Watershed Model Calibration using NLDAS-2 Reanalysis Data

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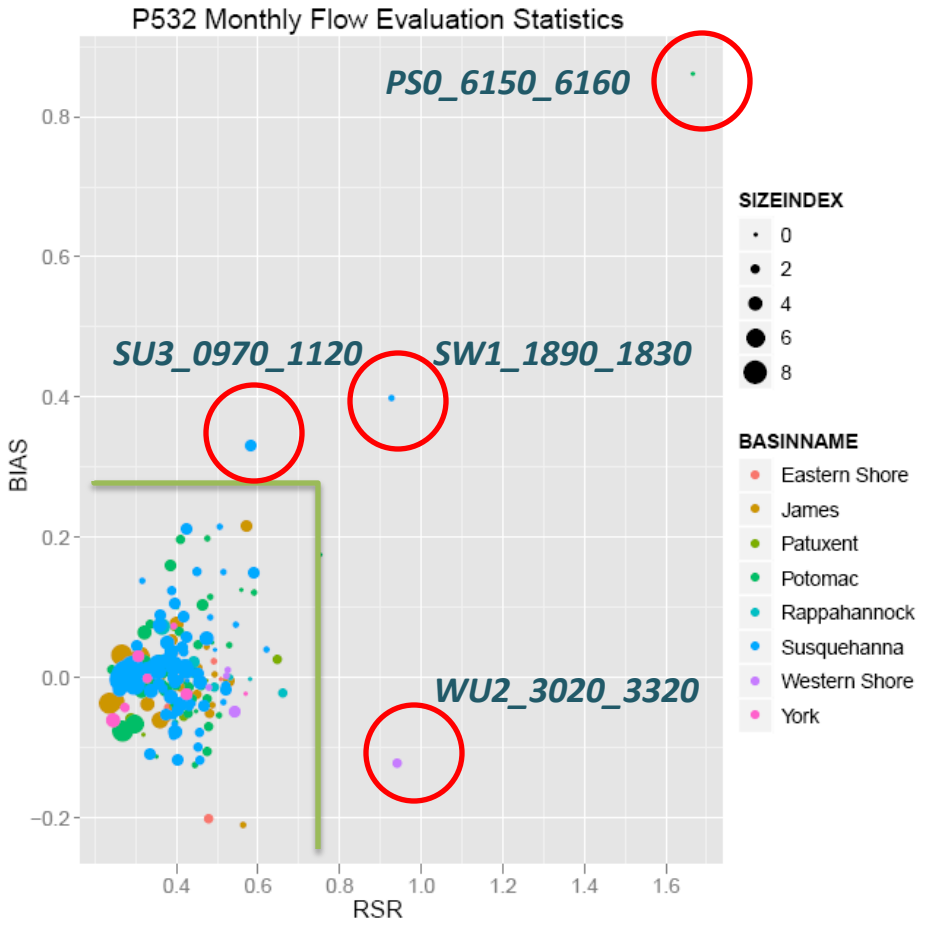
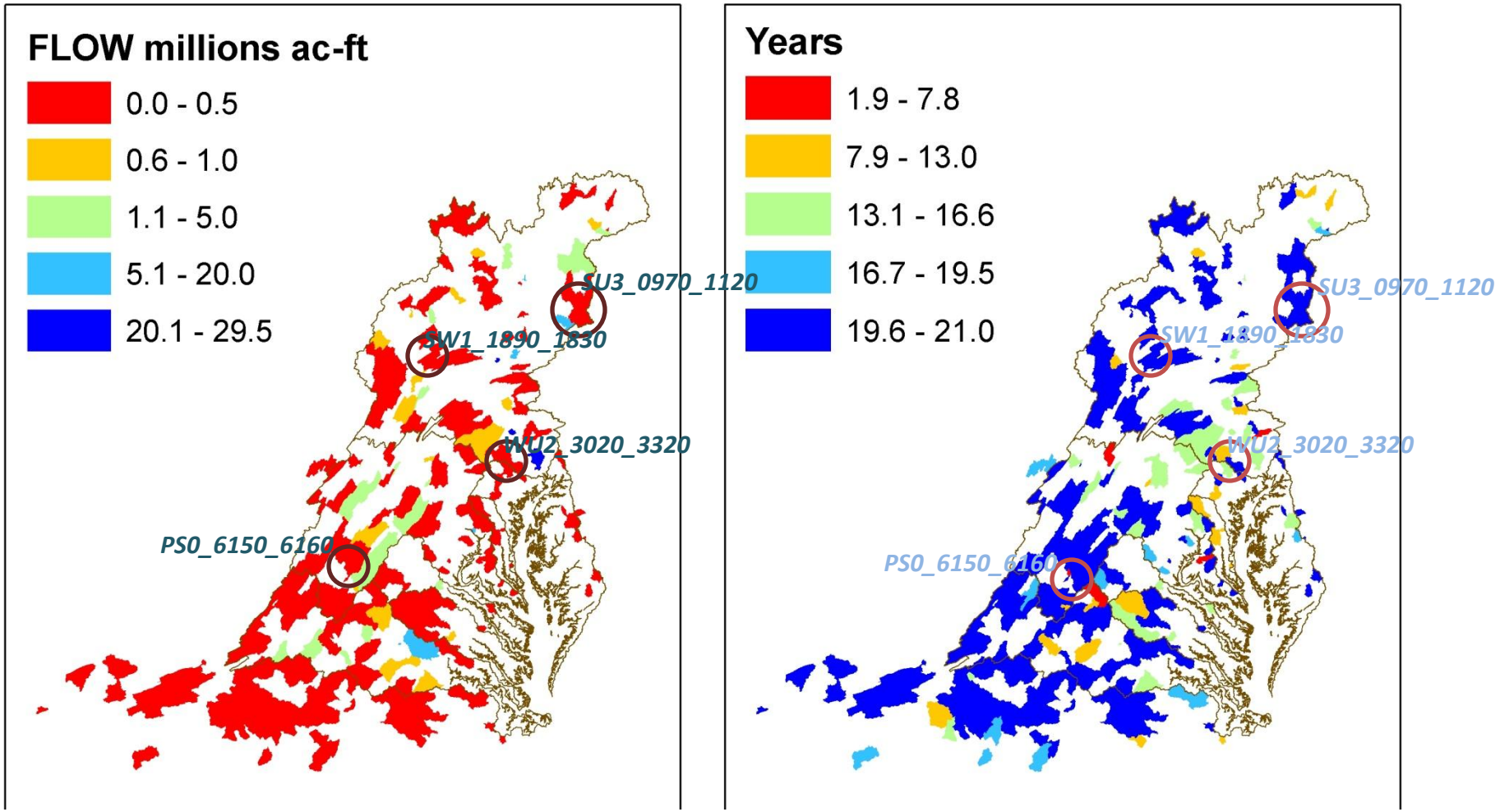
WSM Accuracy

Performance rating	BIAS	RSR
Very good	Bias<±10	0 ≤ RSR ≤ 0.5
Good	±10 < Bias < ±15	0 .5< RSR ≤ 0.6
Satisfactory	±15 < Bias < ±25	0 .6< RSR ≤ 0.7
Unsatisfactory	Bias > ±25	RSR > 0.7



WSM Accuracy

SIMULATED FLOW AND YEARS OF OBSERVED DATA



WSM Accuracy

- The accuracy assessment results for flow indicated that 98 % of river segments had a very good performance, a good performance or a satisfactory performance and 2% an unsatisfactory performance.

- The lack of sufficient observation data can limit the calibration processes and can lead to an unsatisfactory calibration performance. This is especially applicable for small river segments.

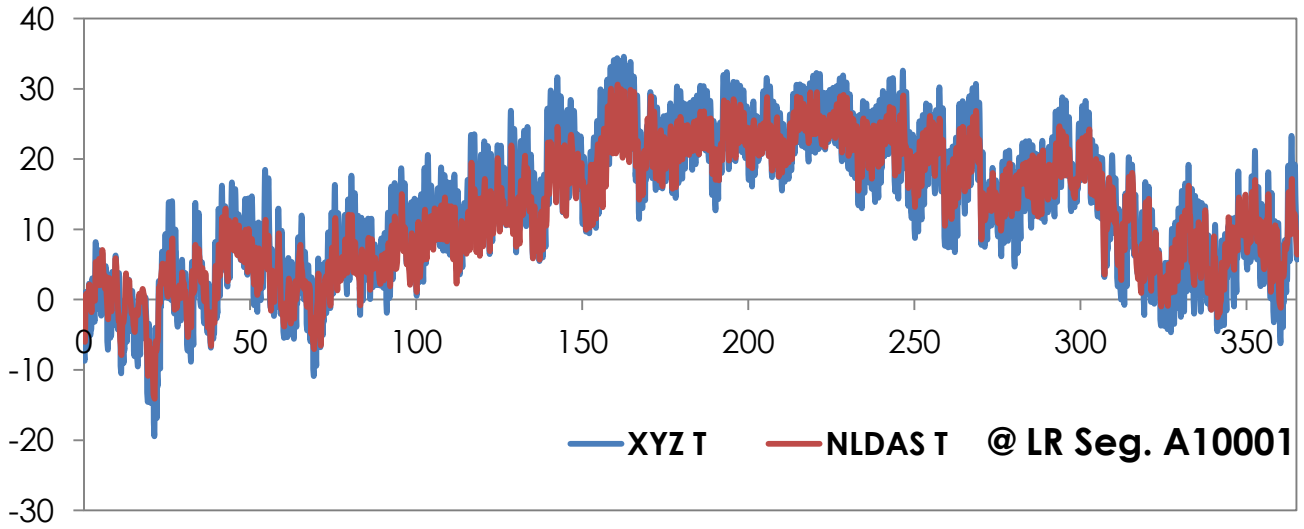
Extension of WSM to 2011

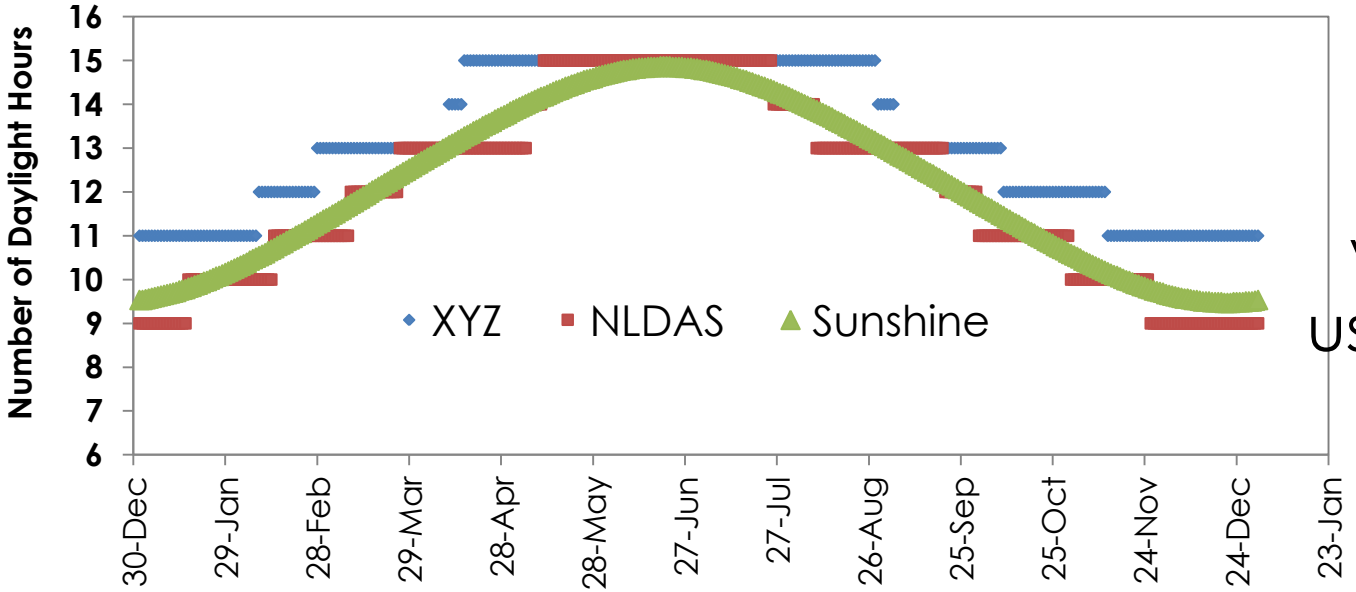
- An extension of the precipitation and meteorological data to 2011 and the recalibration of the WSM would allow application of the new monitoring data to refine the assessment of open water DO and SAV-clarity WQ standards in shallow water systems.

- North American Land Data Assimilation Systems (NLDAS)

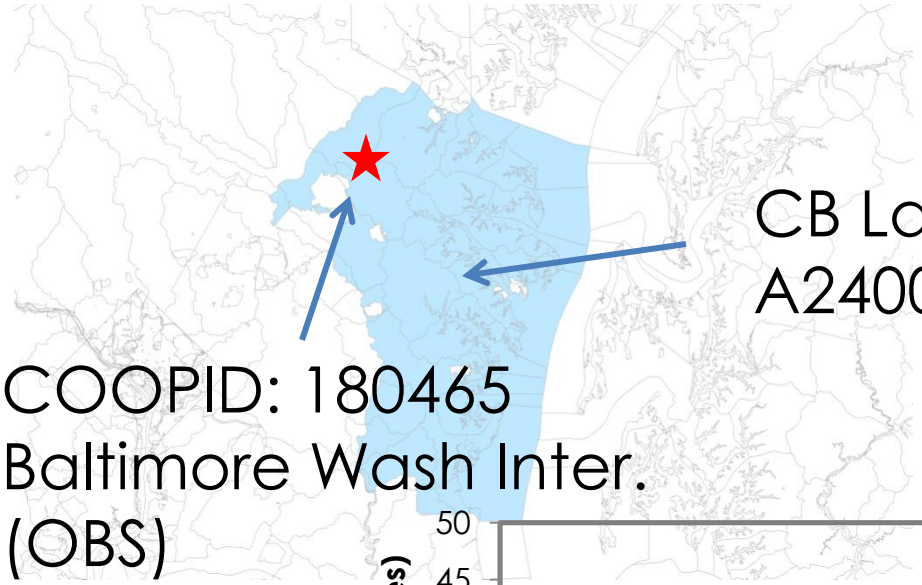
Hamon Method
Daily PET f (Daily T, Daylight Hours)

There is relatively small difference in the temperature data



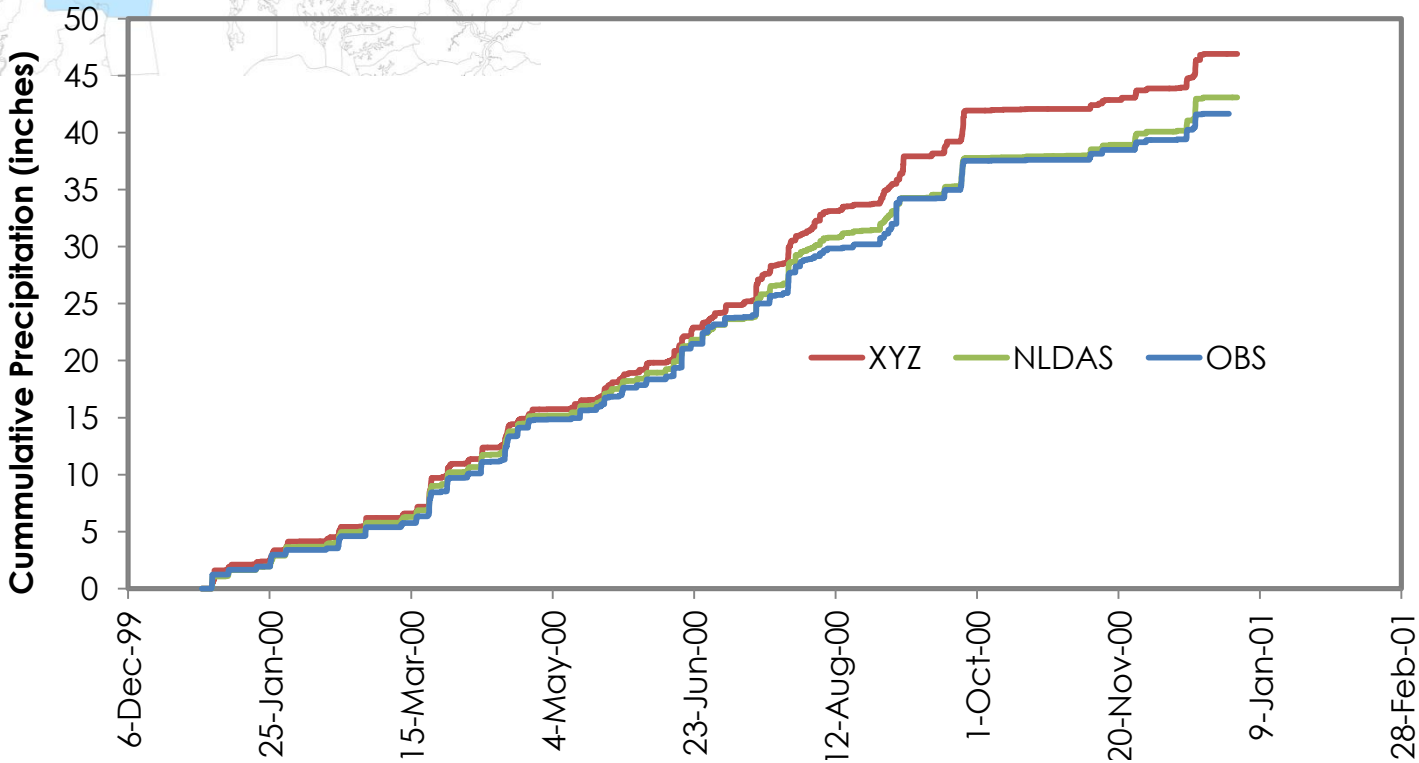


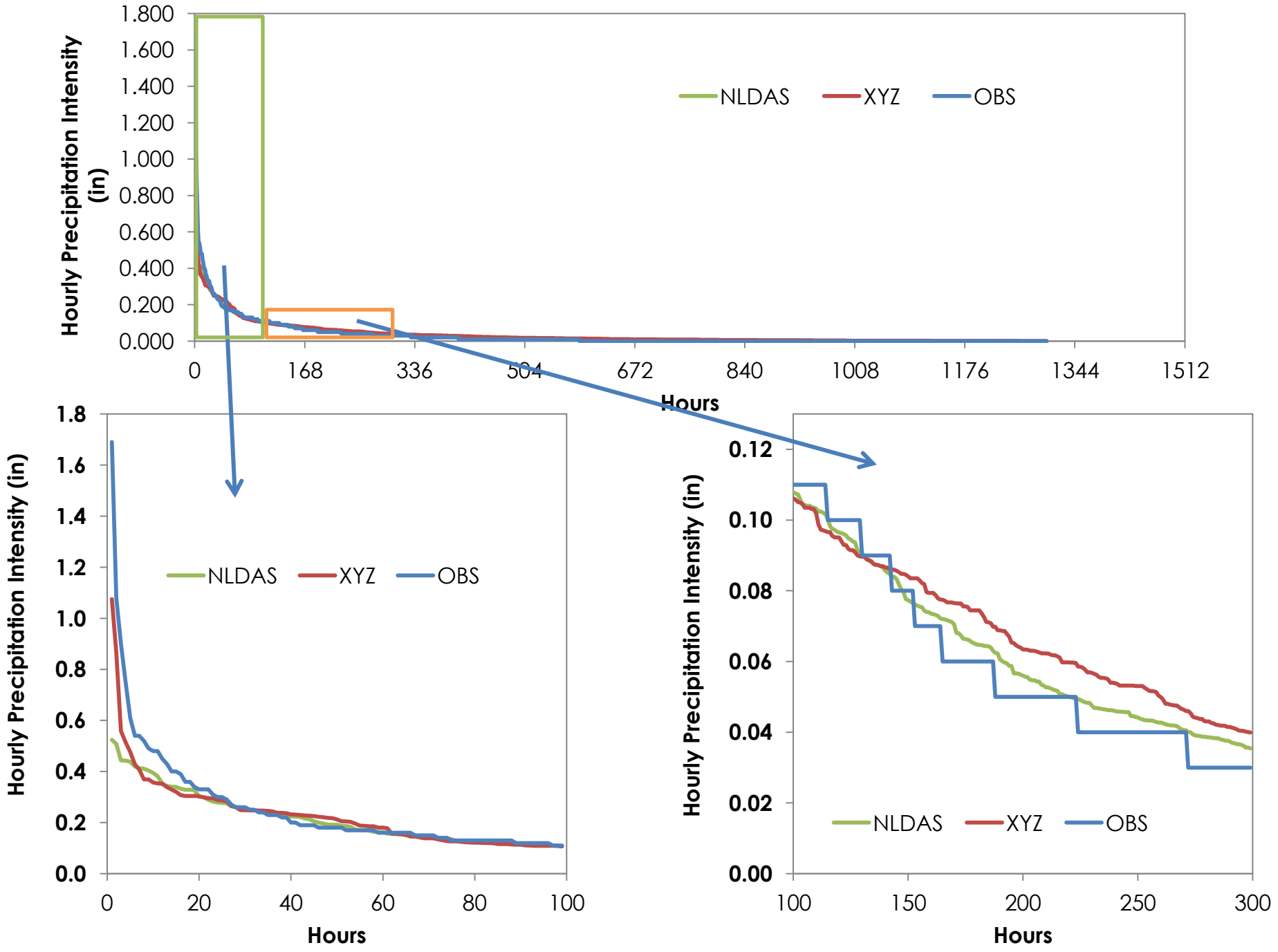
Now: Number of daylight hours were determined using NLDAS2 Solar radiation data



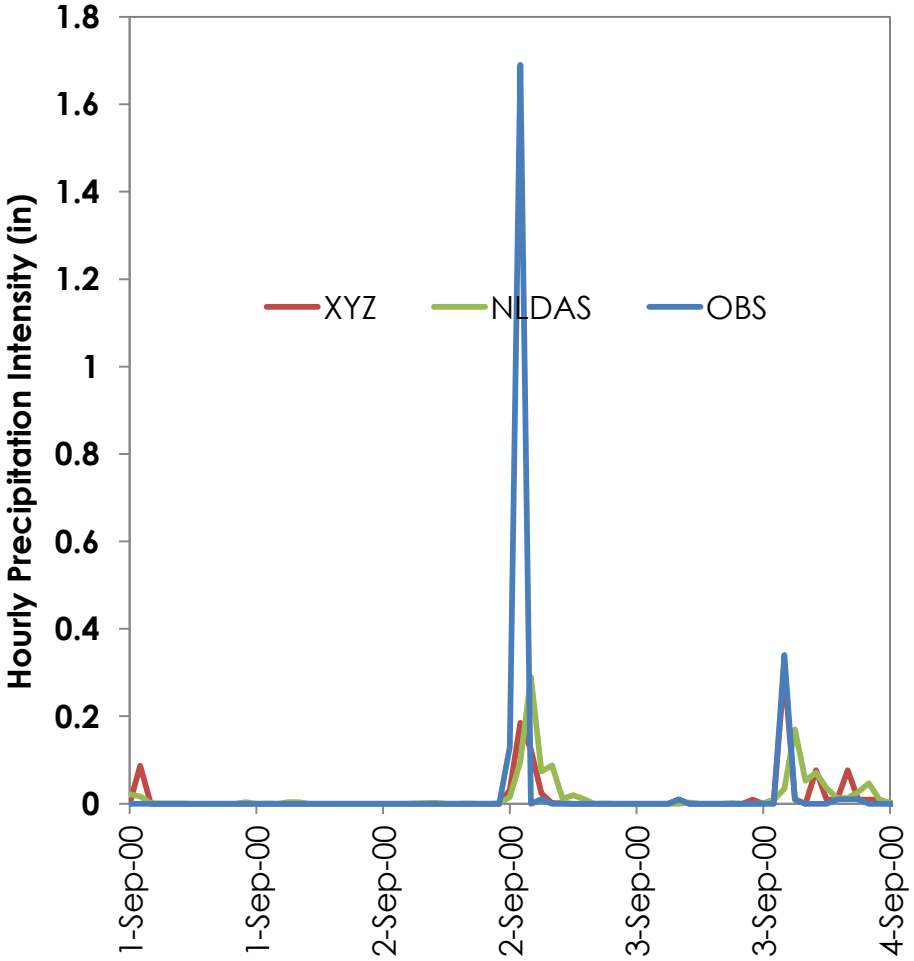
CB Land Segment
A24003 (XYZ, NLDAS)

COOPID: 180465
Baltimore Wash Inter.
(OBS)

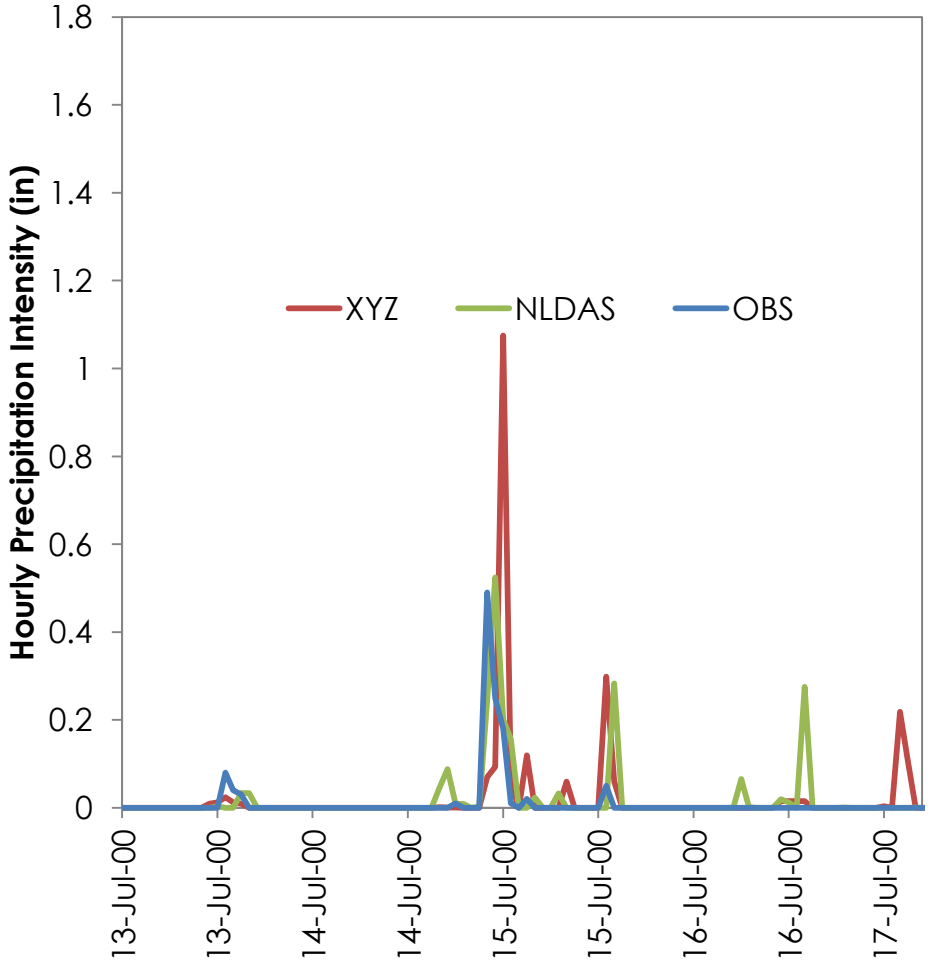



Hourly Precipitation Intensity (in)
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
NLDAS
XYZ
OBS
0
168
336
504
672
840
1008
1176
1344
1512
Hours
Hourly Precipitation Intensity (in)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
NLDAS
XYZ
OBS
0
20
40
60
80
100
Hours
Hourly Precipitation Intensity (in)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
NLDAS
XYZ
OBS
100
150
200
250
300
Hours

GAUGE STATION HAS THE ANNUAL MAX ON SEPT 02 2000



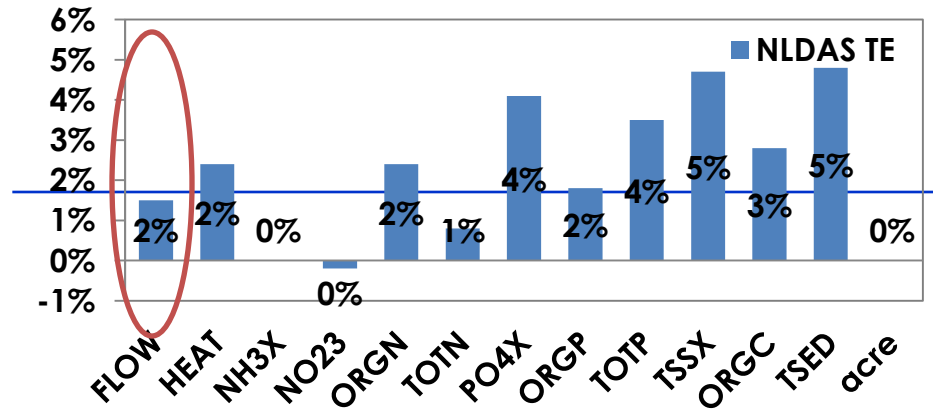
XYZ-METHOD HAS THE ANNUAL MAX ON JUL 05 2000

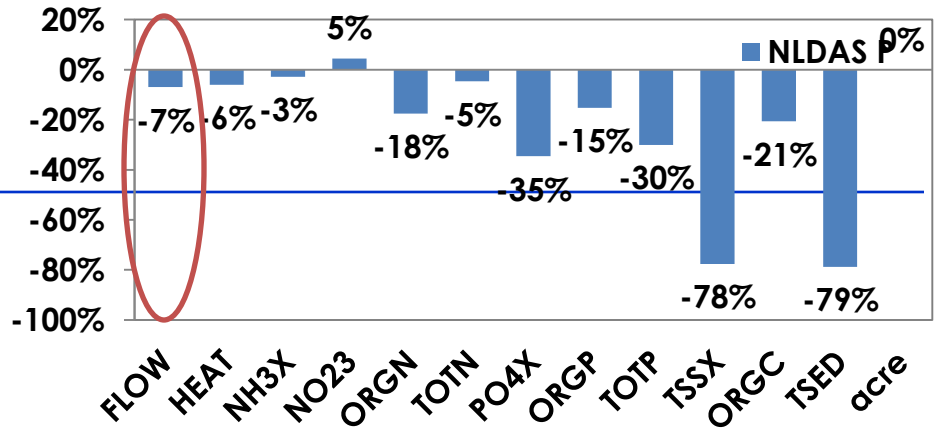


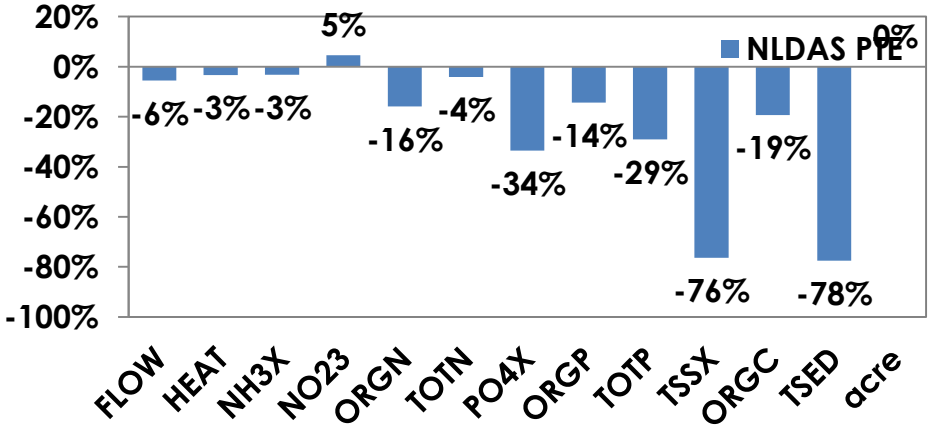
North American Land Data Assimilation Systems (NLDAS)

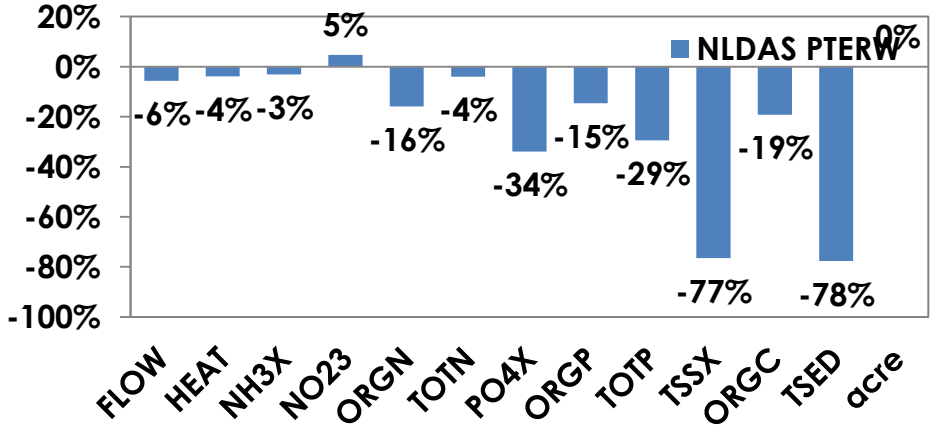
Simulation	Description
P532 Calib	Current generation using XYZ based space-time interpolation
NLDAS TE	P532 with NLDAS-2 **Temperature** & **PET *** estimates using Hamon Method
NLDAS P	P532 with NLDAS-2 Climate Reanalysis **Precipitation**
NLDAS PTE	P532 with NLDAS-2 **Precipitation**, **Temperature**, Pot. **Evapotranspiration ***
NLDAS PTERW	P532 with NLDAS-2 PTE + **Solar Radiation**, **Wind Speed**
NLDAS PTERWD	P532 with NLDAS-2 PTERW + **Dew Point Temperature ***
NLDAS PTERWDC	P532 with NLDAS-2 PTERWD + **Cloud Cover ***

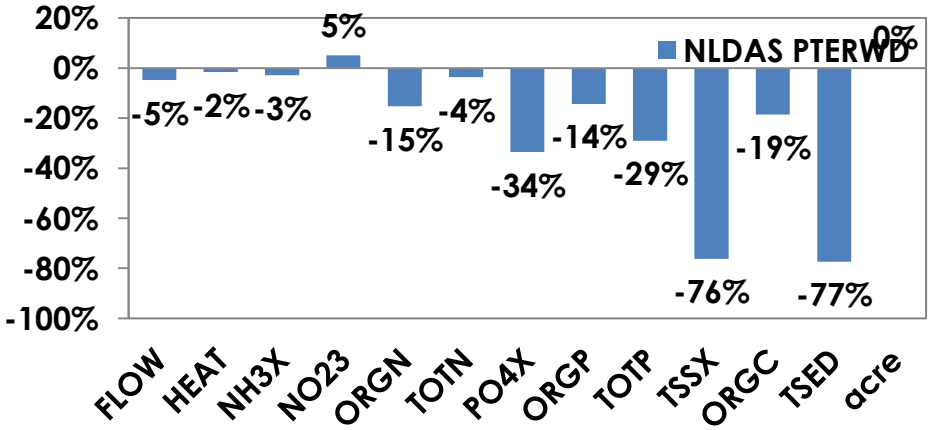
* Derived data products computed using appropriate equations

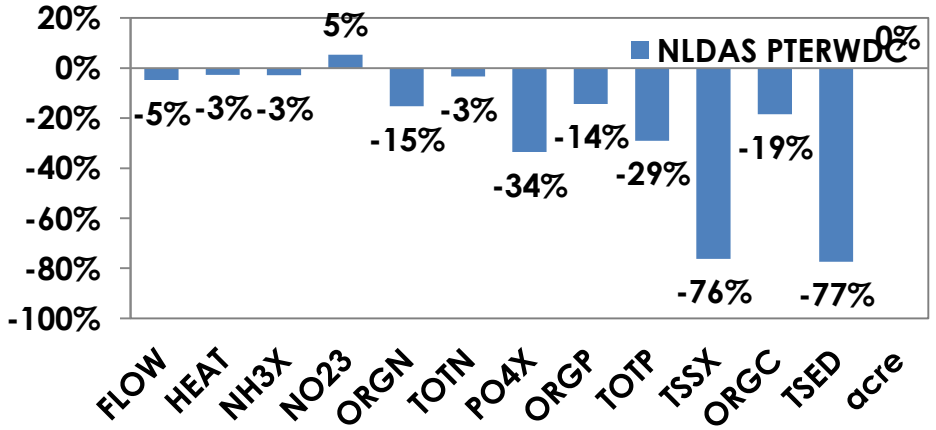

NLDAS TE
6%
5%
4%
3%
2%
1%
0%
-1%
2%
2%
0%
0%
2%
1%
4%
2%
4%
5%
3%
5%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre


NLDAS P
20%
0%
-20%
-40%
-60%
-80%
-100%
-7%
-6%
-3%
5%
-18%
-5%
-35%
-15%
-30%
-78%
-21%
-79%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre

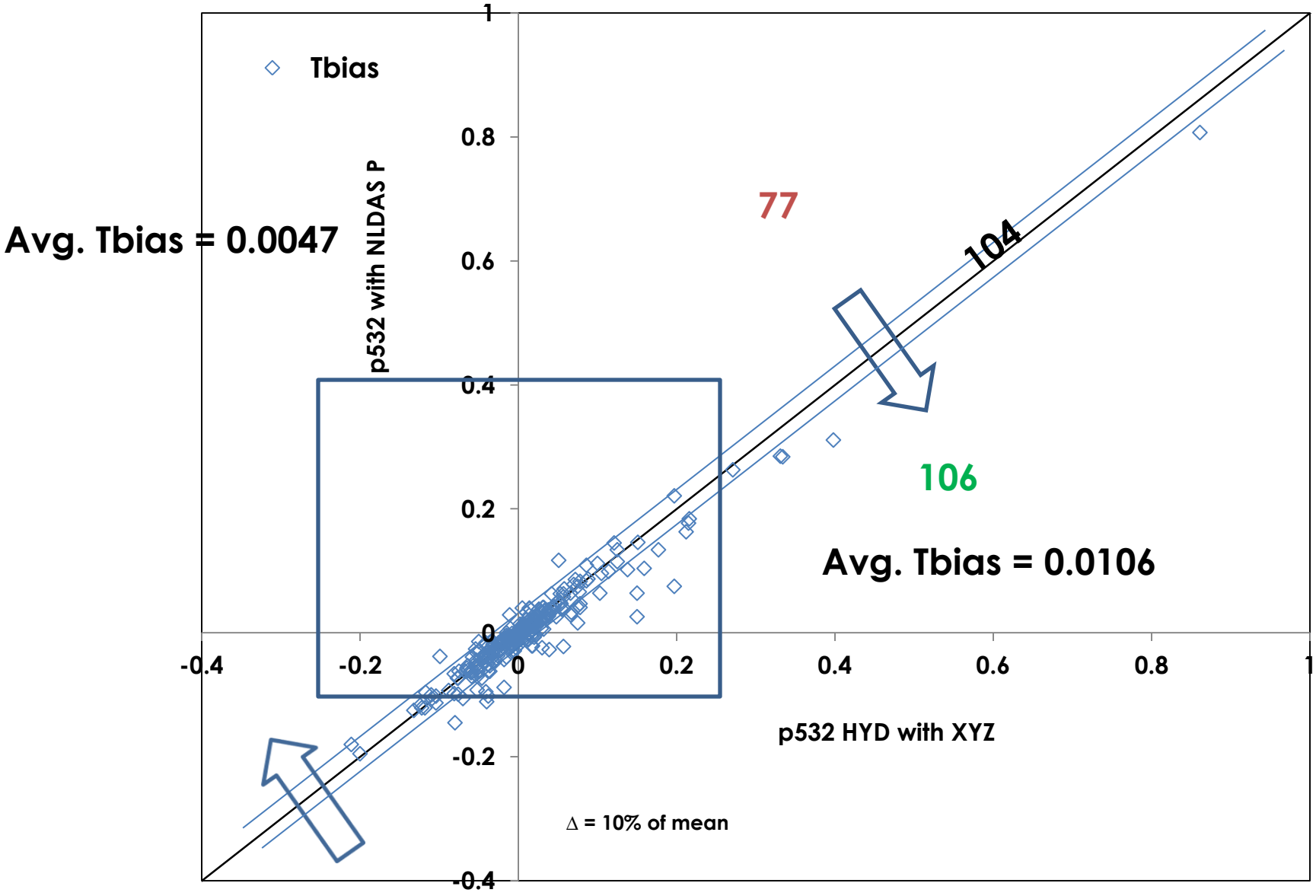

NLDAS PTE
20%
0%
-20%
-40%
-60%
-80%
-100%
-6%
-3%
-3%
5%
-16%
-4%
-34%
-14%
-29%
-76%
-19%
-78%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre


NLDAS PTERW
20%
0%
-20%
-40%
-60%
-80%
-100%
-6%
-4%
-3%
5%
-16%
-4%
-34%
-15%
-29%
-77%
-19%
-78%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre

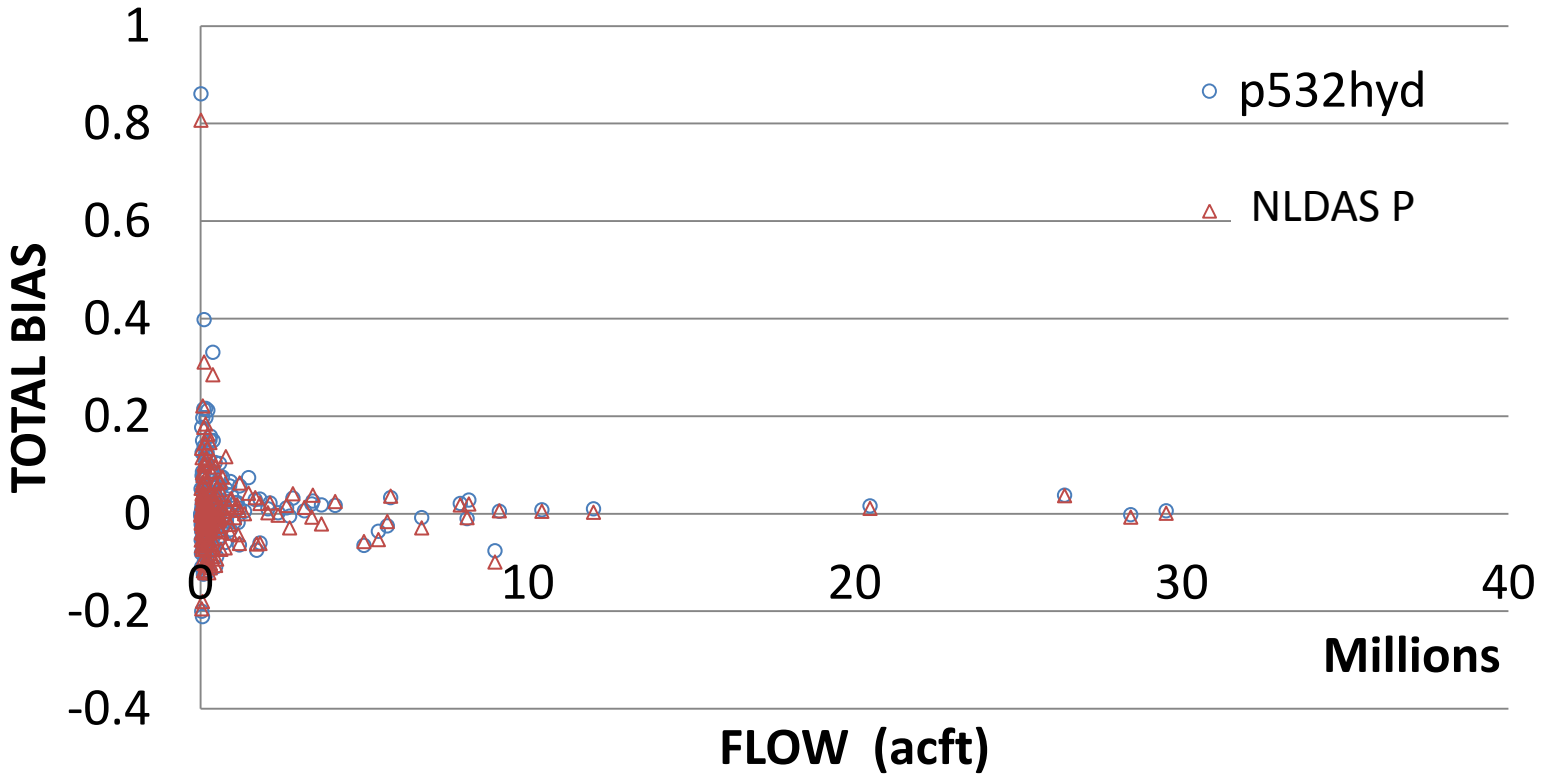

NLDAS PTERWD
20%
0%
-20%
-40%
-60%
-80%
-100%
-5%
-2%
-3%
5%
-15%
-4%
-34%
-14%
-29%
-76%
-19%
-77%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre


NLDAS PTERWDC
20%
0%
-20%
-40%
-60%
-80%
-100%
-5%
-3%
-3%
5%
-15%
-3%
-34%
-14%
-29%
-76%
-19%
-77%
0%
FLOW
HEAT
NH3X
NO23
ORGN
TOTN
PO4X
ORGP
TOTP
TSSX
ORGC
TSED
acre

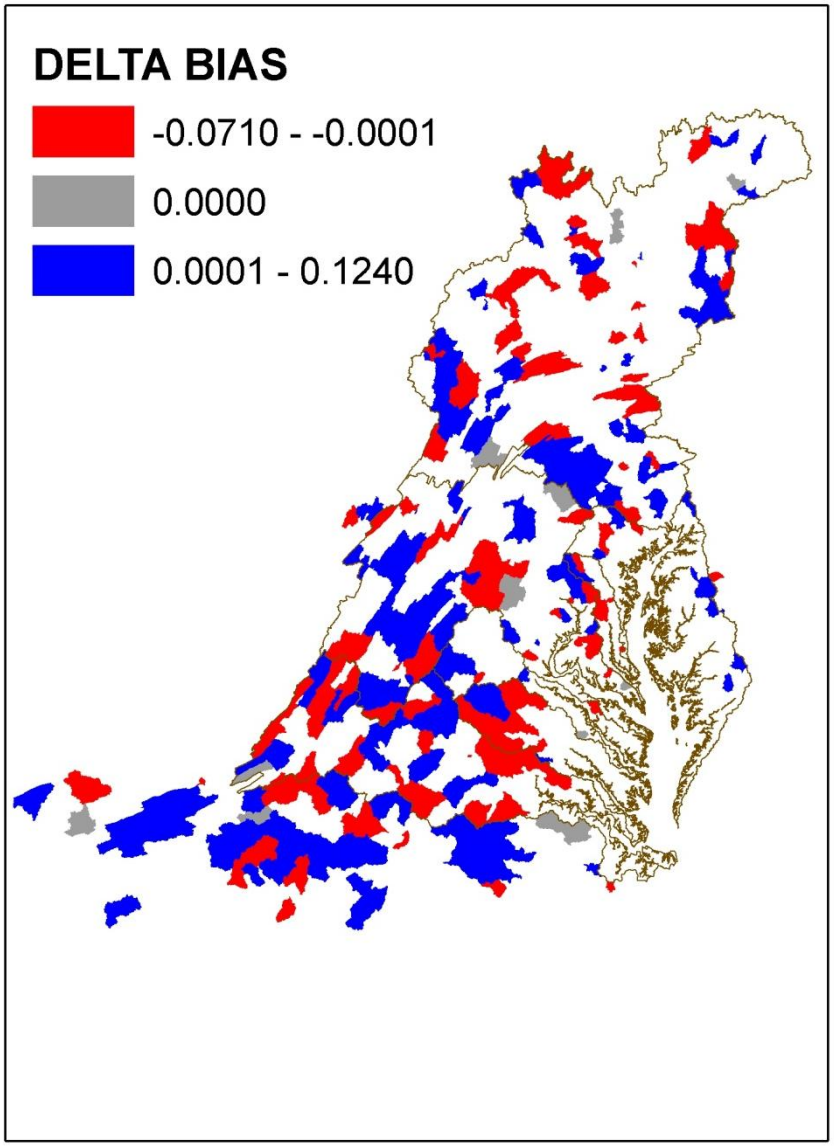
Calibration Run using NLDAS

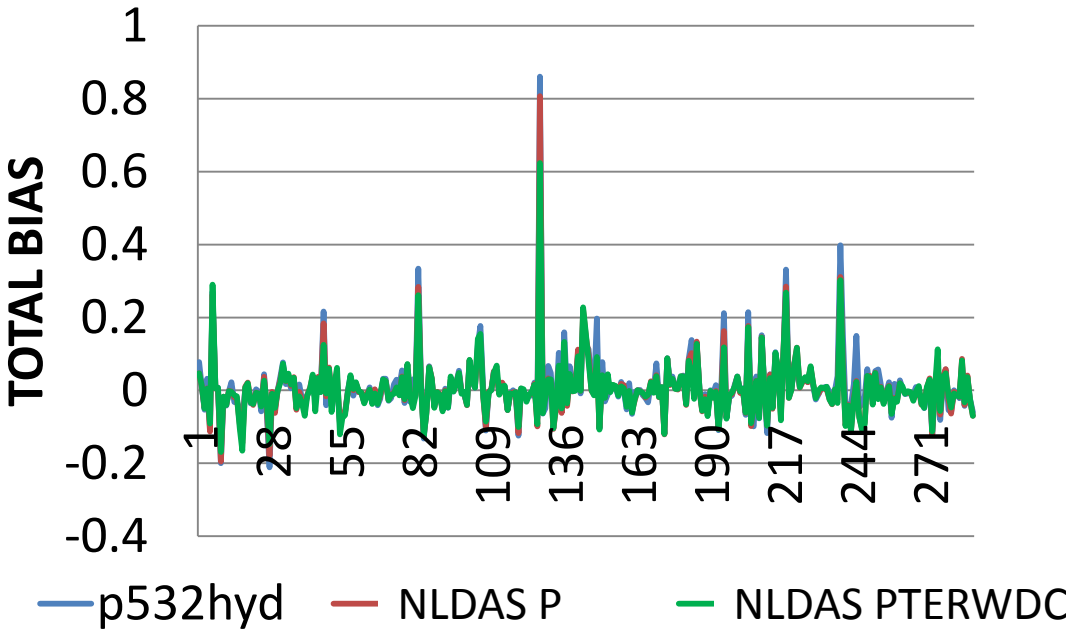


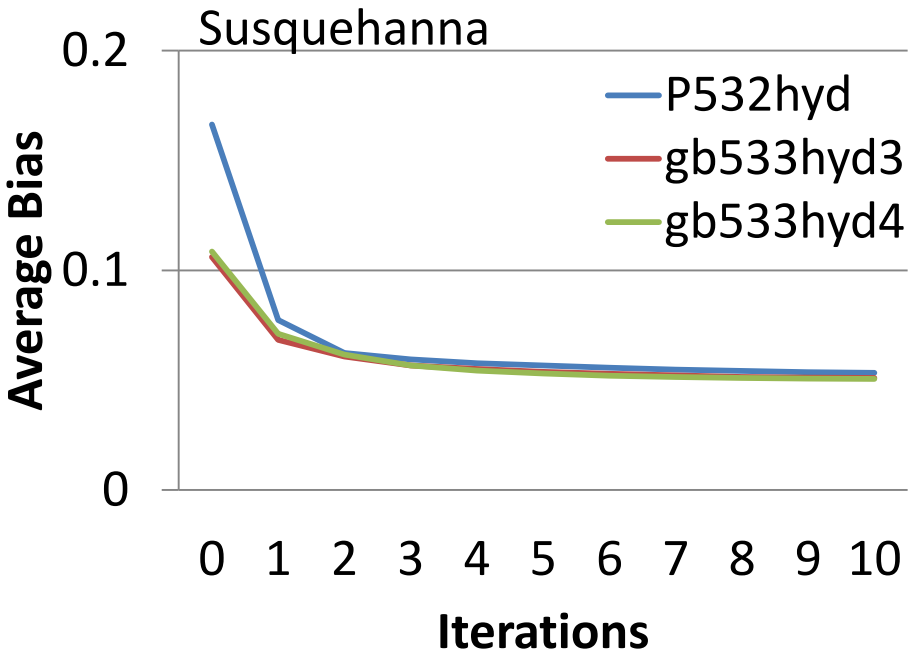
Calibration Run using NLDAS

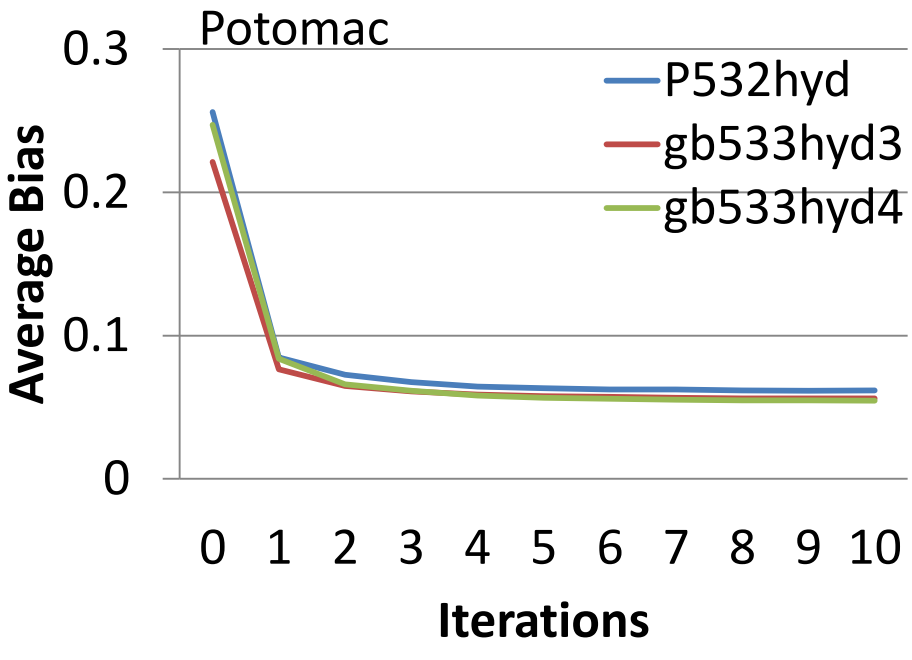


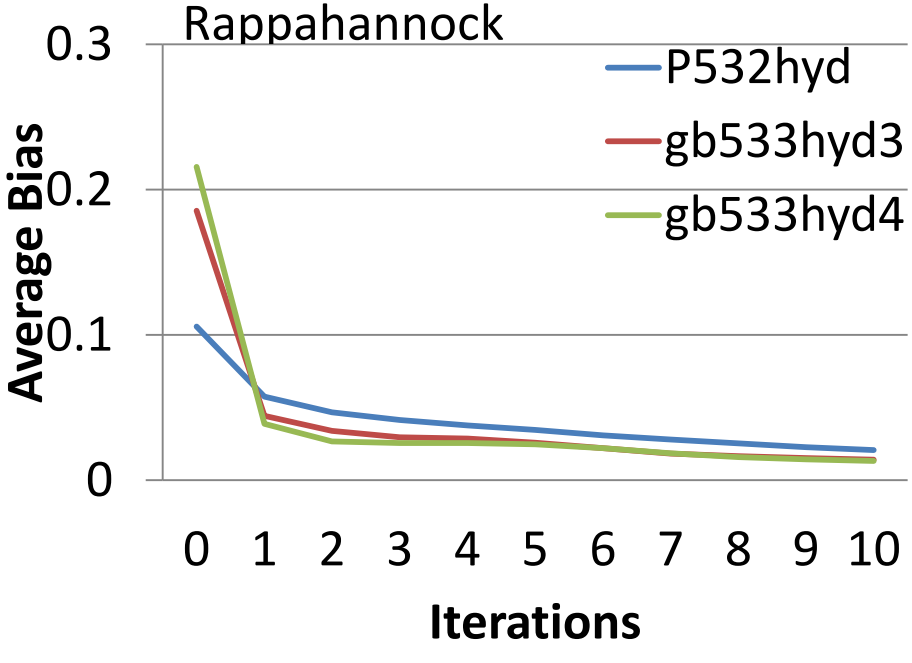
Calibration Run using NLDAS

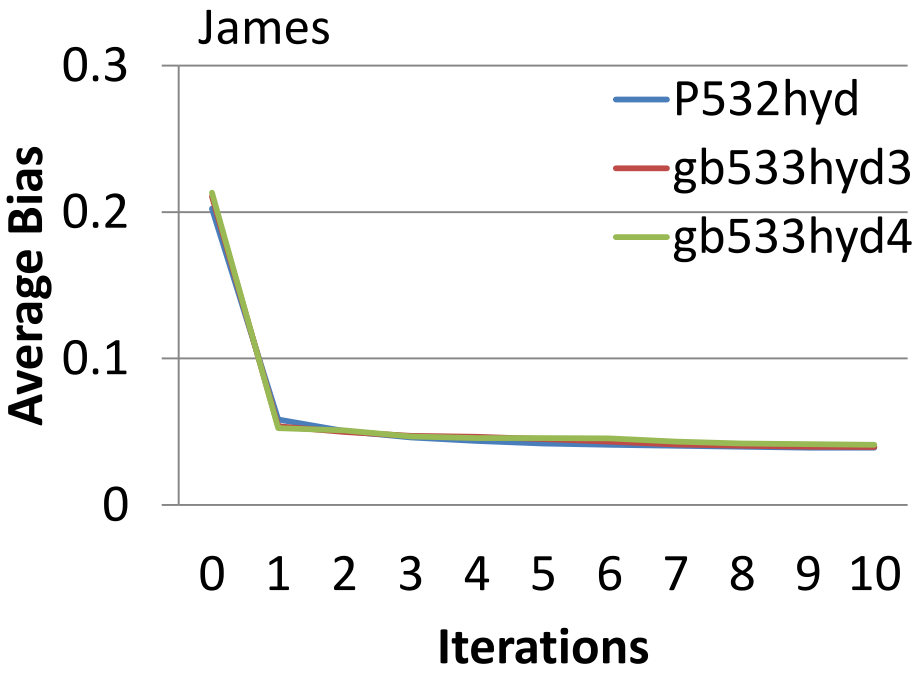




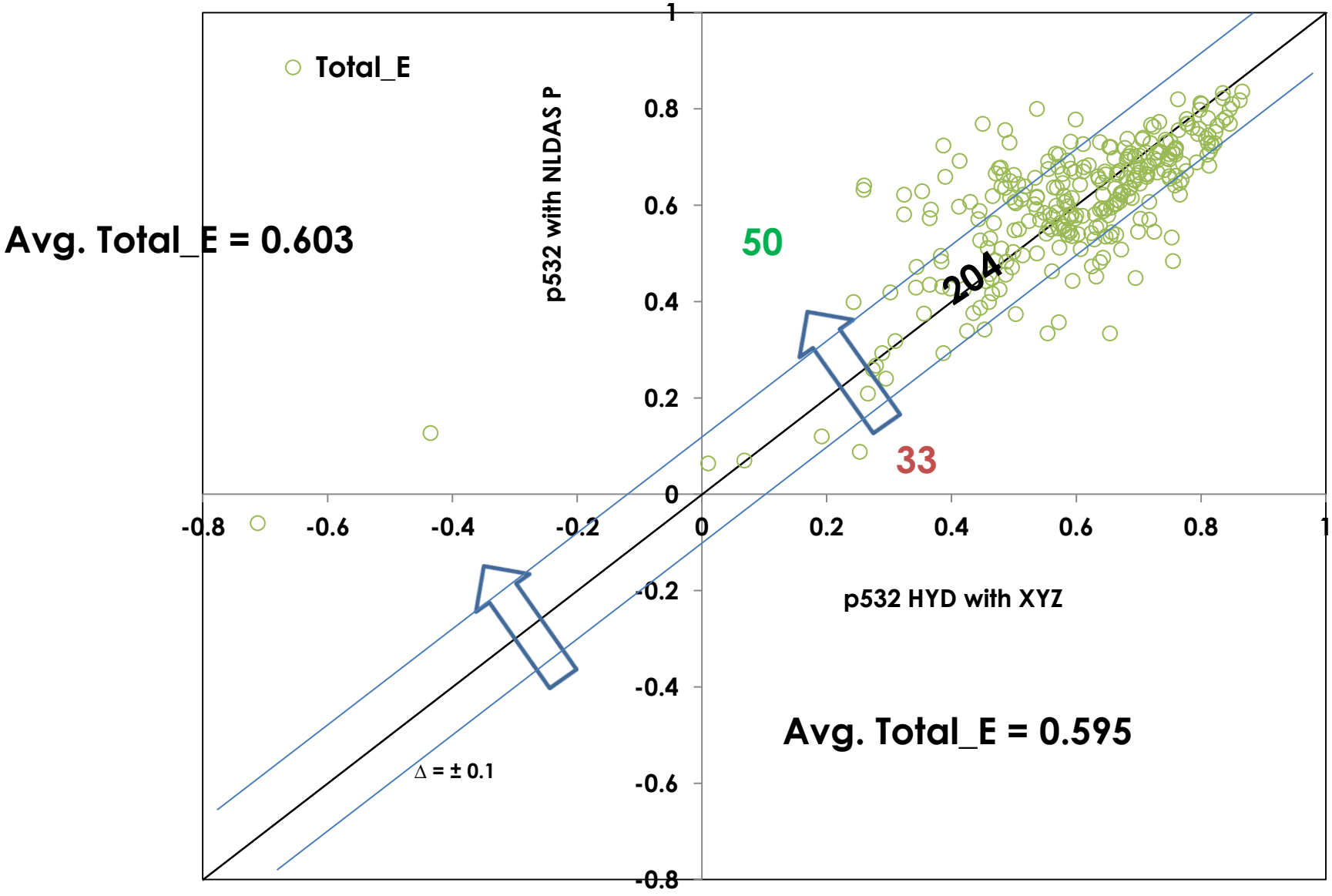

Susquehanna
Average Bias
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4


Potomac
Average Bias
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4

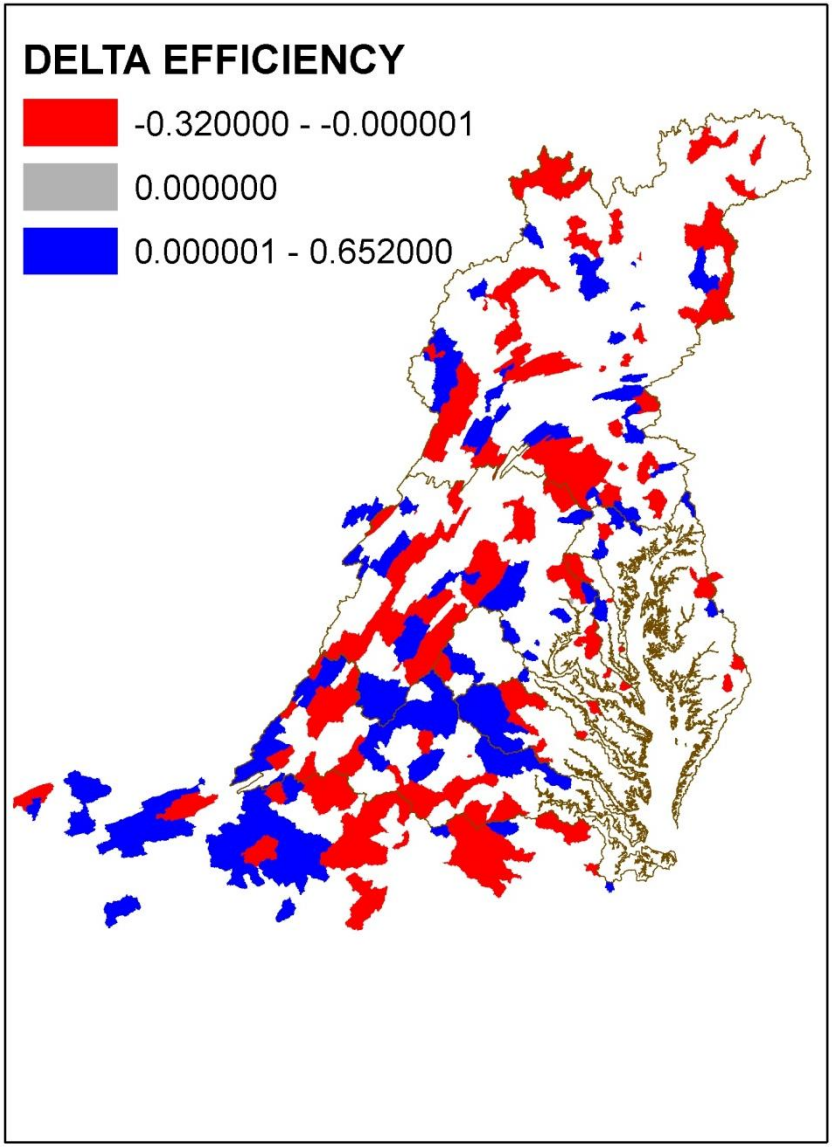

Rappahannock
Average Bias
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4

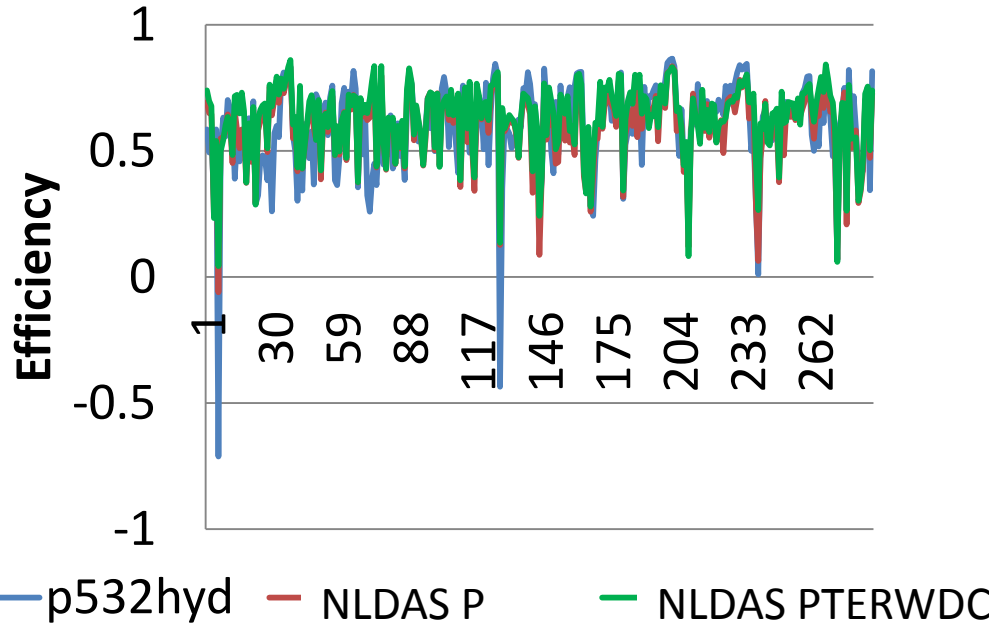

James
Average Bias
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4

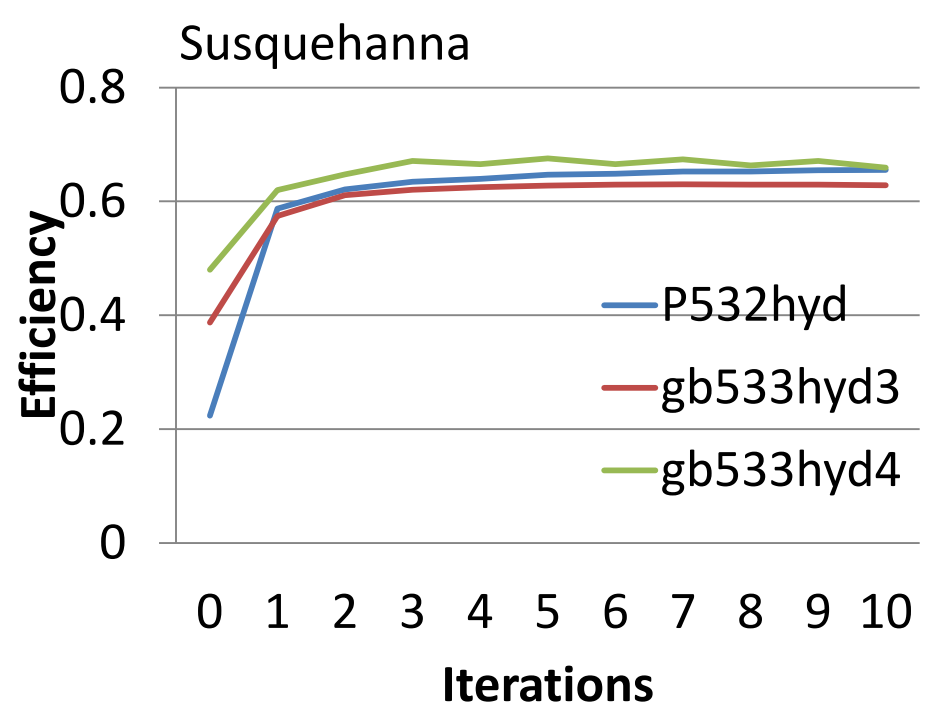
Calibration Run using NLDAS

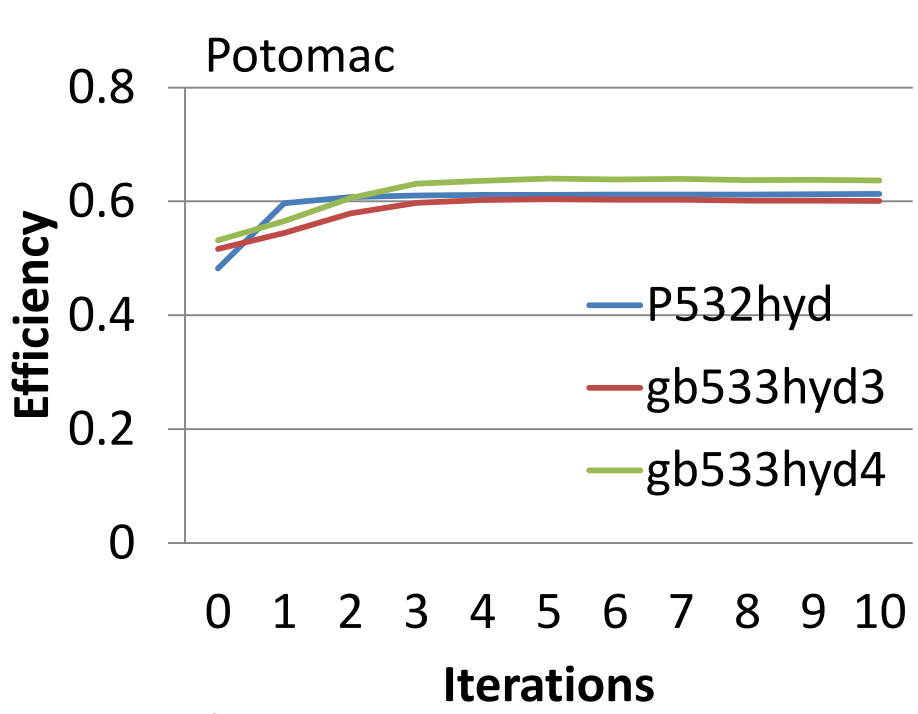


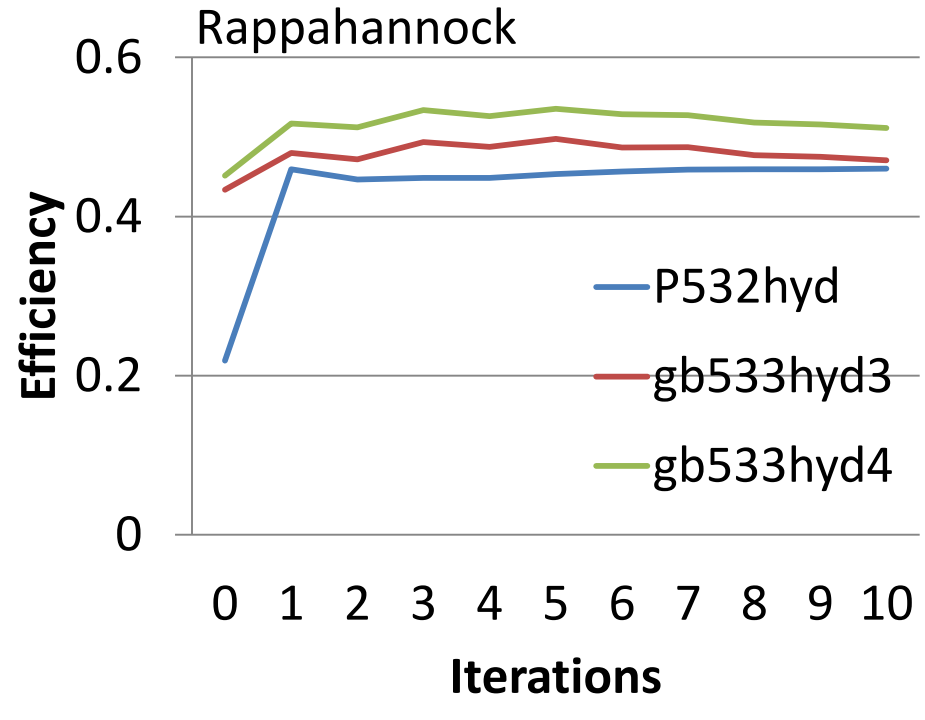
Calibration Run using NLDAS

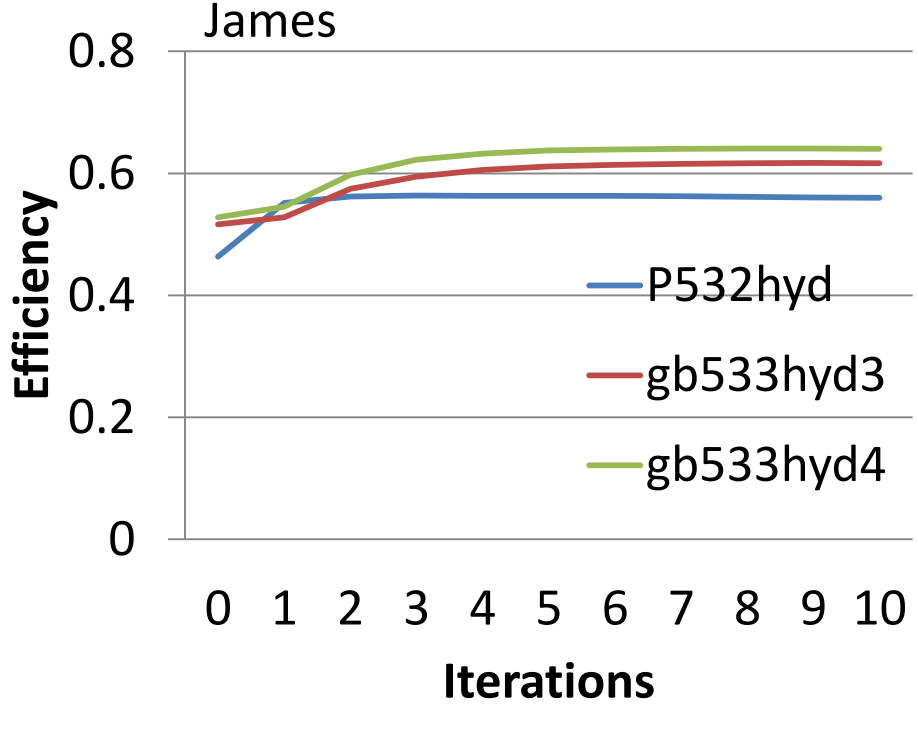





Susquehanna
Efficiency
0.8
0.6
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4


Potomac
Efficiency
0.8
0.6
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4


Rappahannock
Efficiency
0.6
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4


James
Efficiency
0.8
0.6
0.4
0.2
0
0 1 2 3 4 5 6 7 8 9 10
Iterations
P532hyd
gb533hyd3
gb533hyd4

Conclusions

- NLDAS offers improved precipitation and meteorological assimilation data products

- Model calibration using NLDAS data improved the model accuracy.
    - Model calibration using NLDAS data resulted in lower average bias and improved the efficiency across the entire watershed.

- NLDAS offers streamlined access to long-term dataset that offers potential to expand the calibration period and model output (required for ongoing shallow water studies)