79.91
Max.	101.58	104.87	111.87	96.28
NA Count(Year)	0	0	0	0



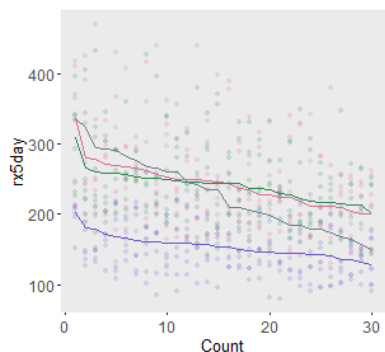
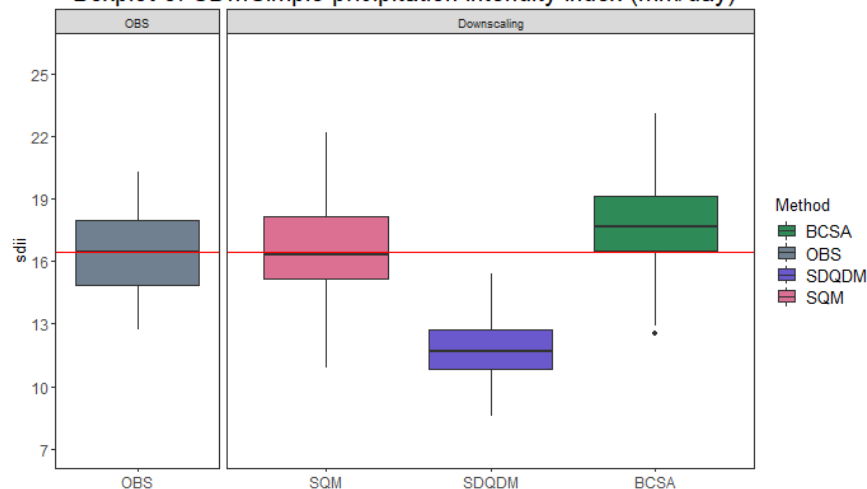
	OBS	SQM	SDQDM	BCSA
Min.	97.45	61.65	44.05	85.21
1st Qu.	121.39	110.07	69.3	122.03
Median	135.92	131.6	81.02	140.59
Mean	138.08	139.41	80.86	144.26
3rd Qu.	151.38	160.68	92.27	161.4
Max.	202.36	256.87	110.67	242.56
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

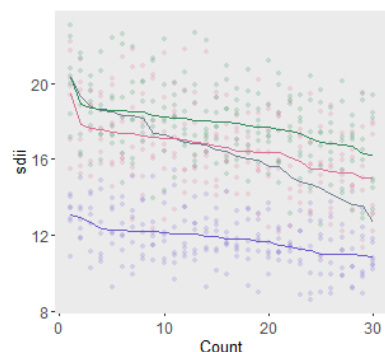
Boxplot of Rx5day: Monthly maximum consecutive 5-day precipitation (mm)



Boxplot of SDII: Simple precipitation intensity index (mm/day)



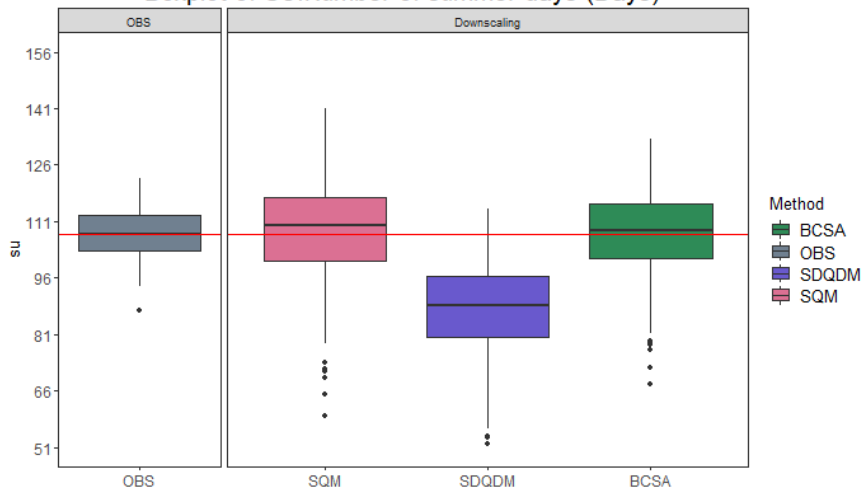
	OBS	SQM	SDQDM	BCSA
Min.	149.81	120.74	79.81	142.34
1st Qu.	184.42	188.97	123.32	199.43
Median	222.23	230.31	149.62	232.29
Mean	228.65	242.03	154.29	240.21
3rd Qu.	267.04	282.56	179.53	269.1
Max.	335.06	470.02	342.48	432.47
NA Count(Year)	0	0	0	0



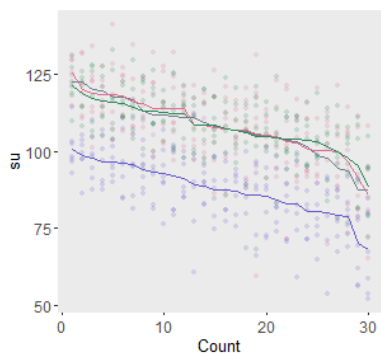
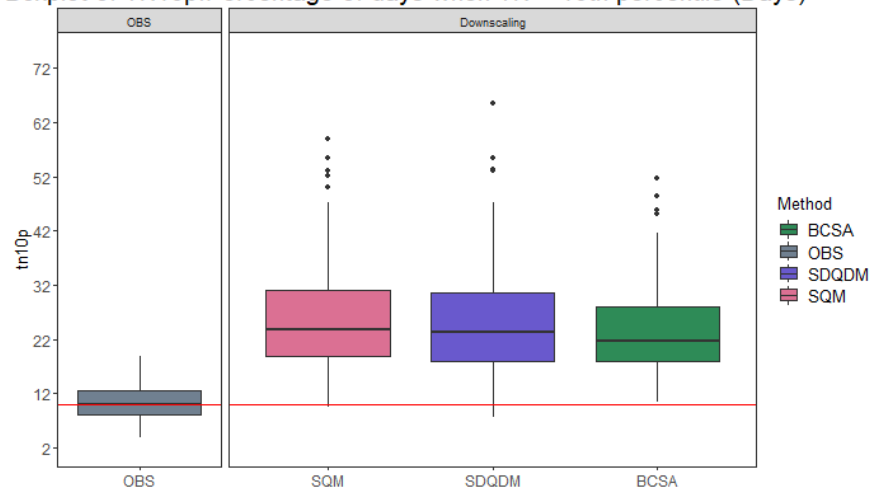
	OBS	SQM	SDQDM	BCSA
Min.	12.7	10.89	8.6	12.54
1st Qu.	14.89	15.16	10.84	16.52
Median	16.45	16.35	11.71	17.7
Mean	16.39	16.61	11.8	17.86
3rd Qu.	17.97	18.18	12.75	19.16
Max.	20.29	22.18	15.43	23.07
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

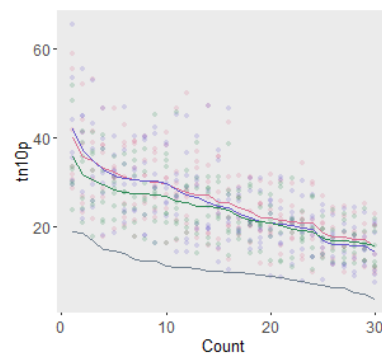
Boxplot of SU: Number of summer days (Days)



Boxplot of TN10p: Percentage of days when TN < 10th percentile (Days)



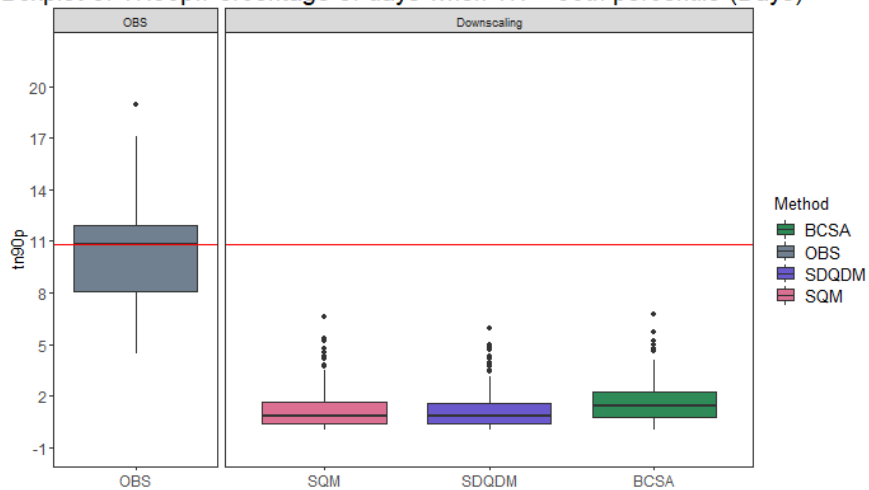
	OBS	SQM	SDQDM	BCSA
Min.	87.27	59.4	52.05	67.9
1st Qu.	103.31	100.6	80.18	101.15
Median	107.52	109.86	88.83	108.82
Mean	107.52	108.25	87.59	107.97
3rd Qu.	112.62	117.54	96.52	115.7
Max.	122.58	141.15	114.25	132.78
NA Count(Year)	0	0	0	0



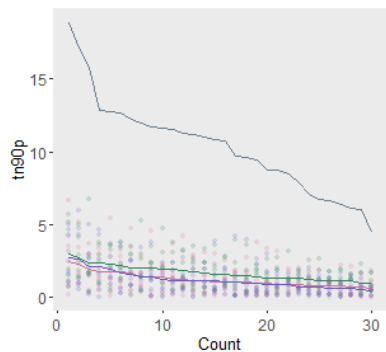
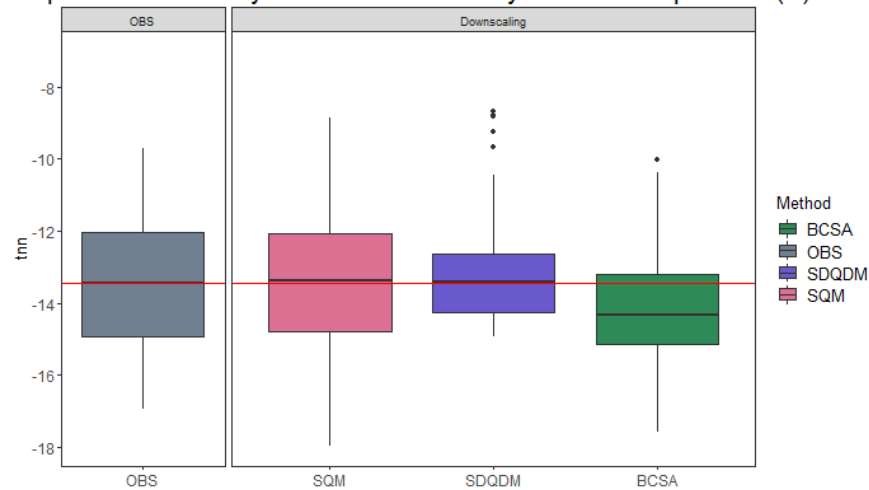
	OBS	SQM	SDQDM	BCSA
Min.	3.85	9.57	7.63	10.47
1st Qu.	7.98	18.8	17.85	17.91
Median	9.93	23.77	23.18	21.65
Mean	10.38	25.69	24.98	23.51
3rd Qu.	12.46	31.1	30.59	28.05
Max.	18.85	58.93	65.48	51.7
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

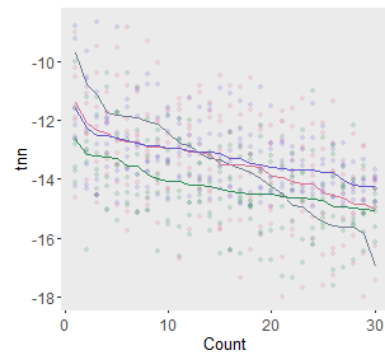
Boxplot of TN90p: Percentage of days when TN > 90th percentile (Days)



Boxplot of TNn: Monthly minimum value of daily minimum temperature (C)



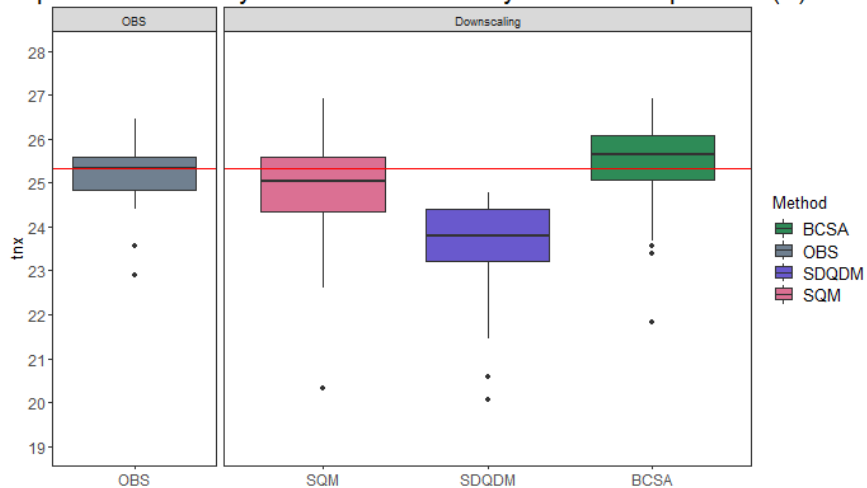
	OBS	SQM	SDQDM	BCSA
Min.	4.44	0	0	0.04
1st Qu.	8.04	0.35	0.4	0.79
Median	10.78	0.85	0.84	1.42
Mean	10.34	1.2	1.18	1.67
3rd Qu.	11.89	1.61	1.57	2.28
Max.	18.9	6.63	5.91	6.75
NA Count(Year)	0	0	0	0



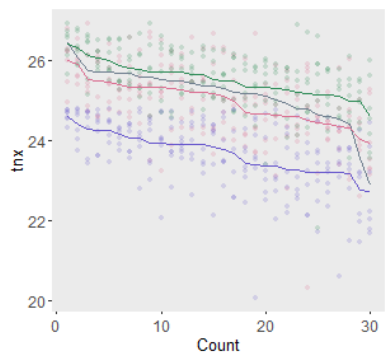
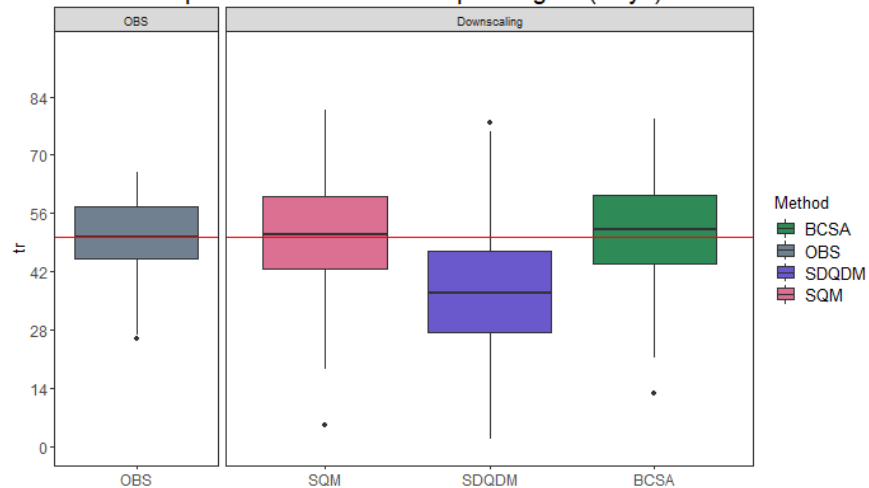
	OBS	SQM	SDQDM	BCSA
Min.	-16.96	-17.99	-14.95	-17.59
1st Qu.	-14.93	-14.79	-14.27	-15.16
Median	-13.44	-13.38	-13.42	-14.32
Mean	-13.49	-13.46	-13.23	-14.21
3rd Qu.	-12.05	-12.06	-12.62	-13.2
Max.	-9.72	-8.87	-8.67	-10.01
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

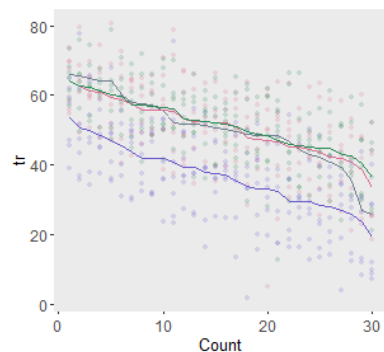
Boxplot of TNx: Monthly maximum value of daily minimum temperature (C)



Boxplot of TR: Number of tropical nights (Days)



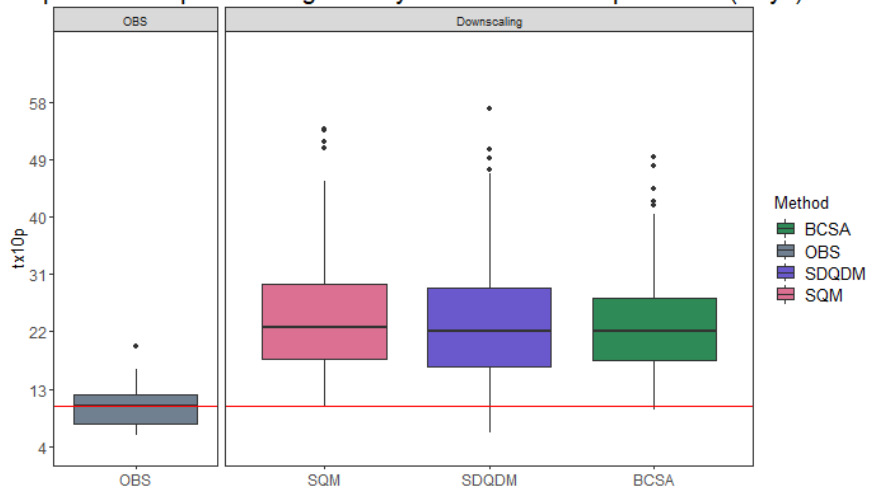
	OBS	SQM	SDQDM	BCSA
<i>Min.</i>	22.9	20.33	20.07	21.82
<i>1st Qu.</i>	24.83	24.33	23.22	25.08
<i>Median</i>	25.33	25.03	23.79	25.64
<i>Mean</i>	25.17	24.98	23.68	25.53
<i>3rd Qu.</i>	25.59	25.59	24.4	26.09
<i>Max.</i>	26.46	26.93	24.79	26.93
<i>NA Count(Year)</i>	0	0	0	0



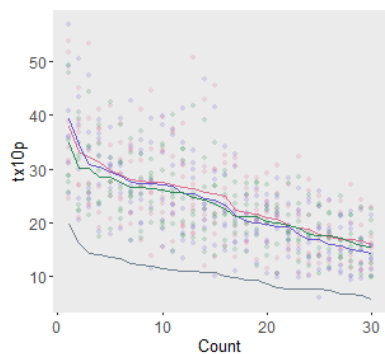
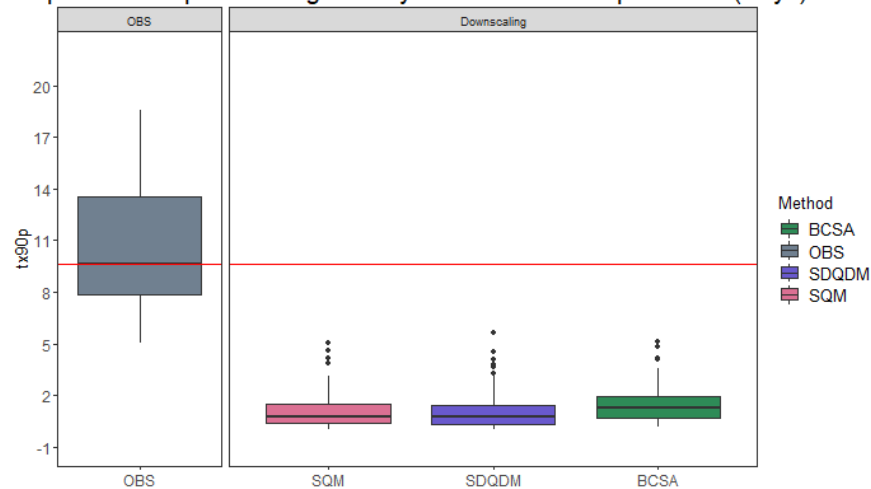
	OBS	SQM	SDQDM	BCSA
<i>Min.</i>	25.95	5.13	1.85	12.8
<i>1st Qu.</i>	45.1	42.61	27.55	43.98
<i>Median</i>	50.38	50.9	36.77	52.12
<i>Mean</i>	50.35	50.85	36.84	51.7
<i>3rd Qu.</i>	57.53	59.91	46.95	60.39
<i>Max.</i>	65.98	80.68	77.73	78.65
<i>NA Count(Year)</i>	0	0	0	0

# Box-plot for climate indices (Historical)

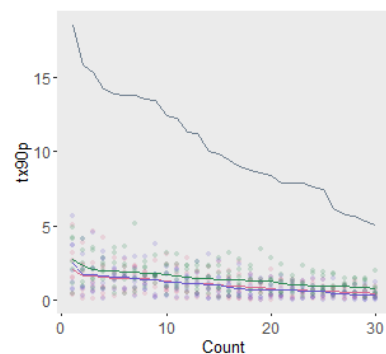
Boxplot of TX10p: Percentage of days when TX < 10th percentile (Days)



Boxplot of TX90p: Percentage of days when TX > 90th percentile (Days)



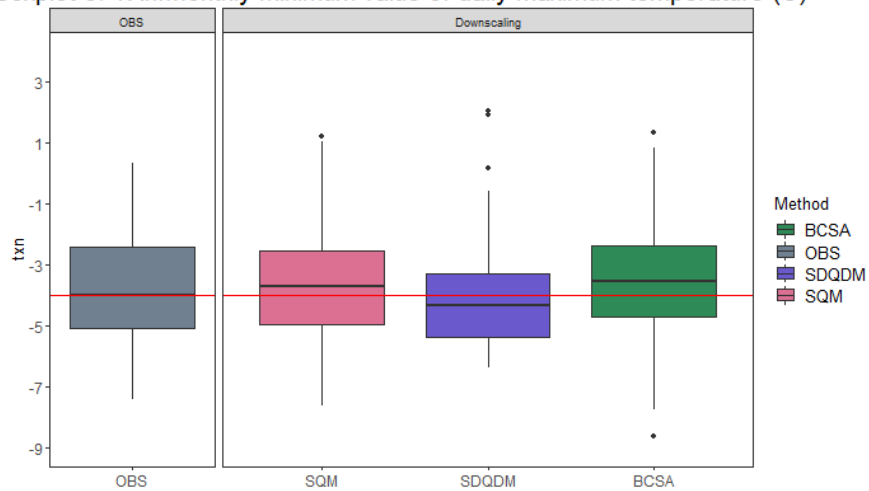
	OBS	SQM	SDQDM	BCSA
Min.	5.78	10.25	6.07	9.83
1st Qu.	7.6	17.72	16.48	17.47
Median	10.33	22.59	22.11	22.08
Mean	10.38	24.21	23.28	23.02
3rd Qu.	12.12	29.36	28.82	27.19
Max.	19.65	53.85	57.01	49.46
NA Count(Year)	0	0	0	0



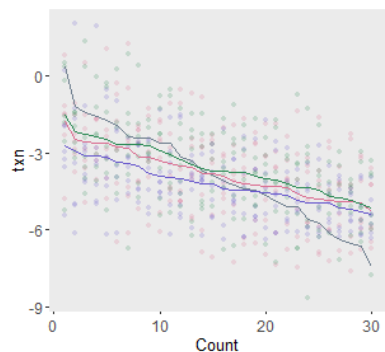
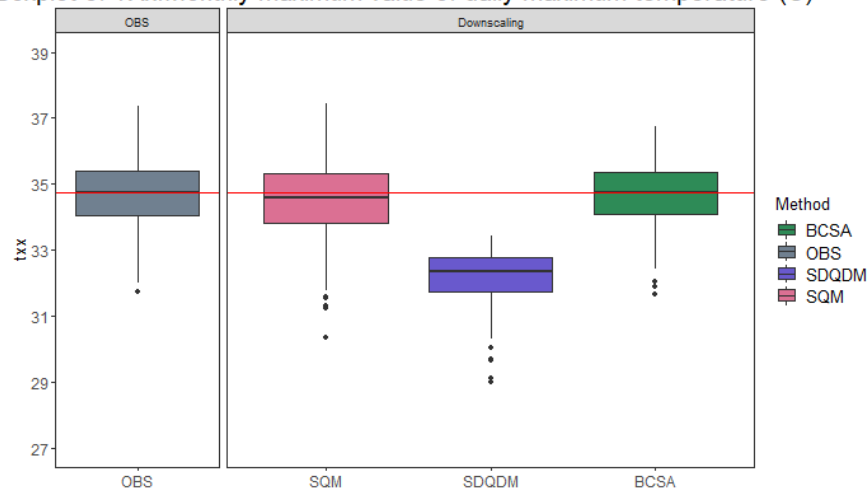
	OBS	SQM	SDQDM	BCSA
Min.	5.03	0	0	0.14
1st Qu.	7.85	0.36	0.29	0.71
Median	9.66	0.77	0.77	1.3
Mean	10.35	1.02	0.99	1.44
3rd Qu.	13.54	1.49	1.44	1.95
Max.	18.56	5.05	5.66	5.1
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

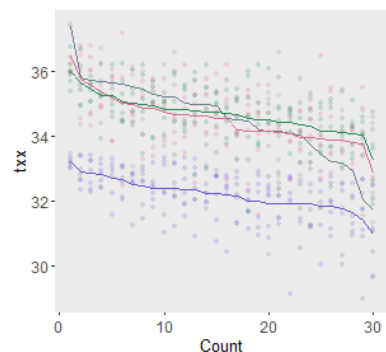
Boxplot of TXn: Monthly minimum value of daily maximum temperature (C)



Boxplot of TXx: Monthly maximum value of daily maximum temperature (C)



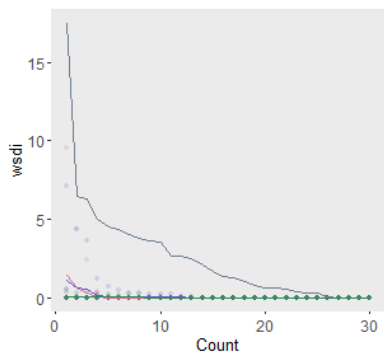
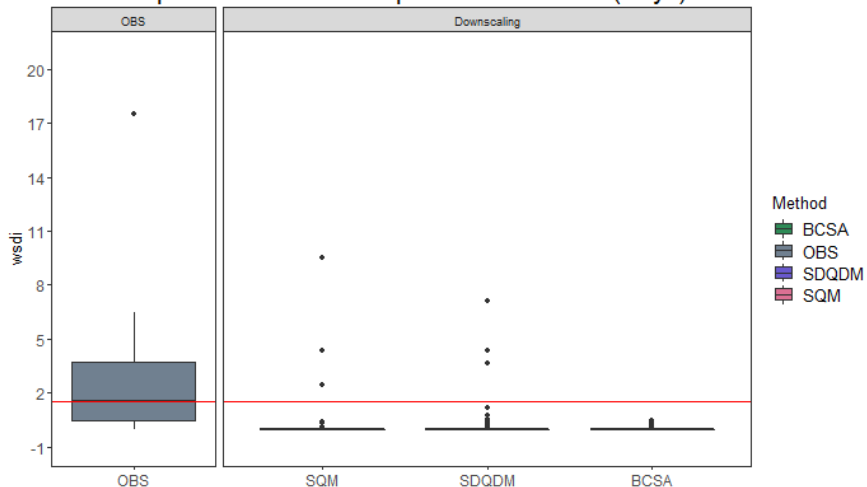
	OBS	SQM	SDQDM	BCSA
Min.	-7.42	-7.61	-6.37	-8.64
1st Qu.	-5.08	-4.94	-5.38	-4.71
Median	-3.99	-3.71	-4.33	-3.53
Mean	-3.84	-3.78	-4.19	-3.55
3rd Qu.	-2.43	-2.54	-3.28	-2.36
Max.	0.35	1.24	2.04	1.35
NA Count(Year)	0	0	0	0



	OBS	SQM	SDQDM	BCSA
Min.	31.74	30.35	28.98	31.67
1st Qu.	34.04	33.82	31.74	34.09
Median	34.73	34.59	32.35	34.72
Mean	34.56	34.51	32.19	34.68
3rd Qu.	35.41	35.32	32.77	35.35
Max.	37.38	37.45	33.44	36.75
NA Count(Year)	0	0	0	0

# Box-plot for climate indices (Historical)

Boxplot of WSDI: Warm spell duration index (Days)



	OBS	SQM	SDQDM	BCSA
Min.	0	0	0	0
1st Qu.	0.43	0	0	0
Median	1.54	0	0	0
Mean	2.81	0.08	0.09	0.01
3rd Qu.	3.75	0	0	0
Max.	17.5	9.53	7.13	0.47
NA Count(Year)	0	0	0	0

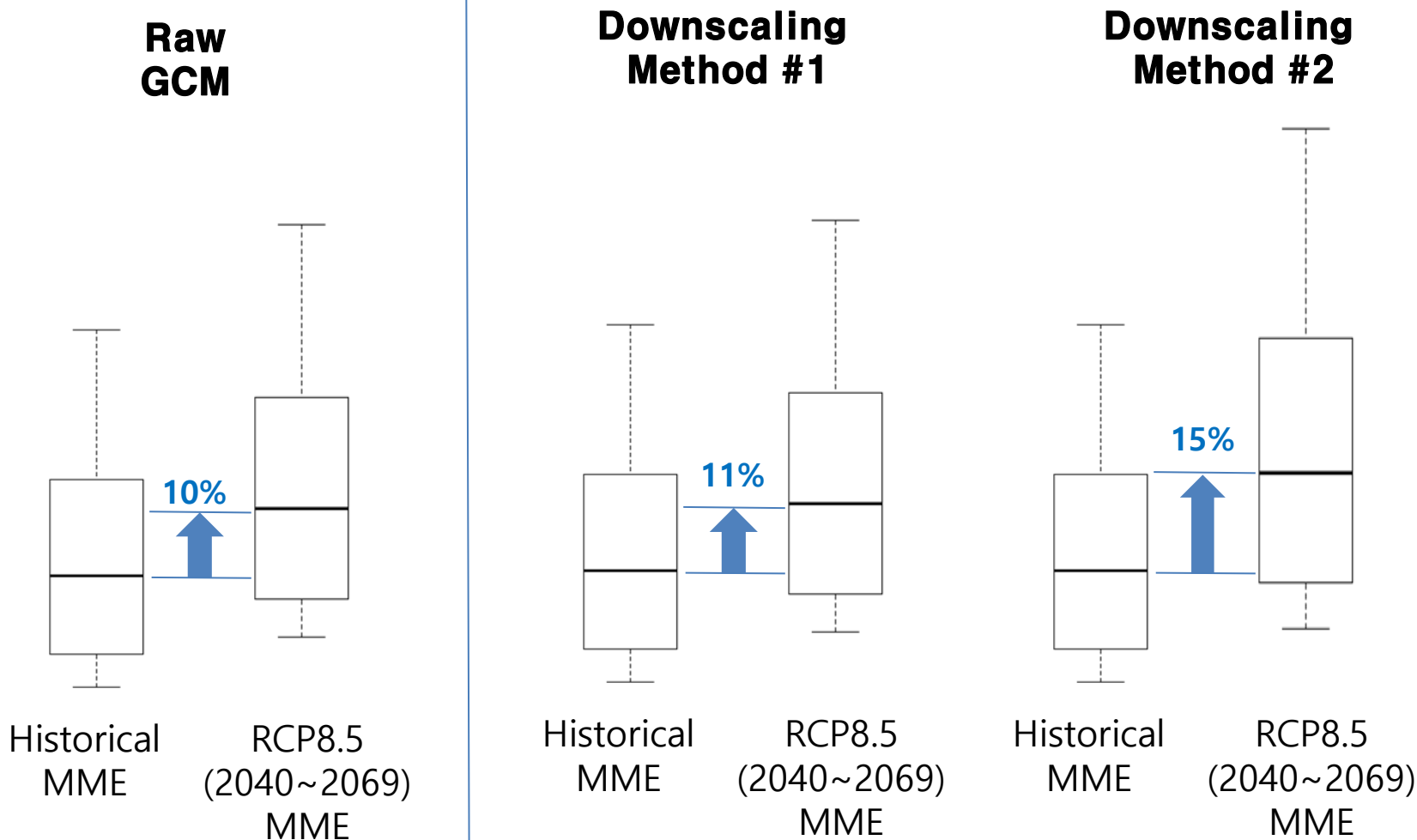
# Hands-on: run AIMS using your data



- ❖ Decide important indices for your objective
- ❖ Select only 4 stations
- ❖ Select your best 5 GCMs

**Check and share your results.**

## 2.2. Comparison of future changes in climate indices before and after downscaling



# Changes in future signal

Signal\_sqm\_bcc-csm1-1\_rcp45.csv

	A	B	C	D
1	Index	S1:2010-2039	S2:2040-2069	S3:2070-2099
2	prcptot	170.4	124.8	210.1
3	cdd	-2.1	-4.2	-1.4
4	cwd	0.4	0.1	0.7
5	r95ptot	86.3	70.3	181.9
6	r99ptot	56.5	30.9	95.6
7	rx1day	13.6	7.9	22.8
8	rx5day	25.0	12.3	58.3
9	sdii	0.7	0.3	1.5
10	rnnmm	6.4	5.7	4.1
11	r10mm	3.4	1.8	2.6
12	r20mm	1.8	1.5	1.5
13	su	24.8	47.4	53.4
14	id	-6.1	-9.3	-10.2
15	txn	2.2	3.8	4.5
16	txx	1.1	3.2	3.9
17	tx10p	-13.3	-19.8	-20.9
18	tx90p	4.6	12.1	17.0
19	wsvdi	2.8	9.6	16.3
20	fd	-24.5	-38.8	-46.6
21	tr	20.0	37.3	42.6
22	tnn	2.5	4.2	5.0
23	tnx	1.3	3.1	3.6
24	tn10p	-14.8	-21.1	-22.2
25	tn90p	4.6	12.1	17.0
26	csdi	-20.7	-25.6	-25.5
27	dtr	0.1	0.0	0.0
28	gsl	29.6	12.4	16.4

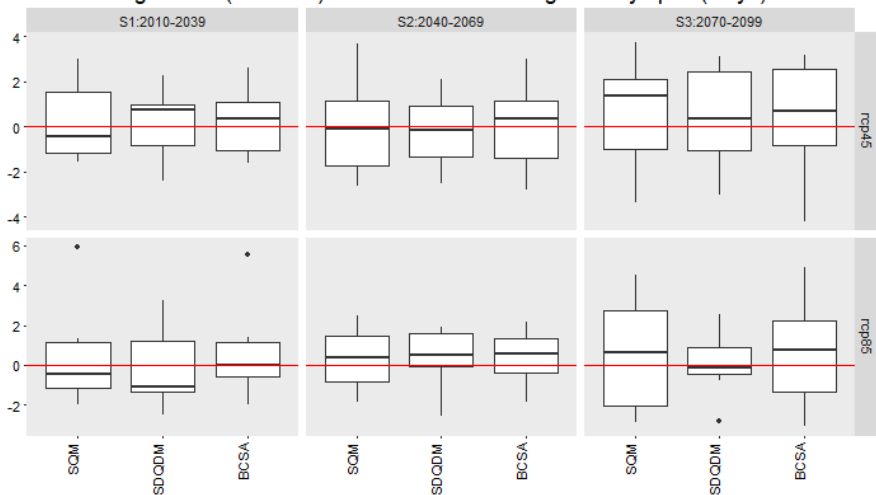
Signal\_sqm\_bcc-csm1-1\_rcp45\_original.csv

	A	B	C	D
1	Index	S1:2010-2039	S2:2040-2069	S3:2070-2099
2	prcptot	108.6	93.9	120.2
3	cdd	0.5	-1.1	0.5
4	cwd	0.1	-0.3	0.2
5	r95ptot	45.1	46.3	93.6
6	r99ptot	16.1	7.0	52.3
7	rx1day	4.9	3.6	8.7
8	rx5day	8.2	1.6	24.9
9	sdii	0.5	0.3	0.8
10	rnnmm	5.7	6.0	2.8
11	r10mm	3.4	3.1	2.7
12	r20mm	2.4	1.9	2.0
13	su	14.7	36.2	41.9
14	id	-1.5	-3.2	-4.1
15	txn	1.0	1.5	2.2
16	txx	0.8	2.1	2.7
17	tx10p	-13.4	-19.9	-21.0
18	tx90p	4.6	12.1	17.1
19	wsvdi	3.1	10.1	17.5
20	fd	-4.1	-7.4	-9.2
21	tr	19.1	35.0	38.1
22	tnn	1.0	1.6	2.2
23	tnx	0.8	1.8	2.2
24	tn10p	-14.7	-21.1	-22.3
			12.6	17.5
			-25.6	-25.5
			0.0	0.0
			12.4	16.4

Change in Signal =  
 [RCP – RCP\_Historical] –  
 [RCP\_Original – RCP\_Original\_Historical]

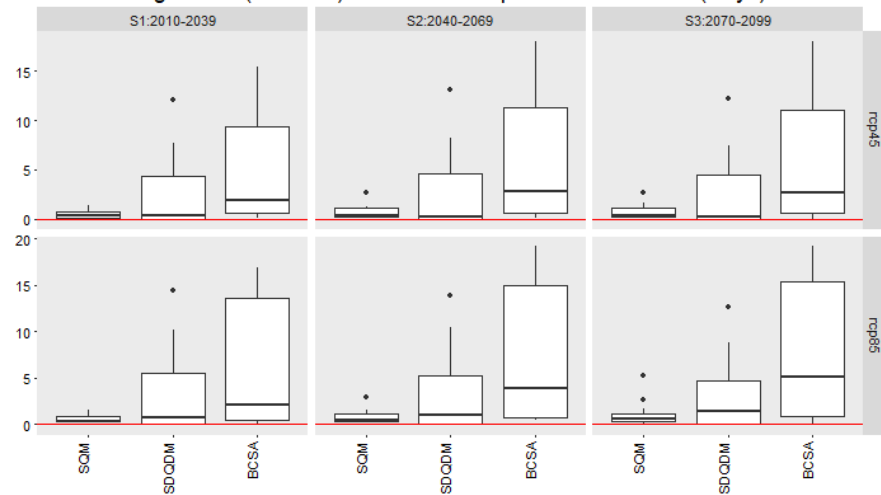
# Box-plot for climate indices (Future)

Signal Diff.(DS-Raw) of CDD:Maximum length of dry spell (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-1.56	-2.41	-1.6	-2.84	-2.55	-2.8	-3.36	-3.04	-4.23
<i>Summary</i> 1st Qu.	-1.16	-0.83	-1.09	-1.71	-1.32	-1.41	-1	-1.03	-0.81
<i>Table of rcp45</i> Median	-0.44	0.77	0.37	-0.1	-0.13	0.34	1.39	0.38	0.71
<i>Table of rcp45</i> Mean	0.25	0.13	0.2	-0.04	-0.2	0	0.58	0.47	0.45
<i>Table of rcp45</i> 3rd Qu.	1.53	0.97	1.11	1.12	0.93	1.12	2.13	2.45	2.57
<i>Table of rcp45</i> Max.	2.99	2.25	2.62	3.67	2.09	3.03	3.77	3.12	3.17
<i>Summary</i> Min.	-1.97	-2.5	-1.94	-1.84	-2.55	-1.84	-2.83	-2.78	-3.08
<i>Summary</i> 1st Qu.	-1.15	-1.34	-0.6	-0.85	-0.05	-0.36	-2.02	-0.47	-1.31
<i>Table of rcp85</i> Median	-0.45	-1.06	0.01	0.39	0.51	0.59	0.63	-0.14	0.78
<i>Table of rcp85</i> Mean	0.49	-0.09	0.66	0.31	0.43	0.41	0.73	0.07	0.64
<i>Table of rcp85</i> 3rd Qu.	1.12	1.19	1.14	1.44	1.62	1.34	2.53	0.9	2.23
<i>Table of rcp85</i> Max.	5.92	3.23	5.52	2.46	1.9	2.17	4.49	2.54	4.92

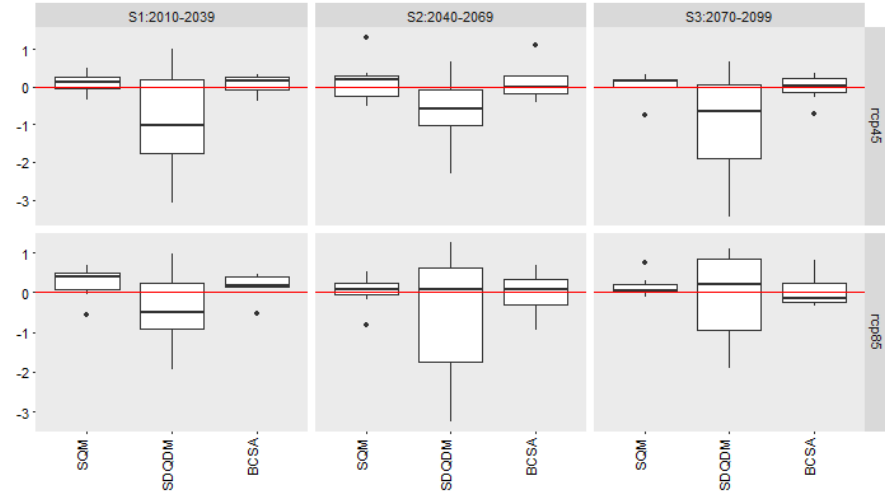
Signal Diff.(DS-Raw) of CSDI: Cold spell duration index (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	0.02	-0.14	0.13	0.03	-0.2	0.02	0.05	-0.09	-0.11
<i>Summary</i> 1st Qu.	0.11	-0.06	0.53	0.22	0.01	0.56	0.19	0	0.6
<i>Table of rcp45</i> Median	0.28	0.28	1.85	0.34	0.25	2.75	0.3	0.16	2.7
<i>Table of rcp45</i> Mean	0.42	2.59	5.22	0.72	2.77	6.38	0.73	2.66	6.41
<i>Table of rcp45</i> 3rd Qu.	0.67	4.35	9.42	1.11	4.55	11.36	1.13	4.51	11
<i>Table of rcp45</i> Max.	1.38	12.08	15.44	2.66	13.14	18.08	2.66	12.28	18.09
<i>Summary</i> Min.	0.1	-0.14	0.04	0.15	-0.19	0.38	-0.03	-0.1	0.04
<i>Summary</i> 1st Qu.	0.23	-0.01	0.46	0.27	-0.03	0.68	0.3	0.08	0.87
<i>Table of rcp85</i> Median	0.33	0.75	2.05	0.41	0.98	3.89	0.59	1.35	5.16
<i>Table of rcp85</i> Mean	0.54	3.24	6.34	0.78	3.14	7.66	1.09	2.93	7.94
<i>Table of rcp85</i> 3rd Qu.	0.88	5.51	13.66	1.07	5.25	15.02	1.14	4.7	15.37
<i>Table of rcp85</i> Max.	1.47	14.43	16.93	2.94	13.89	19.25	5.27	12.63	19.25

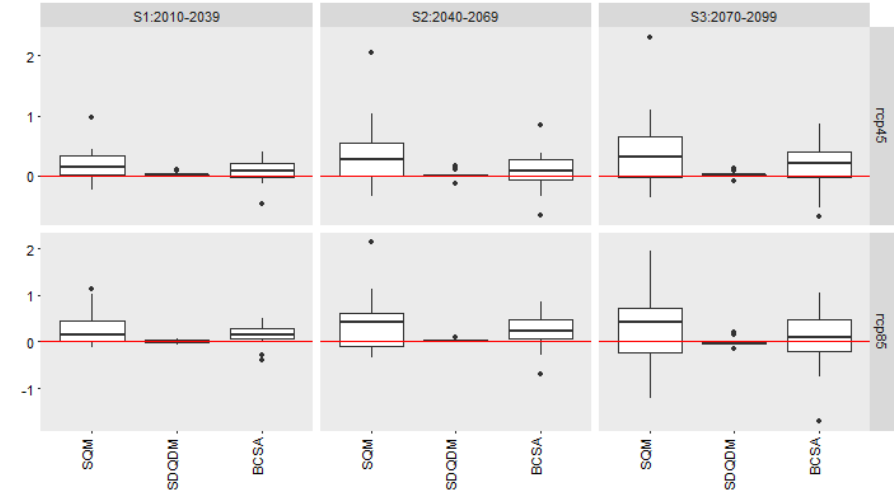
# Box-plot for climate indices (Future)

Signal Diff.(DS-Row) of CWD:Maximum length of wet spell (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<b>Summary Table of rcp45</b>	Min. -0.34	-3.07	-0.39	-0.53	-2.32	-0.41	-0.74	-3.46	-0.72
1st Qu.	-0.03	-1.77	-0.09	-0.25	-1.02	-0.18	-0.02	-1.91	-0.13
Median	0.14	-1.01	0.17	0.19	-0.59	-0.01	0.16	-0.64	0.04
Mean	0.11	-0.89	0.06	0.15	-0.64	0.13	0.02	-1.02	-0.01
3rd Qu.	0.26	0.18	0.25	0.29	-0.09	0.28	0.2	0.05	0.24
Max.	0.48	1.01	0.32	1.32	0.66	1.1	0.34	0.65	0.37
<b>Summary Table of rcp85</b>	Min. -0.55	-1.93	-0.53	-0.81	-3.27	-0.96	-0.1	-1.9	-0.35
1st Qu.	0.08	-0.91	0.13	-0.06	-1.76	-0.31	0	-0.93	-0.23
Median	0.38	-0.51	0.17	0.09	0.07	0.08	0.06	0.22	-0.13
Mean	0.23	-0.4	0.16	0.02	-0.6	-0.02	0.15	-0.1	0.05
3rd Qu.	0.48	0.25	0.39	0.24	0.63	0.33	0.19	0.86	0.23
Max.	0.67	0.99	0.46	0.51	1.27	0.68	0.74	1.11	0.82

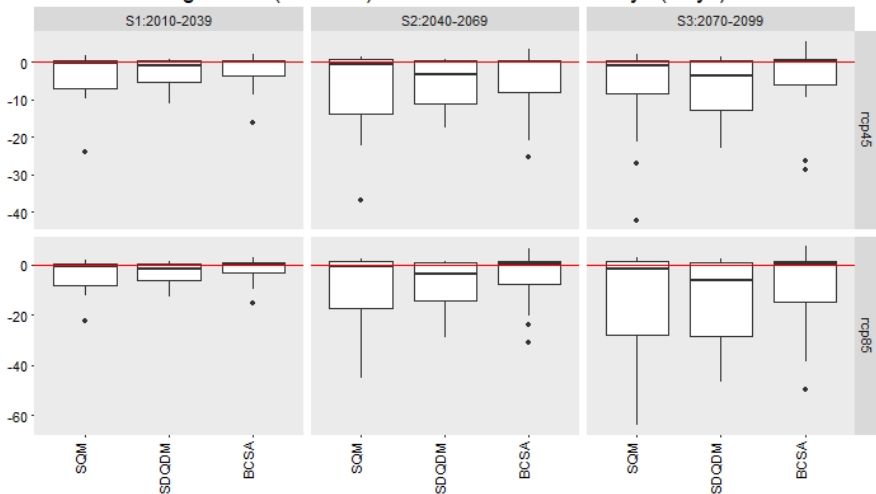
Signal Diff.(DS-Row) of DTR:Daily temperature range (C)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<b>Summary Table of rcp45</b>	Min. -0.23	-0.02	-0.48	-0.34	-0.14	-0.66	-0.36	-0.09	-0.69
1st Qu.	0.01	0	-0.02	0	0	-0.06	-0.03	-0.01	-0.02
Median	0.14	0.01	0.08	0.27	0.01	0.08	0.32	0.01	0.2
Mean	0.19	0.02	0.07	0.38	0.02	0.09	0.42	0.01	0.14
3rd Qu.	0.32	0.02	0.2	0.65	0.01	0.28	0.65	0.02	0.39
Max.	0.98	0.1	0.41	2.06	0.16	0.84	2.32	0.12	0.86
<b>Summary Table of rcp85</b>	Min. -0.13	-0.07	-0.39	-0.34	-0.02	-0.7	-1.22	-0.16	-1.72
1st Qu.	0.01	-0.01	0.06	-0.1	0	0.06	-0.22	-0.03	-0.19
Median	0.15	0.01	0.14	0.41	0.01	0.22	0.43	-0.01	0.09
Mean	0.29	0.01	0.14	0.42	0.02	0.21	0.3	0.01	0.05
3rd Qu.	0.44	0.05	0.28	0.61	0.04	0.48	0.71	0.02	0.49
Max.	1.12	0.07	0.51	2.15	0.11	0.85	1.96	0.21	1.05

# Box-plot for climate indices (Future)

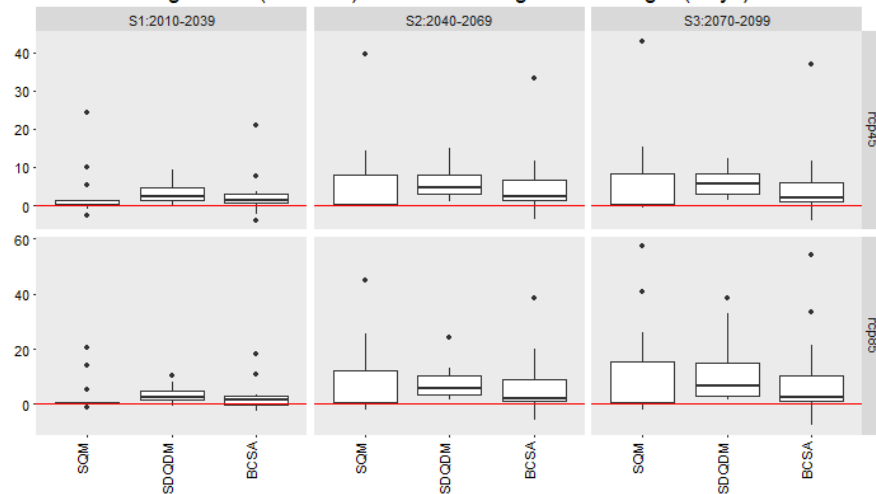
Signal Diff.(DS-Raw) of FD: Number of frost days (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>	Min. -23.93	-11.02	-16.07	-38.9	-17.45	-25.28	-42.41	-22.85	-28.89
<i>Table of rcp45</i>	1st Qu. -7.1	-5.41	-3.6	-13.84	-10.99	-8.05	-8.39	-12.66	-6
	Median -0.28	-1	0.23	-0.62	-3.22	0.23	-0.89	-3.73	0.3
	Mean -3.7	-2.96	-2.23	-7.14	-5.98	-4.66	-7.56	-6.87	-4.57
	3rd Qu. 0.57	0.41	0.64	0.72	0.47	0.59	0.64	0.45	0.72
	Max. 1.73	0.86	2.36	1.67	0.84	3.72	2.17	1.61	5.78

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>	Min. -22.59	-13.04	-15.21	-44.93	-28.81	-31.24	-64.05	-46.9	-49.91
<i>Table of rcp85</i>	1st Qu. -8.49	-6.29	-3.45	-17.32	-14.47	-7.76	-27.97	-28.72	-14.69
	Median -0.72	-1.61	0.02	-0.84	-3.82	0.44	-1.98	-6.32	0.15
	Mean -4.16	-3.32	-2.4	-8.9	-8.37	-5.47	-14.19	-14.26	-9.82
	3rd Qu. 0.27	0.34	0.73	1.32	0.71	1.19	1.33	0.99	1.37
	Max. 1.57	1.11	2.89	2.28	1.49	6.52	2.86	2.38	7.43

Signal Diff.(DS-Raw) of GSL: Growing season length (Days)

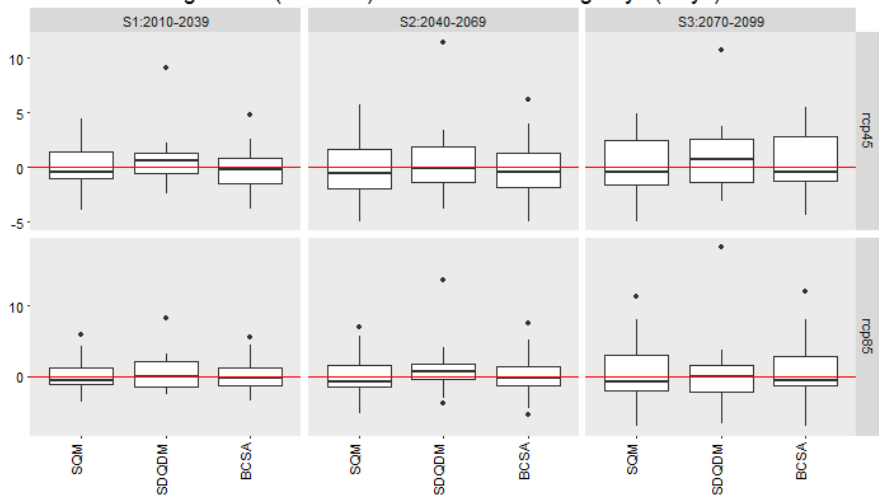


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>	Min. -2.48	-0.06	-4.01	-0.01	1.16	-3.76	-0.74	1.38	-3.83
<i>Table of rcp45</i>	1st Qu. 0.03	1.25	0.78	0.05	2.86	1.38	0.04	2.88	0.99
	Median 0.08	2.47	1.43	0.13	4.56	2.22	0.12	5.78	2.1
	Mean 2.8	3.16	2.79	5.65	5.73	4.96	6.01	6.1	5.18
	3rd Qu. 1.39	4.68	2.98	8.11	8.12	6.58	8.25	8.22	6.12
	Max. 24.21	9.47	21.03	39.4	15.1	33.11	42.99	12.17	36.78

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>	Min. -1.41	-0.52	-2.71	-2.26	1.79	-5.86	-2	1.57	-7.87
<i>Table of rcp85</i>	1st Qu. 0.04	1.44	-0.28	0.05	3.37	1.29	0.06	2.83	1.2
	Median 0.1	2.51	1.53	0.1	5.93	2.19	0.12	6.86	2.33
	Mean 2.92	3.44	2.79	7.29	7.51	6.02	10.91	11.51	9.05
	3rd Qu. 0.79	4.64	3.19	12.25	10.19	8.87	15.26	15.17	10.57
	Max. 20.66	10.49	18.29	44.94	24.23	38.38	57.46	38.5	54.02

# Box-plot for climate indices (Future)

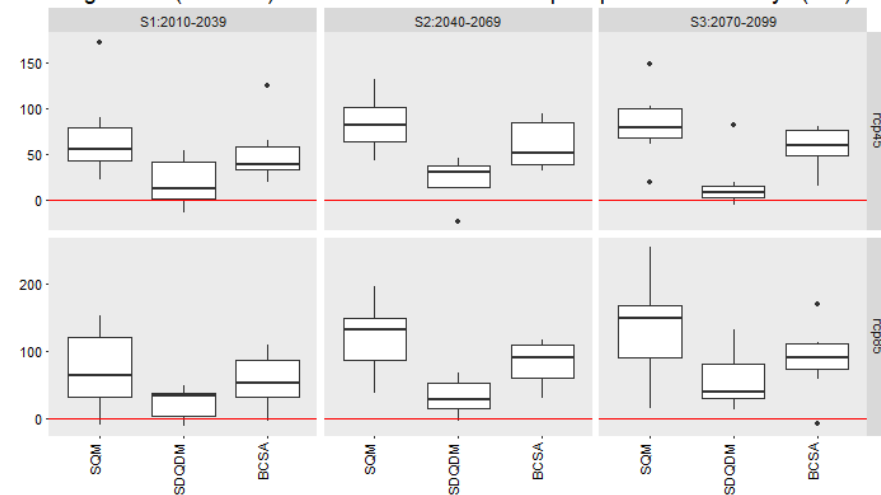
Signal Diff.(DS-Row) of ID: Number of icing days (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-3.91	-2.41	-3.83	-4.97	-3.84	-4.9	-4.92	-3.04	-4.32
<i>Table of rcp45</i> 1st Qu.	-1.02	-0.52	-1.41	-1.93	-1.38	-1.85	-1.59	-1.32	-1.24
<i>Table of rcp45</i> Median	-0.45	0.61	-0.2	-0.59	-0.03	-0.41	-0.43	0.77	-0.44
<i>Table of rcp45</i> Mean	0.12	0.79	-0.01	-0.19	0.68	-0.15	0.29	1.12	0.25
<i>Table of rcp45</i> 3rd Qu.	1.46	1.34	0.82	1.71	1.9	1.29	2.48	2.58	2.81
<i>Table of rcp45</i> Max.	4.52	9.11	4.8	5.71	11.48	6.17	4.97	10.73	5.5

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-3.7	-2.5	-3.43	-5.19	-3.81	-5.44	-7.14	-6.75	-7.09
<i>Table of rcp85</i> 1st Qu.	-1.19	-1.42	-1.28	-1.4	-0.32	-1.23	-2.05	-2.27	-1.33
<i>Table of rcp85</i> Median	-0.55	0.05	-0.3	-0.72	0.63	-0.27	-0.82	-0.12	-0.51
<i>Table of rcp85</i> Mean	0.17	0.61	0.22	0.13	1.15	0.18	0.54	0.58	0.78
<i>Table of rcp85</i> 3rd Qu.	1.23	2.06	1.26	1.64	1.83	1.44	2.99	1.59	2.78
<i>Table of rcp85</i> Max.	5.92	8.25	5.52	7.05	13.57	7.5	11.36	18.36	12.05

Signal Diff.(DS-Row) of PRCP TOT: Annual total precipitation in wet days (mm)

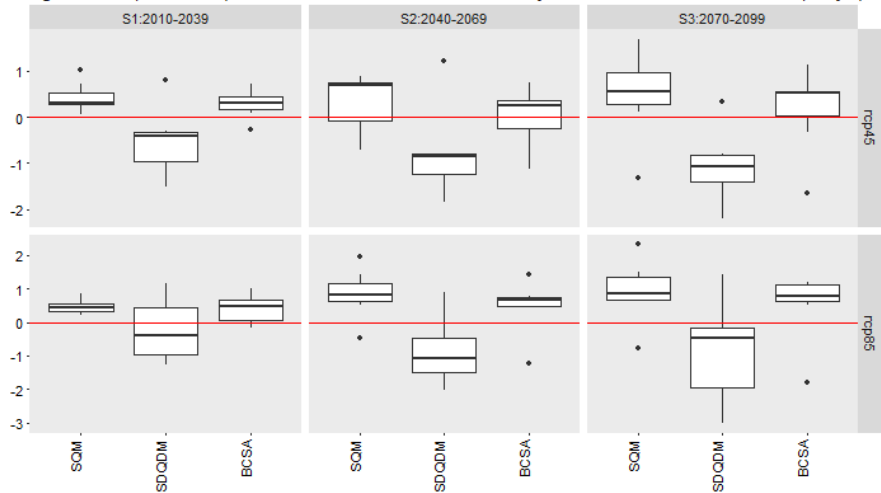


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	21.57	-14.4	19.18	42.28	-24.29	30.91	18.77	-5.94	14.82
<i>Table of rcp45</i> 1st Qu.	43.3	1.44	33.36	63.32	13.92	38.28	68.36	2.04	47.81
<i>Table of rcp45</i> Median	54.85	12.2	38.97	81.48	30.15	51.68	78.77	7.29	58.72
<i>Table of rcp45</i> Mean	70.63	19.38	52.5	83.4	21.86	60.12	83.33	16.6	57.21
<i>Table of rcp45</i> 3rd Qu.	79.35	40.94	58.64	101.19	36.75	83.71	100.23	14.38	75.52
<i>Table of rcp45</i> Max.	172.65	53.11	125.34	131.03	45.84	94.28	148.59	82.03	80.26

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-10.11	-13.06	-3.76	37.83	-5.19	29.45	13.9	11.86	-9.09
<i>Table of rcp85</i> 1st Qu.	31.49	3.9	31.79	85.45	14.25	58.98	89.25	29.61	72.45
<i>Table of rcp85</i> Median	64.53	34.22	52.61	131.15	28.51	89.74	147.97	39.73	90.75
<i>Table of rcp85</i> Mean	73.11	21.95	55.96	119.37	31.9	81.89	133.11	57.49	88.11
<i>Table of rcp85</i> 3rd Qu.	121.21	38.05	85.52	149.48	52.01	109.38	168.07	79.86	110.17
<i>Table of rcp85</i> Max.	151.96	48.59	108.25	196.71	67.49	117.32	255.27	131.92	169.87

# Box-plot for climate indices (Future)

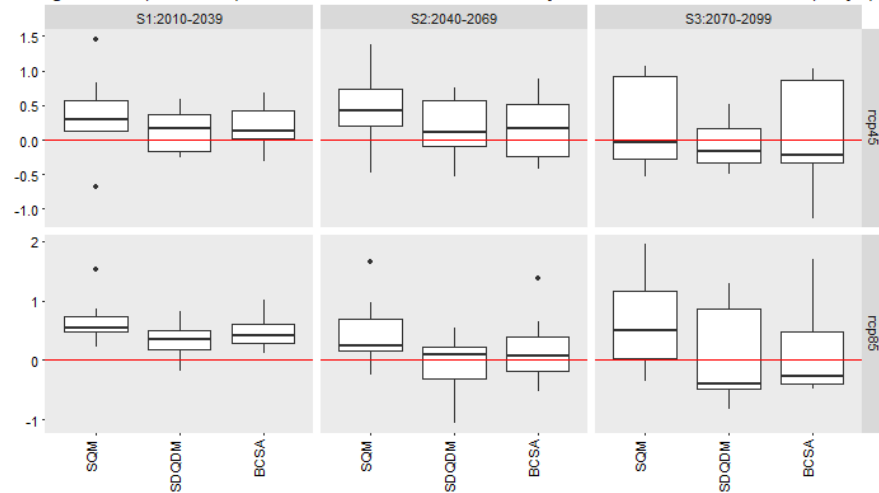
Signal Diff.(DS-Row) of R10mm:Annual count of days when PRCP >= 10mm (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
Summary	Min.	0.05	-1.51	-0.27	-0.7	-1.85	-1.12	-1.32	-2.21	-1.66
Table of rcp45	1st Qu.	0.27	-0.97	0.16	-0.08	-1.25	-0.24	0.27	-1.39	0.03
	Median	0.3	-0.4	0.31	0.7	-0.84	0.26	0.55	-1.08	0.53
	Mean	0.42	-0.52	0.28	0.32	-0.8	0.02	0.48	-1.06	0.17
	3rd Qu.	0.52	-0.32	0.44	0.74	-0.8	0.36	0.96	-0.82	0.57
	Max.	1.02	0.82	0.72	0.9	1.22	0.75	1.7	0.33	1.12

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
Summary	Min.	0.21	-1.26	-0.17	-0.46	-2.02	-1.24	-0.78	-3.04	-1.79
Table of rcp85	1st Qu.	0.34	-0.97	0.05	0.61	-1.49	0.49	0.68	-1.94	0.64
	Median	0.44	-0.39	0.48	0.83	-1.09	0.65	0.87	-0.46	0.78
	Mean	0.47	-0.22	0.4	0.83	-0.87	0.47	0.92	-0.89	0.53
	3rd Qu.	0.55	0.45	0.68	1.15	-0.47	0.73	1.33	-0.16	1.13
	Max.	0.85	1.17	1.02	1.95	0.91	1.44	2.34	1.43	1.2

Signal Diff.(DS-Row) of R20mm:Annual count of days when PRCP >= 20mm (Days)

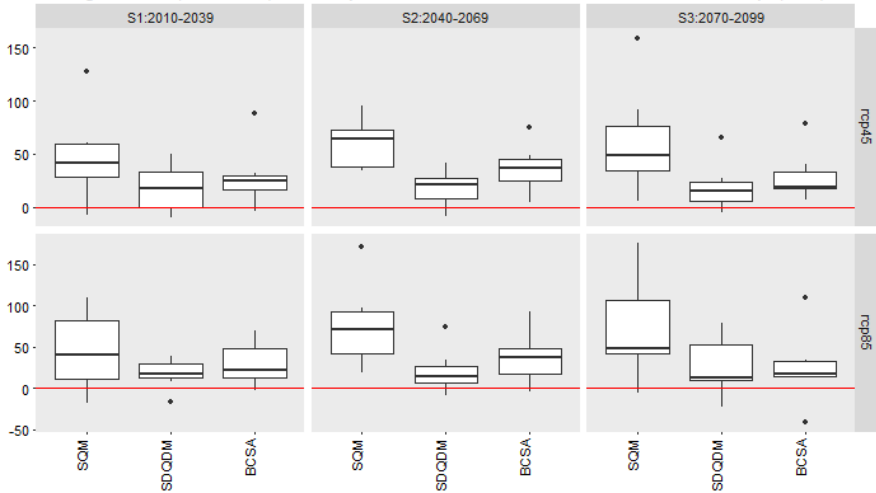


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
Summary	Min.	-0.68	-0.26	-0.32	-0.48	-0.53	-0.42	-0.54	-0.5	-1.14
Table of rcp45	1st Qu.	0.13	-0.16	0.02	0.2	-0.09	-0.24	-0.27	-0.32	-0.32
	Median	0.29	0.17	0.13	0.43	0.11	0.16	-0.04	-0.17	-0.22
	Mean	0.36	0.13	0.19	0.46	0.19	0.17	0.25	-0.07	0.11
	3rd Qu.	0.57	0.36	0.42	0.73	0.57	0.52	0.92	0.16	0.86
	Max.	1.46	0.58	0.68	1.38	0.76	0.89	1.06	0.51	1.03

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
Summary	Min.	0.23	-0.19	0.12	-0.25	-1.07	-0.53	-0.37	-0.83	-0.49
Table of rcp85	1st Qu.	0.47	0.18	0.29	0.16	-0.31	-0.19	0.02	-0.5	-0.4
	Median	0.55	0.34	0.4	0.24	0.08	0.06	0.5	-0.4	-0.27
	Mean	0.67	0.33	0.47	0.48	-0.09	0.19	0.63	0.11	0.15
	3rd Qu.	0.73	0.49	0.61	0.68	0.23	0.4	1.16	0.86	0.48
	Max.	1.53	0.81	1.01	1.66	0.55	1.37	1.96	1.28	1.69

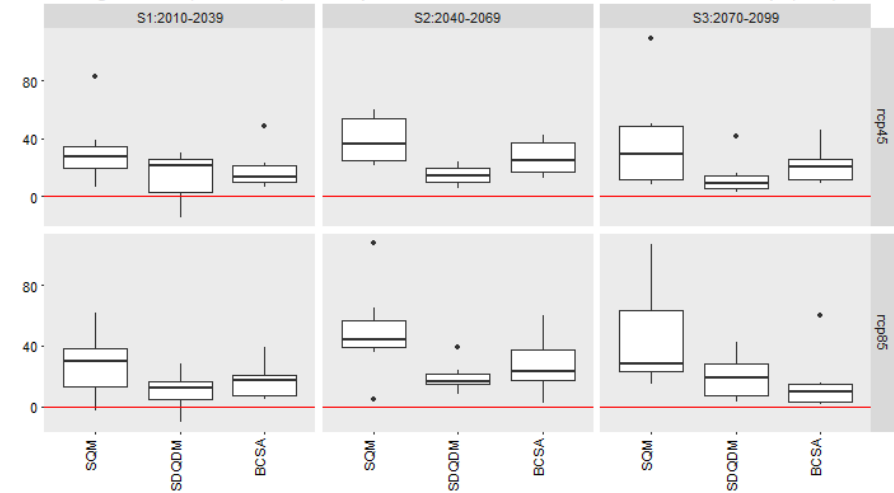
# Box-plot for climate indices (Future)

Signal Diff.(DS-Row) of R95pTOT:Annual total PRCP when PR > 95p (mm)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary Table of rcp45</i>									
Min.	-7.67	-9.99	-3.87	34.57	-8.59	5.11	5.88	-5.02	7.51
1st Qu.	28.57	-0.6	15.9	37.69	8.41	25.1	34.76	6.11	17.16
Median	41.9	18.2	24.33	64.47	20.87	37.31	48.57	14.93	19.2
Mean	48.16	17.72	28.63	59.22	17.75	36.87	62.11	19.21	29.54
3rd Qu.	59.38	33.26	30.1	72.3	26.97	45.08	75.8	23.3	33.8
Max.	127.02	50.47	87.96	95.53	41.21	75.29	159.21	65.73	78.13
<i>Summary Table of rcp85</i>									
Min.	-18.28	-17.27	-2.4	18.48	-8.54	-3.94	-5.2	-23.2	-42.08
1st Qu.	11.31	12.12	12.47	42.47	6.3	16.84	42.37	9.22	14.34
Median	40.93	17.38	21.28	71.24	14	37.8	47.49	12.64	16.95
Mean	45.66	17.32	29.85	75.94	20.75	36.78	73.65	27.25	25.35
3rd Qu.	82.01	28.93	47.75	93.11	26.16	48.5	106.19	52.15	32.42
Max.	110.35	39.06	69.64	170.69	74.88	92.81	176.18	78.59	109.04

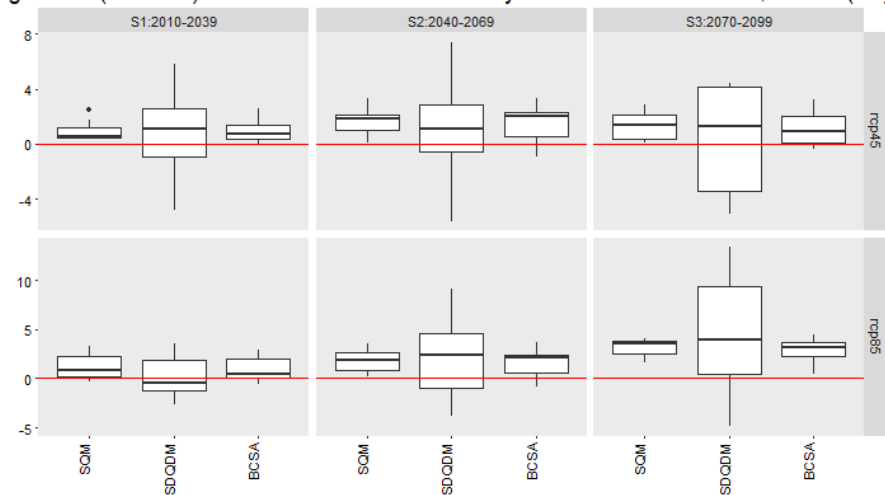
Signal Diff.(DS-Row) of R99pTOT:Annual total PRCP when PR > 99p (mm)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary Table of rcp45</i>									
Min.	6.23	-14.82	6.09	21.75	5.68	12.72	7.91	2.91	8.89
1st Qu.	19.32	3.2	9.98	25.32	10.31	17.21	11.72	5.8	11.33
Median	27.25	21.4	13.4	36.5	14.13	24.57	29.48	9.47	20.66
Mean	32.09	13.57	18.71	39.5	14.85	27	38.24	13.43	21.36
3rd Qu.	34.99	25.9	21.24	53.69	19.61	37.47	48.53	14.07	25.64
Max.	82.53	30.21	49.04	60.24	24.26	42.35	109.77	41.93	46.12
<i>Summary Table of rcp85</i>									
Min.	-2.78	-10.55	5.29	4.78	8.45	2.57	14.8	2.82	1.23
1st Qu.	13.23	5.21	7.05	39.05	15.06	17.08	23.46	7.75	3.34
Median	29.67	12.35	17.13	44.45	16.68	23.64	28.34	19.08	9.54
Mean	27.39	10.65	16.69	49.89	19.6	27.92	46.31	19.5	15.27
3rd Qu.	38.21	16.87	20.43	57.06	21.27	37.61	63.56	28.15	14.84
Max.	61.94	28.61	39.45	107.81	39.43	59.84	107.01	42.78	59.78

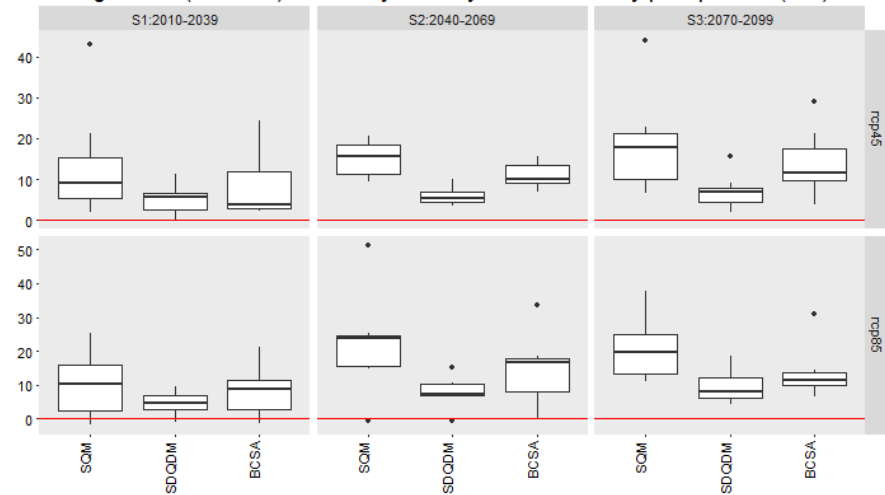
# Box-plot for climate indices (Future)

Signal Diff.(DS-Row) of Rnnmm:Annual count of days when PRCP >= nmm, nn is 1 (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	0.4	-4.86	-0.14	0.11	-5.66	-0.89	0.06	-5.09	-0.36
<i>Table of rcp45</i>	1st Qu.	0.43	-0.93	0.39	1	-0.6	0.57	0.35	-3.4	0.05
	Median	0.54	1.06	0.72	1.81	1.09	2.04	1.38	1.27	0.95
	Mean	0.94	0.76	0.96	1.63	1.05	1.47	1.32	0.29	1.14
	3rd Qu.	1.16	2.57	1.39	2.09	2.83	2.35	2.11	4.13	2.06
	Max.	2.47	5.83	2.69	3.32	7.44	3.31	2.87	4.41	3.2
<i>Summary</i>	Min.	-0.29	-2.64	-0.55	0.21	-3.82	-0.85	1.67	-4.92	0.45
<i>Table of rcp85</i>	1st Qu.	0.15	-1.26	0.05	0.84	-1	0.58	2.54	0.39	2.26
	Median	0.82	-0.47	0.42	1.87	2.43	2.1	3.52	3.96	3.12
	Mean	1.23	0.24	1	1.8	2.13	1.53	3.12	4.57	2.86
	3rd Qu.	2.22	1.91	2.05	2.61	4.6	2.33	3.78	9.38	3.73
	Max.	3.34	3.5	2.96	3.6	9.12	3.65	4.03	13.41	4.48

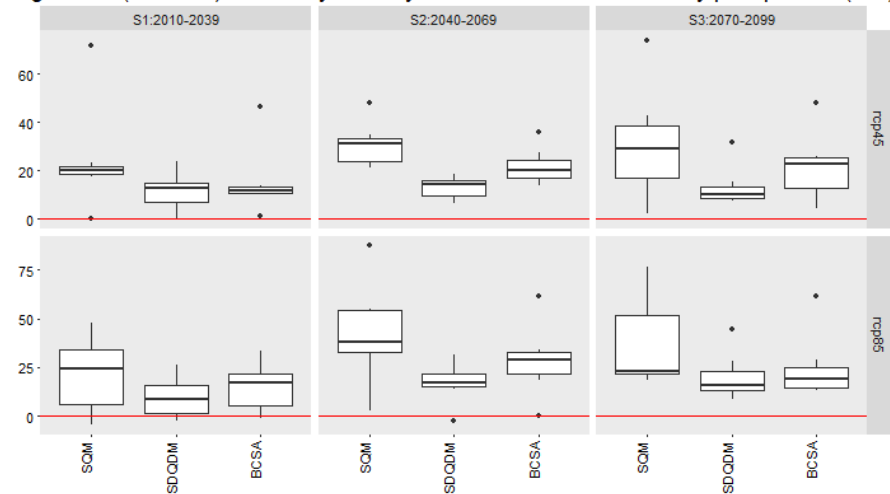
Signal Diff.(DS-Row) of Rx1day:Monthly maximum 1-day precipitation (mm)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	1.87	0.08	2.13	9.31	3.44	6.95	6.56	1.89	3.88
<i>Table of rcp45</i>	1st Qu.	5.26	2.63	2.96	11.32	4.34	8.96	10.1	4.31	9.77
	Median	9.11	5.59	3.86	15.71	5.23	10.13	17.9	6.81	11.42
	Mean	13.6	5.07	8.58	15	5.88	11.07	18.75	6.96	14.09
	3rd Qu.	15.3	6.63	11.89	18.38	6.88	13.51	21.27	7.95	17.4
	Max.	43.09	11.31	24.35	20.54	10.07	15.48	44.07	15.51	28.98
<i>Summary</i>	Min.	-2	-1.15	-1.46	-0.74	-0.68	-0.23	11.18	4.18	6.56
<i>Table of rcp85</i>	1st Qu.	2.51	2.72	2.7	15.43	6.85	7.96	13.23	5.96	9.71
	Median	10.27	4.52	8.67	23.65	7.2	16.83	19.58	7.87	11.51
	Mean	10.06	4.55	8.13	22.04	7.95	14.53	20.76	9.54	13.62
	3rd Qu.	15.9	6.78	11.51	24.6	10.11	17.87	25.11	12.07	13.49
	Max.	25.33	9.49	21.29	51.35	15.2	33.48	37.9	18.66	30.9

# Box-plot for climate indices (Future)

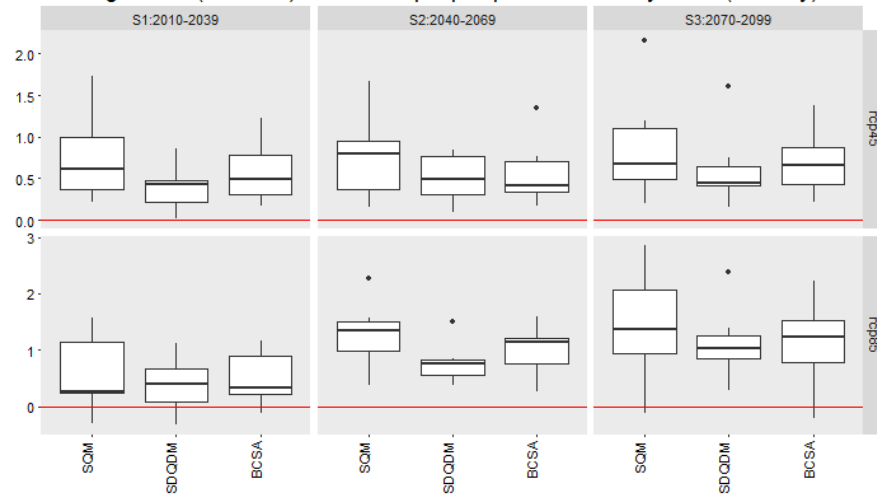
Signal Diff.(DS-Row) of Rx5day:Monthly maximum consecutive 5-day precipitation (mm)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-0.16	-0.56	0.9	20.93	6.28	13.72	2.01	7.19	4.37
<i>Table of rcp45</i> 1st Qu.	18.28	7.1	10.37	23.71	9.42	16.87	17.14	8.3	12.54
<i>Table of rcp45</i> Median	19.94	12.82	11.73	31.15	14.36	20.05	29.32	10.05	22.52
<i>Table of rcp45</i> Mean	24.53	11.36	15.22	30.62	12.85	21.71	30.98	13.17	21.49
<i>Table of rcp45</i> 3rd Qu.	21.89	14.65	13.24	33.3	16.04	24.29	38.52	13.35	25.16
<i>Table of rcp45</i> Max.	71.57	23.74	46.7	48.22	18.42	35.87	74.18	31.63	48.12

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-4.72	-2.26	-1.03	2.67	-2.39	0.12	18.67	8.67	13.02
<i>Table of rcp85</i> 1st Qu.	5.87	1.27	5.24	33.11	15.03	21.51	22.05	13.42	14.38
<i>Table of rcp85</i> Median	24.33	8.81	17.22	38.08	16.98	29.18	23.01	16.15	19.33
<i>Table of rcp85</i> Mean	20.99	9.63	14.77	43.41	17.09	28.4	37.99	20.28	24.85
<i>Table of rcp85</i> 3rd Qu.	33.85	15.98	21.51	54.55	21.85	32.59	51.81	22.83	24.7
<i>Table of rcp85</i> Max.	47.85	26.33	33.73	87.81	31.3	61.33	76.53	44.62	61.36

Signal Diff.(DS-Row) of SDII:Simple pricipitation intensity index (mm/day)

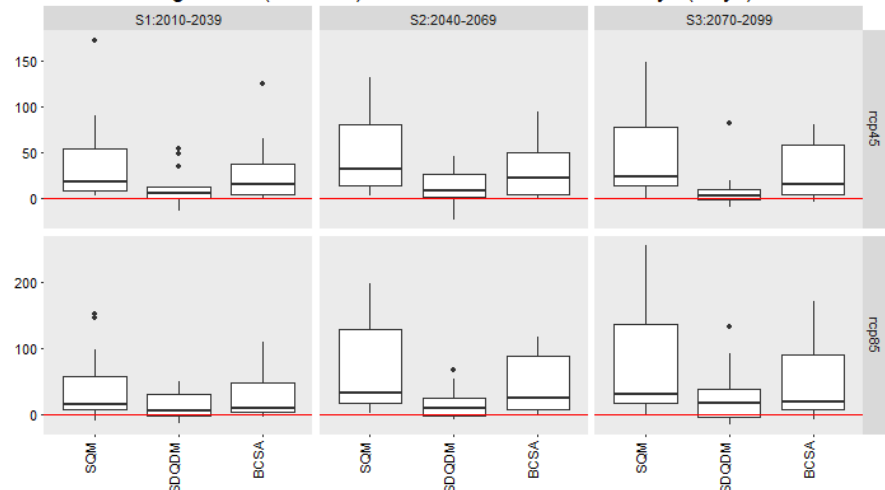


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	0.22	0.01	0.17	0.16	0.1	0.17	0.2	0.15	0.22
<i>Table of rcp45</i> 1st Qu.	0.37	0.22	0.31	0.37	0.3	0.34	0.49	0.42	0.43
<i>Table of rcp45</i> Median	0.61	0.42	0.5	0.8	0.5	0.42	0.68	0.45	0.65
<i>Table of rcp45</i> Mean	0.75	0.38	0.58	0.75	0.51	0.58	0.89	0.62	0.69
<i>Table of rcp45</i> 3rd Qu.	0.99	0.48	0.79	0.95	0.77	0.71	1.1	0.65	0.88
<i>Table of rcp45</i> Max.	1.73	0.88	1.22	1.67	0.84	1.35	2.17	1.61	1.37

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-0.3	-0.34	-0.11	0.37	0.37	0.27	-0.12	0.28	-0.21
<i>Table of rcp85</i> 1st Qu.	0.24	0.08	0.21	0.98	0.56	0.76	0.94	0.84	0.77
<i>Table of rcp85</i> Median	0.27	0.39	0.33	1.35	0.75	1.13	1.37	1.02	1.22
<i>Table of rcp85</i> Mean	0.61	0.38	0.51	1.28	0.77	0.99	1.45	1.13	1.12
<i>Table of rcp85</i> 3rd Qu.	1.14	0.66	0.9	1.49	0.83	1.22	2.06	1.26	1.54
<i>Table of rcp85</i> Max.	1.57	1.11	1.17	2.28	1.49	1.58	2.86	2.38	2.22

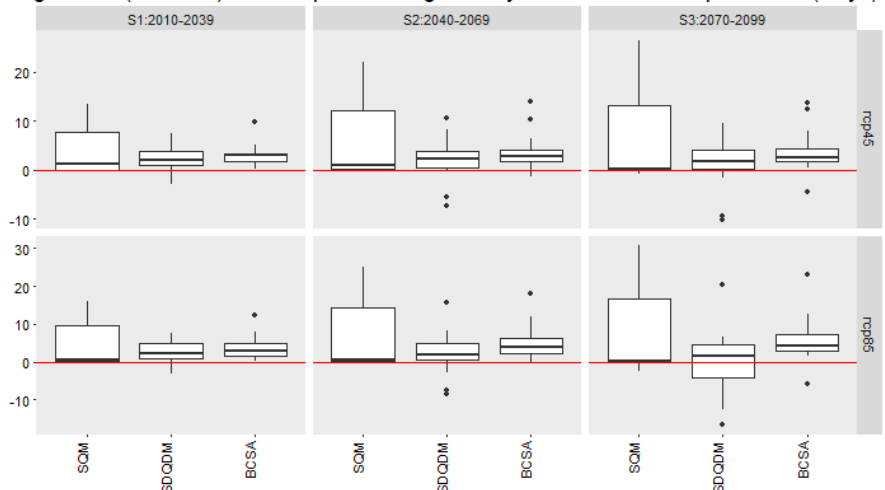
# Box-plot for climate indices (Future)

Signal Diff.(DS-Raw) of SU:Number of summer days (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<b>Summary</b>									
<i>Table of rcp45</i>									
Min.	2.22	-14.4	0.16	1.92	-24.29	-1.4	-0.88	-10.23	-4.6
1st Qu.	8.41	-0.08	3.58	13.13	0.39	3.6	14.11	-1.41	3.74
Median	17.57	4.64	14.52	32.07	7.42	22.41	22.67	3.03	14.23
Mean	39.37	10.9	28.17	47.89	11.39	32.63	48.06	7.98	31.04
3rd Qu.	53.15	11.51	37.57	80.45	26.66	49.93	77.9	9.01	57.48
Max.	172.65	53.11	125.34	131.03	45.84	94.28	148.59	82.03	80.26
<b>Summary</b>									
<i>Table of rcp85</i>									
Min.	-10.11	-13.06	-3.76	1	-8.57	-0.59	-2.59	-16.82	-9.09
1st Qu.	6.73	-1.57	2.8	16.03	-2.03	7	16.31	-4.03	6.4
Median	15.15	4.83	10.03	31.47	9.37	23.76	29.89	16.13	17.86
Mean	41.29	11.89	30.39	67.06	16.26	44.43	75.31	27.53	48.36
3rd Qu.	56.37	29.42	48.08	127.25	25.34	87.99	136.51	37.3	89.74
Max.	151.96	48.59	108.25	196.71	67.49	117.32	255.27	131.92	169.87

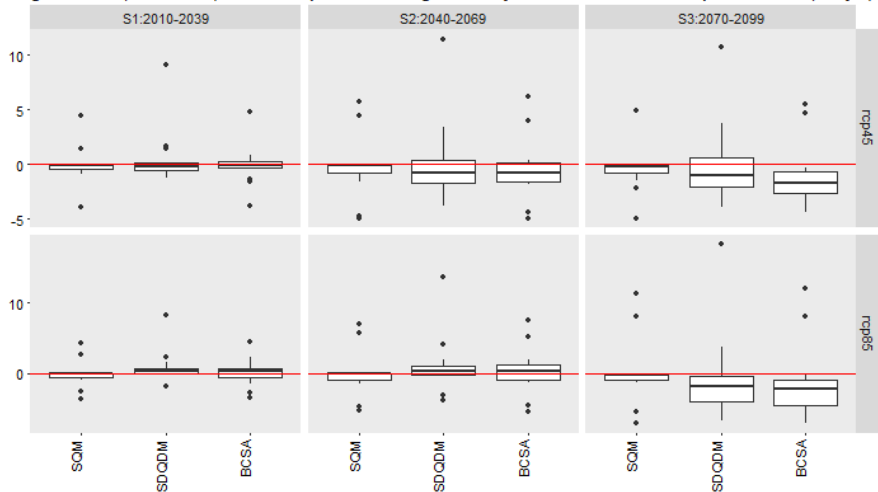
Signal Diff.(DS-Raw) of TN10p:Percentage of days when TN < 10th percentile (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<b>Summary</b>									
<i>Table of rcp45</i>									
Min.	-0.02	-2.88	0.16	0.01	-7.42	-1.4	-0.88	-10.23	-4.6
1st Qu.	0.04	0.91	1.7	0.09	0.36	1.77	0.06	0.11	1.78
Median	1.16	2.12	2.94	1.02	2.18	2.93	0.13	1.73	2.6
Mean	4.08	2.49	3.08	6.23	1.98	3.8	6.44	1.18	3.81
3rd Qu.	7.77	3.74	3.34	12.15	3.92	4.15	13.3	4.17	4.38
Max.	13.56	7.59	9.88	21.89	10.66	13.9	26.56	9.58	13.83
<b>Summary</b>									
<i>Table of rcp85</i>									
Min.	0.02	-3.02	0.09	0.04	-8.57	-0.59	-2.59	-16.82	-5.74
1st Qu.	0.08	0.75	1.46	0.09	0.51	2.12	0.06	-4.03	2.88
Median	0.66	2.07	3.02	0.59	1.87	3.76	0.15	1.62	4.13
Mean	4.77	2.52	3.75	7.42	2.08	5.12	8.8	0.27	5.77
3rd Qu.	9.67	4.93	4.86	14.47	4.92	6.26	16.57	4.4	7.37
Max.	15.96	7.72	12.22	25.1	15.83	18.07	30.89	20.4	23.04

# Box-plot for climate indices (Future)

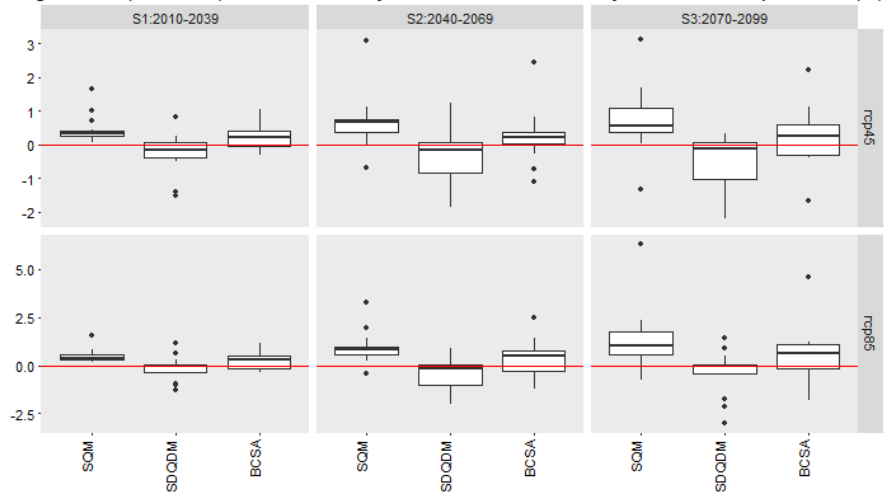
Signal Diff.(DS-Row) of TN90p:Percentage of days when TN > 90th percentile (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>									
<i>Table of rcp45</i>									
Min.	-3.91	-1.24	-3.83	-4.97	-3.84	-4.9	-4.92	-3.94	-4.32
1st Qu.	-0.37	-0.48	-0.29	-0.77	-1.67	-1.59	-0.76	-2.08	-2.6
Median	-0.03	-0.15	-0.04	-0.06	-0.77	-0.82	-0.13	-0.97	-1.7
Mean	-0.01	0.61	-0.08	-0.19	0.17	-0.51	-0.05	-0.14	-0.98
3rd Qu.	0	0.17	0.29	-0.04	0.39	0.12	-0.05	0.66	-0.67
Max.	4.52	9.11	4.8	5.71	11.48	6.17	4.97	10.73	5.5

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>									
<i>Table of rcp85</i>									
Min.	-3.7	-1.89	-3.43	-5.19	-3.81	-5.44	-7.14	-6.75	-7.09
1st Qu.	-0.54	-0.02	-0.53	-0.87	-0.22	-1.02	-1	-4.03	-4.51
Median	0	0.31	0.28	-0.02	0.28	0.4	-0.14	-1.87	-2.28
Mean	-0.07	0.81	0.15	-0.03	1.08	0.31	0.23	-0.77	-1.2
3rd Qu.	0.01	0.71	0.71	0.03	1	1.19	-0.05	-0.34	-0.84
Max.	4.22	8.25	4.65	7.05	13.57	7.5	11.36	18.36	12.05

Signal Diff.(DS-Row) of TNn:Monthly minimum value of daily minimum temperature (C)

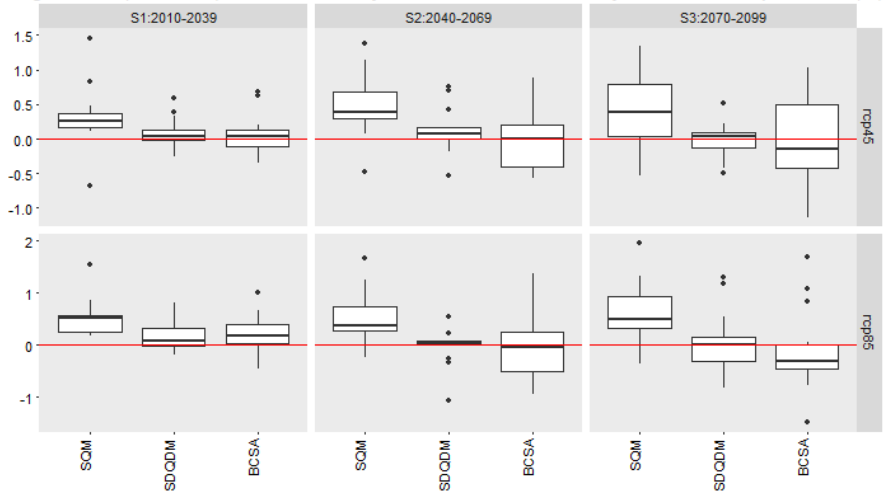


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>									
<i>Table of rcp45</i>									
Min.	0.05	-1.51	-0.32	-0.7	-1.85	-1.12	-1.32	-2.21	-1.66
1st Qu.	0.26	-0.39	-0.05	0.38	-0.83	0.03	0.37	-1.03	-0.31
Median	0.31	-0.15	0.23	0.65	-0.15	0.21	0.55	-0.12	0.27
Mean	0.45	-0.25	0.21	0.61	-0.39	0.26	0.73	-0.52	0.24
3rd Qu.	0.42	0.05	0.4	0.75	0.07	0.37	1.08	0.05	0.57
Max.	1.66	0.82	1.04	3.09	1.22	2.43	3.14	0.33	2.23

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i>									
<i>Table of rcp85</i>									
Min.	0.18	-1.26	-0.37	-0.46	-2.02	-1.24	-0.78	-3.04	-1.79
1st Qu.	0.31	-0.34	-0.14	0.59	-1	-0.27	0.57	-0.43	-0.14
Median	0.37	-0.02	0.3	0.81	-0.18	0.49	1.02	-0.06	0.64
Mean	0.49	-0.13	0.29	0.92	-0.44	0.35	1.37	-0.37	0.59
3rd Qu.	0.54	0.02	0.48	0.98	0.06	0.75	1.72	0.02	1.08
Max.	1.68	1.17	1.15	3.28	0.91	2.48	6.32	1.43	4.57

# Box-plot for climate indices (Future)

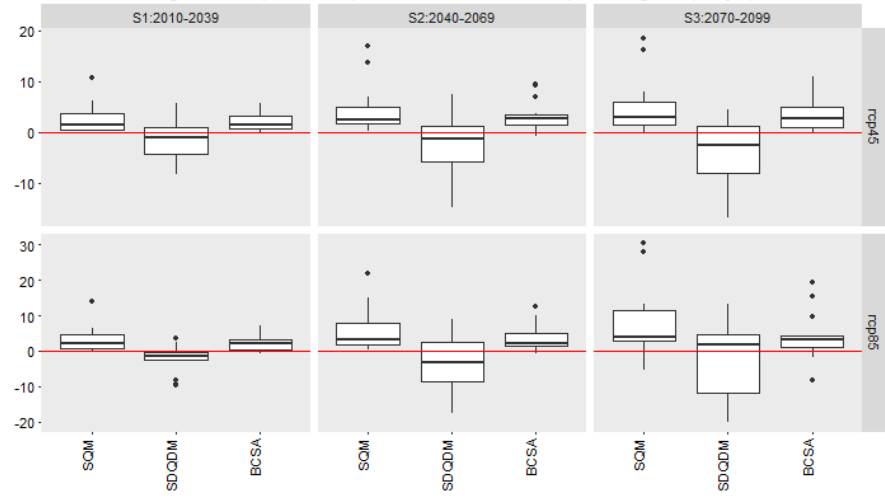
Signal Diff.(DS-Row) of TNx:Monthly maximum value of daily minimum temperature (C)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-0.68	-0.26	-0.36	-0.48	-0.53	-0.57	-0.54	-0.5	-1.14
<i>Table of rcp45</i> 1st Qu.	0.16	-0.02	-0.11	0.3	0	-0.4	0.04	-0.14	-0.41
<i>Table of rcp45</i> Median	0.25	0.04	0.05	0.39	0.07	0	0.4	0.04	-0.15
<i>Table of rcp45</i> Mean	0.31	0.07	0.05	0.49	0.12	0.01	0.42	-0.01	-0.01
<i>Table of rcp45</i> 3rd Qu.	0.37	0.14	0.12	0.69	0.16	0.21	0.78	0.1	0.5
<i>Table of rcp45</i> Max.	1.46	0.58	0.68	1.38	0.76	0.89	1.34	0.51	1.03

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	0.17	-0.19	-0.46	-0.25	-1.07	-0.95	-0.37	-0.83	-1.5
<i>Table of rcp85</i> 1st Qu.	0.23	-0.02	0.02	0.26	0	-0.5	0.32	-0.32	-0.45
<i>Table of rcp85</i> Median	0.51	0.06	0.17	0.36	0.03	-0.05	0.49	0	-0.32
<i>Table of rcp85</i> Mean	0.51	0.17	0.19	0.53	-0.03	-0.04	0.61	0.07	-0.1
<i>Table of rcp85</i> 3rd Qu.	0.57	0.32	0.38	0.72	0.08	0.25	0.92	0.16	0.01
<i>Table of rcp85</i> Max.	1.53	0.81	1.01	1.66	0.55	1.37	1.96	1.28	1.69

Signal Diff.(DS-Row) of TR: Number of tropical nights (Days)

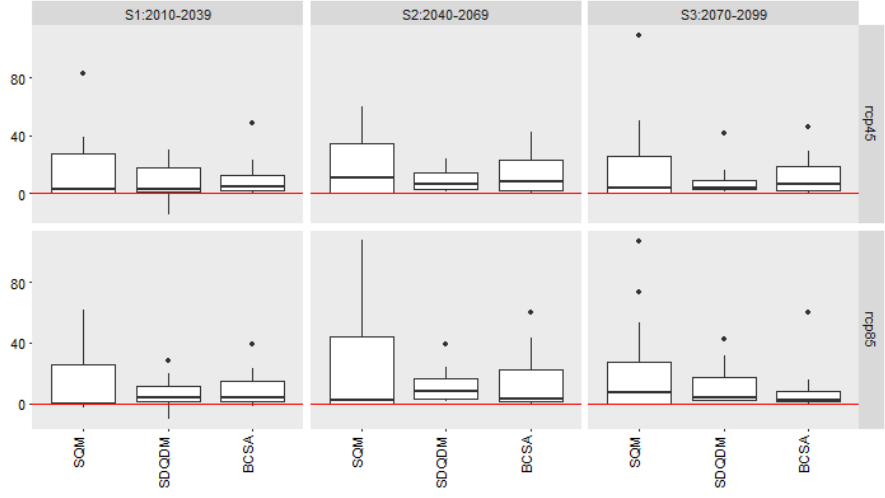


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	0.4	-8.3	-0.14	0.11	-14.71	-0.89	0.06	-16.81	-0.36
<i>Table of rcp45</i> 1st Qu.	0.55	-4.31	0.83	1.83	-5.69	1.5	1.39	-8.1	0.93
<i>Table of rcp45</i> Median	1.48	-0.93	1.56	2.41	-1.31	2.69	2.84	-2.49	2.65
<i>Table of rcp45</i> Mean	2.65	-1.45	2.07	4.42	-2.83	3.3	4.87	-3.8	3.41
<i>Table of rcp45</i> 3rd Qu.	3.78	0.97	3.32	4.97	1.19	3.53	5.91	1.15	4.92
<i>Table of rcp45</i> Max.	10.63	5.83	5.67	17.06	7.44	9.47	18.56	4.41	10.89

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<i>Summary</i> Min.	-0.29	-9.62	-0.55	0.21	-17.61	-0.85	-5.45	-20.28	-8.43
<i>Table of rcp85</i> 1st Qu.	0.79	-2.57	0.5	1.77	-8.73	1.45	2.92	-11.92	0.94
<i>Table of rcp85</i> Median	2.22	-1.42	2.05	3.05	-3.18	2.33	4	1.9	3.06
<i>Table of rcp85</i> Mean	3.19	-2.21	2.18	5.62	-3.23	3.49	8.28	-2	4.07
<i>Table of rcp85</i> 3rd Qu.	4.66	-0.3	3.17	8.04	2.63	4.98	11.6	4.65	4.36
<i>Table of rcp85</i> Max.	13.87	3.5	7.01	22.07	9.12	12.63	30.57	13.41	19.23

# Box-plot for climate indices (Future)

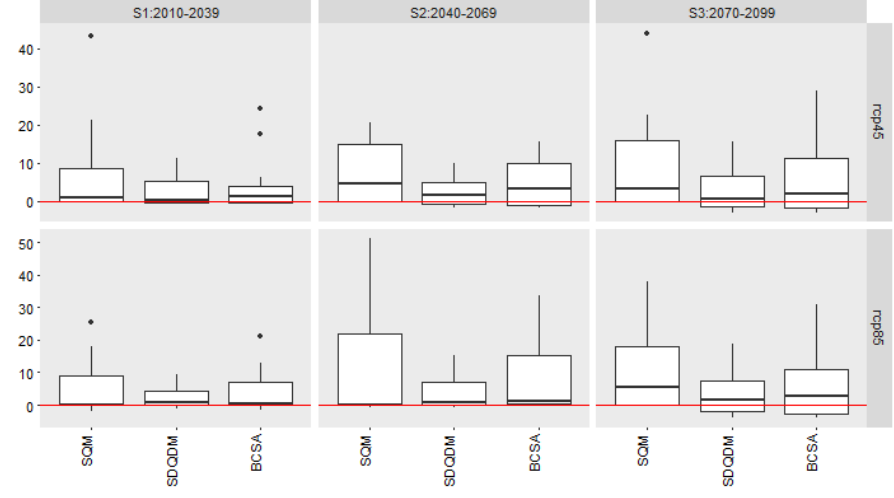
Signal Diff.(DS-Row) of TX10p:Percentage of days when TX < 10th percentile (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	0	-14.82	-0.28	0.01	1.16	-0.38	0.02	1.38	-0.49
<i>Table of rcp45</i>	1st Qu.	0.04	1.27	1.83	0.08	2.86	2.02	0.08	2.64	1.91
	Median	3.17	3.02	4.6	10.94	6.39	8.18	4.03	4.07	6.14
	Mean	16.07	8.04	10.16	19.79	9.08	14.53	19.16	8.38	11.61
	3rd Qu.	27.24	17.52	12.66	34.32	13.98	22.94	25.68	9	18.6
	Max.	82.53	30.21	49.04	60.24	24.26	42.35	109.77	41.93	46.12

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-2.78	-10.55	-1.51	0.02	1.79	-1.23	0.03	1.57	-1.11
<i>Table of rcp85</i>	1st Qu.	0.04	1.56	1.83	0.07	3.37	1.96	0.09	2.72	1.49
	Median	0.1	3.85	4.25	2.45	8.21	3.27	7.46	4.24	2.61
	Mean	13.72	6.87	9.15	24.98	11.78	14.88	23.2	11.41	8.4
	3rd Qu.	25.86	11.63	14.83	43.9	16.33	22.81	27.71	17.28	8.07
	Max.	61.94	28.61	39.45	107.81	39.43	59.84	107.01	42.78	59.78

Signal Diff.(DS-Row) of TX90p:Percentage of days when TX > 90th percentile (Days)

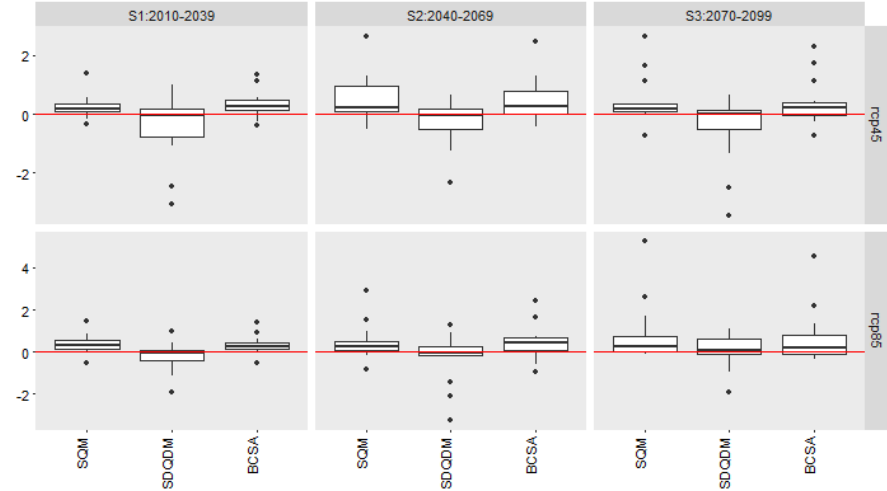


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-0.03	-0.62	-0.55	-0.05	-1.75	-1.62	-0.2	-2.86	-3.08
<i>Table of rcp45</i>	1st Qu.	-0.01	-0.28	-0.38	-0.04	-0.83	-0.87	-0.08	-1.47	-1.6
	Median	0.94	0.21	1.42	4.85	1.52	3.3	3.27	0.7	2.08
	Mean	6.8	2.45	4.2	7.48	2.49	5.07	9.34	2.66	6.28
	3rd Qu.	8.48	5.43	3.82	14.83	5.03	10.1	16.95	6.61	11.41
	Max.	43.09	11.31	24.35	20.54	10.07	15.48	44.07	15.51	28.98

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-2	-1.15	-1.46	-0.74	-0.68	-0.23	-0.2	-4.1	-3.73
<i>Table of rcp85</i>	1st Qu.	-0.01	0.12	0.18	0.01	0.04	0.23	-0.1	-2.14	-2.78
	Median	0.03	0.62	0.56	0.02	0.88	1.22	5.57	1.64	2.64
	Mean	5.03	2.41	4.21	11.02	4.11	7.5	10.33	3.6	5.48
	3rd Qu.	8.87	4.18	7.2	21.78	7.2	15.29	18.15	7.51	11.08
	Max.	25.33	9.49	21.29	51.35	15.2	33.48	37.9	18.66	30.9

# Box-plot for climate indices (Future)

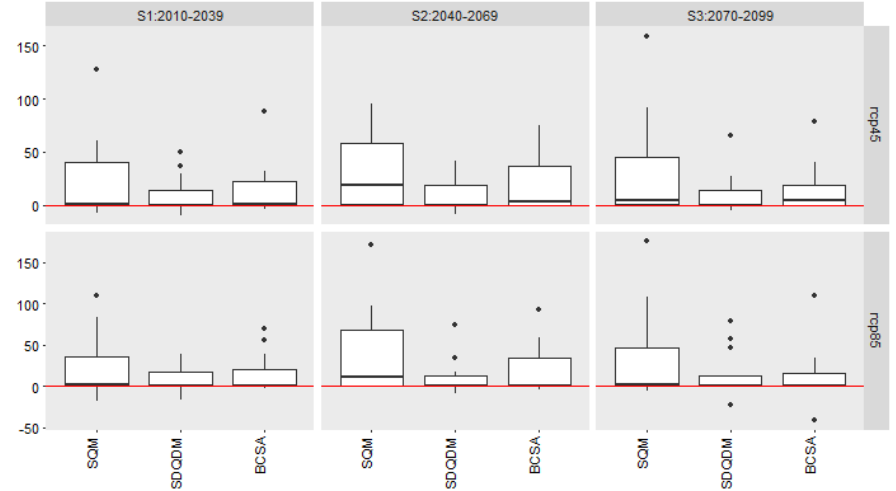
Signal Diff.(DS-Raw) of TXn:Monthly minimum value of daily maximum temperature (C)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-0.34	-3.07	-0.39	-0.53	-2.32	-0.41	-0.74	-3.46	-0.72
<i>Table of rcp45</i>	1st Qu.	0.09	-0.79	0.14	0.07	-0.53	0	0.08	-0.53	-0.02
	Median	0.19	-0.04	0.25	0.23	-0.03	0.28	0.17	-0.02	0.21
	Mean	0.26	-0.43	0.33	0.5	-0.28	0.46	0.44	-0.49	0.4
	3rd Qu.	0.36	0.19	0.48	0.93	0.18	0.78	0.33	0.15	0.41
	Max.	1.38	1.01	1.34	2.66	0.66	2.45	2.66	0.65	2.3

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-0.55	-1.93	-0.53	-0.81	-3.27	-0.96	-0.1	-1.9	-0.35
<i>Table of rcp85</i>	1st Qu.	0.14	-0.42	0.15	0.1	-0.19	0.1	0.02	-0.09	-0.09
	Median	0.32	-0.05	0.28	0.27	-0.02	0.44	0.23	0.09	0.22
	Mean	0.37	-0.21	0.35	0.48	-0.3	0.47	0.85	0.05	0.68
	3rd Qu.	0.59	0.06	0.45	0.5	0.28	0.68	0.71	0.64	0.79
	Max.	1.47	0.99	1.38	2.94	1.27	2.41	5.27	1.11	4.53

Signal Diff.(DS-Raw) of TXx:Monthly maximum value of daily maximum temperature (C)

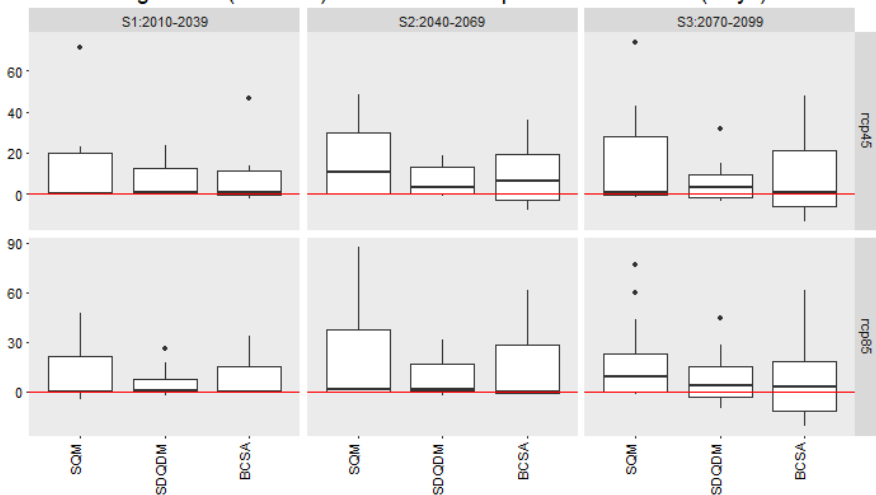


	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-7.67	-9.99	-3.87	-0.34	-8.59	-0.66	-0.36	-5.02	-0.69
<i>Table of rcp45</i>	1st Qu.	0.22	-0.01	-0.02	0.54	0	0.68	-0.03	0.01	
	Median	0.71	0.03	0.39	18.31	0.14	2.97	4.1	0.06	4.18
	Mean	24.24	8.87	14.34	29.92	8.89	18.44	31.39	9.61	14.77
	3rd Qu.	40.08	13.68	22.61	58.54	18.43	37.09	45.16	14.51	18.96
	Max.	127.02	50.47	87.96	95.53	41.21	75.29	159.21	65.73	78.13

	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3	
<i>Summary</i>	Min.	-18.28	-17.27	-2.4	-0.34	-8.54	-3.94	-5.2	-23.2	-42.08
<i>Table of rcp85</i>	1st Qu.	0.44	0.04	0.07	0.72	0.03	-0.03	0.35	-0.01	-0.29
	Median	1.07	0.06	0.49	10.31	0.1	0.63	1.58	0.17	0.25
	Mean	23.08	8.68	14.99	38.32	10.4	18.42	37.06	13.84	12.49
	3rd Qu.	35.19	17.24	20.42	68.02	12.23	34.11	46.92	12.06	16.32
	Max.	110.35	39.06	69.64	170.69	74.88	92.81	176.18	78.69	109.04

# Box-plot for climate indices (Future)

Signal Diff.(DS-Raw) of WSDI:Warm speel duration index (Days)



	SQM S1	SDQDM S1	BCSA S1	SQM S2	SDQDM S2	BCSA S2	SQM S3	SDQDM S3	BCSA S3
<b>Summary Table of rcp45</b>									
Min.	-0.34	-0.56	-2.32	-0.67	-1.15	-7.71	-1.56	-3.57	-13.69
1st Qu.	-0.07	-0.01	-0.27	-0.14	-0.23	-3.2	-0.31	-1.82	-5.99
Median	0.02	0.42	0.43	10.45	3.08	6.02	0.96	3.33	0.64
Mean	12.21	5.7	7.18	15.17	6.2	8.95	15.17	5.58	7.07
3rd Qu.	19.79	12.28	11.51	29.92	13.22	19.44	28.12	9.64	20.89
Max.	71.57	23.74	46.7	48.22	18.42	35.87	74.18	31.63	48.12
<b>Summary Table of rcp85</b>									
Min.	-4.72	-2.26	-1.03	-0.19	-2.39	-1.78	-2.2	-10.36	-21.51
1st Qu.	-0.02	0.06	-0.04	-0.11	0.61	-1.12	-0.51	-3.66	-11.87
Median	0	0.37	0.01	1.33	1.22	-0.26	9.14	3.3	2.66
Mean	10.49	4.89	7.35	21.65	8.9	13.59	18.5	7.63	5.46
3rd Qu.	21.68	7.15	15.48	37.4	16.8	28.01	22.8	15.49	18.34
Max.	47.85	26.33	33.73	87.81	31.3	61.33	76.53	44.62	61.36

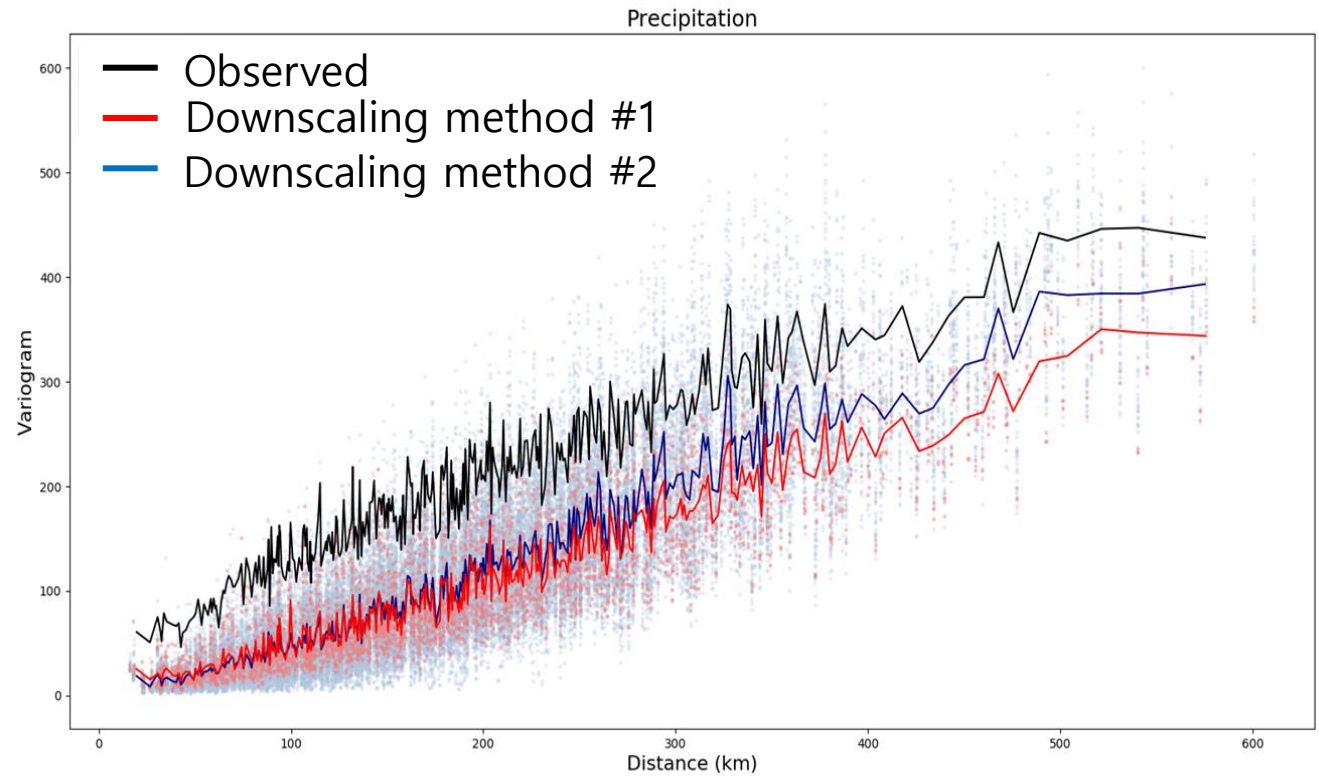
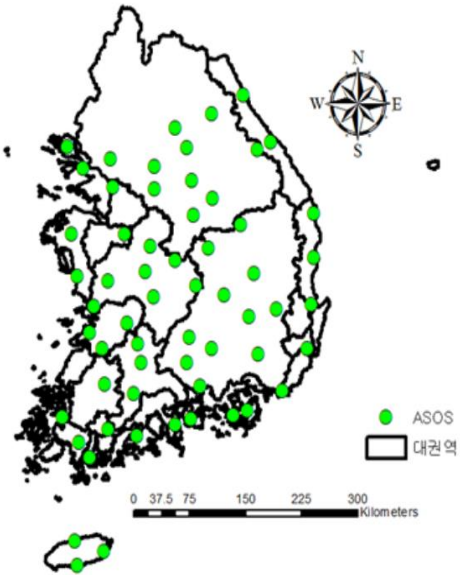
# Hands-on: run AIMS using your data



- ❖ Decide important indices for your objective
- ❖ Select only 4 stations
- ❖ Select your best 5 GCMs

**Check and share your results.**

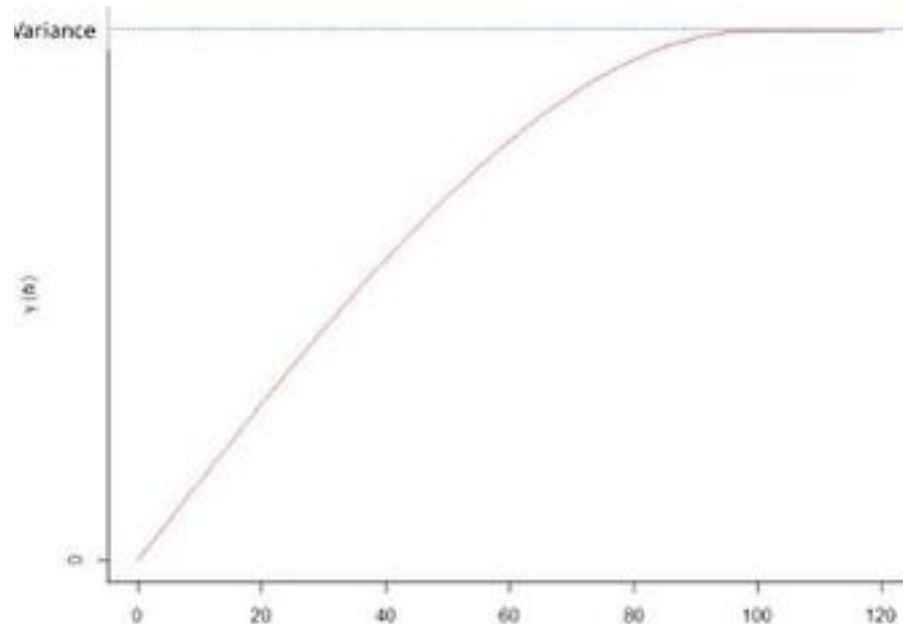
# 3. Evaluating spatial reproducibility



# Spatial Reproducibility

- Variogram curve
  - Variance of difference between two points corresponding to distance
- \$(project)/SpatialReproducibility
  - Data
  - graph

$$2\gamma(x, y) = E \left[ (Z(x) - Z(y))^2 \right]$$

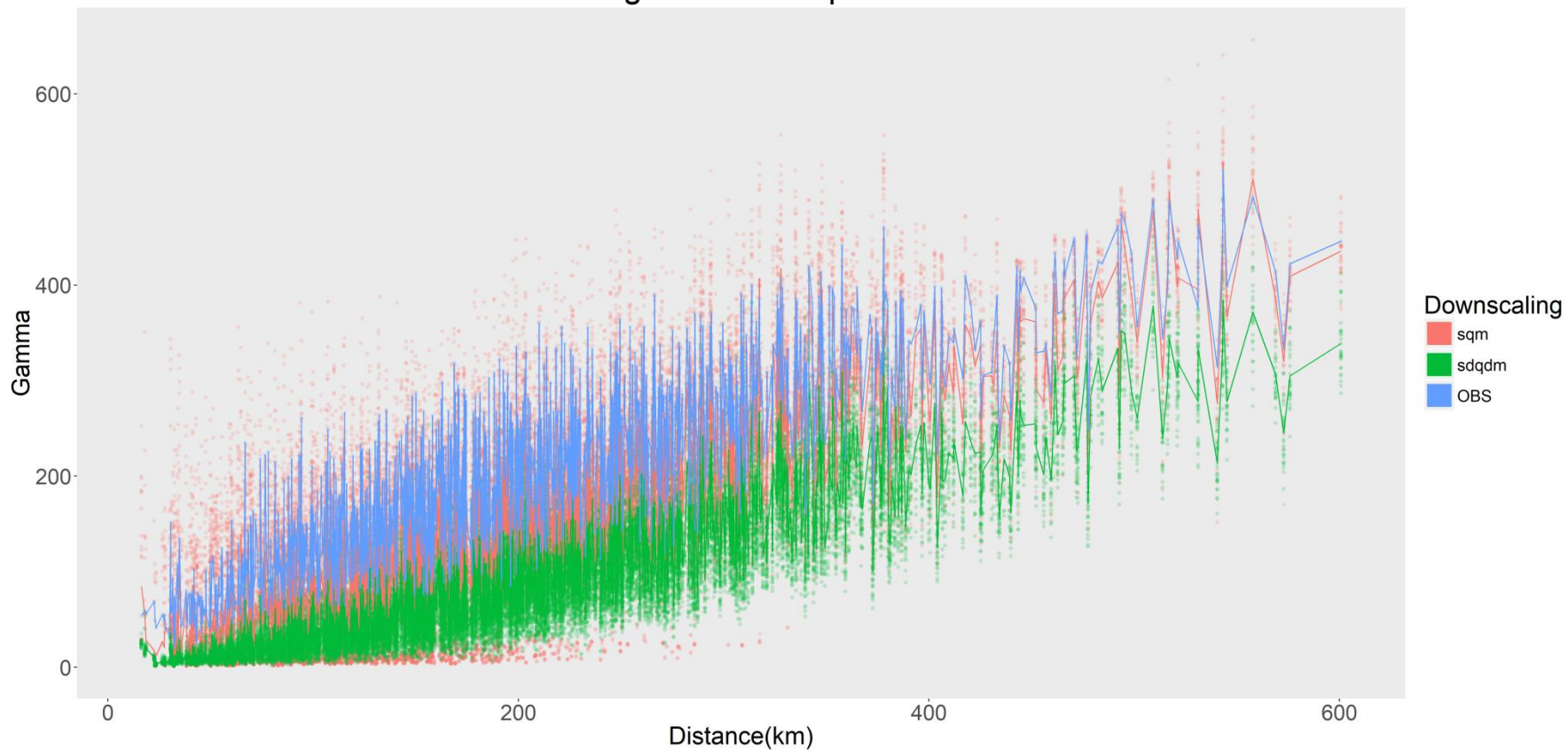


# Variogram curves

Evaluation: Spatial Reproducibility Done

No user option is available.

Variogram of Precipitation



# Hands-on: run AIMS using your data



- ❖ Decide important indices for your objective
- ❖ Select only 4 stations
- ❖ Select your best 5 GCMs

**Check and share your results.**



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# Thank You!