Towards climate change projections of Energy Demand

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funded by the California Energy Commission

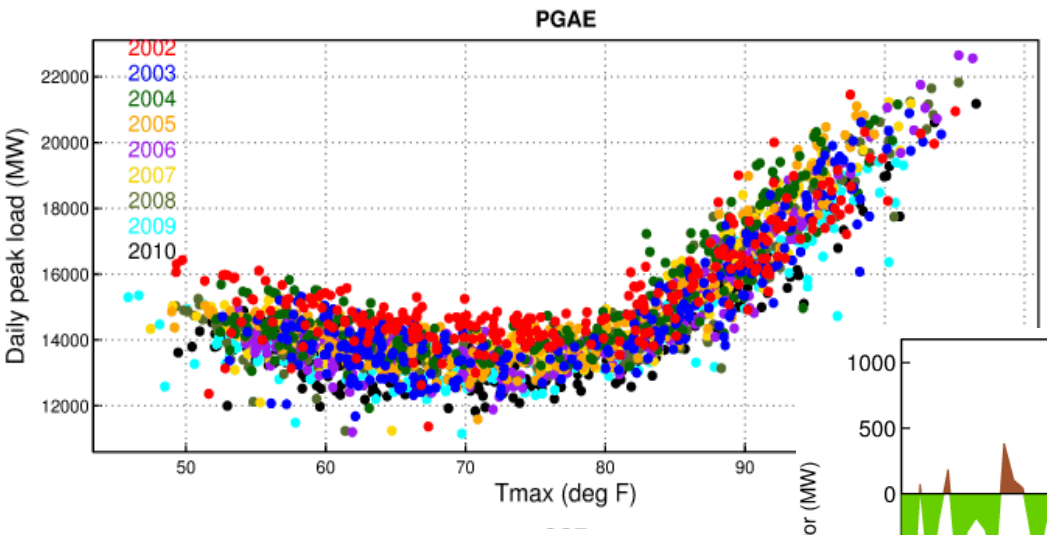
study objectives:

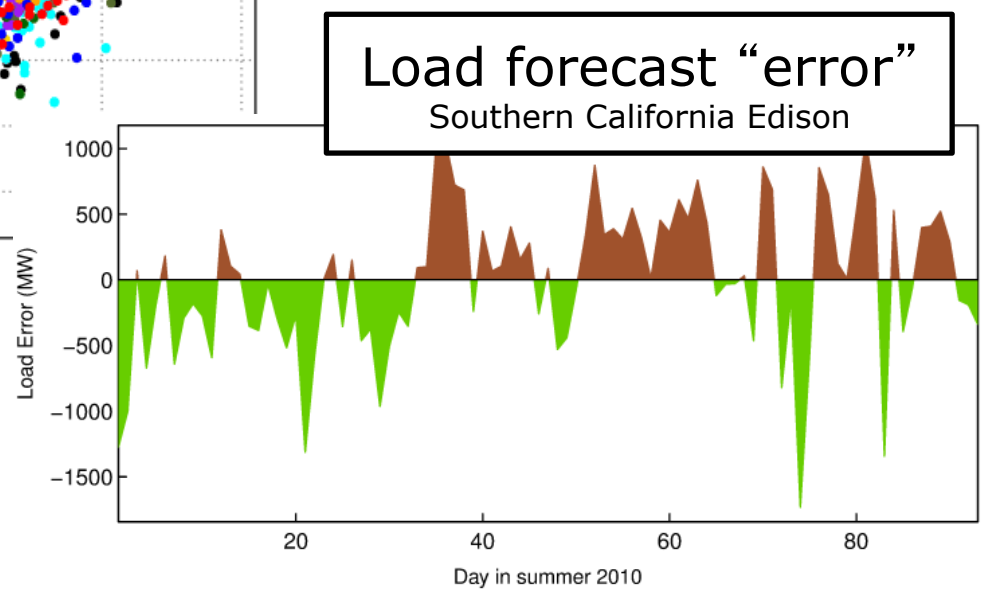
1) development of new downscaling technique designed for energy applications;

2) exploratory study of short and ~10 yr probabilistic forecast to estimate energy demand

Load Forecasting

keyed upon Load vs. daily Tmax 2002-2010

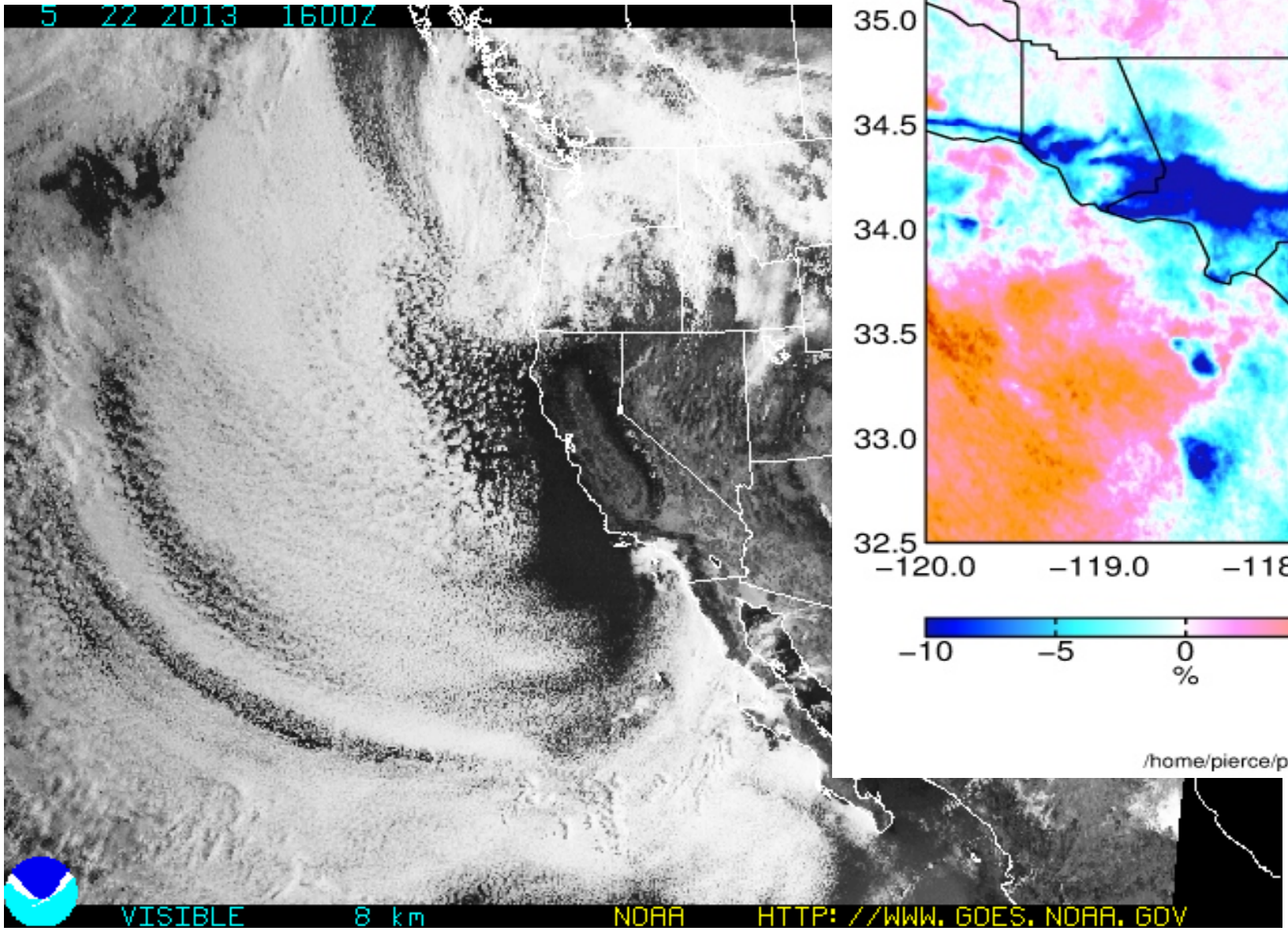


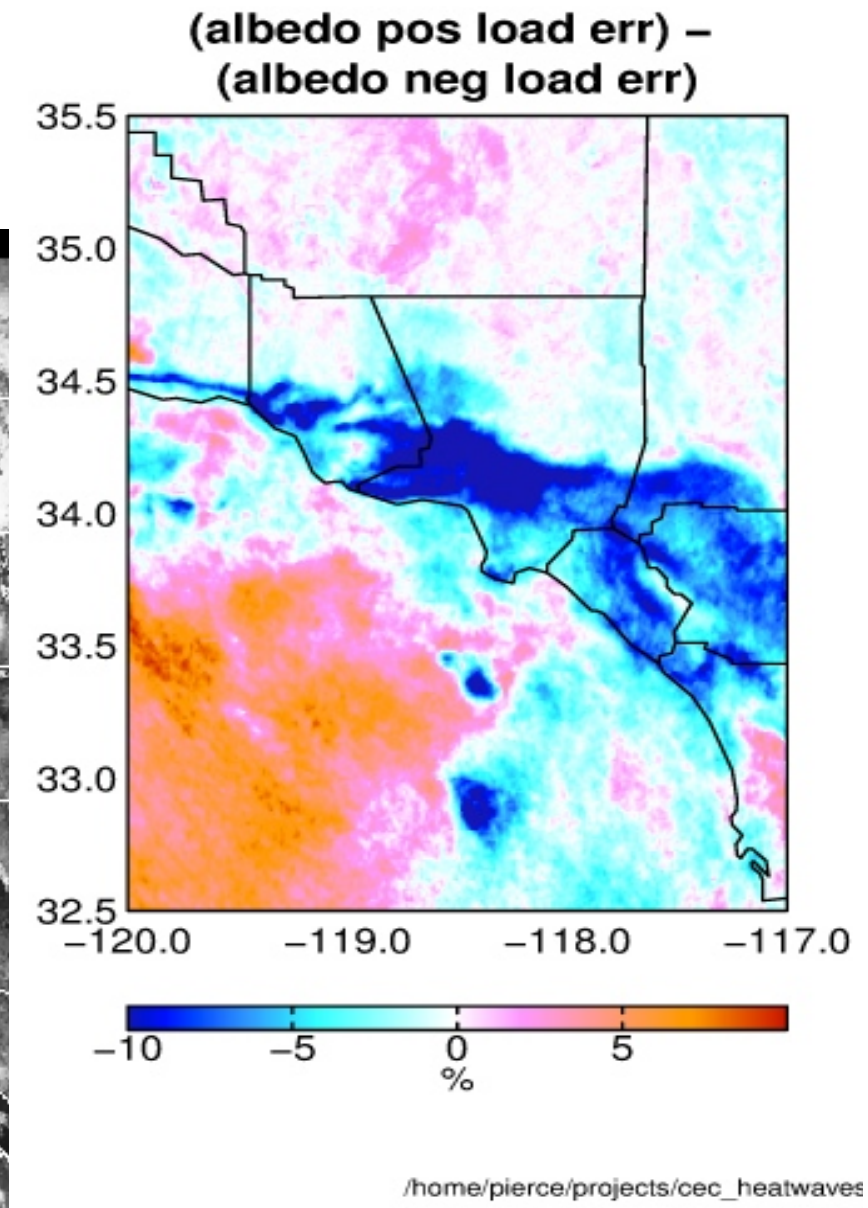


Load Errors (observed-predicted) have weather time scales

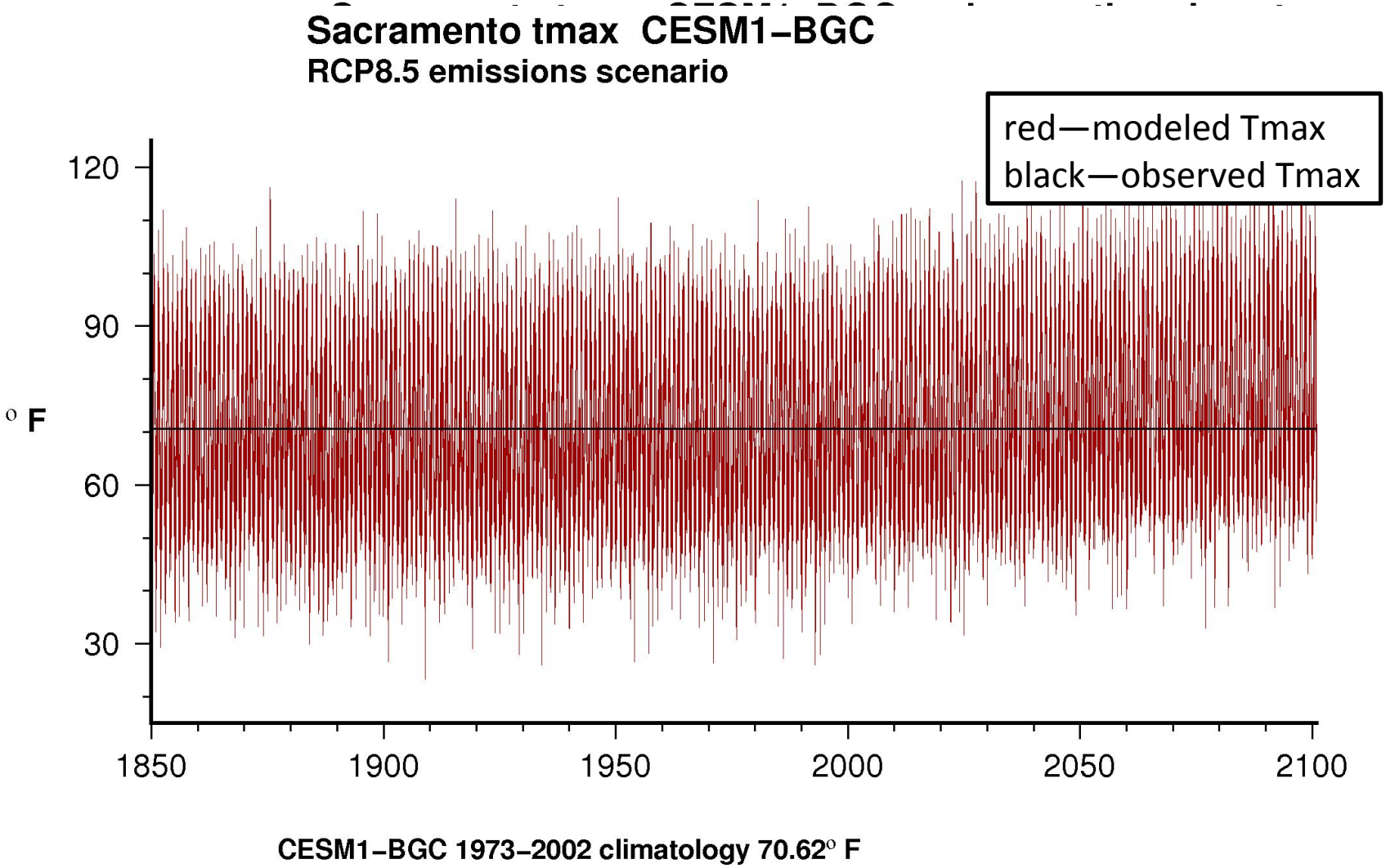
have looked at PG&E, Southern California Edison, and SDG&E

Summer stratus clouds reduce electrical loads





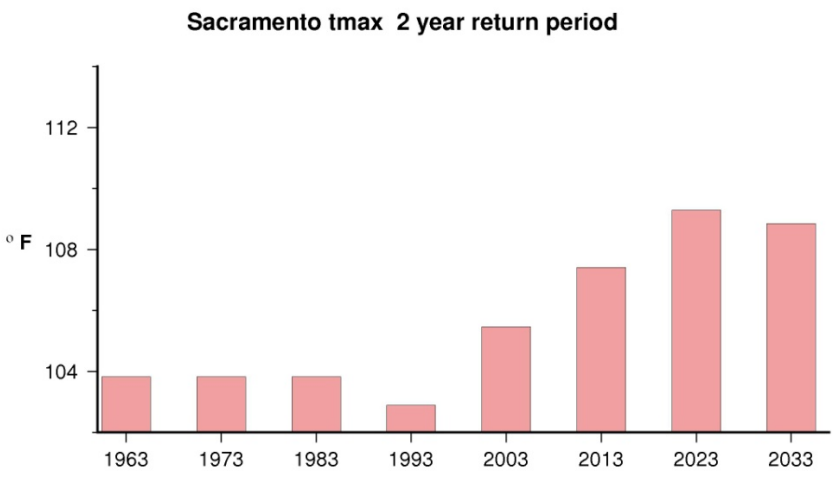
daily maximum temp (Tmax) , modeled and observed



Projected increase 2-yr and 10-yr daily Tmax extremes

Sacramento, from CESM1 RCP8.5 S global climate model

2 year return Tmax values



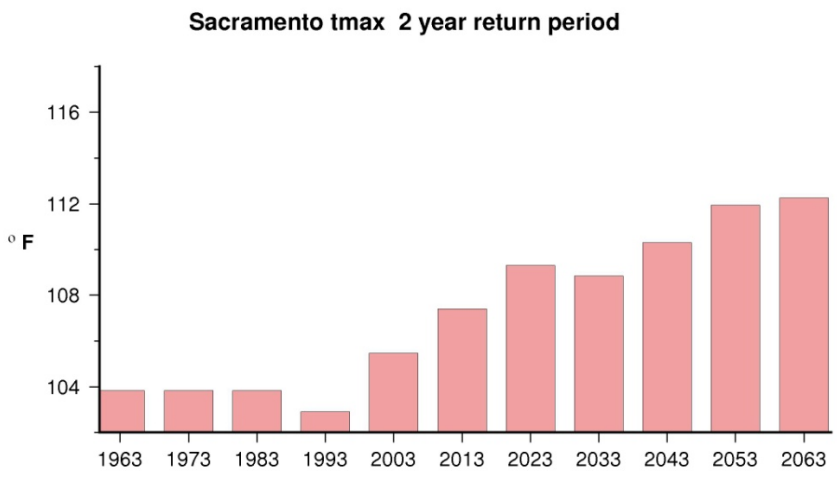
10 year return Tmax values

and looking further ahead---

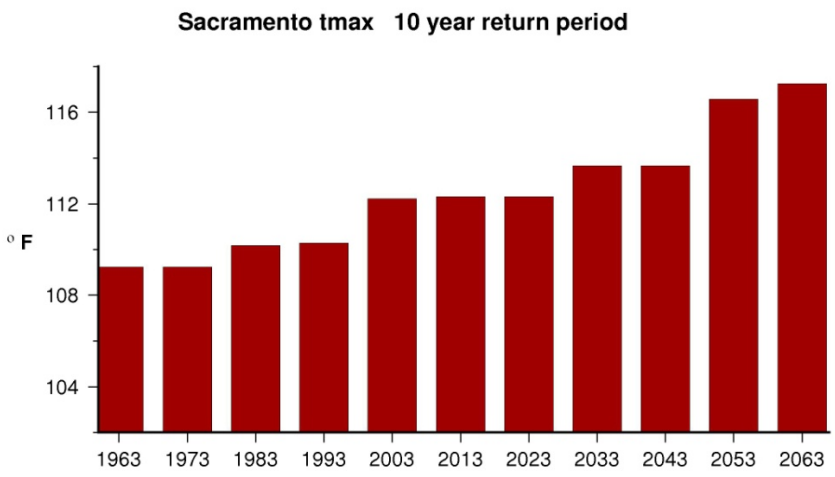
Projected increase 2-year and 10-year daily Tmax extremes

Sacramento, from CESM1 RCP8.5 S global climate model

2 year return Tmax values

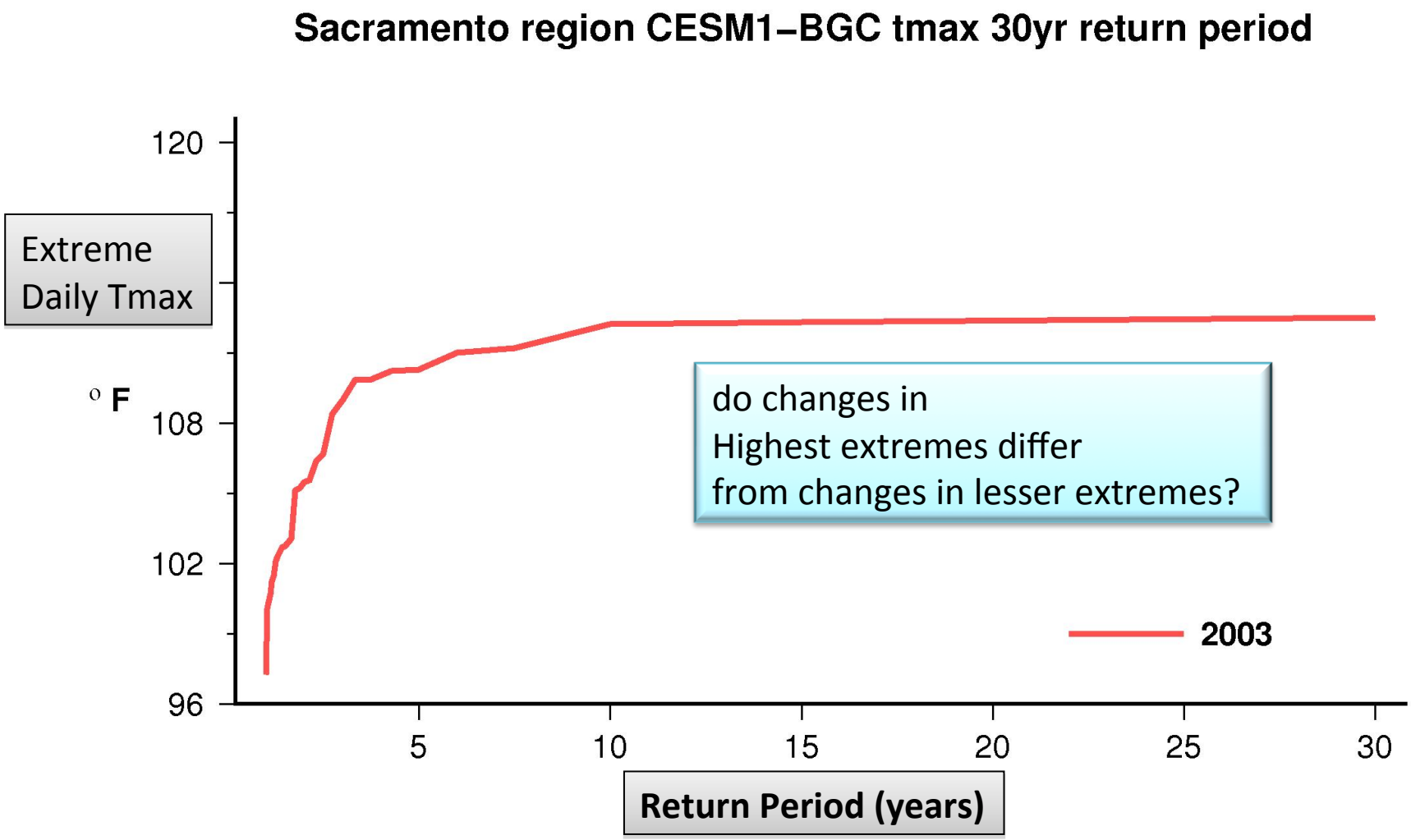


10 year return Tmax values

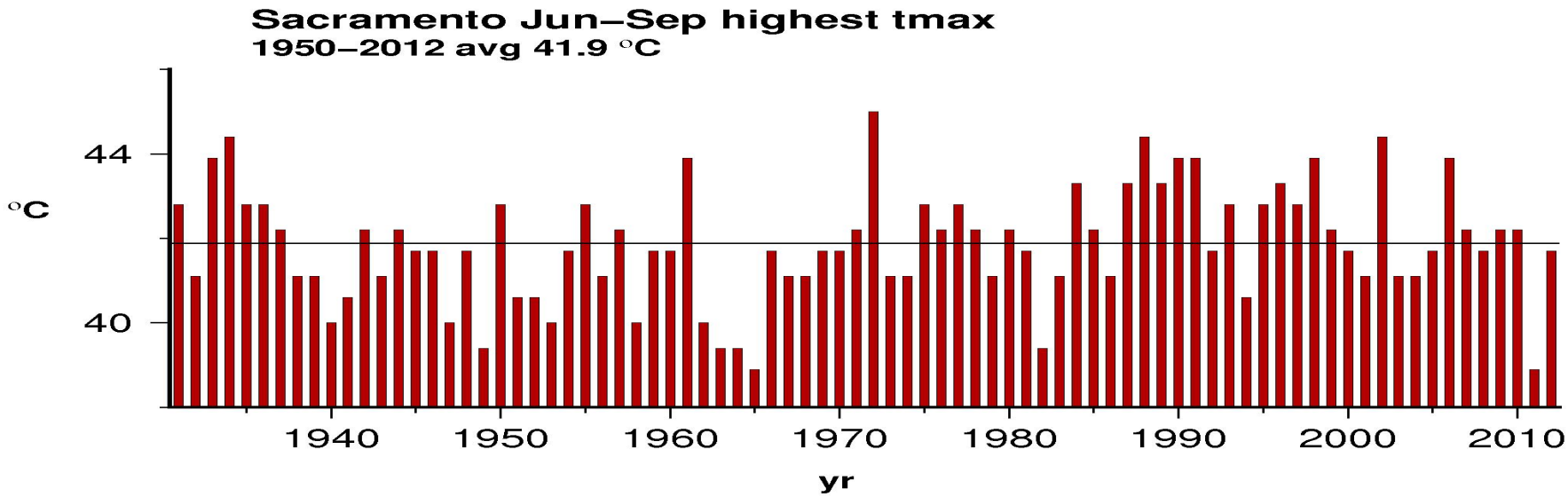


Projected 1-30 year return period daily Tmax extremes

from 30year windows centered on 2003, 2023, 2063



Observed Maximum Daily Temperature, Sacramento



forecasting is challenged by considerable year-to-year variation--
magnitude of extreme hot day and number of extremes fluctuates greatly

Key Points

- Marine layer cloud cover is implicated in load forecast "errors" in the LA basin
- Hottest day in 2 and 10 years is being not investigated in current climate models
  - Initial result indicates only small change by 2023; this will be eclipsed by natural variability.
  - Substantial changes in extreme daytime temperatures likely to occur by mid-century

Work In Progress:

- improved statistical downscaling is being developed which will be useful in estimating extreme events
- multiple GCM simulations
- continued diagnostics observed and simulated