PHENOMENOLOGICAL APPROACH FOR EXTREMES: SOME THOUGHTS

Ronald Stewart
University of Manitoba

OBJECTIVES

Overall: To summarize some of the phenomena-related issues that are associated with 'extremes'

Specifics:

- **Extremes and phenomena**
- **Some examples**
- **Connections between extremes**
- **Future conditions and issues**

EXTREMES

Regardless of definition,

Aren't 'extremes' linked in some way to phenomena?

EXAMPLES OF PHENOMENA

Mid latitude cyclones
Hurricanes
Drought
Thunderstorm/hail/tornado
Snow storms, freezing rain/wet snow/rain-on-snow
Floods
Heat waves/wind storms/forest fires
...

Linkages between them
Chains of events

PHENOMENA QUESTIONS

What impacts/extreme values are being considered?

What phenomena are linked with these?

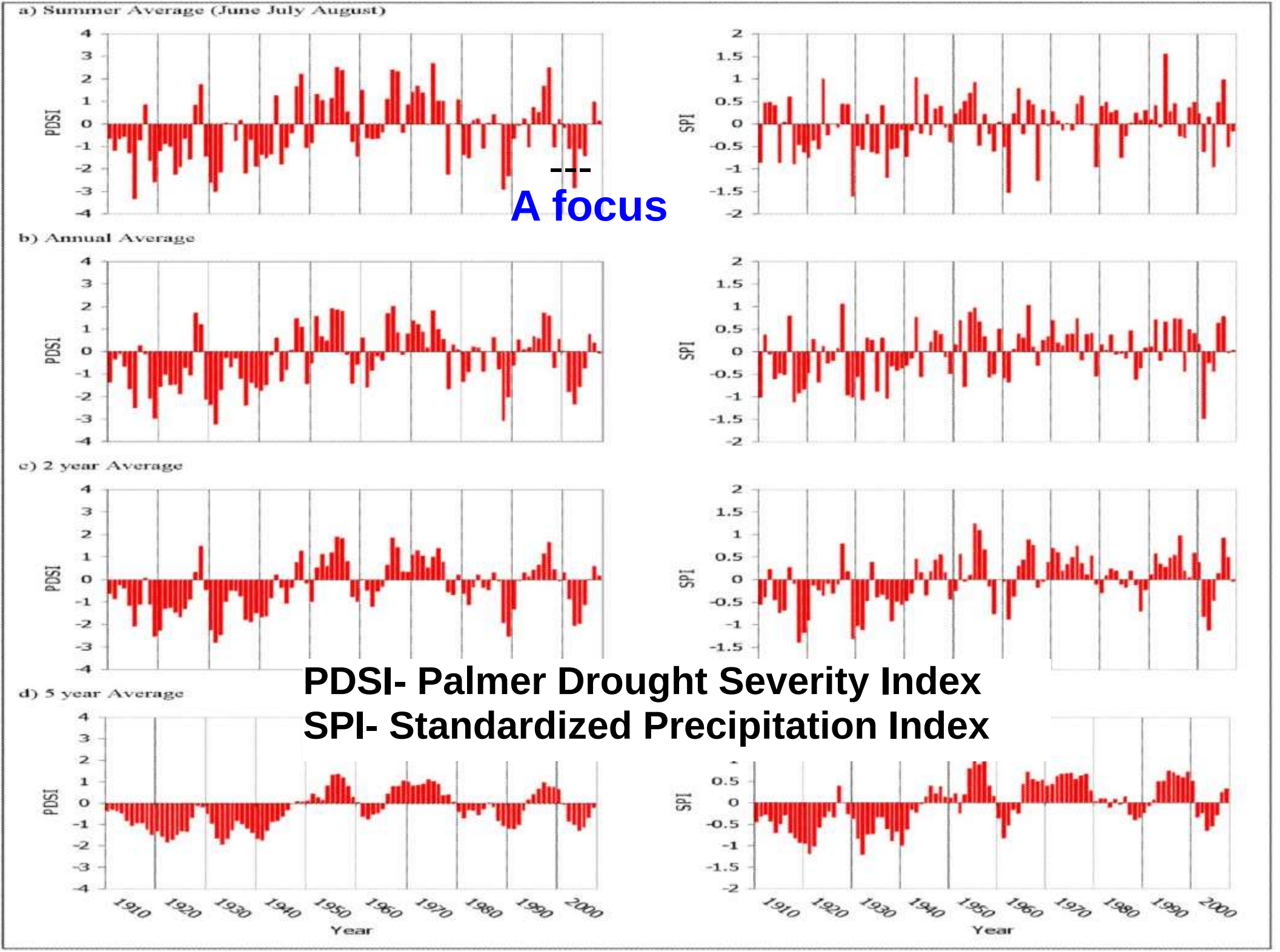
What factors govern their occurrence and location?

What factors govern their structure and magnitude?

How are particular phenomena linked with others?

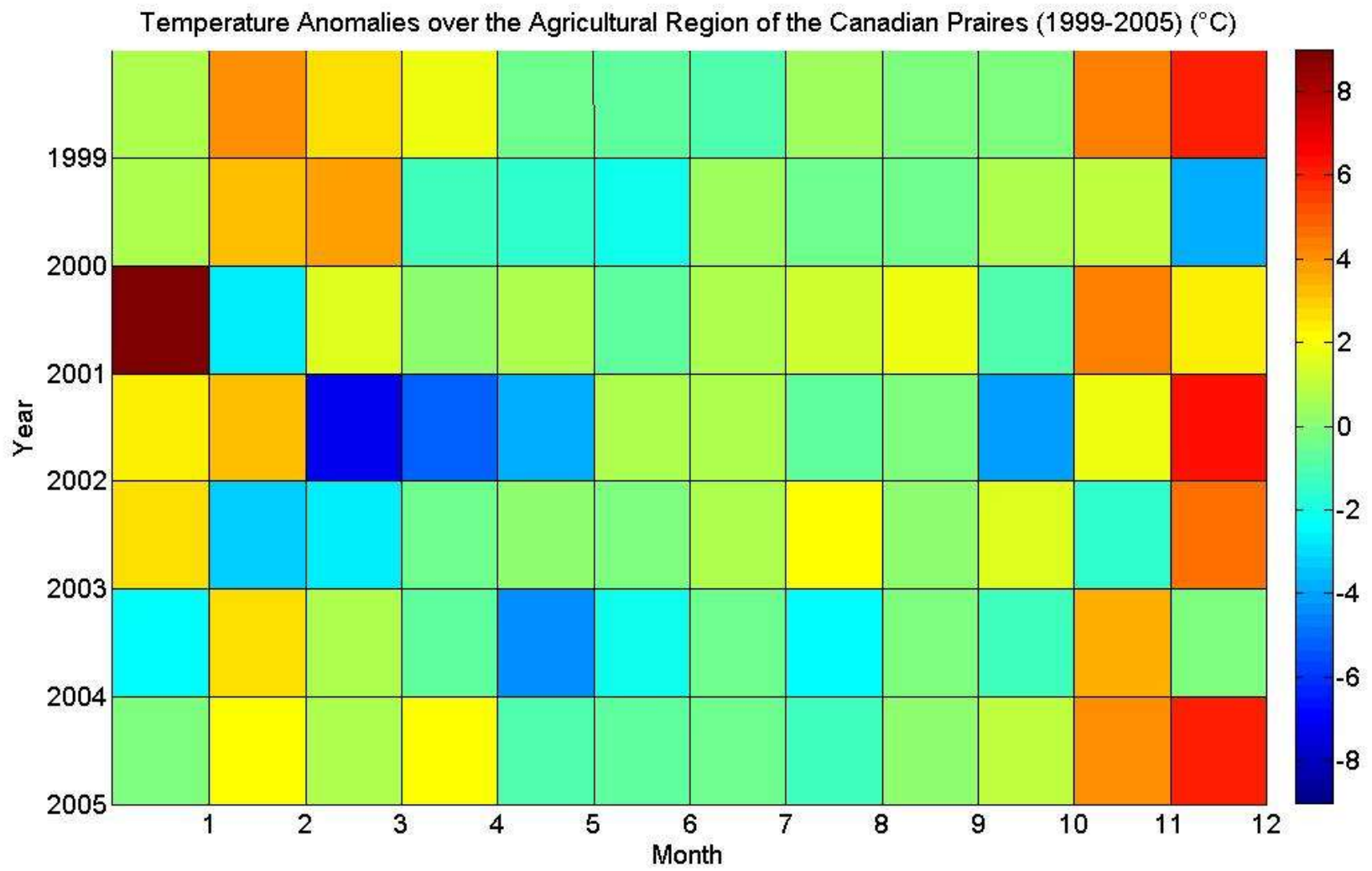
How may all these issues change in the future?

...

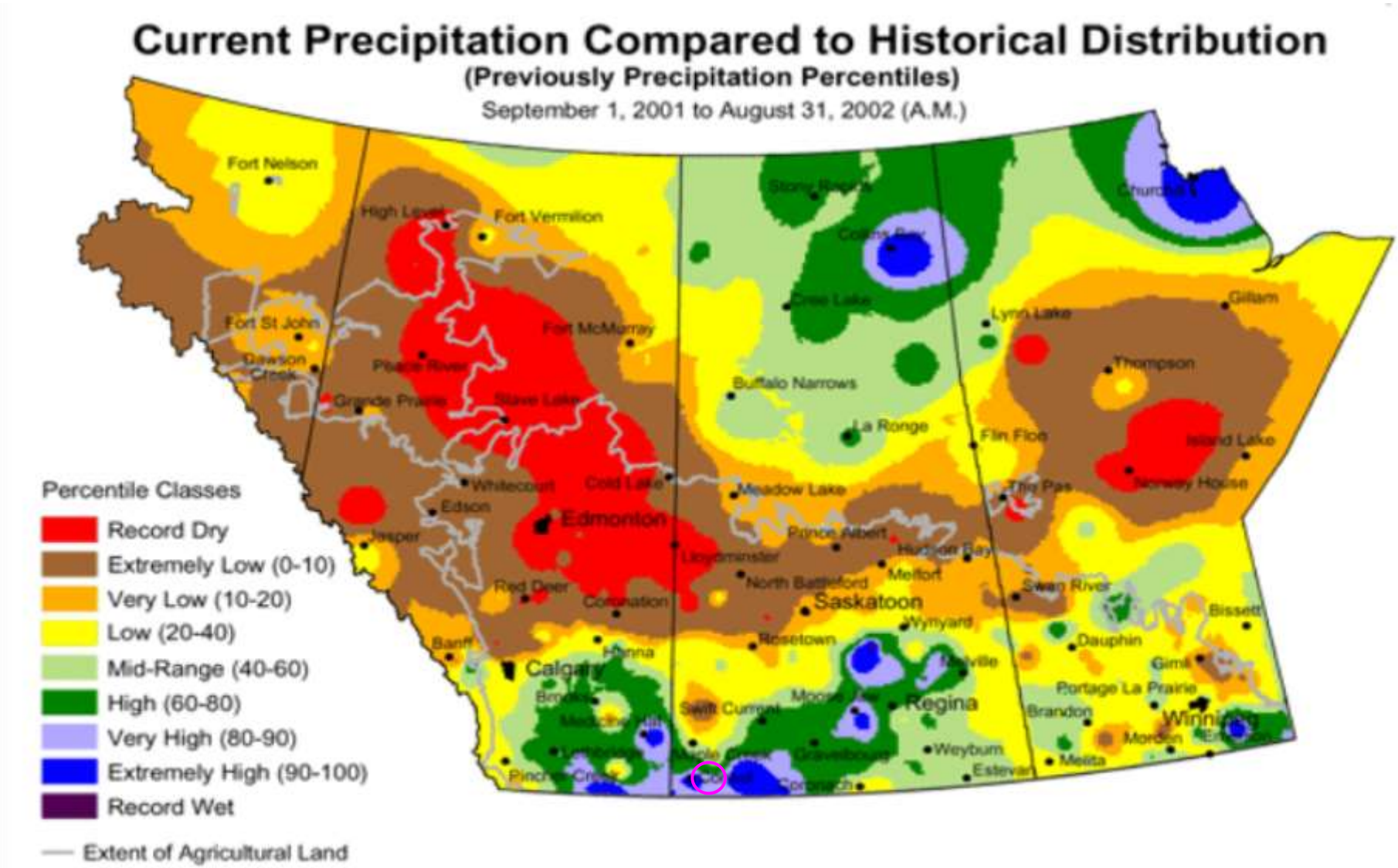

a) Summer Average (June July August)
PDSI
SPI

A focus
b) Annual Average
PDSI
SPI
c) 2 year Average
PDSI
SPI
PDSI- Palmer Drought Severity Index
SPI- Standardized Precipitation Index
d) 5 year Average
PDSI
SPI
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year

Monthly temperature anomalies: agricultural region of the Prairies

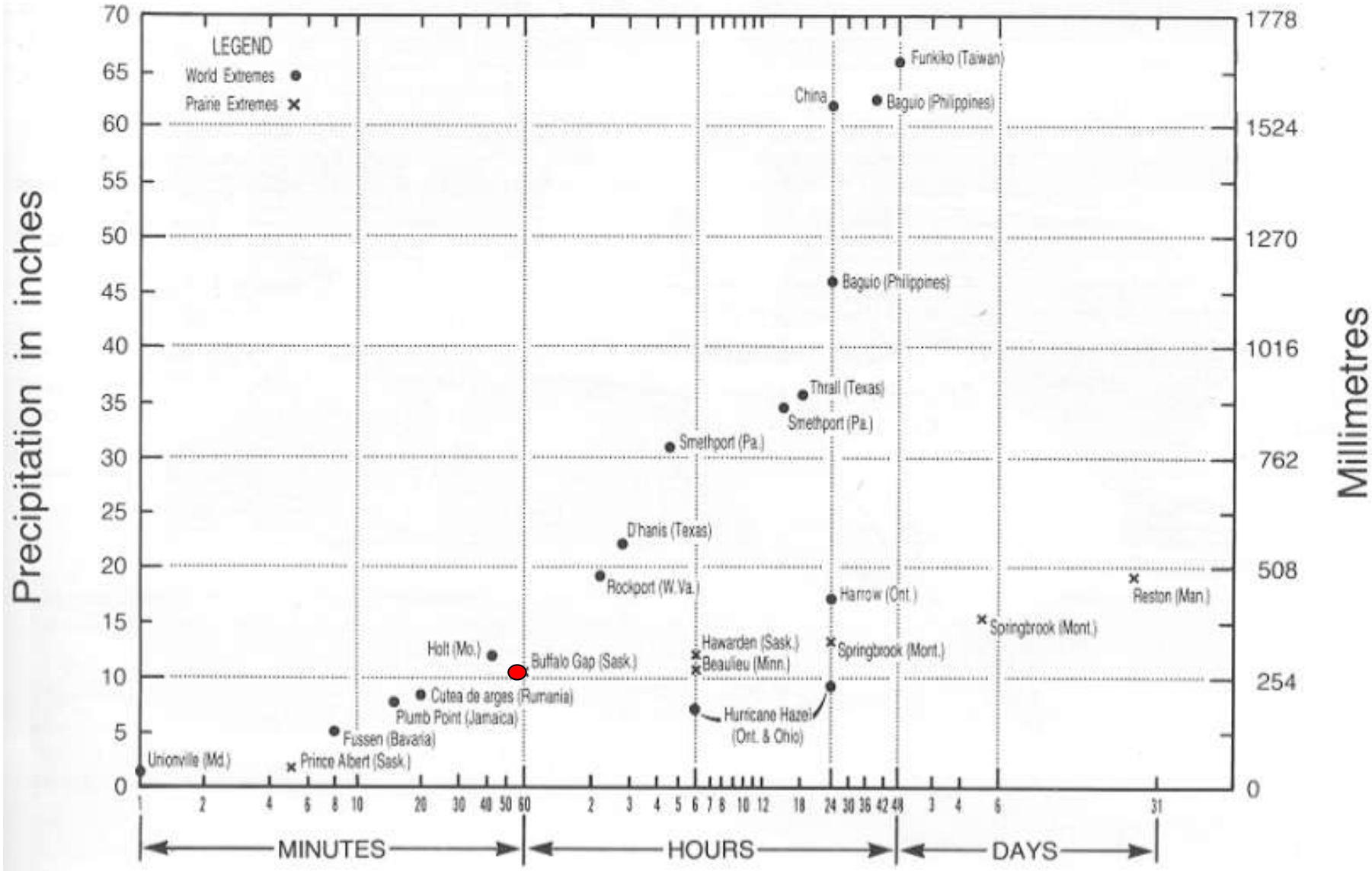


CANADIAN PRAIRIES
2002



Prepared by PFRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.

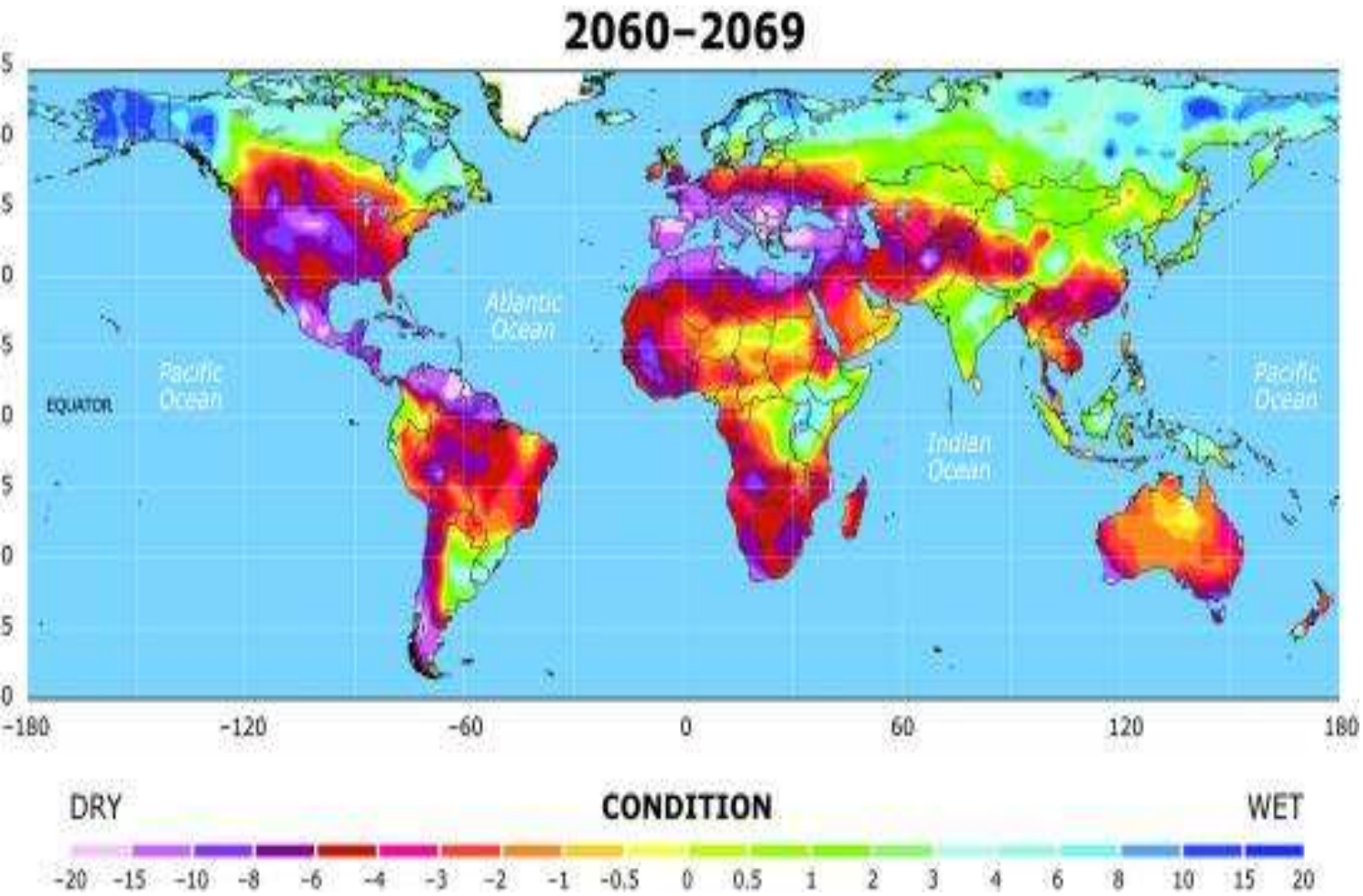
EXTREME RAINFALLS



Thanks to Danny Blair, Bill Rannie and Irene Hanuta

Adapted from Handbook on the Principles of Hydrology, D.M. Gray, ed.

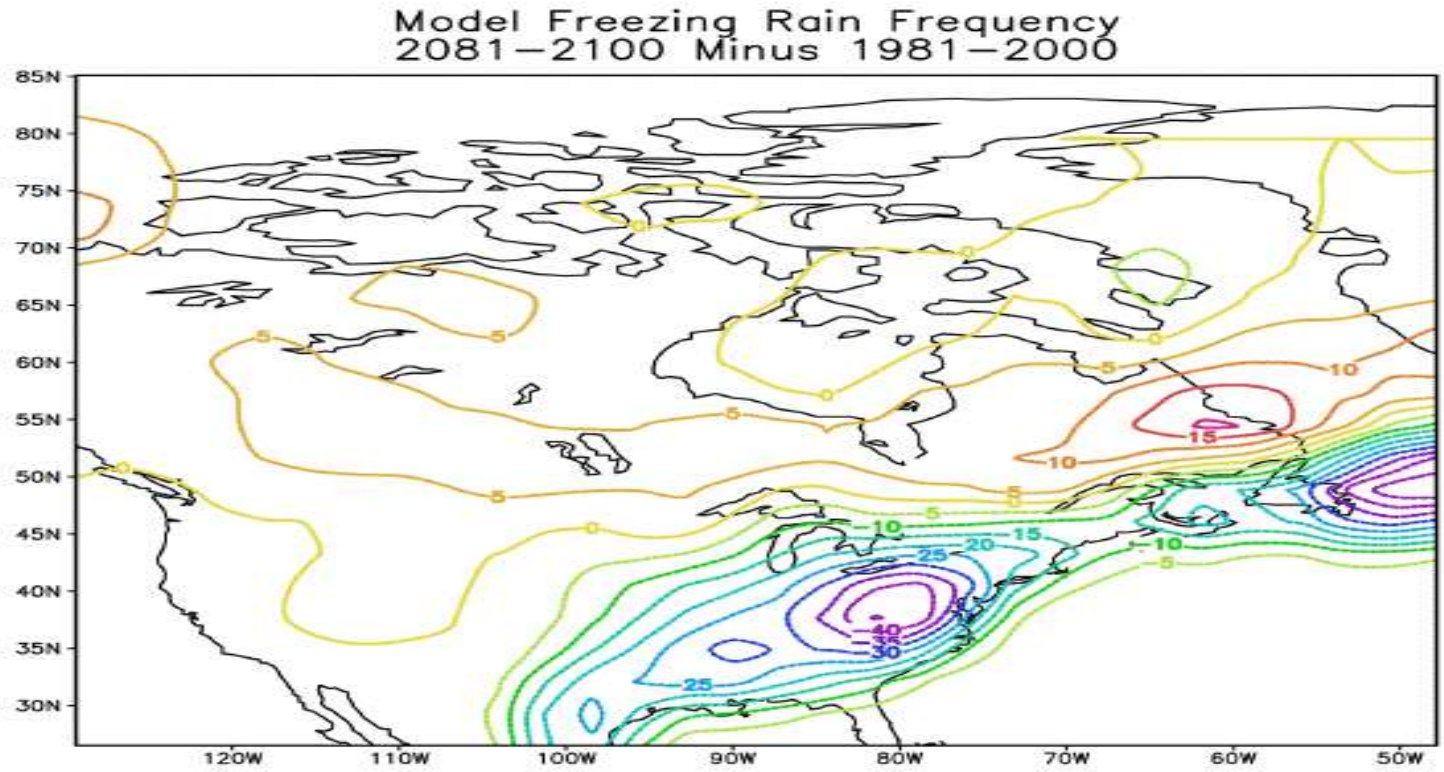
Future Drought?



Global climate models remain inconsistent in capturing precipitation changes and other atmospheric factors, especially at the regional scale. (Dai, 2010)

BIG IMPACTS

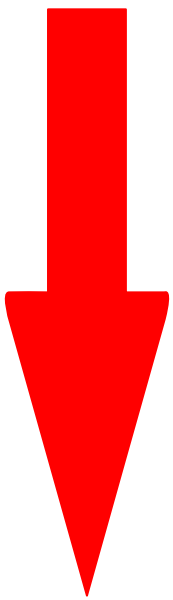
And Hydrology!



courtesy: Steve Lambert and Bjarne Hansen

FLOODS .. CUMULATIVE/SEQUENTIAL PHENOMENA

February 2, 2011, Manitoba, where spring is both longed for as welcome relief to a harsh winter and dreaded in anticipation of massive flooding. The Province has begun its fight against an impending **potentially record setting flood**.



Wet autumn
Substantial Winter Precipitation
...
Major Flooding

SIMILAR ...

Similar perspectives could be applied to other 'extremes'...

- temperature
- wind
- ...

As well as to other

- cumulative/sequential phenomena
- simultaneous 'extremes' phenomena

SOME SCIENTIFIC ISSUES

There are a number of critical scientific and technical issues limiting quantitative assessment of phenomena including:

scientific:

- fundamental understanding of formation processes
- factors leading to values above/below thresholds
- chains-of-events
- ...

technical:

- spatial resolution of climate models
- ...

SUMMARY

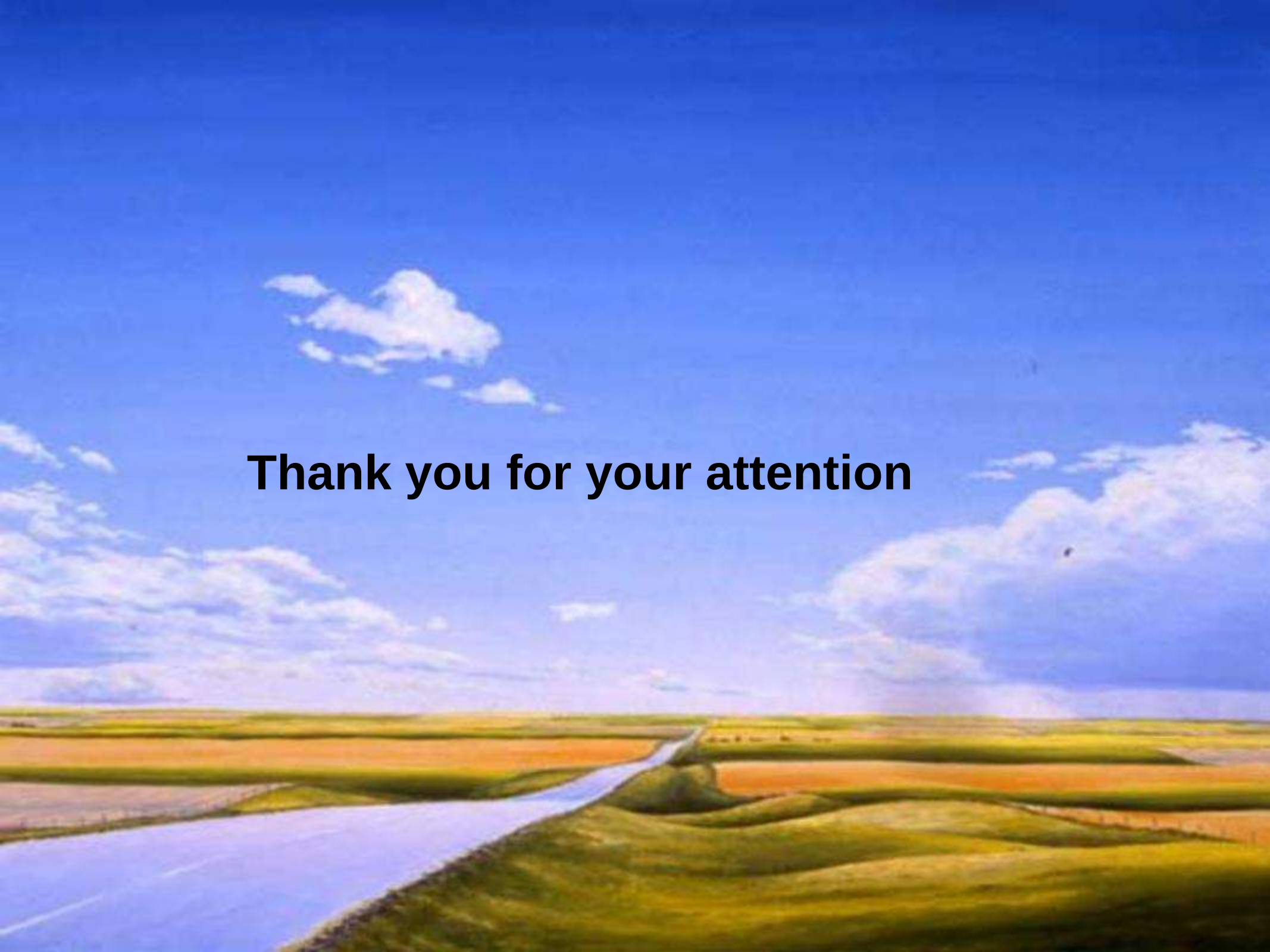
Many phenomena can be associated with an 'extreme'.

In many instances, an 'extreme' can be linked with a chain-of-events of phenomena.

With climate change, one expects that features of many phenomena may be altered.

There are numerous scientific and technical issues limiting our abilities to anticipate future conditions.

southern Manitoba June 2005


Thank you for your attention