Rain Records

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1 Introduction

In March of 1991 I started a daily record of rainfall. We were in a drought at the time and on water restrictions, so the garden was suffering somewhat!

I have recently been asked *why* I collect the data, in a similar manner as if the person were asking me *why* I was wearing a fried egg on my head. Yes, I suppose I am mad, but I am also a keen gardener, and rain, or rather, the lack thereof, affects me greatly! :-)

It is somewhat difficult to intelligently present such a large body of data, but obviously the first thing is to establish a *season*, since calendar years are meaningless in the Summer rainfall areas! Hence the 2000 season runs from July 1999 to June 2000, much like SARS really :-) (I guess that now needs explaining: not Severe Acute Respiratory Syndrome, but the South African Revenue Service!!)

In all the years of recording, the split at July has let me down only a few times.

It is hard to make a LOT of sense out of the data. We supposedly have a 7 or so year dry cycle and a 7 or so year wet cycle. It is difficult to conclude that from my data. The cause of the cycle is apparently the "El-niño" effect in the Pacific. It certainly has produced widespread drought, but the trouble is: South-West is where all the "weather" comes from, and this is interrupted by it.

If this pattern were to have continued, we would be in the hands of El-niño! The Tropical Complex from the North, however descends from the North, via Botswana, and has assisted us in Egoli for many years. As a direct result, the rainfall has been quite good when, for example, the northern VryStaat has been terrible. The "Usual" pattern would have catered for the Vrystaat before us!!

The ONI (Oceanic Niño Index) is published in raw data form at `https://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php`. Further discussion (focussed on USA effects) is at `https://www.climate.gov/news-features/understanding-climate/climate-variability-oceani`

A positive value of ONI corresponds to a warming El Niño, which generally implies drought for us, and a negative ONI corresponds to a cooling La Niña, implying rain. Note that the ONI is expressed as ° C above or below a 30-year average. (Sort of kills the "its only 2 degrees" argument...)

In above figure, it can be seen that there is at least some correlation. In 1990-2, there is a strong El Niño, producing significant drought. 1996-7 was a moderate La Niña, with very wet conditions. So the "strength" of the ONI does not necessarily correlate. 2010, of course was rather damp, in the presence of a very strong El Niño... 2015 onwards is a bit of a mixed bag, with 2016 particularly uncorrelated. But 2022 is once again, damp.

Lastly, most publications state that the average rainfall in JoBurg is 500–750mm. JaNee.

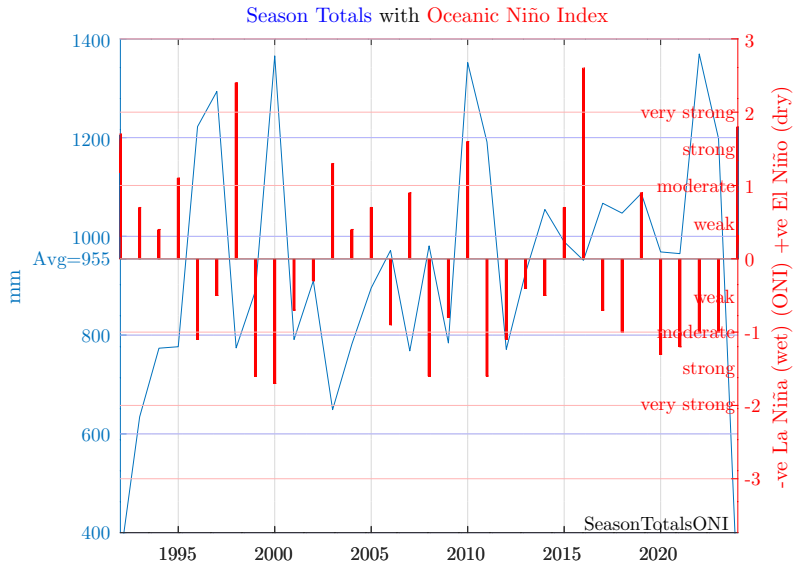

Figure 1: Season Totals overlaid on the Oceanic Niño Index

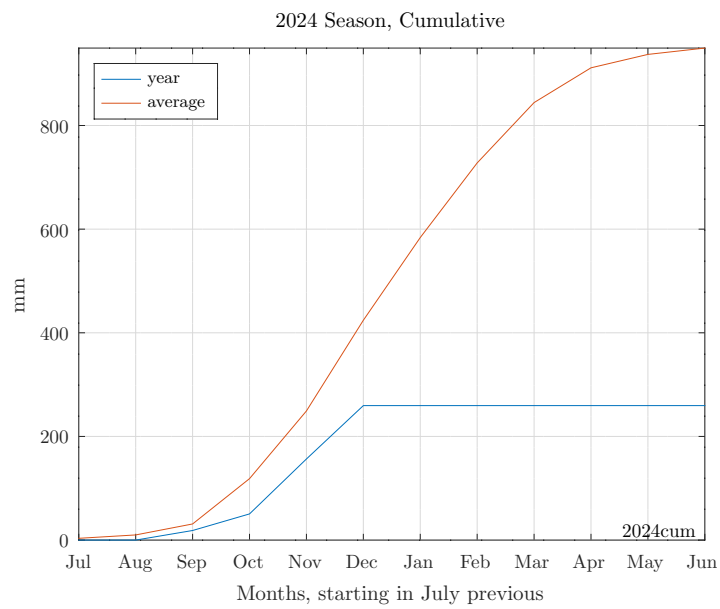

Figure 2: Cumulative current season

2 Current Season, cumulative, for the impatient :-)

3 Rain Data by Season

3.1 Totals by Season

Simply a plot of the annual total seasonal rainfall. Note that in 1996 we moved from Crosby to Kensington, ie west JHB to east JHB, but there shouldn't be much of a difference :-) <— See note above, I am changing my mind :-) The average values shown do not include the effects of the current (incomplete) season, as that would artificially affect them. Notice that in *very* dry years, less rain falls per day (obviously for far fewer days too) and on *very* wet years, more falls per day.

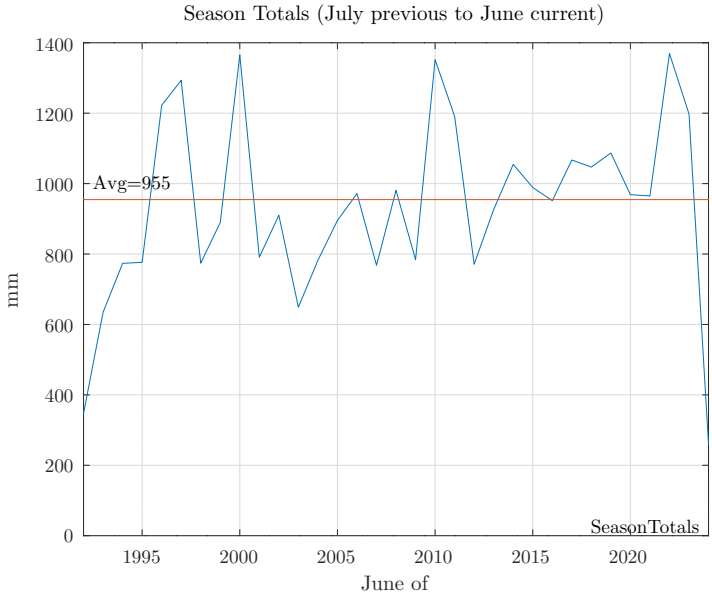

Figure 3: Season totals at the Clark's

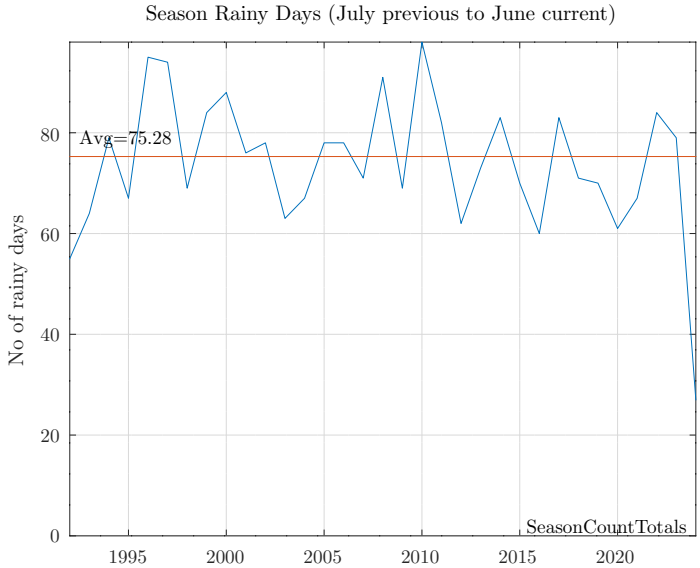

Figure 4: Season count totals (wet-days)

But on other years which are not *extreme*, but do vary quite a lot in total rainfall, the *average* amount per rainy day is pretty constant!! I did not really expect the consistency.

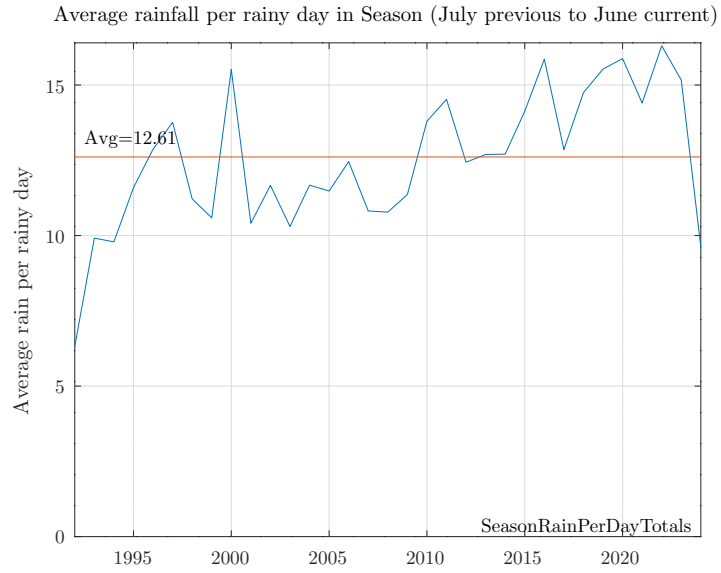

Figure 5: Average amount of rain per rainy day

Summary Table of Summed rainfall by Month

Season	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
1992	0.0	0.0	17.0	63.5	27.0	67.0	29.5	29.0	82.5	21.0	0.0	11.0	347.5
1993	0.0	28.0	12.0	37.5	160.0	143.0	61.5	52.5	104.0	36.0	0.0	0.0	634.5
1994	0.0	6.5	1.0	222.5	77.0	135.0	112.5	108.0	31.0	80.0	0.0	0.0	773.5
1995	0.0	4.0	6.5	79.0	48.0	128.0	192.0	75.0	136.0	67.0	41.0	0.0	776.5
1996	0.0	11.5	6.5	147.8	165.5	240.5	201.0	248.5	61.0	81.0	52.0	7.0	1222.2
1997	0.0	24.5	5.0	135.0	72.0	191.0	230.5	87.5	363.5	44.5	133.0	7.0	1293.5
1998	11.0	7.0	70.0	59.0	138.0	120.5	245.5	71.0	30.0	22.0	0.0	0.0	774.0
1999	0.0	0.0	29.5	98.0	239.0	155.5	90.5	89.0	77.5	65.0	37.0	8.5	889.5
2000	1.5	1.0	17.5	15.0	77.0	206.5	225.5	401.5	307.5	71.5	39.0	2.0	1365.5
2001	0.0	9.0	47.0	122.5	150.5	138.0	39.0	135.0	71.0	22.5	53.5	3.0	791.0
2002	0.0	3.0	100.0	114.0	158.0	142.0	107.0	95.0	96.0	19.0	12.0	64.0	910.0
2003	0.0	20.5	5.0	106.0	27.0	185.5	128.0	85.5	66.5	7.0	0.0	18.0	649.0
2004	0.0	6.0	4.0	93.0	94.5	72.0	149.0	177.5	115.5	56.5	0.0	14.0	782.0
2005	26.5	5.5	0.0	47.5	52.5	199.5	219.0	160.0	88.5	92.5	4.0	0.0	895.5
2006	0.0	0.0	1.5	54.0	158.0	134.0	217.0	259.0	121.0	24.5	2.5	0.0	971.5
2007	1.5	42.0	9.5	63.0	143.5	230.5	95.5	33.0	62.5	49.0	0.0	38.0	768.0
2008	0.8	0.0	46.0	170.0	95.0	122.0	199.5	63.5	159.0	30.0	65.5	29.5	980.8
2009	0.0	0.0	0.0	111.0	137.5	105.5	198.5	67.5	107.5	3.5	32.0	21.0	784.0
2010	0.0	24.5	8.5	148.5	149.5	189.5	324.0	152.0	114.5	196.5	44.5	0.0	1352.0
2011	0.0	0.0	0.0	68.5	122.5	303.5	206.5	93.5	213.0	106.0	24.0	53.5	1191.0
2012	0.0	6.0	5.0	90.0	59.0	235.0	185.5	67.5	101.0	19.0	0.0	3.0	771.0
2013	0.0	2.5	121.0	73.5	131.0	133.5	147.5	87.0	73.5	146.0	11.0	0.0	926.5
2014	0.0	9.5	6.0	154.0	152.0	247.0	50.5	124.0	236.0	65.0	2.0	8.5	1054.5
2015	0.0	2.0	22.0	52.0	154.5	364.0	167.5	117.5	65.5	42.0	0.0	2.0	989.0
2016	31.0	1.0	75.0	12.0	89.0	104.0	186.0	210.5	144.0	16.5	63.0	19.5	951.5
2017	28.0	0.0	4.0	86.0	188.5	153.5	170.0	294.5	50.0	43.0	49.5	0.0	1067.0
2018	11.0	0.0	0.0	140.5	154.5	207.0	93.0	123.5	195.5	90.0	25.0	7.0	1047.0
2019	0.0	0.0	20.0	70.0	87.5	95.5	290.5	244.5	57.0	222.0	0.0	0.0	1087.0
2020	0.0	0.0	24.0	3.5	160.0	292.0	76.0	180.0	86.5	128.5	0.0	18.0	968.5
2021	0.0	0.0	9.0	73.5	252.0	186.0	119.0	162.5	99.0	32.0	11.0	21.0	965.0
2022	0.0	1.0	8.0	96.0	211.5	240.5	299.0	118.5	140.5	203.5	24.0	27.0	1369.5
2023	2.0	0.0	0.0	47.0	272.5	206.0	50.5	394.0	70.5	44.0	102.5	9.0	1198.0
2024	0.0	0.0	18.5	32.0	106.0	103.0	0.0	0.0	0.0	0.0	0.0	0.0	259.5
Avg	3.4	6.5	21.2	87.4	130.6	175.0	159.6	144.0	116.5	67.1	25.9	12.2	***954.6***

Bottom right is the overall average.

3.2 Monthly Totals by Wet and Dry Months

It is difficult to present the monthly data, as there are now too many years of it, and we are running out of graph space :-)

It is to be noted that the really wet months are a tad random!! And yes, Feb 2000 was a reasonably damp month. Note too that May '97 in the "dry" months was rather special, leading to the pretty good seasonal total, even so late in the year.

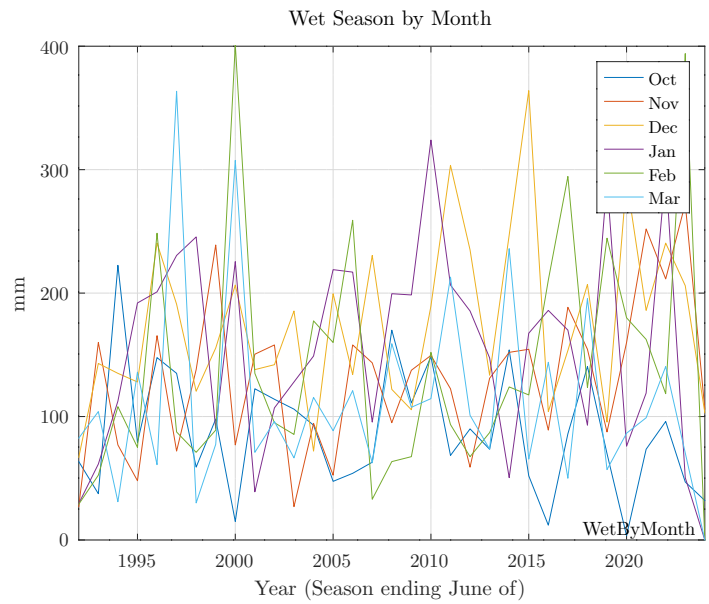

Figure 6: "Wet" part of the season—monthly totals

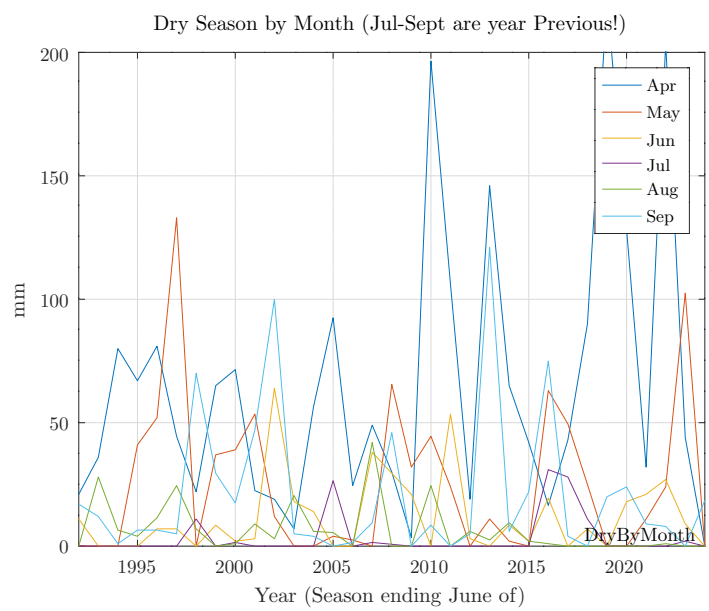

Figure 7: "Dry" part of the season—monthly totals

3.3 Lies, Damned lies, and Statistics

Another way of looking at this is the min/mean/max type of graph per month. I have also added the First Quartile, Median, Third Quartile. I think that the month of February shows beautifully the classic question so often asked by newcomers to statistics: "What is the difference between a mean and a median". The difference between min/max and 1st and 3rd quartiles is *even more* marked. The difference is caused by a once-off 30mm in 1992, and a once-off 401.5mm in 2000.

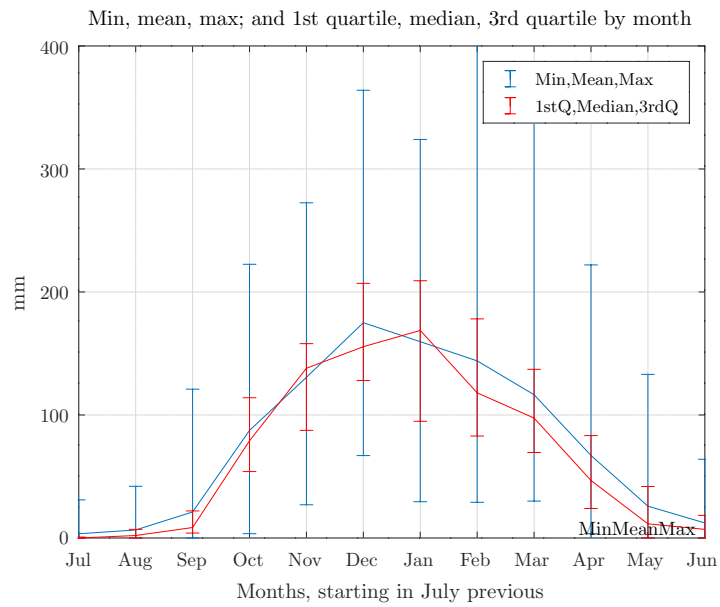

Figure 8: Min,mean,max and 1st quartile,median,3rd quartile by month.

Also of interest is a similar graph of the number of rainy days by month.

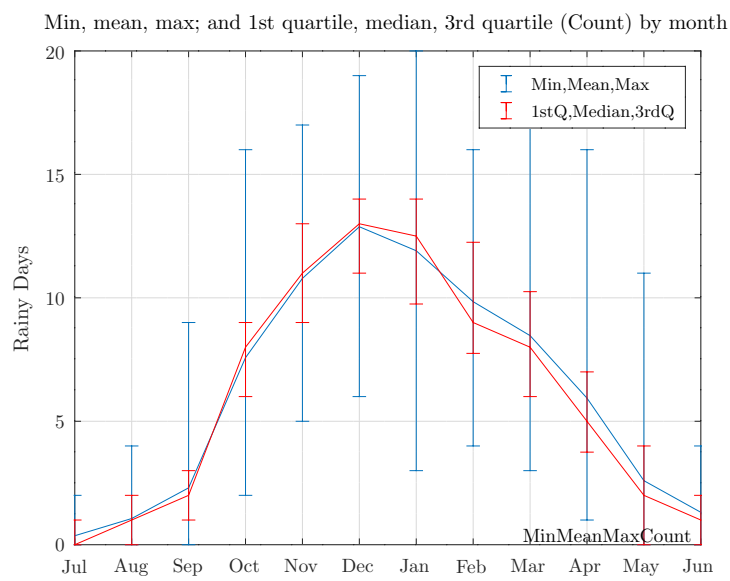

Figure 9: Min,mean,max and 1st quartile,median,3rd quartile rainy days by month.

4 Rain Data detail

For those oddballs that really like detailed stuff, here is the data on a yearly and a monthly basis.

4.1 Per Year

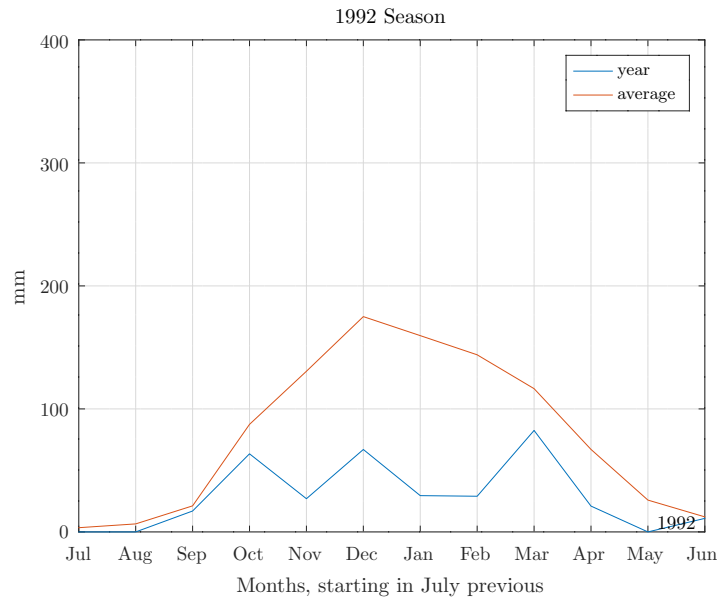

Figure 10: 1992 Season

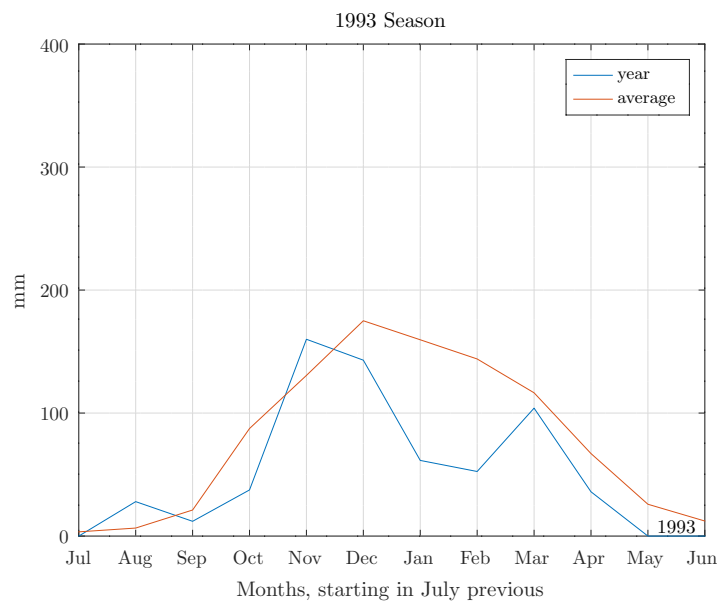

Figure 11: 1993 Season

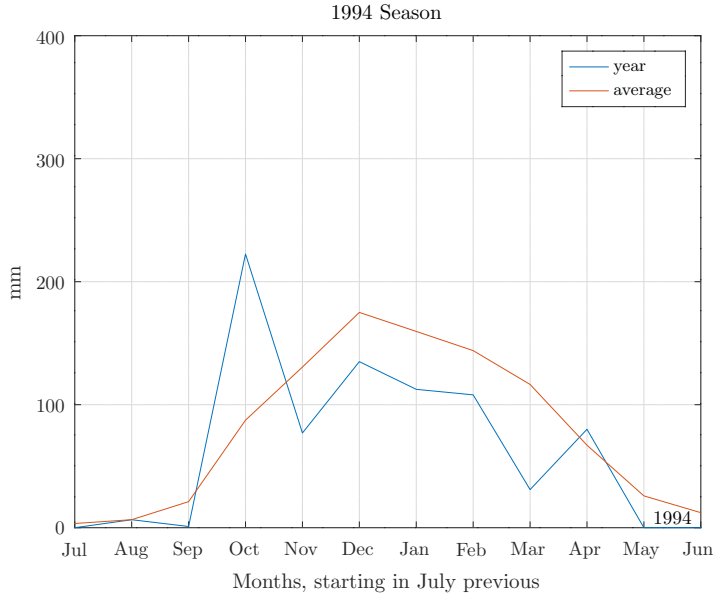

Figure 12: 1994 Season

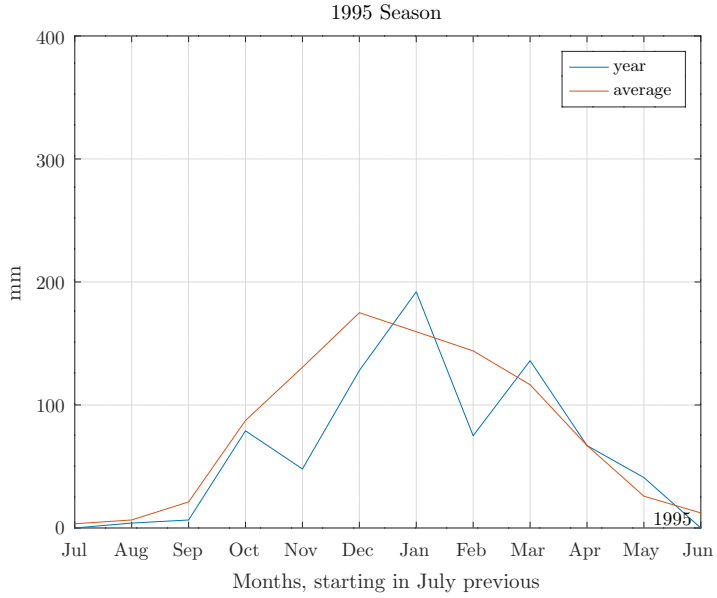

Figure 13: 1995 Season

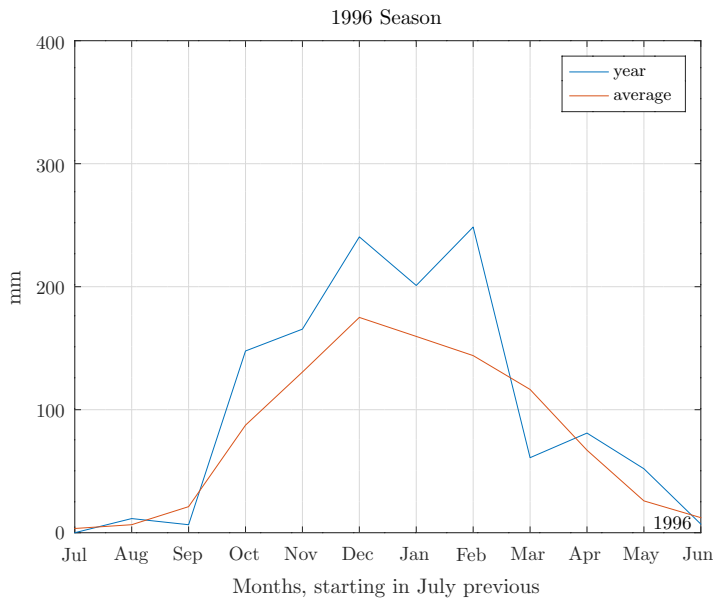

Figure 14: 1996 Season

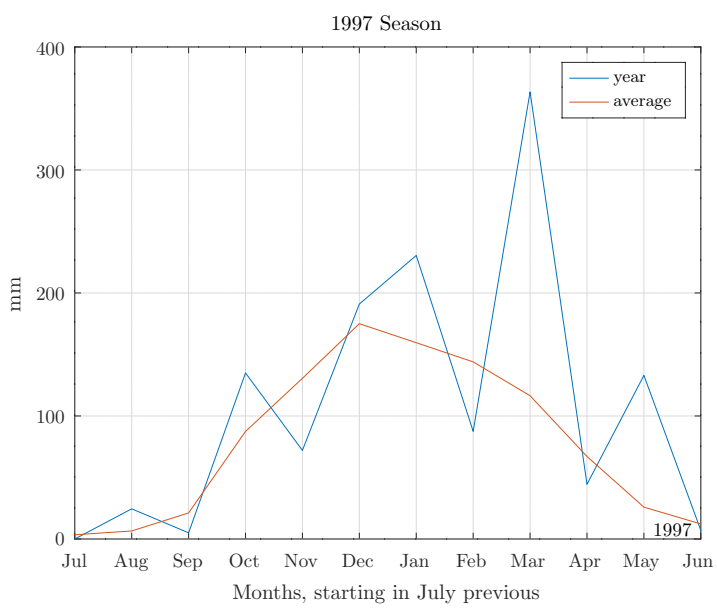

Figure 15: 1997 Season

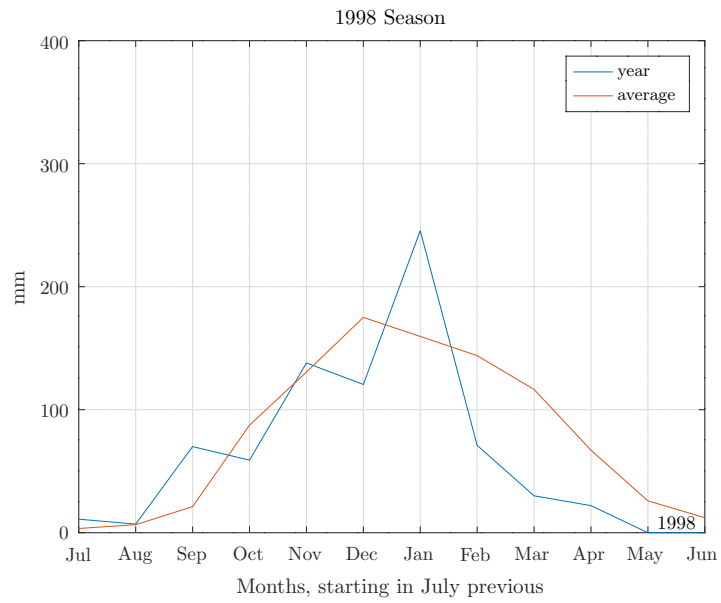

Figure 16: 1998 Season

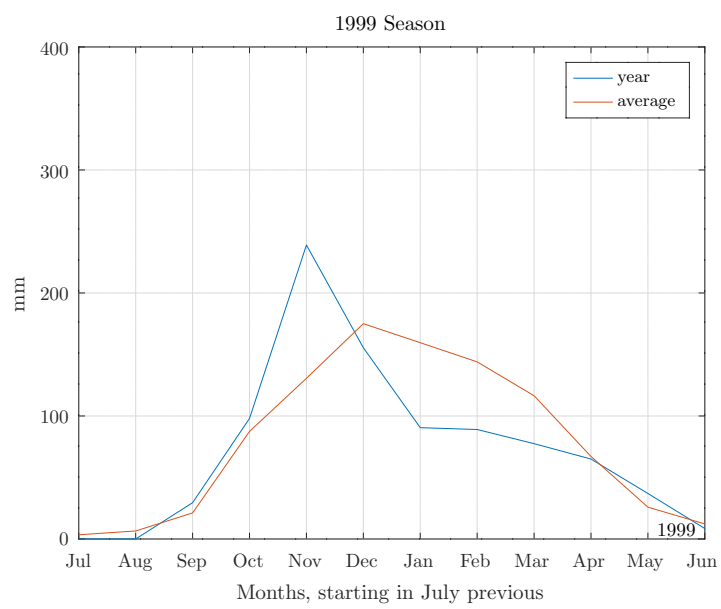

Figure 17: 1999 Season

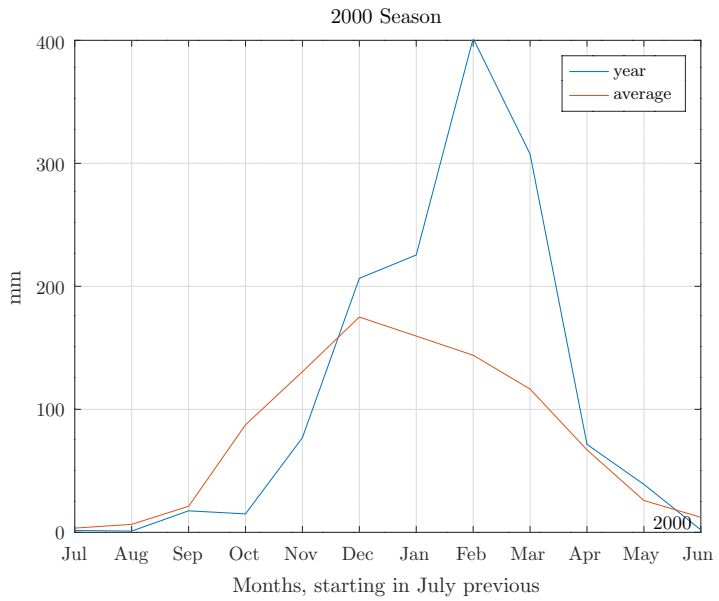

Figure 18: 2000 Season

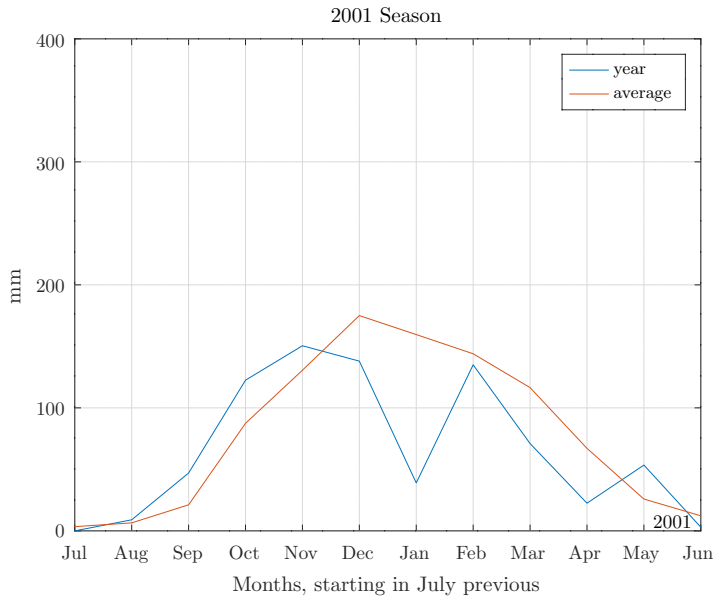

Figure 19: 2001 Season

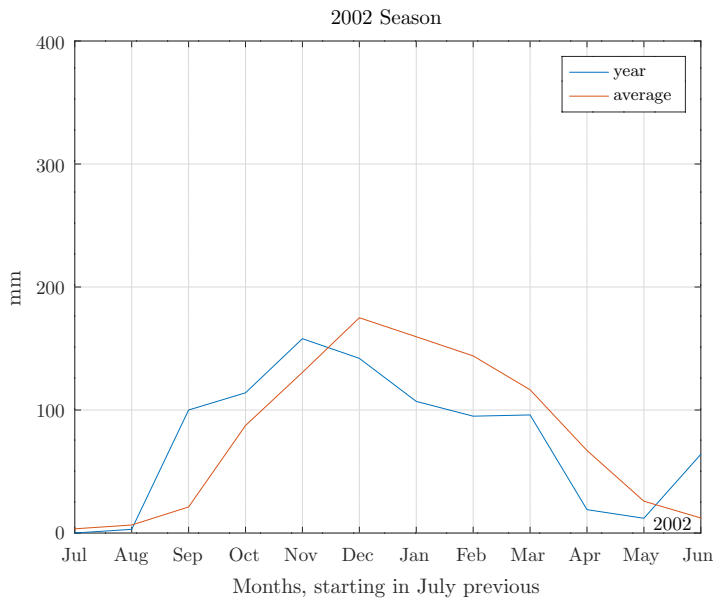

Figure 20: 2002 Season

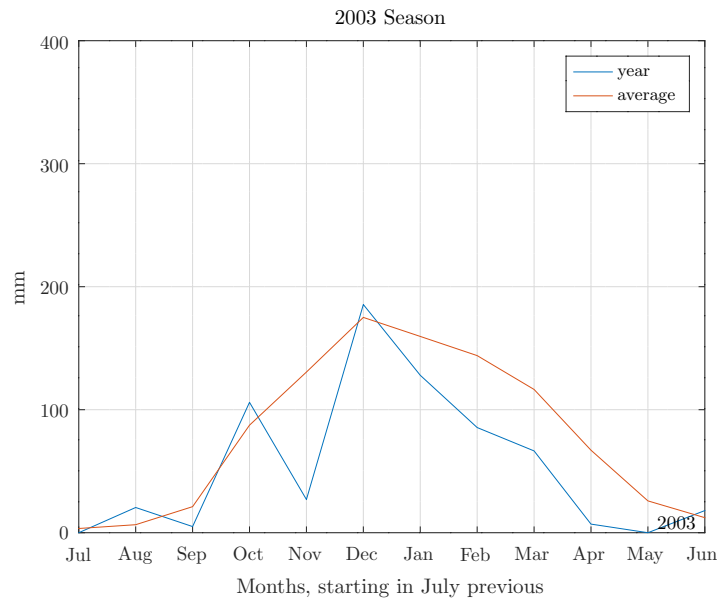

Figure 21: 2003 Season

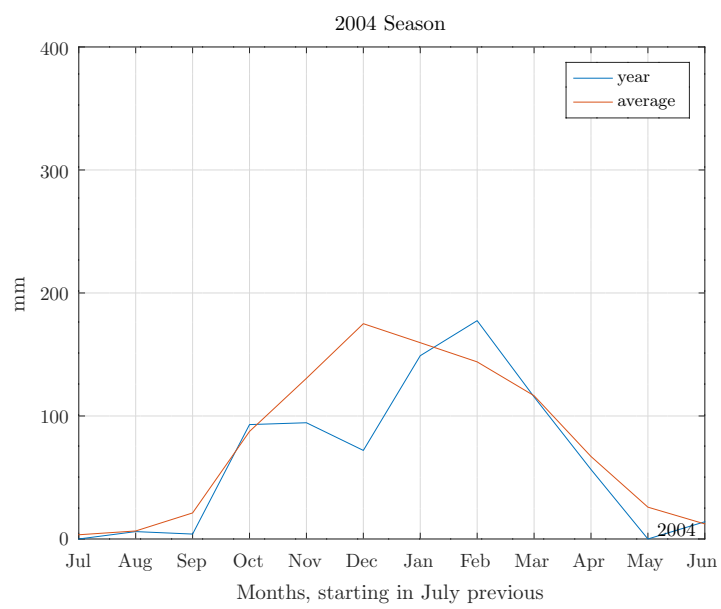

Figure 22: 2004 Season

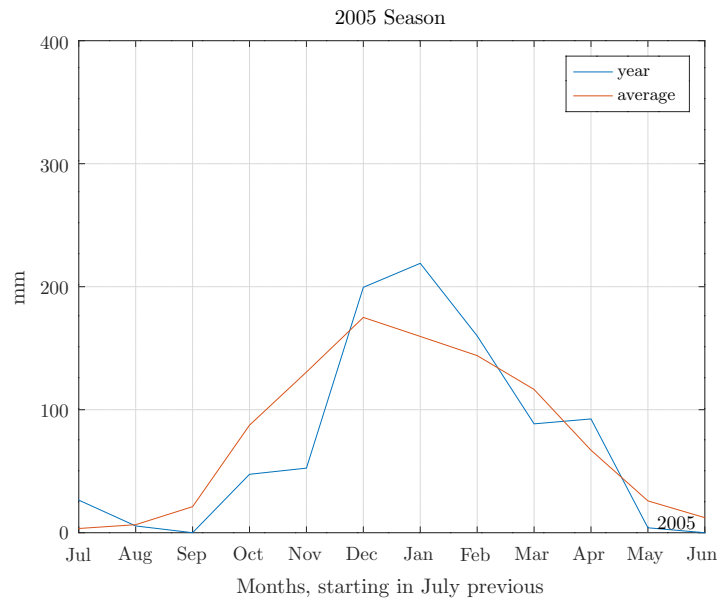

Figure 23: 2005 Season

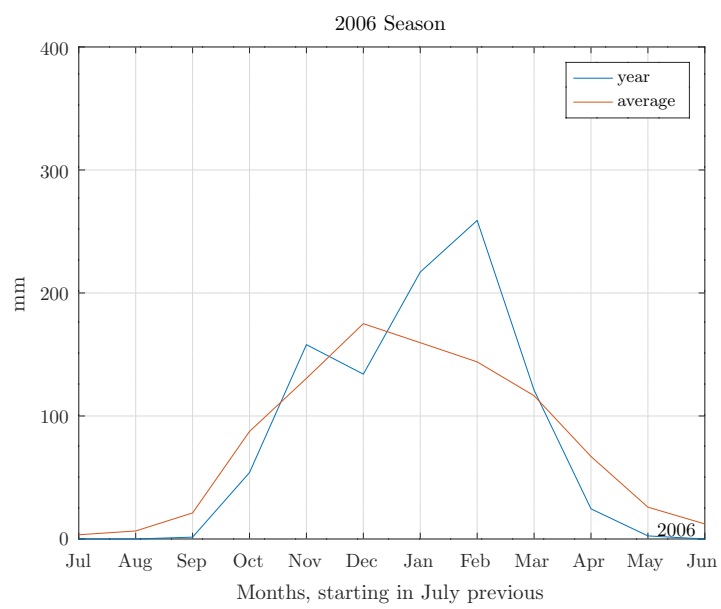

Figure 24: 2006 Season

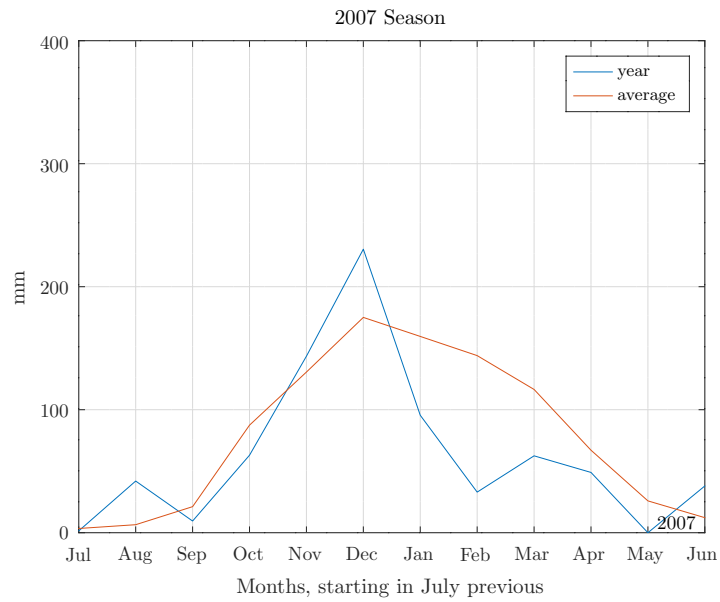

Figure 25: 2007 Season

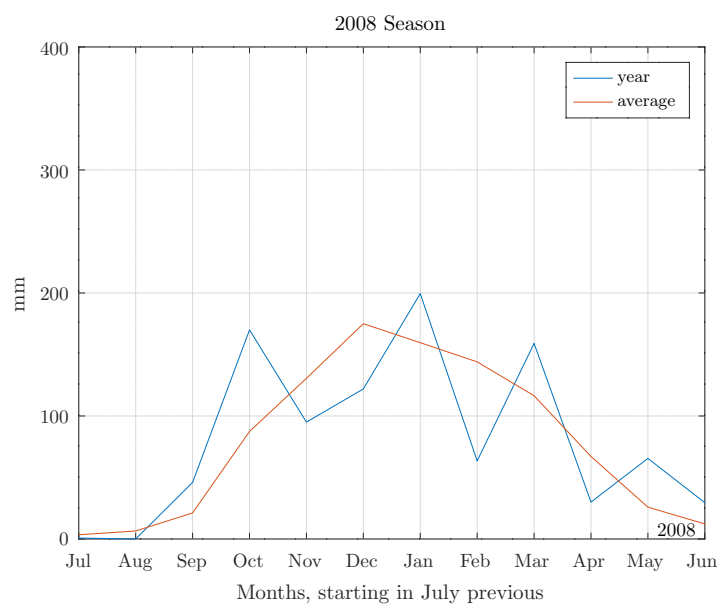

Figure 26: 2008 Season

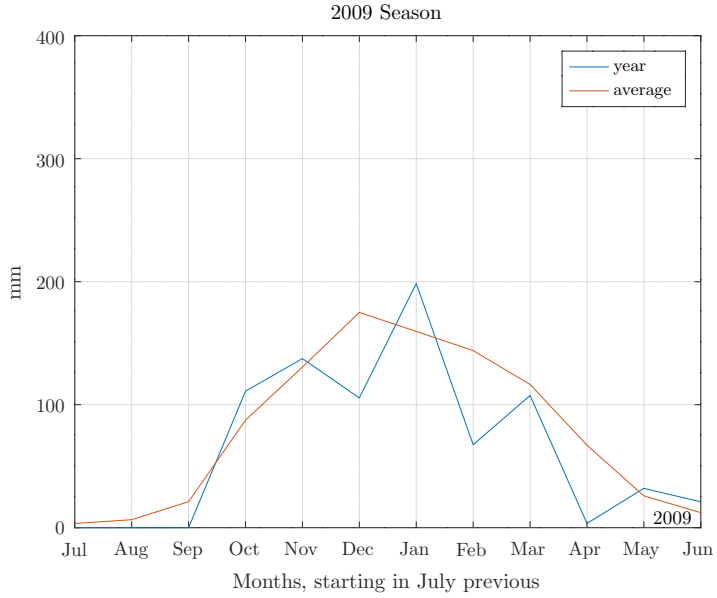

Figure 27: 2009 Season

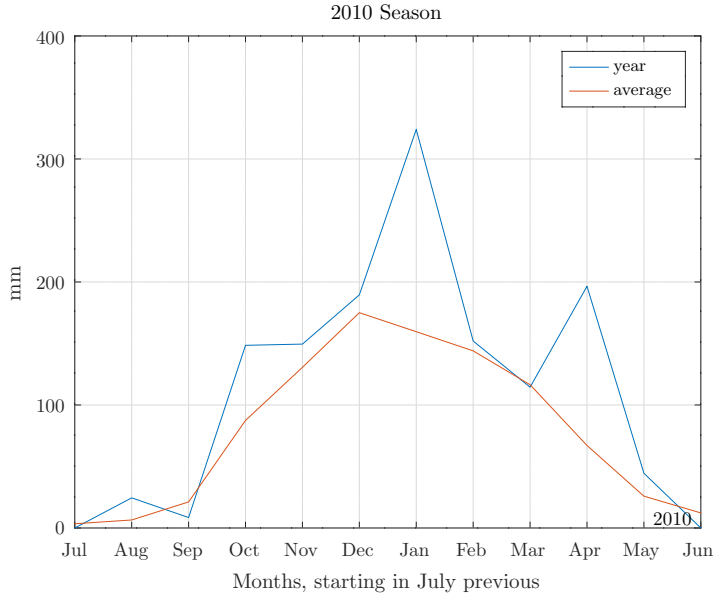

Figure 28: 2010 Season

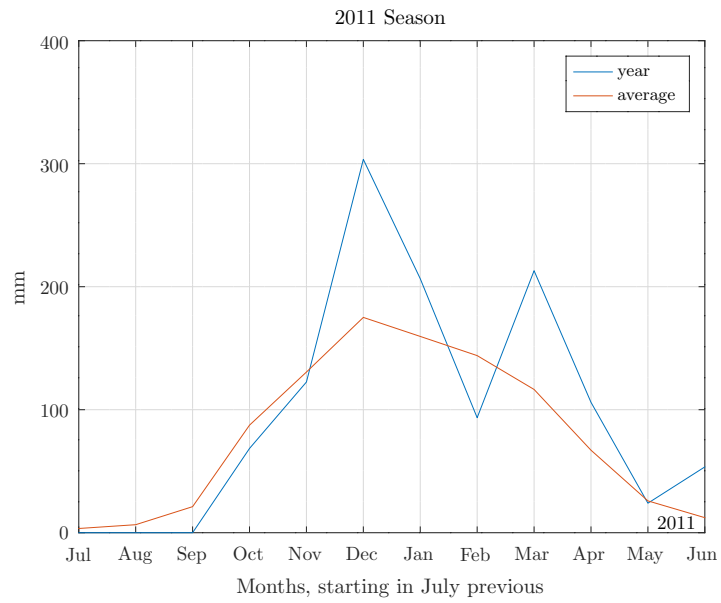

Figure 29: 2011 Season

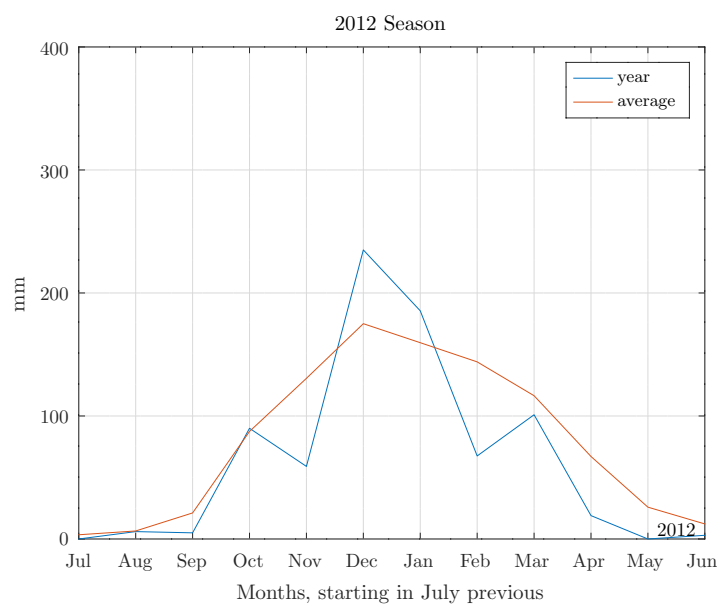

Figure 30: 2012 Season

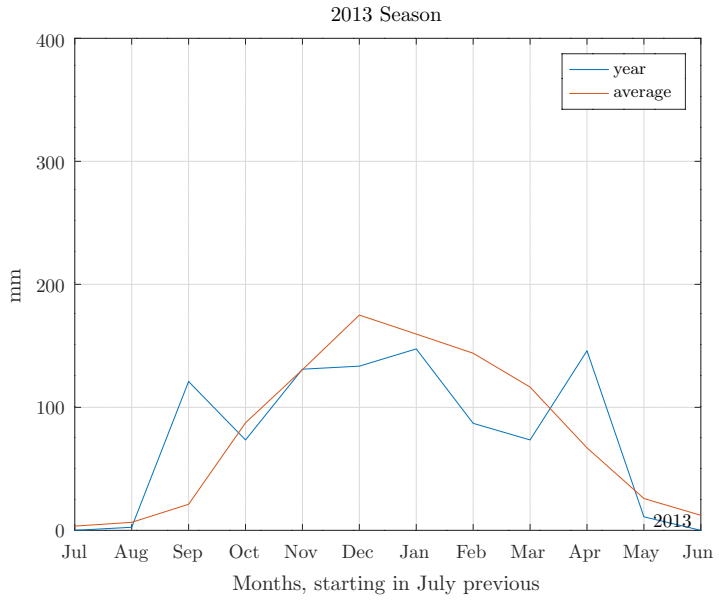

Figure 31: 2013 Season

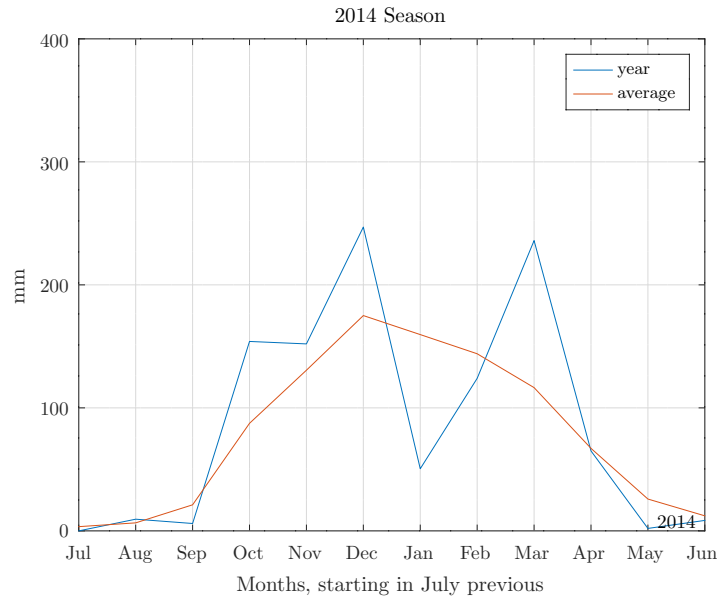

Figure 32: 2014 Season

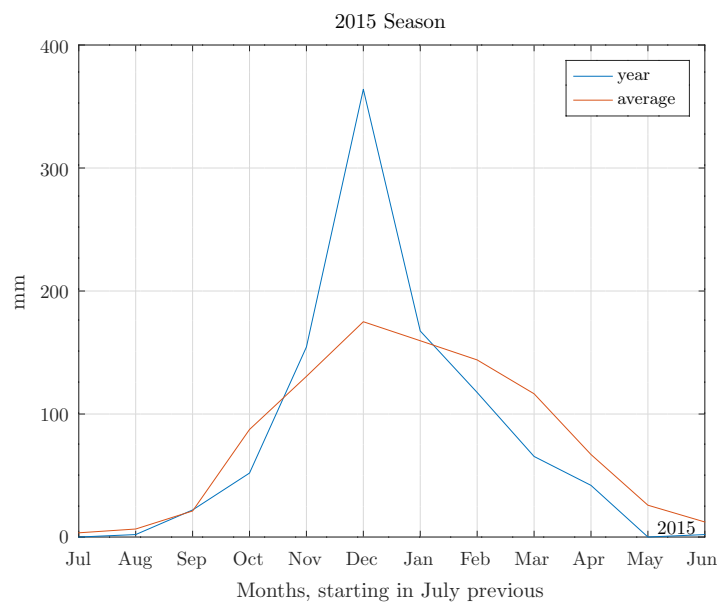

Figure 33: 2015 Season

4.2 Per Year Cumulative

The cumulative graphs show very nicely "when" the season "kicks-in". Some "good" seasons are awful to begin with, some start off with a bang, but fizzle dismally.

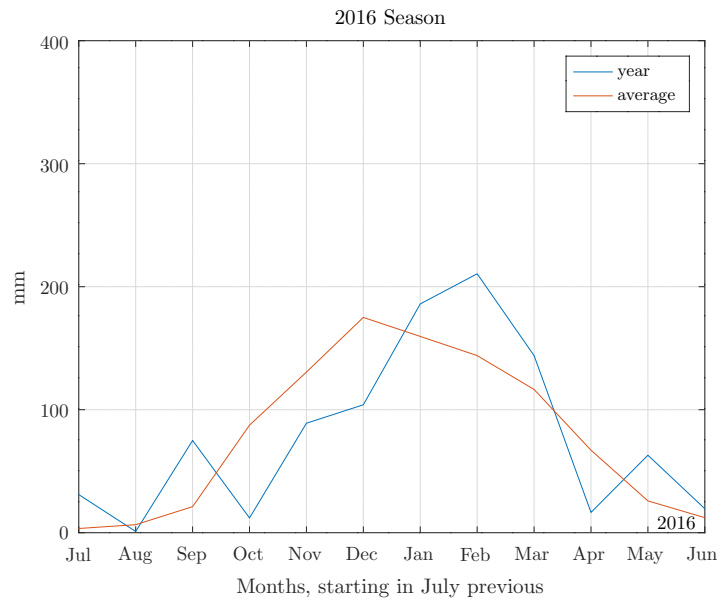

Figure 34: 2016 Season

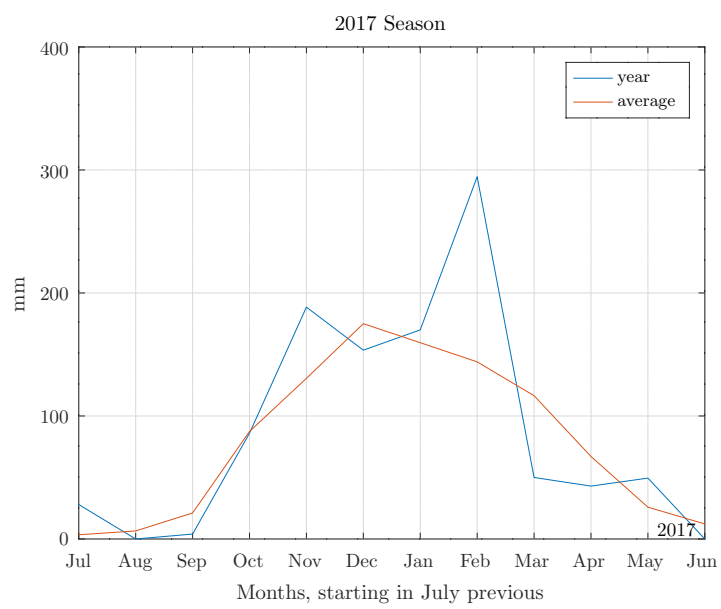

Figure 35: 2017 Season

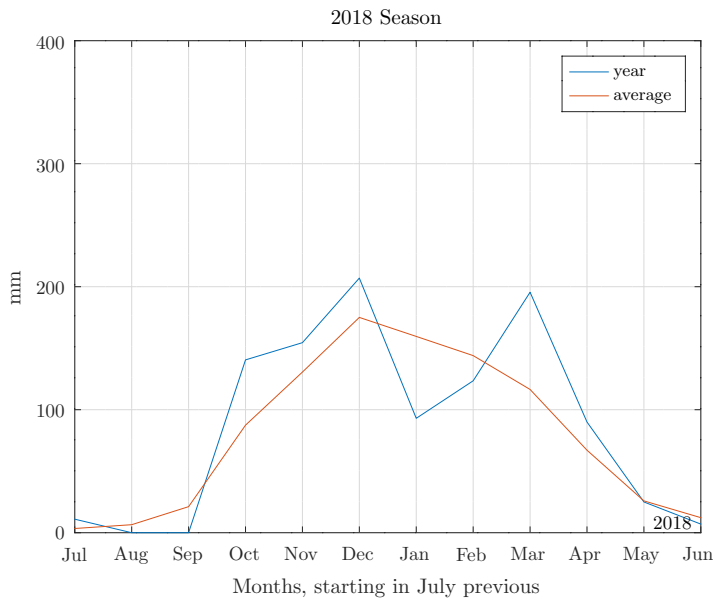

Figure 36: 2018 Season

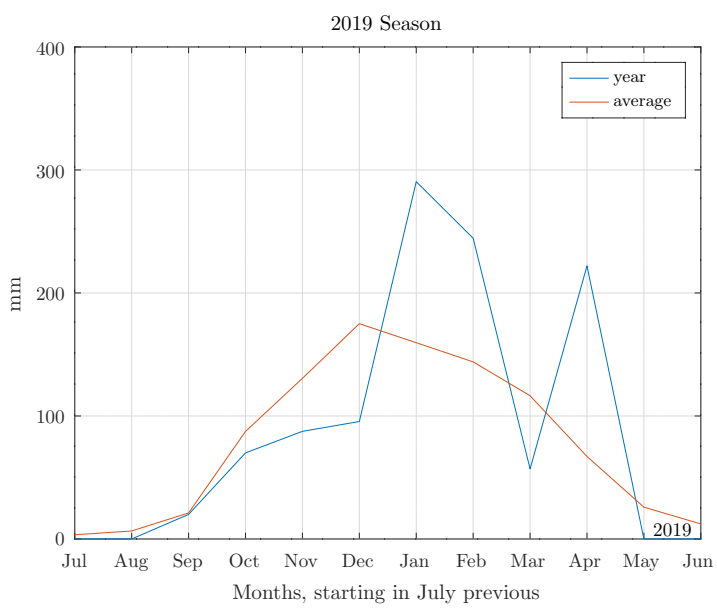

Figure 37: 2019 Season

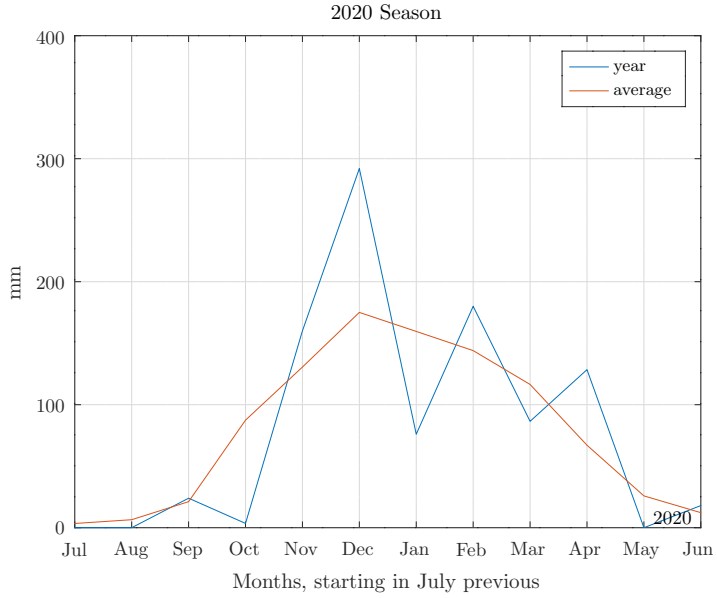

Figure 38: 2020 Season

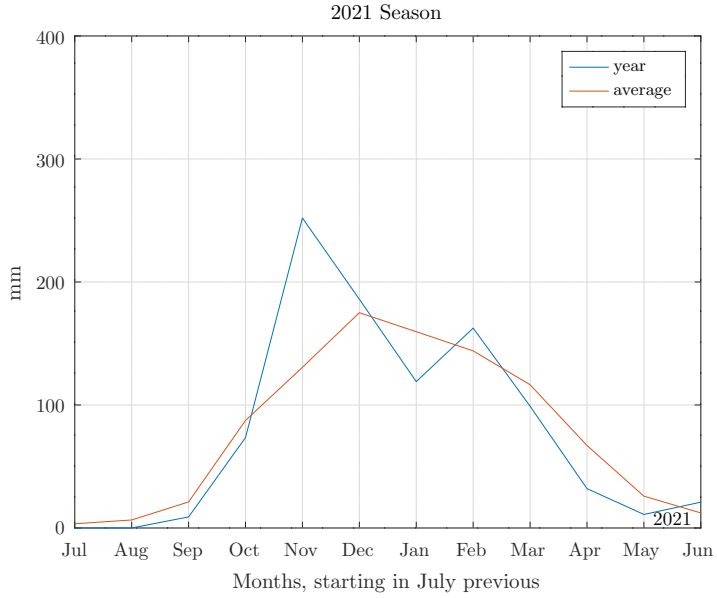

Figure 39: 2021 Season

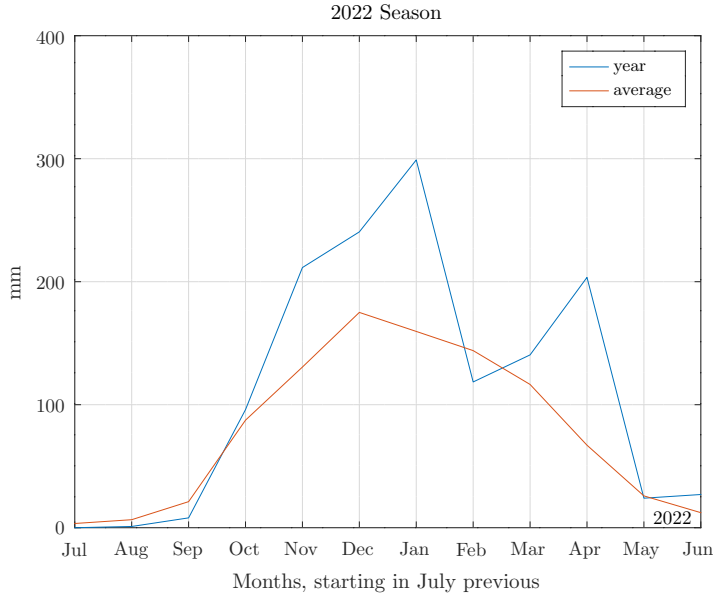

Figure 40: 2022 Season

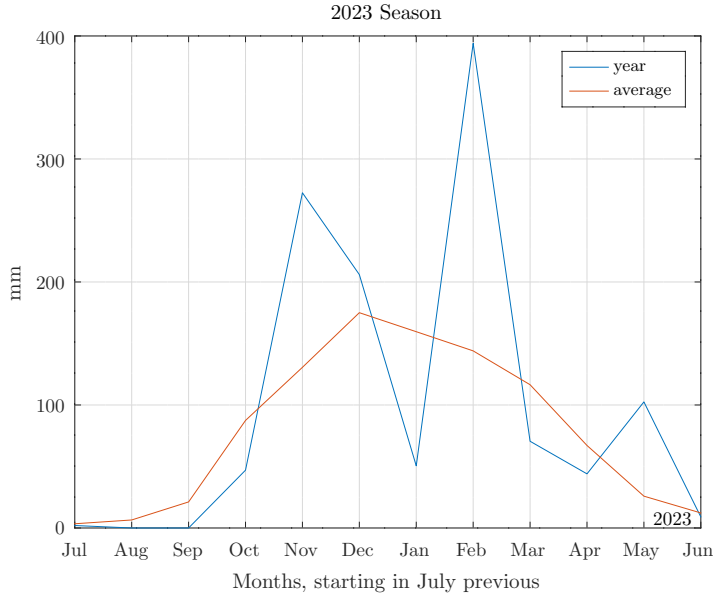

Figure 41: 2023 Season

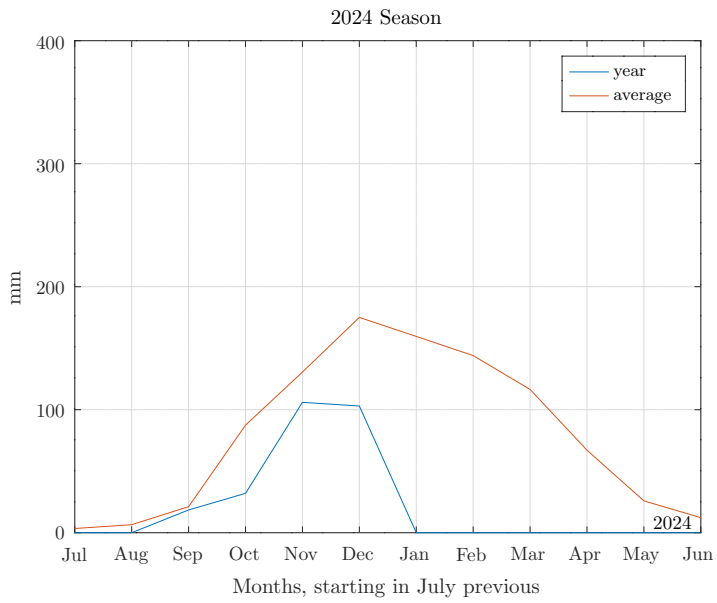

Figure 42: 2024 Season

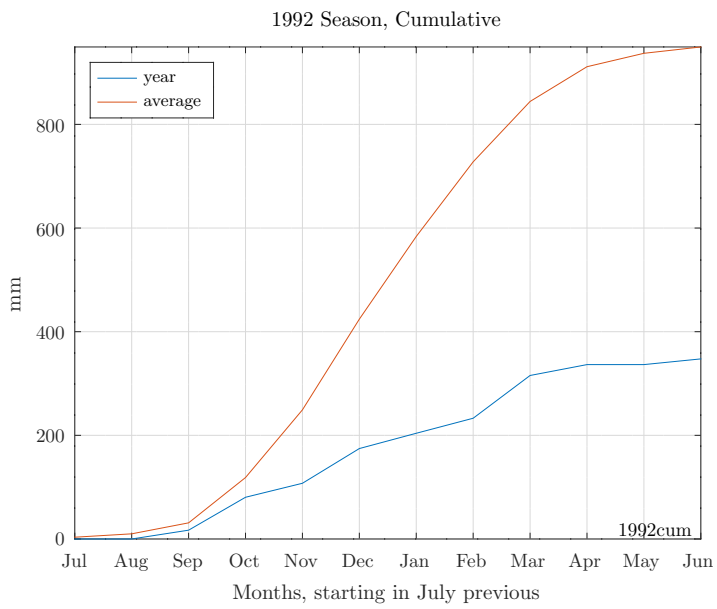

Figure 43: 1992 Season

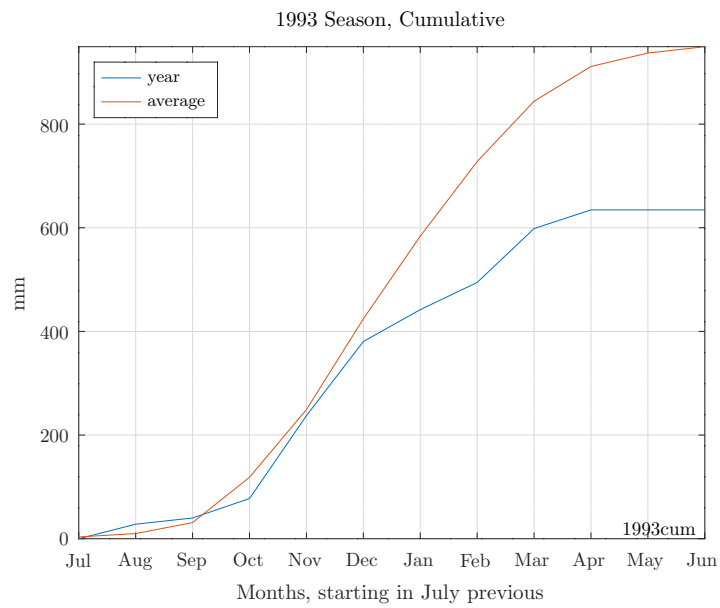

Figure 44: 1993 Season

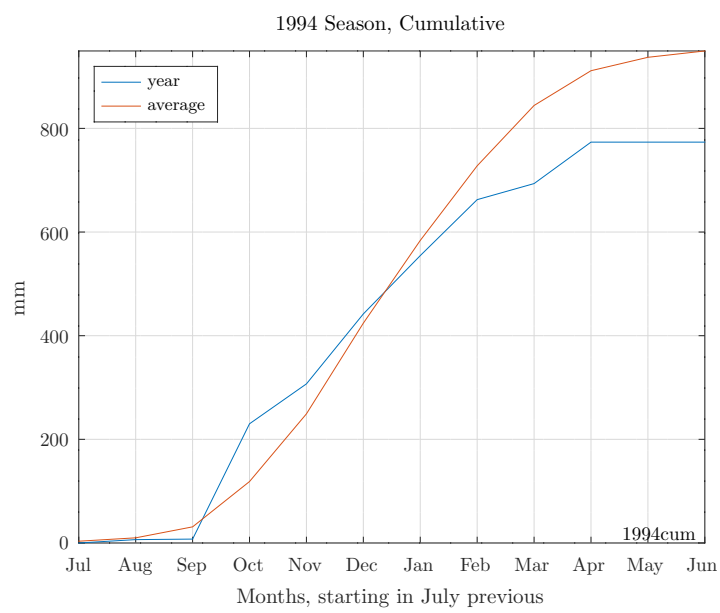

Figure 45: 1994 Season

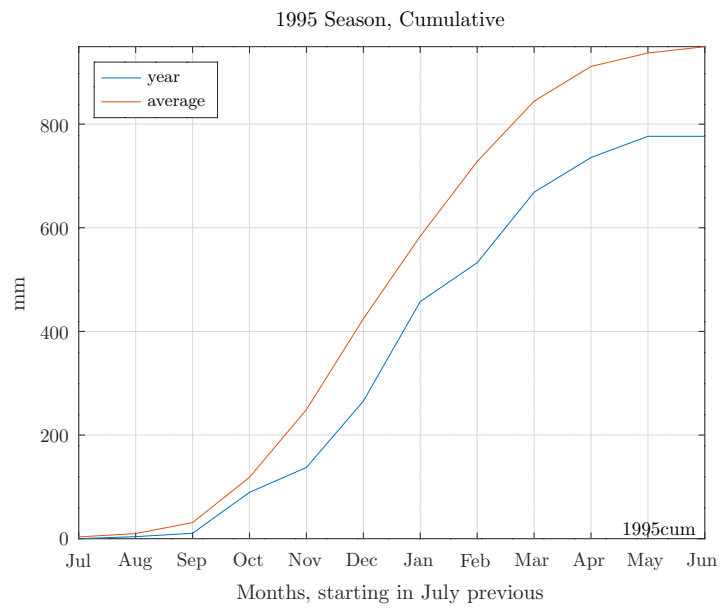

Figure 46: 1995 Season

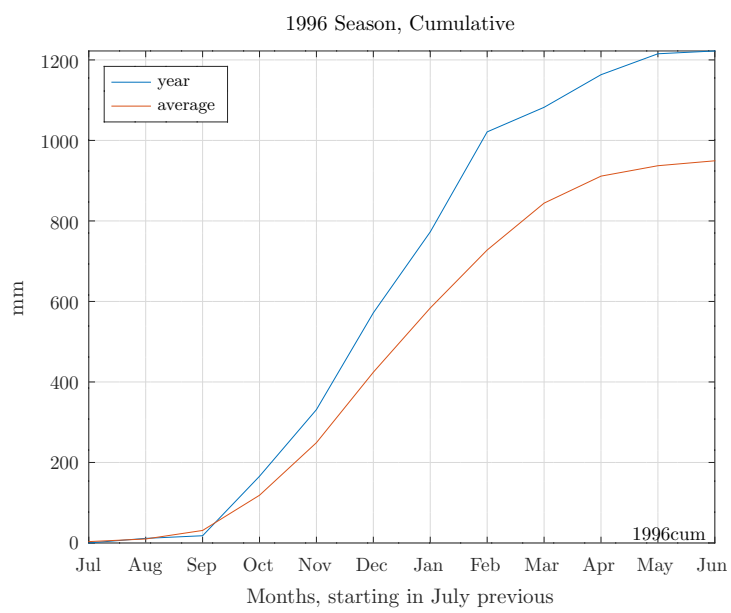

Figure 47: 1996 Season

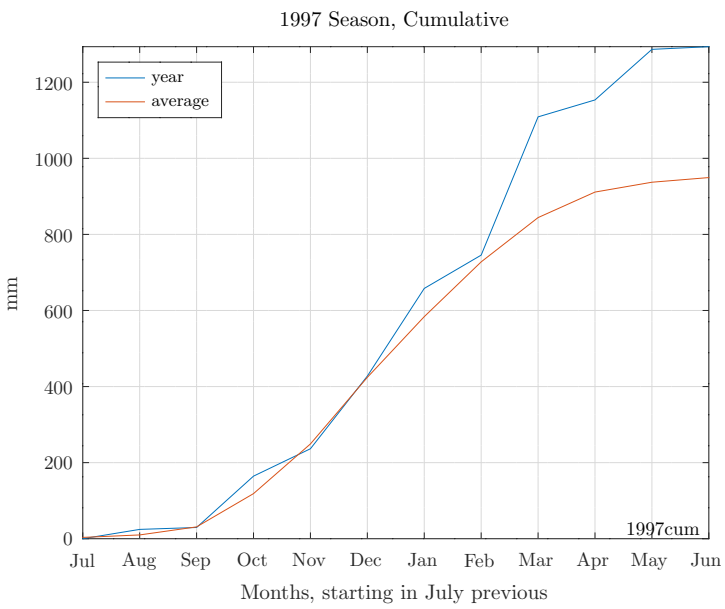

Figure 48: 1997 Season

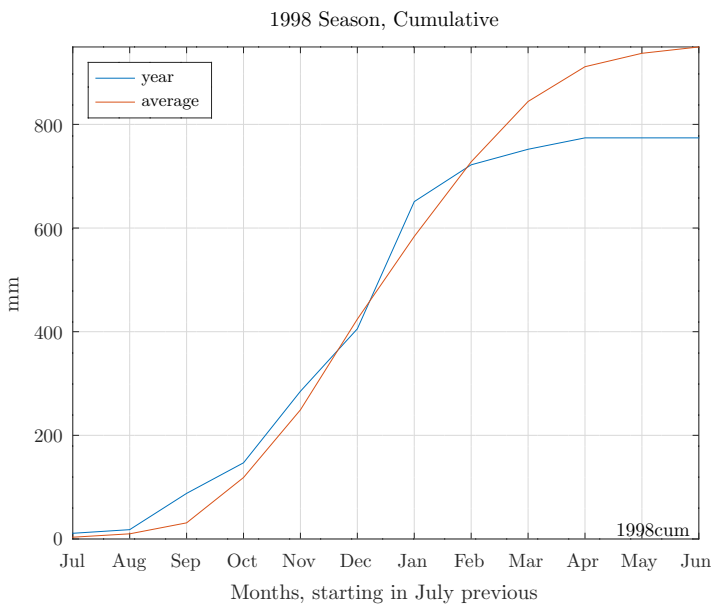

Figure 49: 1998 Season

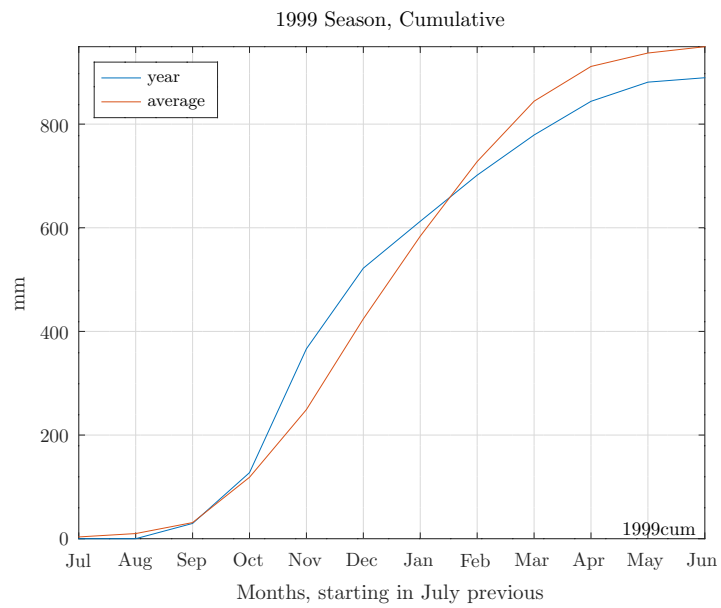

Figure 50: 1999 Season

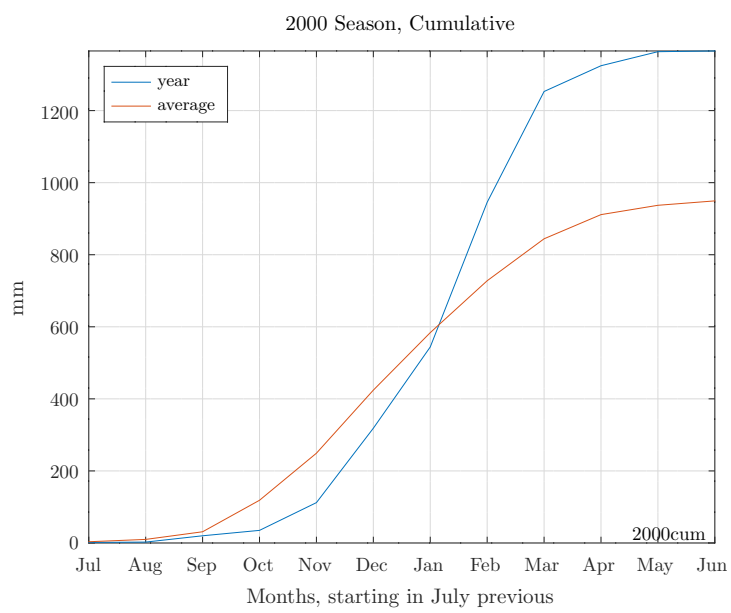

Figure 51: 2000 Season

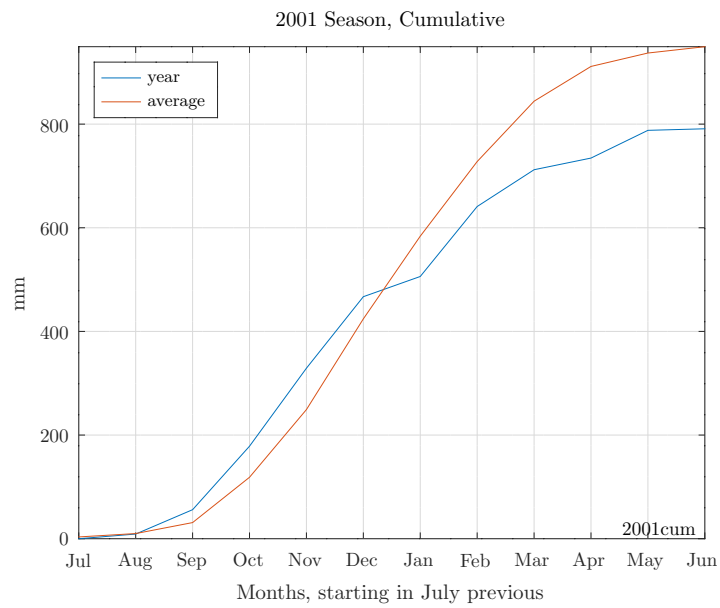

Figure 52: 2001 Season

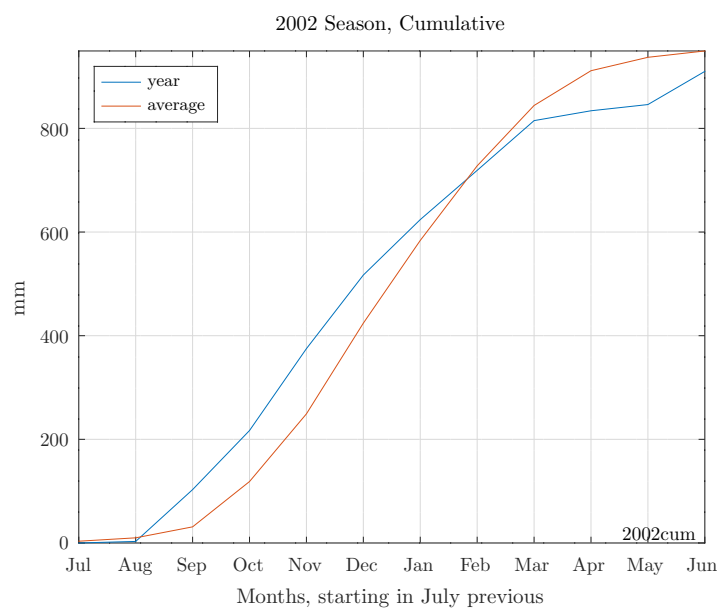

Figure 53: 2002 Season

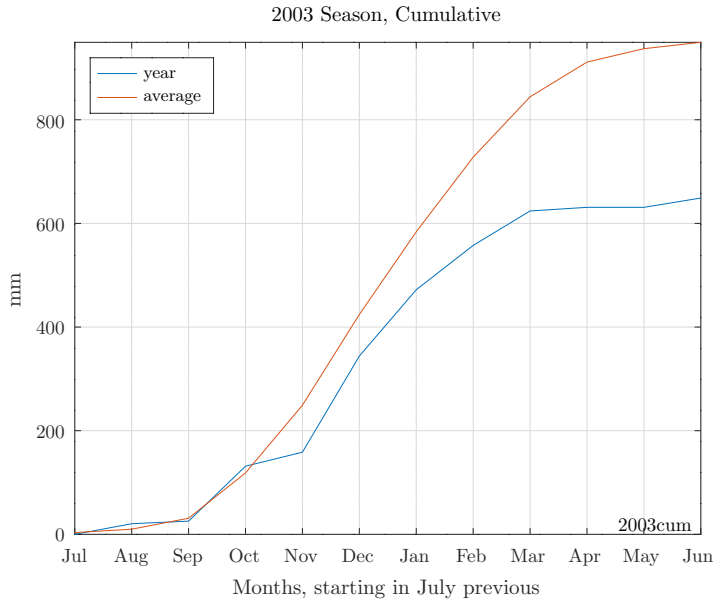

Figure 54: 2003 Season

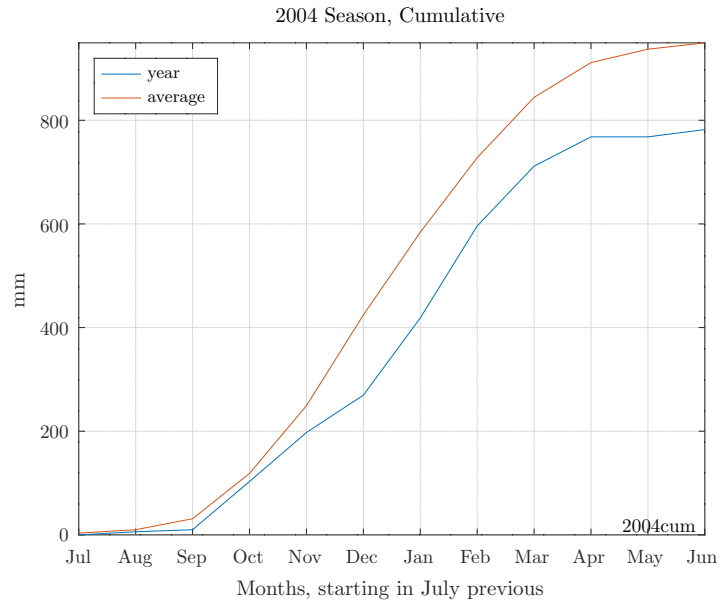

Figure 55: 2004 Season

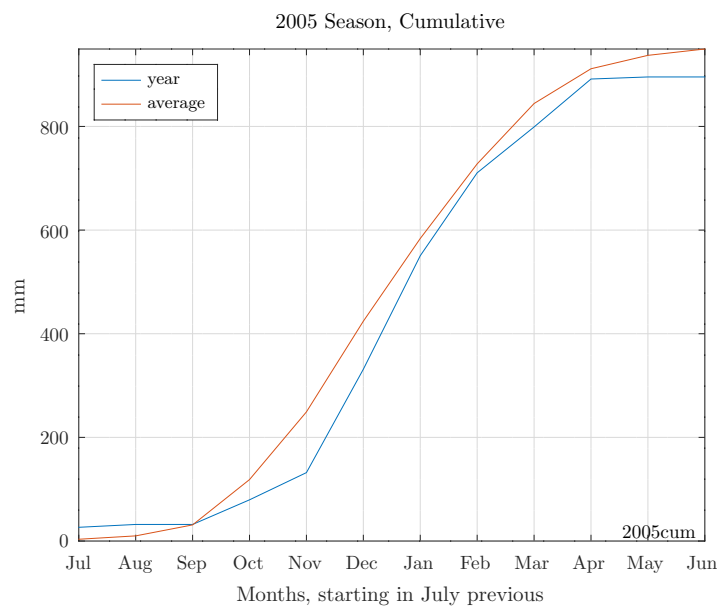

Figure 56: 2005 Season

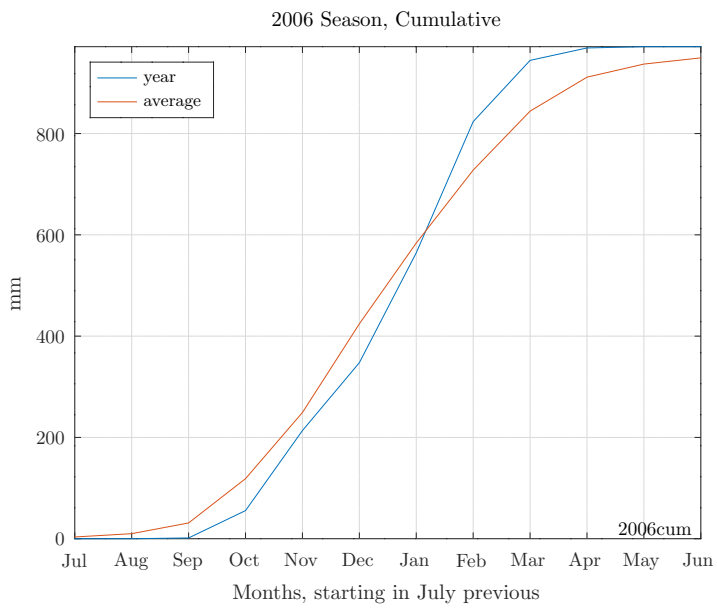

Figure 57: 2006 Season

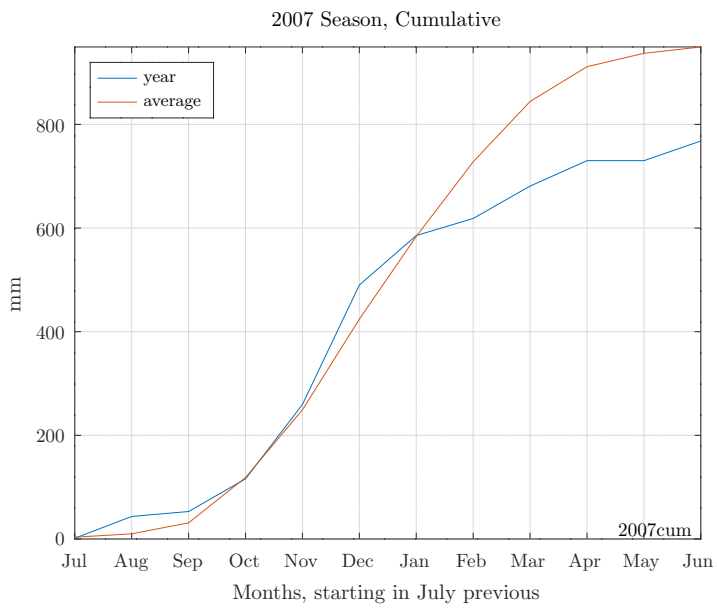

Figure 58: 2007 Season

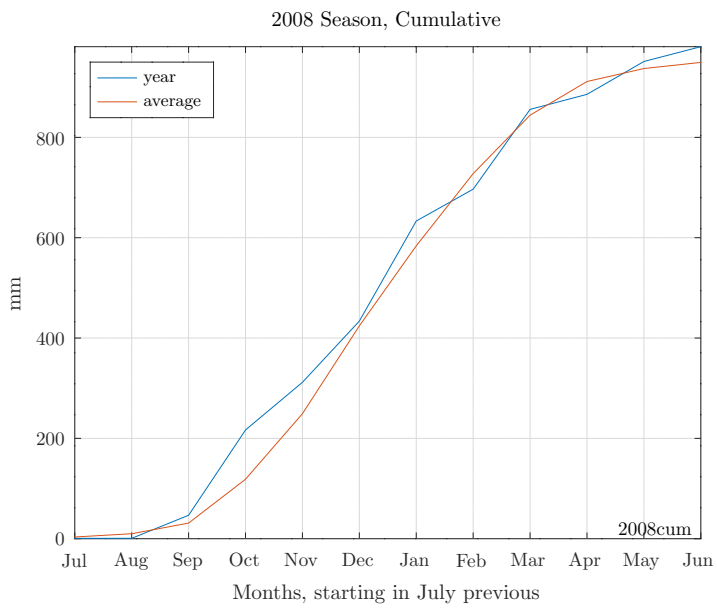

Figure 59: 2008 Season

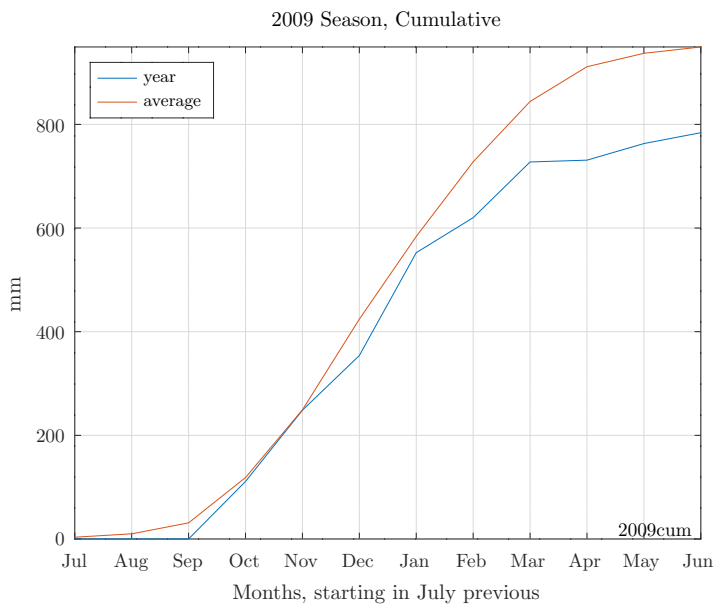

Figure 60: 2009 Season

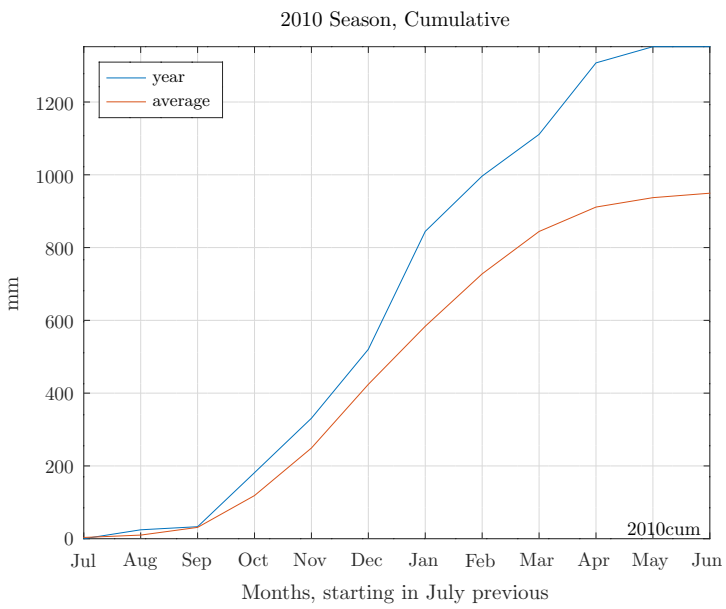

Figure 61: 2010 Season

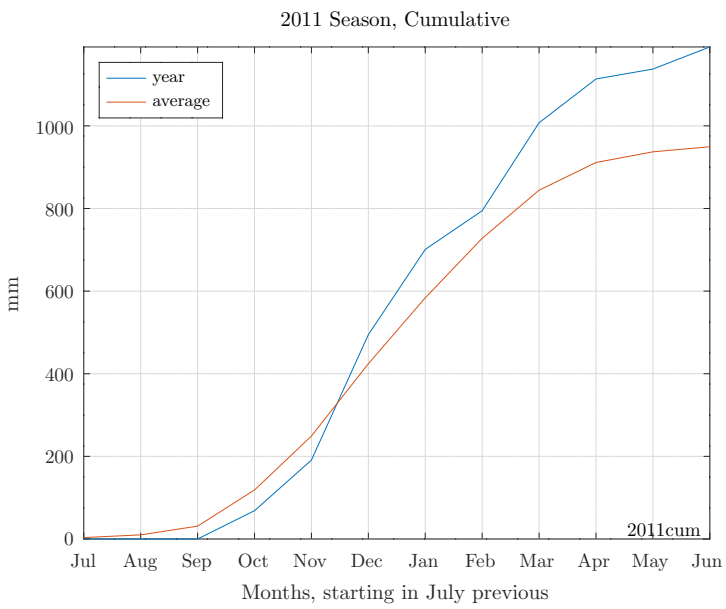

Figure 62: 2011 Season

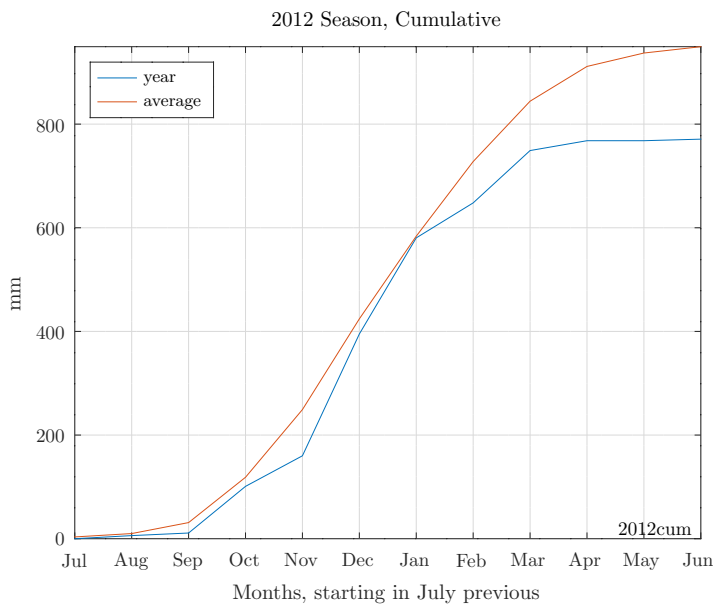

Figure 63: 2012 Season

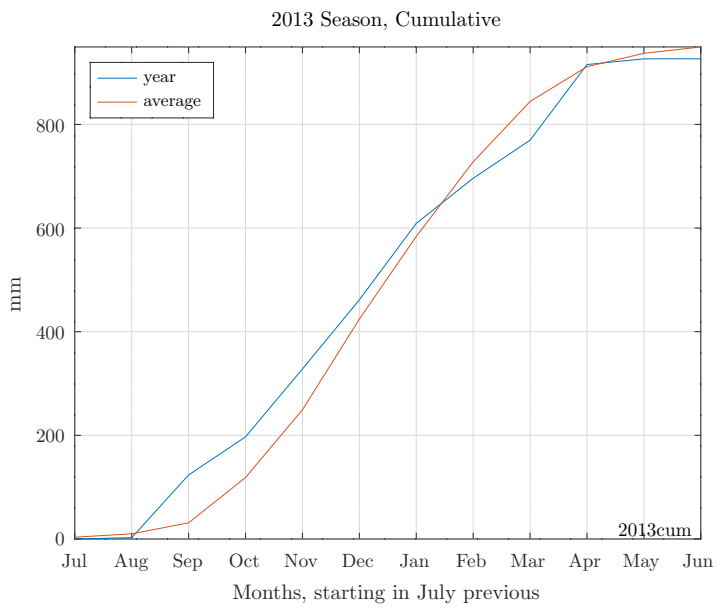

Figure 64: 2013 Season

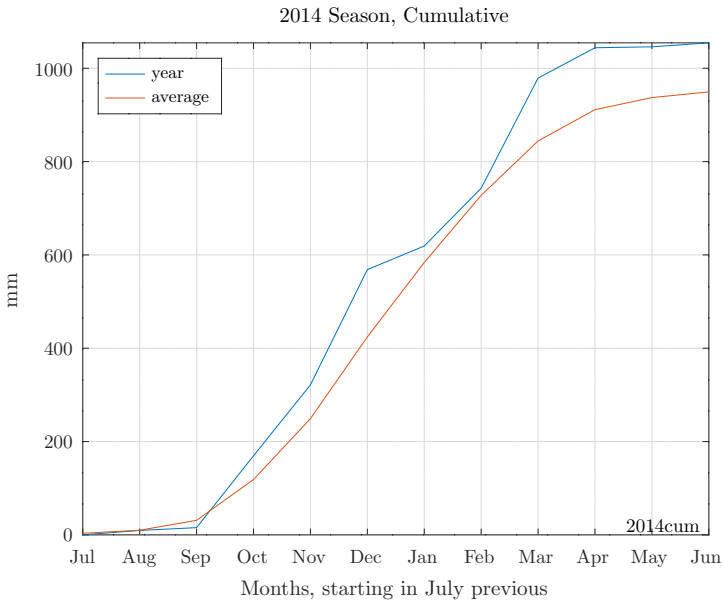

Figure 65: 2014 Season

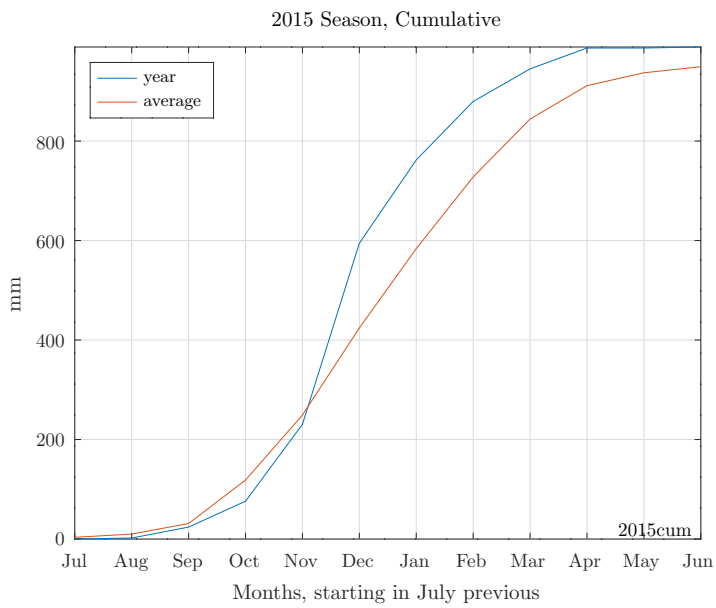

Figure 66: 2015 Season

4.3 Per Month

Note the scale changes: “Wet” and “Dry” months have different maxima on the yranges, but are consistent within those classifications for comparison purposes.

The online version is ”http://ytdp.ee.wits.ac.za/rain.html”

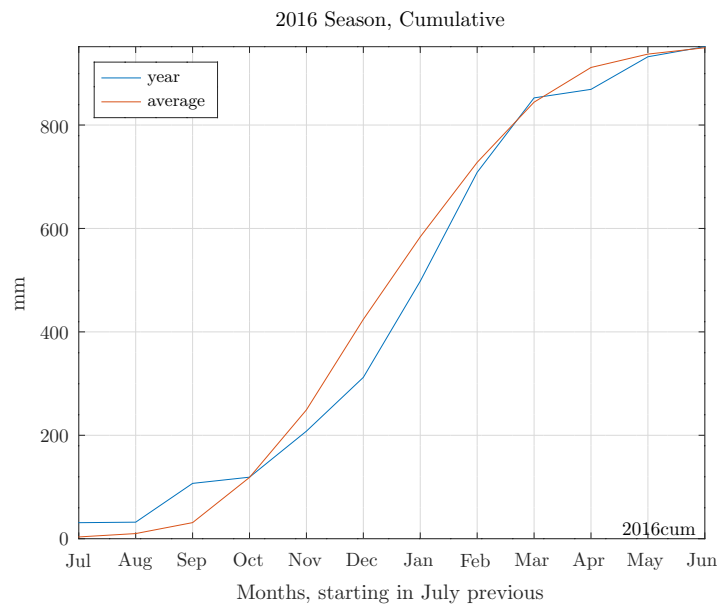

Figure 67: 2016 Season

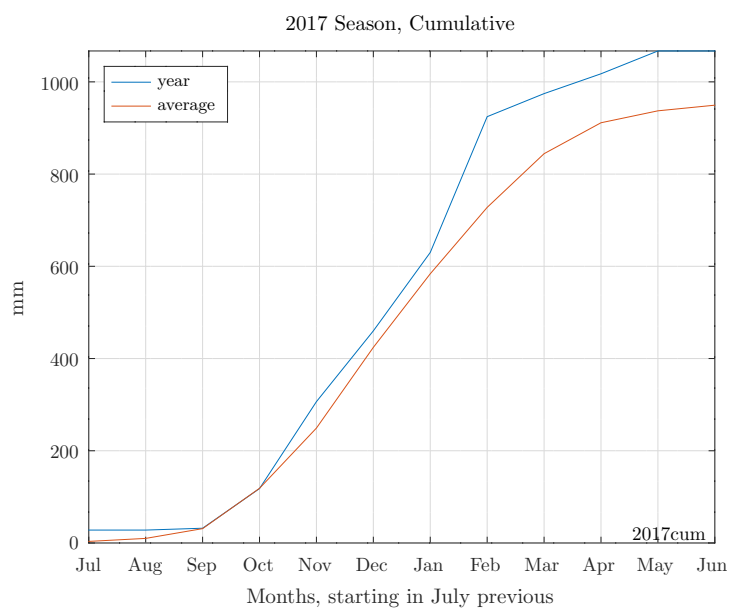

Figure 68: 2017 Season

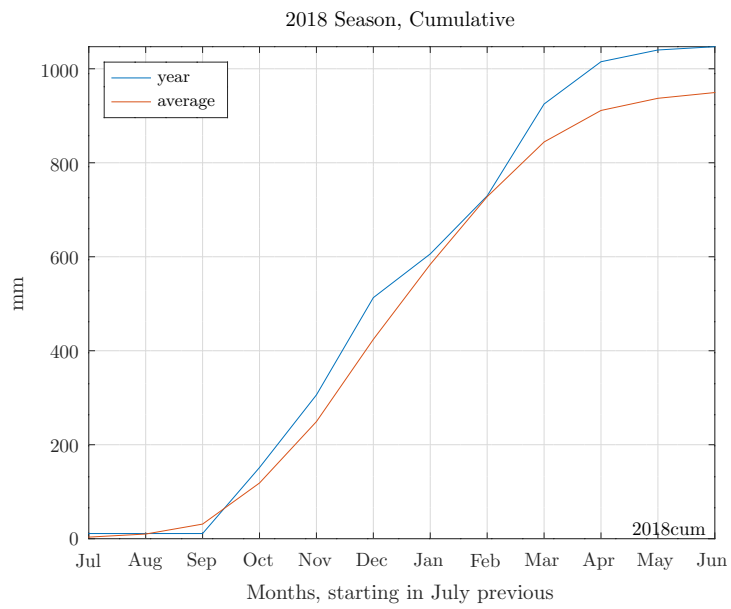

Figure 69: 2018 Season

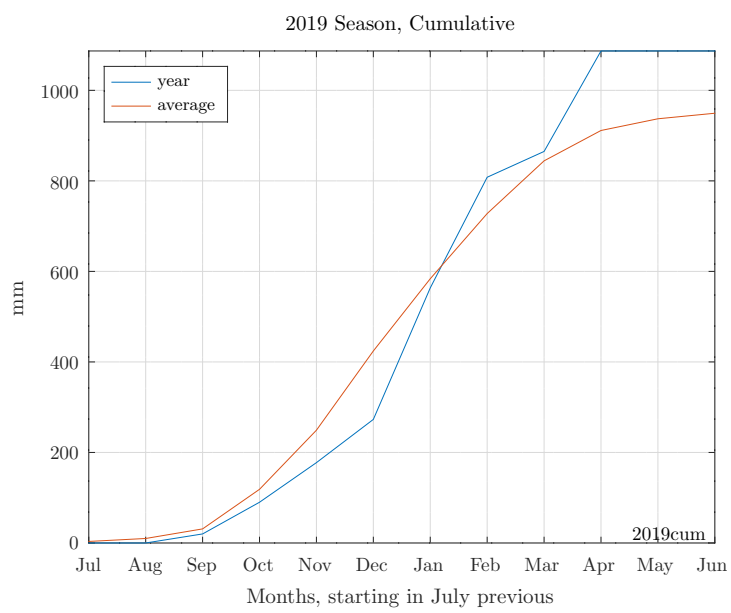

Figure 70: 2019 Season

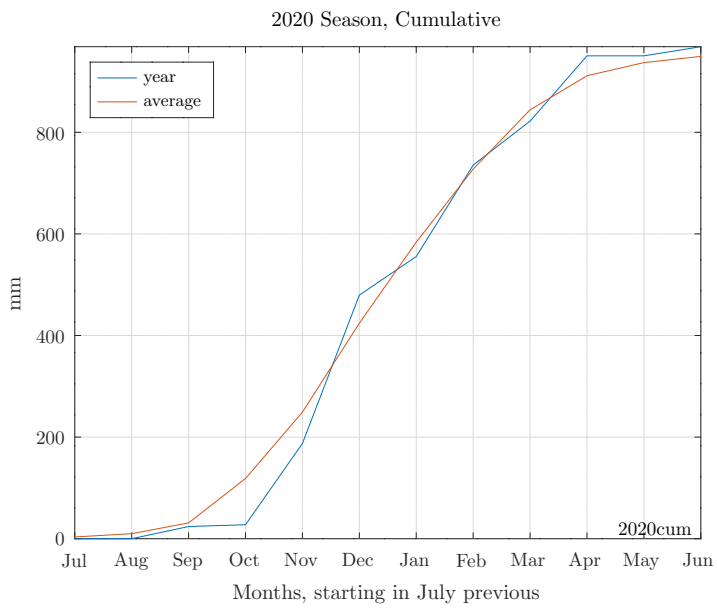

Figure 71: 2020 Season

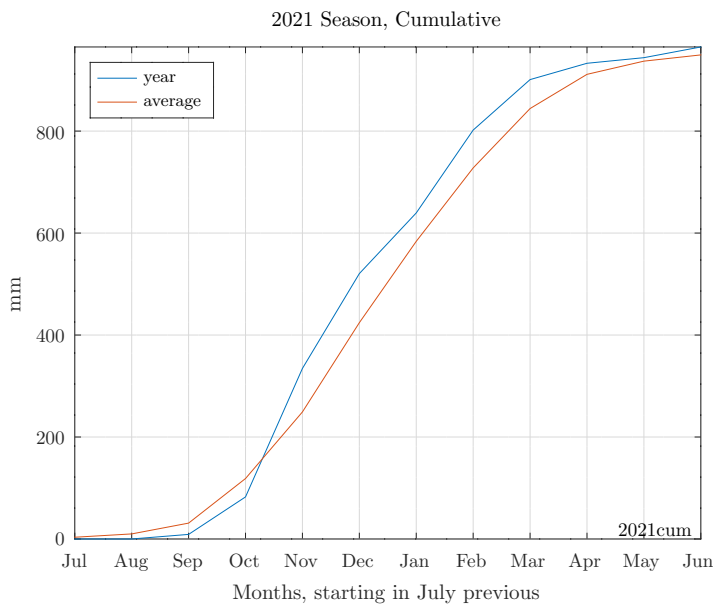

Figure 72: 2021 Season

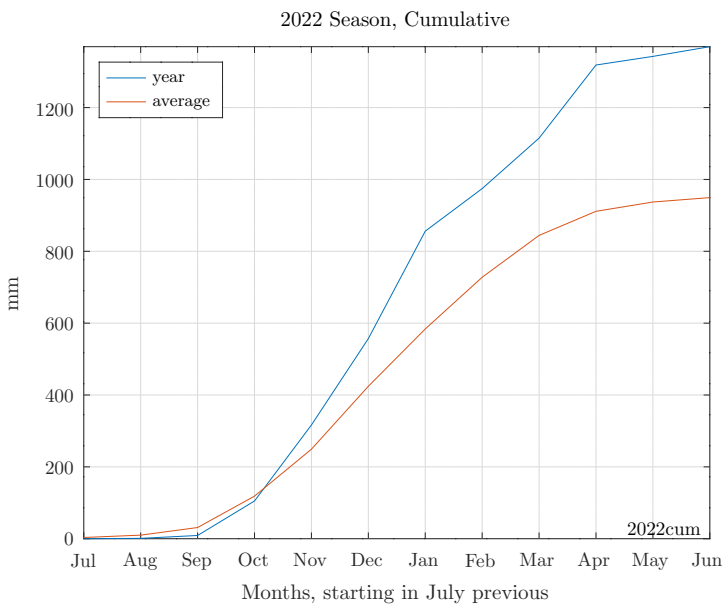

Figure 73: 2022 Season

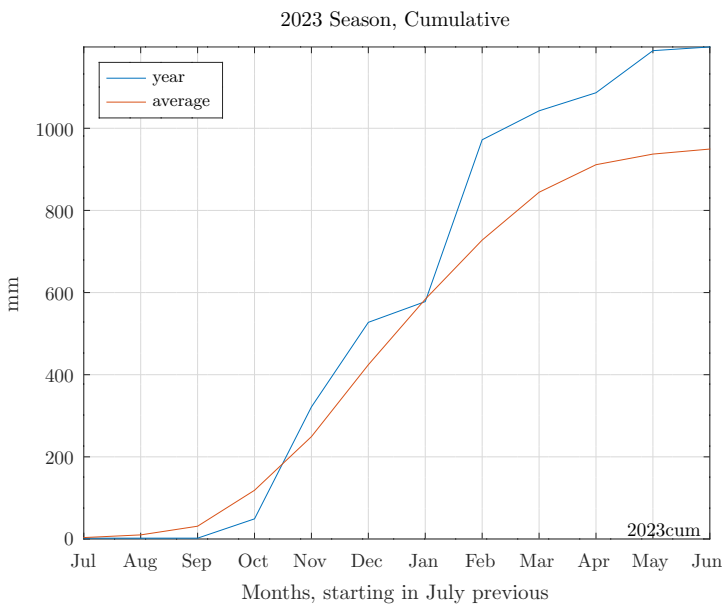

Figure 74: 2023 Season

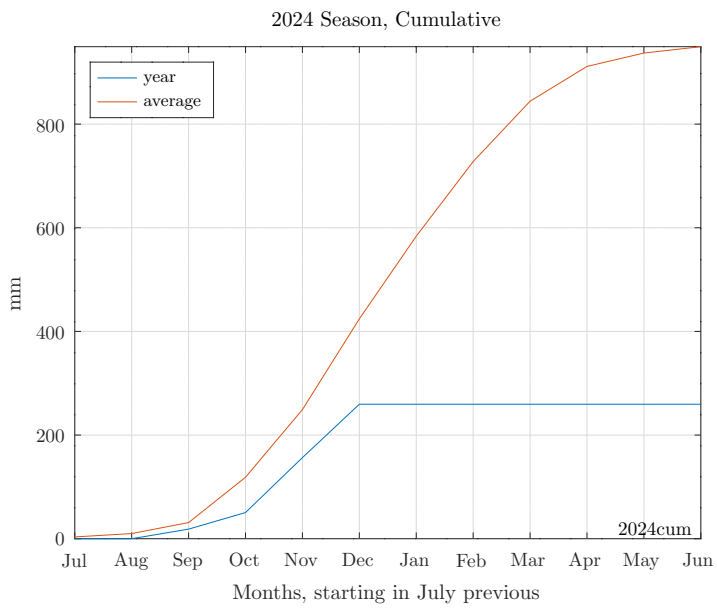

Figure 75: 2024 Season

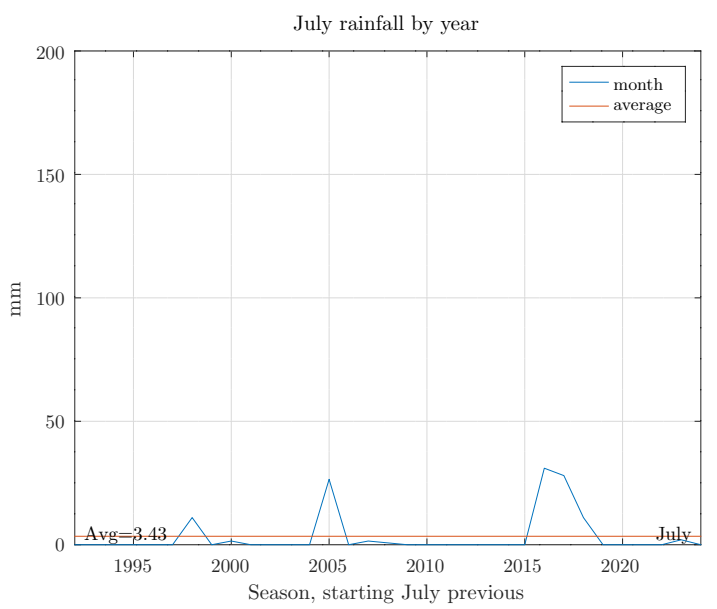

Figure 76: July

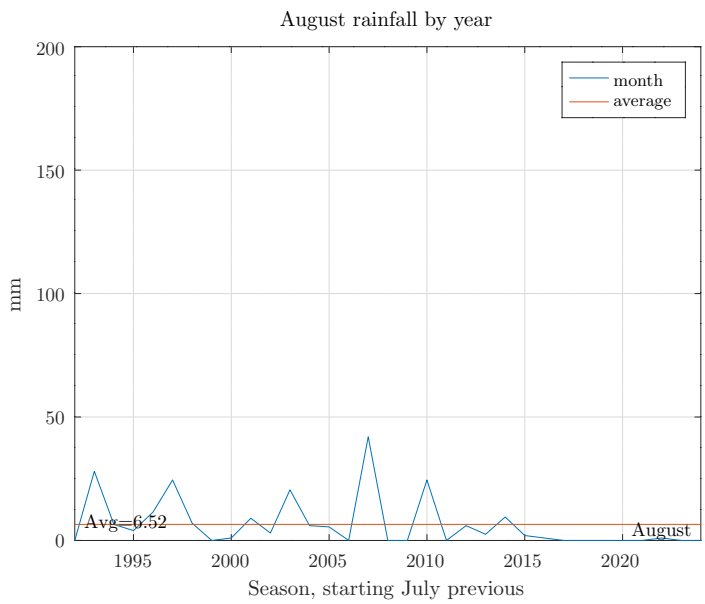

Figure 77: August

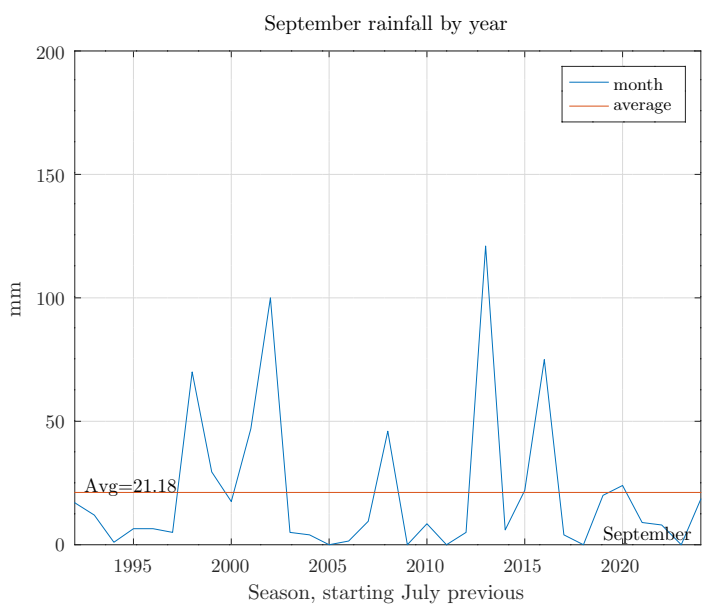

Figure 78: September

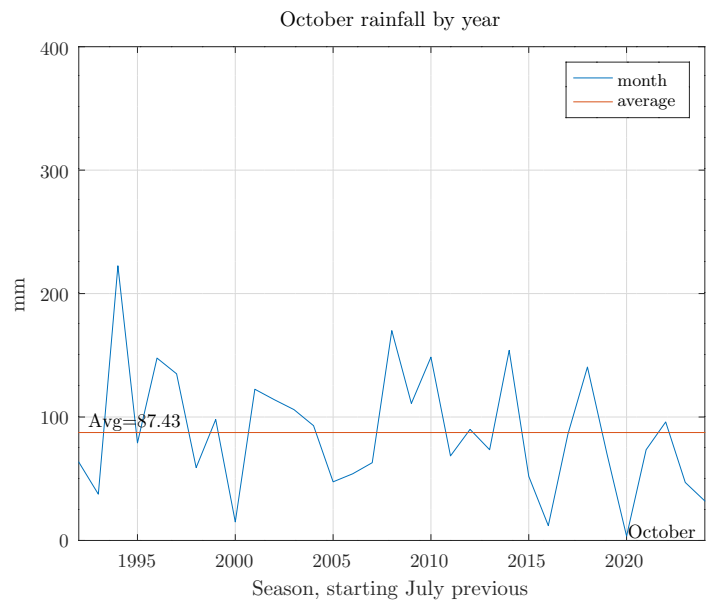

Figure 79: October

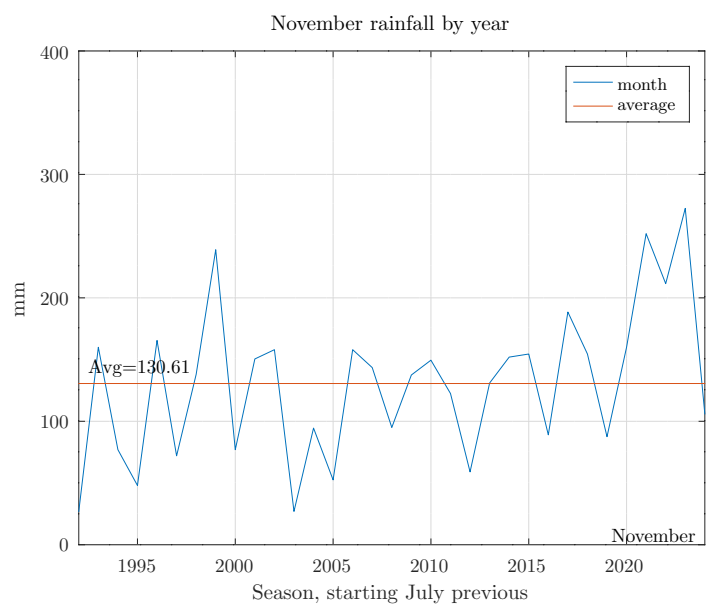

Figure 80: November

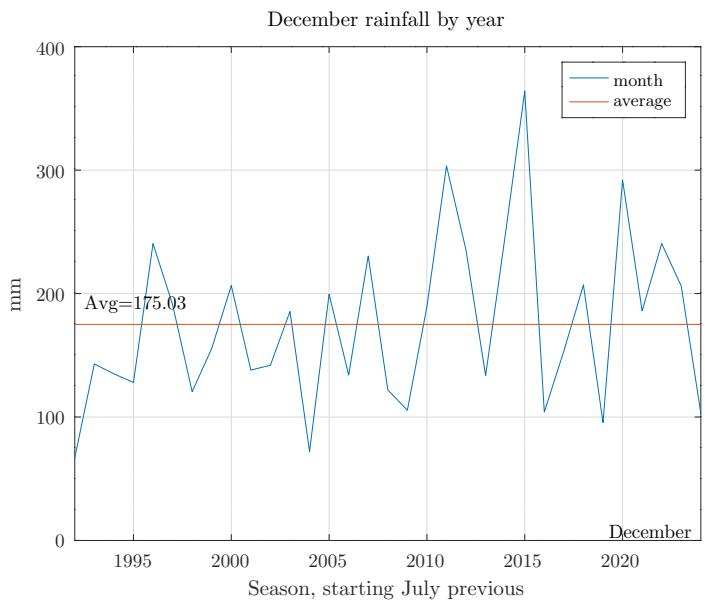

Figure 81: December

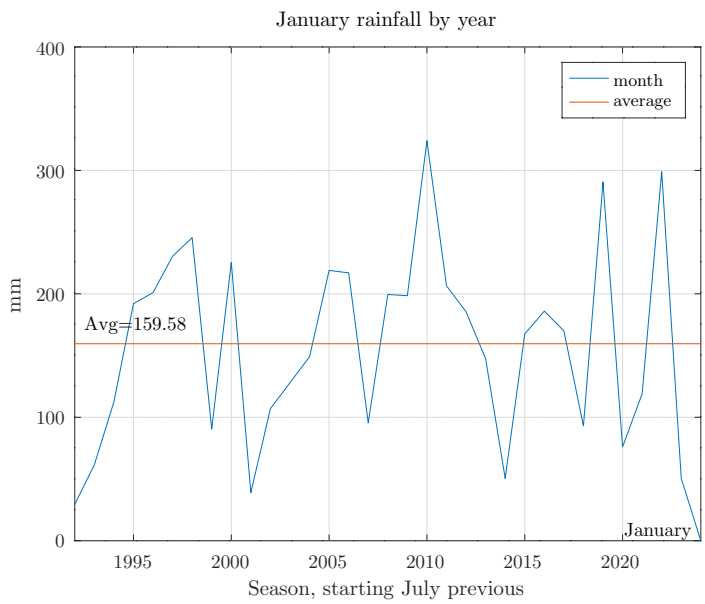

Figure 82: January

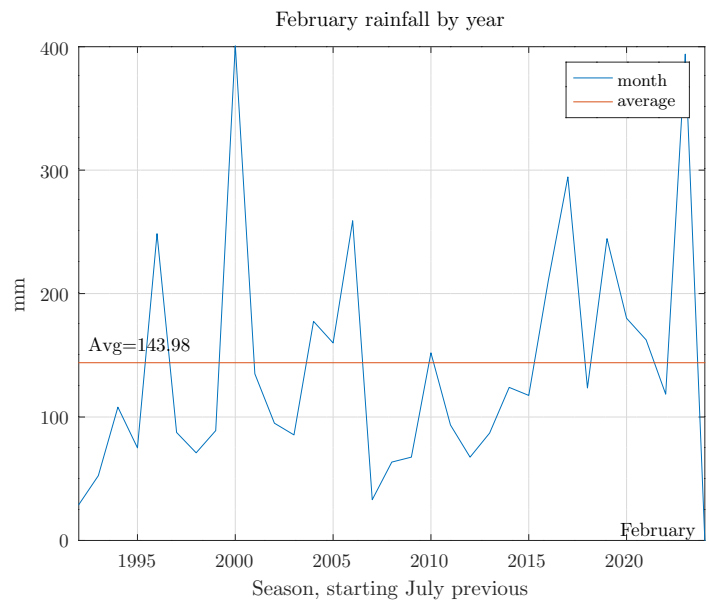

Figure 83: February

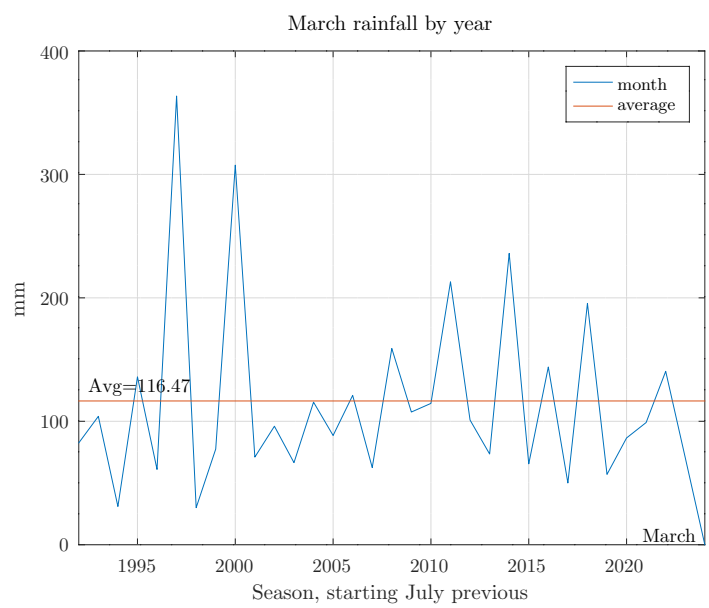

Figure 84: March

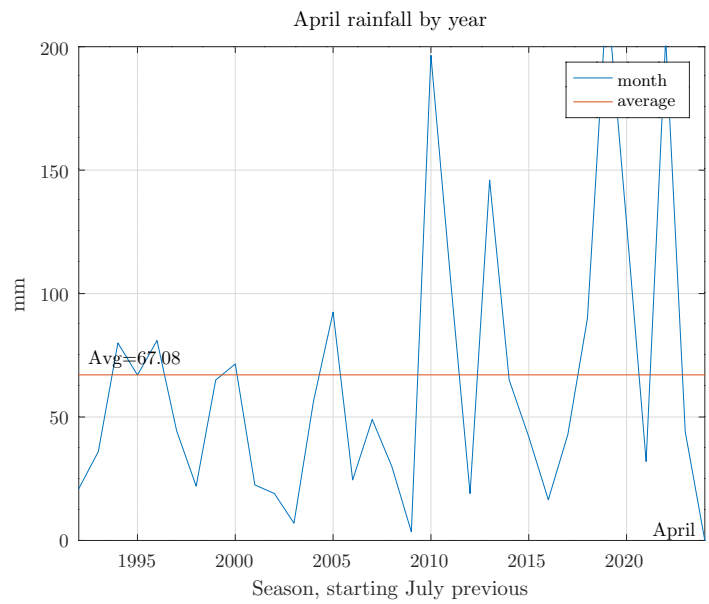

Figure 85: April

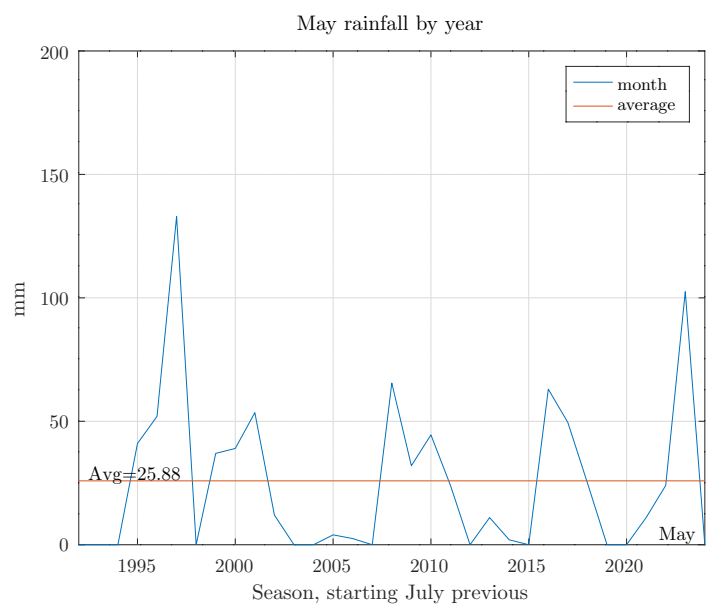

Figure 86: May

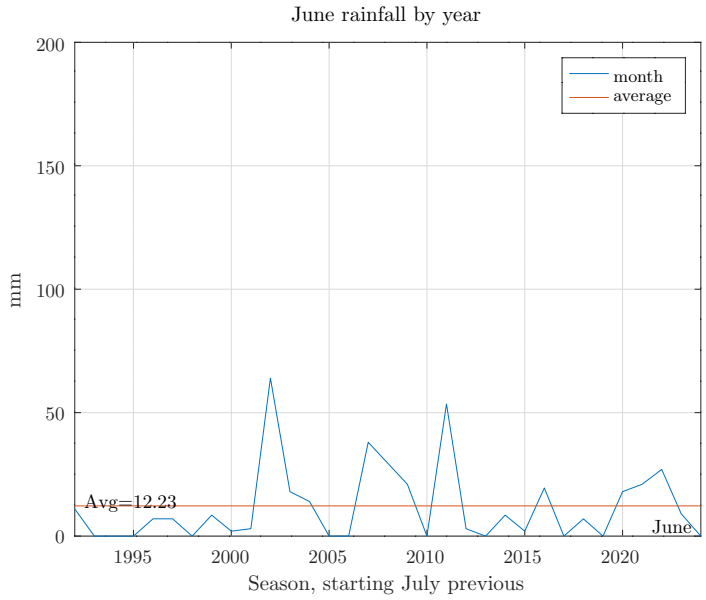

Figure 87: June