Temperature Sensitivity over the Central Valley Reservoirs and Field ET in CalSim 3

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CWEMF Annual Meeting

April 19, 2023

Introduction

- Major Non-recoverable Water Losses
  - Total Evaporative Losses from Reservoirs (ET_{res})
  - Total Field Evapotranspiration (ET_{field}) from WBAs

❖ How Sensitive are ET_{res} and ET_{field} to Air Temperature Input used in CalSim 3?

Objective of the Study

- Identifying temperature sensitivity of CalSim 3 reservoir and field evaporation;
- Analyzing the trend of reservoir and field evaporation over a longer time period; and
- Examining the changes in ET pattern over Central Valley because of temperature variation.

Data Used in Reservoir Evaporation Analysis

- Base data – PRISM Data
- Detrended data – Livneh Data
- Surface area of the reservoirs – CalSim3
- Hargreaves-Samani equation
- CalSim Hydro Output

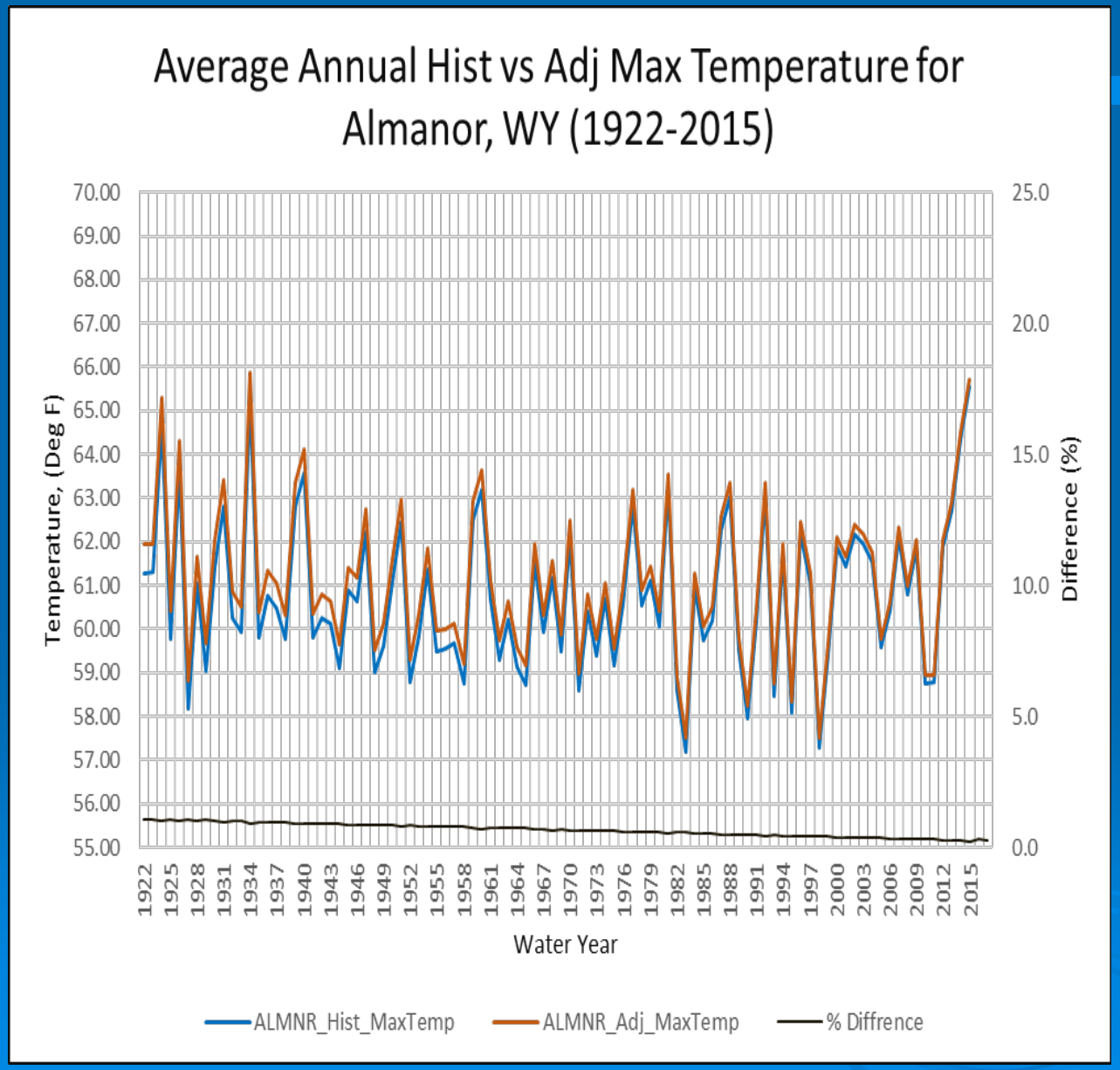
Methodology Used for the Analysis

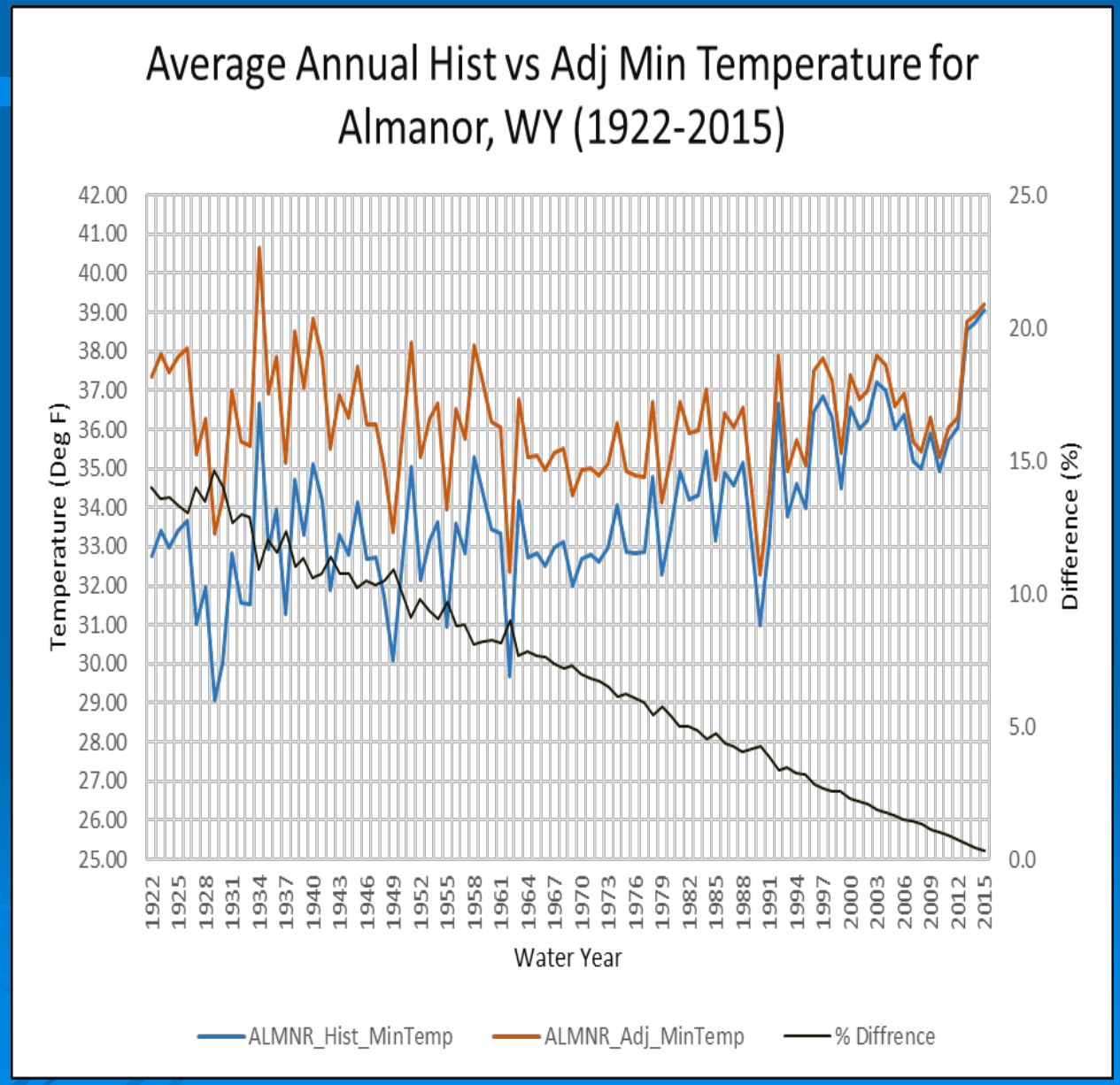
$$Reservoir\_Evap_{Adj} = Reservoir\_Evap_{Hist} + (Reservoir\_Evap_{Dtrend} - Reservoir\_Evap_{Bsln})$$

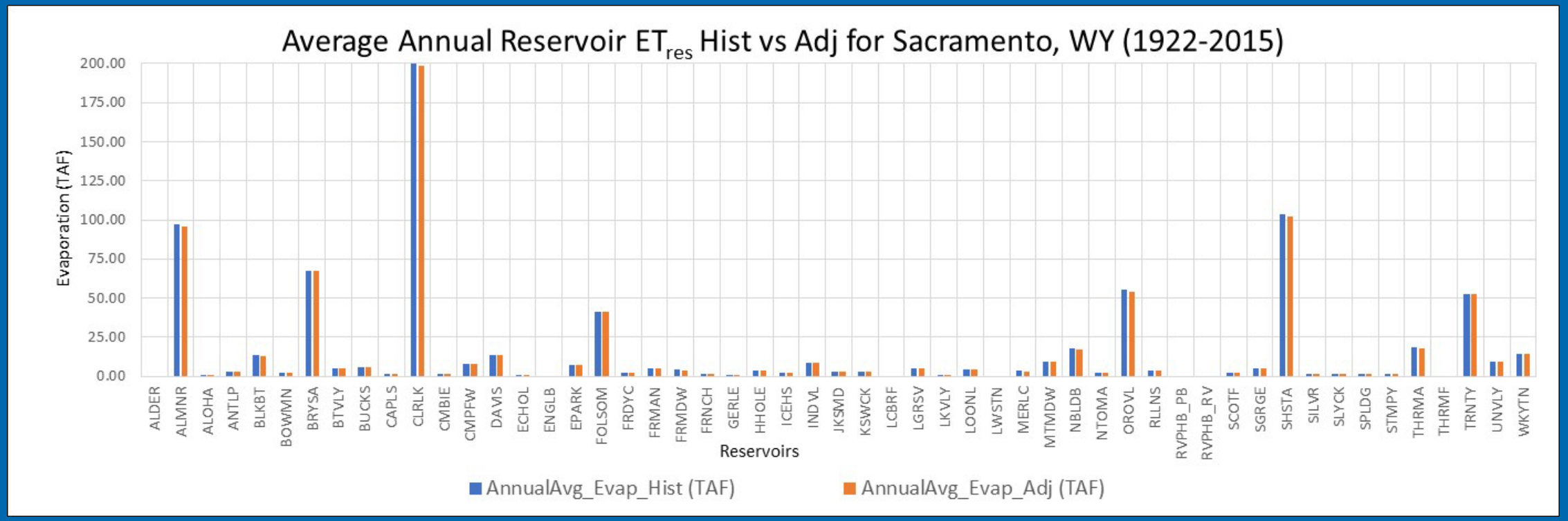
$$Monthly\ TotalReservoir\_Evap_{(Adj,Hist)} = Surface\_Area\_Reservoir_{(monthly)} * Monthly\ Reservoir\_EvapRate_{(adj,hist)}$$

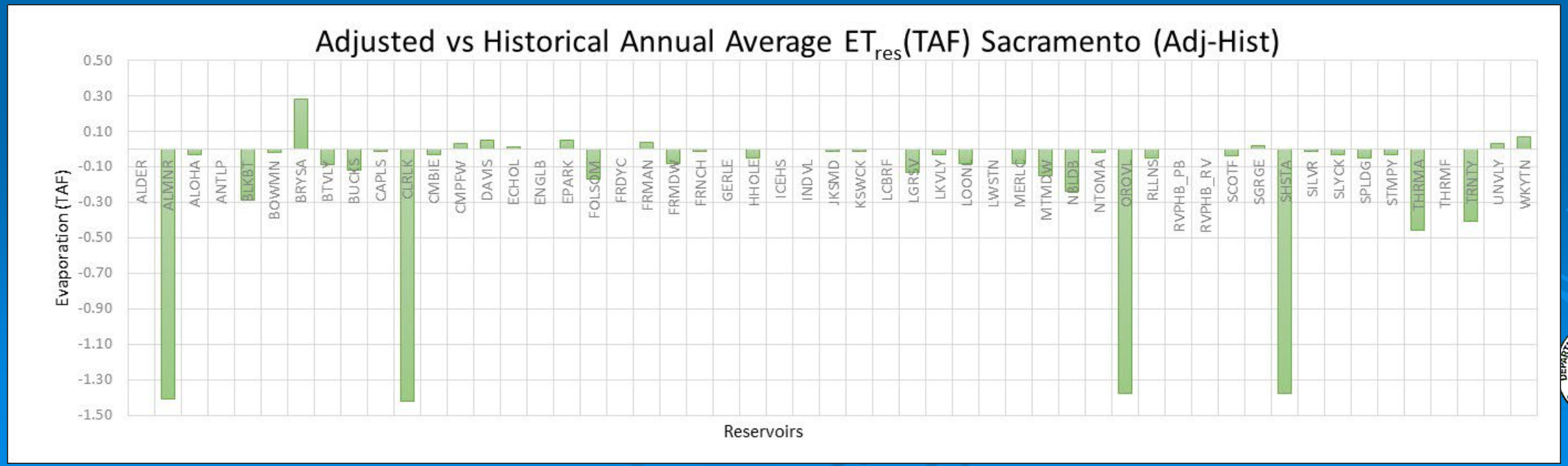
$$Annual\ TotalReservoir\_Evap_{(Adj,Hist)} = \sum_{month=10}^{month=09} (Monthly\ TotalReservoir\_Evap_{(Adj,Hist)})/(12 * 1000)$$

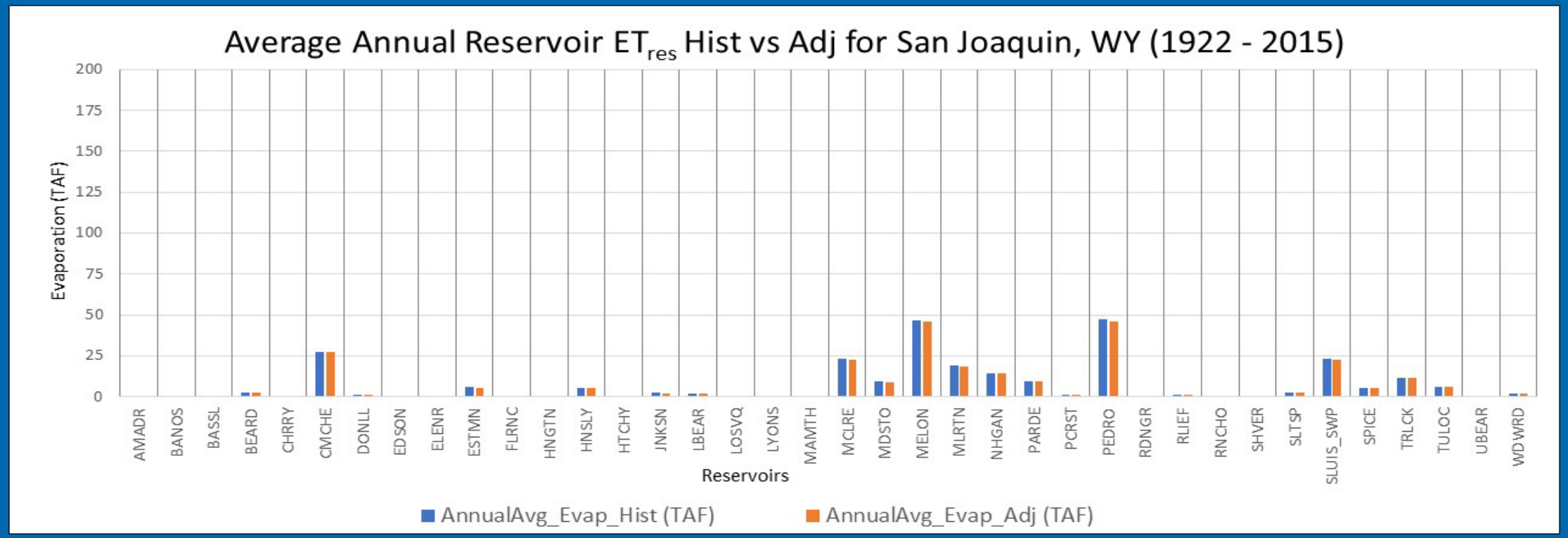
Historical and Adjusted Temperature Data

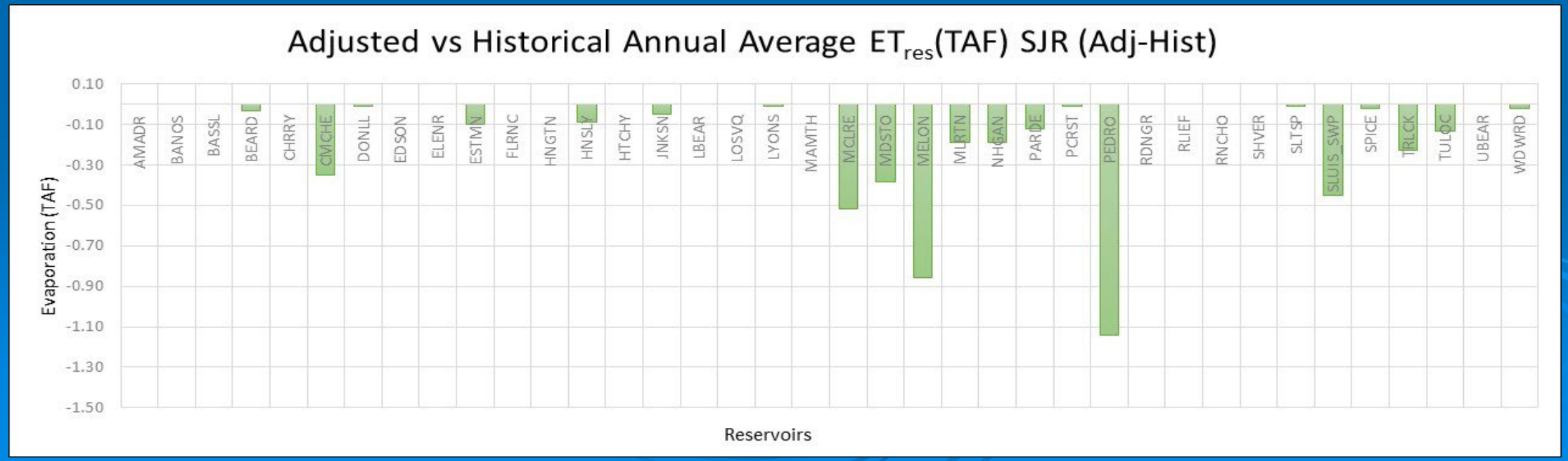





Average Annual Reservoir ET$_{res}$ Hist vs Adj for Sacramento, WY (1922-2015)
Evaporation (TAF)
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
ALDER ALMNR ALOHA ANTLP BLKBT BOWMN BRYSA BTVLY BUCKS CAPLS CLRLK CMBIE CMPFW DAVIS ECHOL ENGLB EPARK FOLSOM FRDYC FRMAN FRMDW FRNCH GERLE HHOLE ICEHS INDVL JKSMD KSWCK LCBRF LGRSV LKVLY LOONL LWSTN MERLC MTMDW NBLDB NTOMA OROVL RLLNS RVPHB_PB RVPHB_RV SCOTF SGRGE SHSTA SILVR SLYCK SPLDG STMPY THRMA THRMF TRNTY UNVLY WKYTN
Reservoirs
AnnualAvg_Evap_Hist (TAF)
AnnualAvg_Evap_Adj (TAF)


Adjusted vs Historical Annual Average ET$_{res}$(TAF) Sacramento (Adj-Hist)
Evaporation (TAF)
0.50
0.30
0.10
-0.10
-0.30
-0.50
-0.70
-0.90
-1.10
-1.30
-1.50
ALDER ALMNR ALOHA ANTLP BLKBT BOWMN BRYSA BTVLY BUCKS CAPLS CLRLK CMBIE CMPFW DAVIS ECHOL ENGLB EPARK FOLSOM FRDYC FRMAN FRMDW FRNCH GERLE HHOLE ICEHS INDVL JKSMD KSWCK LCBRF LGRSV LKVLY LOONL LWSTN MERLC MTMDW NBLDB NTOMA OROVL RLLNS RVPHB_PB RVPHB_RV SCOTF SGRGE SHSTA SILVR SLYCK SPLDG STMPY THRMA THRMF TRNTY UNVLY WKYTN
Reservoirs


Average Annual Reservoir ET$_{res}$ Hist vs Adj for San Joaquin, WY (1922 - 2015)
Evaporation (TAF)
200
175
150
125
100
75
50
25
0
AMADR
BANOS
BASSL
BEARD
CHRRY
CMCHE
DONLL
EDSON
ELENR
ESTMN
FLRNC
HNGTN
HNSLY
HTCHY
JNKSN
LBEAR
LOSVQ
LYONS
MAMTH
MCLRE
MDSTO
MELON
MLRTN
NHGAN
PARDE
PCRST
PEDRO
RDNGR
RLIEF
RNCHO
SHVER
SLTSP
SLUIS_SWP
SPICE
TRLCK
TULOC
UBEAR
WDWRD
Reservoirs
AnnualAvg_Evap_Hist (TAF)
AnnualAvg_Evap_Adj (TAF)


Adjusted vs Historical Annual Average ET$_{res}$(TAF) SJR (Adj-Hist)
Evaporation (TAF)
0.10
-0.10
-0.30
-0.50
-0.70
-0.90
-1.10
-1.30
-1.50
AMADR
BANOS
BASSL
BEARD
CHRRY
CMCHE
DONLL
EDSON
ELENR
ESTMN
FLRNC
HNGTN
HNSLY
HTCHY
JNKSN
LBEAR
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MLRTN
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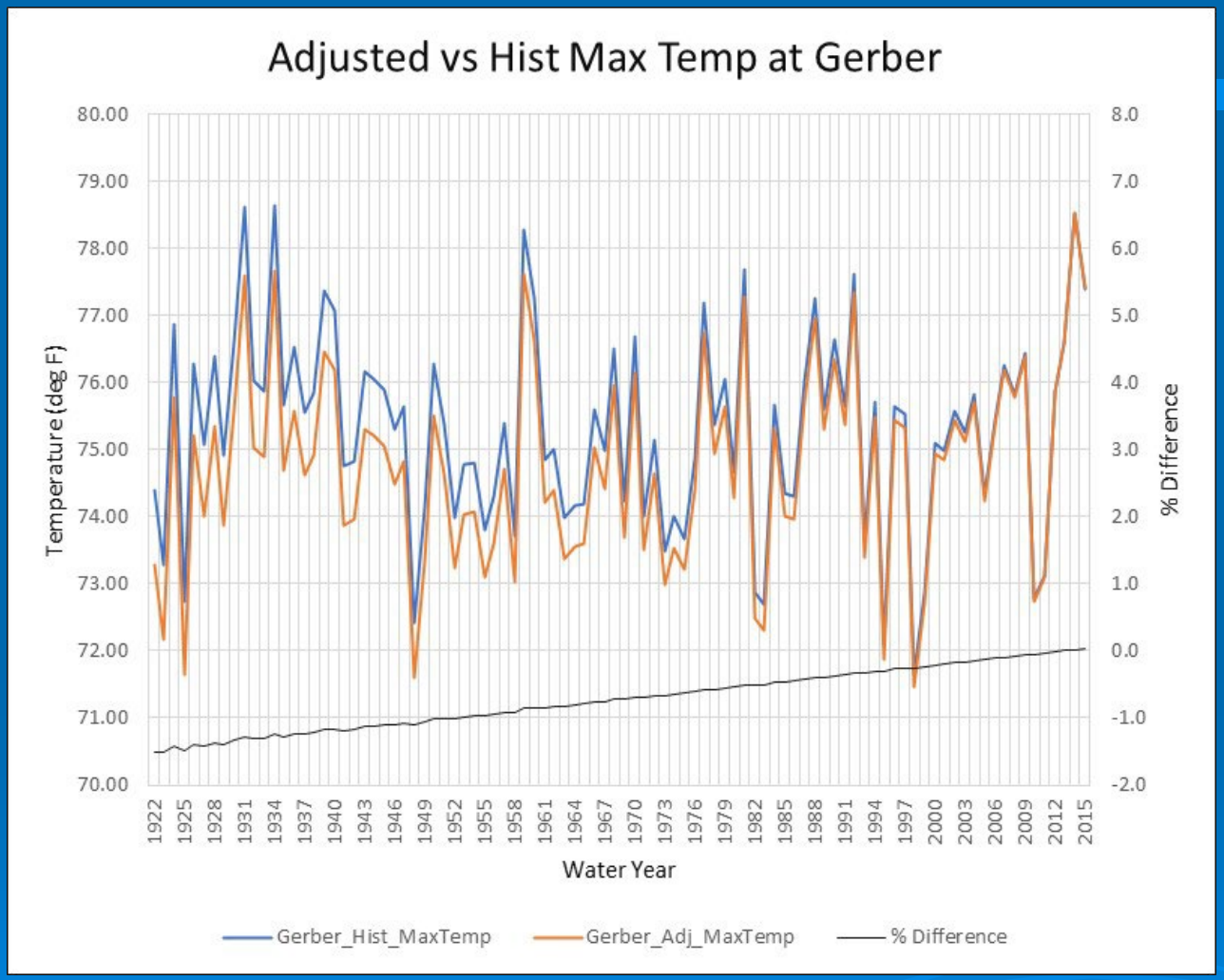
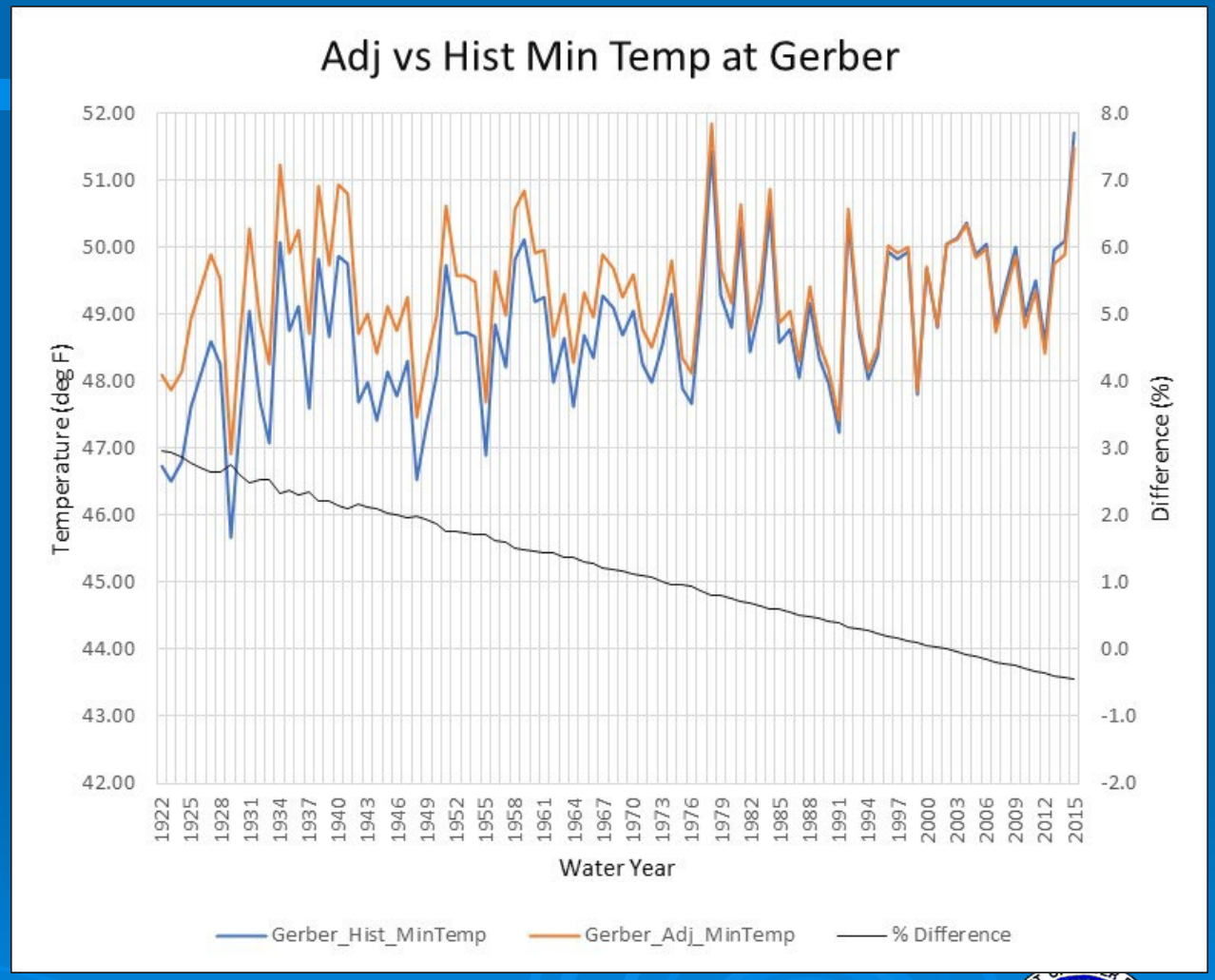
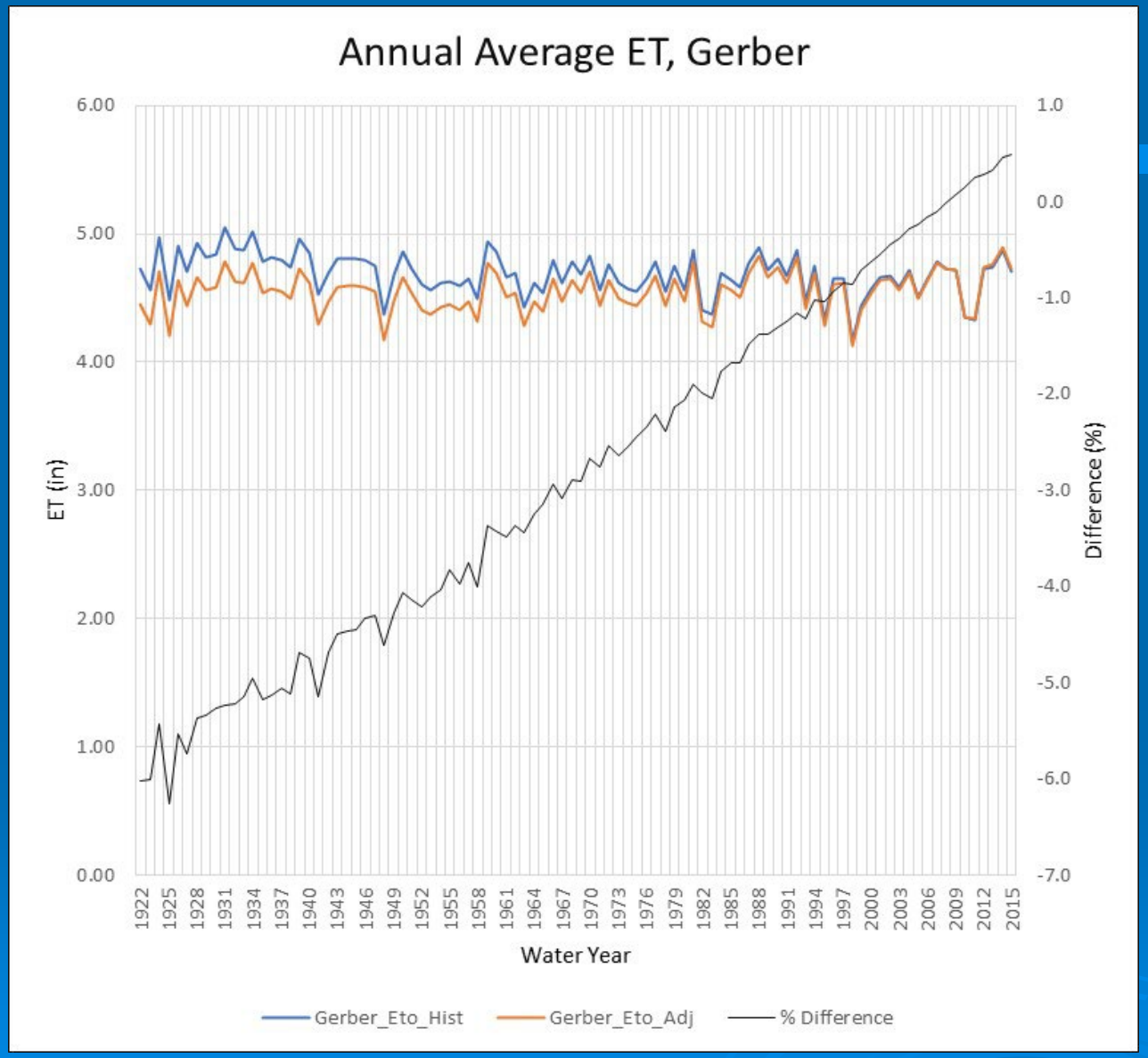
PEDRO
RDNGR
RLIEF
RNCHO
SHVER
SLTSP
SLUIS_SWP
SPICE
TRLCK
TULOC
UBEAR
WDWRD
Reservoirs

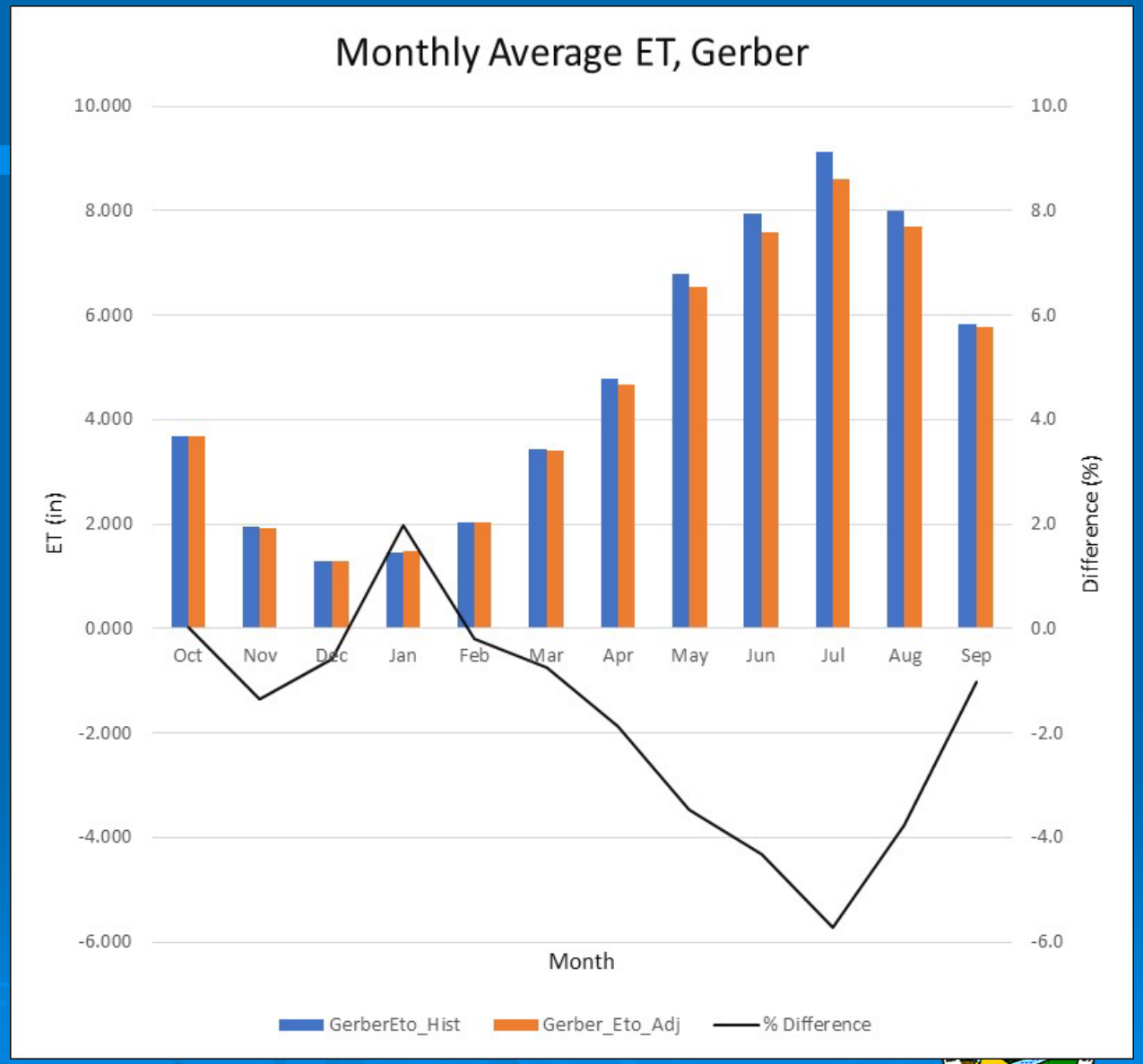
Historical and Adjusted Temperature at CIMIS Station



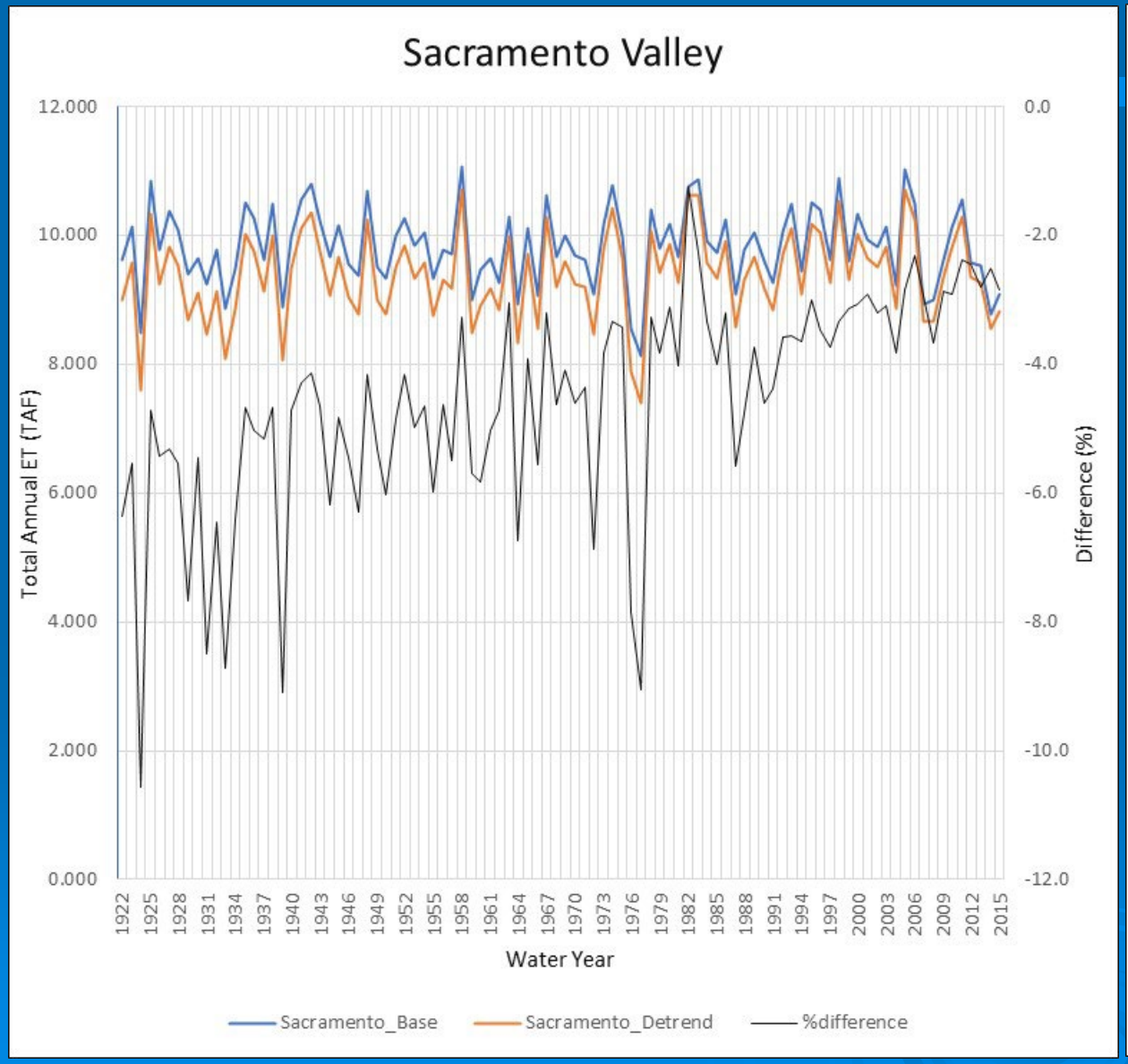


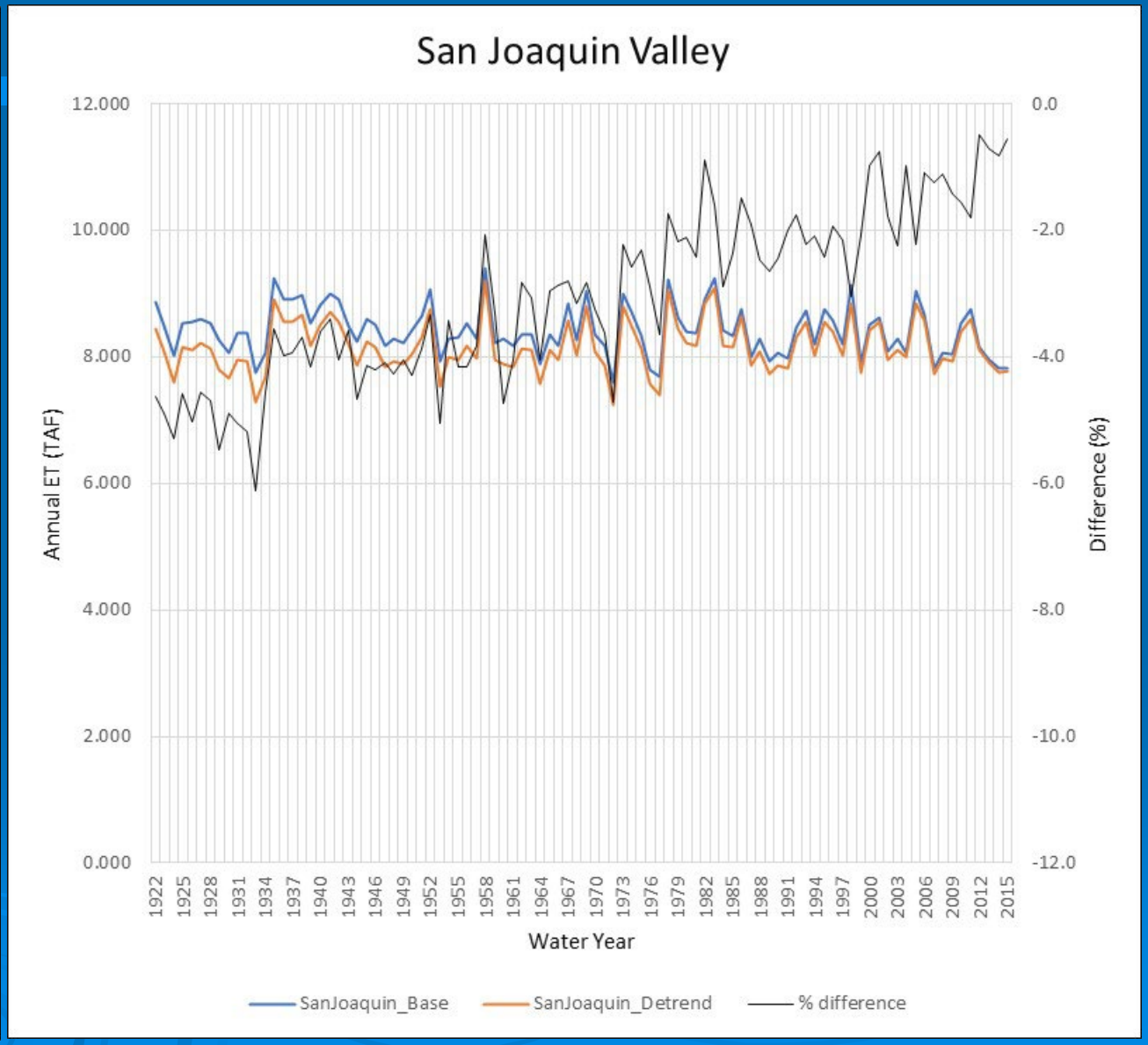
Historical and Adjusted ET at CIMIS Station



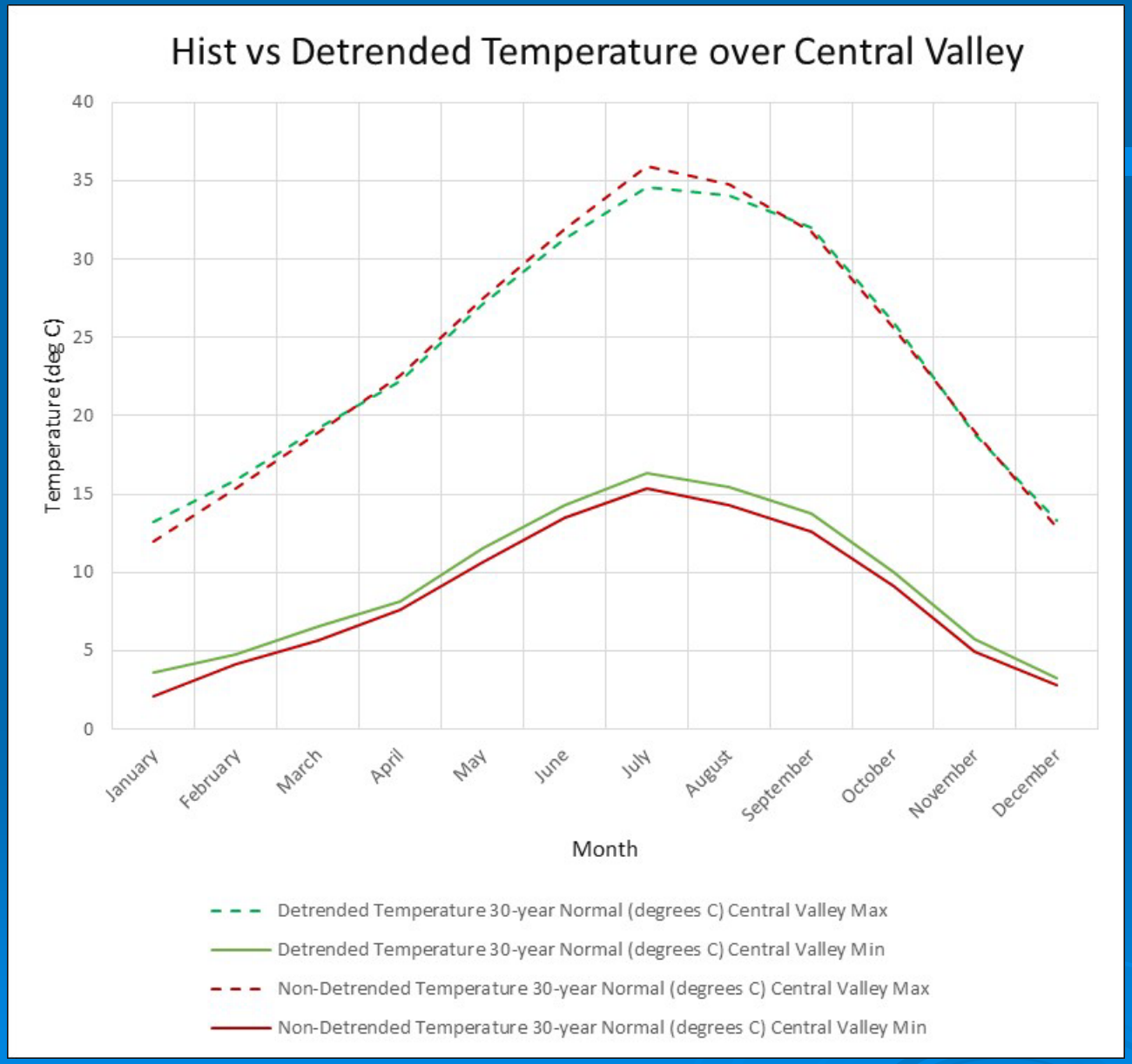


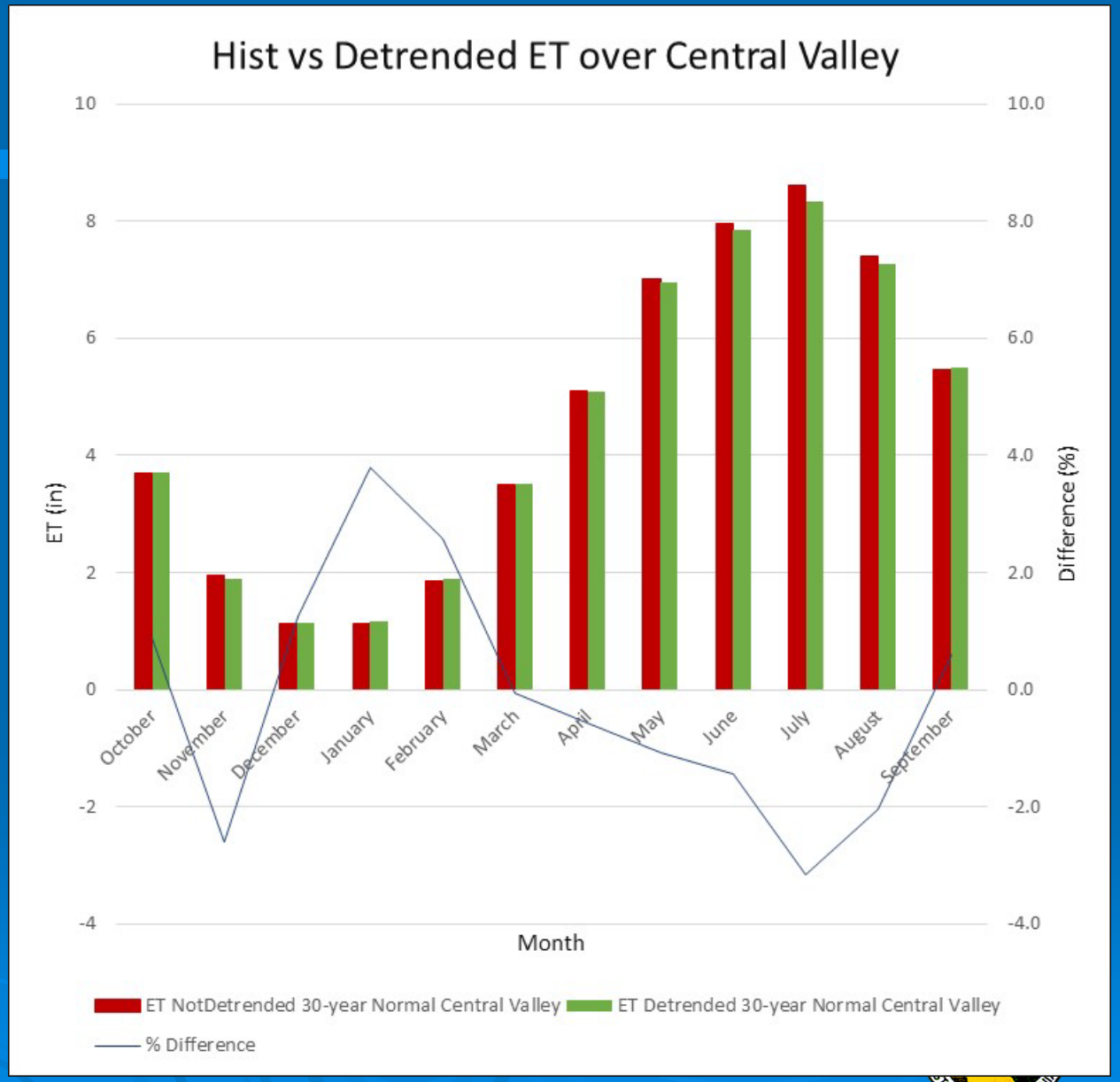
Historical vs Detrended ET, Central Valley





30-yr Normal Historical vs Detrended ET, Central Valley





Summary

- Difference between historical and adjusted reservoir evaporation is insignificant.
- Adjusted maximum temperature is lower than the historical maximum temperature and adjusted minimum temperature is higher than the historical minimum temperature at CIMIS location.
- Detrended ET for Central Valley is lower than the historical ET for the Spring and the Summer
- Detrended ET for Central Valley is higher than the historical ET for the Fall and the Winter.

Thank You !