



State Water Resources Control Board

**State Water Resources Control Board**

Division of Water Rights  
1001 I Street, 14<sup>th</sup> Floor  
Sacramento, CA 95814

**Los Angeles Regional Water Quality Control Board**

TMDL and Nonpoint Source Unit  
320 W. 4<sup>th</sup> Street, #200  
Los Angeles, CA 90013

**DRAFT MODEL DOCUMENTATION REPORT FOR THE GROUNDWATER  
-SURFACE WATER MODEL OF THE VENTURA RIVER WATERSHED:  
APPENDICES B, D, E, & F**

*Prepared by*

**Geosyntec**  
consultants

engineers | scientists | innovators

924 Anacapa Street, Suite 4a  
Santa Barbara, CA 93101  
Project Number: LA0421



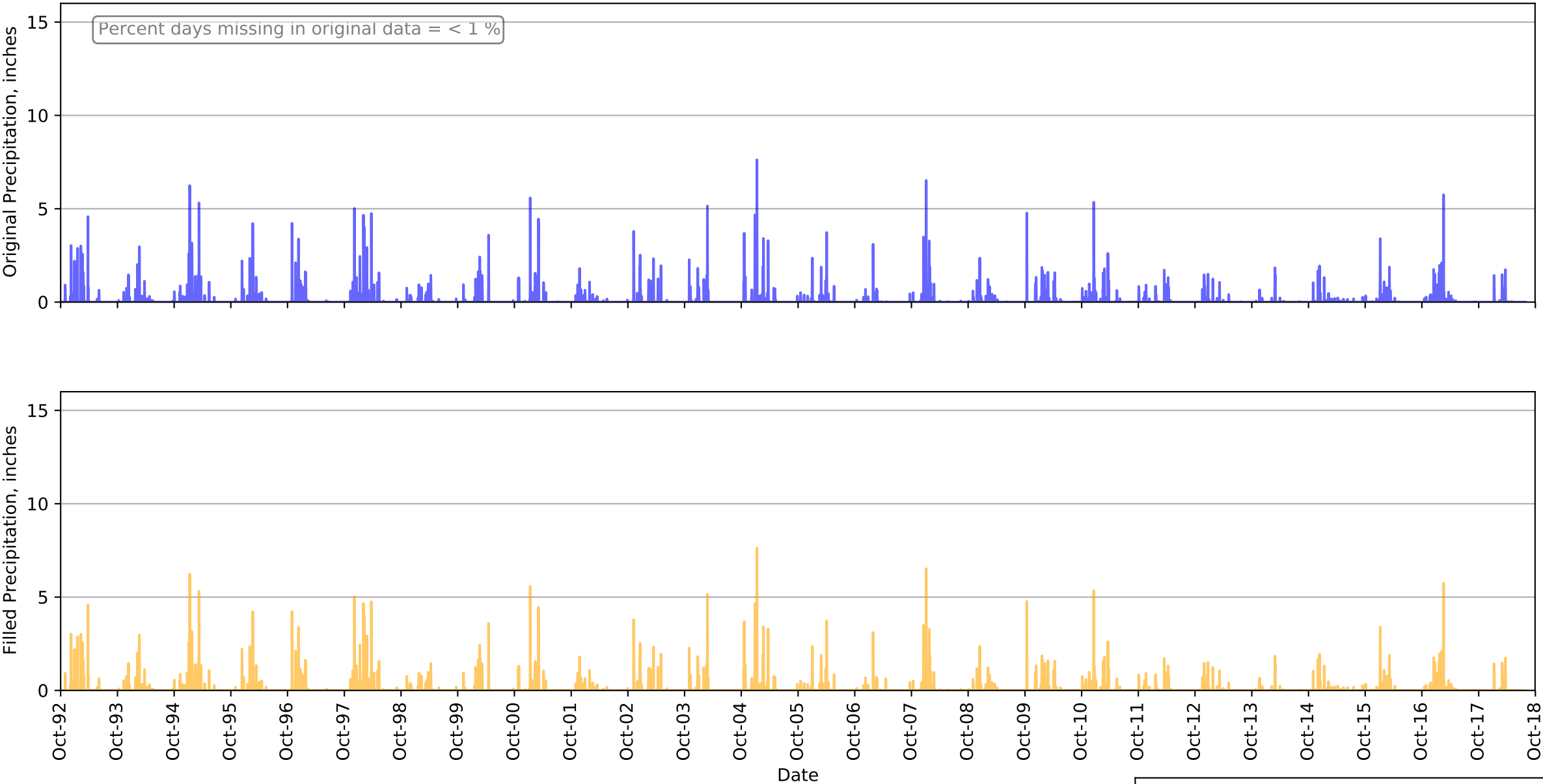
**DBS&A**  
Daniel B. Stephens & Associates, Inc.

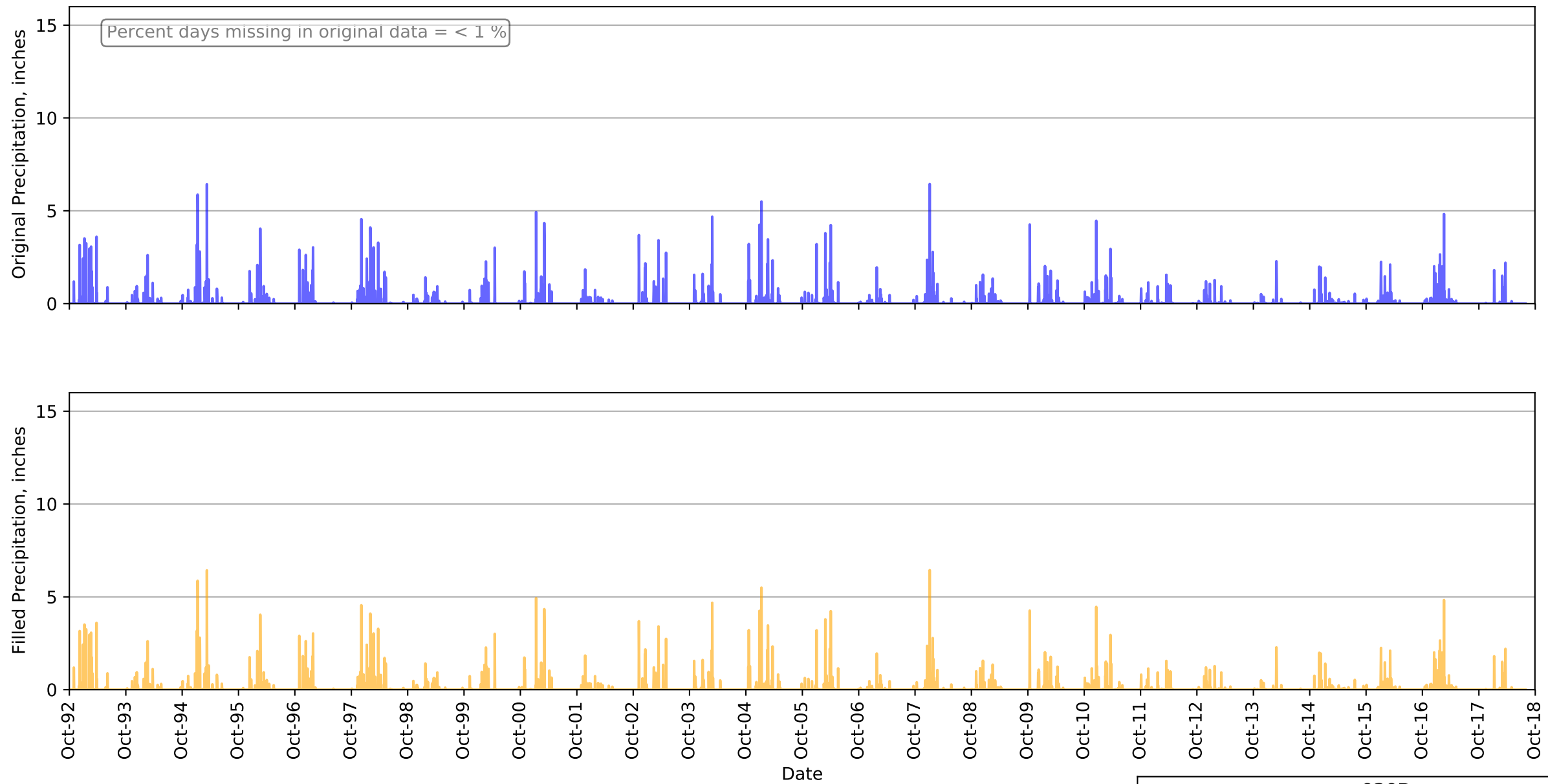
3916 State Street, Suite A  
Santa Barbara, CA 93105

December 2021

## **APPENDIX B: PRECIPITATION DATA**

Appendix B presents measured and patched precipitation plots for 37 rainfall stations in the Ventura River Watershed, and nearby areas, from October 1992 to October 2018. For each rainfall station, two plots are shown. The upper frames of these plots show the raw data for each rain gage station, including data gaps, while the lower frames show the filled data that will be used as input to the model. The gaps in the daily data at each rain gage were filled using data from the nearest available rain gage that was then scaled based upon comparison of the overlapping records between the rain gage pairs. The percent of days missing in the measured precipitation data are shown. The locations of rainfall stations are shown in Figure 3.4. The precipitation datasets are from the Ventura County Watershed Protection District, and the National Oceanic and Atmospheric Administration Global Historical Climatology Network. If you need accessibility assistance with the information presented in this appendix, please contact the State Water Board at [instreamflows@waterboards.ca.gov](mailto:instreamflows@waterboards.ca.gov).





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 Ventura River Watershed, Ventura County, CA

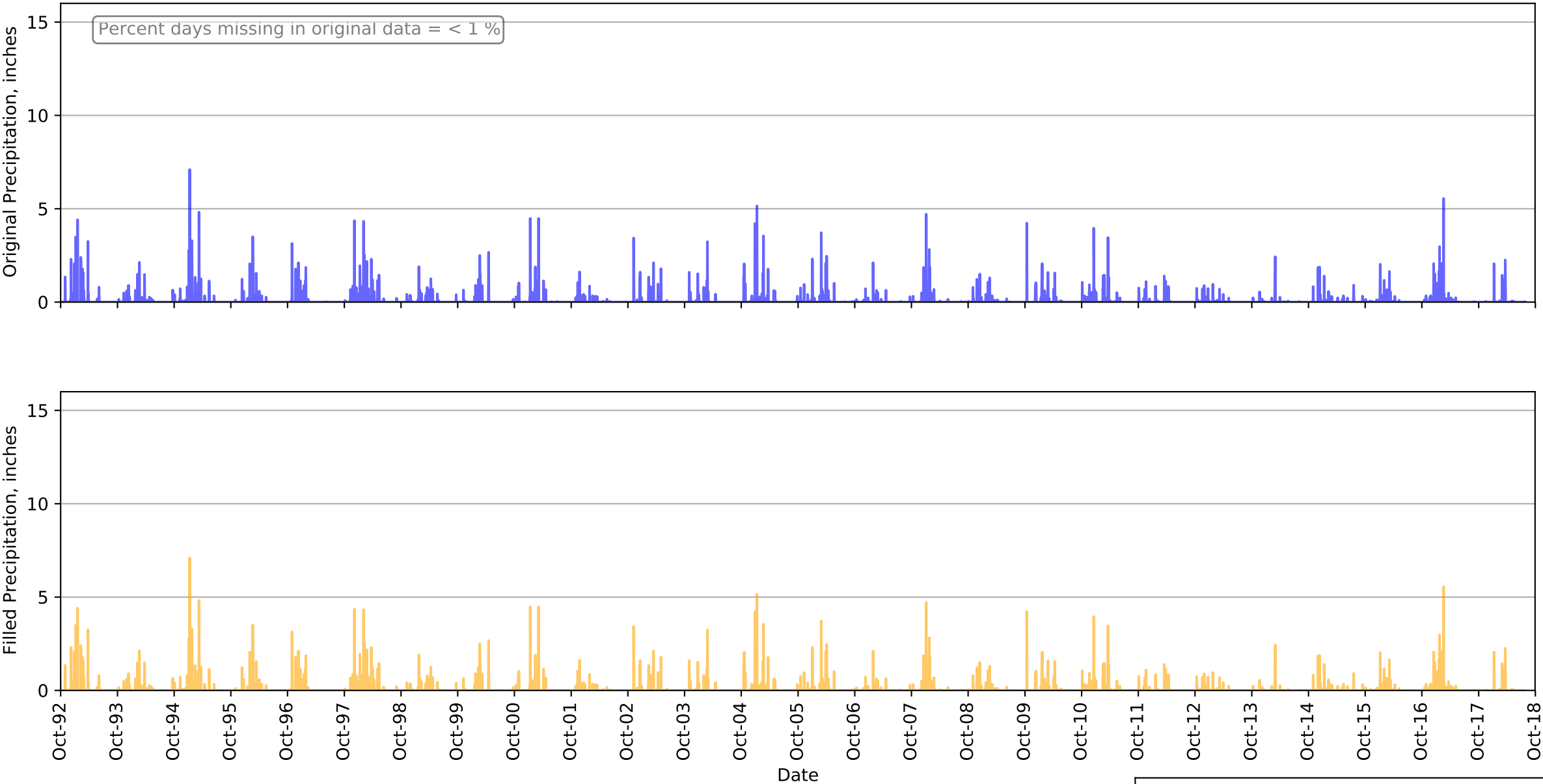
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 consultants

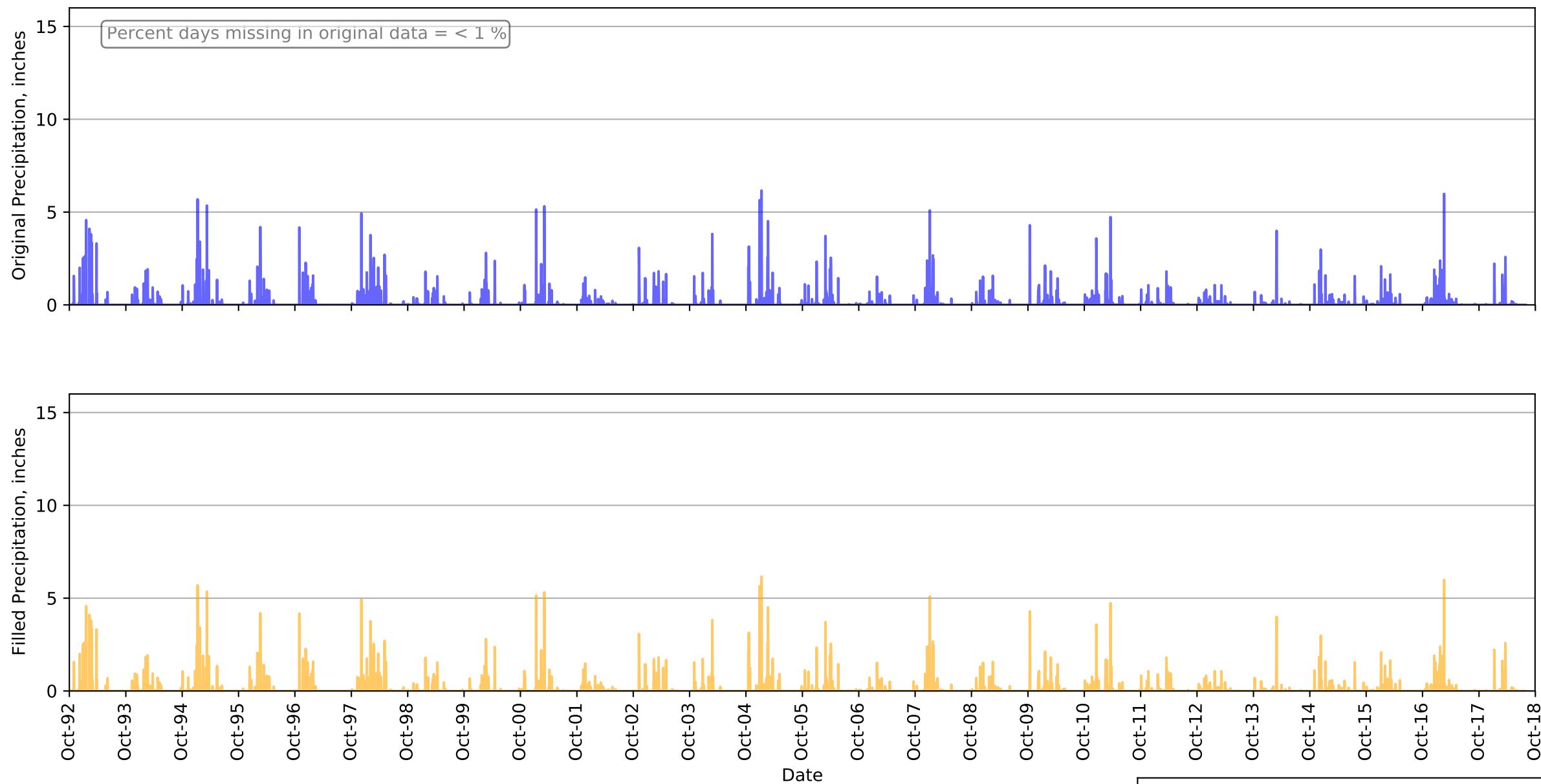
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**Figure**  
**B.2**







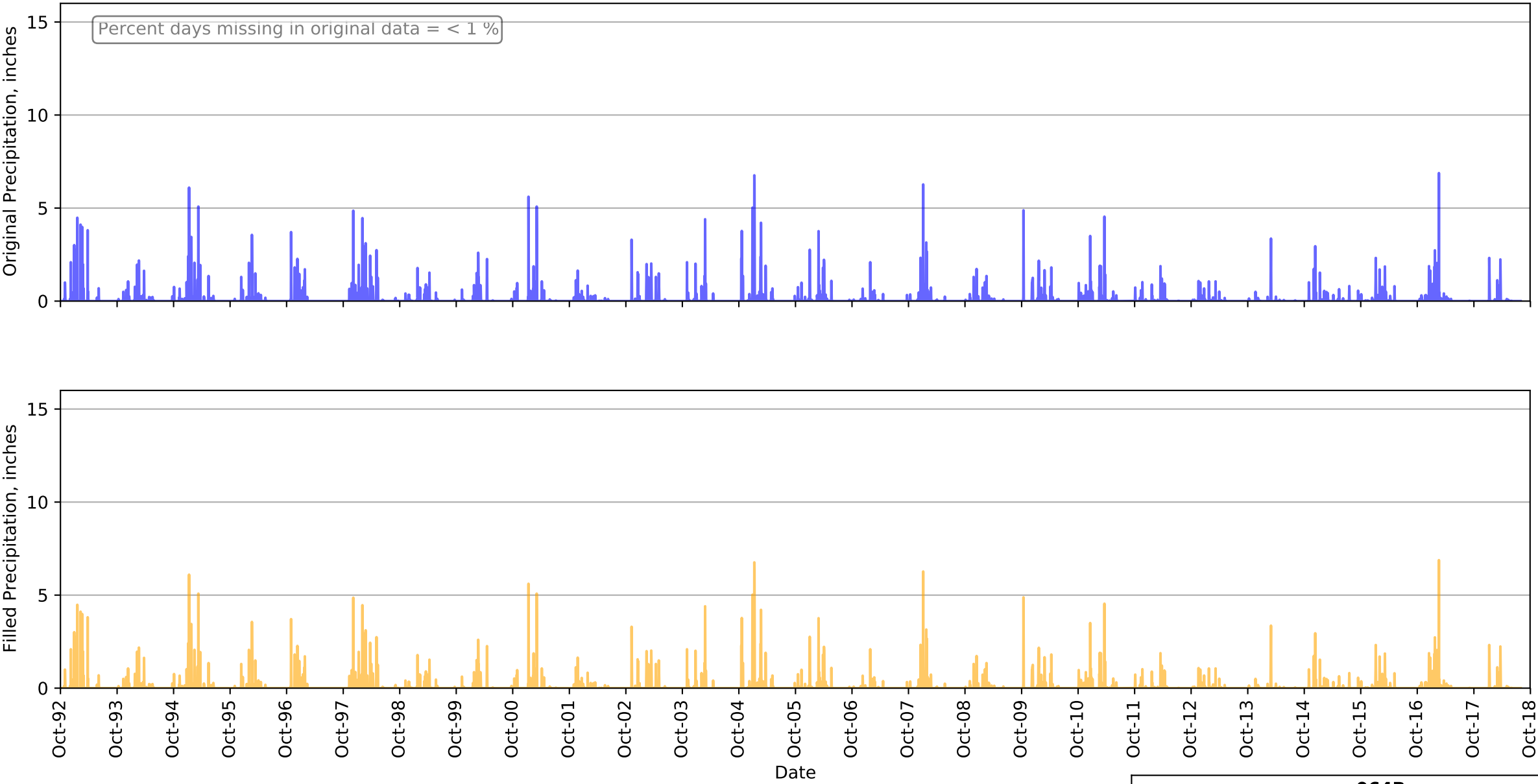
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**Ojai Thatcher School (VCWPD)**  
Ventura River Watershed, Ventura County, CA


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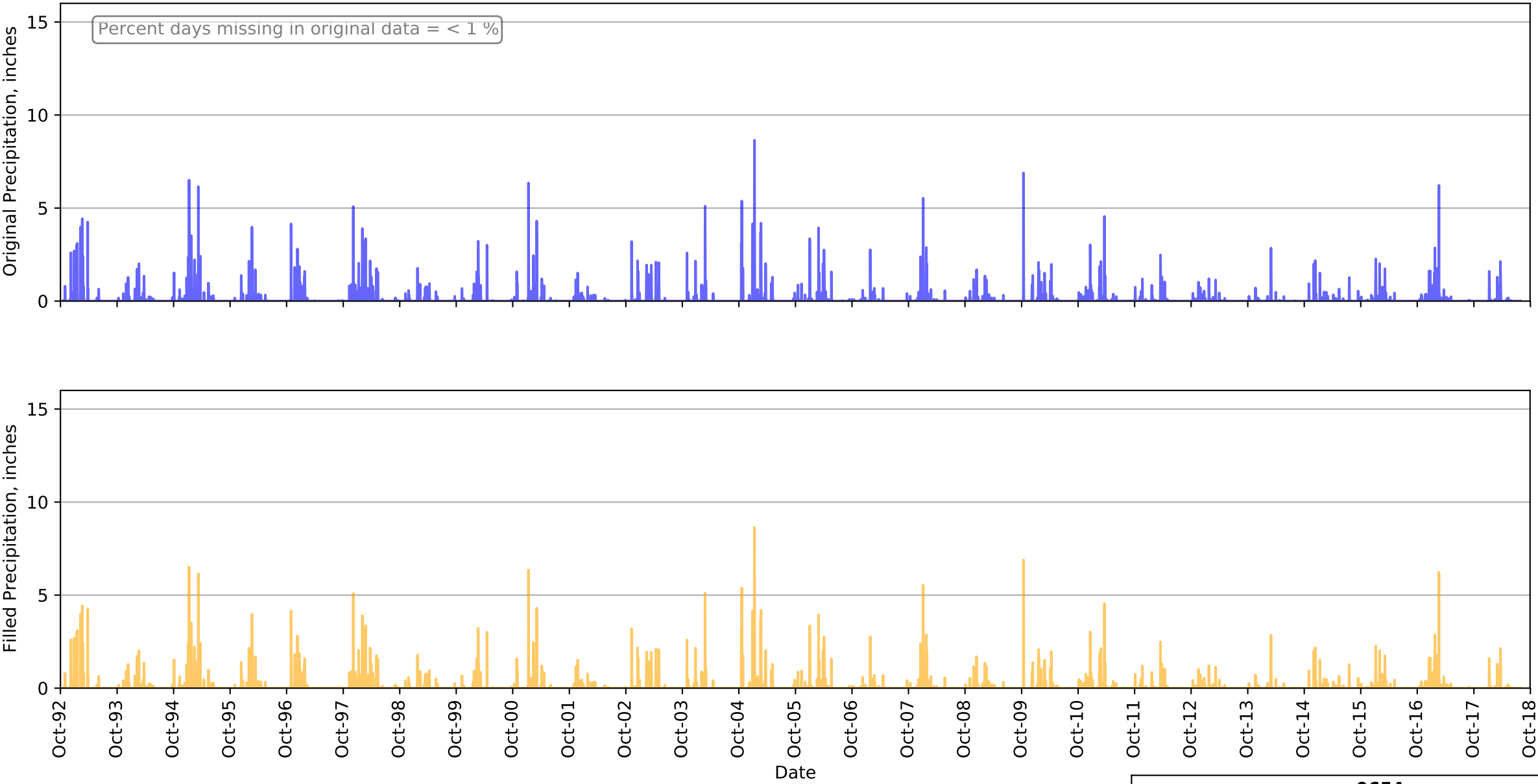
Santa Barbara

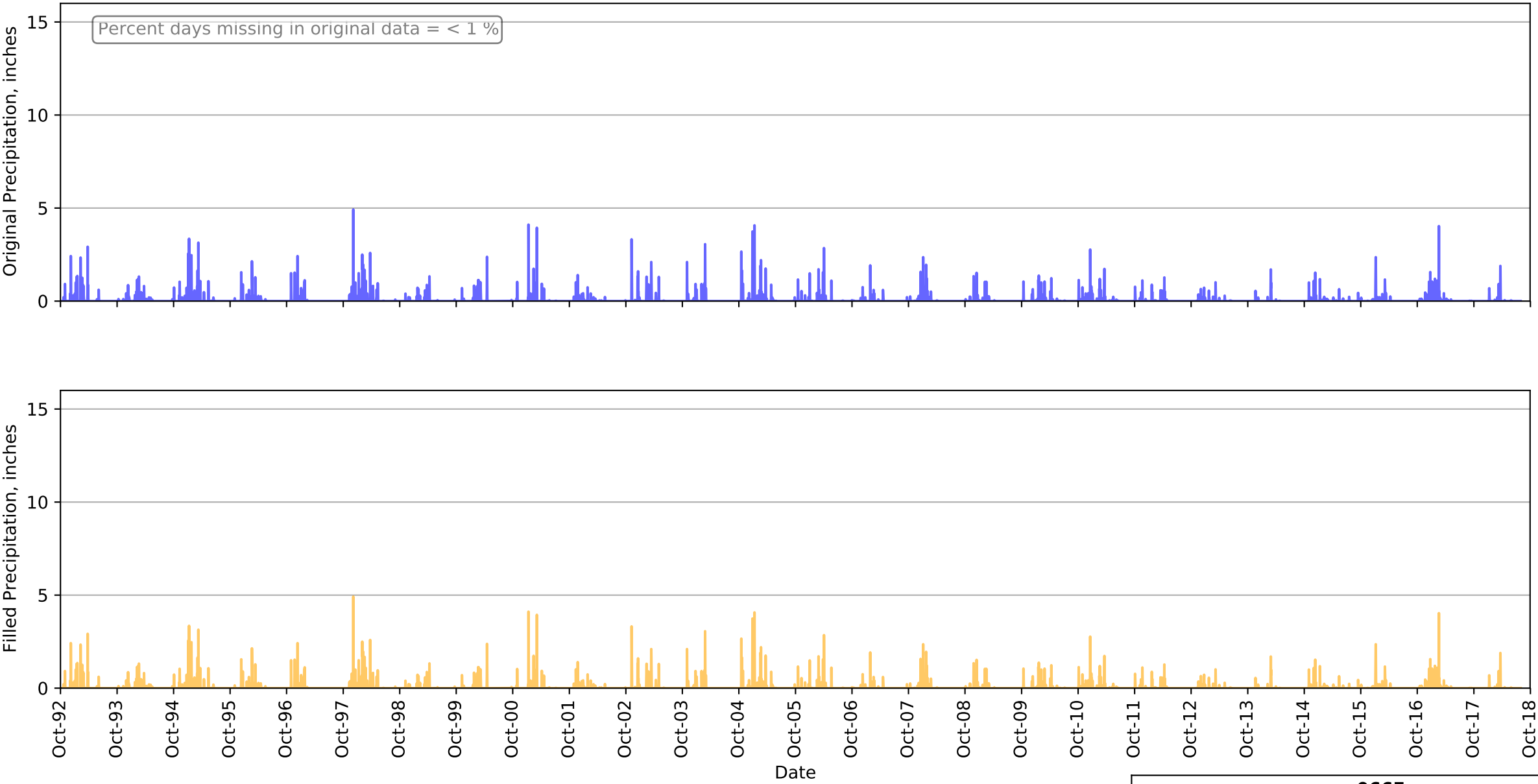
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**Figure**  
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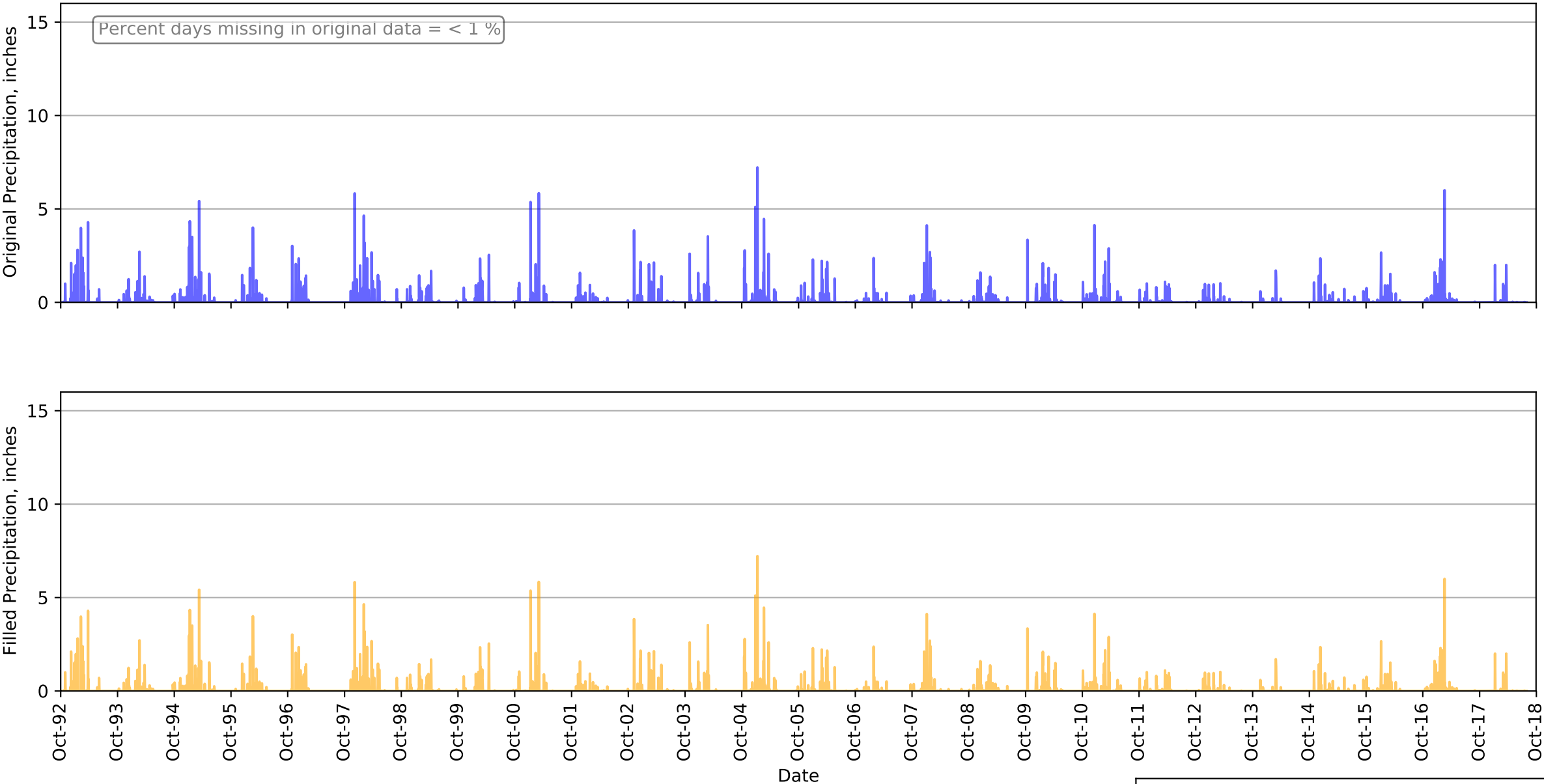


<b>064B</b> <b>Upper Ojai-Happy Valley (VCWPD)</b> Ventura River Watershed, Ventura County, CA	
	
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<b>Figure B.5</b>	

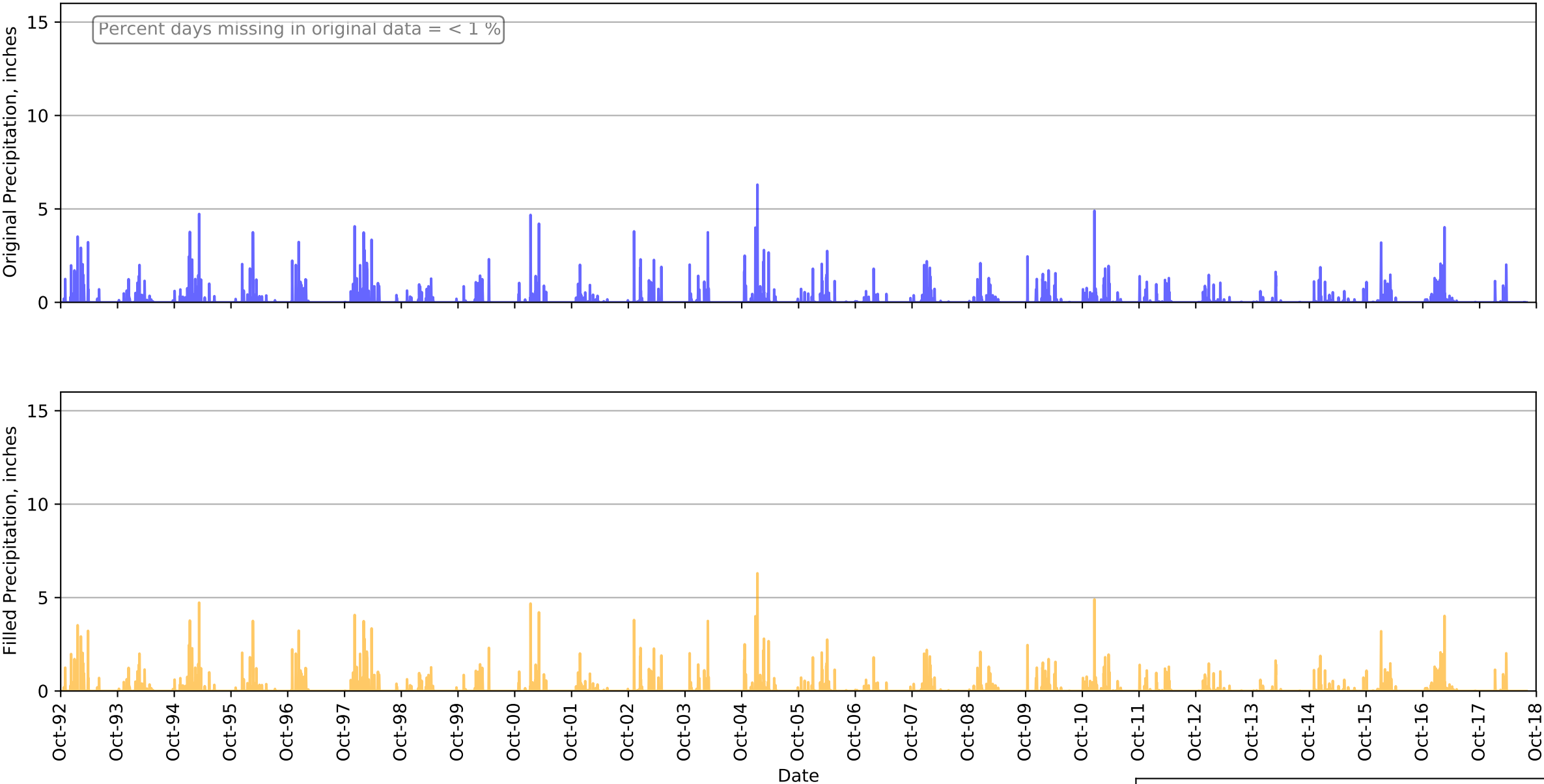


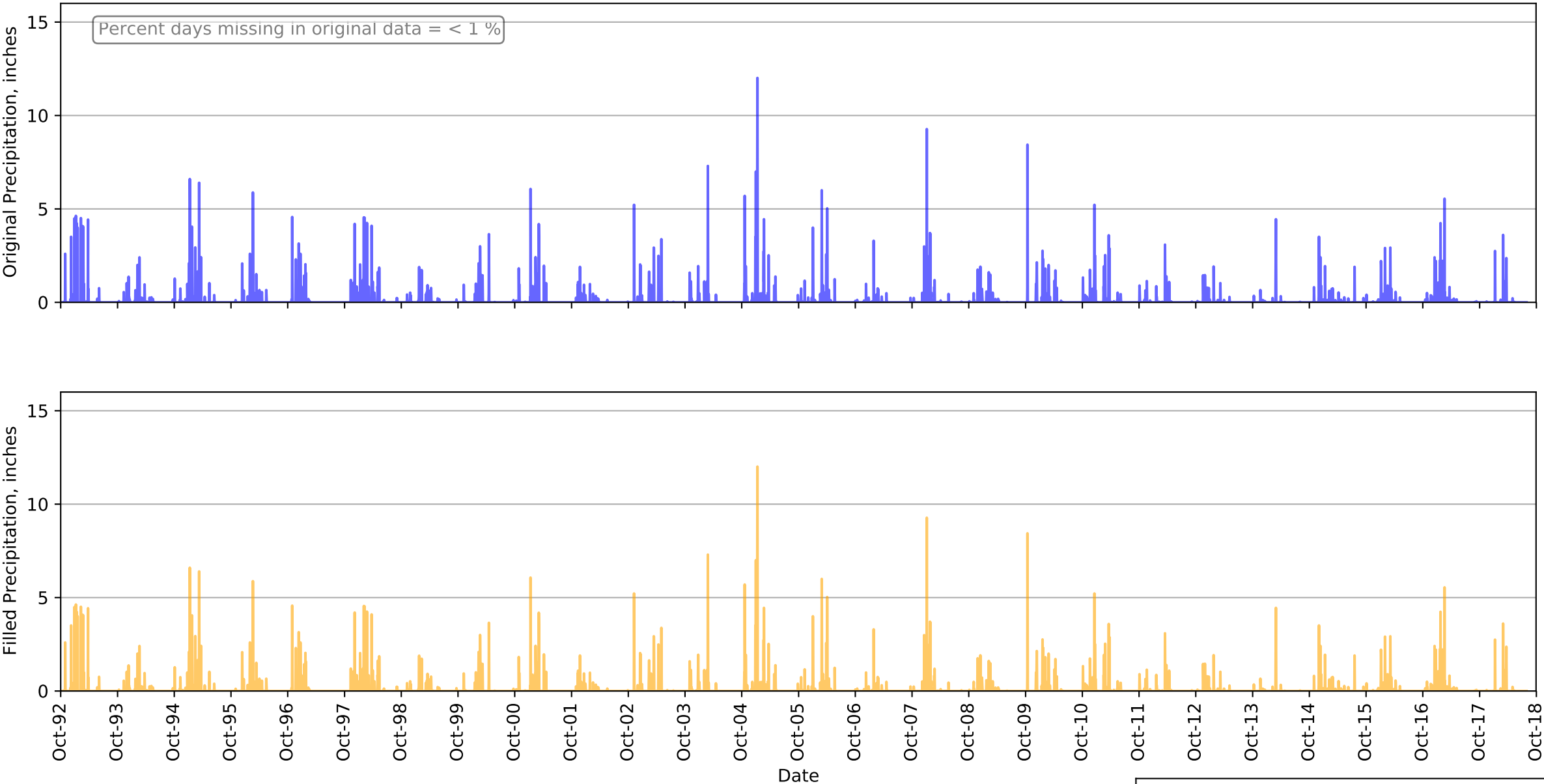


066E Ventura-Downtown (VCWPD) Ventura River Watershed, Ventura County, CA		
Geosyntec consultants		Figure B.7
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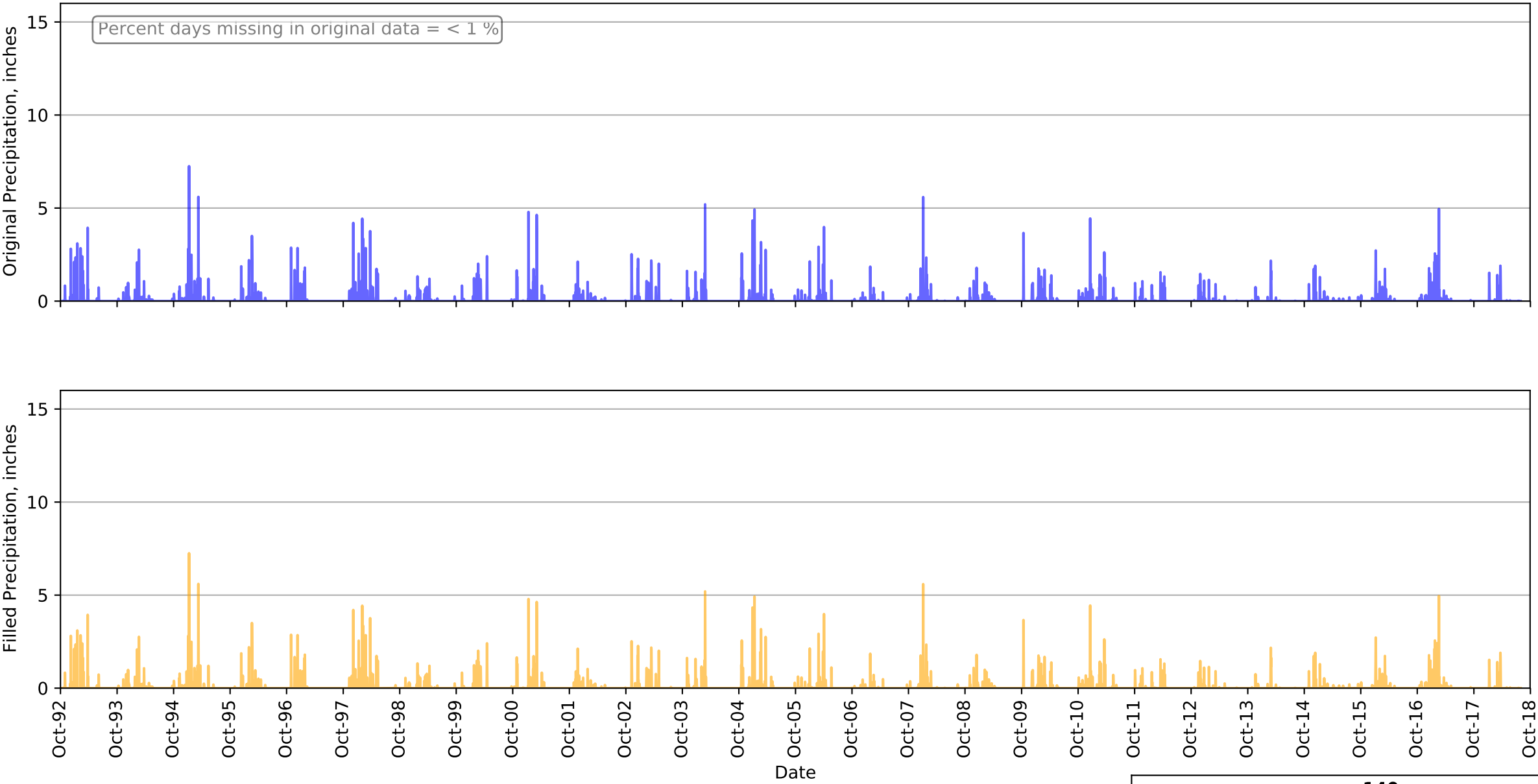


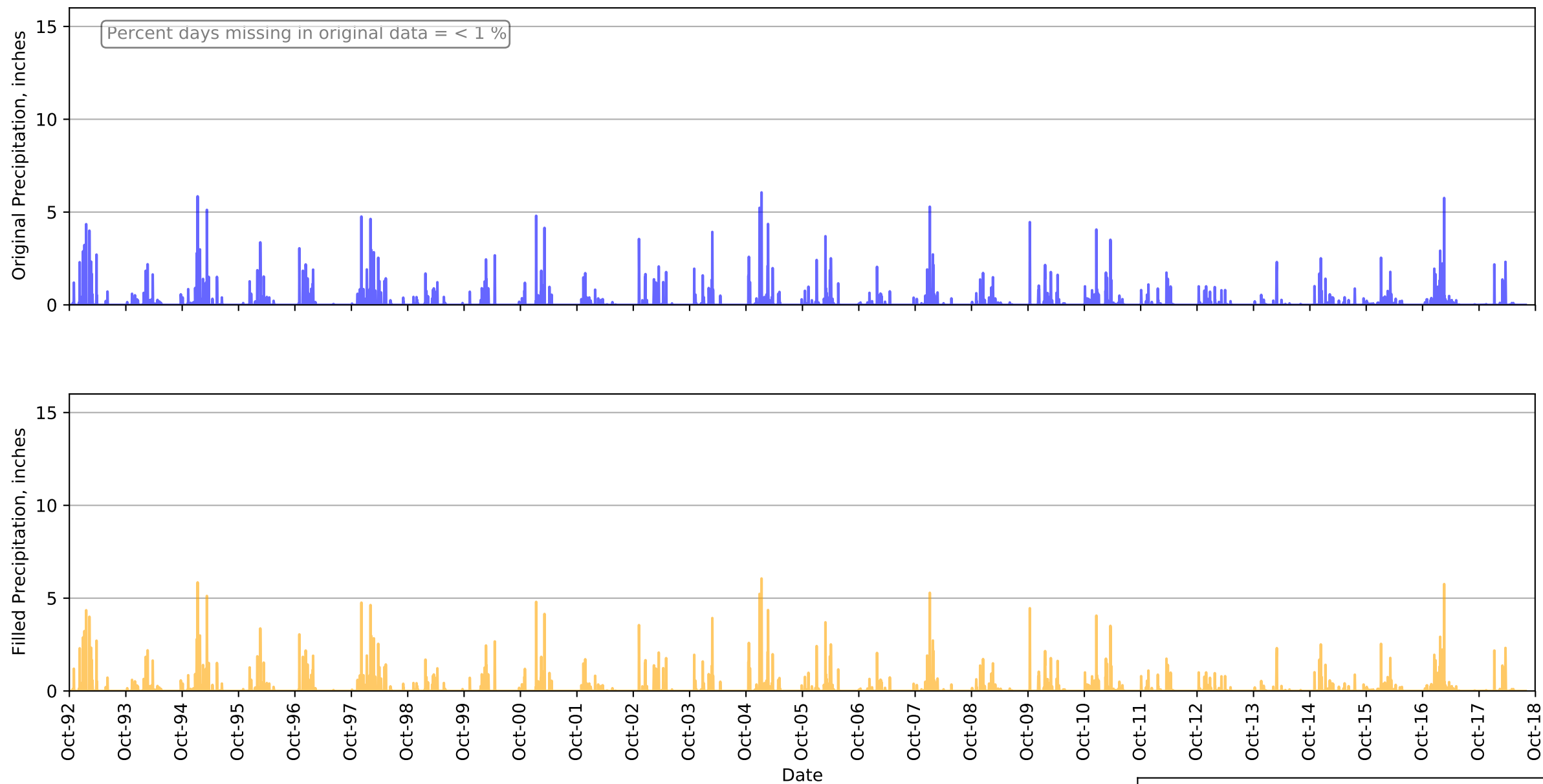
<b>085</b> <b>Canada Larga (VCWPD)</b> Ventura River Watershed, Ventura County, CA		
<b>Geosyntec</b> consultants		<b>Figure</b> <b>B.8</b>
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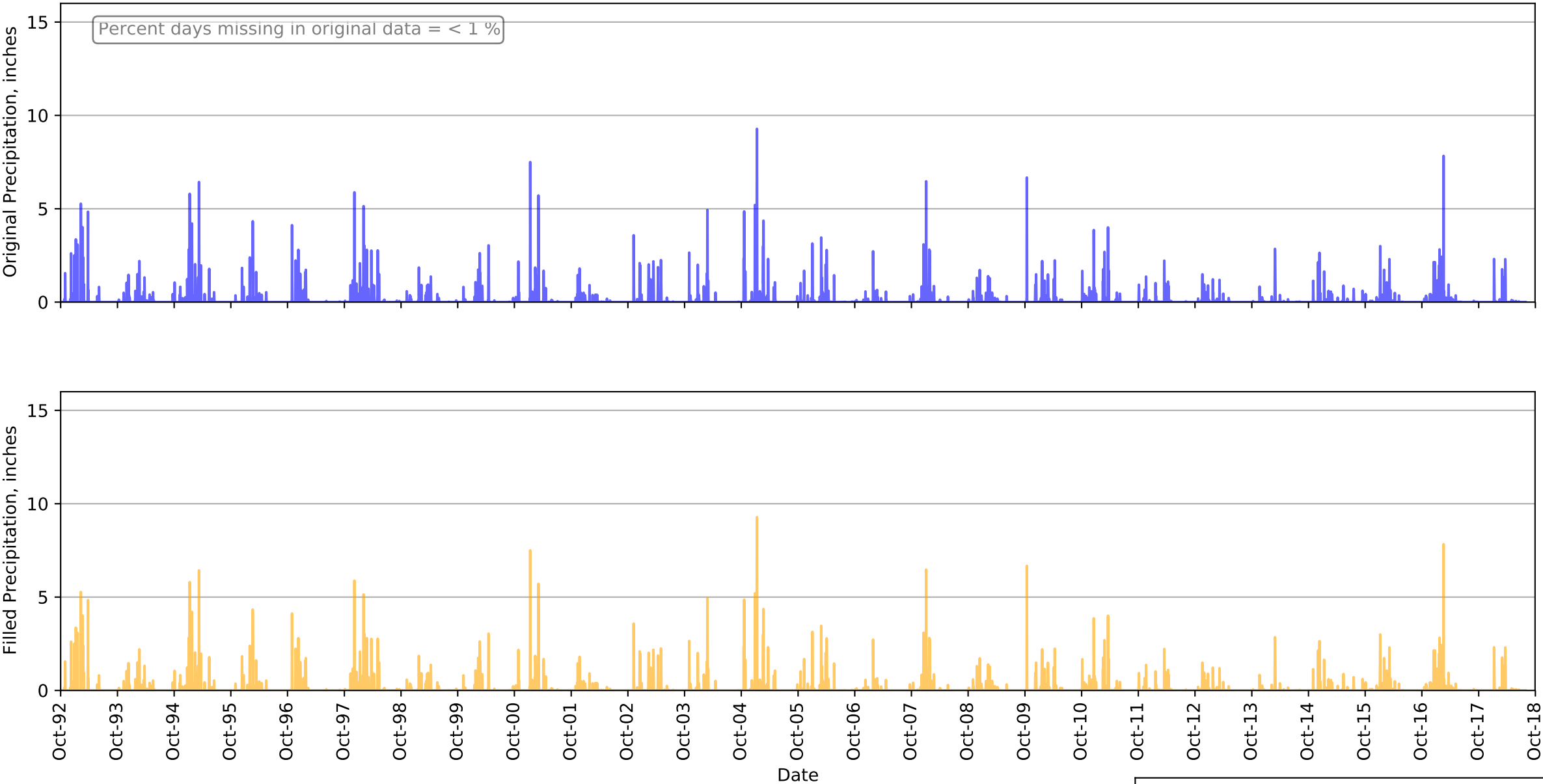
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Ventura River Watershed, Ventura County, CA

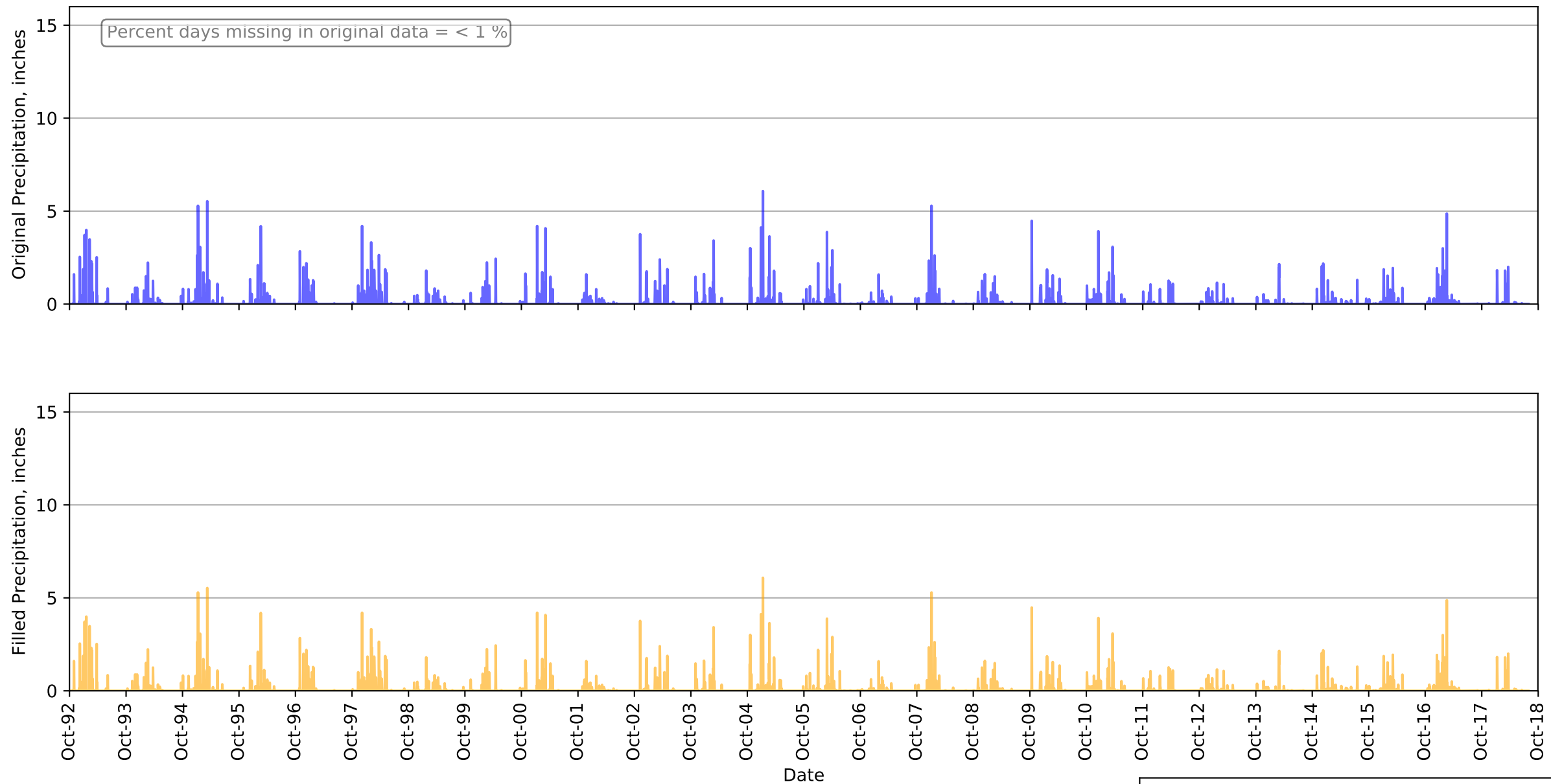
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**Figure**  
**B.12**





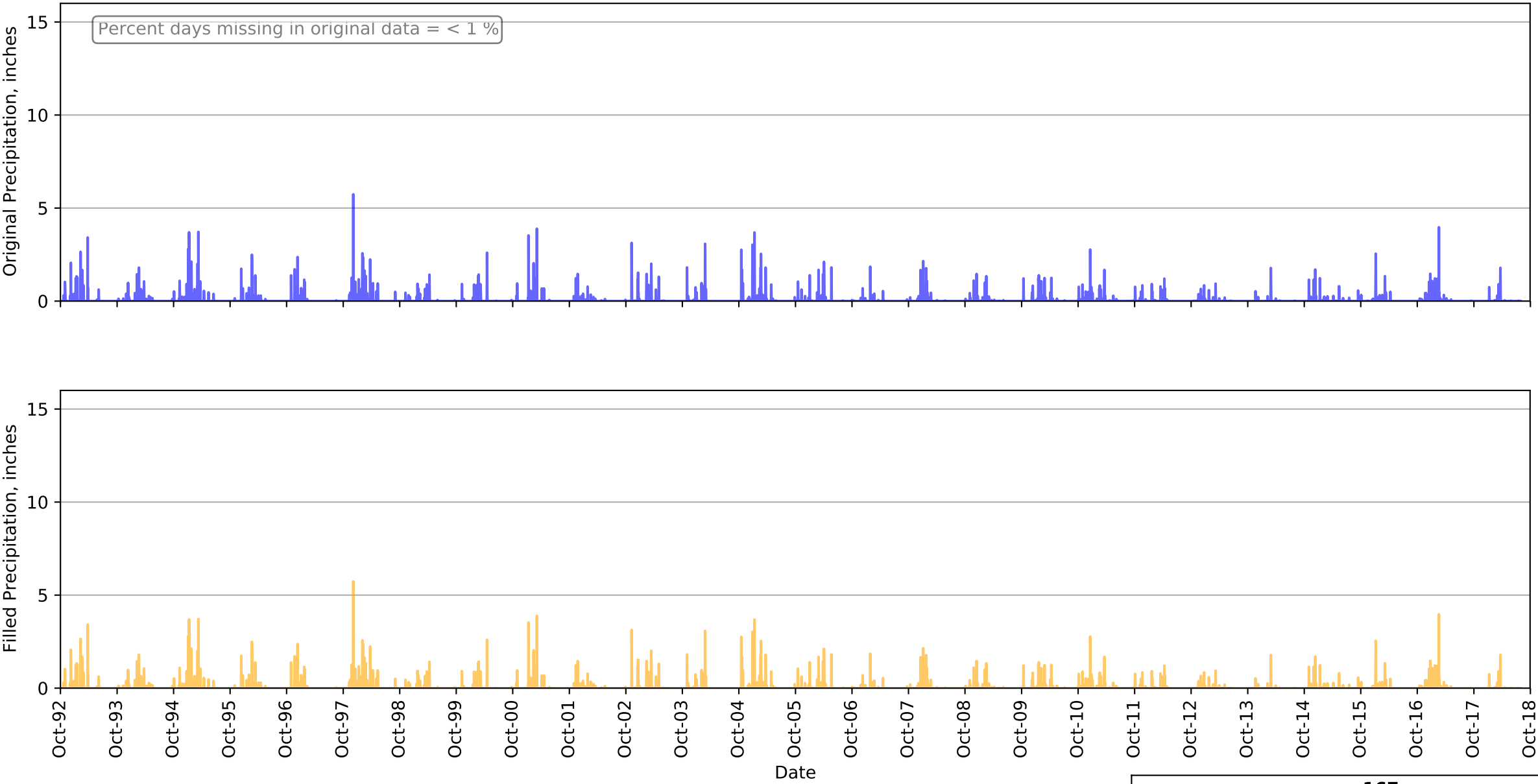
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Ventura River Watershed, Ventura County, CA

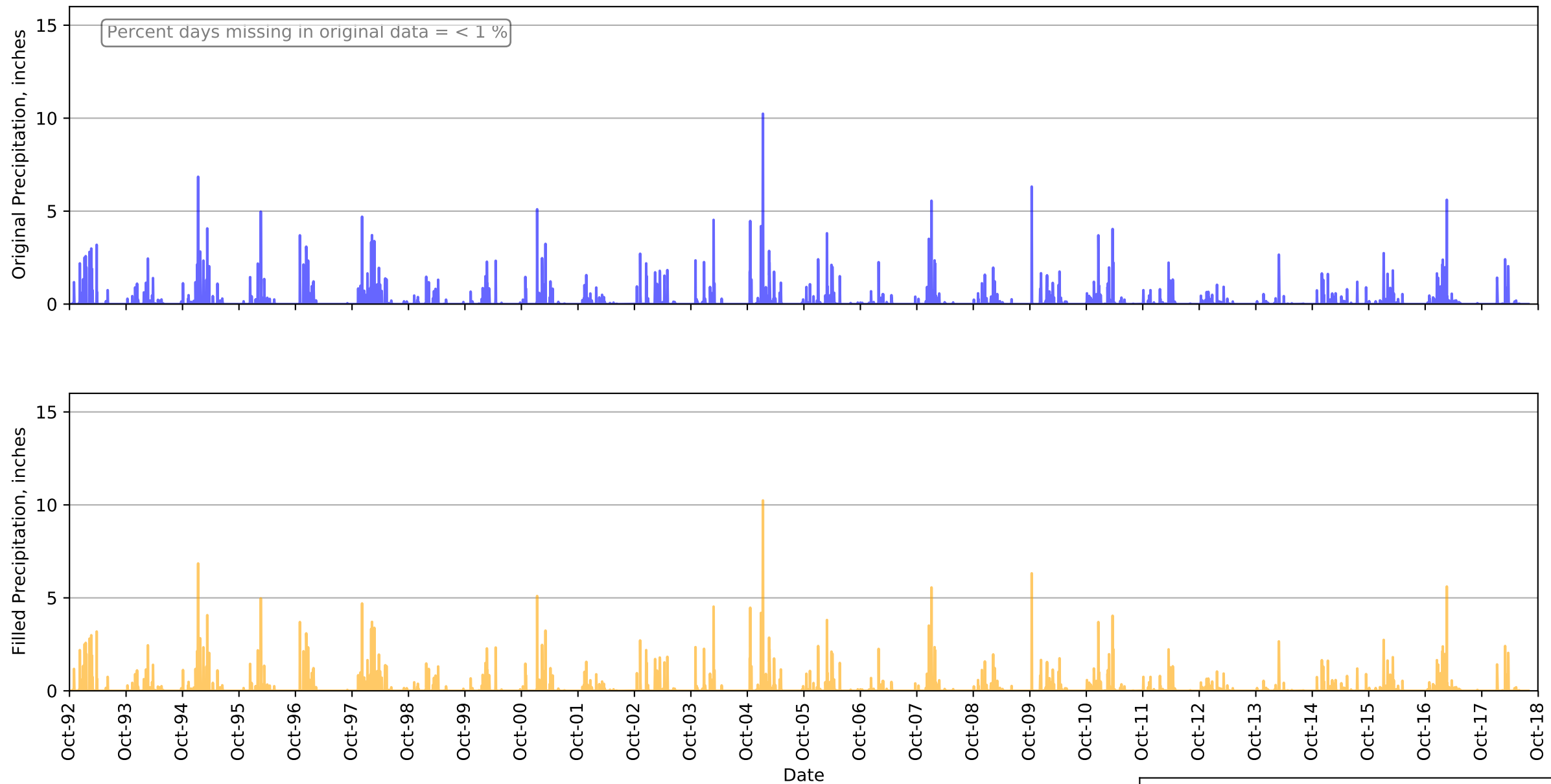
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**Figure**  
**B.14**





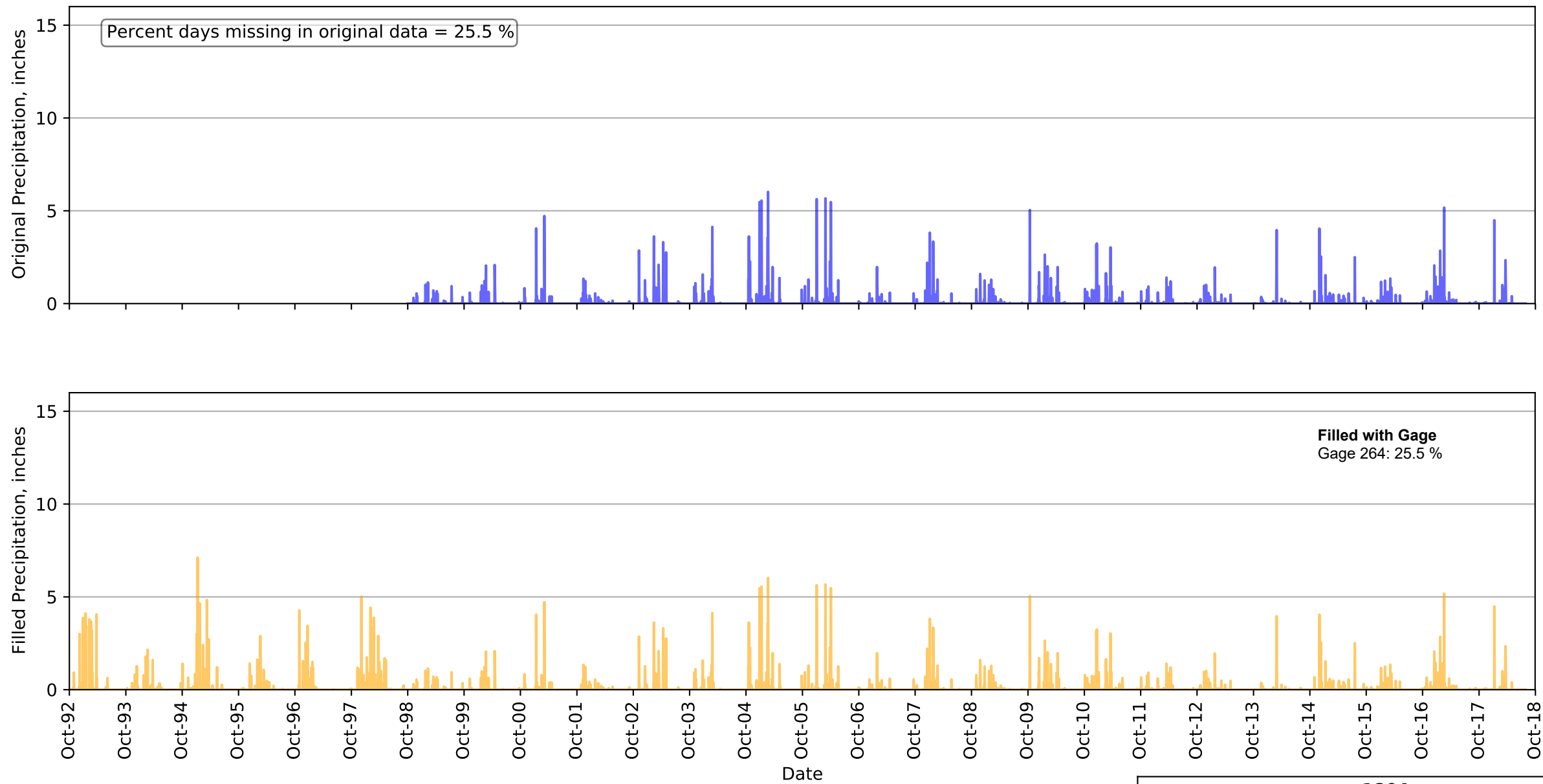
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**Santa Paula Canyon-Ferndale Ranch (VCWPD)**  
Ventura River Watershed, Ventura County, CA

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**Figure**  
**B.16**



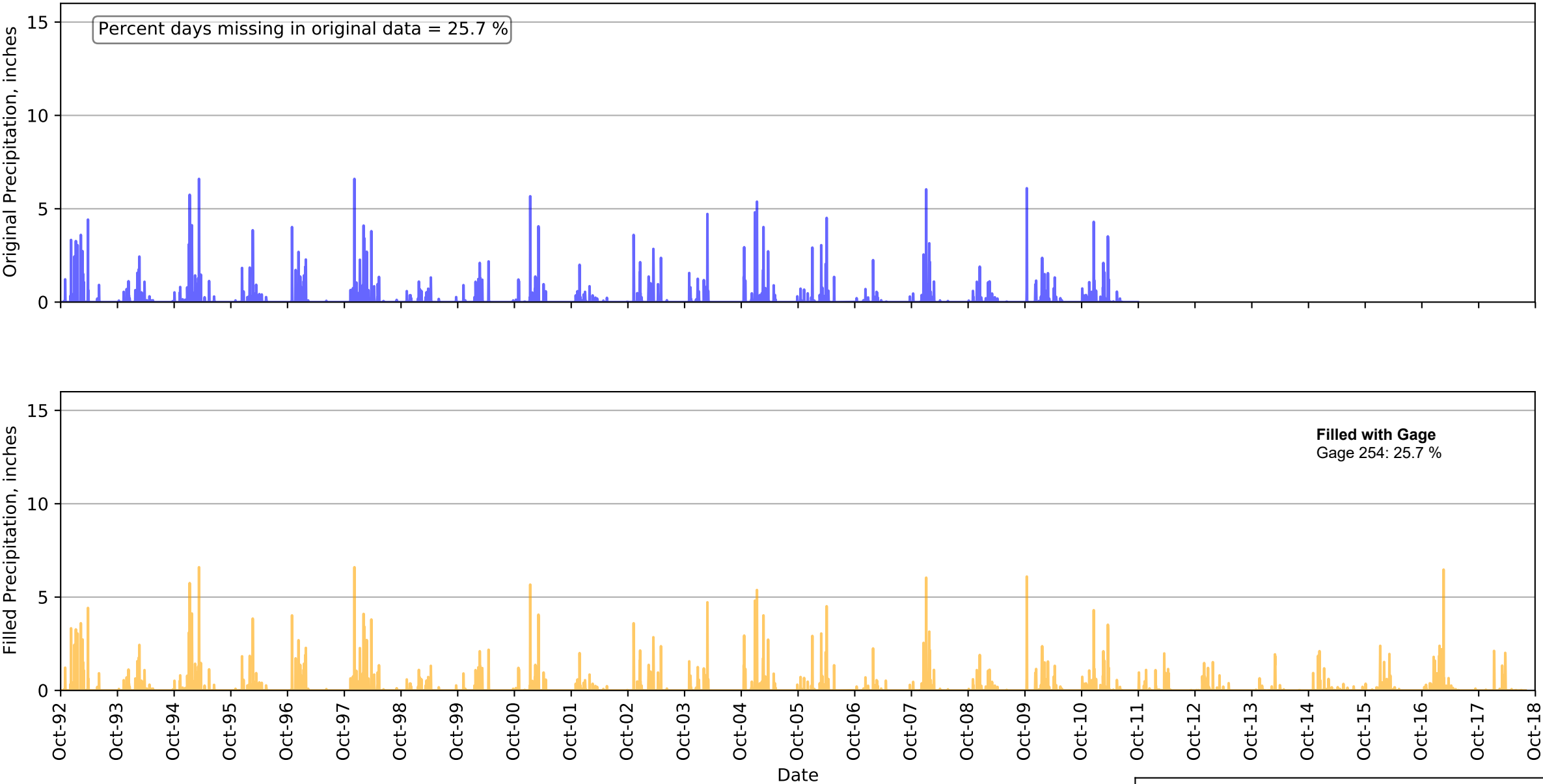
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**Ortega Hill (VCWPD)**  
Ventura River Watershed, Ventura County, CA

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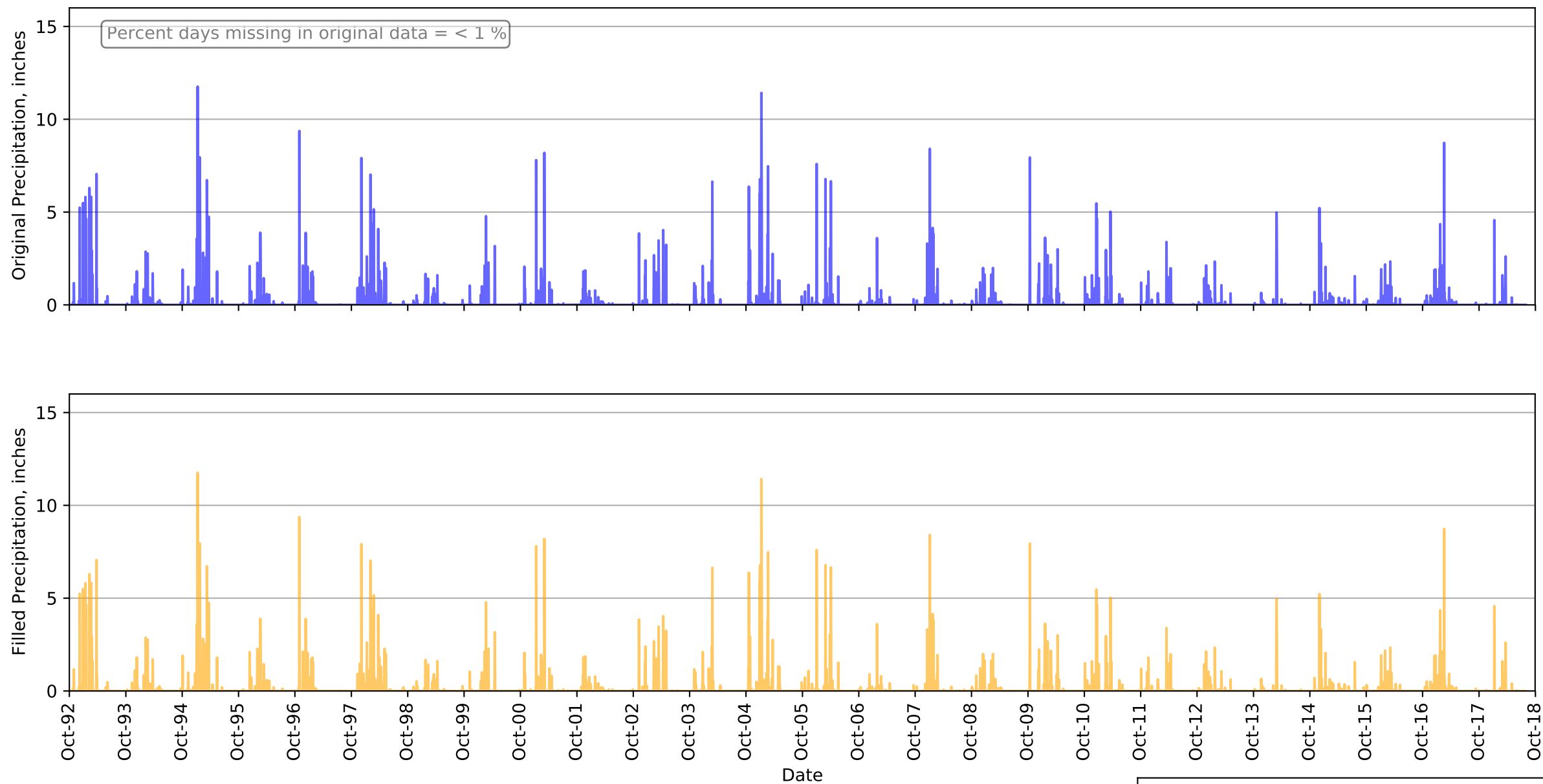
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**Figure**  
**B.17**







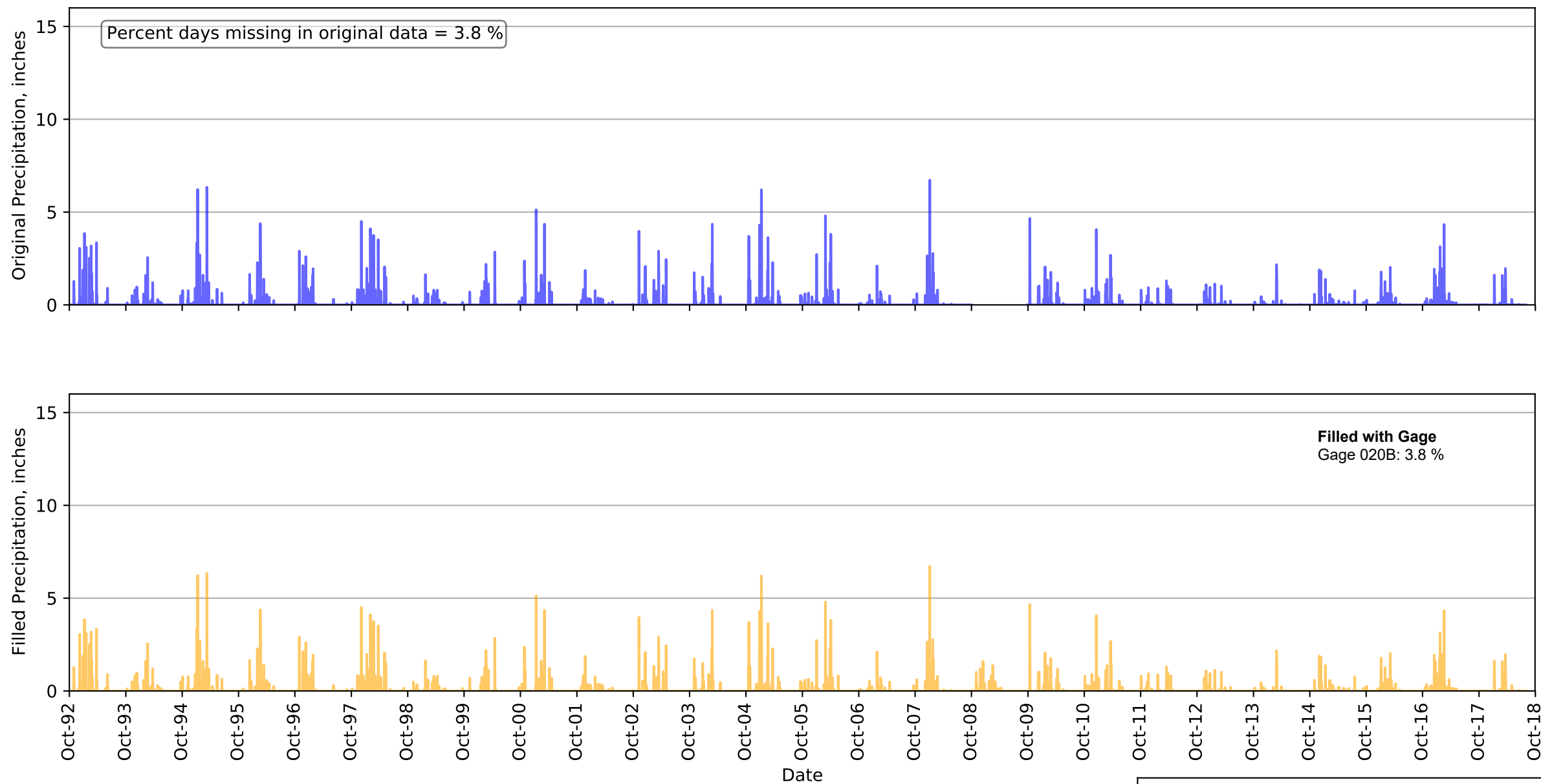
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 Ventura River Watershed, Ventura County, CA

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**Figure**  
**B.19**



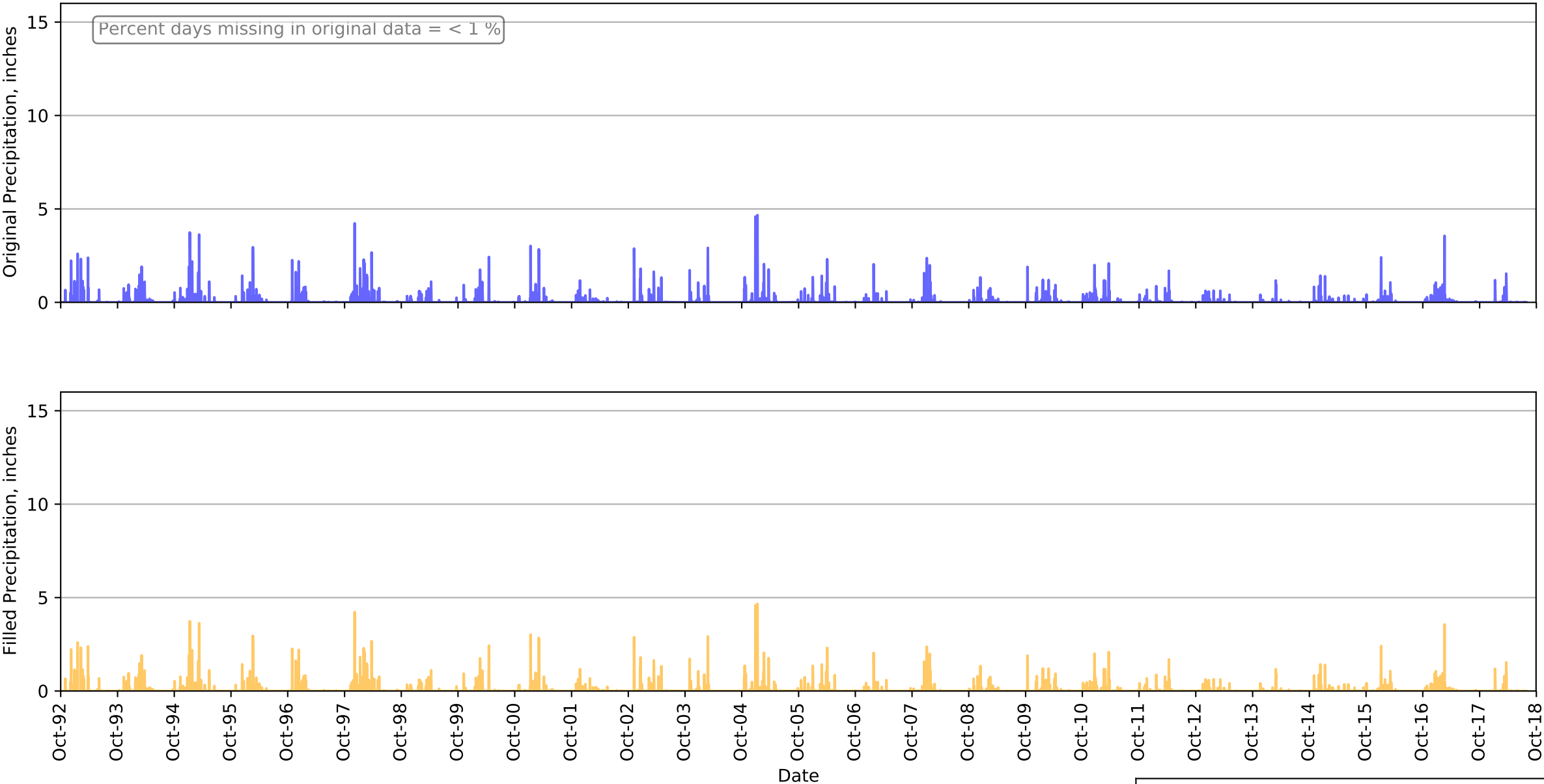
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 Ventura River Watershed, Ventura County, CA

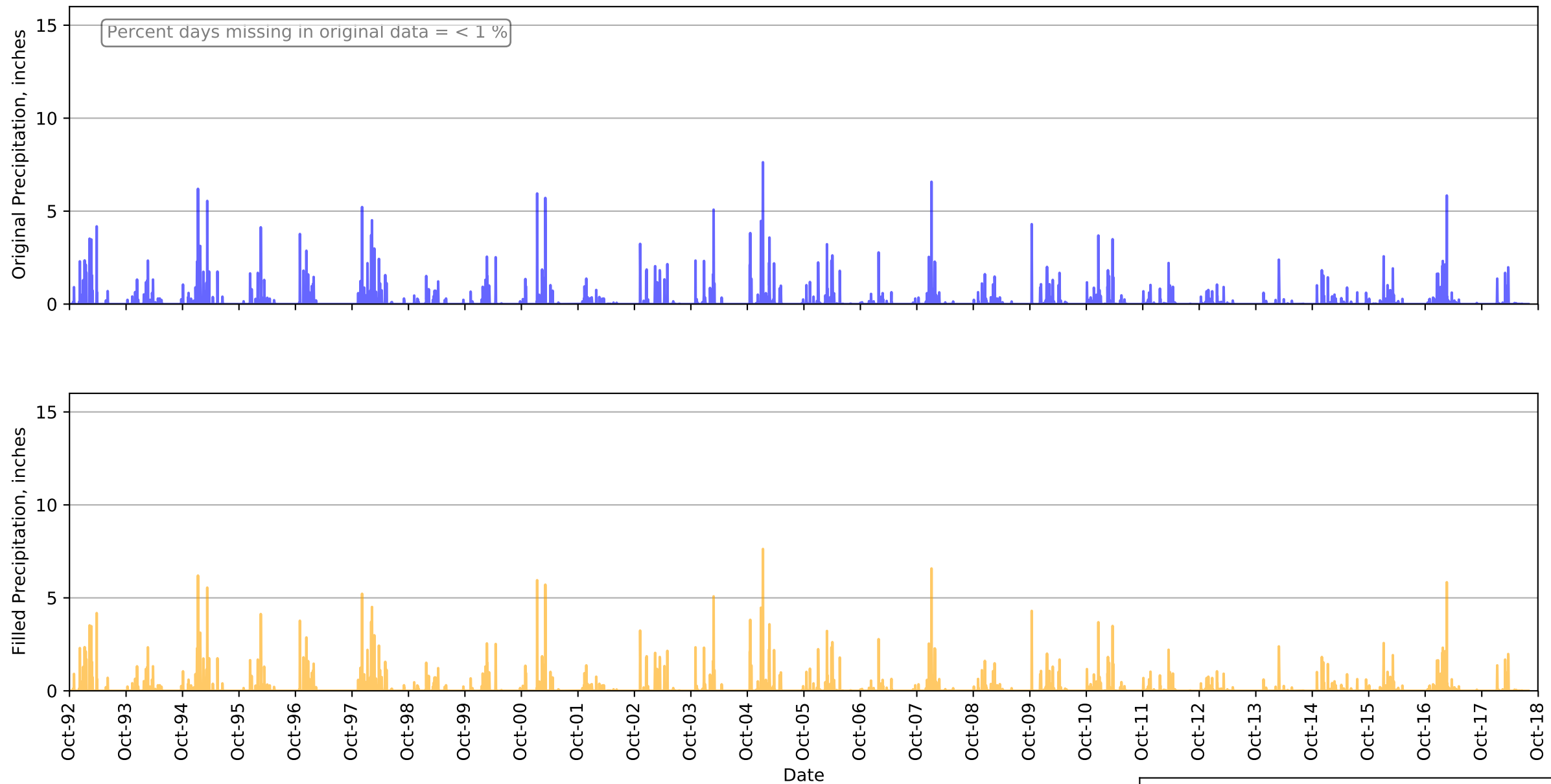
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**Figure**  
**B.20**





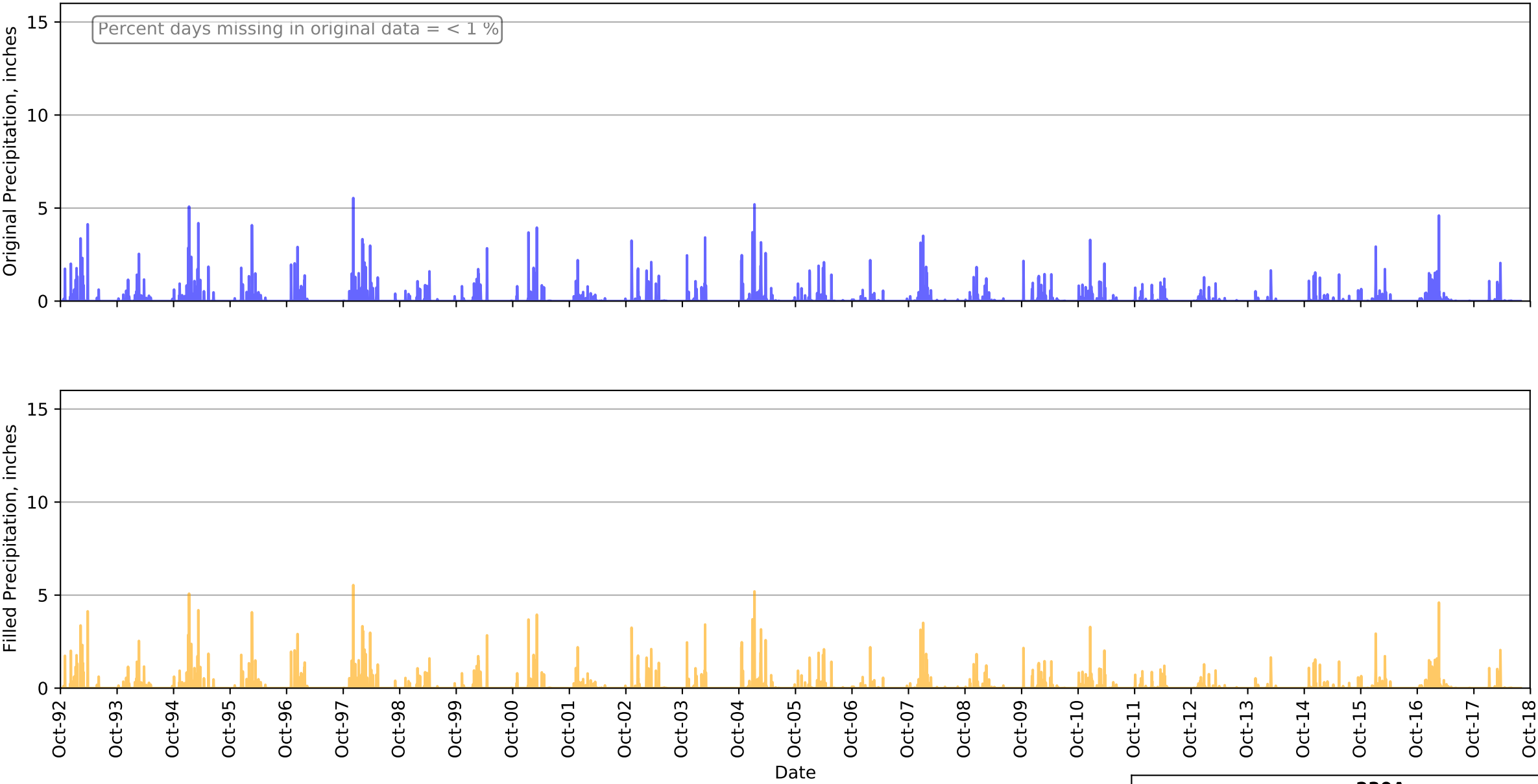
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Ventura River Watershed, Ventura County, CA

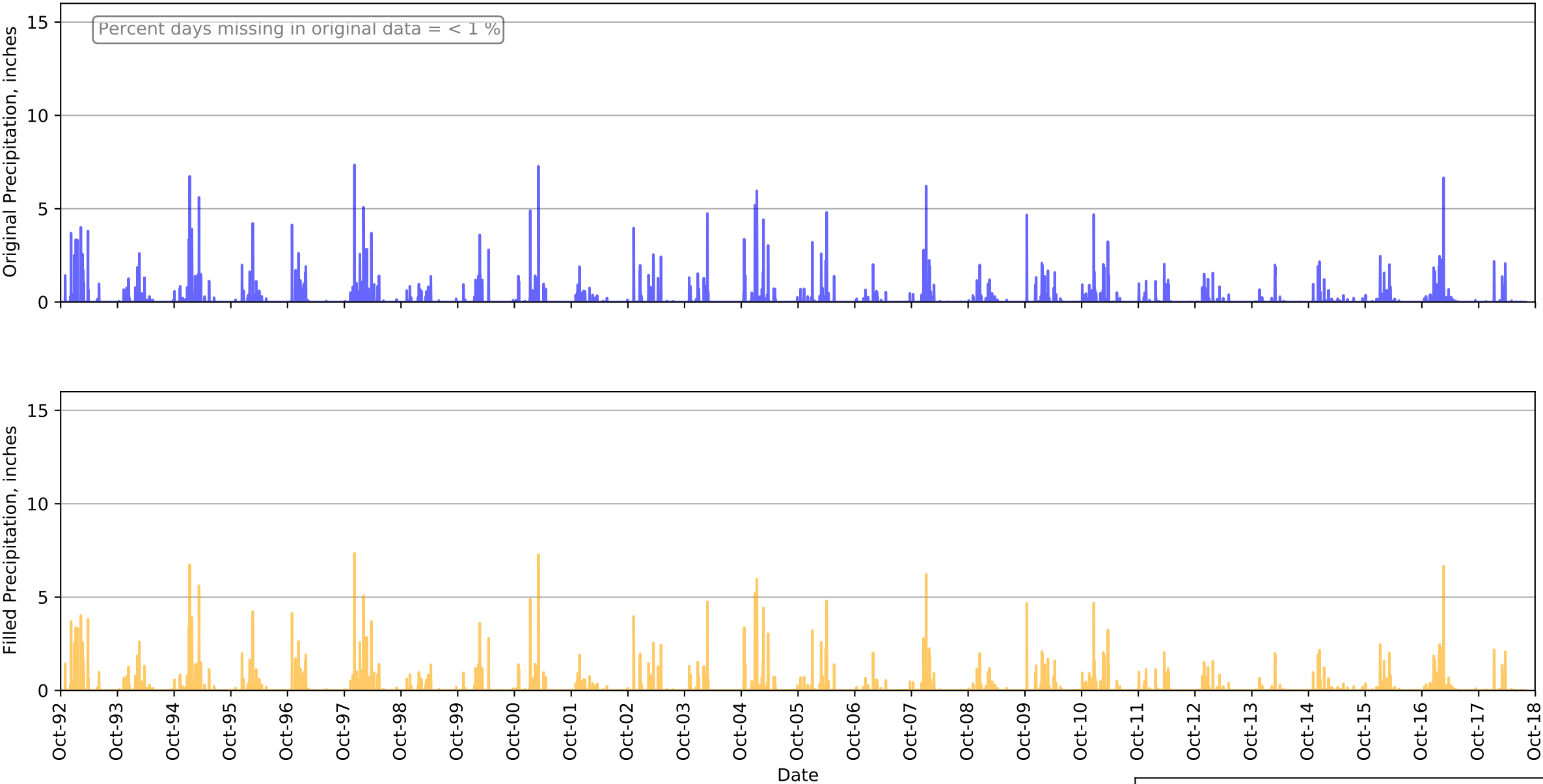
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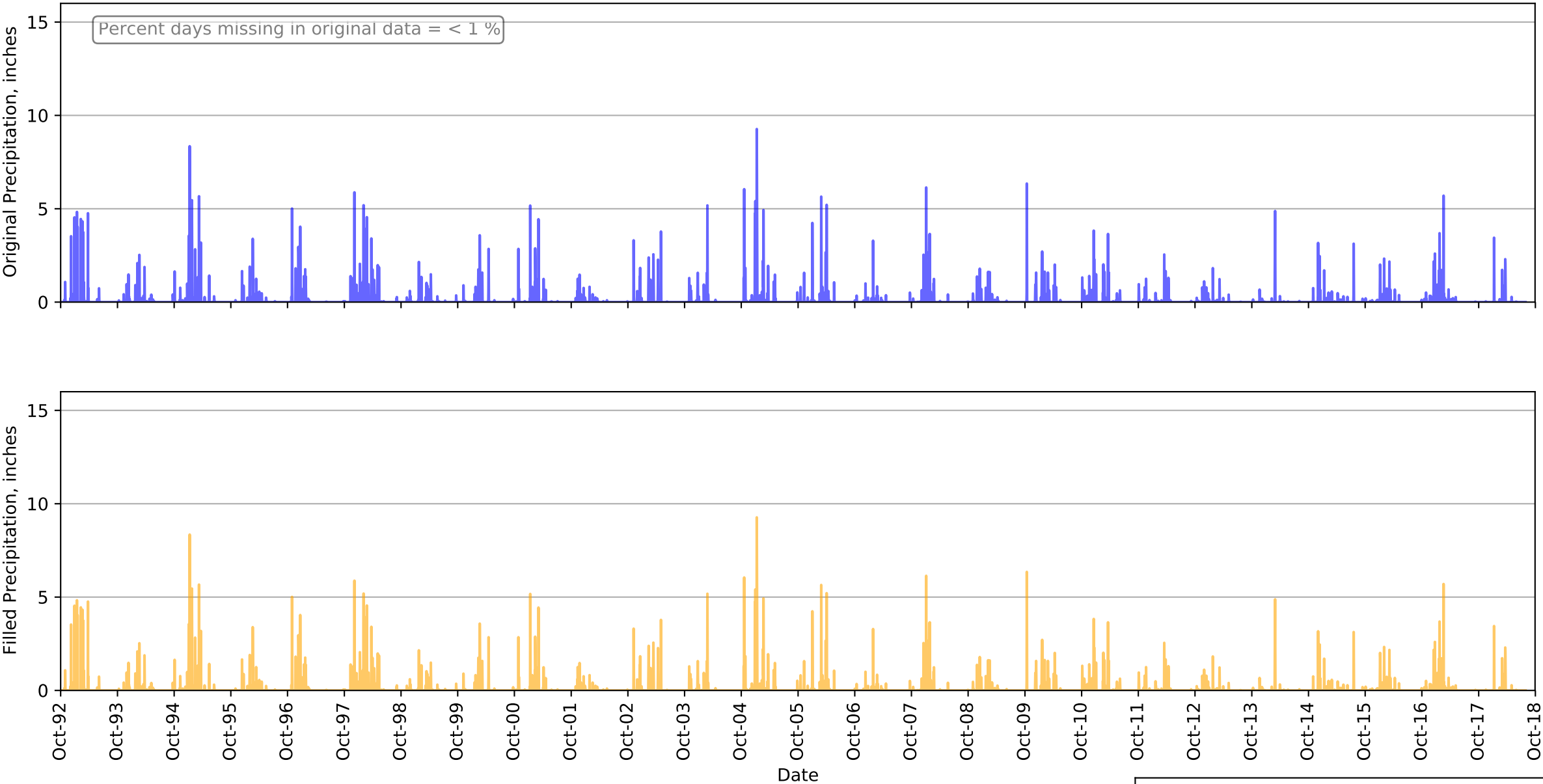
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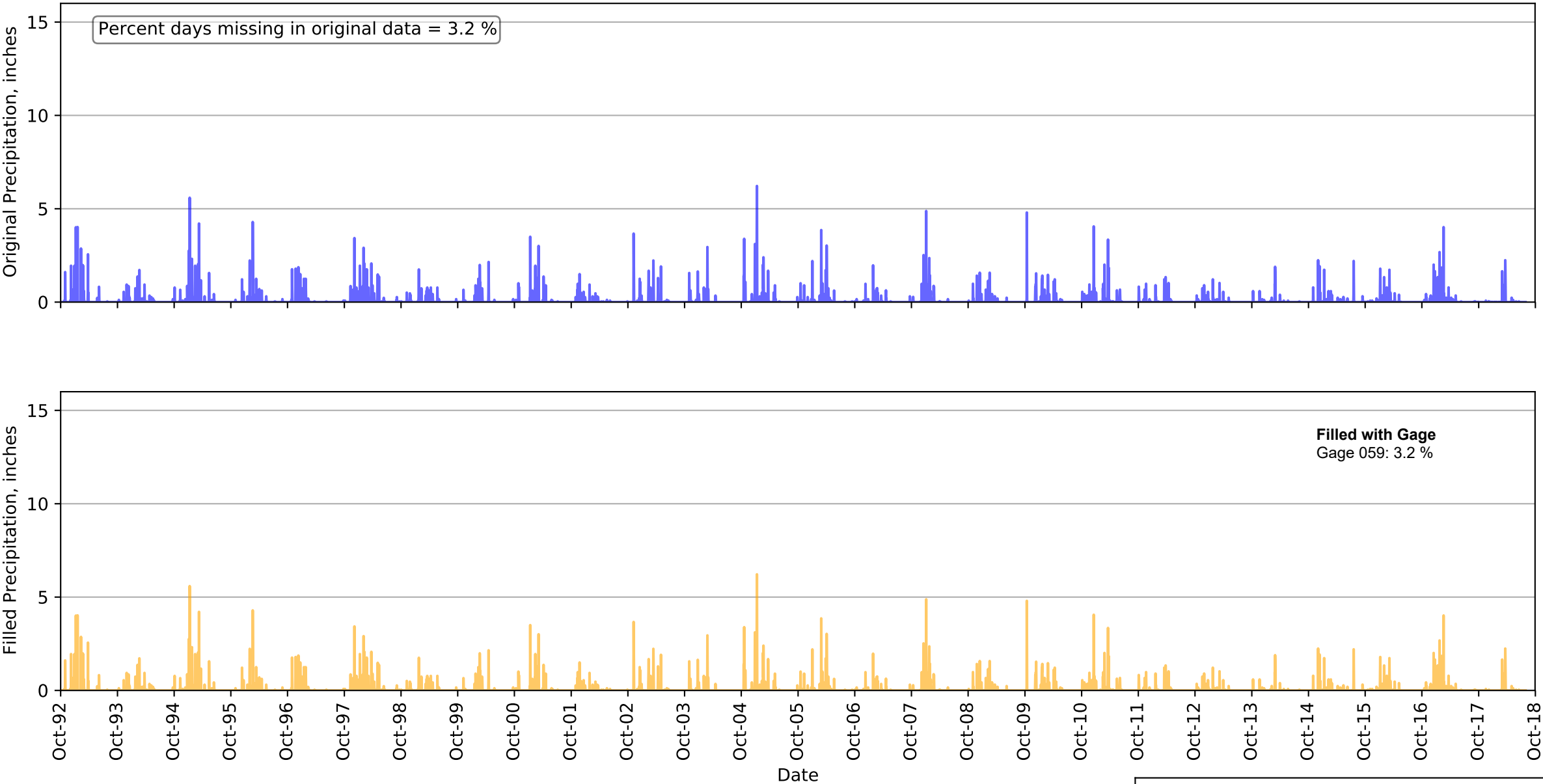
December 2021

**Figure**  
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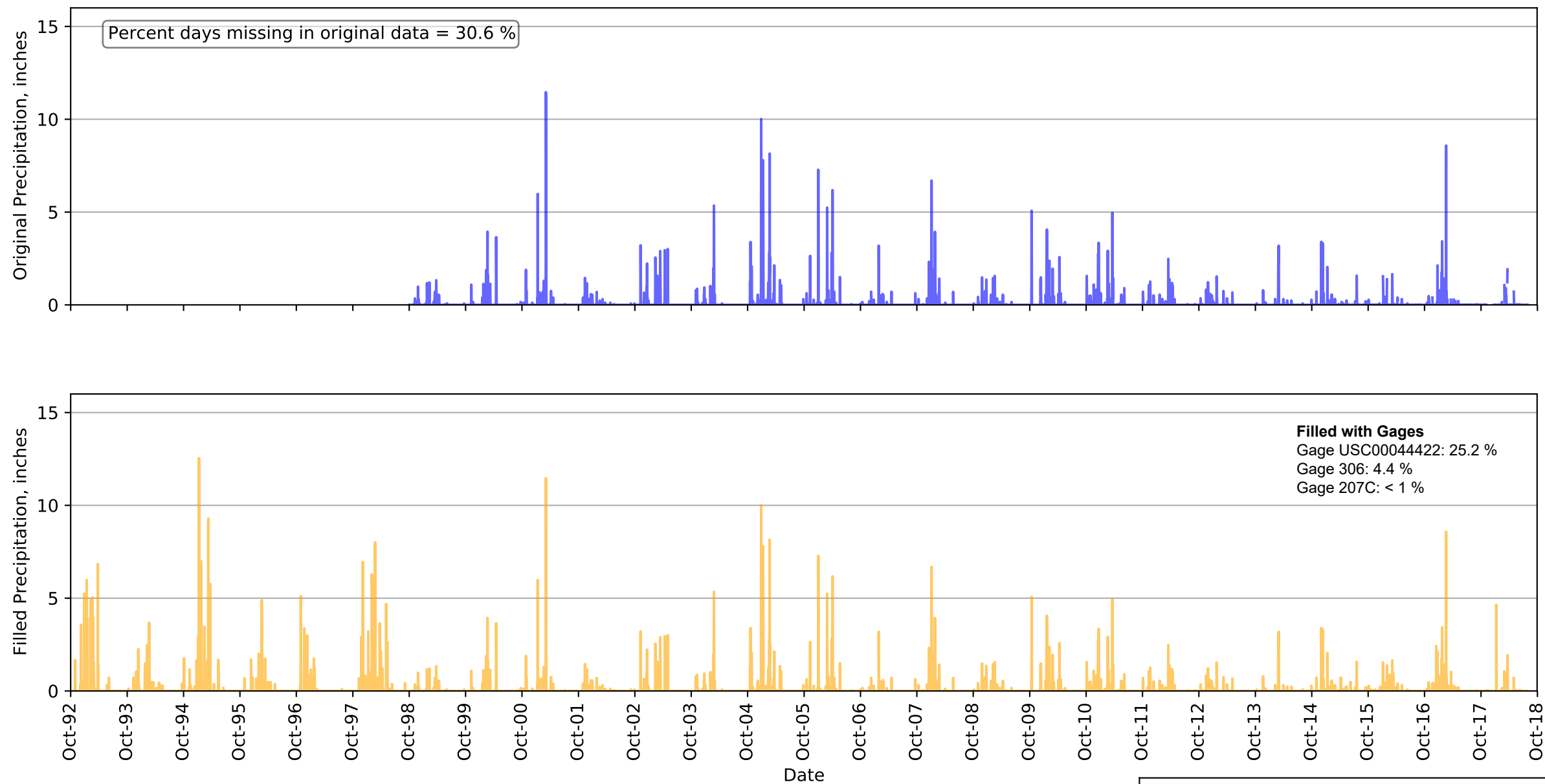












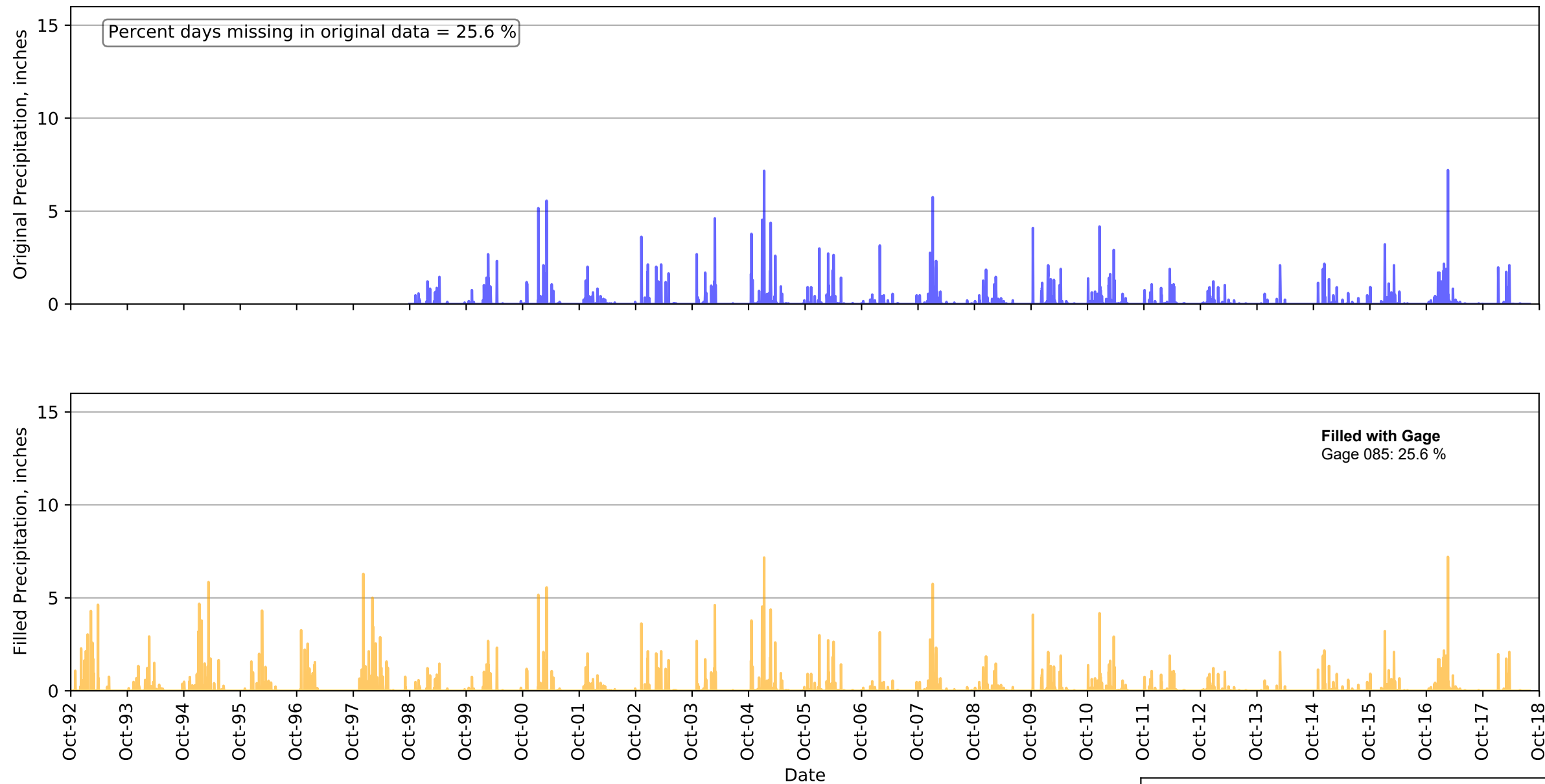
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Ventura River Watershed, Ventura County, CA

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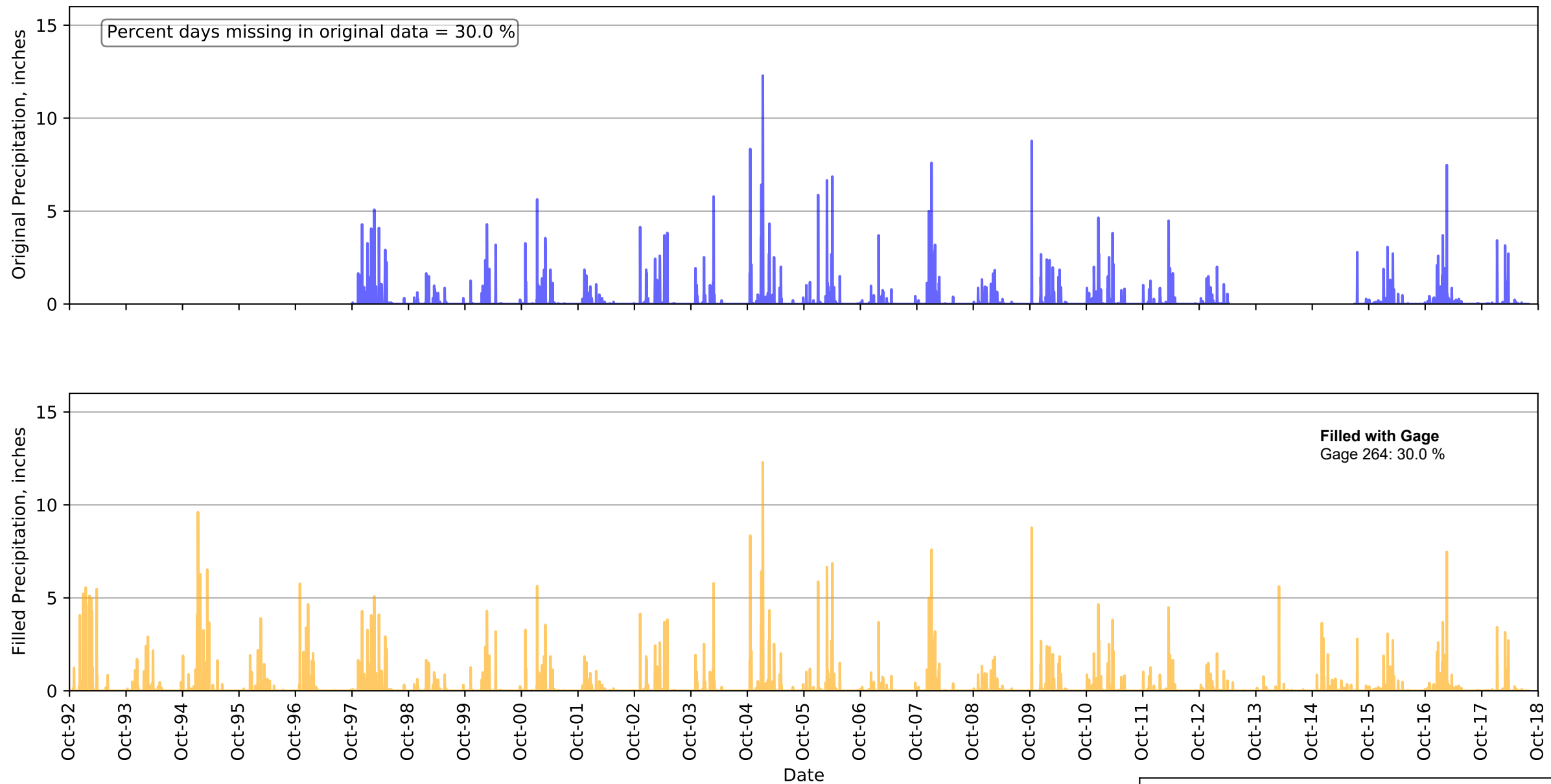
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**Figure**  
**B.27**



302 Canada Larga-Verde Canyon (VCWPD) Ventura River Watershed, Ventura County, CA		
Geosyntec consultants		Figure B.28
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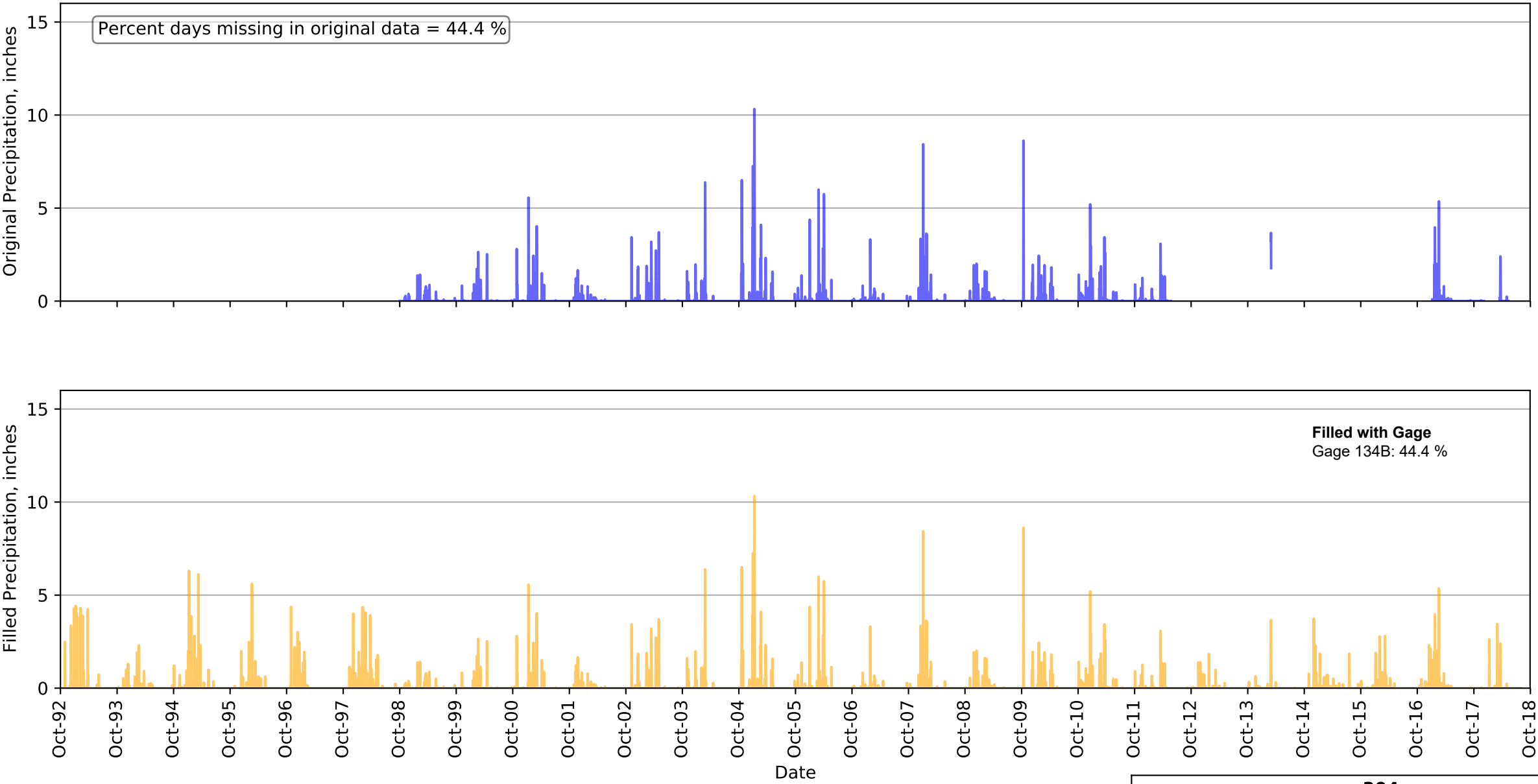
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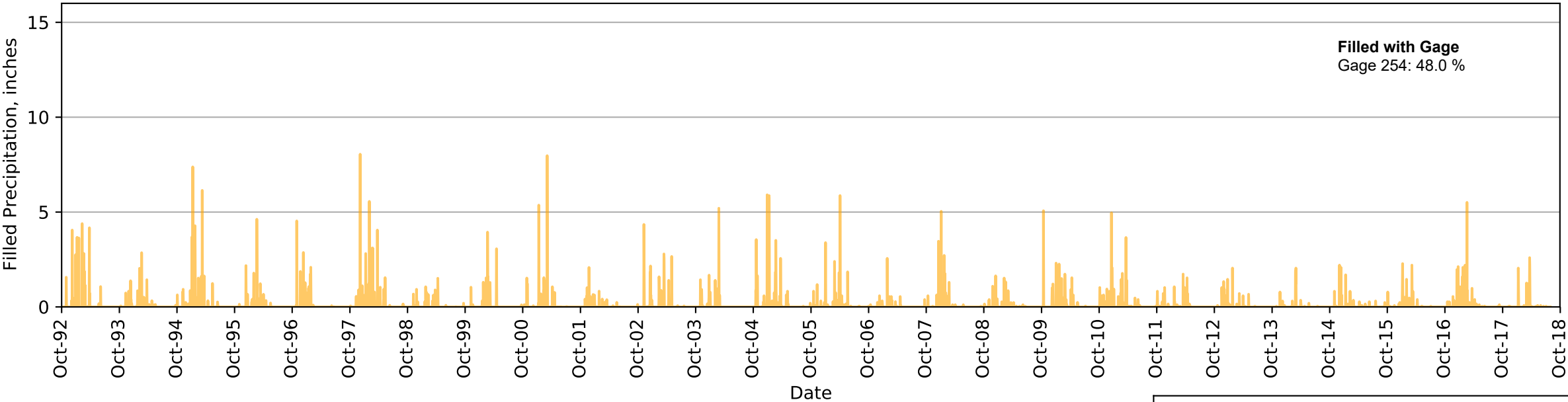
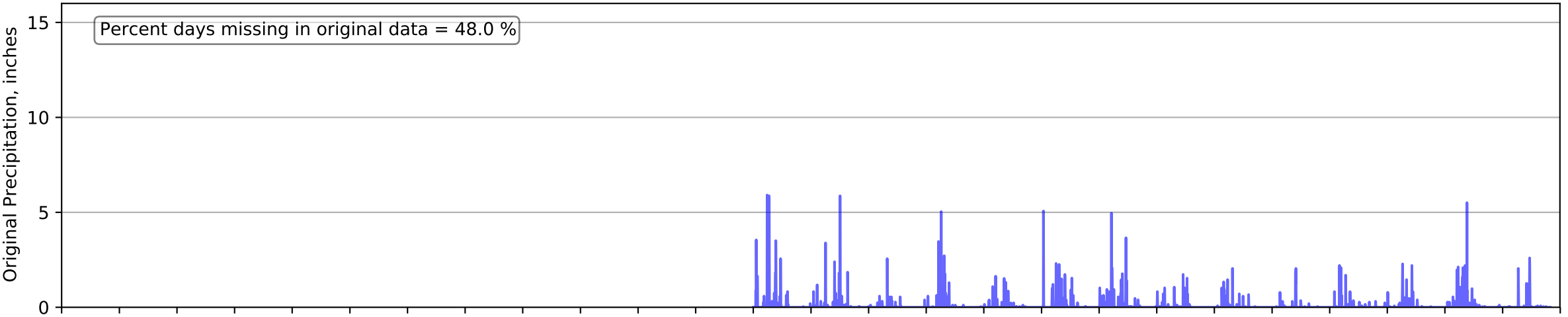
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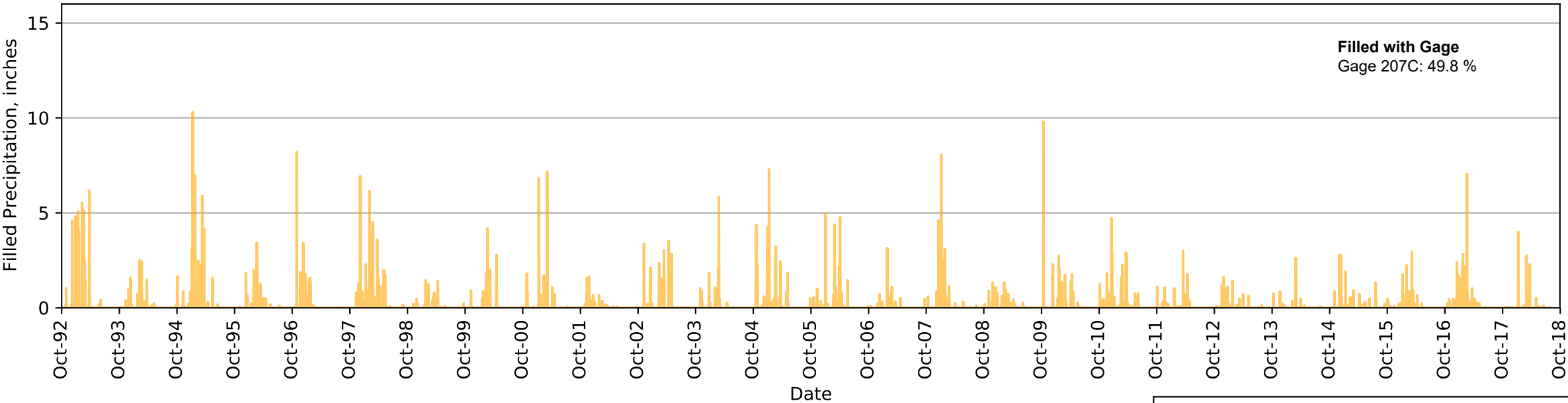
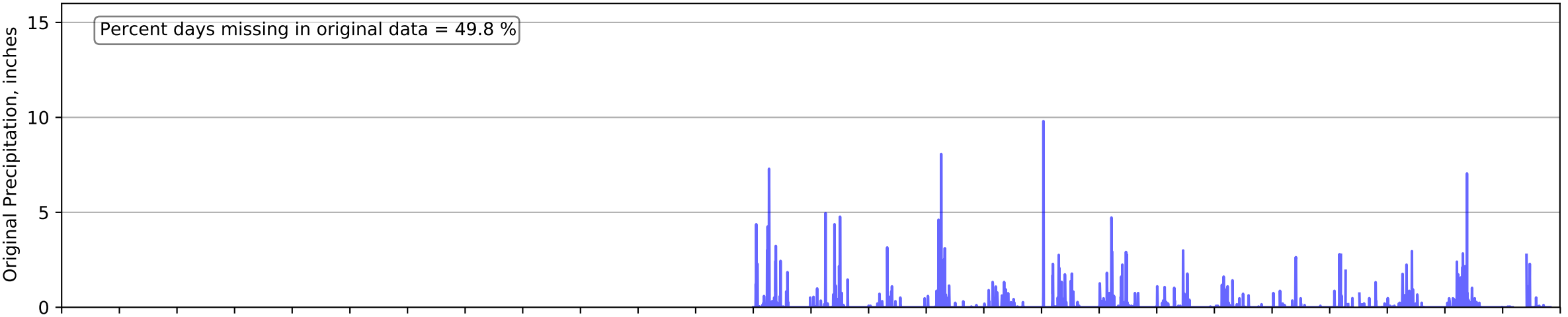
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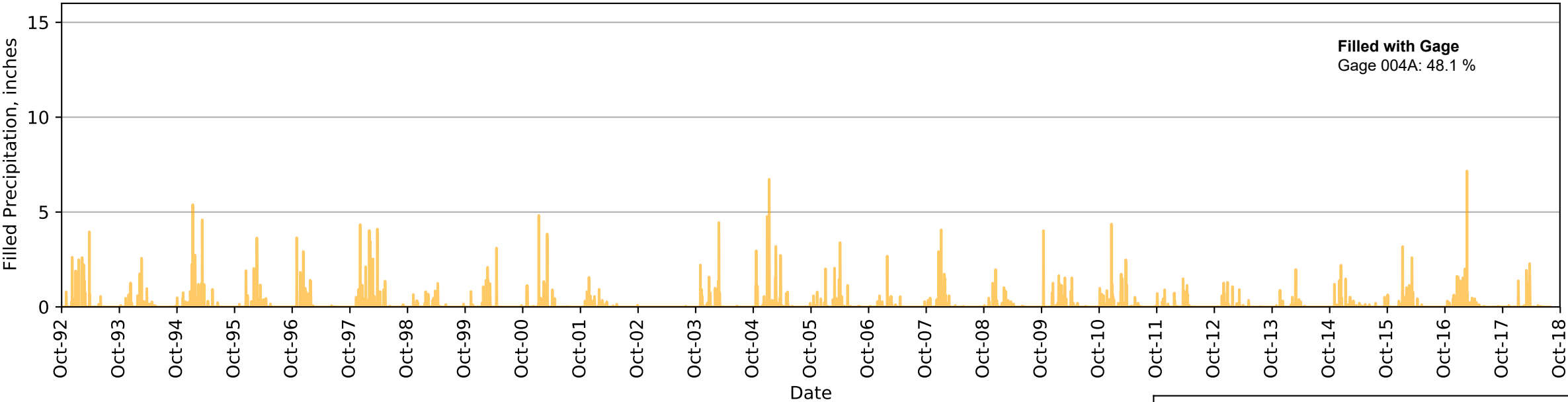
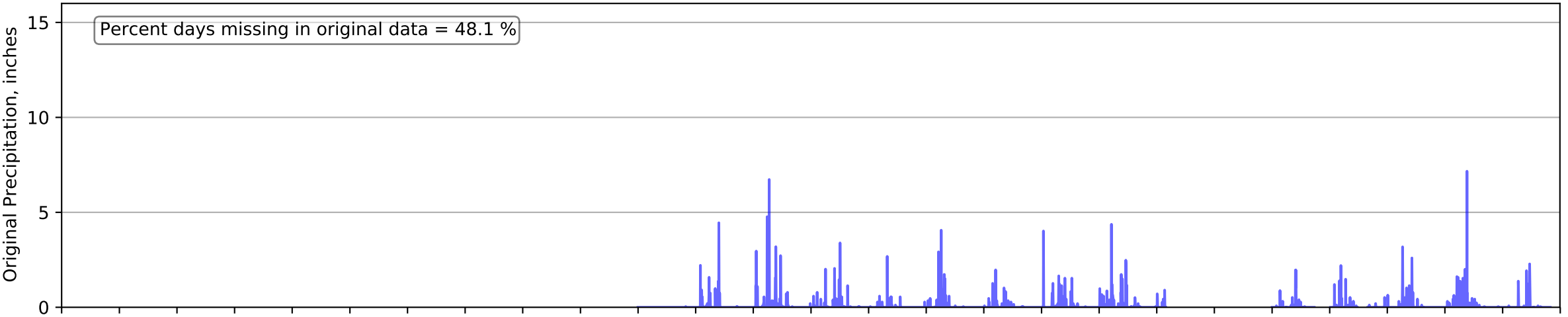
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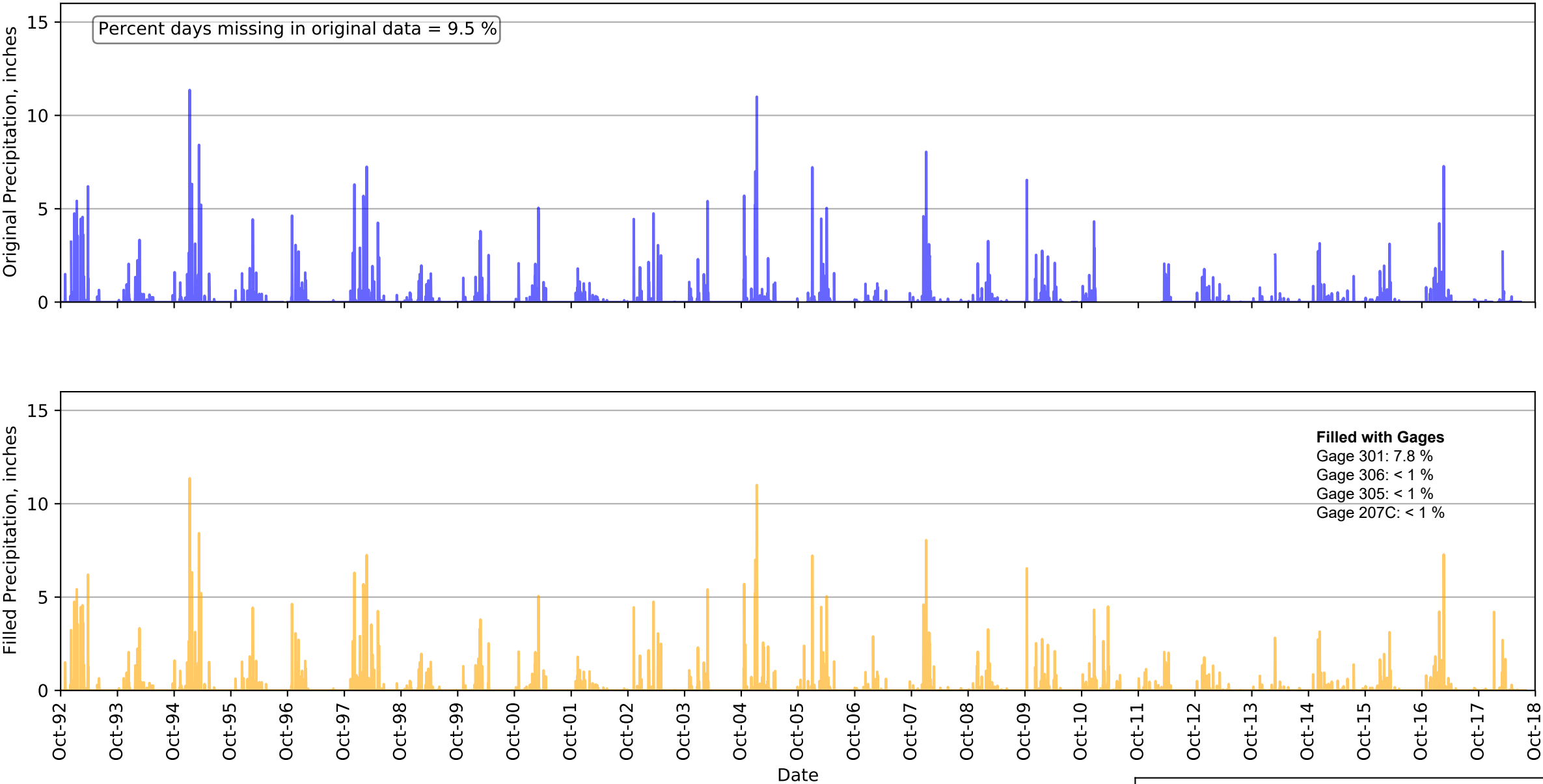




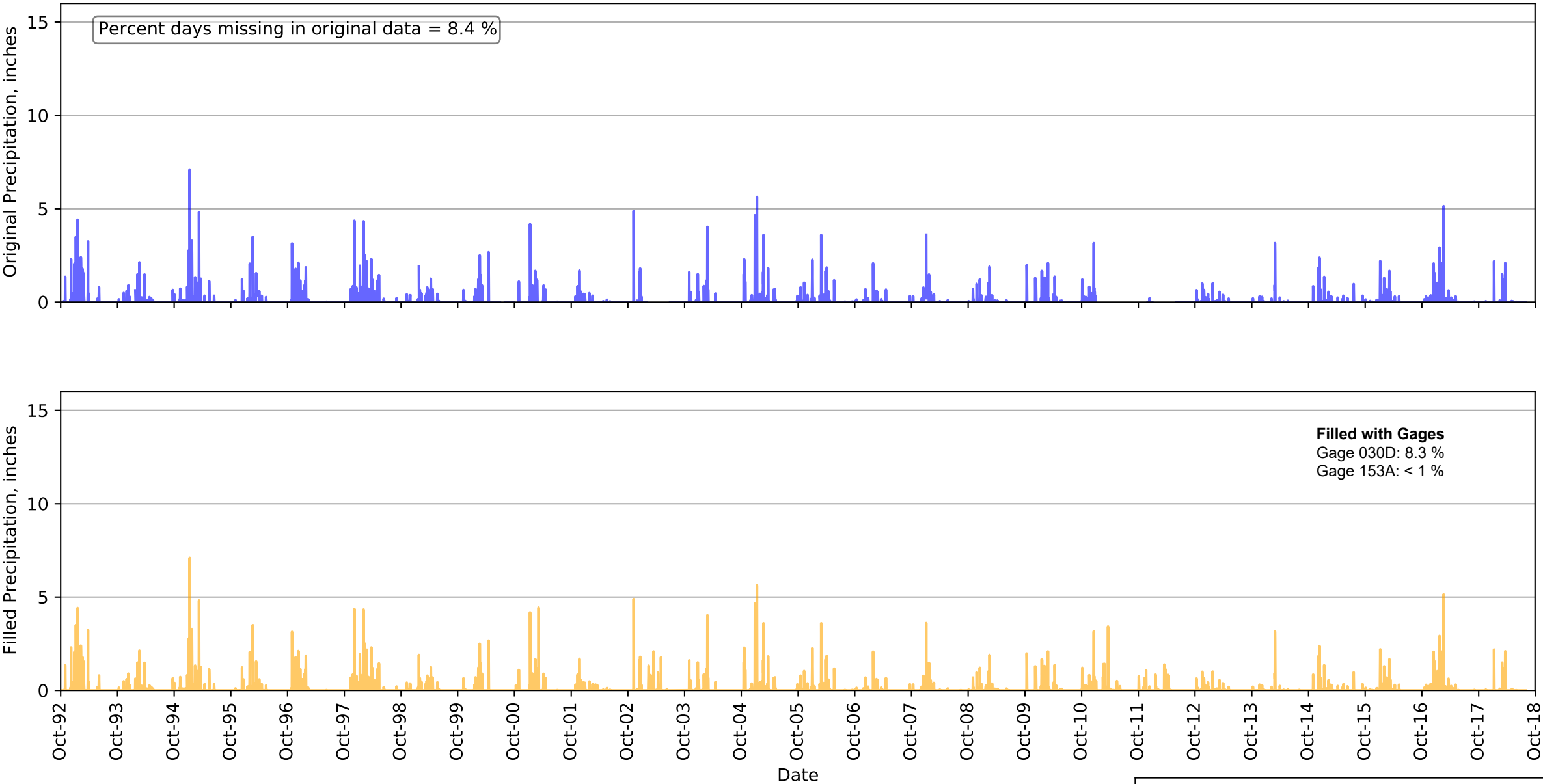


306 White Ledge Peak (VCWPD) Ventura River Watershed, Ventura County, CA		
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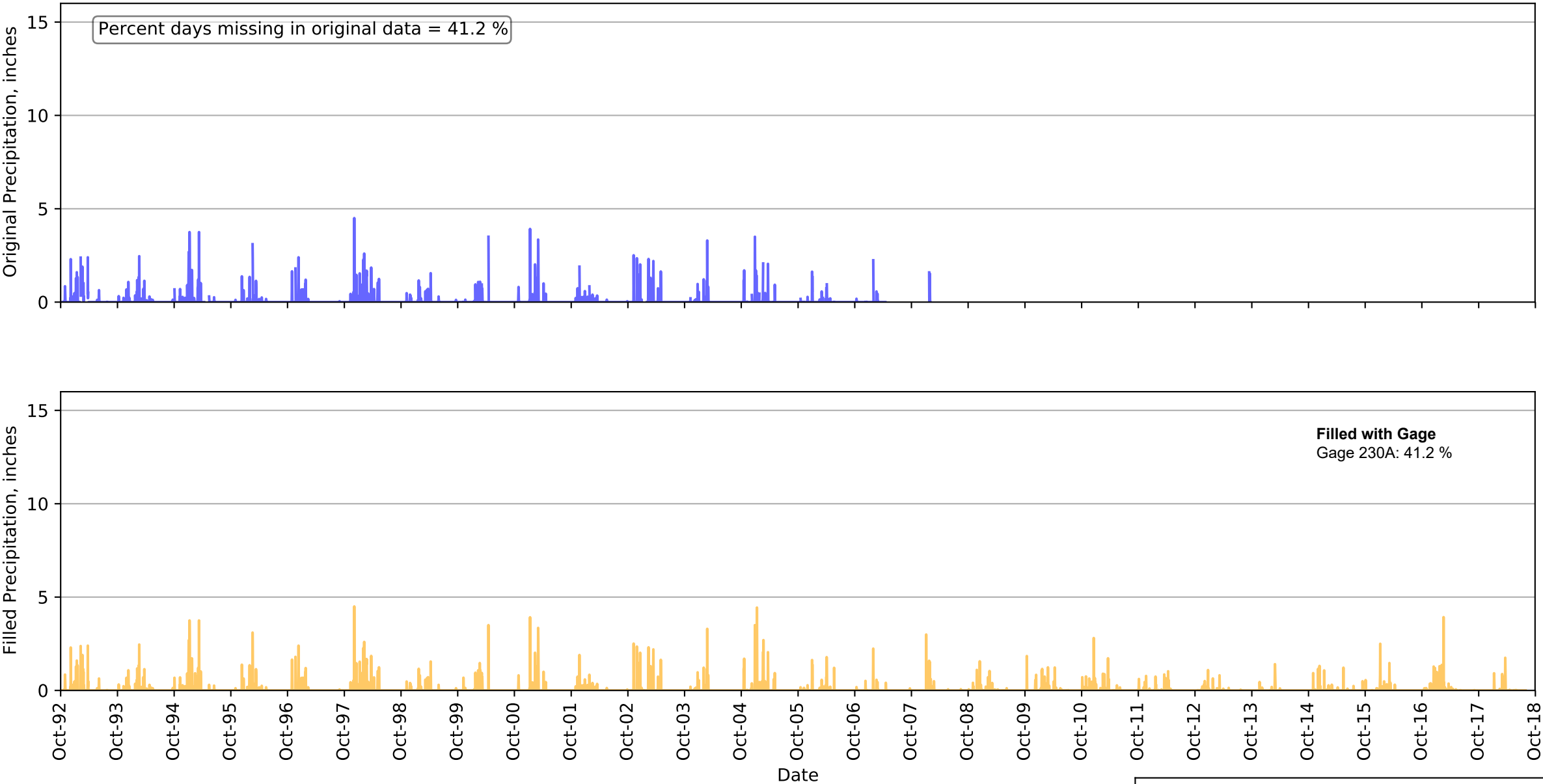




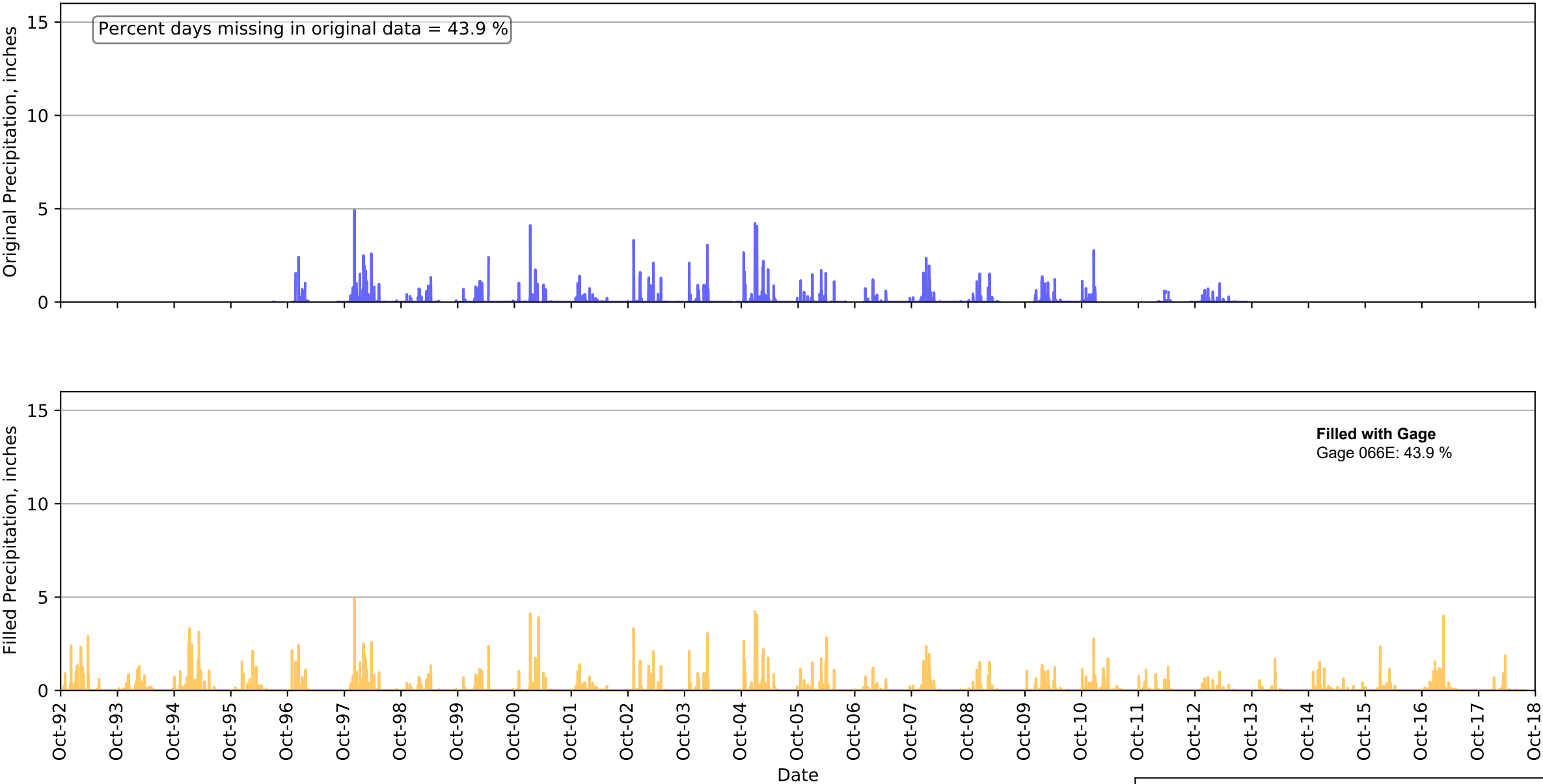




USC00046399 Ojai (NCDC) Ventura River Watershed, Ventura County, CA		
Geosyntec consultants		Figure B.35
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<b>USC00047957</b> <b>Santa Paula (NCDC)</b> Ventura River Watershed, Ventura County, CA		
<b>Geosyntec</b> consultants		<b>Figure</b> <b>B.36</b>
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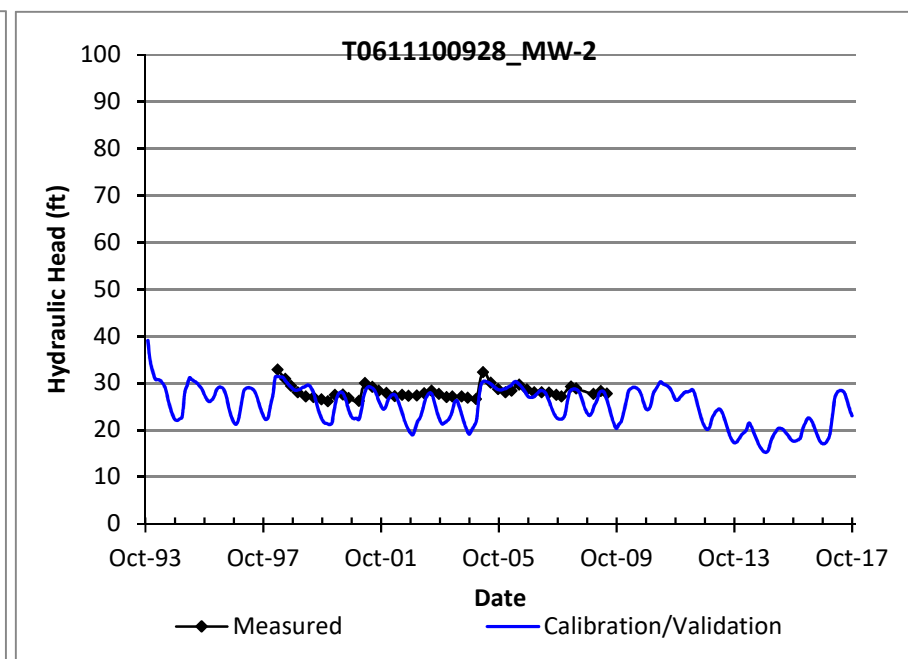
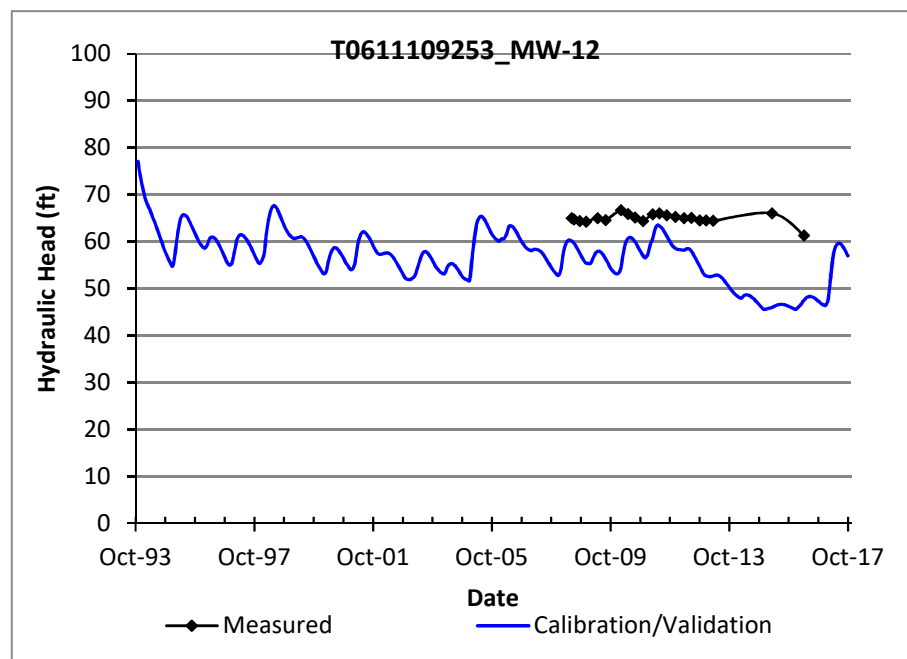
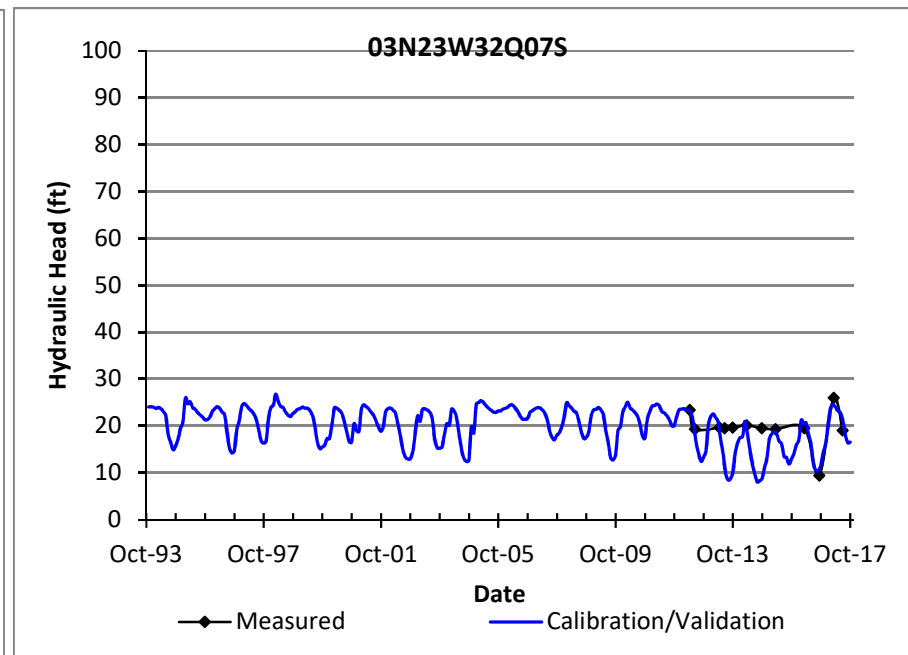
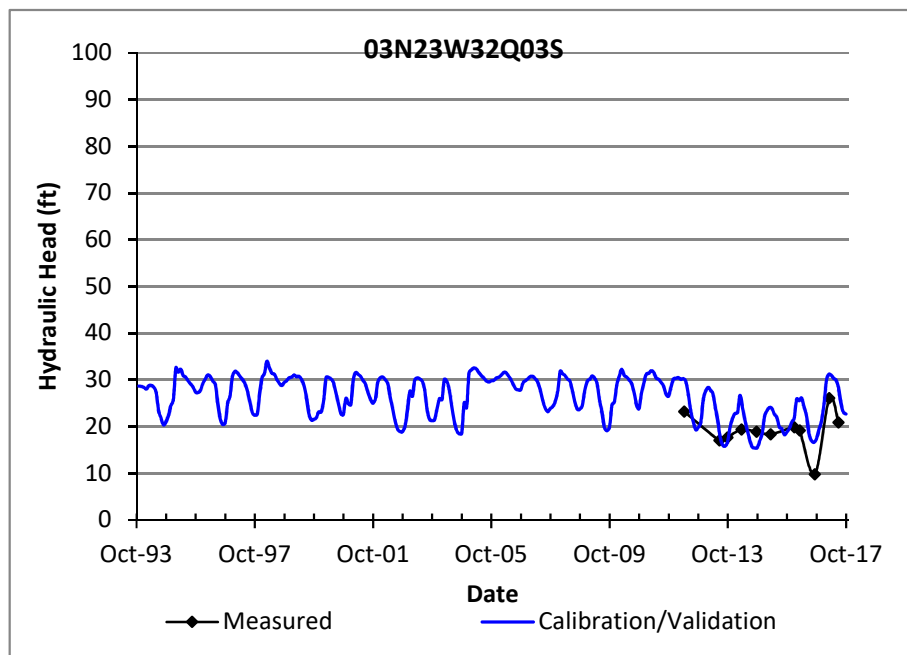


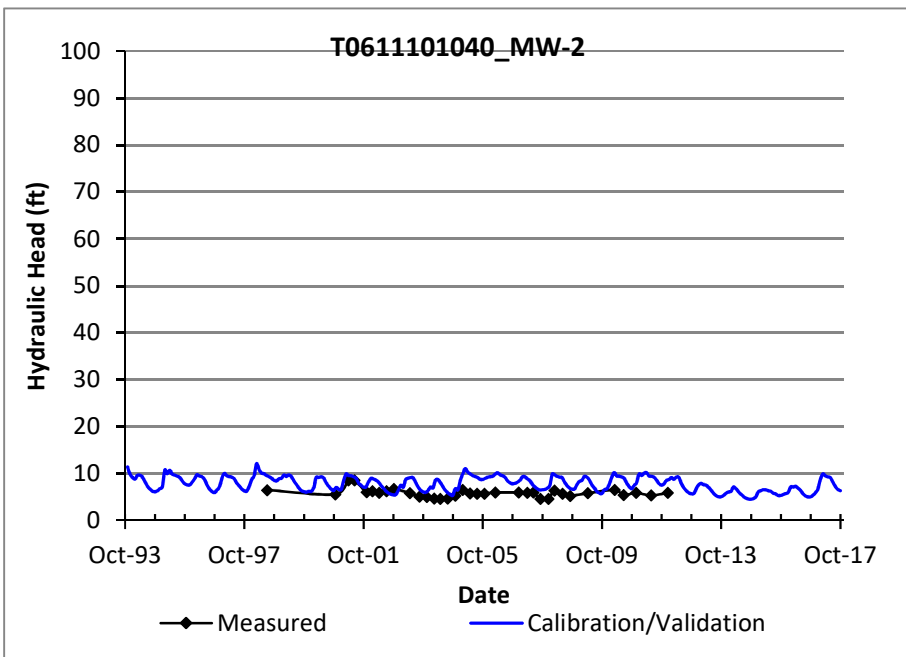
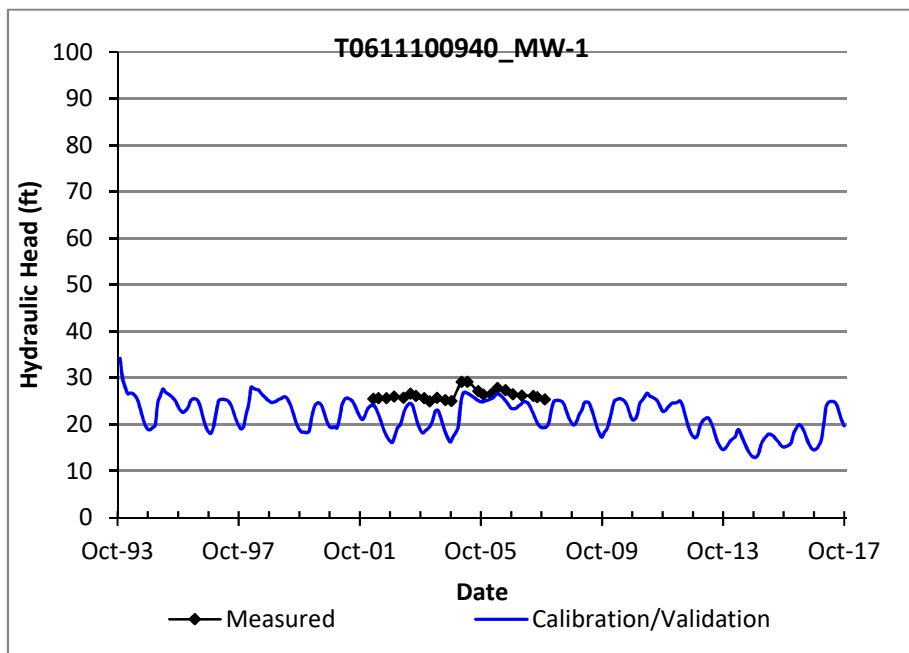
## **APPENDIX D: GROUNDWATER CALIBRATION HYDROGRAPHS**

Appendix D presents comparison of observed and simulated groundwater elevations at each well location in the Ventura River Watershed. Each hydrograph plots observed and simulated hydraulic head at a well, in feet above mean sea level, for water years 1993 to 2017. Some hydrographs do not have a complete observed dataset for the modeling period. The locations of the wells are described in Figure 1.9. The groundwater level data are mostly from the State Water Resources Control Board's GeoTracker database, the Ojai Basin Groundwater Management Agency, the Upper Ventura River Groundwater Agency, and the Ventura County Watershed Protection District. If you need accessibility assistance with the information presented in this appendix, please contact the State Water Board at [instreamflows@waterboards.ca.gov](mailto:instreamflows@waterboards.ca.gov).

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**Lower Ventura River Valley Basin**

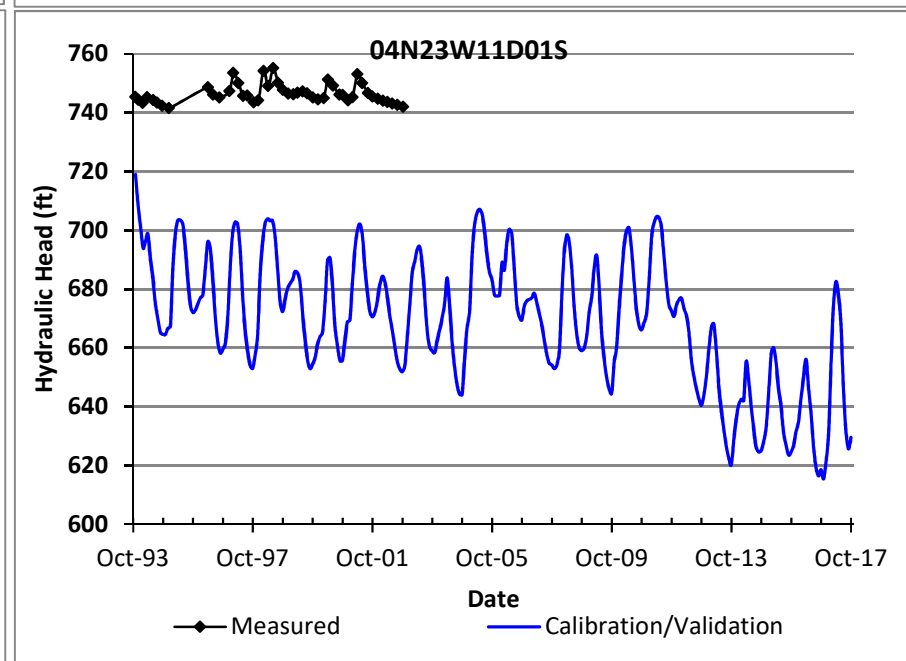
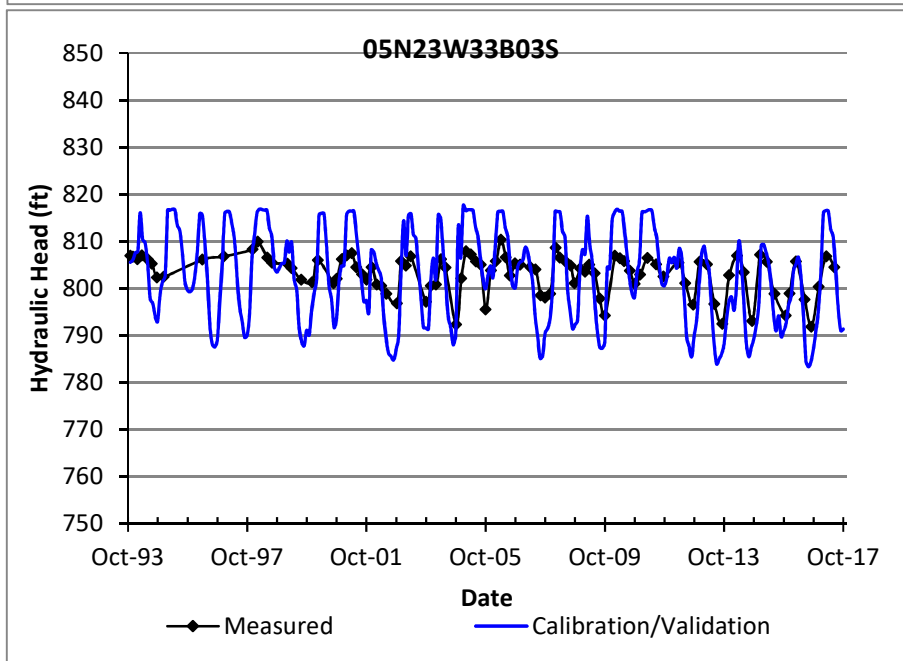
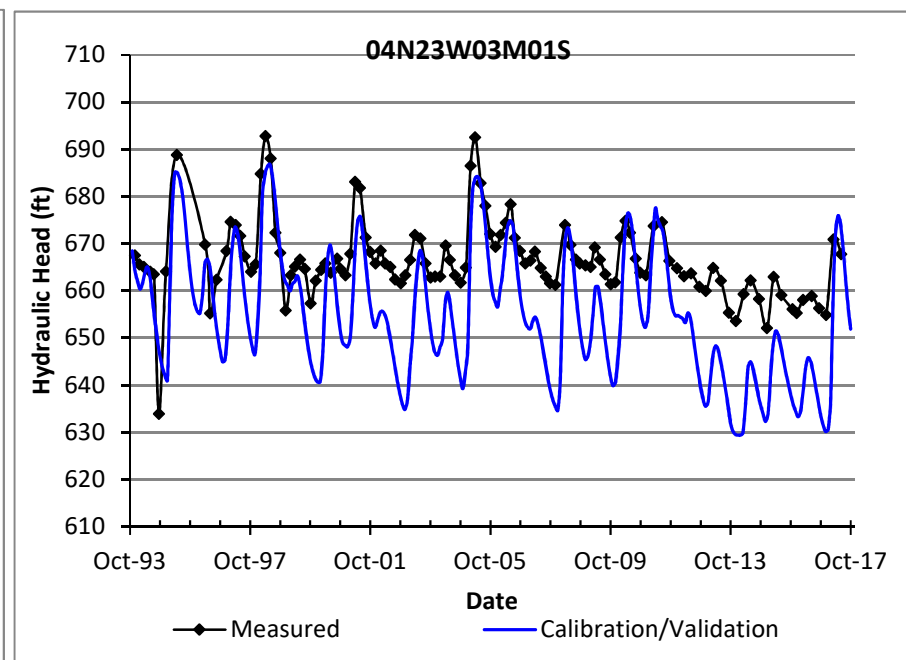
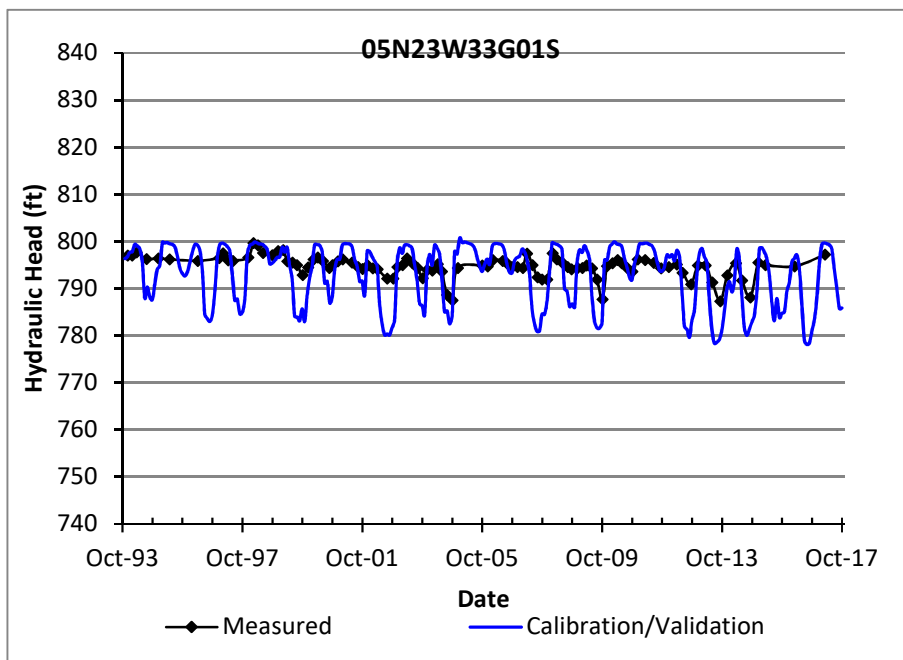


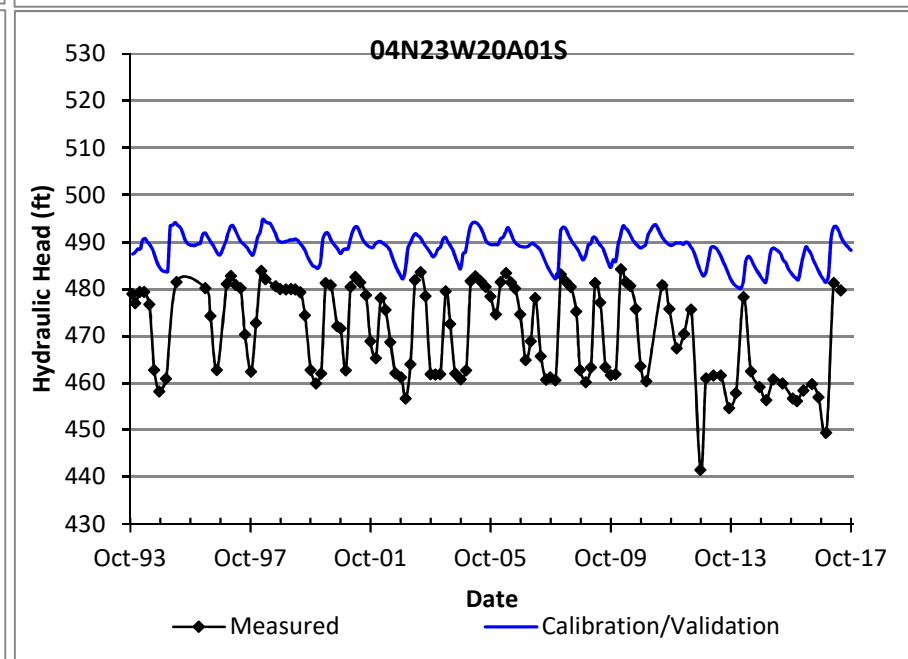
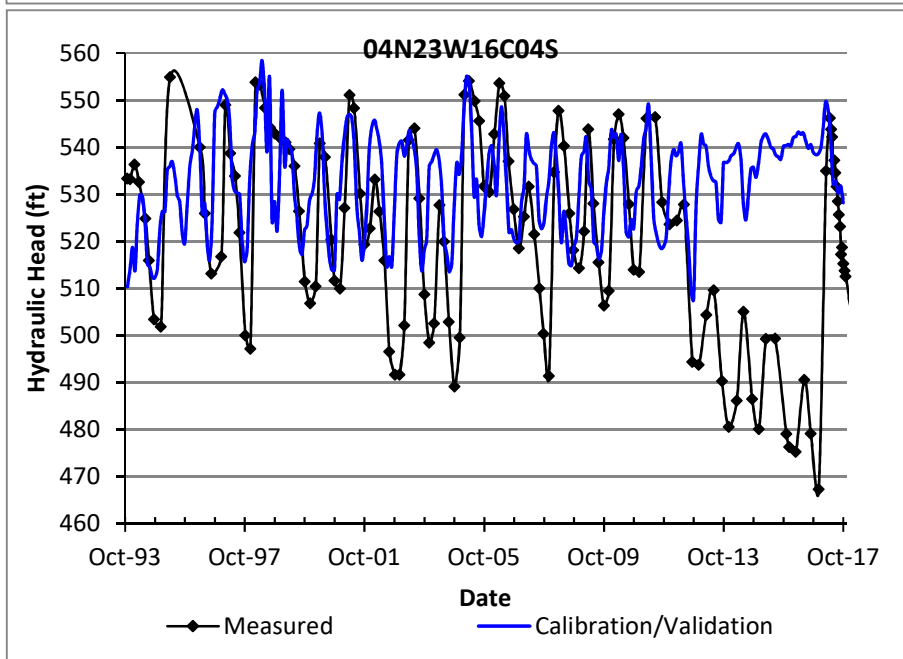
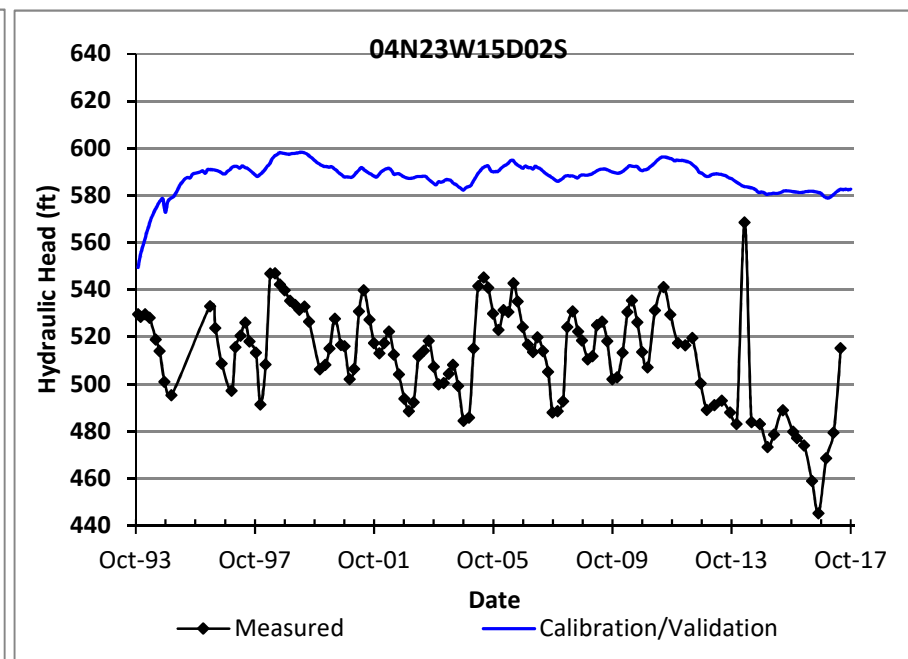
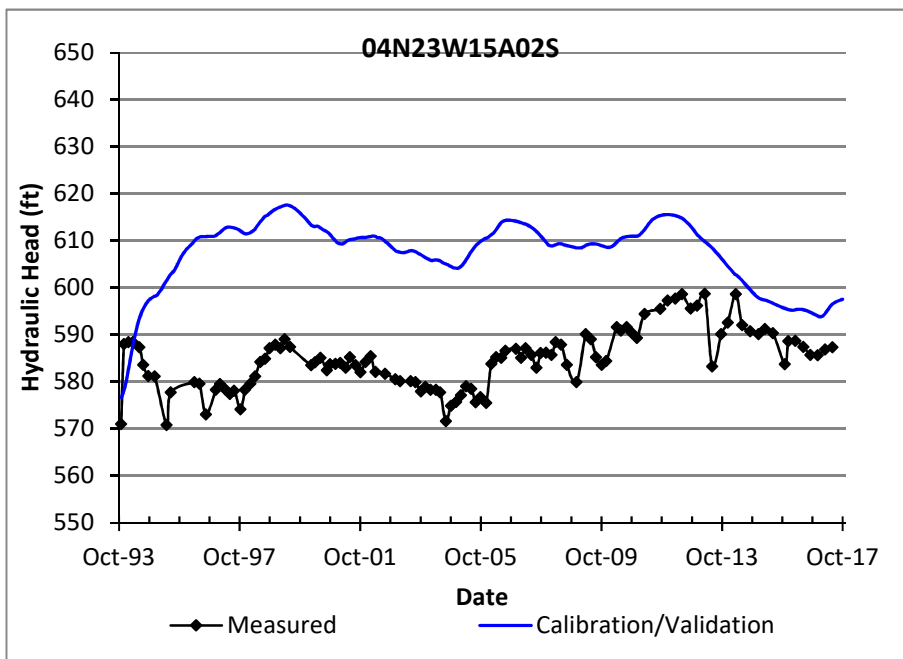


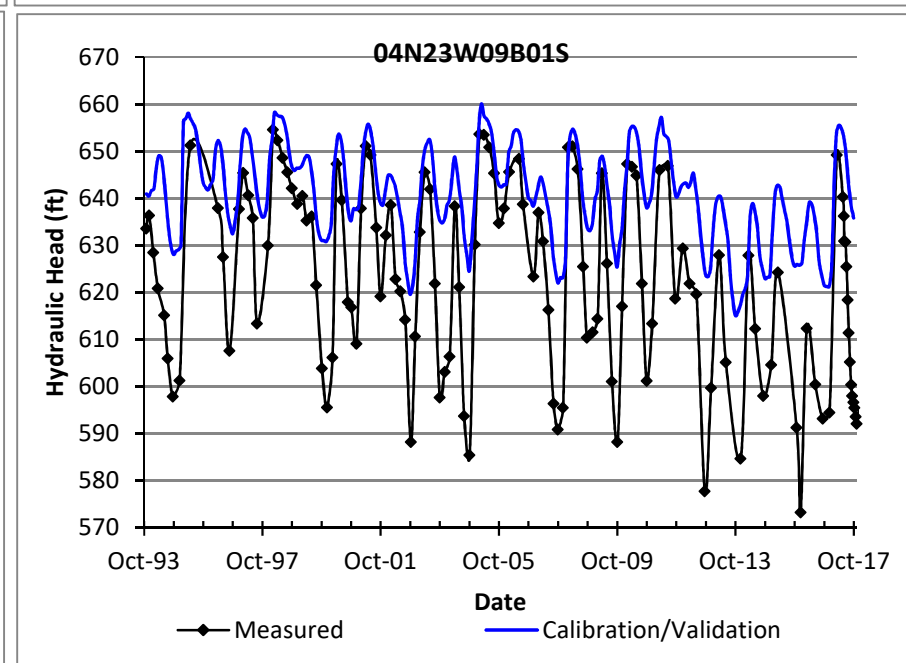
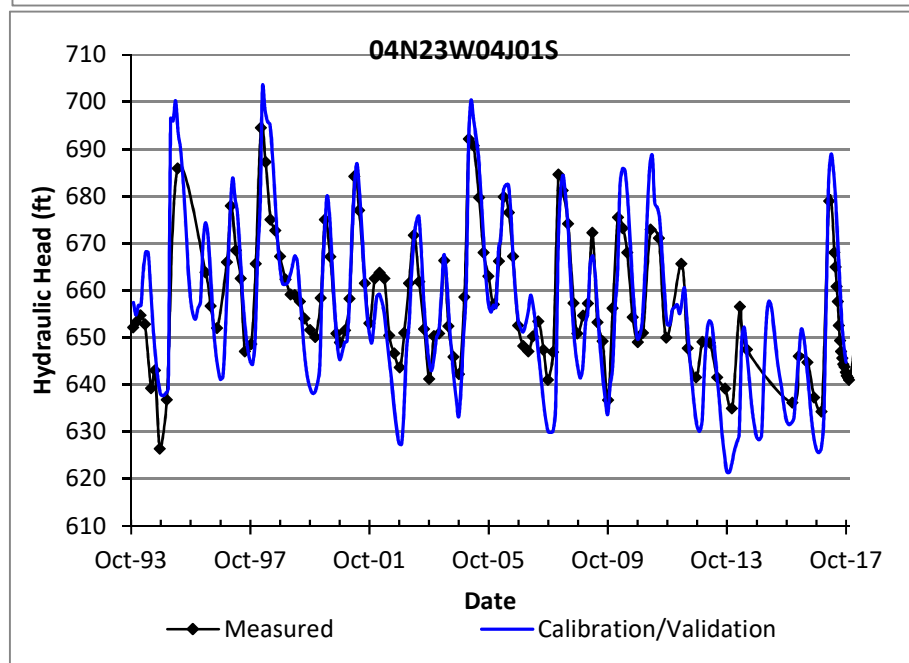
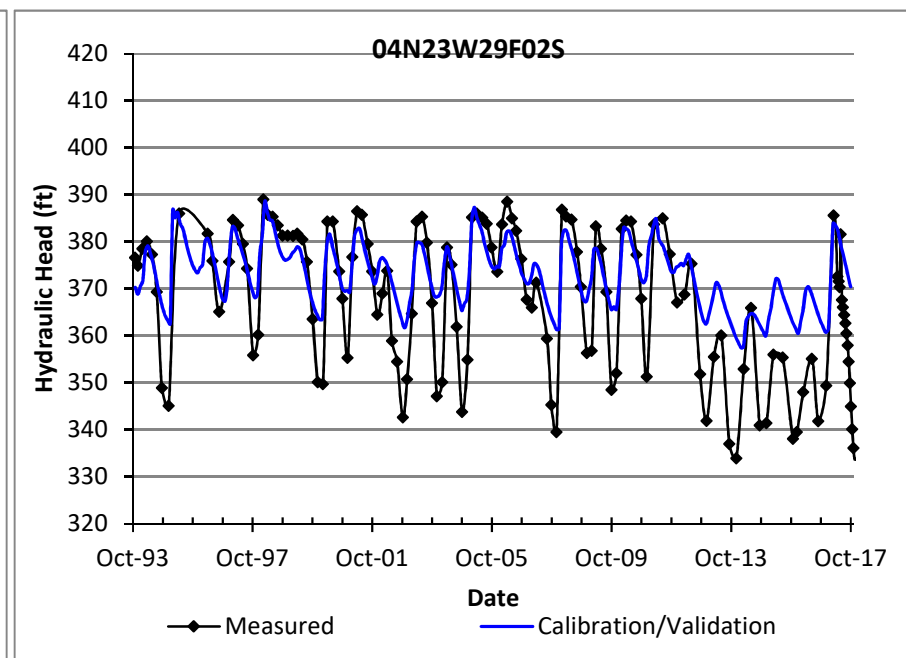
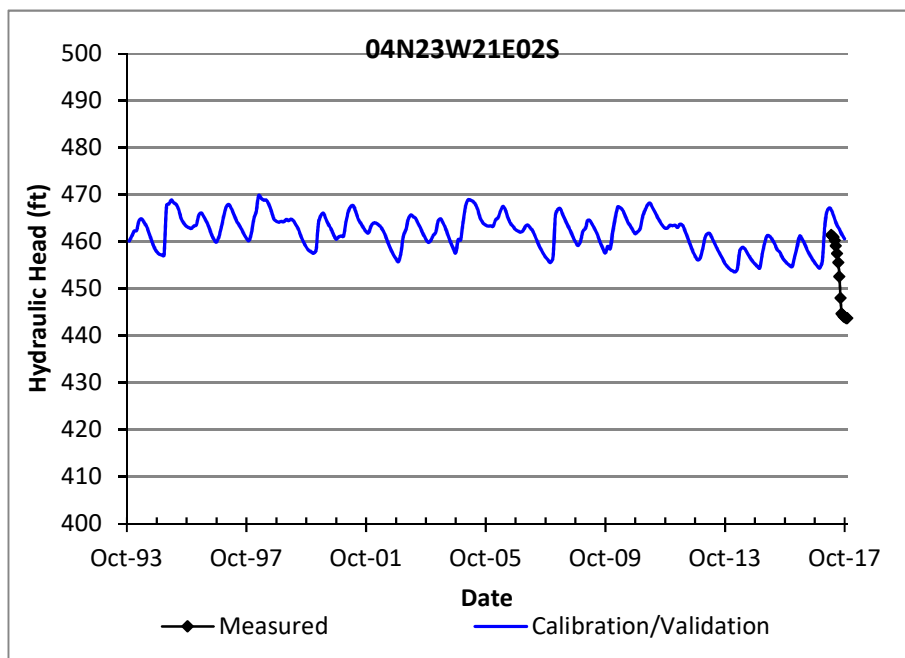
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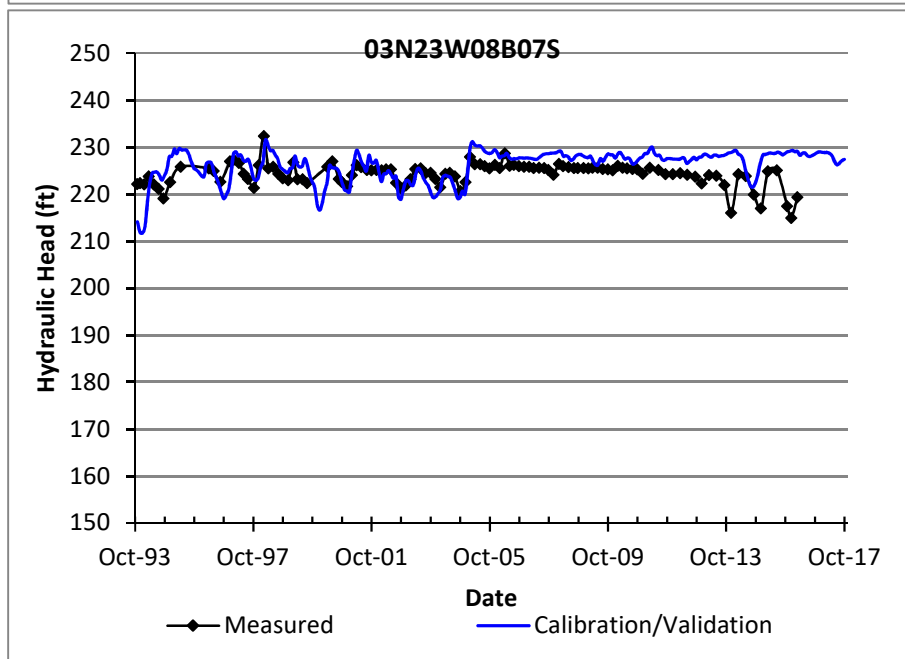
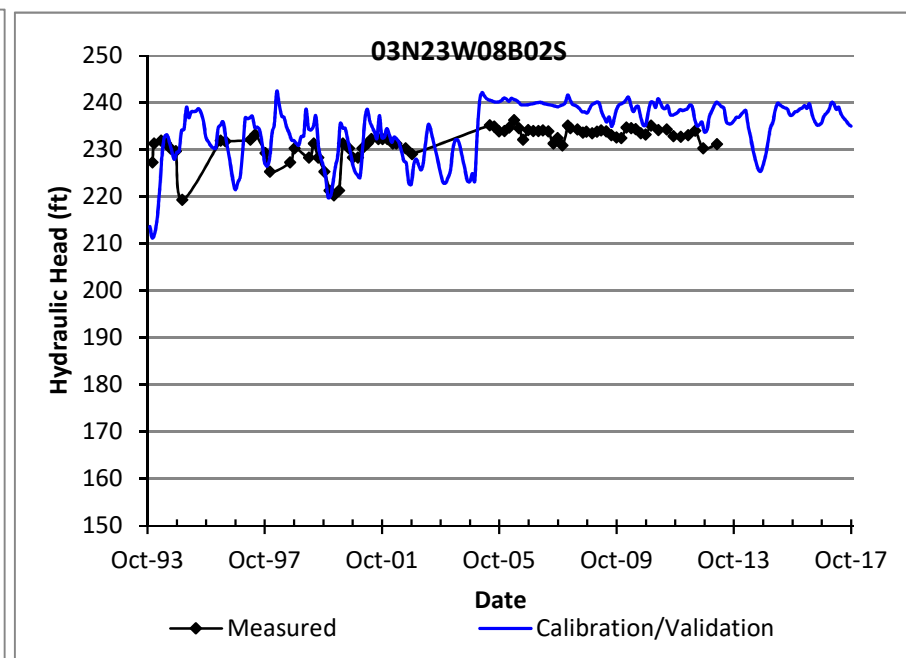
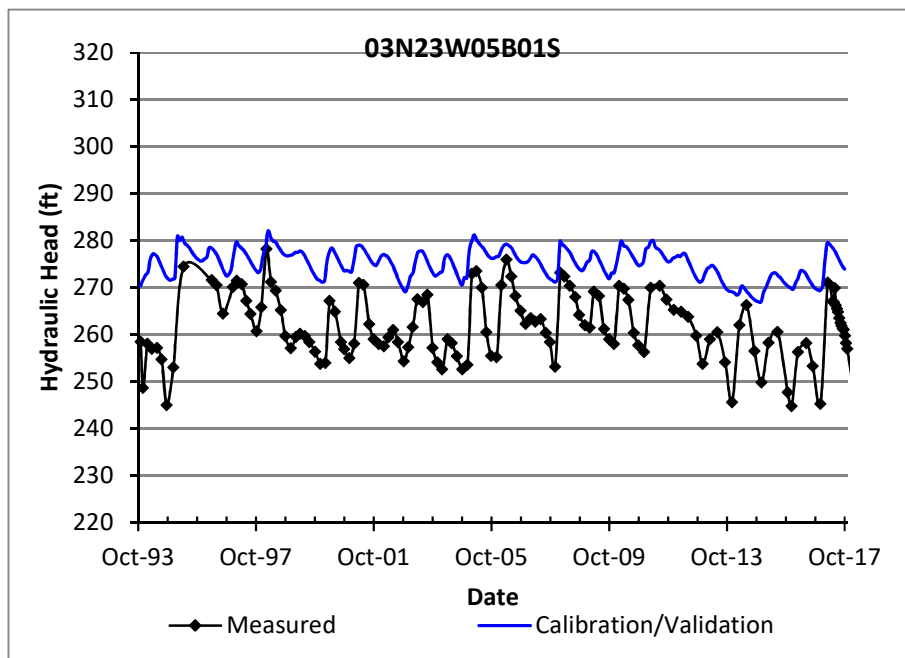
**Upper Ventura River Valley Basin**





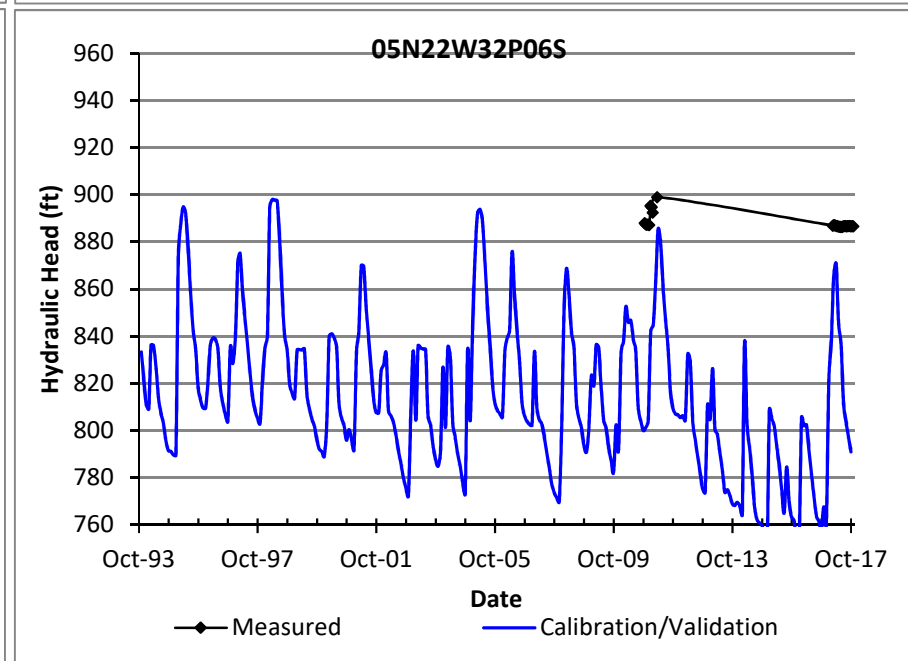
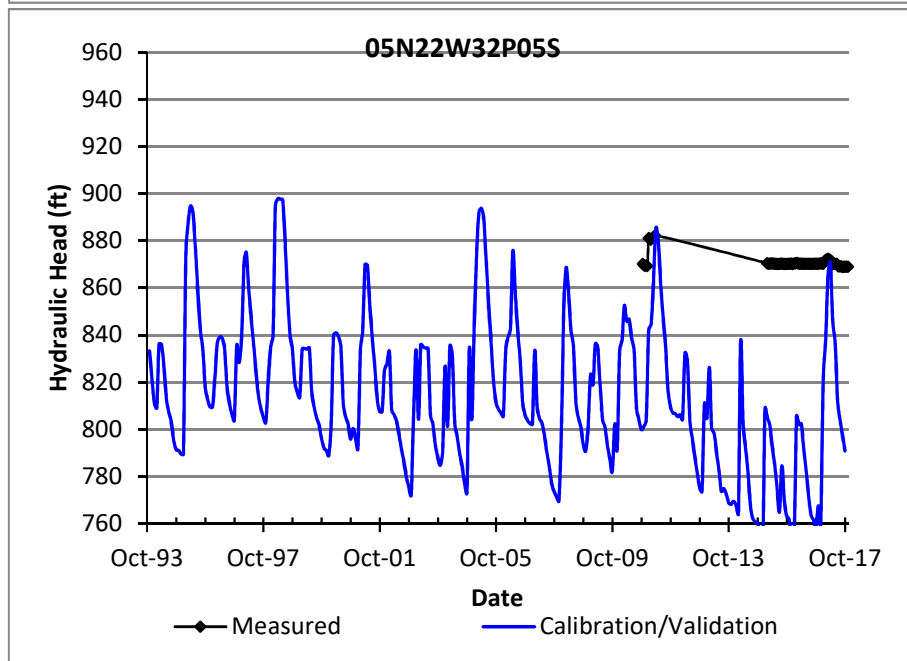
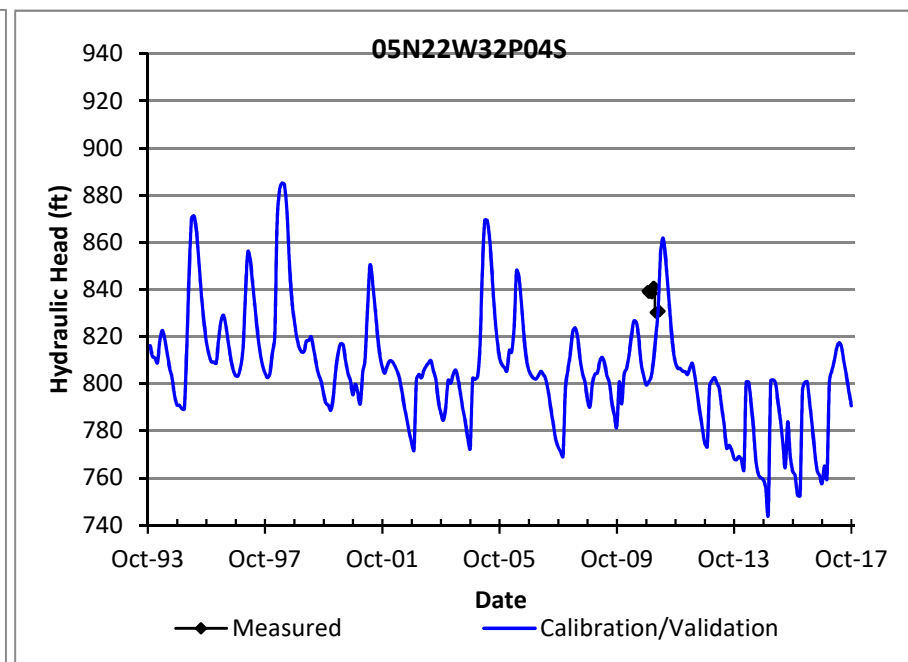
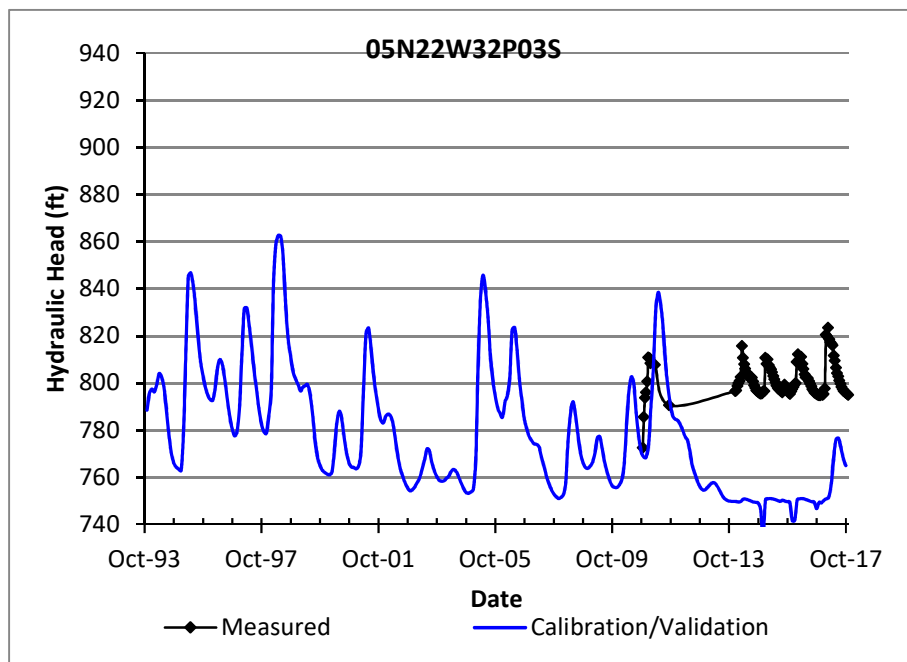


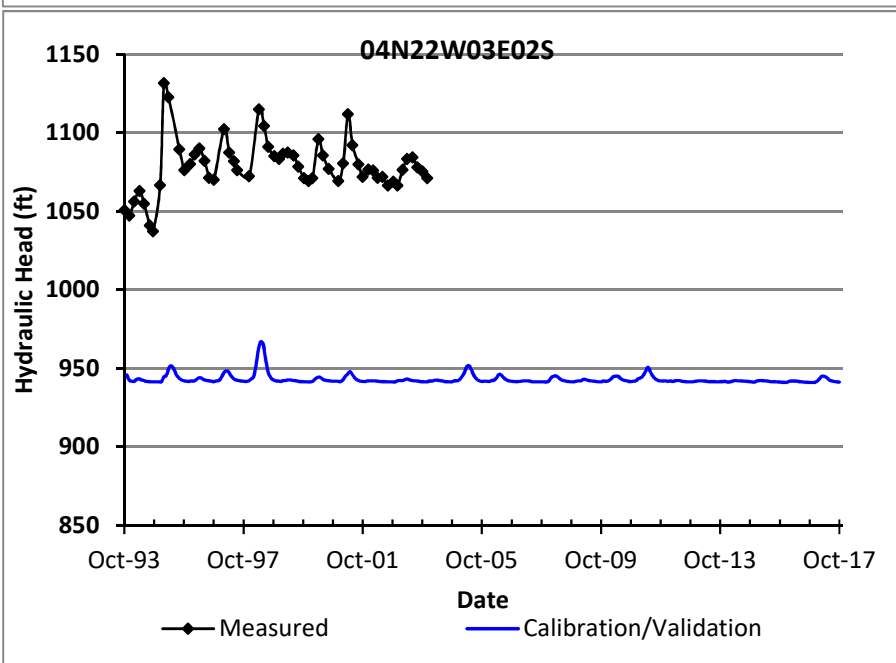
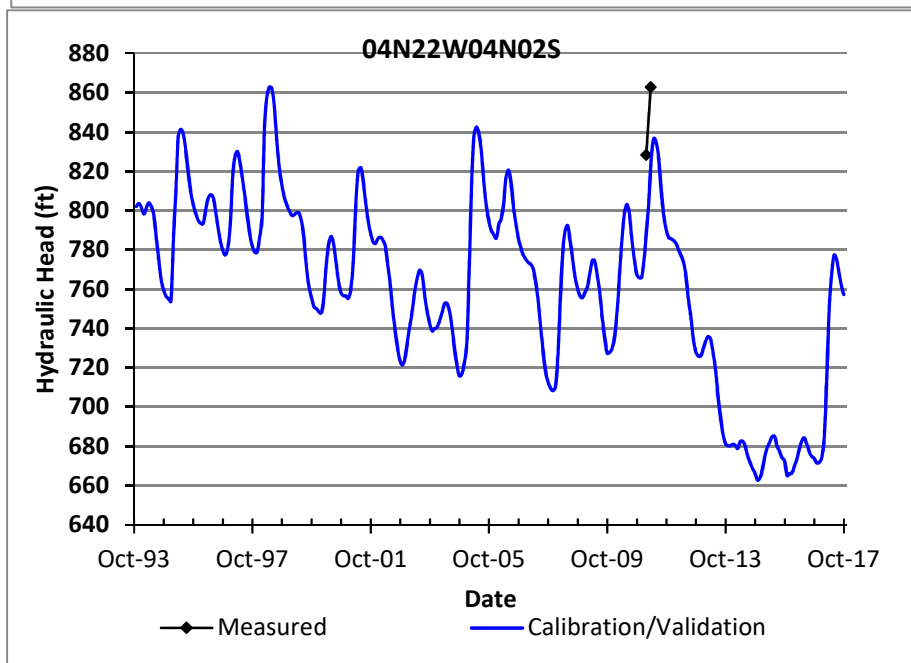
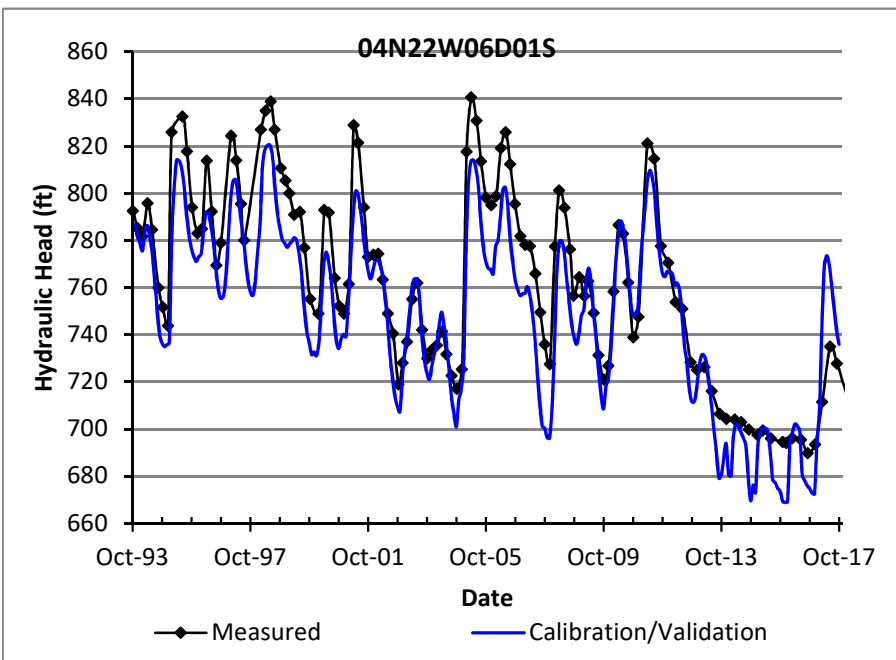
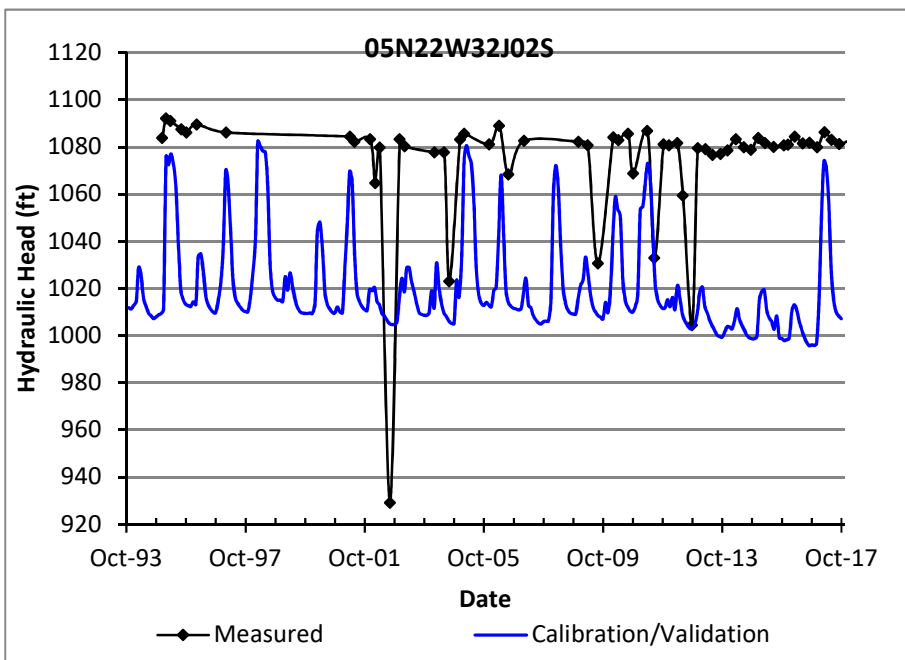


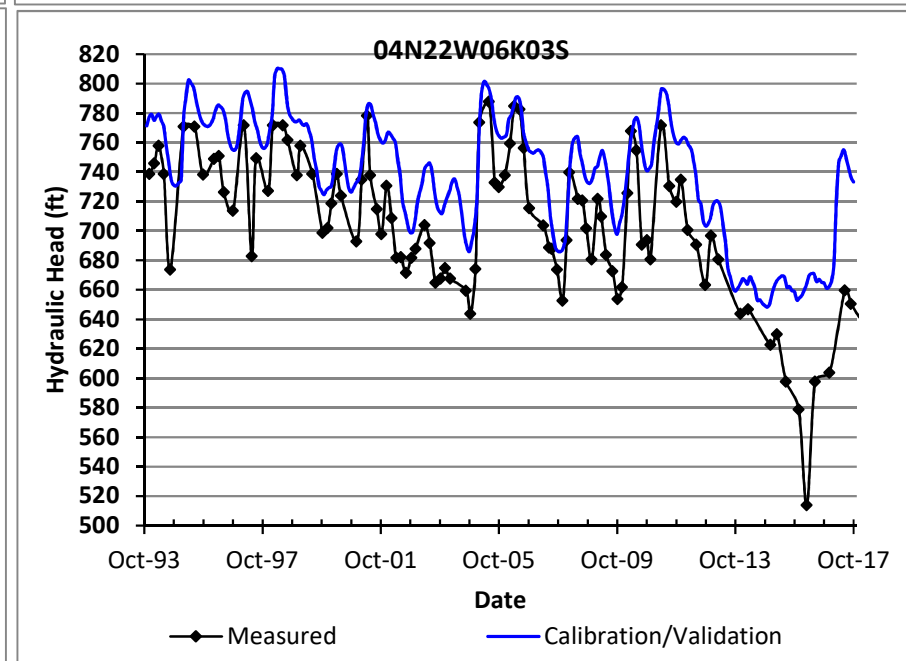
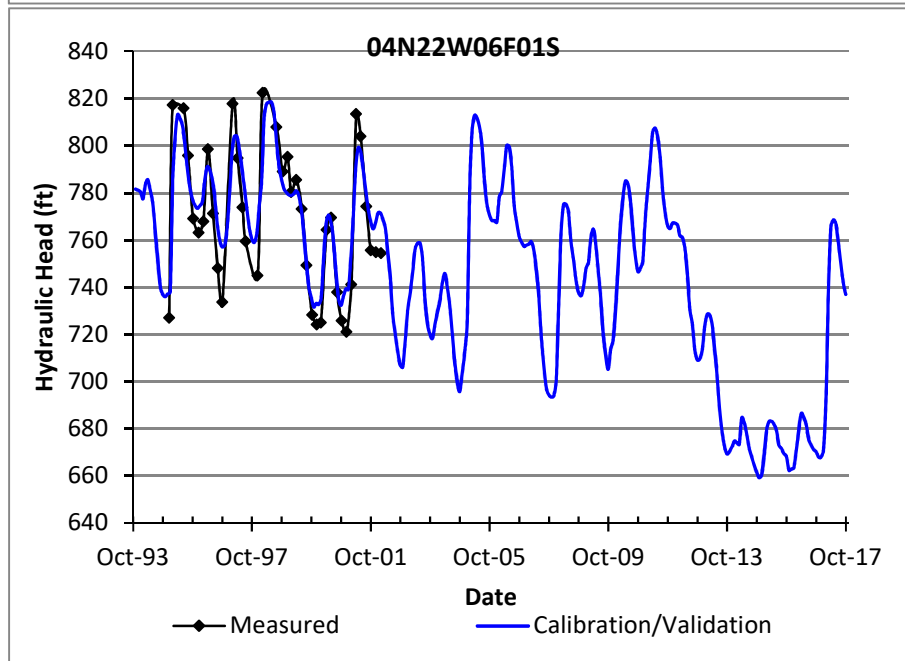
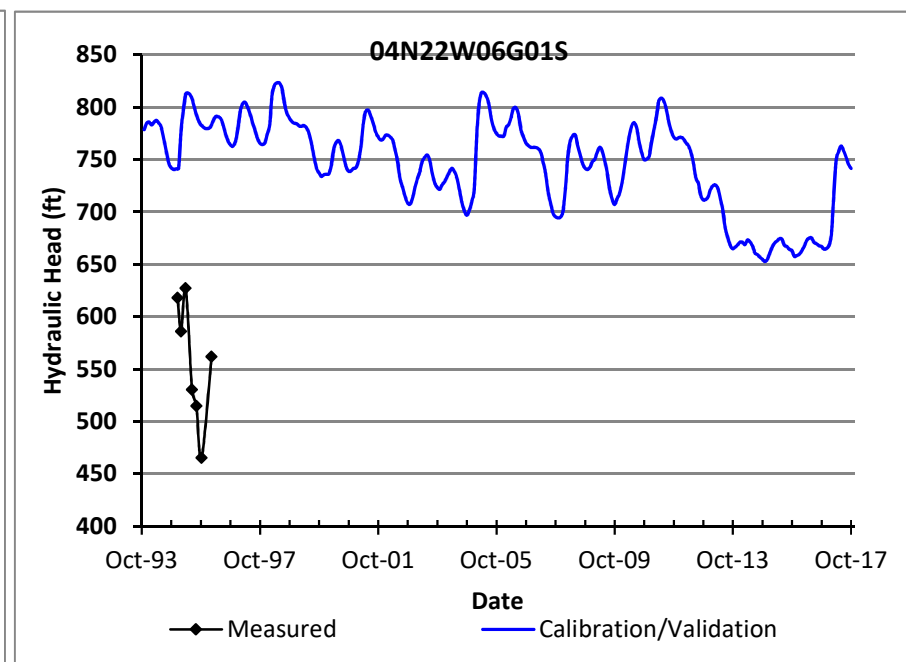
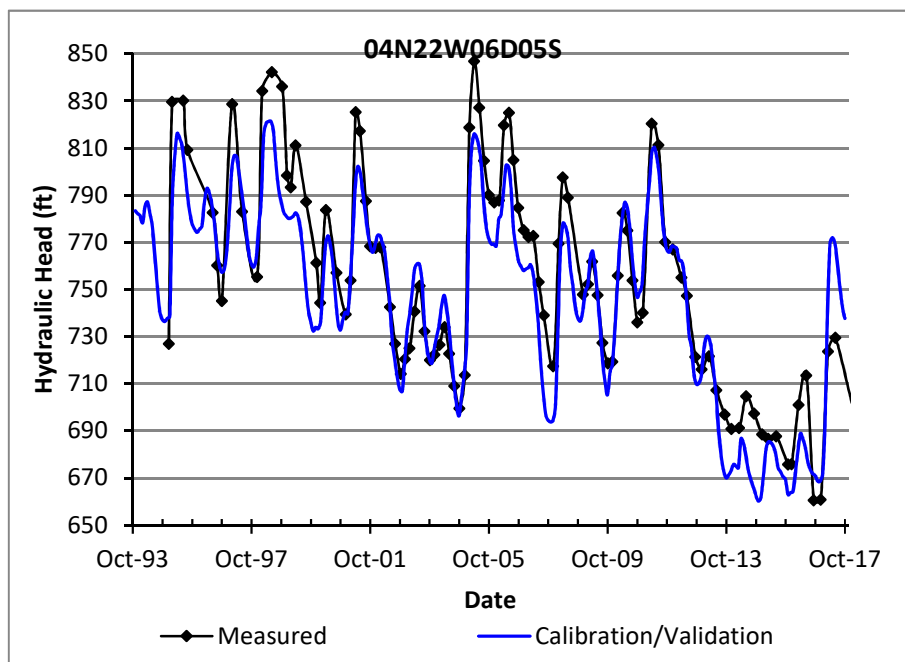


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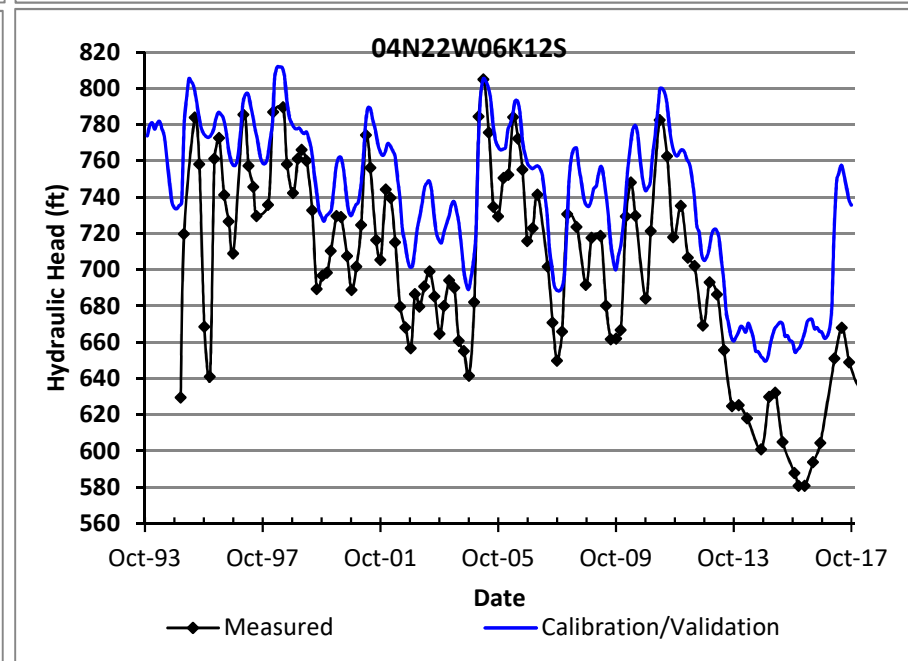
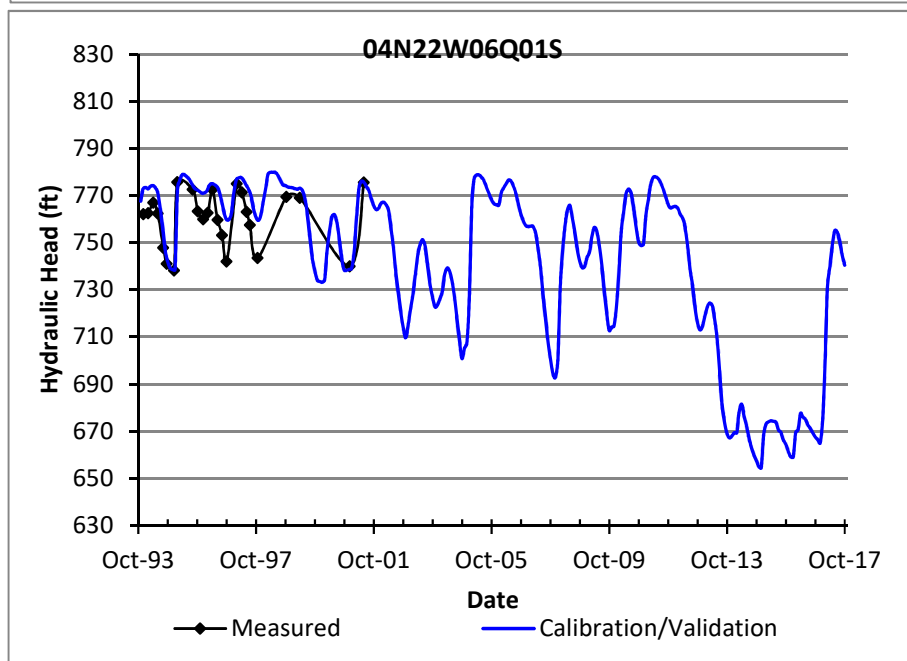
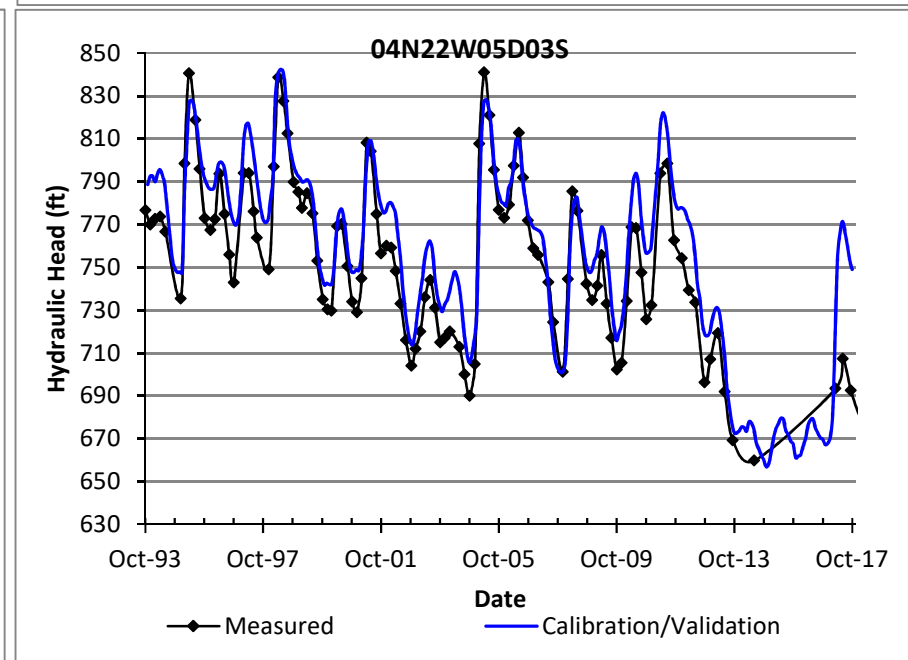
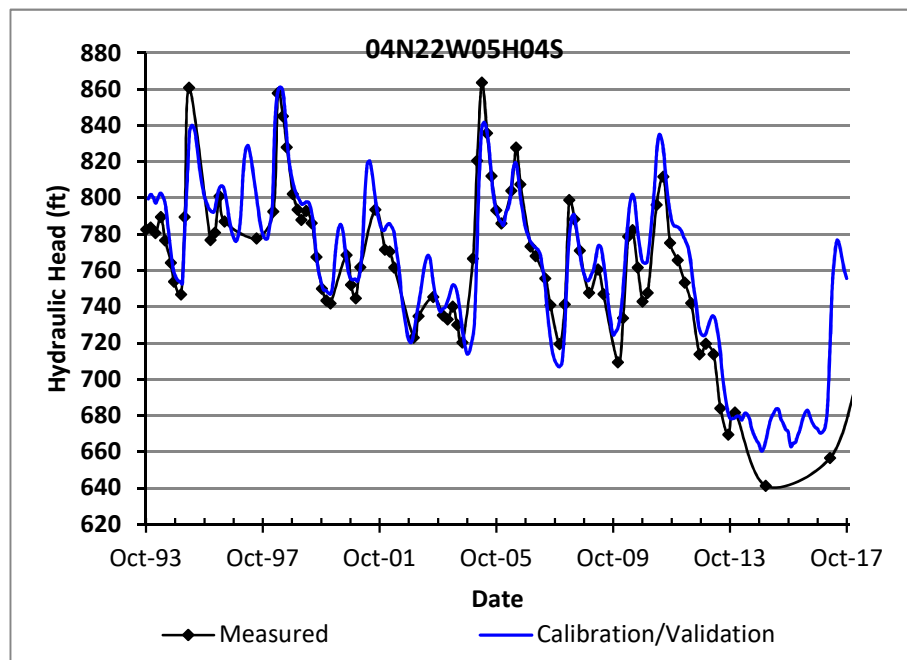
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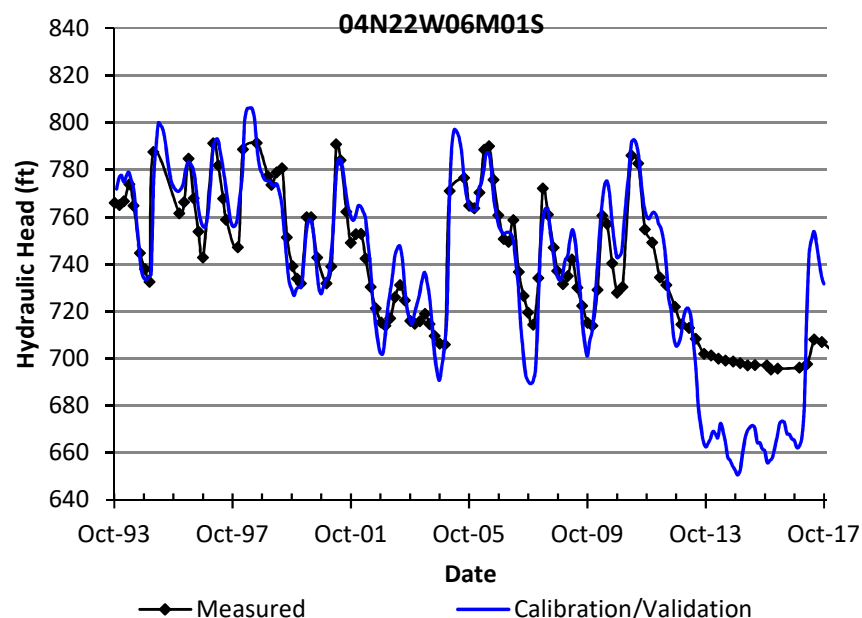
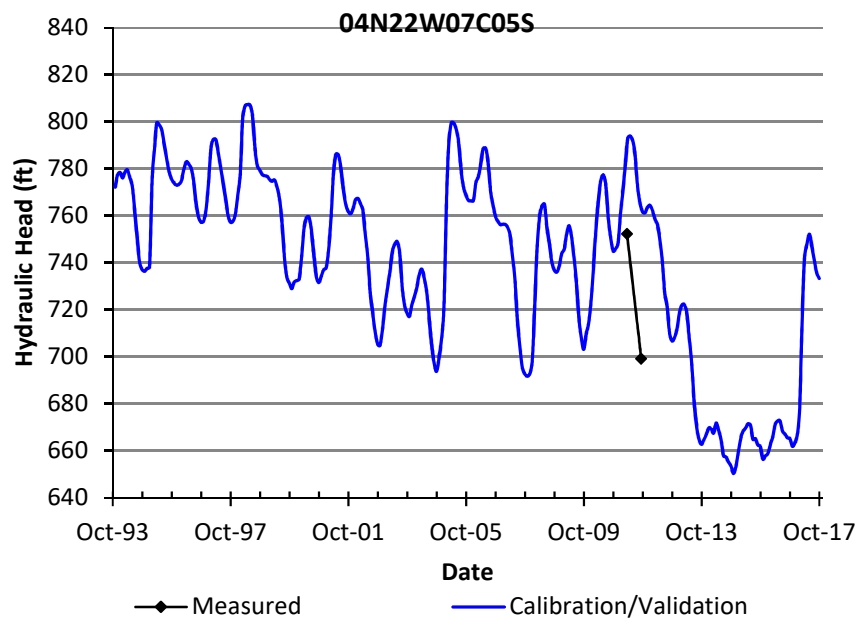
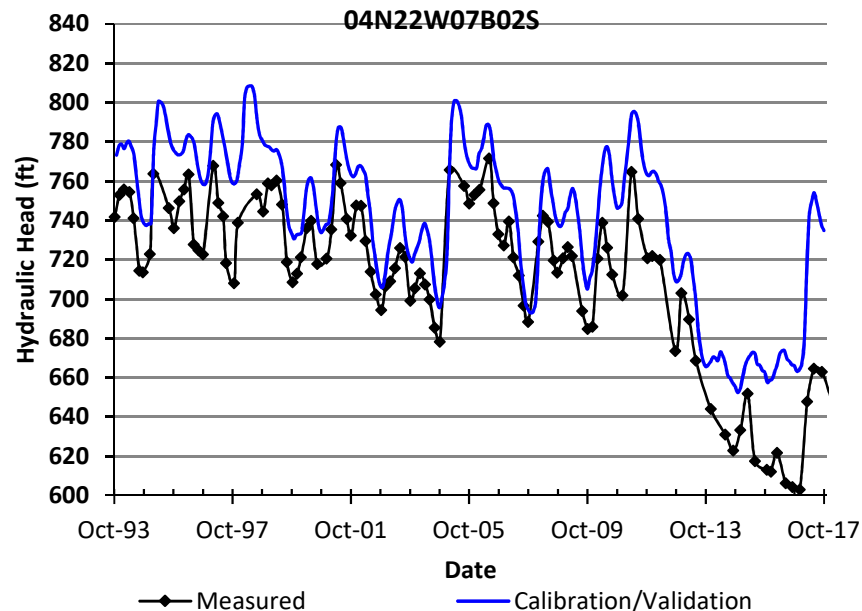
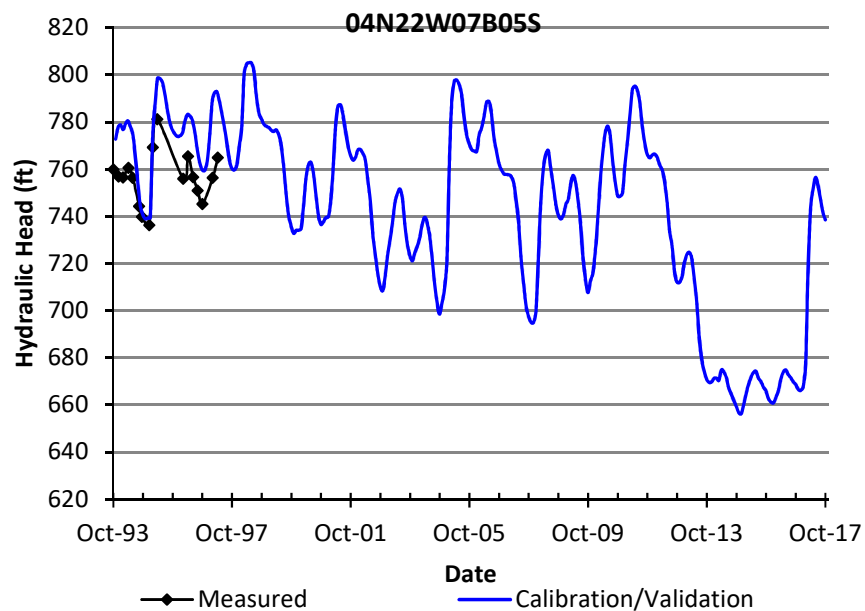


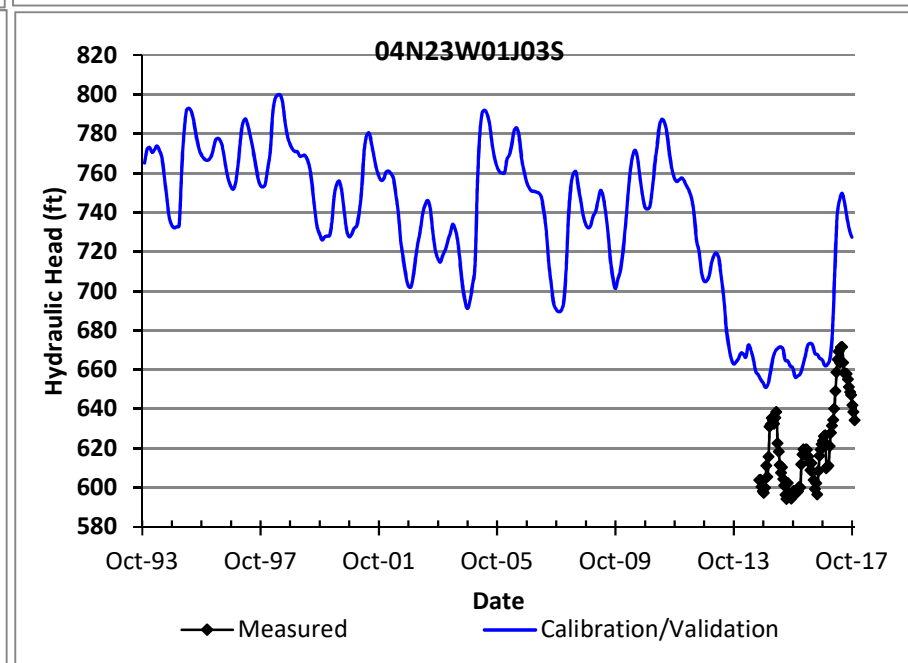
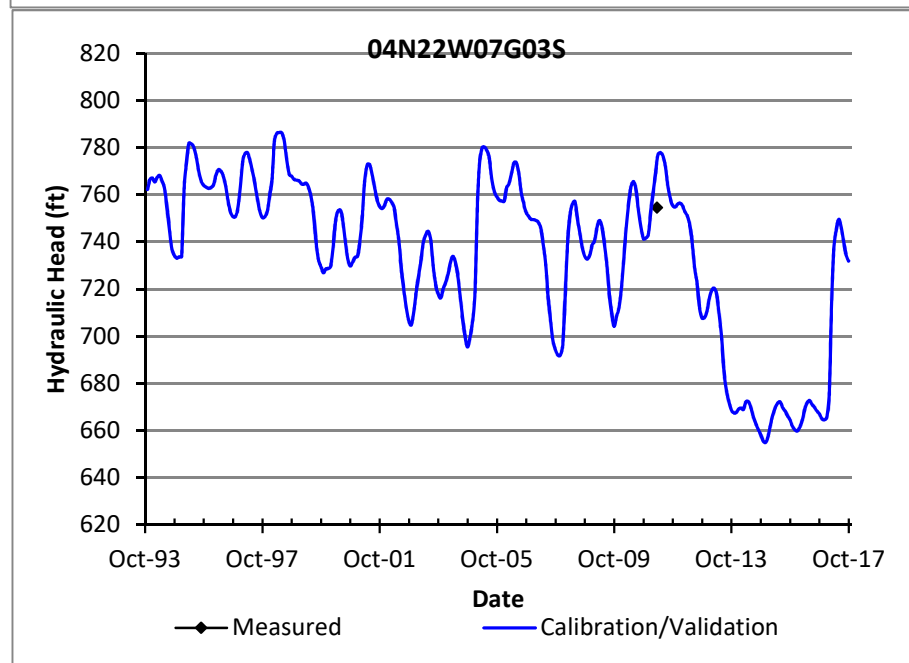
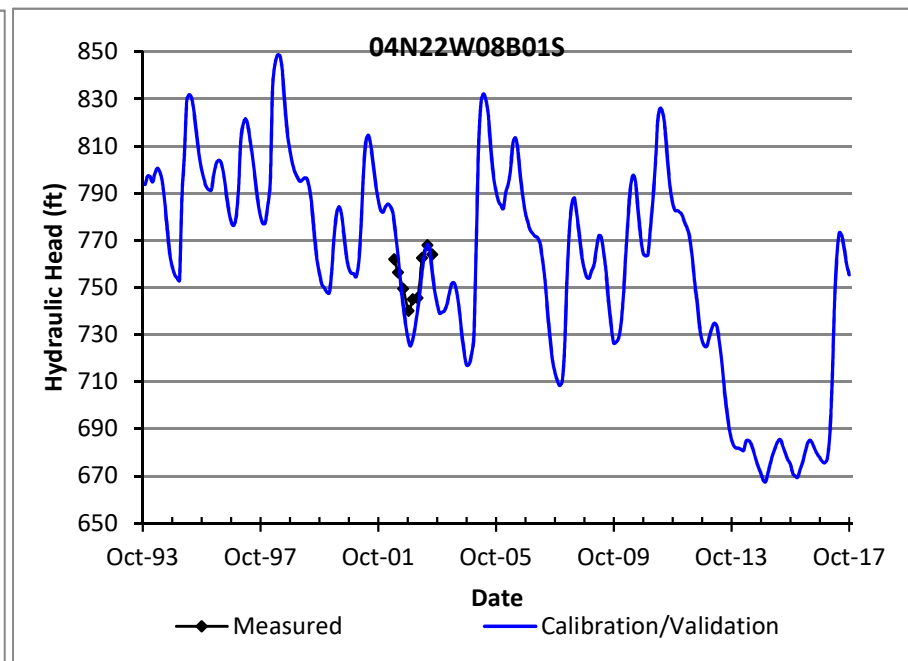
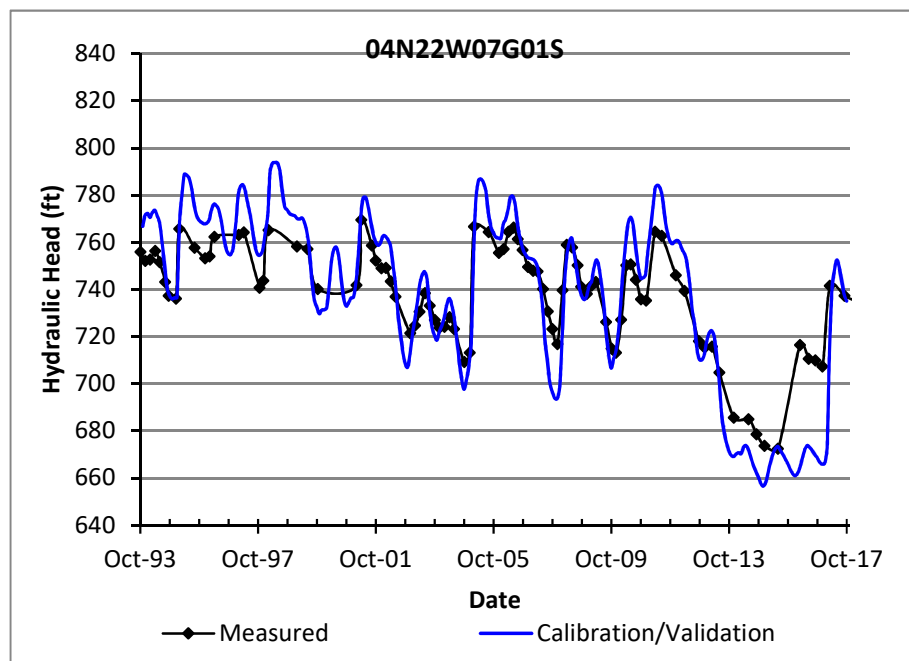


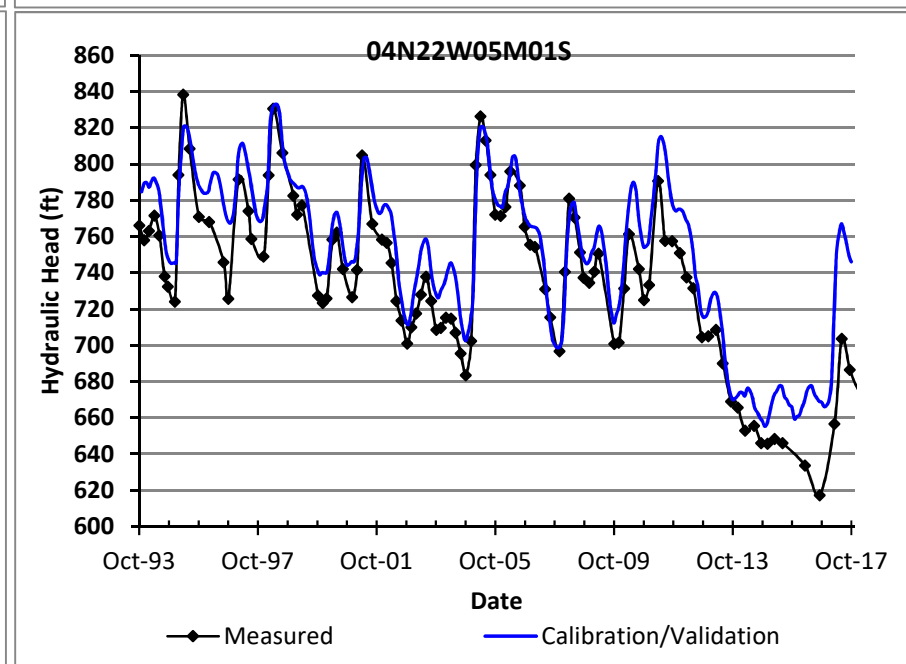
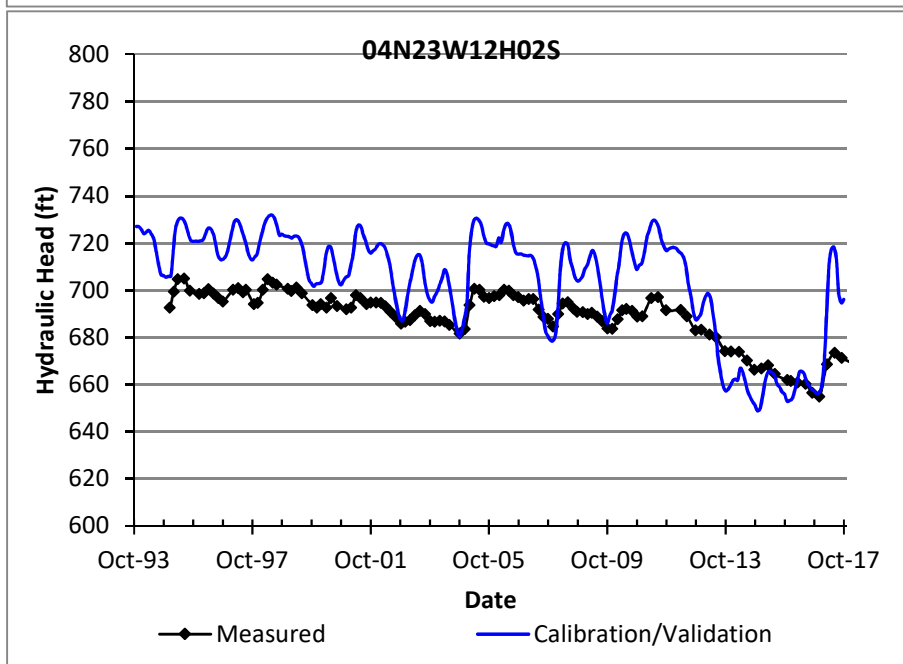
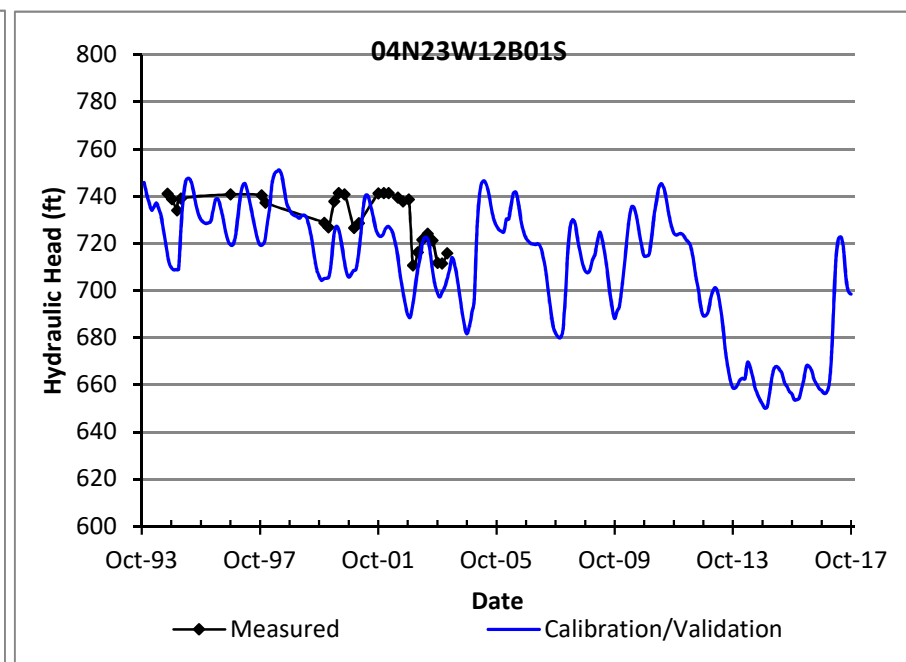
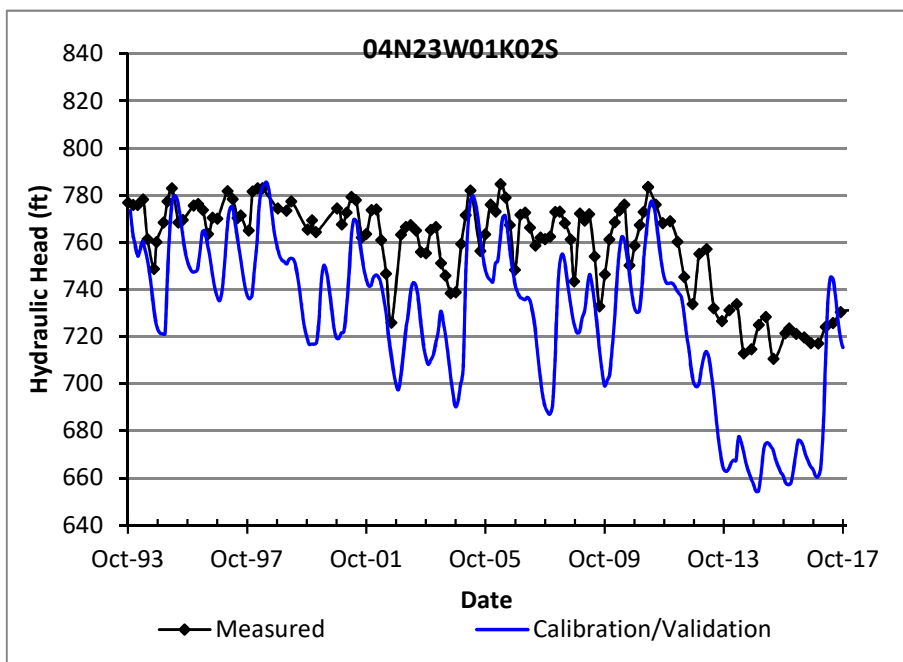


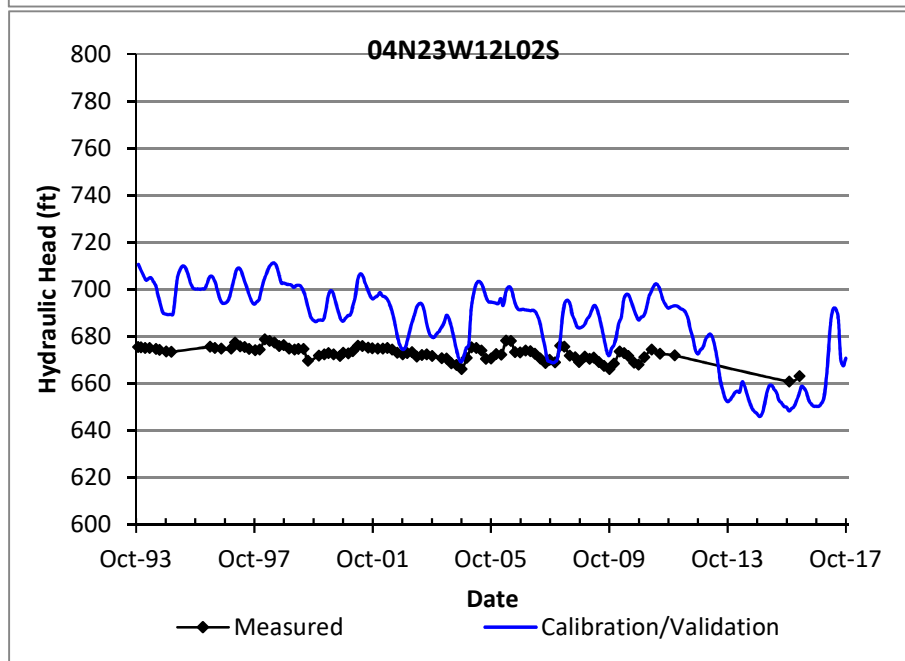
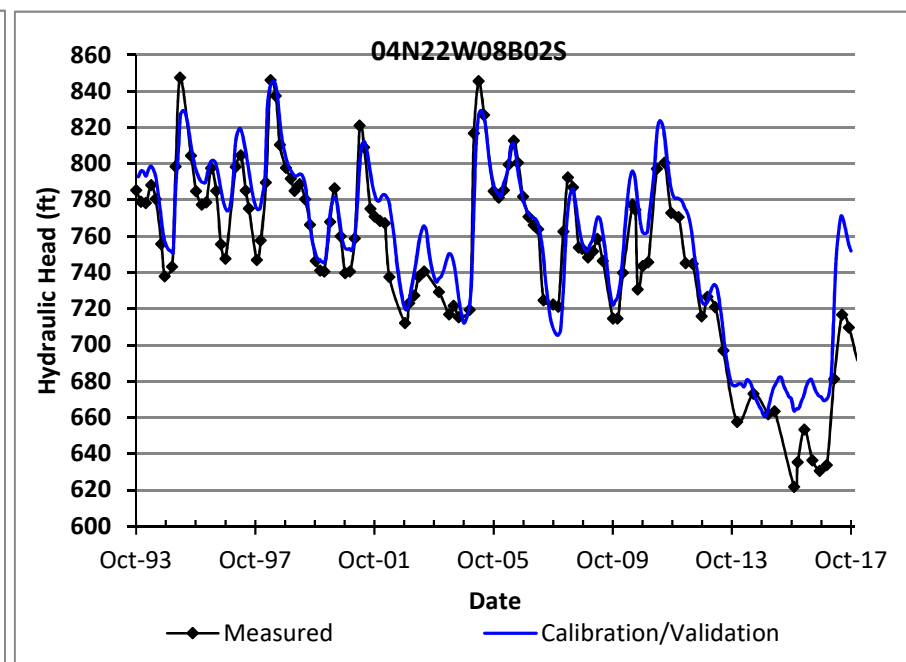
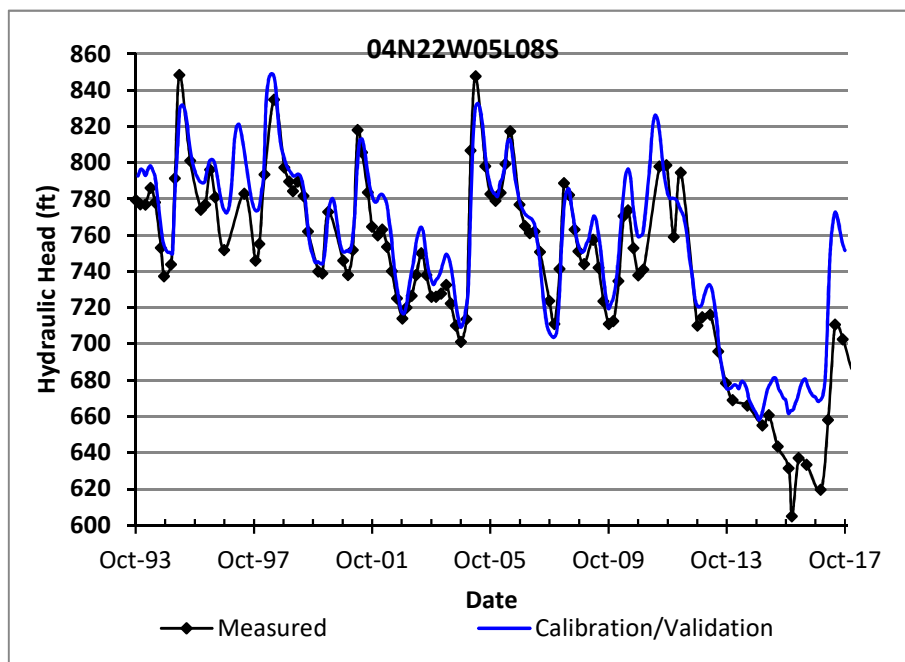






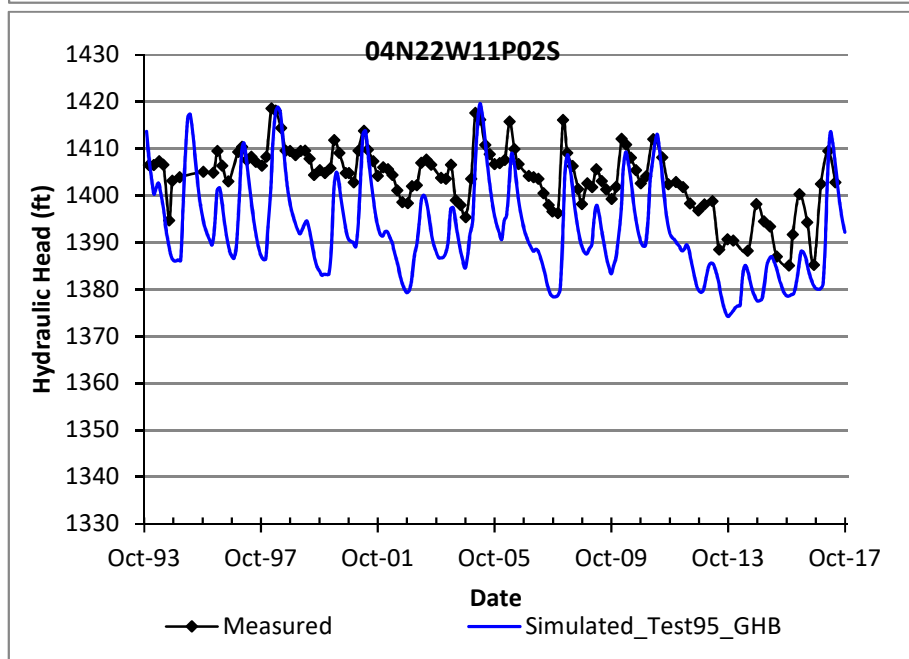
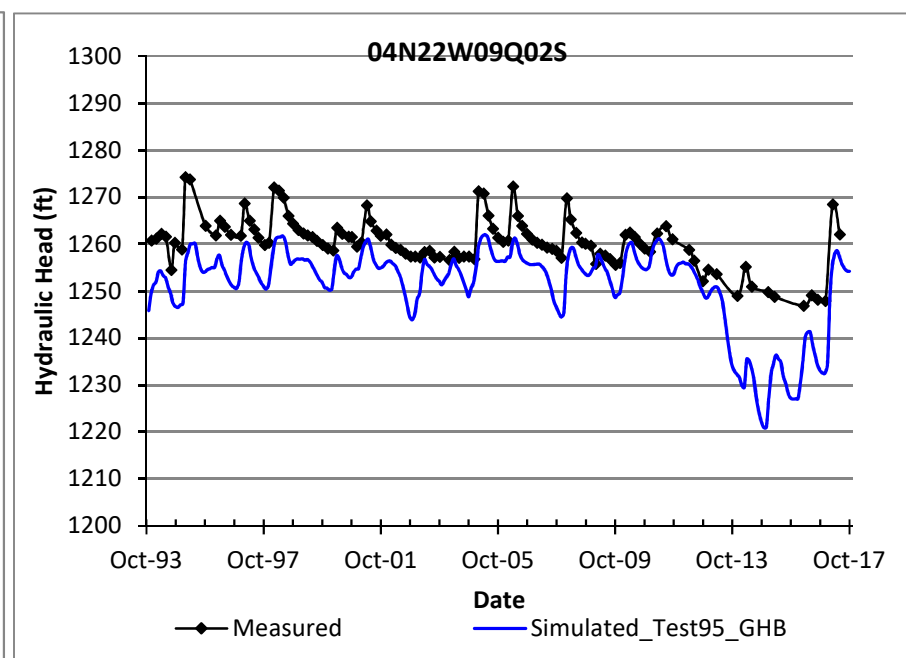
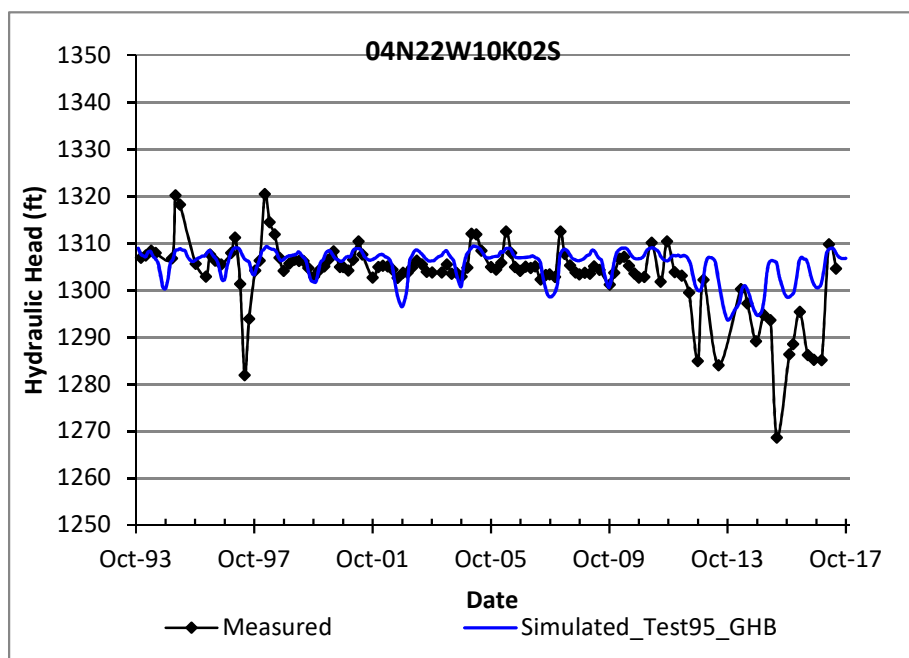






Draft VRW GW-SW Model Report

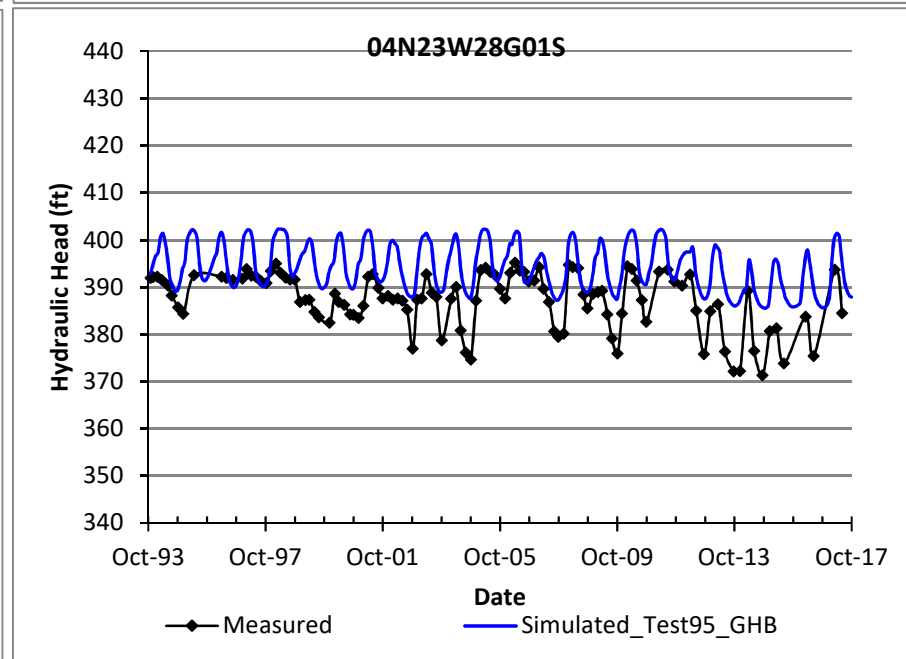
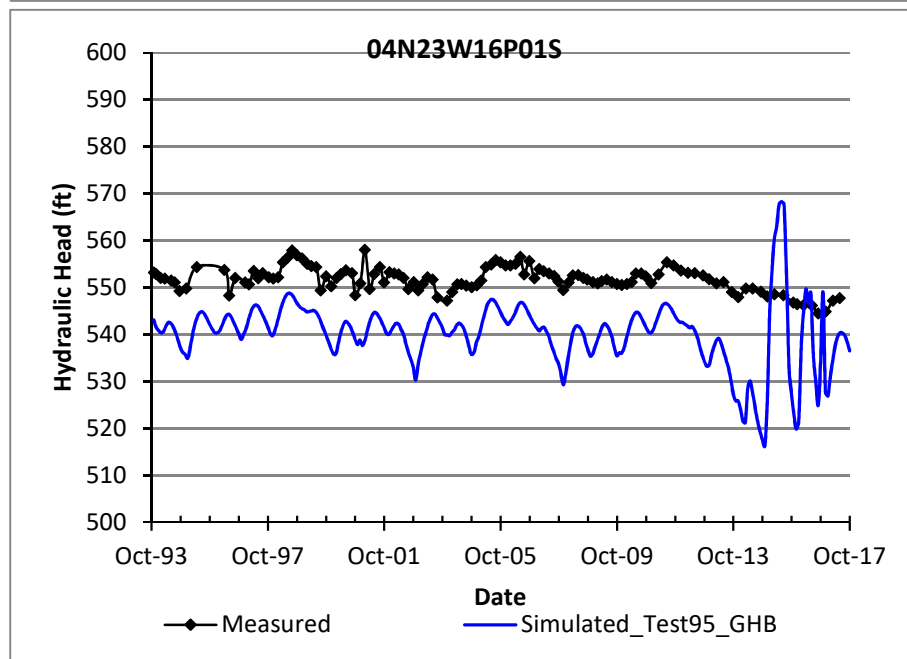
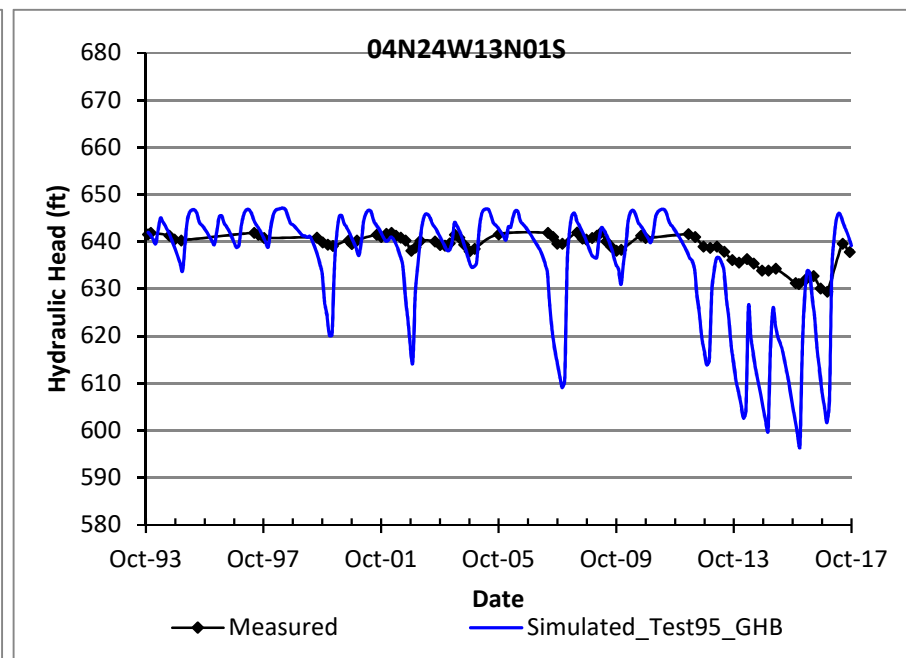
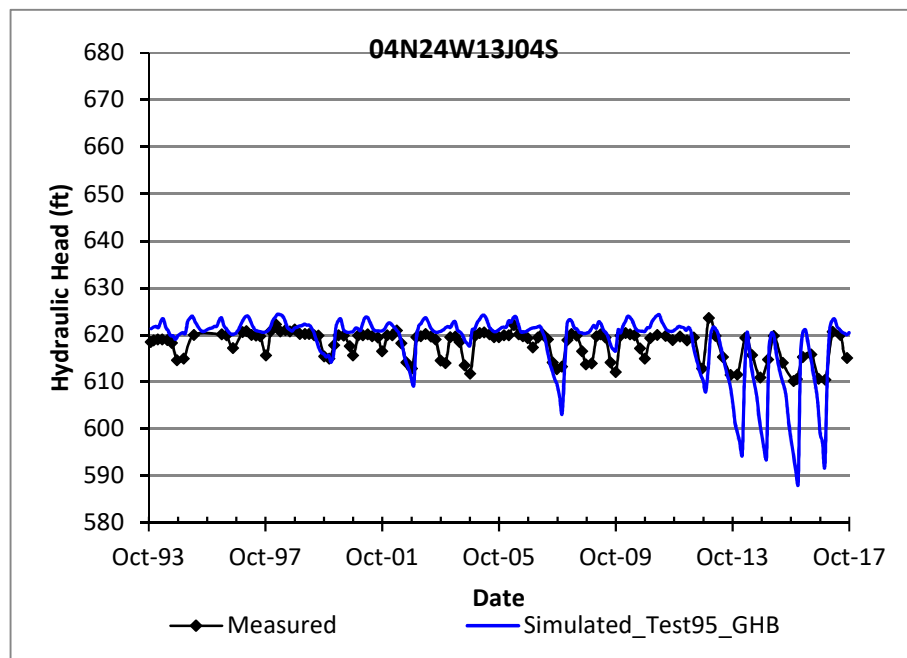
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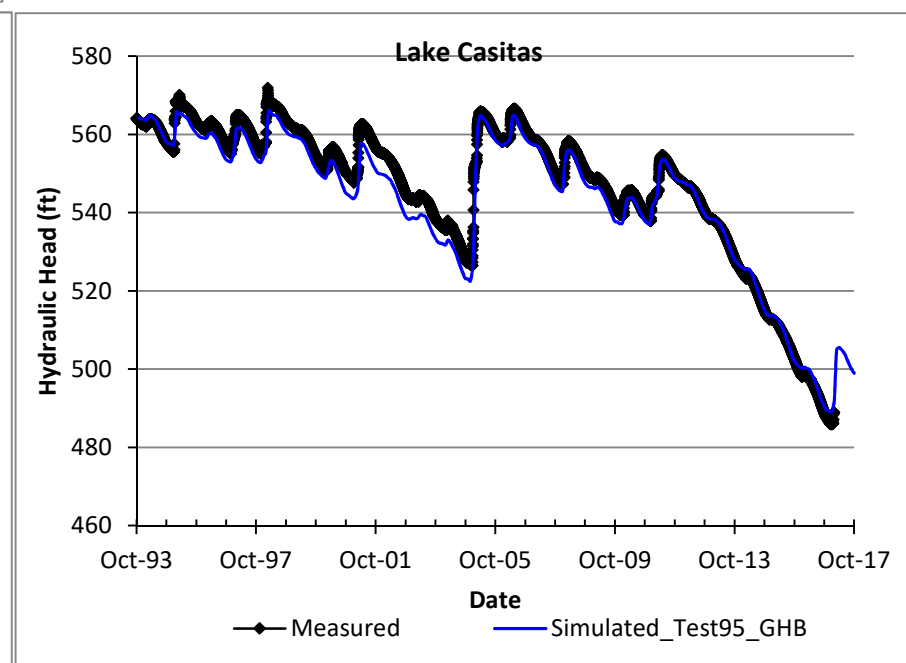
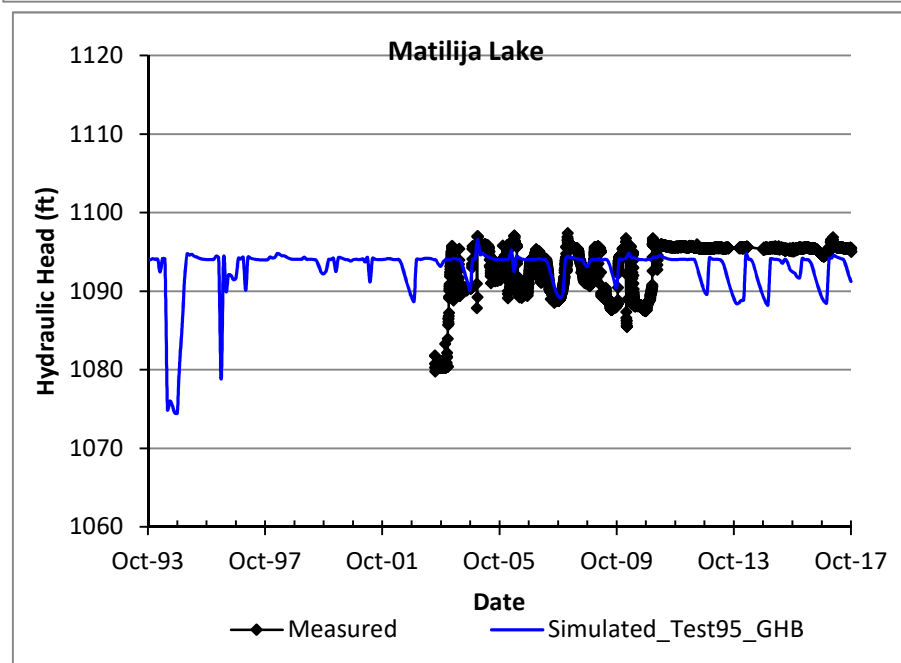
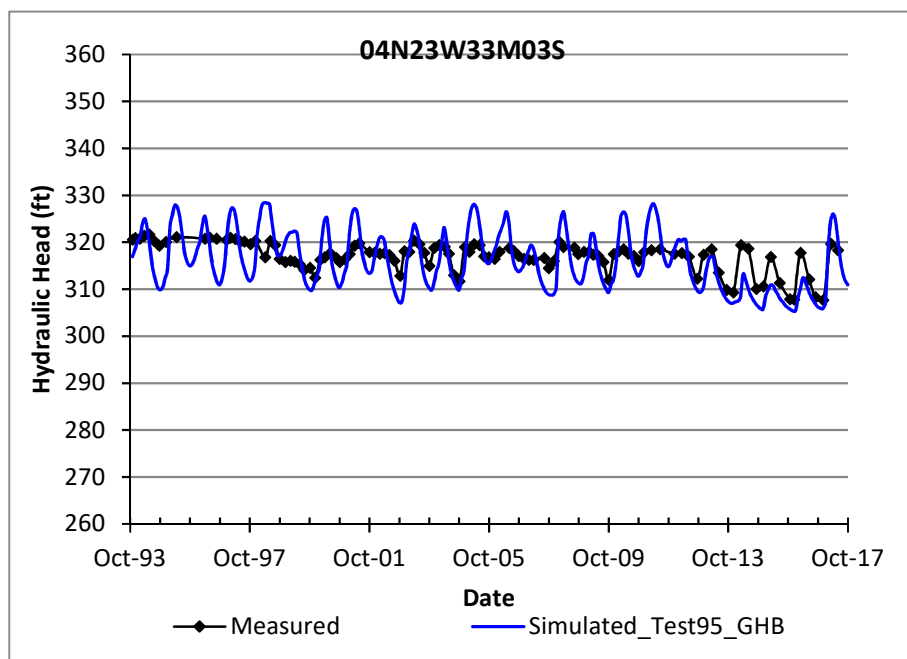


## Draft VRW GW-SW Model Report

### **Outside the basins**



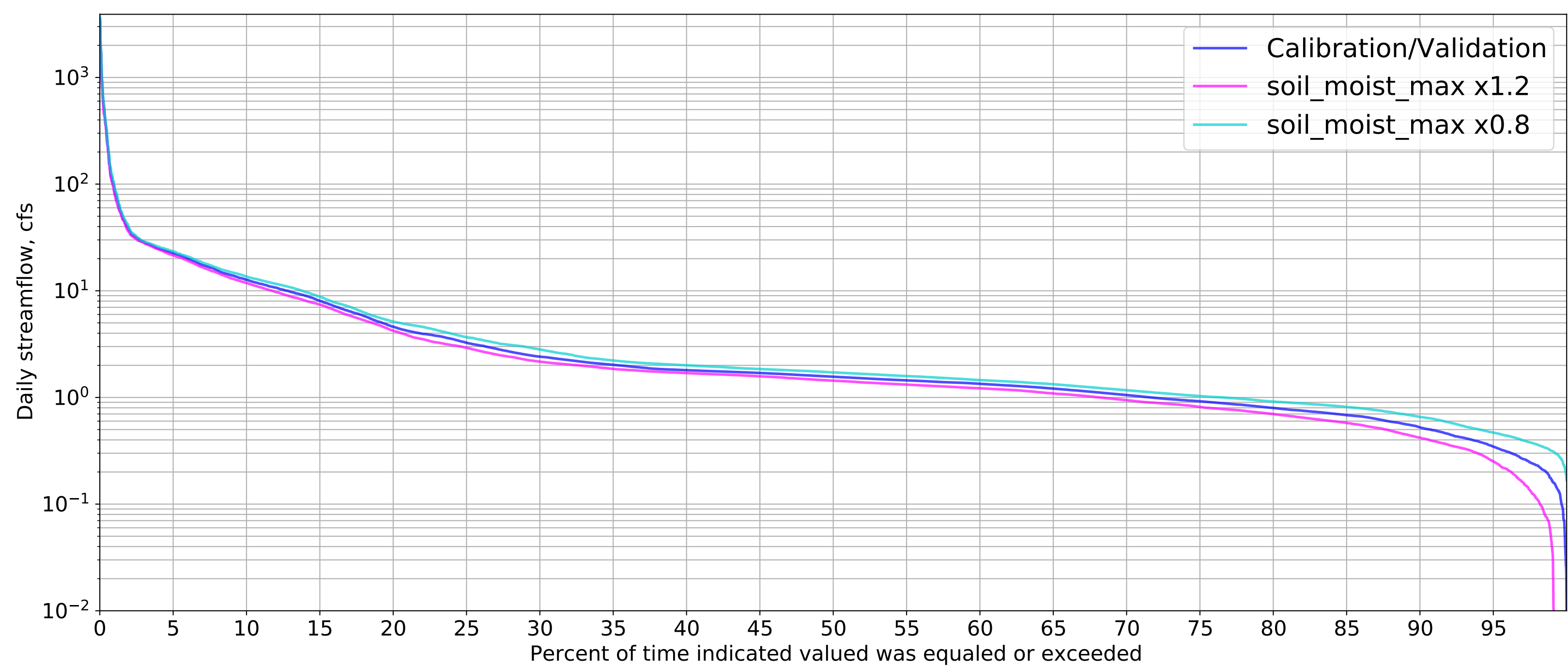
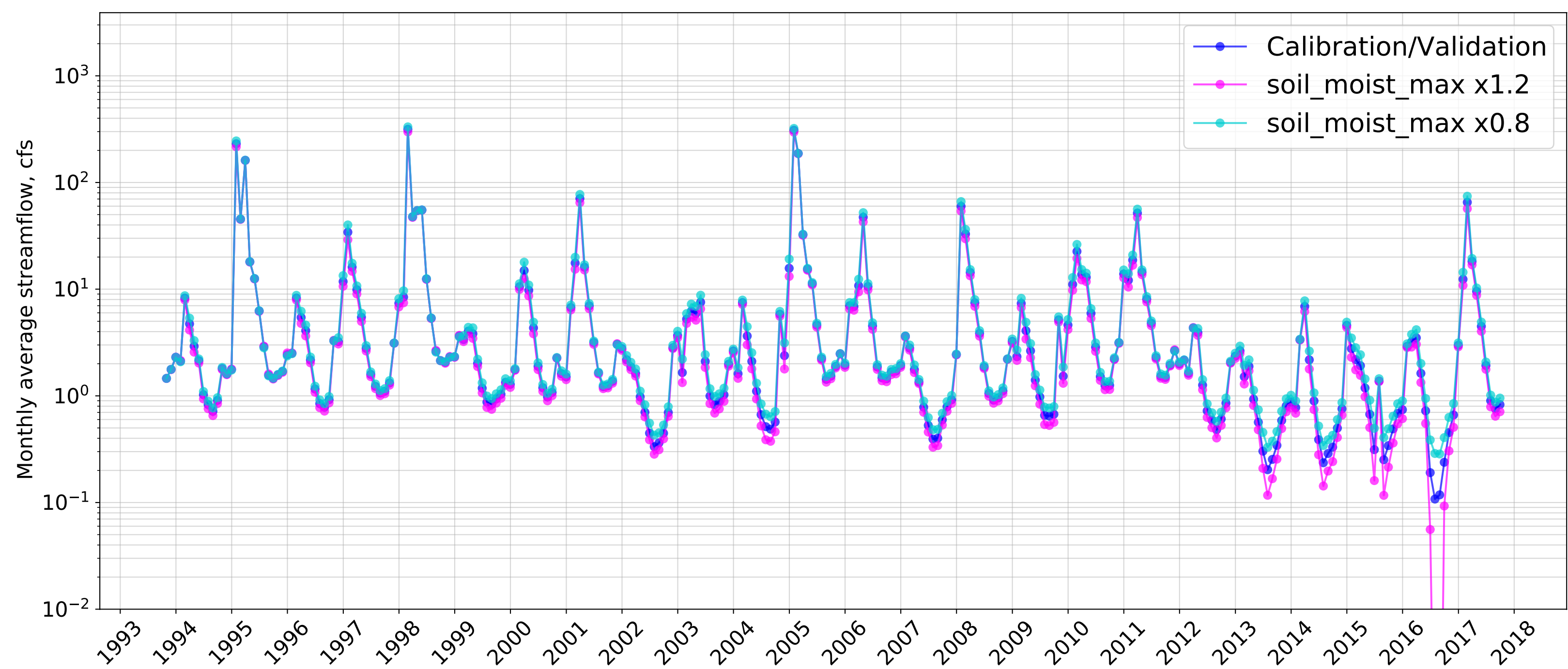
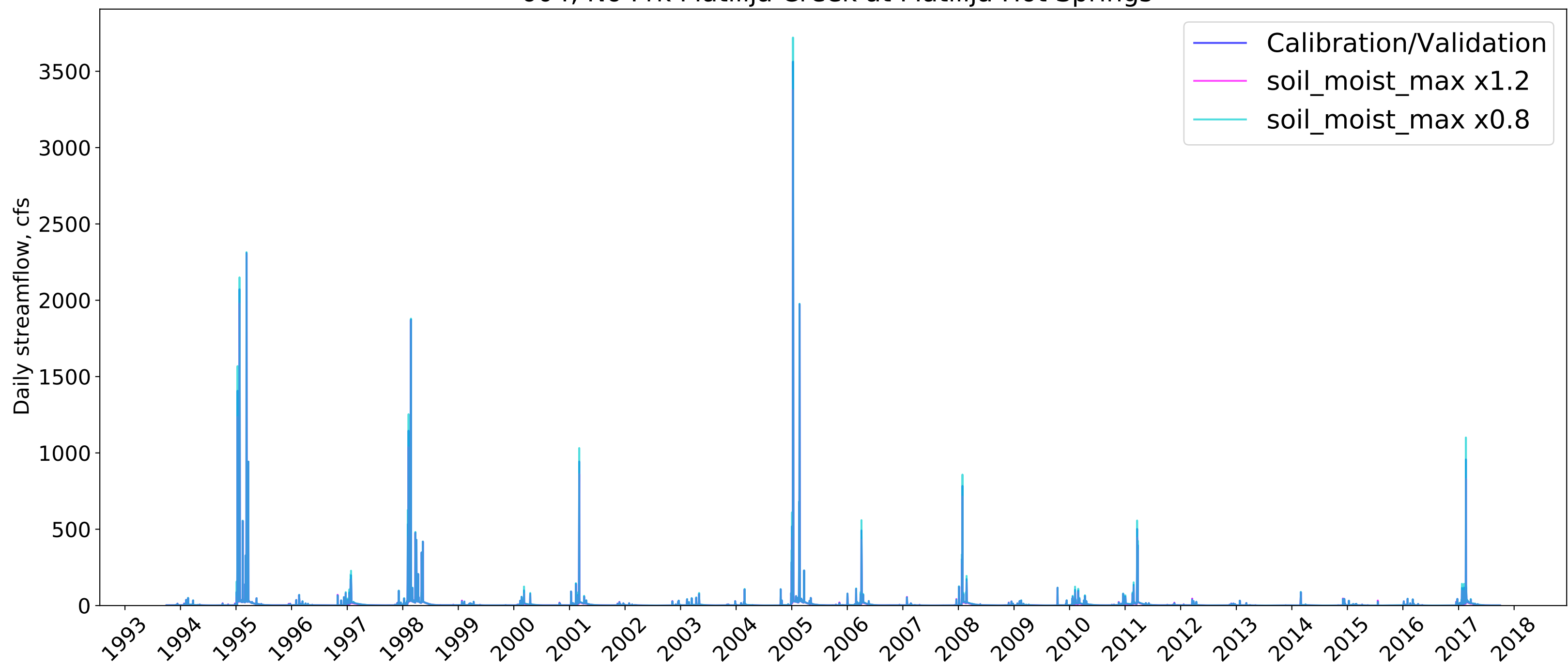




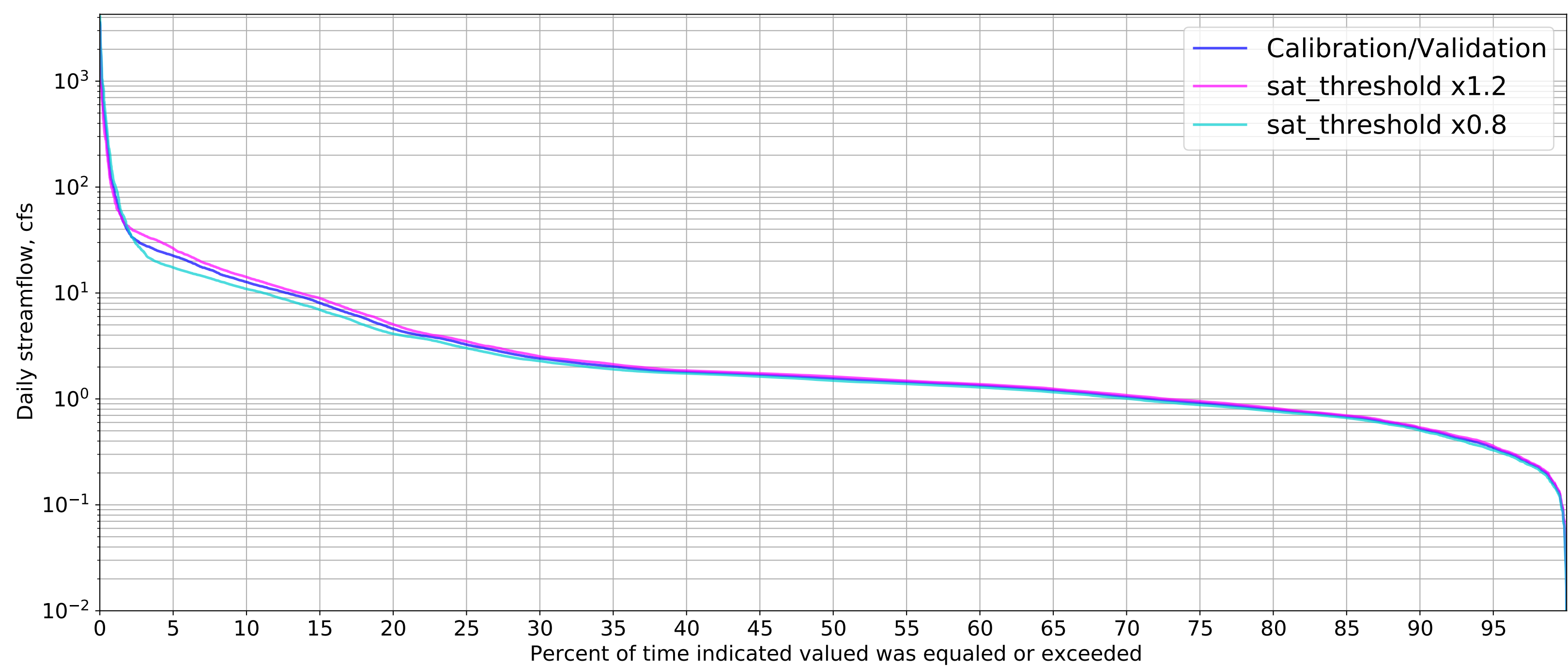
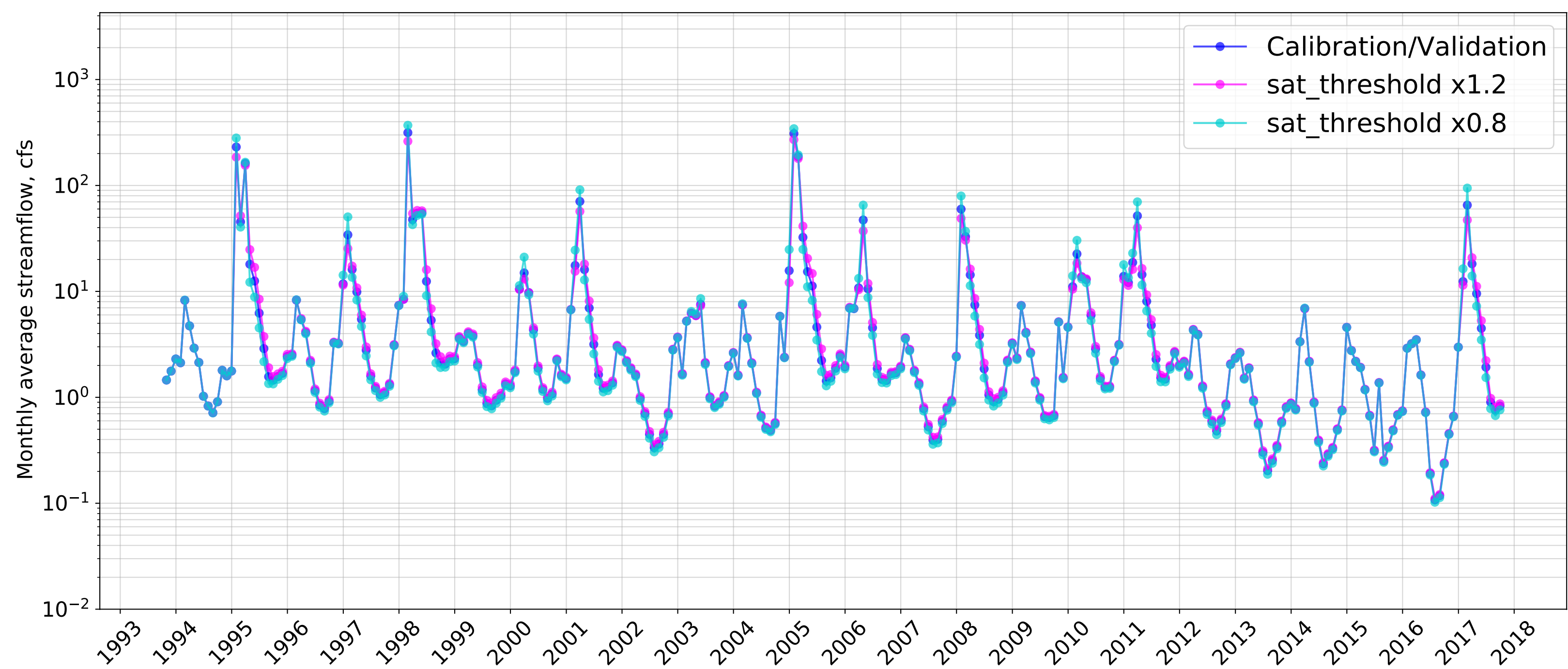
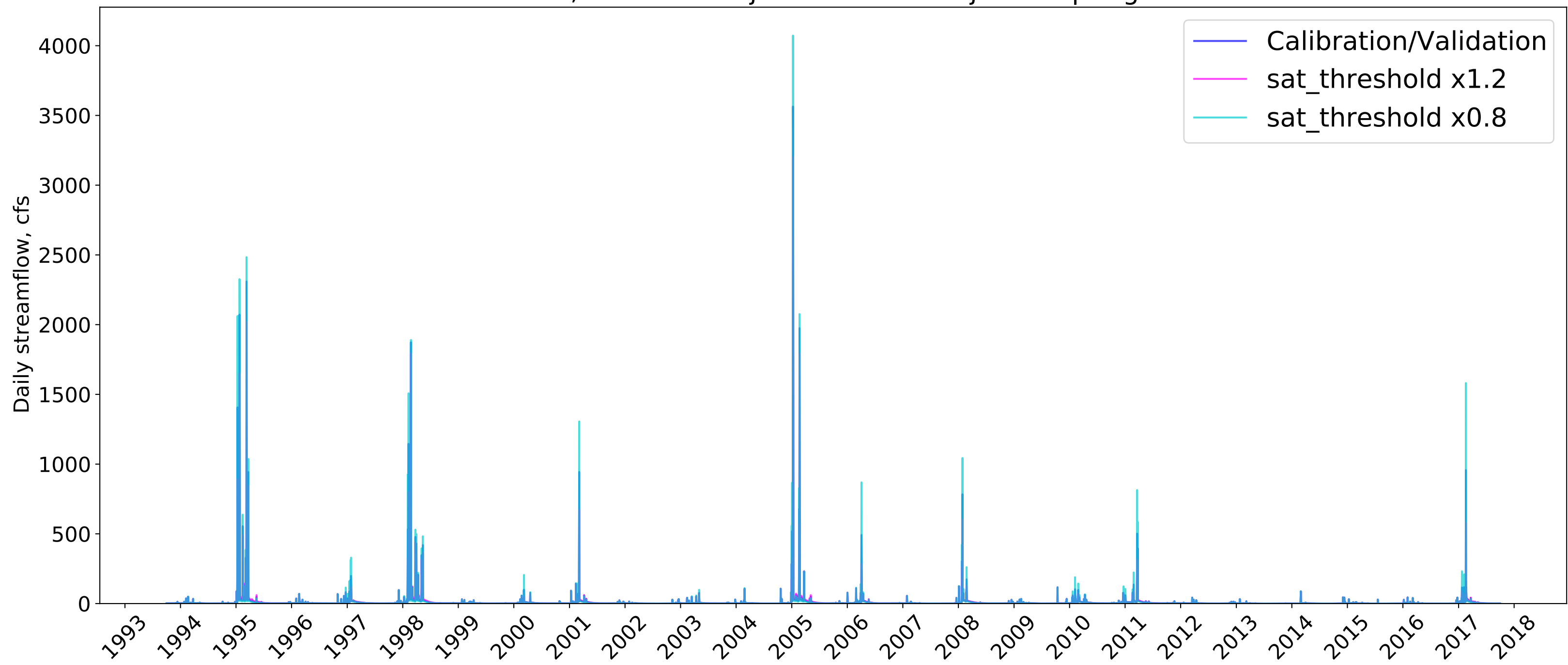
## **APPENDIX E: SENSITIVITY ANALYSIS STREAMFLOW PLOTS**

Appendix E presents the sensitivity analyses results for surface water flows. Fifteen model parameters were increased and decreased. The changes to surface water flows are shown at four streamflow gages in the Ventura River Watershed. Streamflow gage locations are shown in Figure 3.1. Each page of the appendix has three graphs that show how modifying the parameter impacted surface water flows at the specified gage. The three types of graphs are daily streamflow and monthly average streamflow, in cfs for water years 1993 to 2017, and logarithmic exceedance probability curves, in cfs. The calibration results, and the results for increasing and decreasing a model parameter, are plotted as three lines on each graph. If you need accessibility assistance with the information presented in this appendix, please contact the State Water Board at [instreamflows@waterboards.ca.gov](mailto:instreamflows@waterboards.ca.gov).

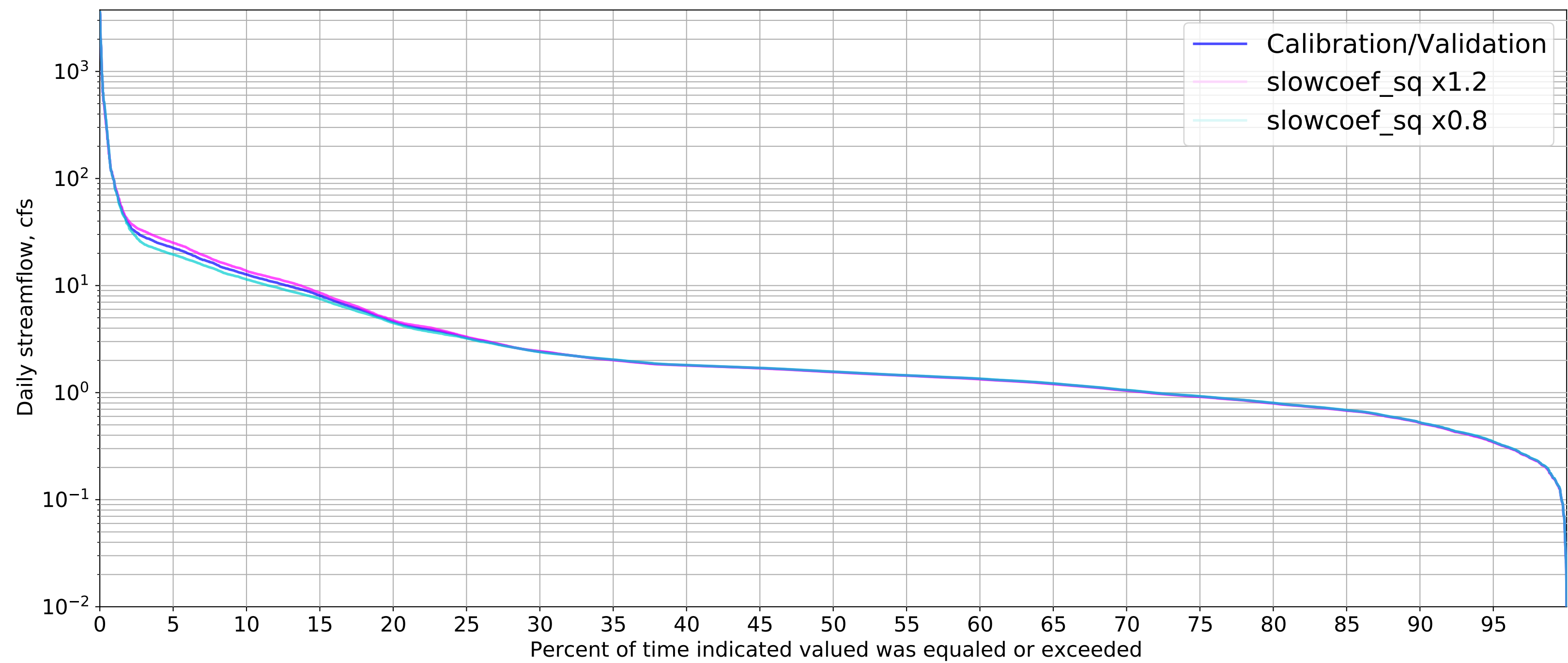
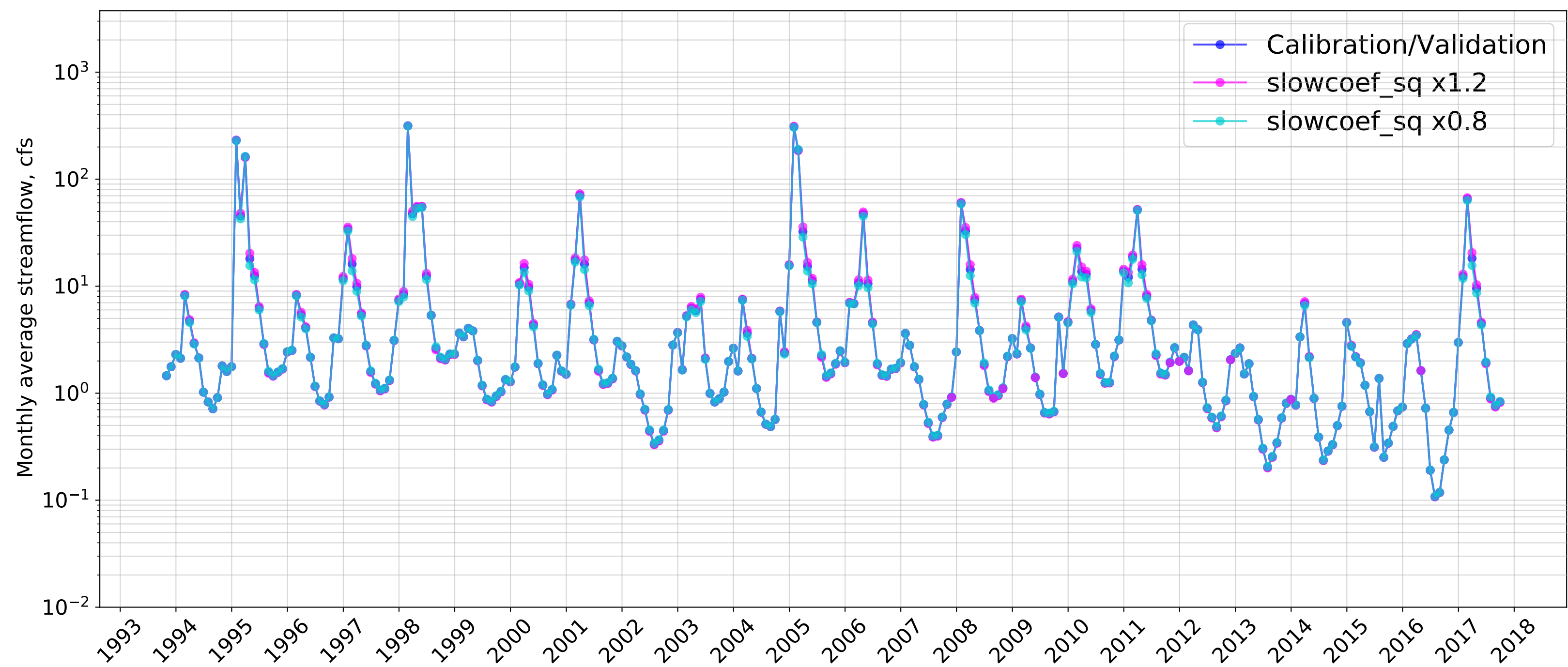
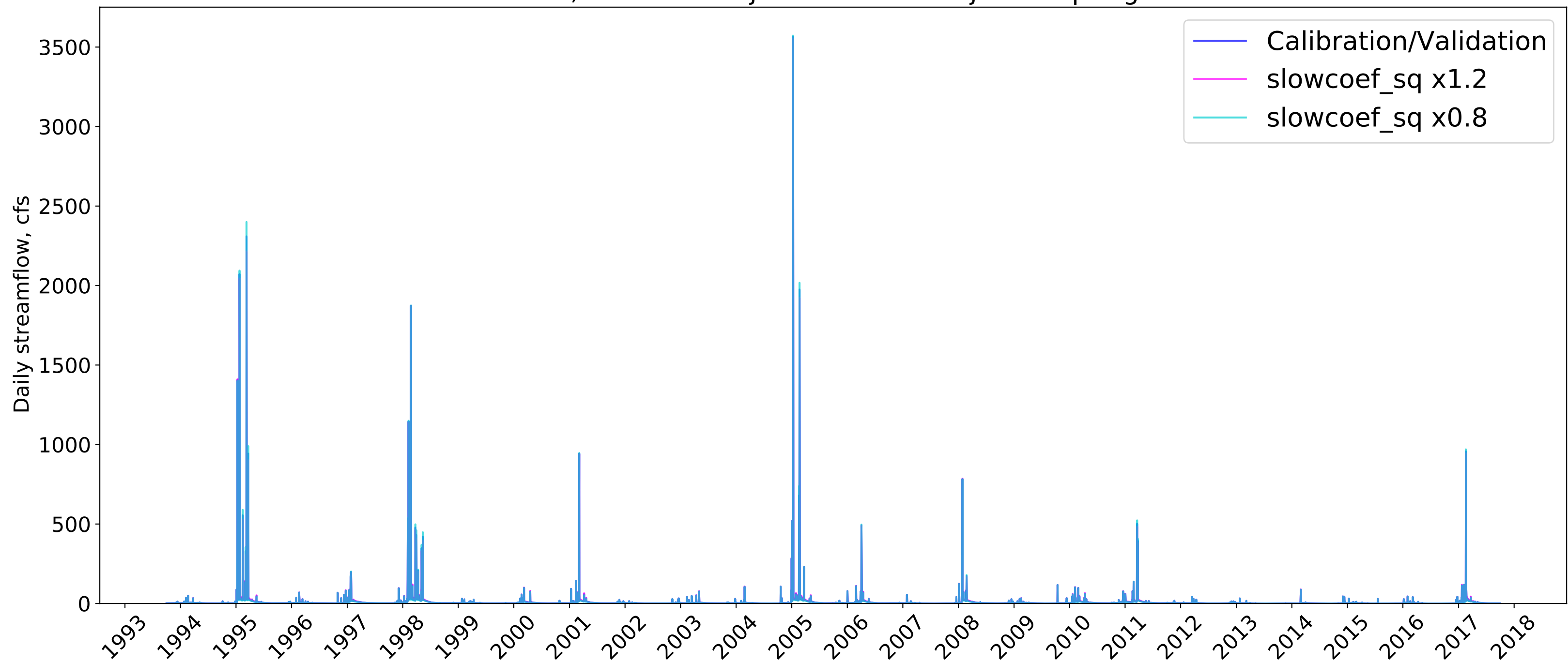
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604, No Frk Matilija Creek at Matilija Hot Springs

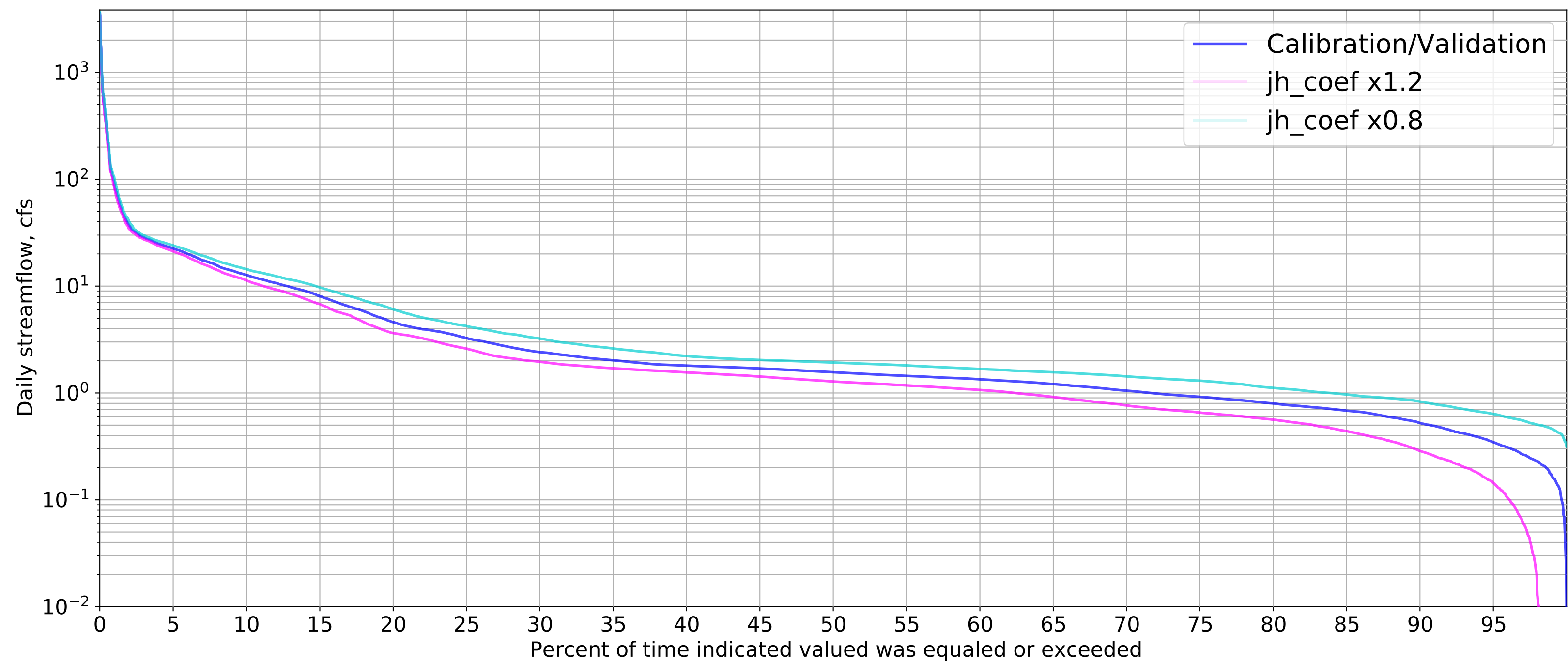
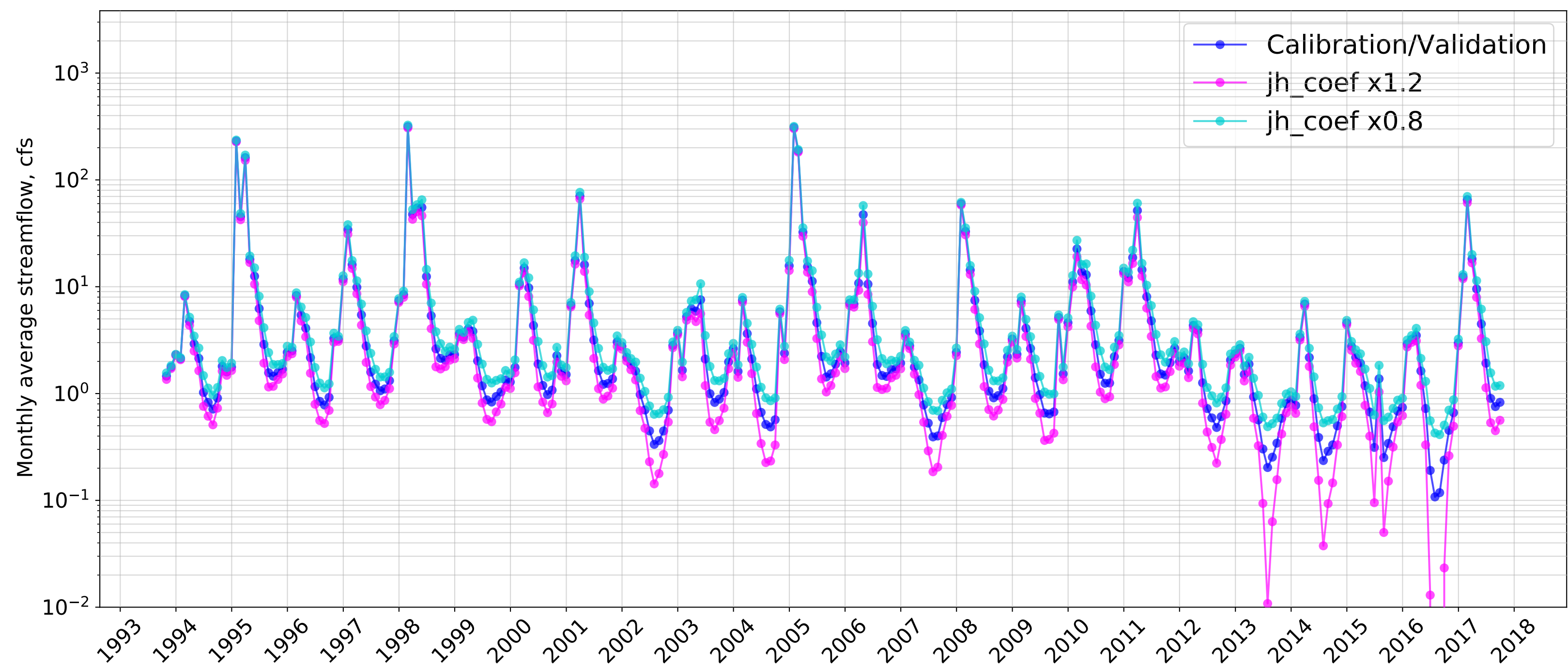
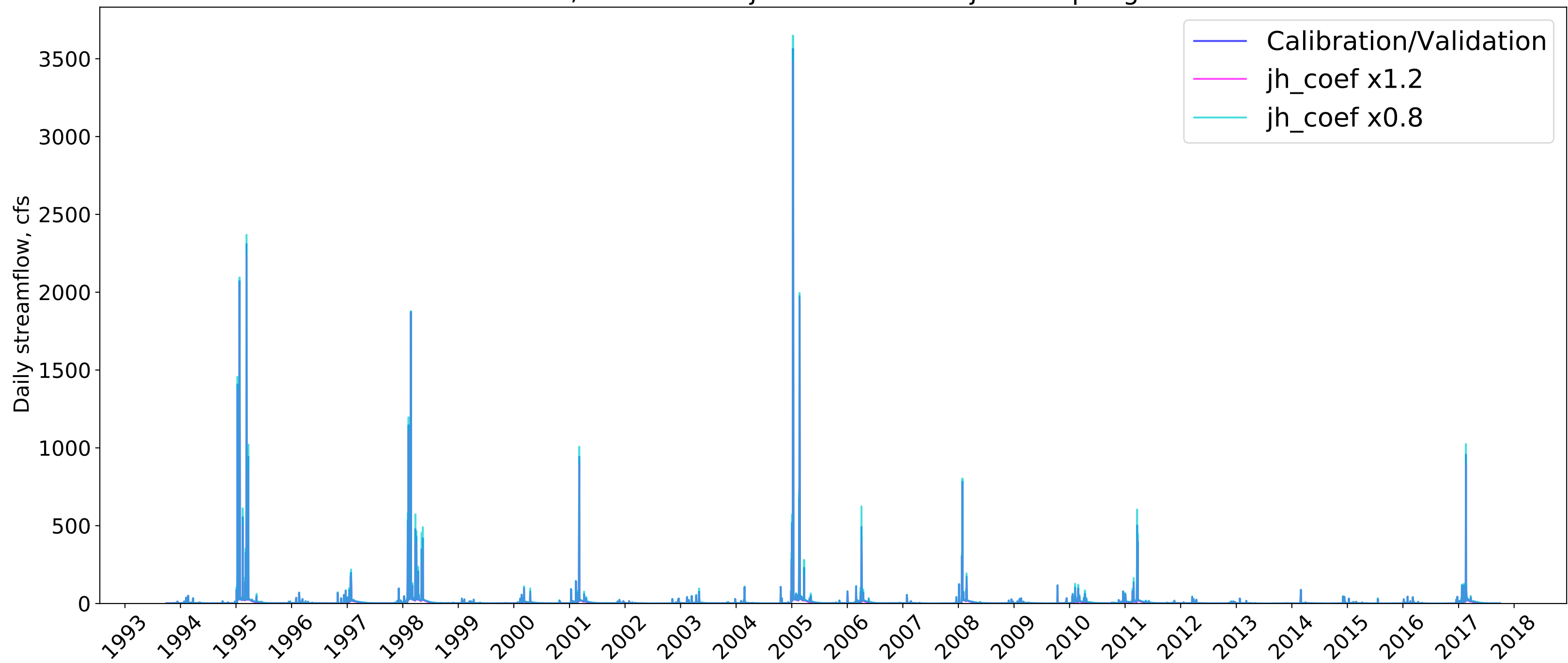


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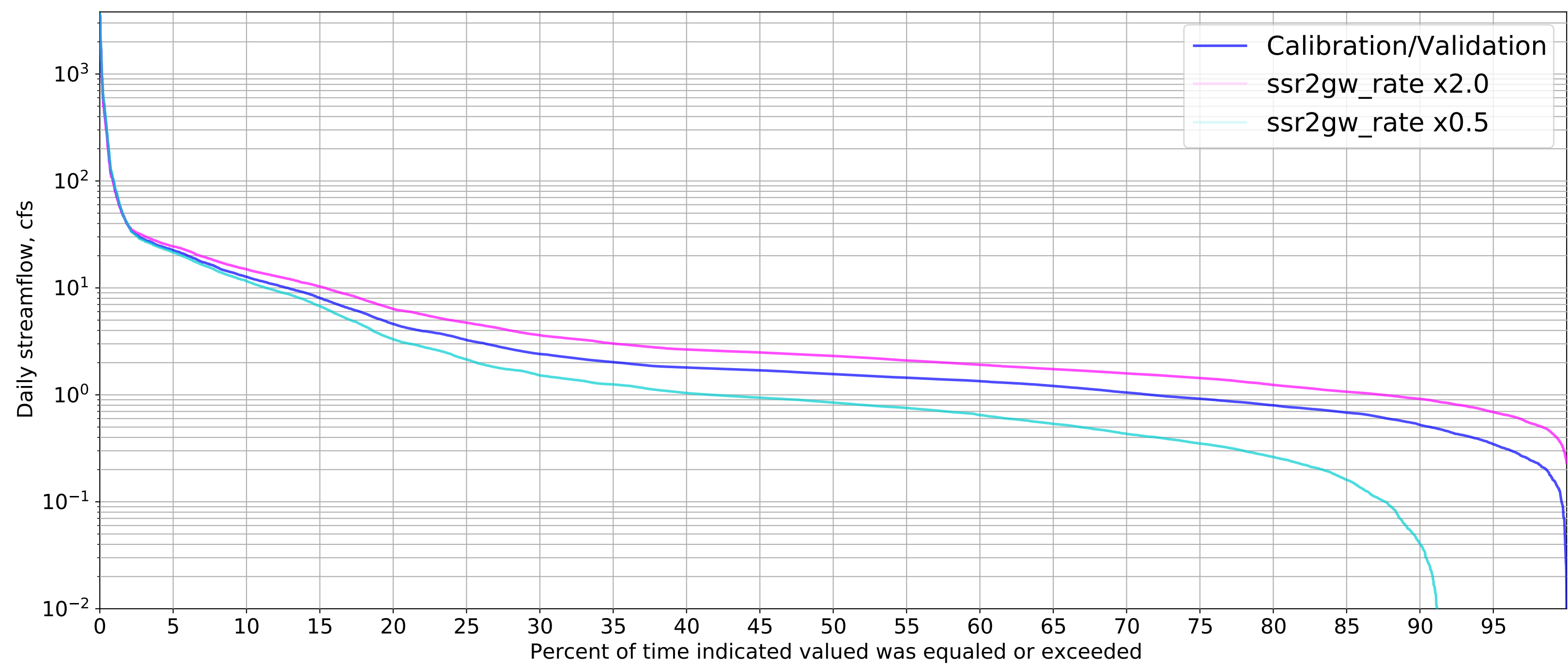
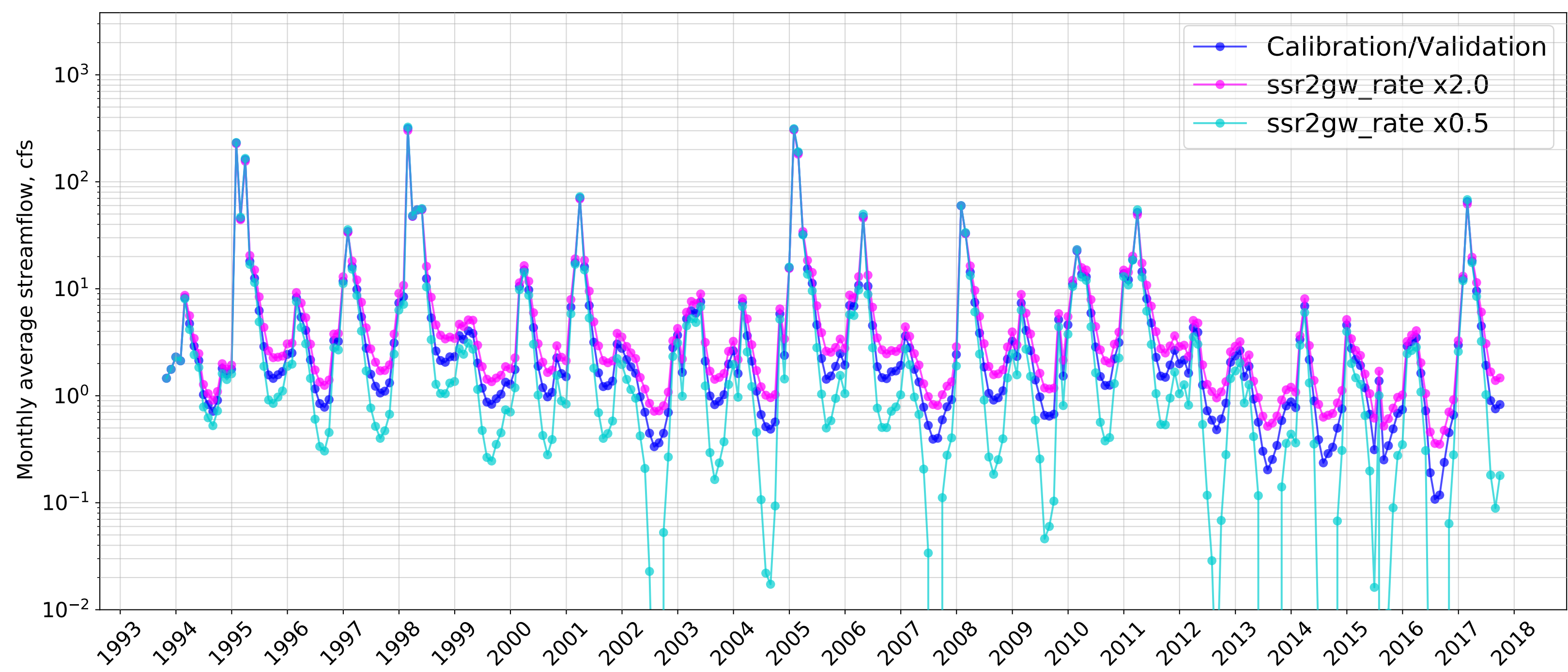
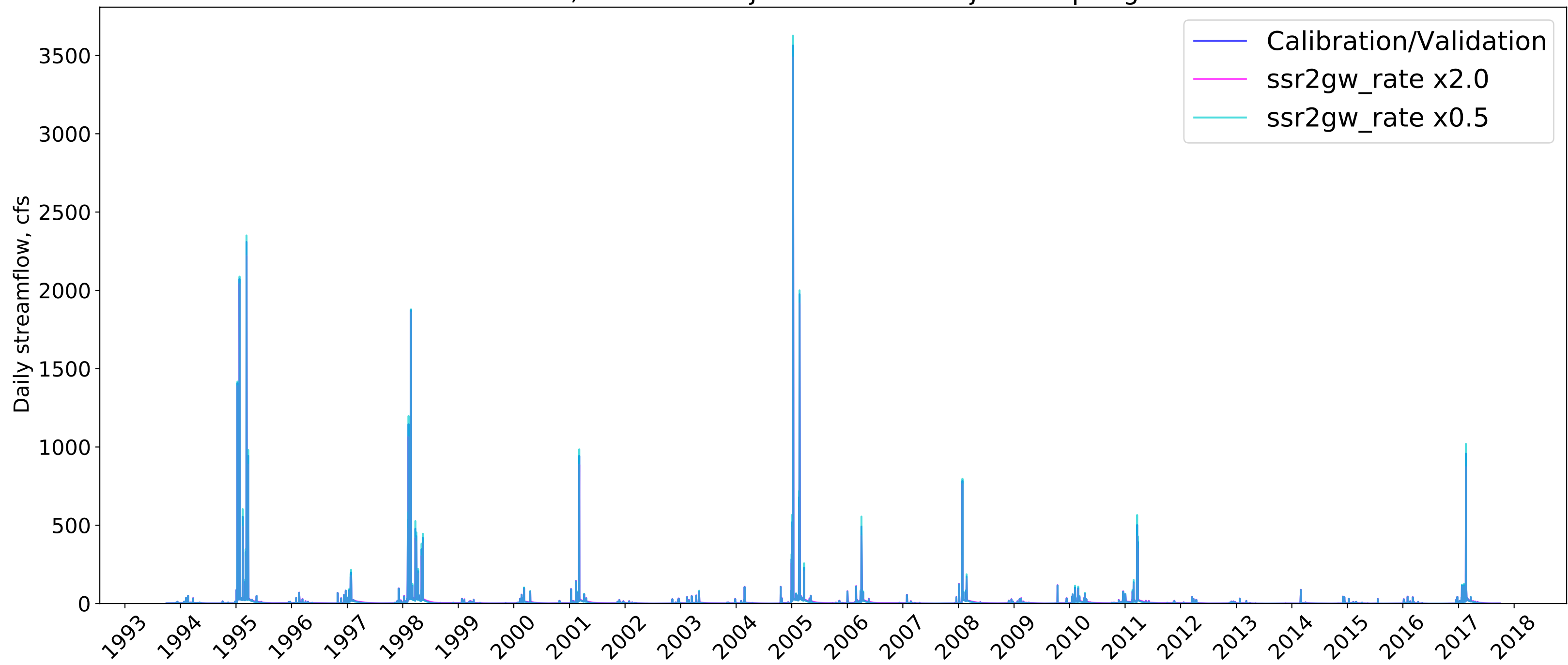




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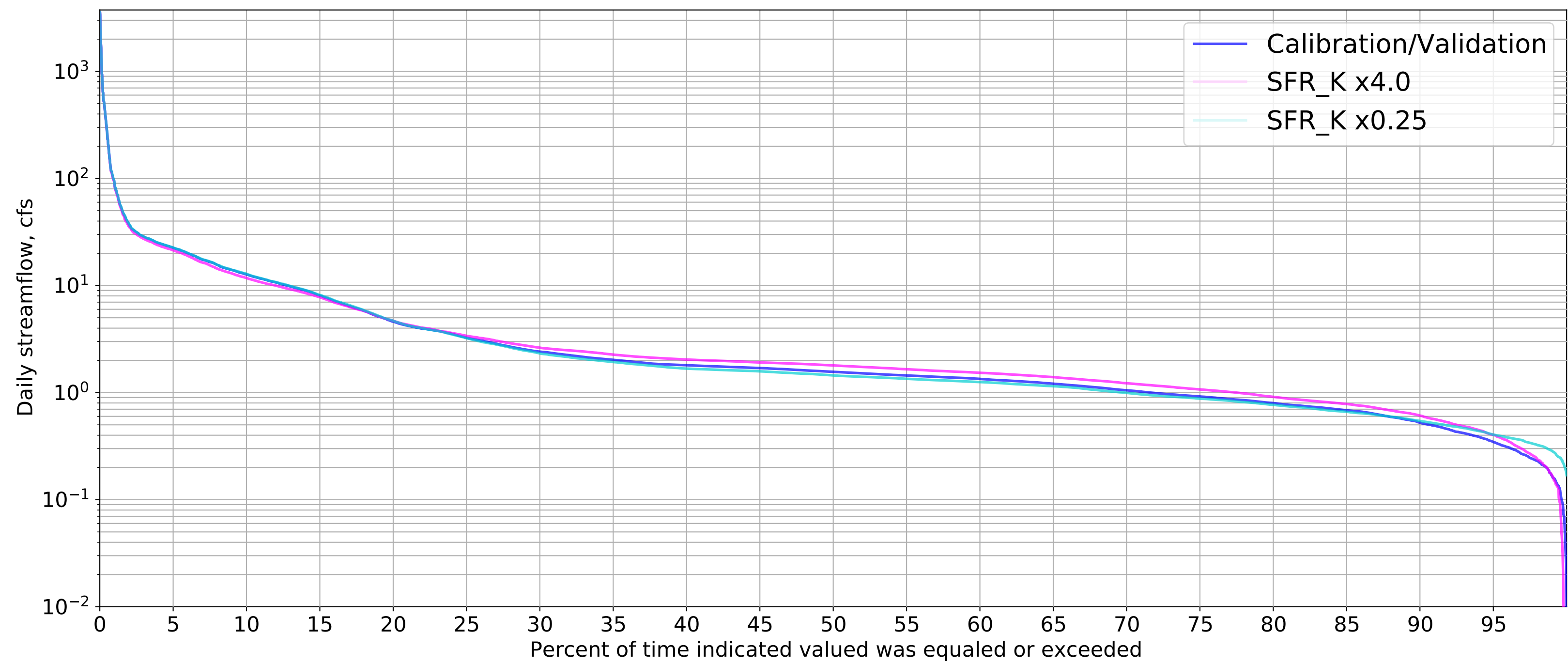
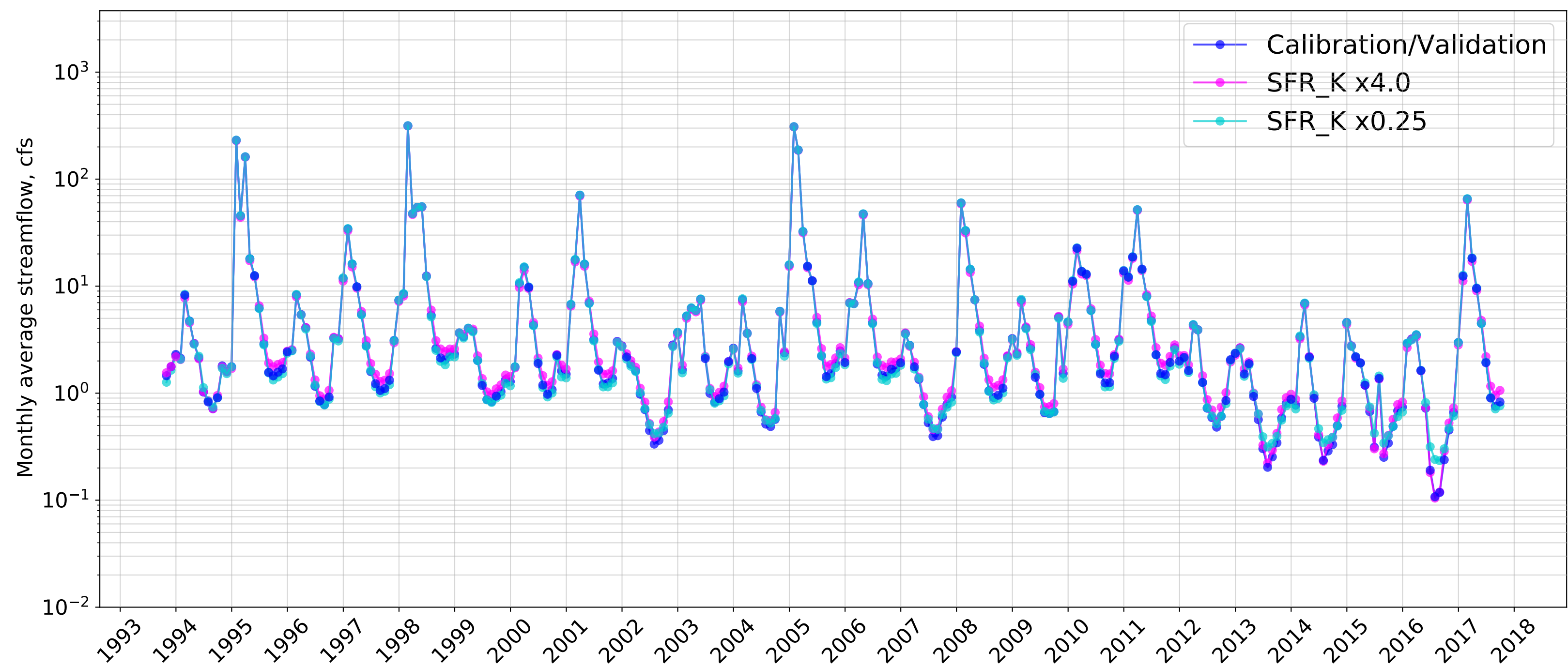
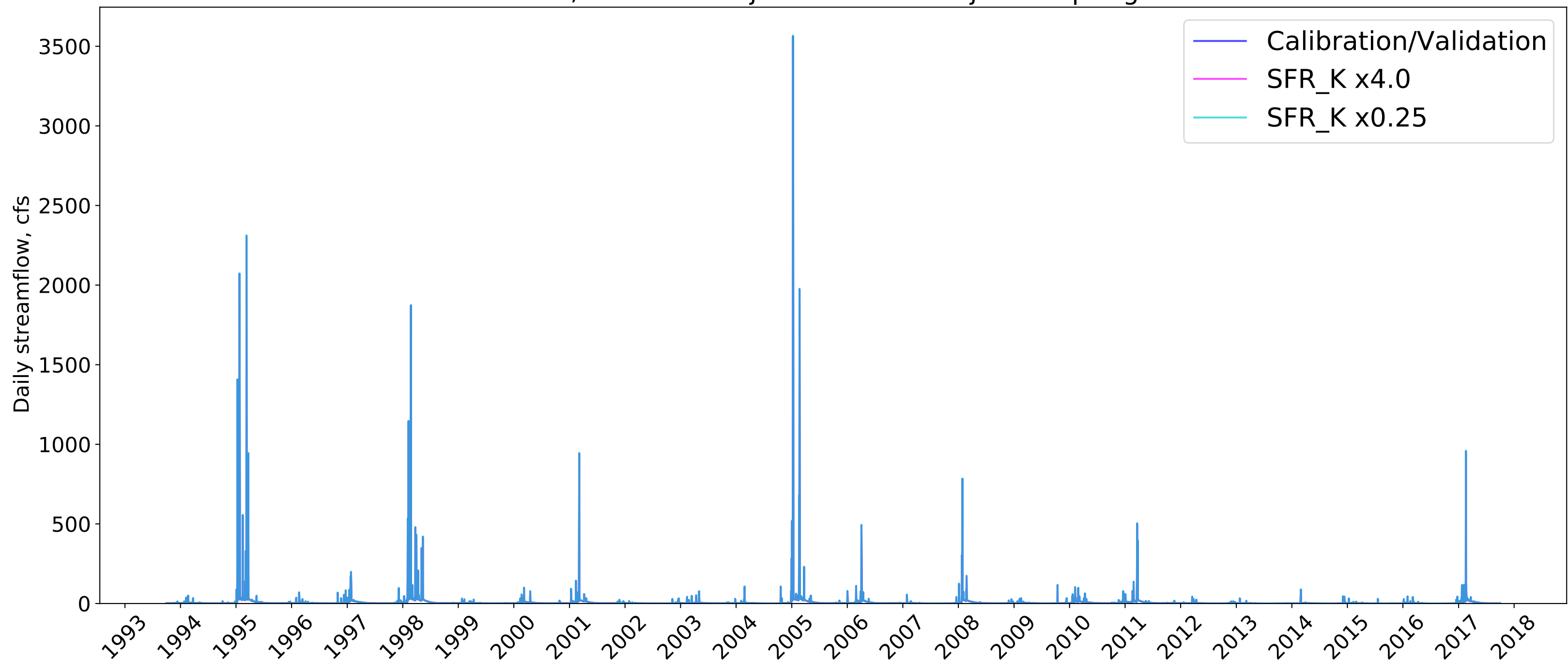


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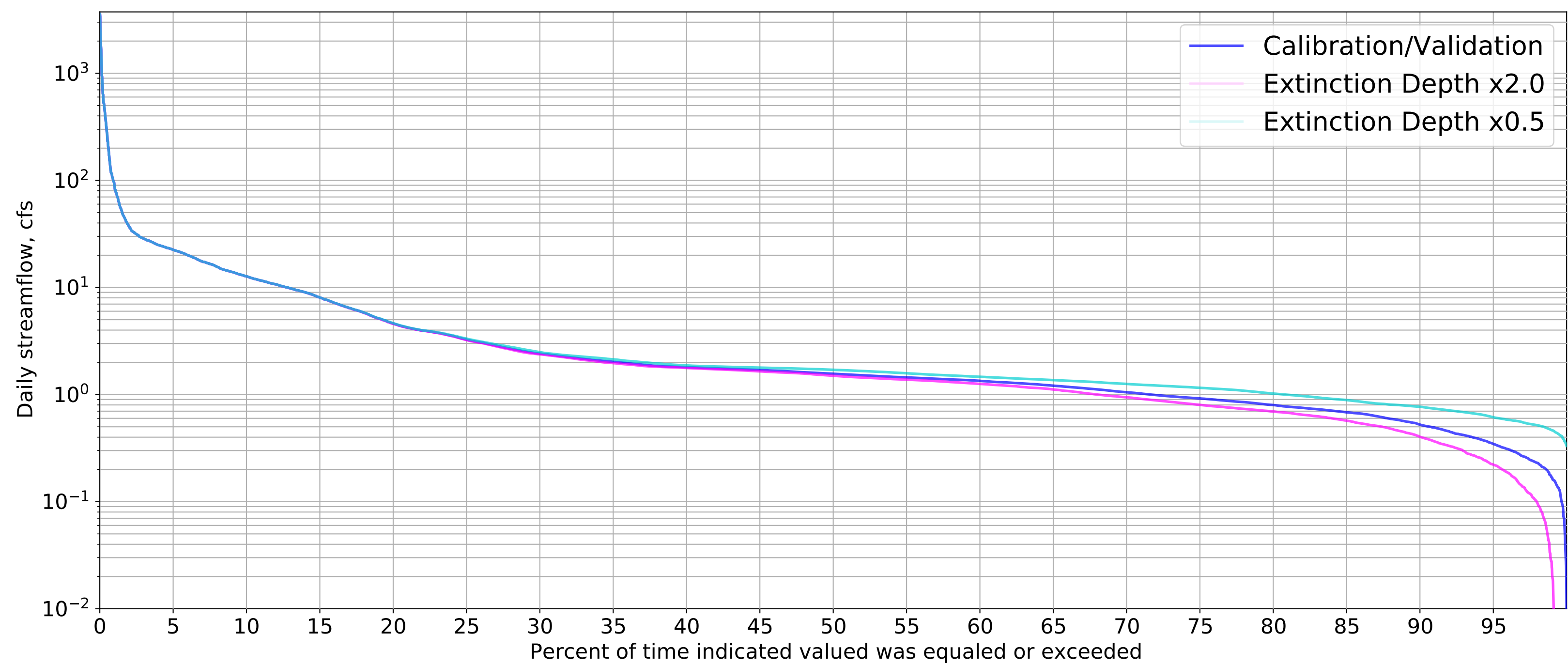
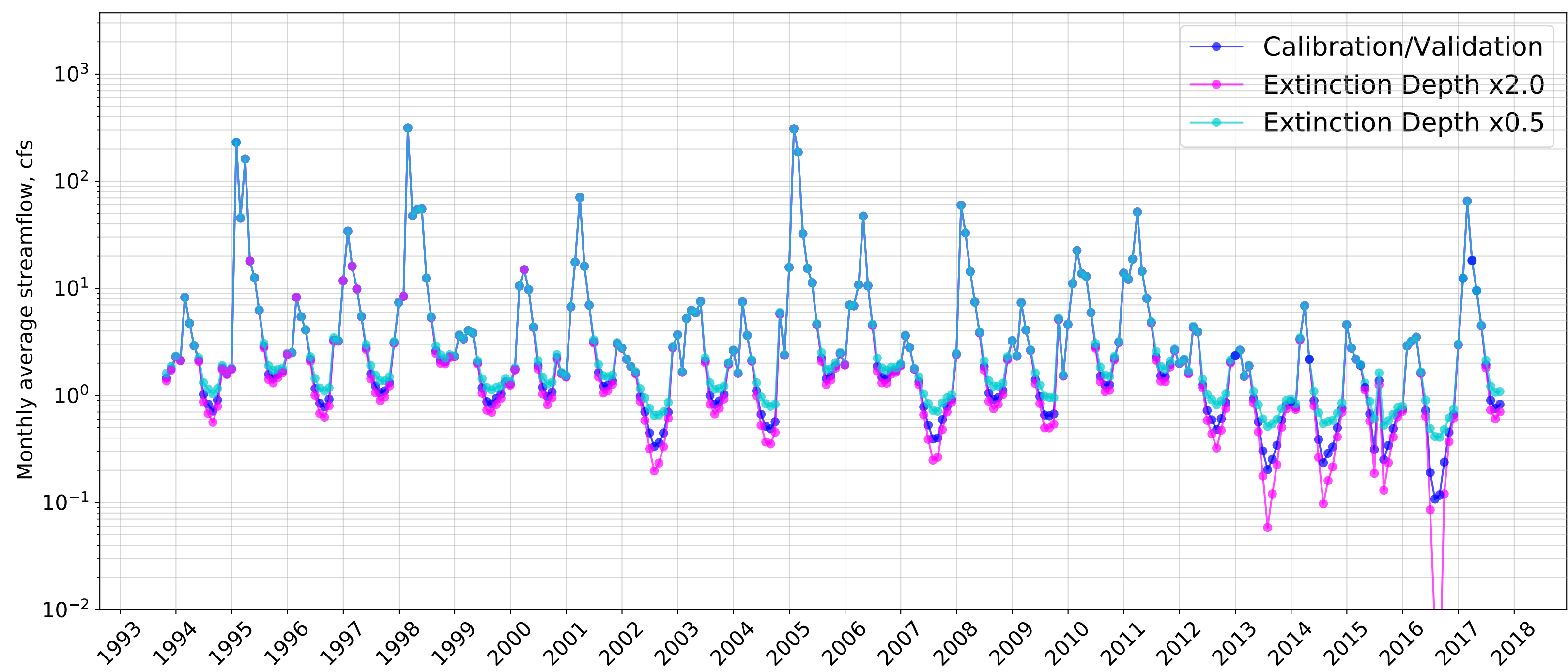
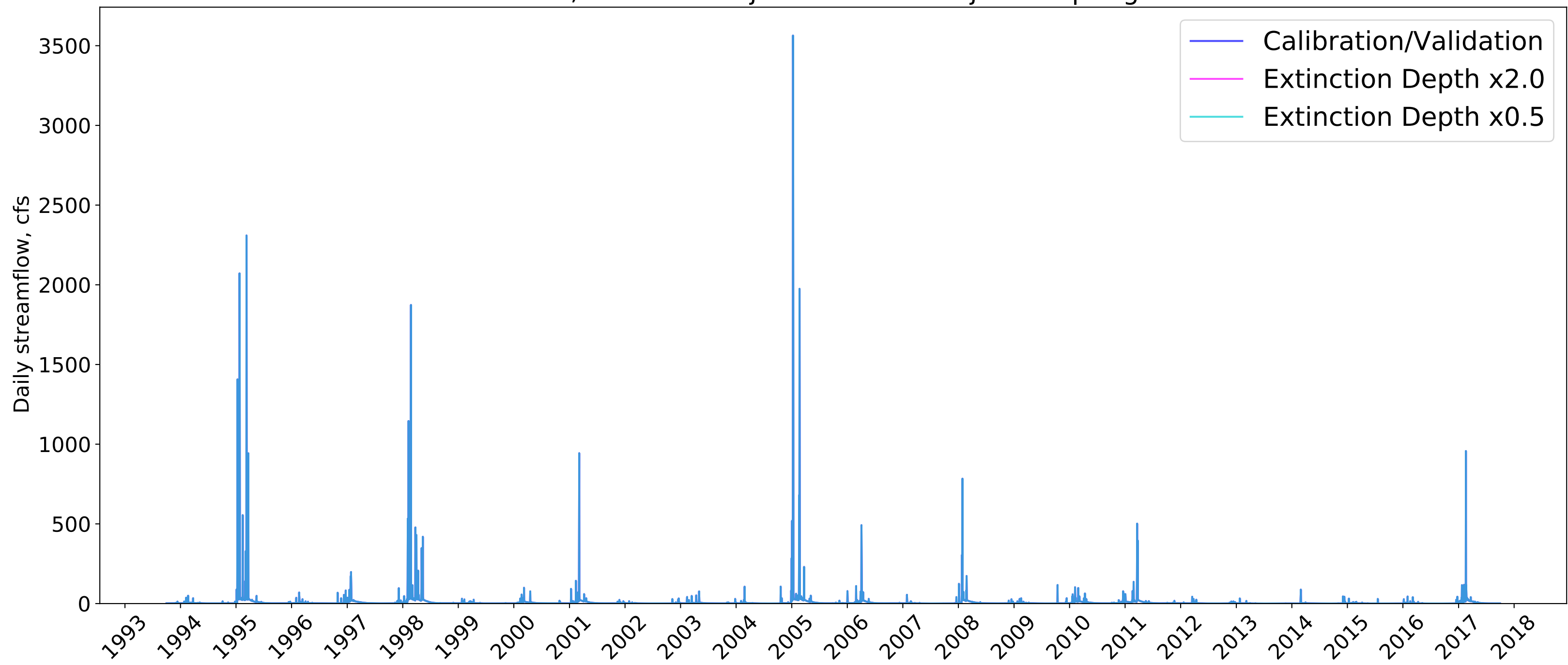




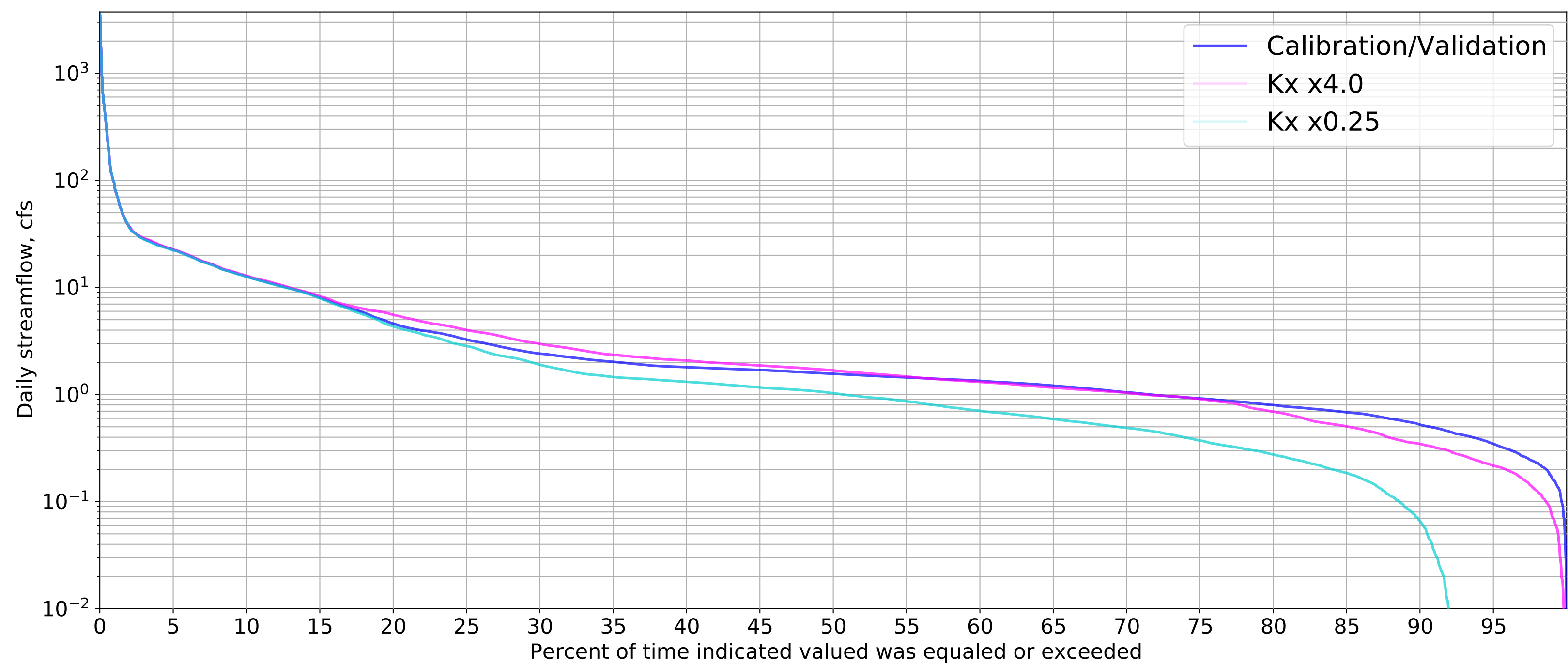
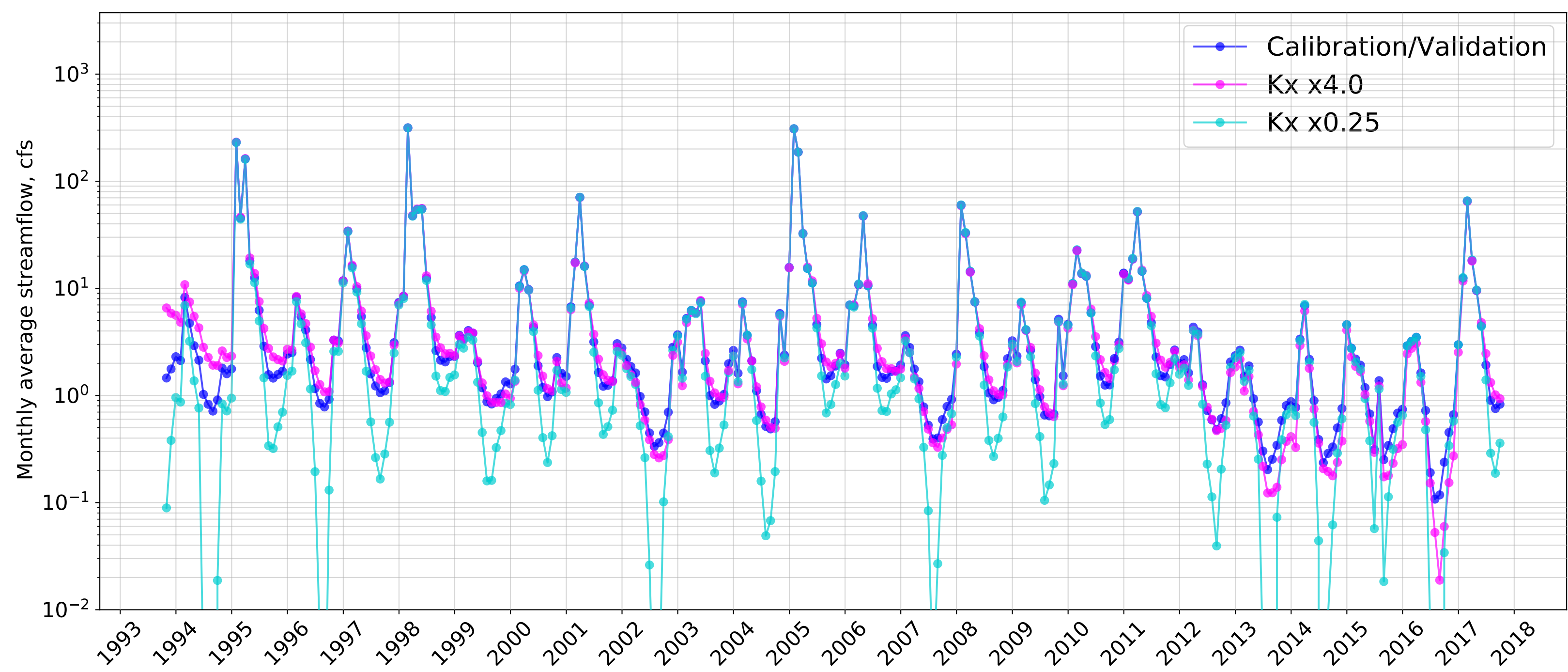
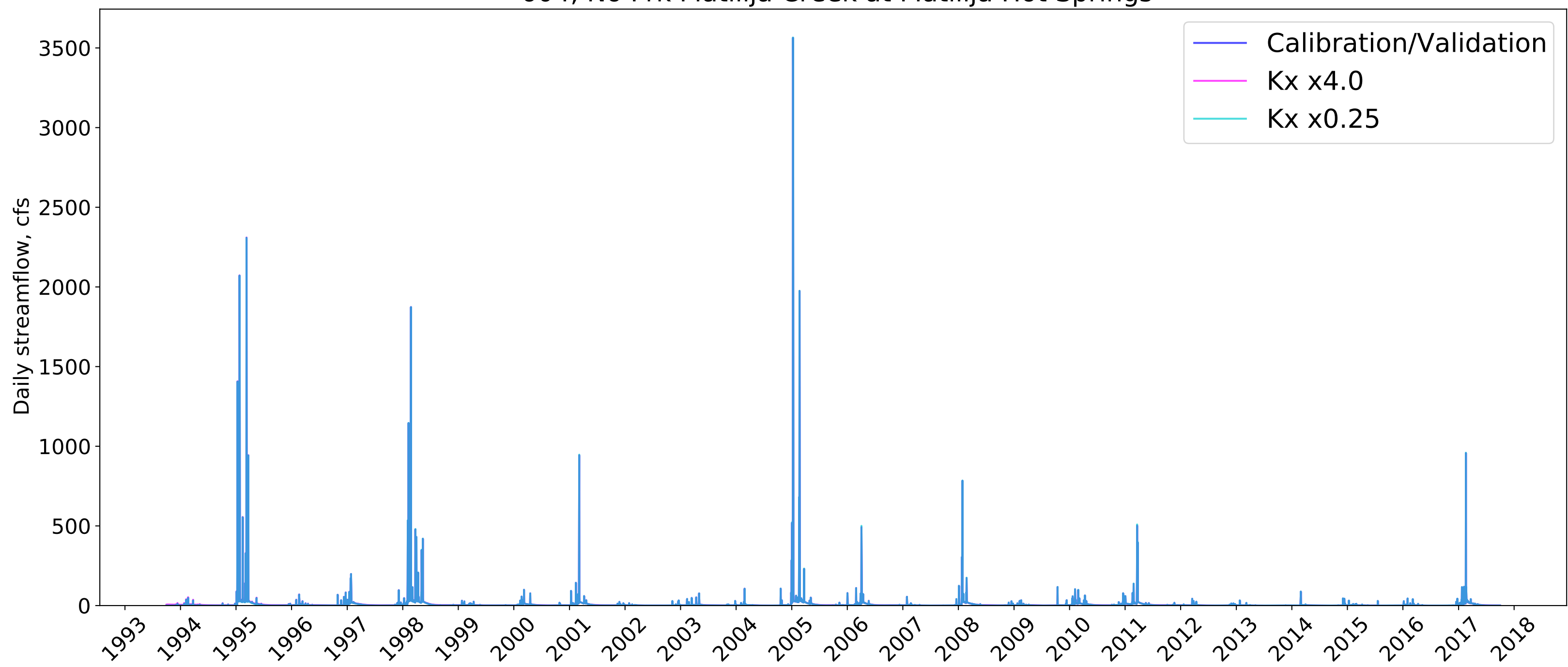
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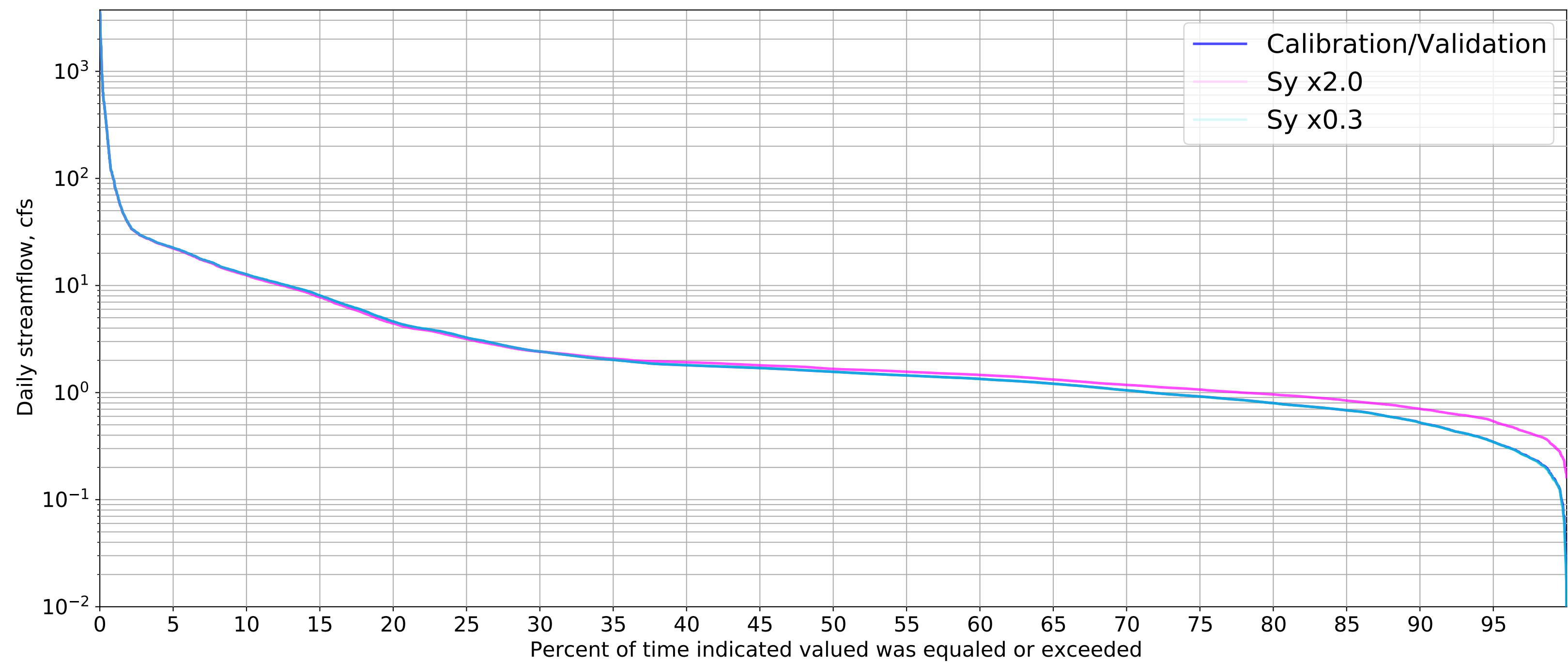
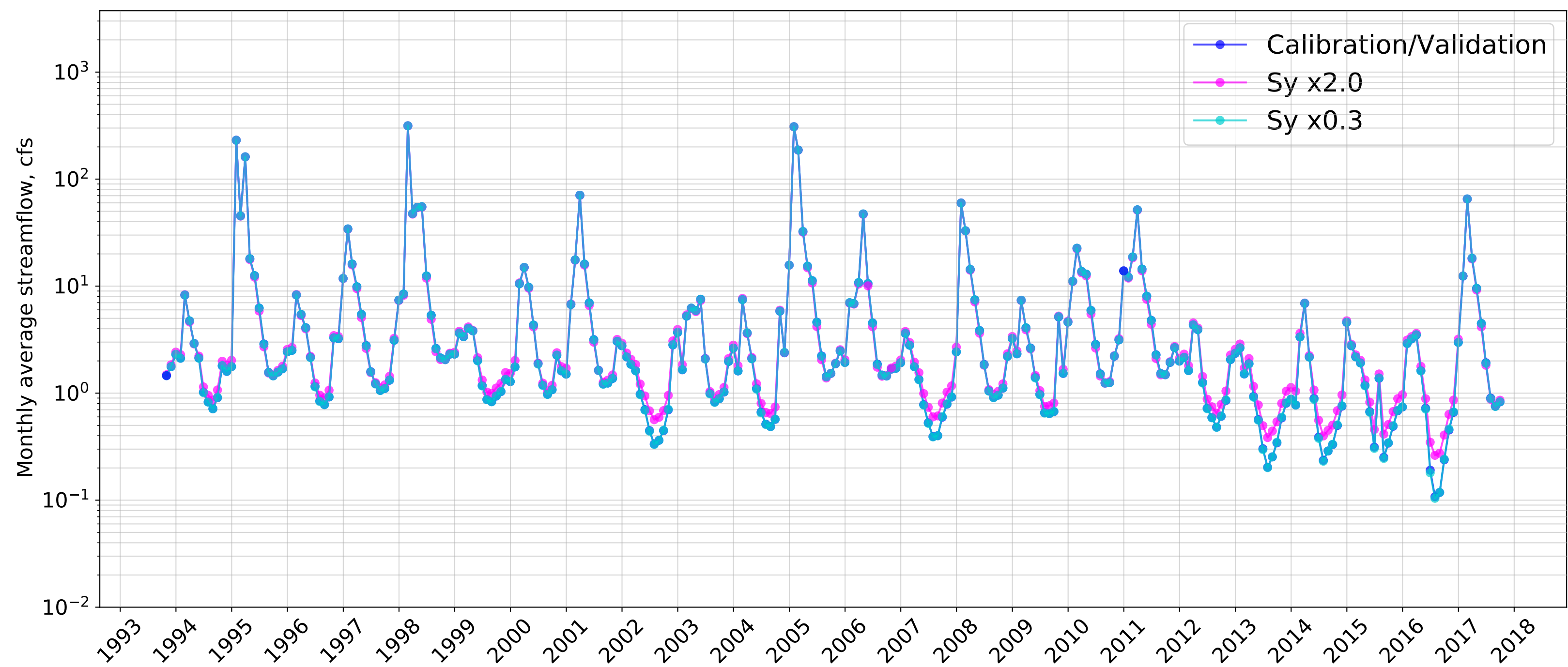
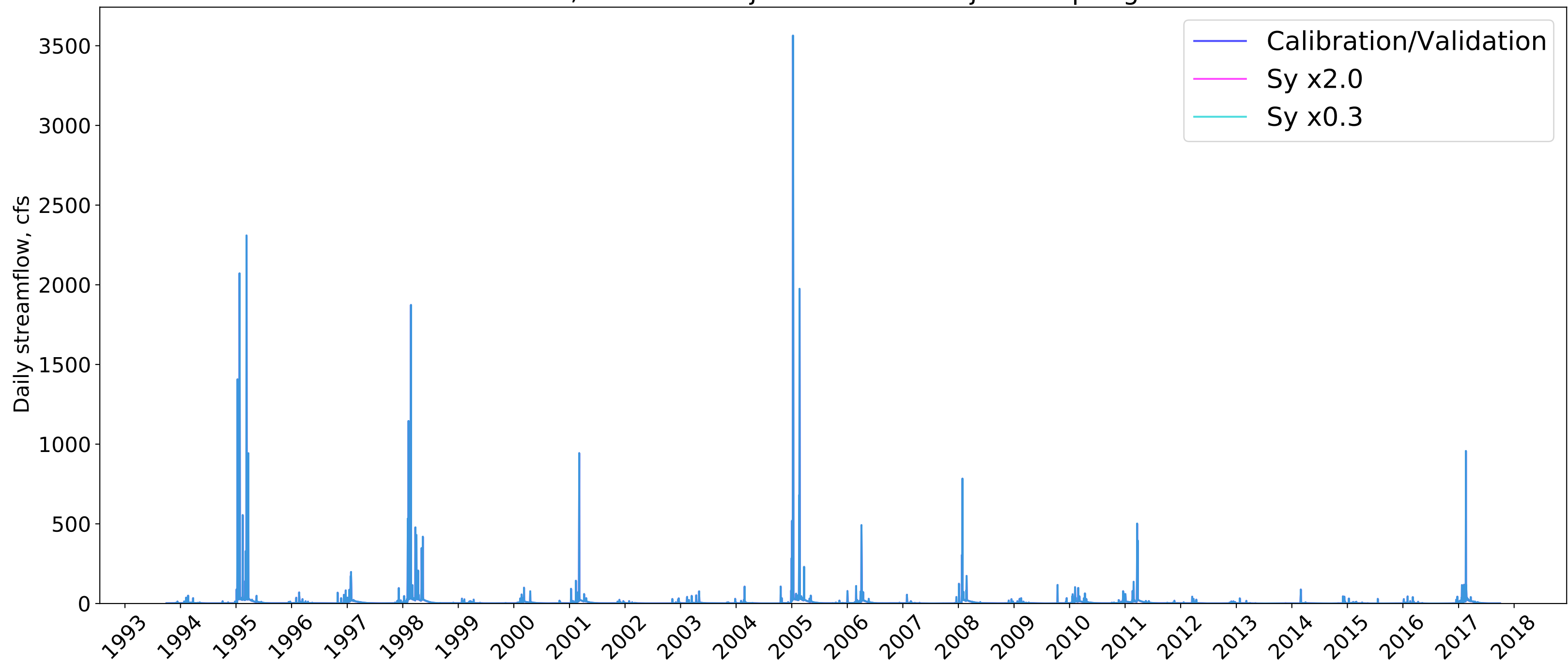
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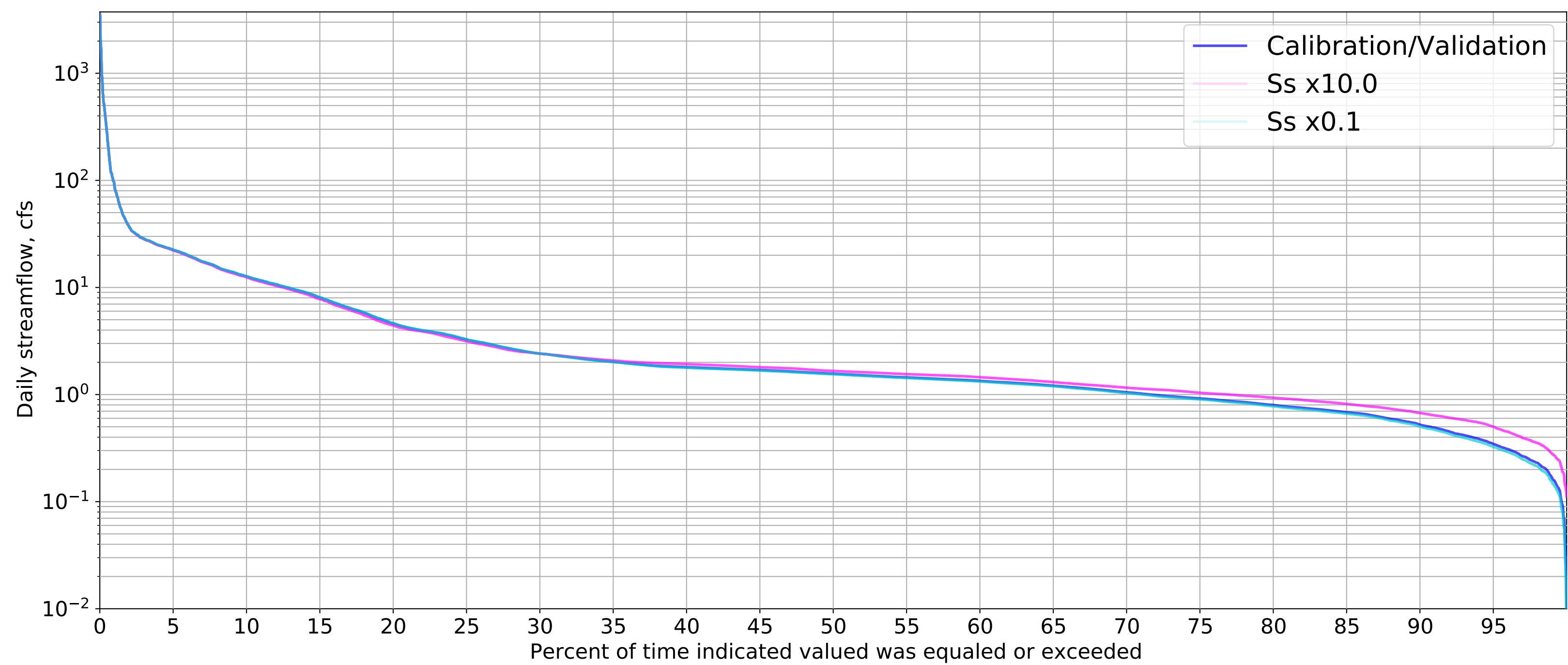
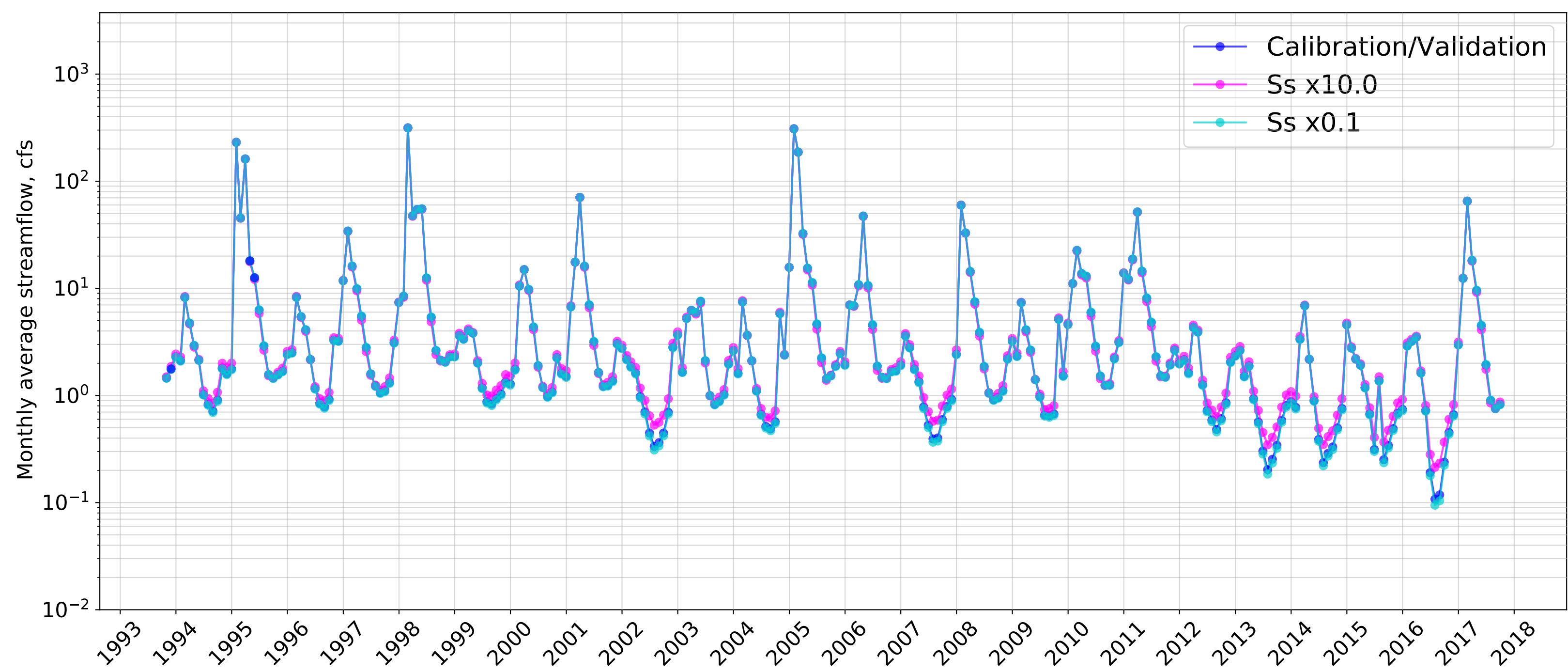
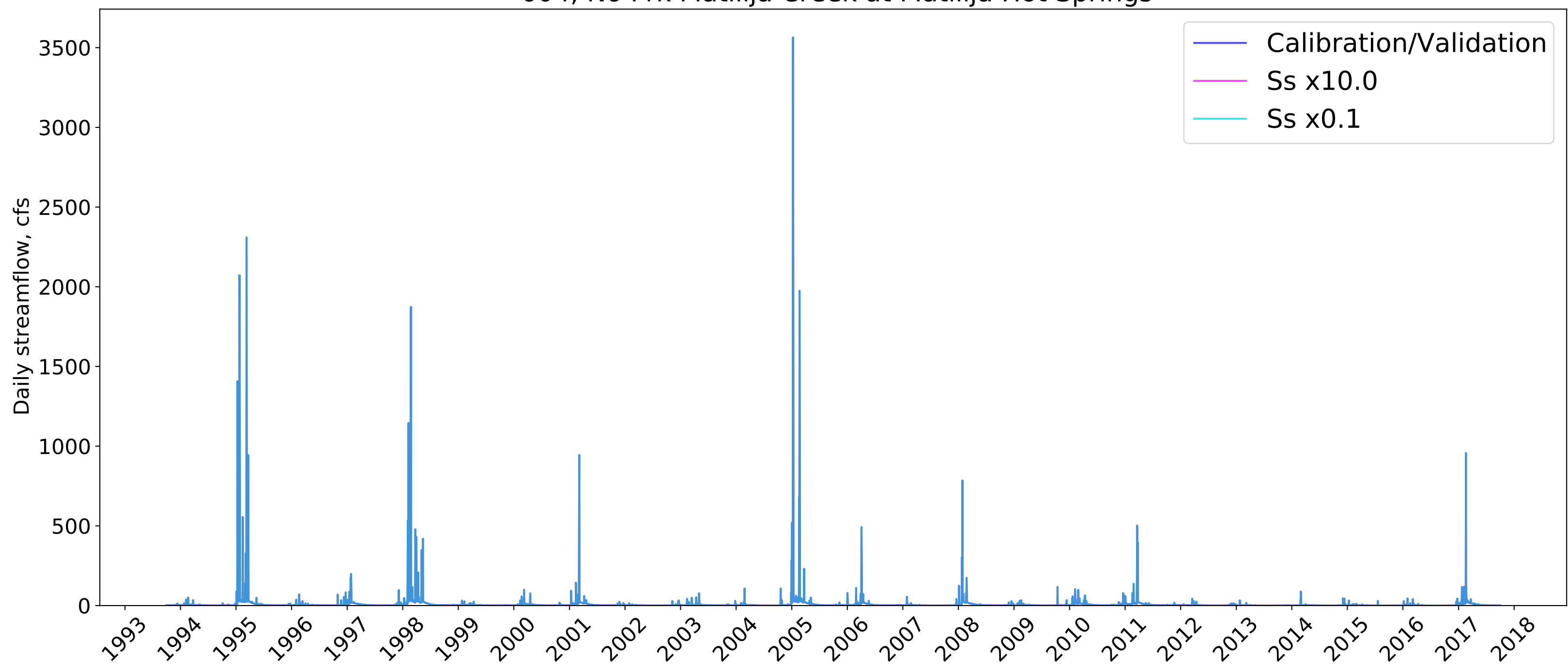


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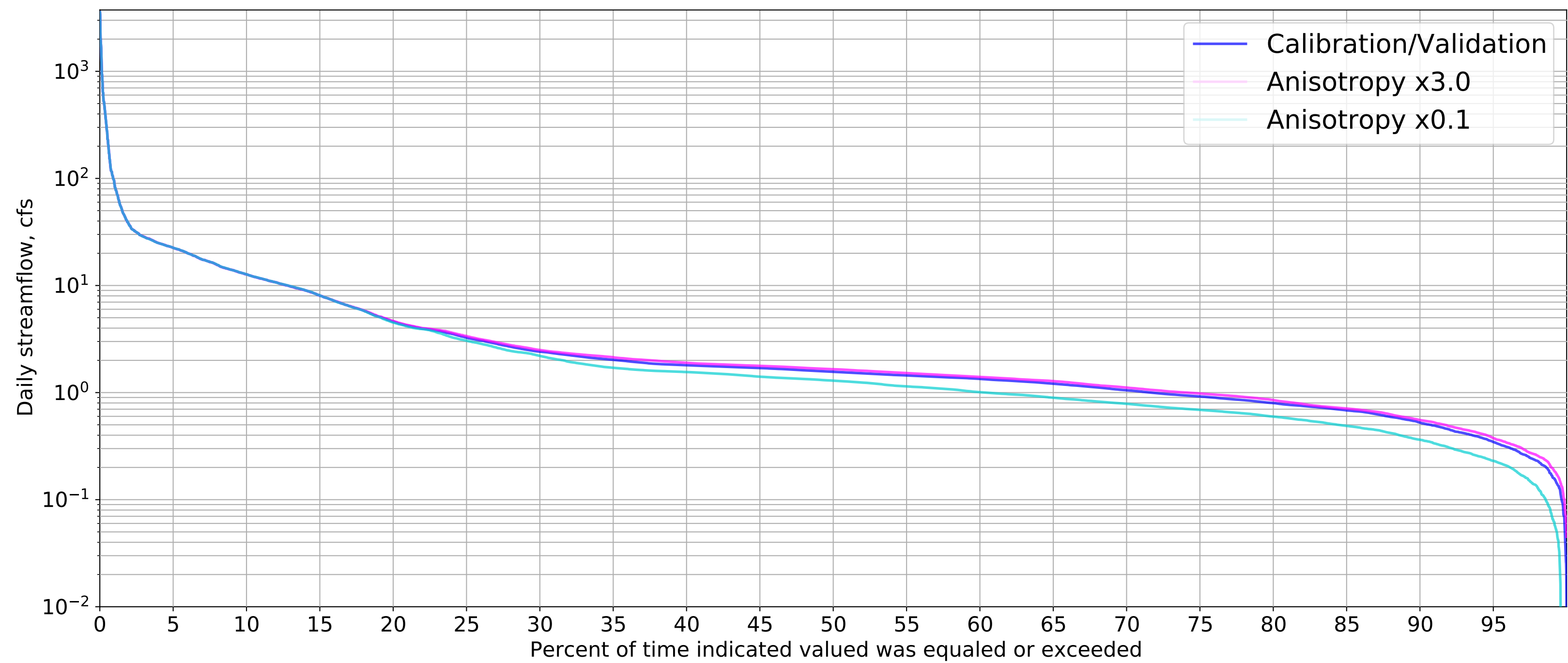
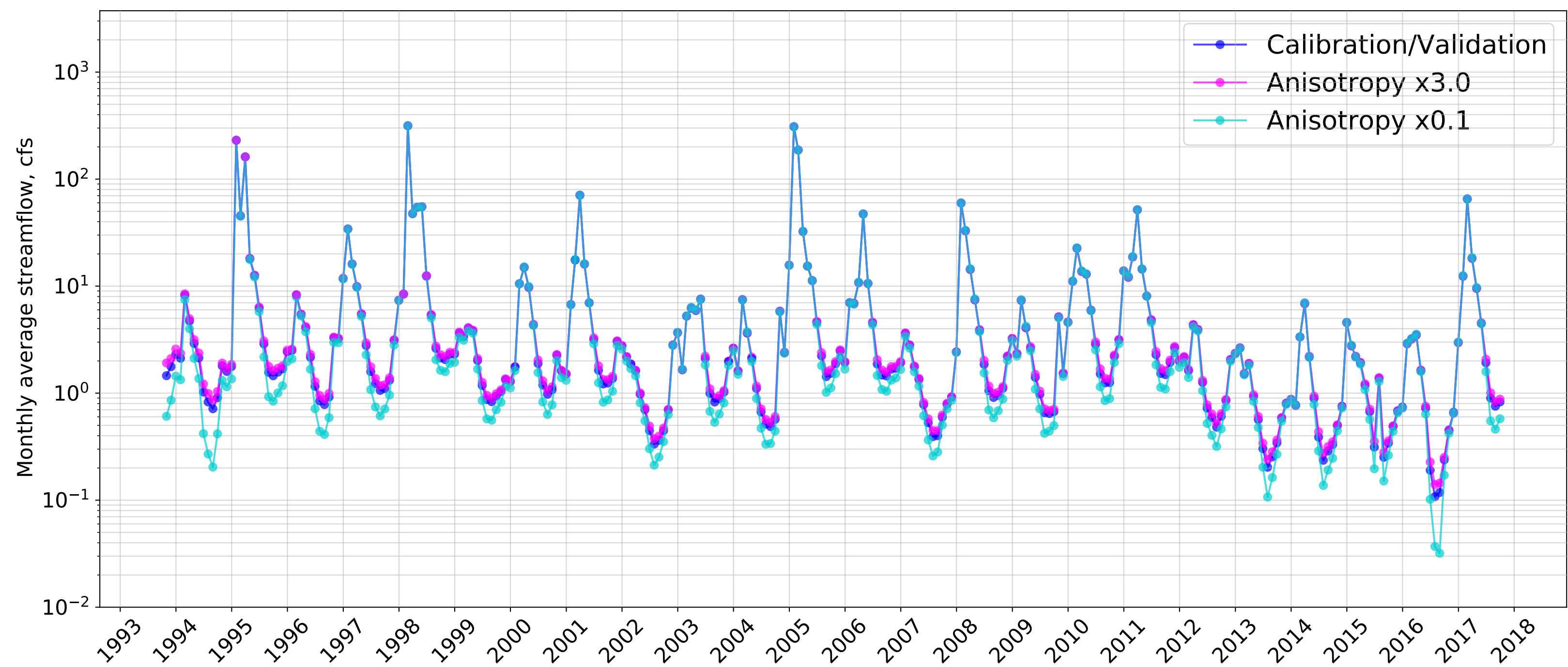
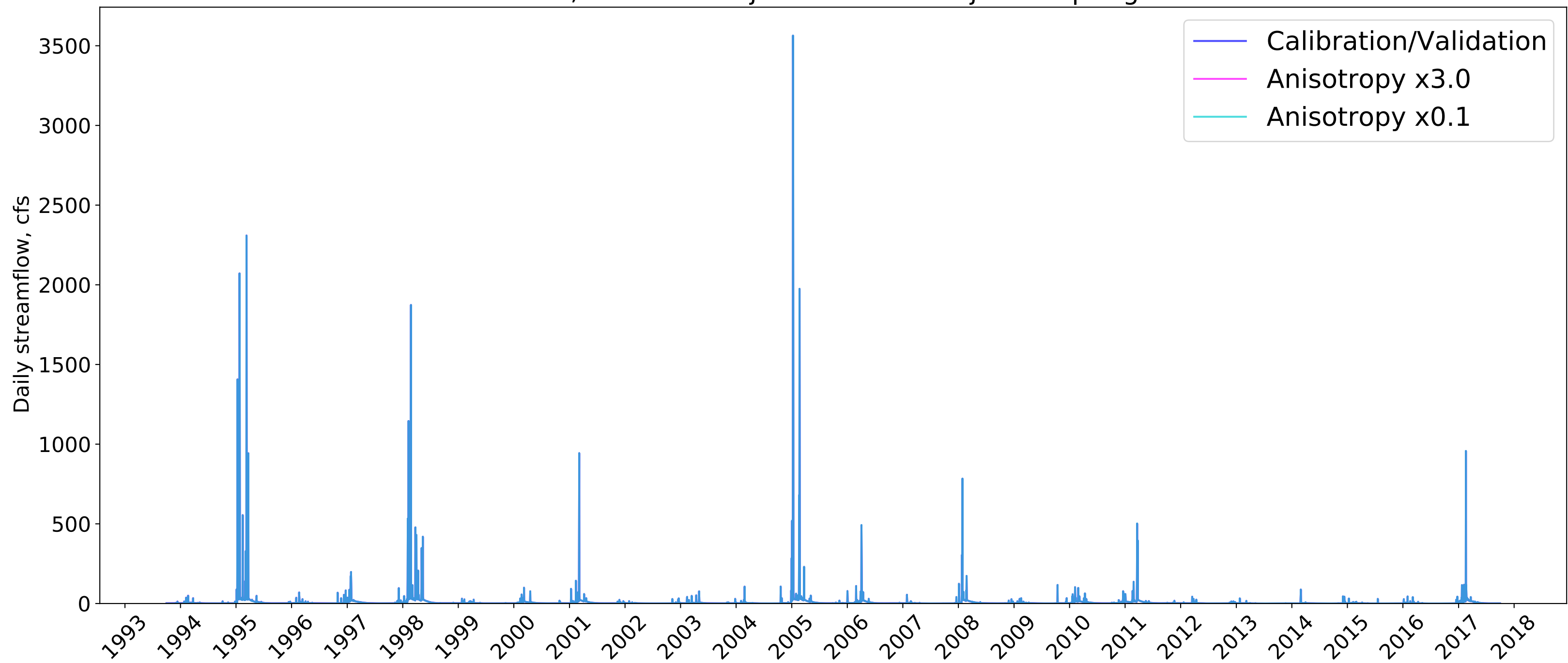




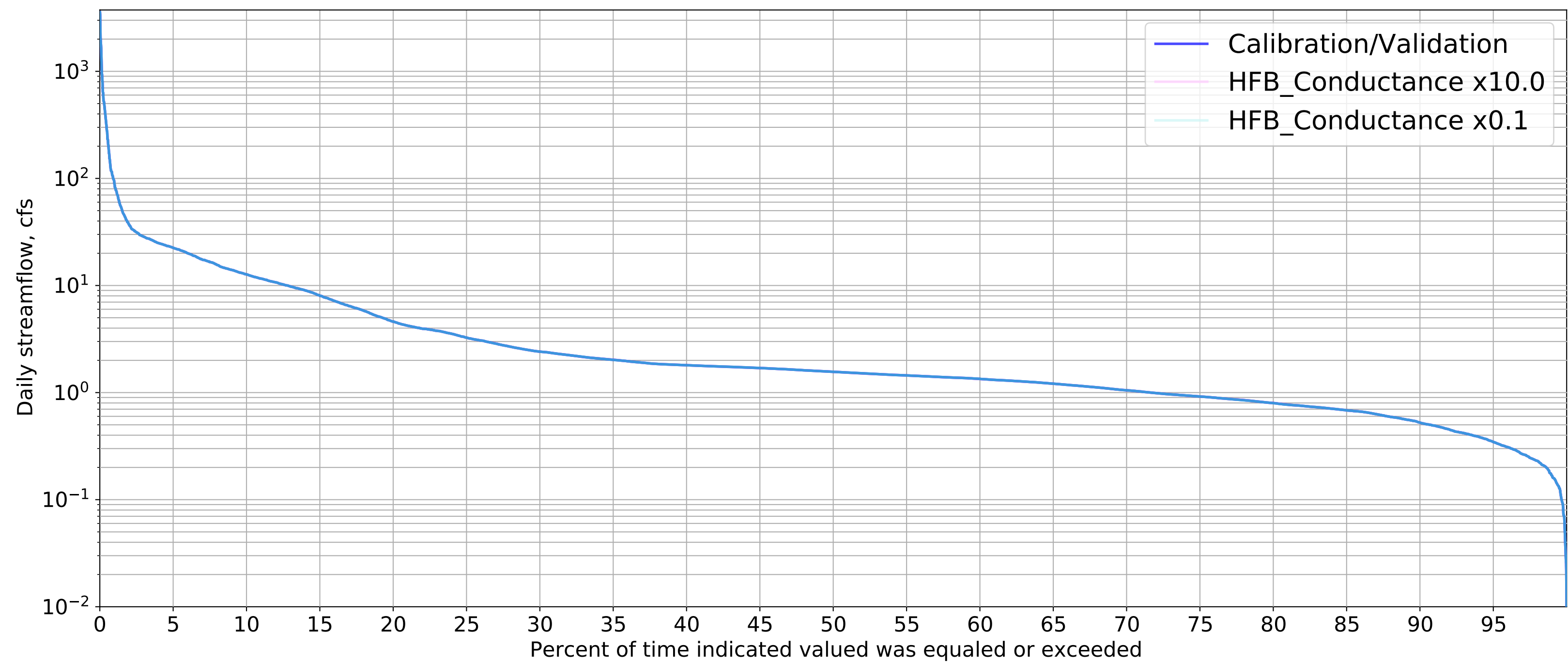
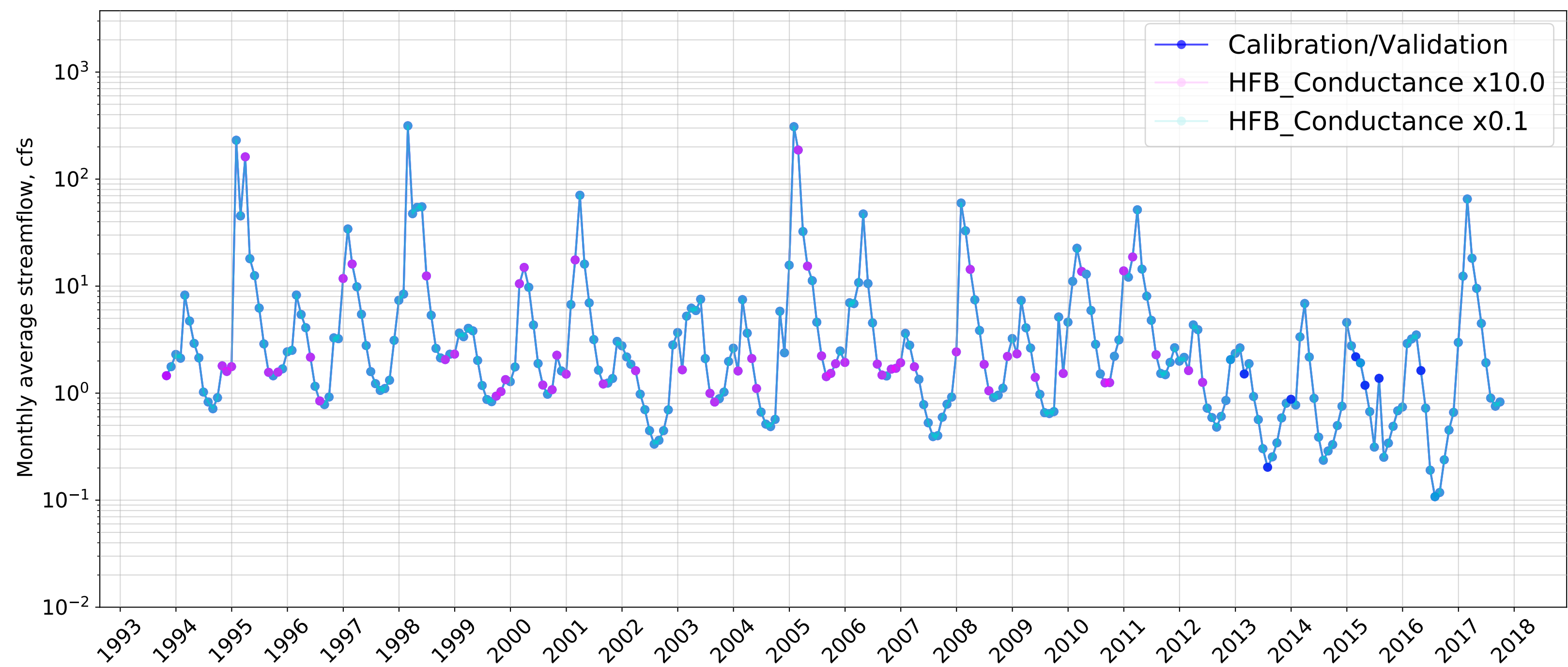
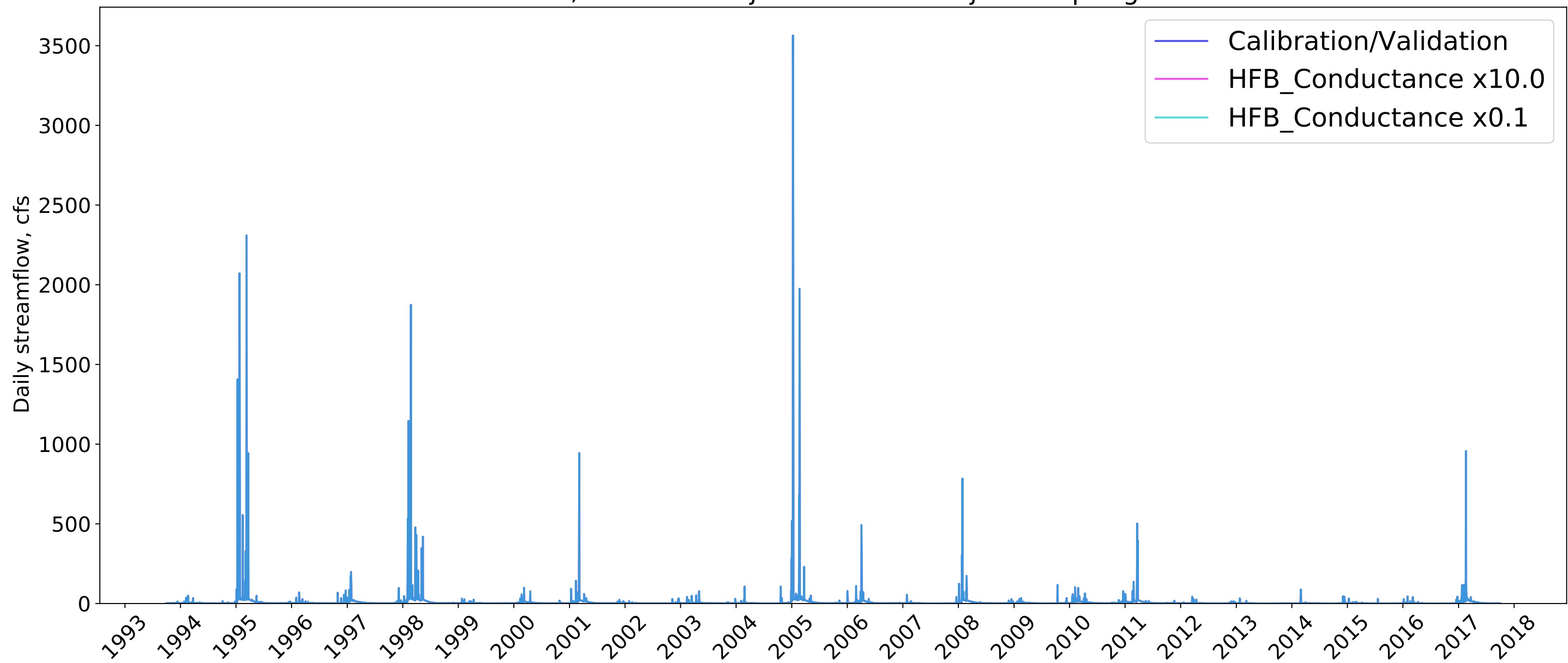
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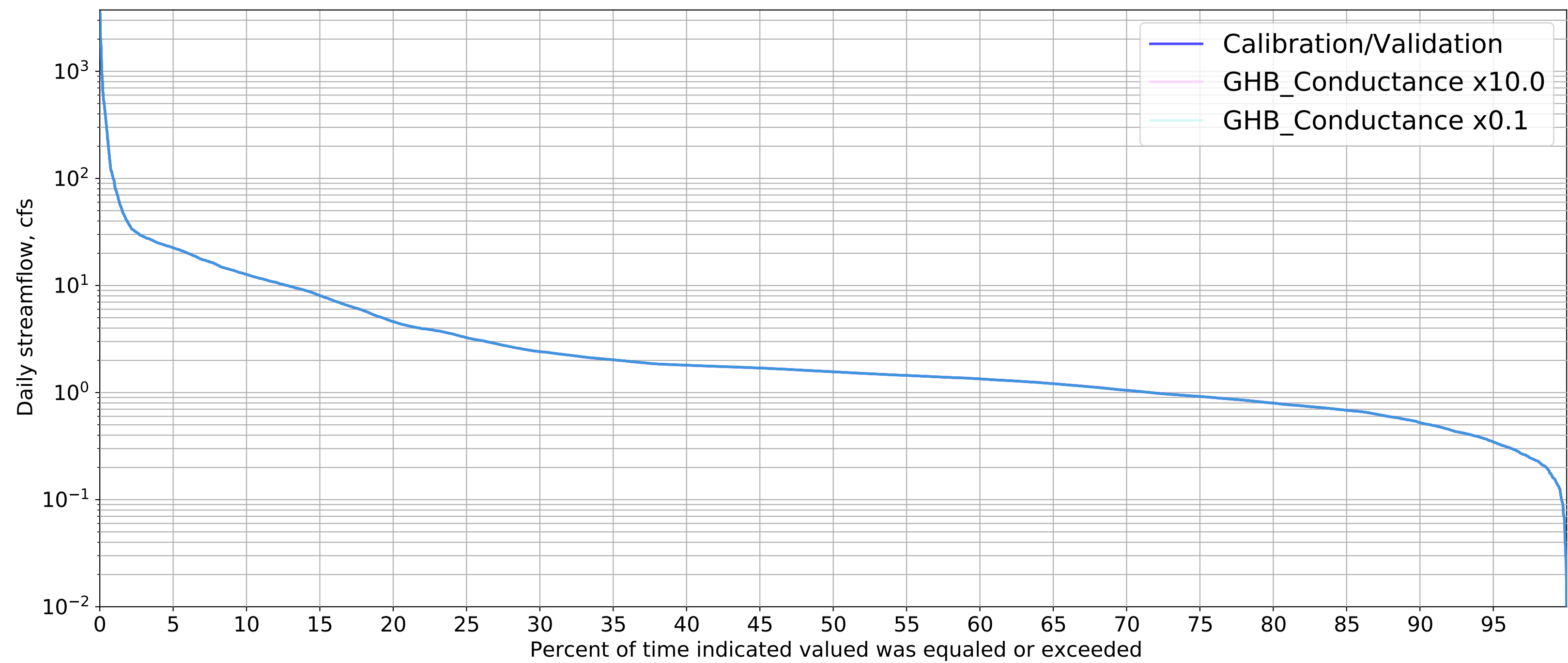
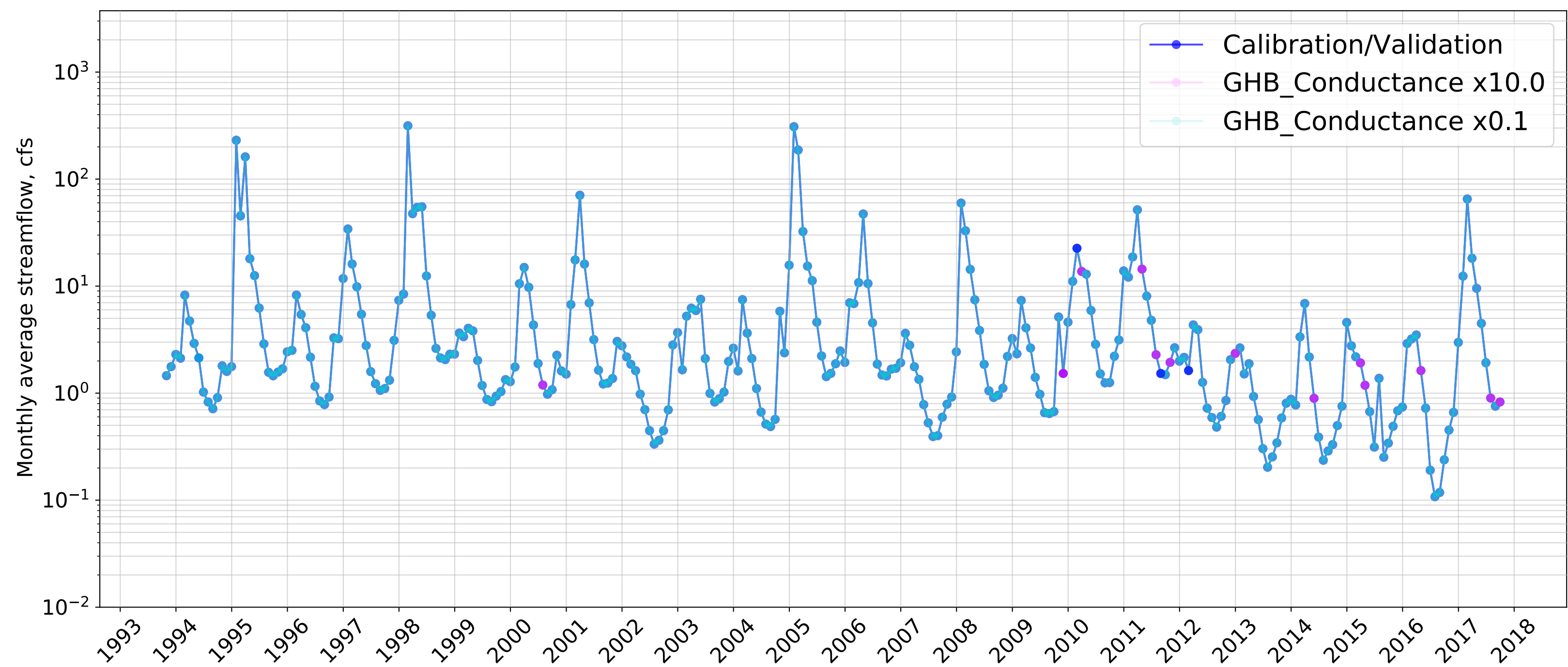
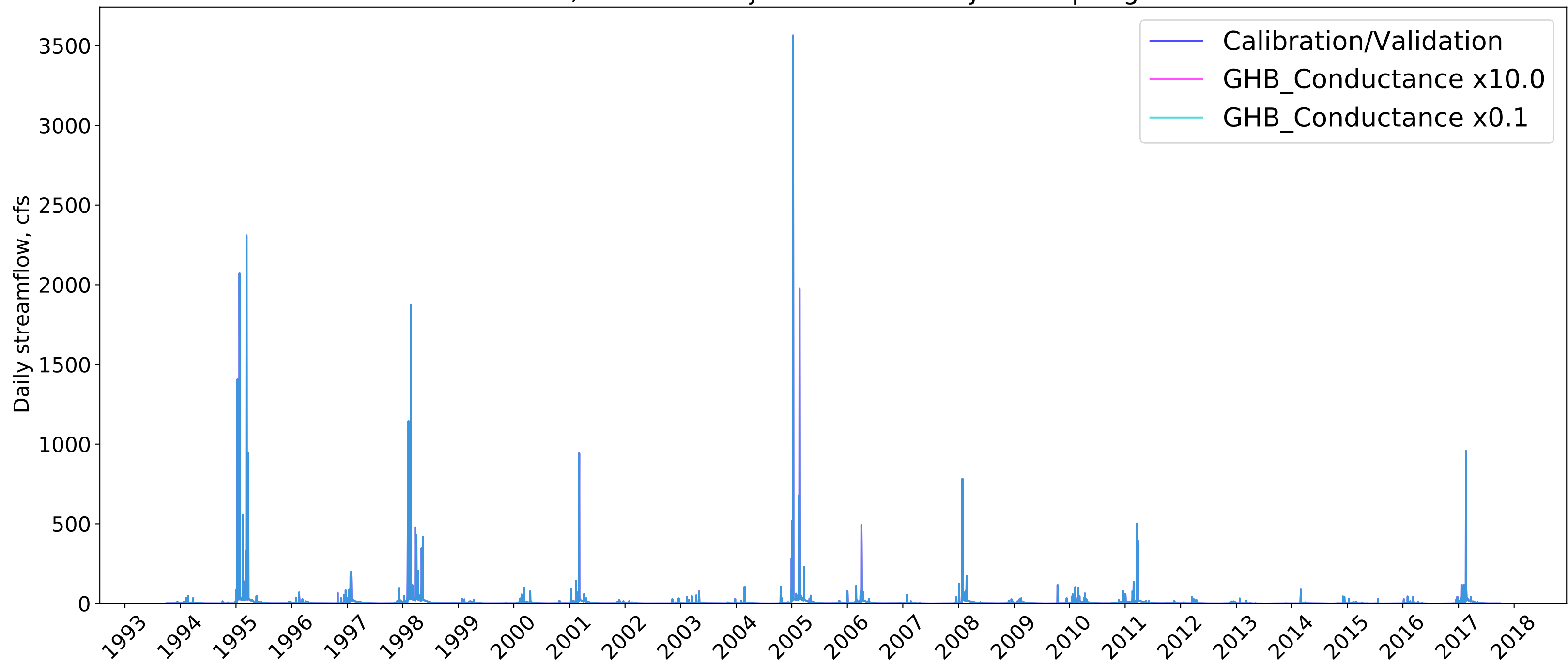
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604, No Frk Matilija Creek at Matilija Hot Springs

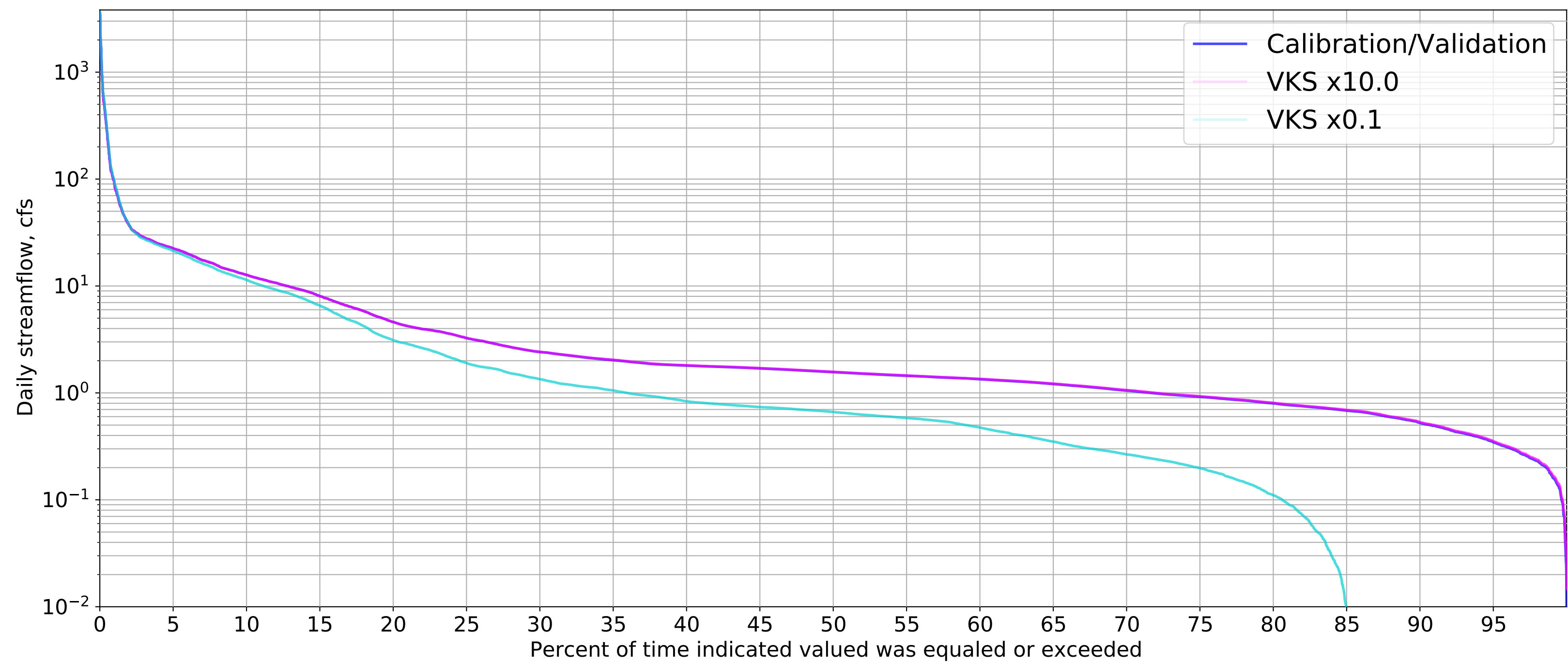
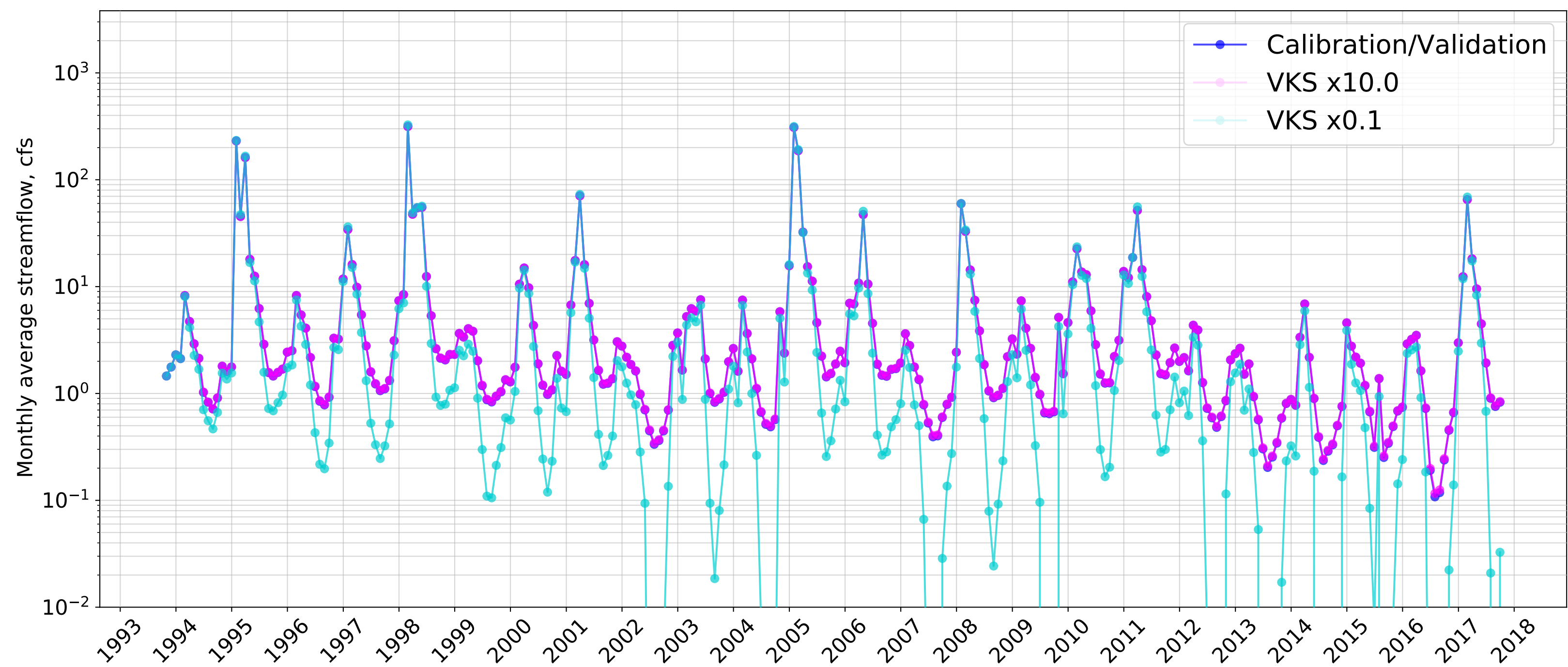
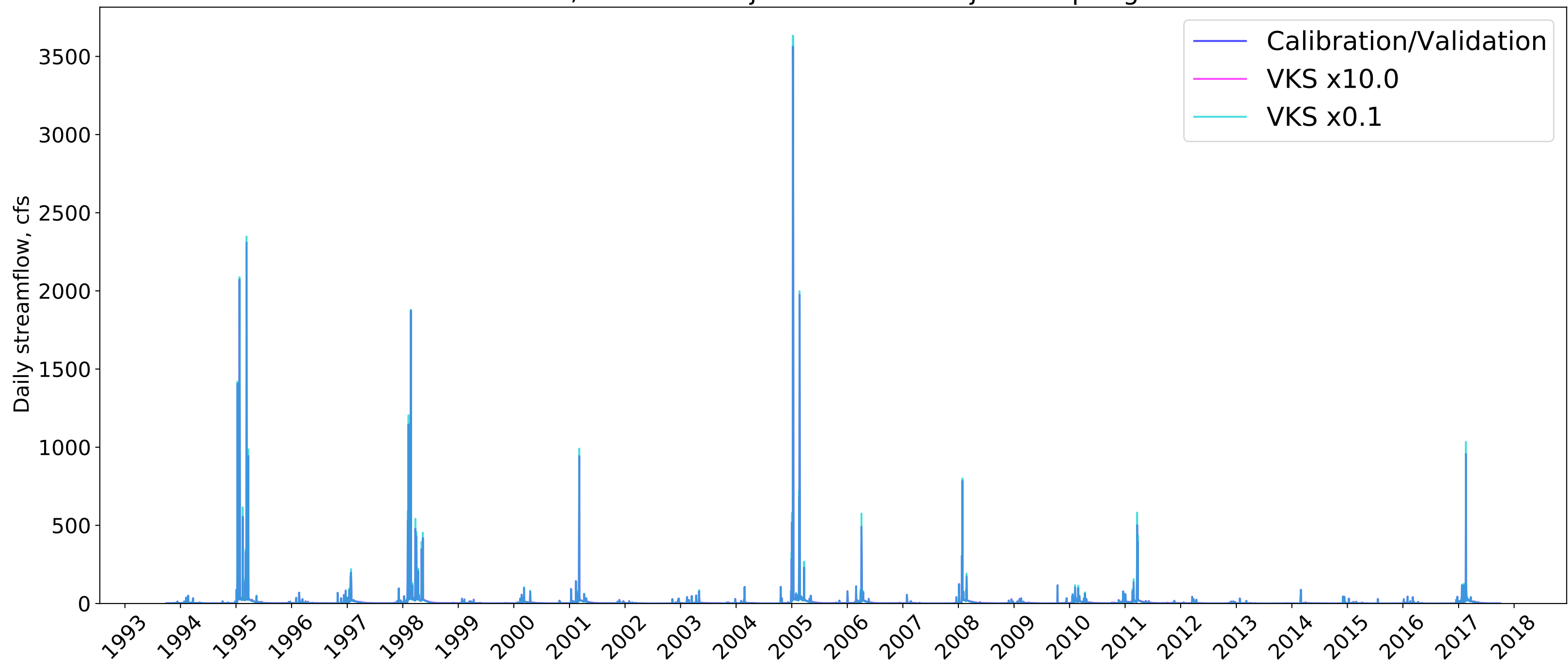


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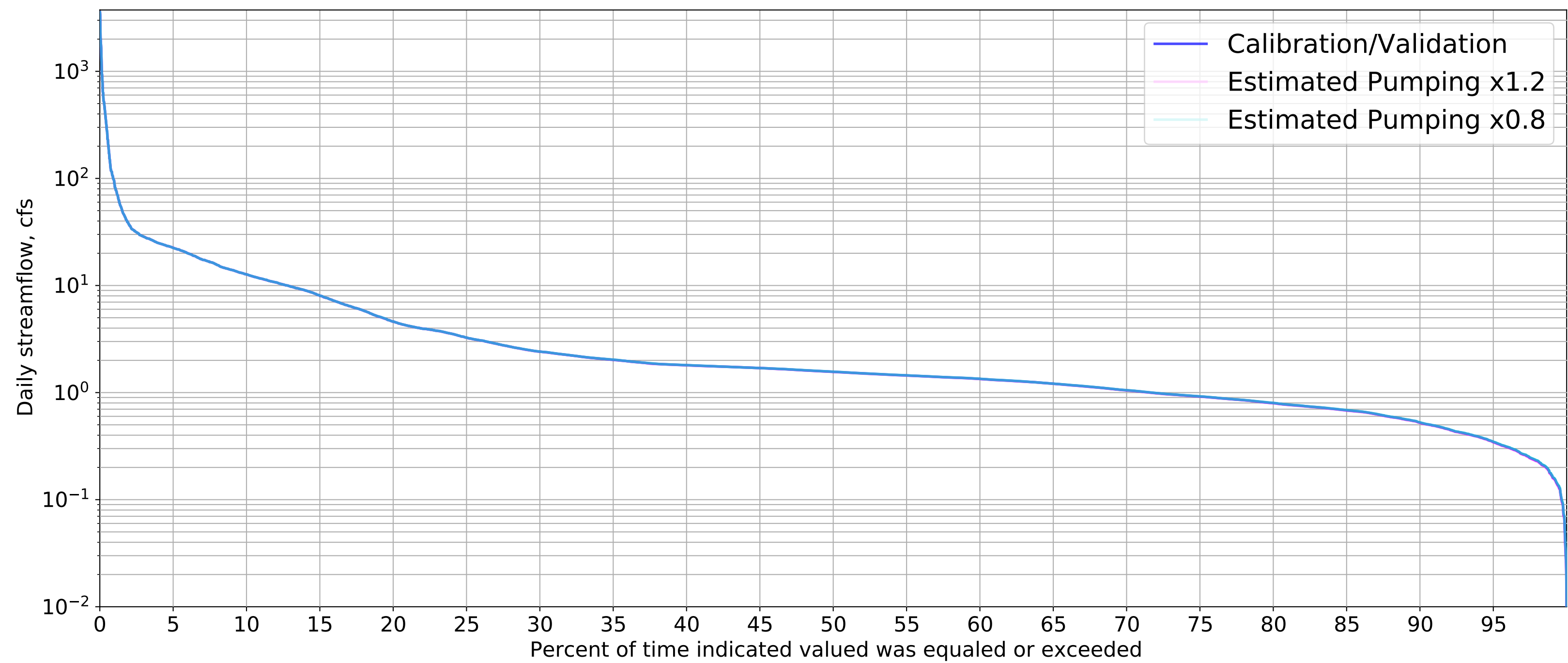
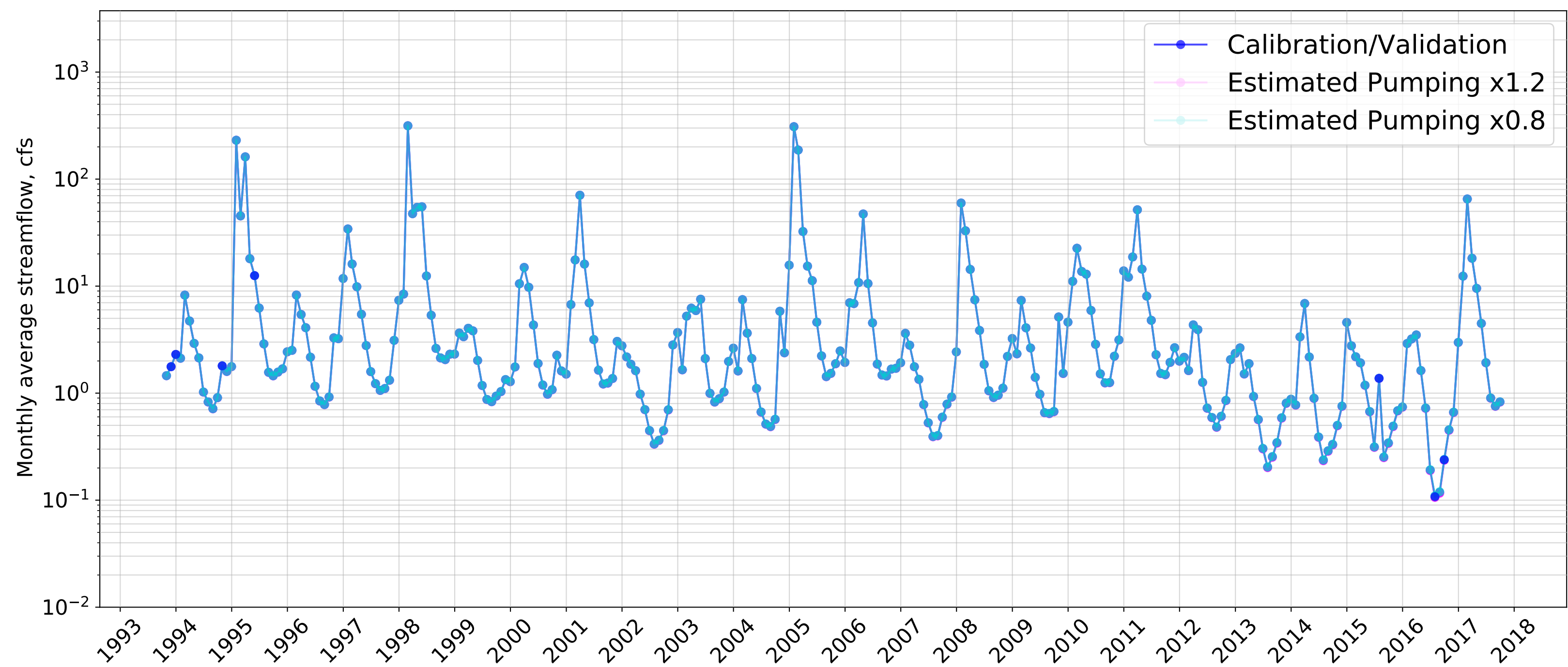
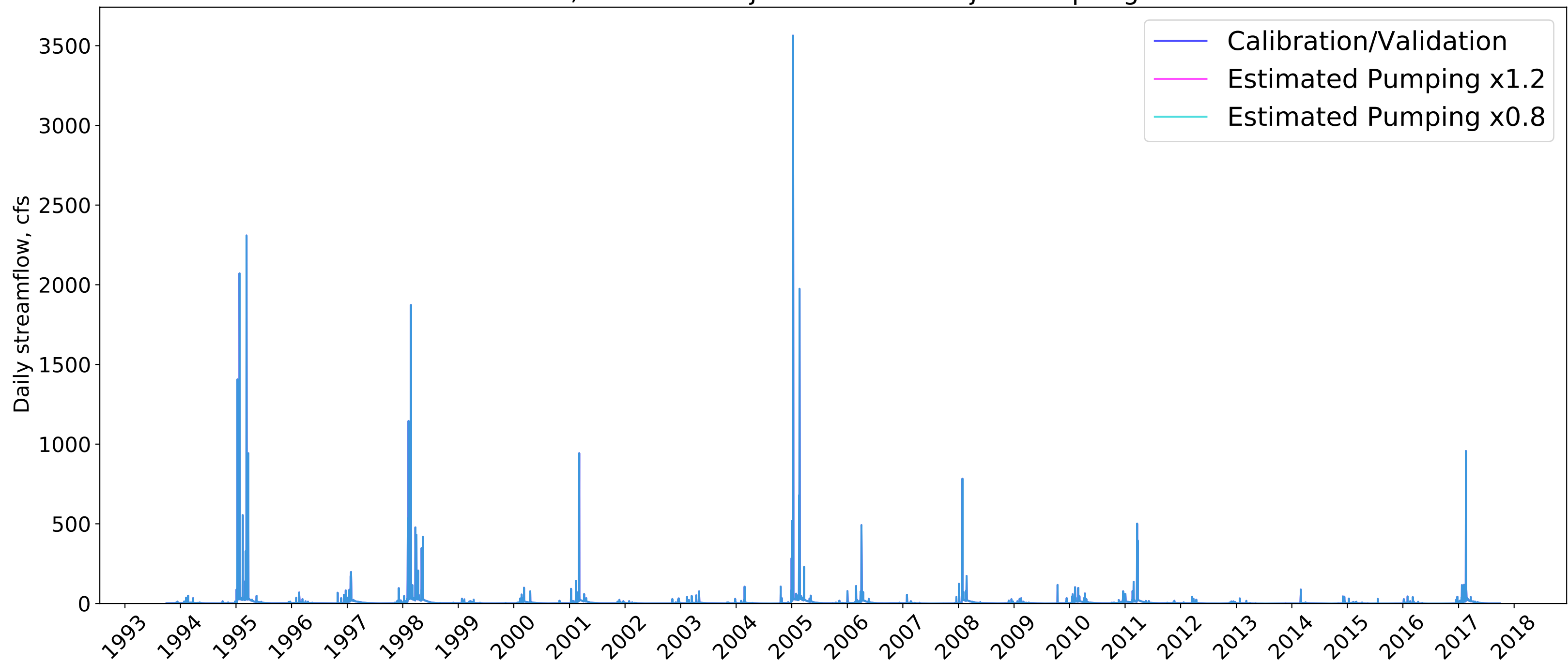




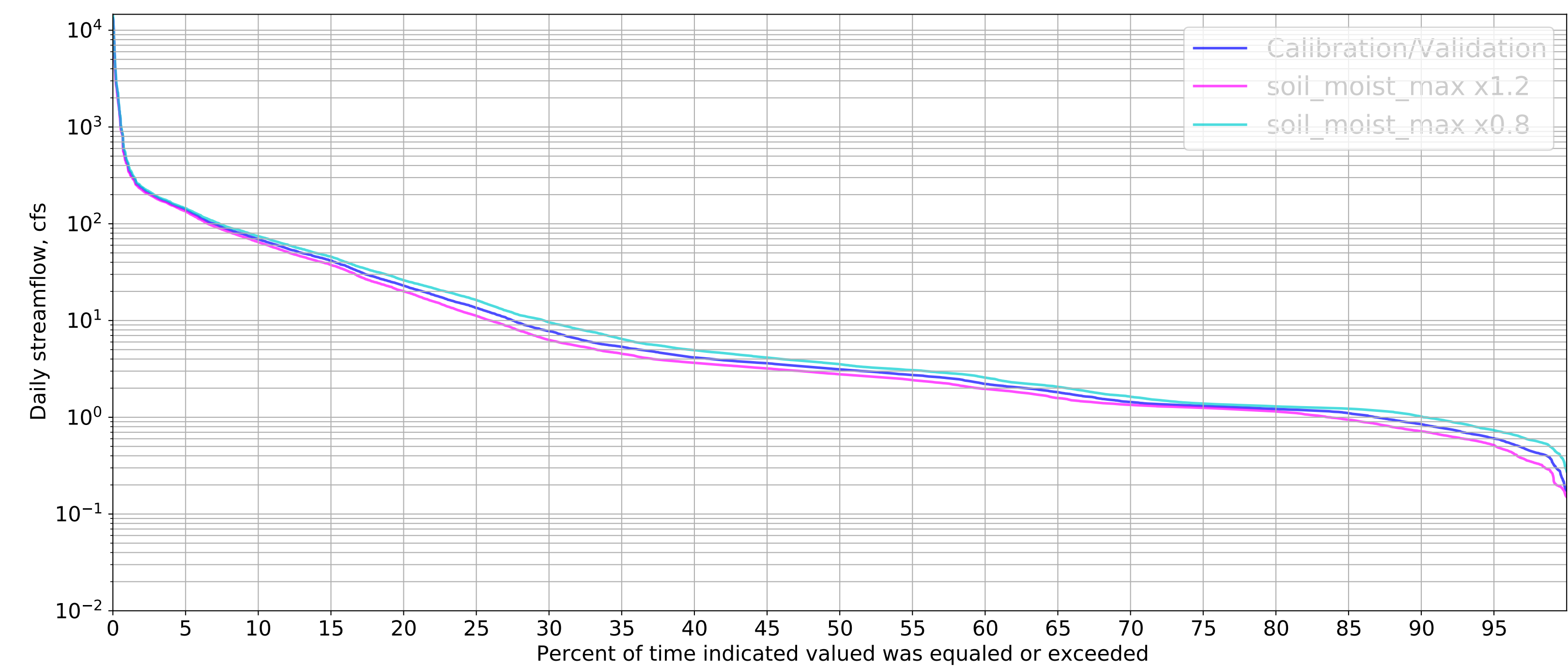
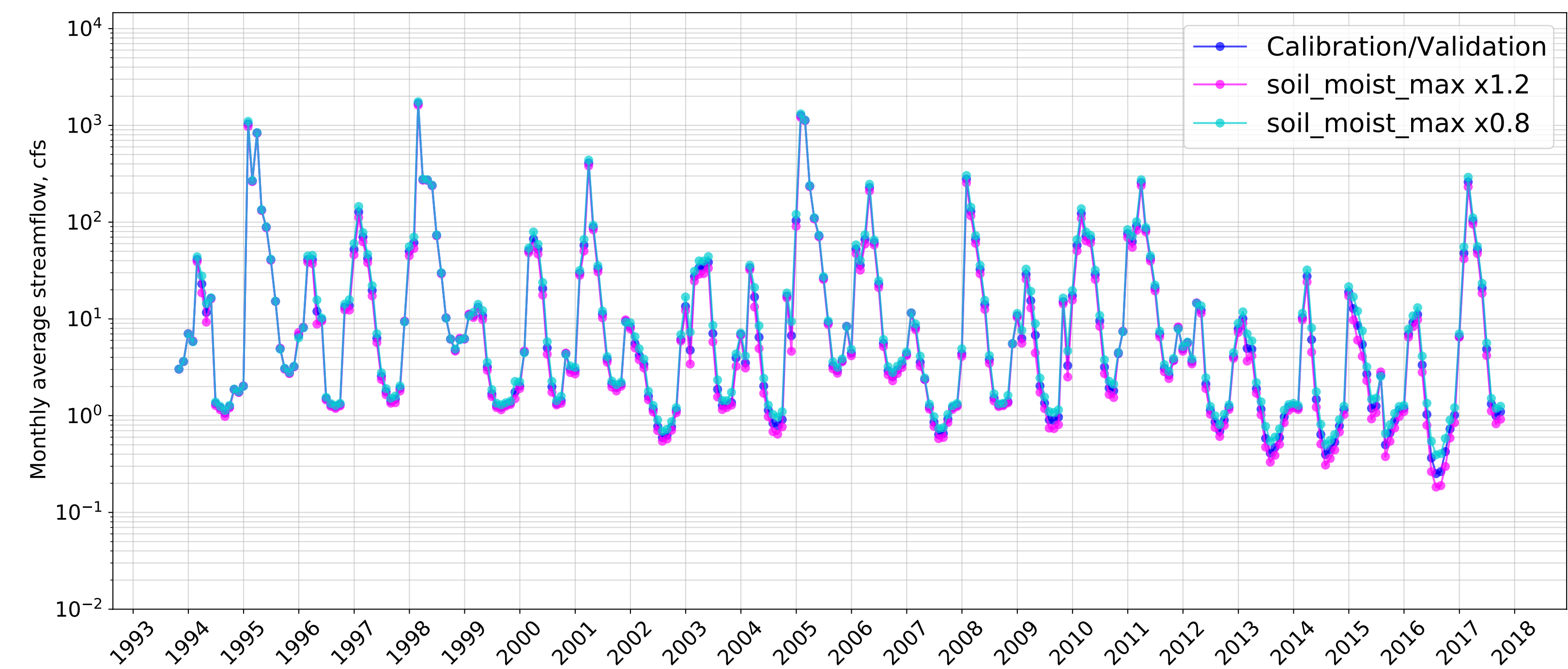
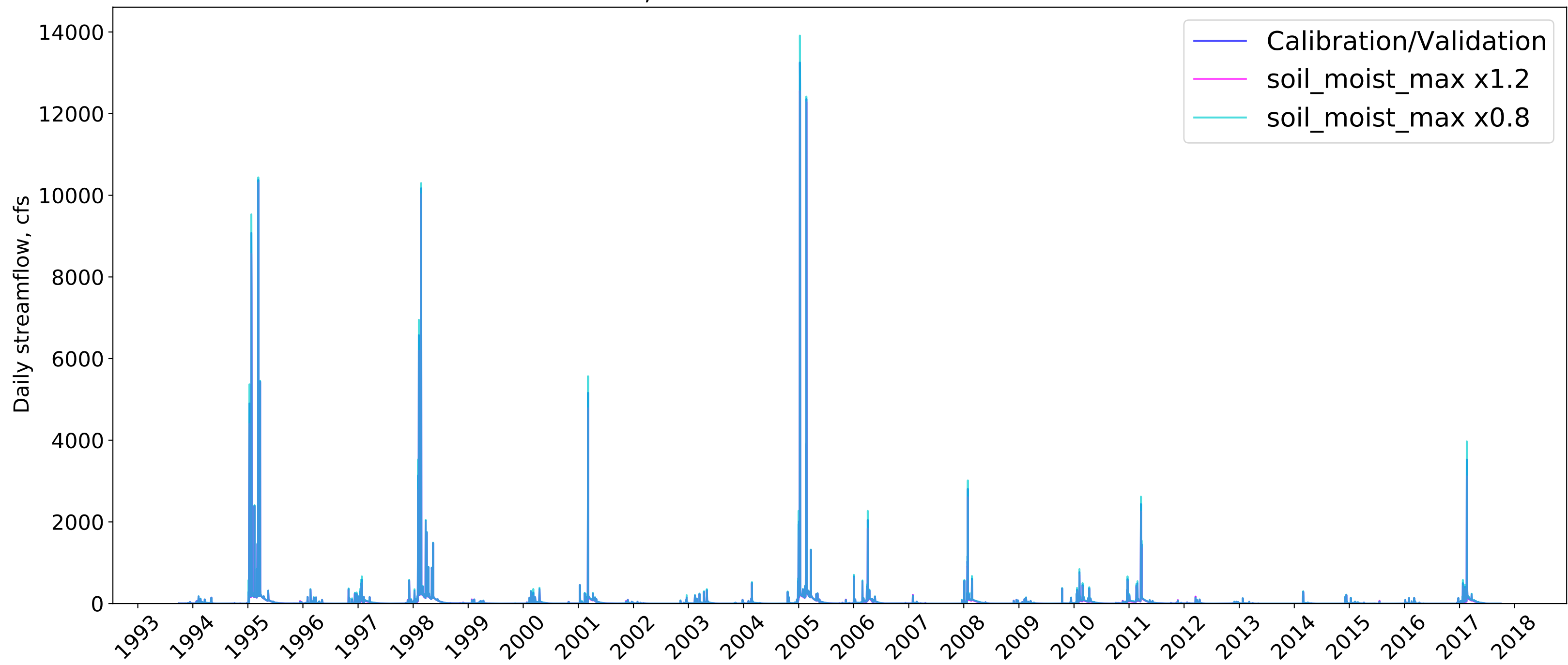
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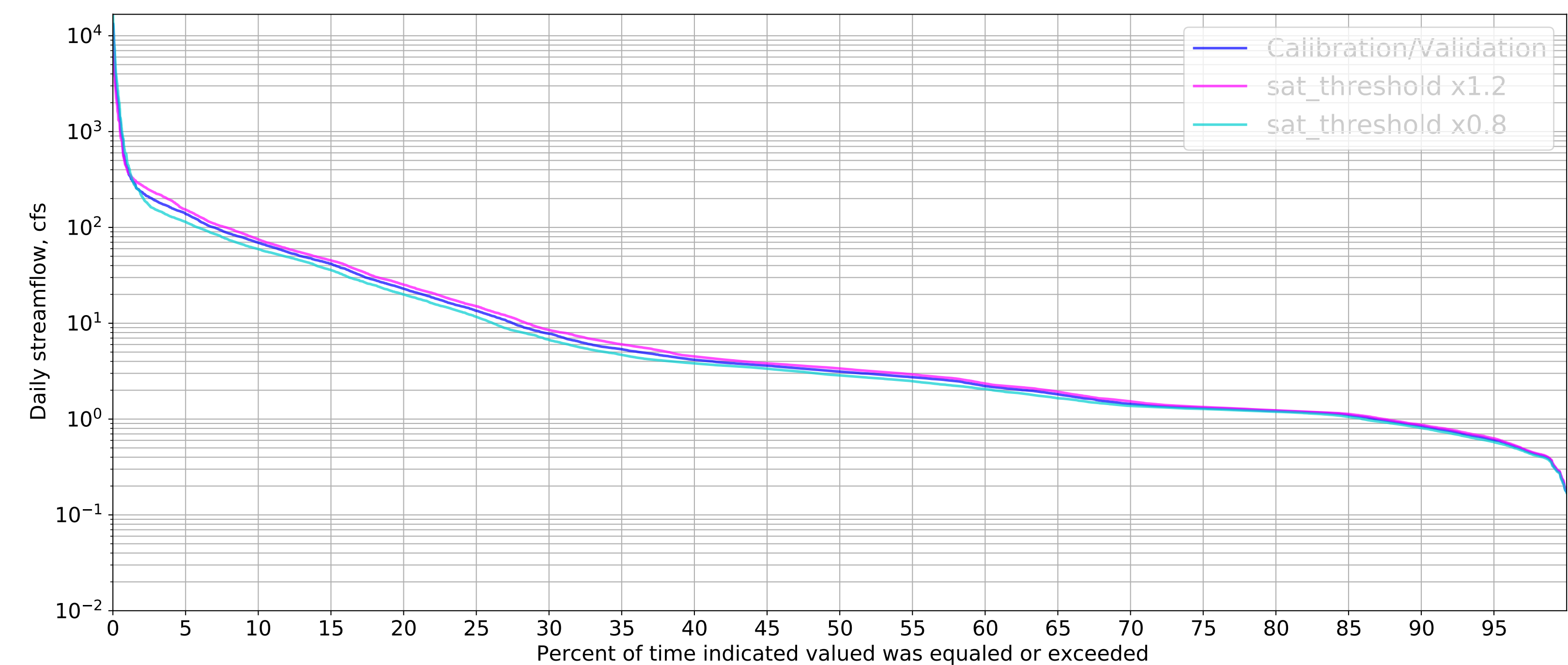
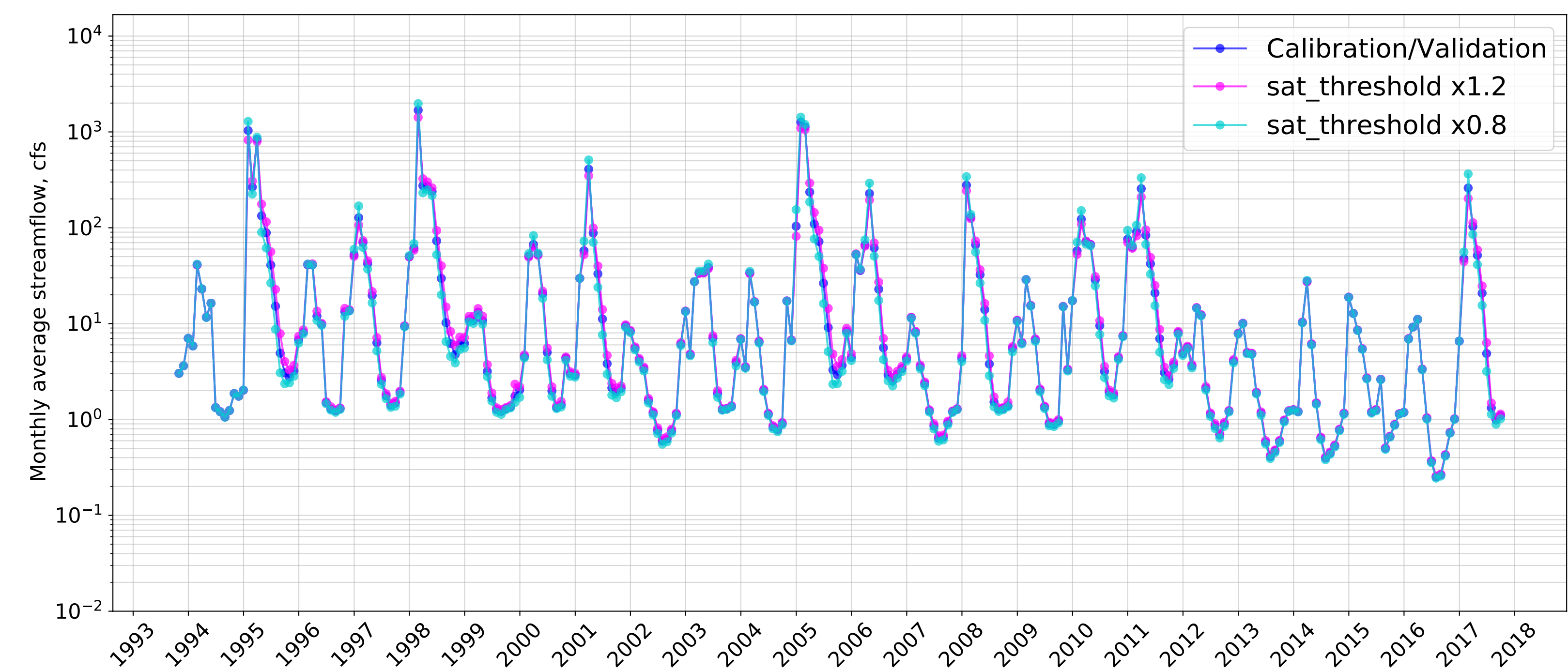
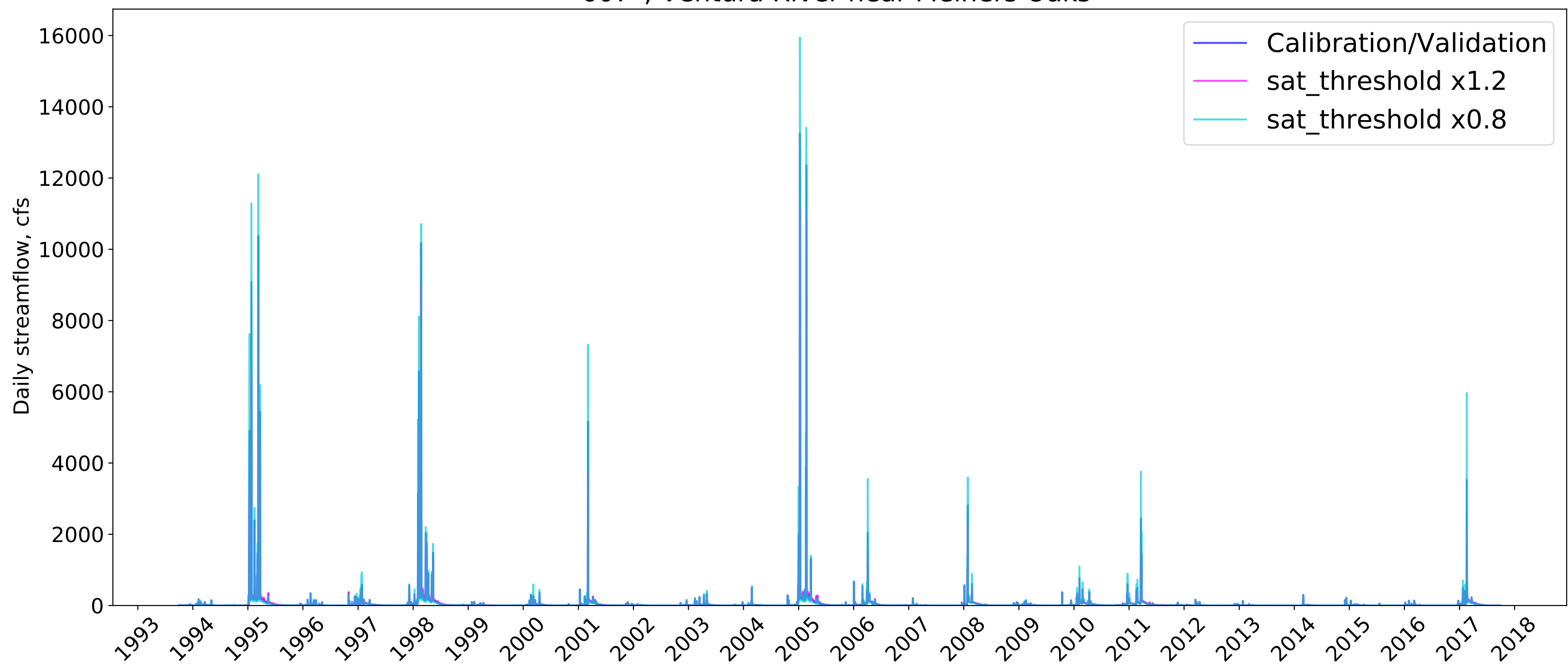
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607\*, Ventura River near Meiners Oaks\*

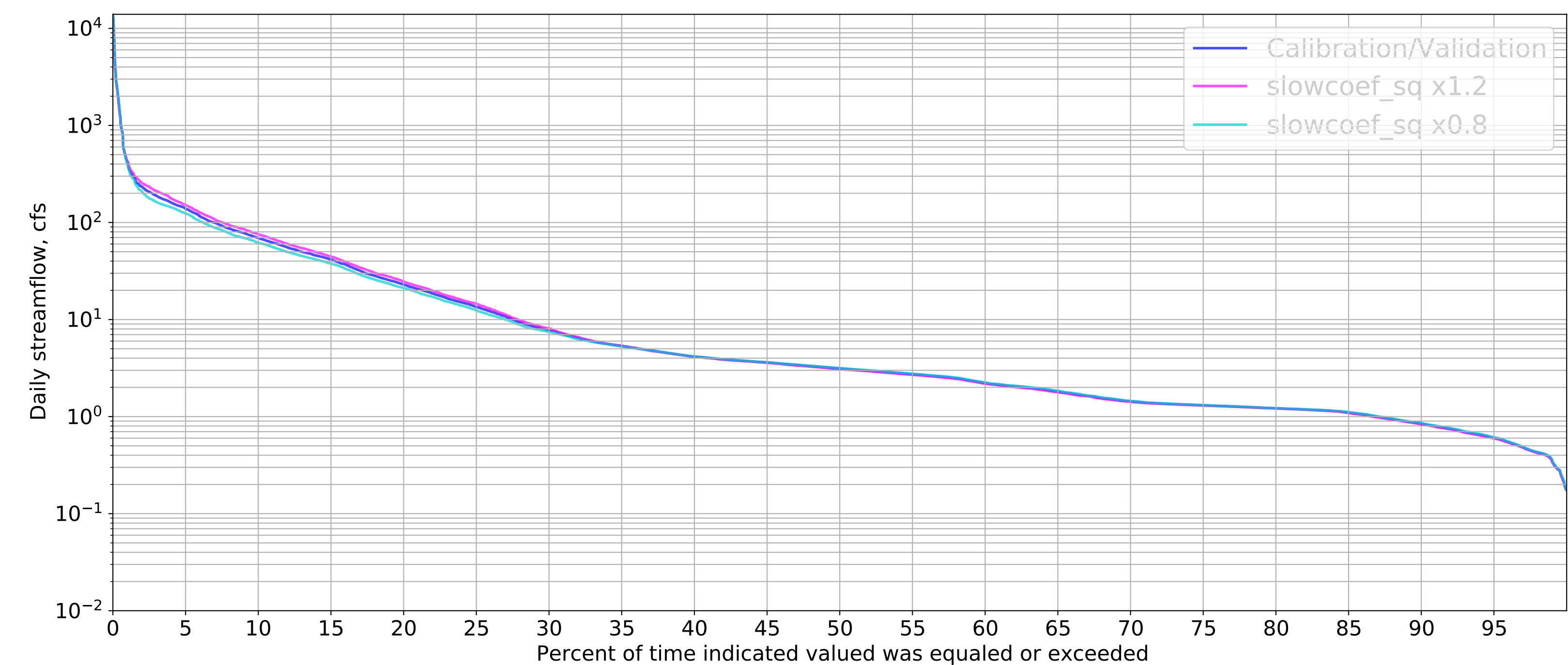
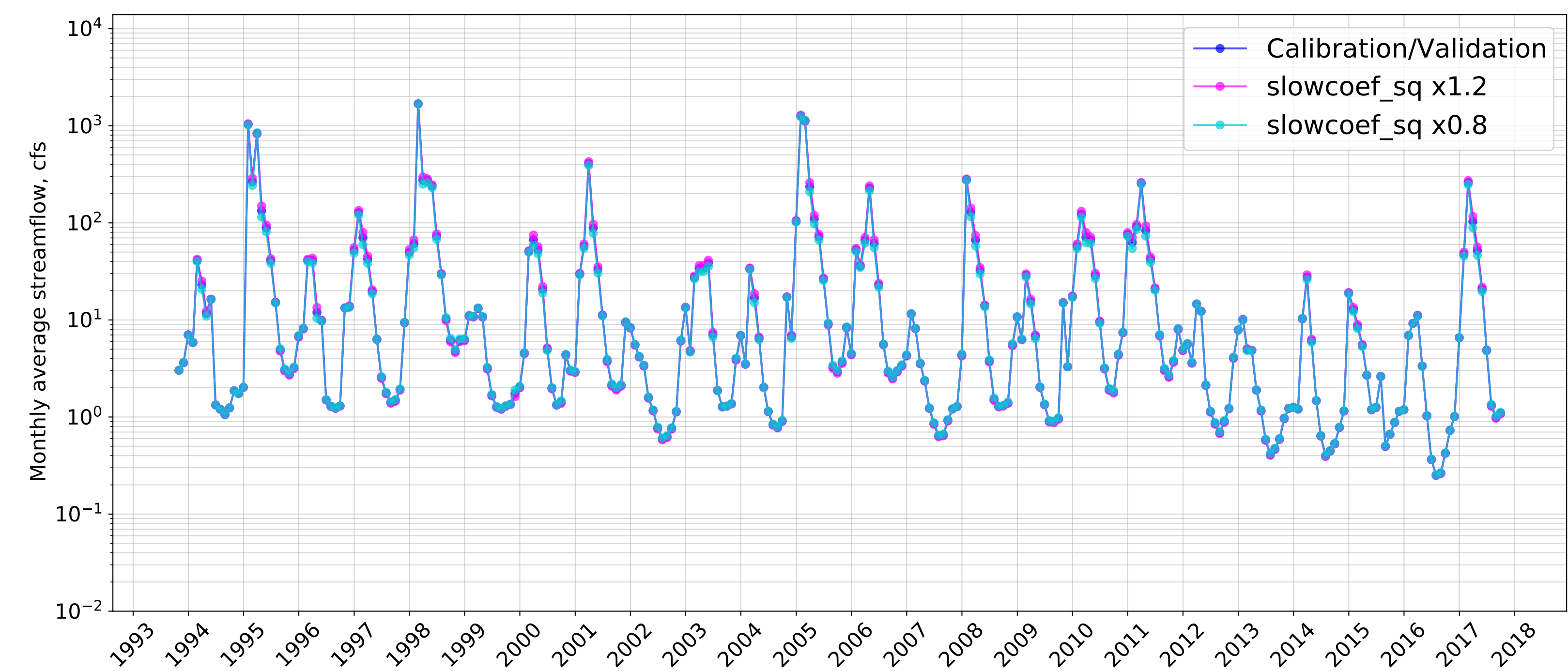
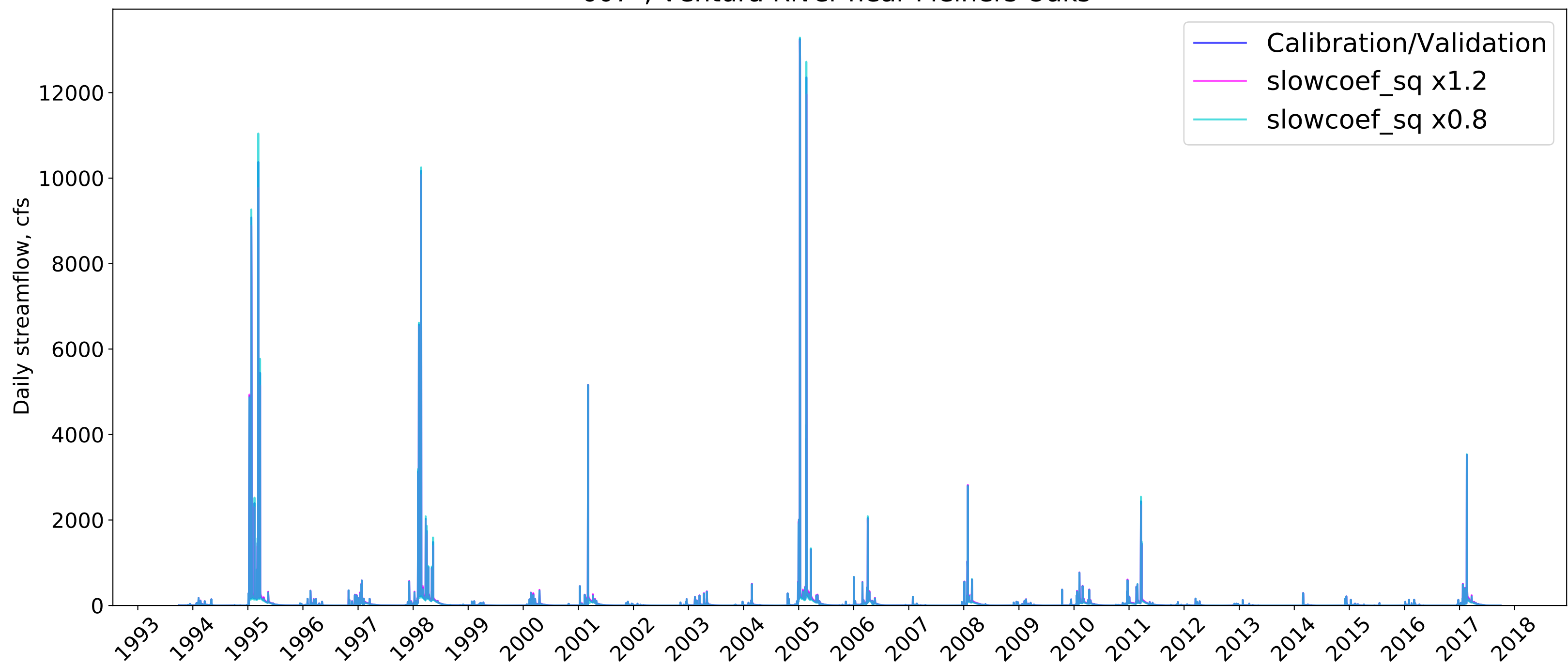


607\*, Ventura River near Meiners Oaks\*

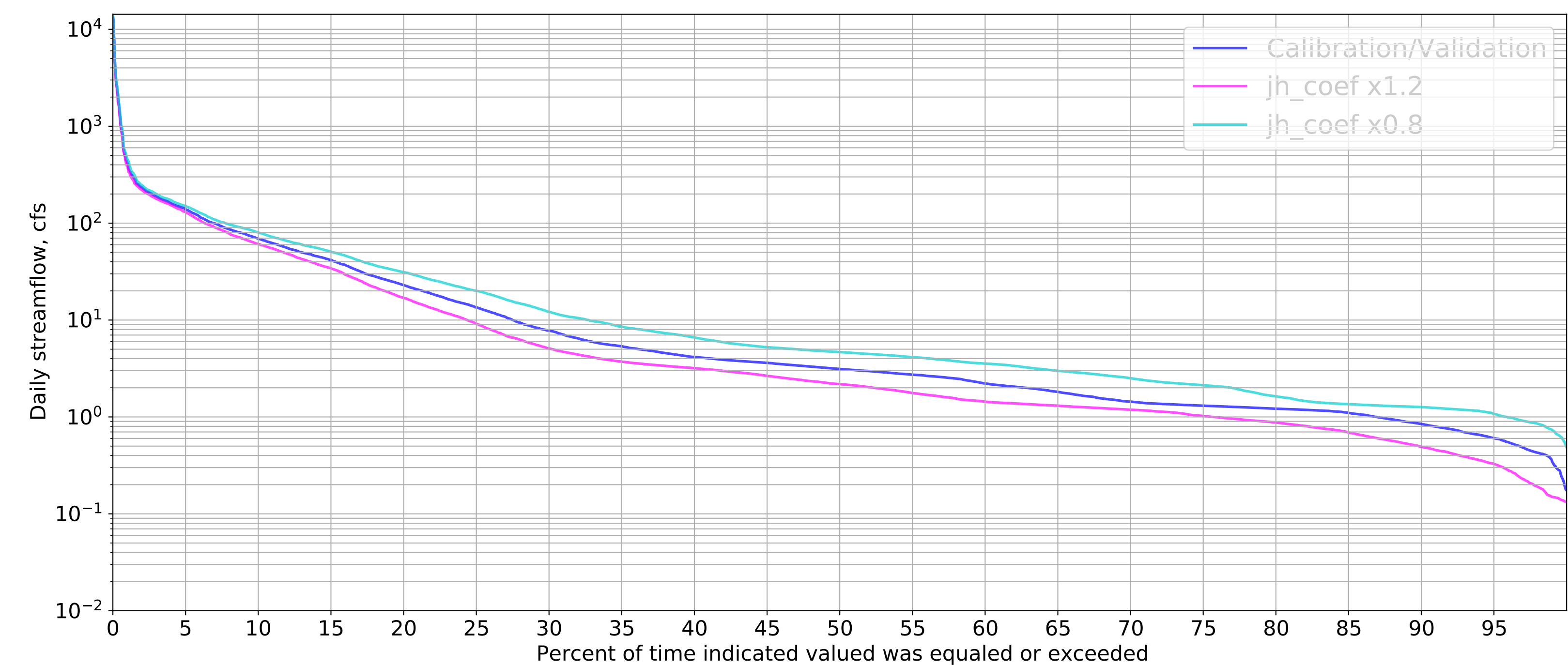
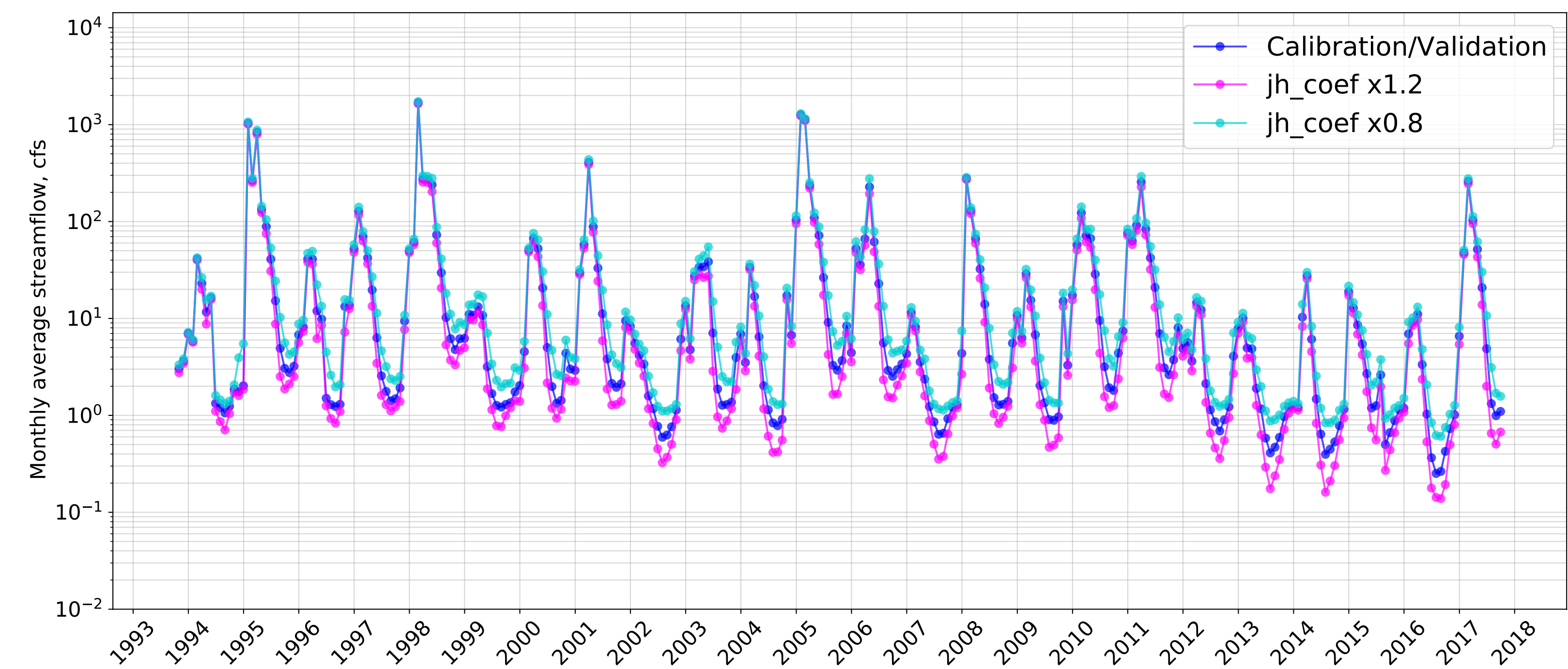
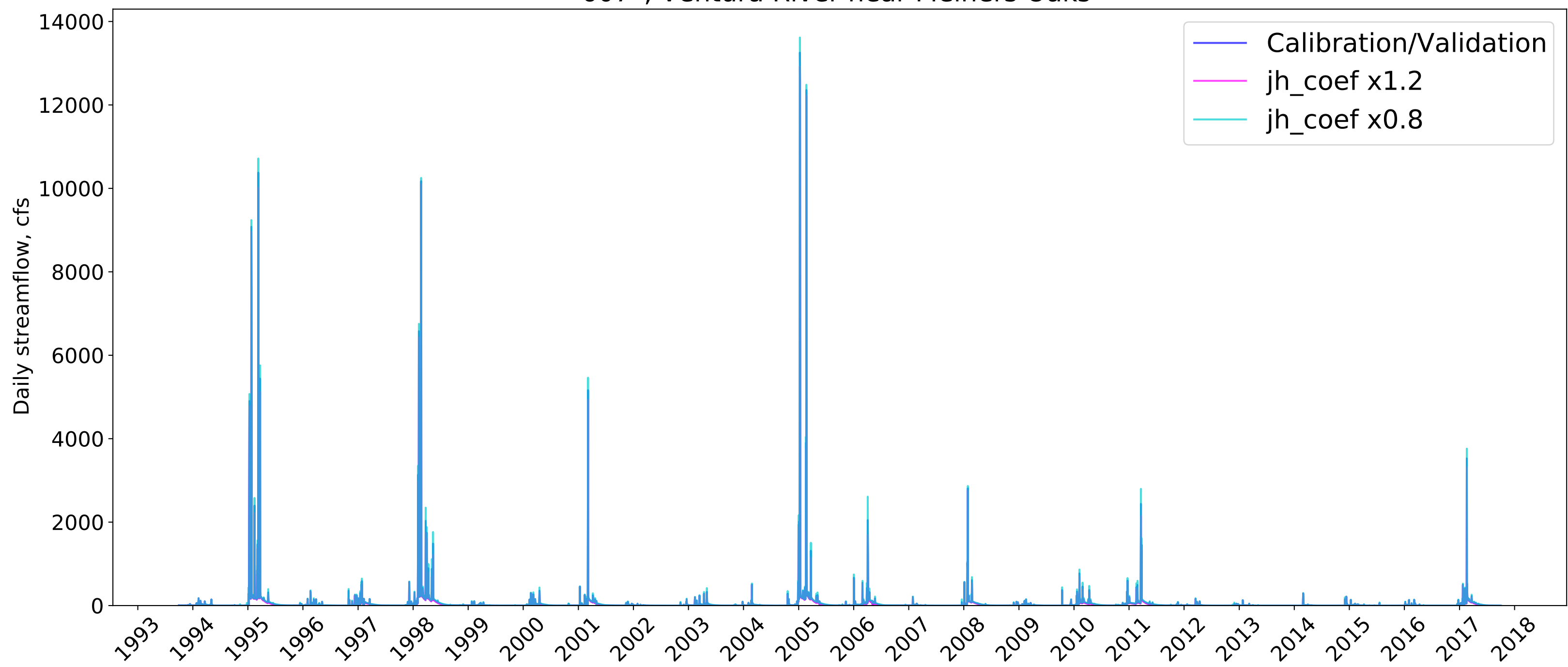




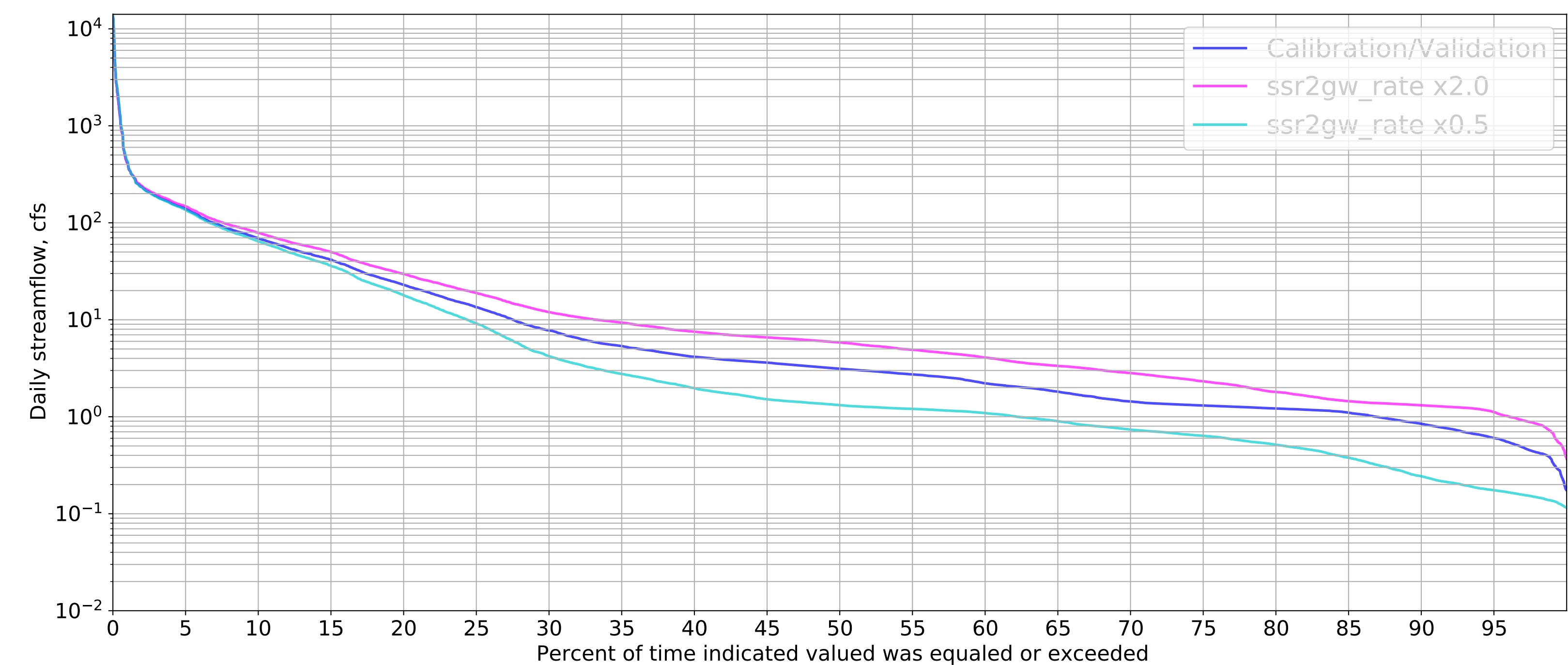
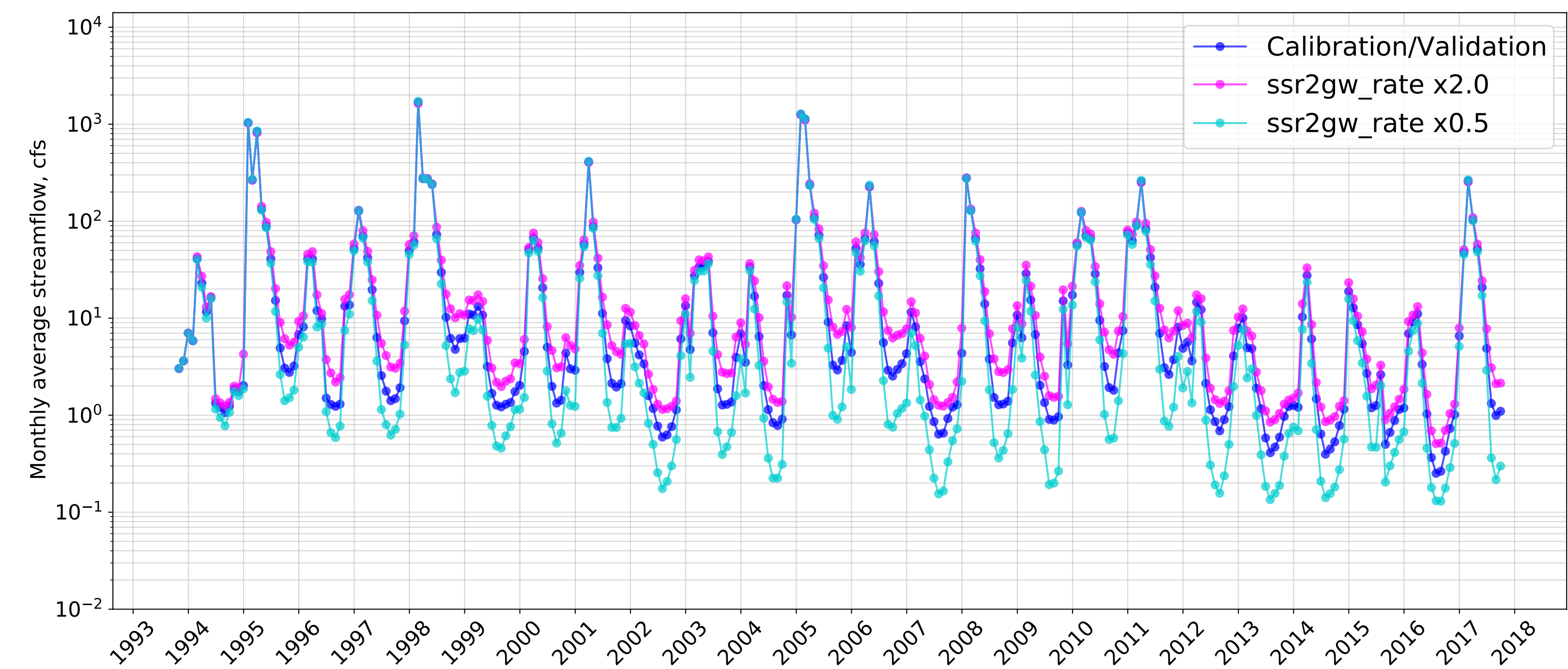
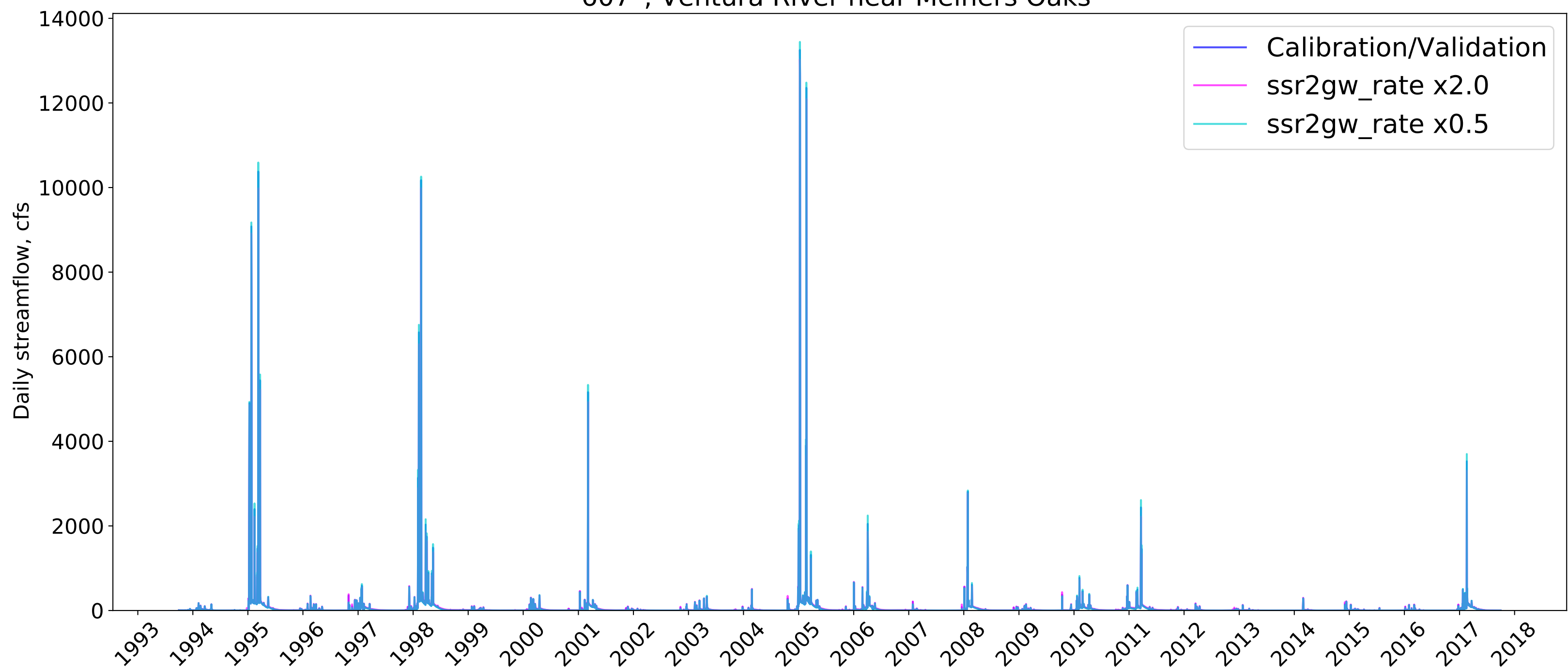
607\*, Ventura River near Meiners Oaks\*



607\*, Ventura River near Meiners Oaks\*

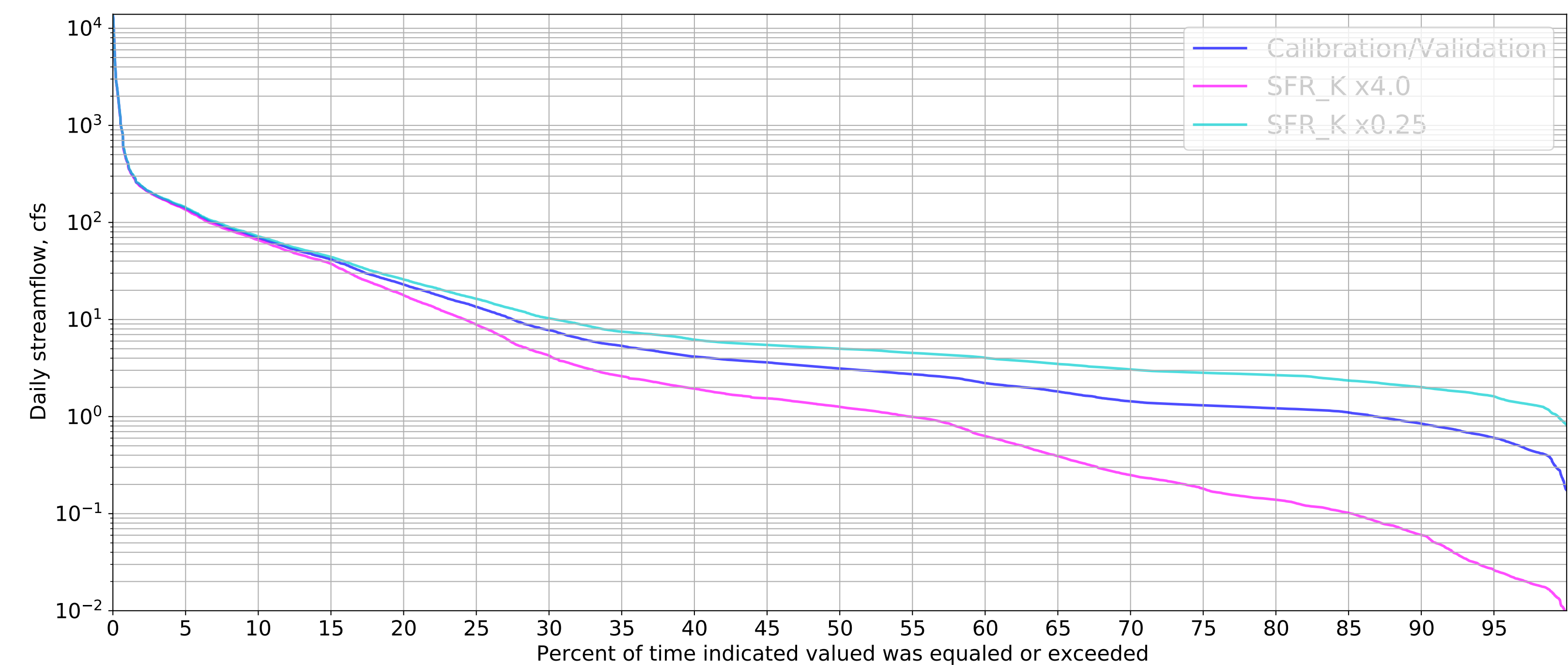
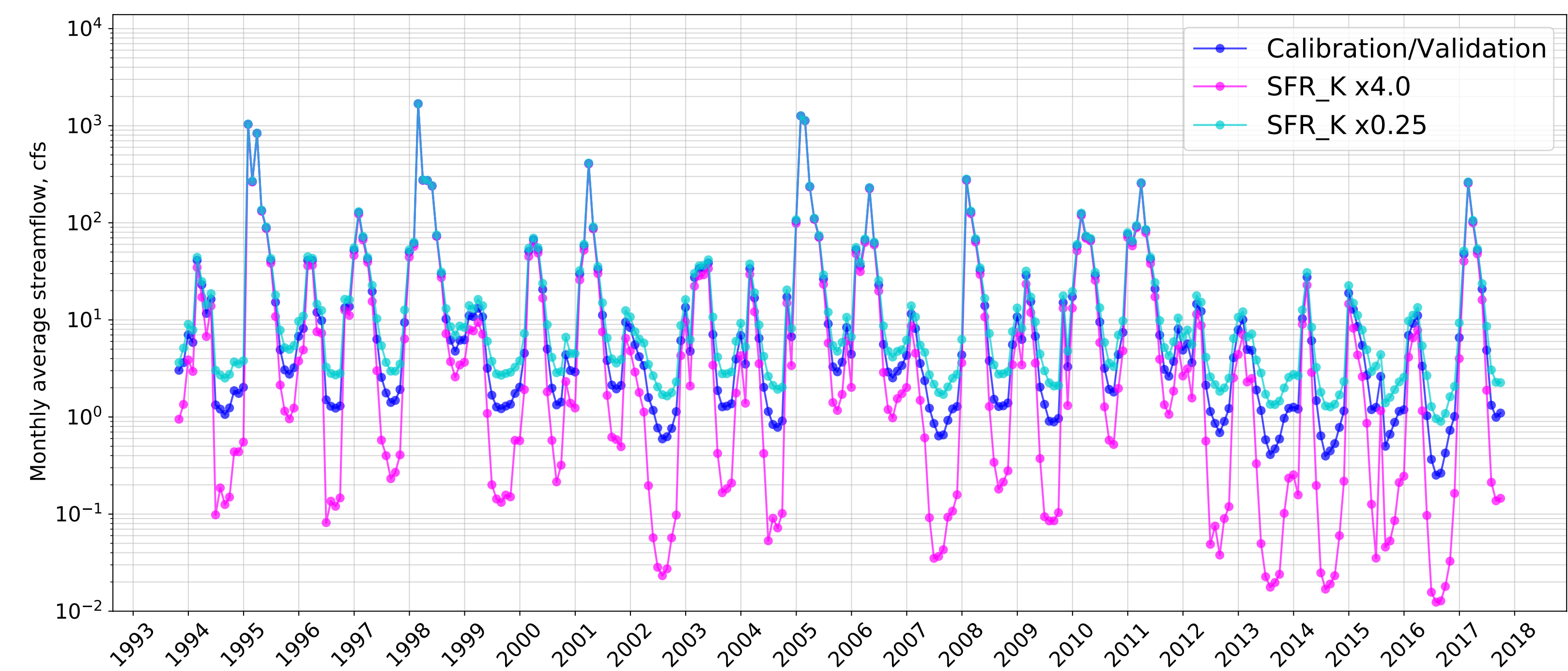
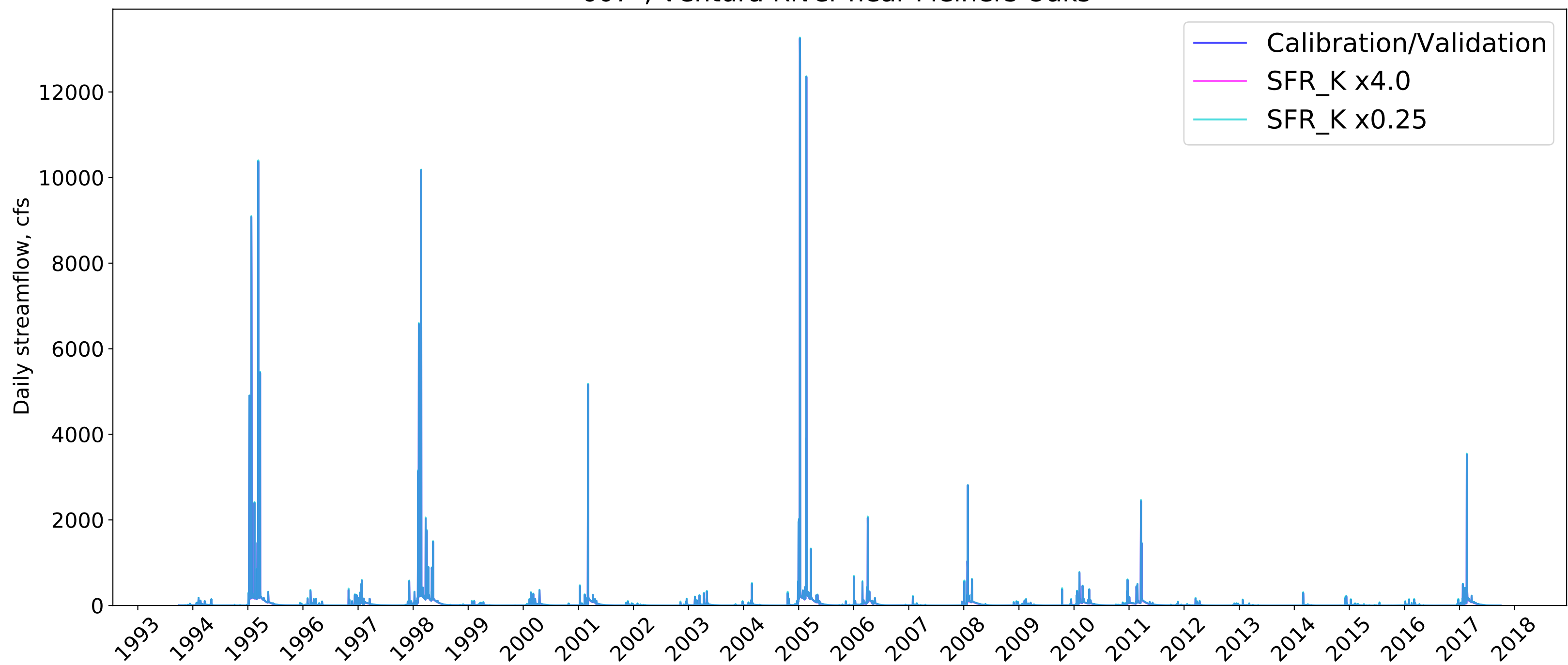


607\*, Ventura River near Meiners Oaks\*



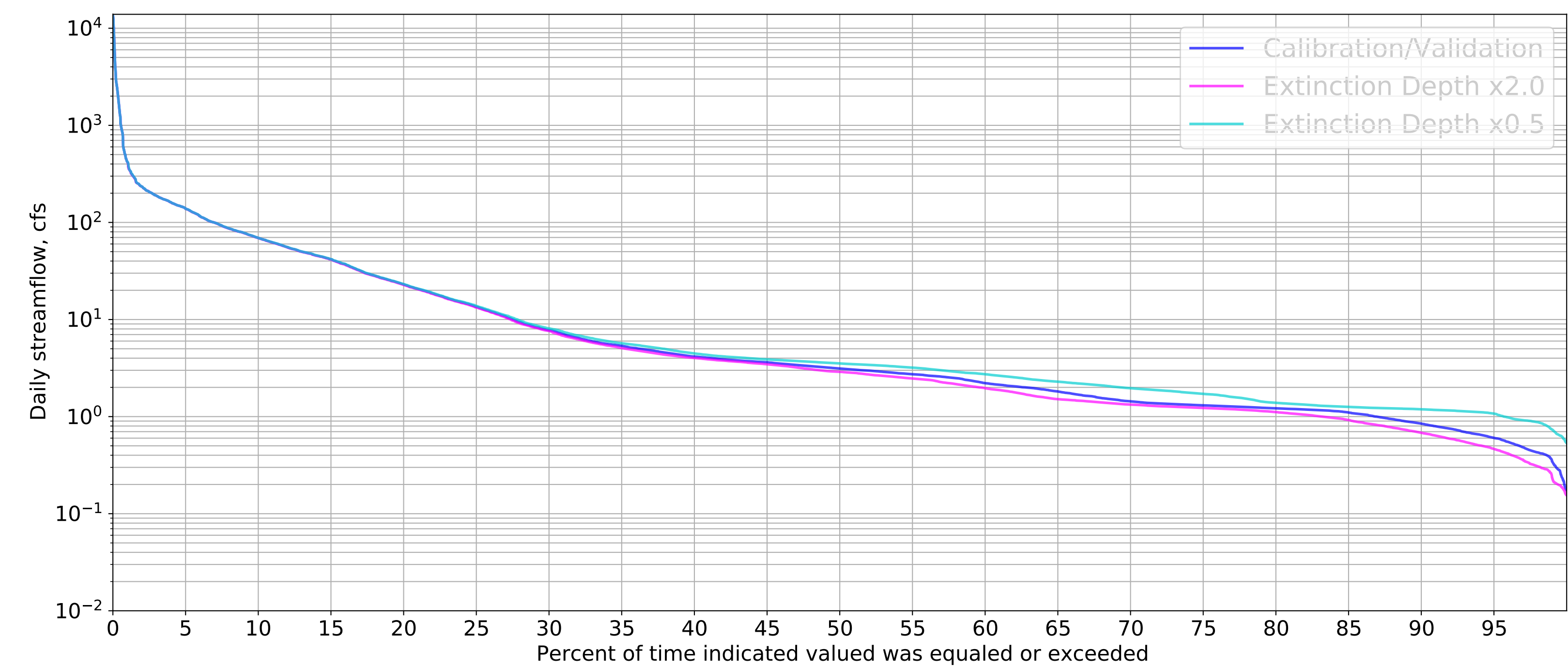
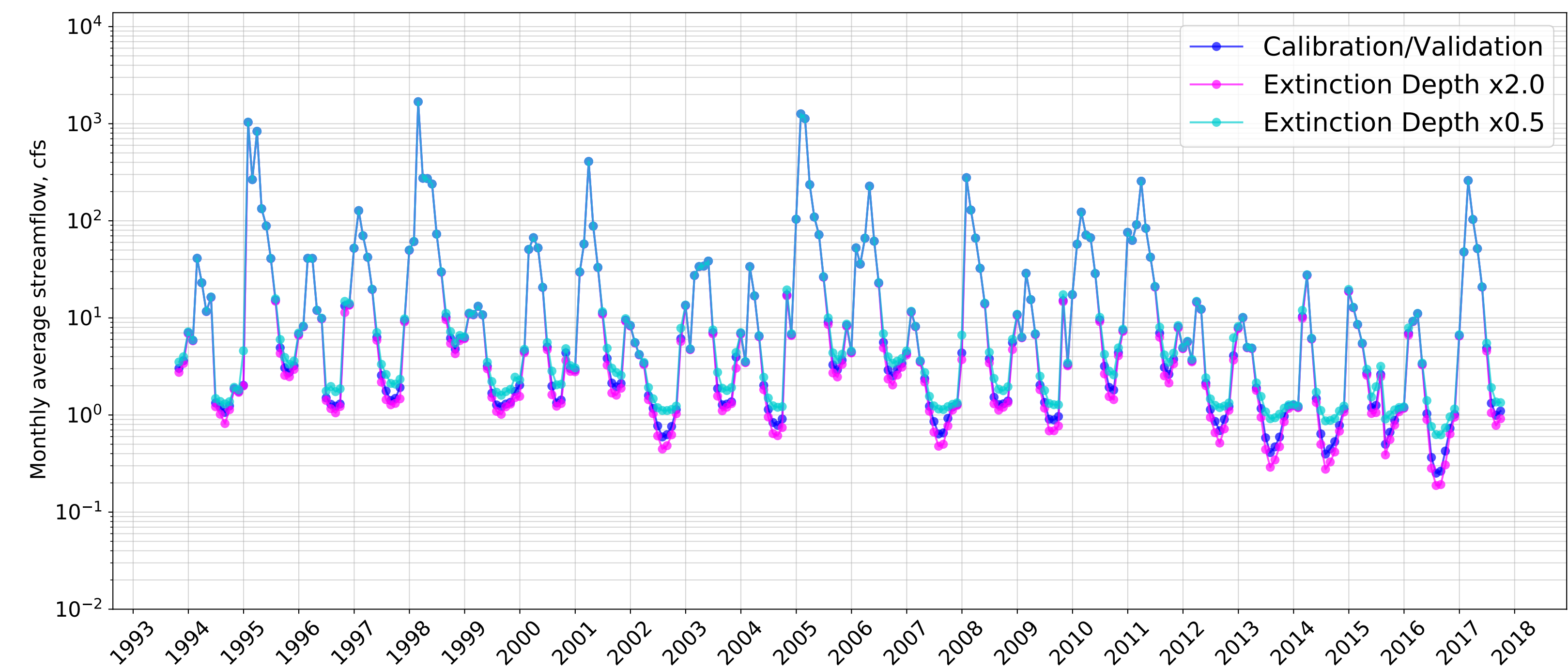
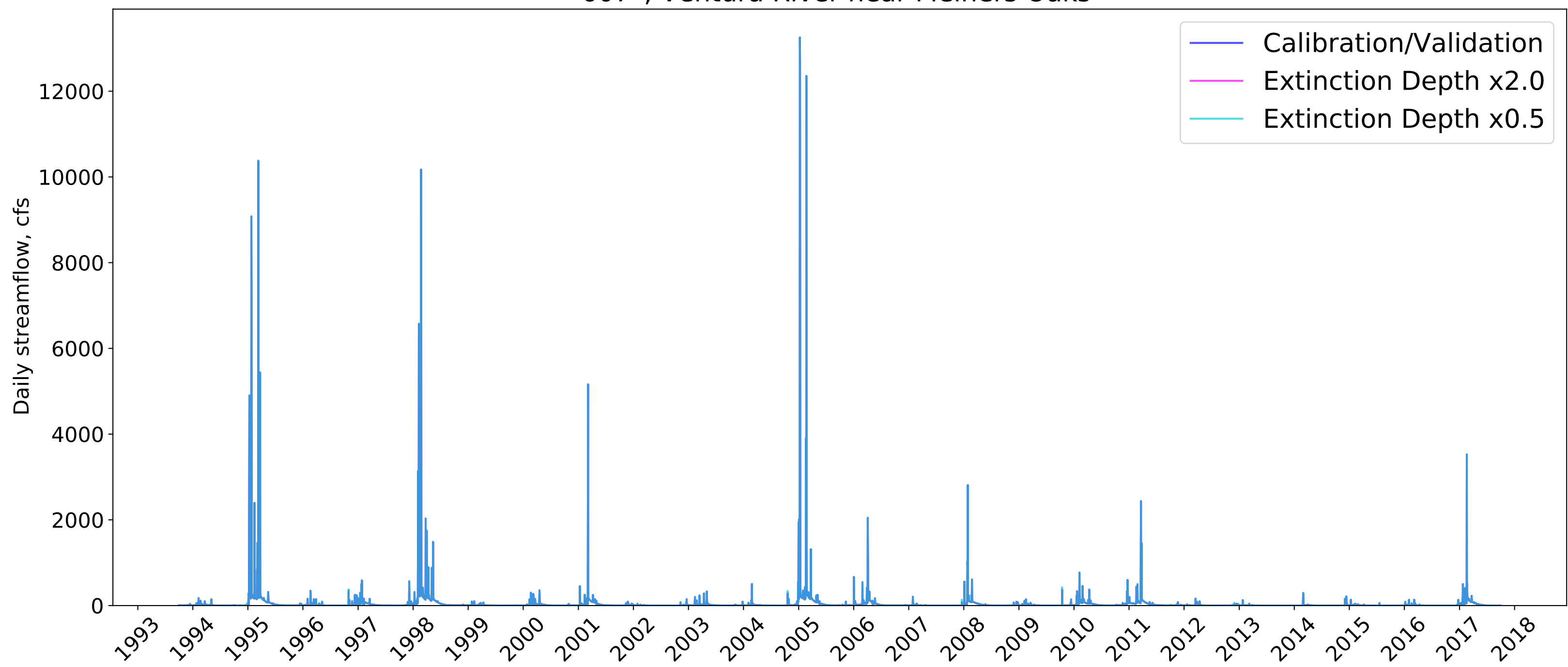


607\*, Ventura River near Meiners Oaks\*

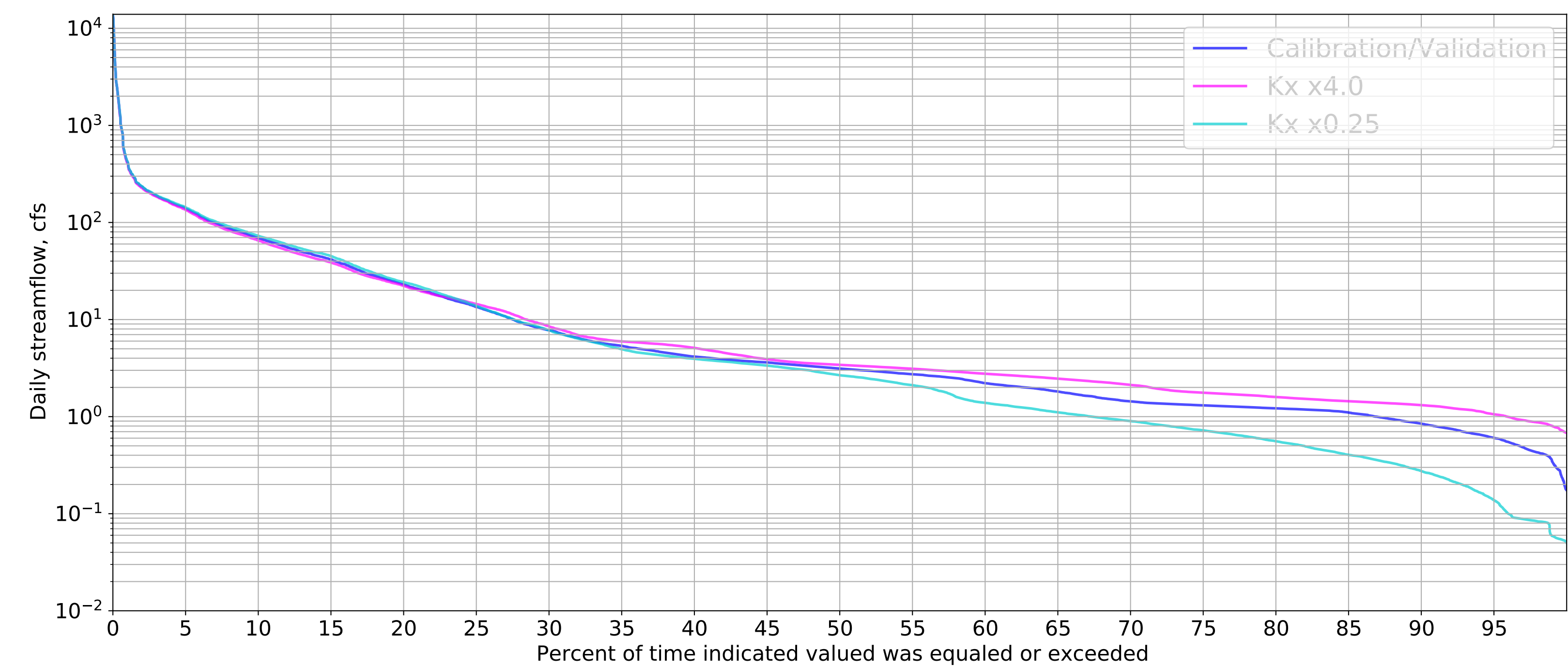
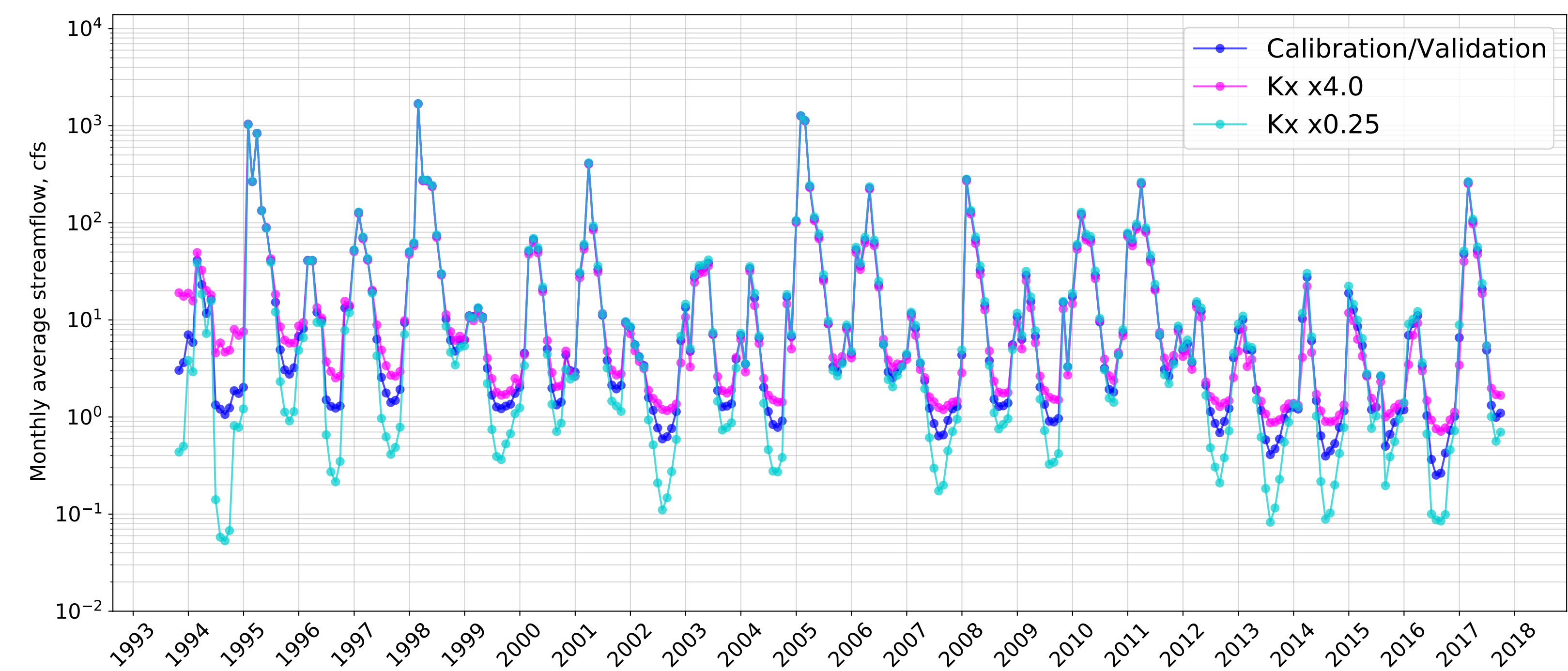
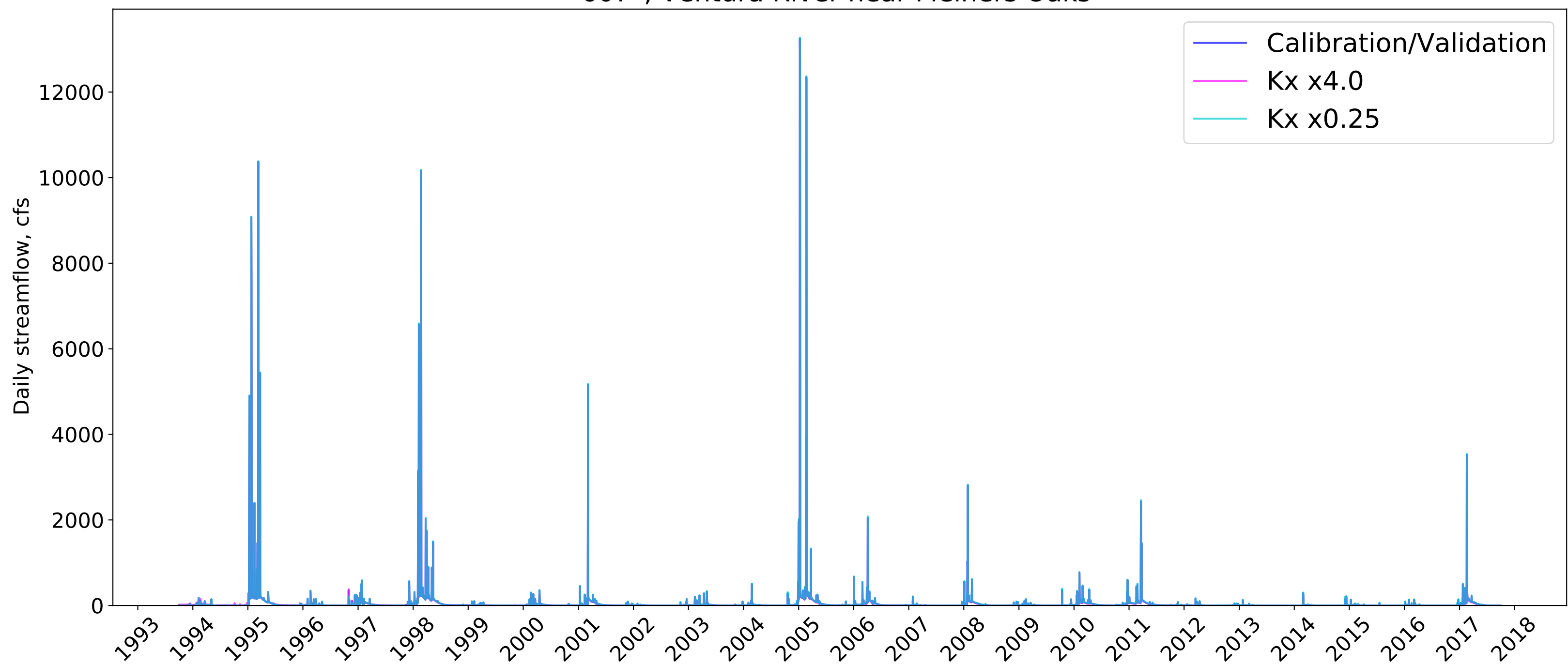




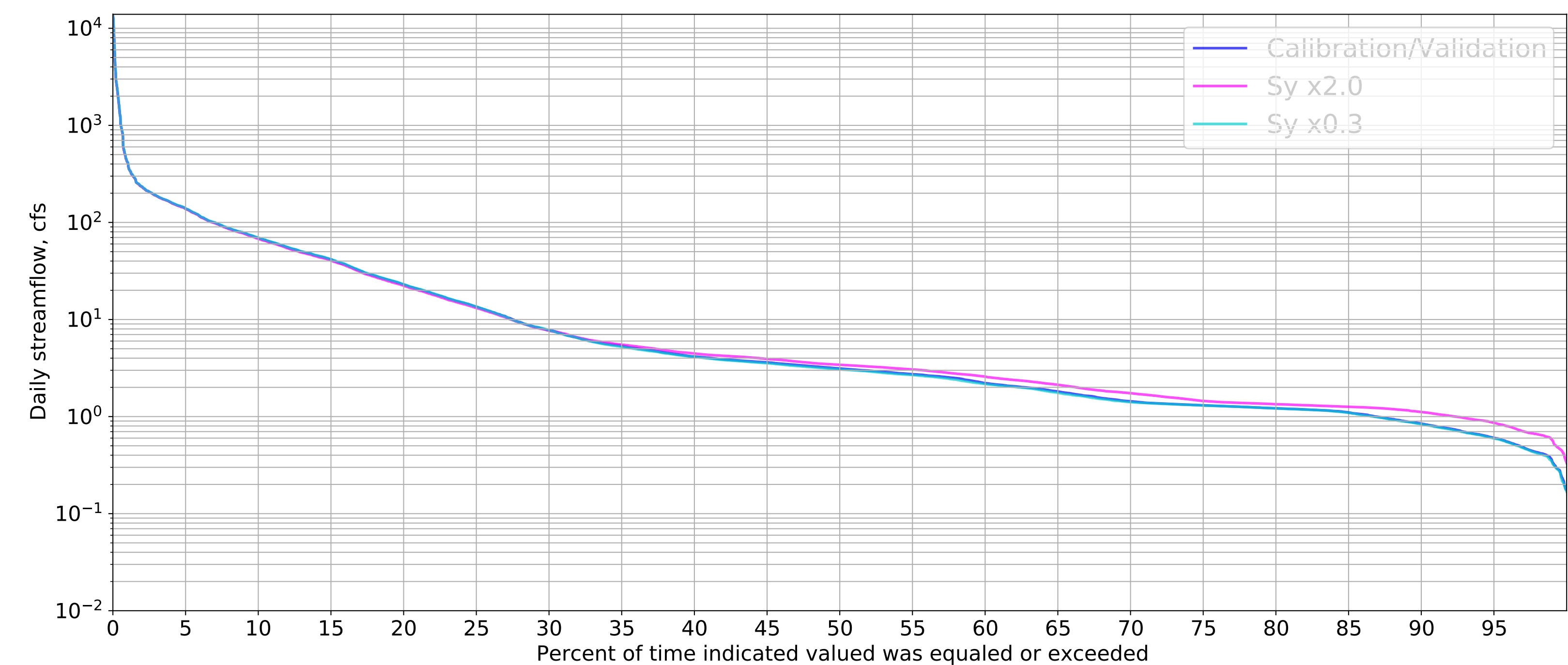
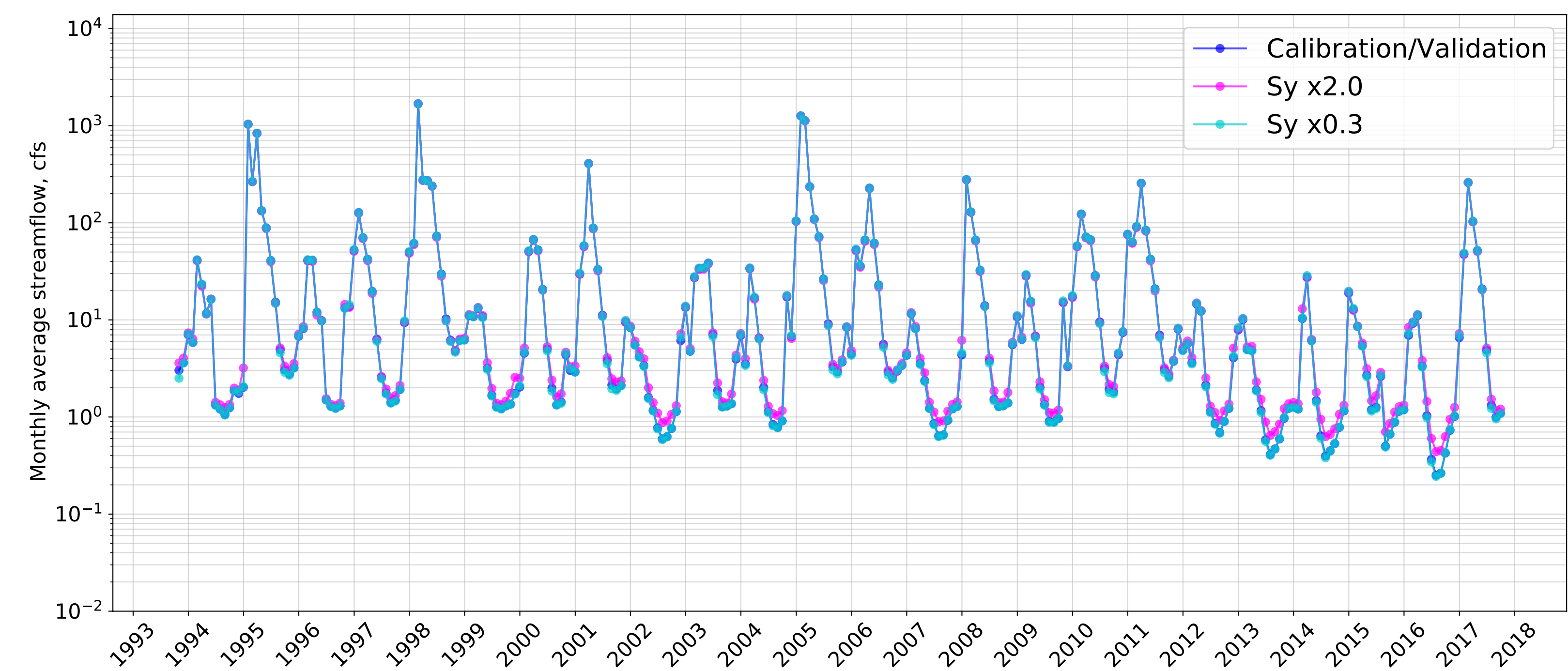
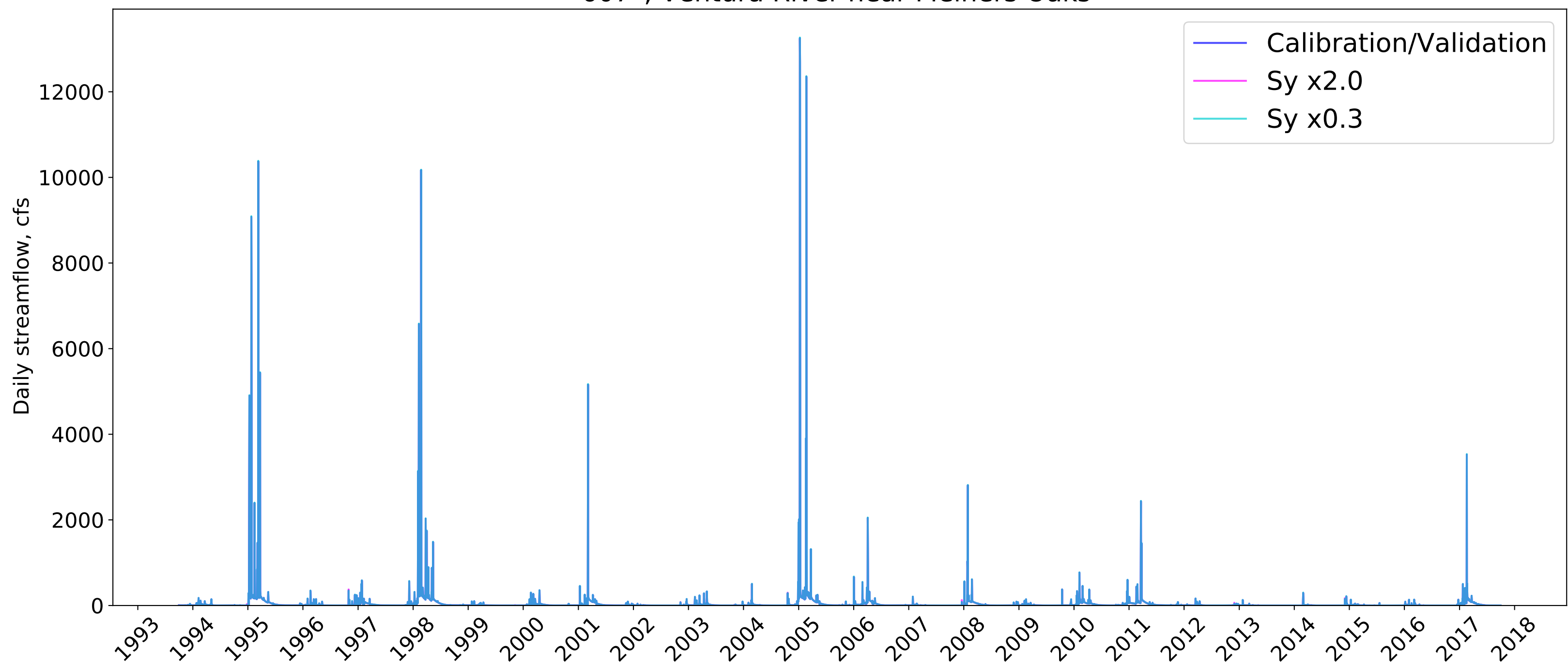
607\*, Ventura River near Meiners Oaks\*



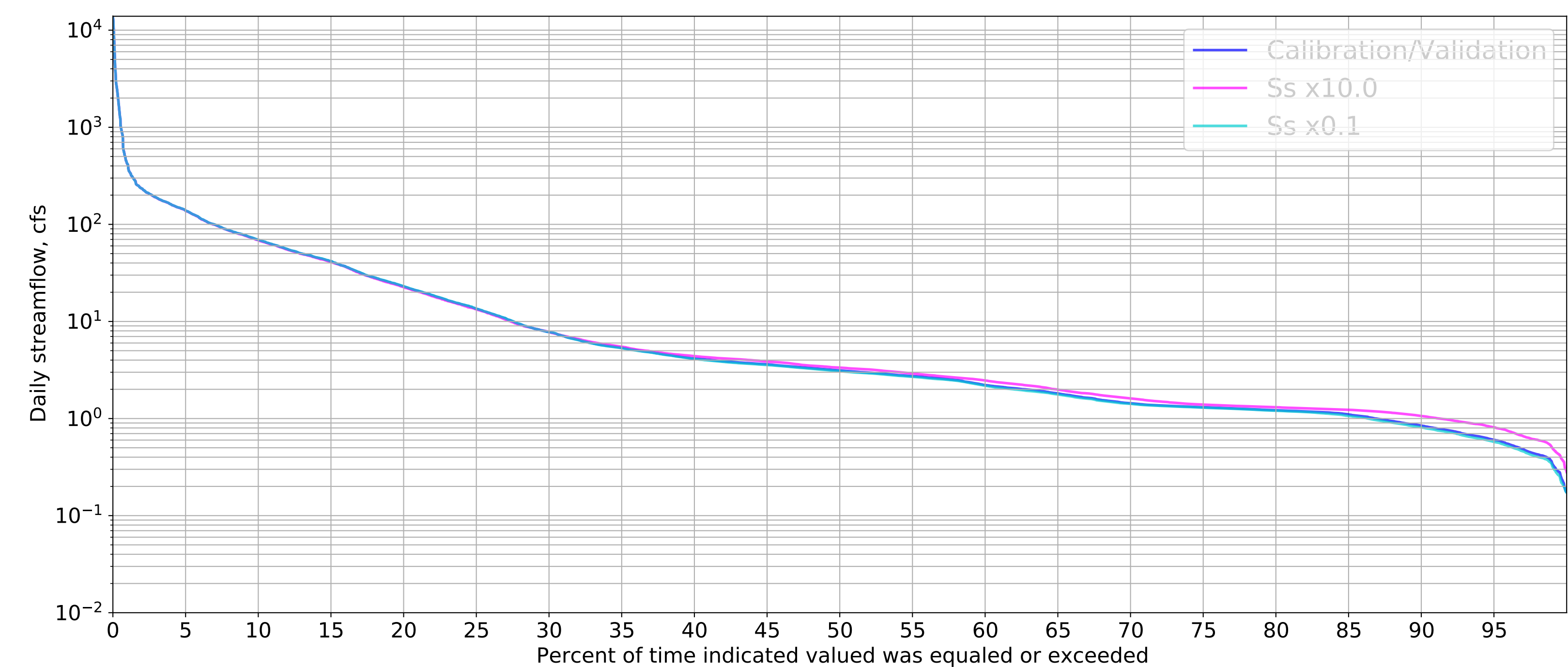
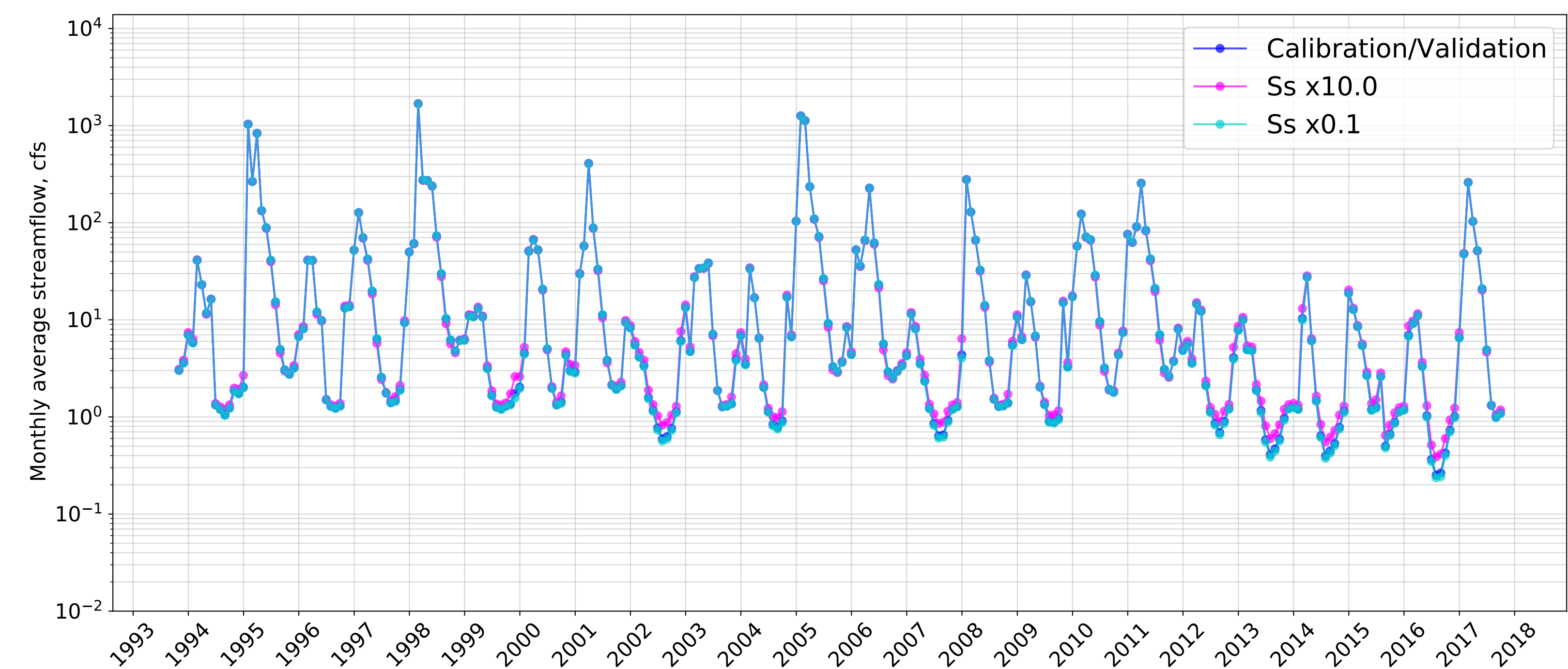
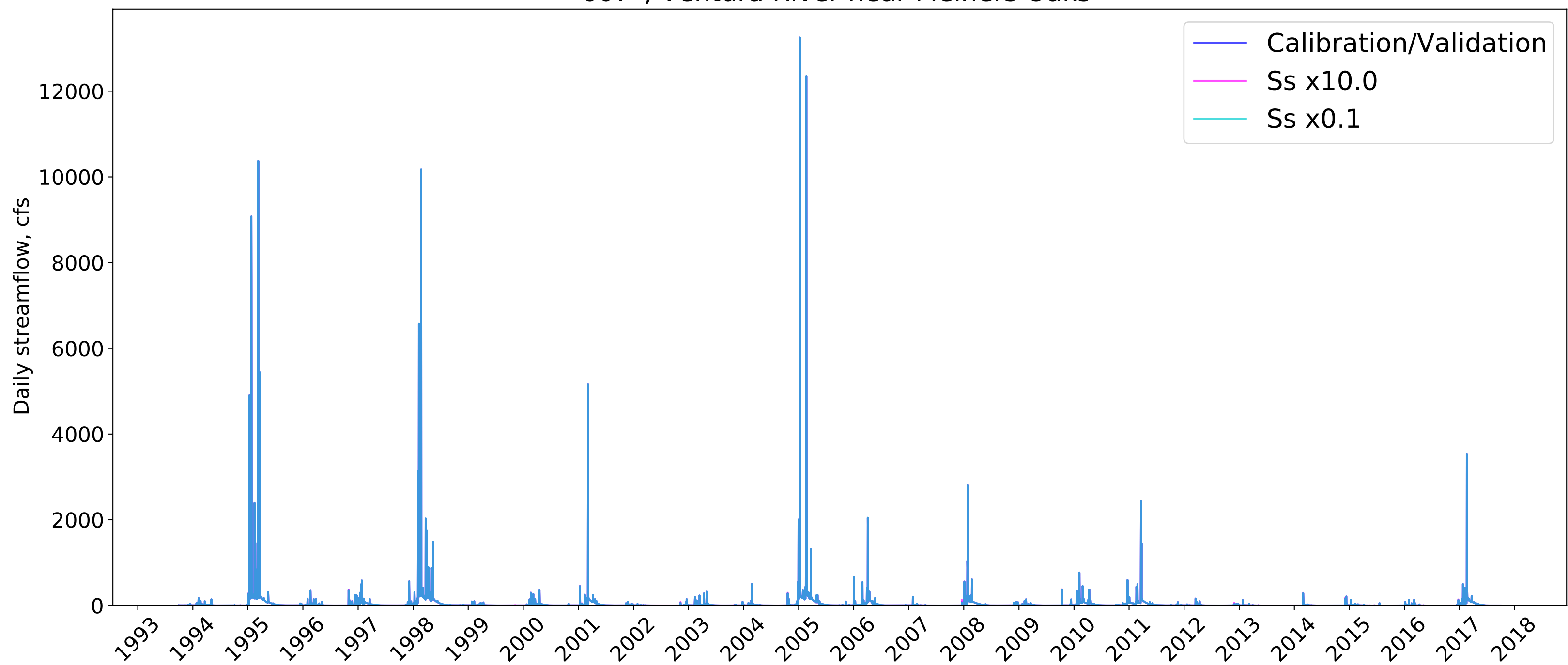
607\*, Ventura River near Meiners Oaks\*



607\*, Ventura River near Meiners Oaks\*

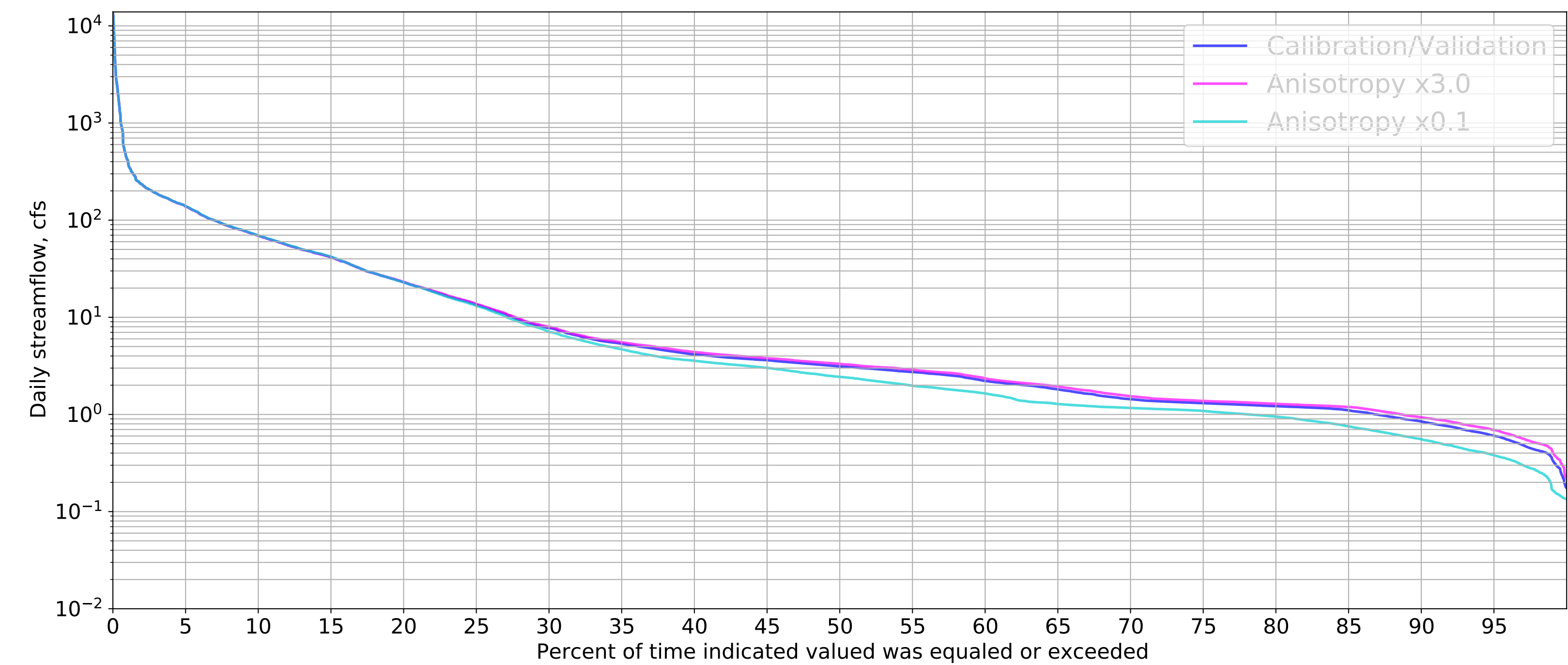
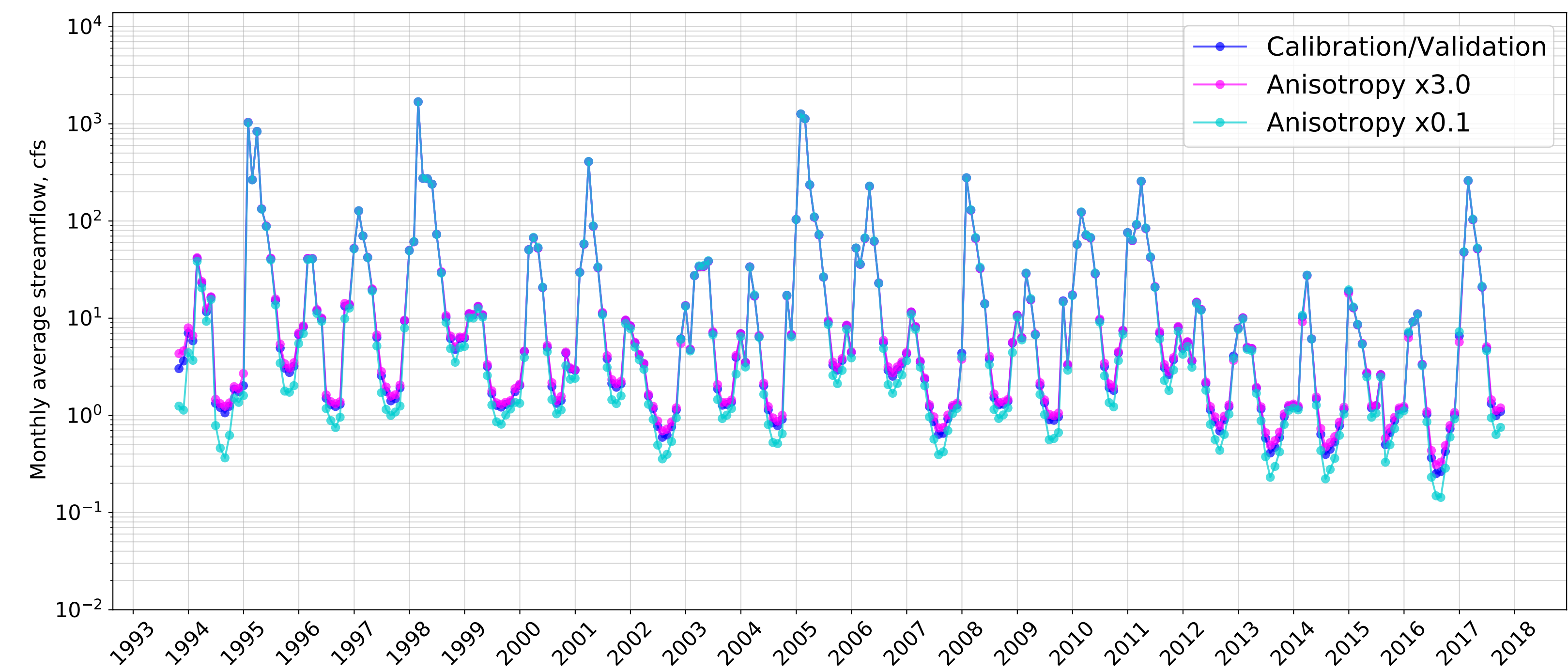
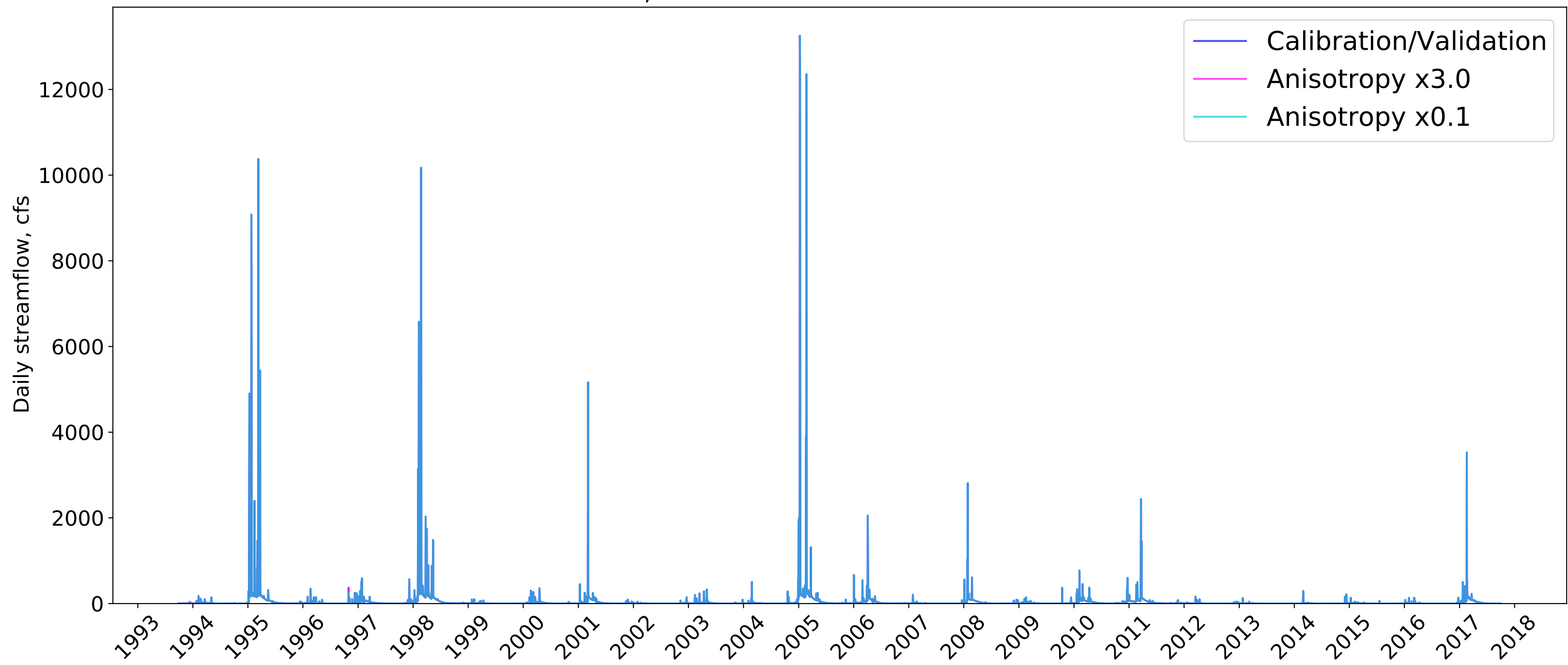


607\*, Ventura River near Meiners Oaks\*

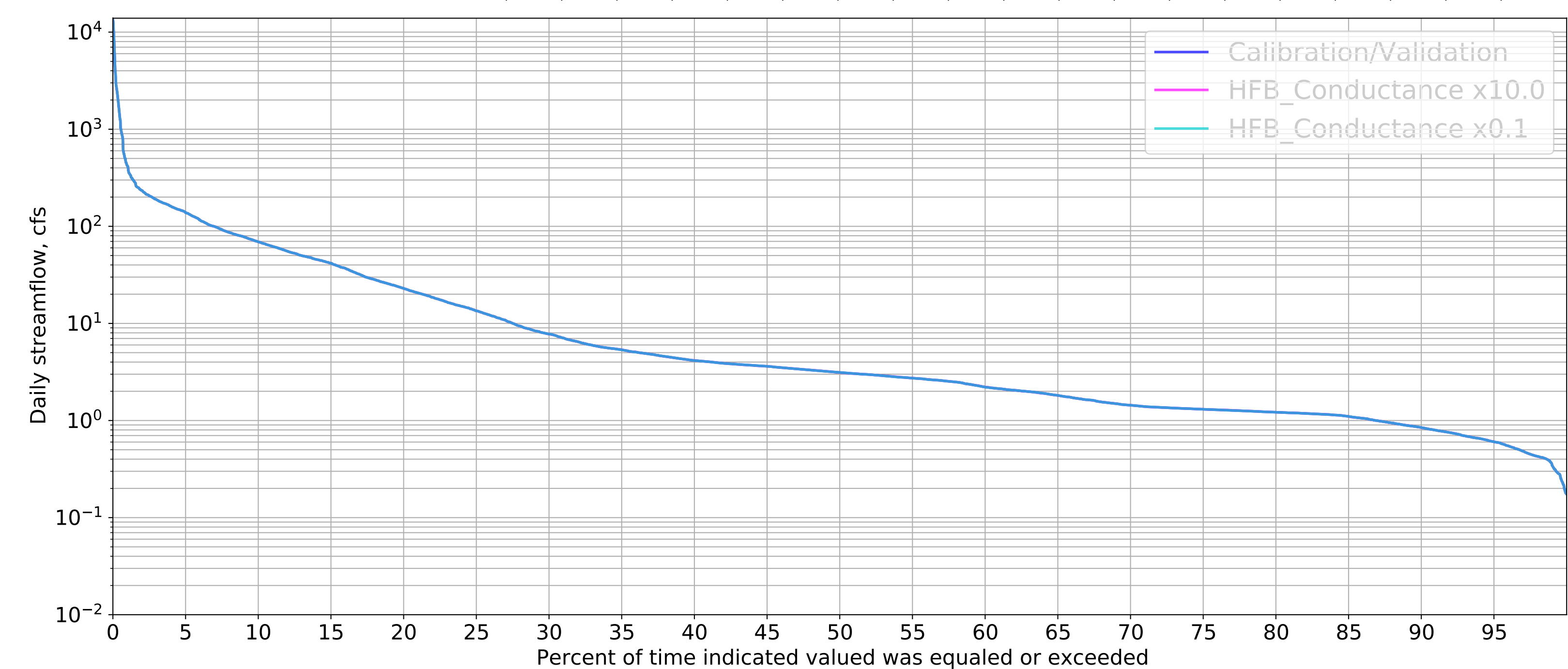
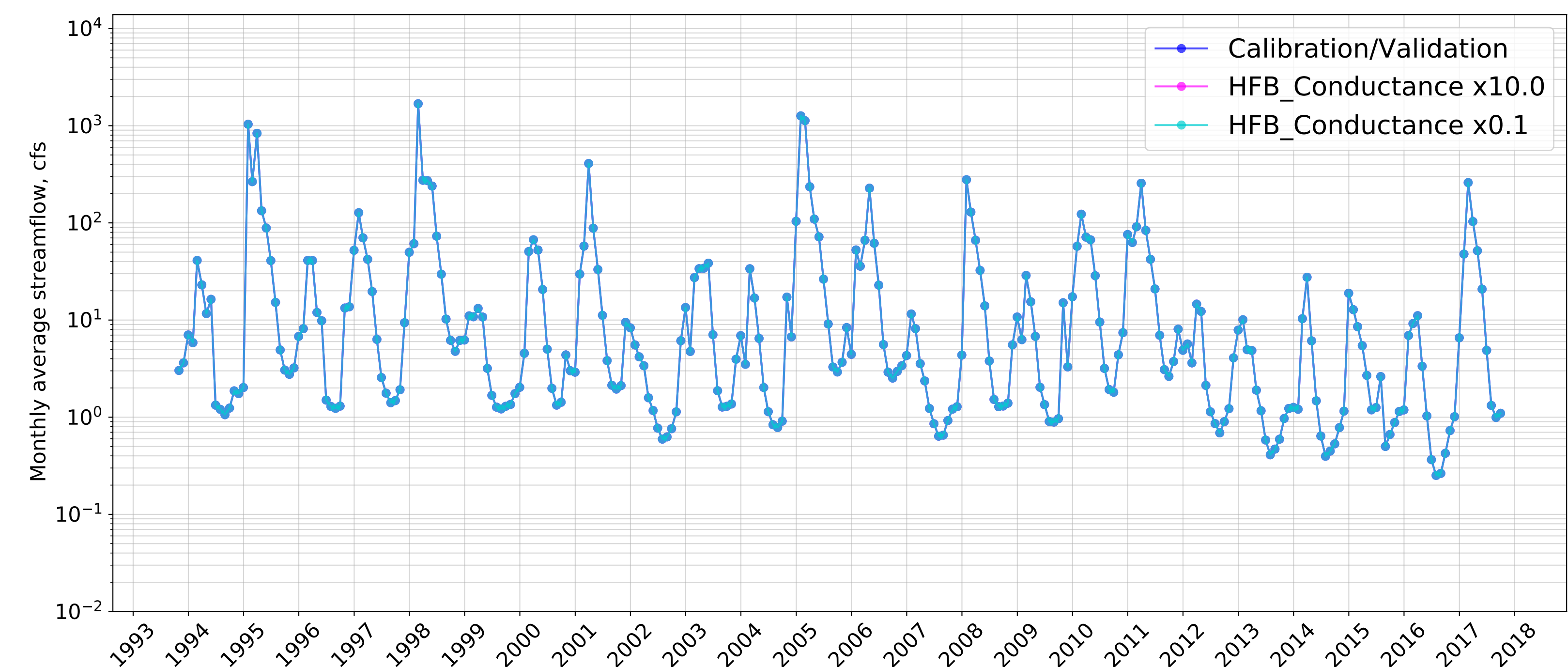
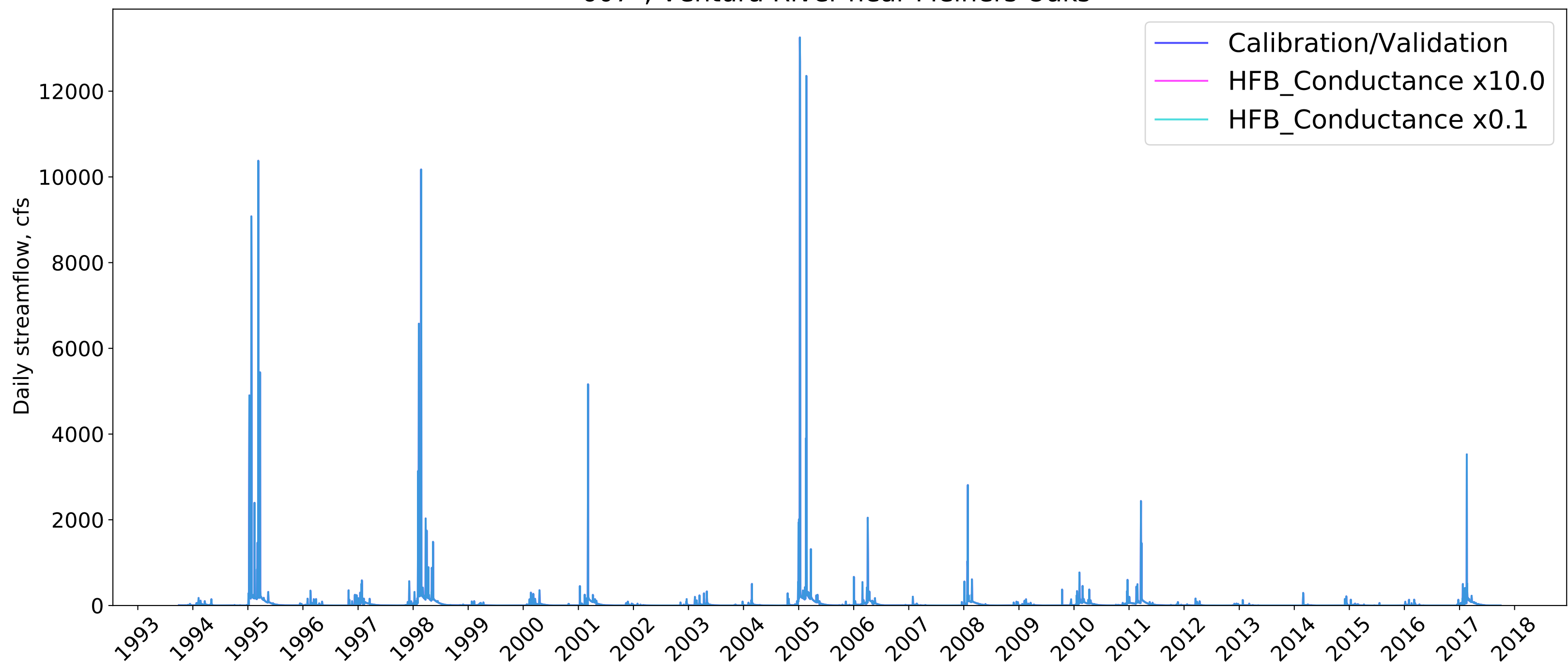




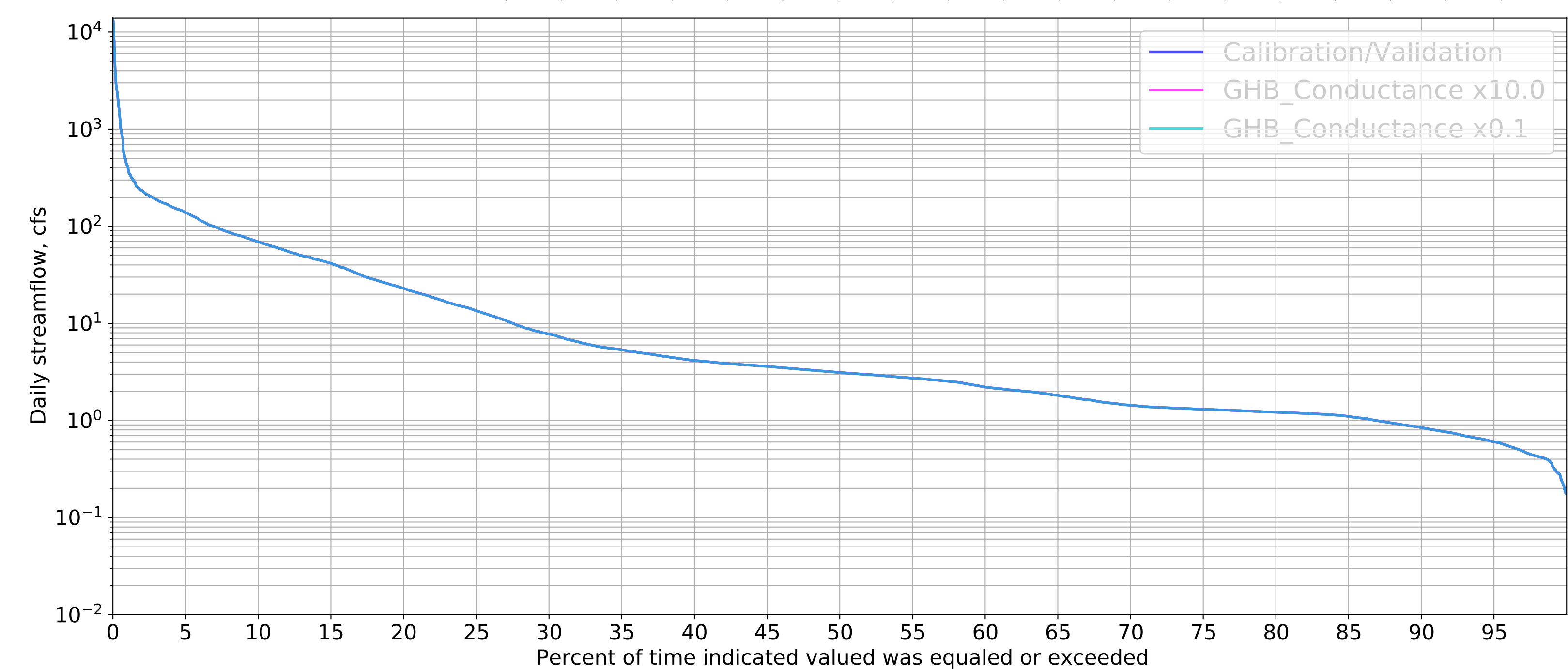
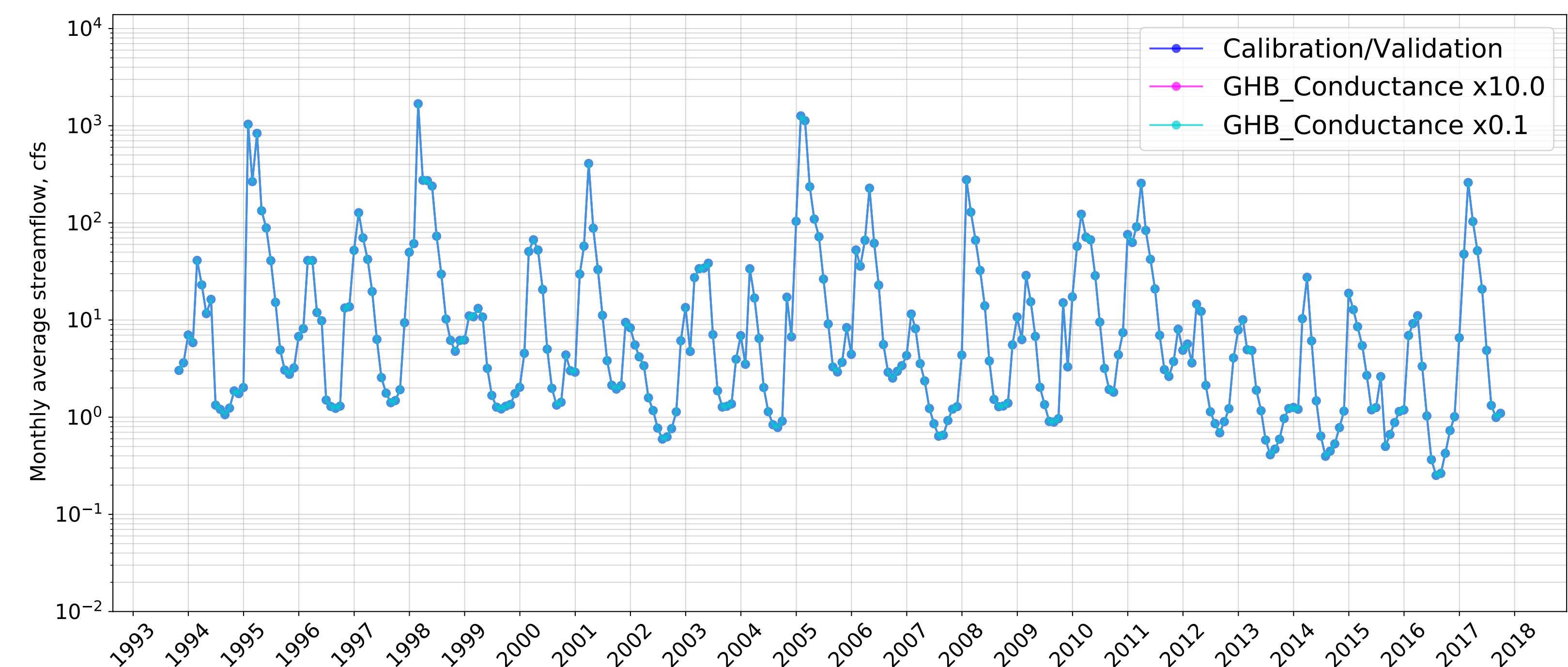
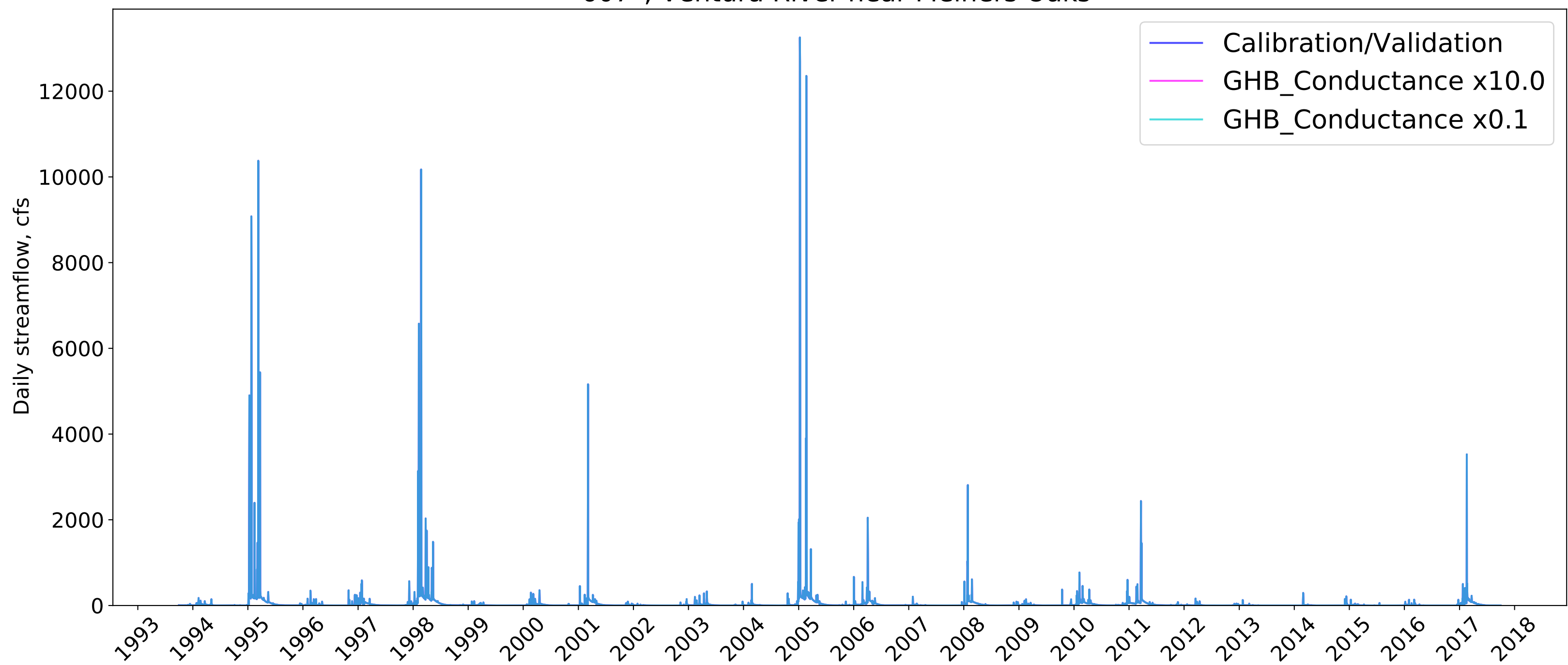
607\*, Ventura River near Meiners Oaks\*



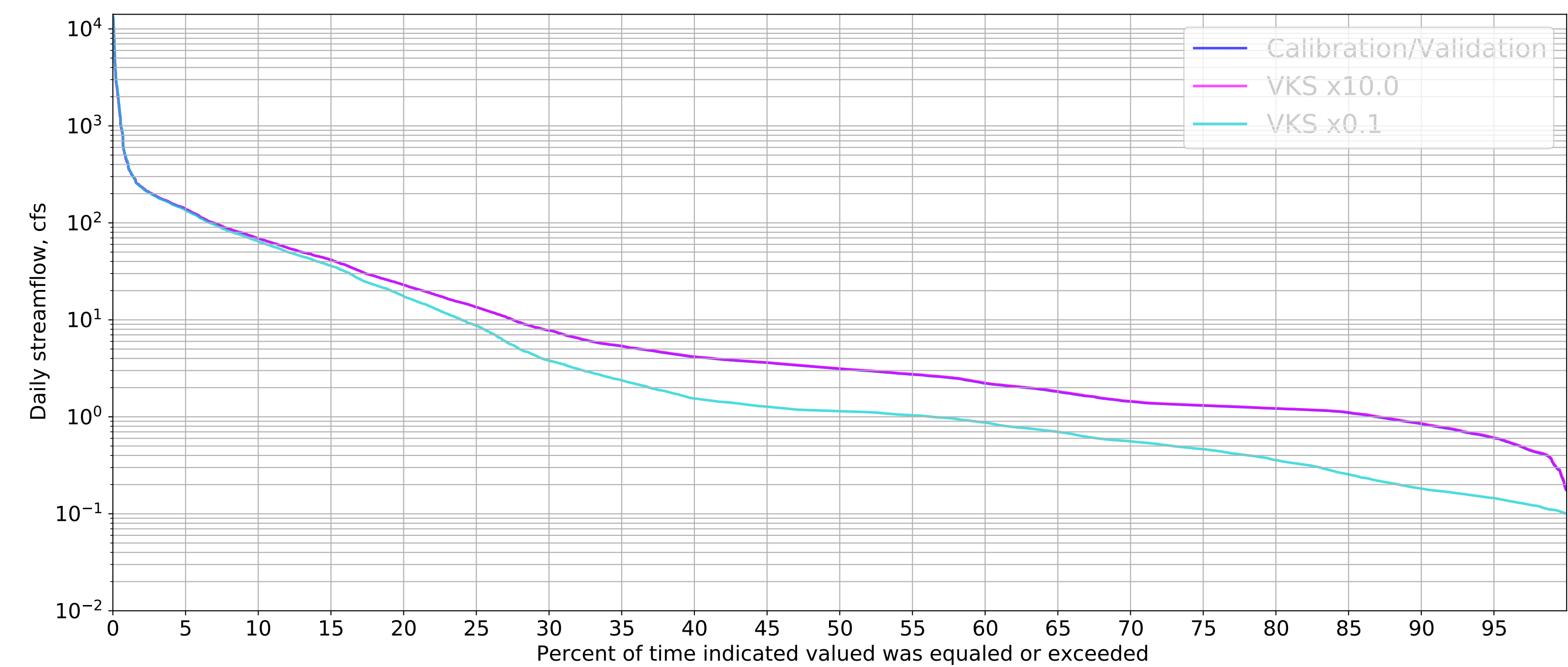
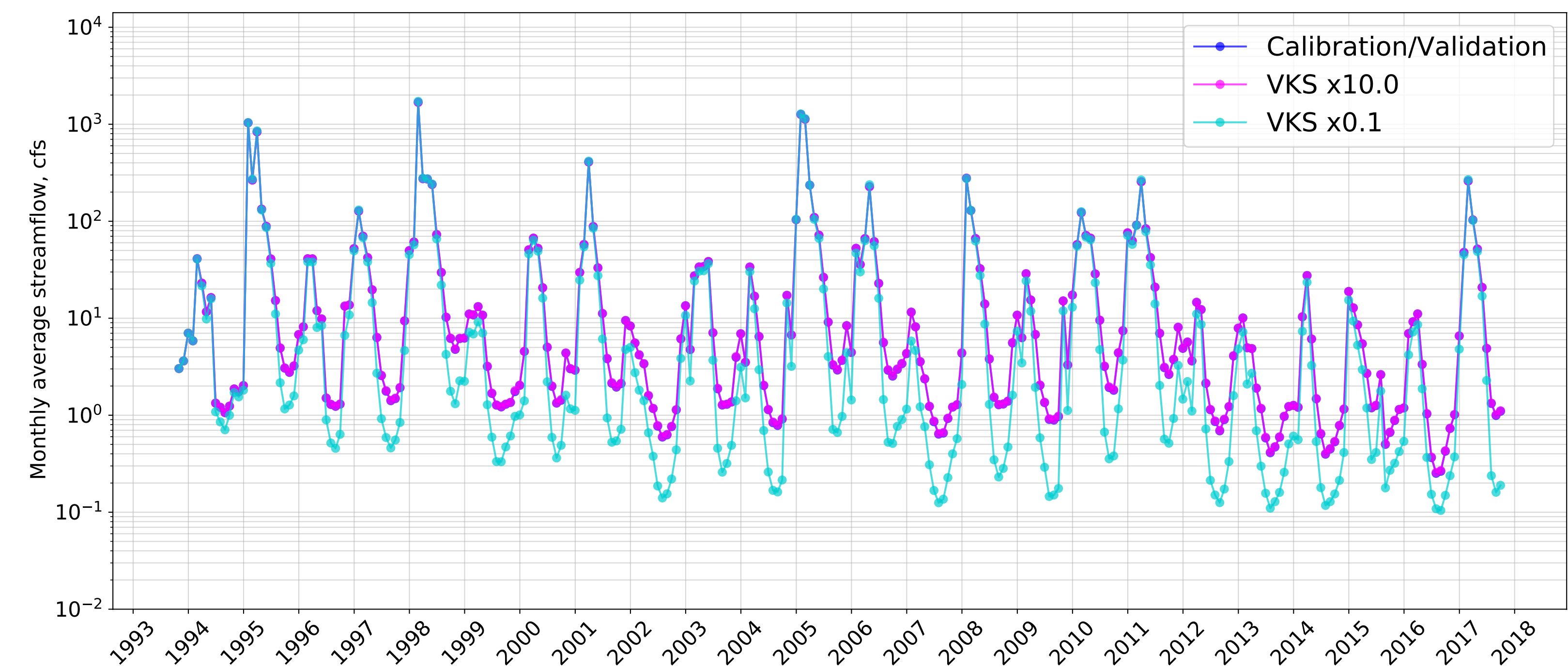
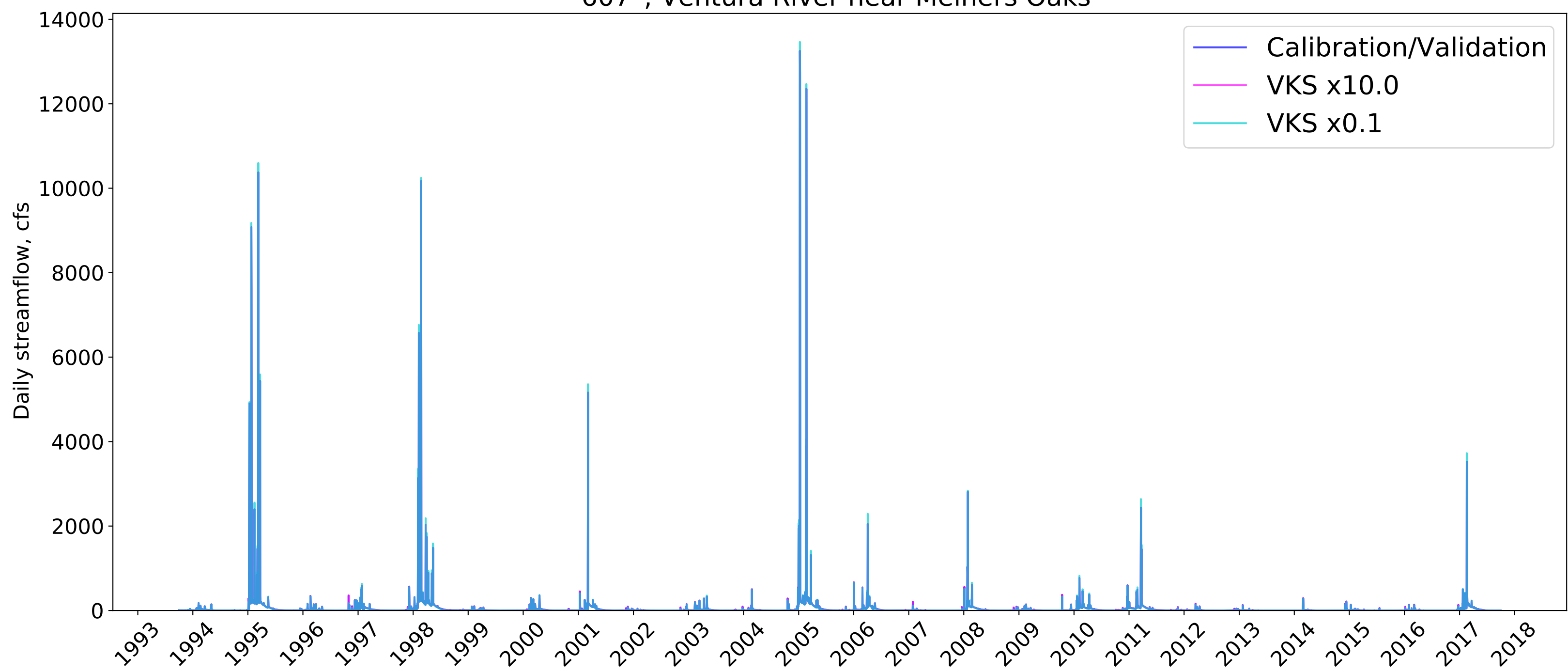
607\*, Ventura River near Meiners Oaks\*



607\*, Ventura River near Meiners Oaks\*

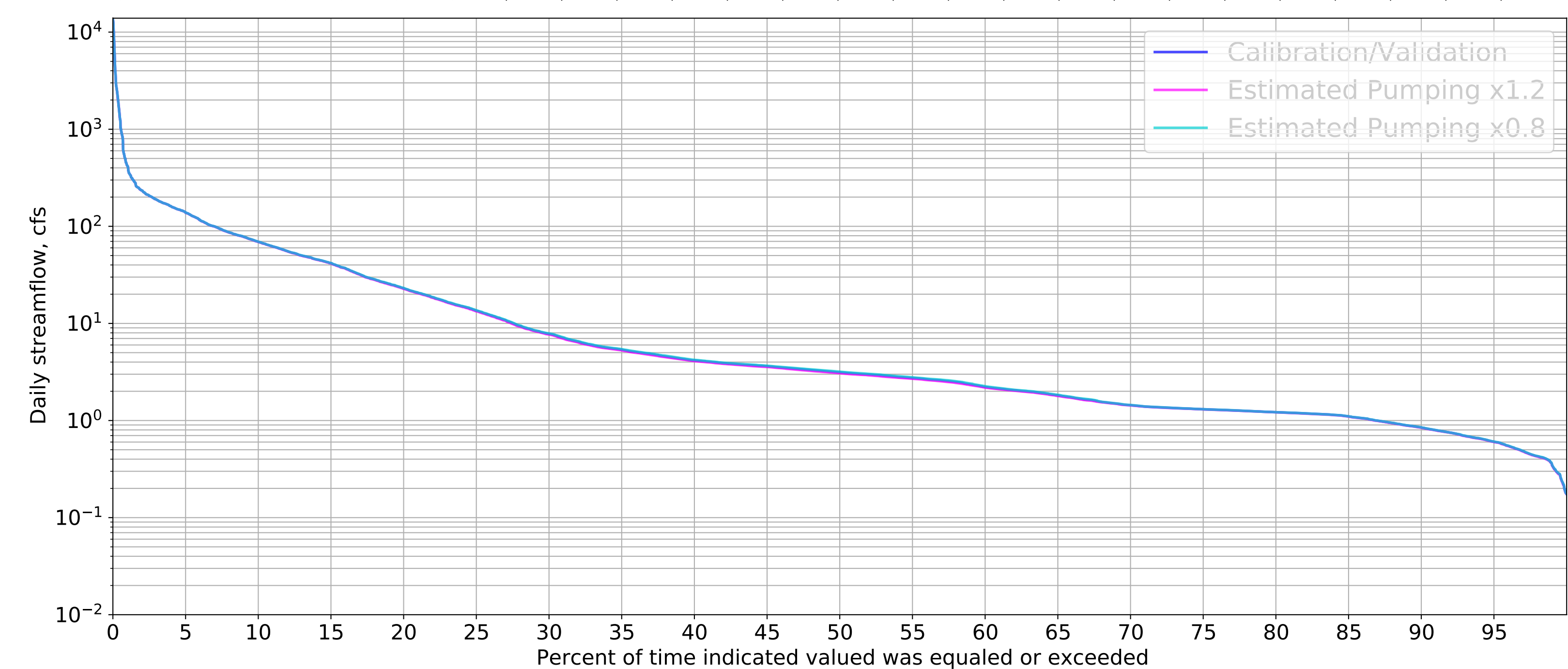
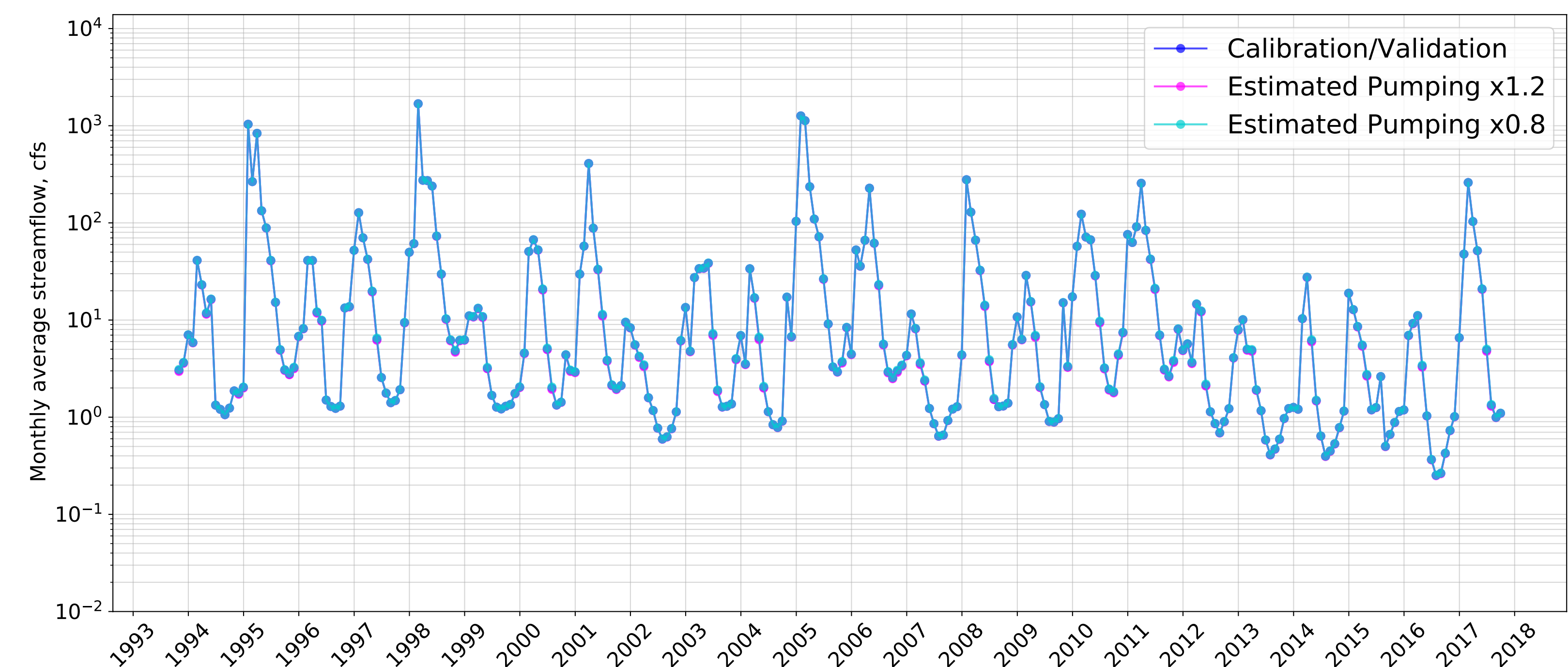
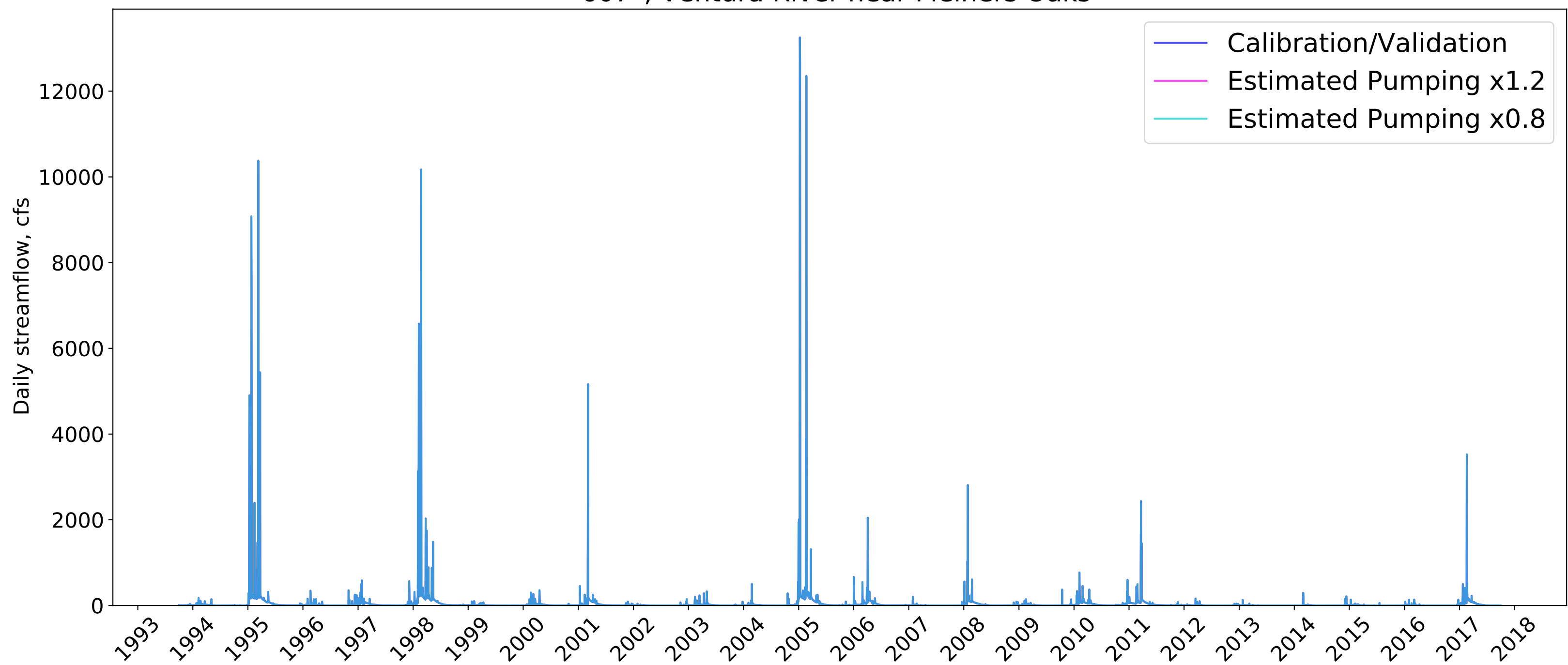


607\*, Ventura River near Meiners Oaks\*

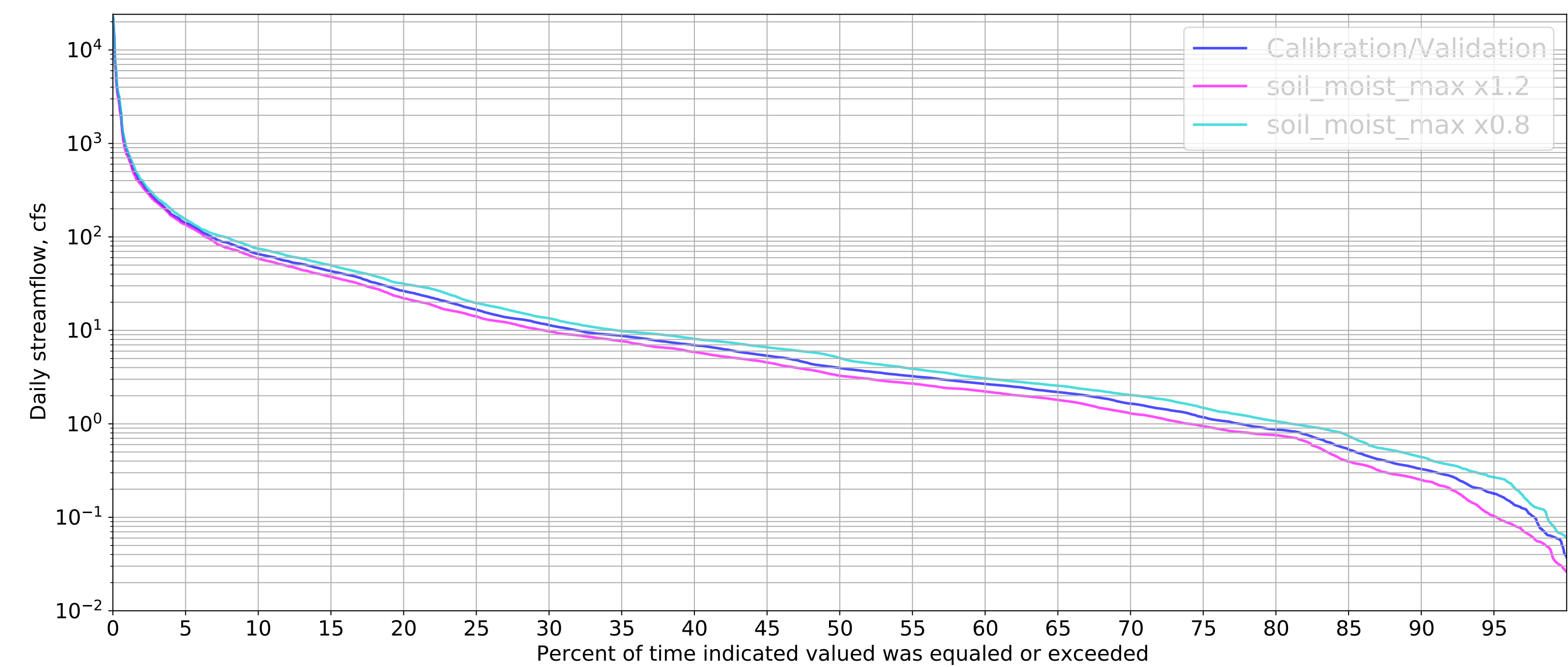
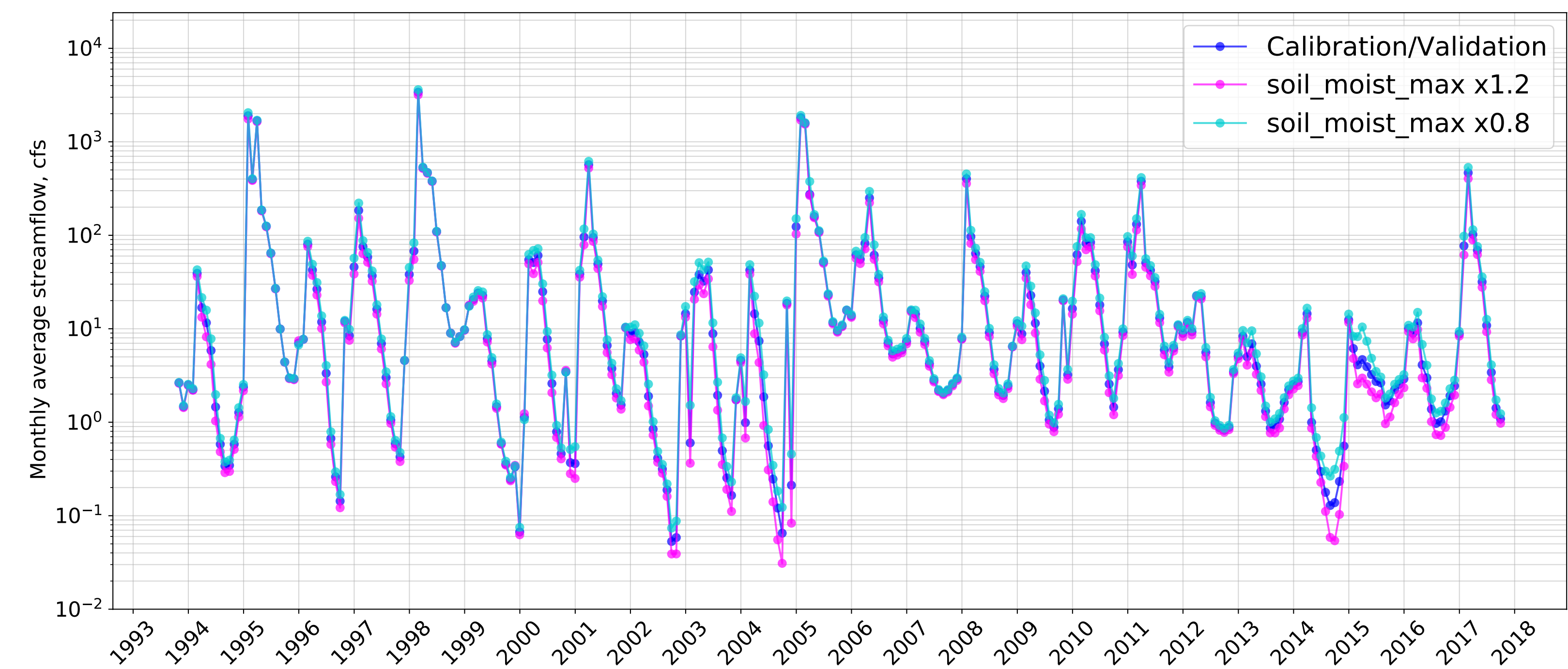
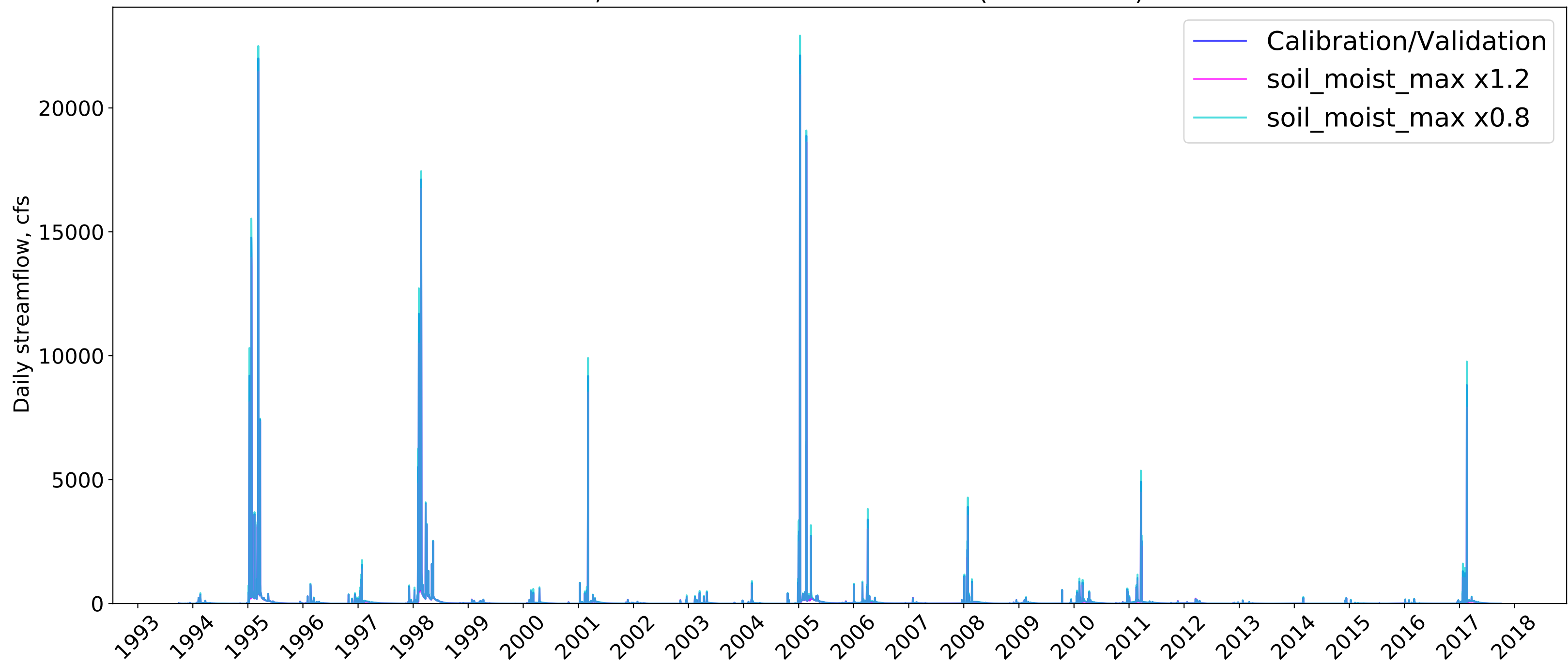




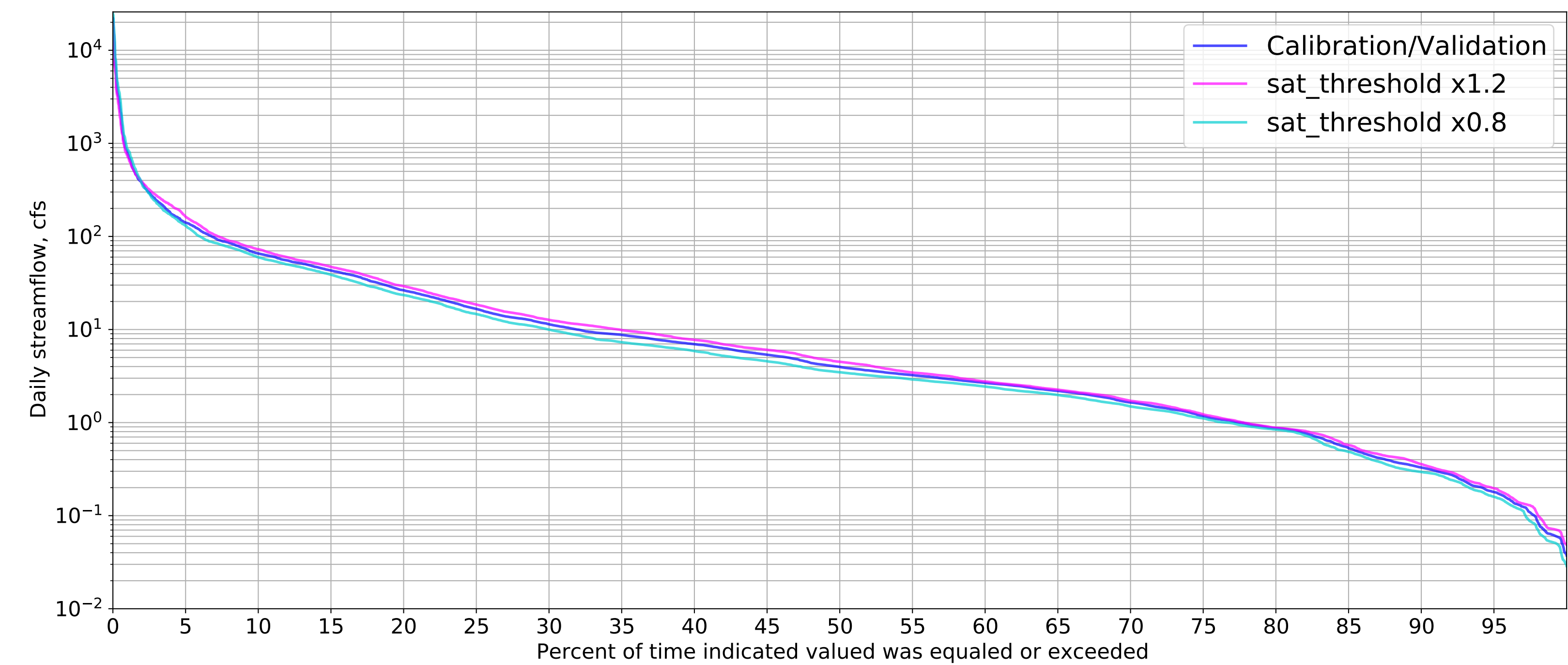
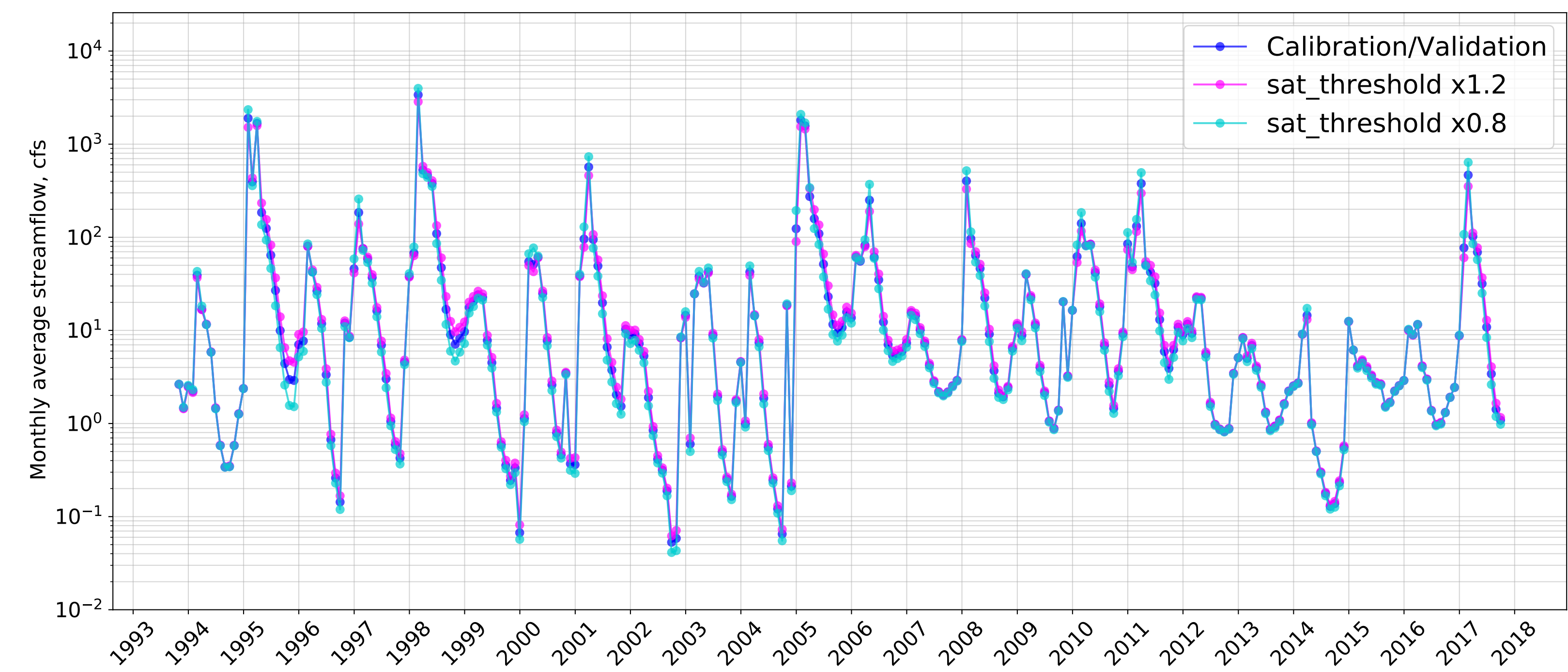
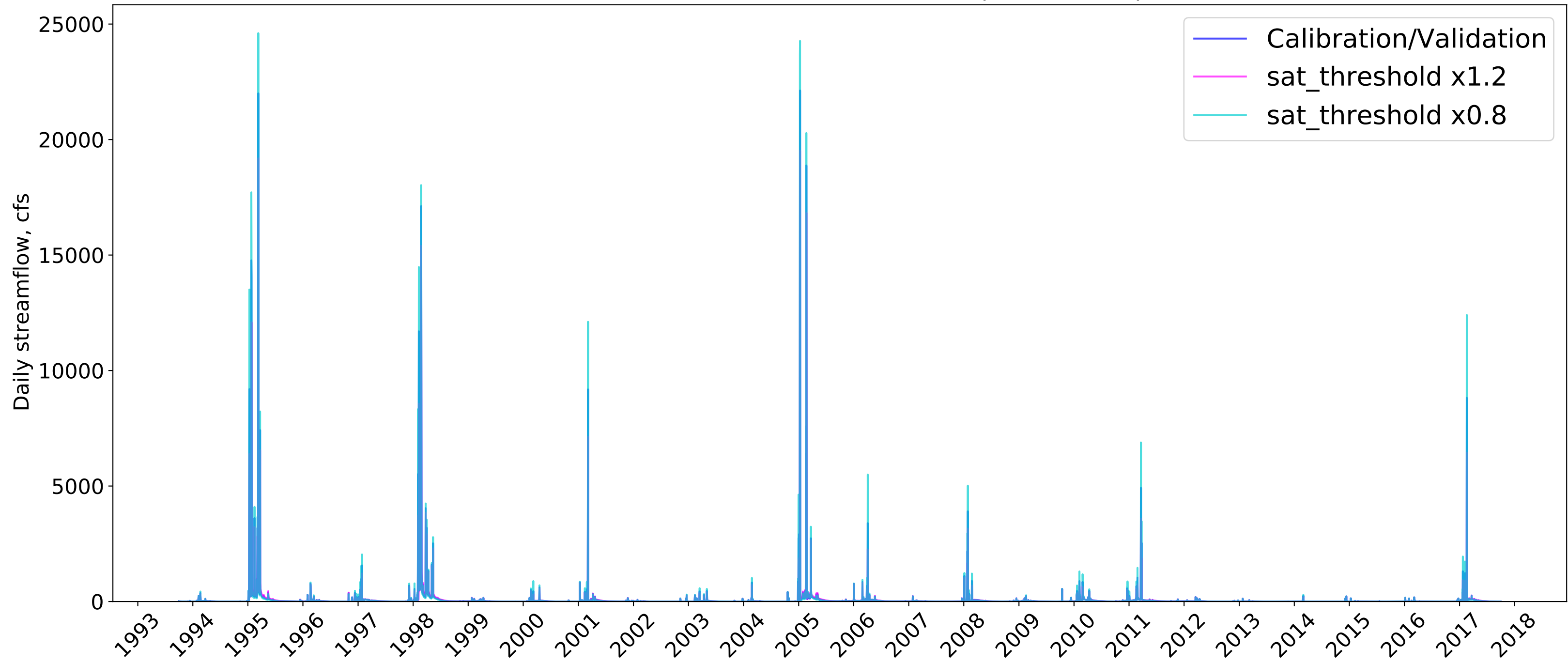
607\*, Ventura River near Meiners Oaks\*



608, Ventura River near Ventura (Foster Park)

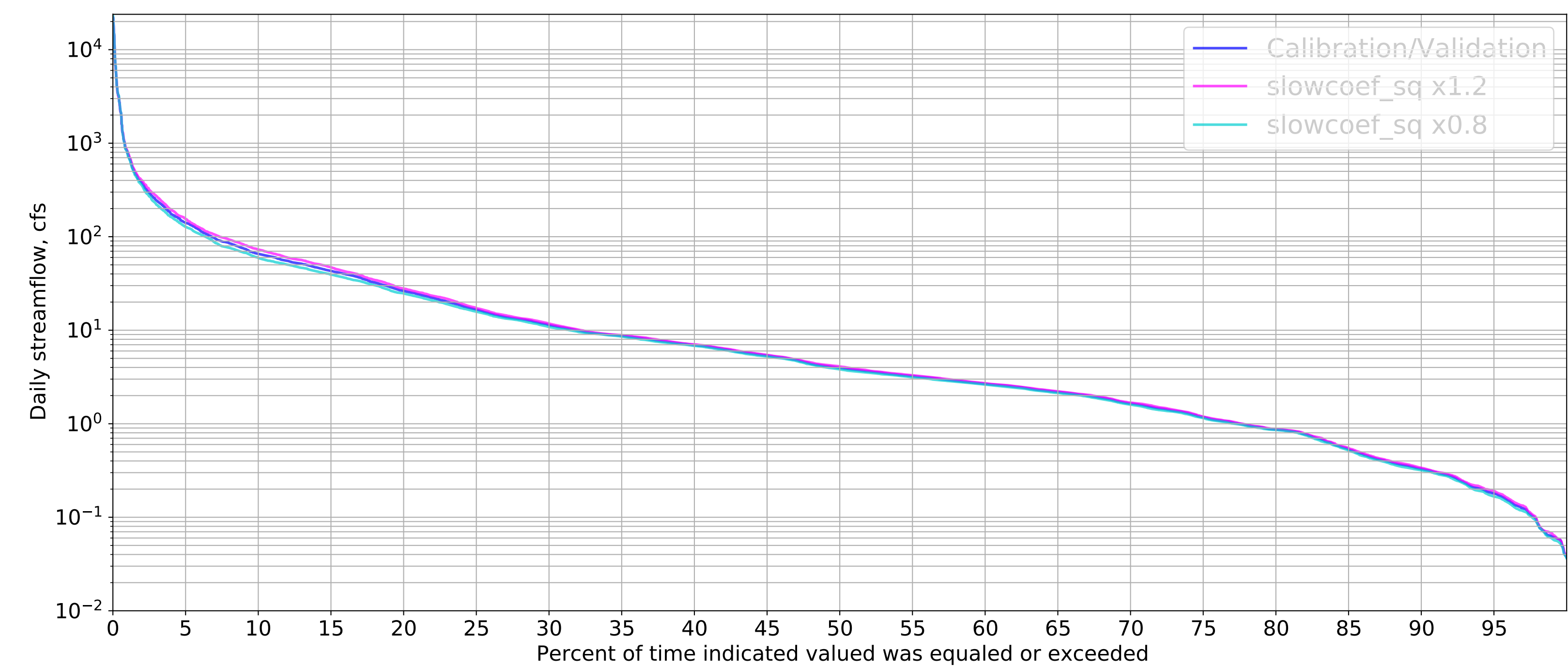
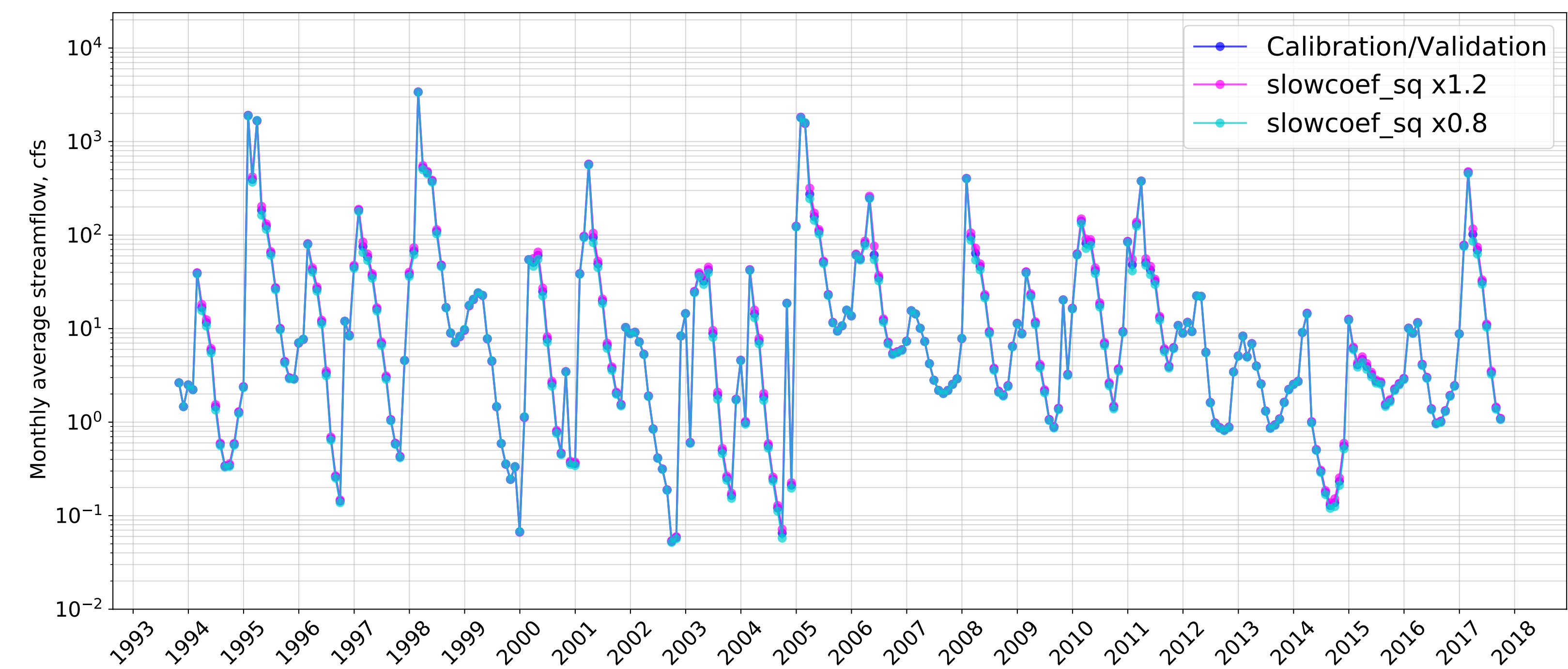
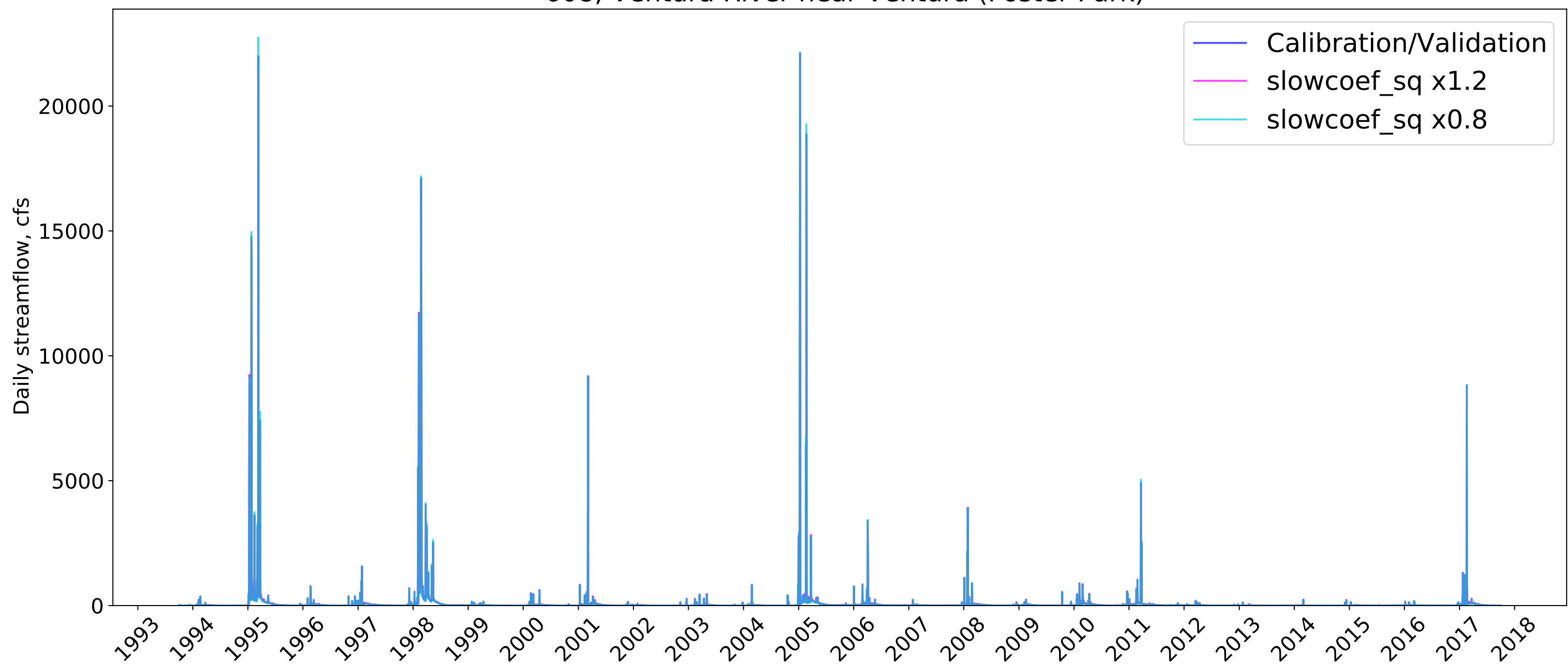


608, Ventura River near Ventura (Foster Park)

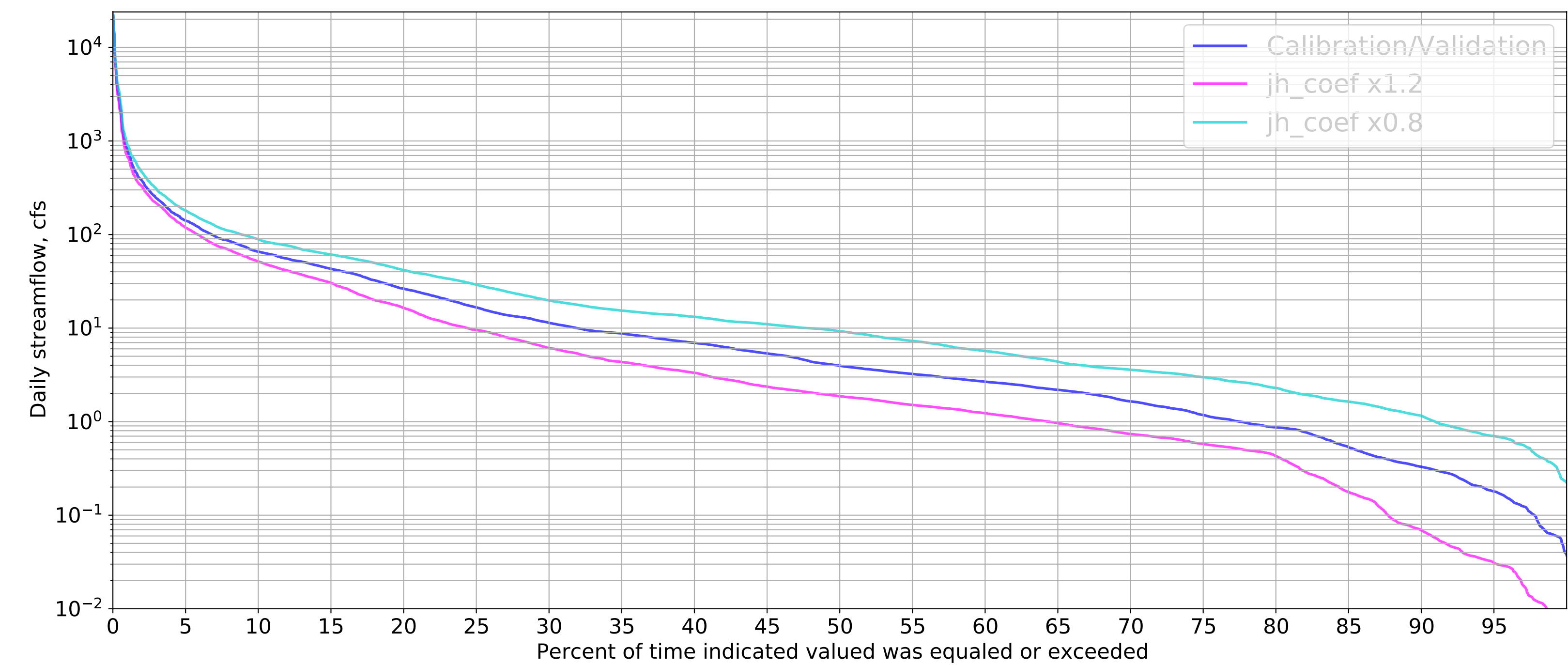
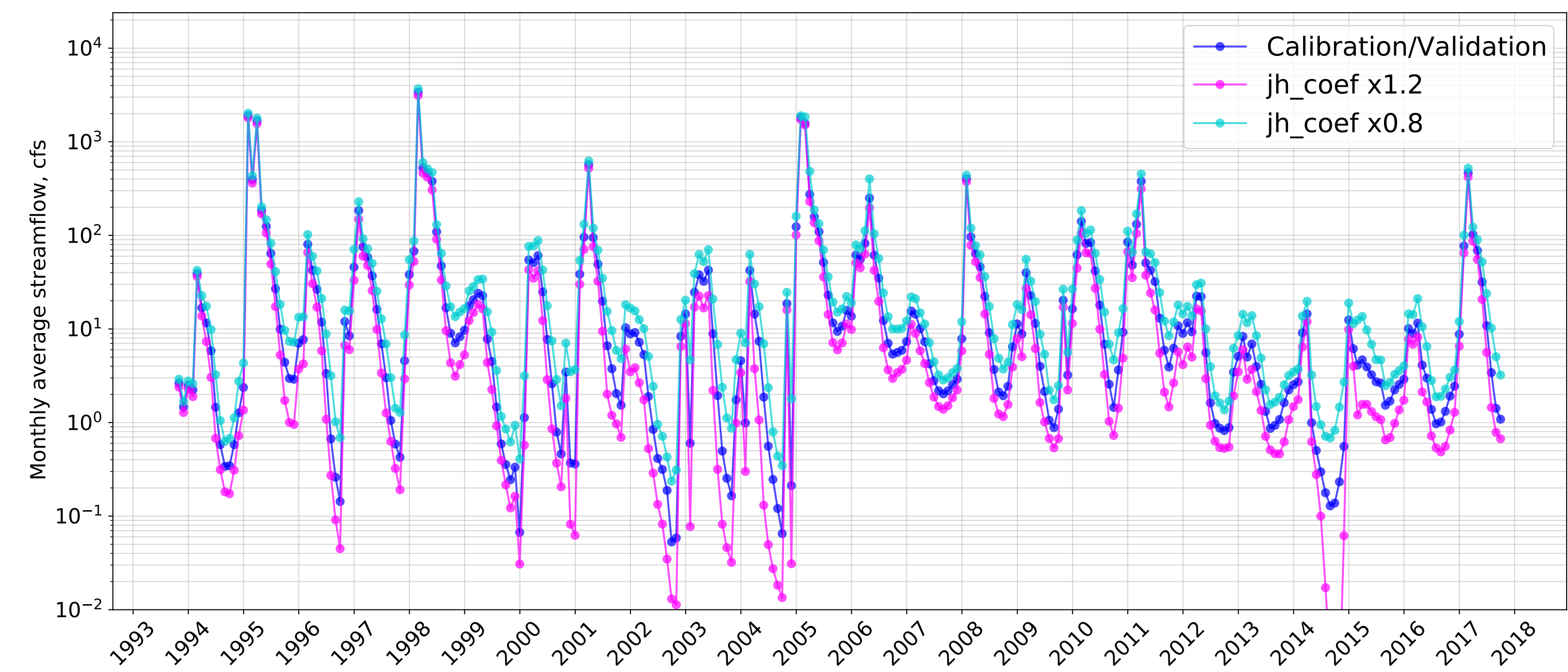
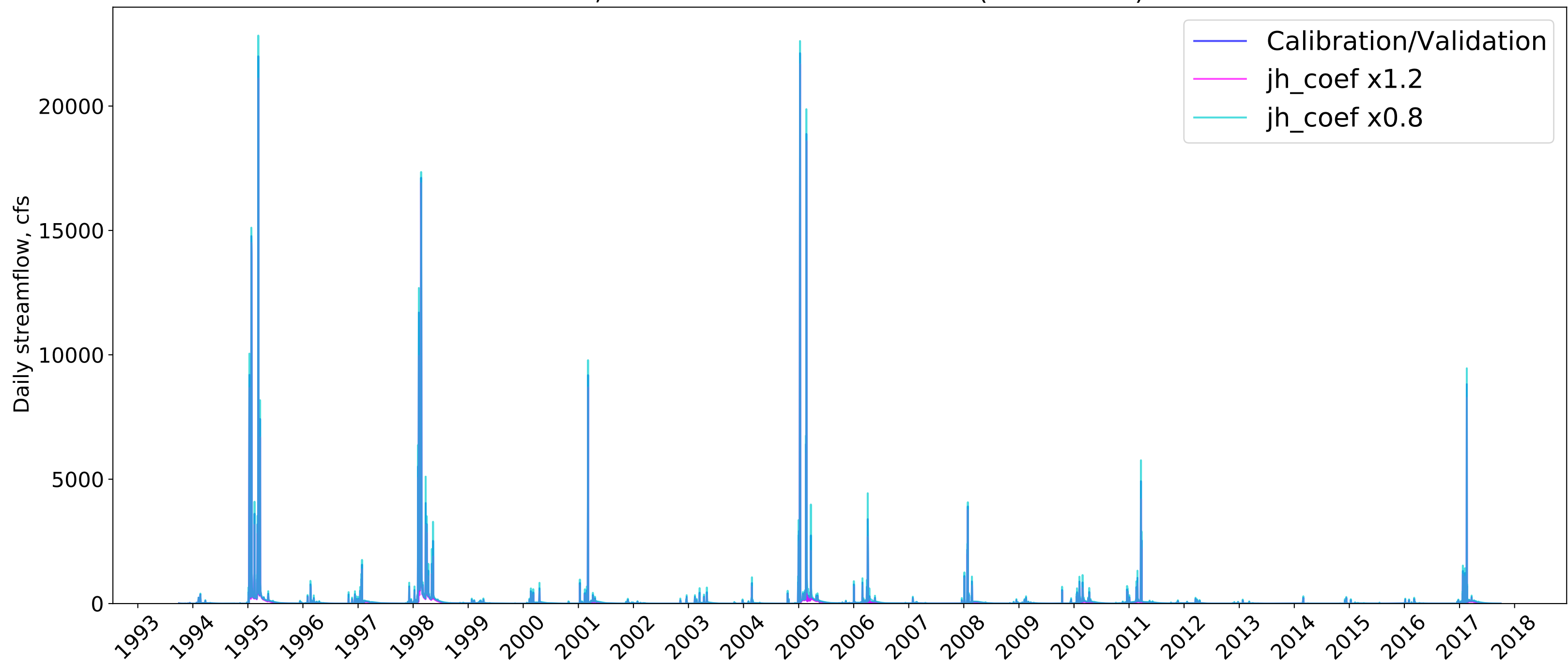




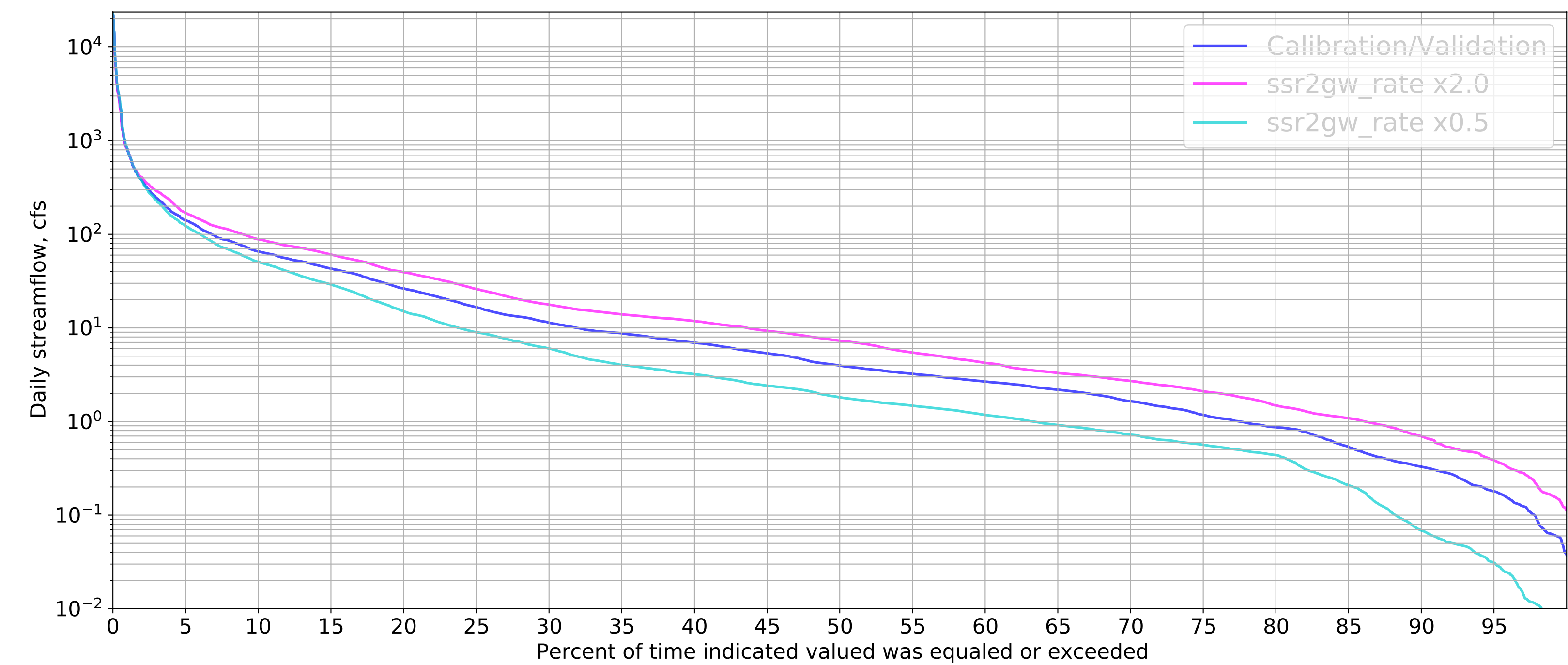
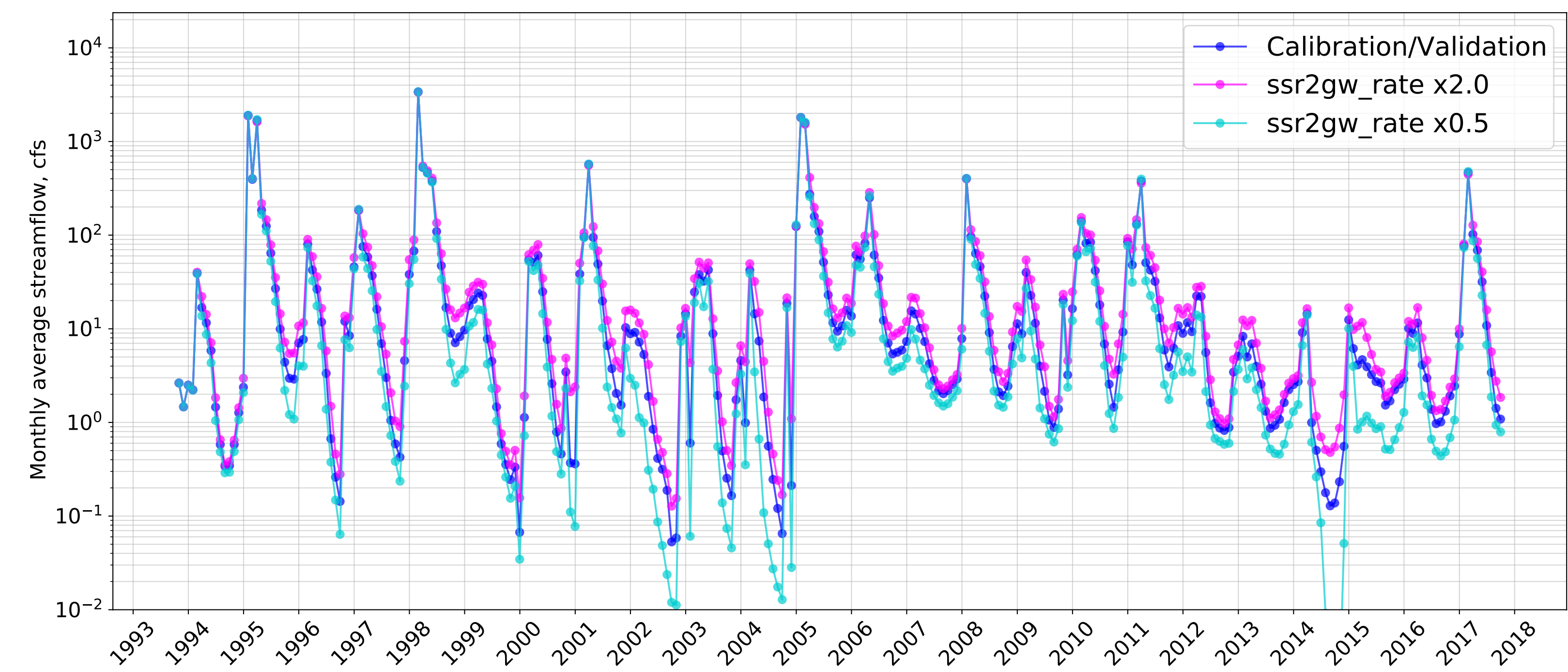
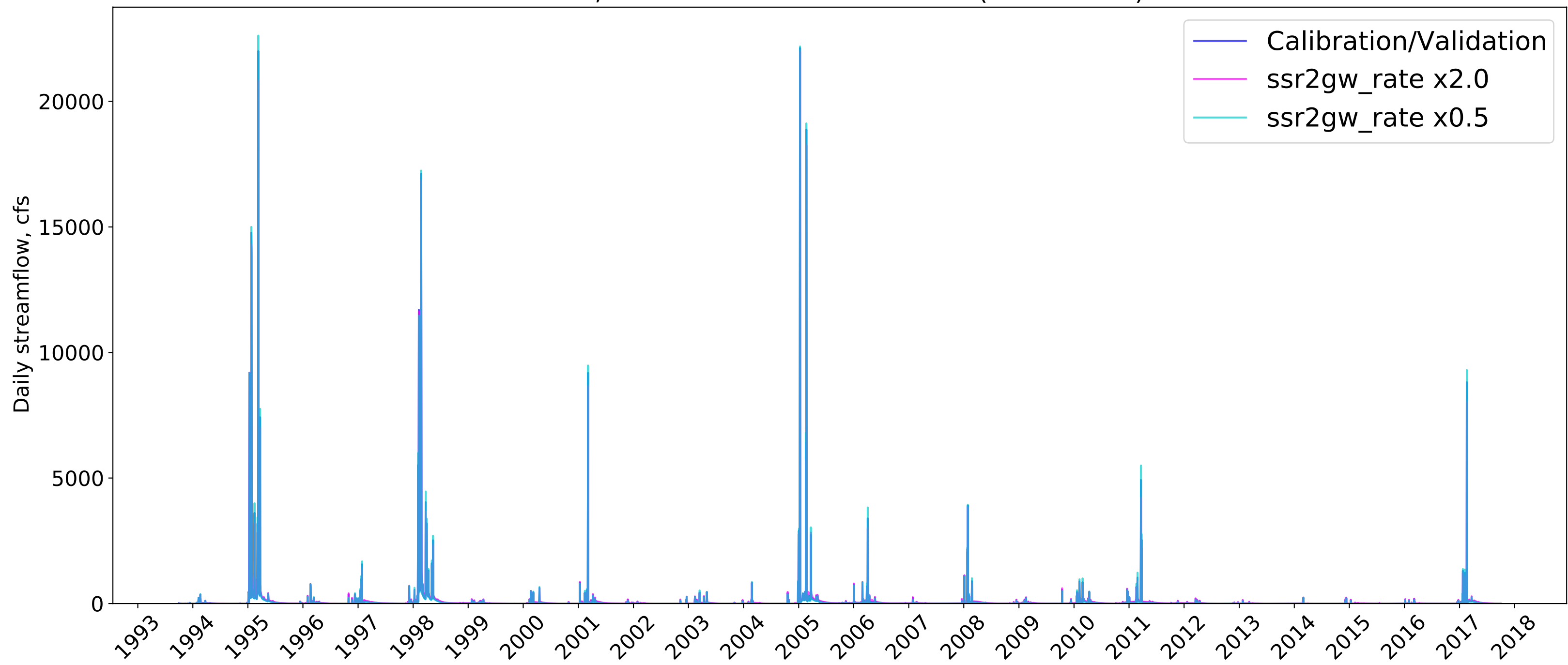
608, Ventura River near Ventura (Foster Park)



608, Ventura River near Ventura (Foster Park)

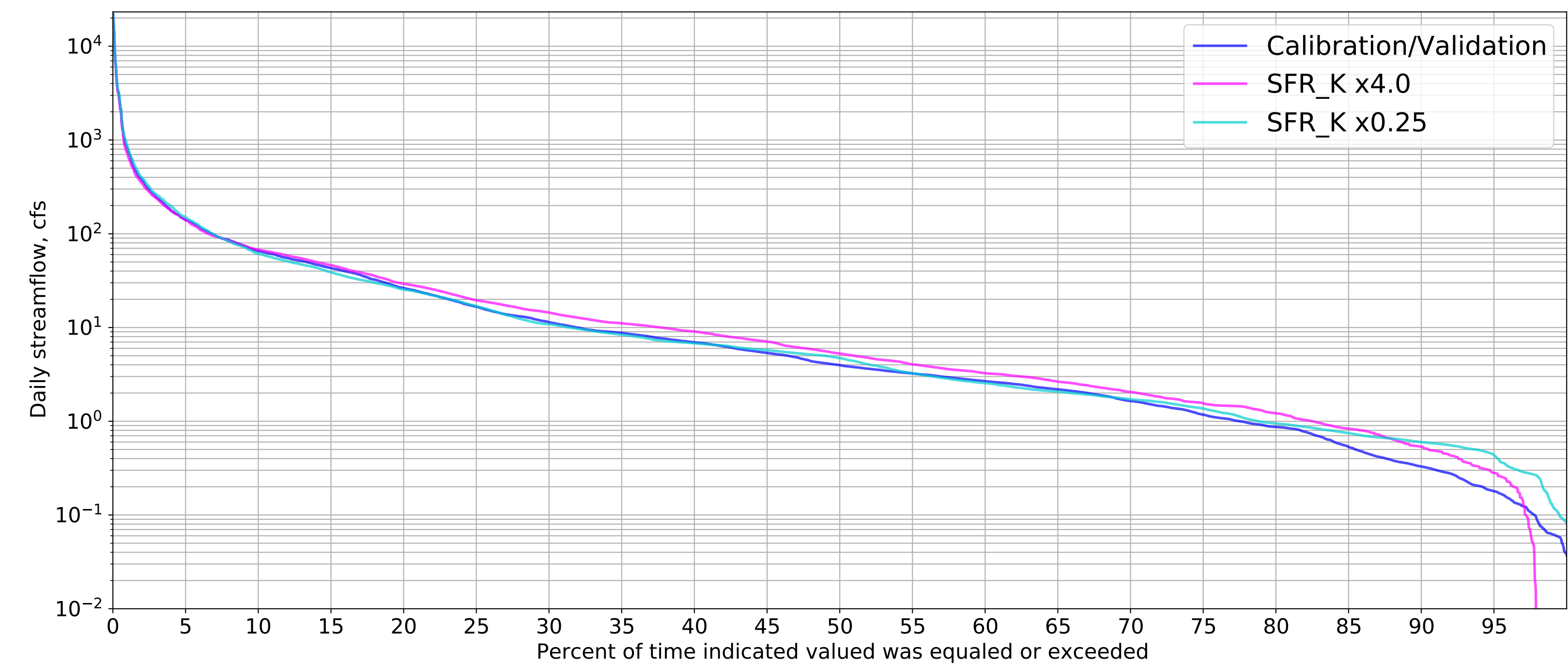
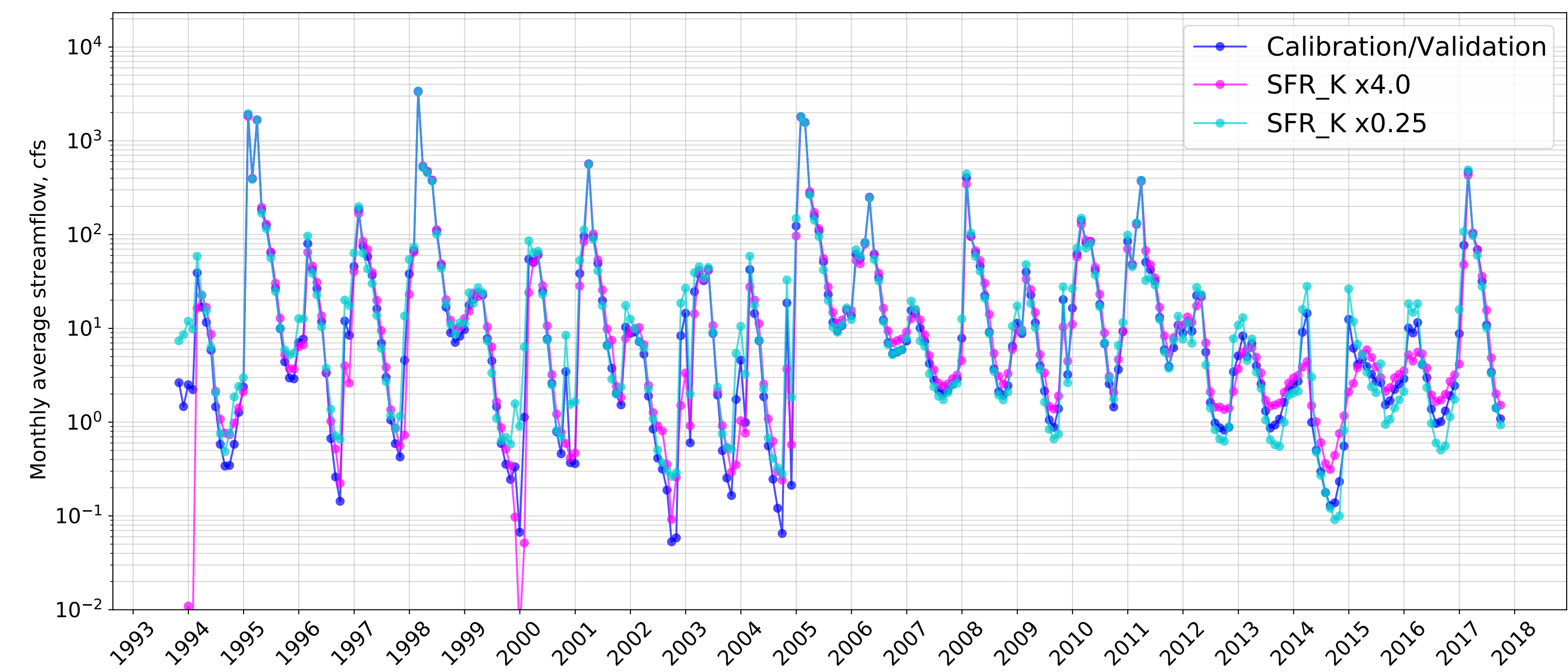
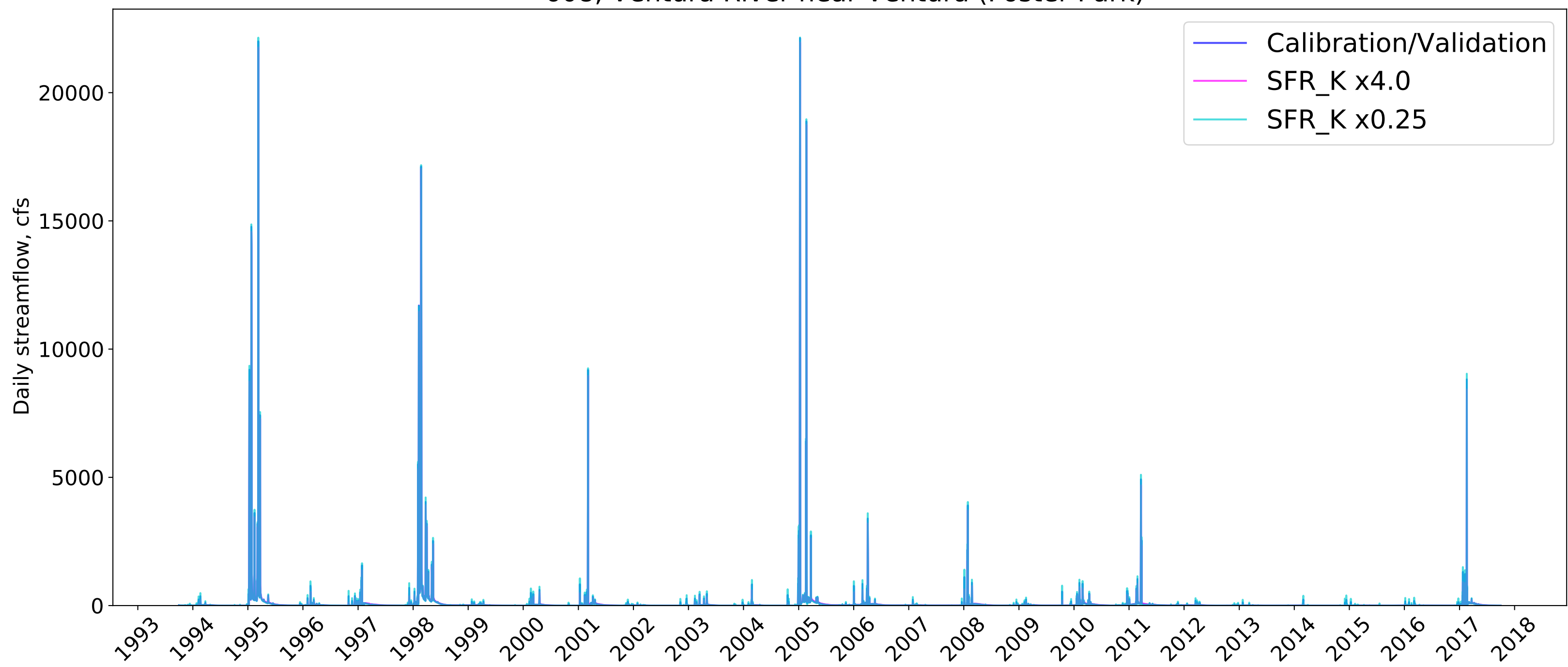


608, Ventura River near Ventura (Foster Park)

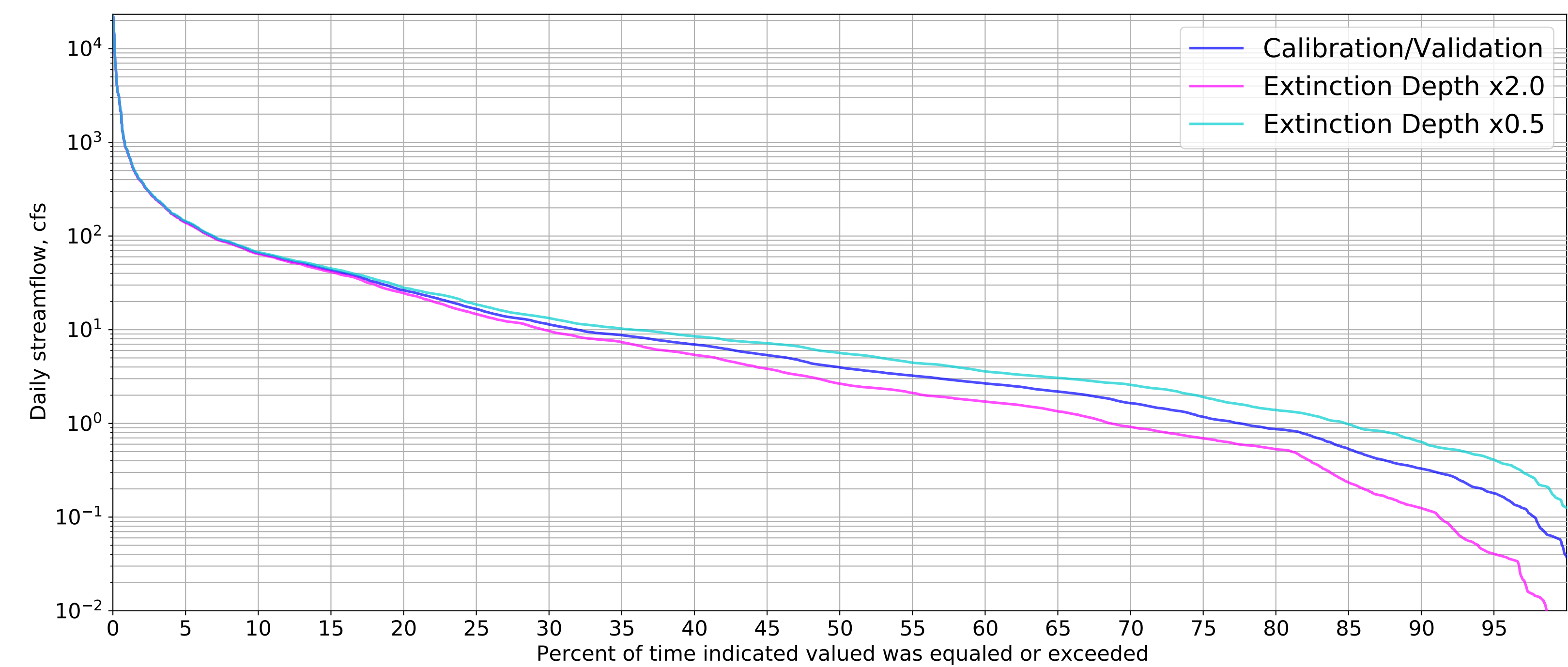
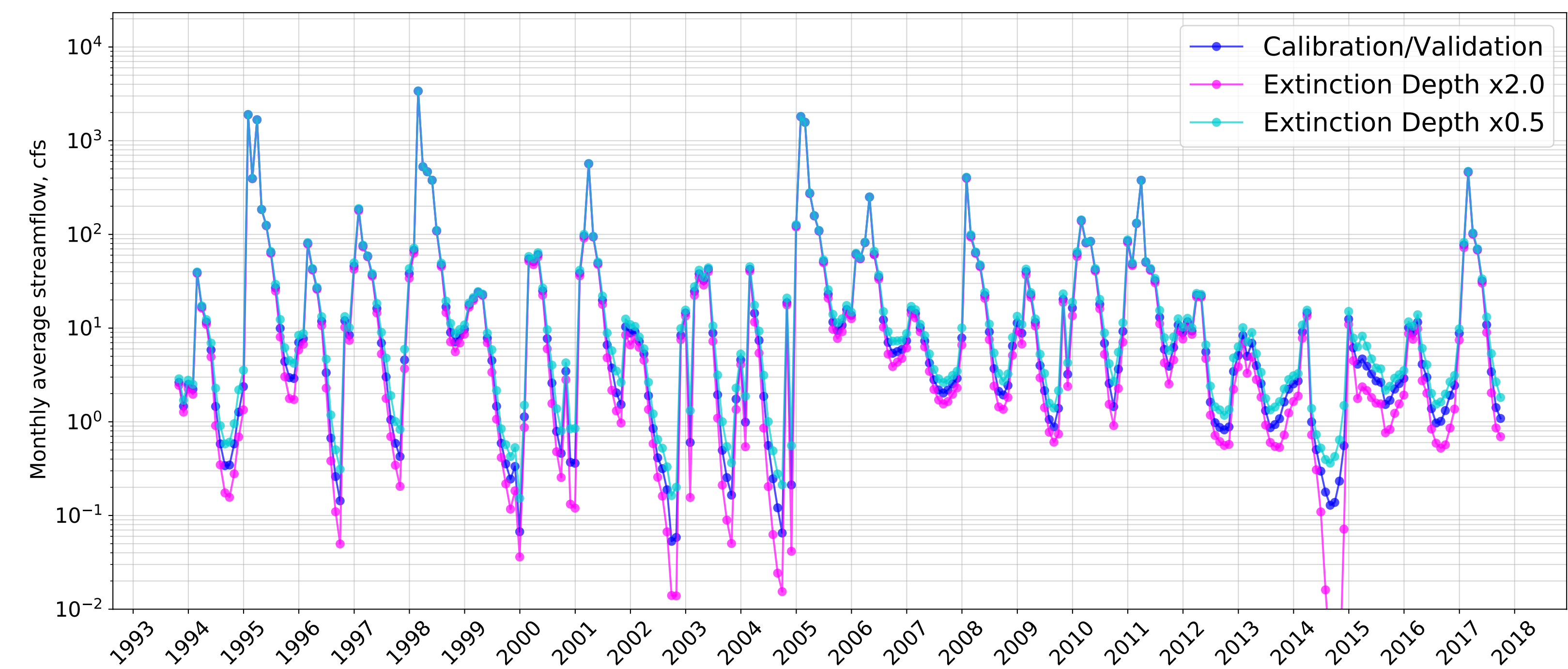
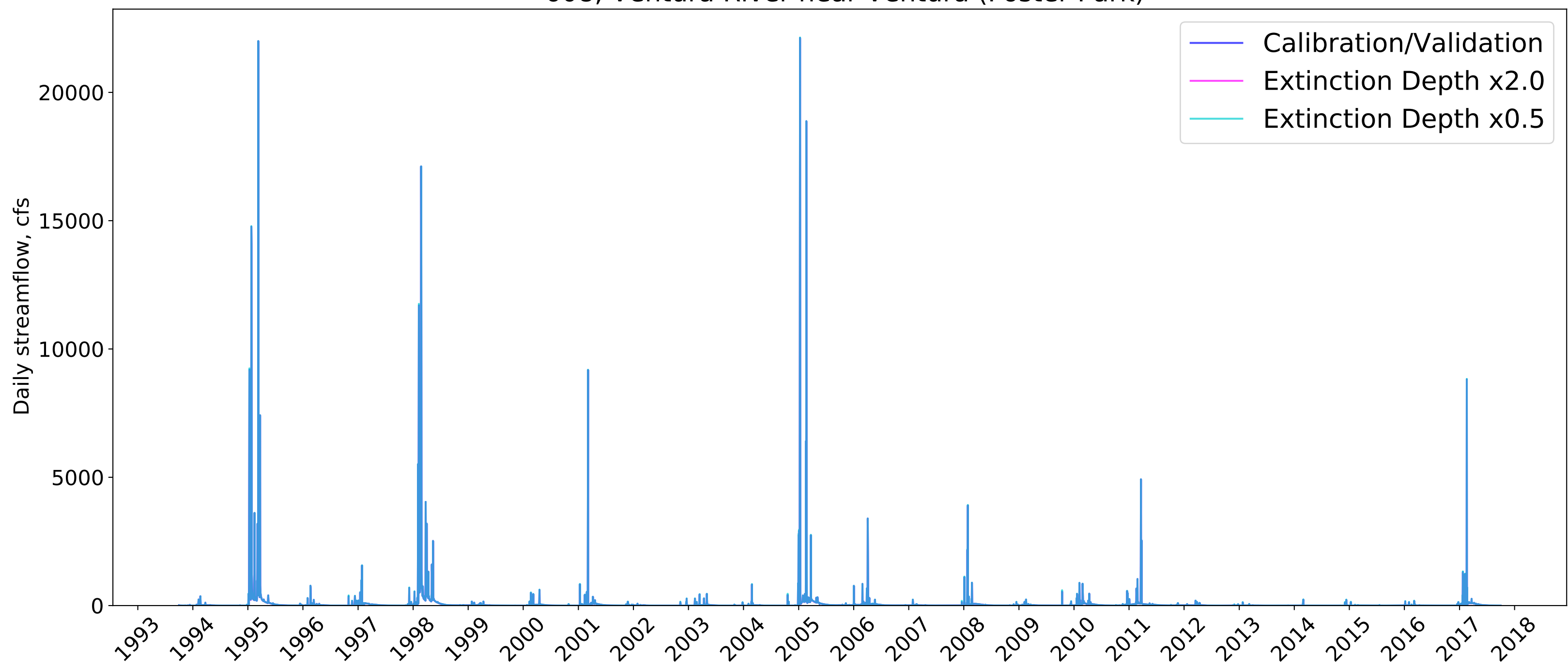




608, Ventura River near Ventura (Foster Park)

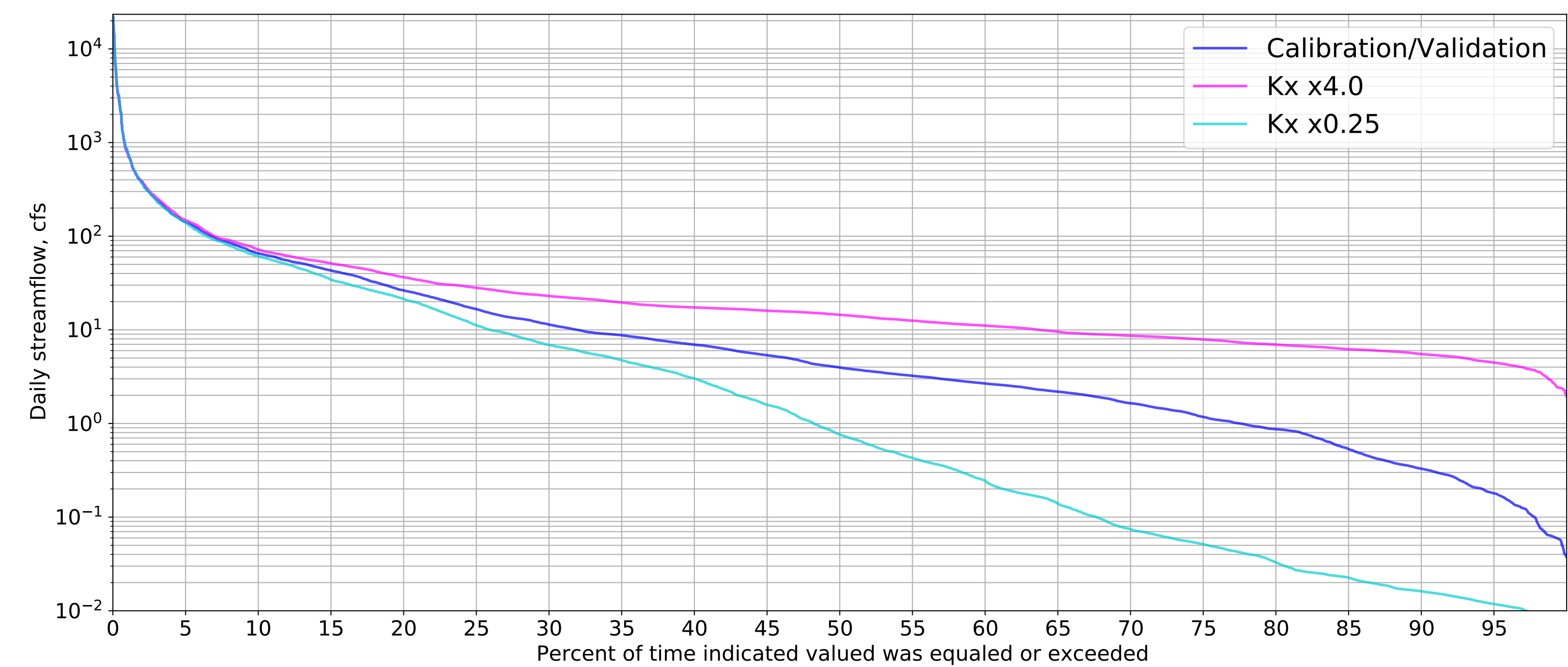
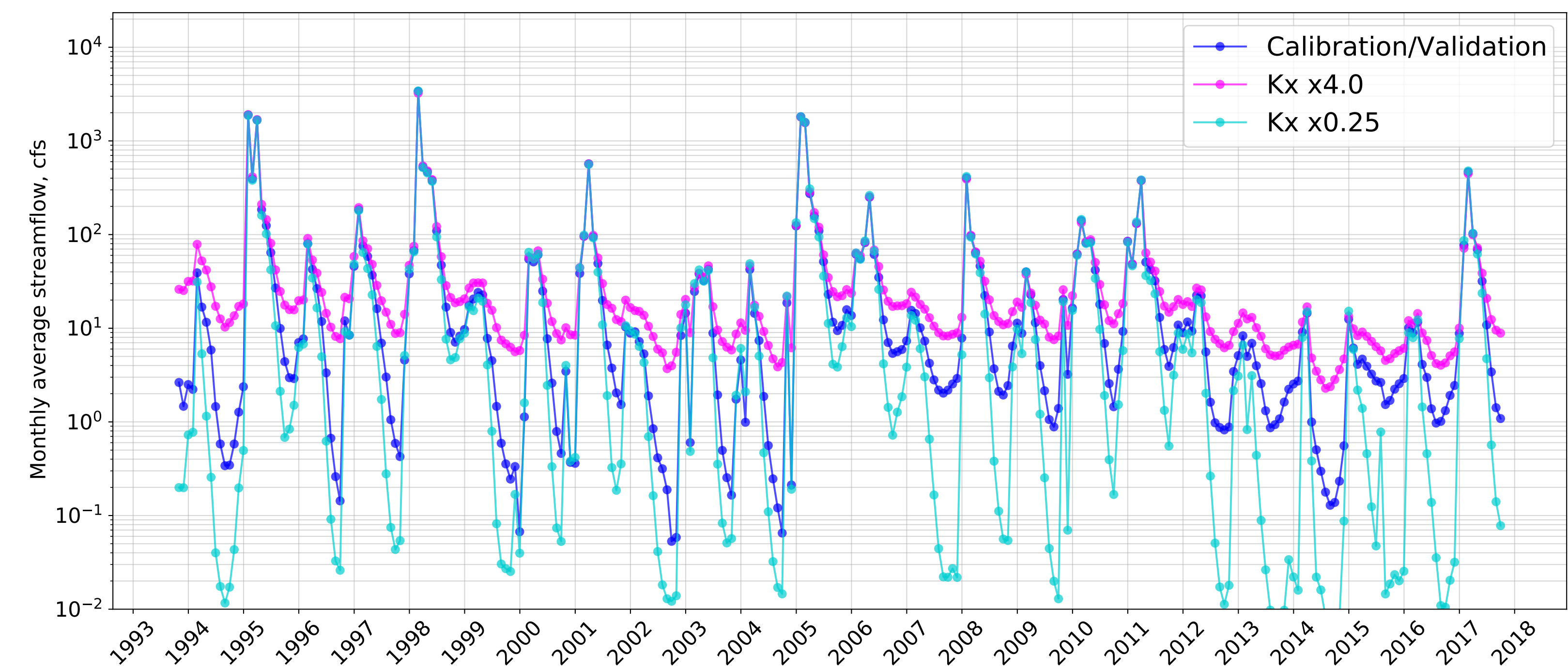
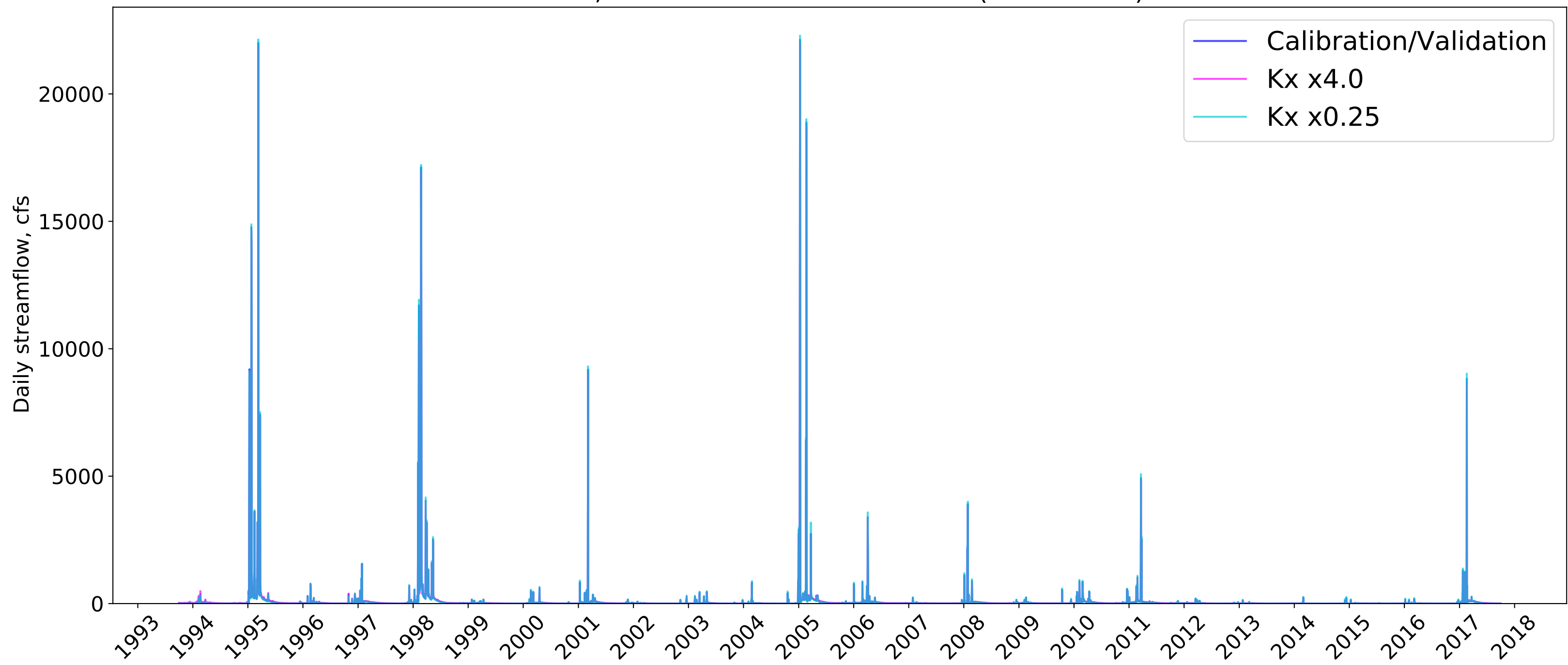


608, Ventura River near Ventura (Foster Park)

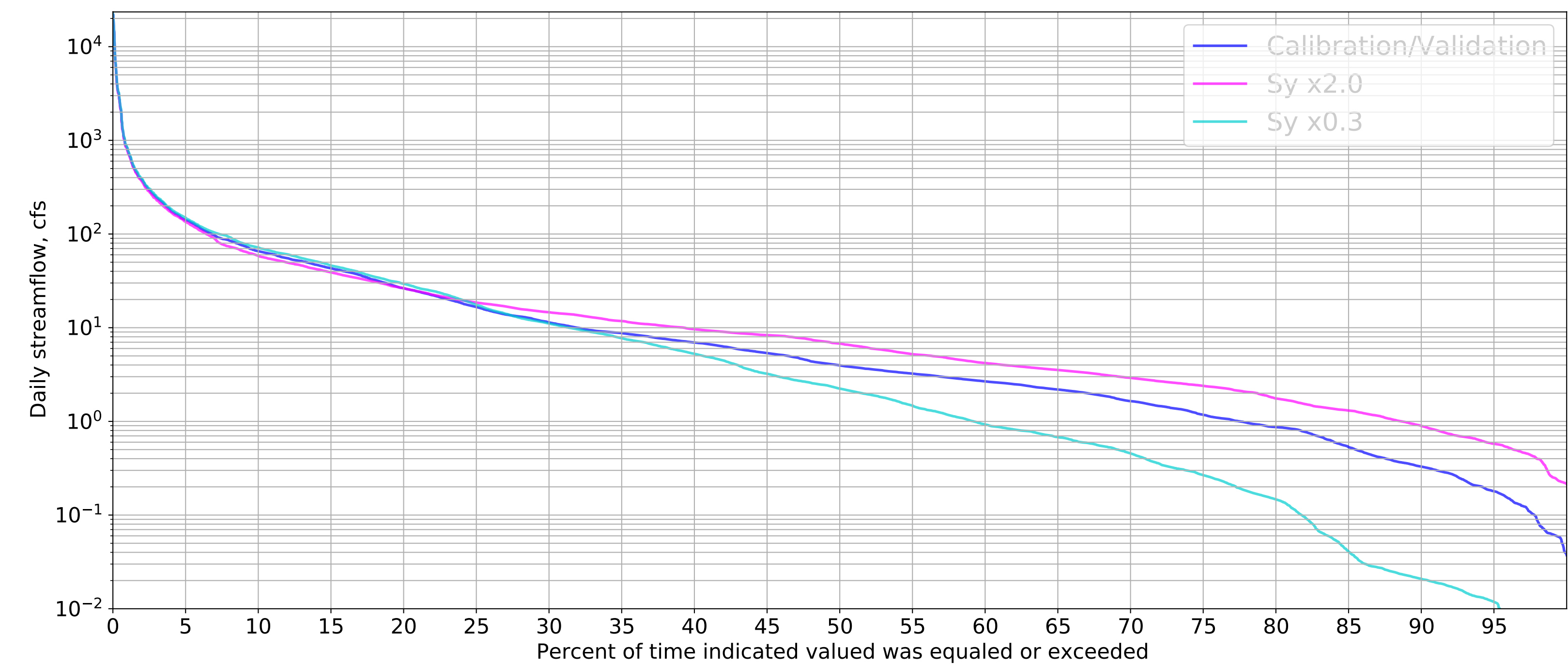
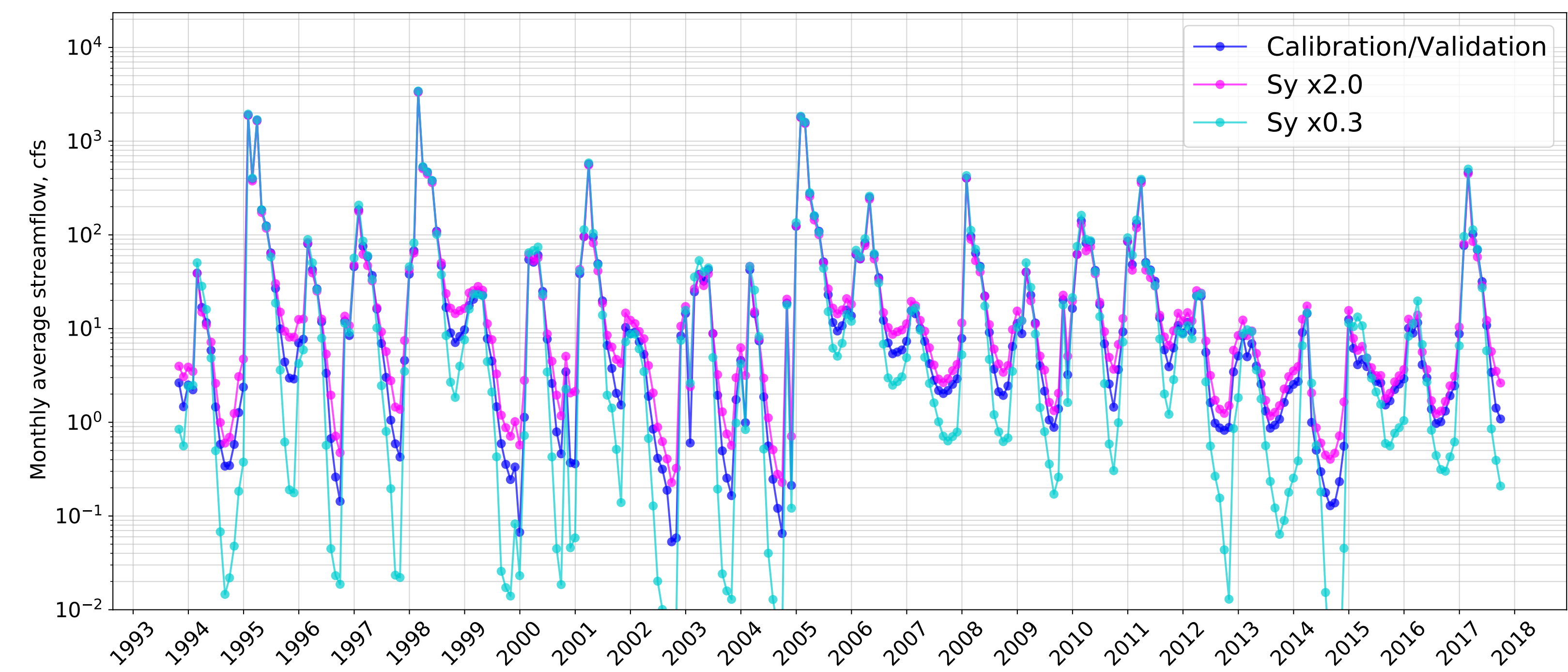
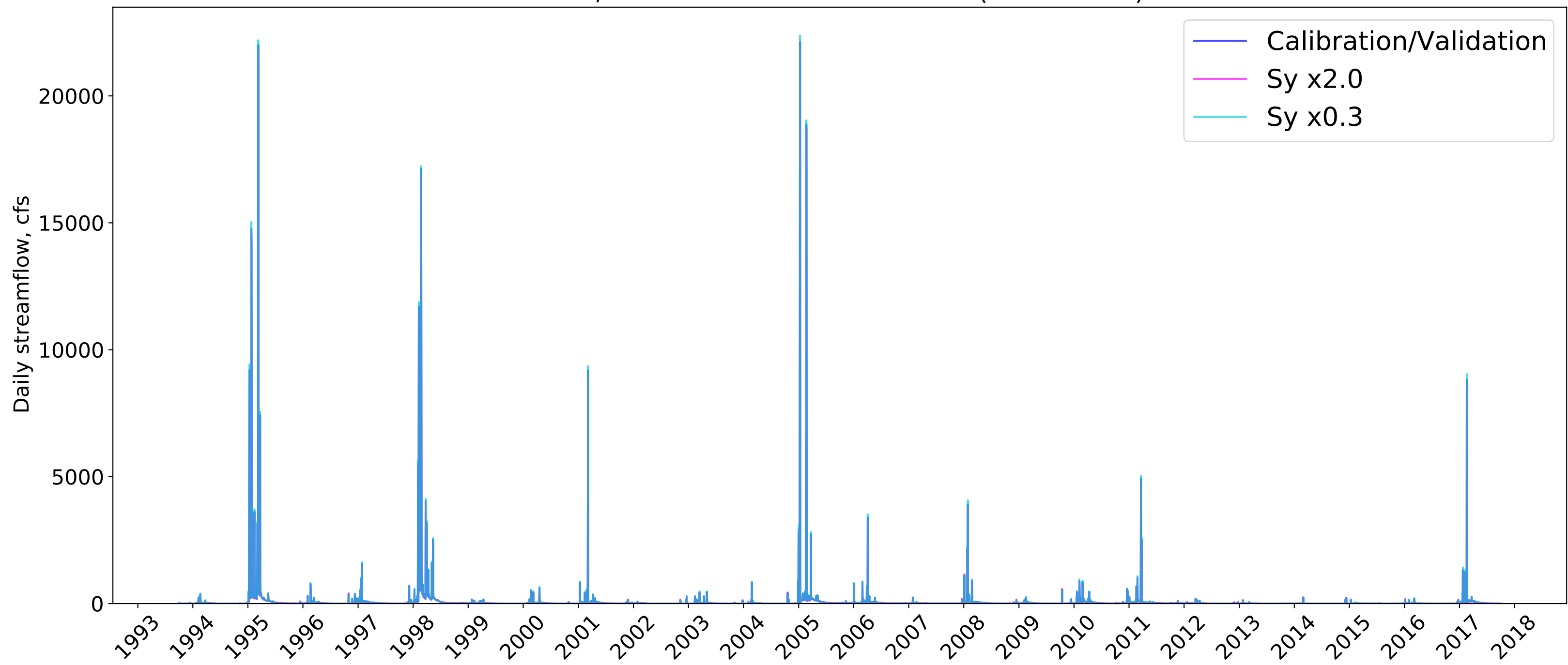




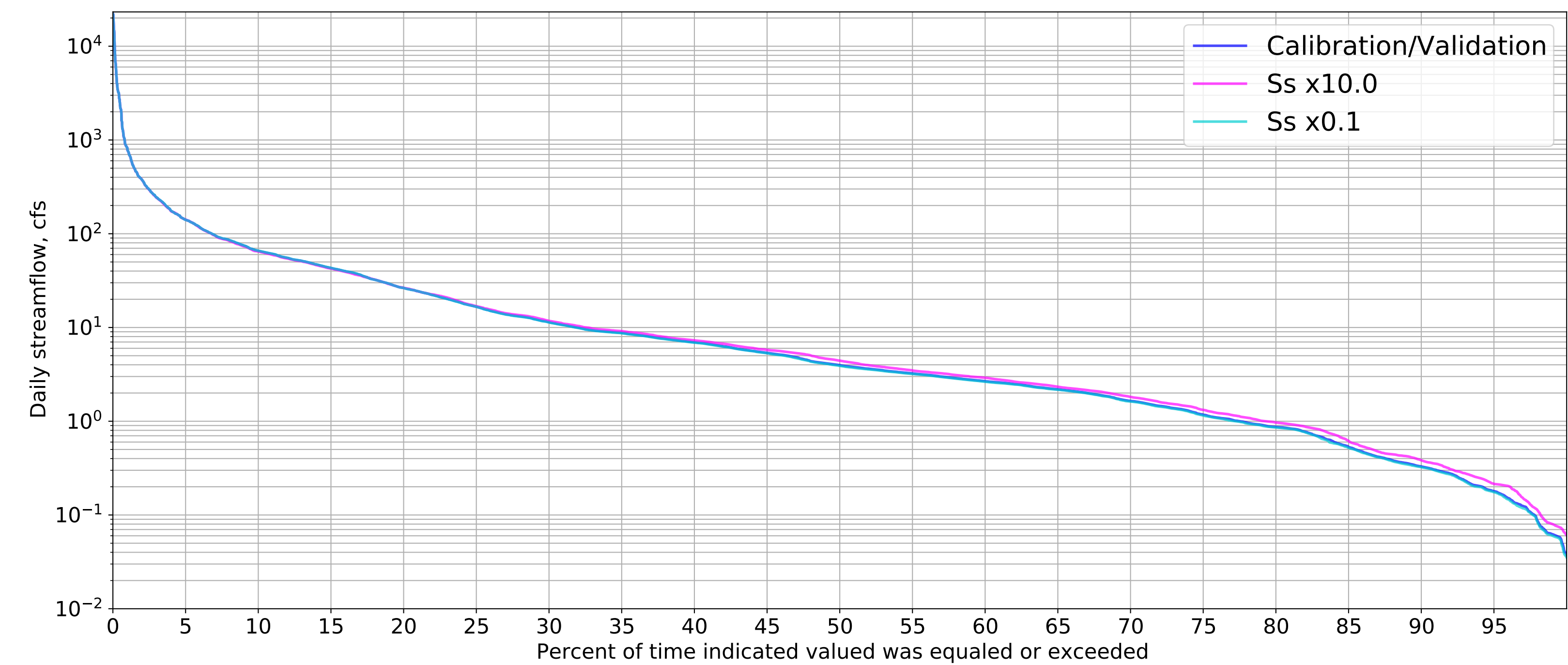
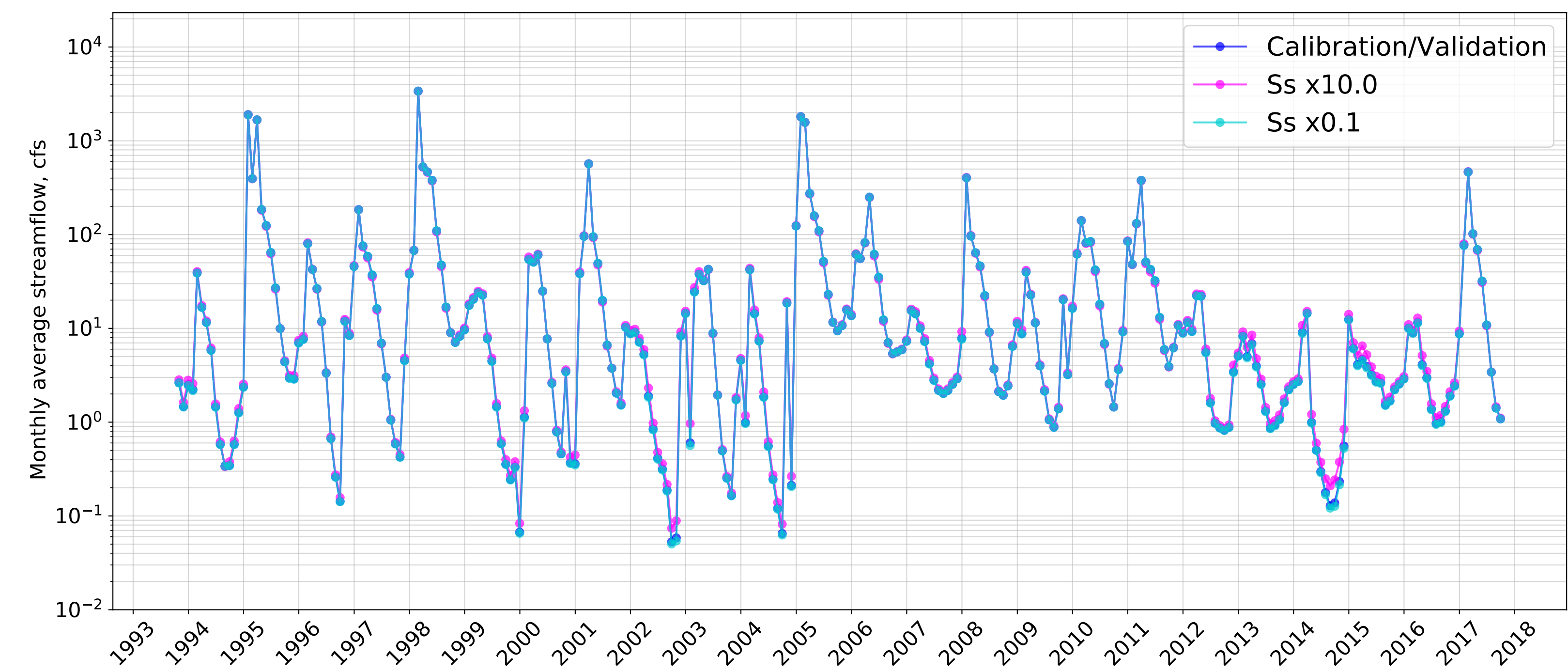
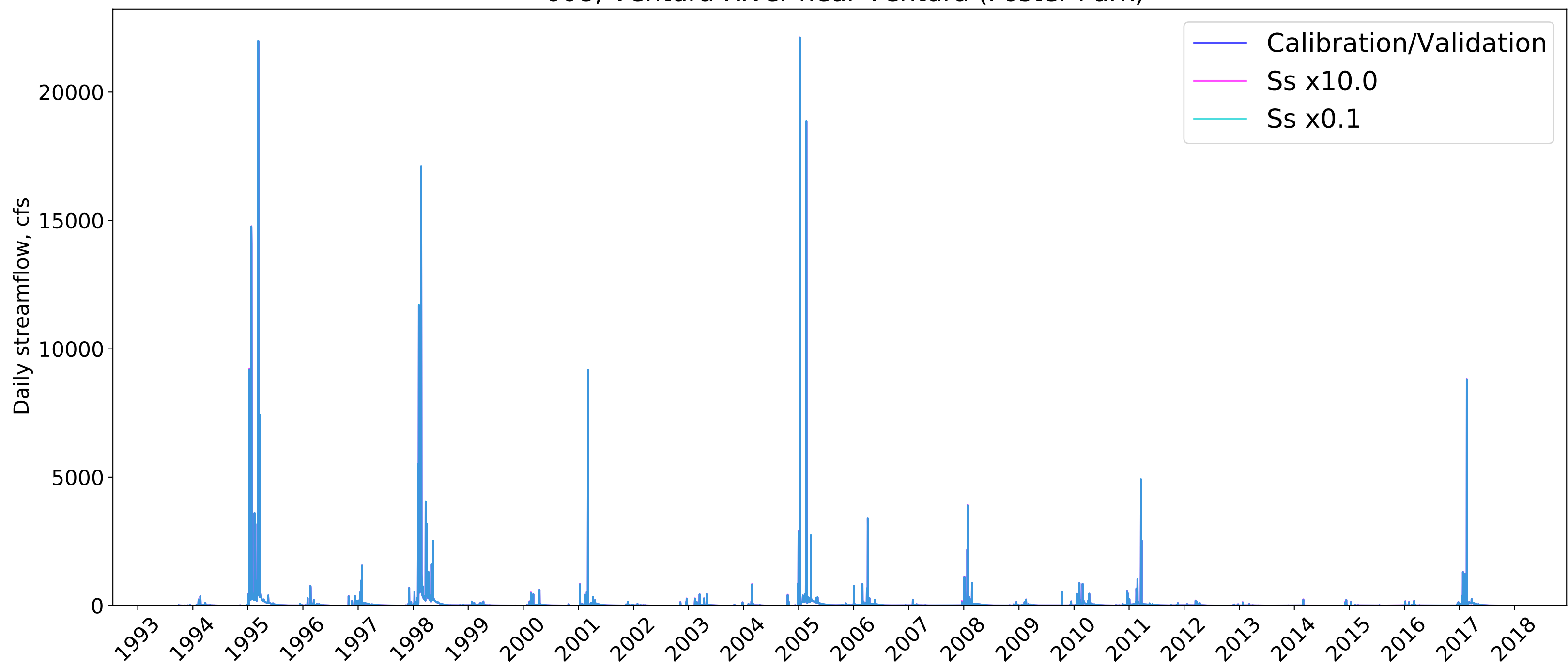
608, Ventura River near Ventura (Foster Park)



608, Ventura River near Ventura (Foster Park)

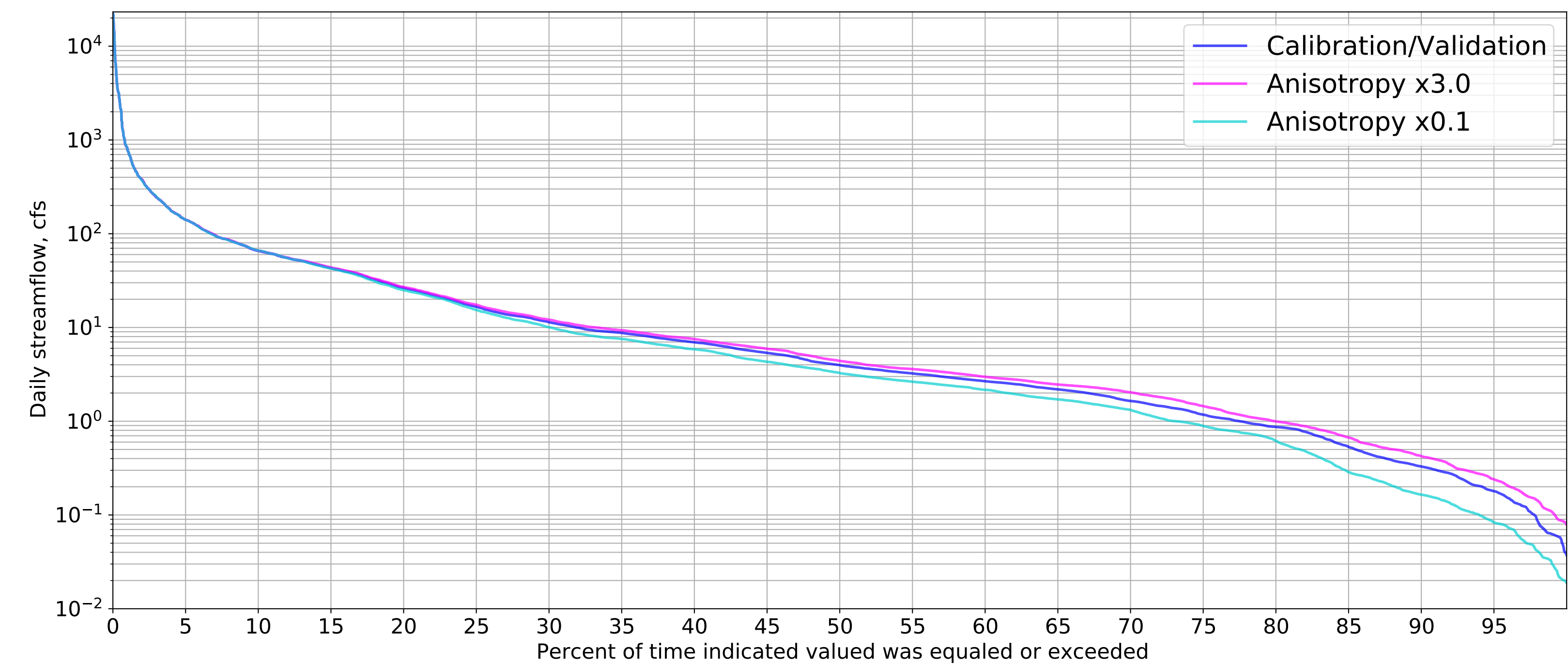
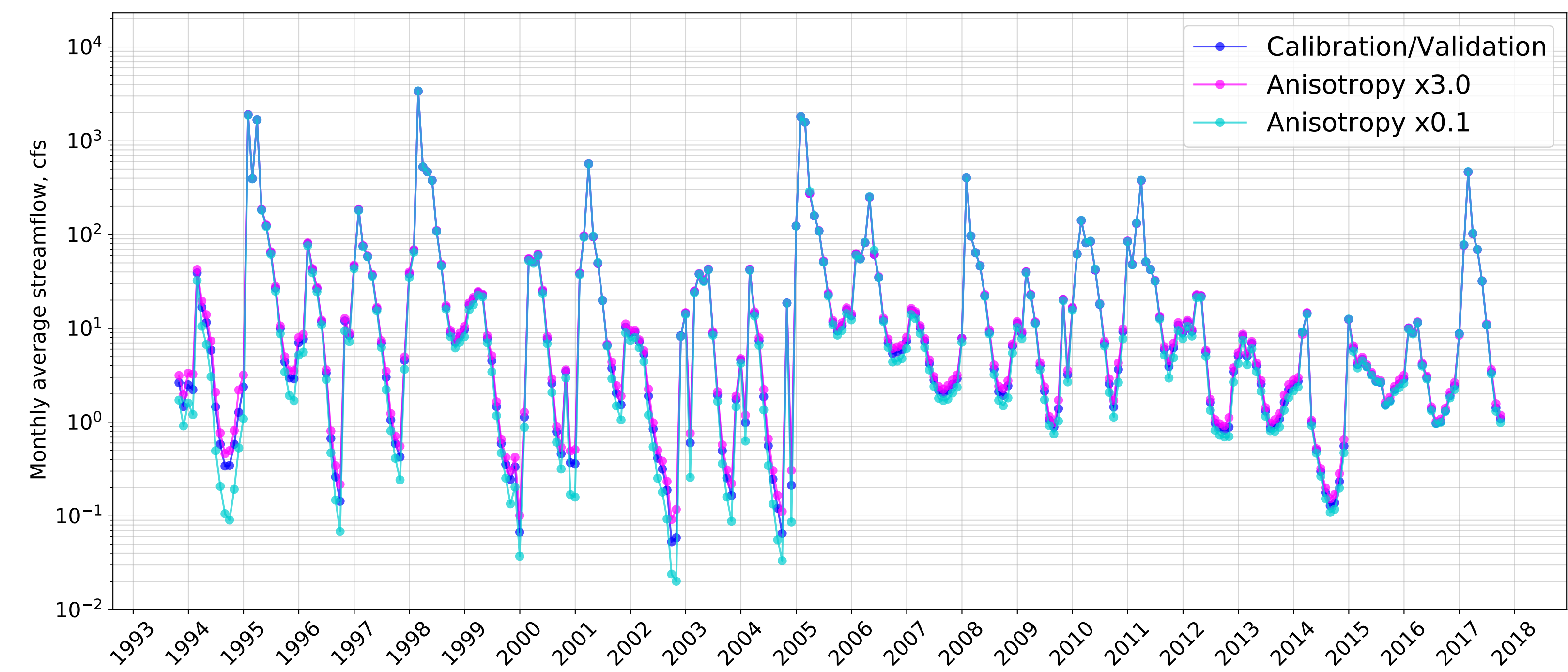
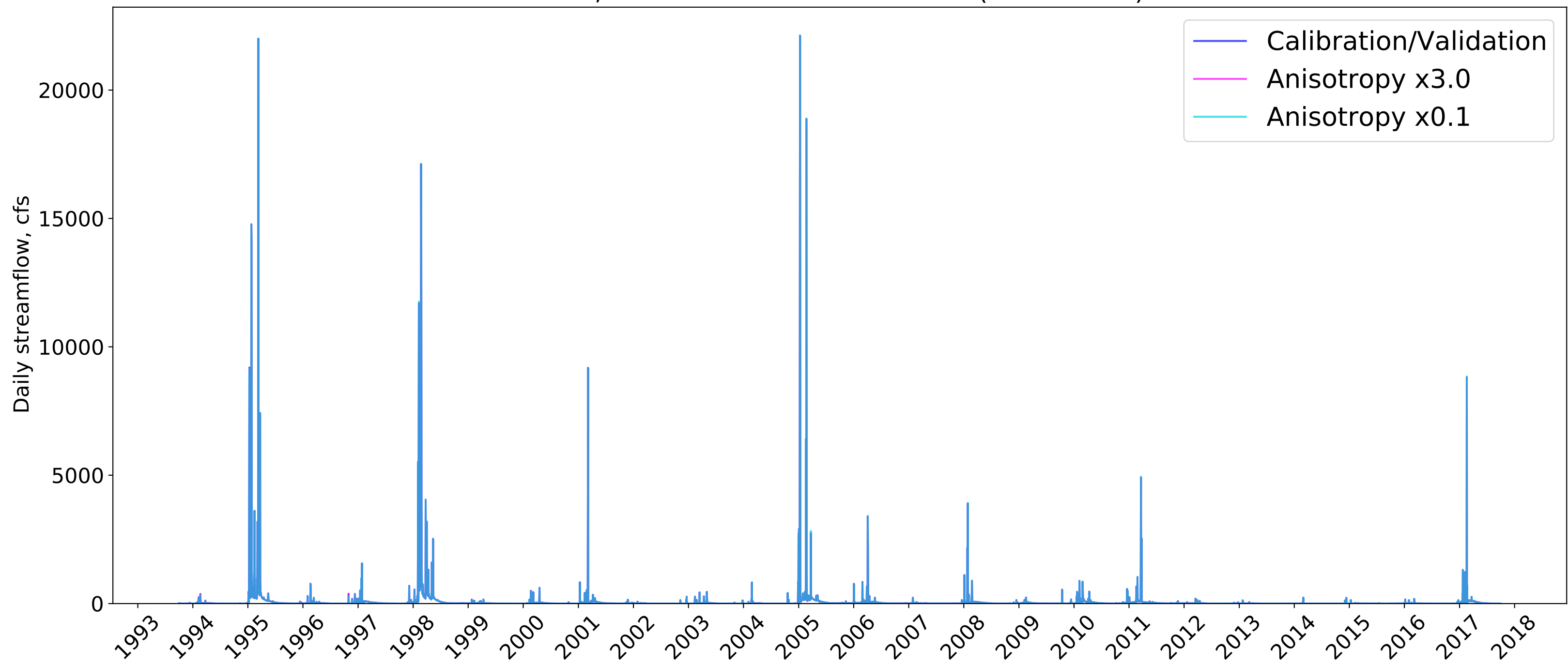


608, Ventura River near Ventura (Foster Park)

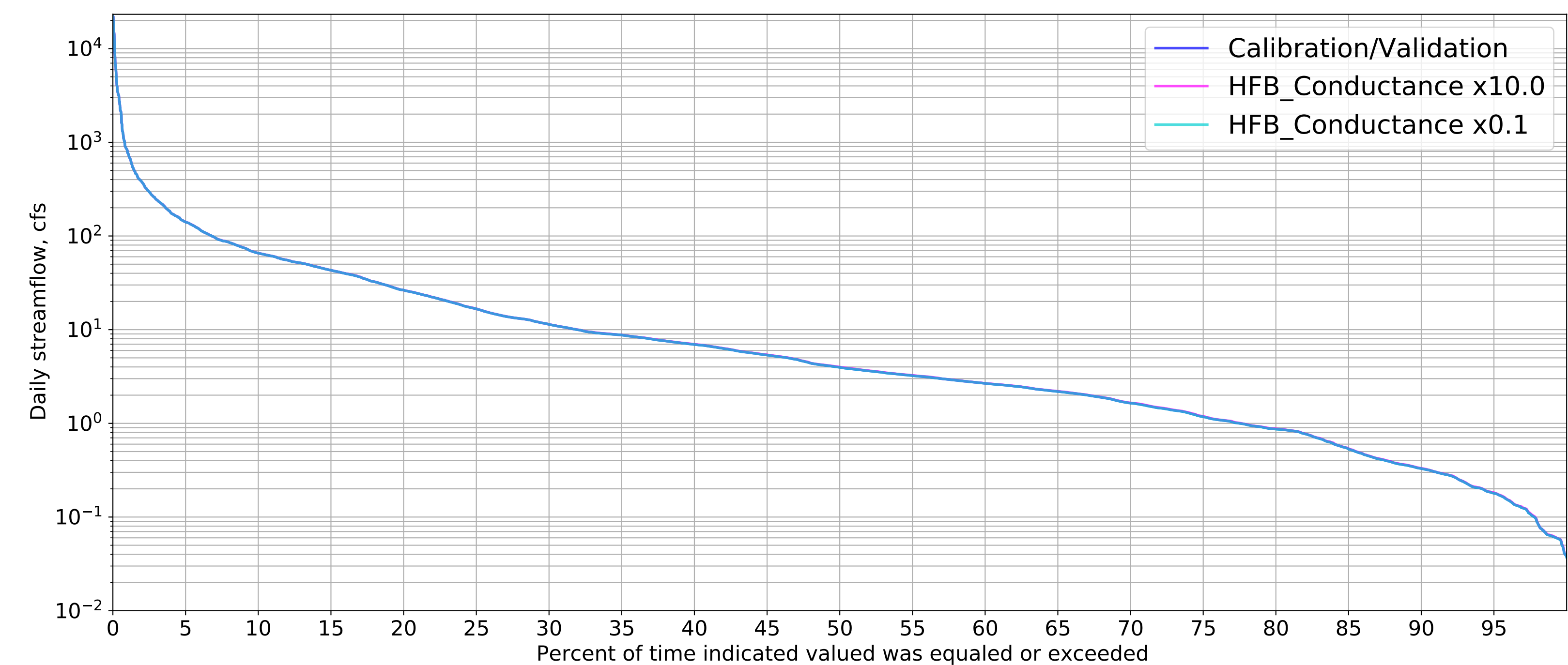
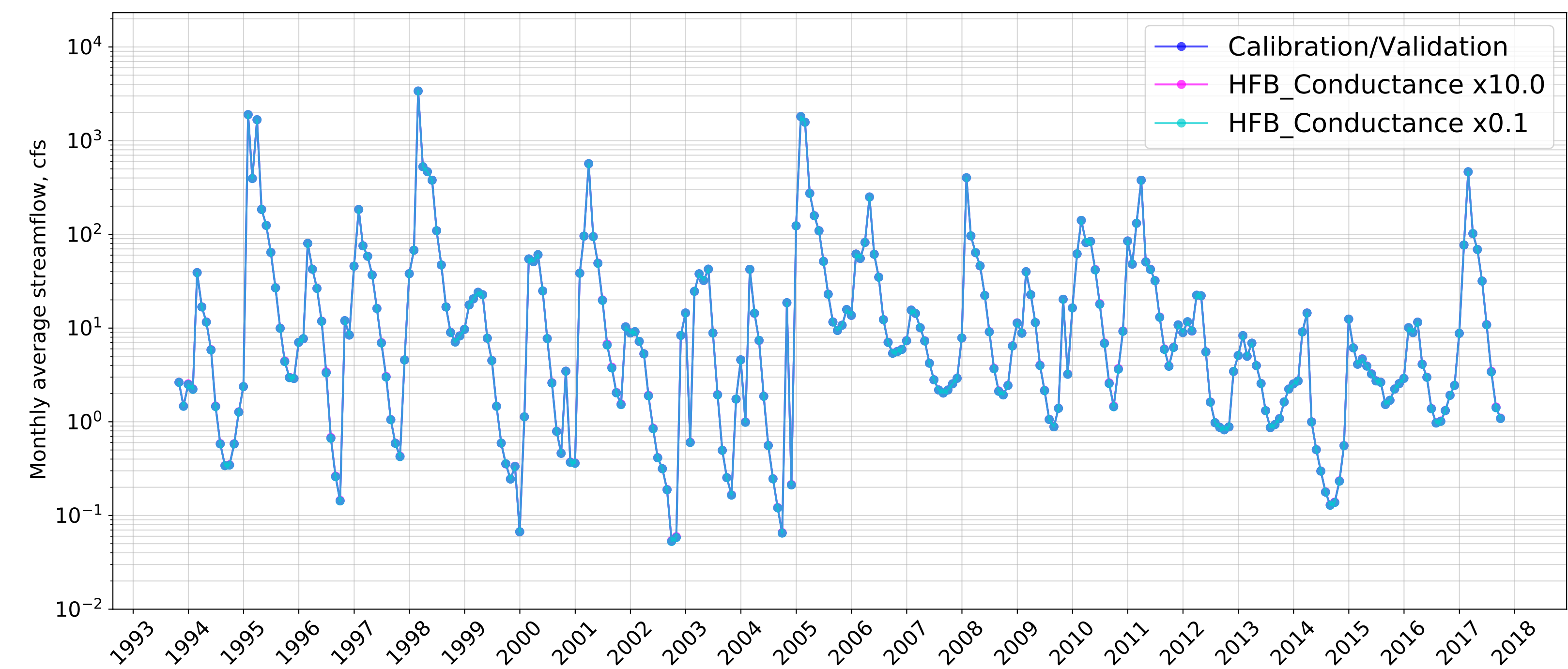
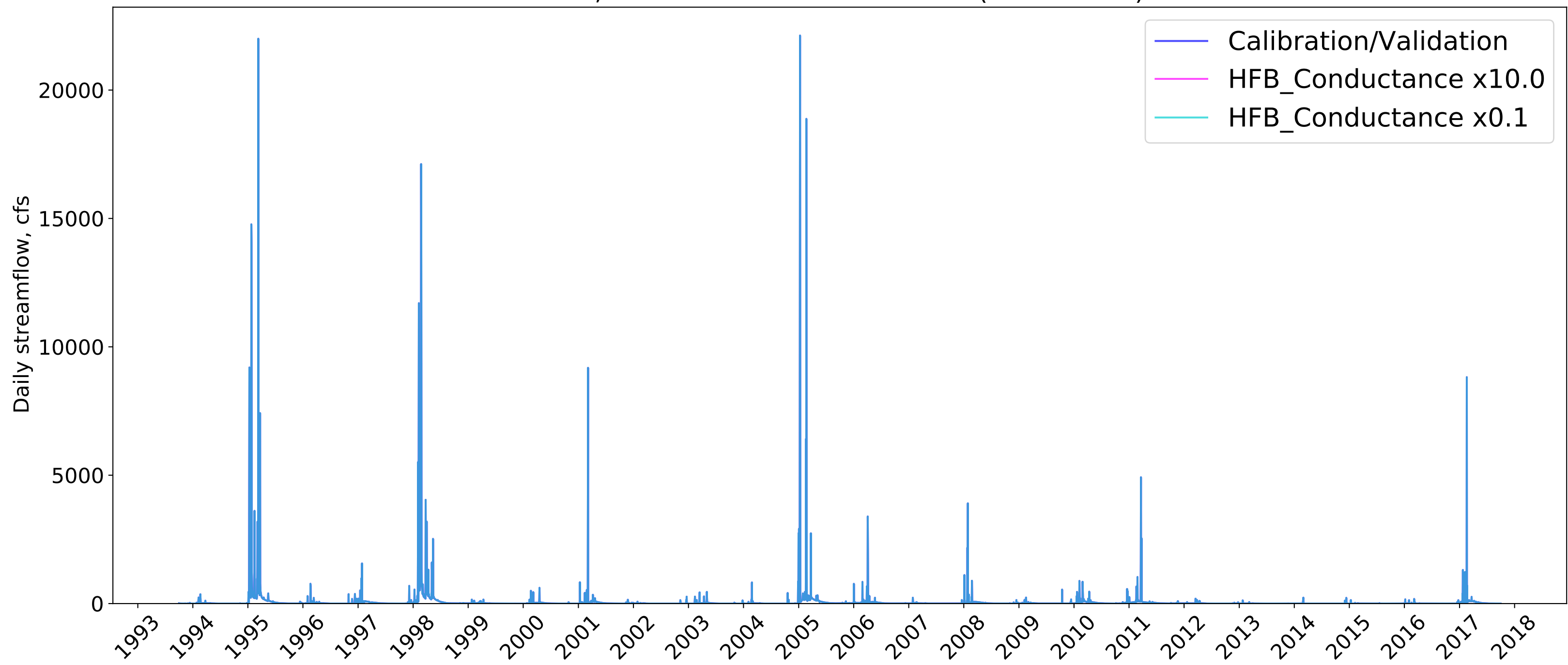




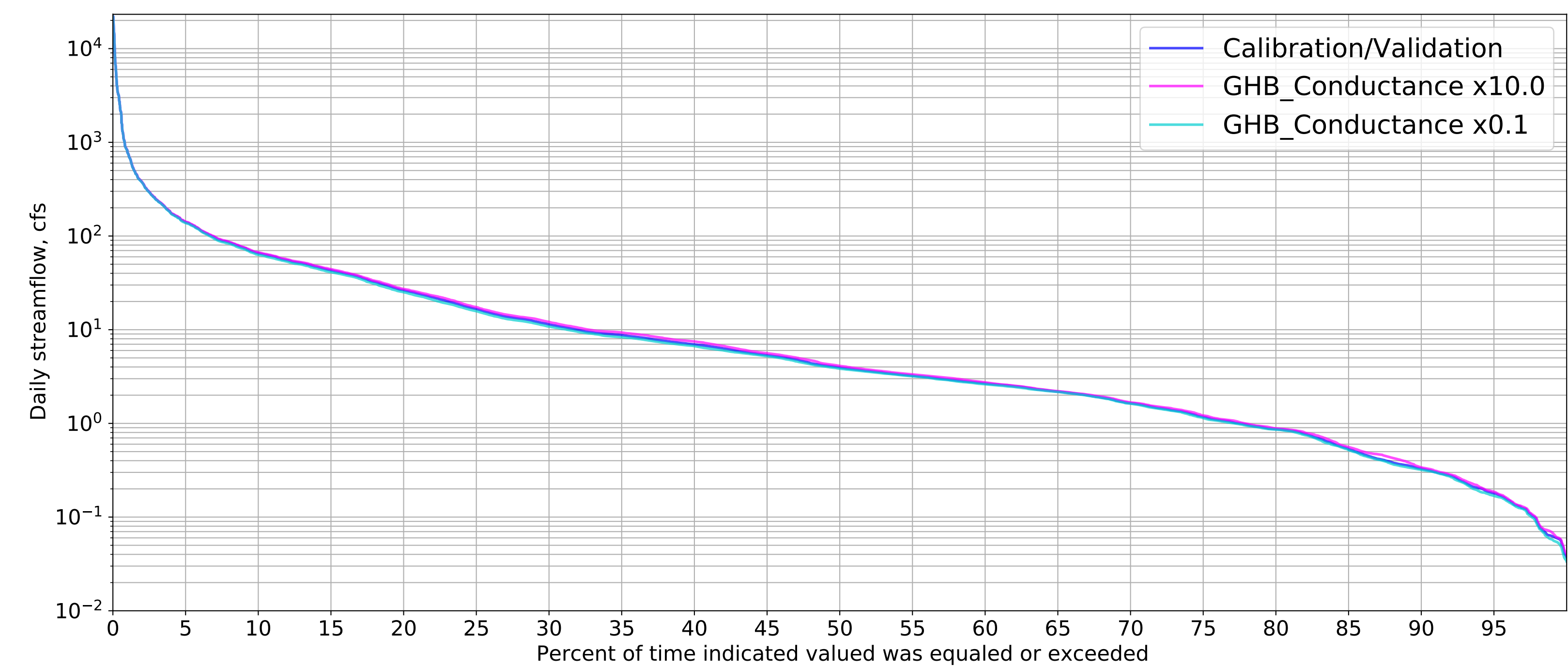
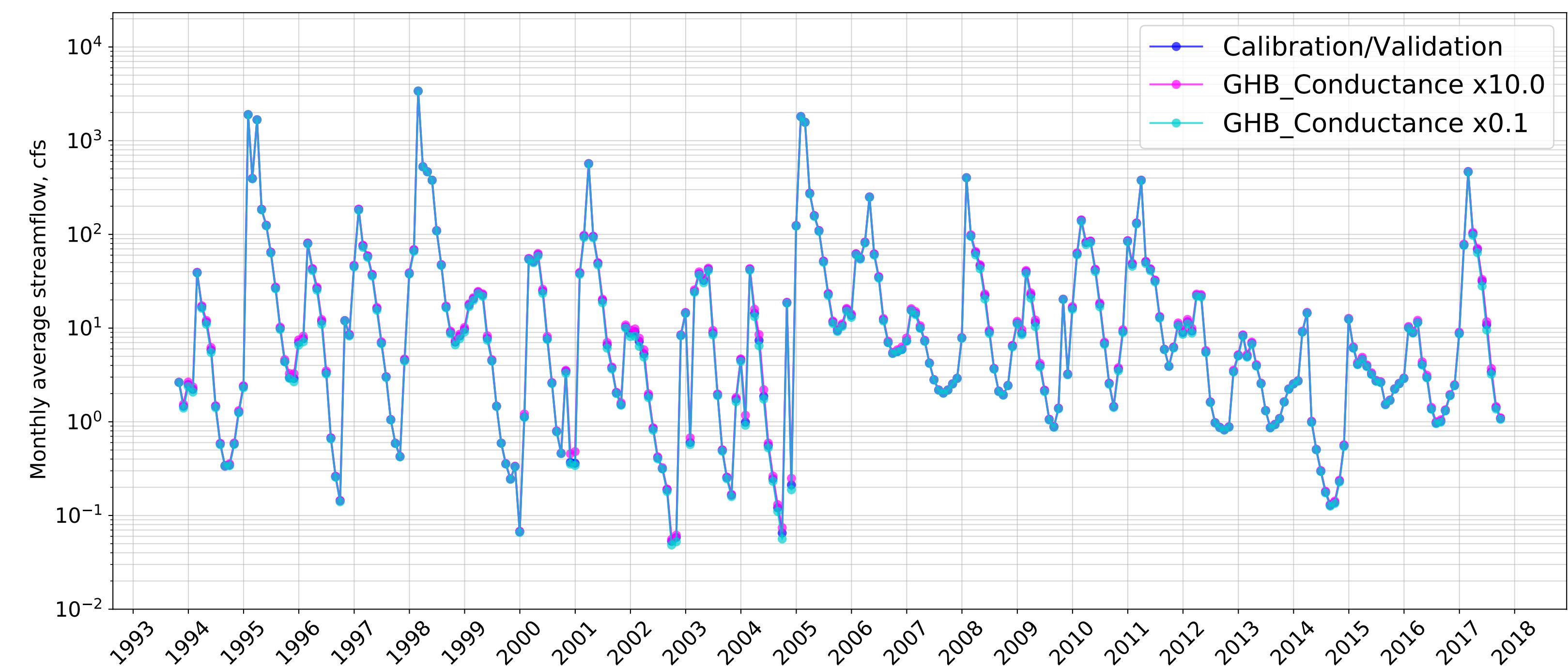
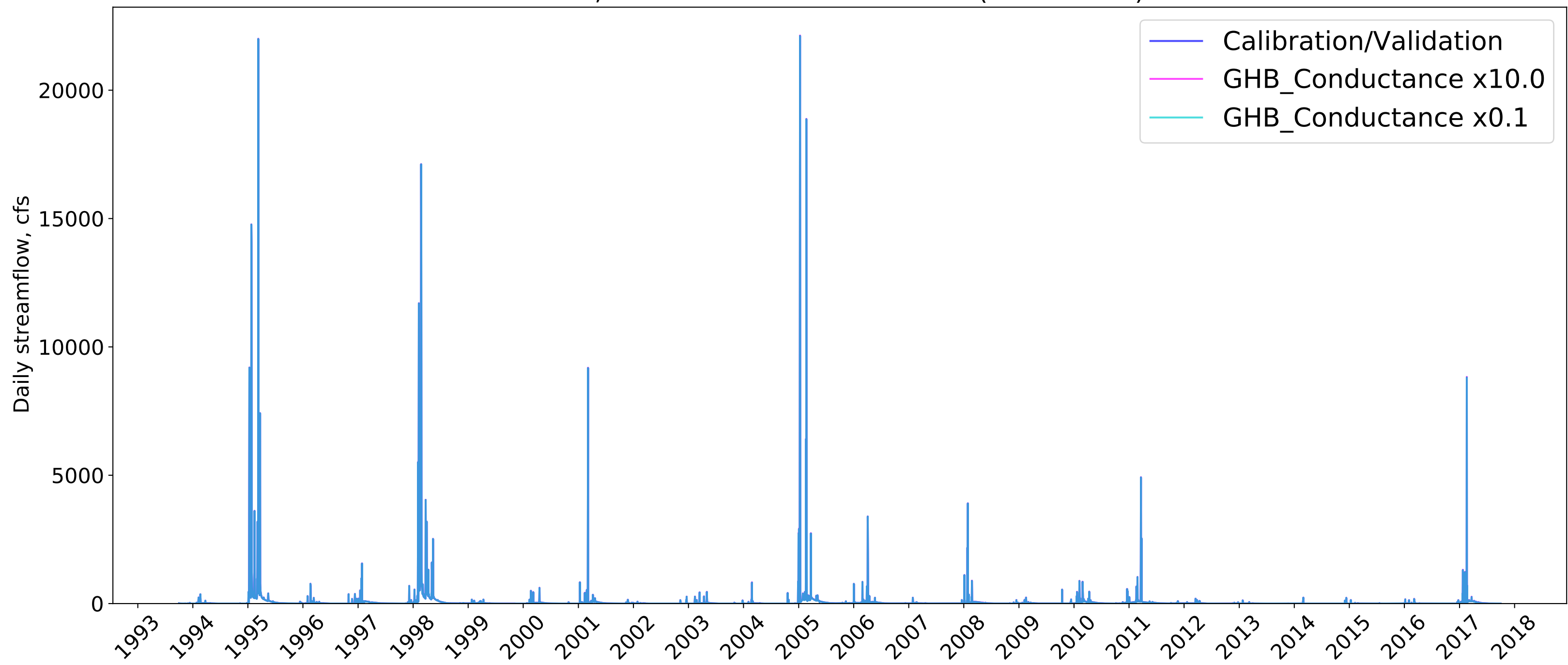
608, Ventura River near Ventura (Foster Park)



608, Ventura River near Ventura (Foster Park)

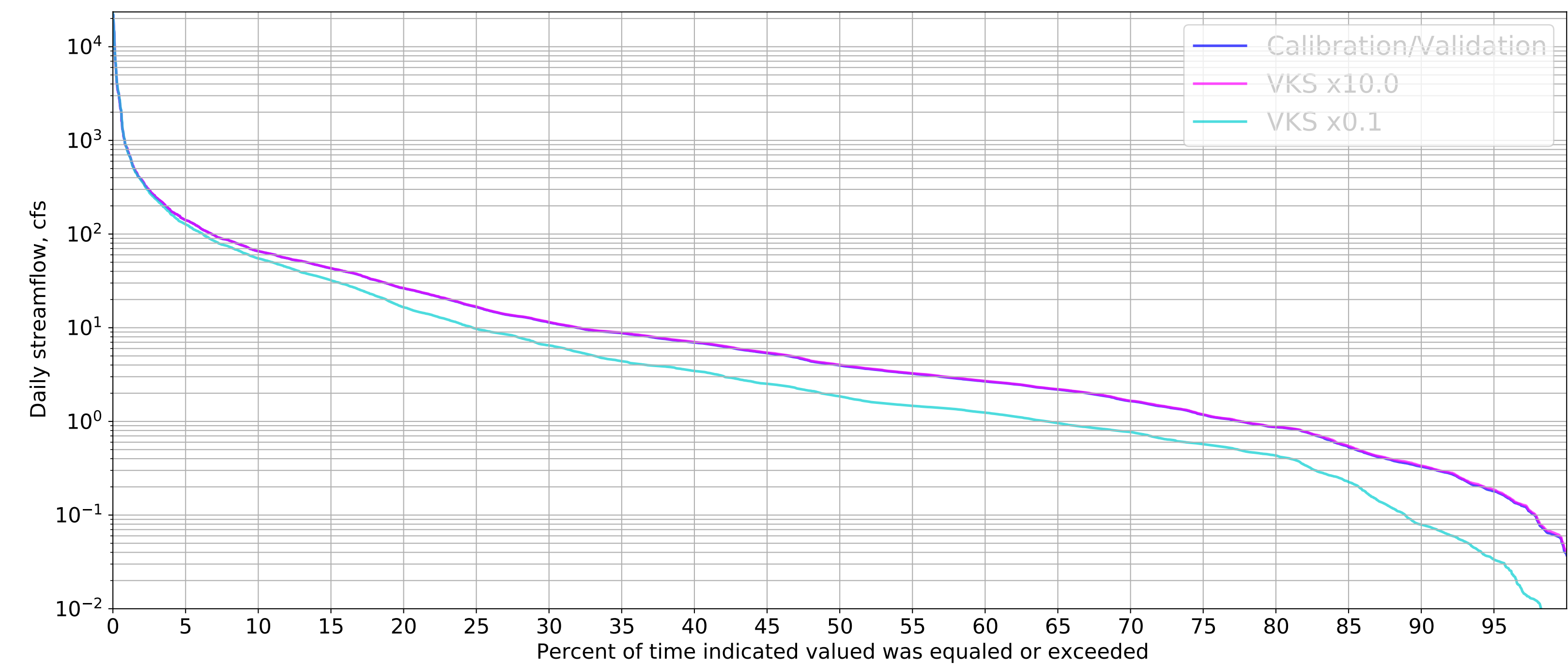
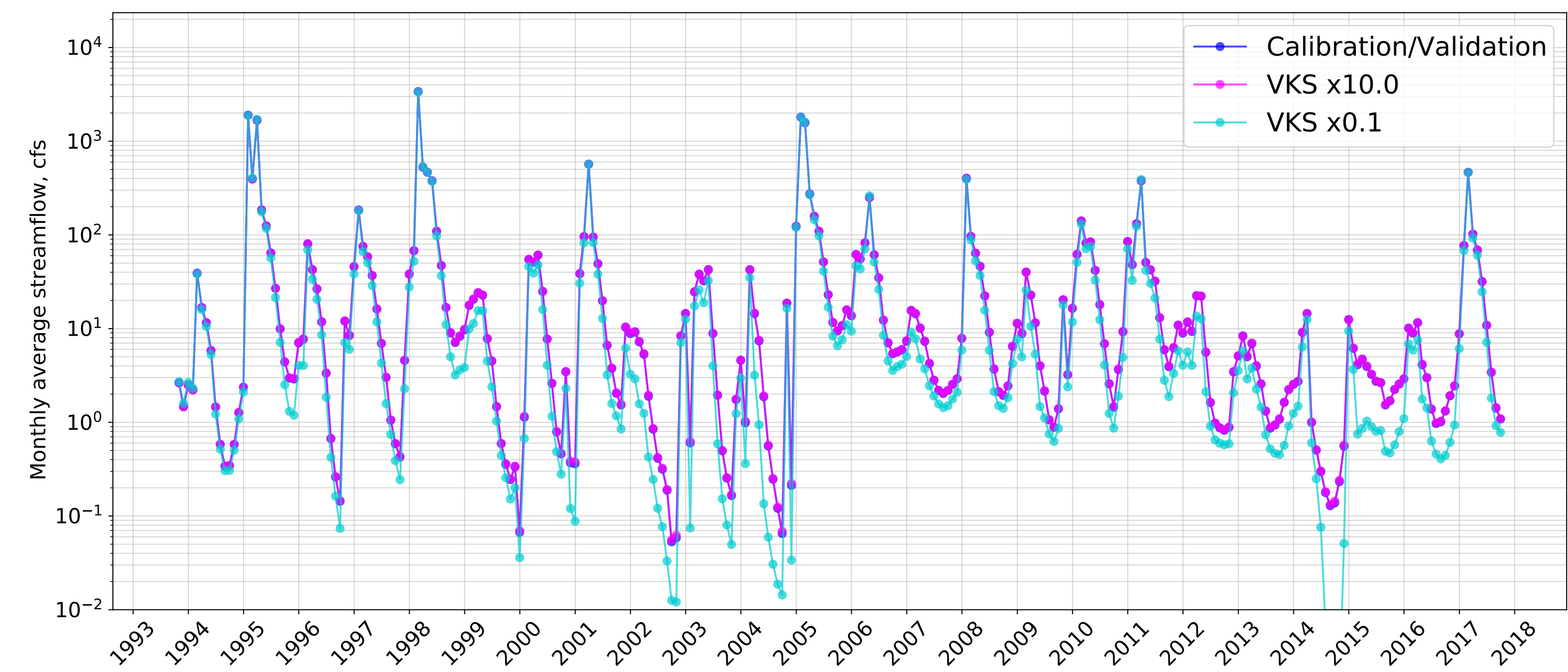
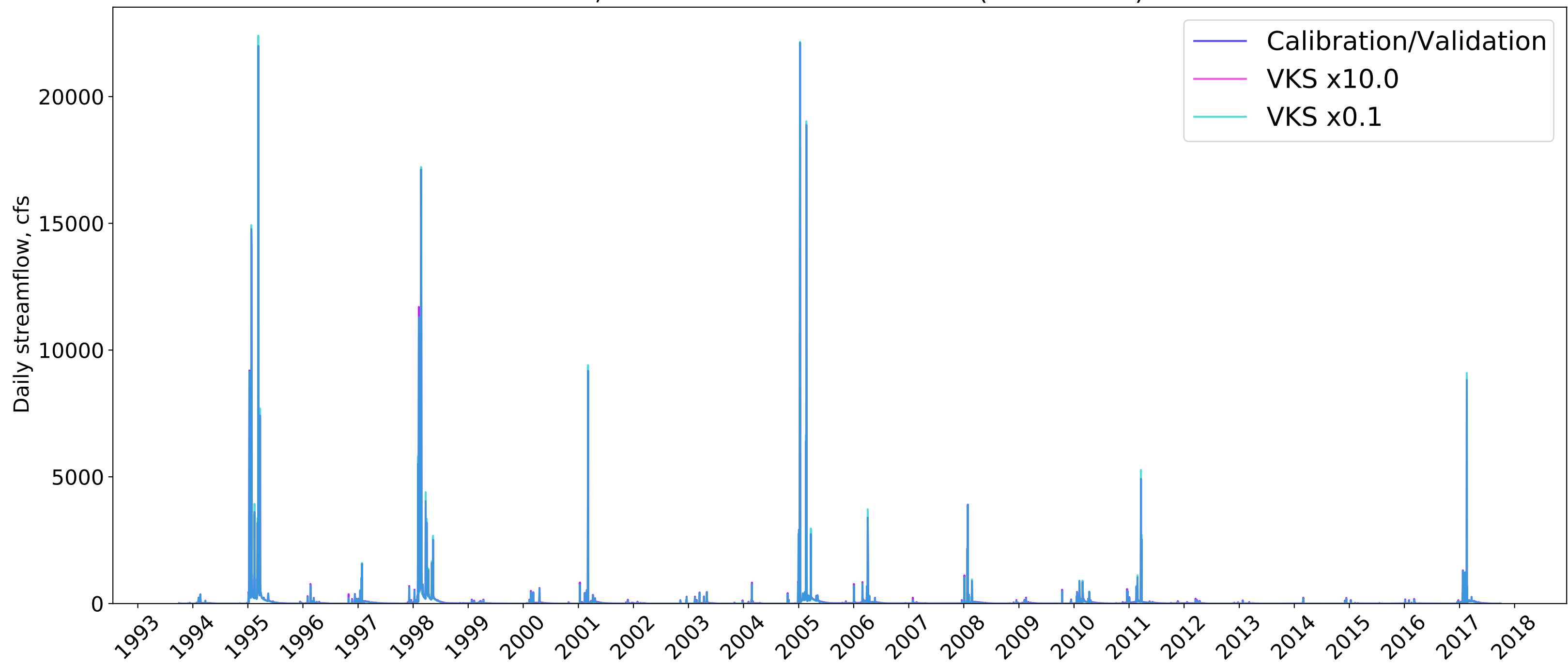


608, Ventura River near Ventura (Foster Park)

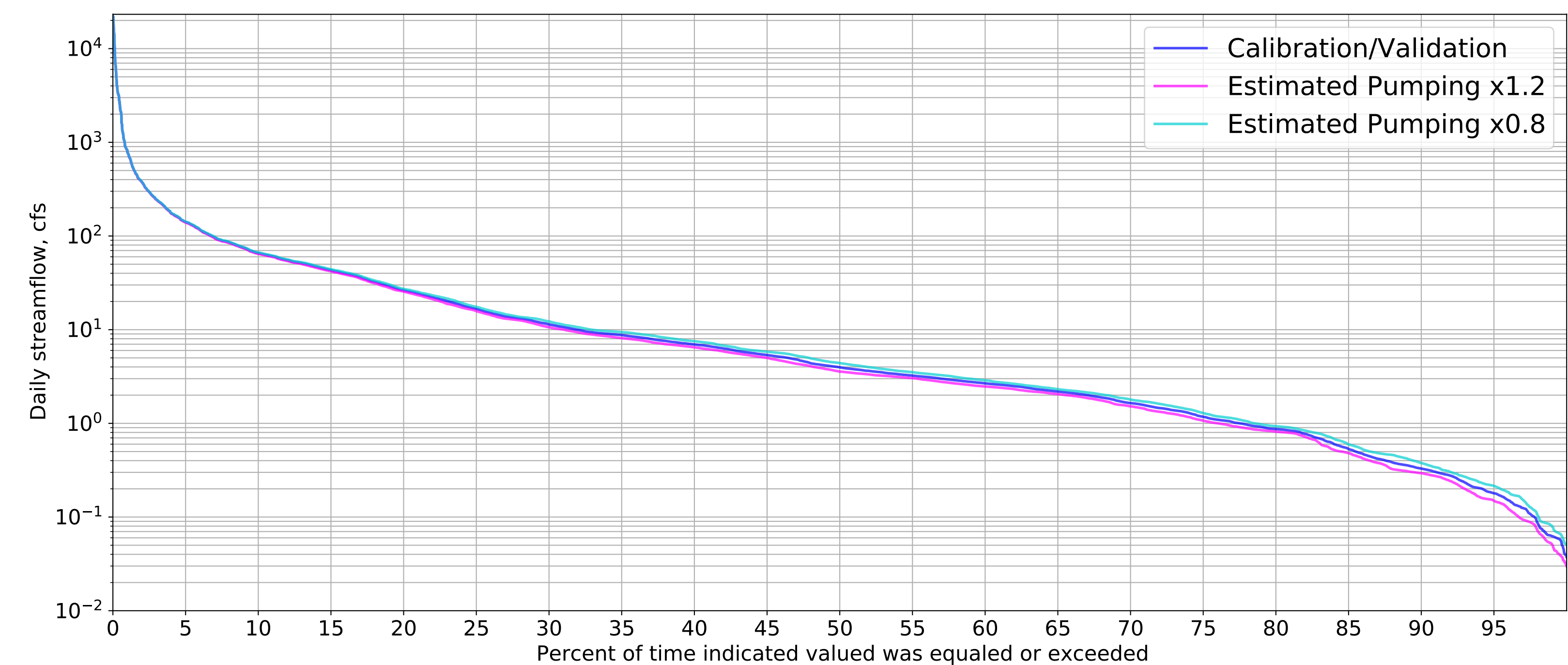
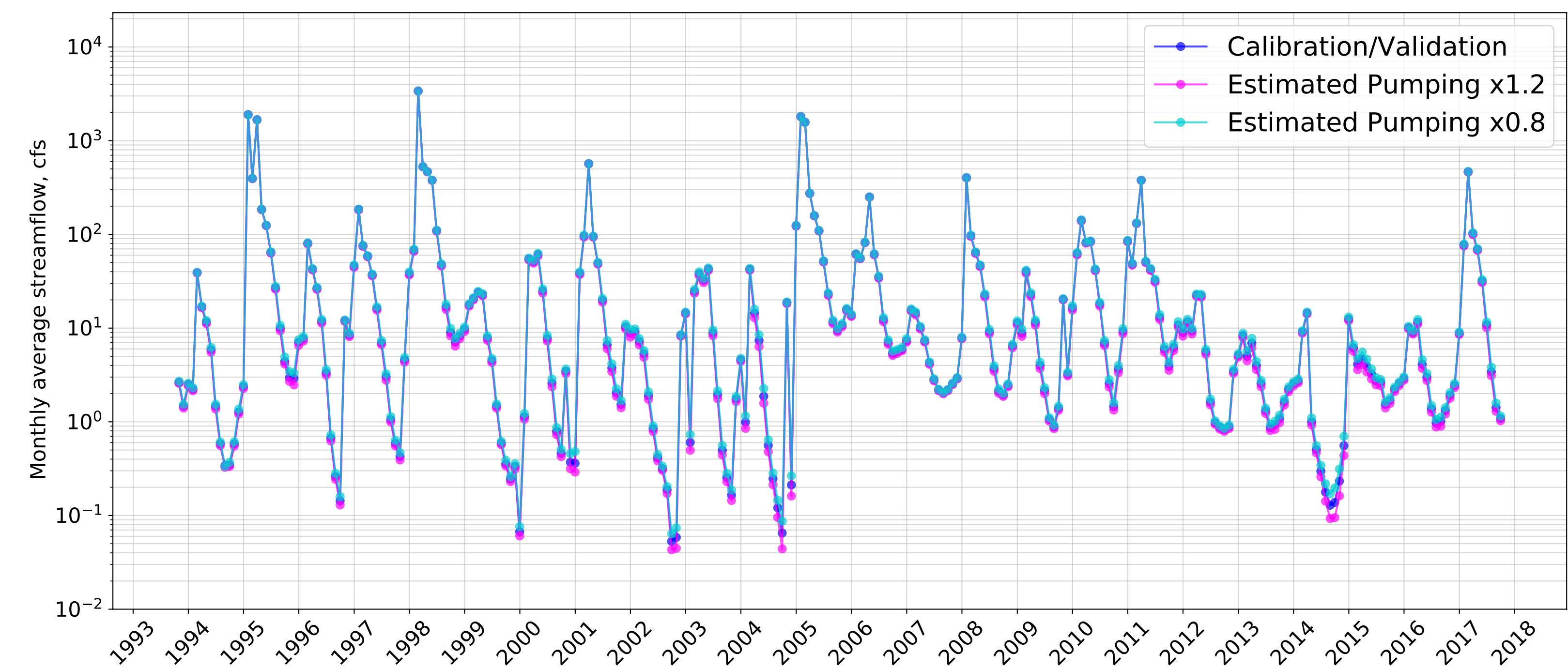
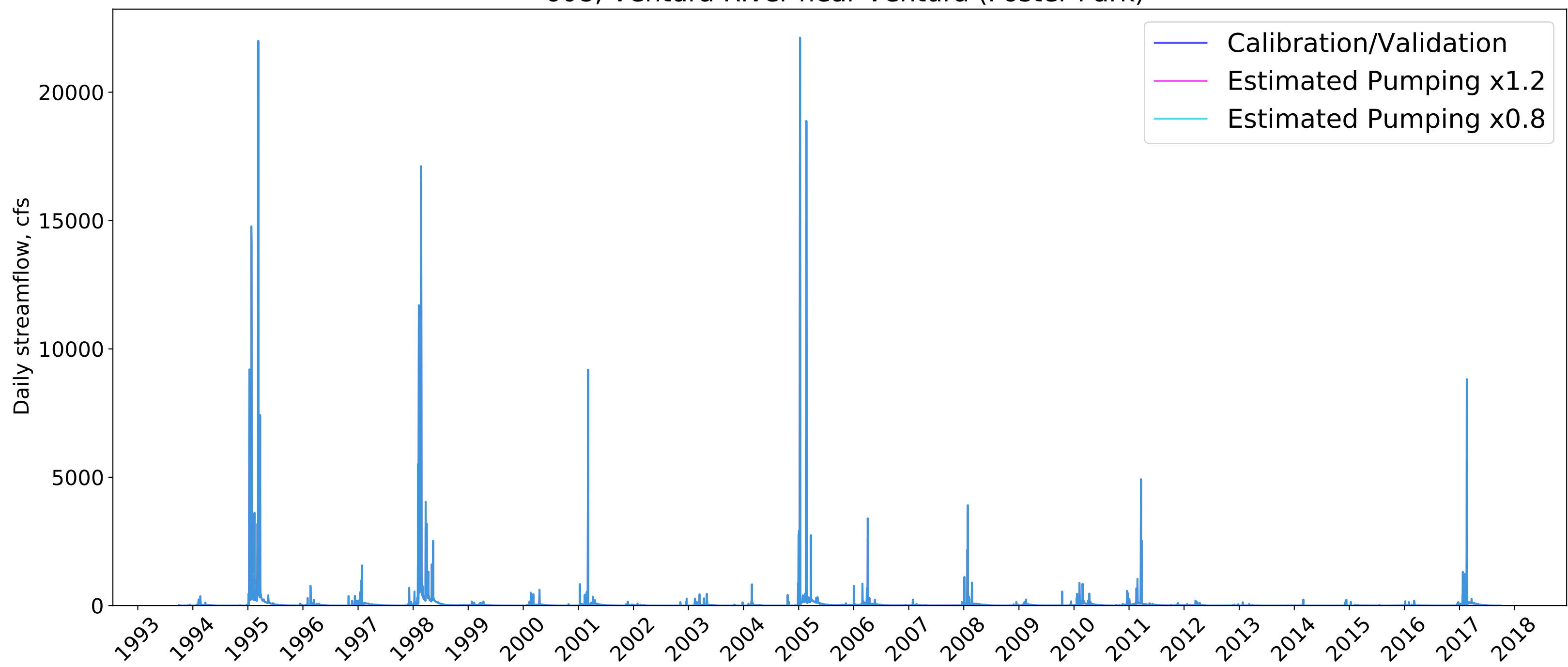




608, Ventura River near Ventura (Foster Park)

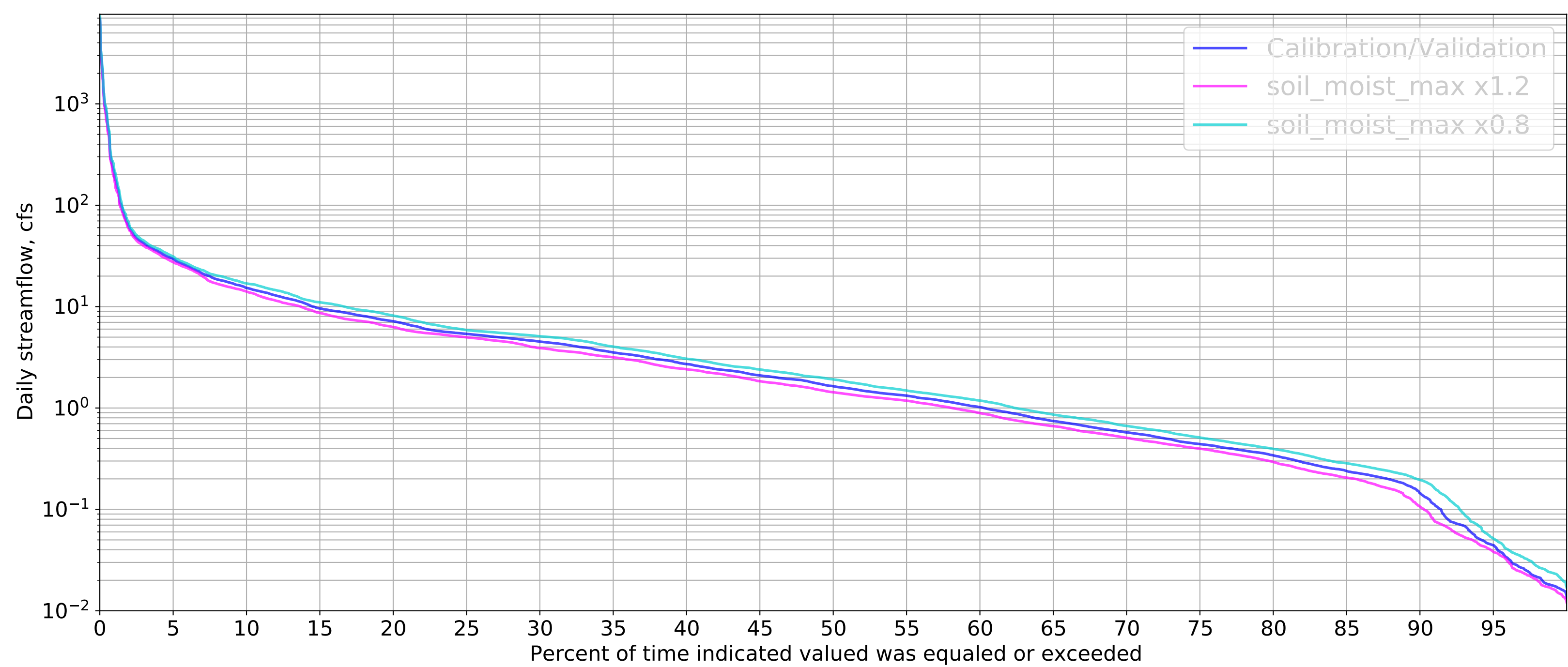
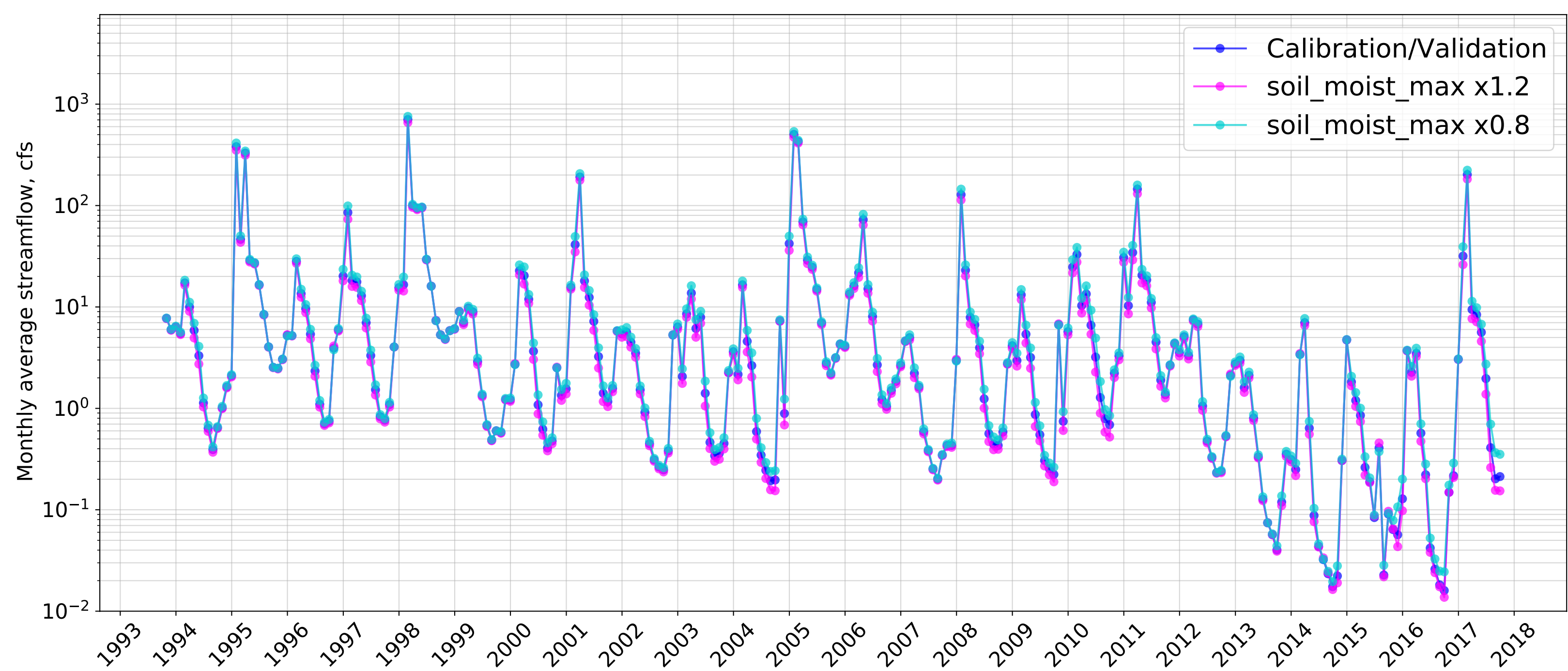
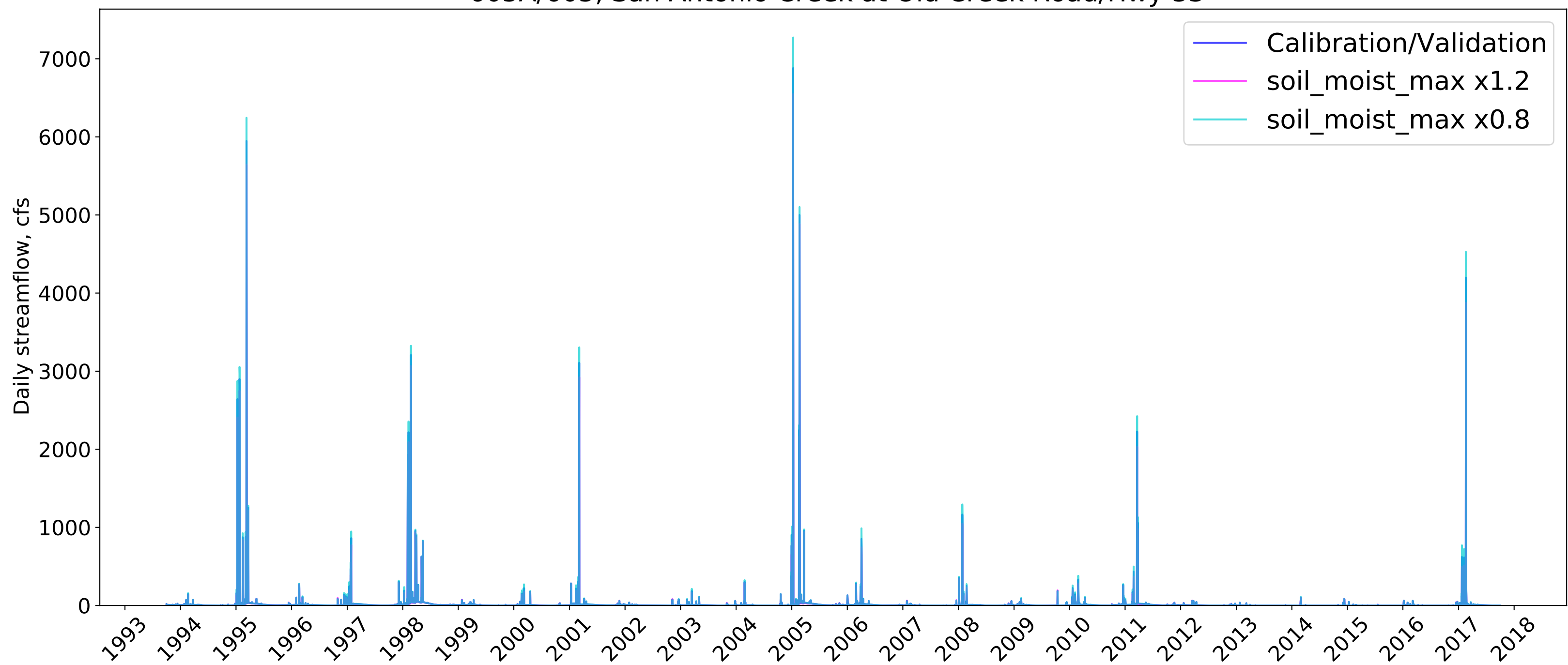


608, Ventura River near Ventura (Foster Park)

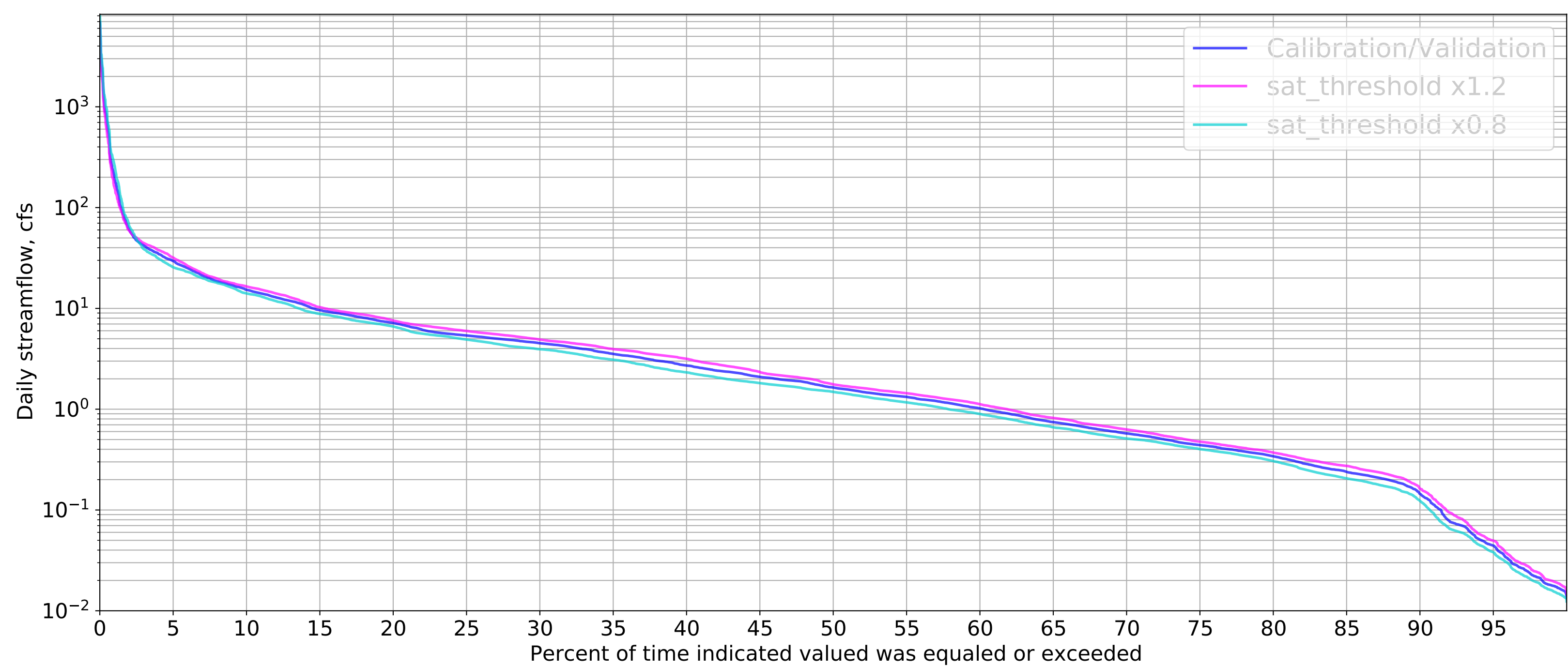
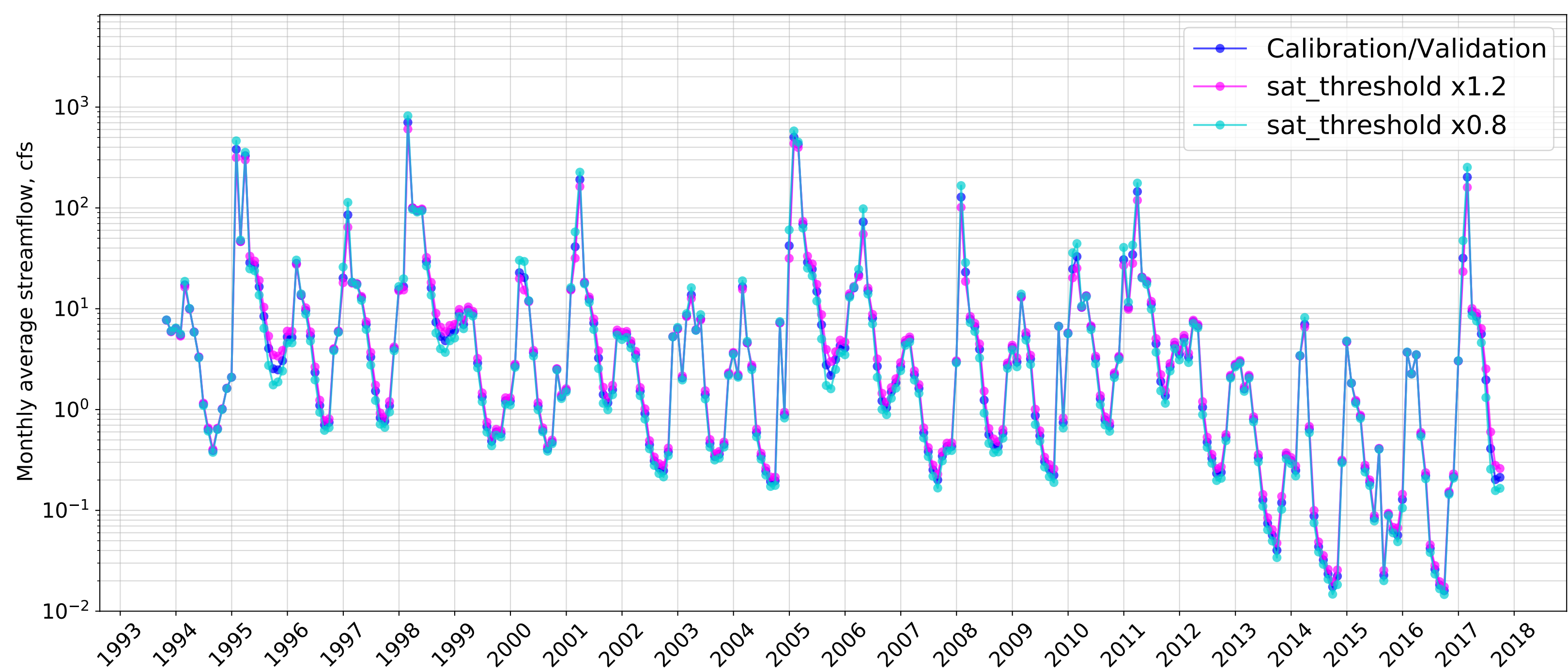
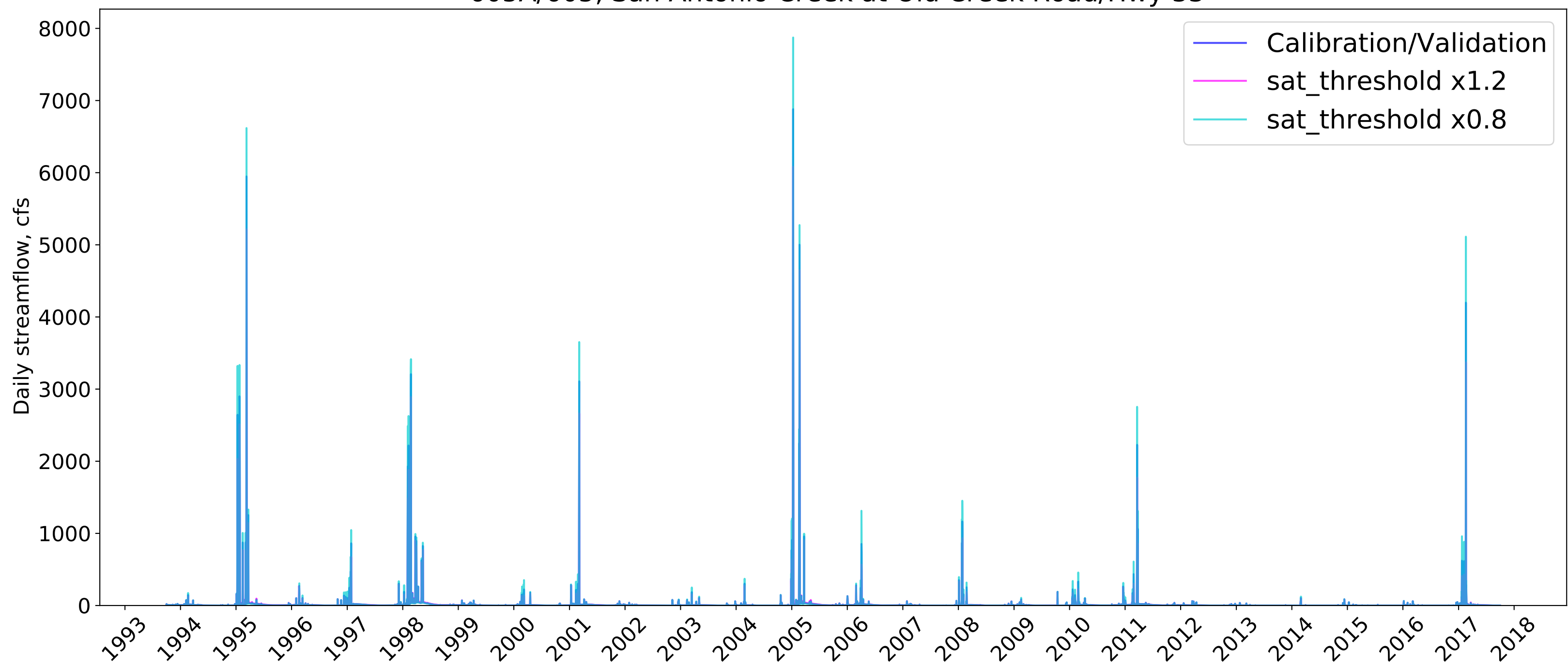




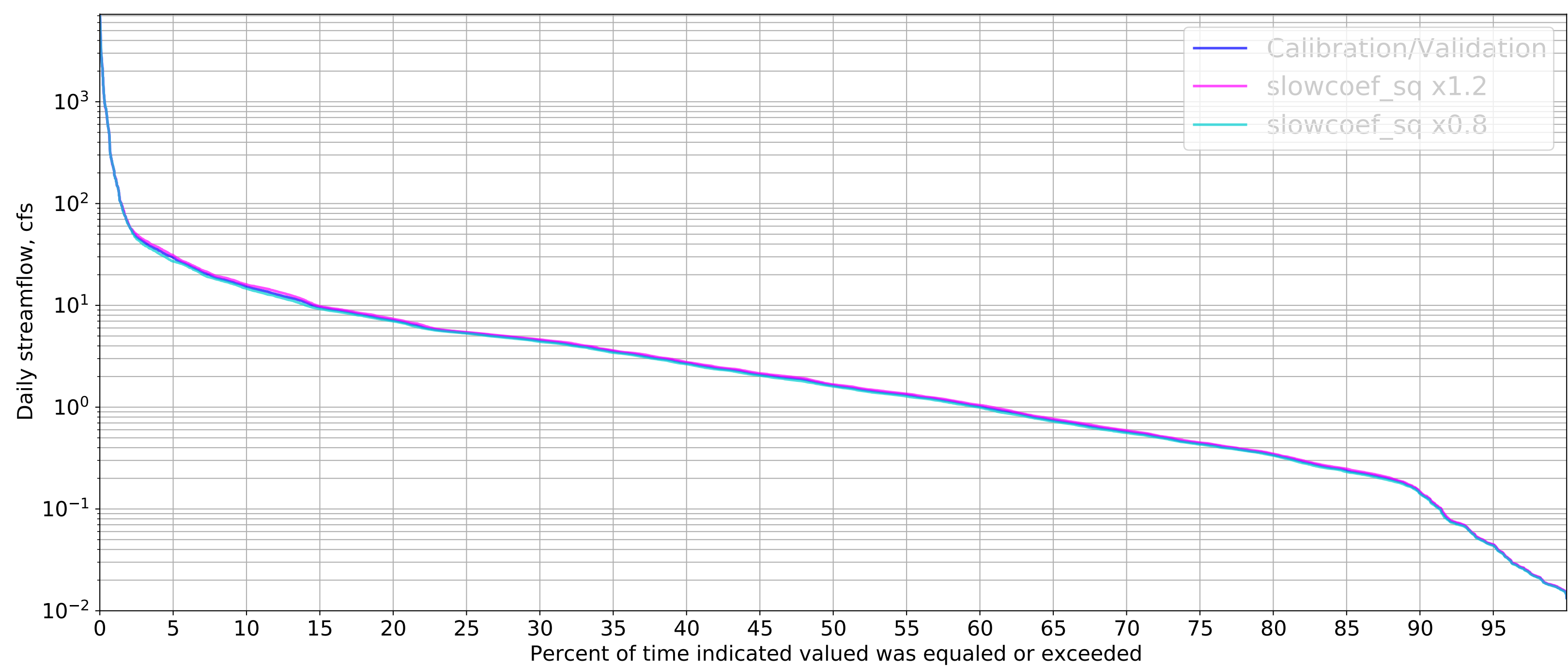
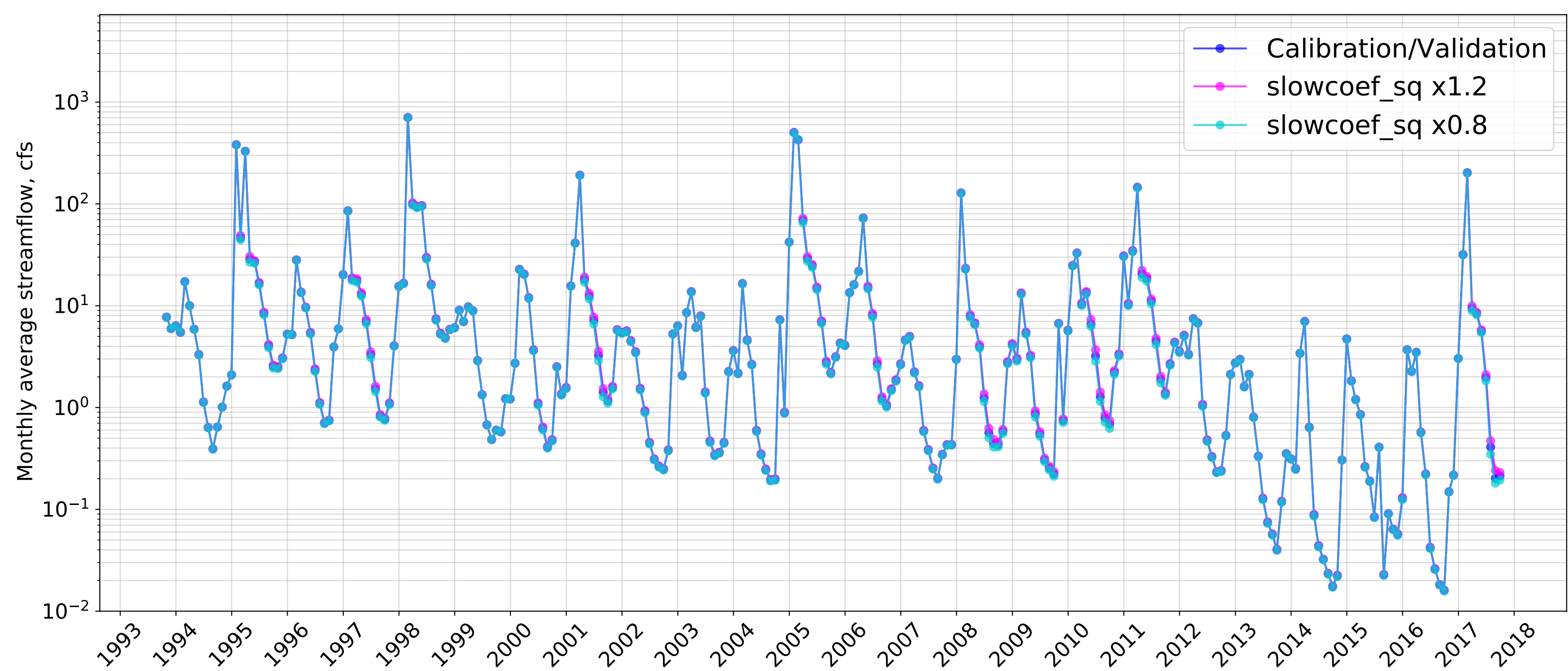
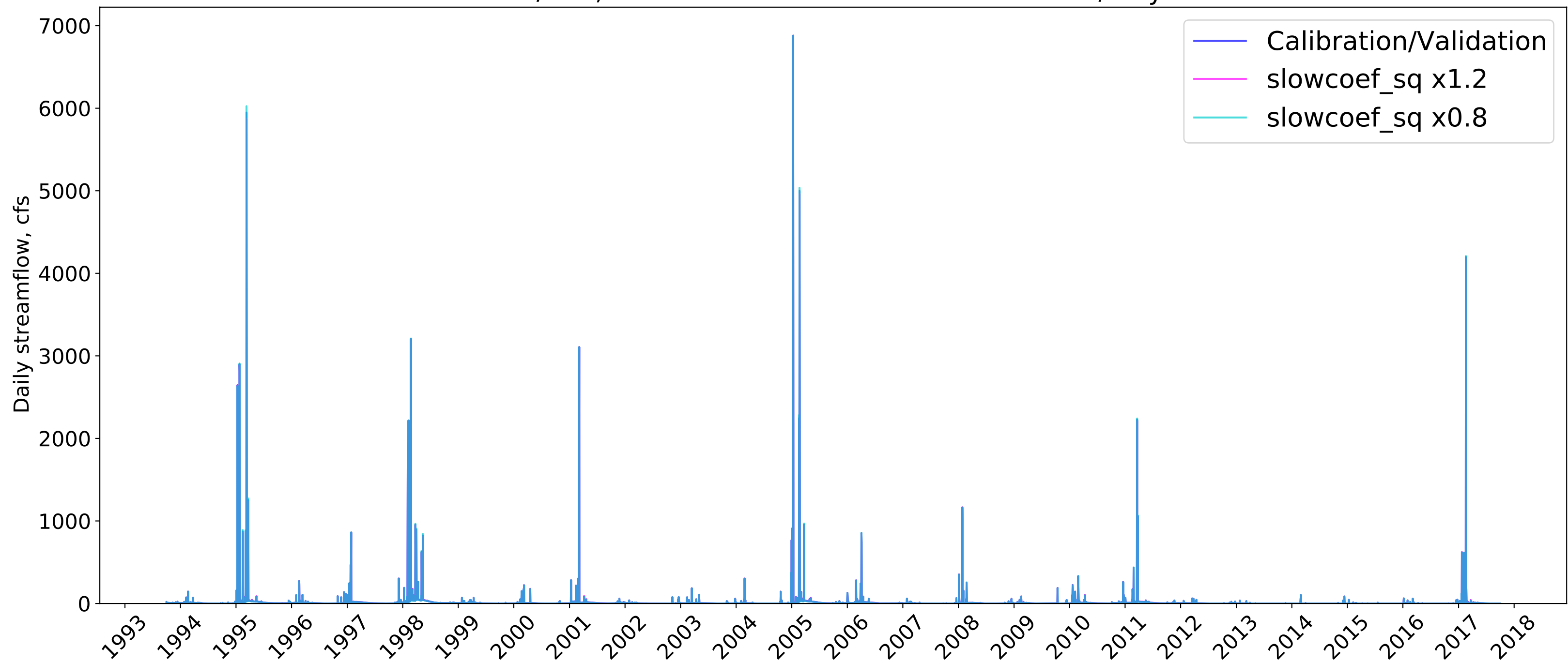
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



605A/605, San Antonio Creek at Old Creek Road/Hwy 33

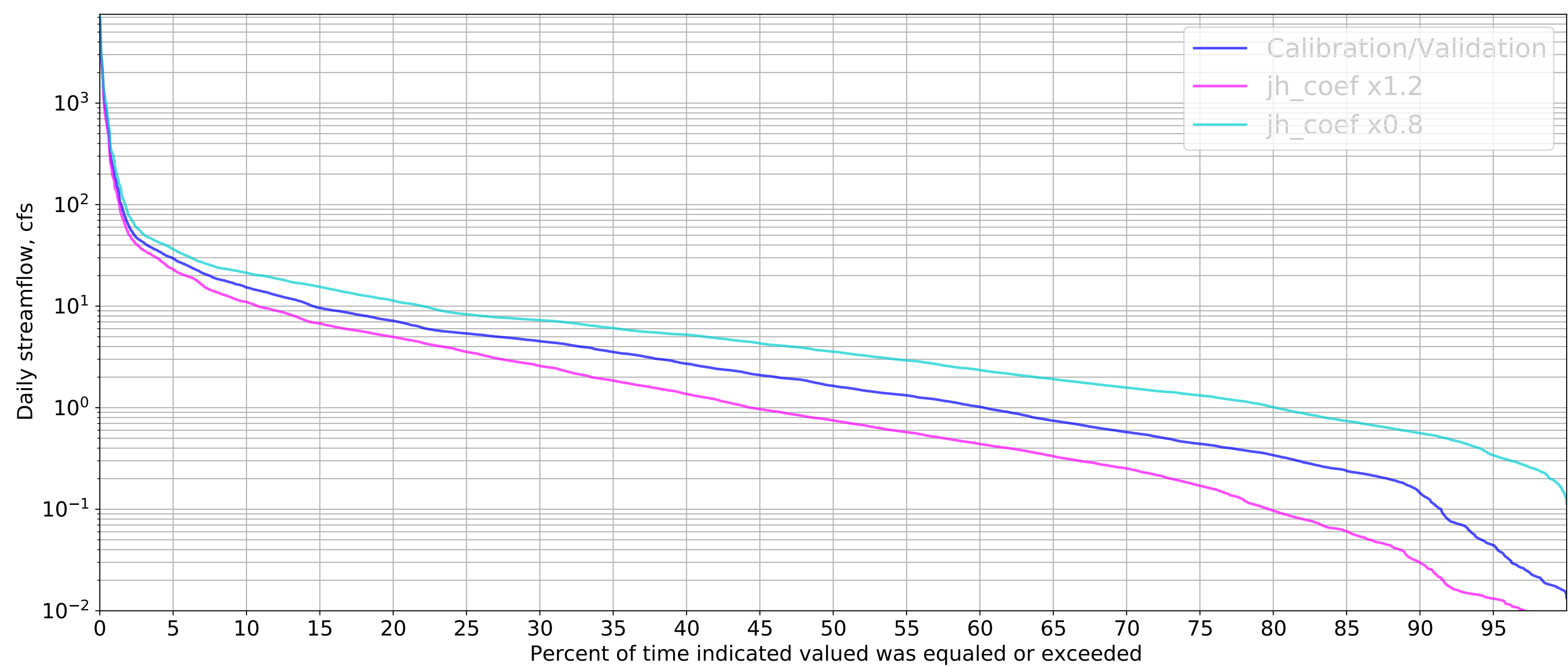
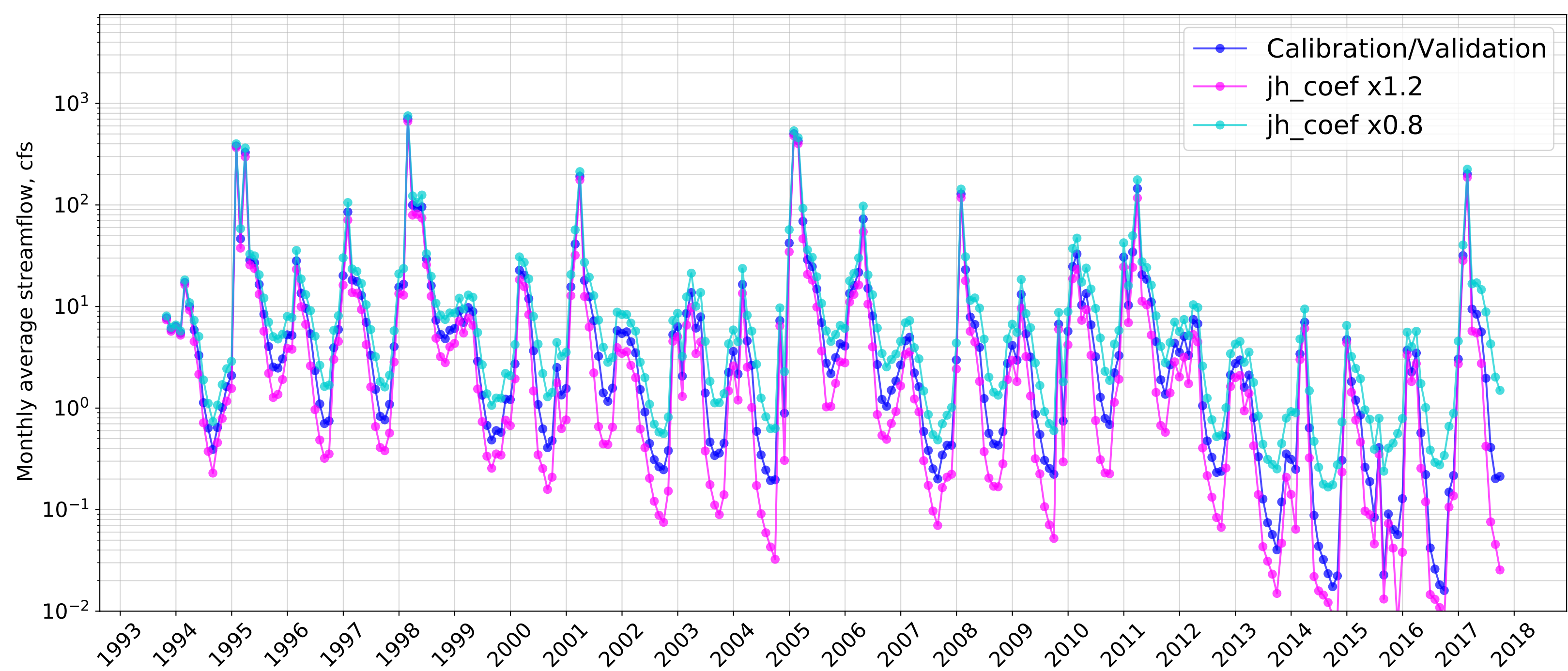
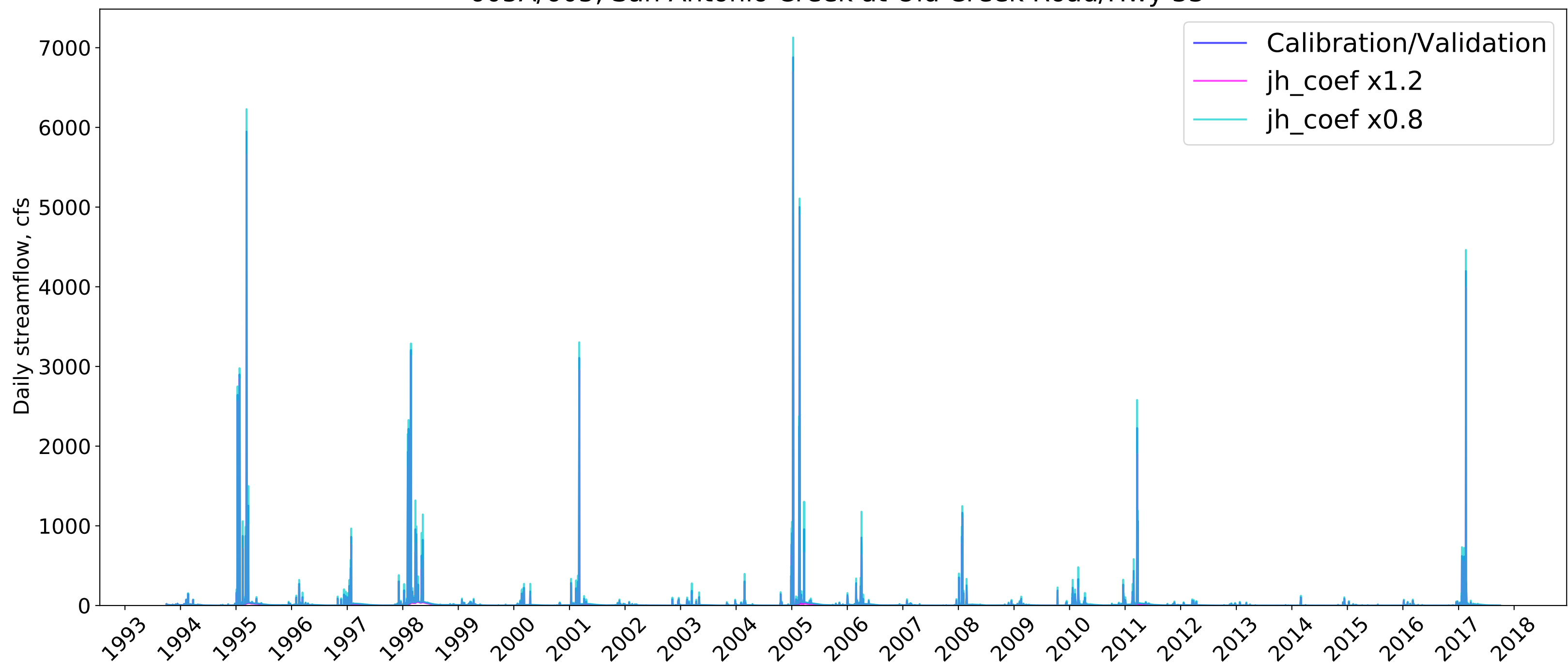


605A/605, San Antonio Creek at Old Creek Road/Hwy 33

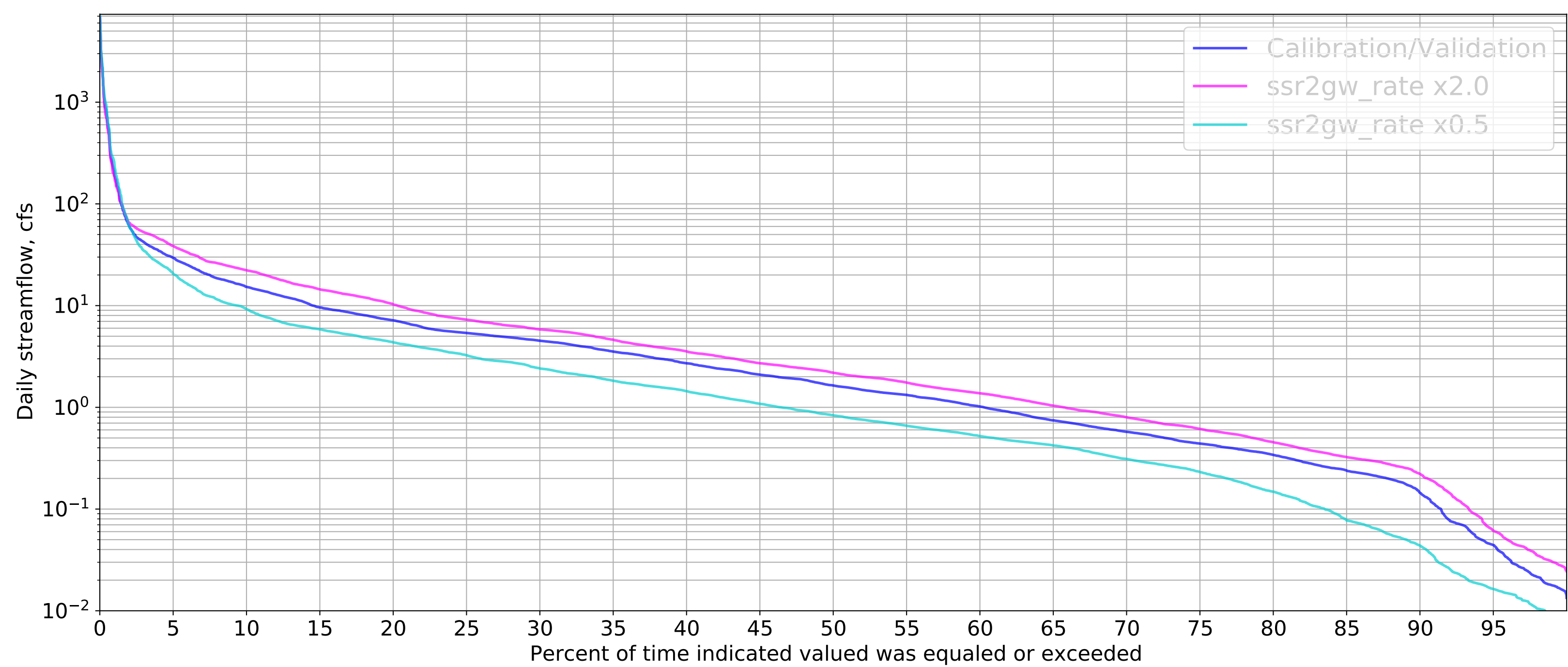
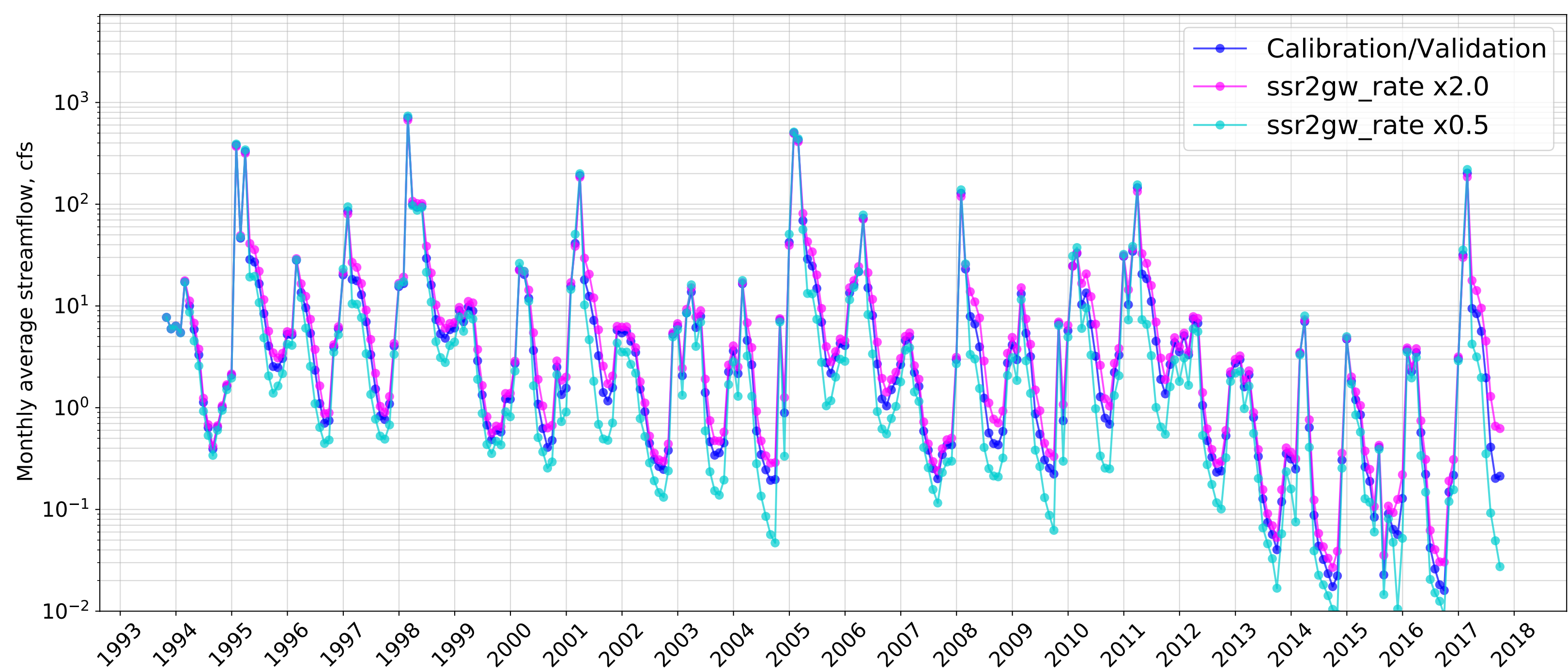
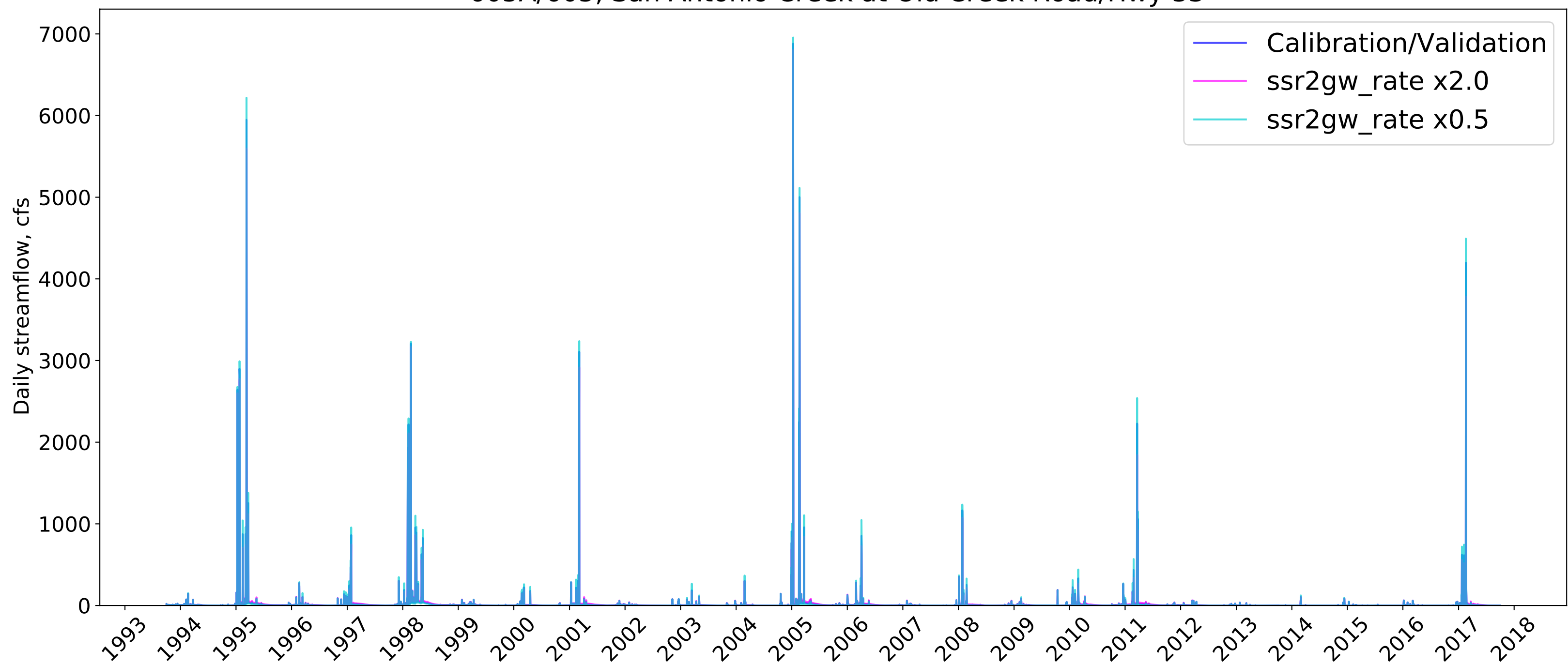




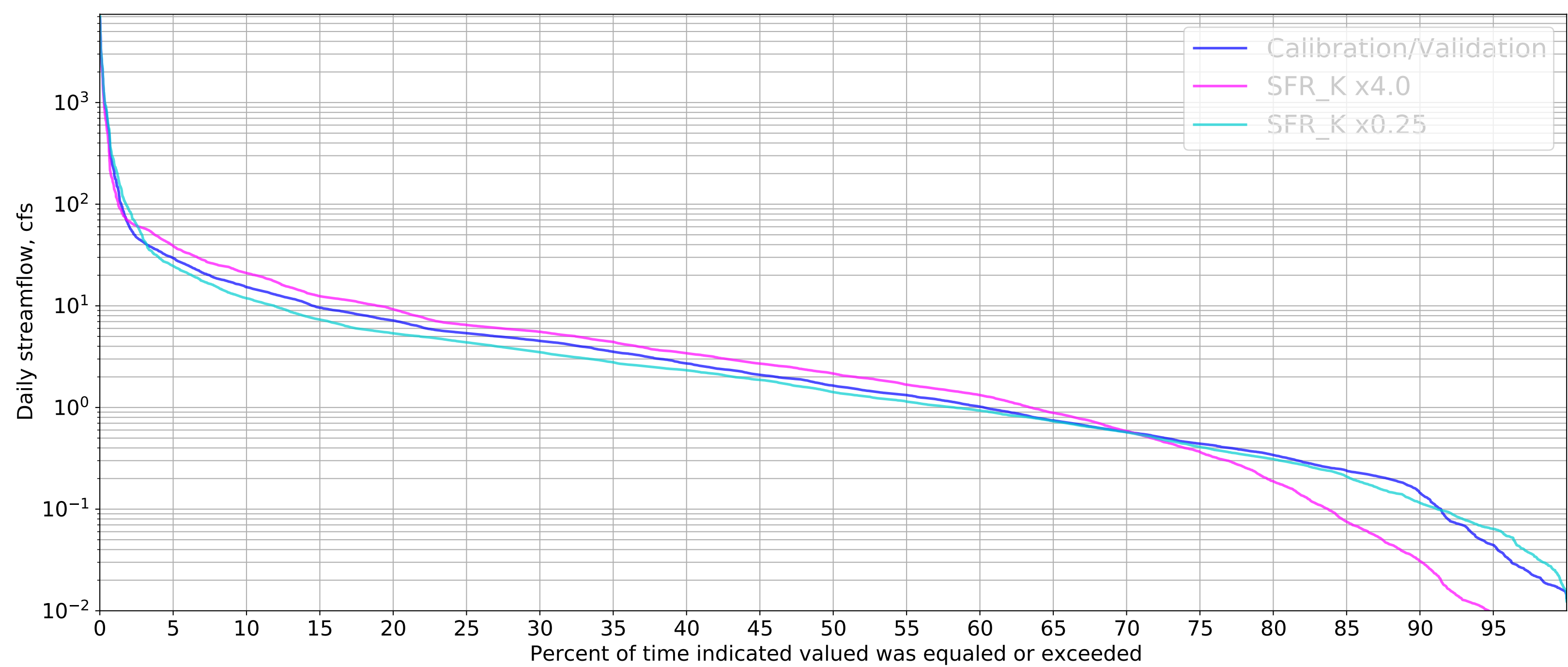
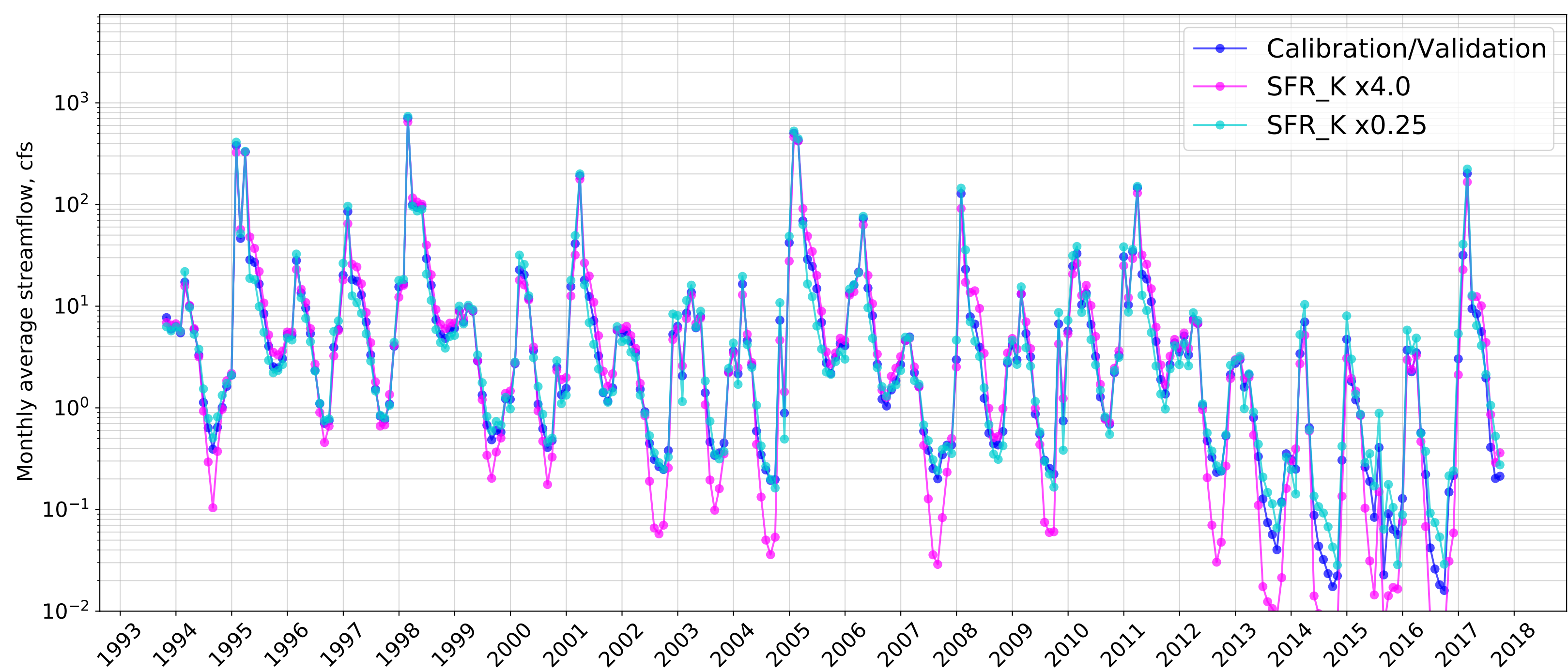
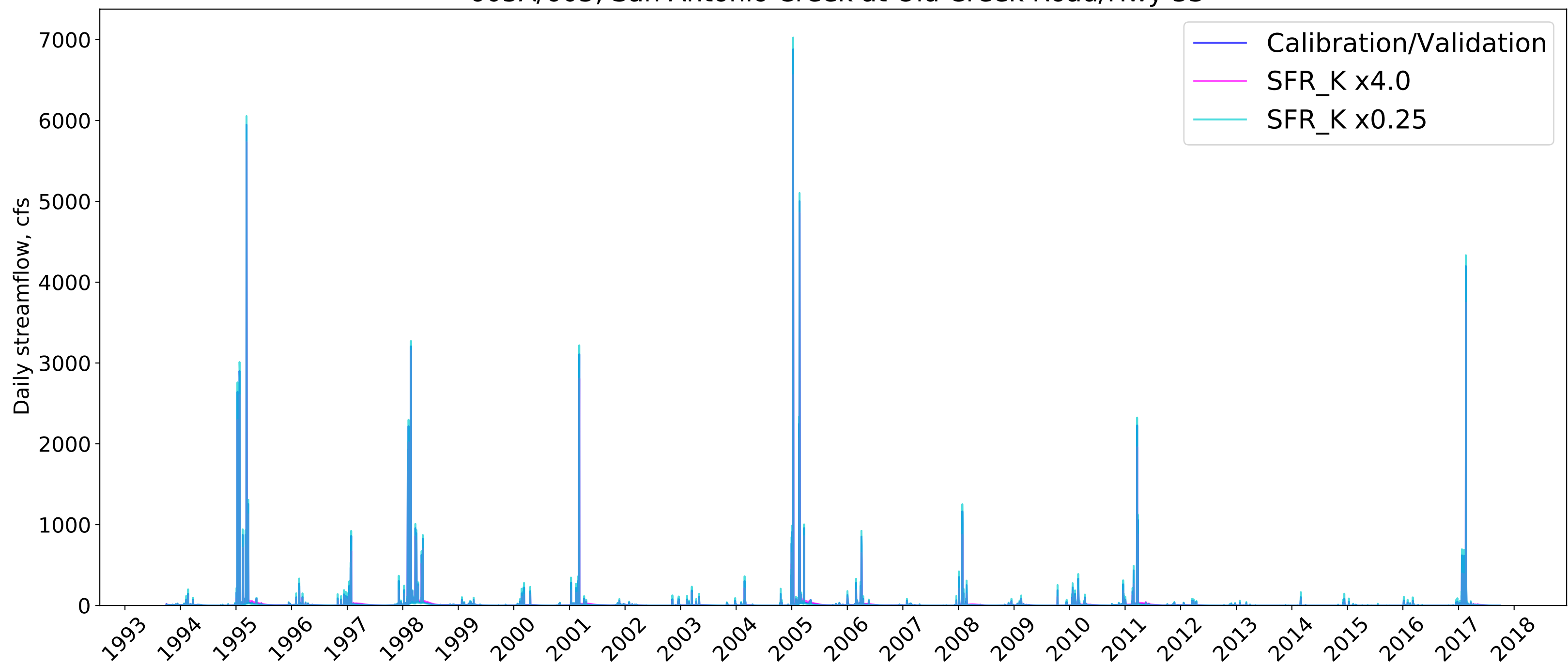
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



605A/605, San Antonio Creek at Old Creek Road/Hwy 33

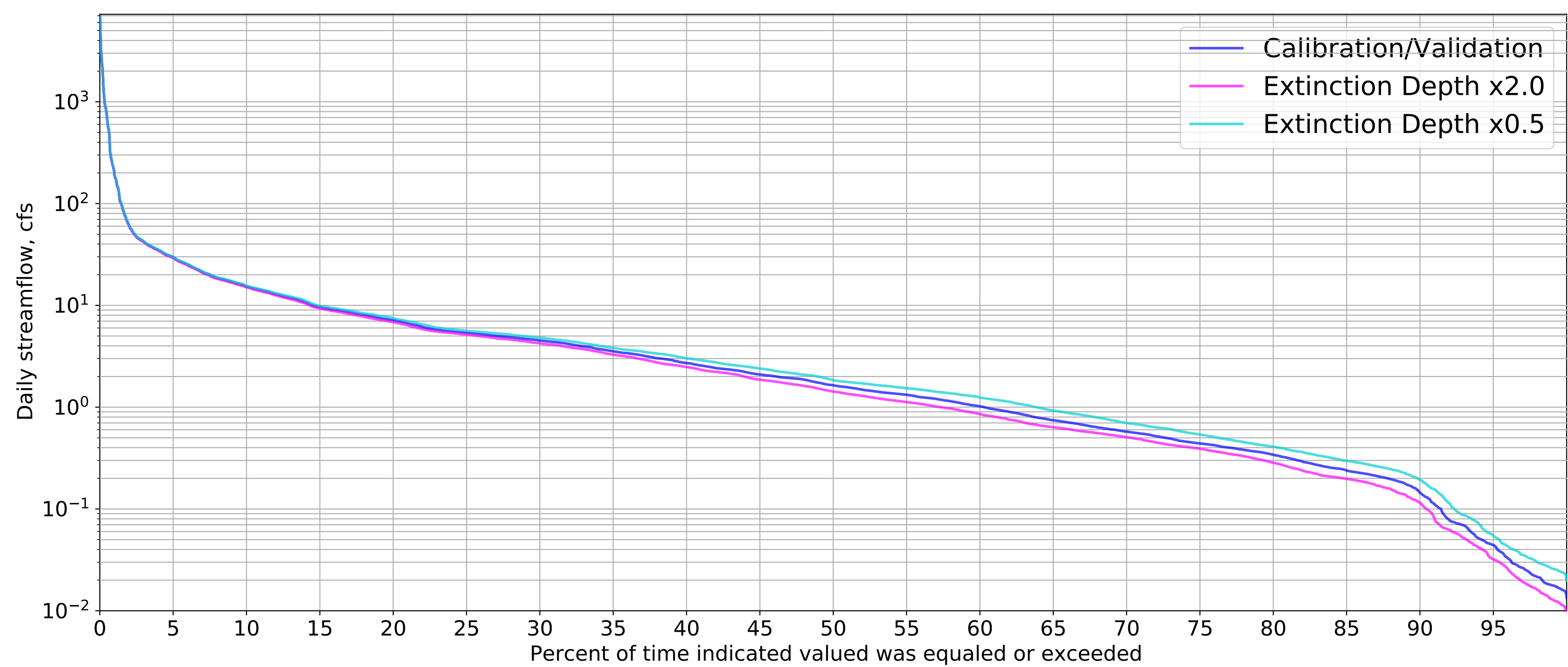
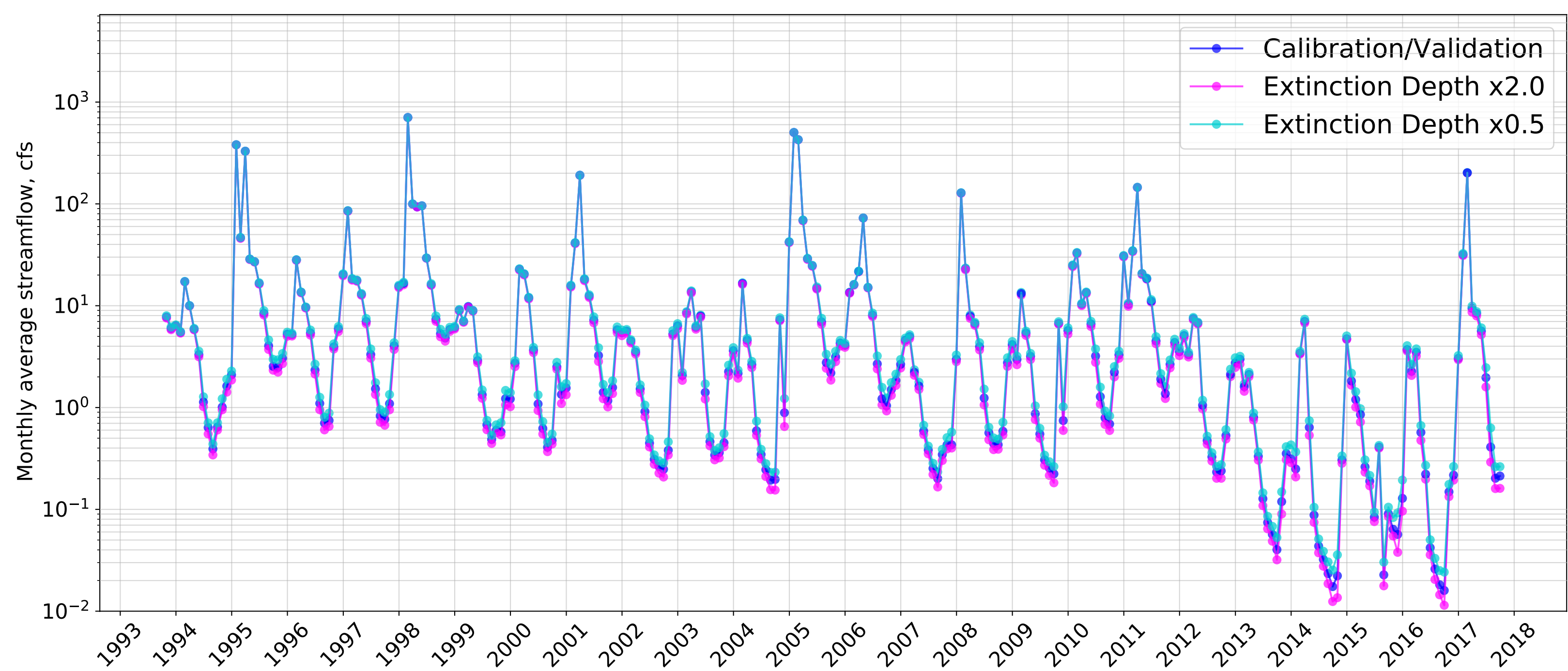
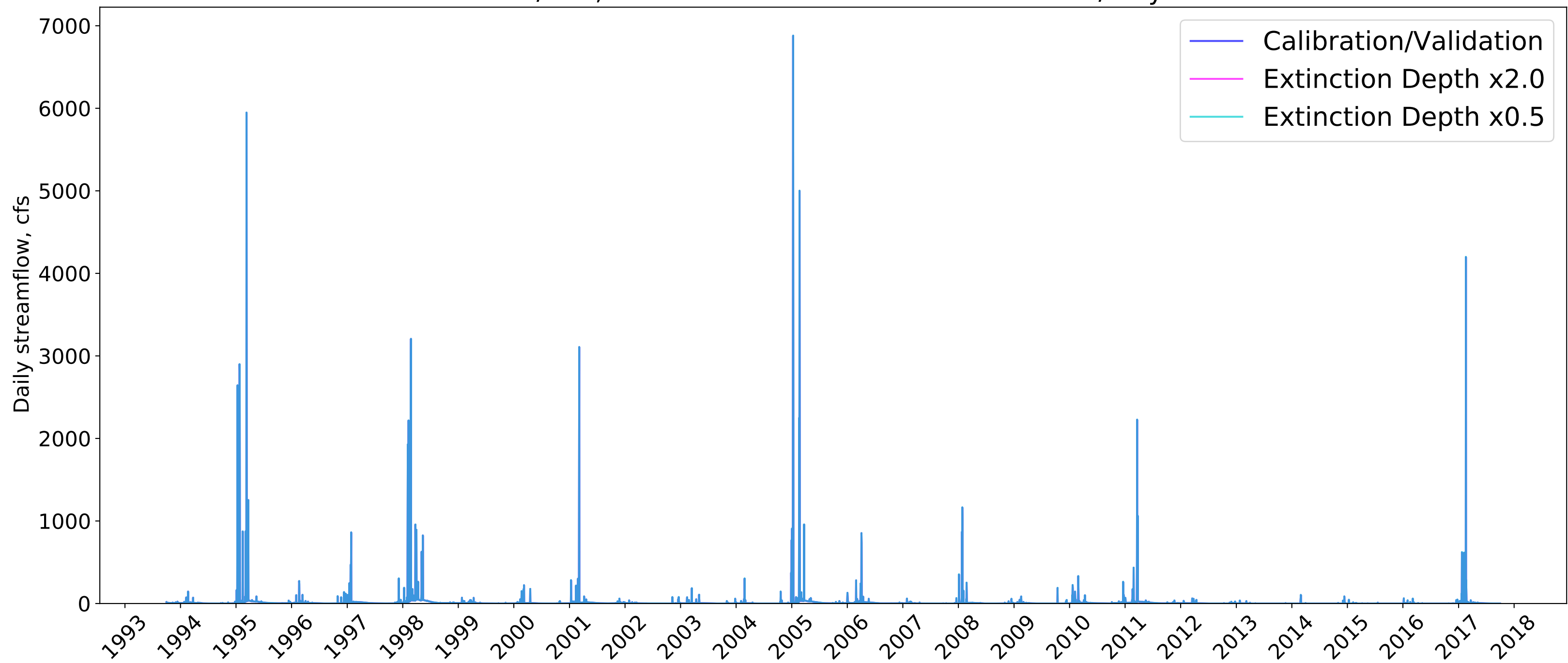


605A/605, San Antonio Creek at Old Creek Road/Hwy 33

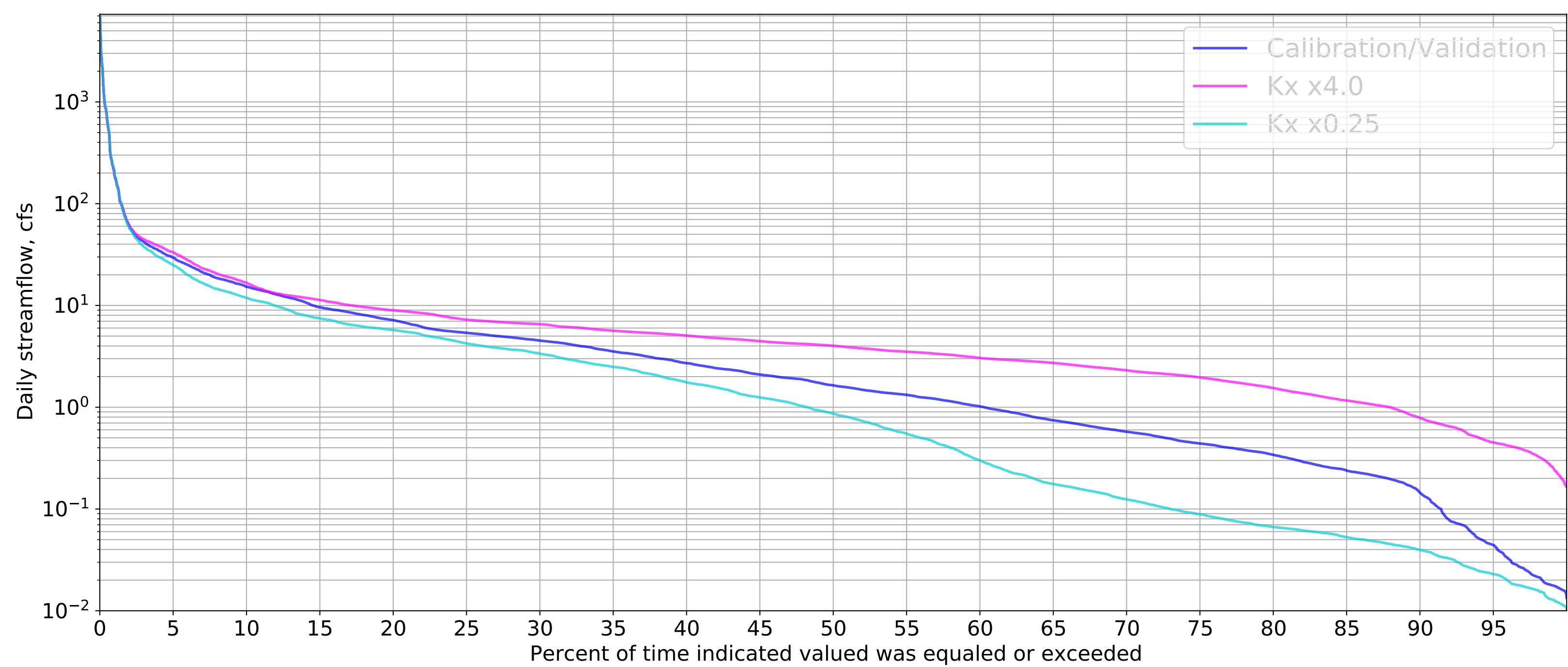
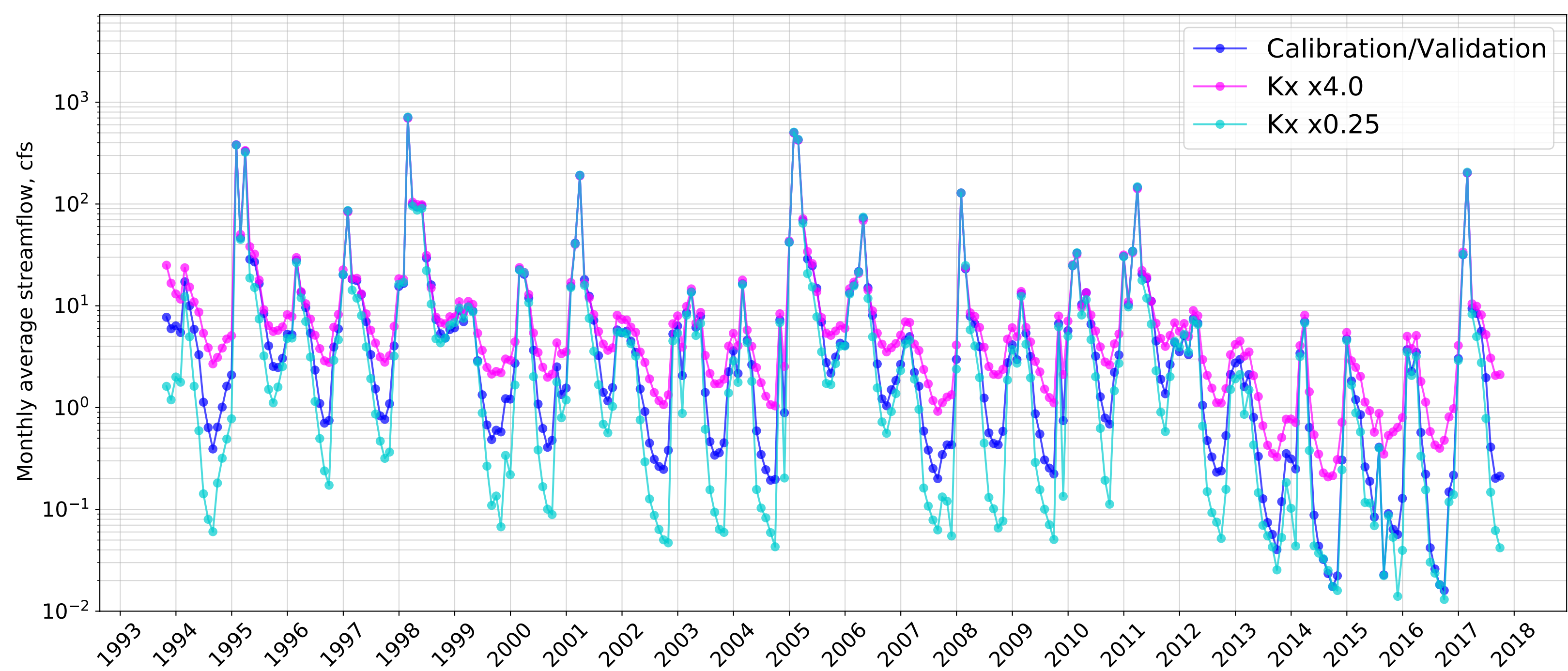
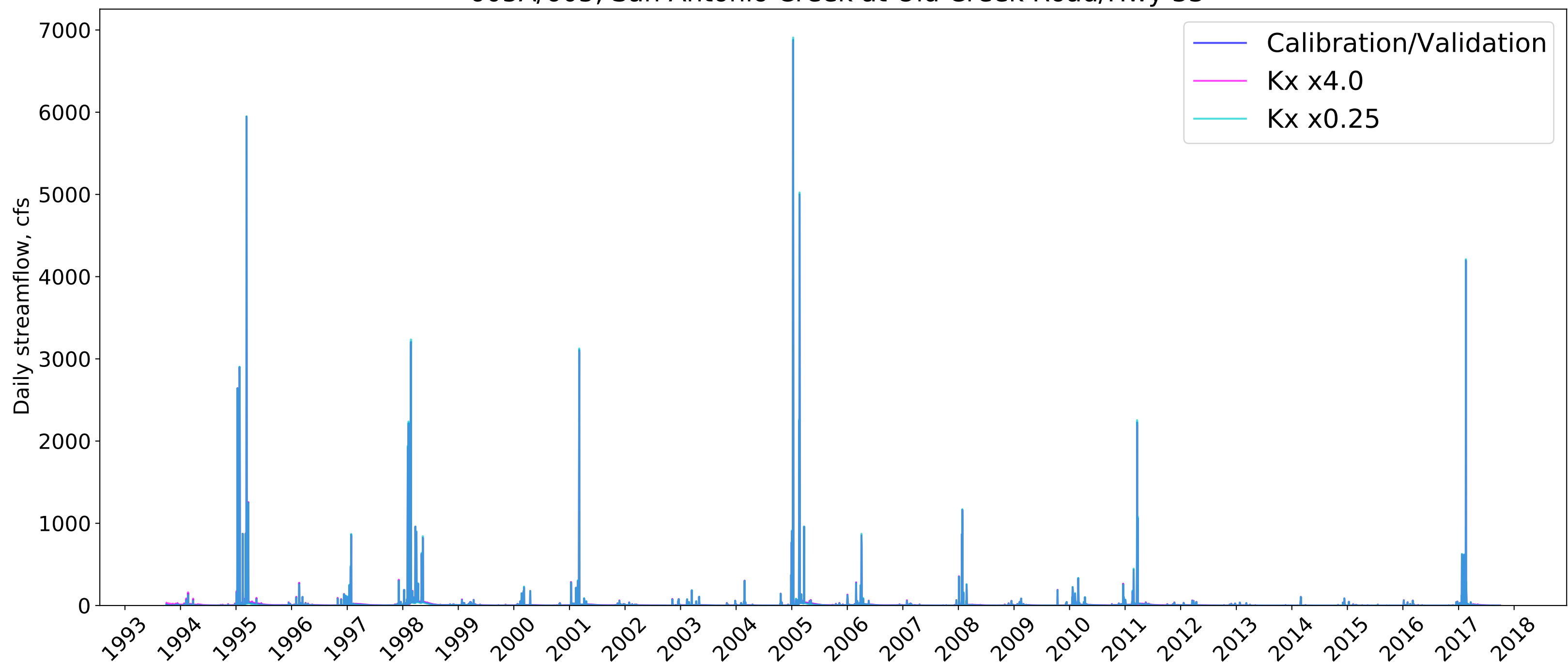




605A/605, San Antonio Creek at Old Creek Road/Hwy 33

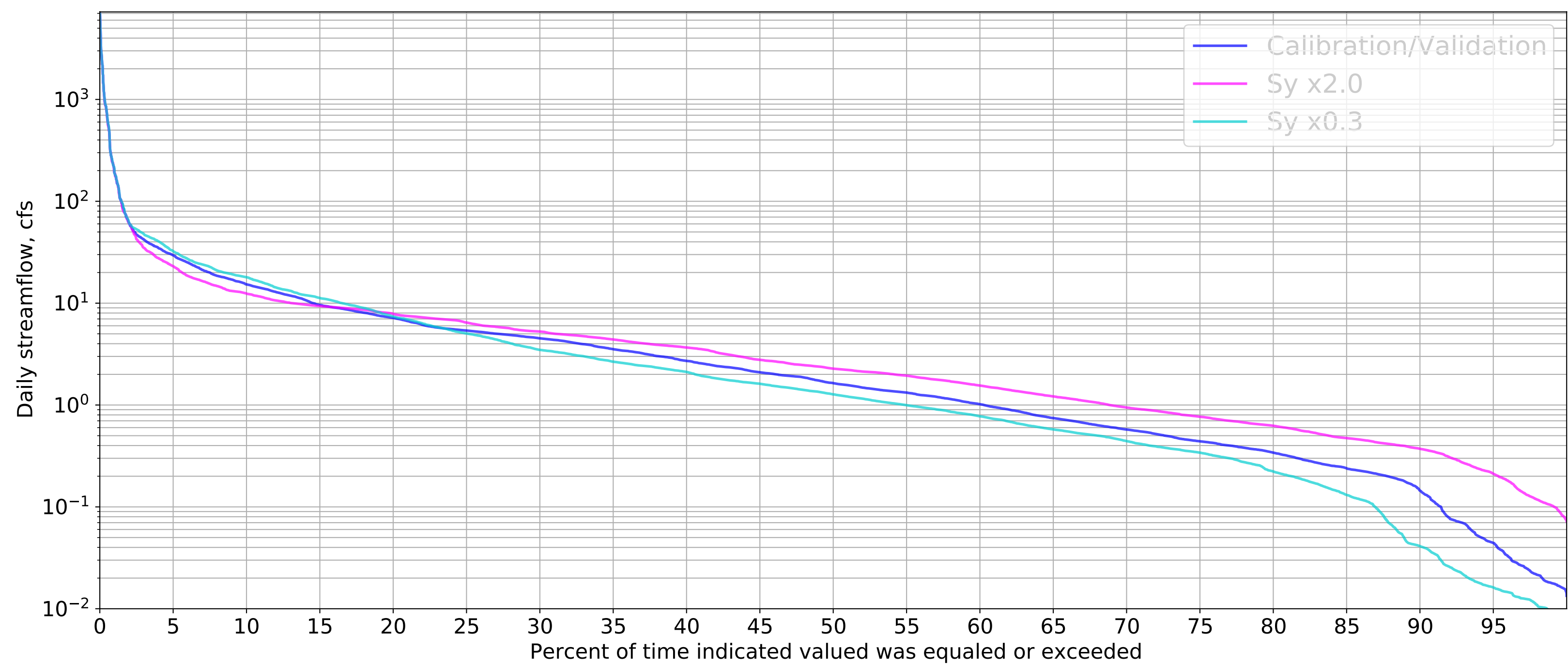
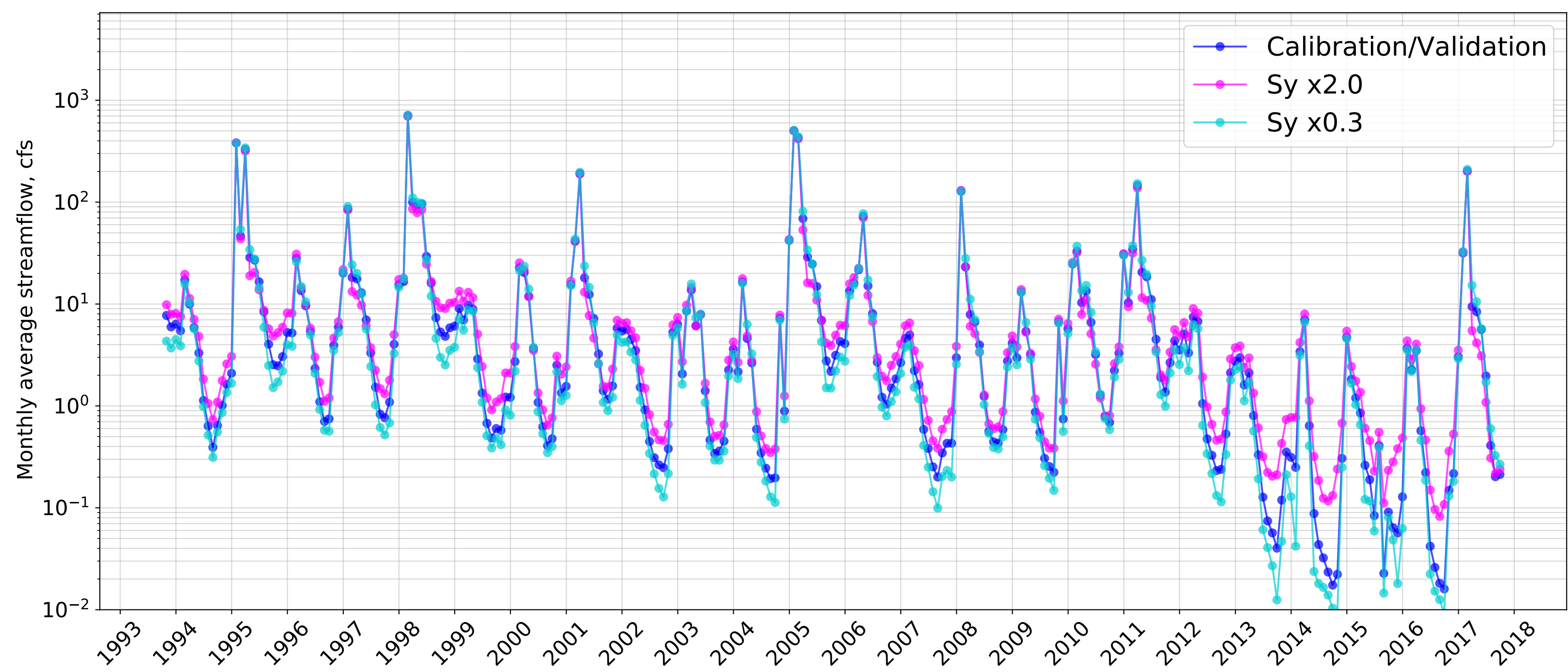
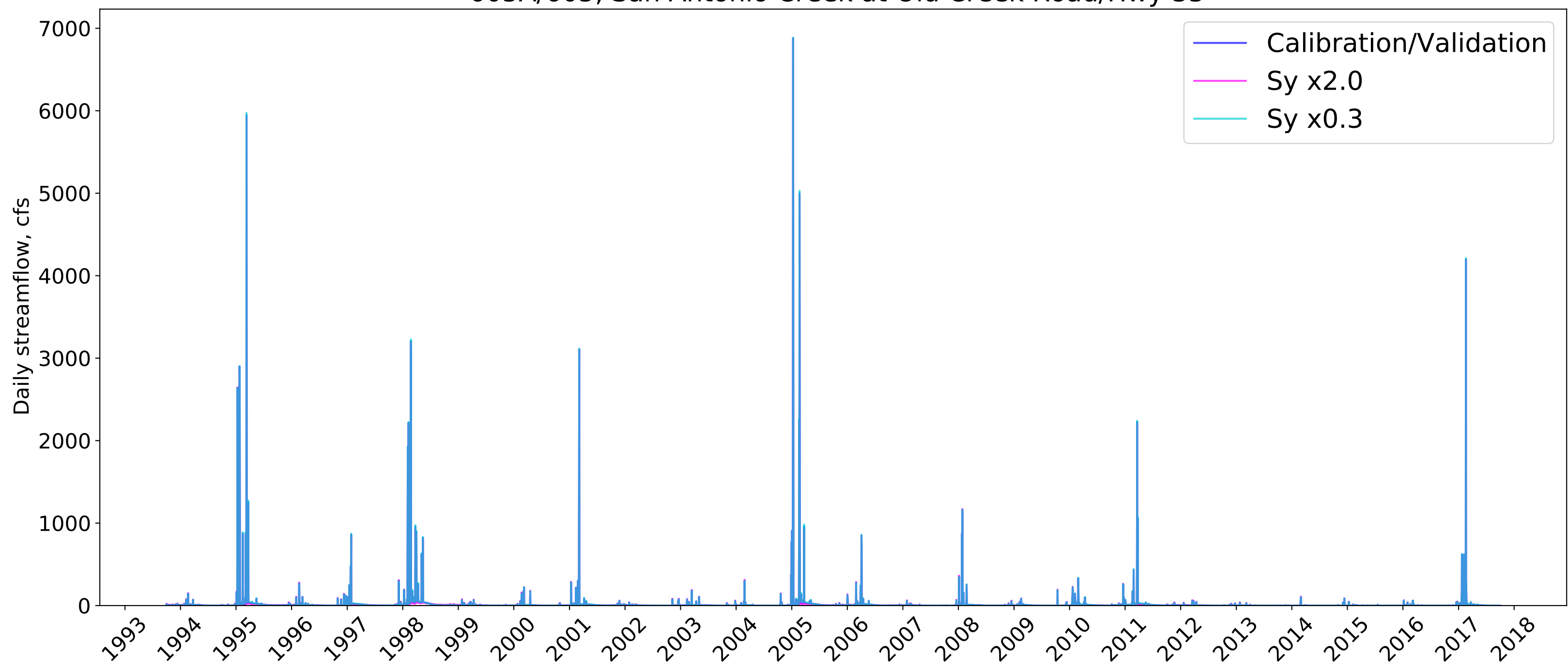


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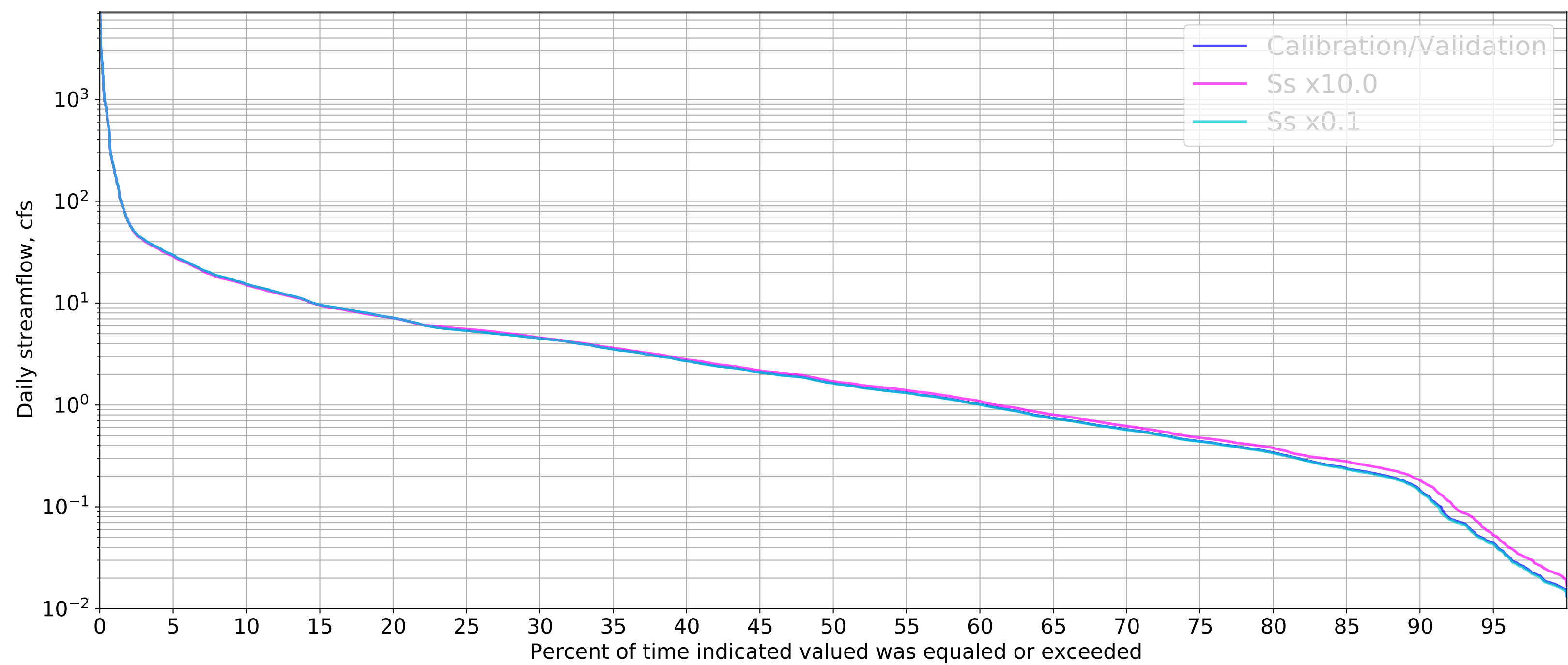
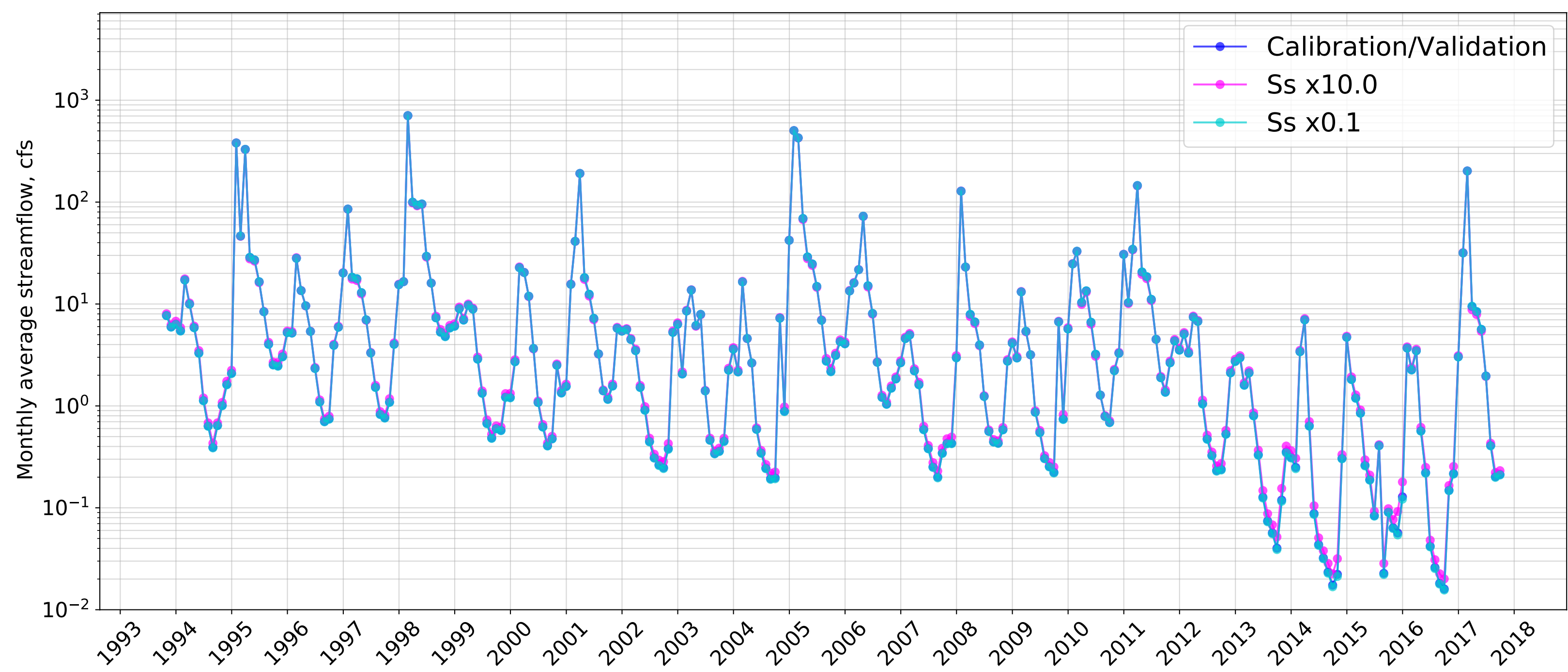
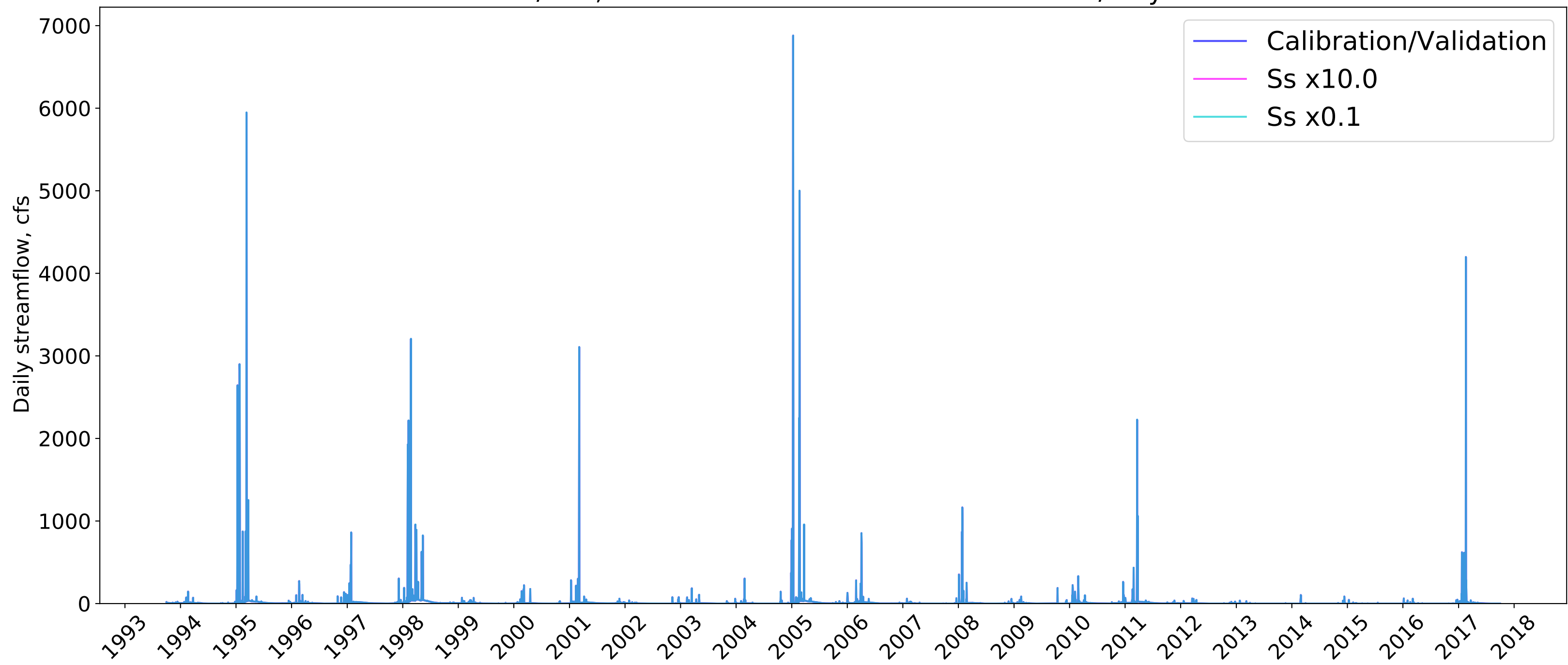




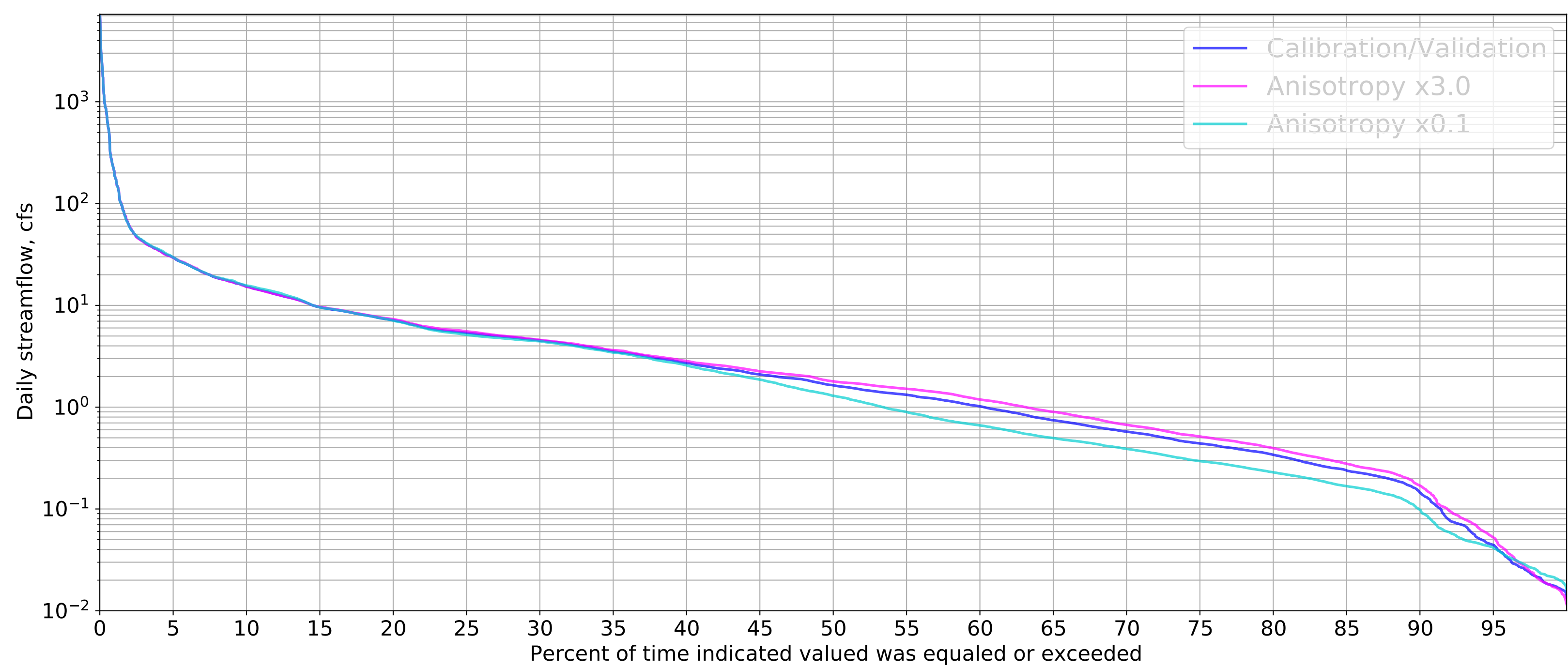
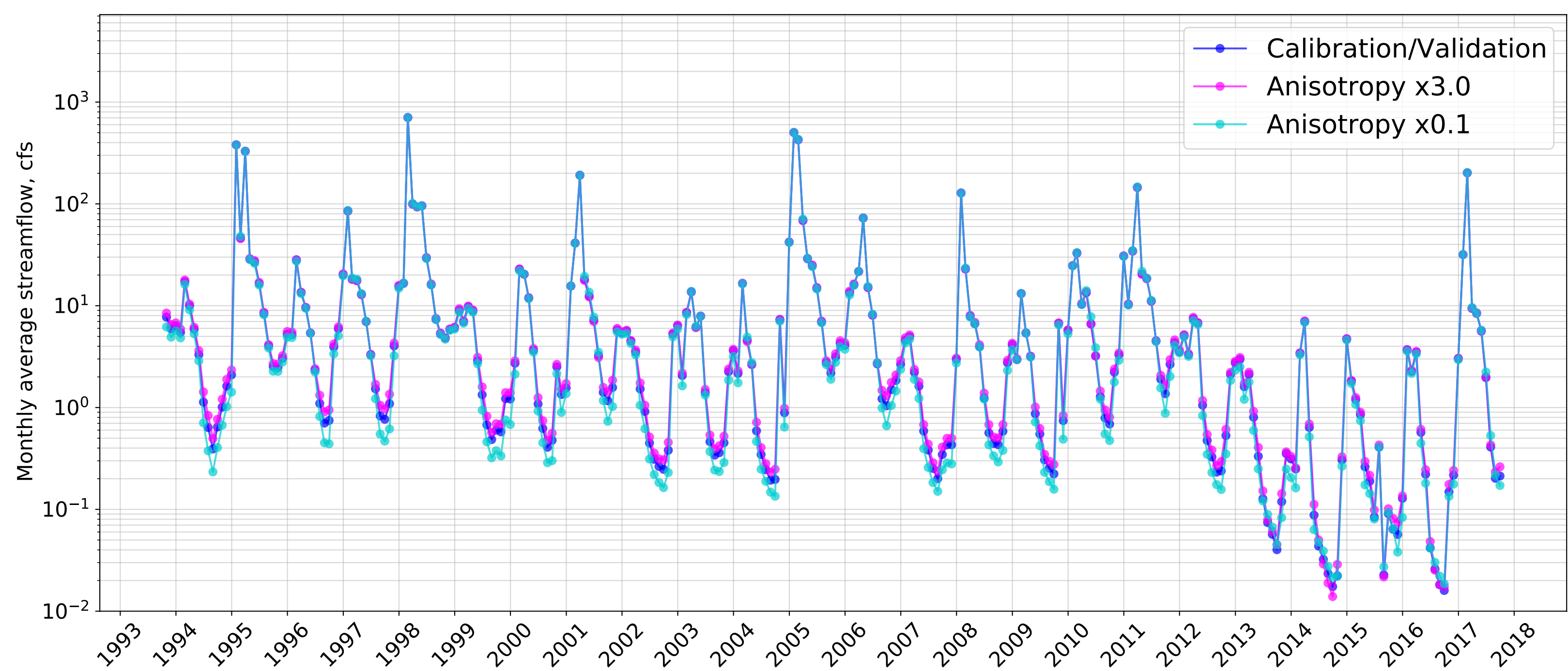
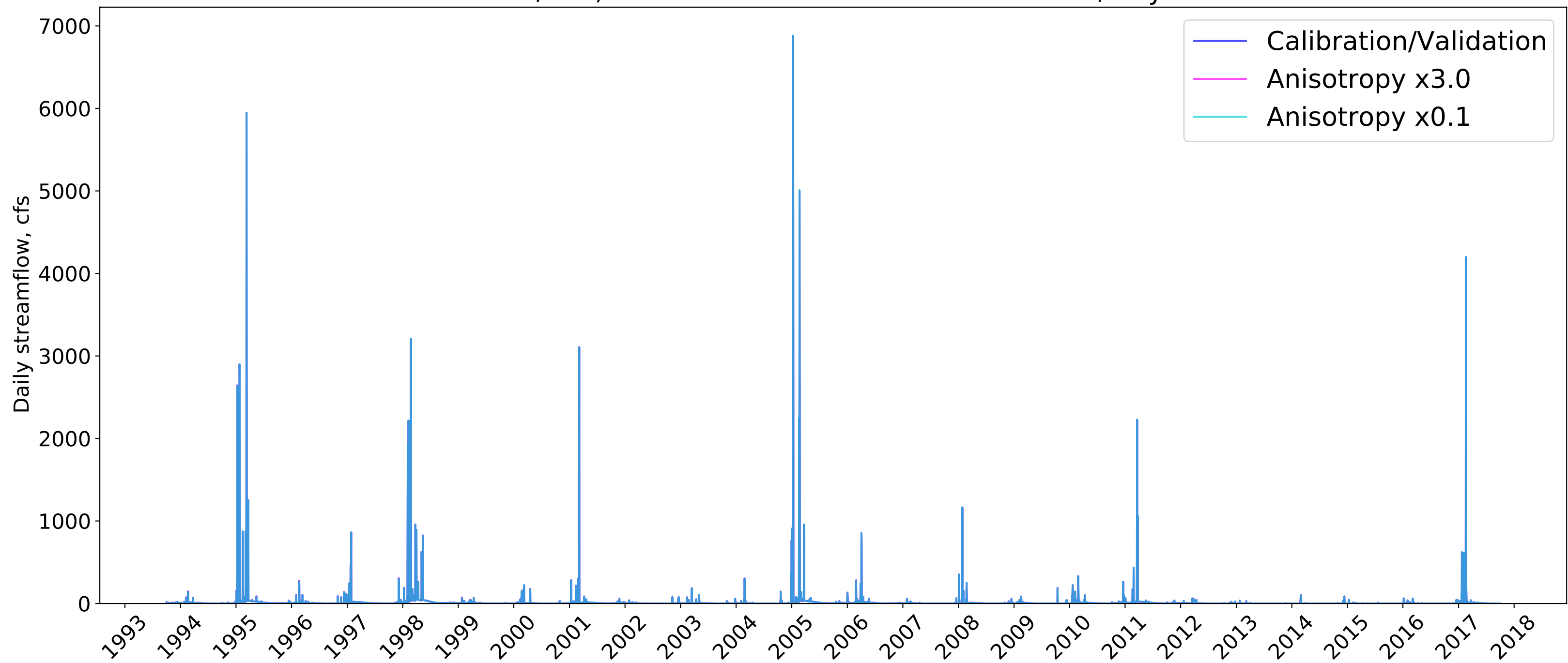
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605A/605, San Antonio Creek at Old Creek Road/Hwy 33

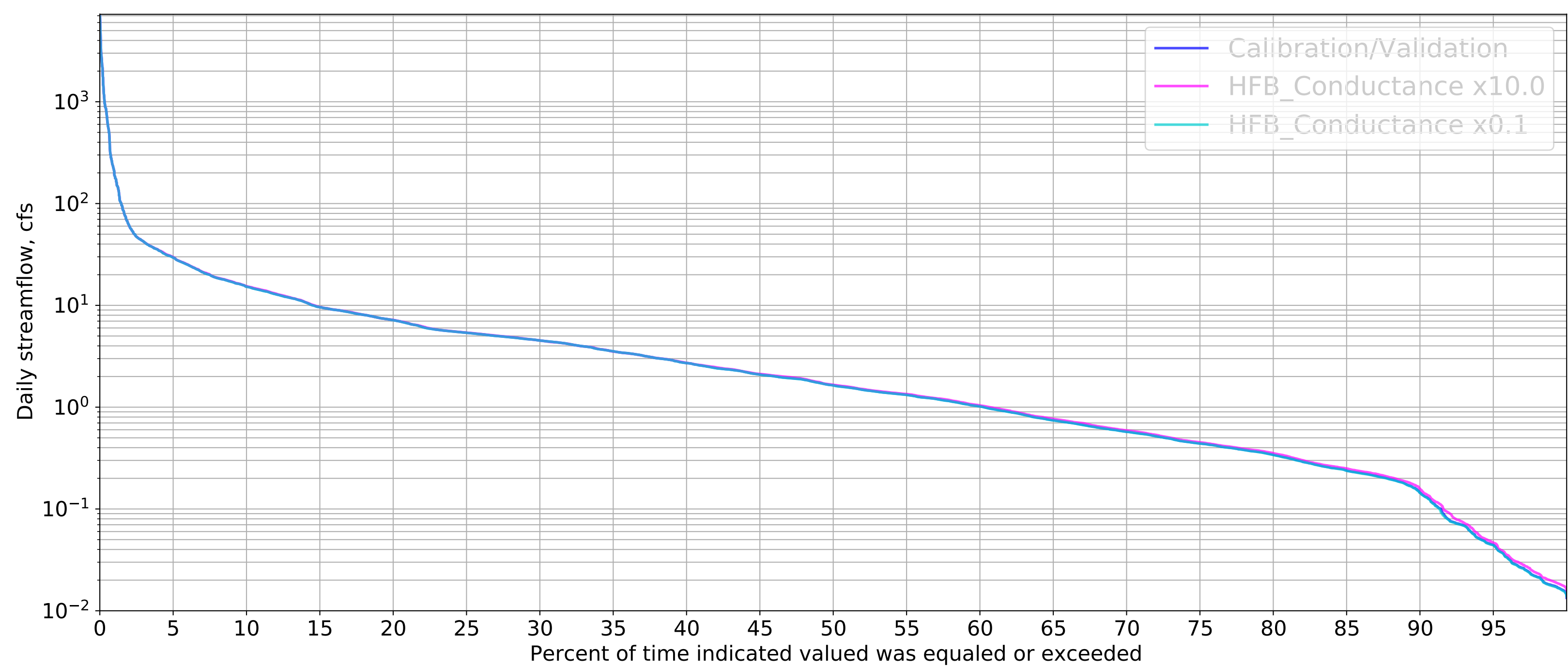
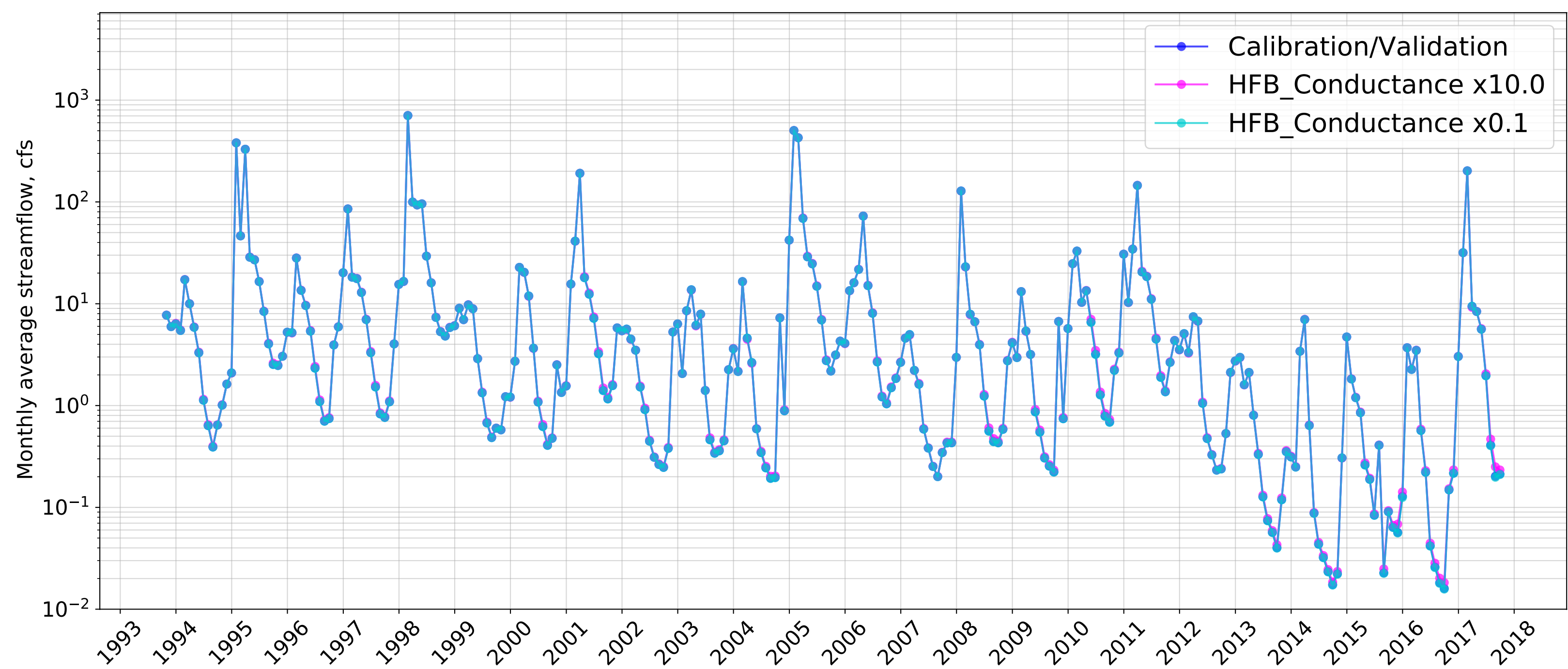
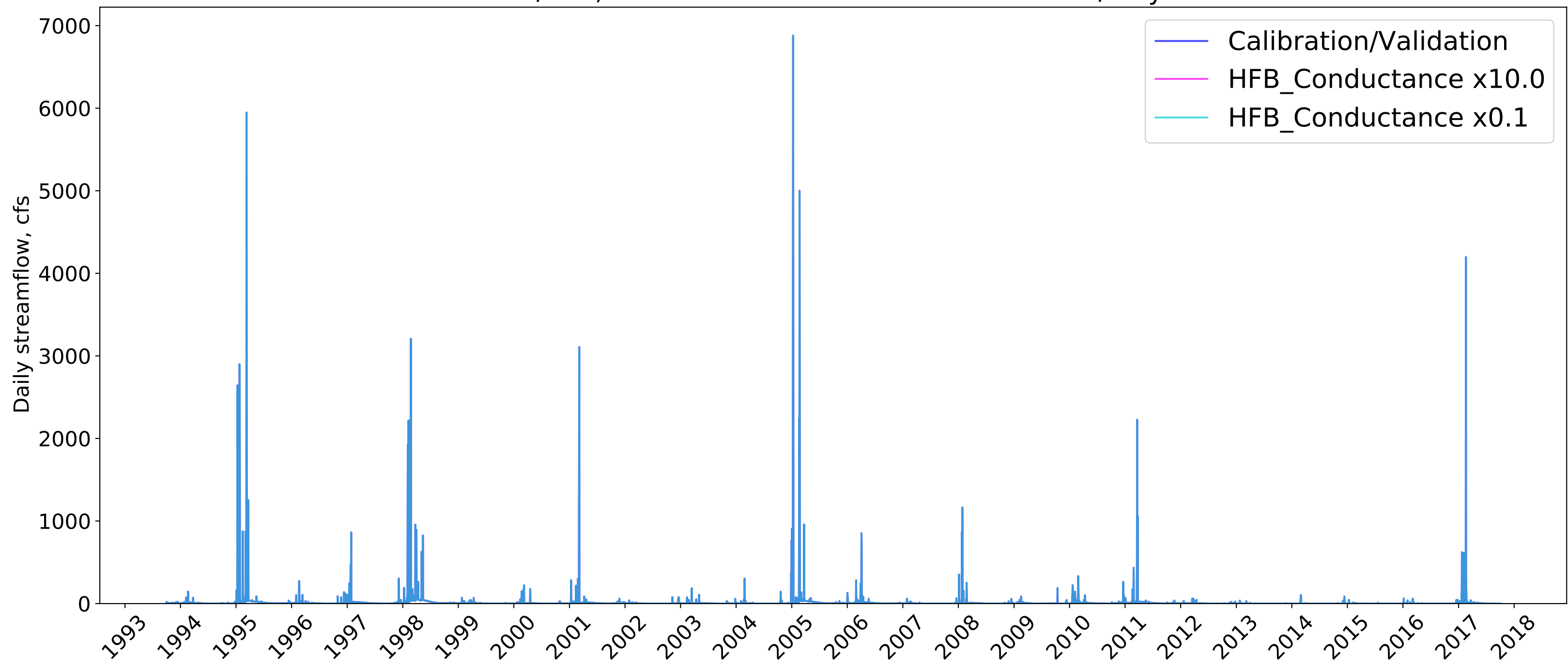


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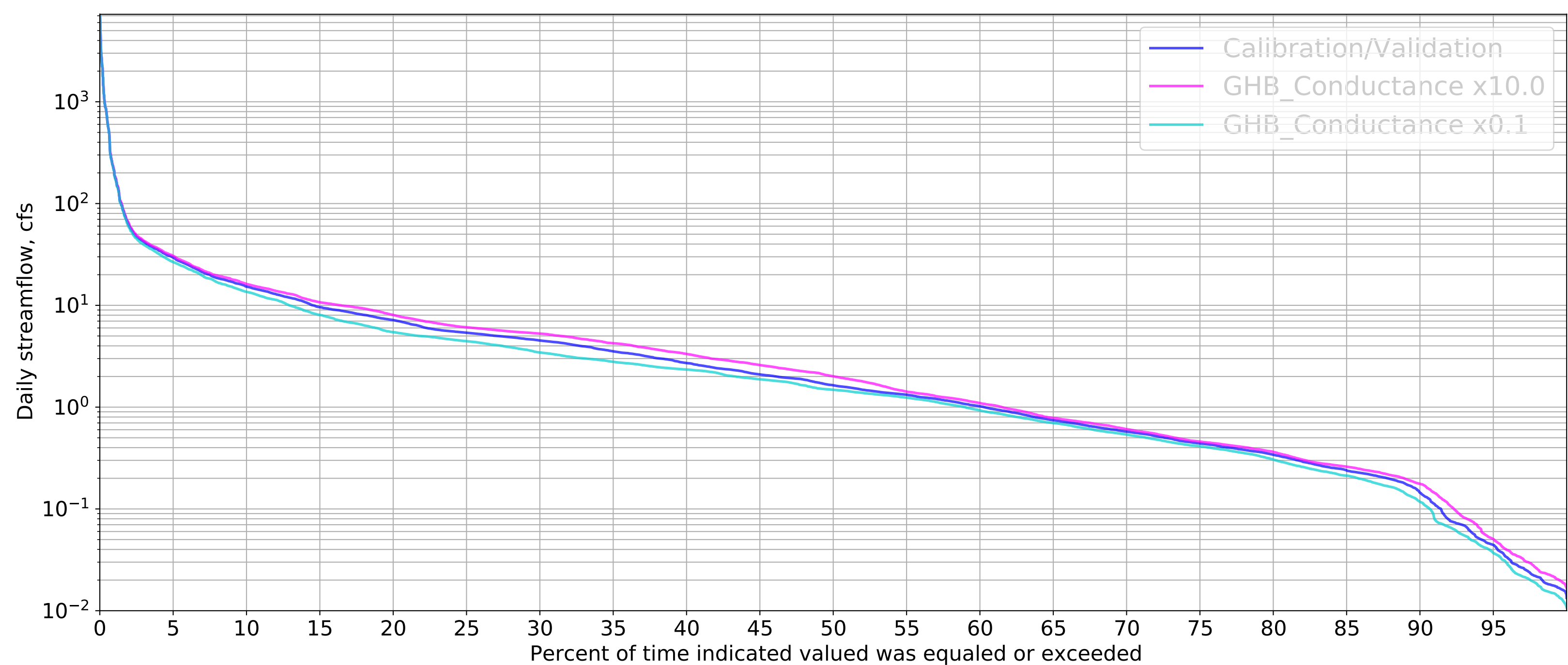
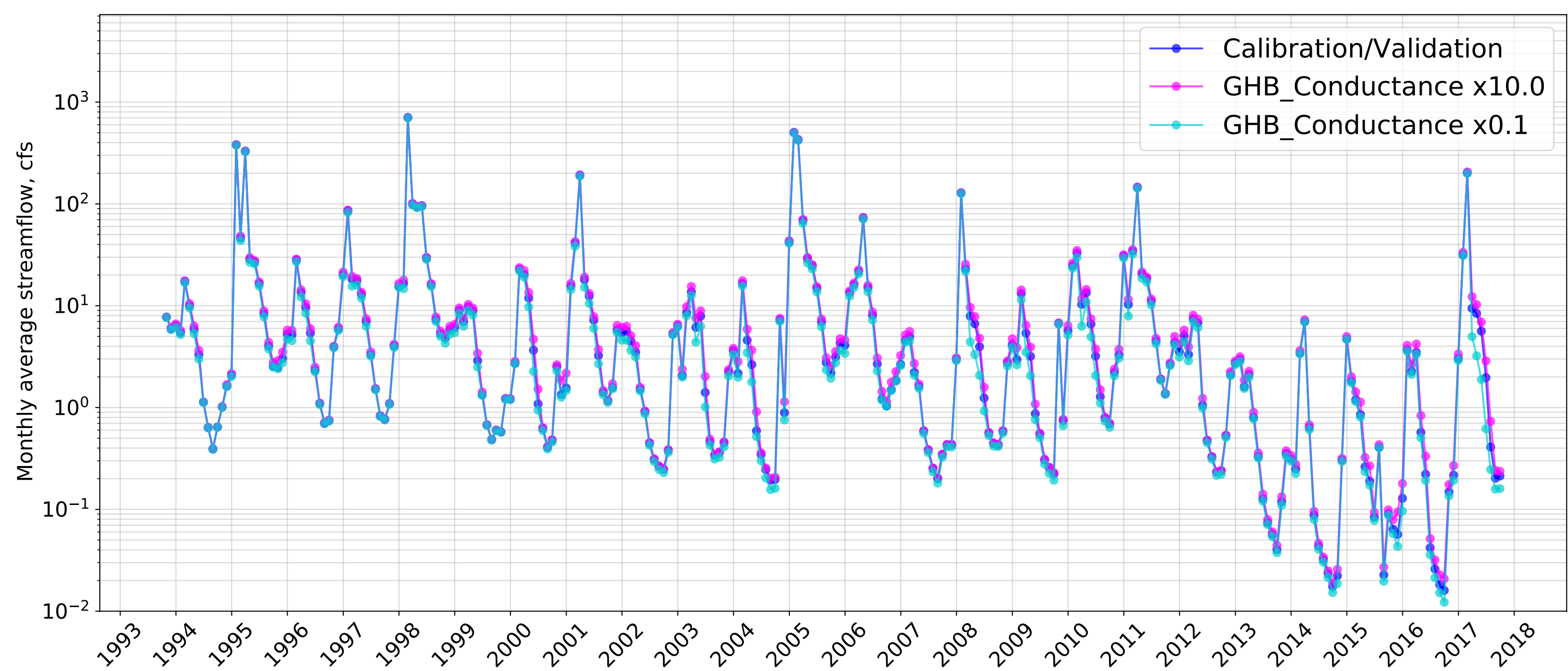
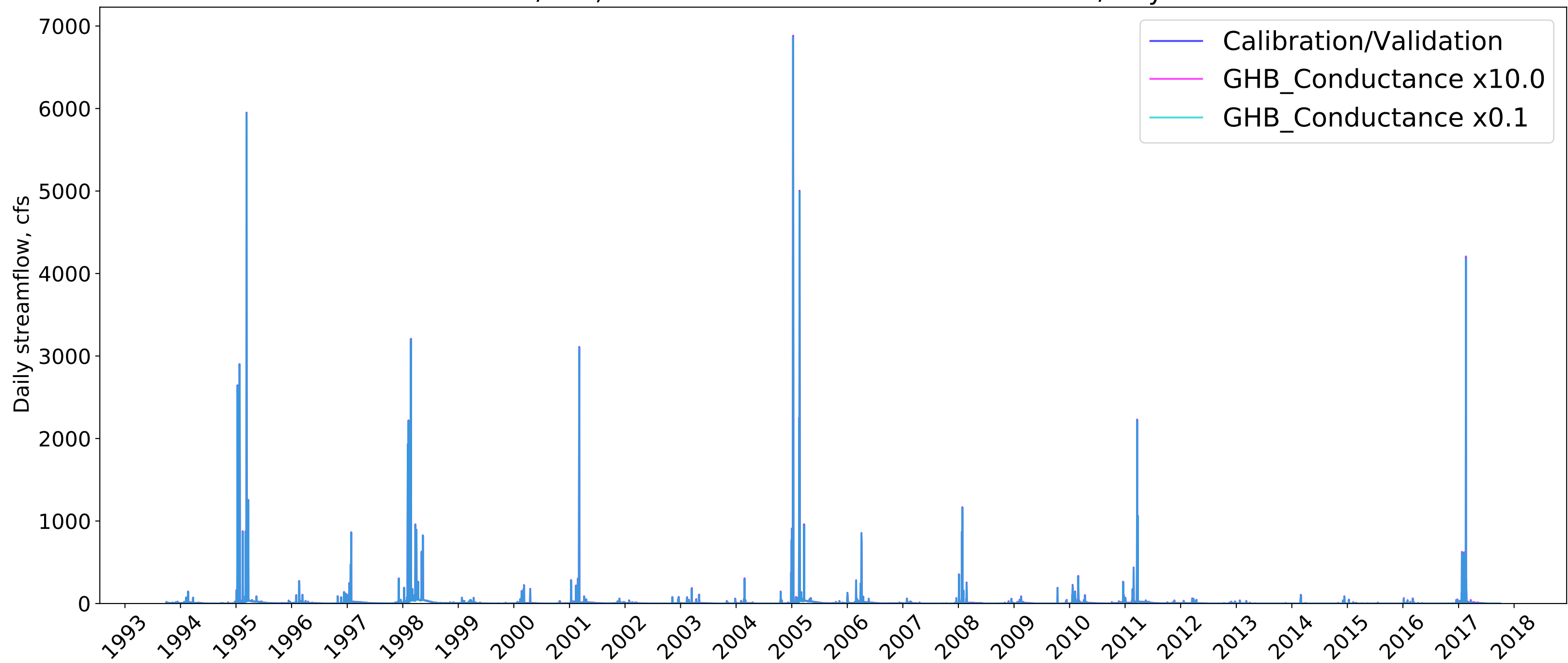




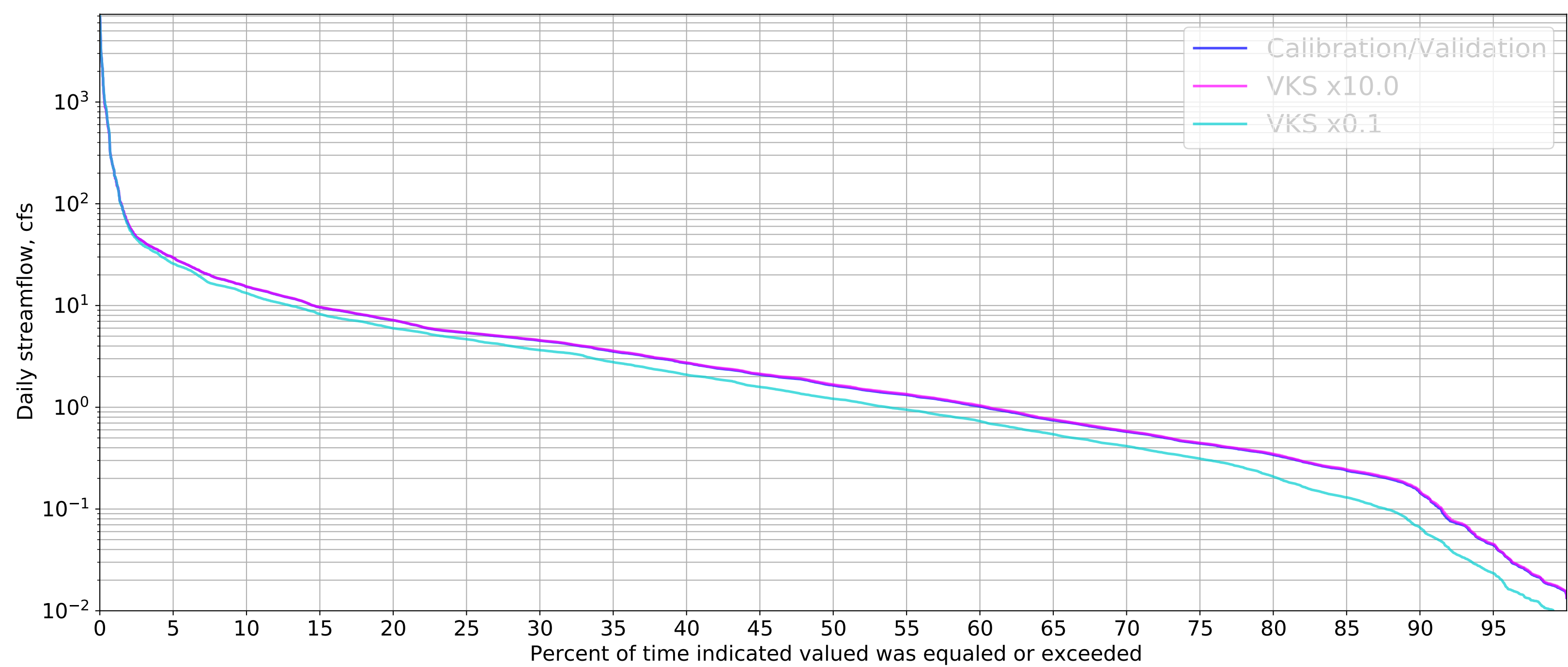
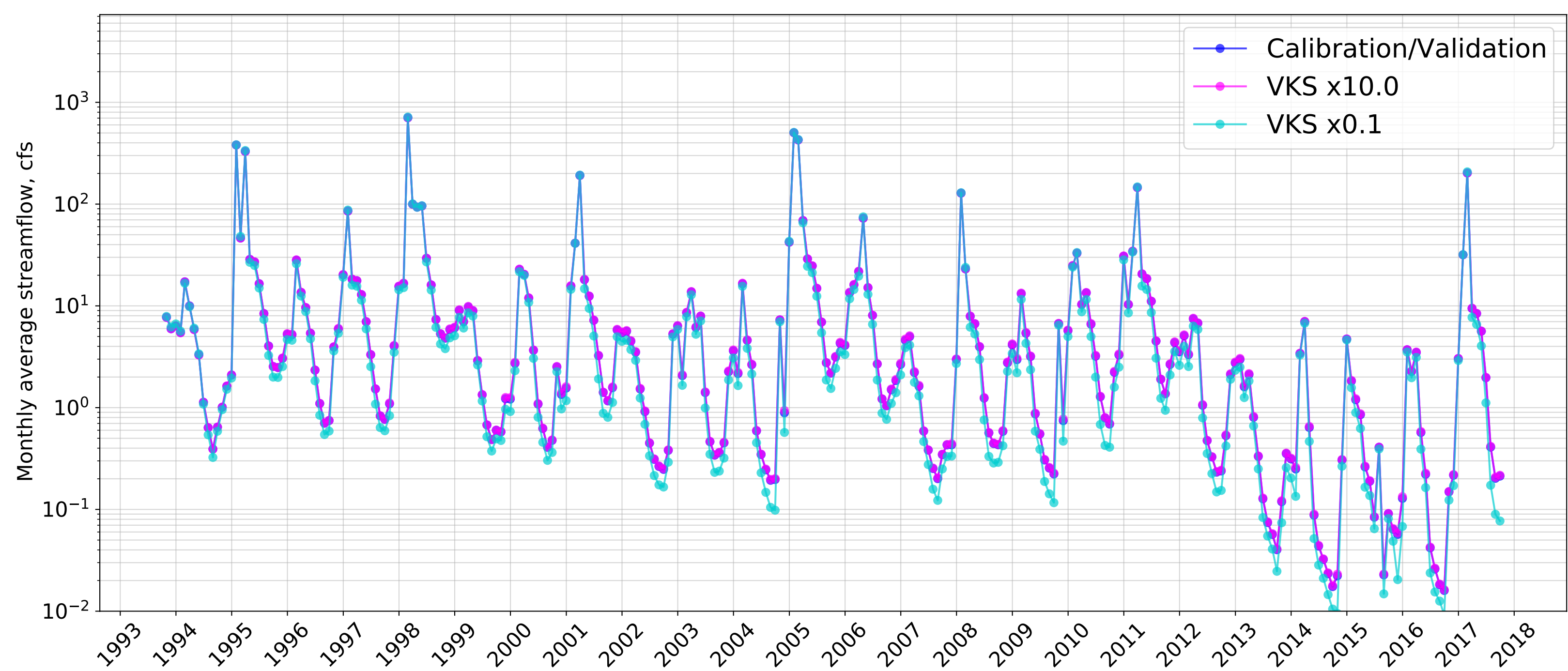
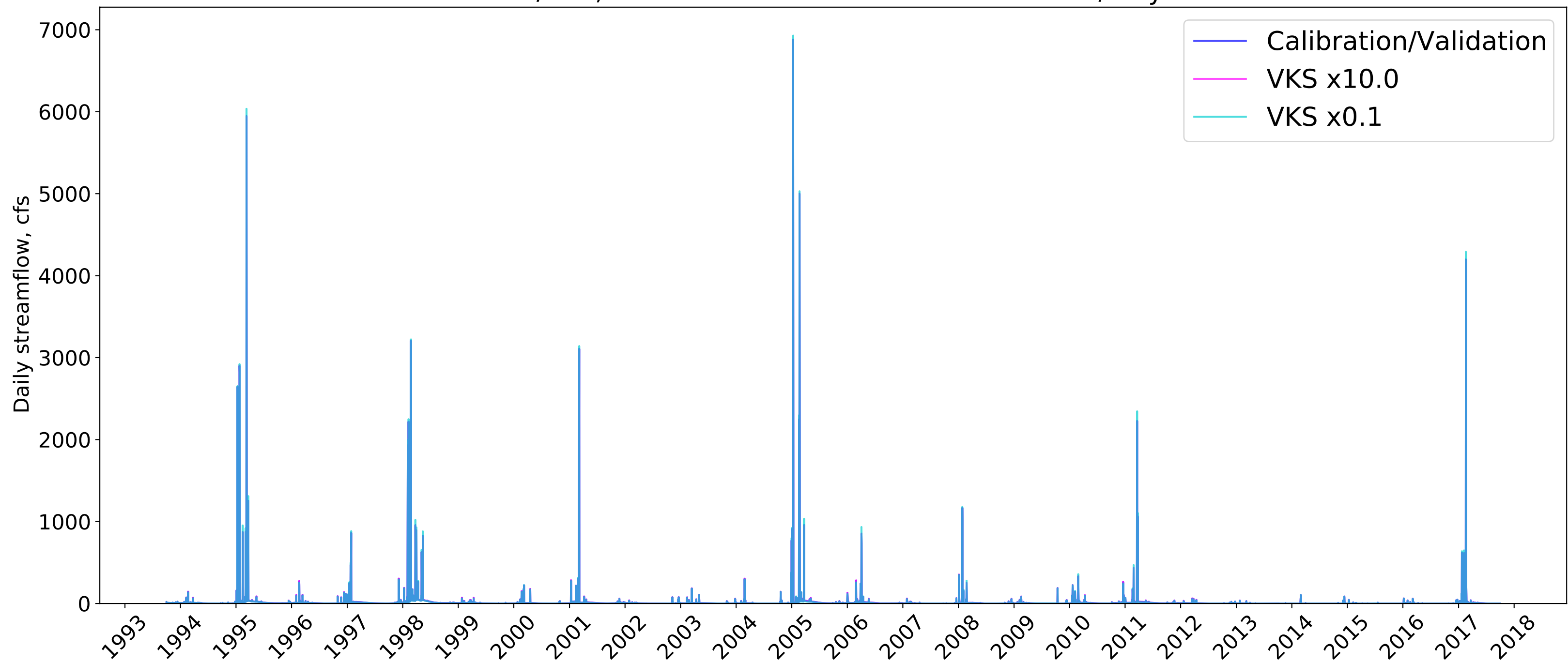
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605A/605, San Antonio Creek at Old Creek Road/Hwy 33

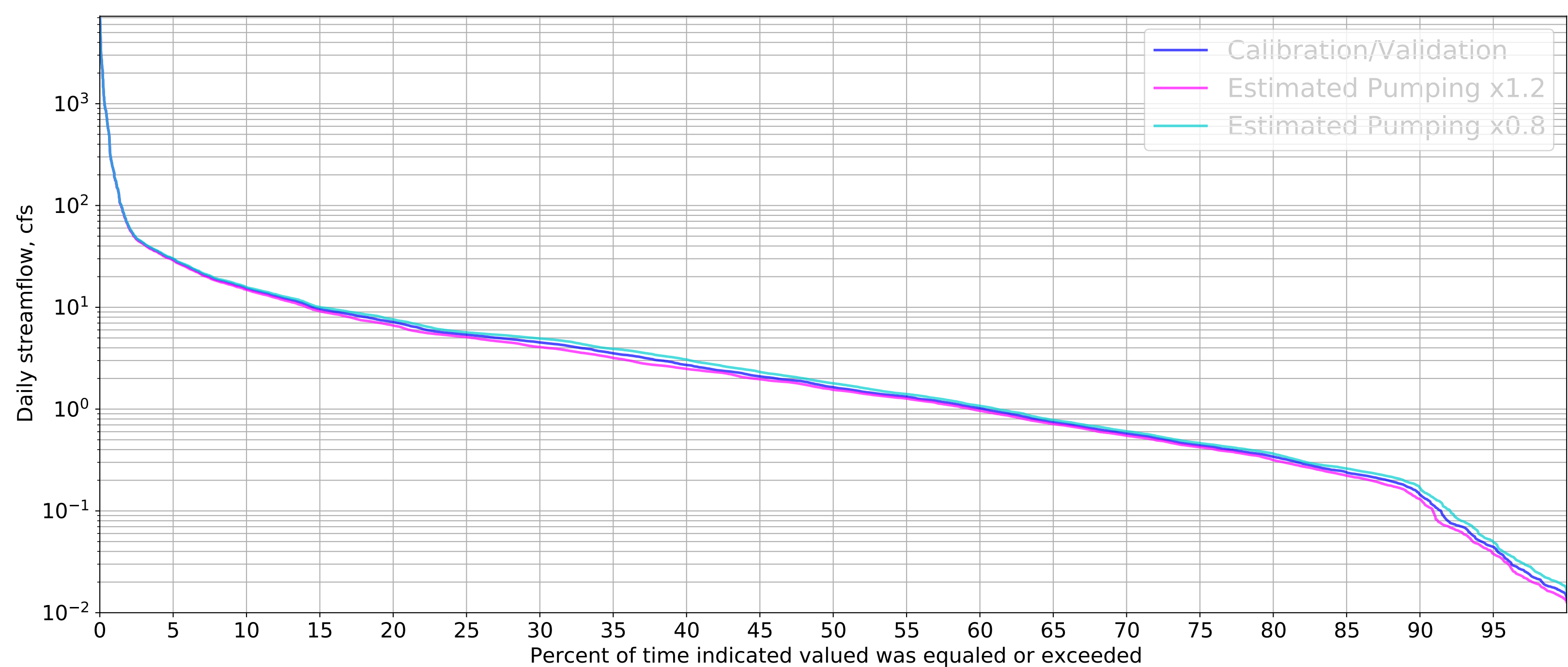
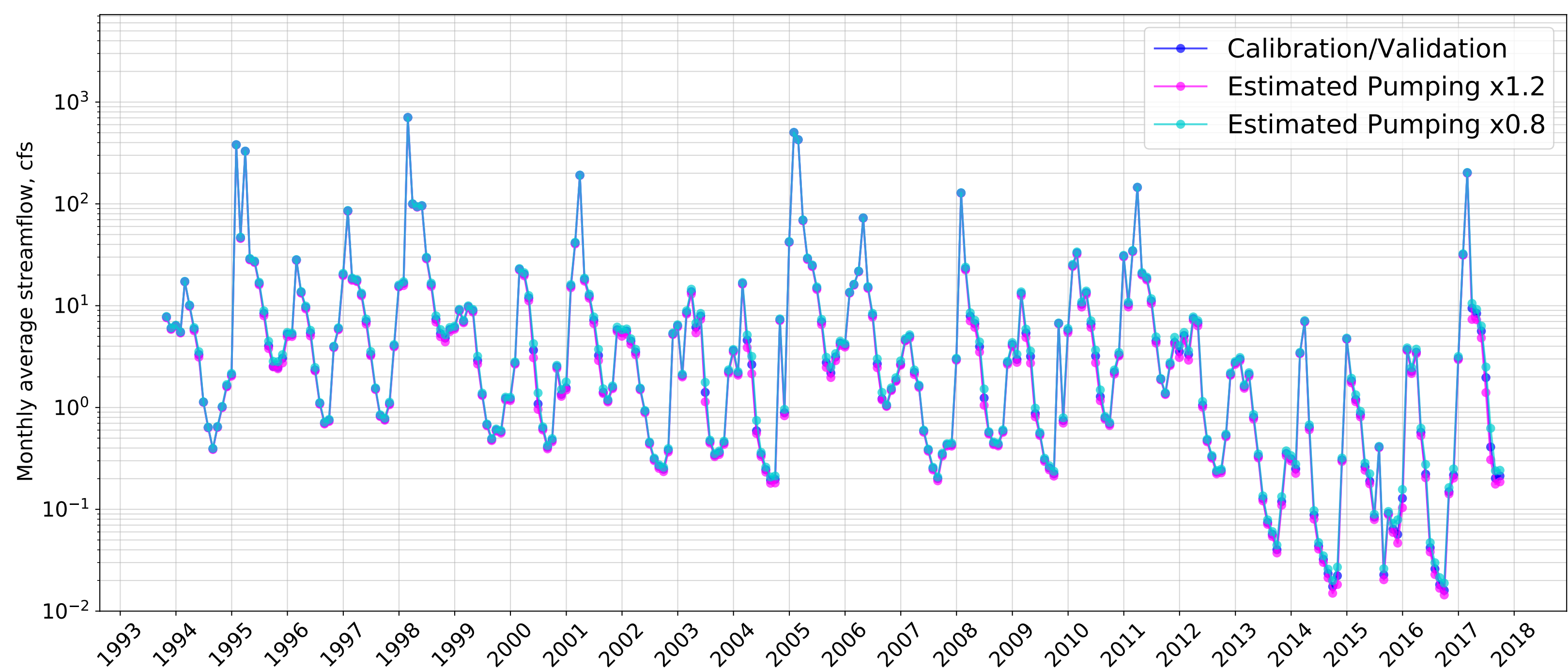
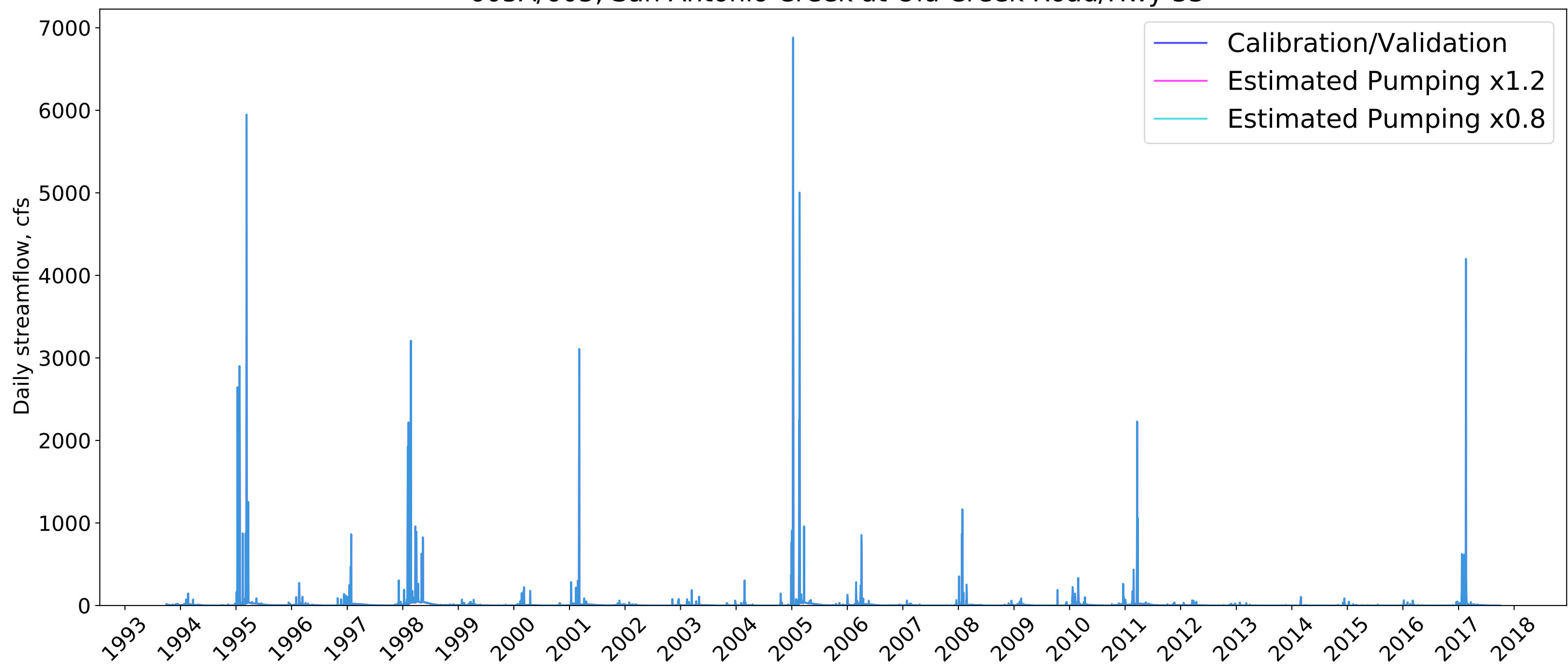


605A/605, San Antonio Creek at Old Creek Road/Hwy 33





605A/605, San Antonio Creek at Old Creek Road/Hwy 33



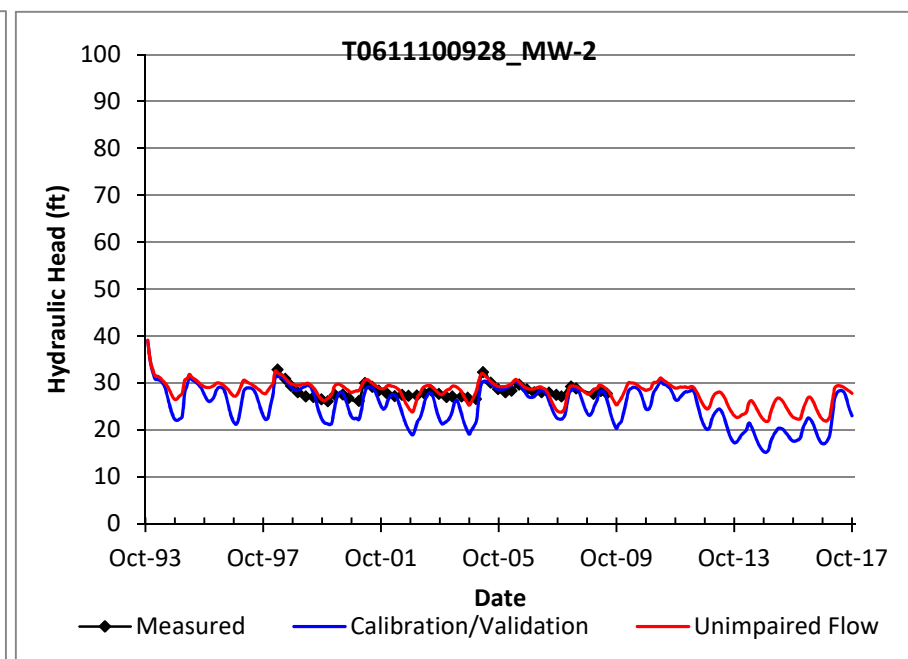
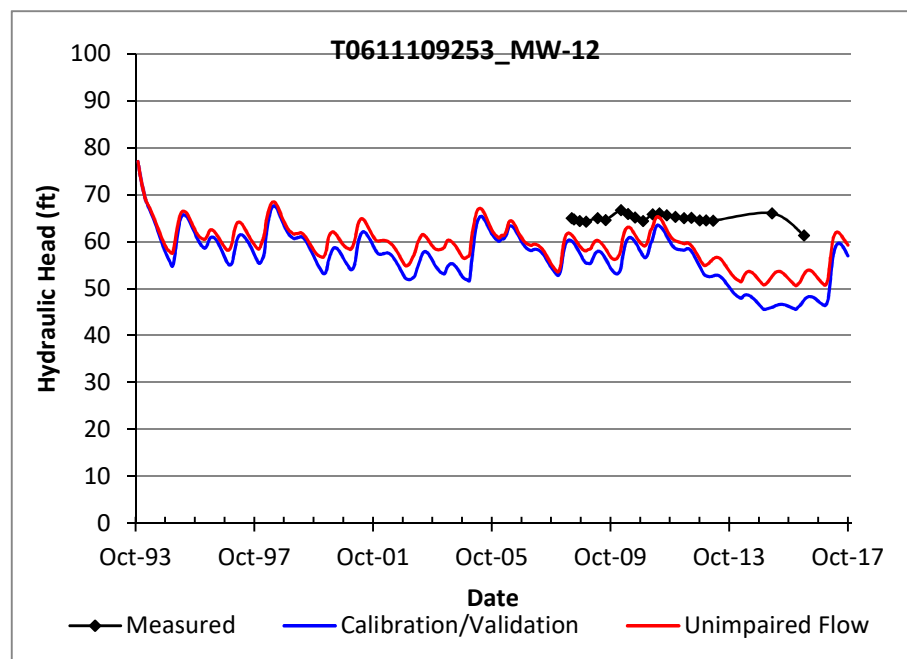
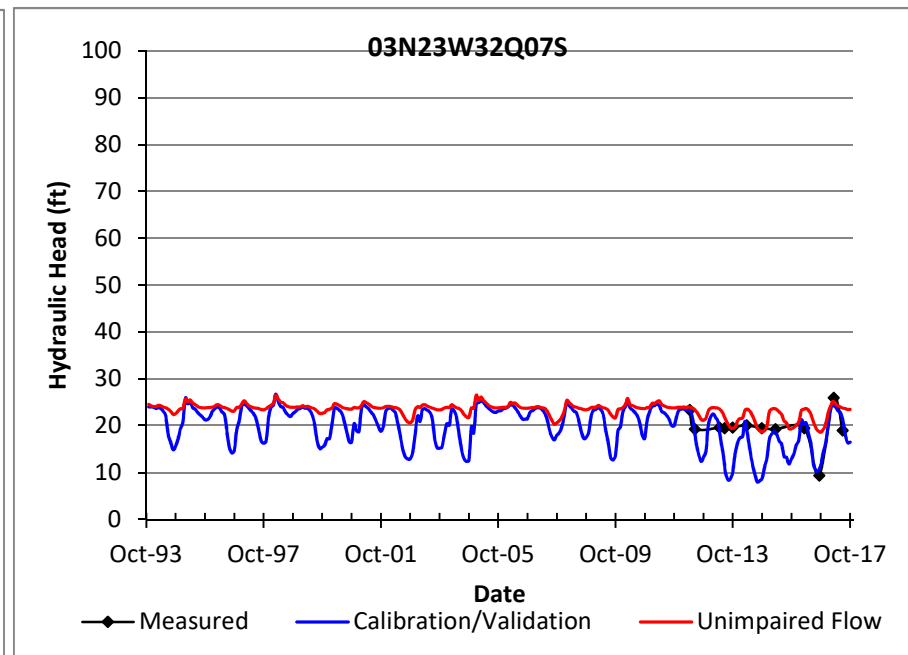
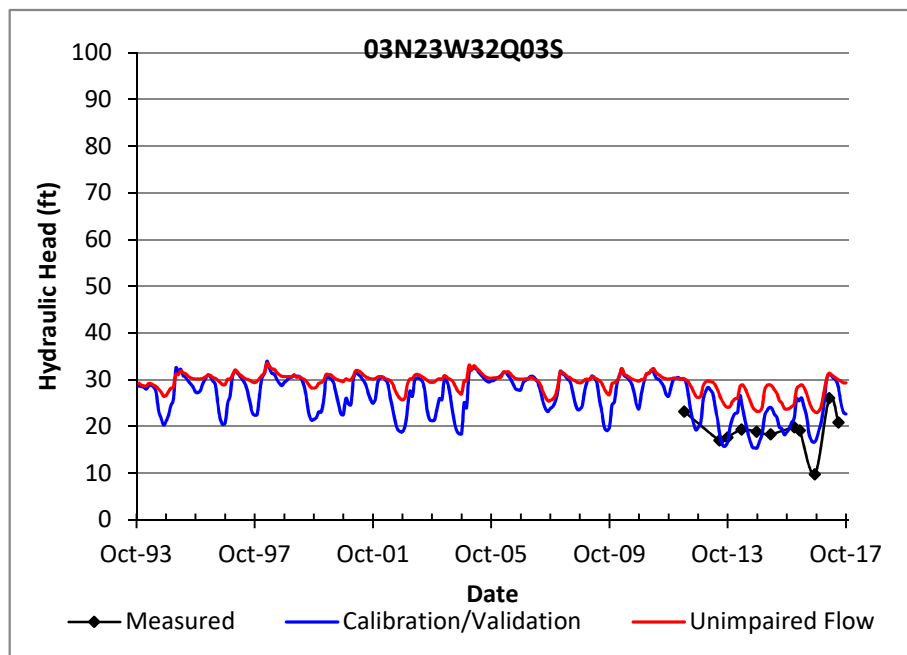
## **APPENDIX F: GROUNDWATER UNIMPAIRED FLOW HYDROGRAPHS**

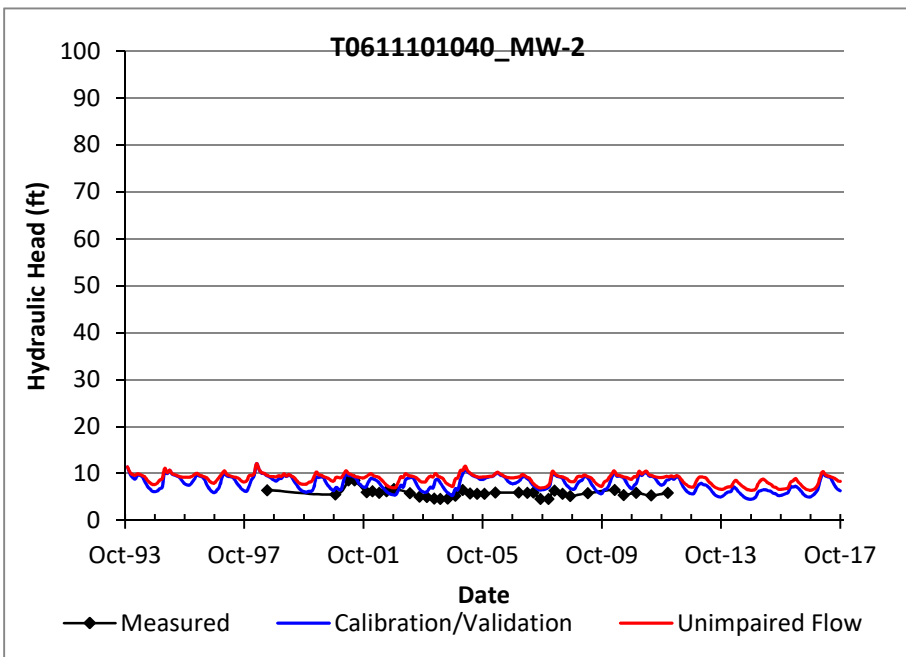
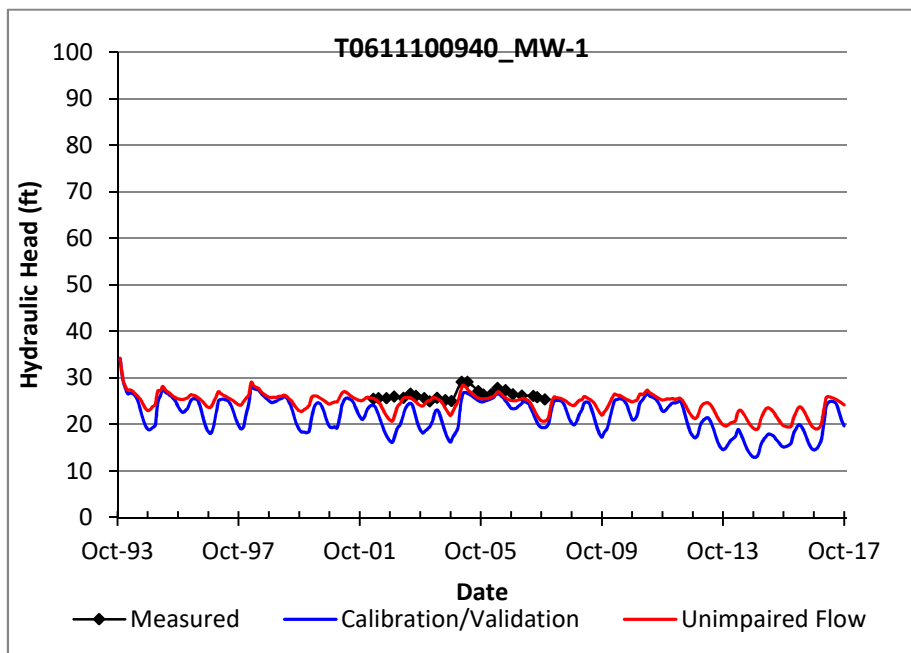
Appendix F presents comparison of observed, simulated, and unimpaired flow scenario groundwater elevations at each well location in the Ventura River Watershed. Each hydrograph plots observed, simulated, and unimpaired hydraulic head at a well, in feet above mean sea level, for water years 1993 to 2017. Some hydrographs do not have a complete observed dataset for the modeling period. The locations of the wells are described in Figure 1.9. The groundwater level data are mostly from the State Water Resources Control Board's GeoTracker database, the Ojai Basin Groundwater Management Agency, the Upper Ventura River Groundwater Agency, and the Ventura County Watershed Protection District. If you need accessibility assistance with the information presented in this appendix, please contact the State Water Board at [instreamflows@waterboards.ca.gov](mailto:instreamflows@waterboards.ca.gov).



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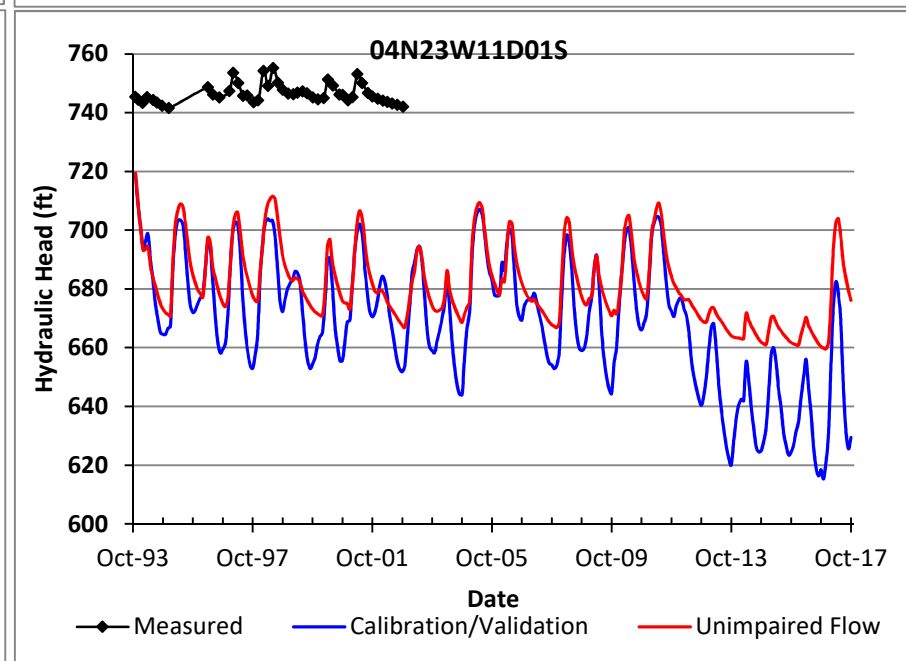
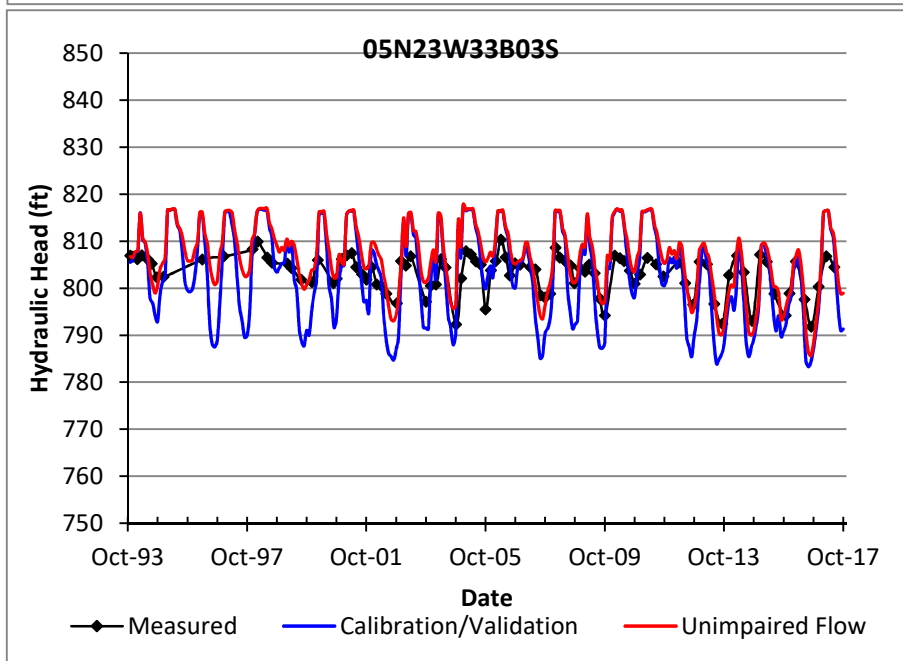
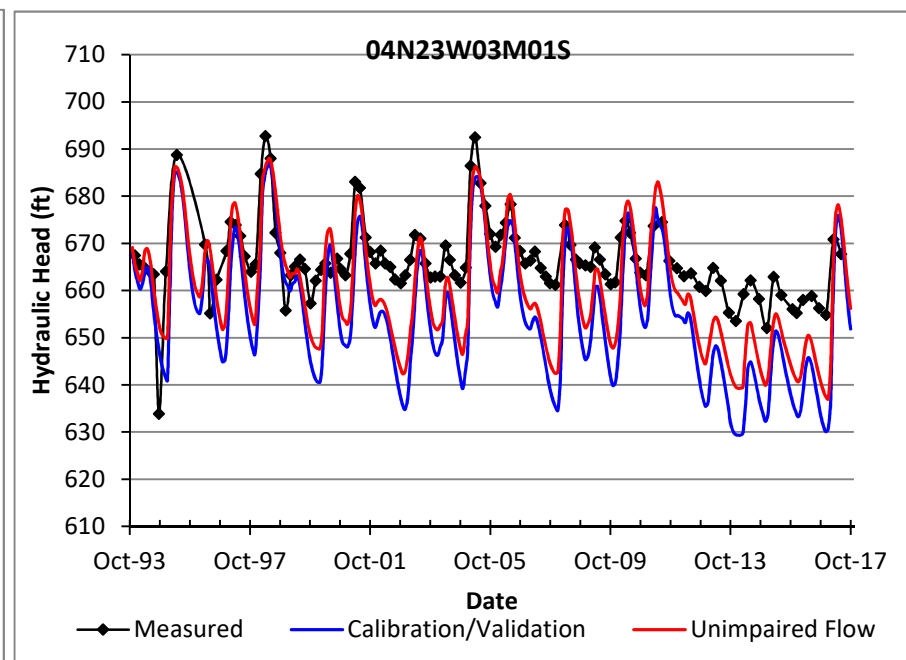
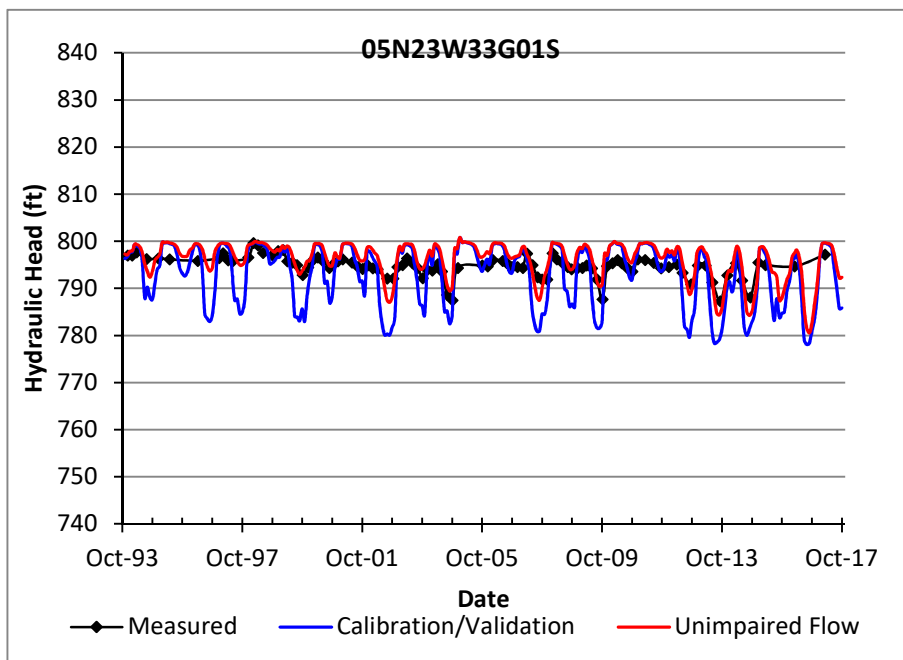
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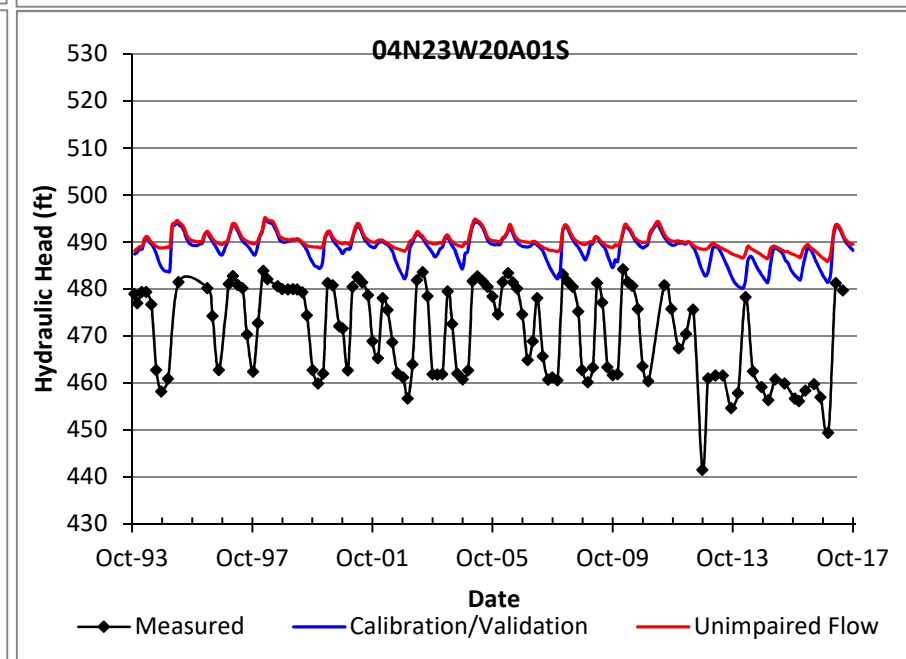
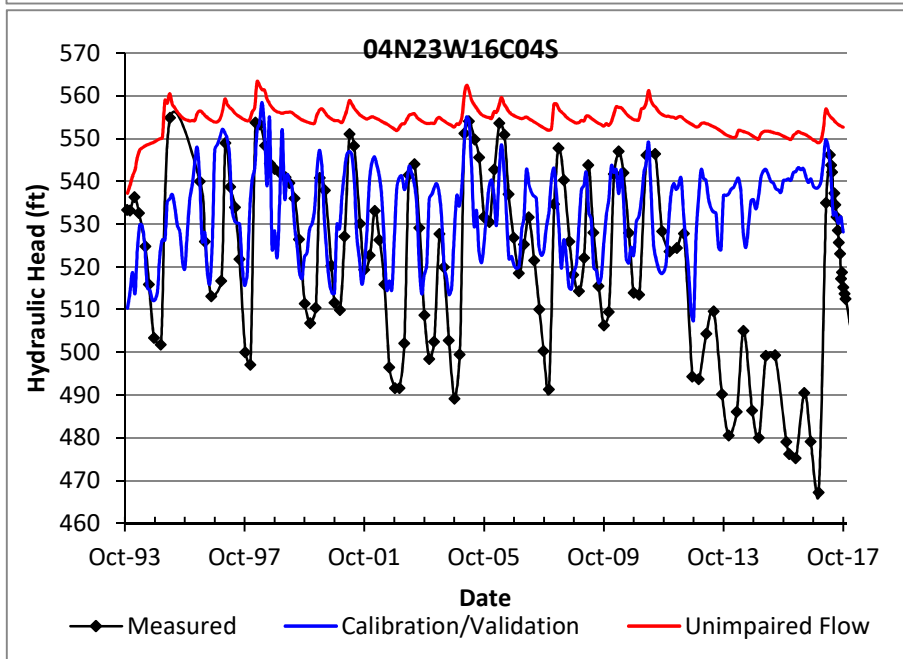
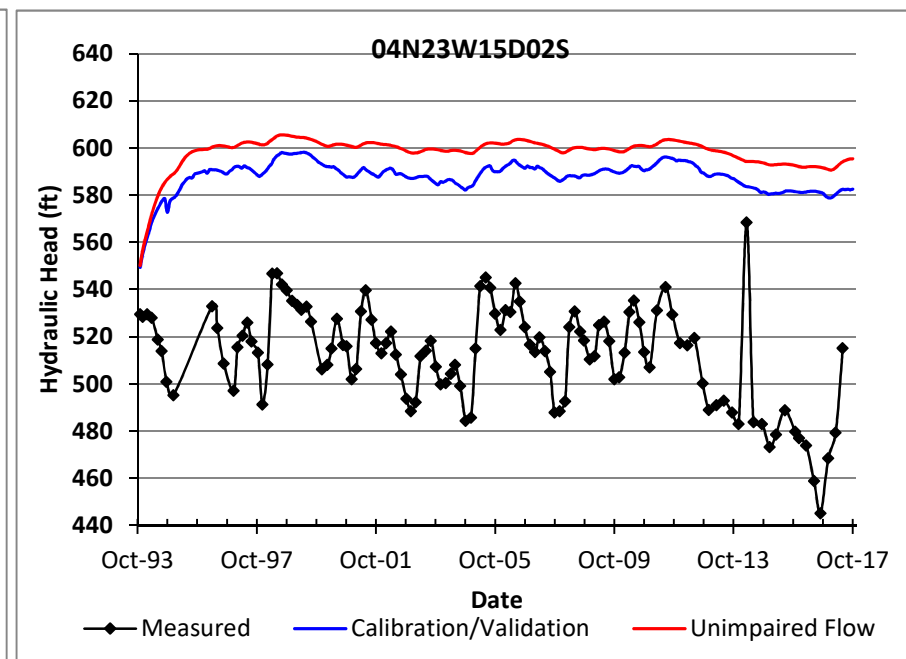
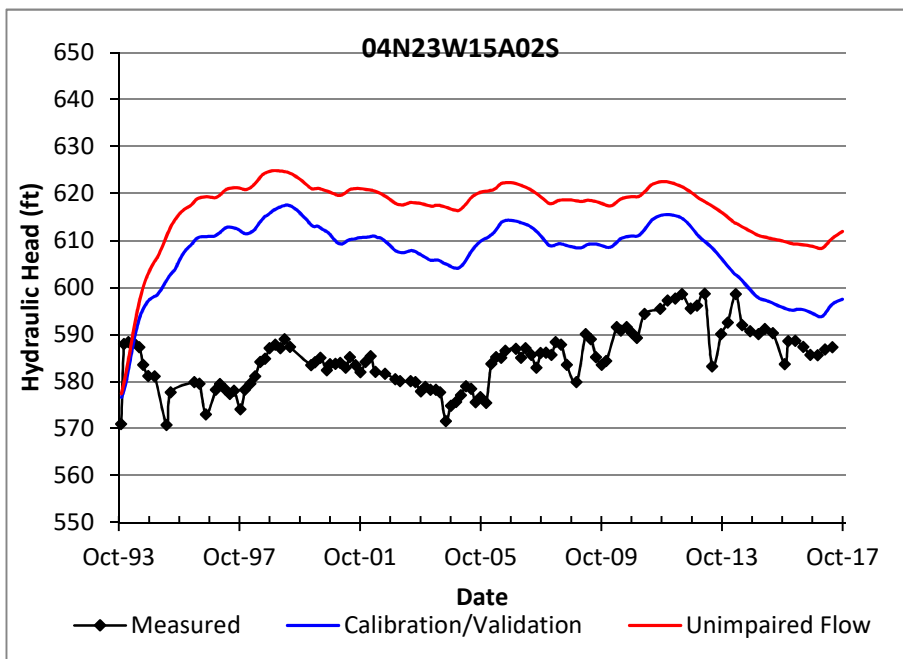




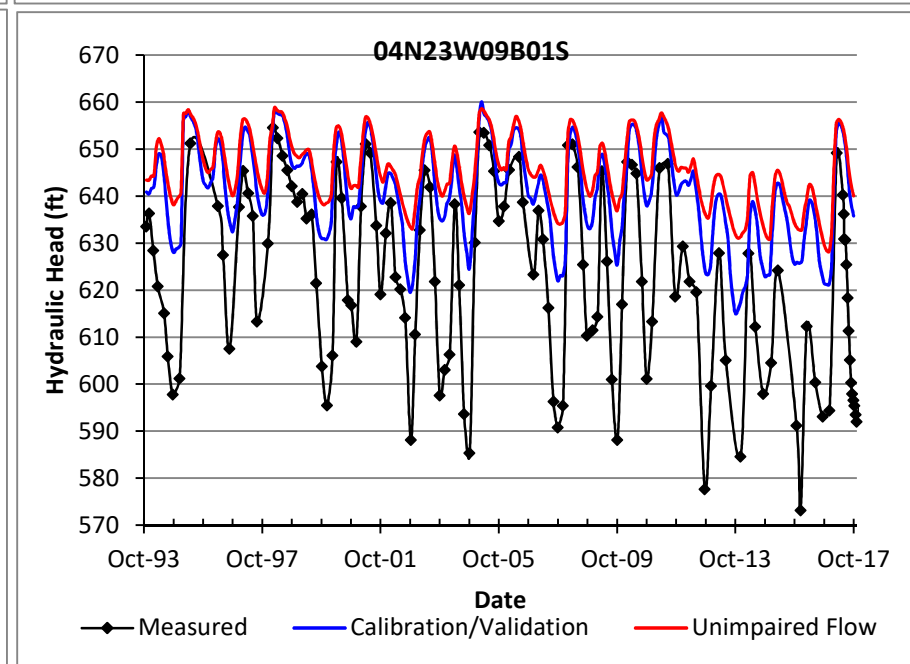
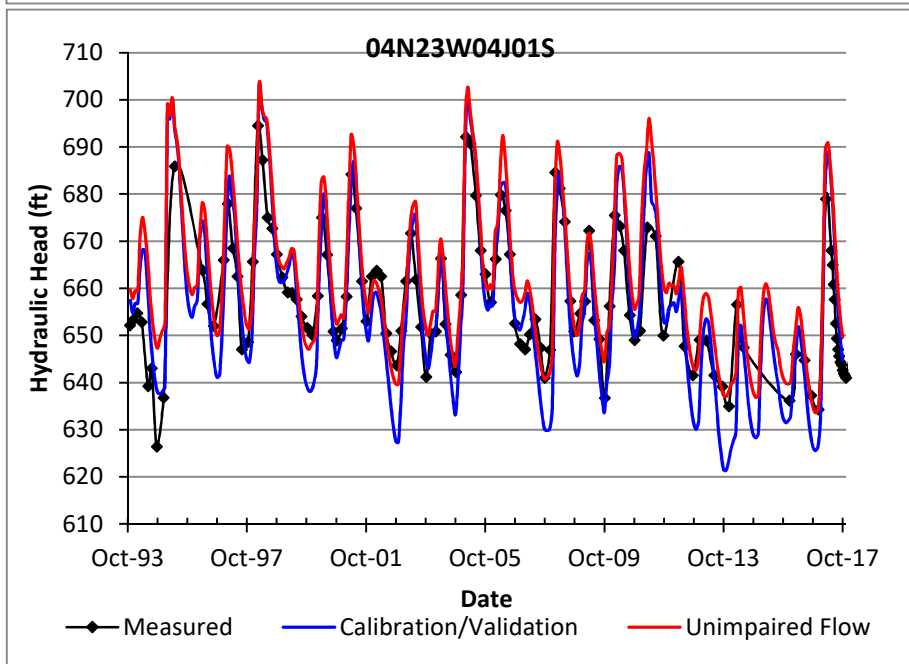
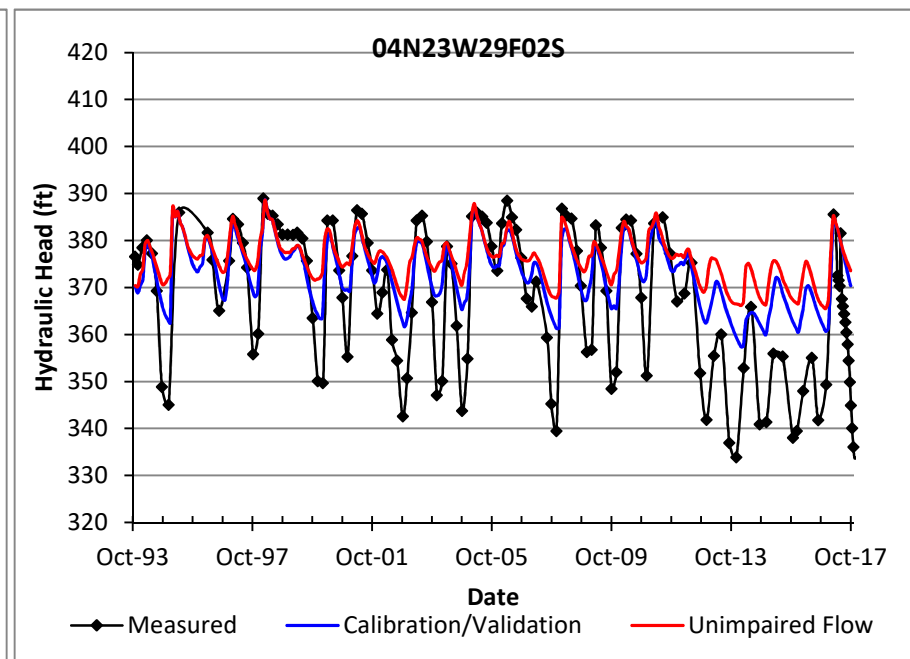
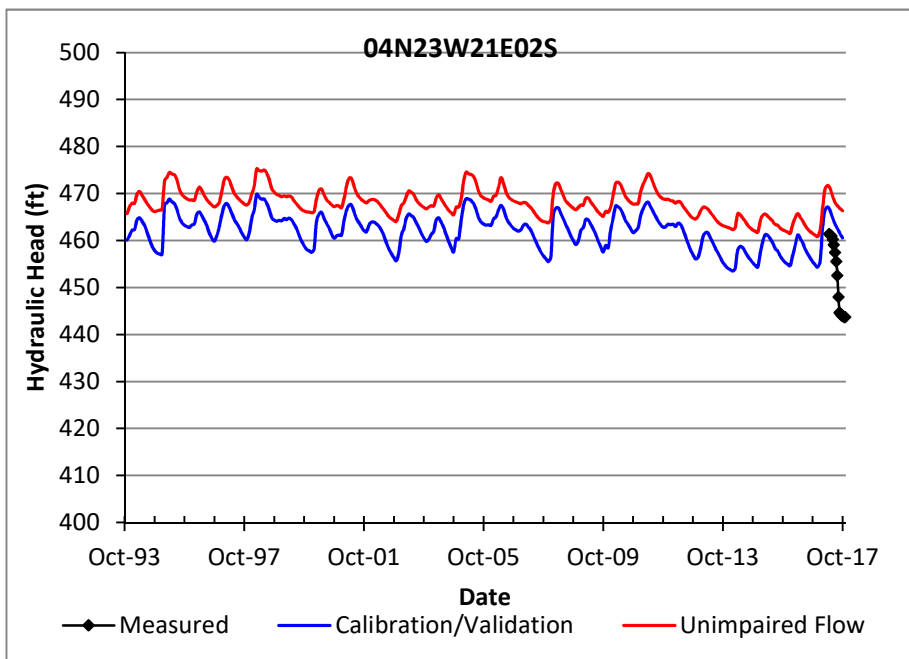
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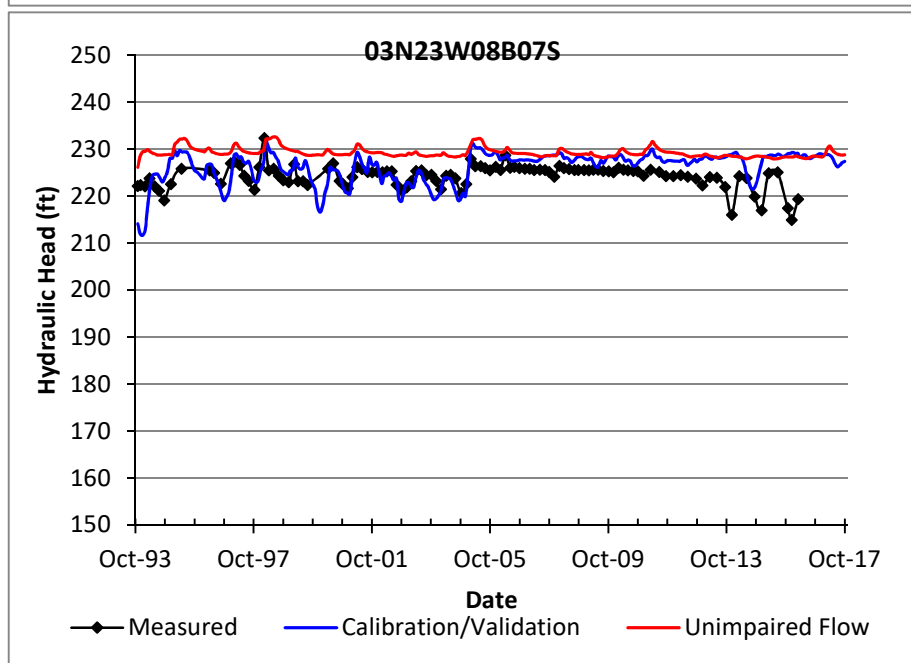
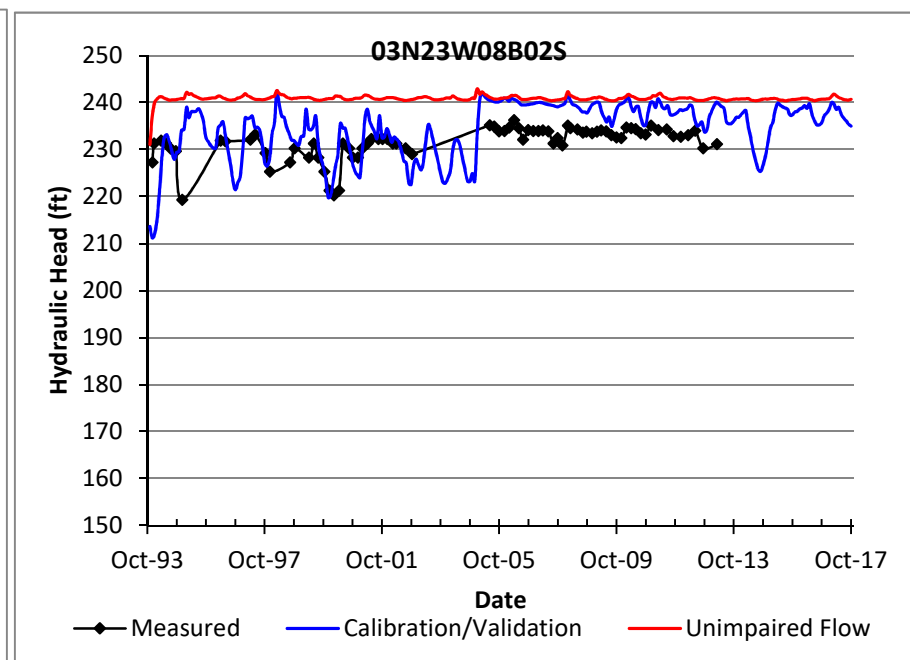
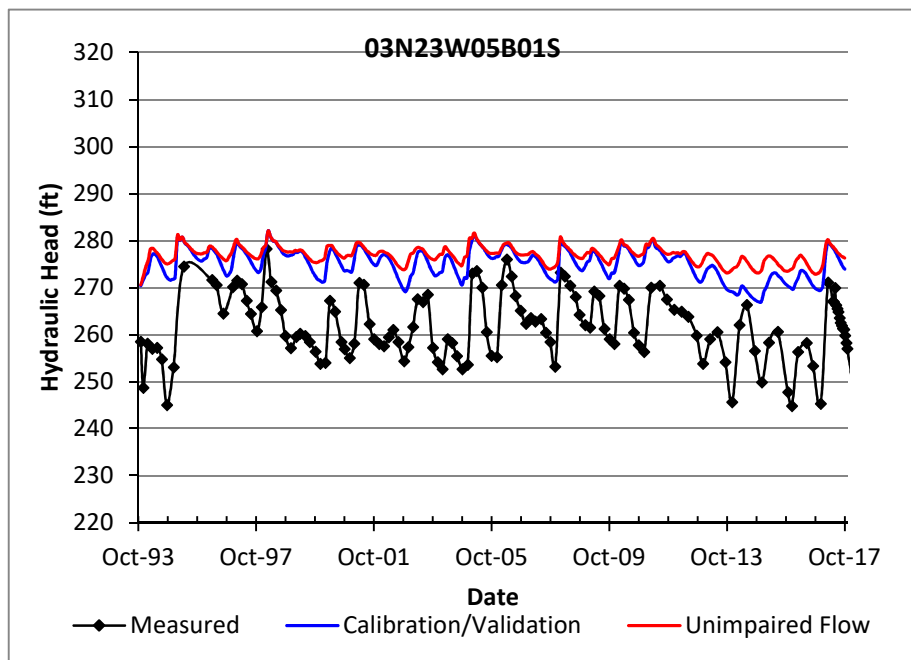
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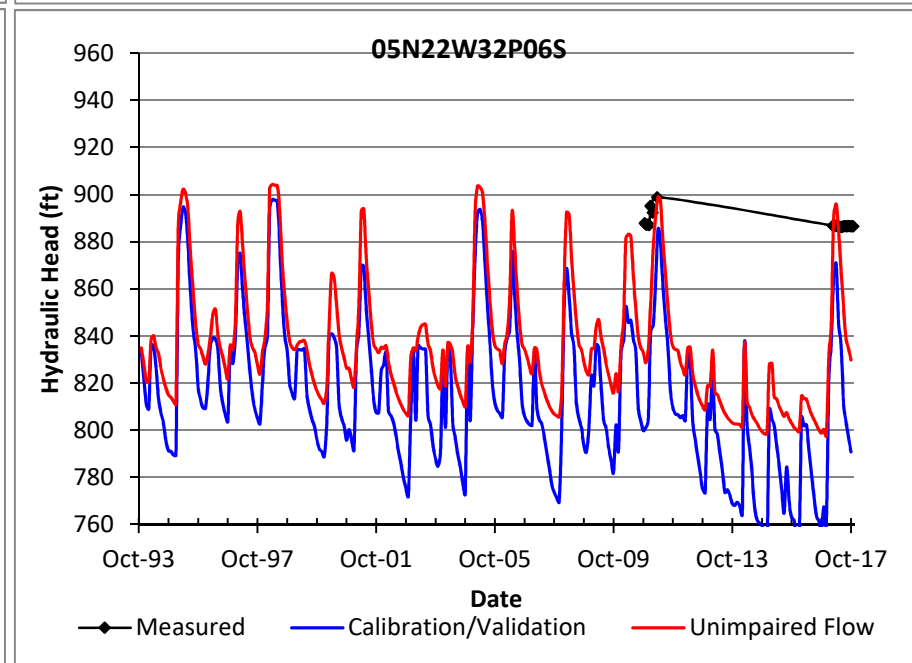
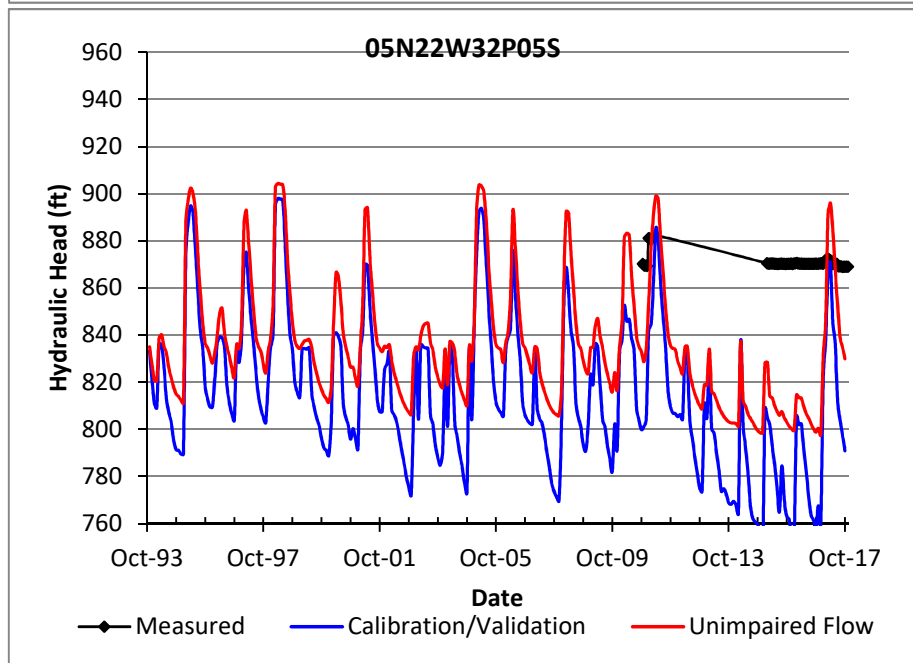
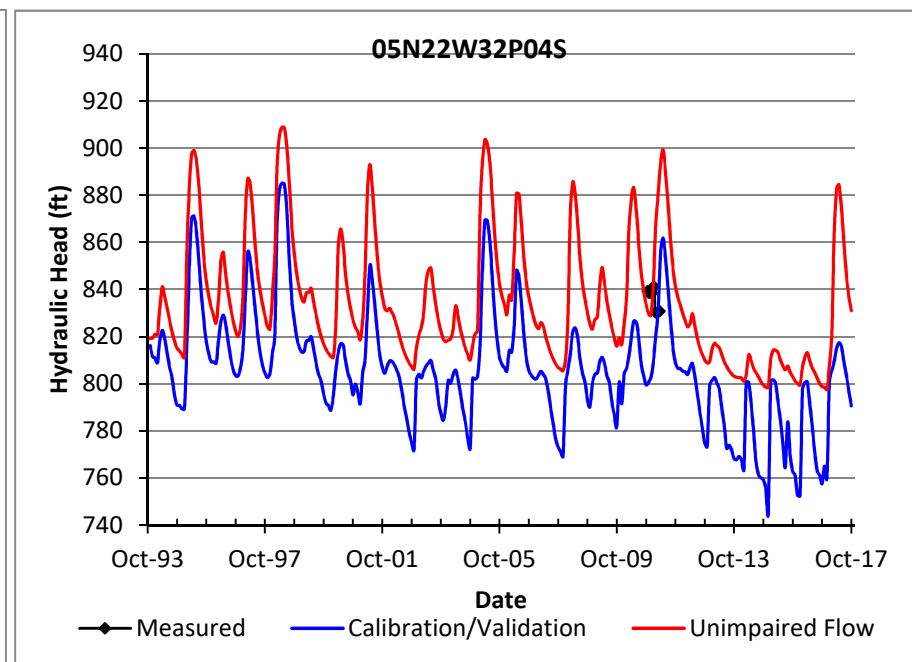
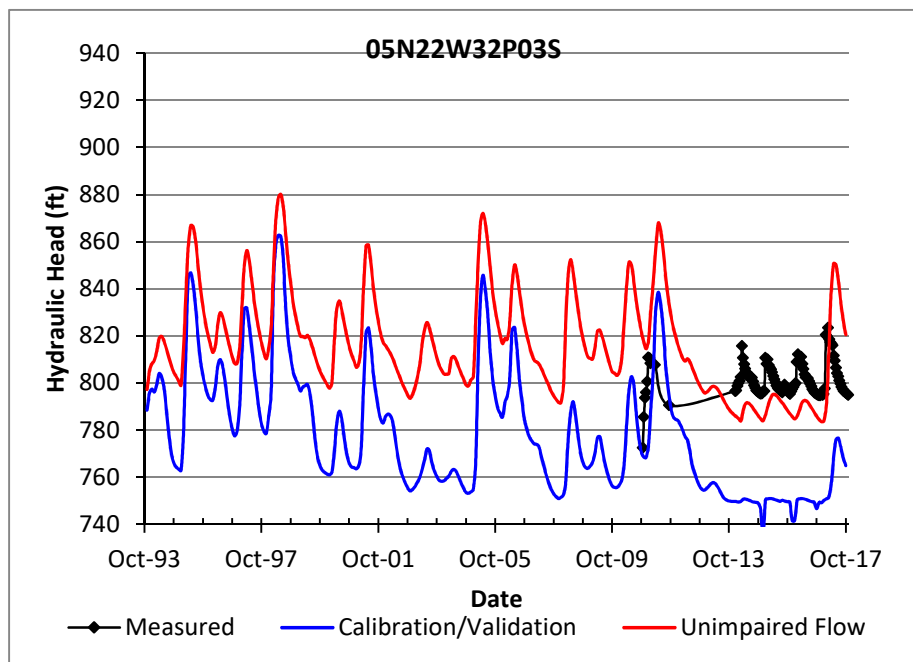


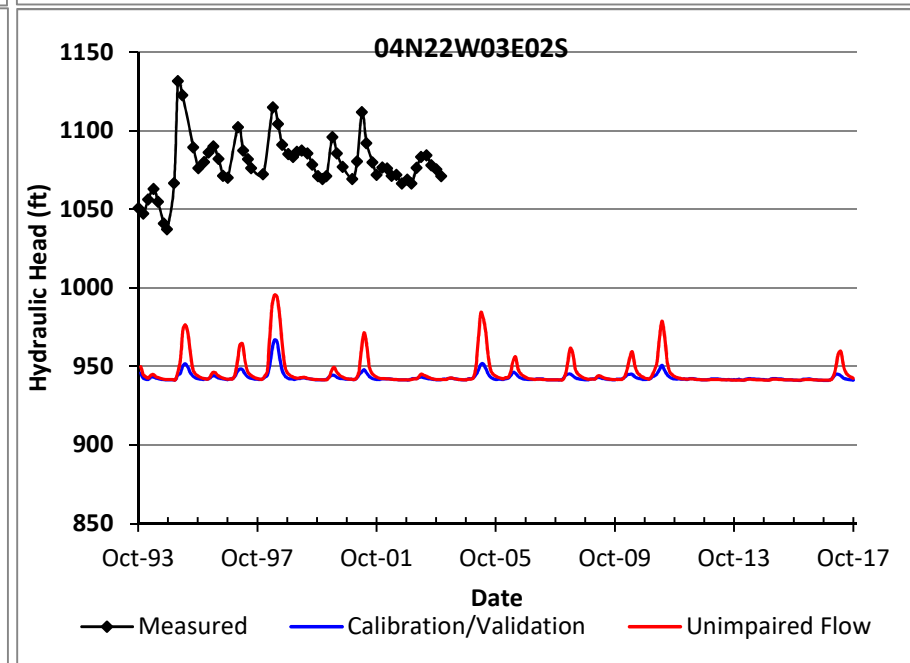
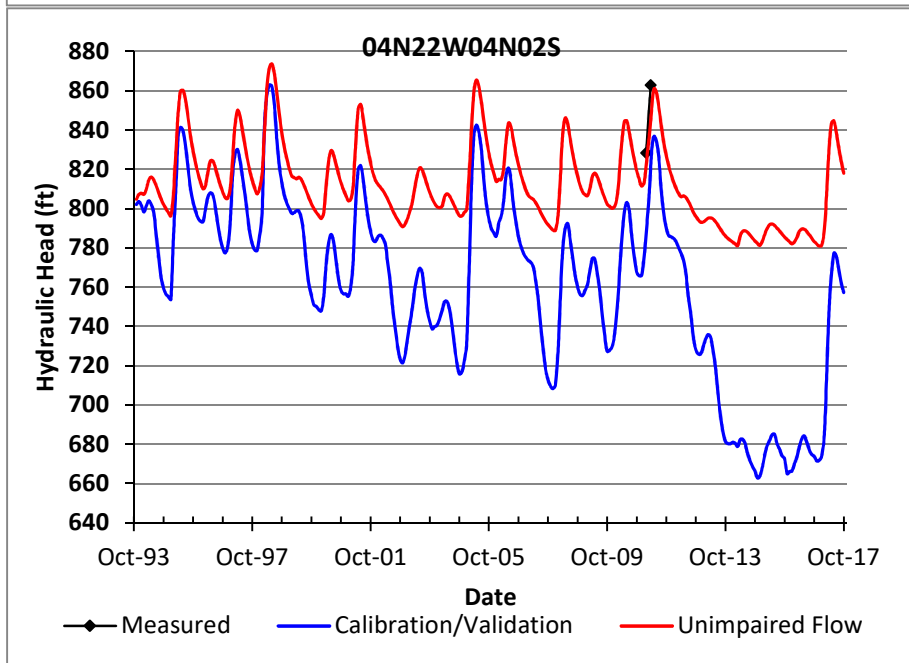
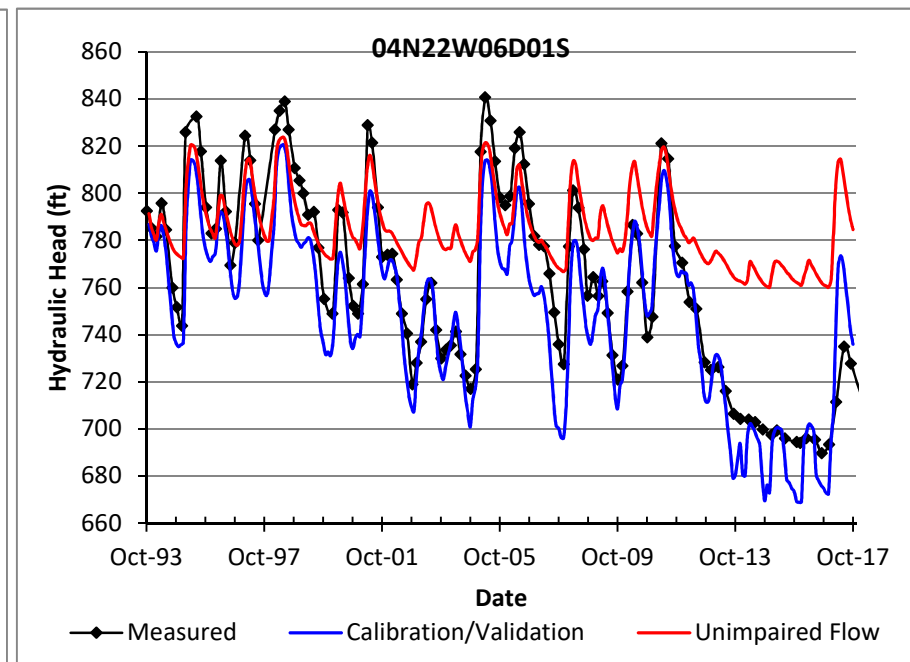
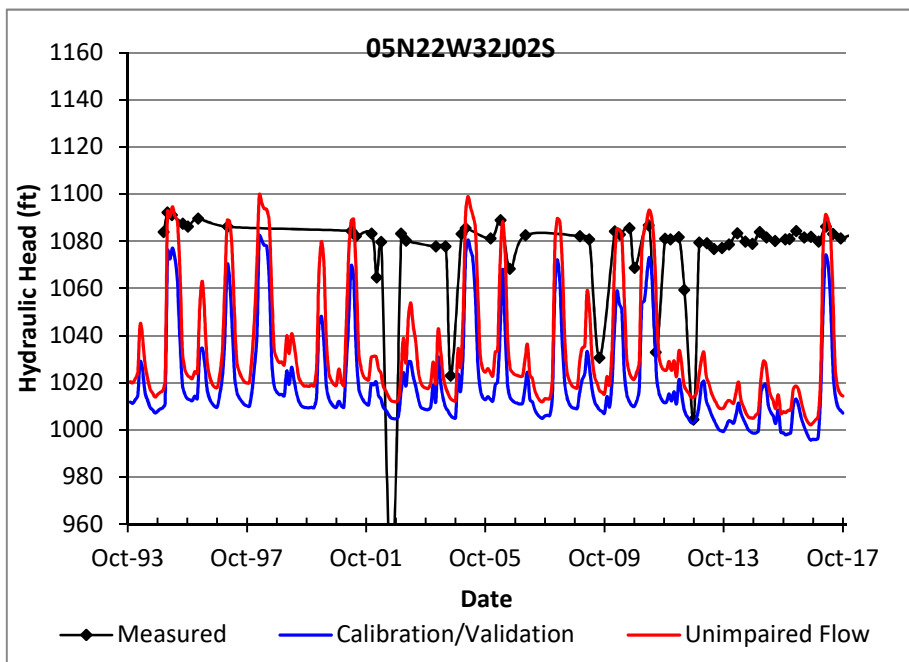


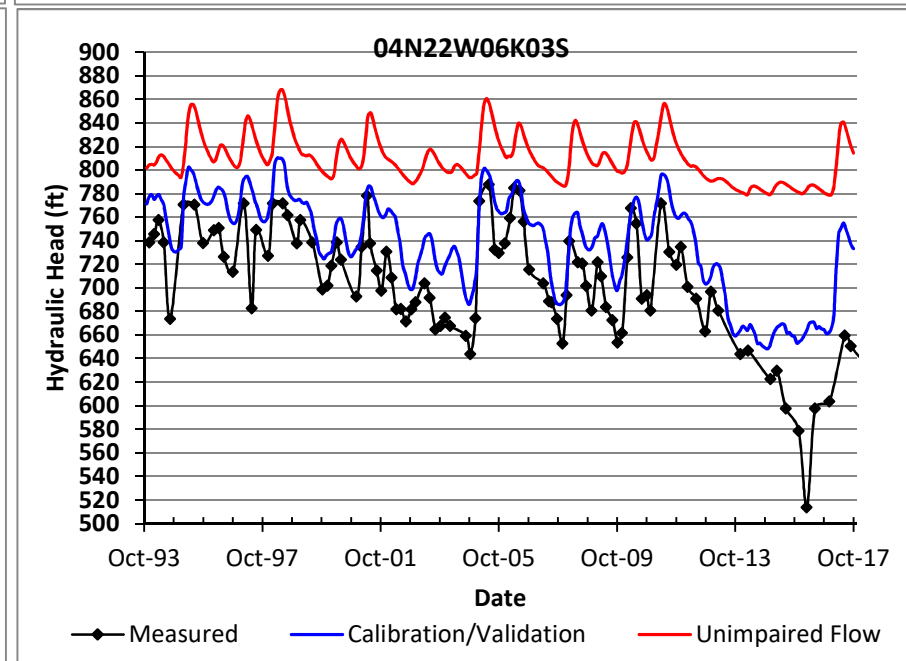
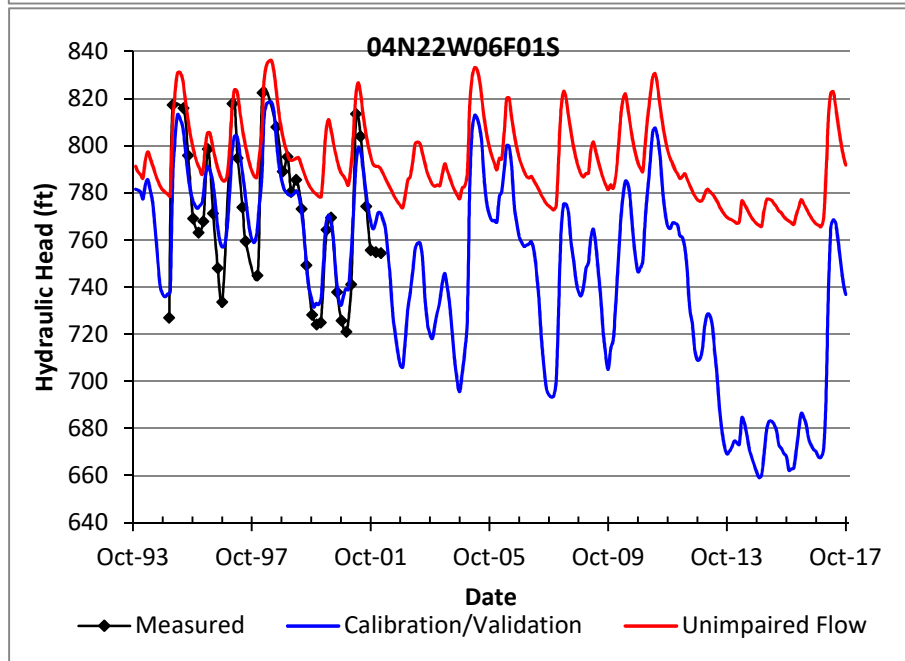
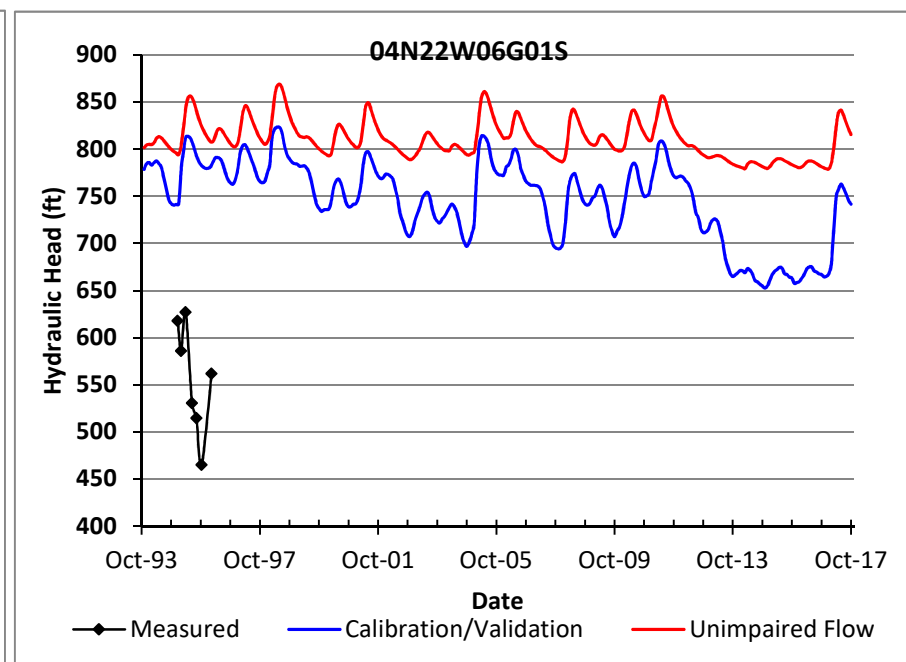
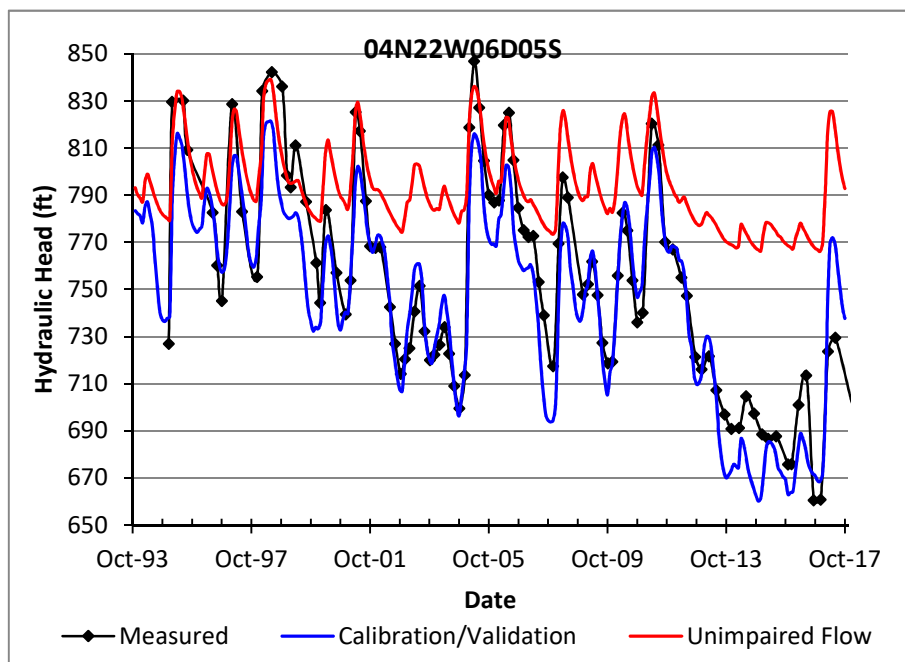


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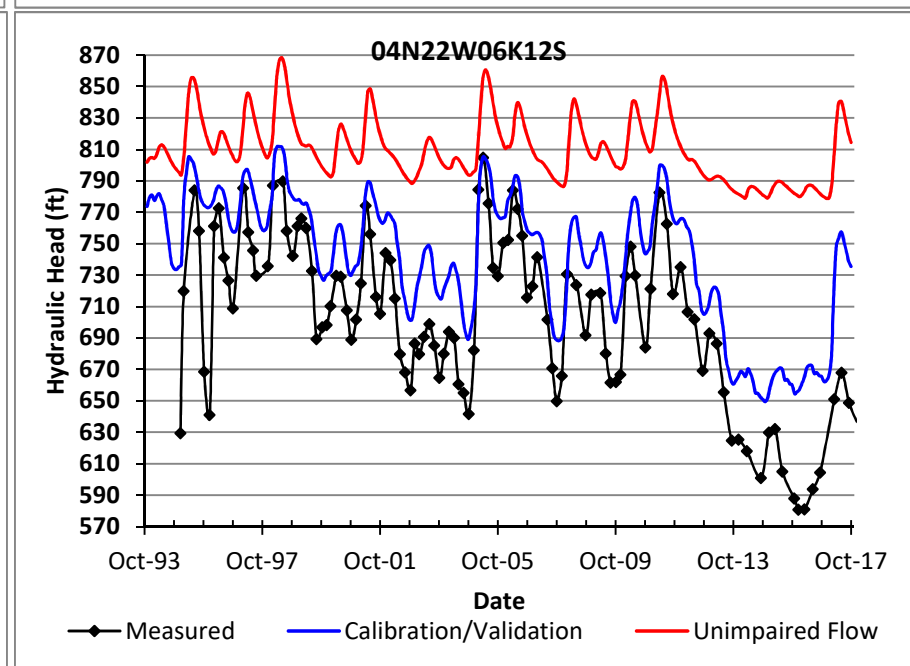
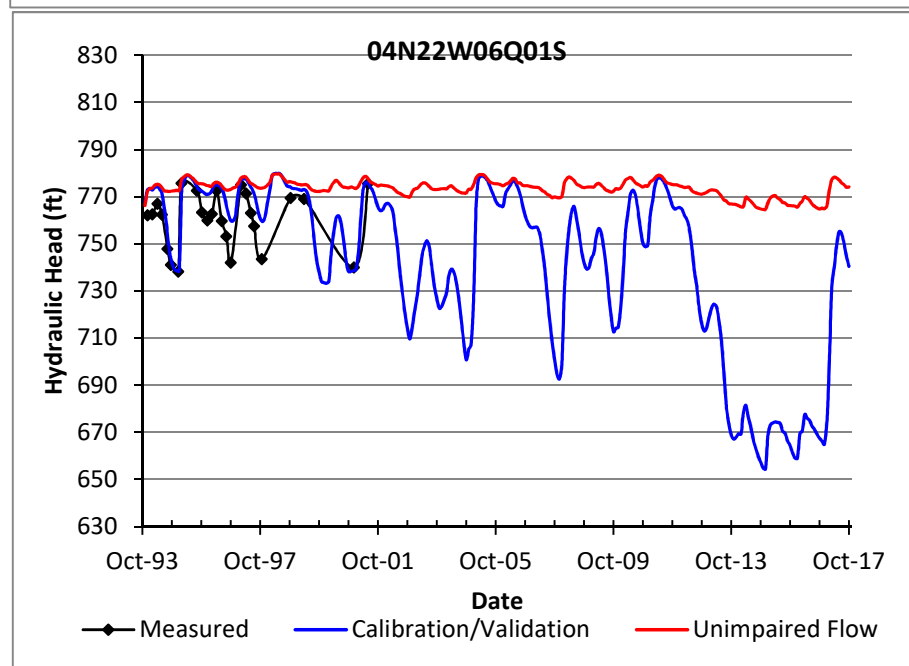
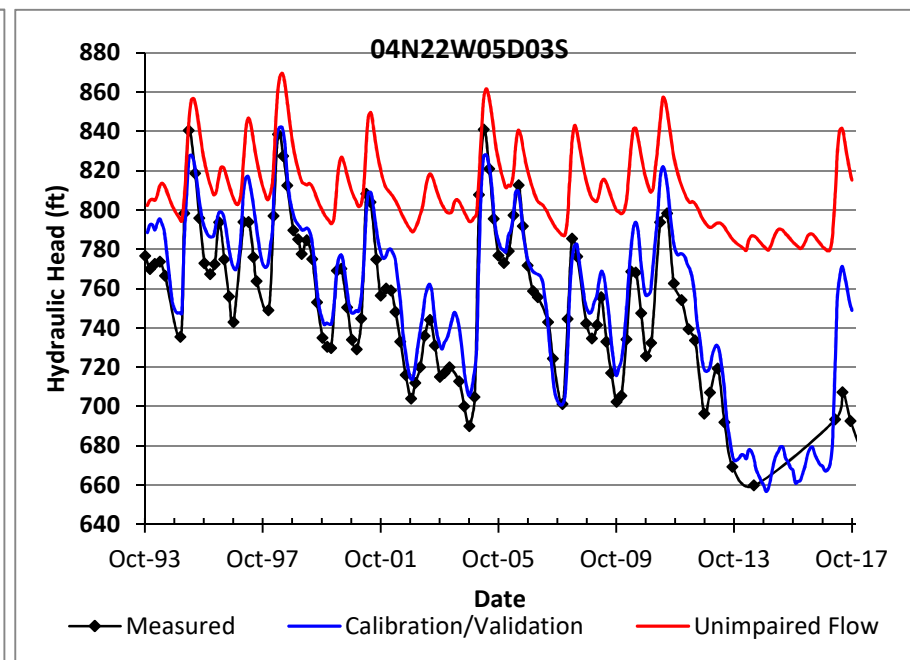
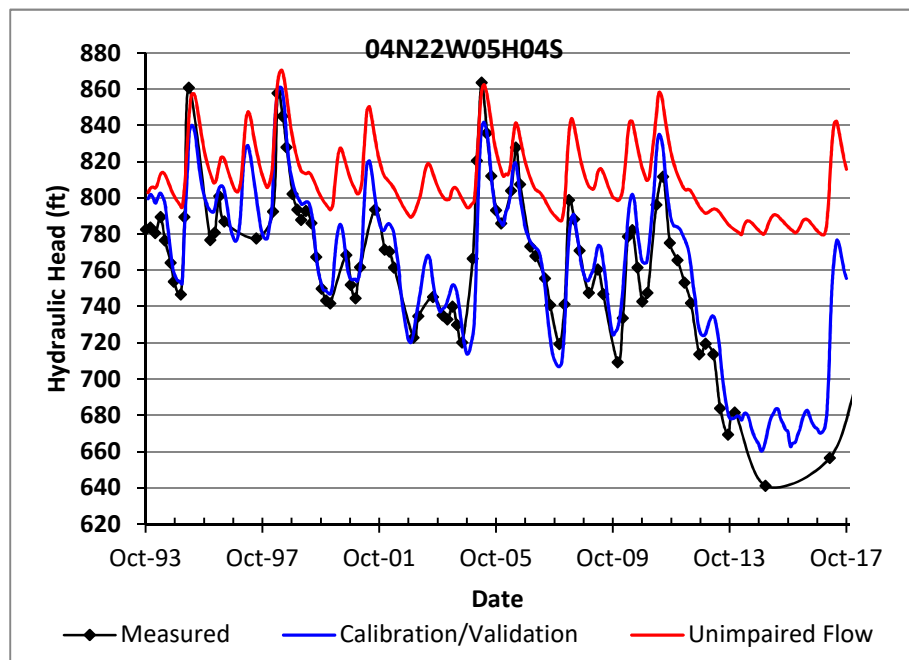
**Ojai Valley Basin**

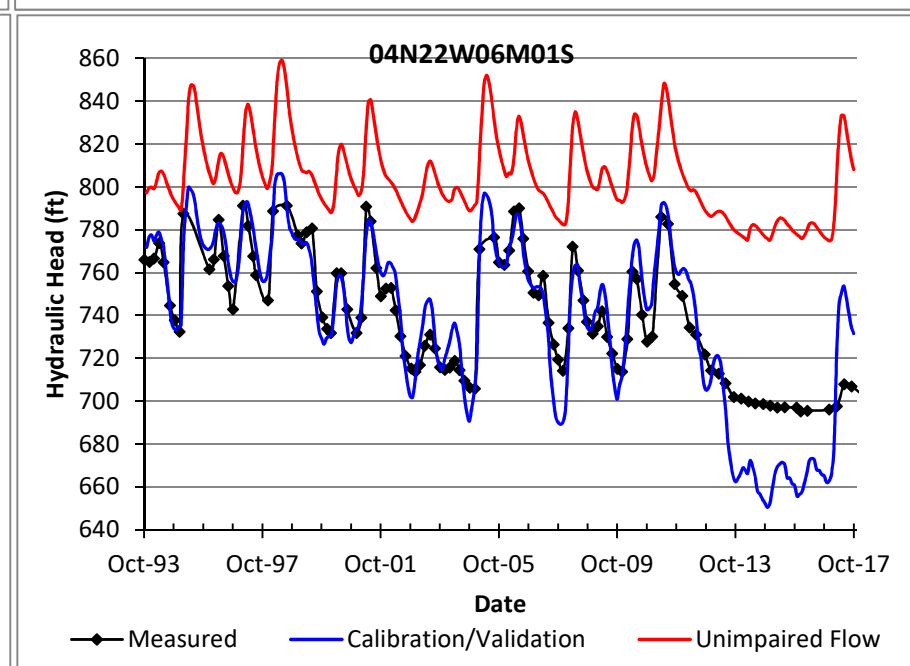
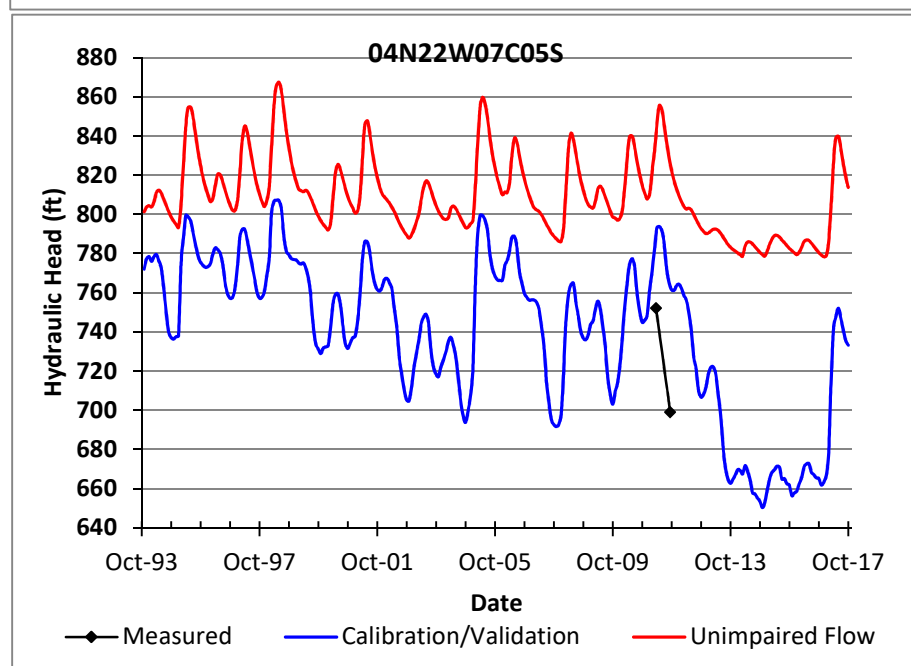
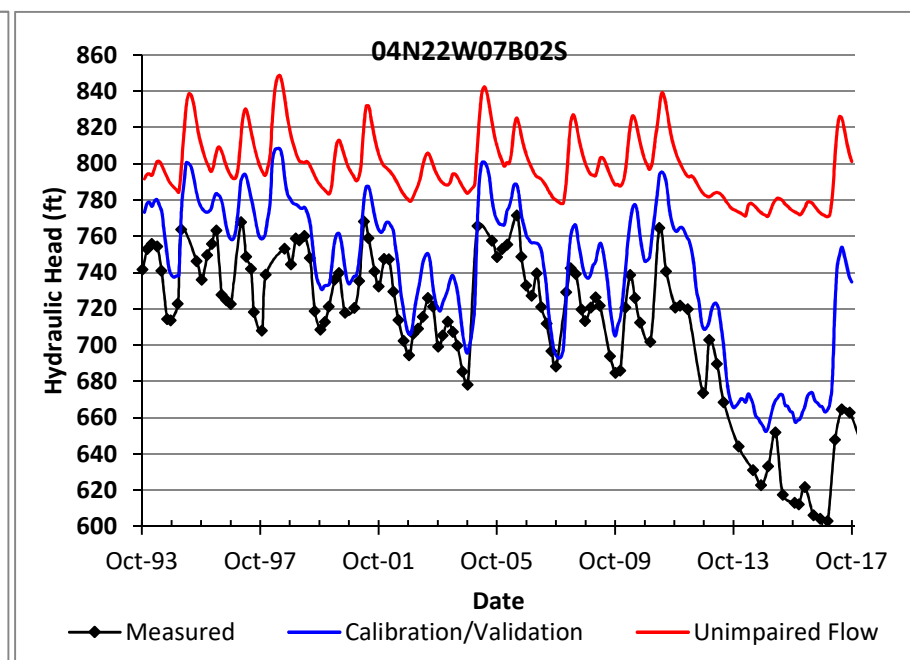
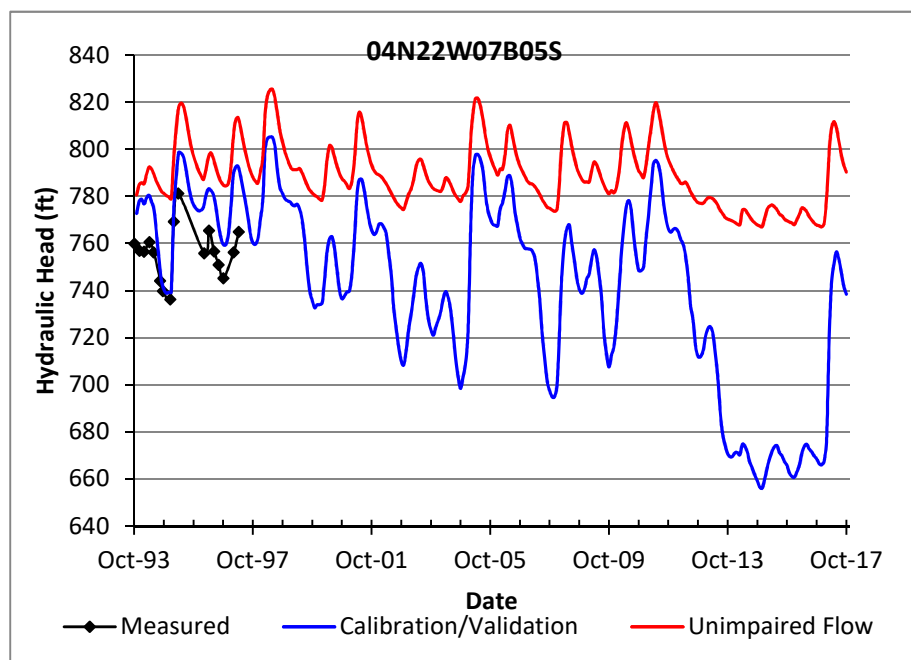


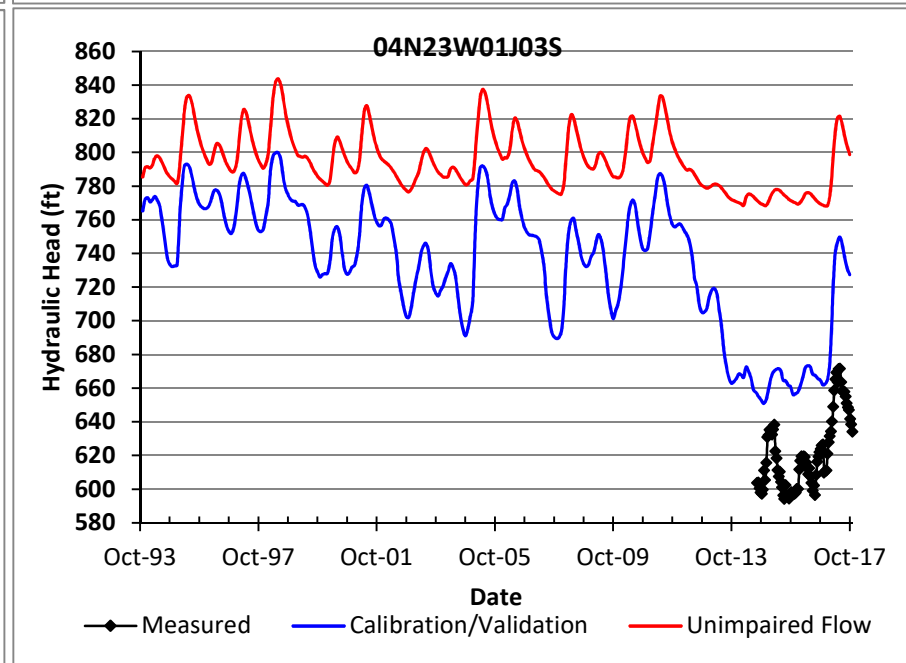
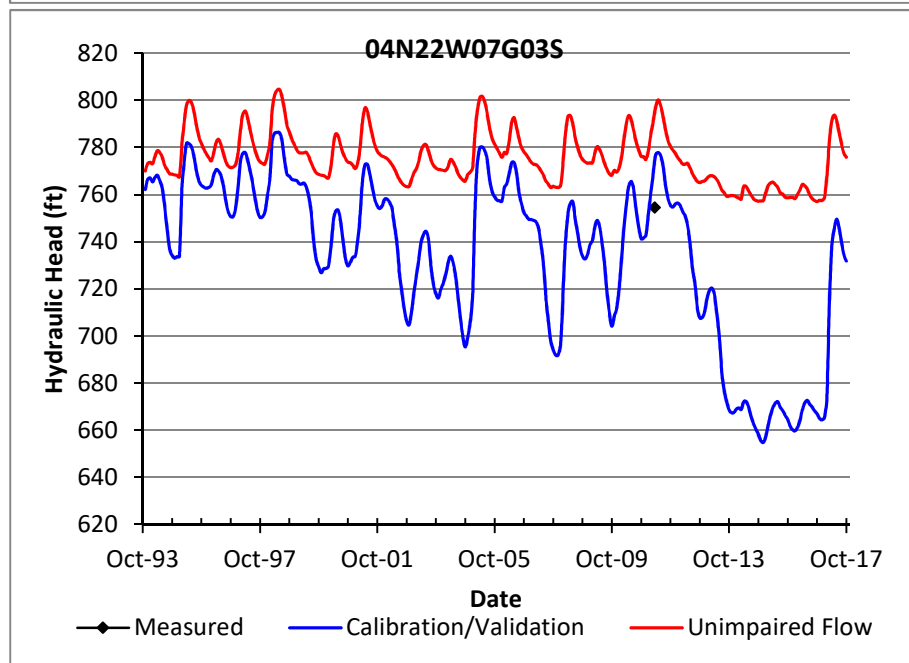
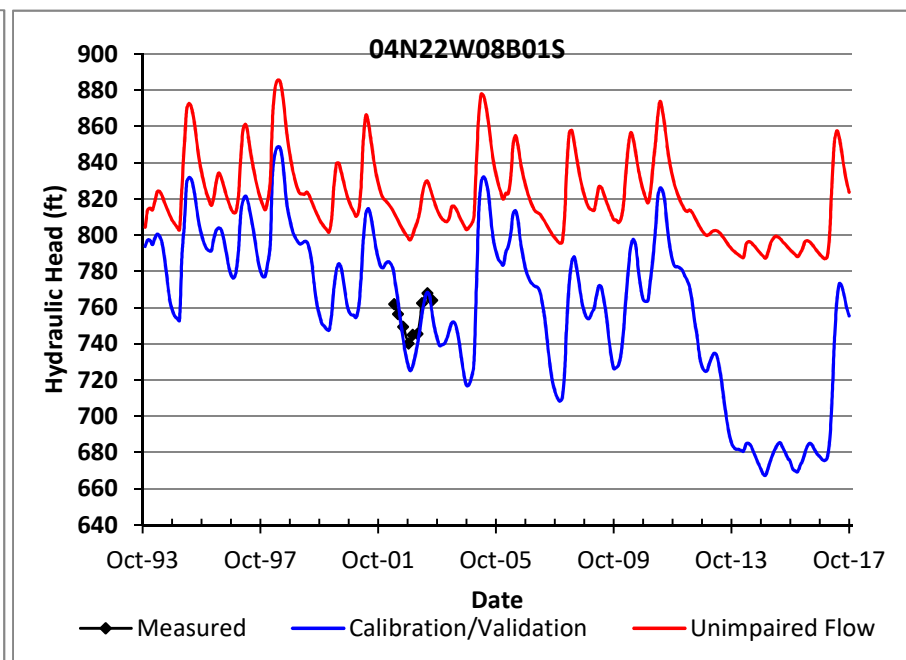
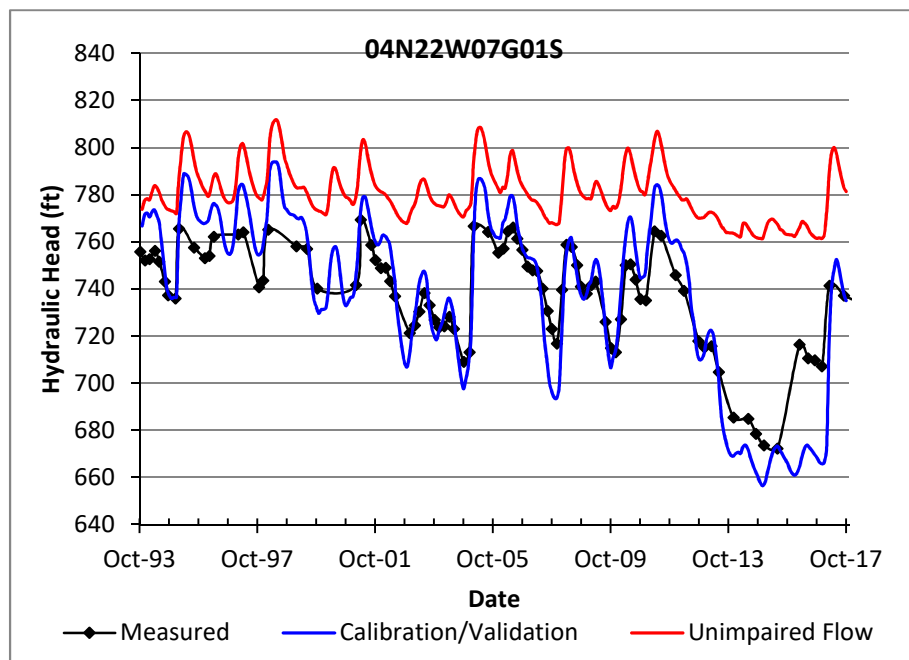


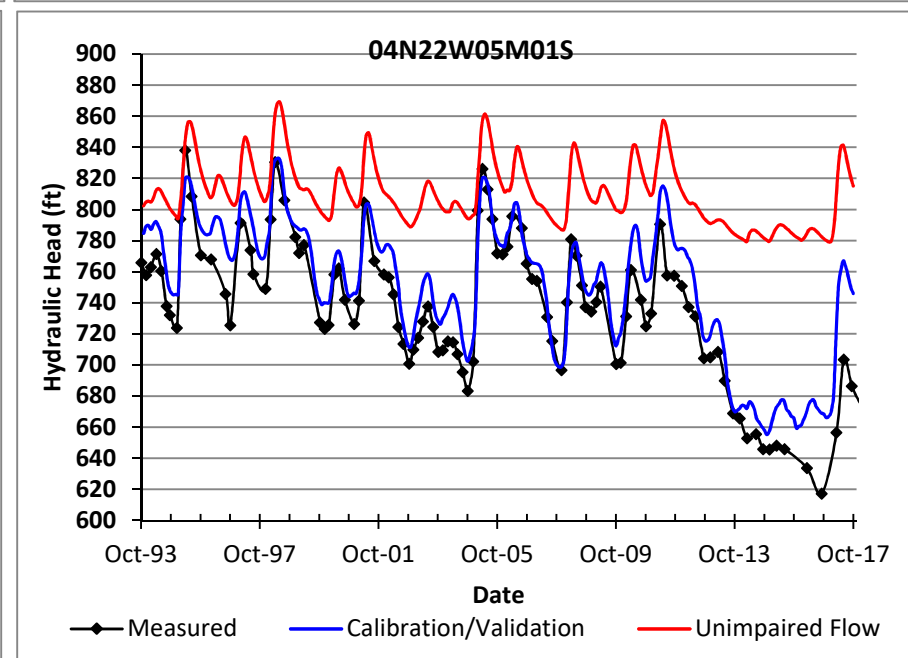
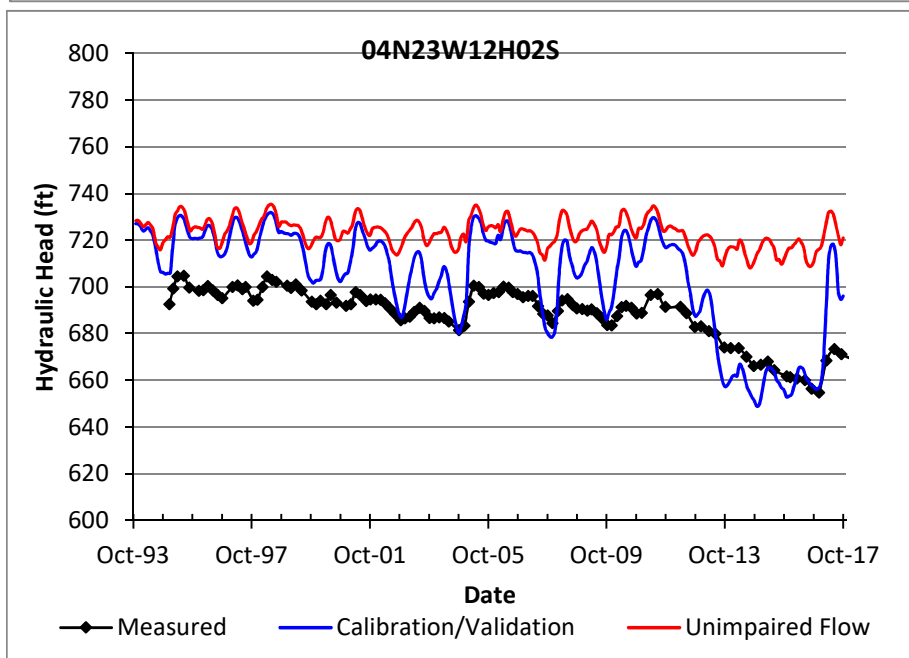
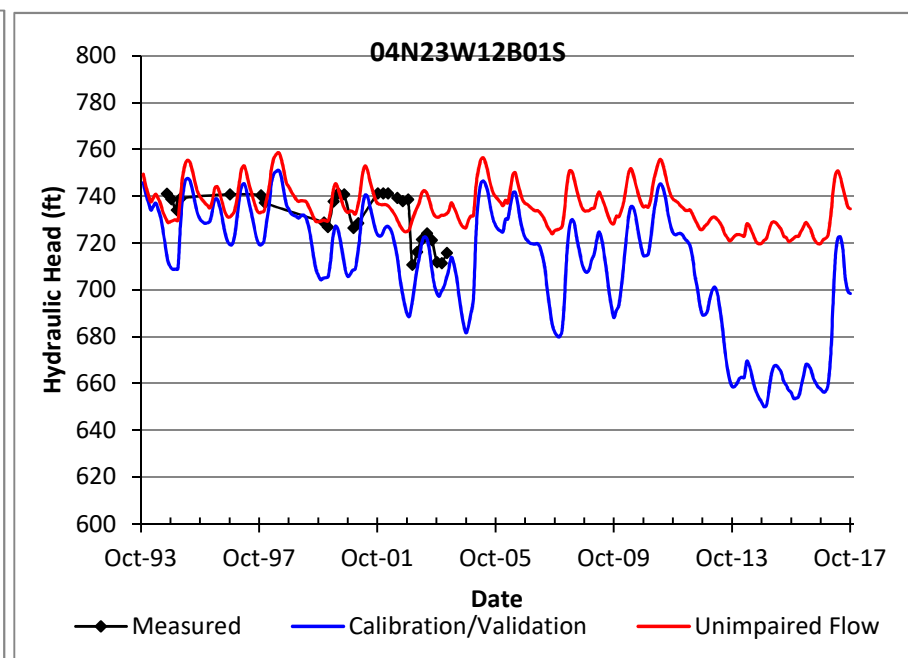
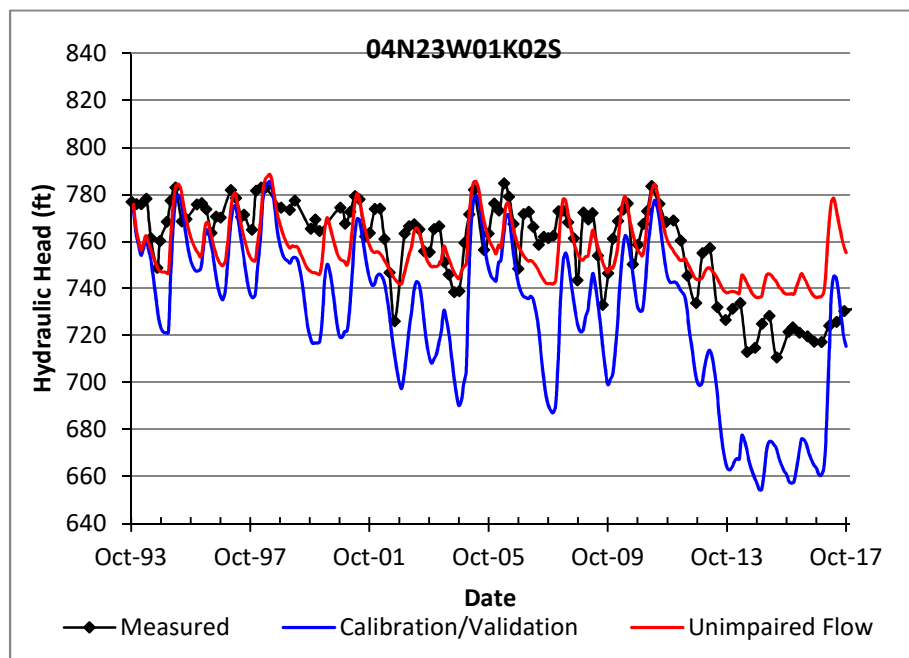


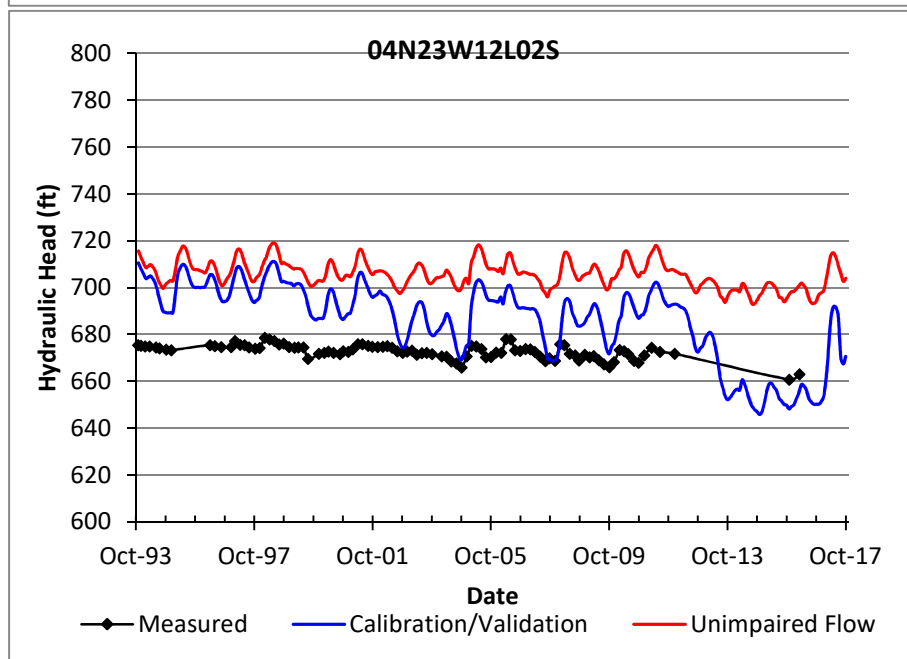
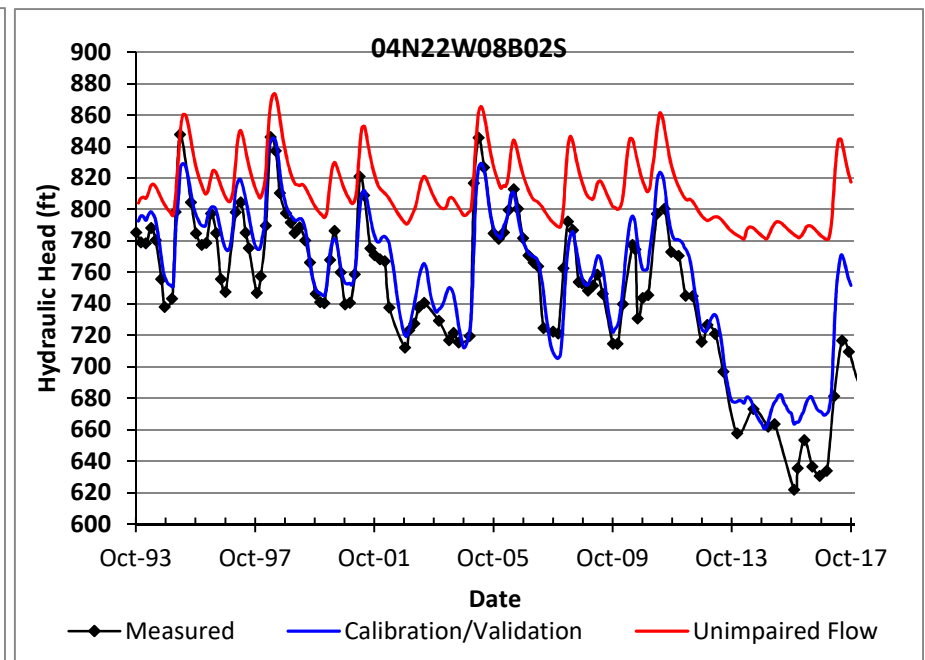
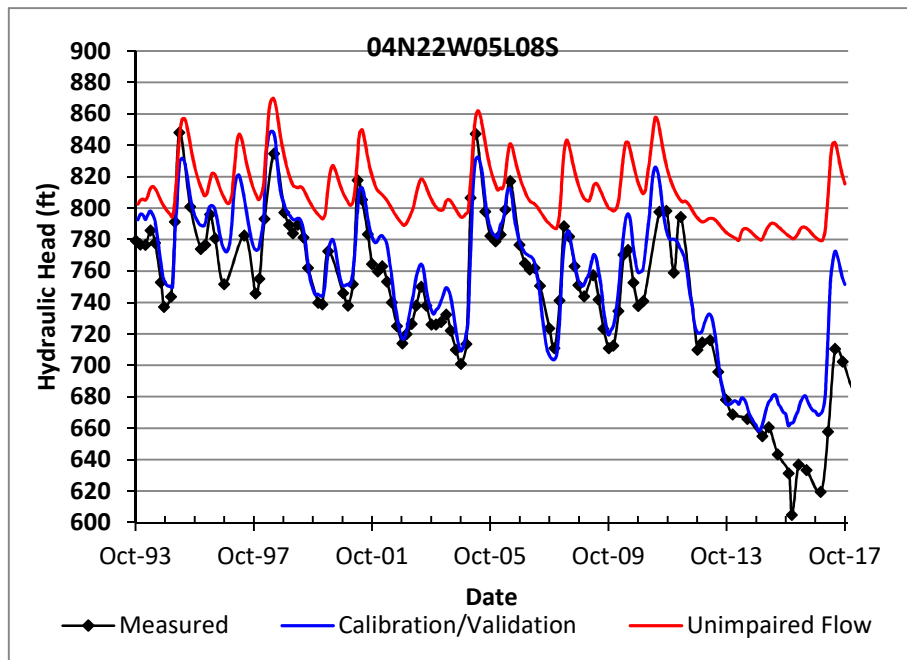








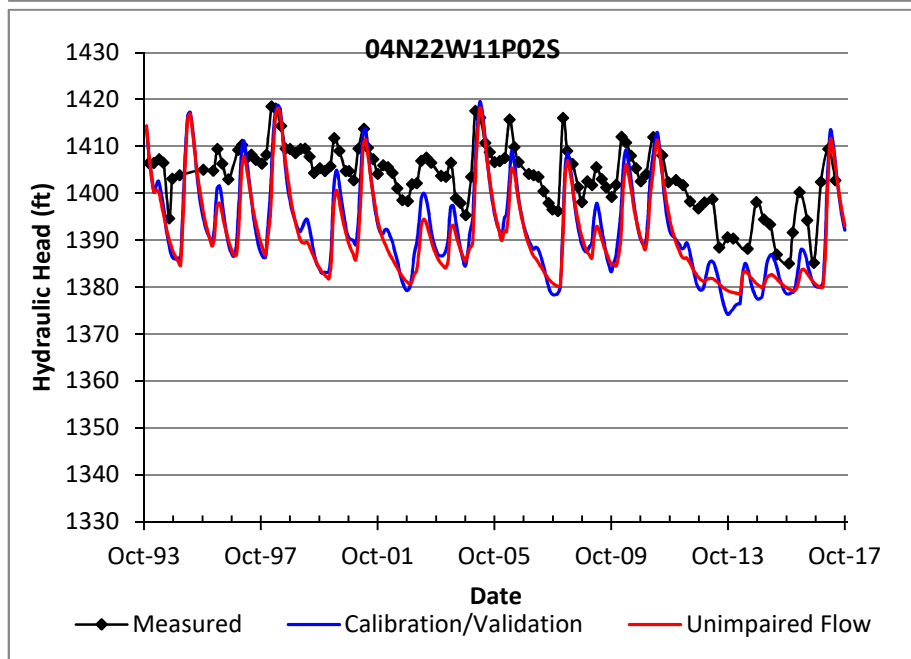
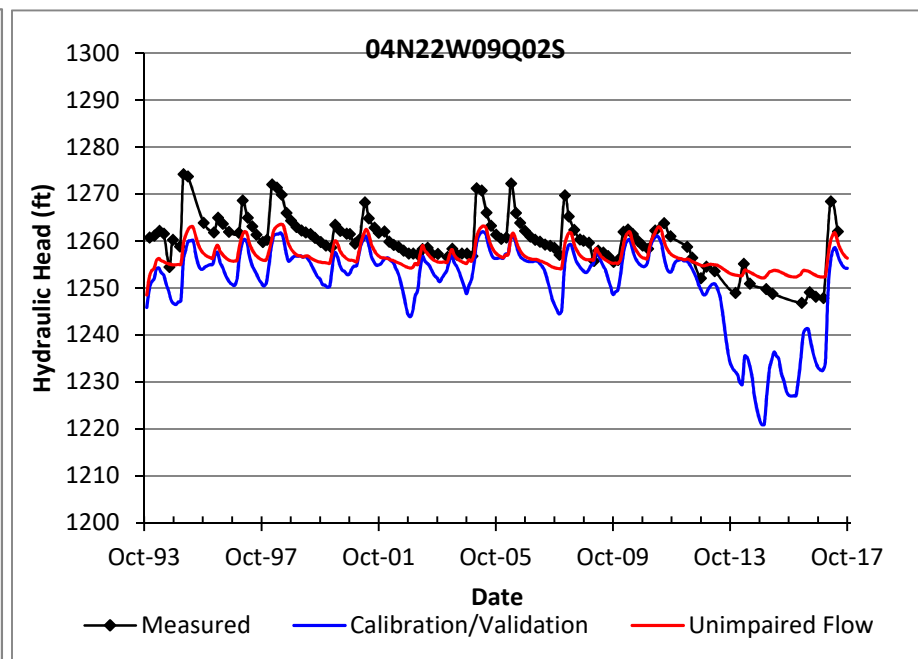
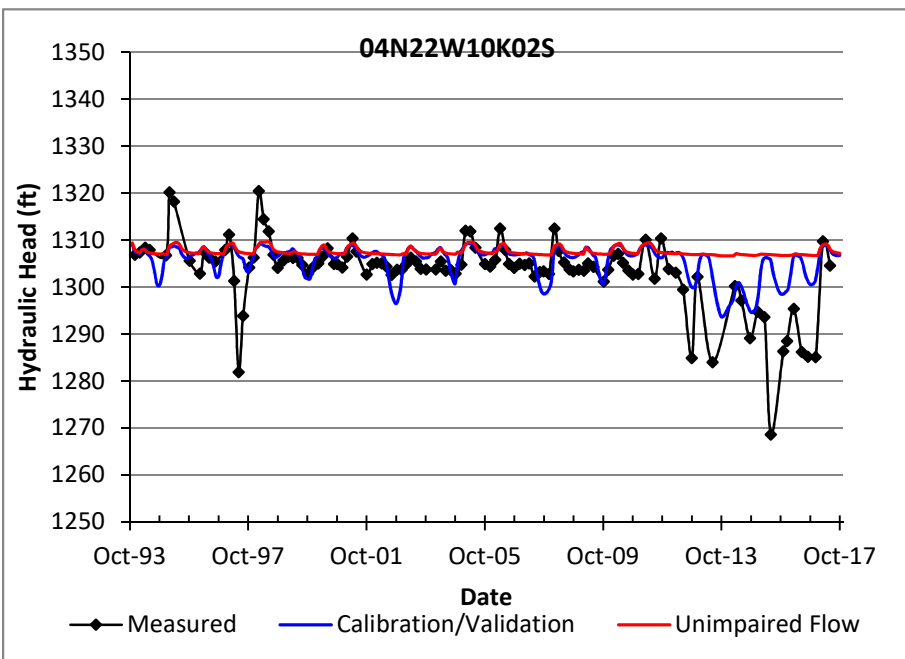




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**Upper Ojai Valley Basin**





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### **Outside the basins**

