

Evaluating gridded datasets for physically based hydrological modelling of drought

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CRHM data requirements

- CRHM requires only a few variables:
 - Air temperature, RH
 - Precipitation, Windspeed
 - Q_{si}
- Lack of solar radiation measurements are a national disgrace
- Required for modelling snow melt, evaporation and other processes
- Currently, measurement are only available at Regina

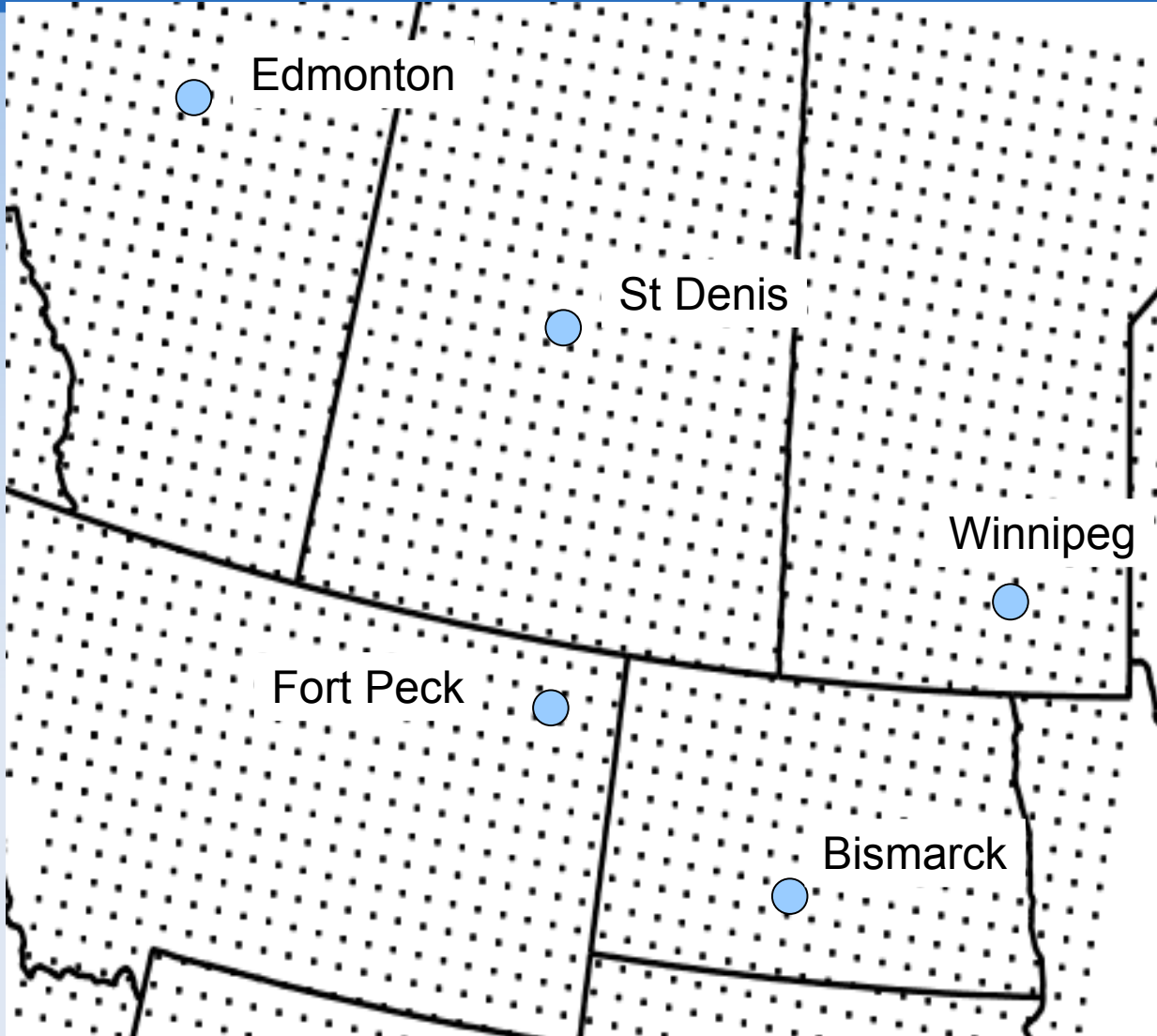
NARR

- North American Regional Reanalysis
- Uses RCM to calculate gridded variables for North America
- Data available on 3-hour or daily time step since 1979
- Free!

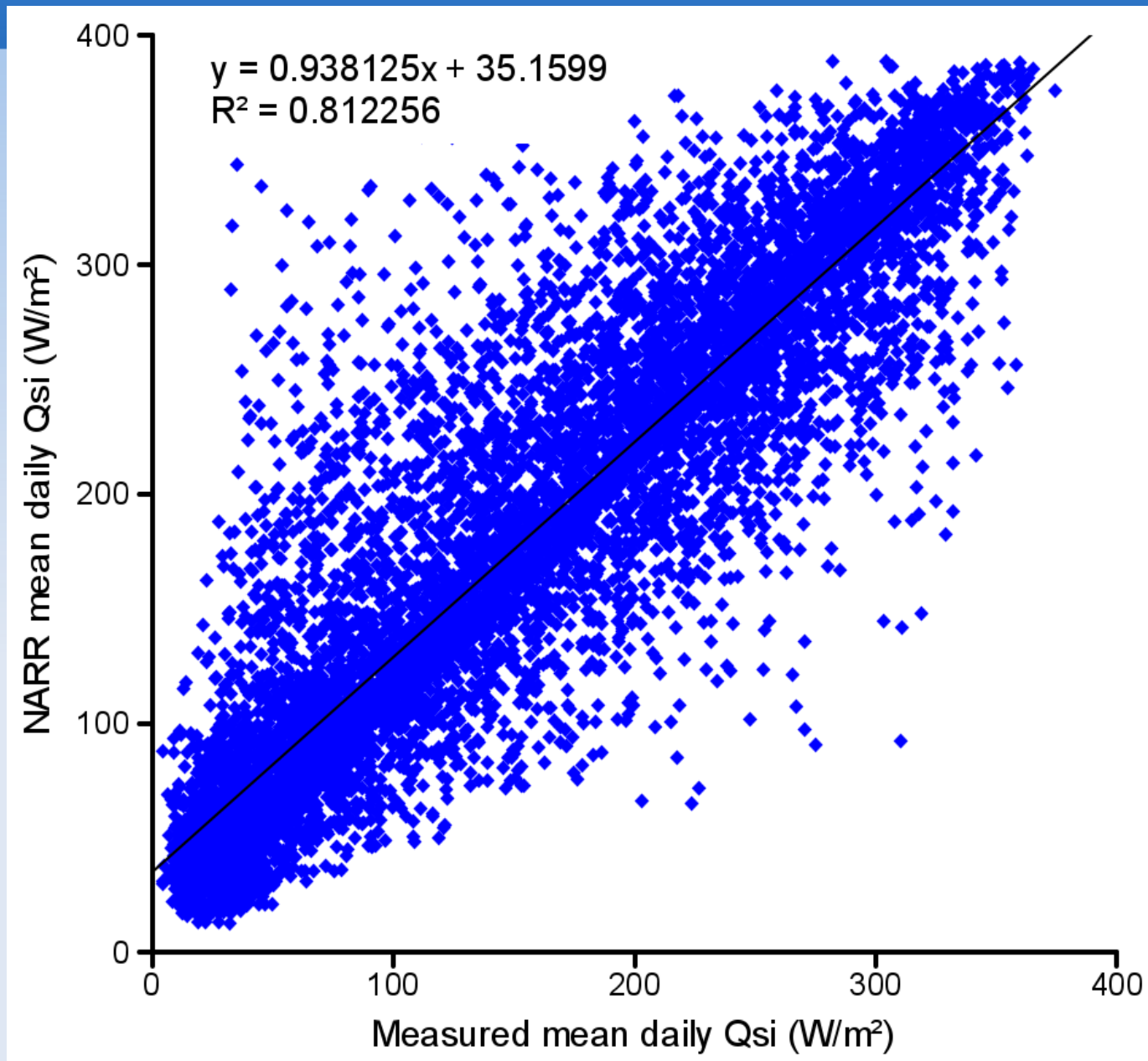
NARR Variables

- All data required by CRHM are available from NARR
- Quality of data varies
- Incoming shortwave radiation is computed from modelled clouds, NOT from surface measurements

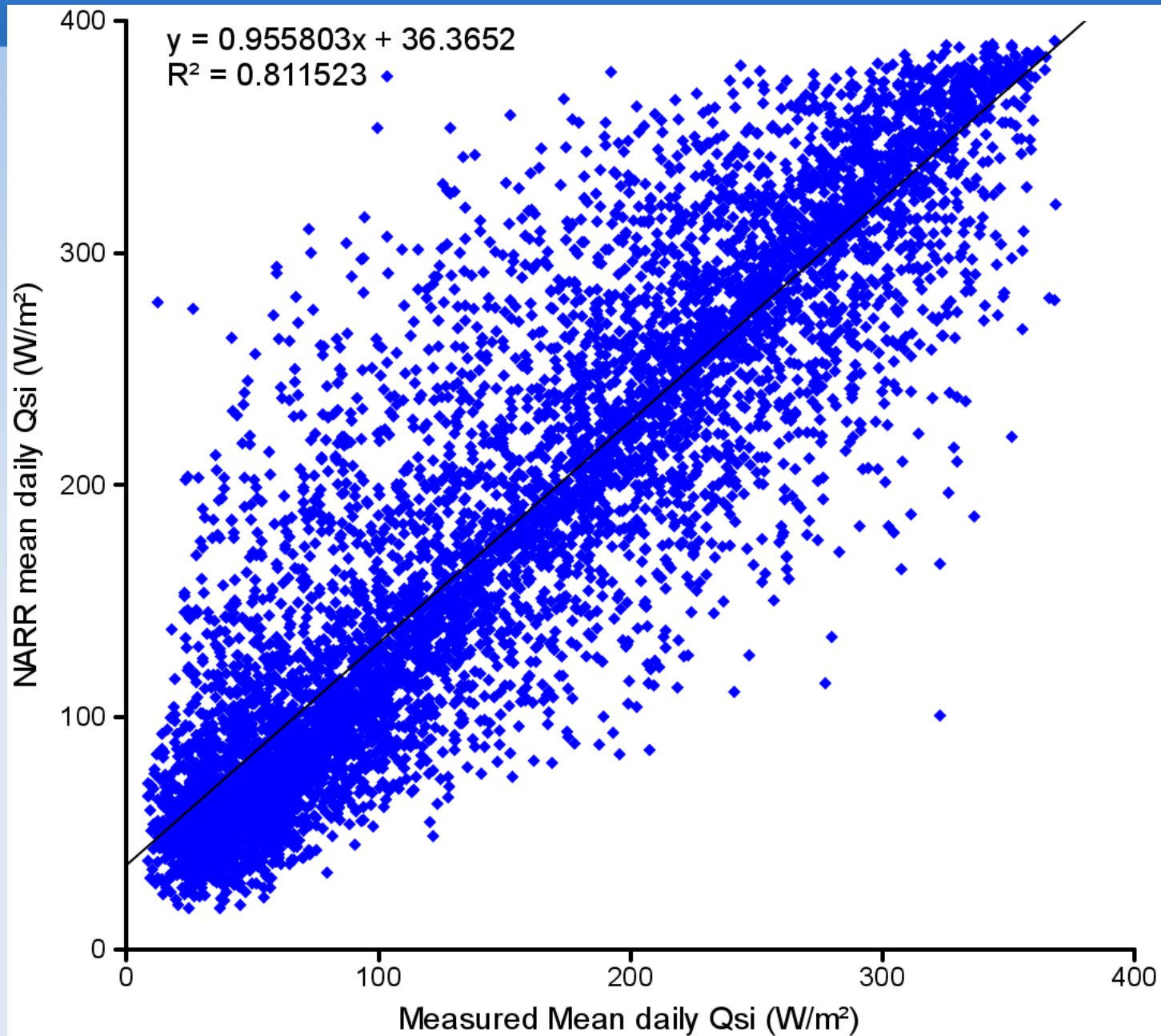
NARR Qsi test



Edmonton 1979-2000



Winnipeg 1979-2000



Regression constants

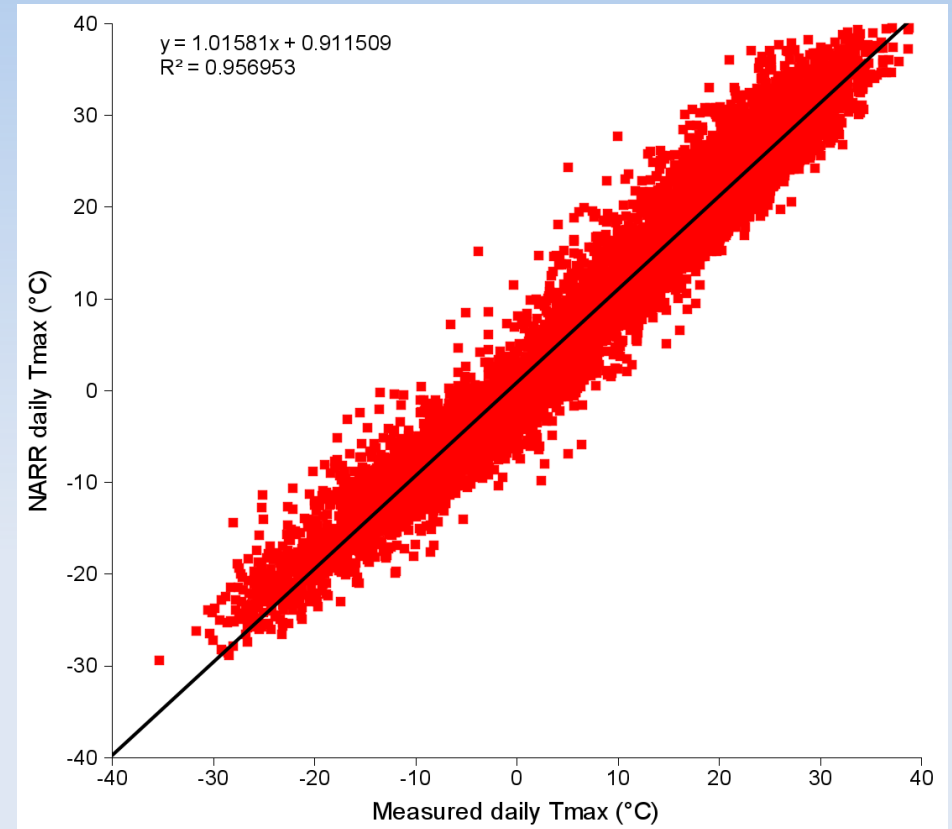
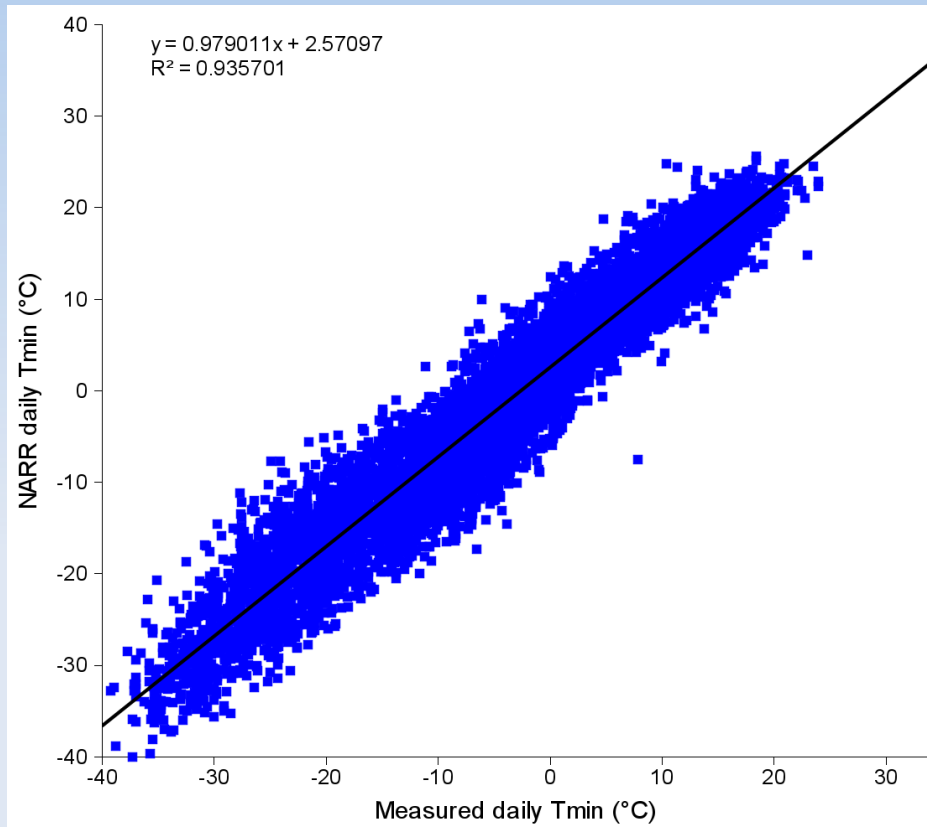
Measured Qsi vs NARR Qsi, zero intercept

<u>Location</u>	Confidence levels		
	<u>Slope</u>	<u>2.5%</u>	<u>97.5%</u>
Edmonton	0.851	0.846	0.855
St. Denis	0.811	0.793	0.829
Winnipeg	0.840	0.835	0.844
Wolf Point	0.812	0.804	0.820
Bismarck	0.822	0.814	0.830

- Regression slopes are quite consistent

Why not use all NARR data?

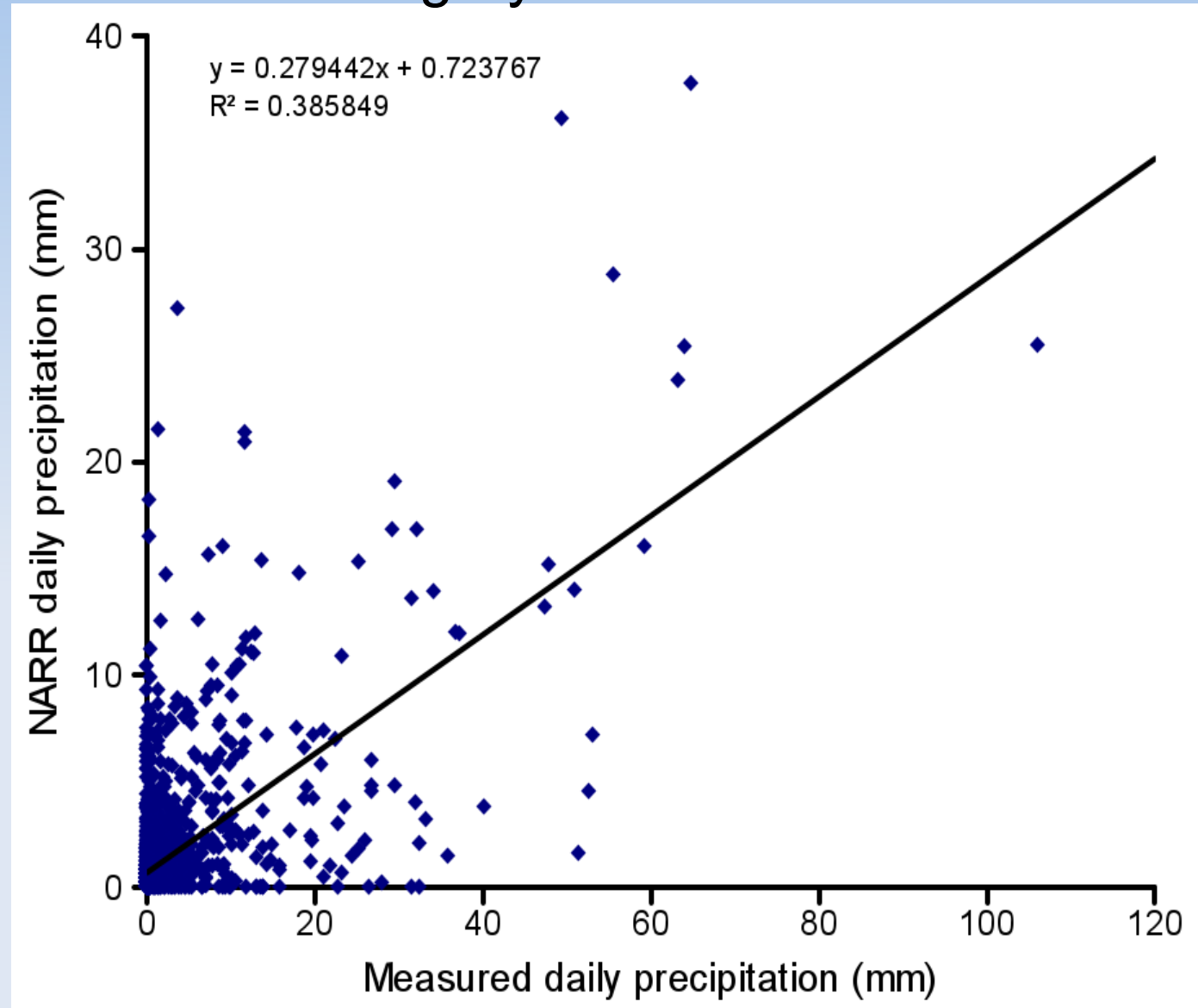
Winnipeg daily Tmin & Tmax, 1979-2000



NARR precipitation

Calgary 1999-2003

- Unusable
- Will have to find another source for precipitation



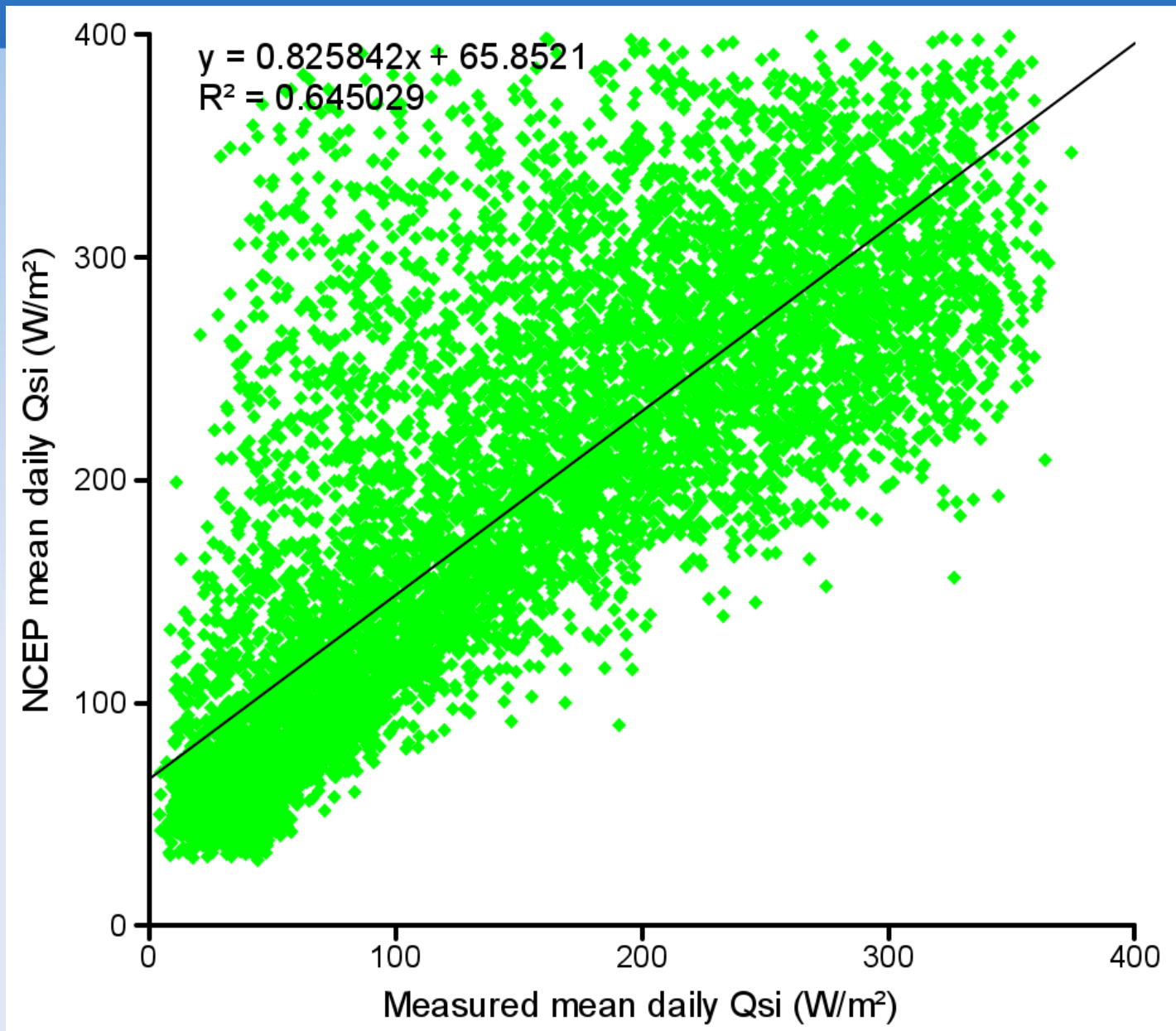
Qsi sources

- NARR data only goes back to 1979
- Want to run models on normal period of 1961-1990
- Need alternative method for estimating Qsi

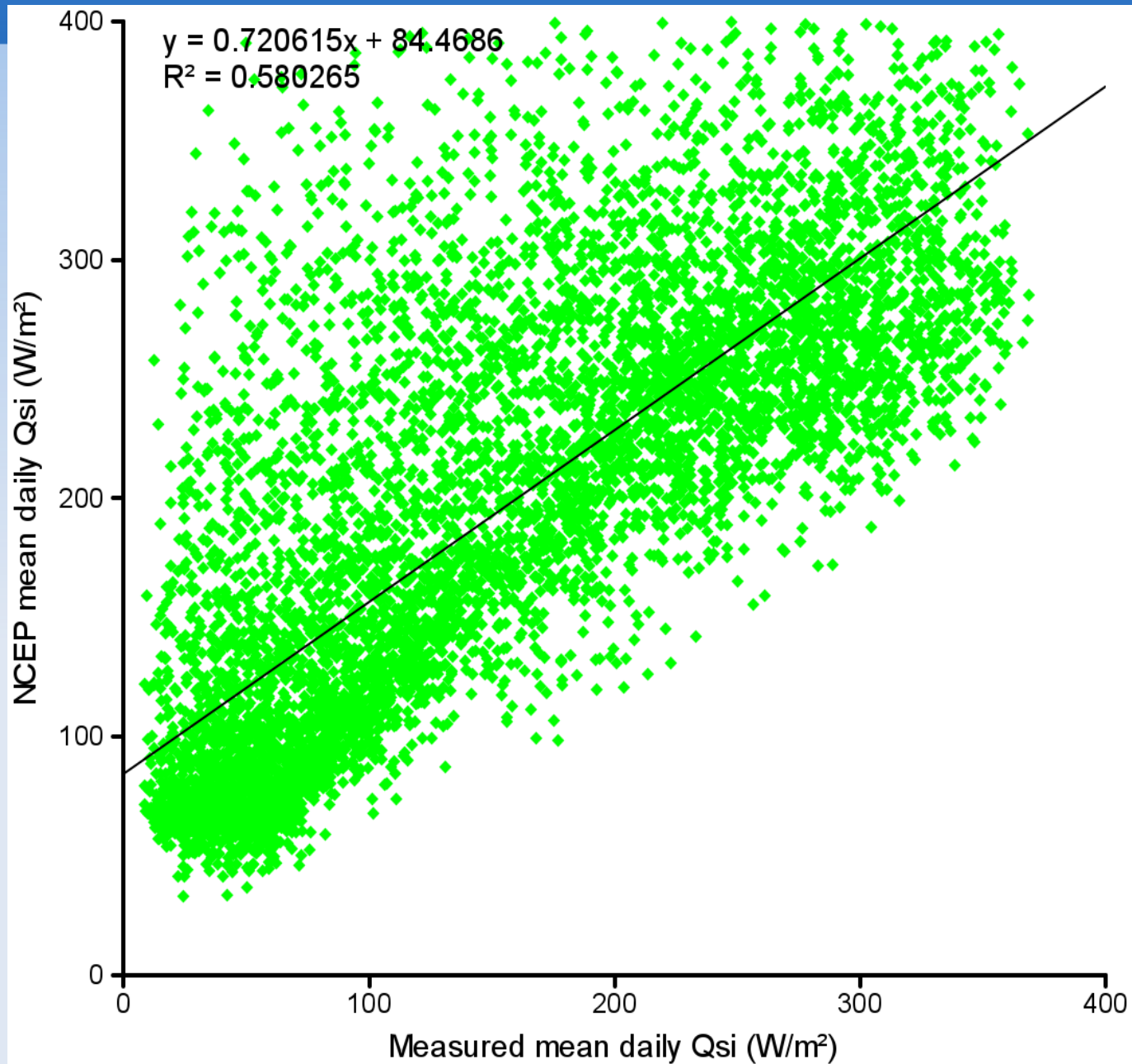
NCEP

- NCEP is a reanalysis project similar to NARR
- Over longer period of time (1948-present)
- Coarser temporal resolution (6 hour)
- Coarser spatial resolution (~ 210 km)

Edmonton 1979-2000



Winnipeg 1979-2000



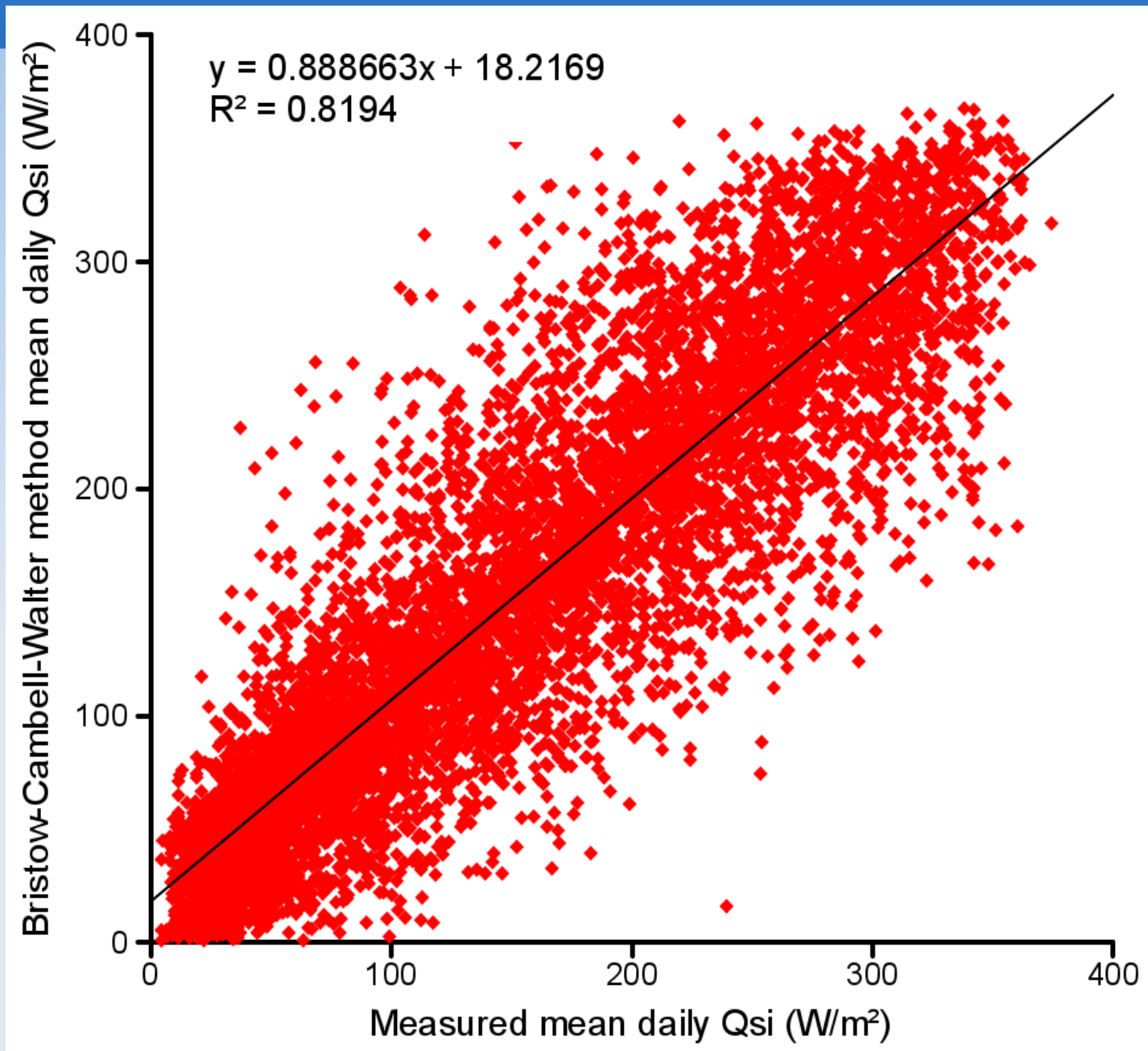
Bristow-Campbell-Walter

- Qsi can be calculated directly if the atmospheric transmittance is known
- Bristow and Campbell (1984) developed a simple relationship between daily atmospheric transmittance (T_t) and the range of daily air temperatures (ΔT)

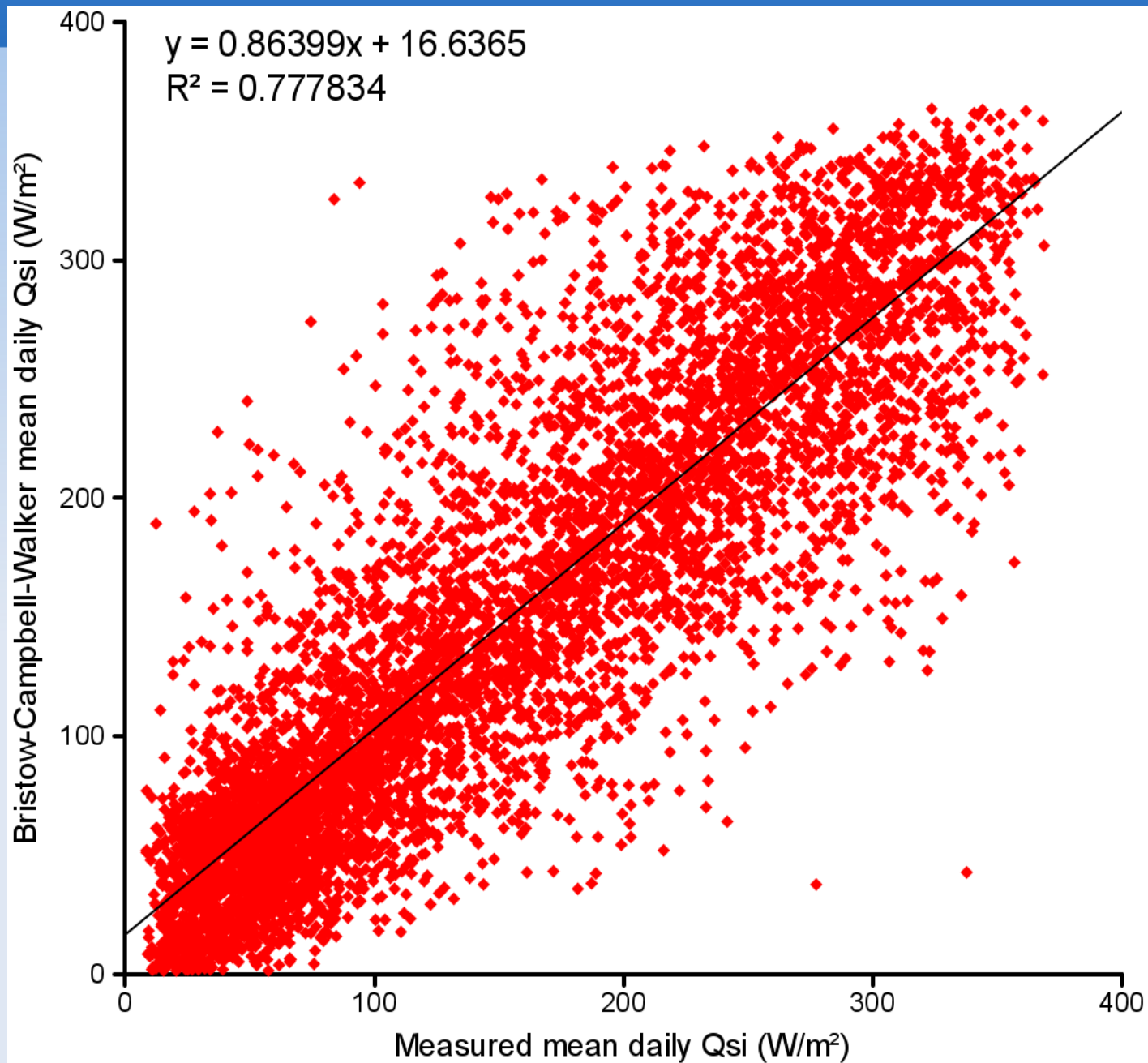
$$T_t = A [1 - \exp(-B \Delta T^C)]$$

- A, B and C are constants
- Walter et al. (2005) showed simple methods for estimating constants

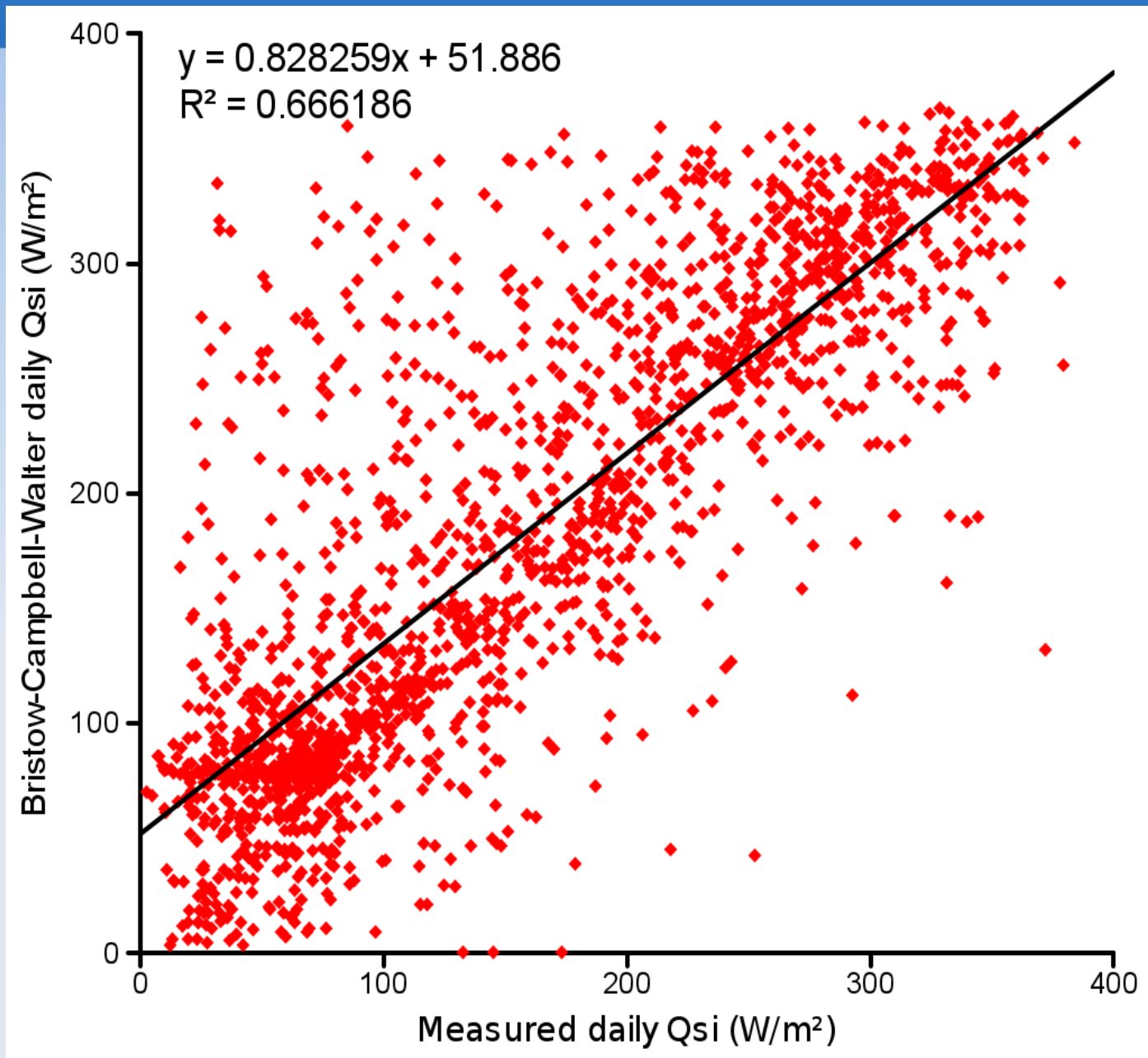
Edmonton 1979-2000



Winnipeg 1979-2000



Bismarck, 1995-2004



Summary

- Qsi for normal period 1962-1978 will be calculated
- Qsi for normal period 1979-1987 will be determined by NARR
- Qsi for drought period (1999-2005) determined by NARR
- Don't use NCEP Qsi!