What you should be doing

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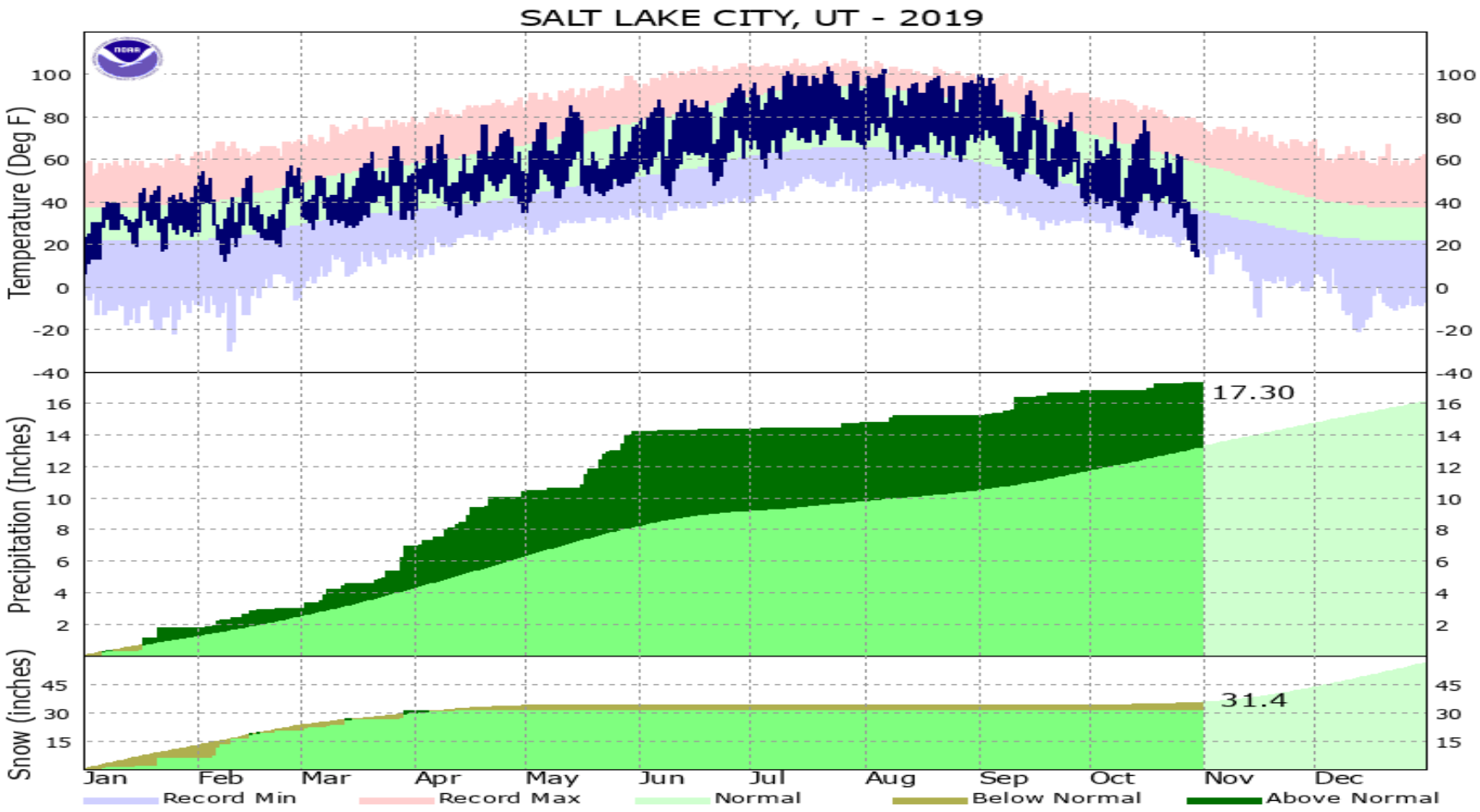
Exploratory Empirical Analyses

- Objective is to reduce the complexity (dimensionality) within a large data set
- What is a value commonly observed?
- How much variability is there among all the values?
- What are extreme cases that have been observed?

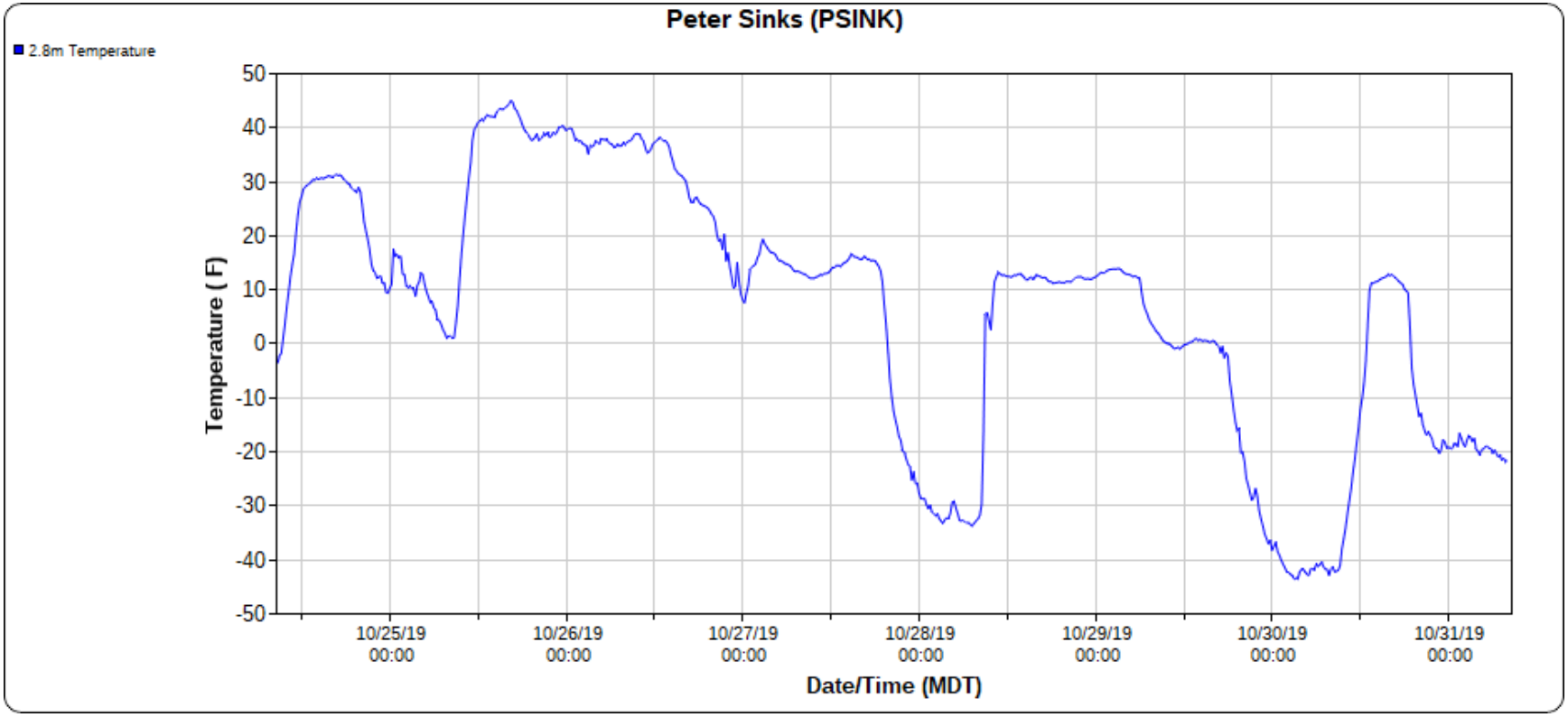
Exploring Data: What is the Objective?

- Summarizing some of the typical characteristics of the data
- How often are critical thresholds for specific applications reached?
  - Road temperature below freezing point
  - Hot, dry, windy conditions potentially leading to wildfires
- Approach to be used will depend on what is considered important to know to address the objective

So, it's really cold here



And, it's really cold in Peter Sinks this week

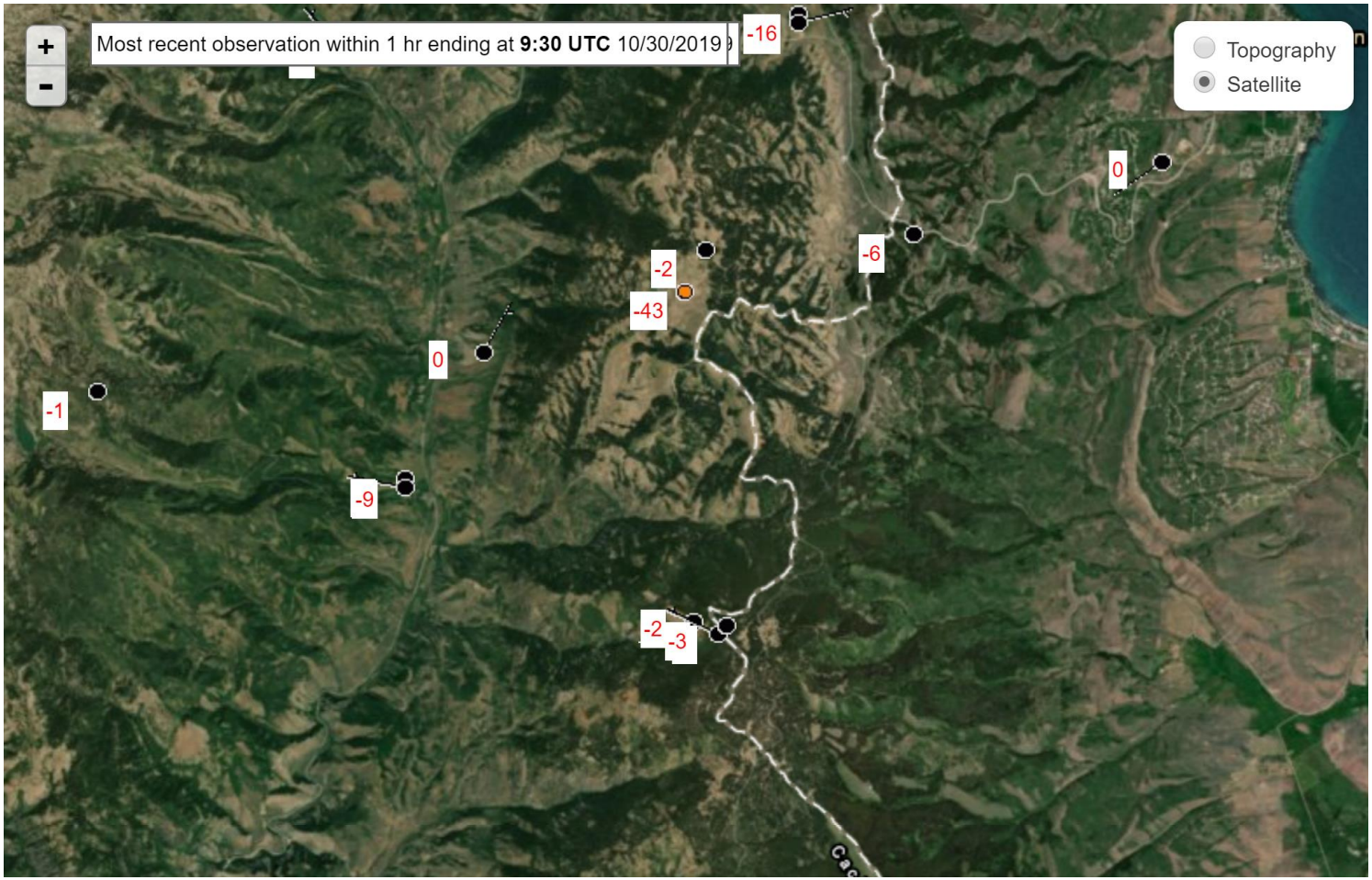


		10-31		10-30		10-29		10-28		10-27	
		Max/ Time	Min/ Time	Max/ Time	Min/ Time	Max/ Time	Min/ Time	Max/ Time	Min/ Time	Max/ Time	Min Time
PSINK Peter Sinks	UTAH CLIMATE CENTER 8164 ft	-17 1:30	-22 7:45	13 16:15	-44 03:00	14 03:00	-38 00:00	13 10:45	-34 07:15	19 02:45	-28 00:0

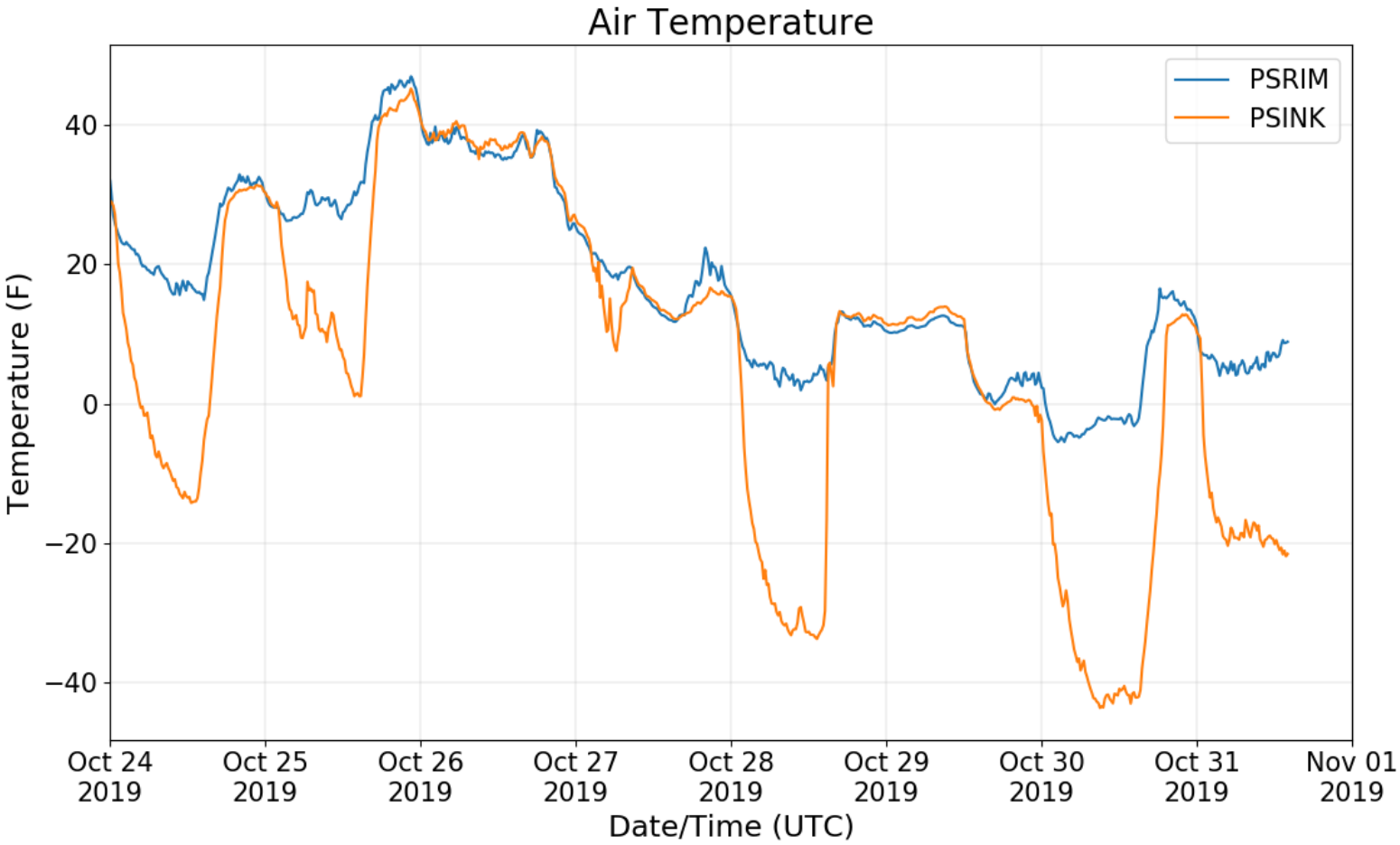
Why?

- Record situations provide cases to understand physical processes
- What makes it unusual?
- Why here/there?
- Why now/recently/before?
- What other unusual things are happening at the same time?
- Shift from exploratory to inferential analysis
- Public perception of extremes: is global warming over?

Peter Sinks

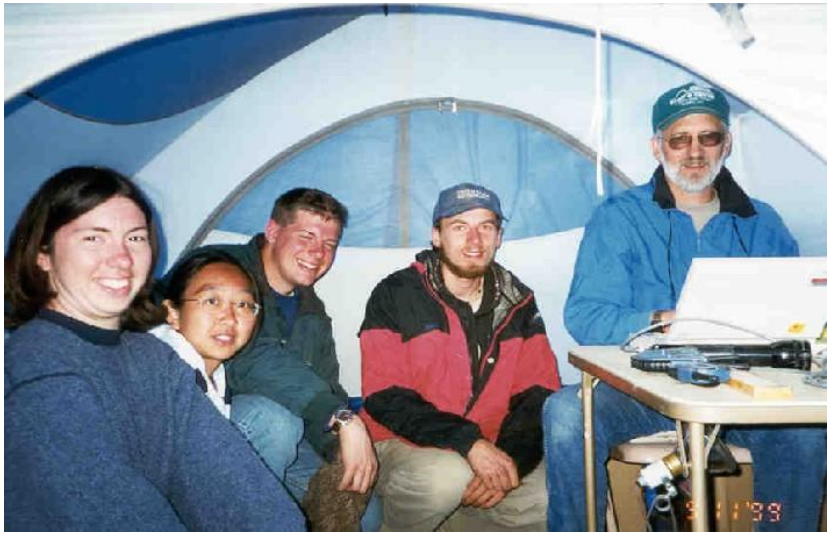

Most recent observation within 1 hr ending at 9:30 UTC 10/30/2019
Topography
Satellite
-16
0
-6
-2
-43
0
-1
-9
-2
-3

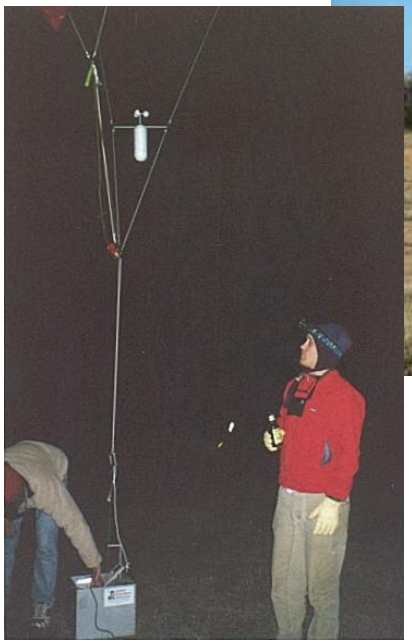
Bottom vs. Top of Peter Sinks

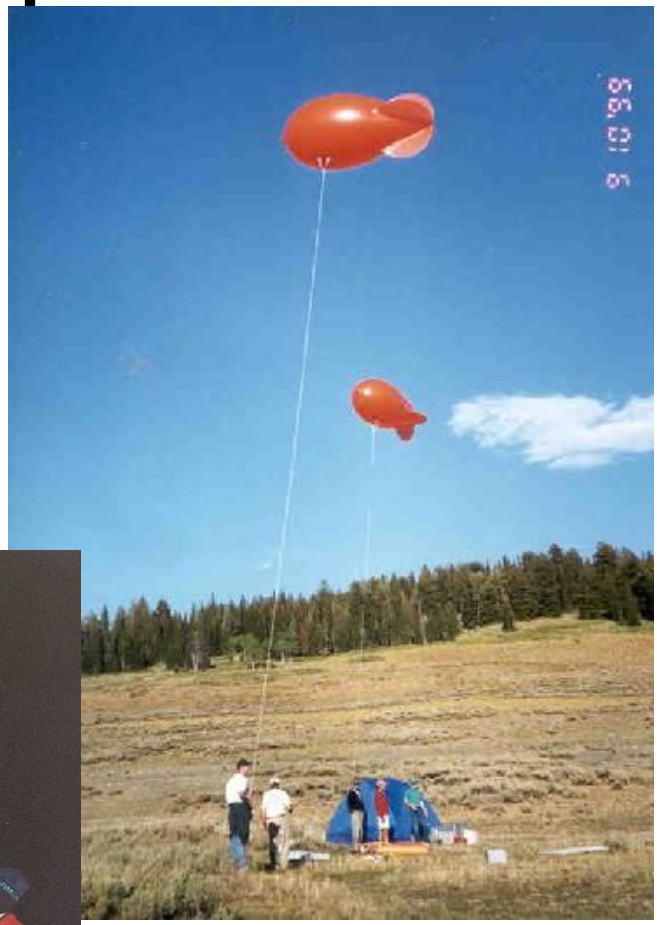


3000 feet in horizontal distance
270 feet in vertical distance

1999: Peter Sinks Experiment







What did we learn?

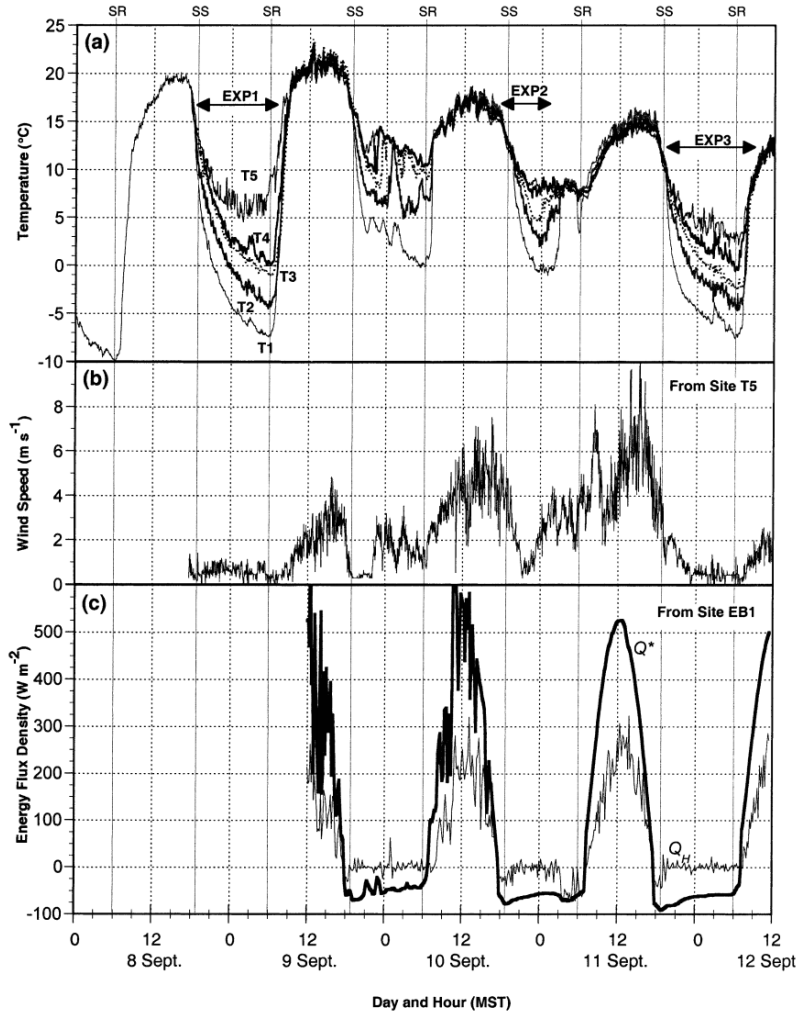


FIG. 4. Time series of (a) air temperature from towers T1–T5 on the east sidewall, (b) wind speed at tower T5 near the top of the east sidewall, and (c) net radiation Q^* and sensible heat flux Q_H at site EB1 on the basin floor. Experimental periods are indicated.

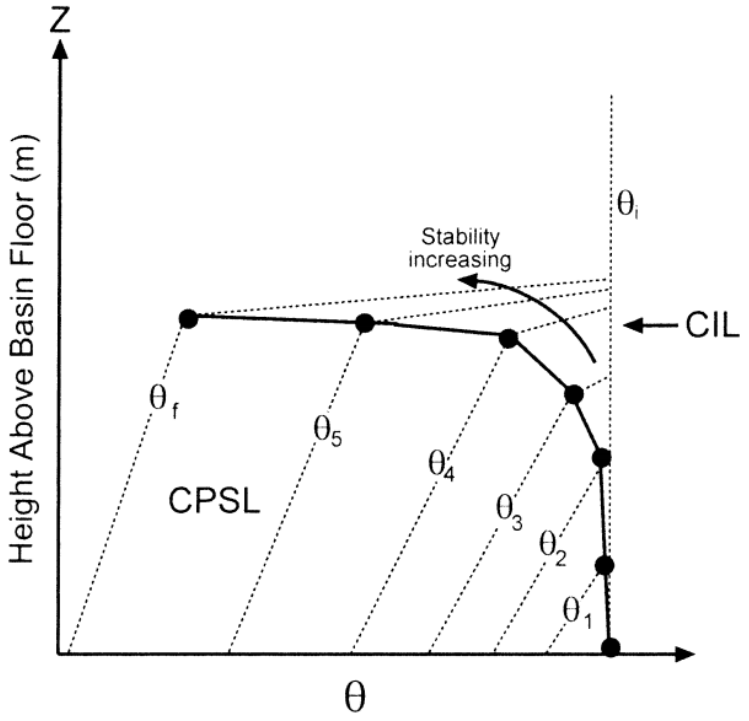
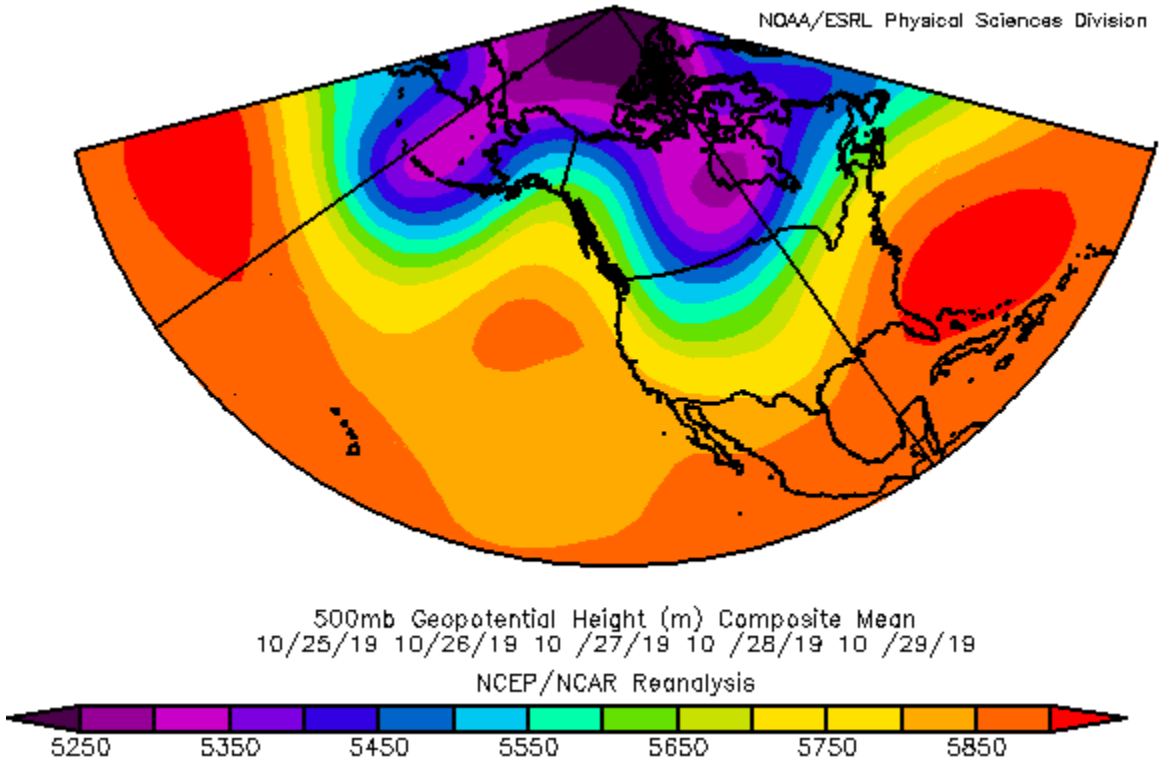


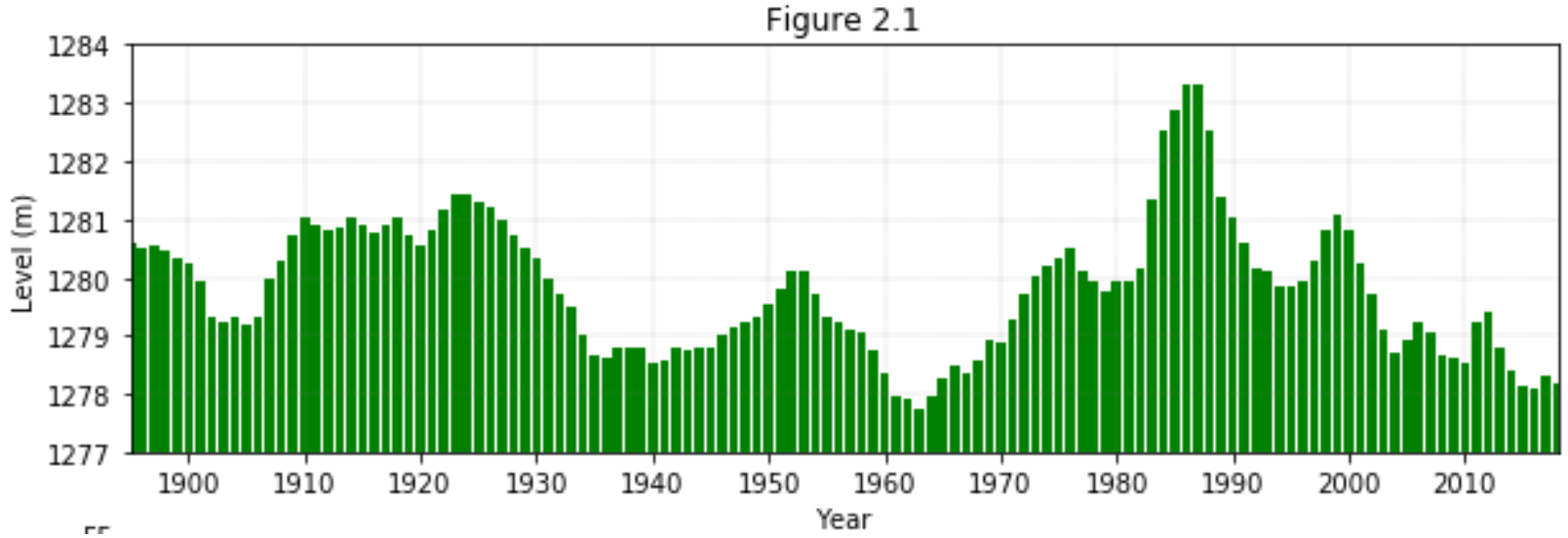
FIG. 6. Schematic diagram of the buildup of the CAP over the basin center during the evening transition period. The CAP is composed of two sublayers, the CPSL and the CIL. The black dots indicate the top of the CPSL at each sounding time. Dashed lines are potential temperature profiles, where θ_i is the well-mixed late-afternoon sounding and θ_f is the sunrise sounding.

What else is happening

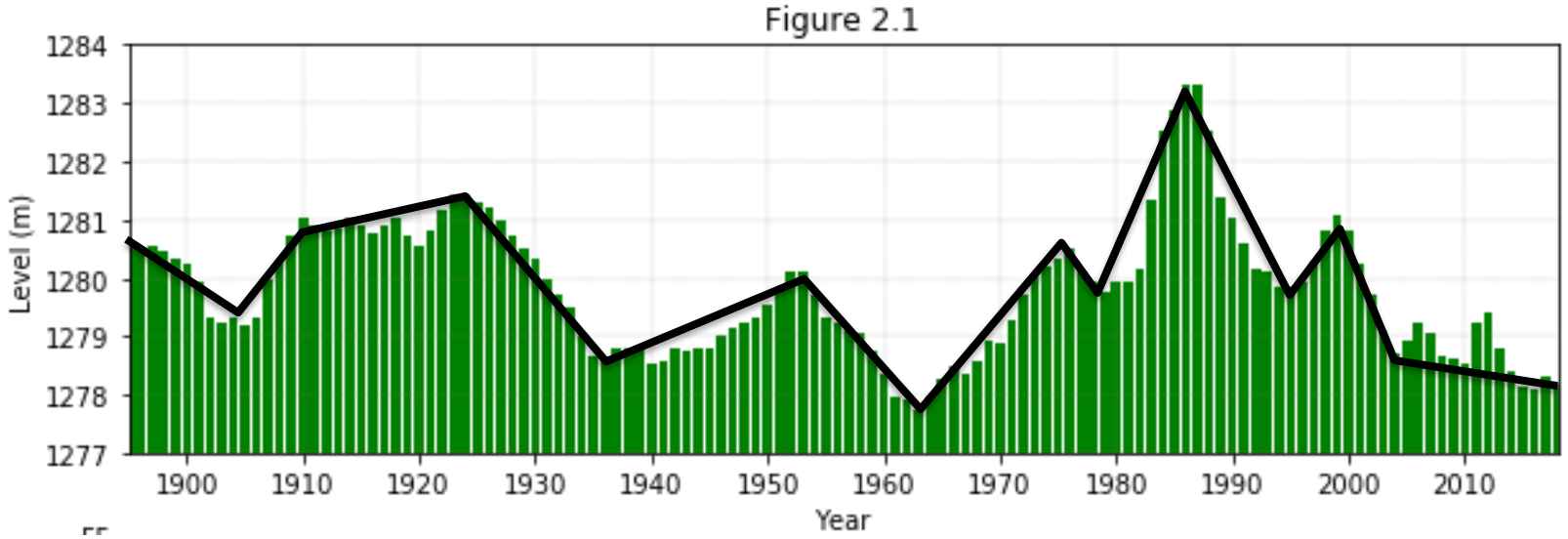
- Wildfires in CA
- Windstorm in AK
- Large-scale weather features



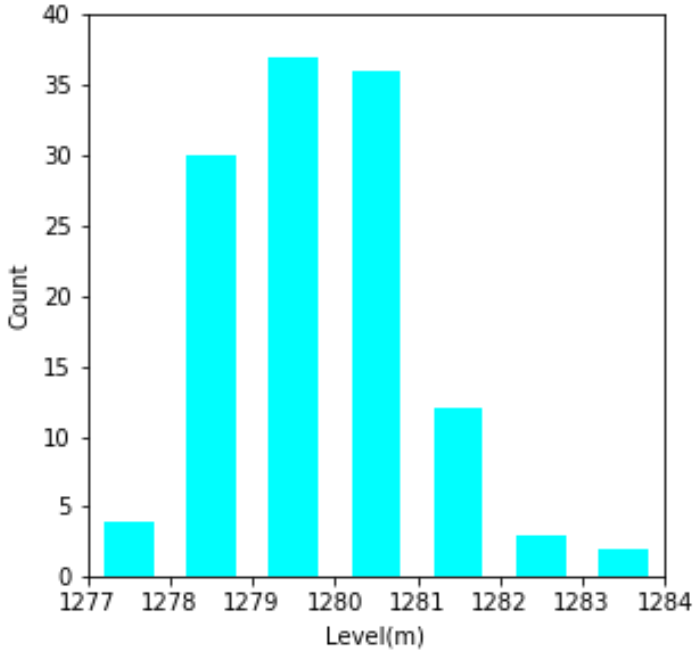
Great Salt Lake Level

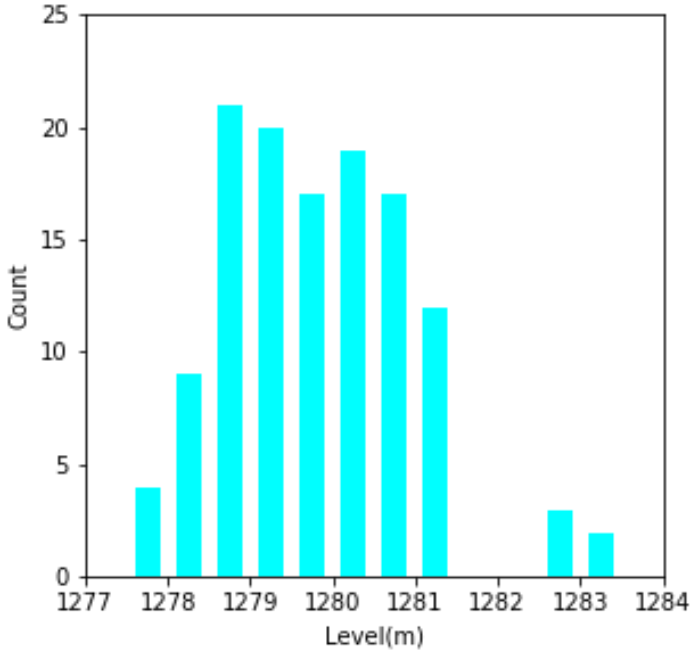


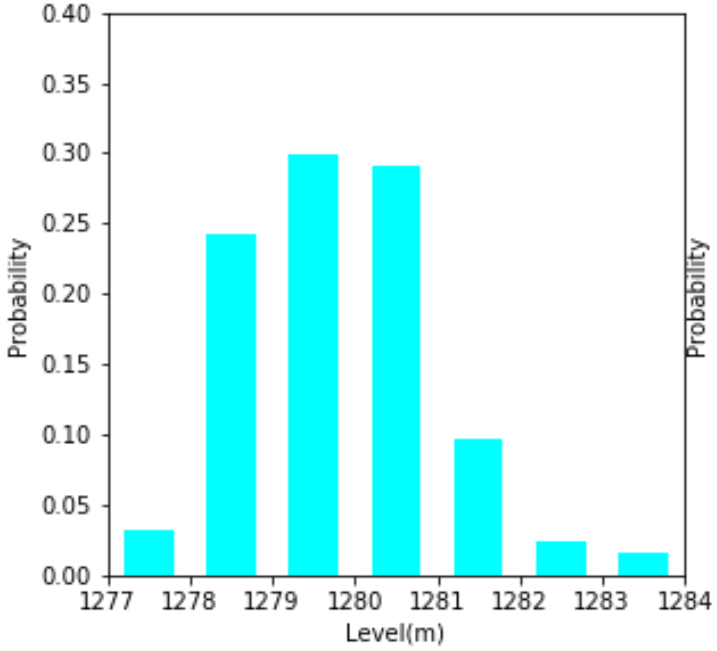
Great Salt Lake Level

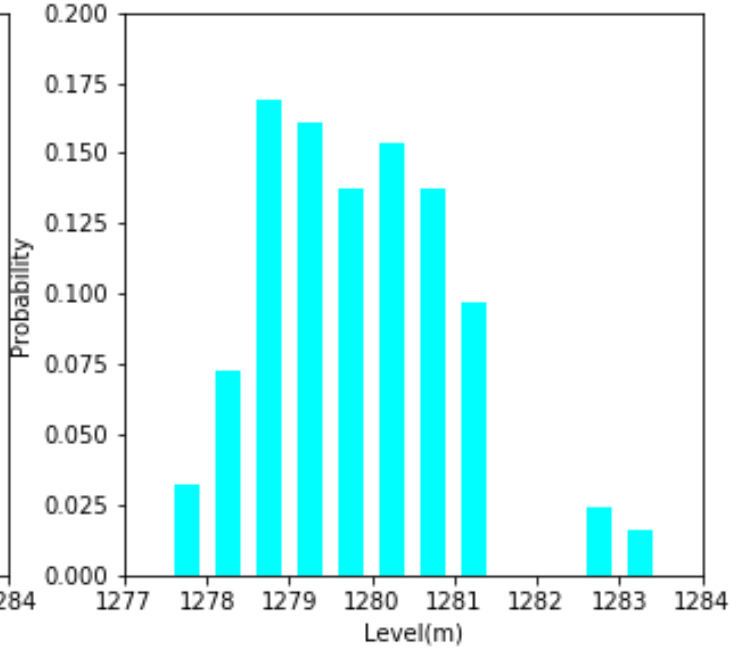


Lake Level Histograms

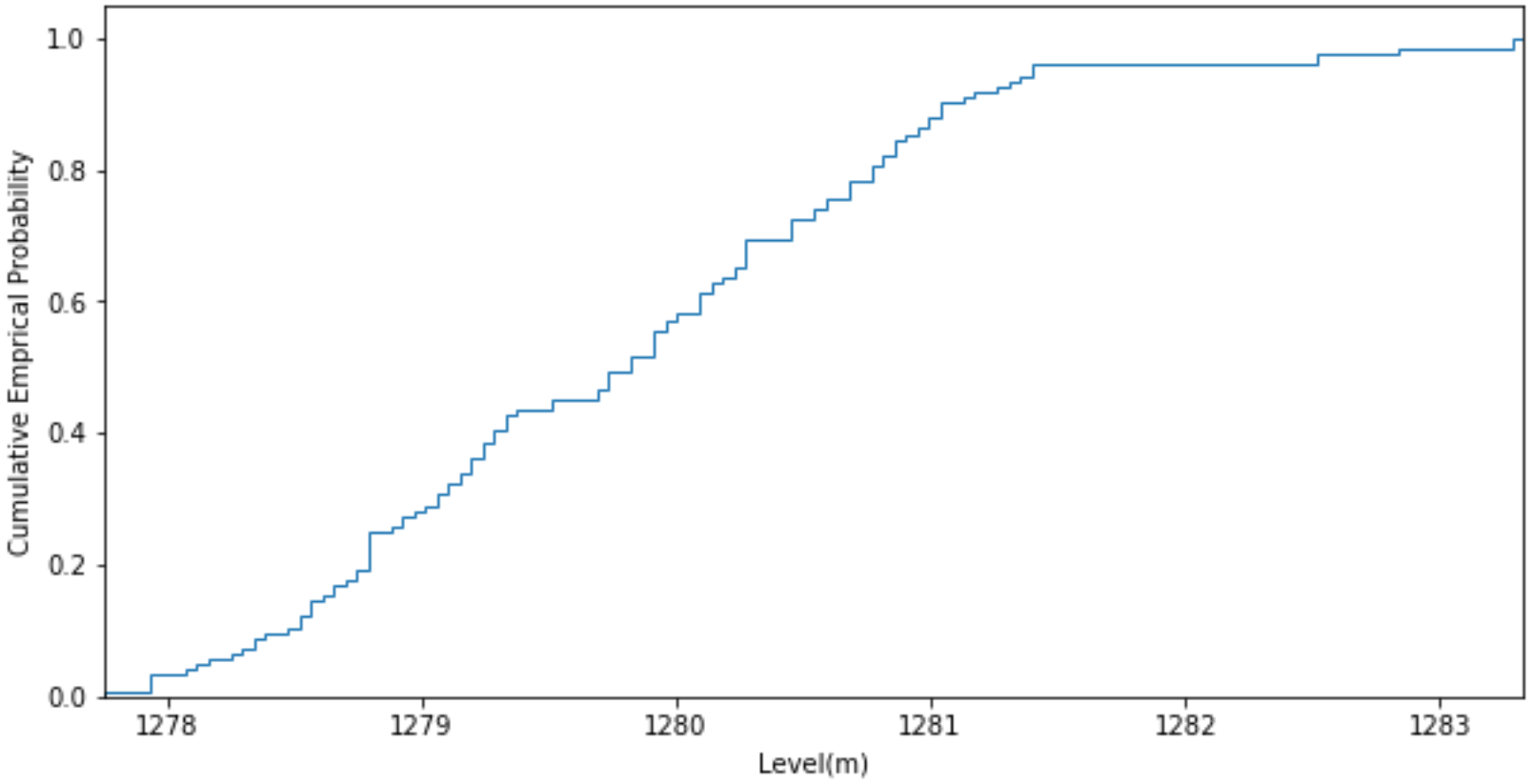




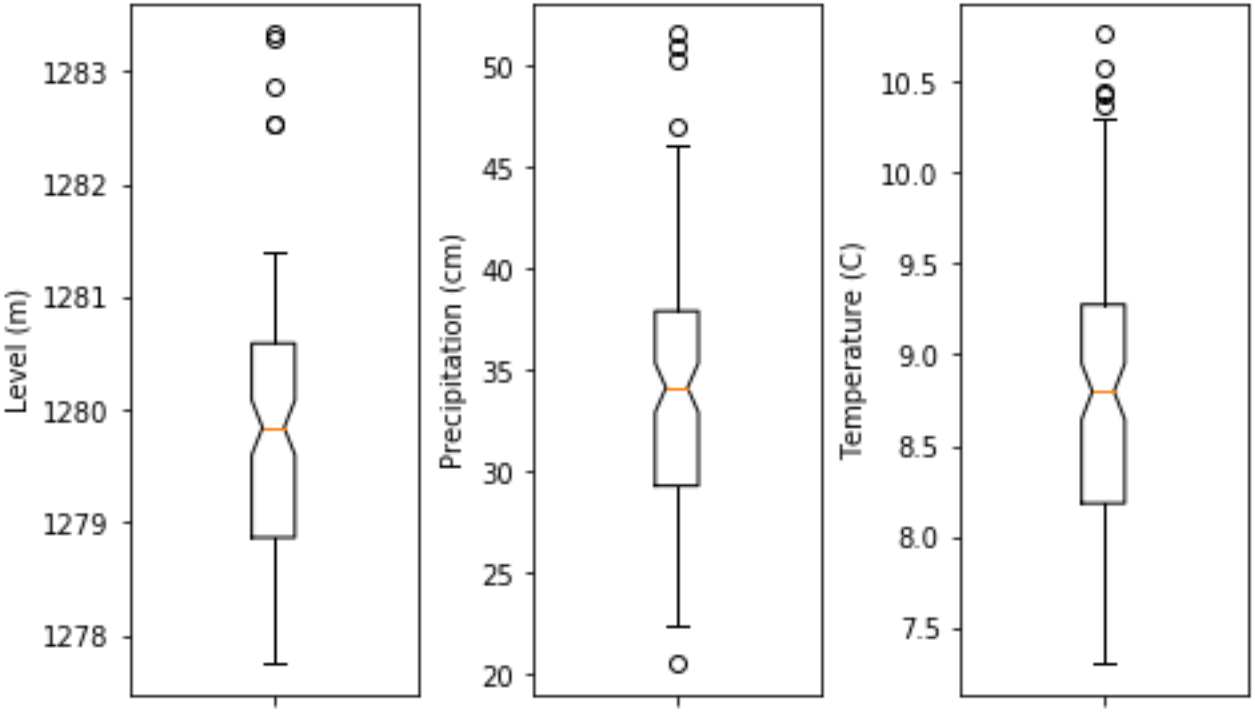




Empirical Cumulative Distribution Function Lake Level



Boxplots


Level (m)
1283
1282
1281
1280
1279
1278
Precipitation (cm)
50
45
40
35
30
25
20
Temperature (C)
10.5
10.0
9.5
9.0
8.5
8.0
7.5

Time Series

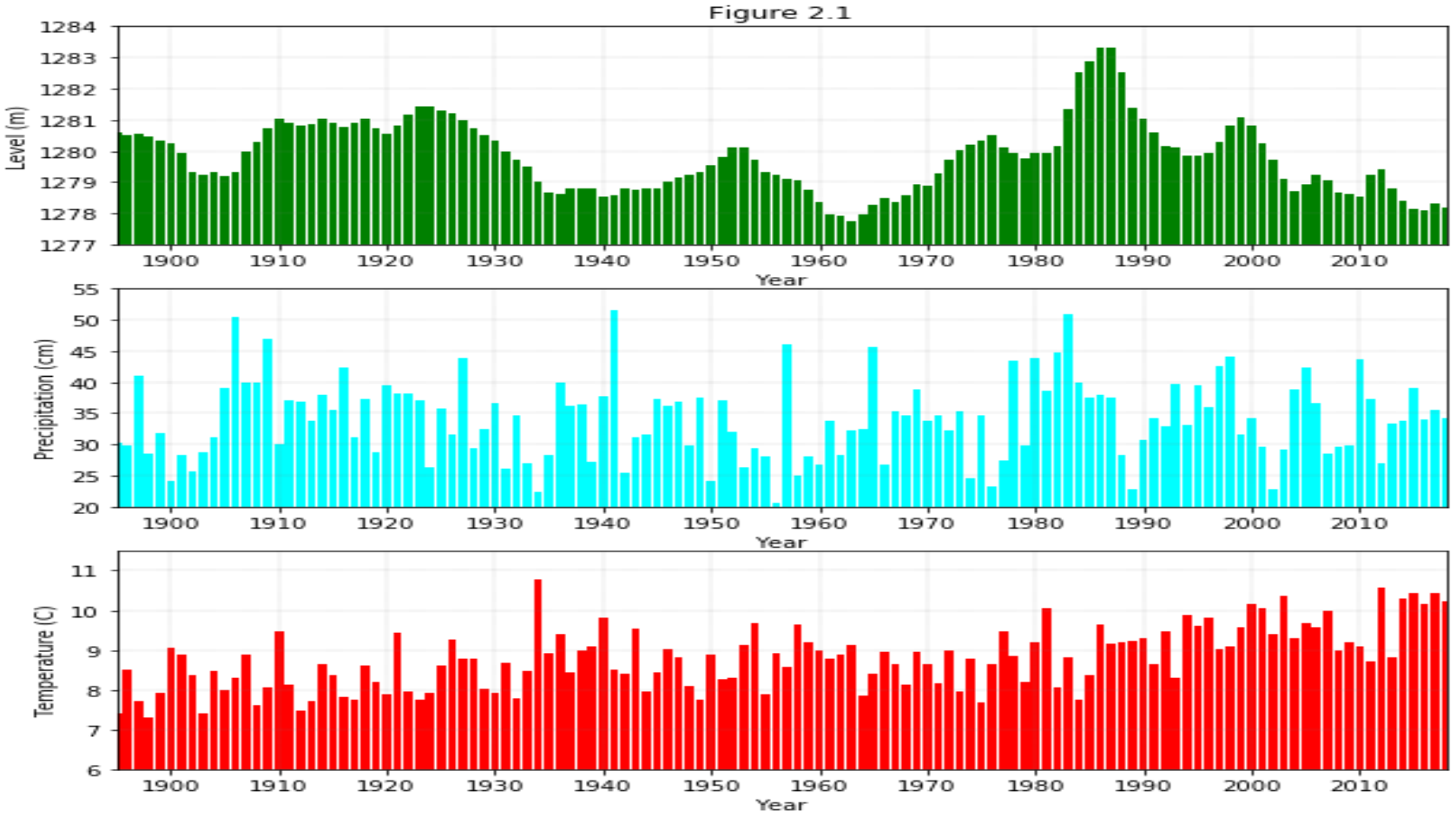
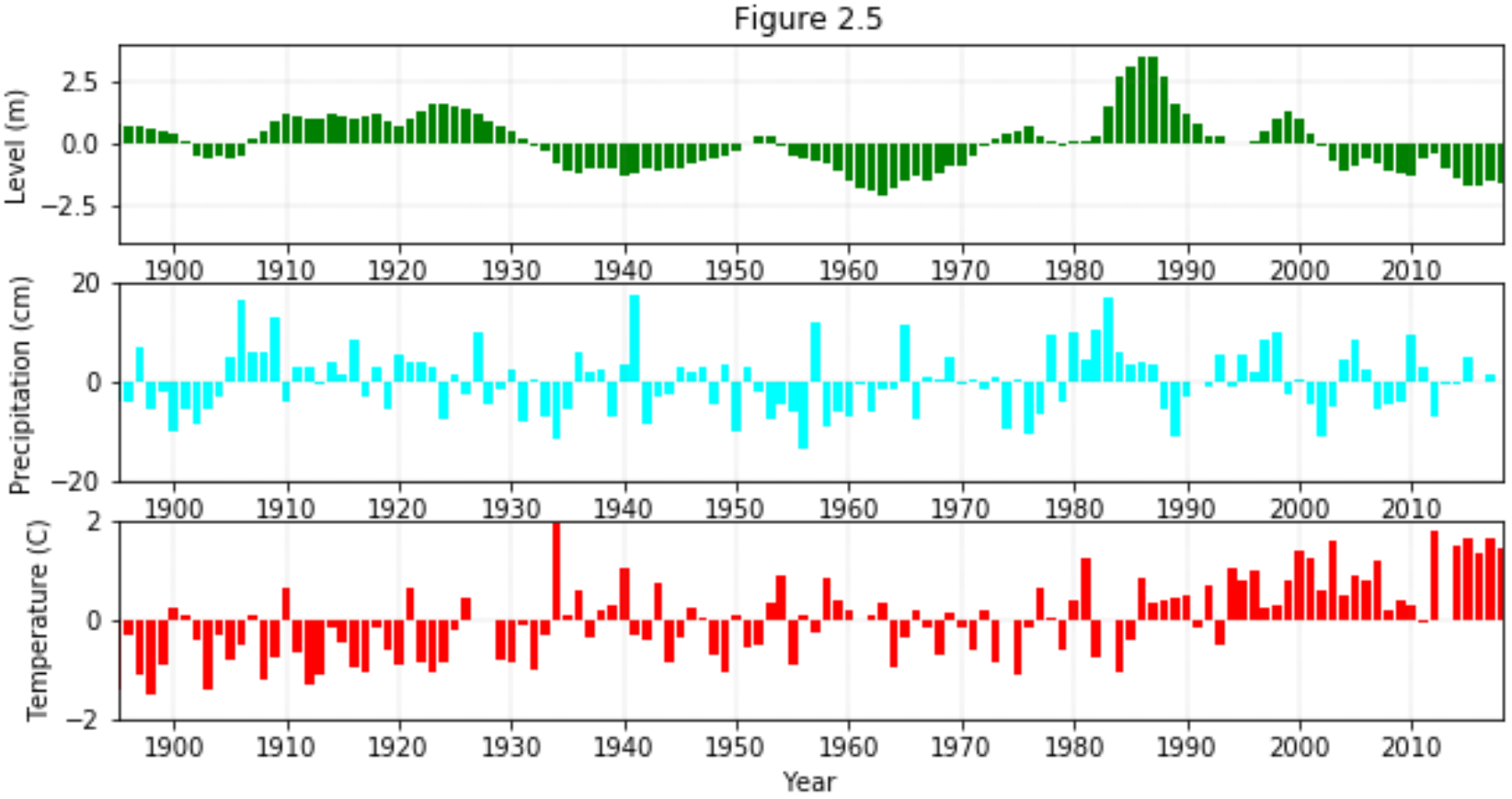


Figure 2.1
Level (m)
1284
1283
1282
1281
1280
1279
1278
1277
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year
Precipitation (cm)
55
50
45
40
35
30
25
20
Year
Temperature (C)
11
10
9
8
7
6
Year

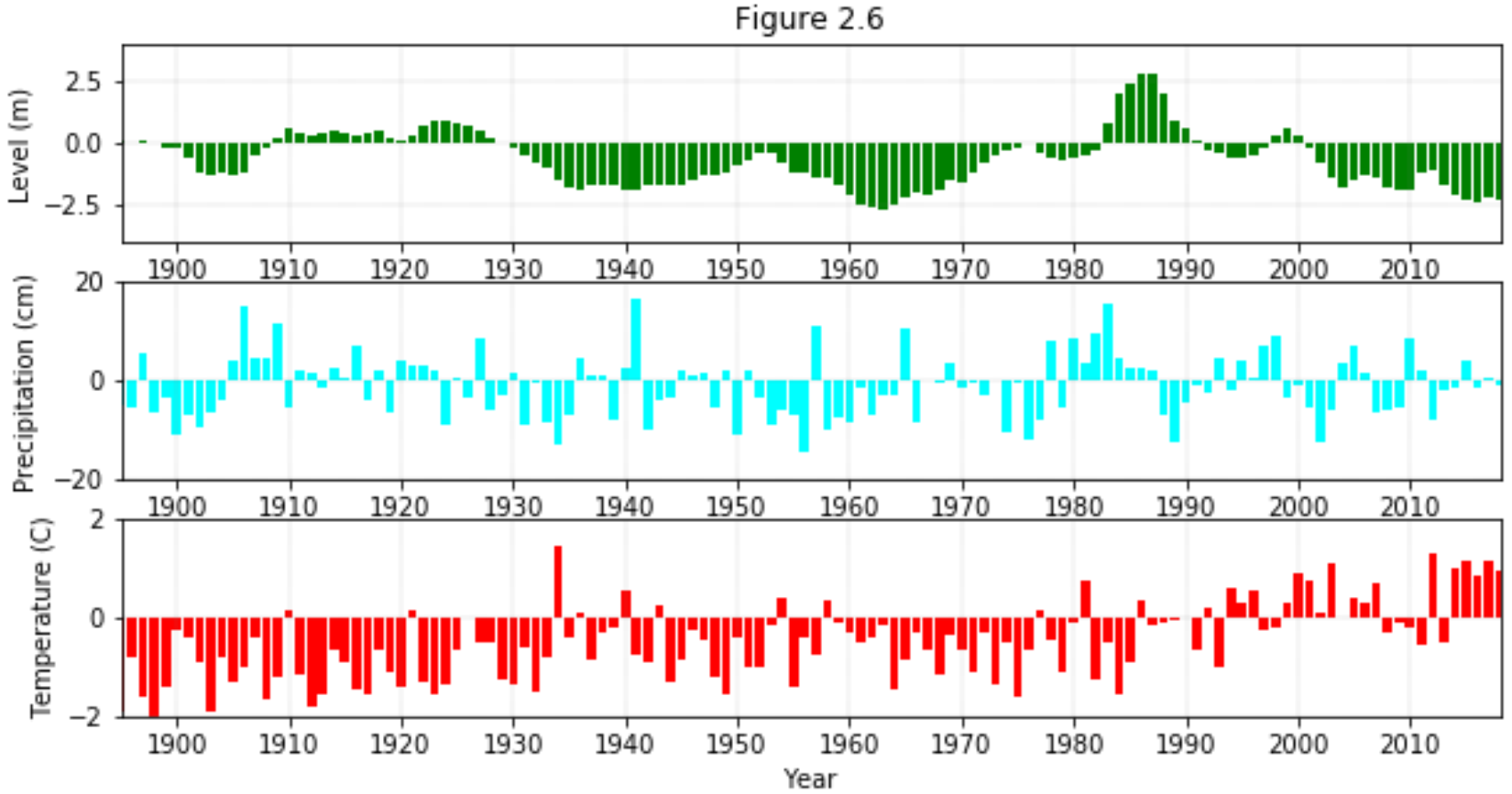
Transforming Data

- Anomalies: departure from long-term mean



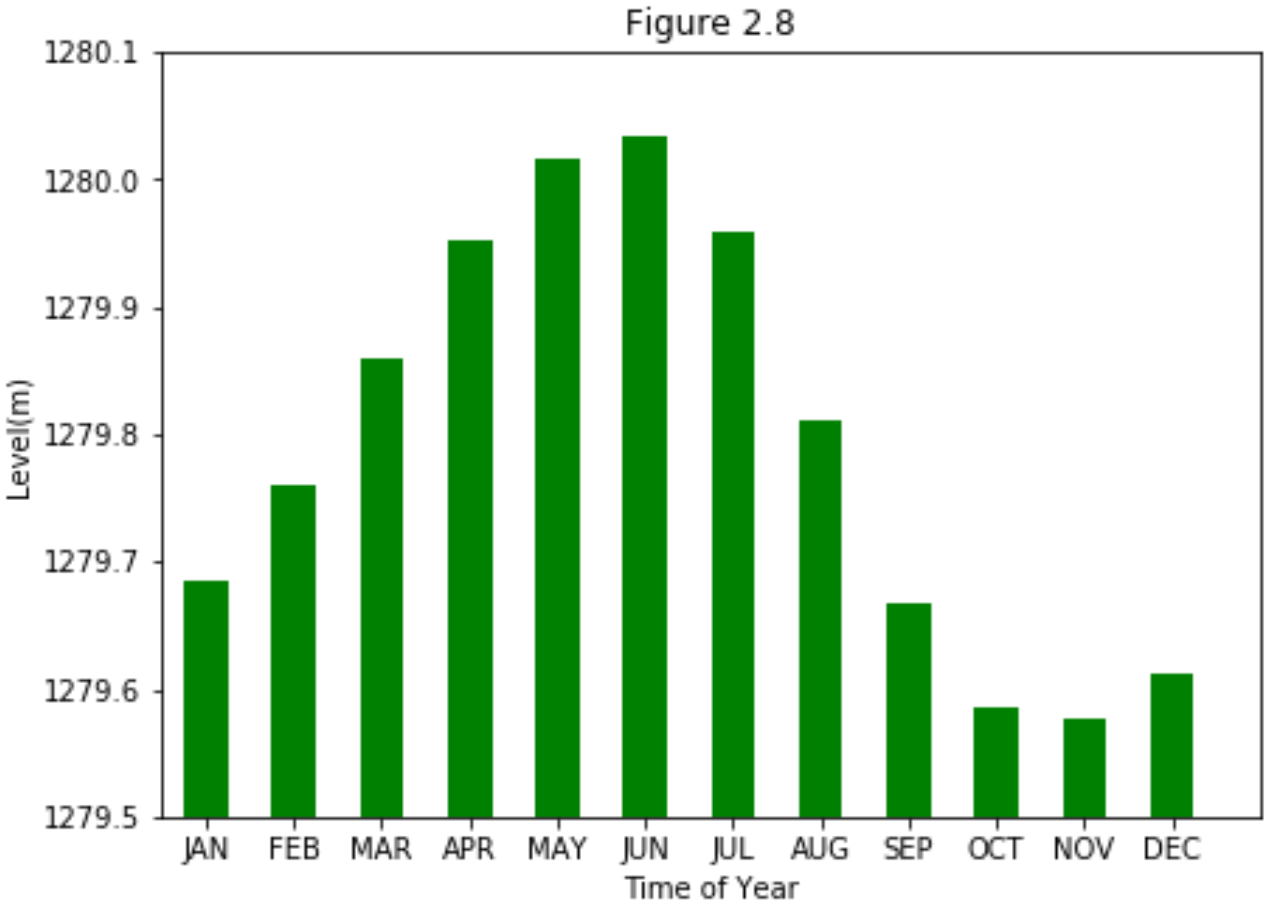
Transforming Data

- Anomaly relative to arbitrary definition of climate normal (1981-2010) mean



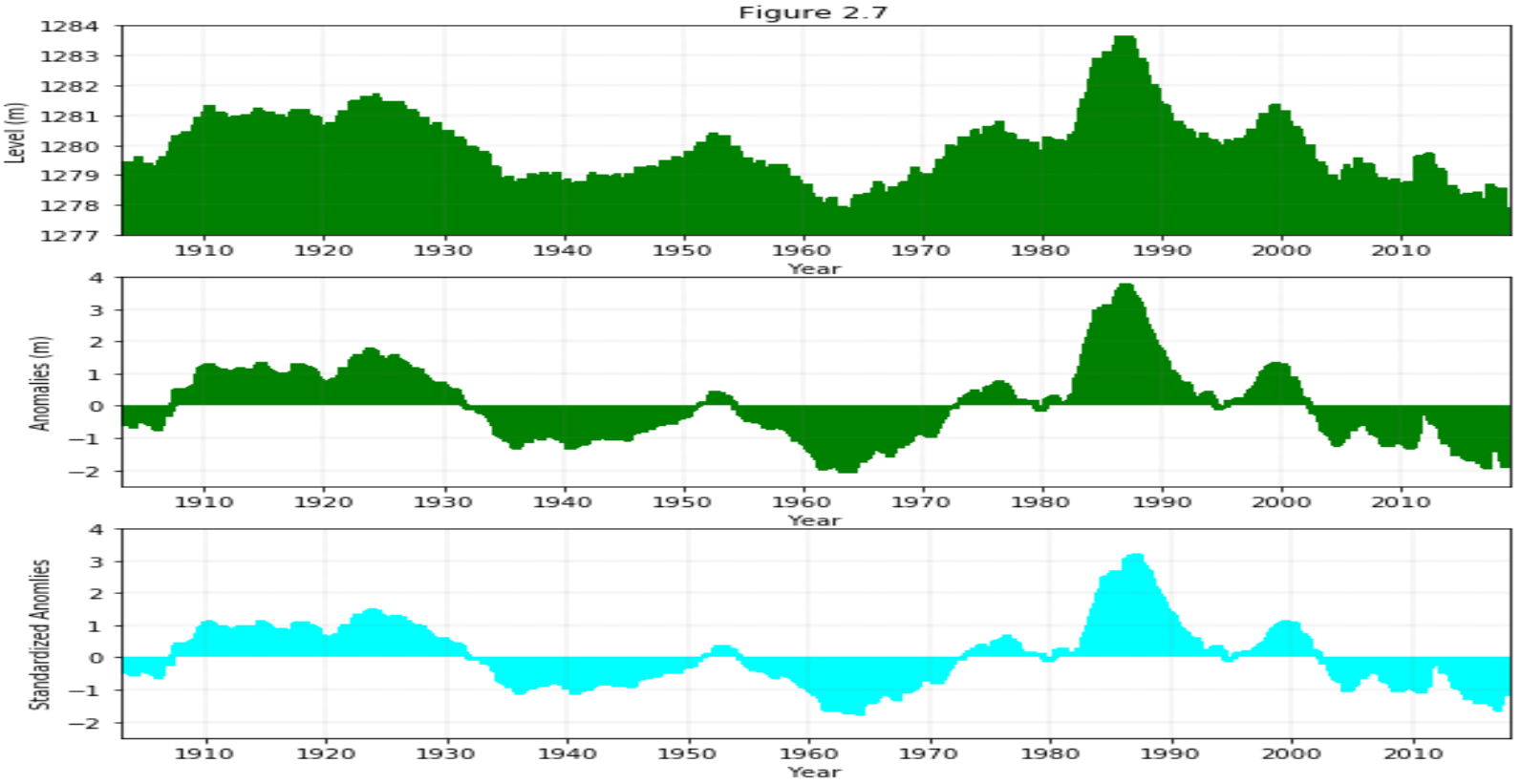
Transforming data

- Removing climatological seasonal cycle

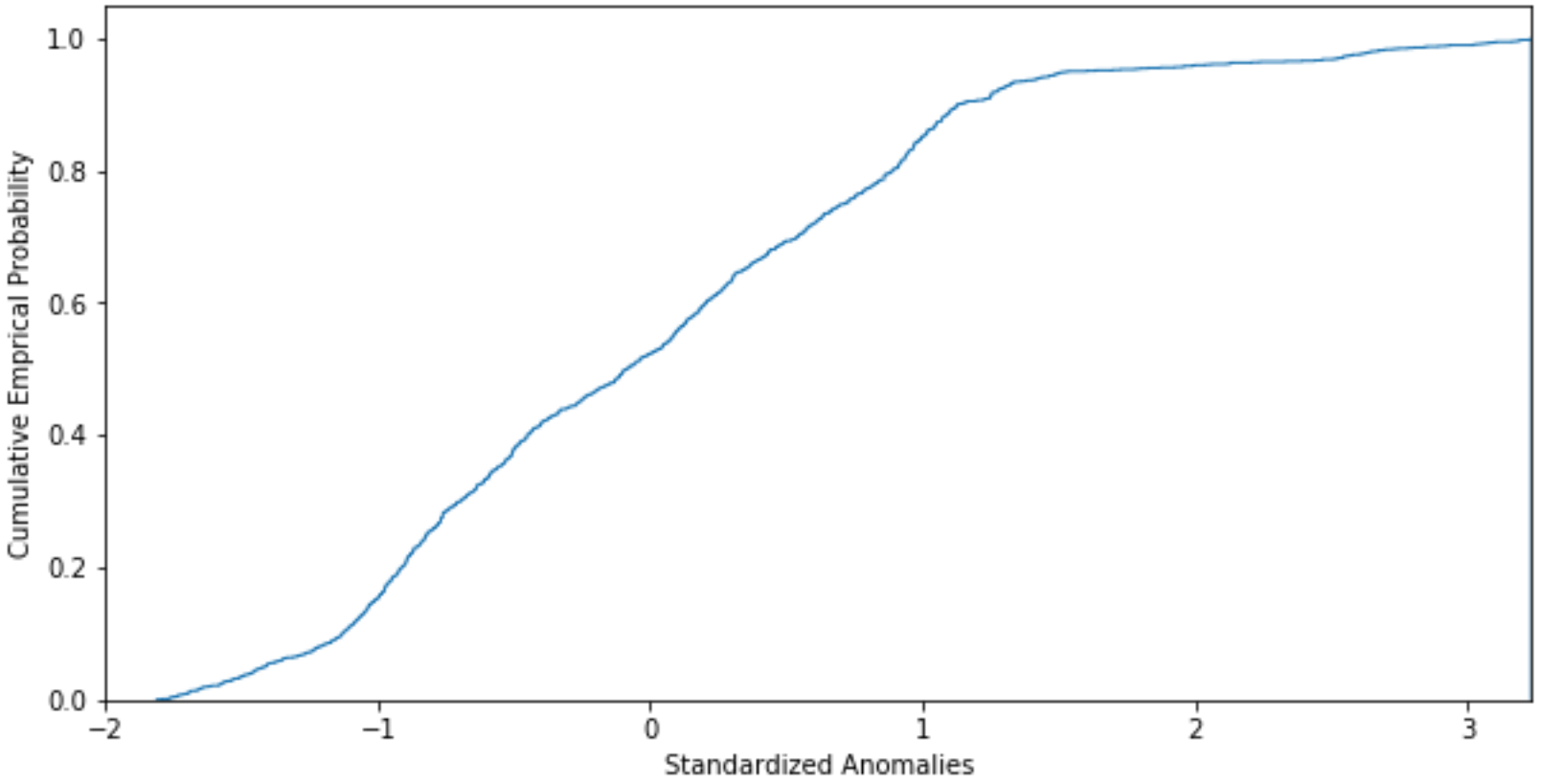


Transforming data

- Removing climatological seasonal cycle
- Computing standardized (non-dimensional) anomalies

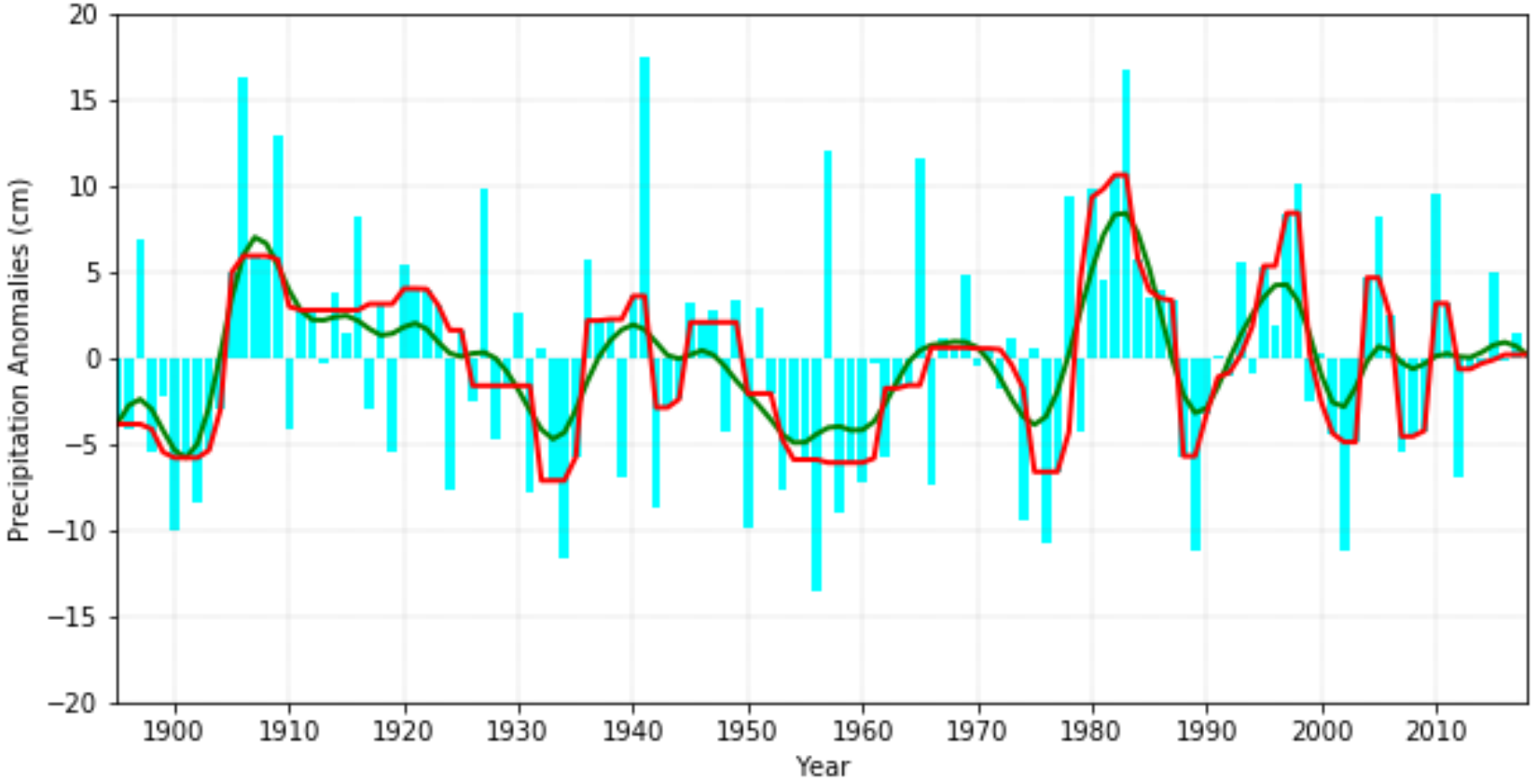


CDF of Monthly Standardized Anomalies



Transforming Data

- Low pass filter: keep slow variations, remove fast ones



Filter characteristics

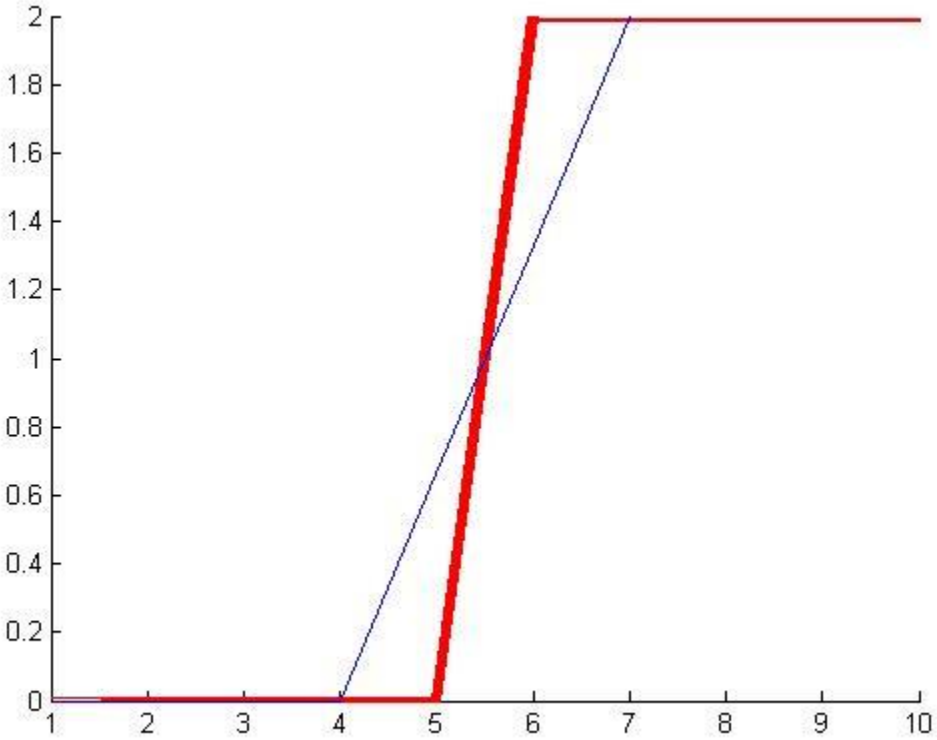


Figure 2.10. Example of original and median smoother (red line) and running mean smoother (blue line).

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