The Atmosphere During Drought Over Edmonton

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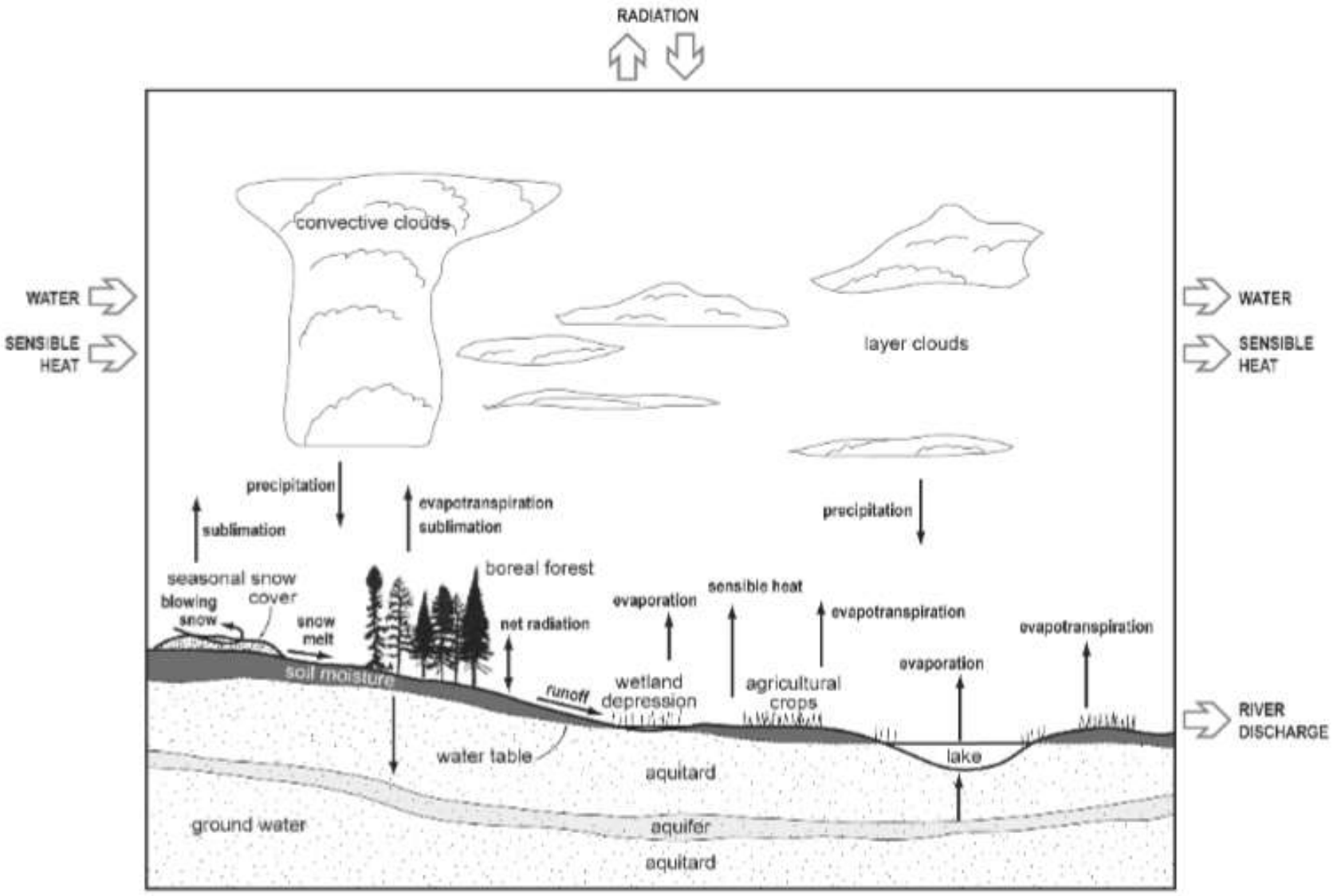
Objective

- To examine the atmosphere over Edmonton during the recent drought
  - Look at a single site over a long term
  - Edmonton seems ideal
    - Sounding site (Stony Plain) close by
    - Various E.C. observation sites
    - Radar (Carvel)
    - Corrected precipitation
    - Other possible data sources

Motivation



Motivation is to quantify and understand some of the variables and relationships between them.

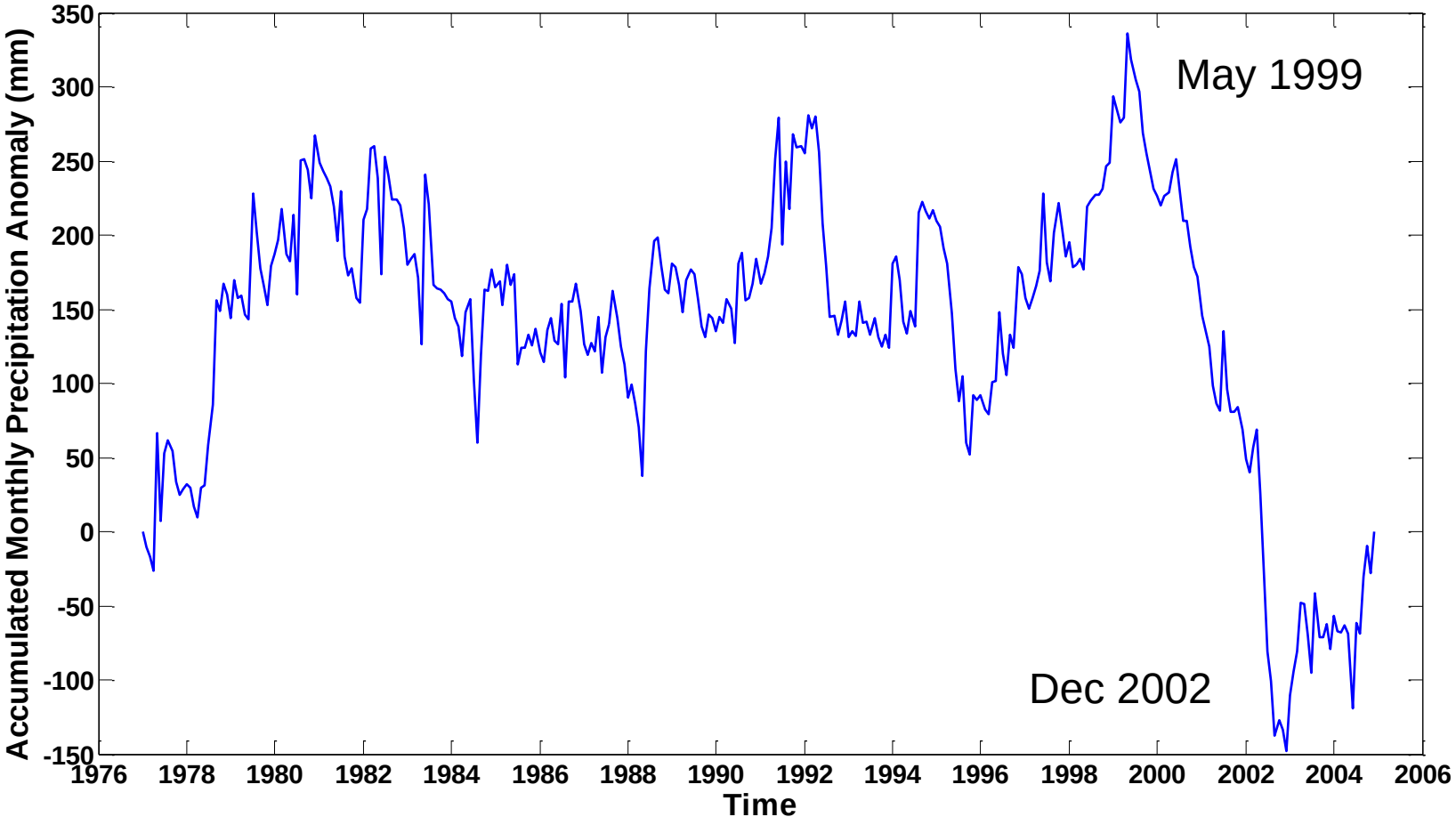
Data

- 33 years of sounding data from Stony Plain
- Corrected precipitation data from Edmonton
- 27 years of temperature data from the EC Archive

Approach

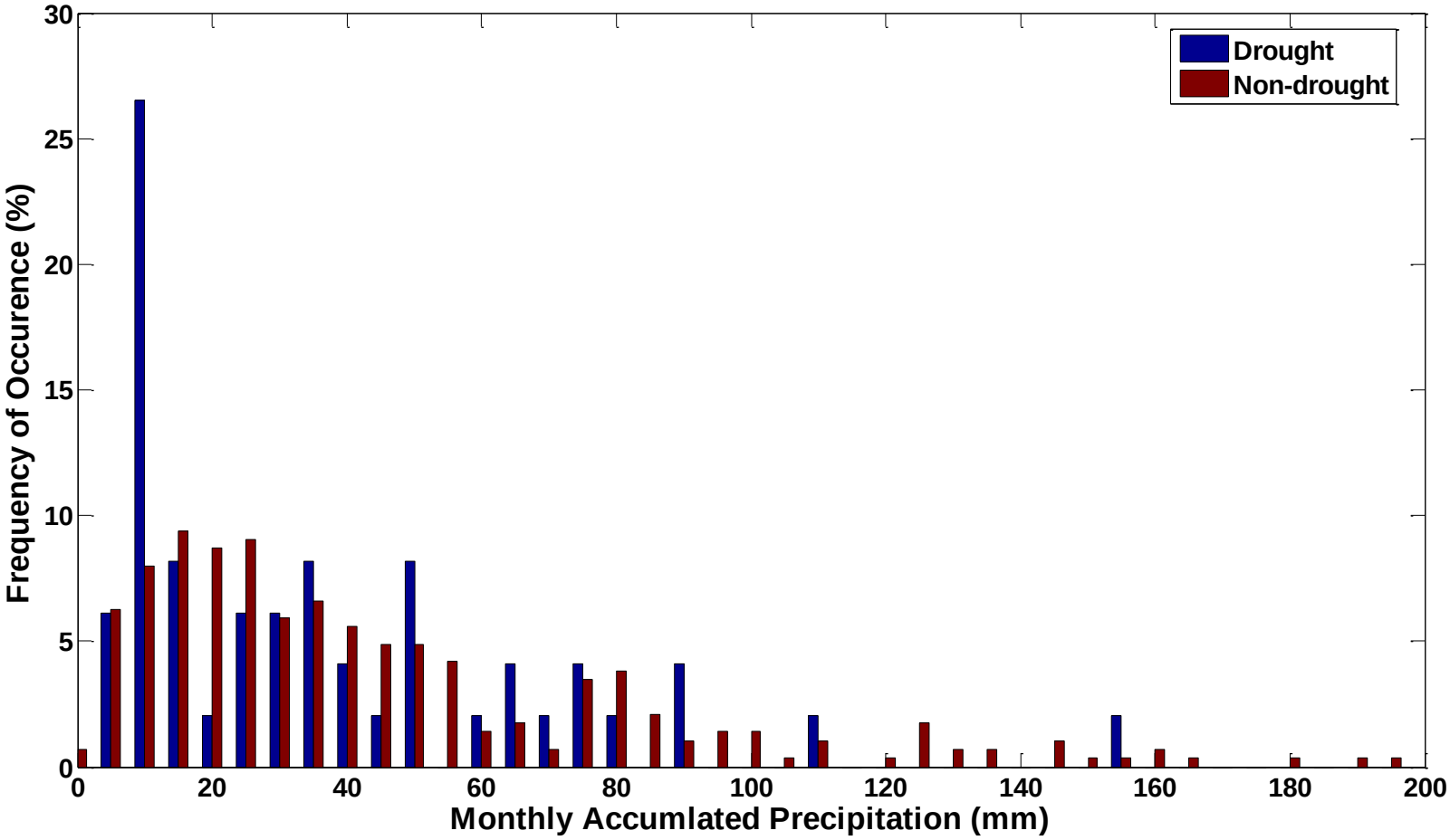
- Compare various parameters against long term averages or accumulations
- Are these consistent? Can we gain some insight as to possible influences that extended the drought

Precipitation



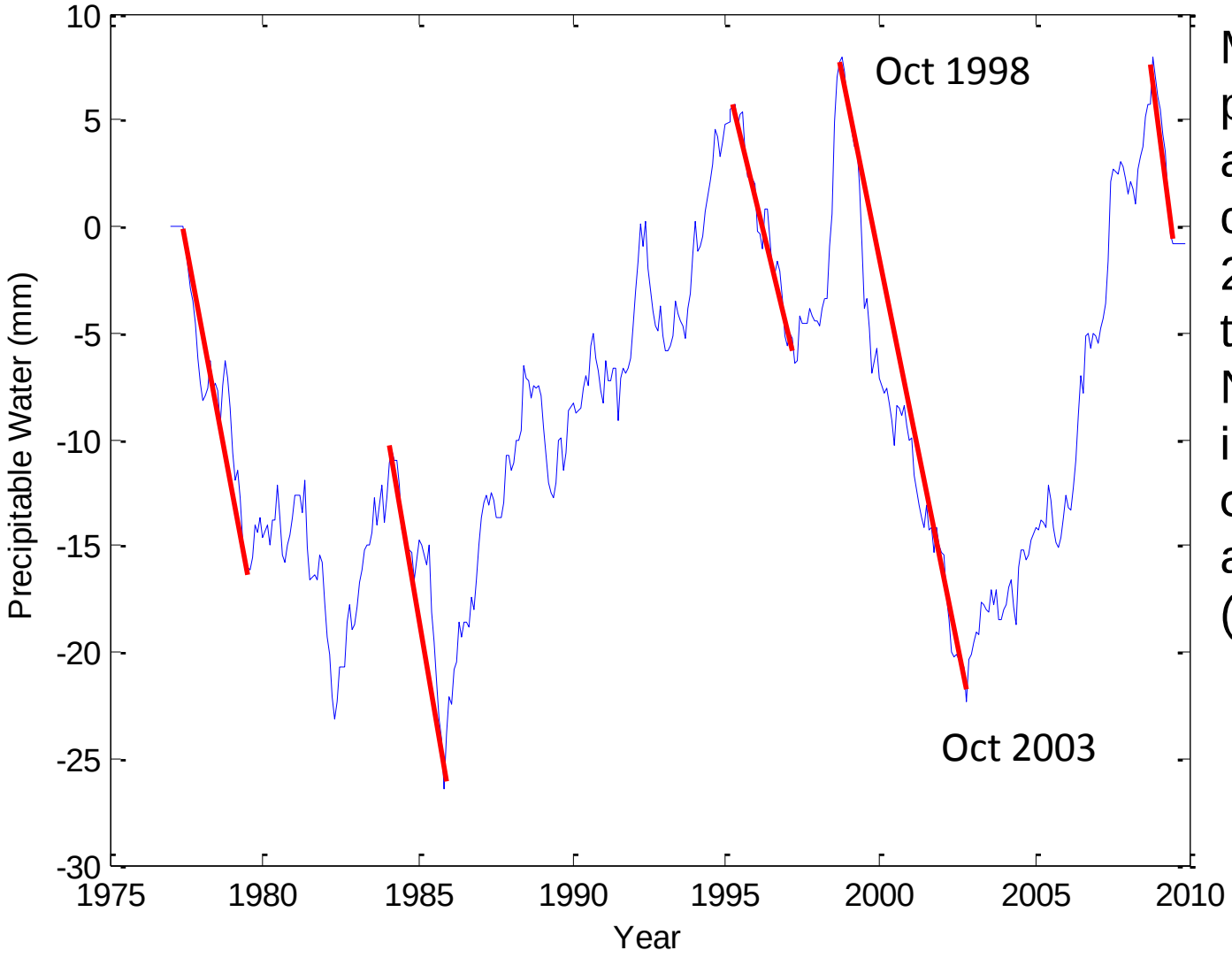
Precipitation anomaly is calculated (1977-2004). Result is then accumulated. From May 1999 to December 2002, almost 500 mm was “lost”.

Precipitation



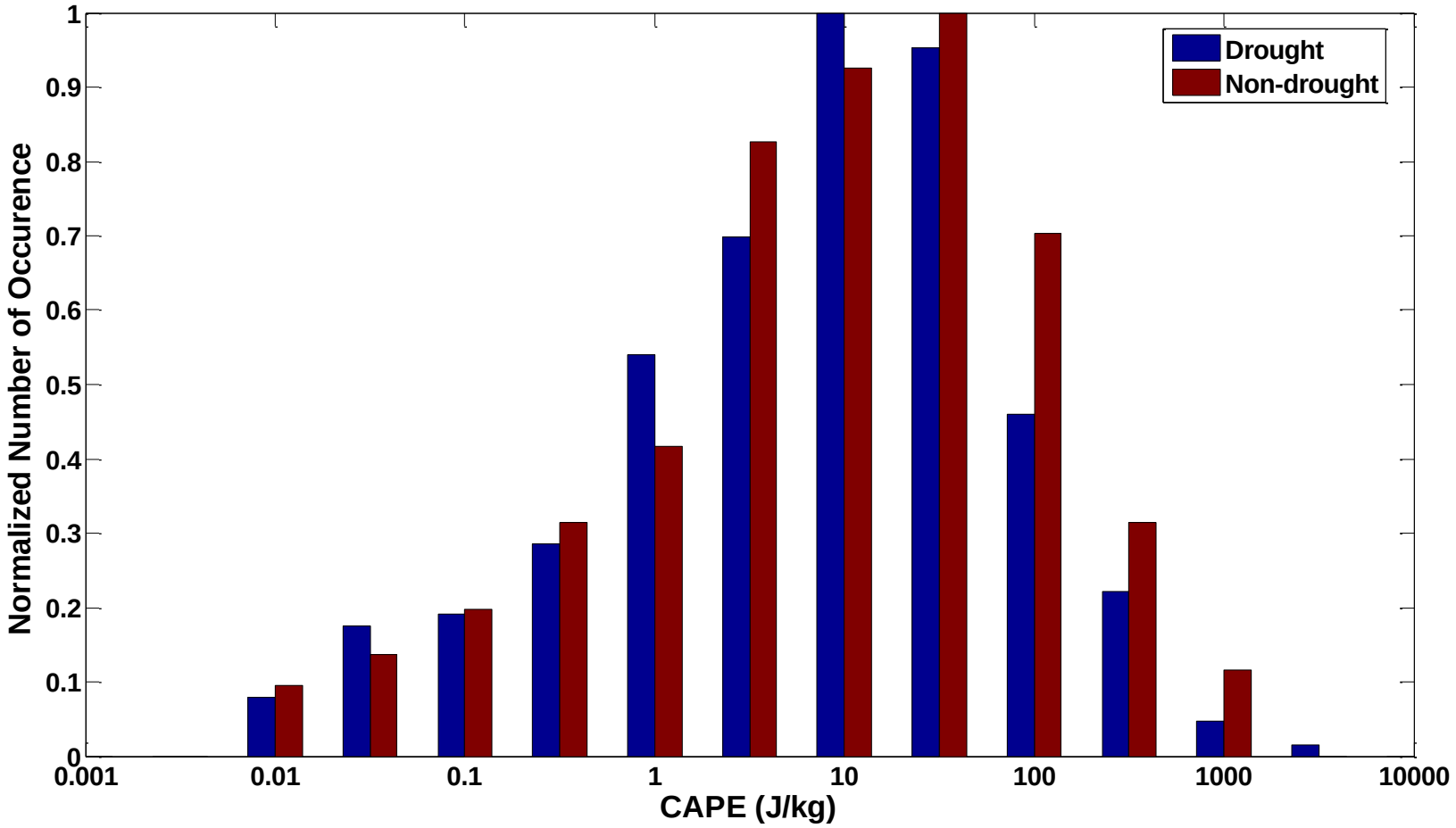
When precipitation was recorded during drought, the monthly accumulation was more likely to be lower.

Precipitable Water

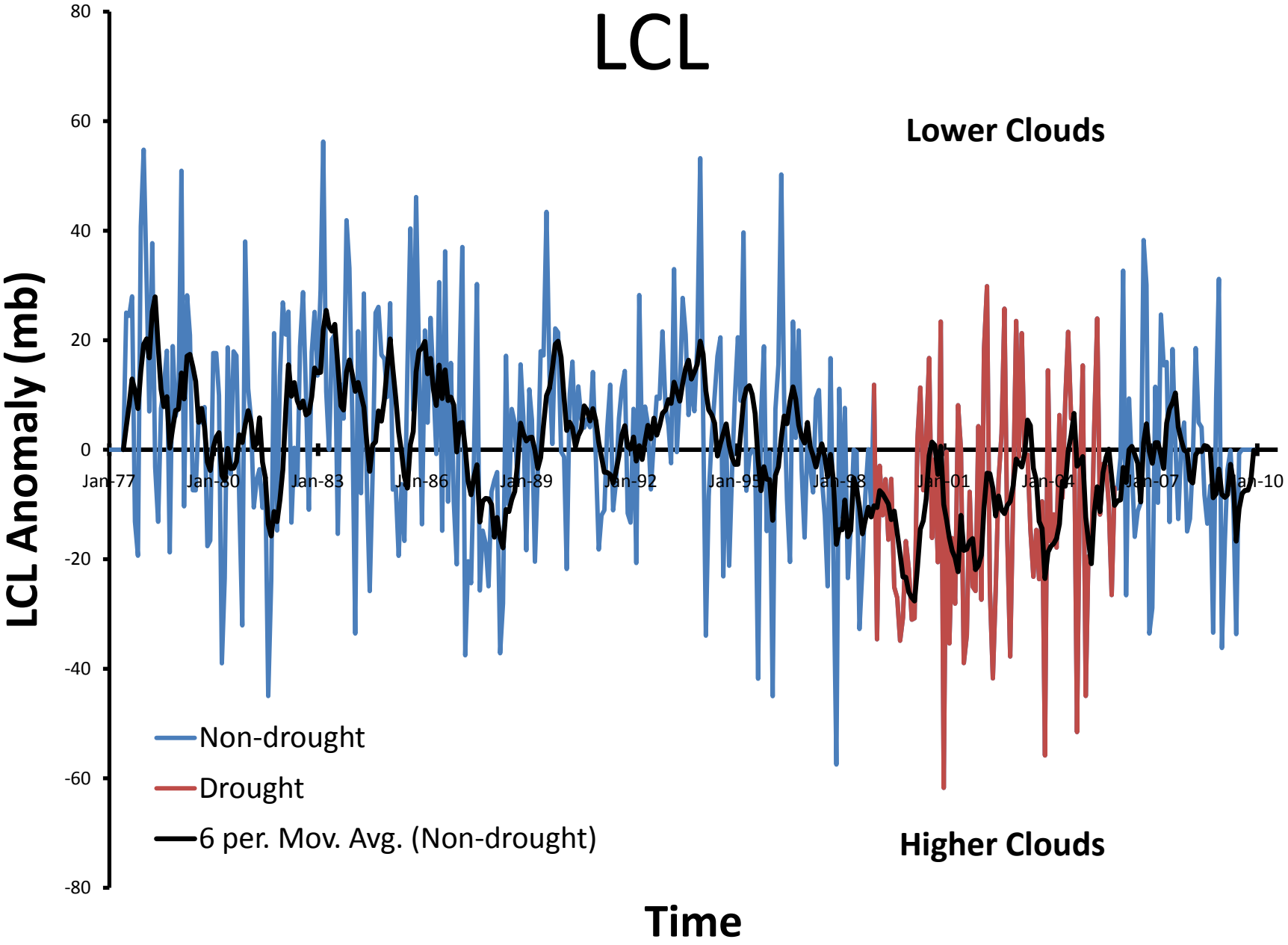


Monthly precipitable water anomaly is calculated (1977-2009). Result is then accumulated. Negative slope indicates a “drying out” of the atmosphere (drought?)

CAPE

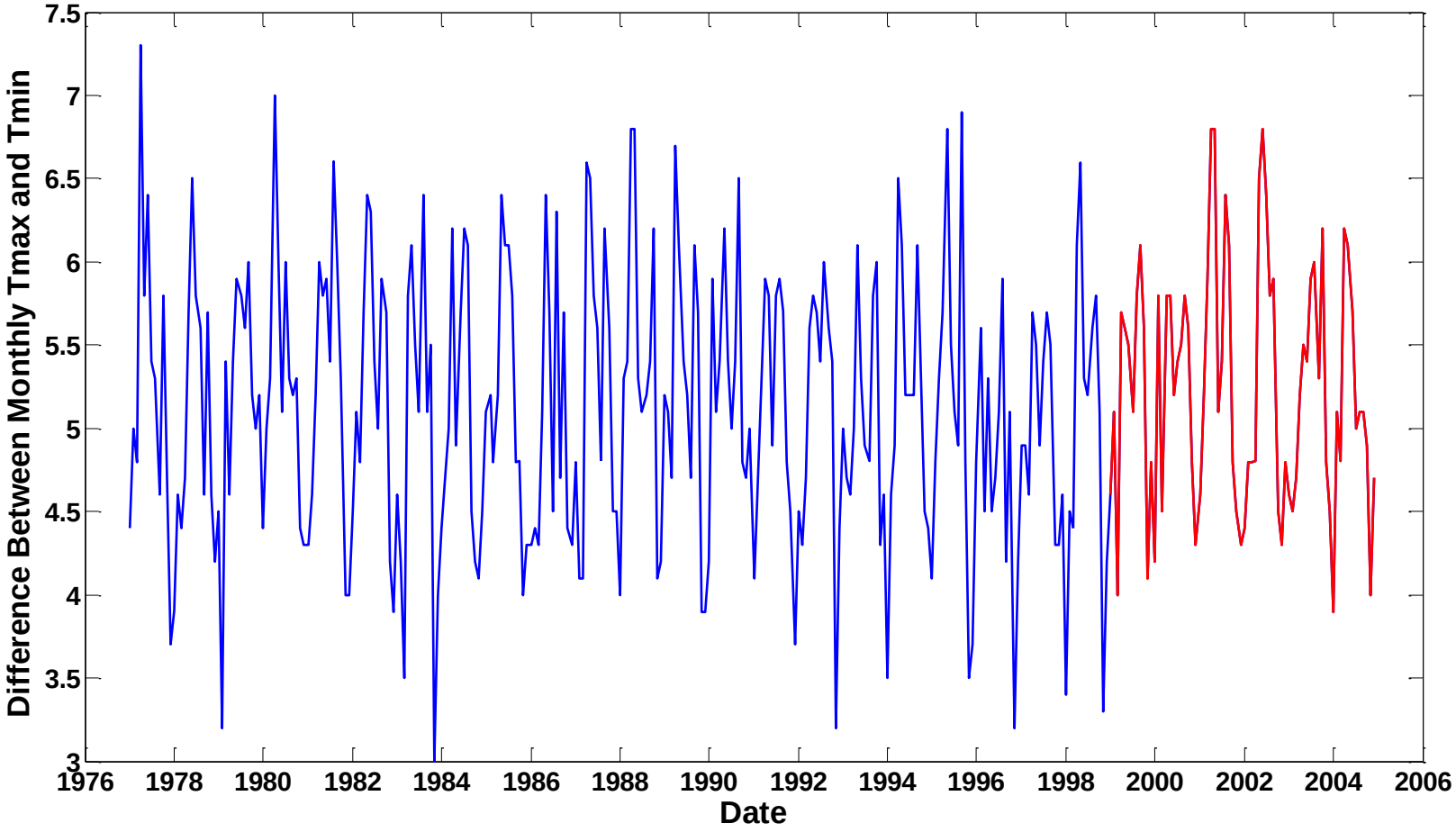


CAPE for drought plotted as a histogram with "non-drought" CAPE and normalized. Drought period clearly has proportionally more smaller values, therefore less chance for convective storms to develop.



LCL anomaly (1977-2009) plotted over time also with a trendline (6 months moving average). Clouds were higher during drought.

Temperature Difference



The difference between monthly mean max. and monthly mean min. plotted against time. Drought period has slightly higher differences in winter but summer was similar to other periods.

Summary

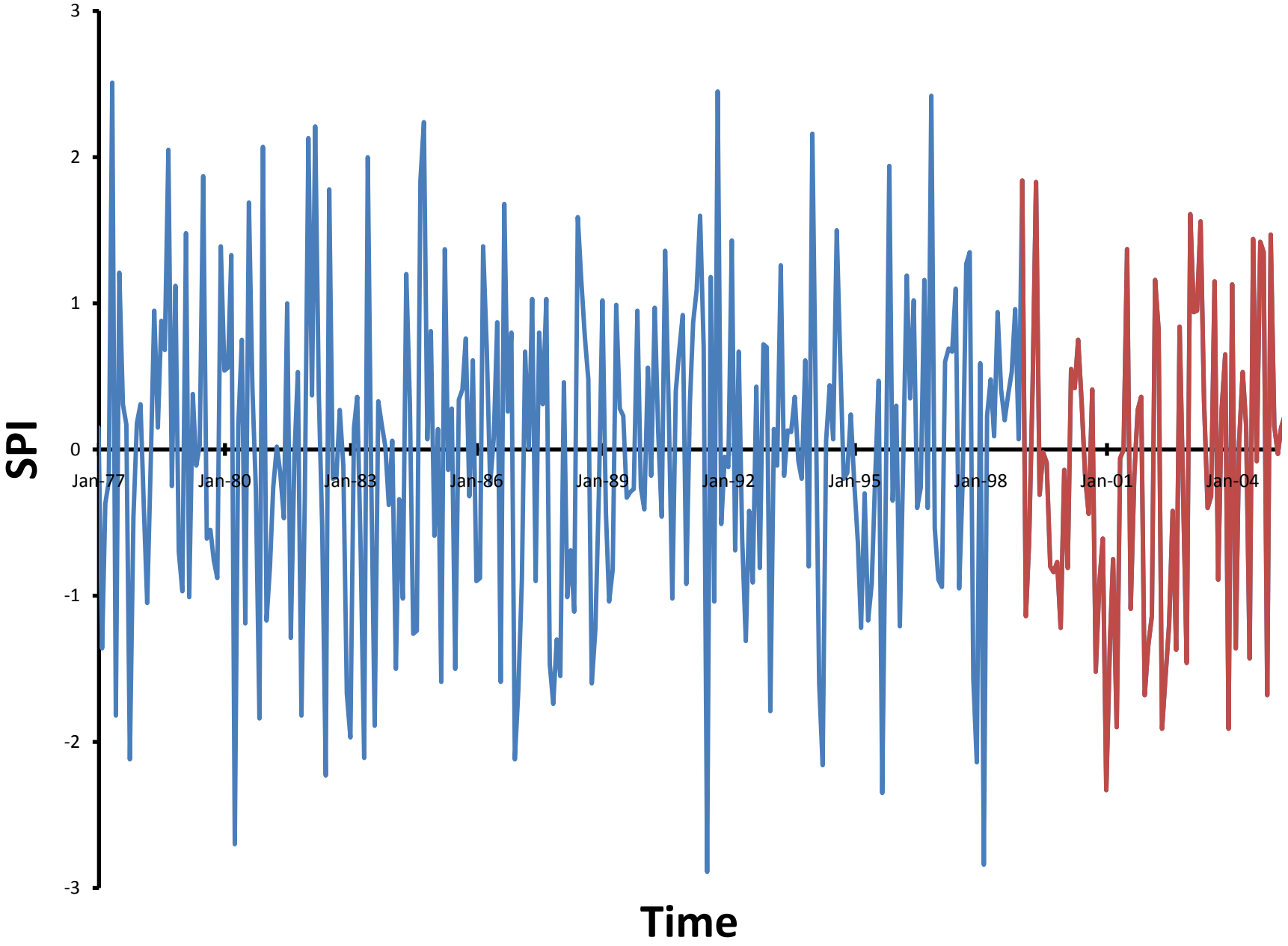
- Edmonton “lost” almost 500 mm of precipitation
- The atmosphere did “dry out” Oct. 1998 to Oct. 2003
- CAPE tended to be lower (less energy) during drought
- LCL indicted clouds tended to be higher during drought
- Monthly temperature Tmax - Tmin were slightly higher in winter, similar in summer

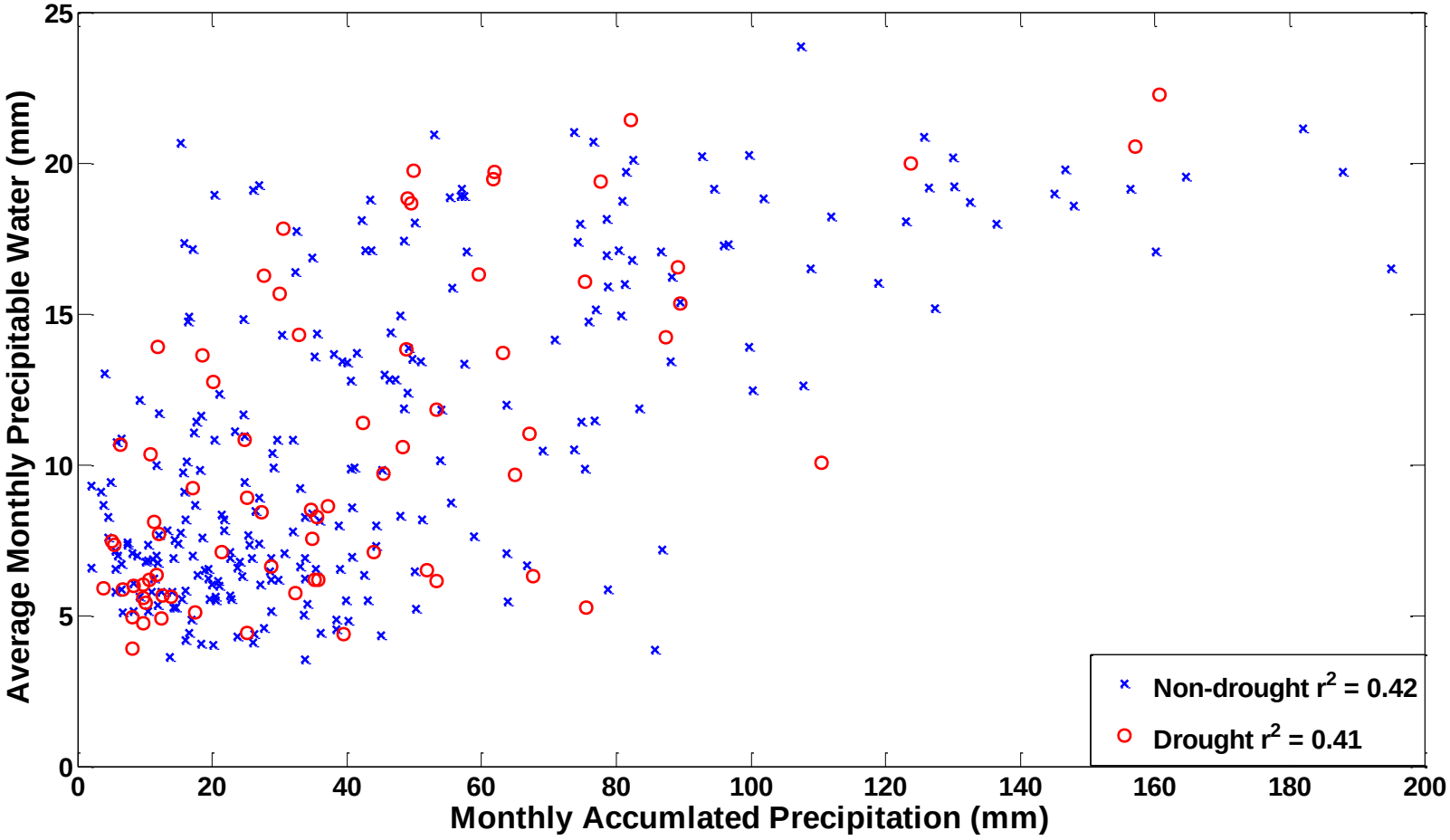
Summary (cont.)

- Such information needs to be replicated in models

Future

- Use radar data to examine drought and non-drought periods
- Use as a proxy? Radar coverage is much greater than the radiosonde network


SPI
3
2
1
0
-1
-2
-3
Jan-77
Jan-80
Jan-83
Jan-86
Jan-89
Jan-92
Jan-95
Jan-98
Jan-01
Jan-04
Time


Average Monthly Precipitable Water (mm)
Monthly Accumlated Precipitation (mm)
0
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200
Non-drought r2 = 0.42
Drought r2 = 0.41