=enter title here=

=list all authors here=

$^{=number=}$=Affiliation Address=

Key Points:

- enter point 1 here
- enter point 2 here
- enter point 3 here

Corresponding author: =name=, `=email address=`

Abstract

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Plain Language Summary

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1 Introduction

2 Materials and Methods

2.1 Meteorological Data

2.1.1 Observational stations

map of where the stations are

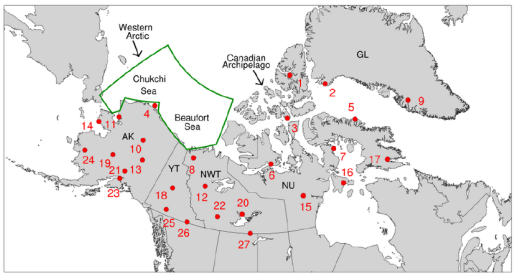


Figure 1: Stations map - source in link (comment)

- there are few stations - these are my key sites for comparison

heatmap of data availability

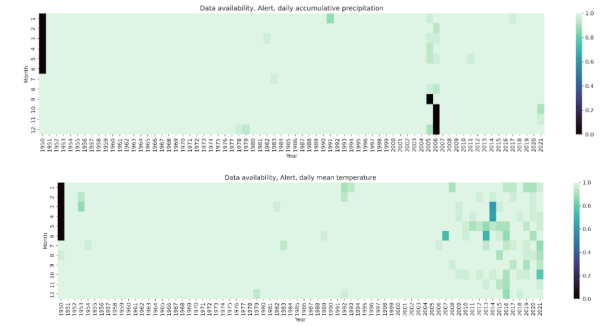
- of the stations there is little data

end my key validation period is my key stations are this is where I have sufficient data

(Mahrt & Gamage, 1987) supplemental - if I change time period I get the same results

2.1.2 Observational data available

What is the data sensors, precision, limits from a gauge set up for rain and snow = discontinuity minimum amount of precip that I can record



(a)

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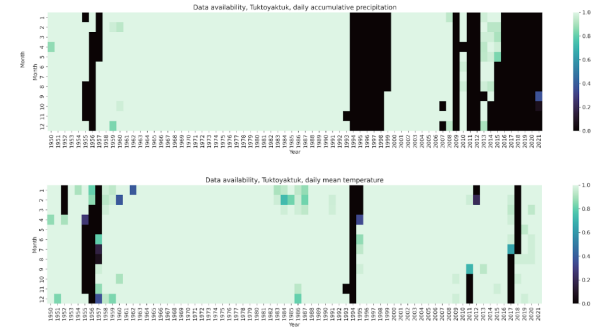

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Figure 2: Heatmap of data availability, Alert, Eureka and Tuktoyaktuk

2.2 Reanalysis

reanalysis is xxx ERA5 is xxx Why did I choose to use ERA5

(standard paragraph of this)

2.2.1 Variables in reanalysis

how can you describe the variables what does the literature say about how much we can trust them

this is precip, this is what is analysed, there is convective and large scale there is an issue with TP - this is corrected for in the literature

variable at a certain time step, this is how you work with them This is how we use the spun up precip data

2.3 Methods

2.3.1 Data correction

selected and sorted (mentioned above) plotted meteorological data

1. extract one grid point of ERA5 (nearest neighbour) as opposed to 6 which are closest - this method is a choice, sometimes this can be misplaced, looked at this in the supplement so that i do not have an issue with misplaced results

prob 1 2. we have known issues with ERA - too much TP remove from the gauge as it evaporates

problem 2 3. deal with amount of precip - amount is 10 times too small, fixed this show a plot of before and after

]

Figure 3: ERA correction TP

threshold

- how I scaled this, 10 year decadal mean - evaluation of this method - does it work? still need to work on this .... 1. monthly is sum of daily? 2. compare to Vancouver weather or somewhere else where ERA is good

subsection - metrics that I choose and why these are good metrics - What is it that I am trying to do? - want to see precip quanity, frequency, list of variables, how used what they mean, how computed

2.3.2 Weather & climatology

1. evaluate changes in number of events

processing ERA5 - remove TP, correct for accumulation

method for comparasion

3 Results

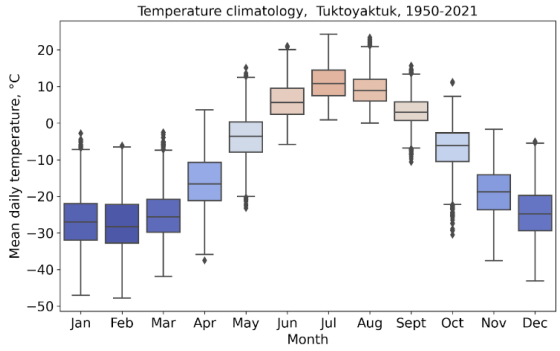
3.1 Seasonal cycle and climatology

method - take period afterage or first 30 year average etc, ? - is this stable enough to do this ?

plot annual cycle? base climatology before large changes

comment on climatology - winter months, spring - is coupled or decoupled with precipitation and temperature,

based on this = this is how I define my seasons - 4 seasons - based on my climatology



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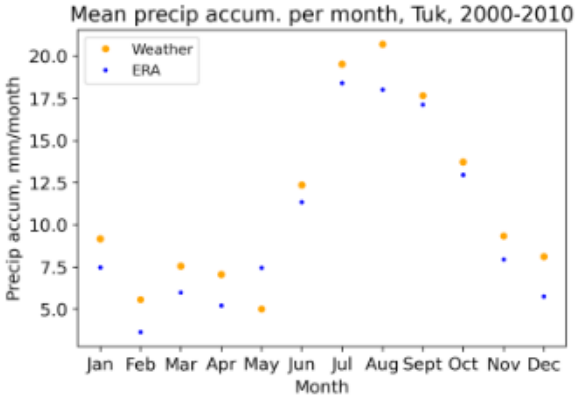


(b)

Figure 4: Plot showing seasons, annual cycle of temperature and precipitation

3.1.1 evaluating the climatology in ERA

era is not doing enough in summer vs winter subdued seasonal cycle assimilated temperature as assimilation but not perfect seems to start spring earlier or later

I am seeing an interesting pattern first month when precip is double , map onto the whole of ERA - how representative is my data point over the general area (show this in the methods section)

with a proper description of what is in the plot needs to be very percise, numbers or % ERA is understmating spring precip by 20% etc

]

Figure 5: Plot showing same climatology in ERA

3.2 climatology of extreme events

definition of extreme events - consistent with literature or not?

explain whether you can use a special threshold per site?

or more simple and have the exact same result?

is the meaning of the results the same in each case? 1. precip distribution (plots)

plot for precntile to define extremes show a comparasion of whether you need a different level for different sites or not

3.2.1 evaluation of ERA for extremes

2. does era show the same (plots)

describe what these show

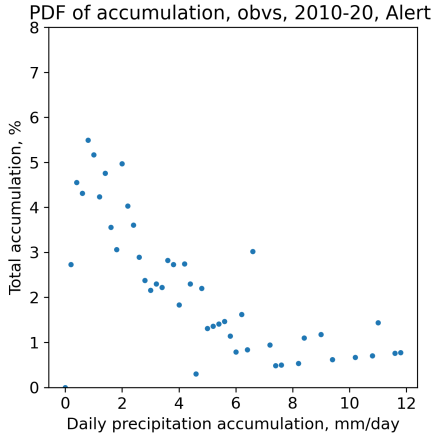
seasonal number of events we have more events in summer - expected as precip is higher when warmer ERA finds all events occurrence is well characterised once you massage data this is not obvious that these would be the same

can trust ERA to find these events

- evaluation of era is good at occurrence, is the amount or the proportionality of the amount also good? or even after correction does it still underestimate?

is the percentage of annual precipitation described by these events

—



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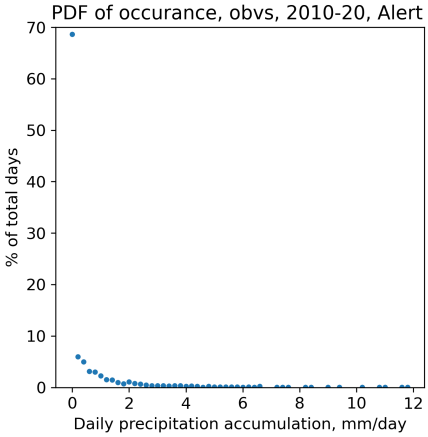

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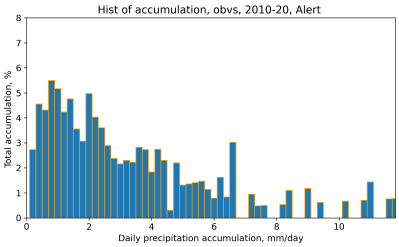

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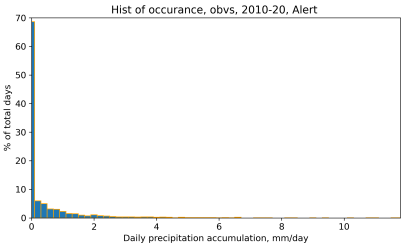

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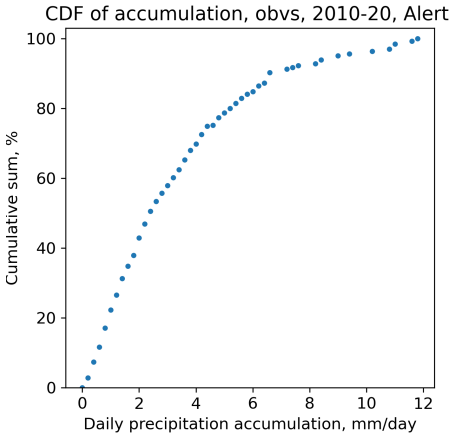

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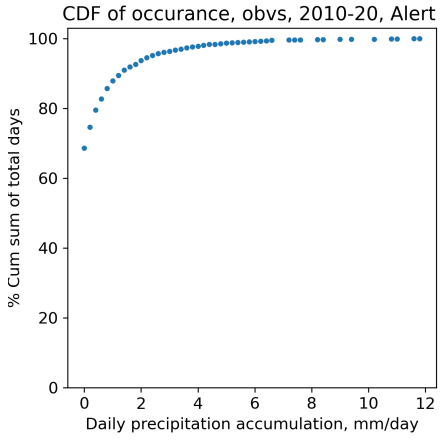
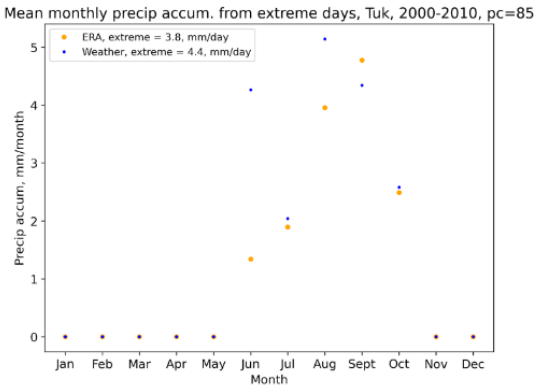


(f)

Figure 6: Hist, CDF and PDF, showing where the extreme of 85% is coming from



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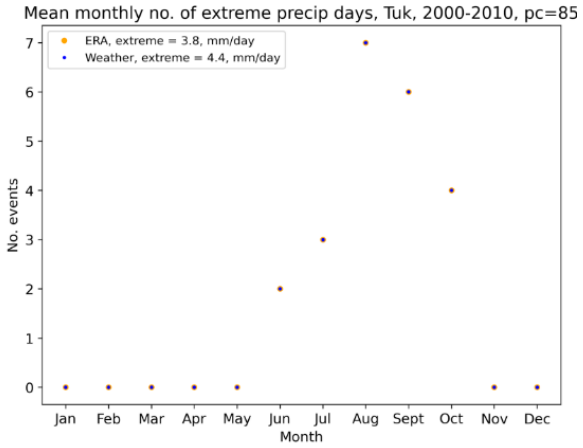


(b)

Figure 7: Number of extreme precip days per season, with subplot of accumulation due to extremes

PLOT IN PROGRESS

]

Figure 8: Number of extreme precip days per season - ERA comparasion, with subplot of accumulation due to extremes

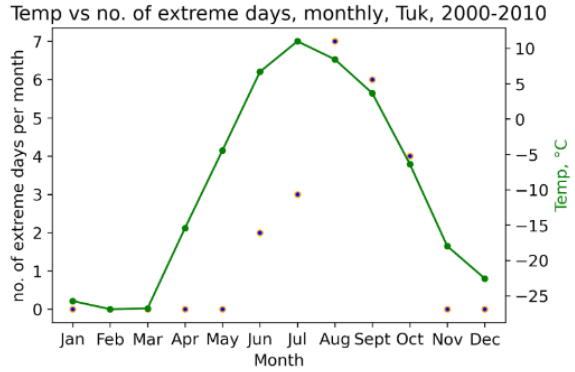
3.3 Attribution/mechanisms of events

—-

3.3.1 variability

what drives variability what makes seasons different?

—- temperature vs no. of extreme days



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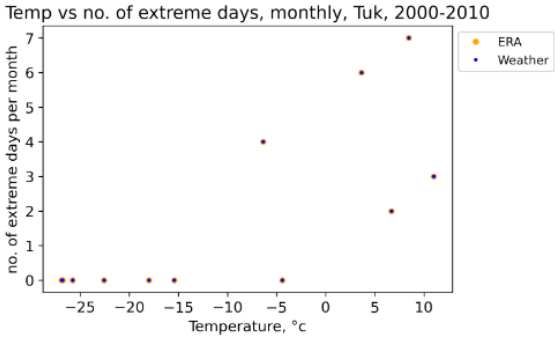

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Figure 9: Temperature and extreme days

as a diagnostic of what drives extremes

good to do for climatology too

expect / normal

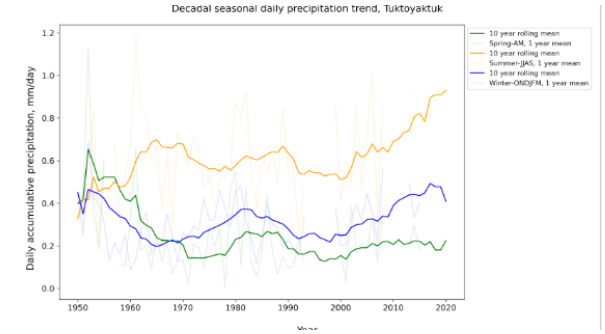
expect more in summer time, showed already

no. at tuk in winter - dynamical origin - very different mechanisms

3.3.2 trends

- looking at yearly trends and changes

total time trends



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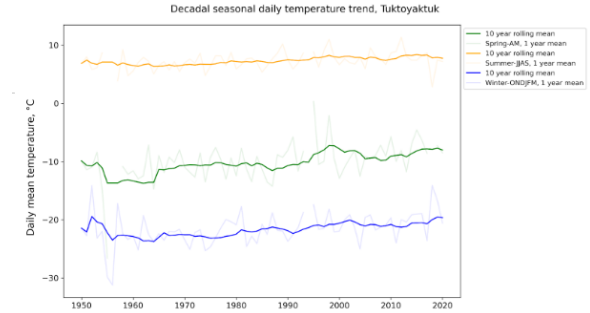


(b)

Figure 10: Precipitation and temperature trend

Q1 is the number of precip days per month and year?

- within months - within years

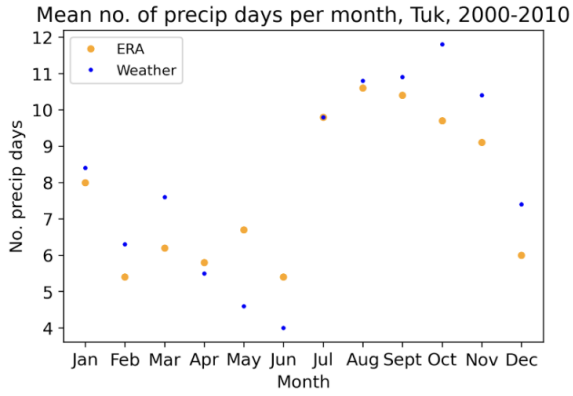
Q2 is the accumulative yearly / monthly precip changing?

trend in temp and precip how do i describe what is the signal how do i make a relationship between these?

is my amount of precip increasing due to xxx

if correlation make a plot of this

what is special about this climatology?



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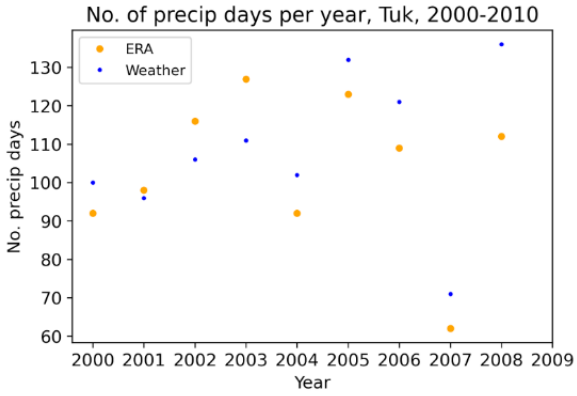


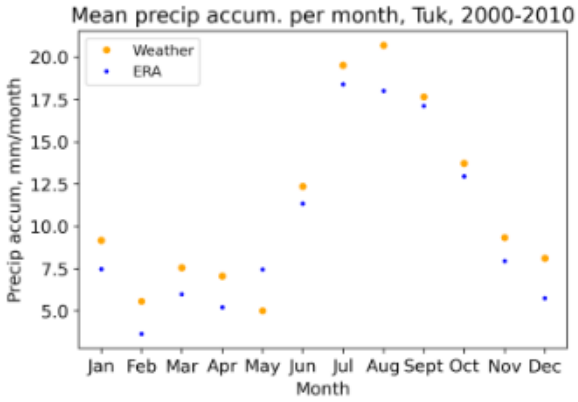
(b)

Figure 11: No. precip days per month and per year - show that this has changed ?? needs work

Table 1: Time of the Transition Between Phase 1 and Phase 2[a]

Run	Time (min)
$l1$	260
$l2$	300
$l3$	340
$h1$	270
$h2$	250
$h3$	380
$r1$	370
$r2$	390

[a]Footnote text here.



(a)

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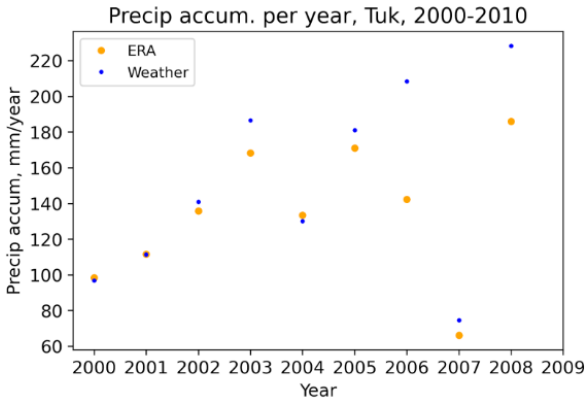

(b)

Figure 12: accumulative yearly / monthly precip - has this changed?

4 Discussion

5 Conclusion

6 = enter section title =

7 Open Research

AGU requires an Availability Statement for the underlying data needed to understand, evaluate, and build upon the reported research at the time of peer review and publication.

Authors should include an Availability Statement for the software that has a significant impact on the research. Details and templates are in the Availability Statement section of the Data and Software for Authors Guidance: `https://www.agu.org/Publish-with-AGU/Publish/Author-Resources/Data-and-Software-for-Authors#availability`

It is important to cite individual datasets in this section and, and they must be included in your bibliography. Please use the type field in your bibtex file to specify the type of data cited. Some options include Dataset, Software, Collection, ComputationalNotebook. Ex:

```
@misc{https://doi.org/10.7283/633e-1497,
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  url = {https://www.unavco.org/data/doi/10.7283/633E-1497},
  author = {de Zeeuw-van Dalfsen, Elske and Sleeman, Reinoud},
  title = {KNMI Dutch Antilles GPS Network - SAB1-St_Johns_Saba_NA P.S.},
  publisher = {UNAVCO, Inc.},
  year = {2019},
  type = {dataset}
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```

For physical samples, use the IGSN persistent identifier, see the International Geo Sample Numbers section: `https://www.agu.org/Publish-with-AGU/Publish/Author-Resources/Data-and-Software-for-Authors#IGSN`

Acknowledgments

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All funding sources related to this work from all authors

Any real or perceived financial conflicts of interests for any author

Other affiliations for any author that may be perceived as having a conflict of interest with respect to the results of this paper.

It is also the appropriate place to thank colleagues and other contributors. AGU does not normally allow dedications.

References

Mahrt, L., & Gamage, N. (1987, April). Observations of Turbulence in Stratified Flow. *Journal of Atmospheric Sciences*, *44*(7), 1106-1122. doi: 10.1175/1520-0469(1987)044⟨1106:OOTISF⟩2.0.CO;2