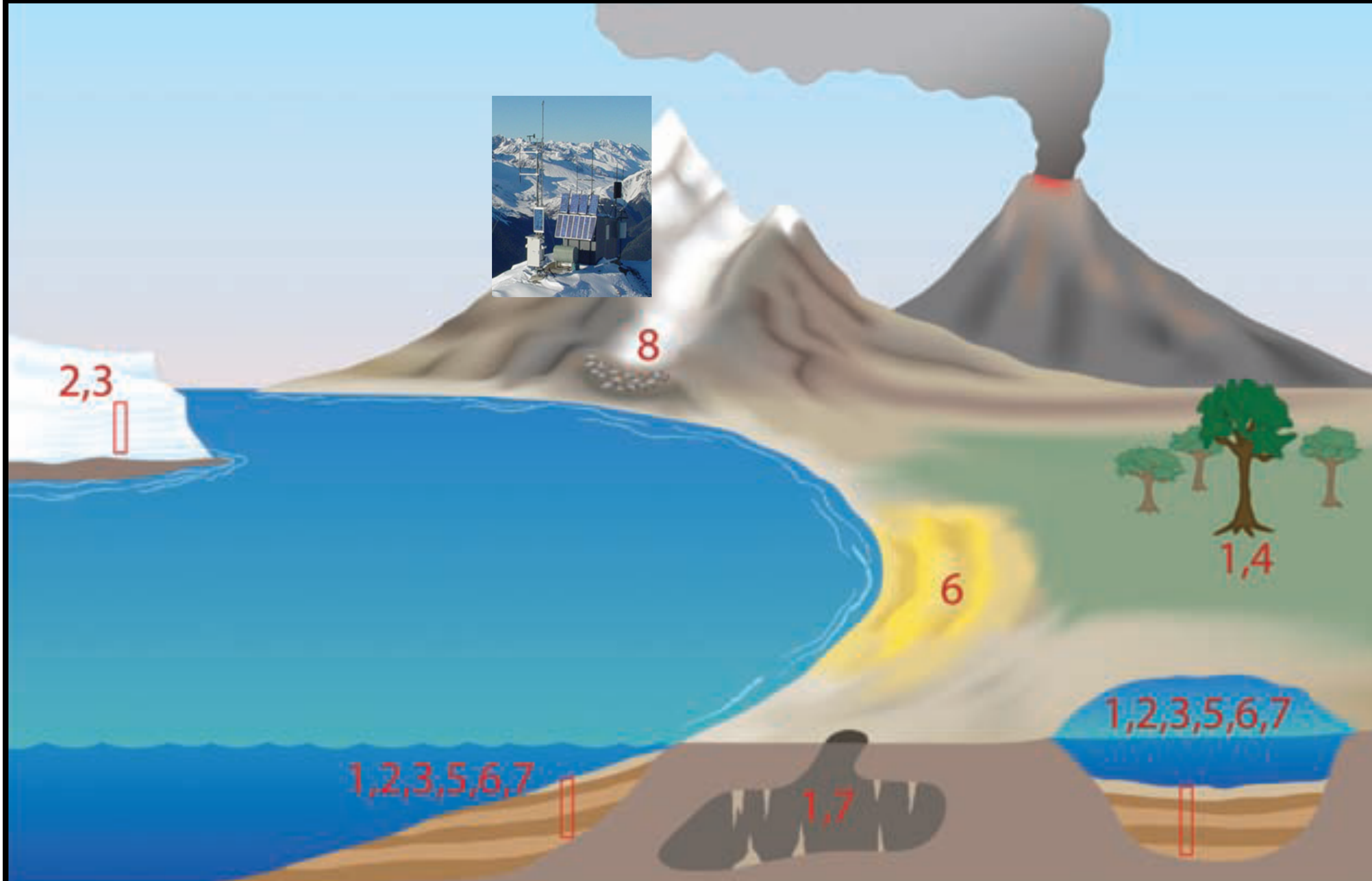
Paleoclimate Observation Networks

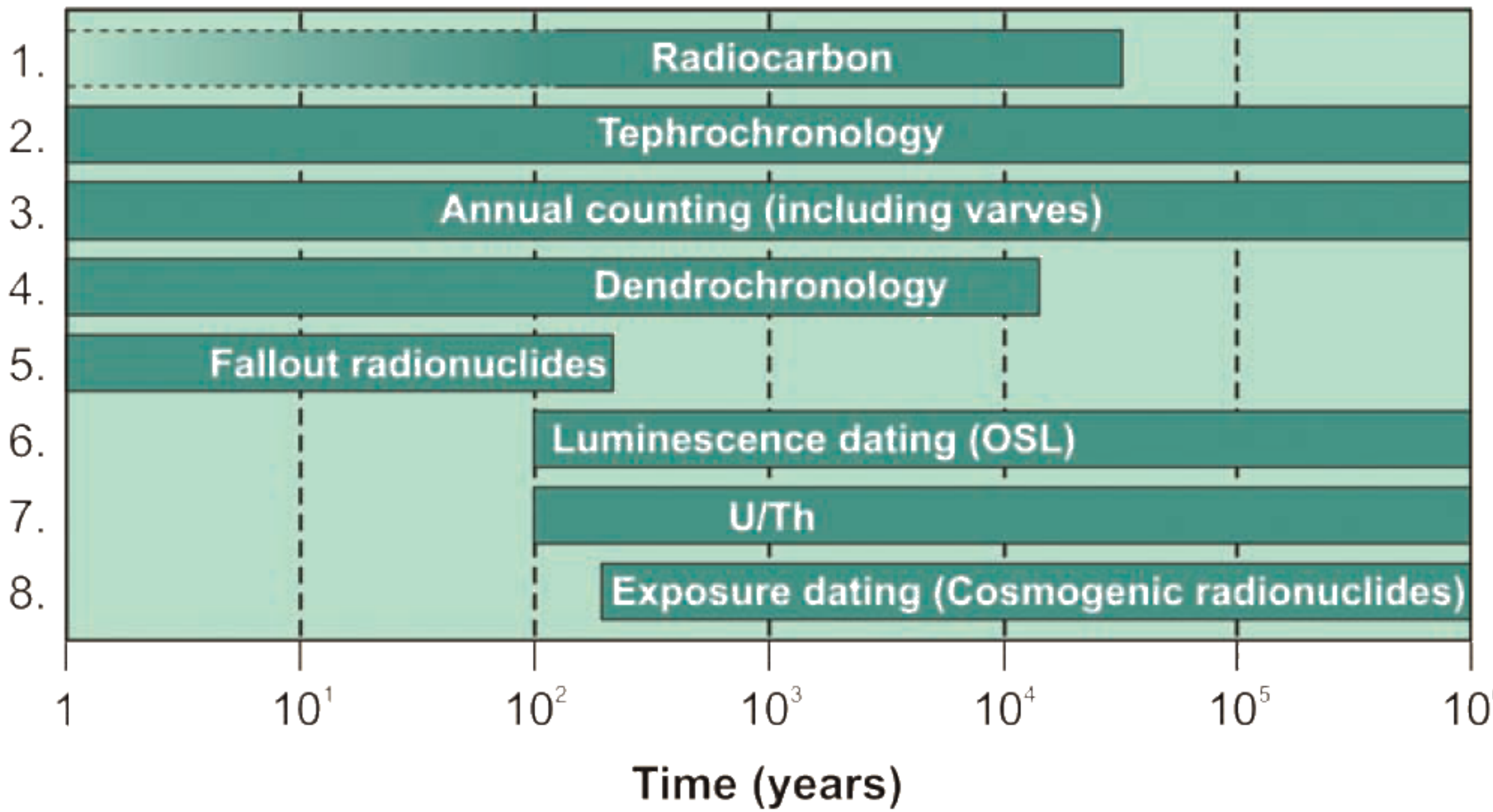
Dave Sauchyn, PARC

Integrated Observation and Prediction Networks, Canmore, Dec 8-10, 2008



Bertrand et al. 2008, EuroCLIMATE Spring School

Chronological Control



THE LAKE FILE

http://www.scirpus.ca/cgi-bin/lakes_index.cgi

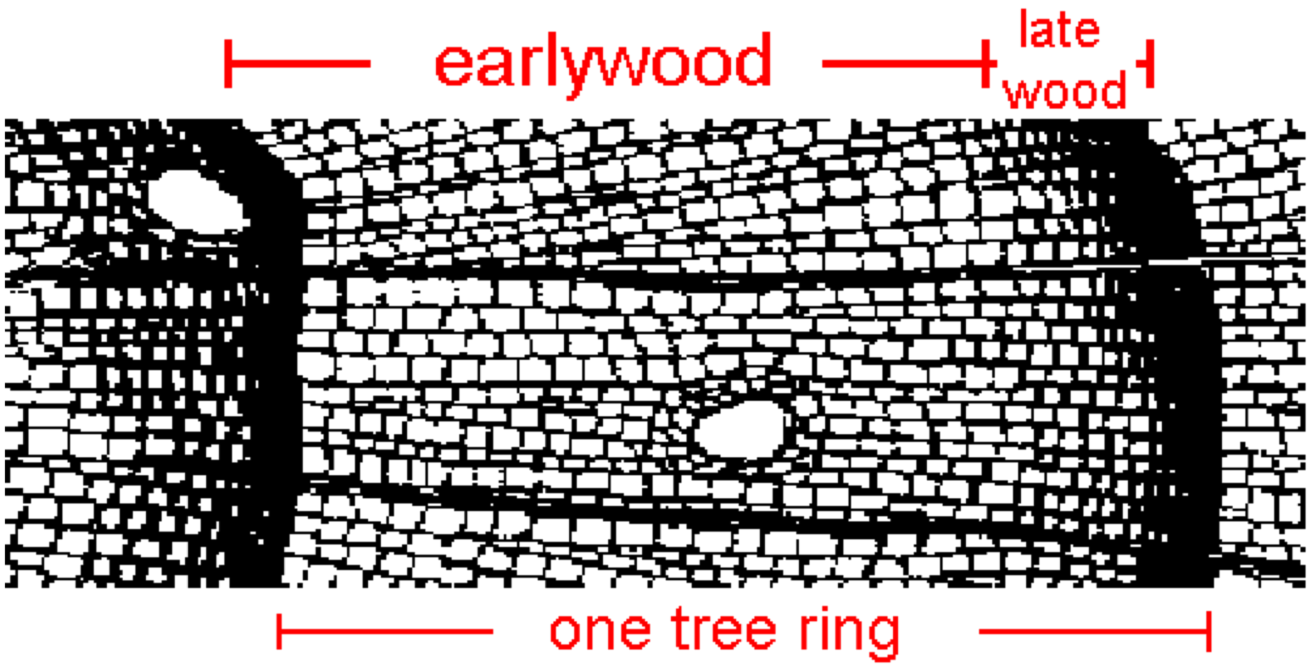
Total number of sites: **507**.
Number of citations: **538**.

Lake Louise (Alta)

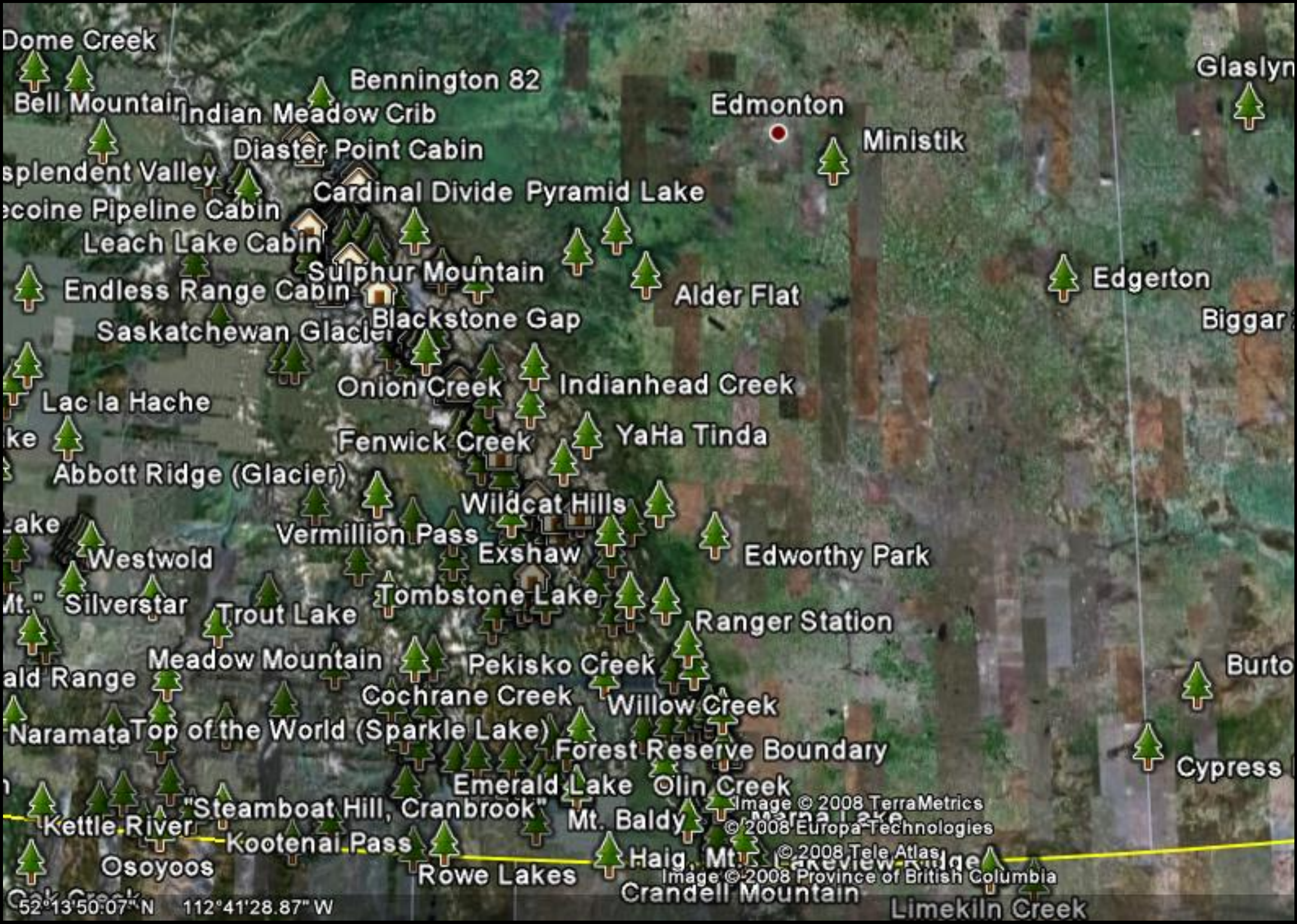
Location: Alberta, Canada Latitude (N): 51.43° Longitude (W): 116.18°
Site notes: In Banff National Park.

Beierle, B. D. 1997 *Early Holocene Climate of Southwestern Alberta, Canada, Reconstructed from Lake Sediment Cores*. Unpublished M.Sc. thesis. Department of Geography, University of Calgary, Calgary, Alberta, Canada xii + 115 pages.
Sites discussed: Upper Kananaskis Lake, Lower Burstall Lake, Lake Louise, Copper Lake, Johnson Lake, Summit Lake, Frederick Lake, Cartwright Lake, Sibbald Lake, Beauvais Lake, Beaver Mines Lake, Sibbald Pass (Bog), Pilot Lake, Herbert Lake, Altrude Lake.

A Tree-Ring Series



Tree-Ring Collections in Canada



http://www.mta.ca/candendro/google.htm




University of Regina Tree Ring Lab

www.parc.ca/urtreelab

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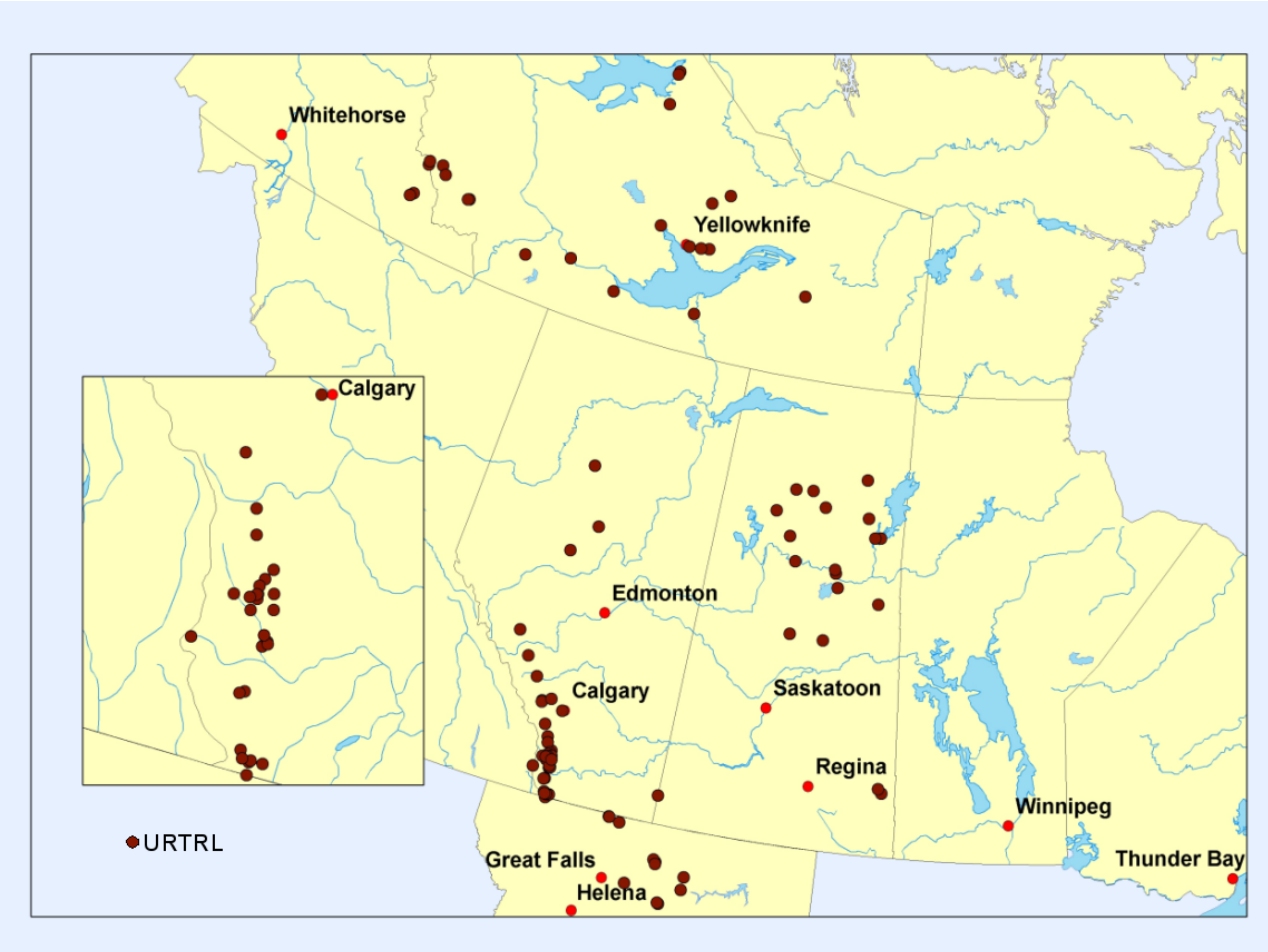
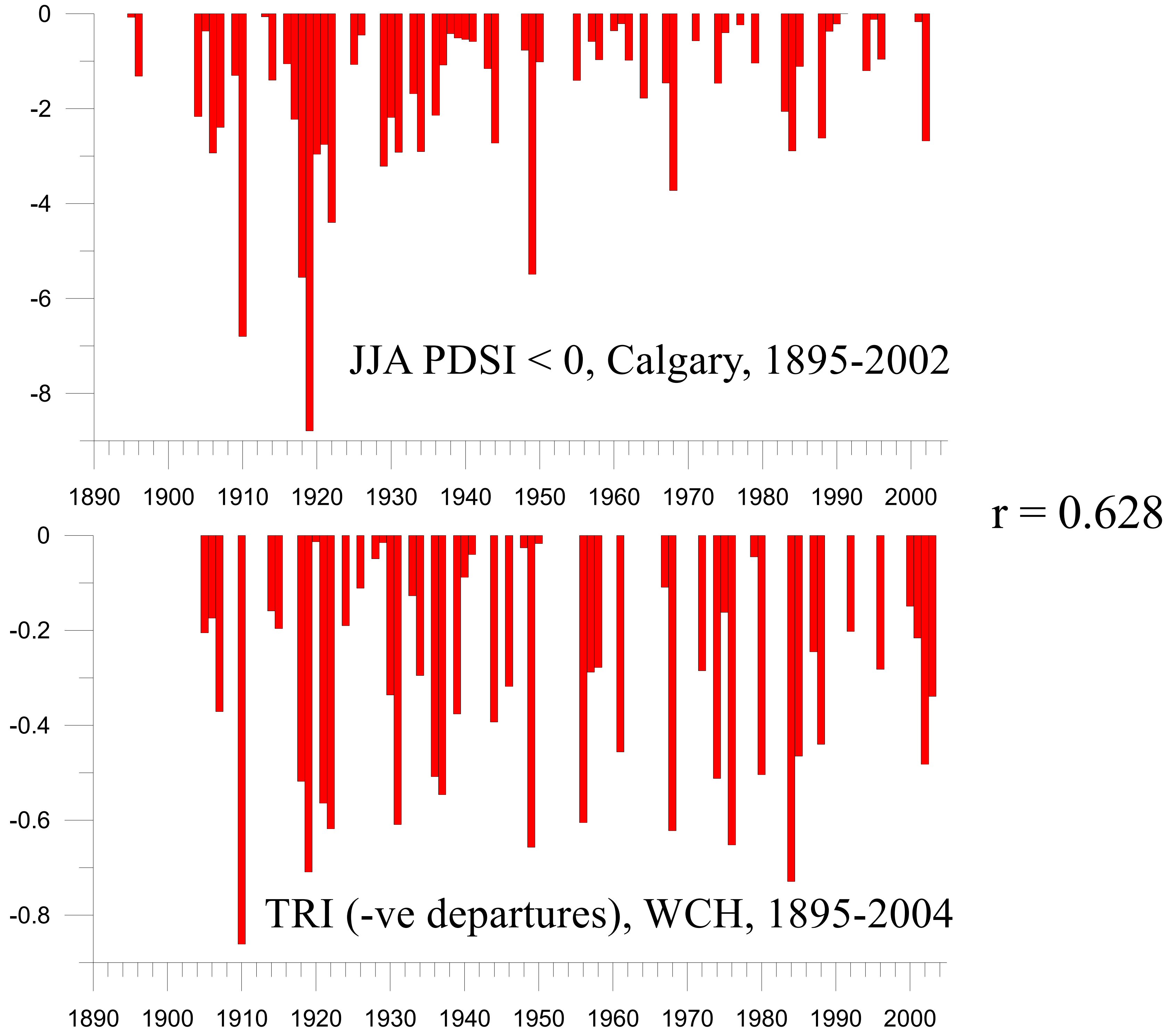
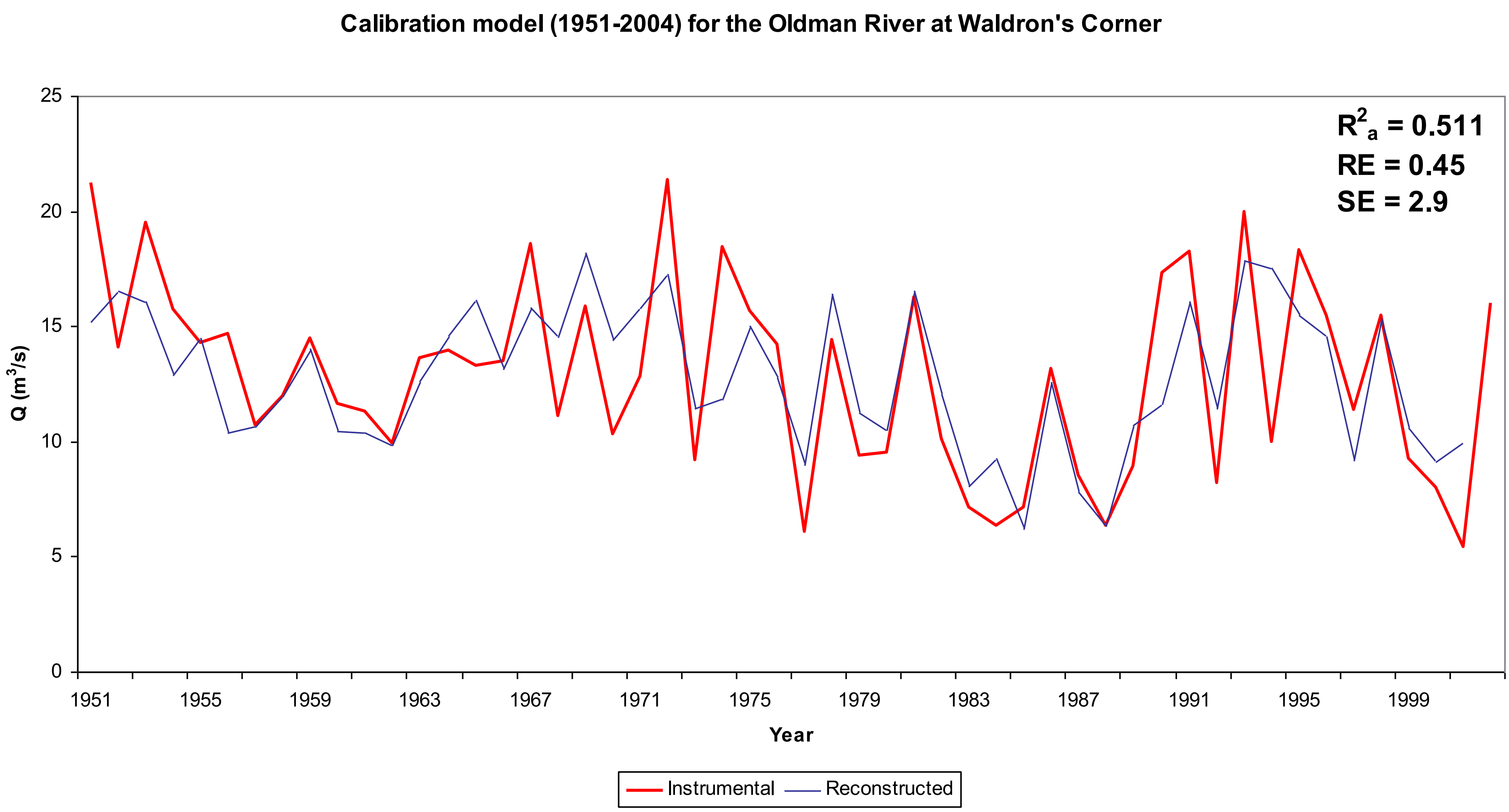
INTRODUCTION

The University of Regina Tree-Ring Lab was established in 1998. Since then we have built a network of 60 tree-ring chronologies encompassing the island forests of eastern Montana, and the foothills and boreal forests of Alberta, Saskatchewan and the NWT. Our tree-ring processing and measuring facility is located in the Department of Geography. The researchers and our data processing lab are based at the Prairie Adaptation Research Collaborative (PARC), a climate change research center. At PARC our tree-ring records are applied to providing a better understanding of the climate of the western interior, a context for forecasts of future climate change, high resolution climate records for investigating the climate forcing of biophysical systems, and providing resource managers and planners with a longer view of precipitation and streamflow in this region.

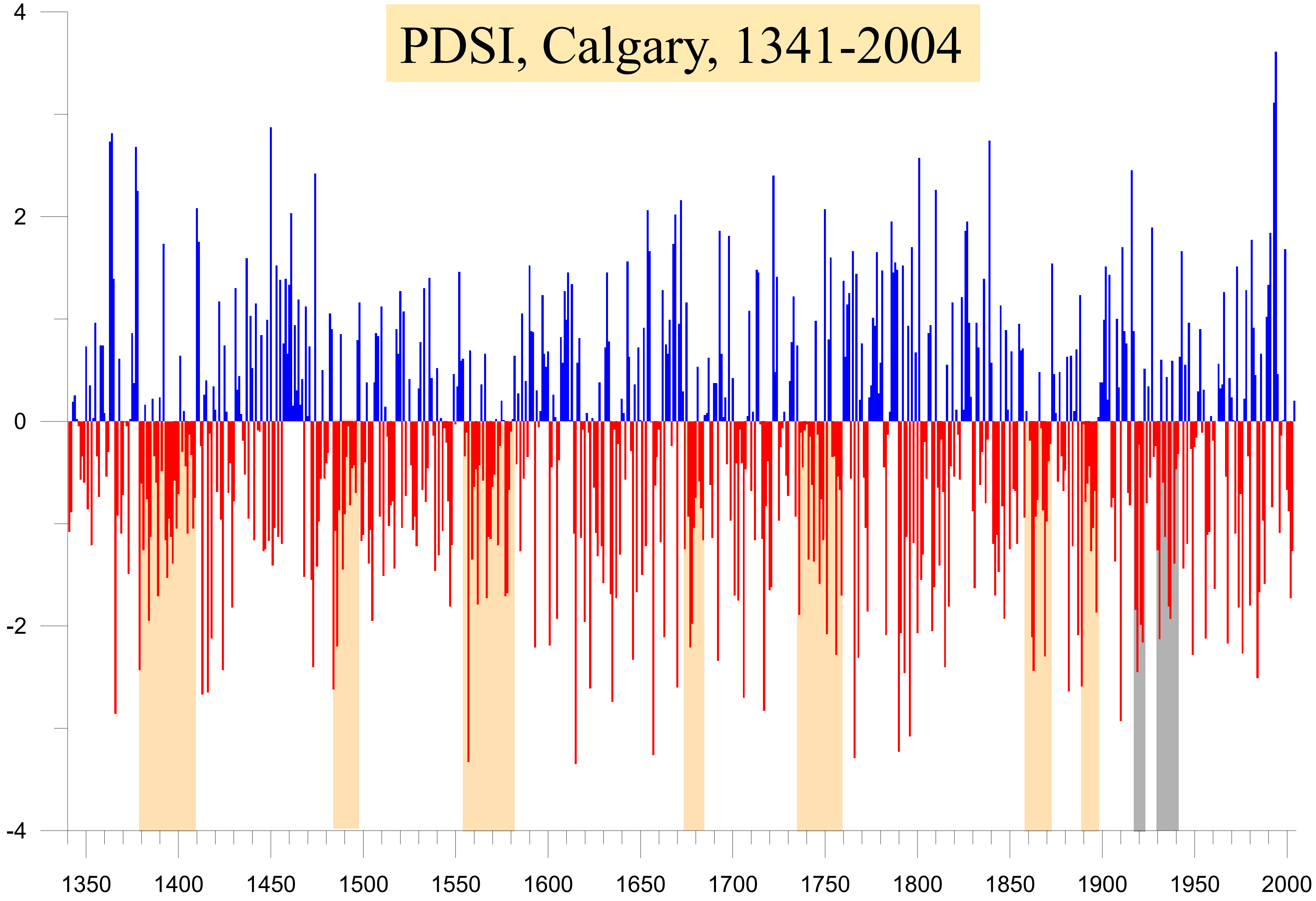
This website is hosted by the Prairie Adaptation Research Collaborative


Whitehorse
Yellowknife
Calgary
Edmonton
Calgary
Saskatoon
Regina
Winnipeg
Thunder Bay
Great Falls
Helena
URTRL

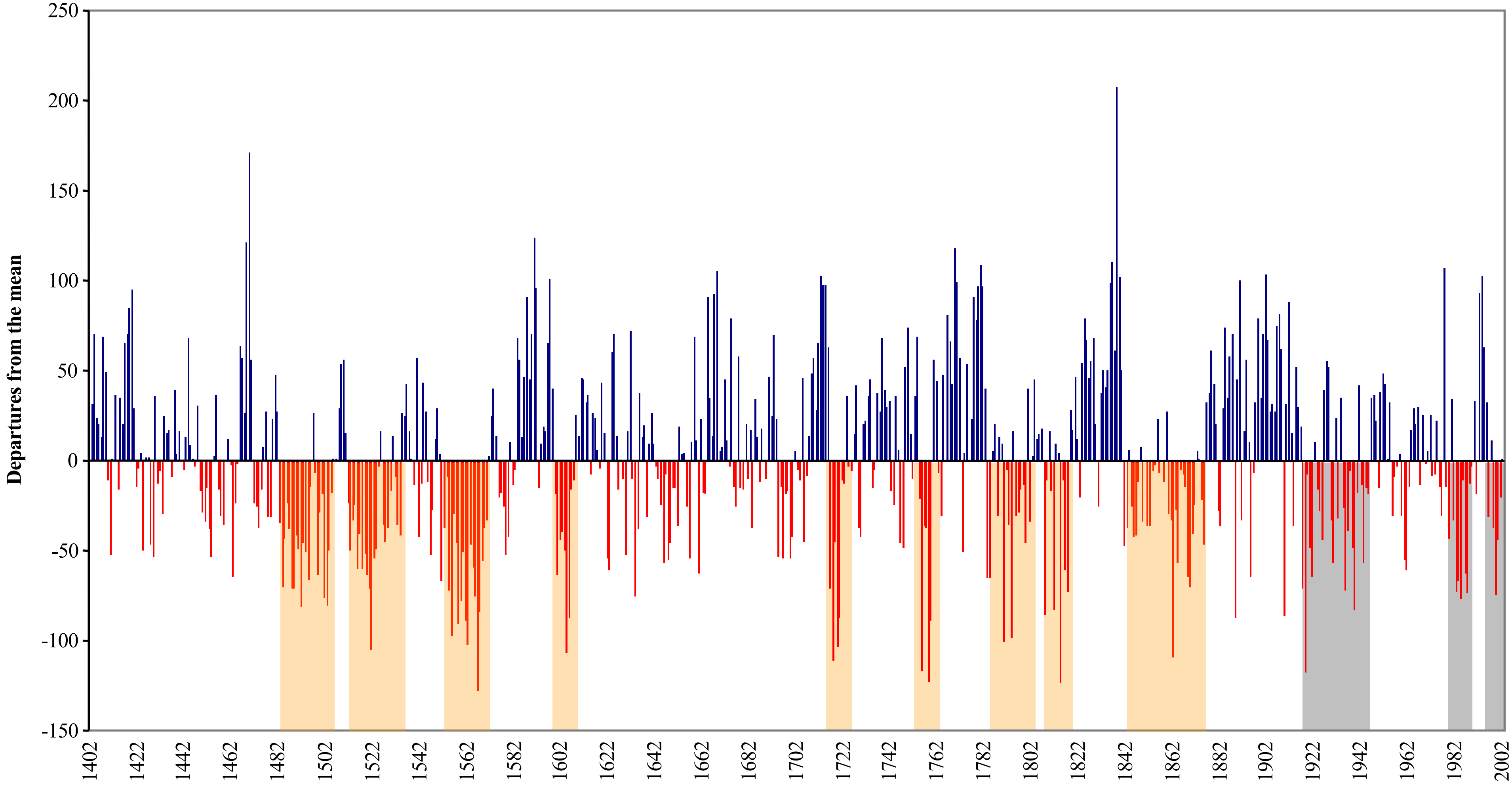

0
-2
-4
-6
-8
JJA PDSI < 0, Calgary, 1895-2002
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
r = 0.628
0
-0.2
-0.4
-0.6
-0.8
TRI (-ve departures), WCH, 1895-2004
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000



Calibration model (1951-2004) for the Oldman River at Waldron's Corner
R^2_a = 0.511
RE = 0.45
SE = 2.9
Q (m^3/s)
0
5
10
15
20
25
1951
1955
1959
1963
1967
1971
1975
1979
1983
1987
1991
1995
1999
Year
Instrumental
Reconstructed


PDSI, Calgary, 1341-2004
4
2
0
-2
-4
1350
1400
1450
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000

South Saskatchewan River at Medicine Hat, 1402-2004



Axelson 2007


NSERC
CRSNG
EPCOR
WWCRC
Understanding Climate Change

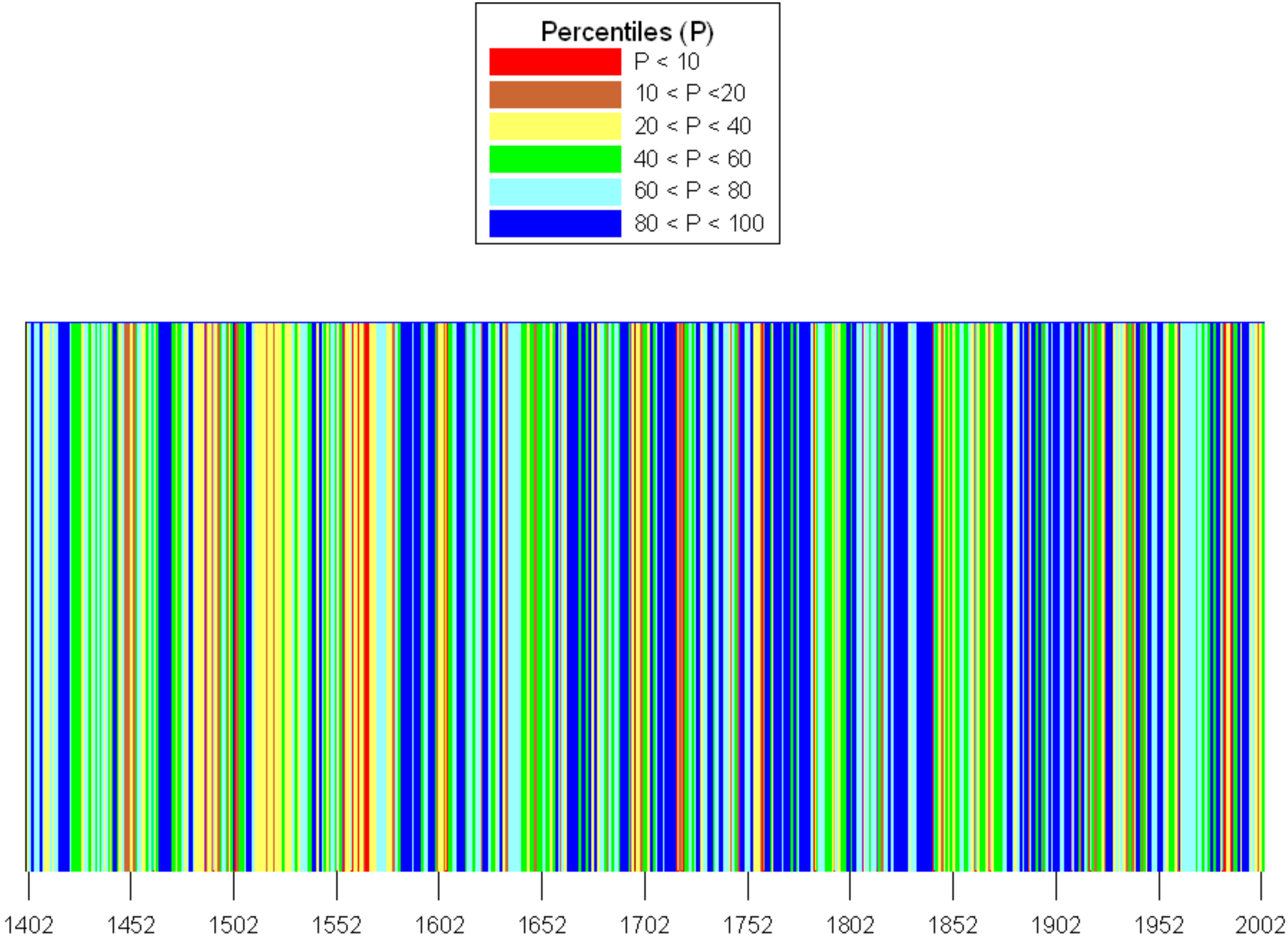
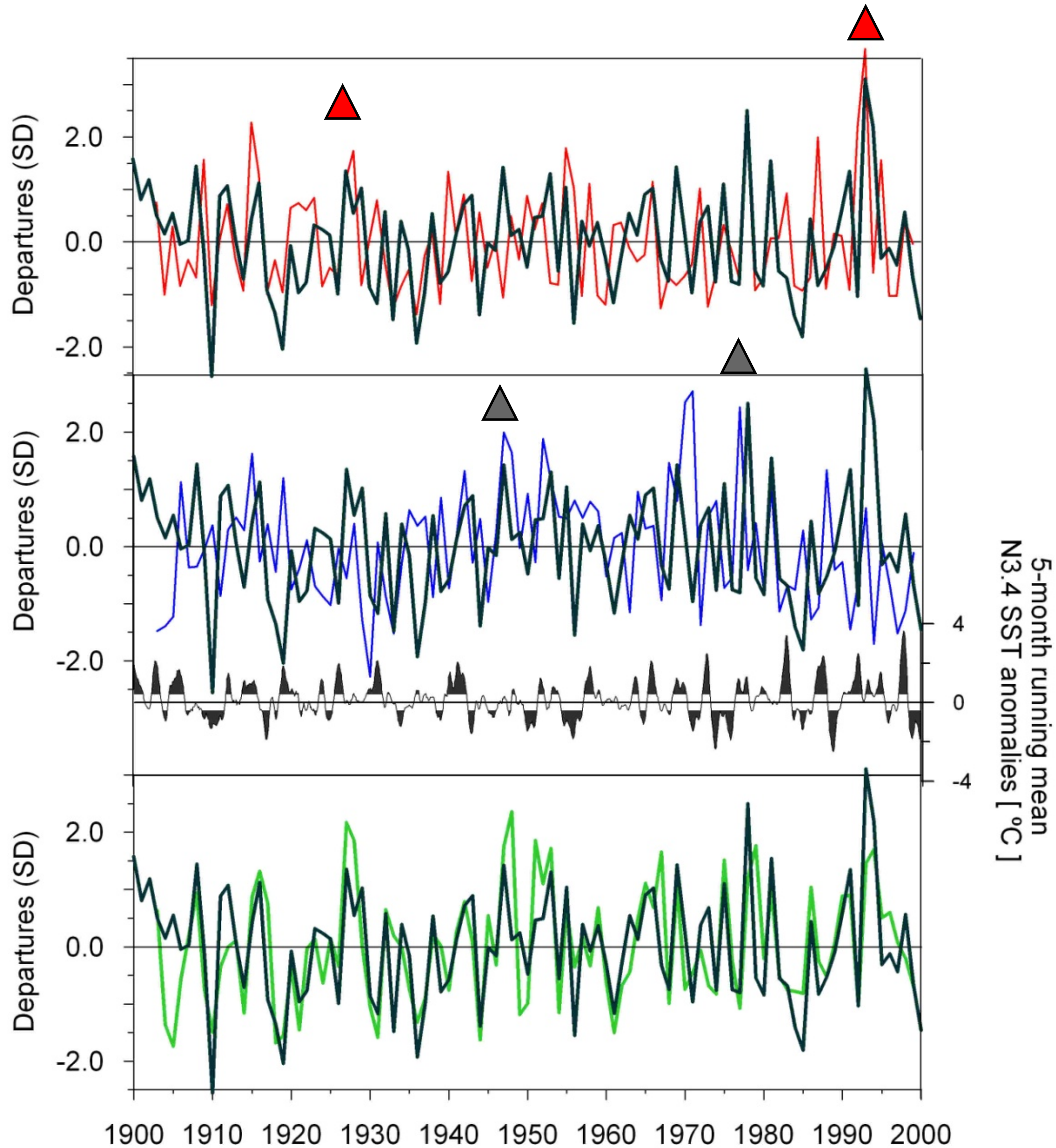

Percentiles (P)
P < 10
10 < P <20
20 < P < 40
40 < P < 60
60 < P < 80
80 < P < 100
1402
1452
1502
1552
1602
1652
1702
1752
1802
1852
1902
1952
2002

Figure 8. Seasonal precipitation, ENSO and tree growth response

El Niño→ winter (-); summer (+)
La Niña→ winter (+); summer (-)

Response to summer

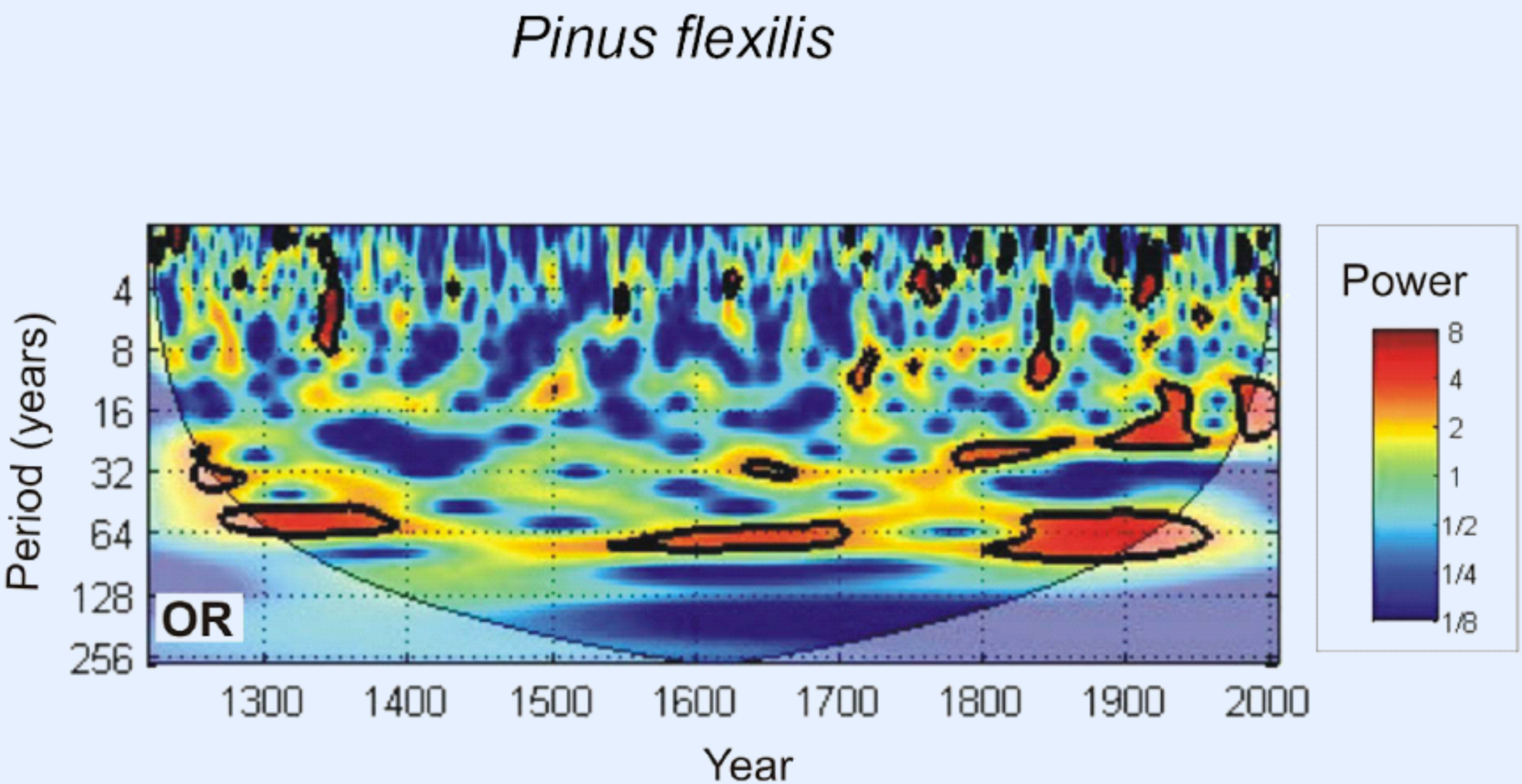
Response to winter



Annual ppt (July-June)
July ppt
Jan-Feb ppt
Tree growth

r = .67

Wavelet power spectrum



Advantages for Direct Observation and Prediction

- The paleo record puts the historical (instrumental) record in **context**, i.e. which parts of various climate cycles are currently being measured
  - How do we know that there’s climate change?
  - Are there trends in instrumental records?

- In some cases, a high-resolution proxy record is as good or better than a poorly sited or maintained gauge and thus can used to infill data gaps in space and time

- Whether we use sensors, gauges, ice, wood, sediment, etc., it is all monitoring, i.e. they all are capturing climate signals of various resolution and length.

Advantages for Paleo Records and Modeling

- Inferences from proxies are only as good as the calibration (instrumental) data

- Two current problems in paleo research are higher resolution and capturing different climate signals (i.e. a snowpack depth/duration); better calibration data are necessary to address both problems

- The use of multiple proxies enhances climate reconstruction, but especially where a climate station is nearby for calibration of the various proxies and to tease out the different signals