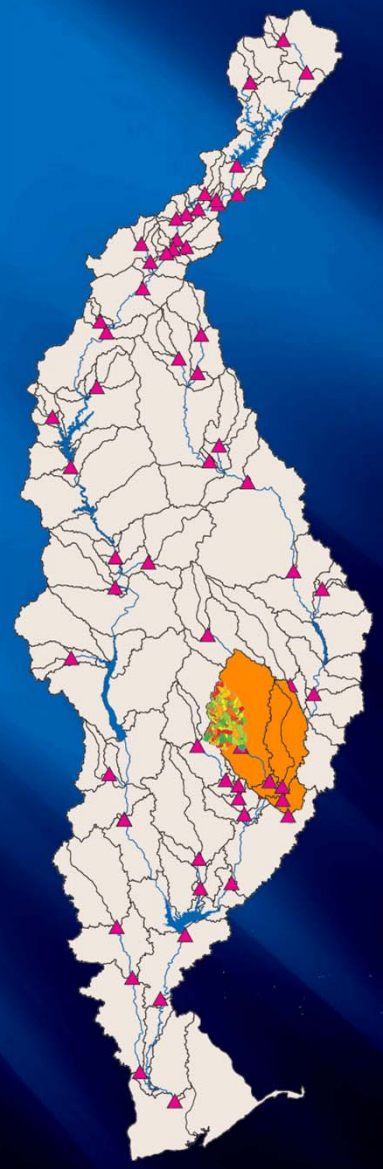
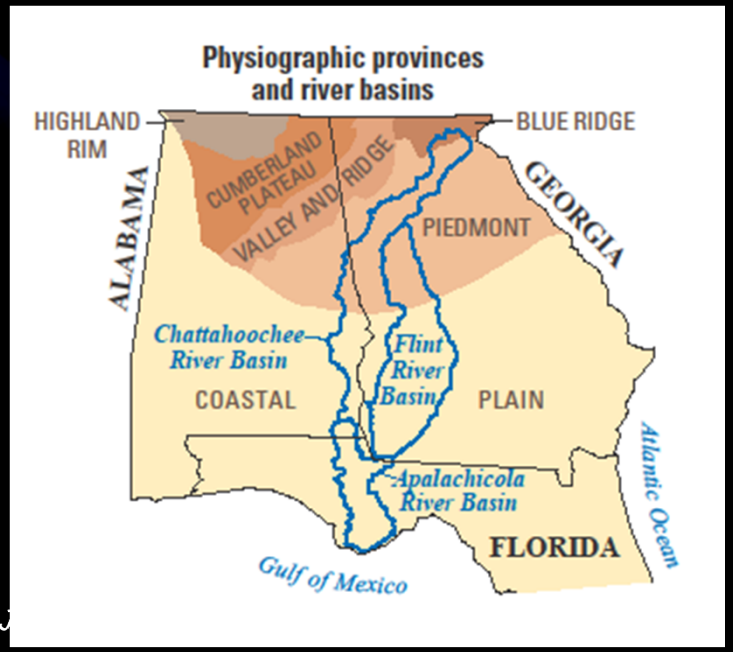
Coupled Simulations with PRMS and SNTemp



The coupling of PRMS with SNTemp will allow scientists and watershed managers to evaluate the effects of historical climate and projected climate change, landscape evolution, and resource management scenarios on watershed hydrology and in-stream water temperature.



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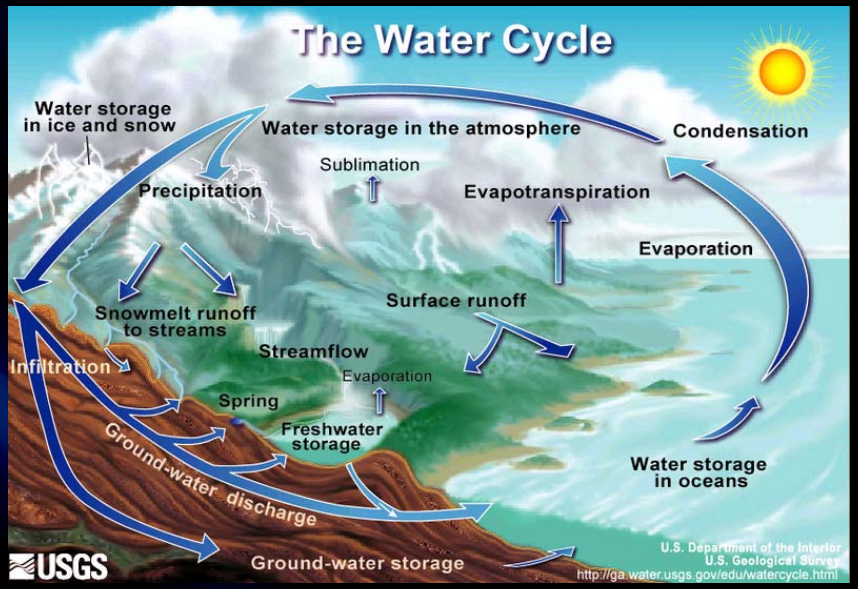
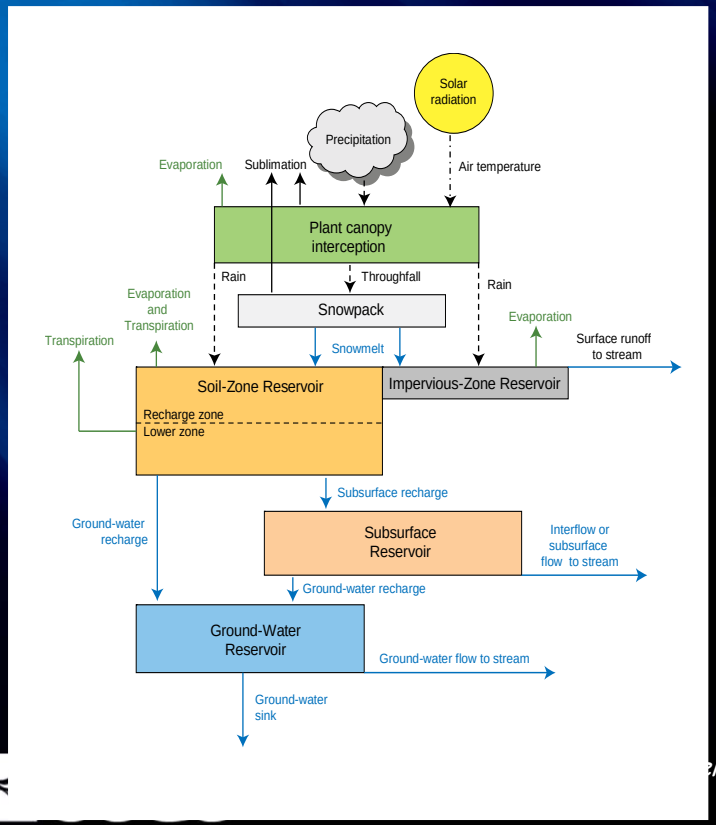
USGS
science for a changing world

PRMS

PRMS is a modular, deterministic, distributed-parameter, physical-process watershed model that simulates watershed response to various combinations of climate and land use.

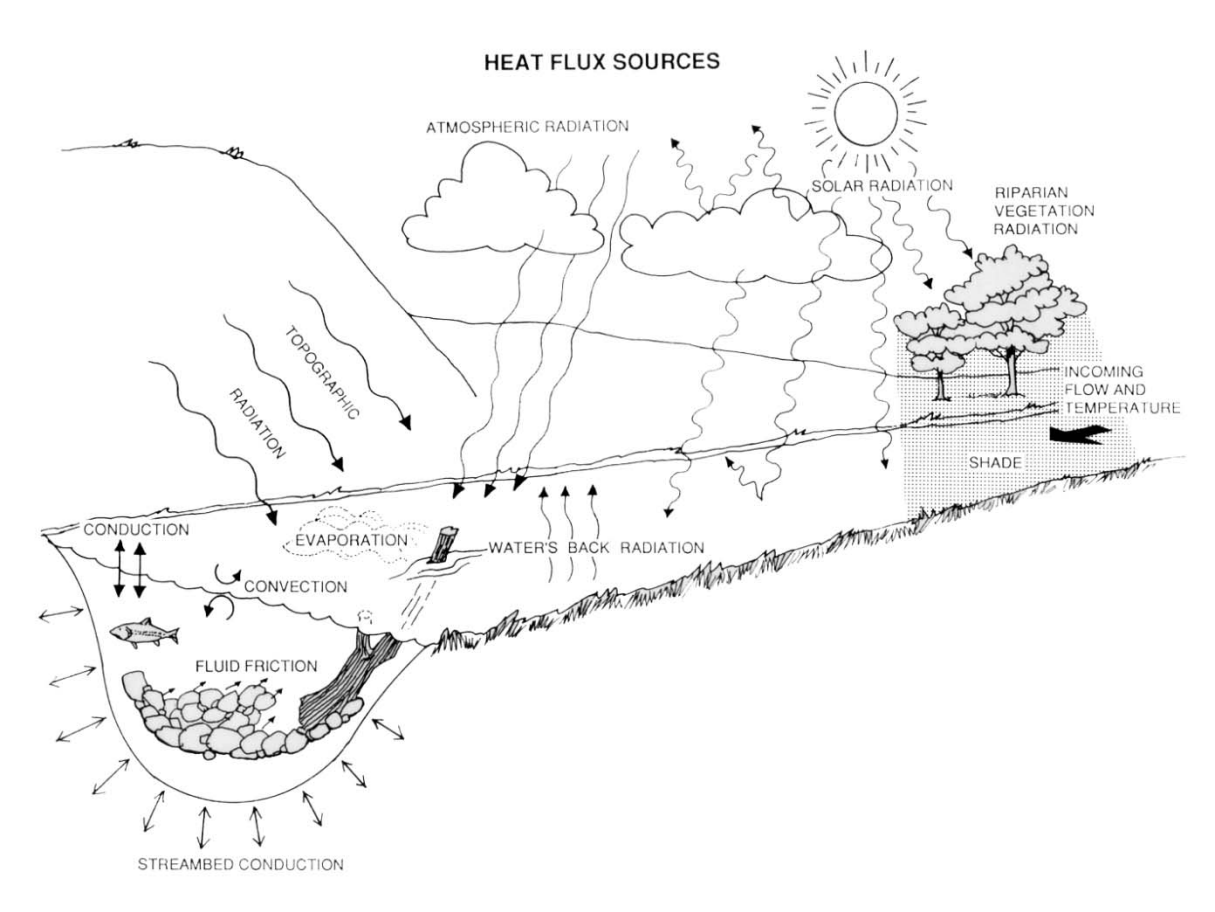




Normal and extreme rainfall and snowmelt can be simulated to evaluate changes in water-balance relations, streamflow regimes, soil-water relations, and ground-water recharge.

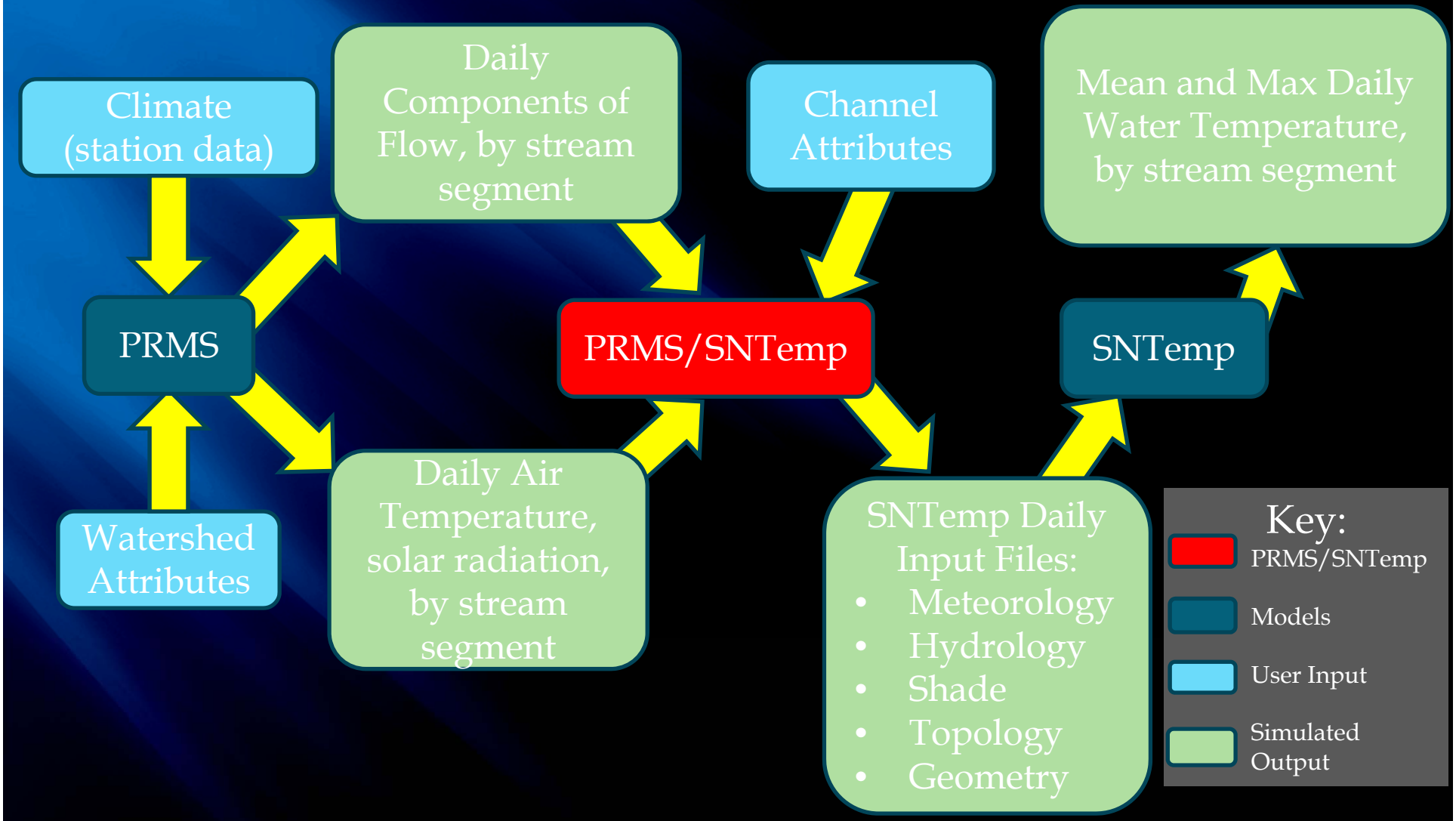
SNTemp

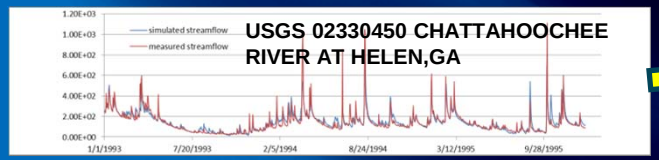
SNTemp was developed to help aquatic biologists and engineers predict the effects of flow regime changes on water temperatures.

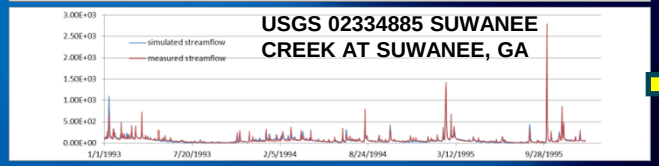


SNTemp developed by US FWS / USGS-BRD

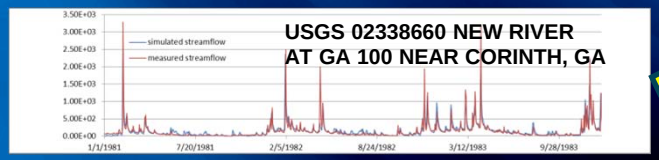
Coupled PRMS and SNTemp

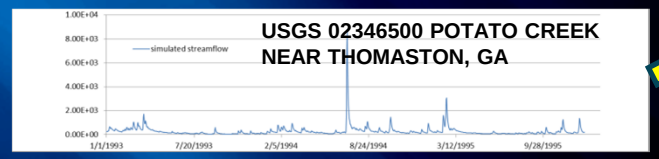


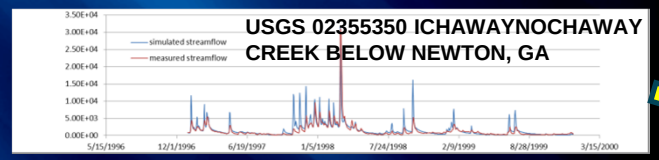

USGS 02330450 CHATTAHOOCHEE RIVER AT HELEN,GA
simulated streamflow
measured streamflow

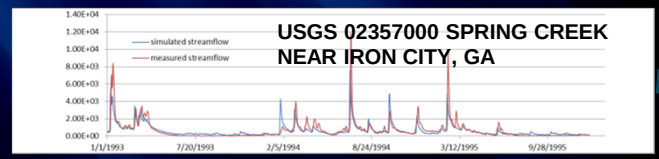

USGS 02334885 SUWANEE CREEK AT SUWANEE, GA
simulated streamflow
measured streamflow

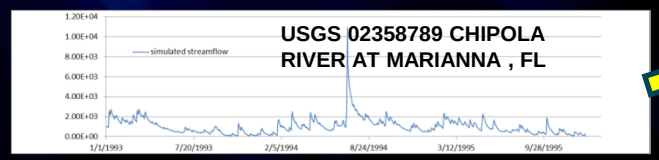
USGS 02337170 CHATTAHOOCHEE RIVER NEAR FAIRBURN, GA
simulated streamflow
measured streamflow

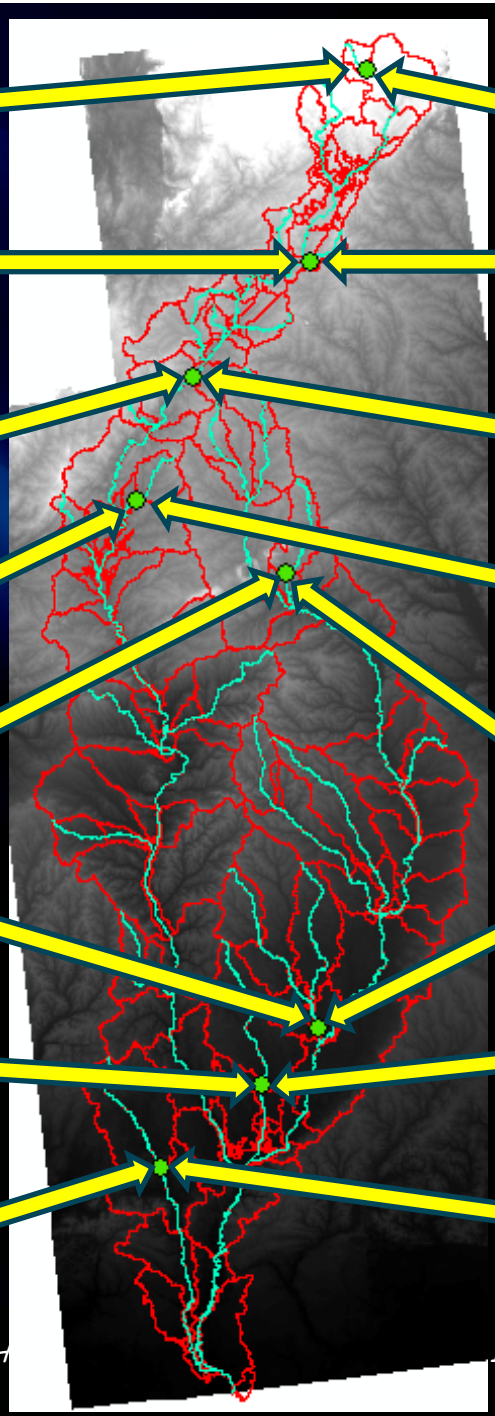

USGS 02338660 NEW RIVER AT GA 100 NEAR CORINTH, GA
simulated streamflow
measured streamflow


USGS 02346500 POTATO CREEK NEAR THOMASTON, GA
simulated streamflow

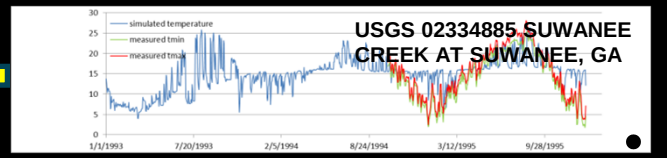

USGS 02355350 ICHAWAYNOCHAWAY CREEK BELOW NEWTON, GA
simulated streamflow
measured streamflow

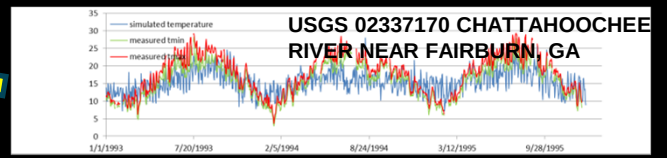

USGS 02357000 SPRING CREEK NEAR IRON CITY, GA
simulated streamflow
measured streamflow

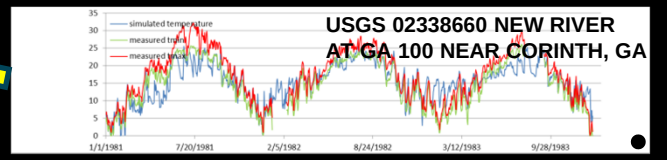

USGS 02358789 CHIPOLA RIVER AT MARIANNA , FL
simulated streamflow

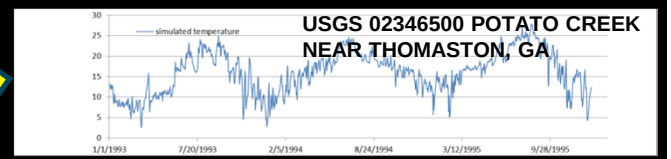


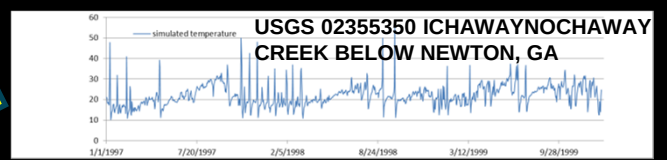
USGS 02330450 CHATTAHOOCHEE RIVER AT HELEN,GA
simulated temperature

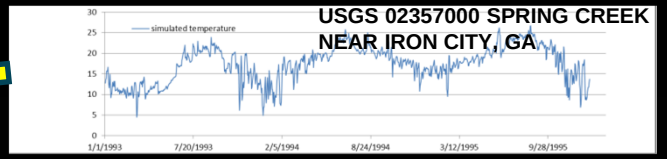

USGS 02334885 SUWANEE CREEK AT SUWANEE, GA
simulated temperature
measured tmin
measured tmax


USGS 02337170 CHATTAHOOCHEE RIVER NEAR FAIRBURN, GA
simulated temperature
measured tmin
measured tmax

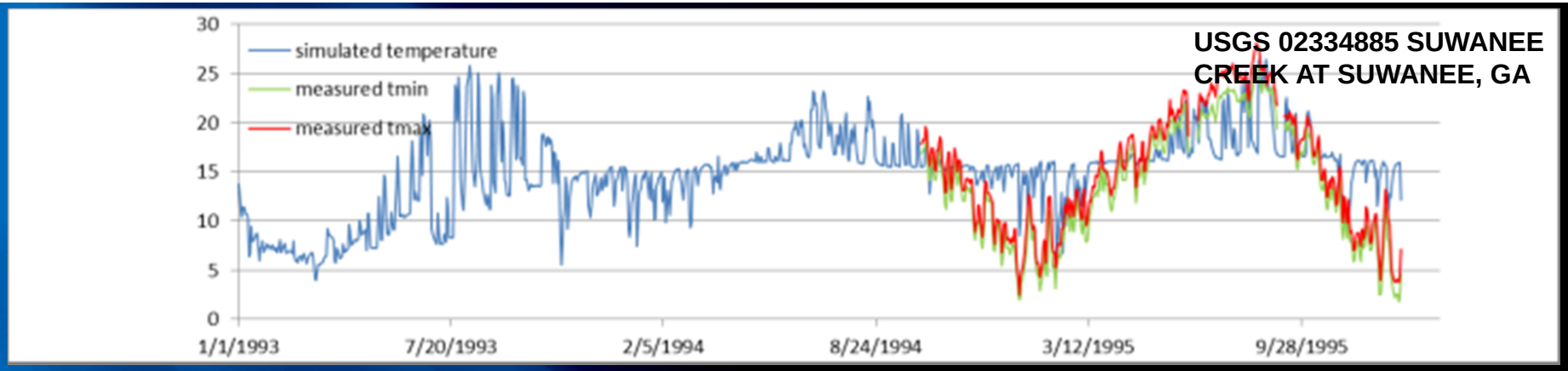

USGS 02338660 NEW RIVER AT GA 100 NEAR CORINTH, GA
simulated temperature
measured tmin
measured tmax

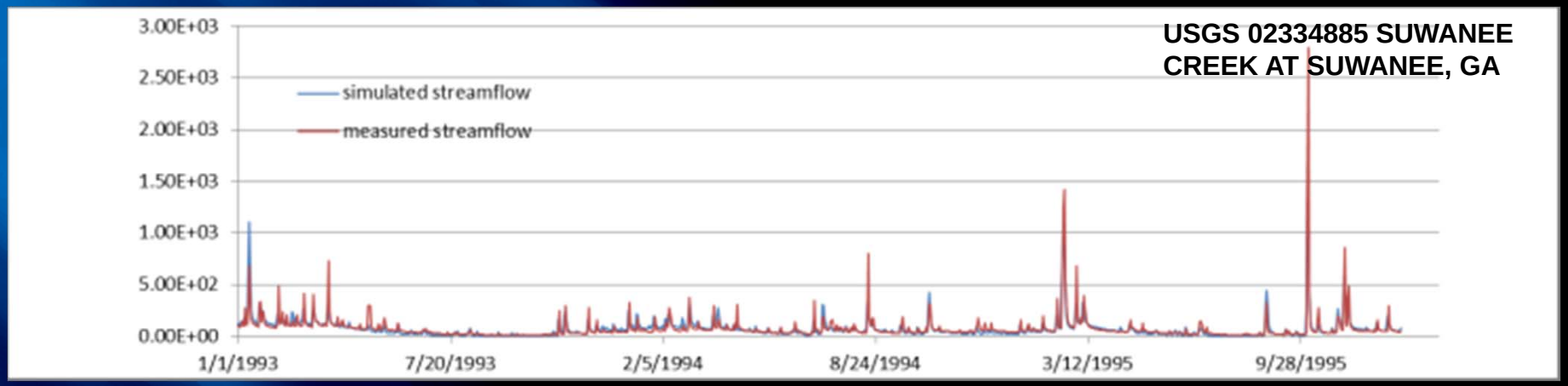

USGS 02346500 POTATO CREEK NEAR THOMASTON, GA
simulated temperature

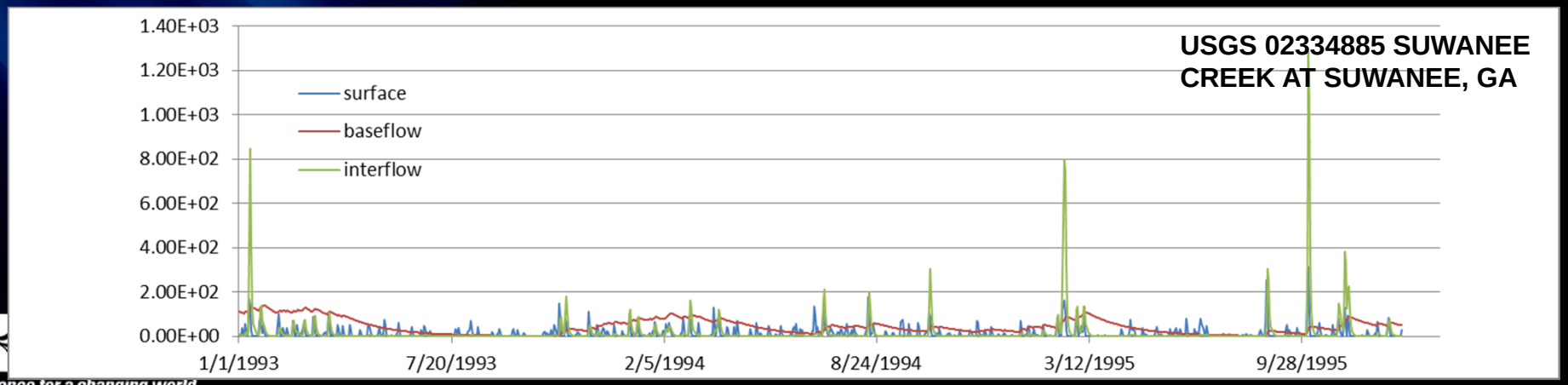

USGS 02355350 ICHAWAYNOCHAWAY CREEK BELOW NEWTON, GA
simulated temperature

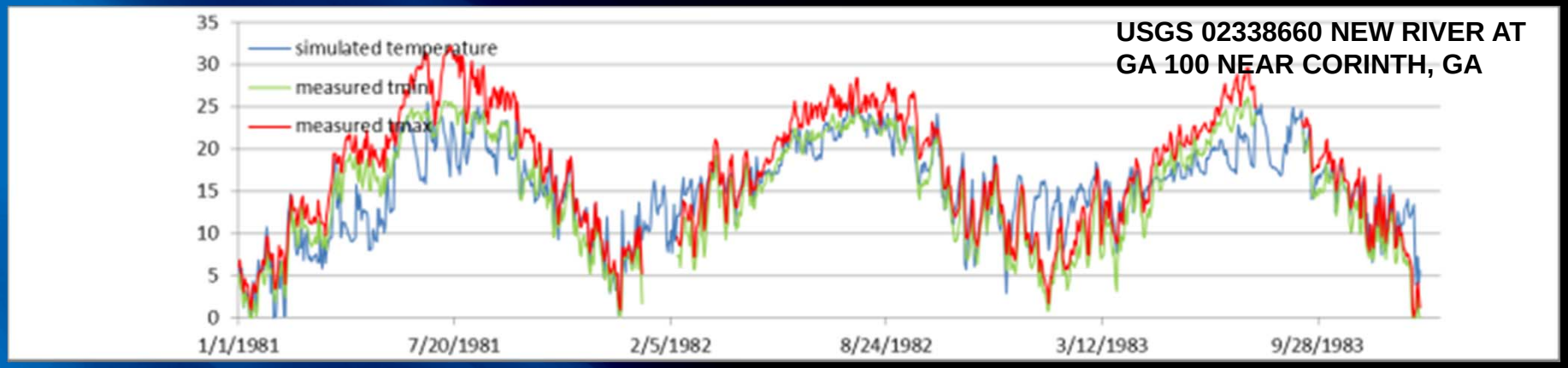

USGS 02357000 SPRING CREEK NEAR IRON CITY, GA
simulated temperature

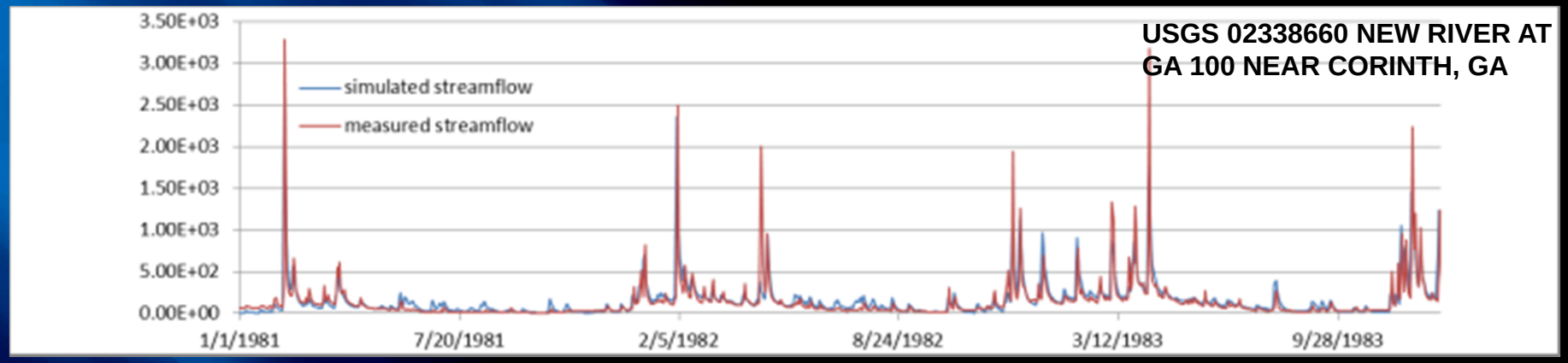
USGS 02358789 CHIPOLA RIVER AT MARIANNA , FL
simulated temperature

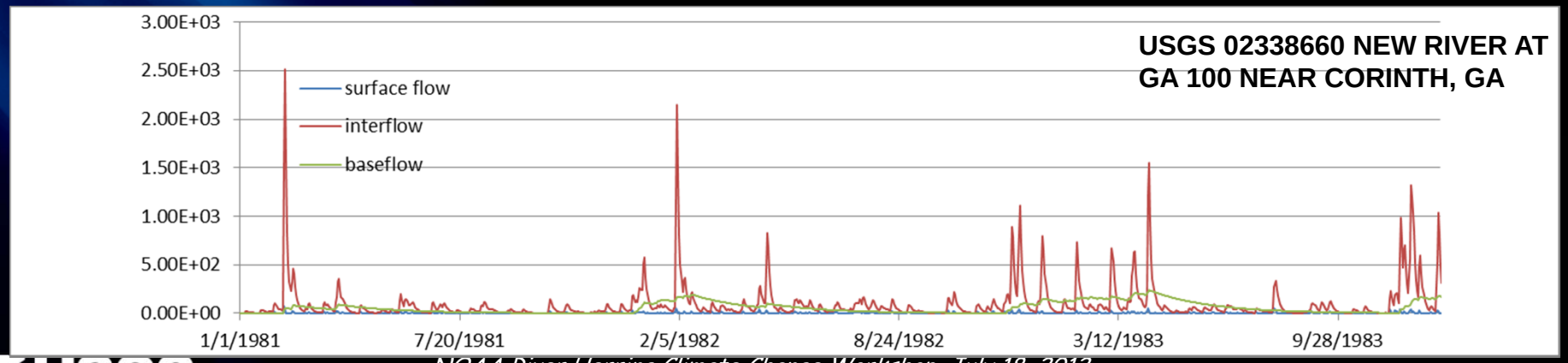

USGS 02334885 SUWANEE CREEK AT SUWANEE, GA
simulated temperature
measured tmin
measured tmax
30
25
20
15
10
5
0
1/1/1993
7/20/1993
2/5/1994
8/24/1994
3/12/1995
9/28/1995


USGS 02334885 SUWANEE CREEK AT SUWANEE, GA
simulated streamflow
measured streamflow
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
1/1/1993
7/20/1993
2/5/1994
8/24/1994
3/12/1995
9/28/1995

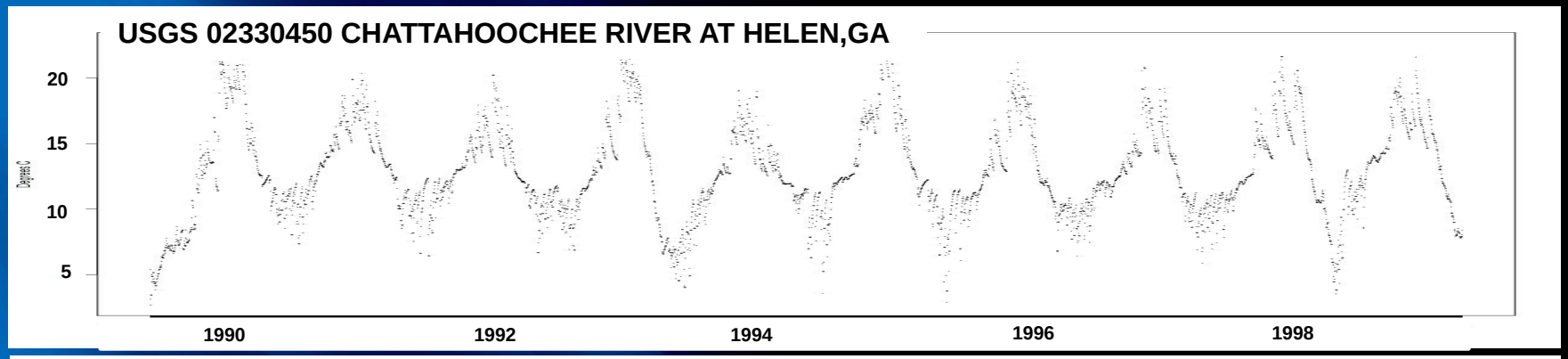

USGS 02334885 SUWANEE CREEK AT SUWANEE, GA
surface
baseflow
interflow
1.40E+03
1.20E+03
1.00E+03
8.00E+02
6.00E+02
4.00E+02
2.00E+02
0.00E+00
1/1/1993
7/20/1993
2/5/1994
8/24/1994
3/12/1995
9/28/1995

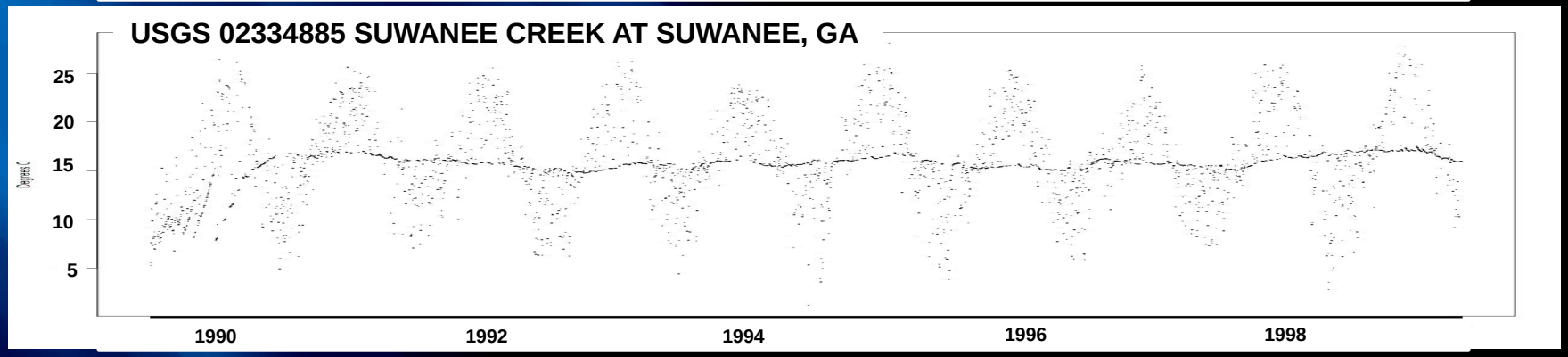

USGS 02338660 NEW RIVER AT GA 100 NEAR CORINTH, GA
simulated temperature
measured tmin
measured tmax
35
30
25
20
15
10
5
0
1/1/1981
7/20/1981
2/5/1982
8/24/1982
3/12/1983
9/28/1983

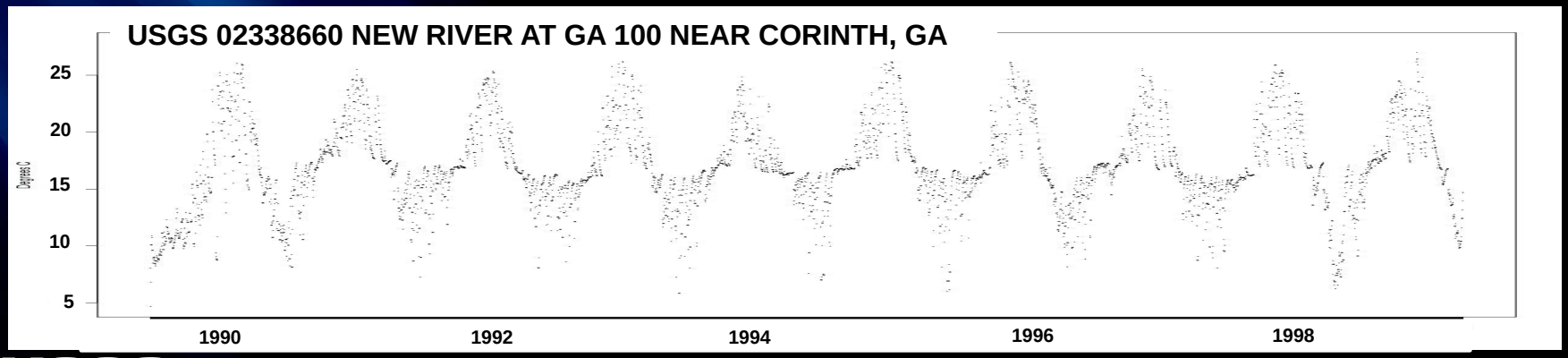

USGS 02338660 NEW RIVER AT GA 100 NEAR CORINTH, GA
simulated streamflow
measured streamflow
3.50E+03
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
1/1/1981
7/20/1981
2/5/1982
8/24/1982
3/12/1983
9/28/1983


USGS 02338660 NEW RIVER AT GA 100 NEAR CORINTH, GA
surface flow
interflow
baseflow
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
1/1/1981
7/20/1981
2/5/1982
8/24/1982
3/12/1983
9/28/1983

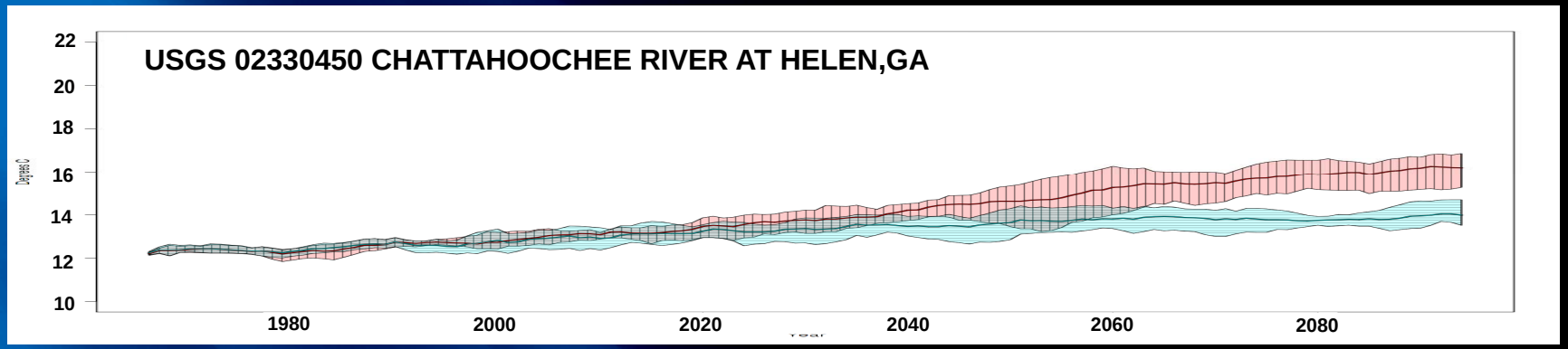
10 Years (1990-1999) of Simulated Daily Historical Stream Temperature

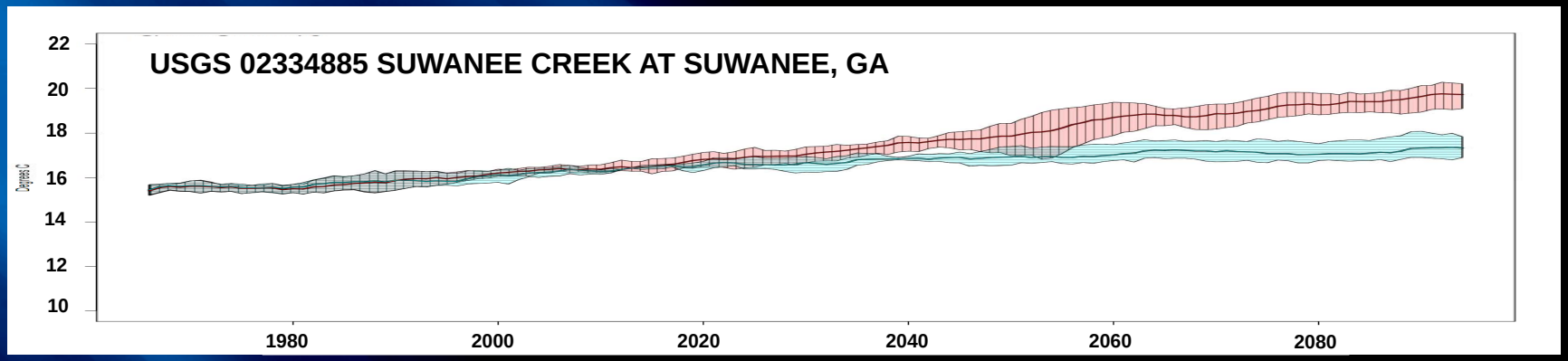


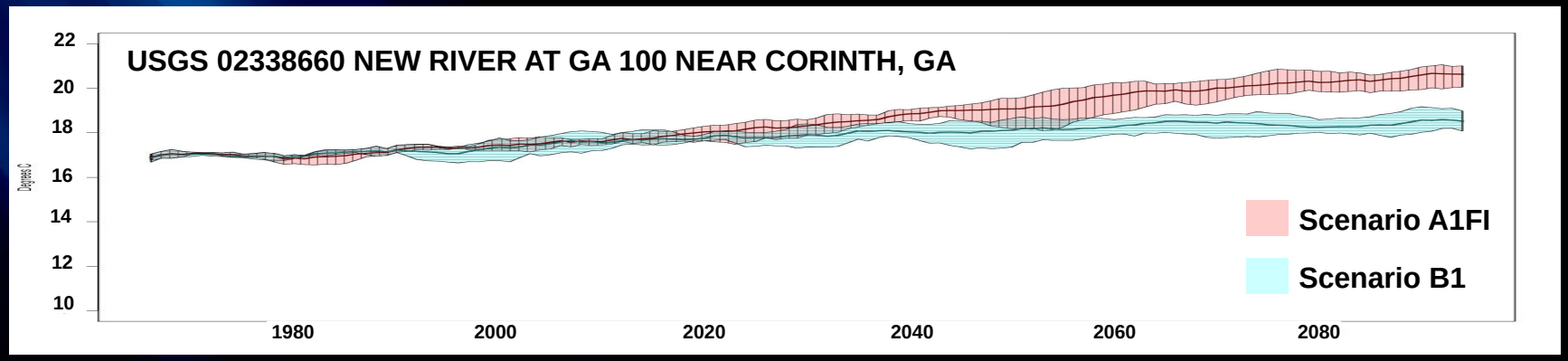




140 Years (1960-2999) of Simulated 11-Year Average Stream Temperature







Status

- Software, documentation, and examples are available:
  - http://wwwbrr.cr.usgs.gov/mows

- Sensitivity analysis:
  - Evaporation/Bowen ratio
  - Air temperature
  - Wind speed
  - Humidity
  - Solar radiation
  - Shade
  - Temperature of lateral inflows (baseflow, interflow, surface RO)

- Calibration with Shuffle Complex Evolution method

- Documentation
  - User's Manual (USGS OFR 2012-116)
  - PRMS Climate Change Study (USGS SIR 2011- 5077)
  - Paper on evaluation of GCMs/Scenarios with respect to stream temperature (in preparation)