



State Water Resources Control Board

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor
Sacramento, CA 95814

Los Angeles Regional Water Quality Control Board

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

**MODEL DOCUMENTATION REPORT FOR THE GROUNDWATER-
SURFACE WATER MODEL FOR THE VENTURARIVER WATERSHED:
APPENDICES B, D, E, & F**

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

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Santa Barbara, CA 93101
Project Number: LA0421



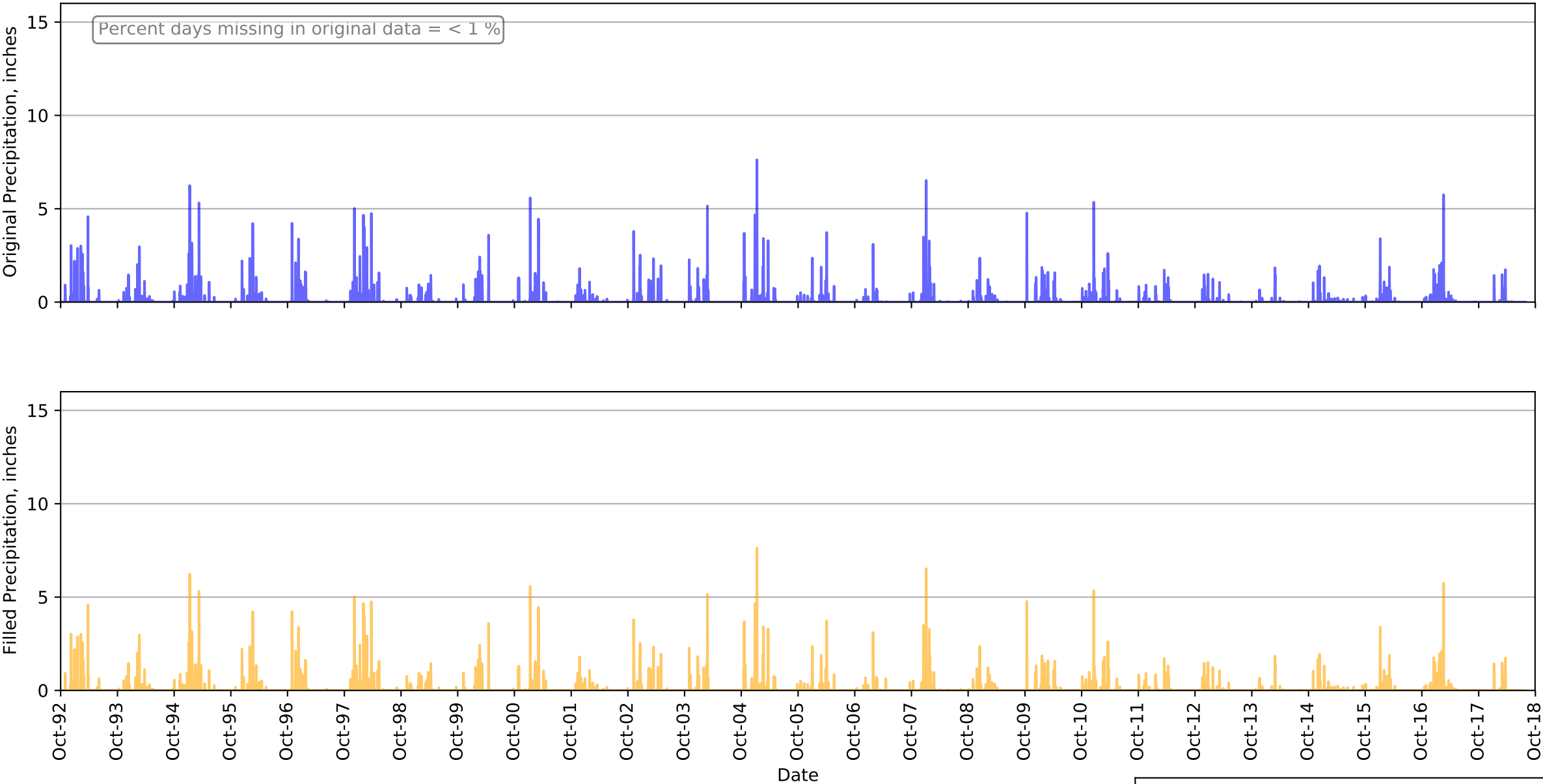
DBS&A
Daniel B. Stephens & Associates, Inc.

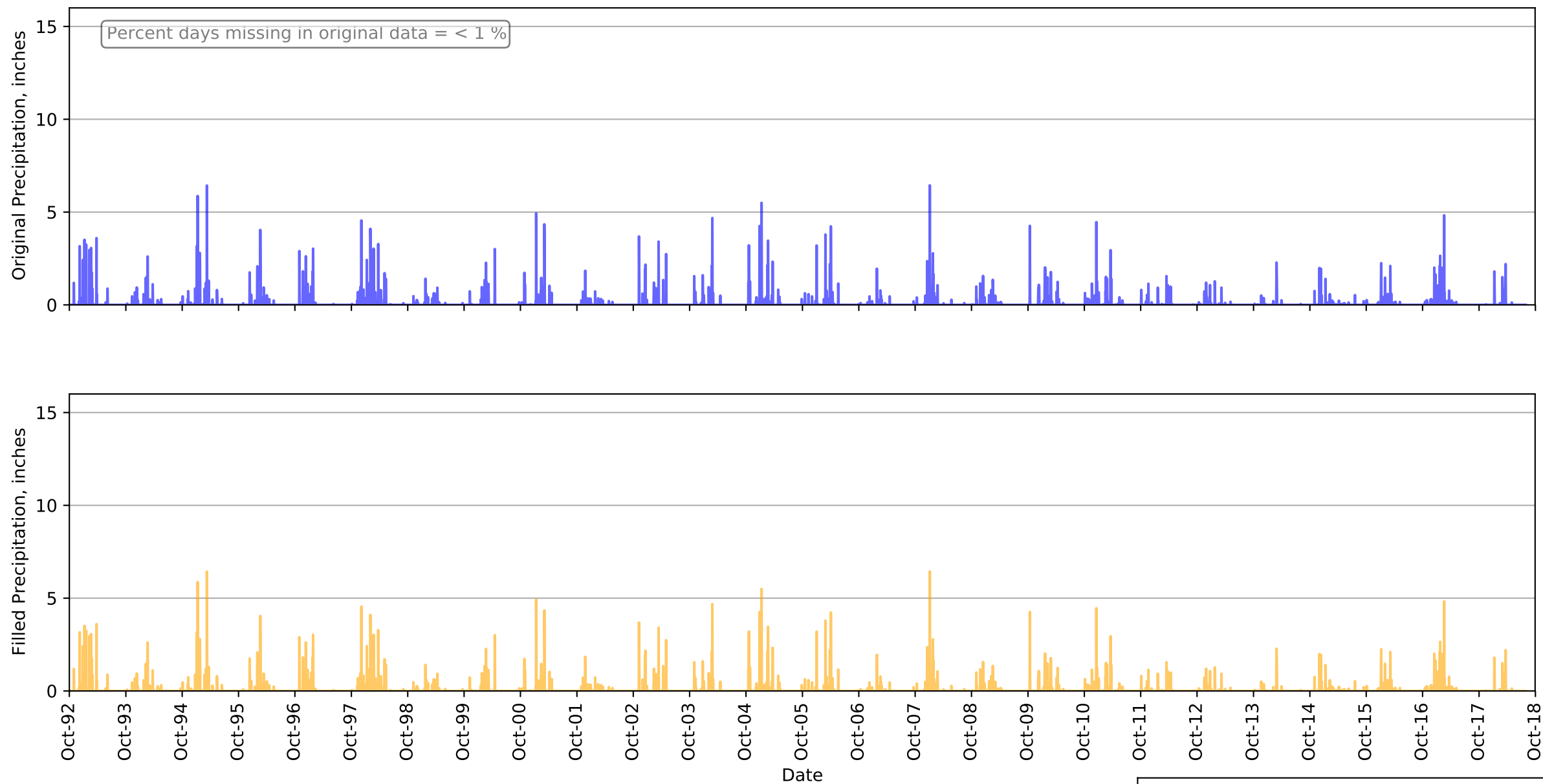
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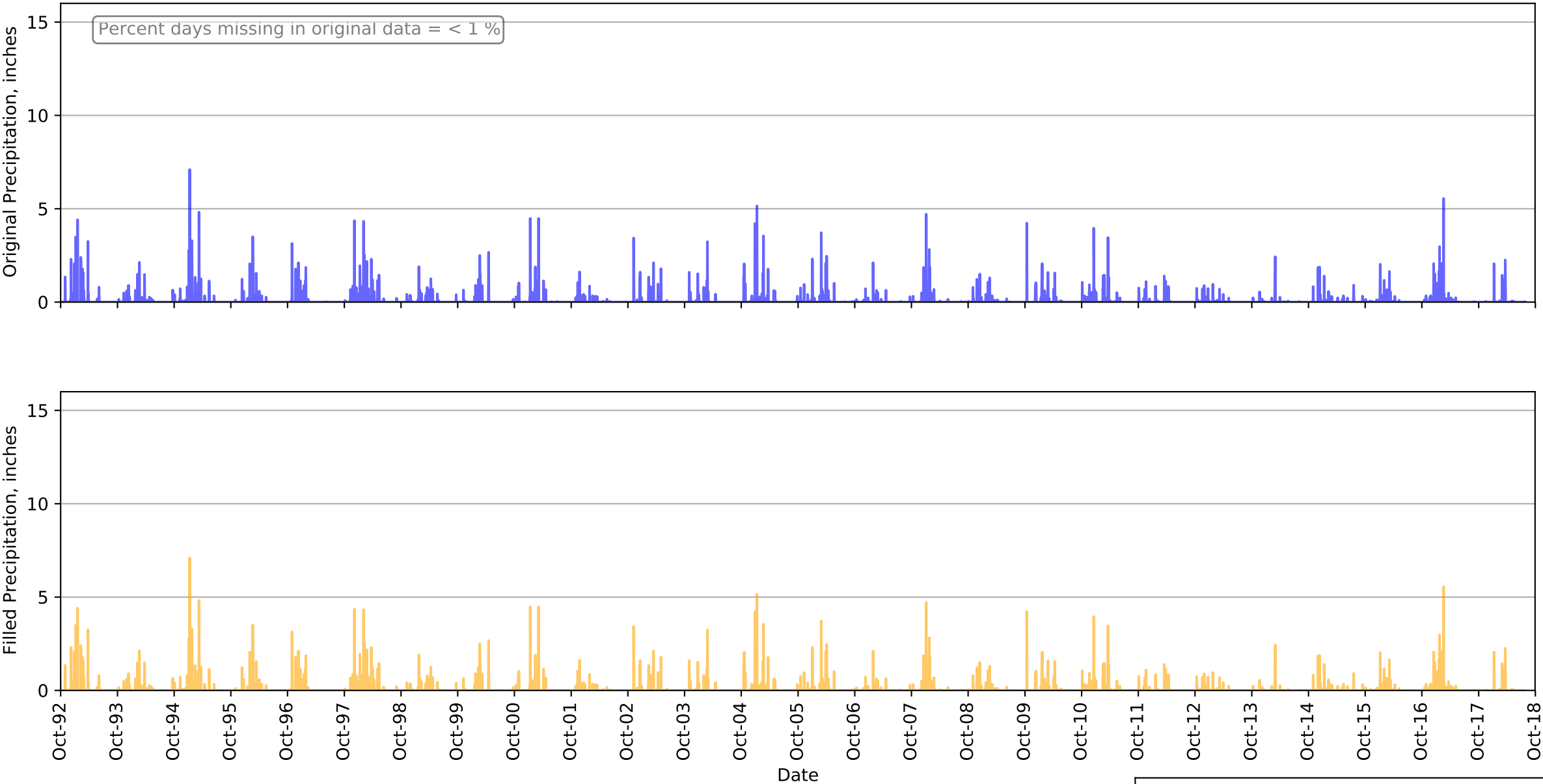
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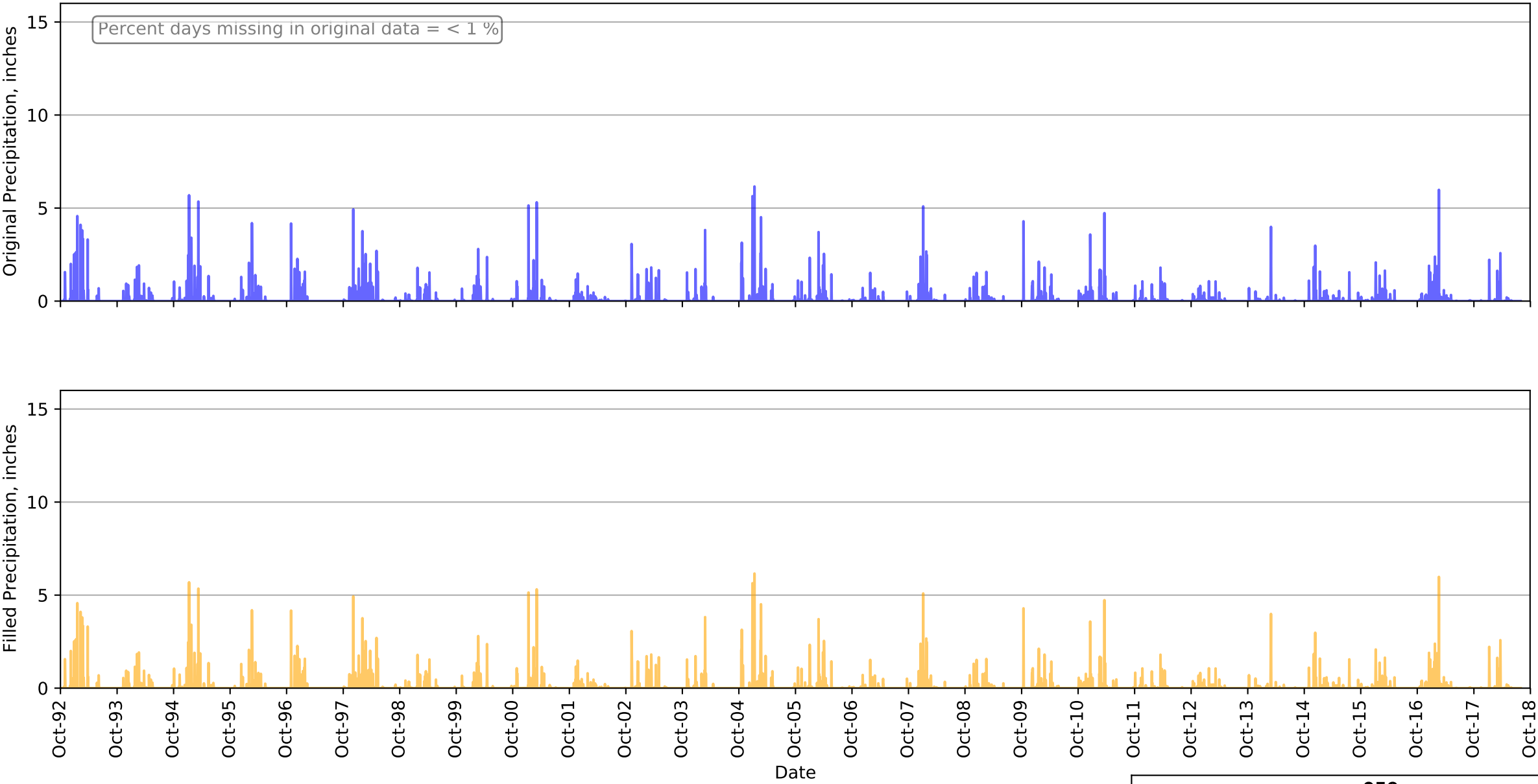
APPENDIX B: PRECIPITATION DATA

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 bar graphs are shown. The upper plot shows the measured data (blue) for each rain gage station, including data gaps. The lower plot shows the filled, or patched, data (yellow) that was 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. Rainfall gage locations are mapped 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.

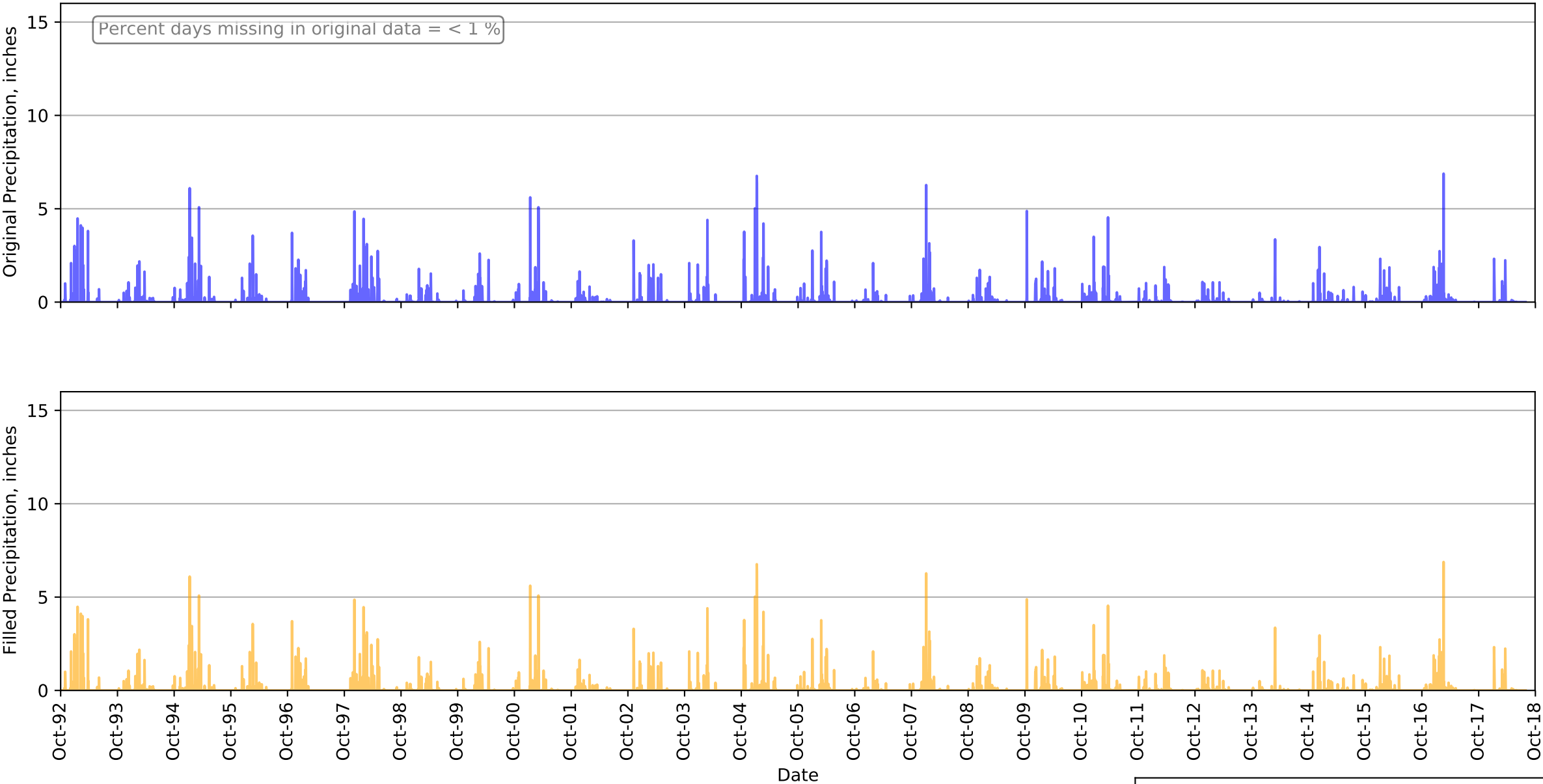




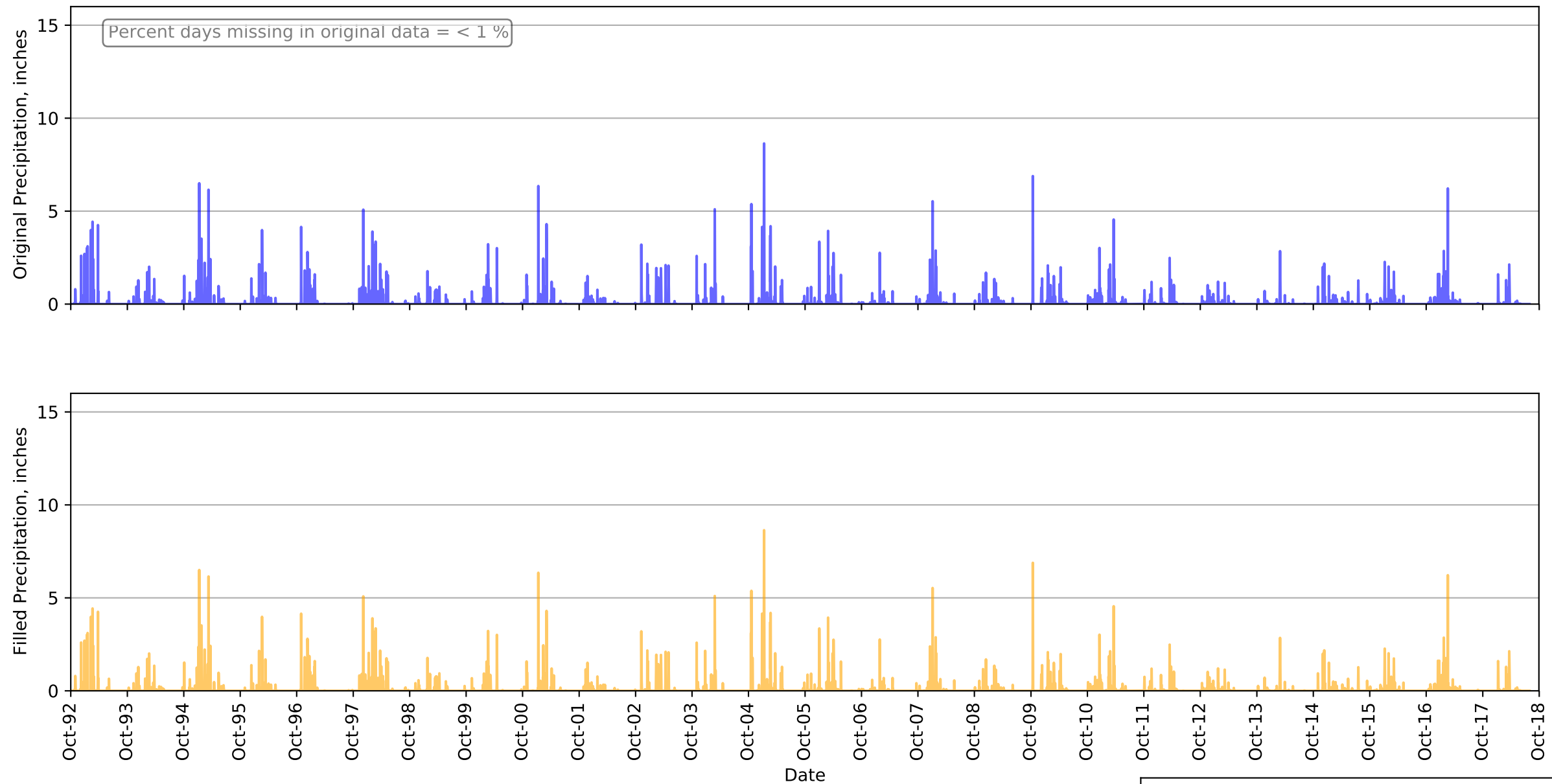




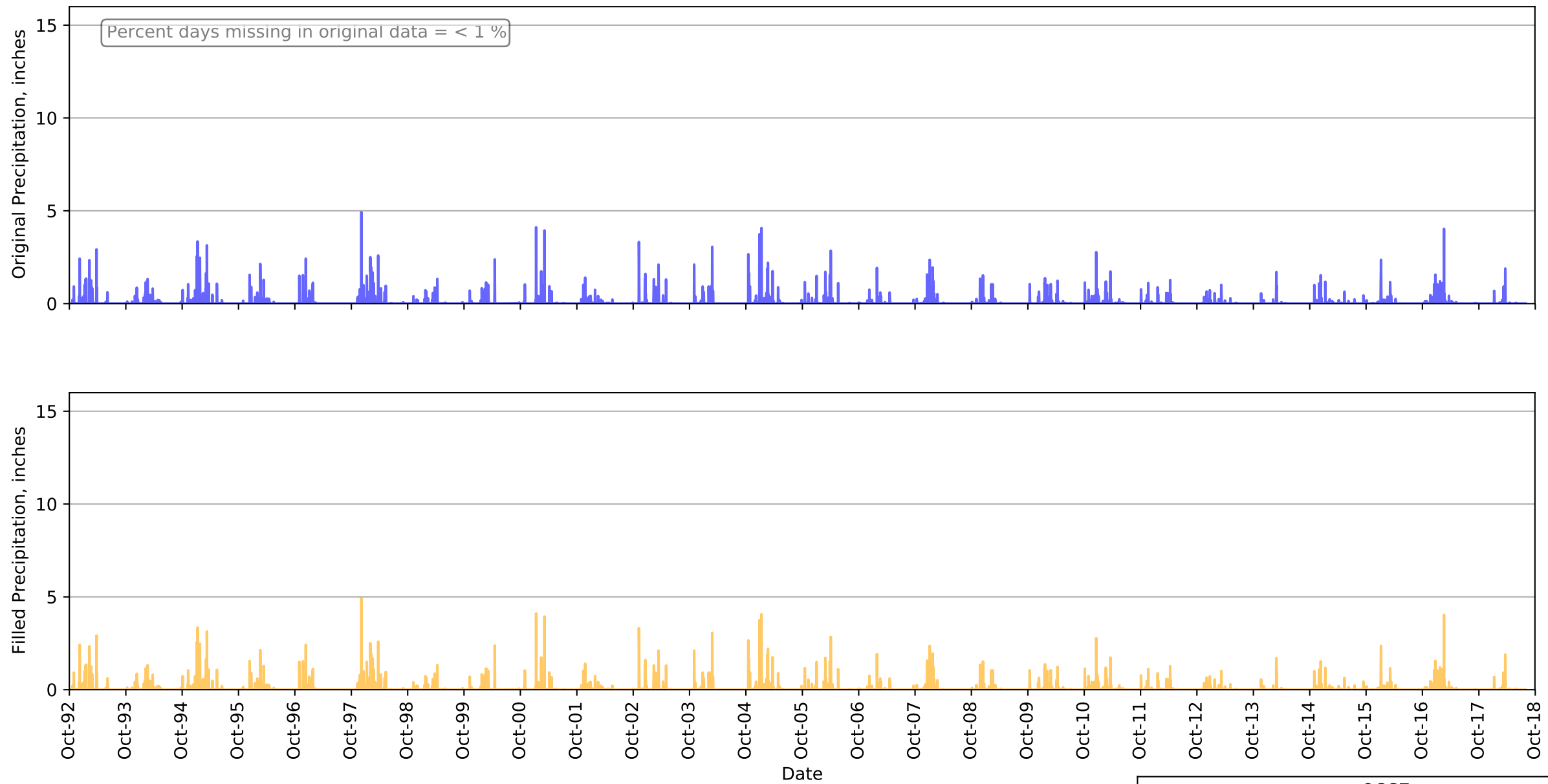
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Geosyntec consultants		Figure B.4
Santa Barbara	December 2021	



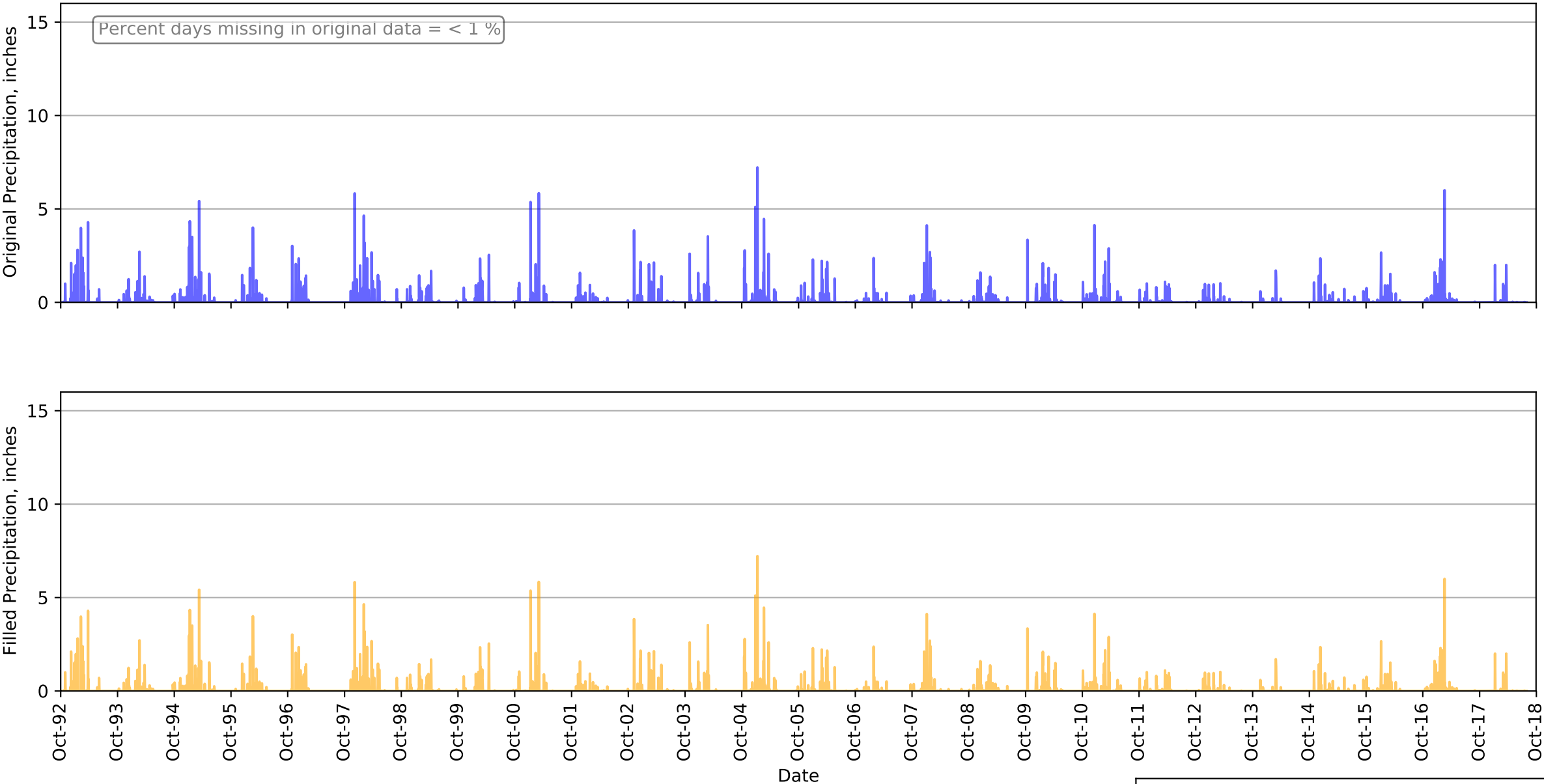
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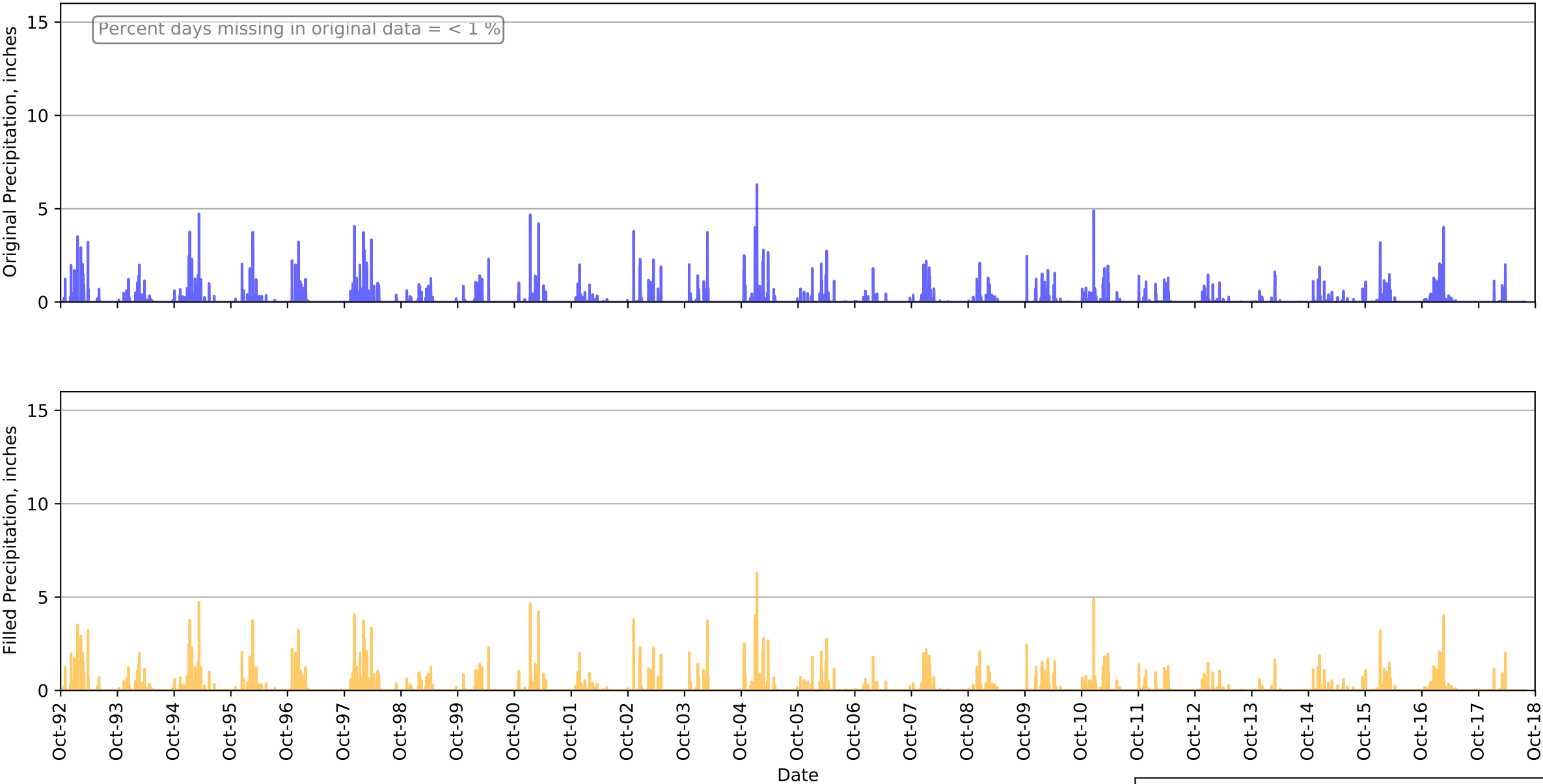
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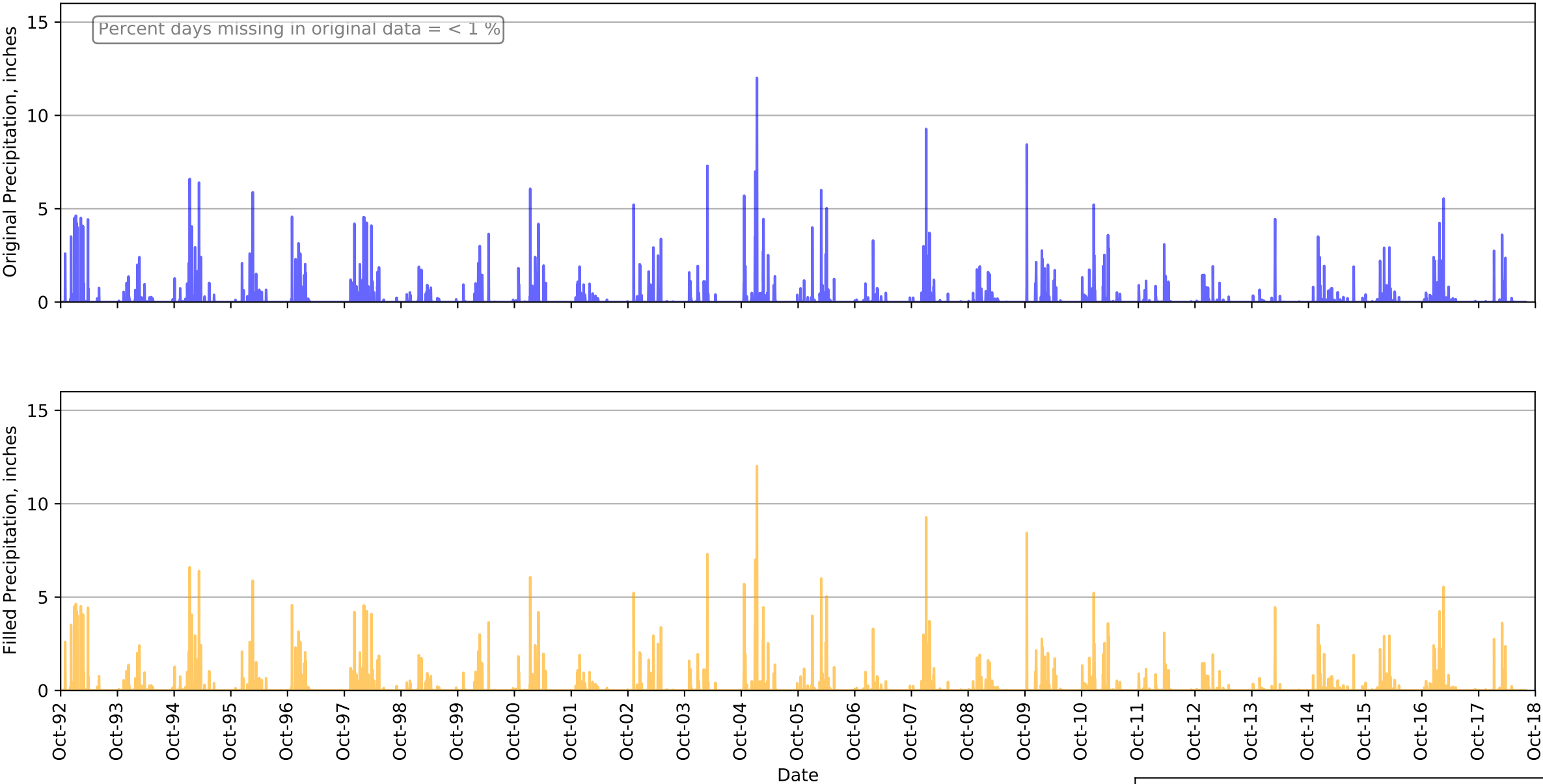


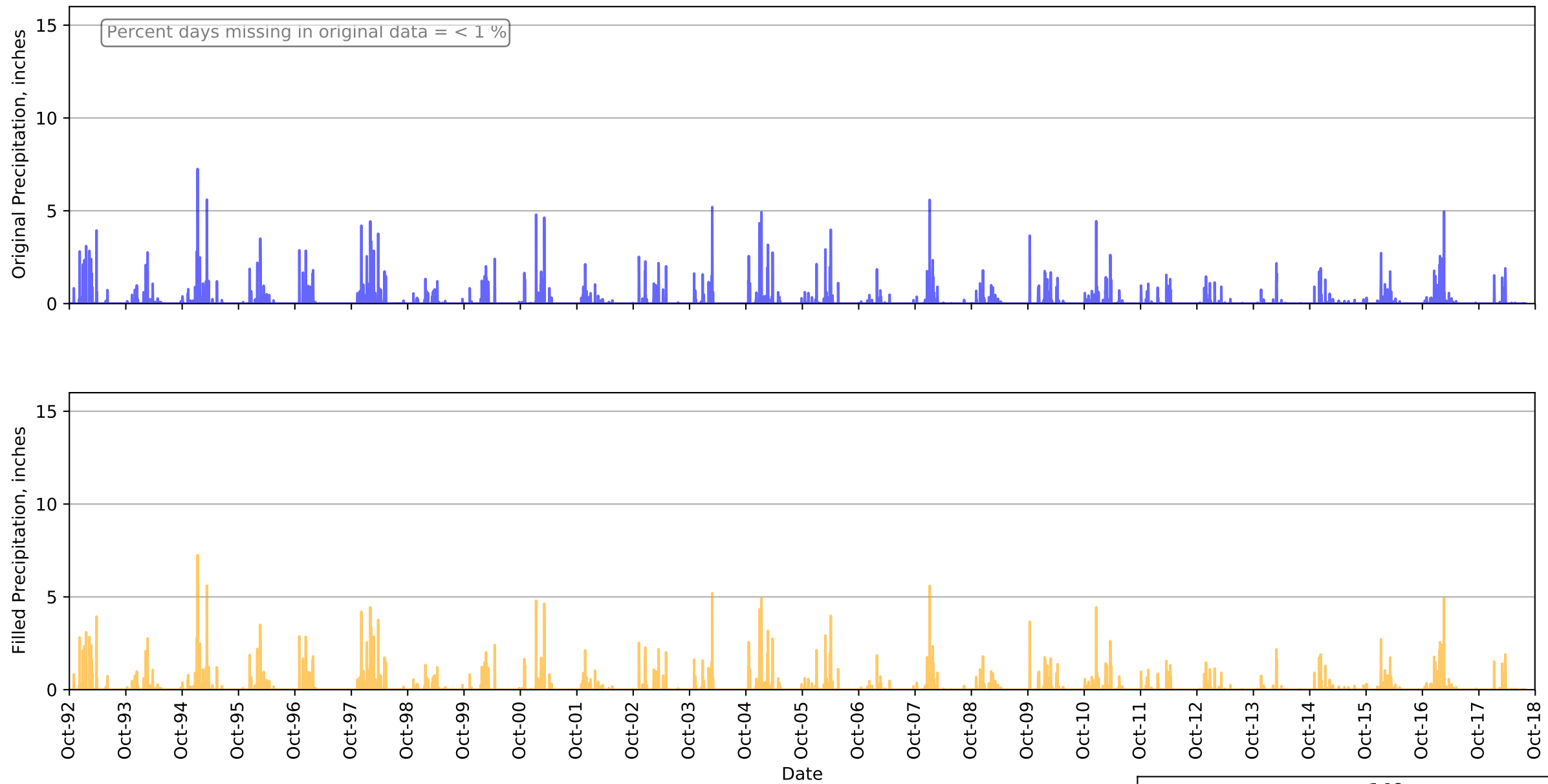
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Santa Barbara	December 2021	

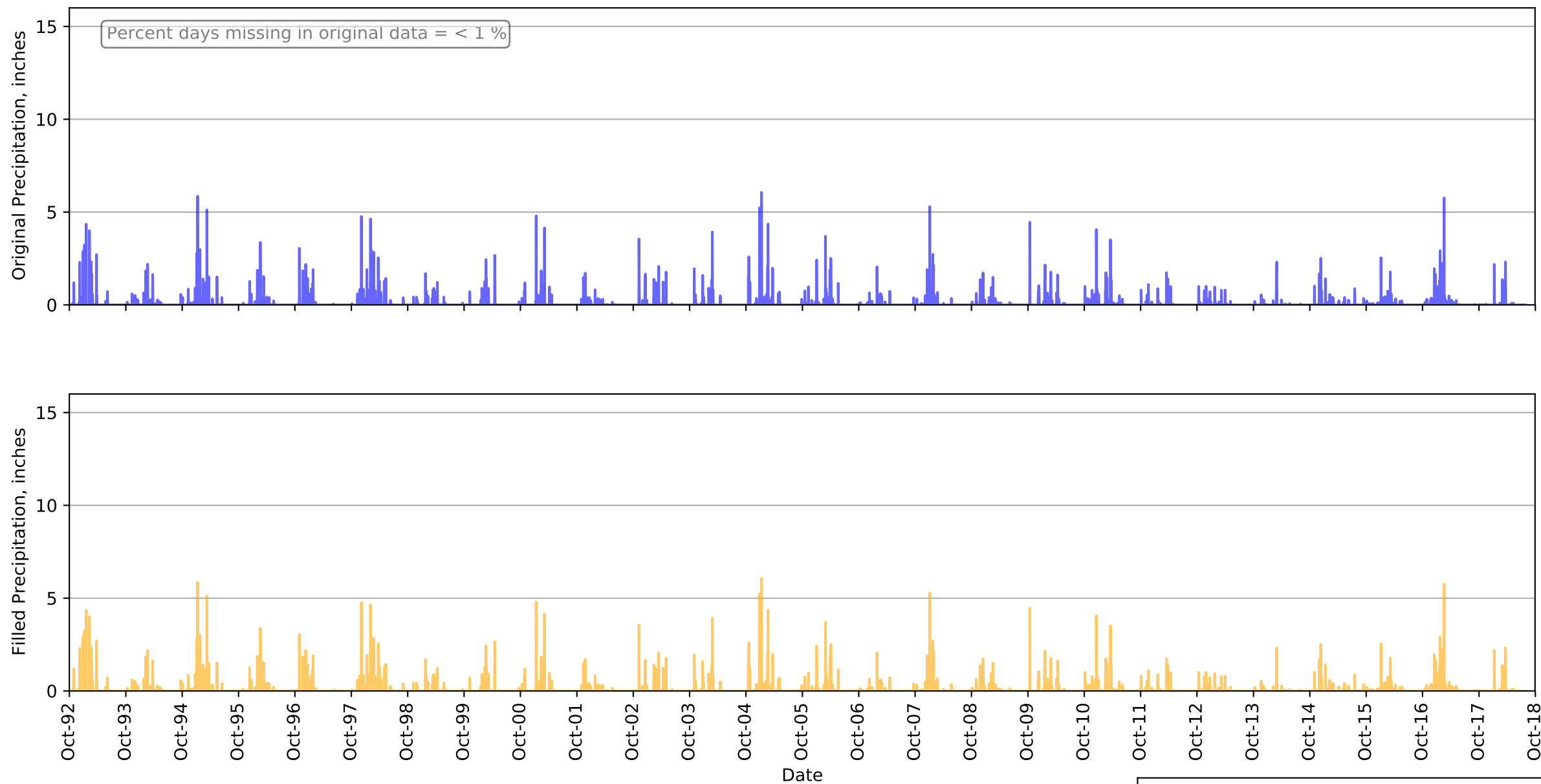


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Santa Barbara	December 2021	









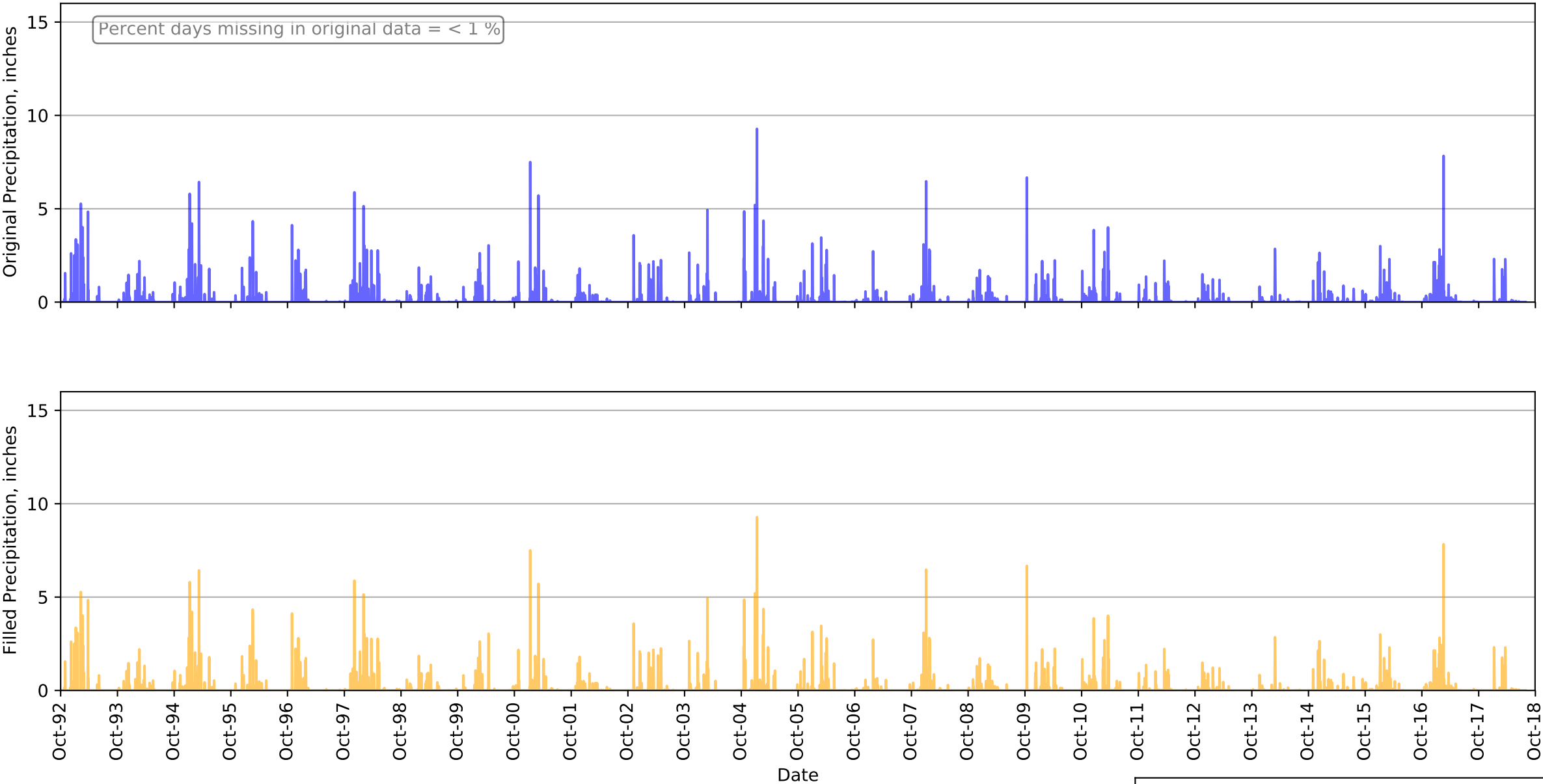
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Ventura River Watershed, Ventura County, CA

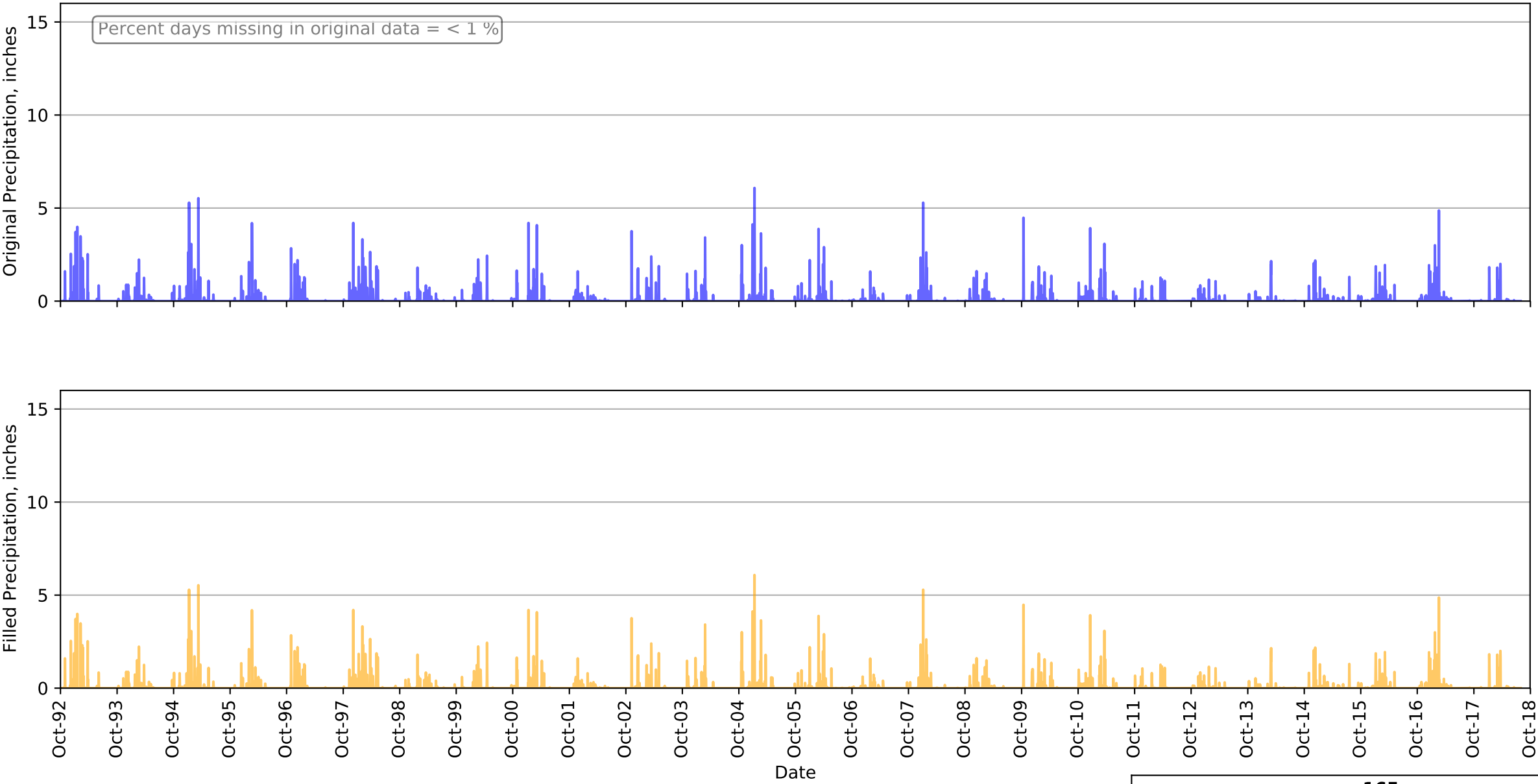
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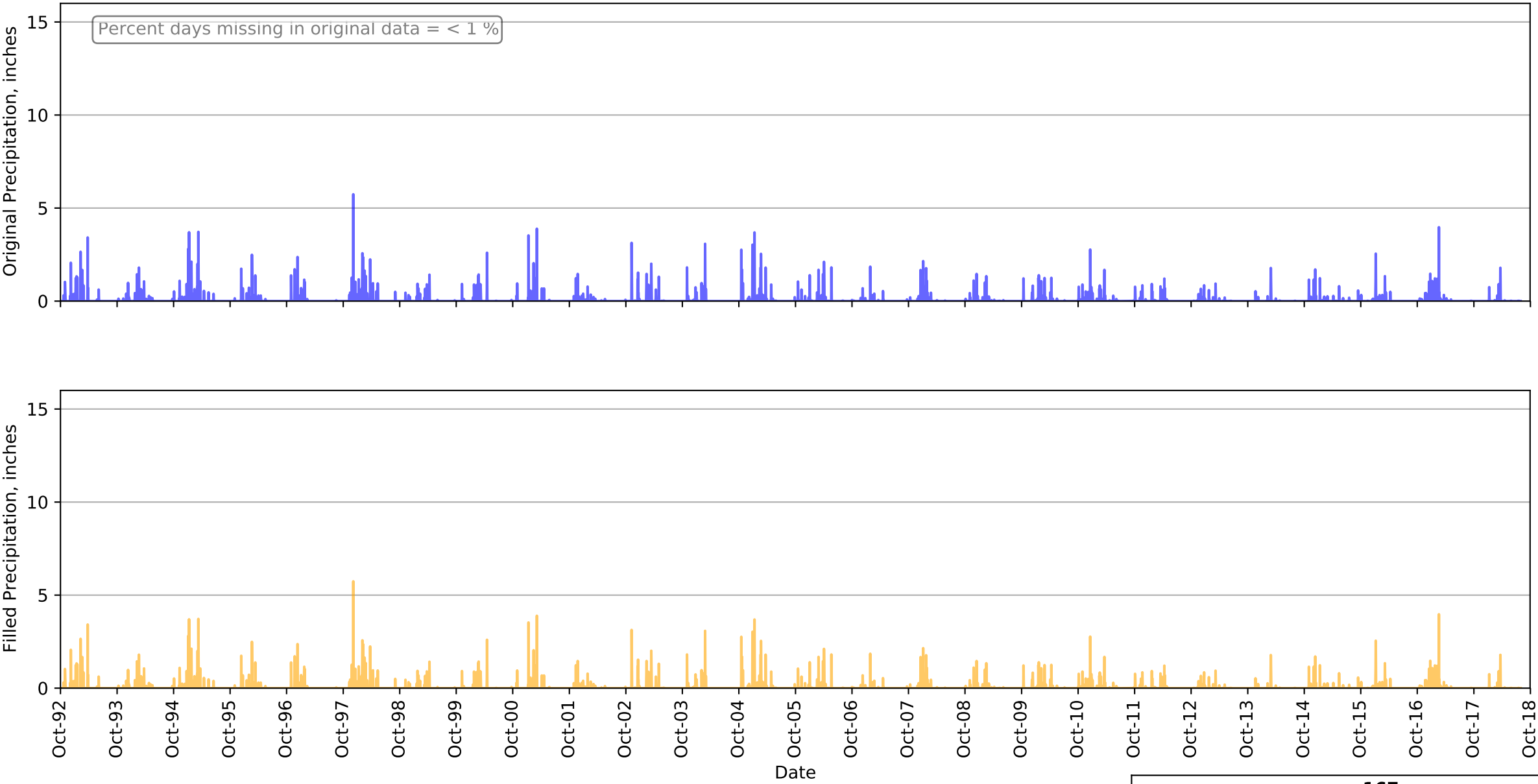
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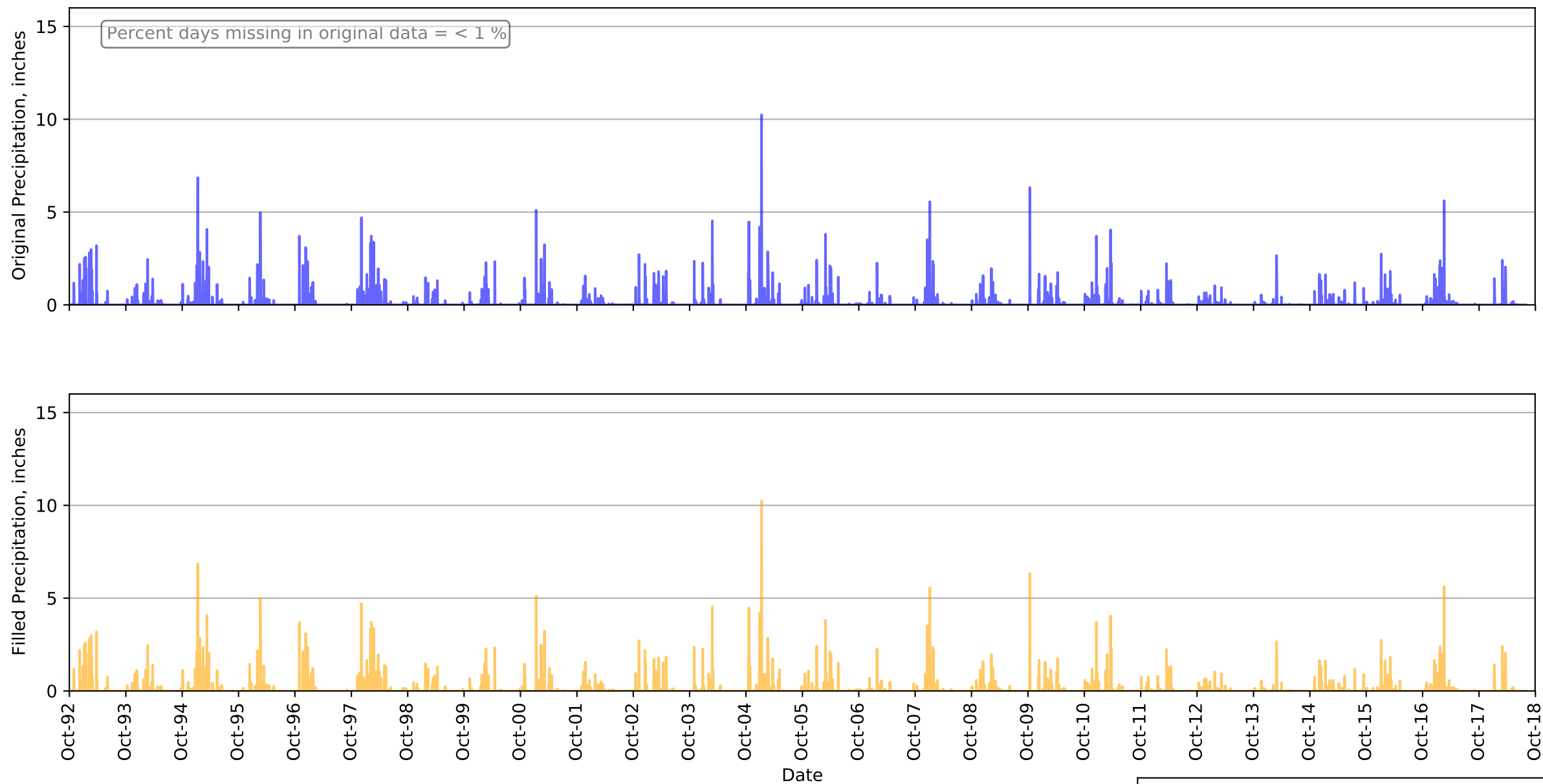
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Figure
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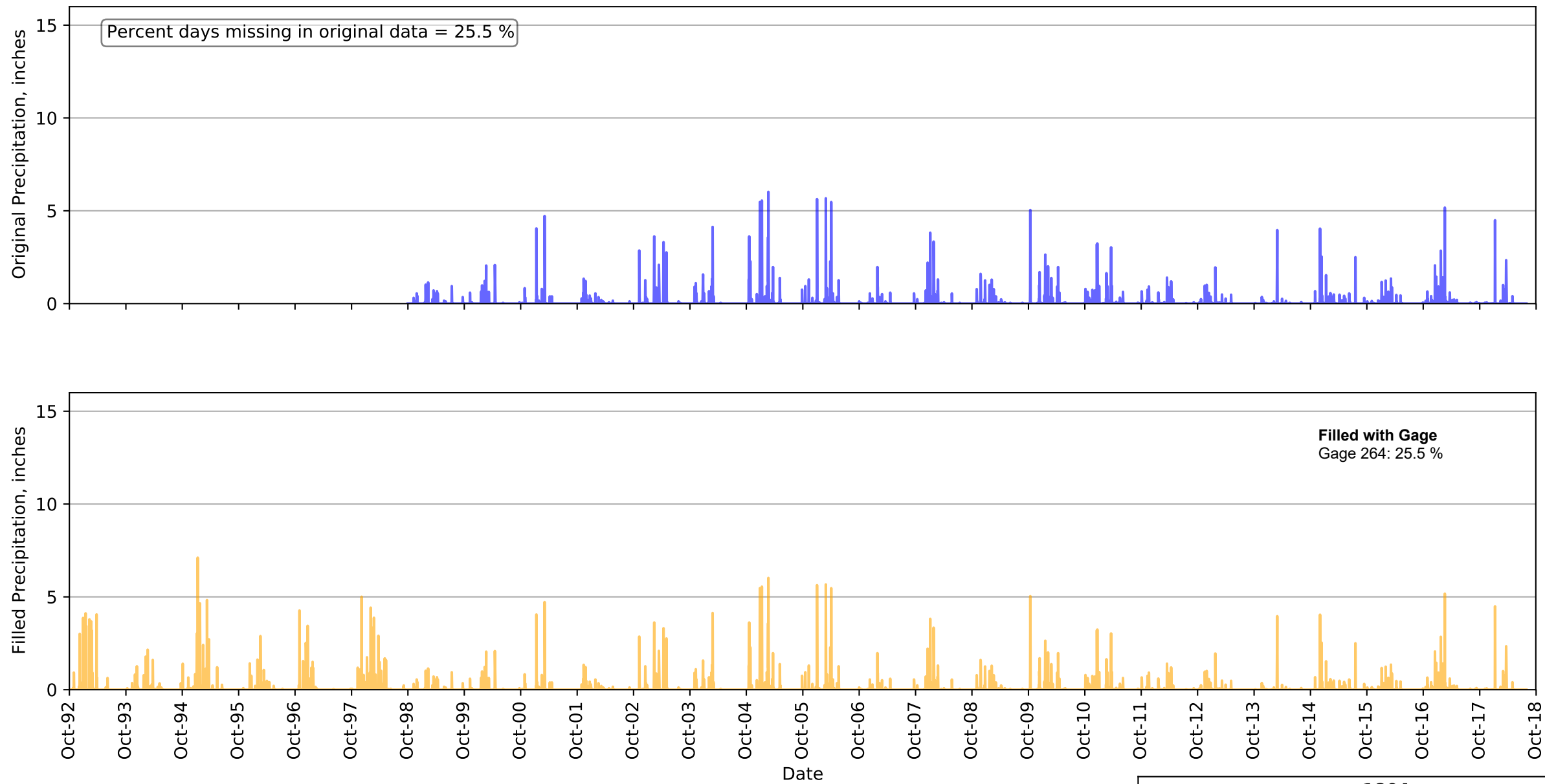
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Santa Barbara

December 2021

Figure
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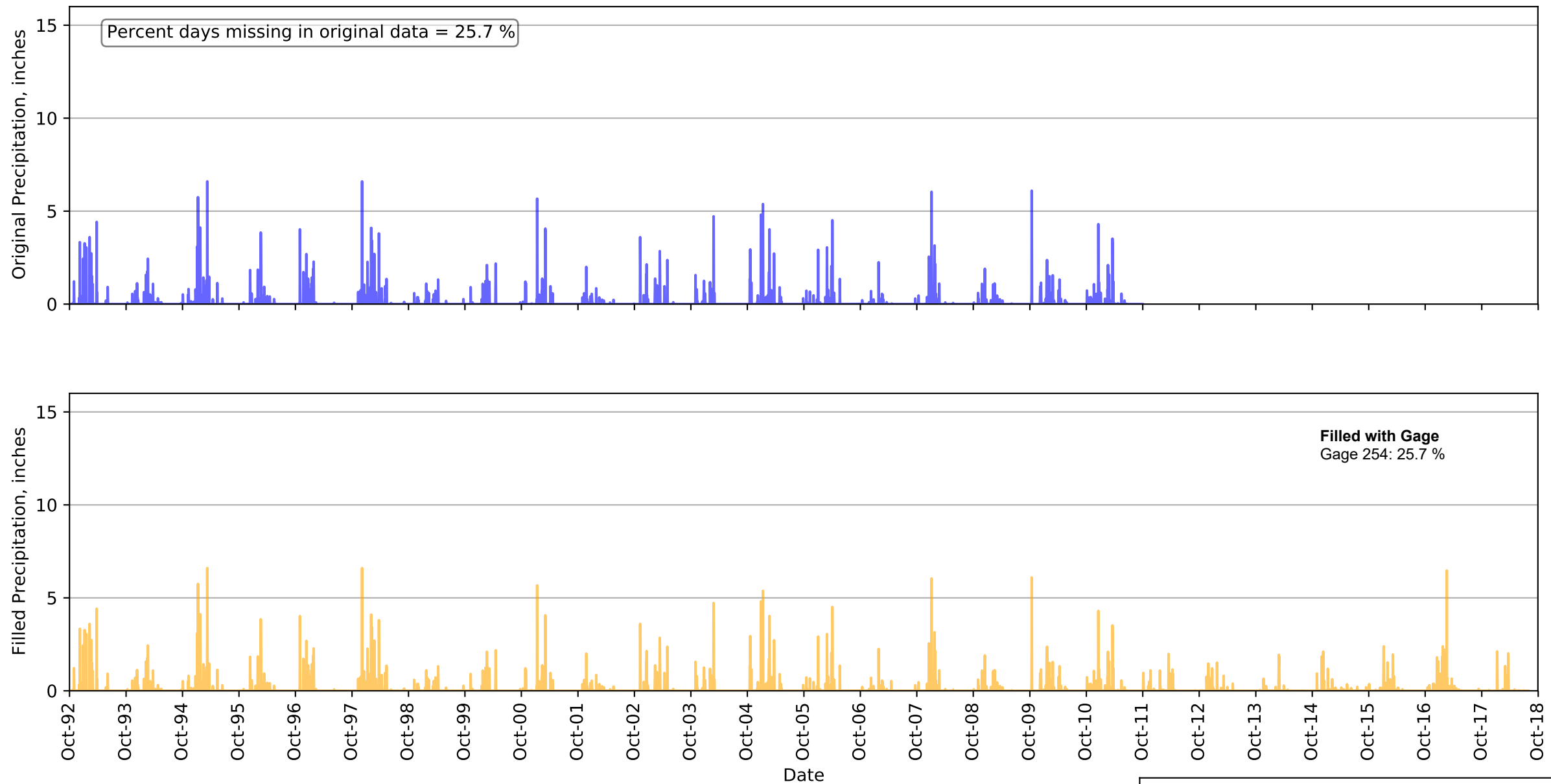
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Santa Barbara

December 2021

Figure
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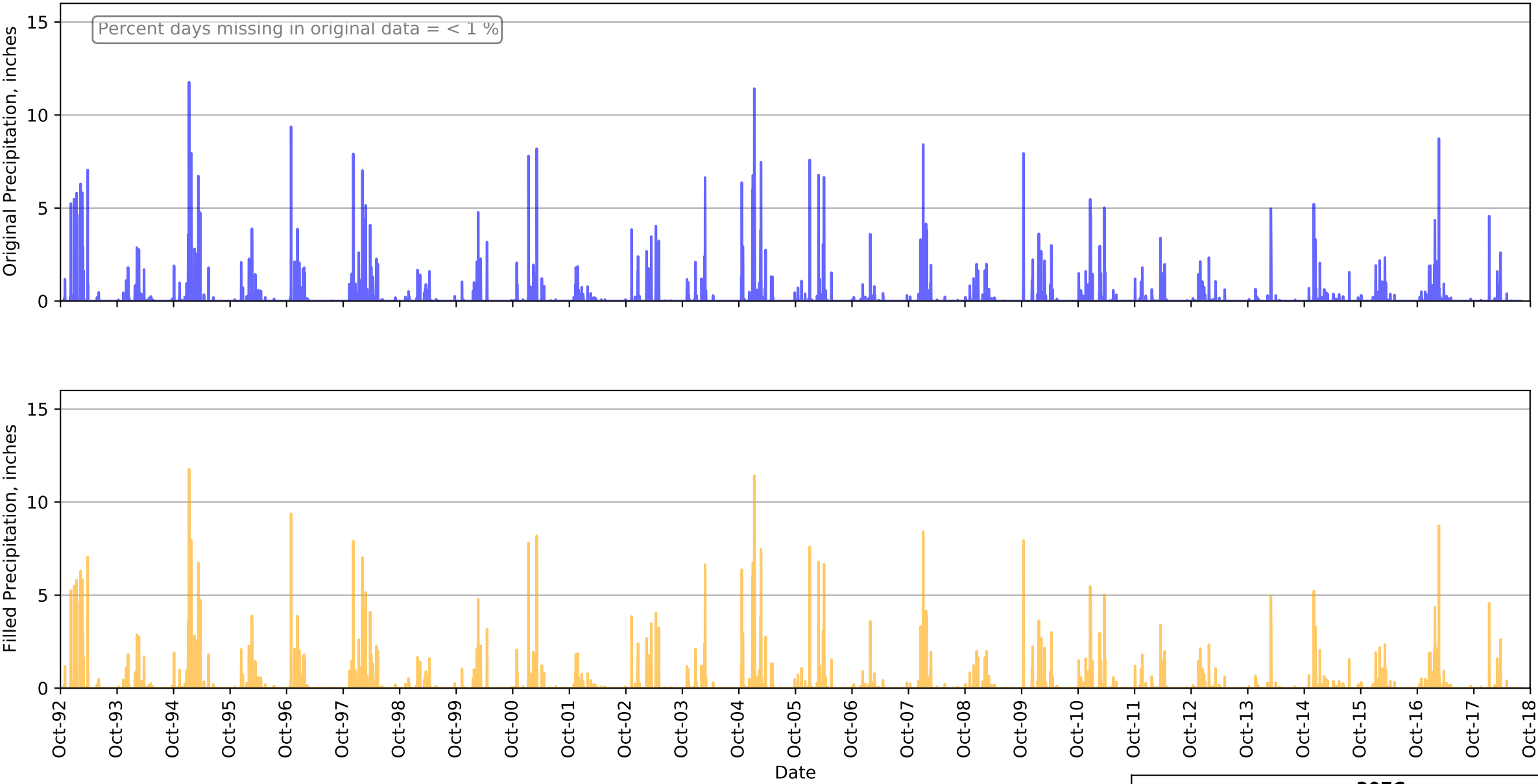
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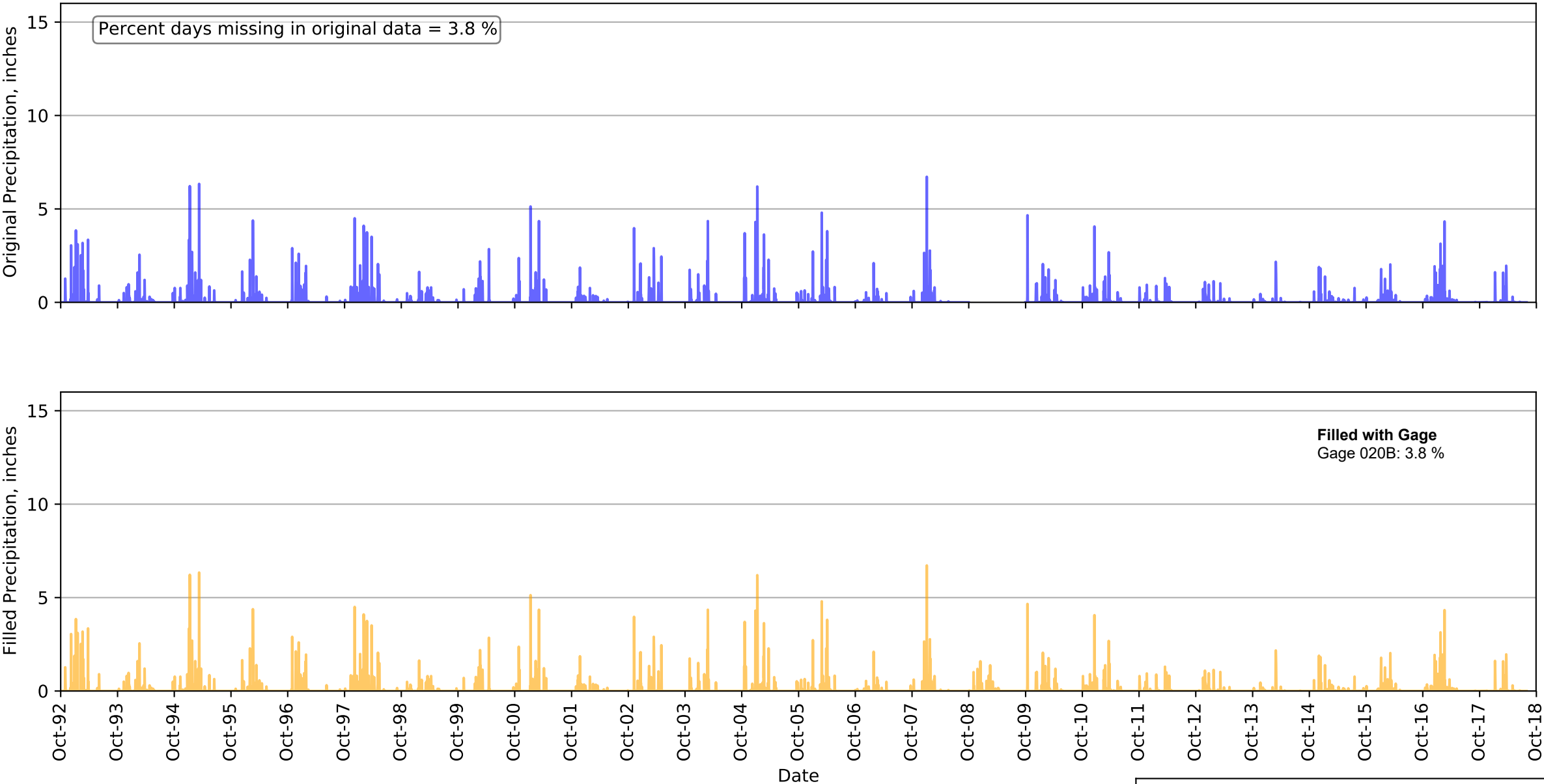
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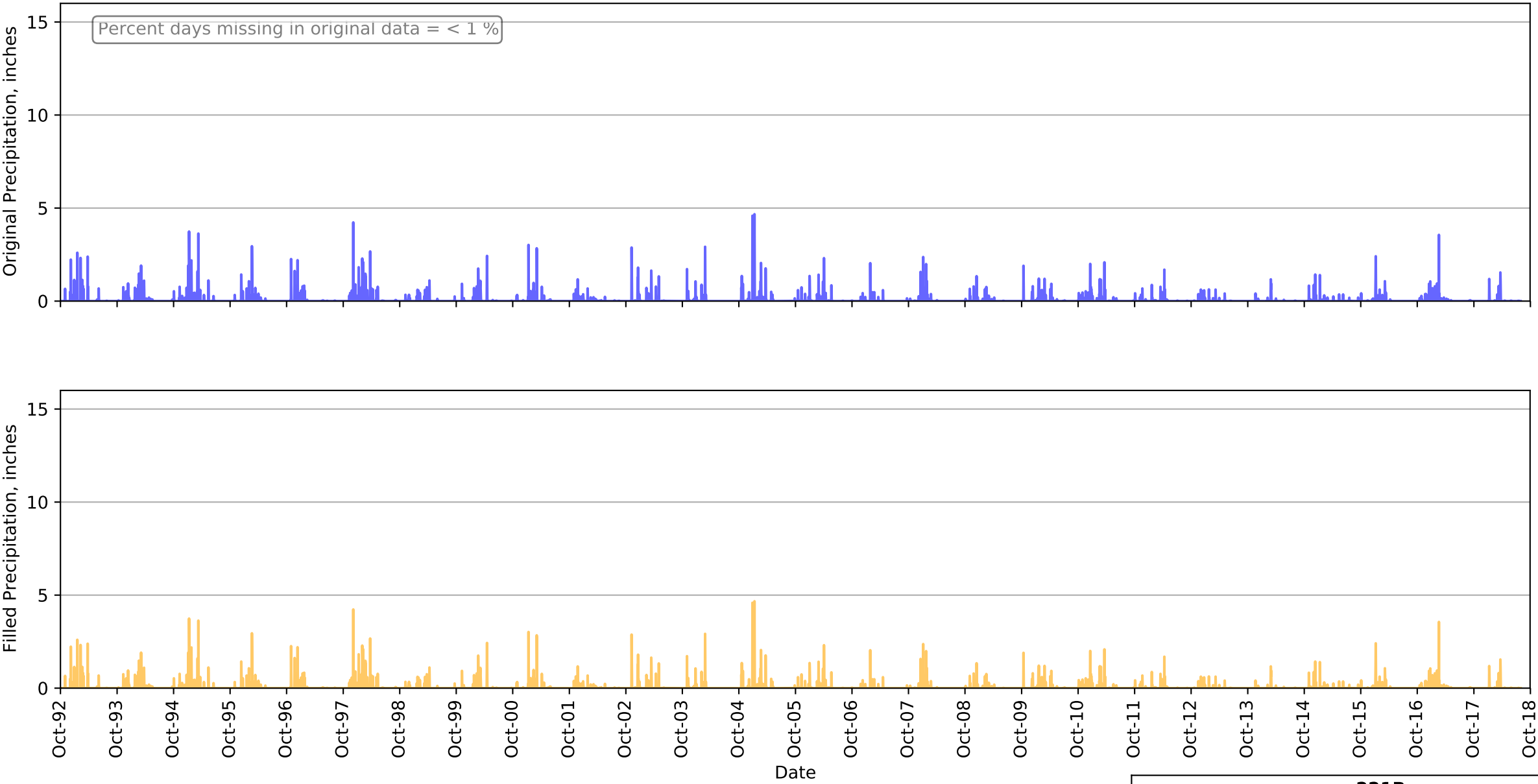
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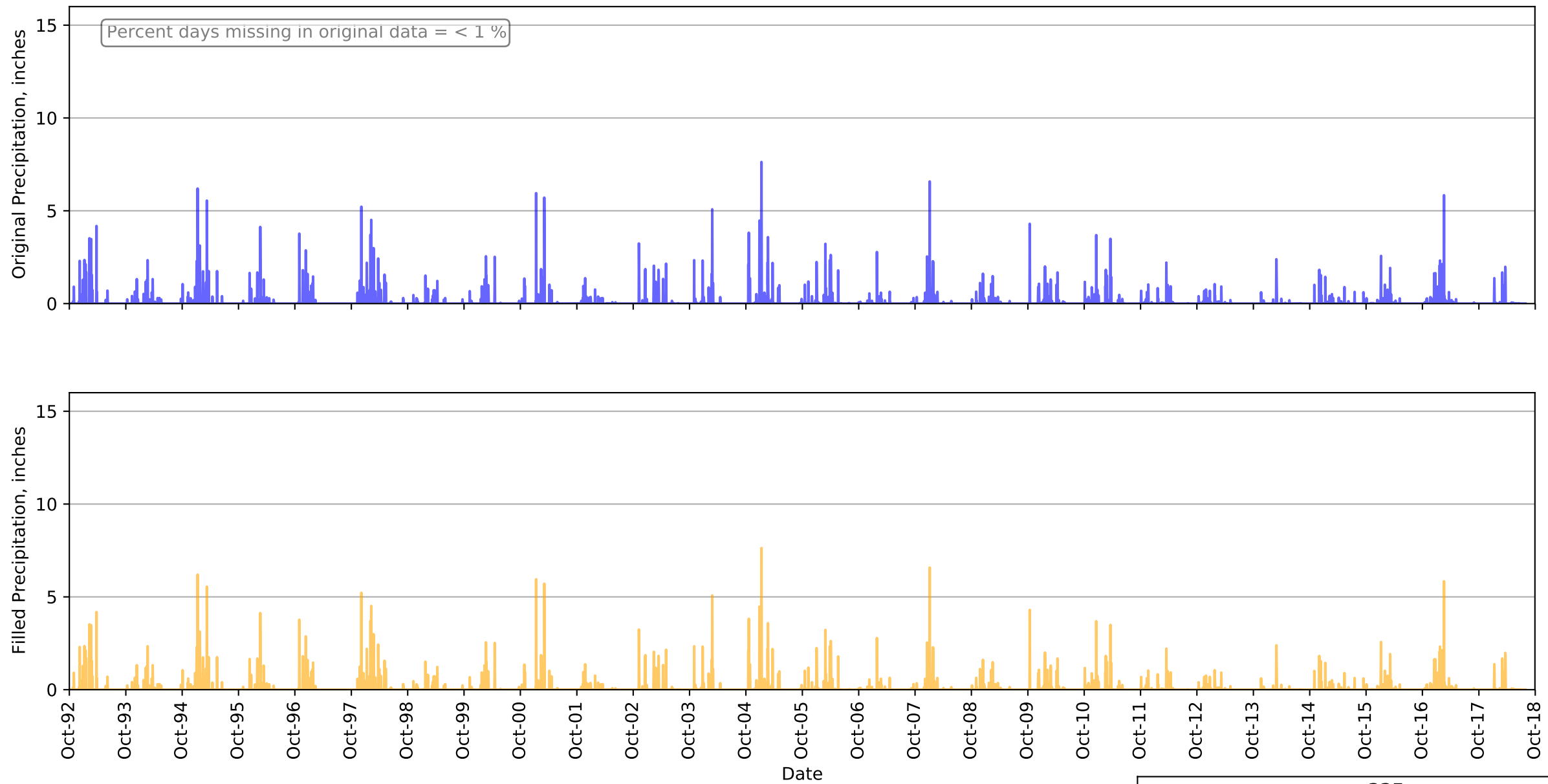
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Santa Barbara	December 2021
Figure B.21	



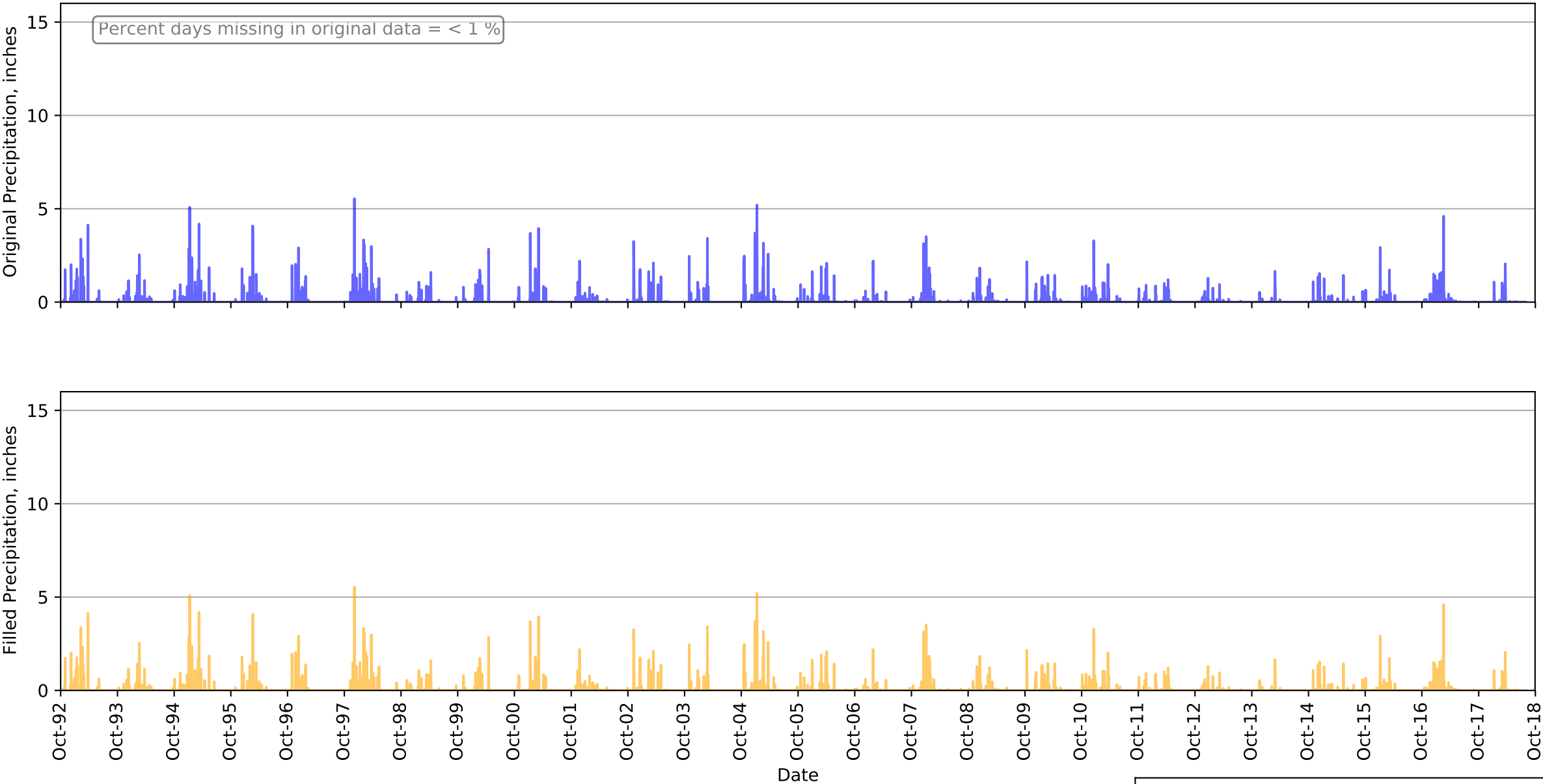
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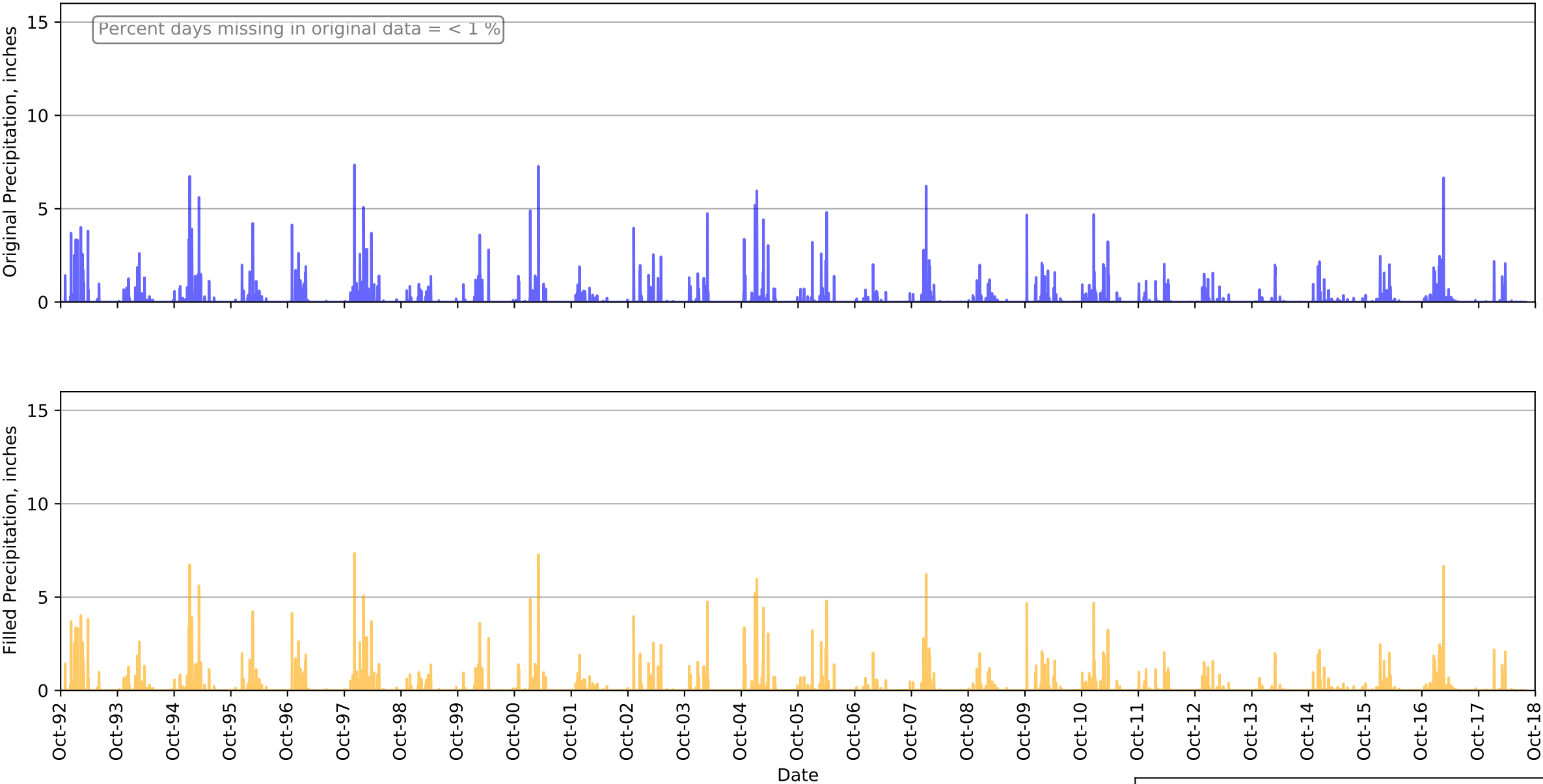
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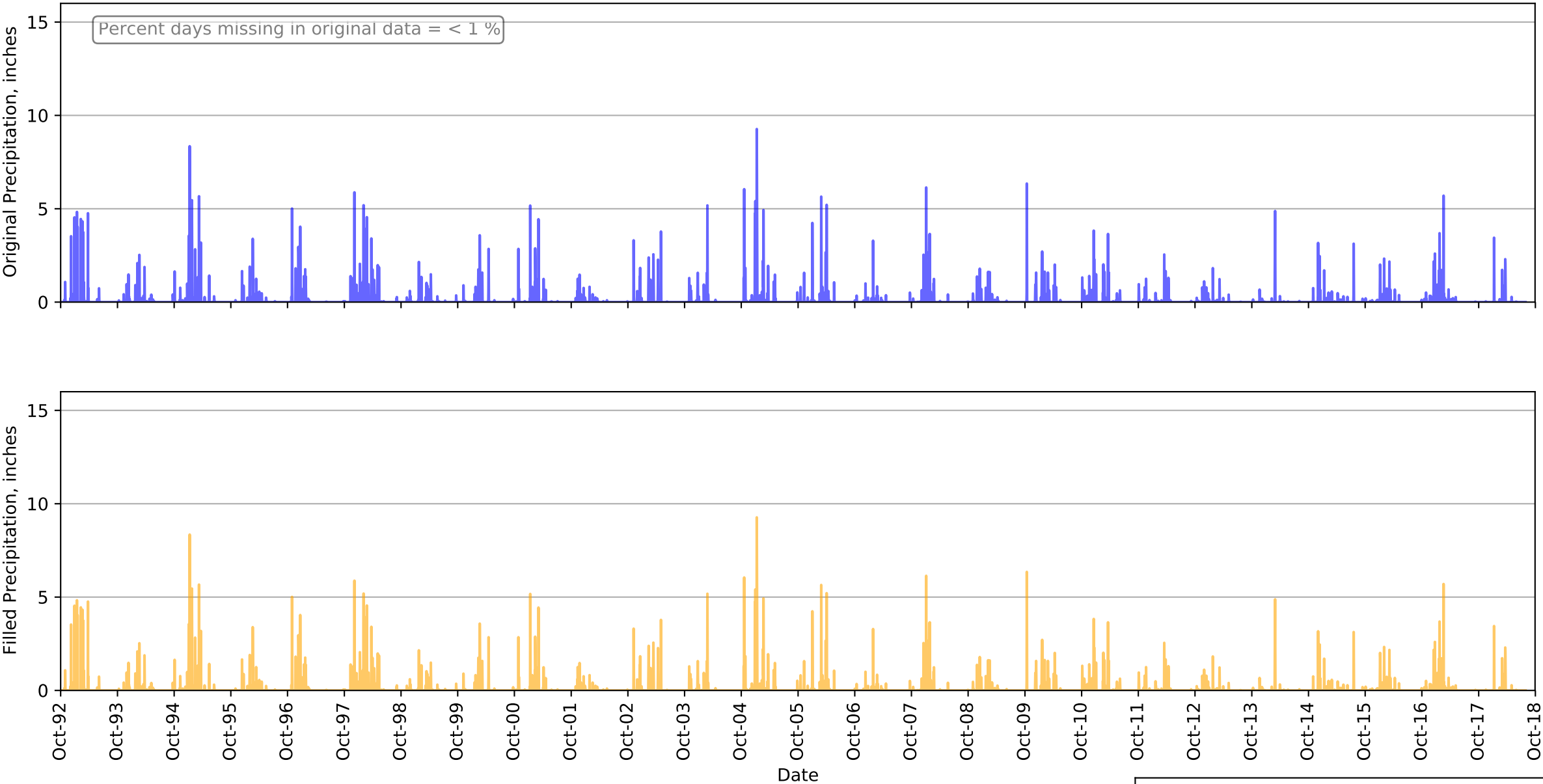
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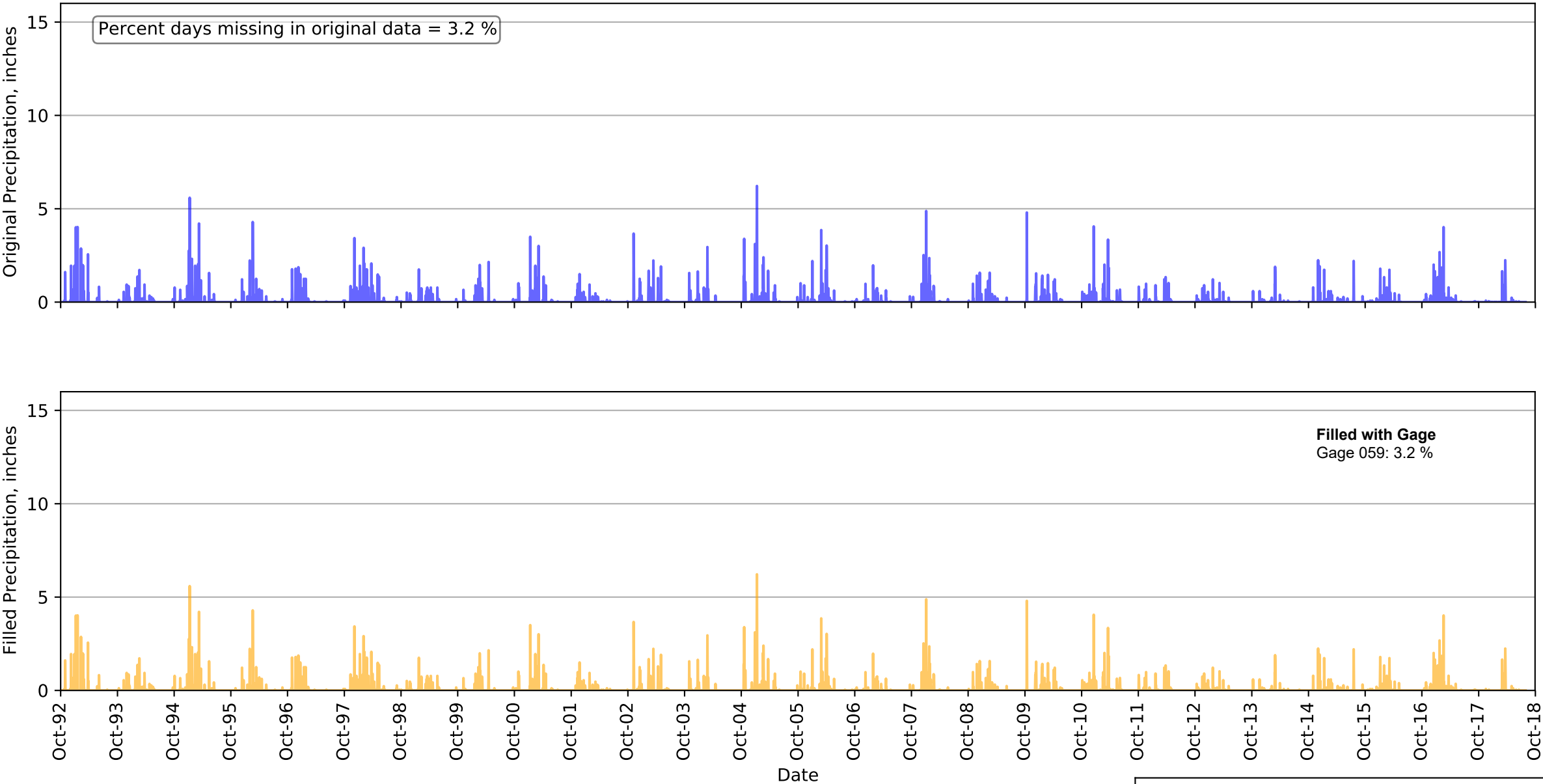
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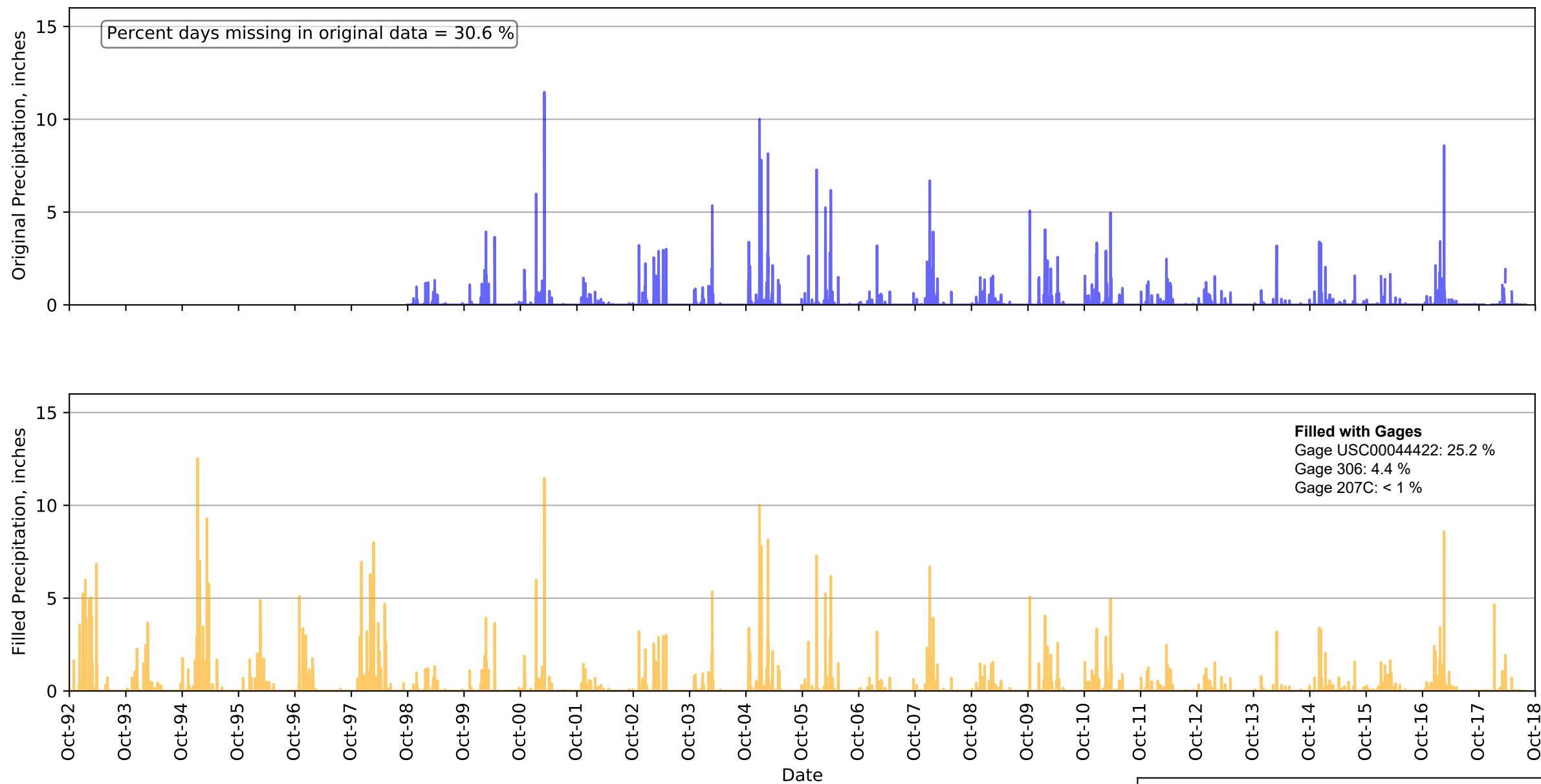
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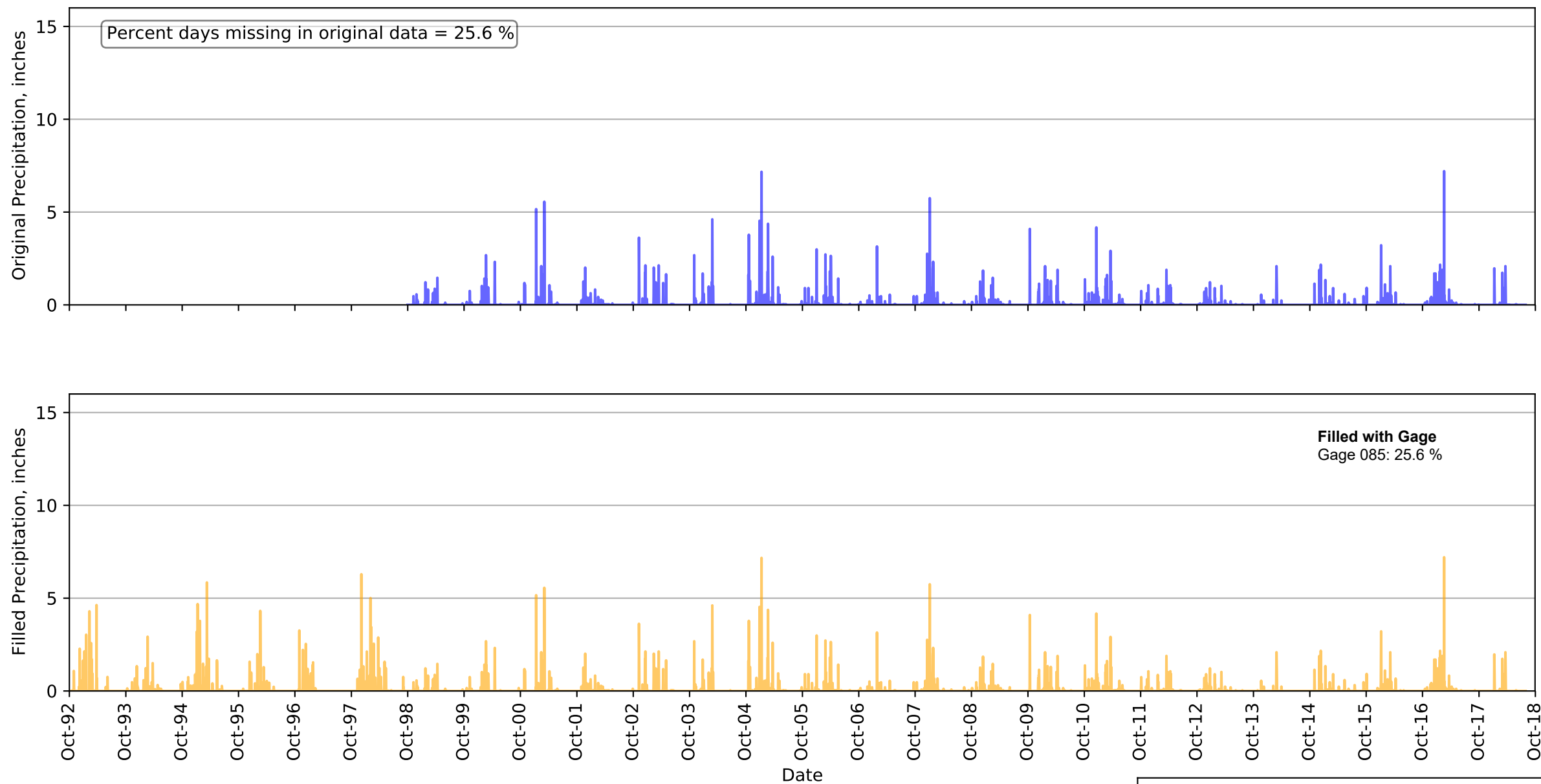
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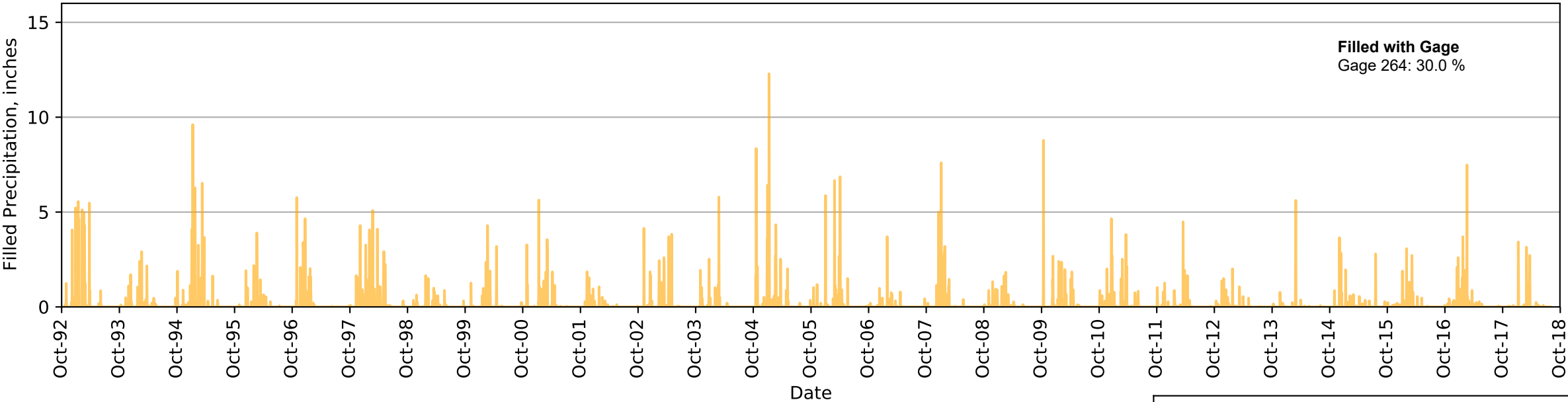
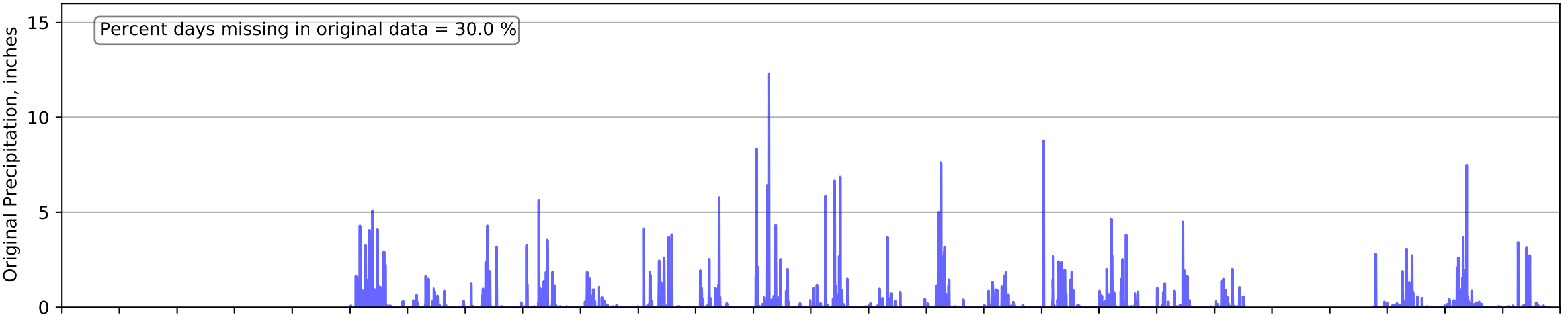
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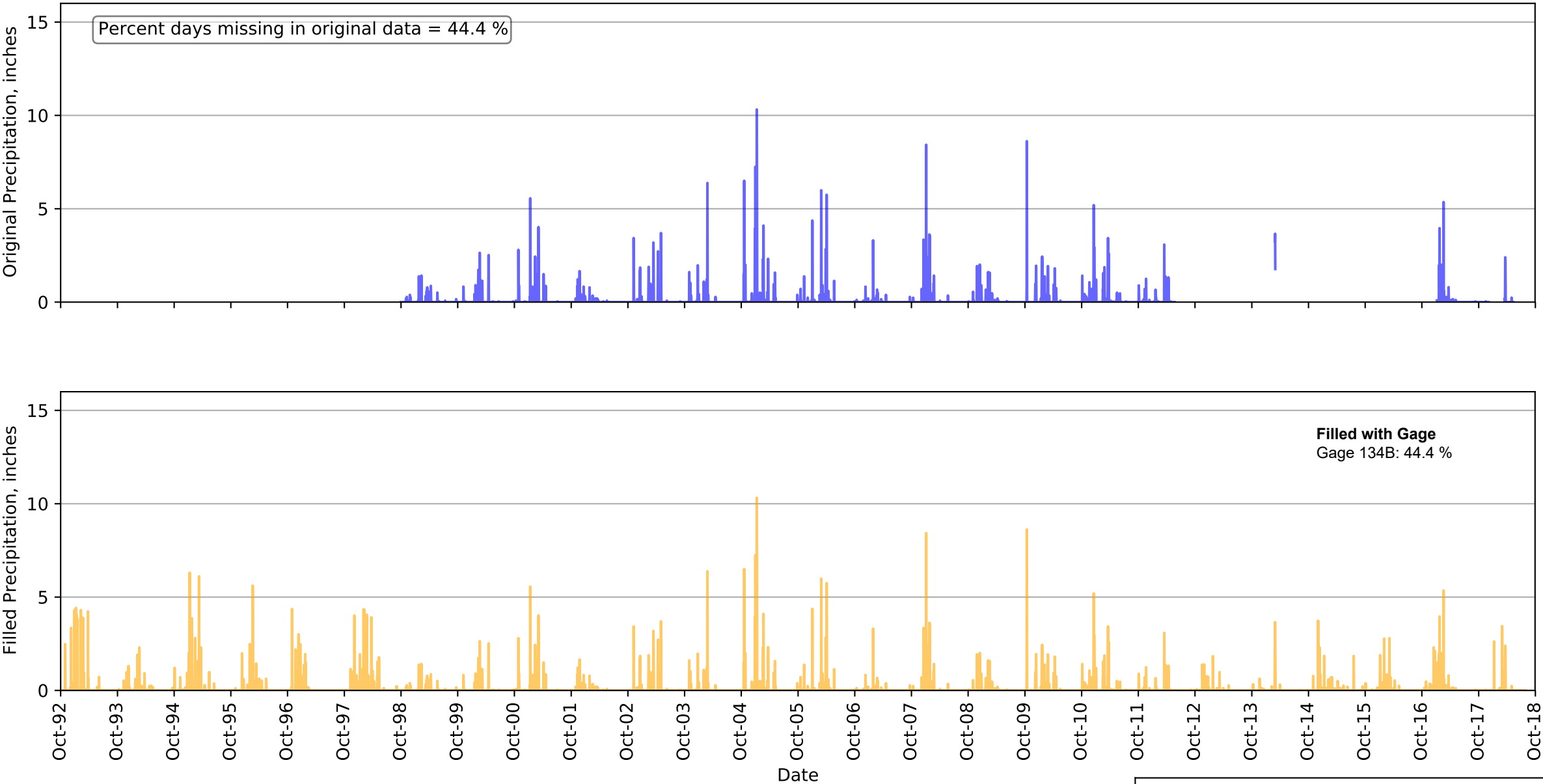
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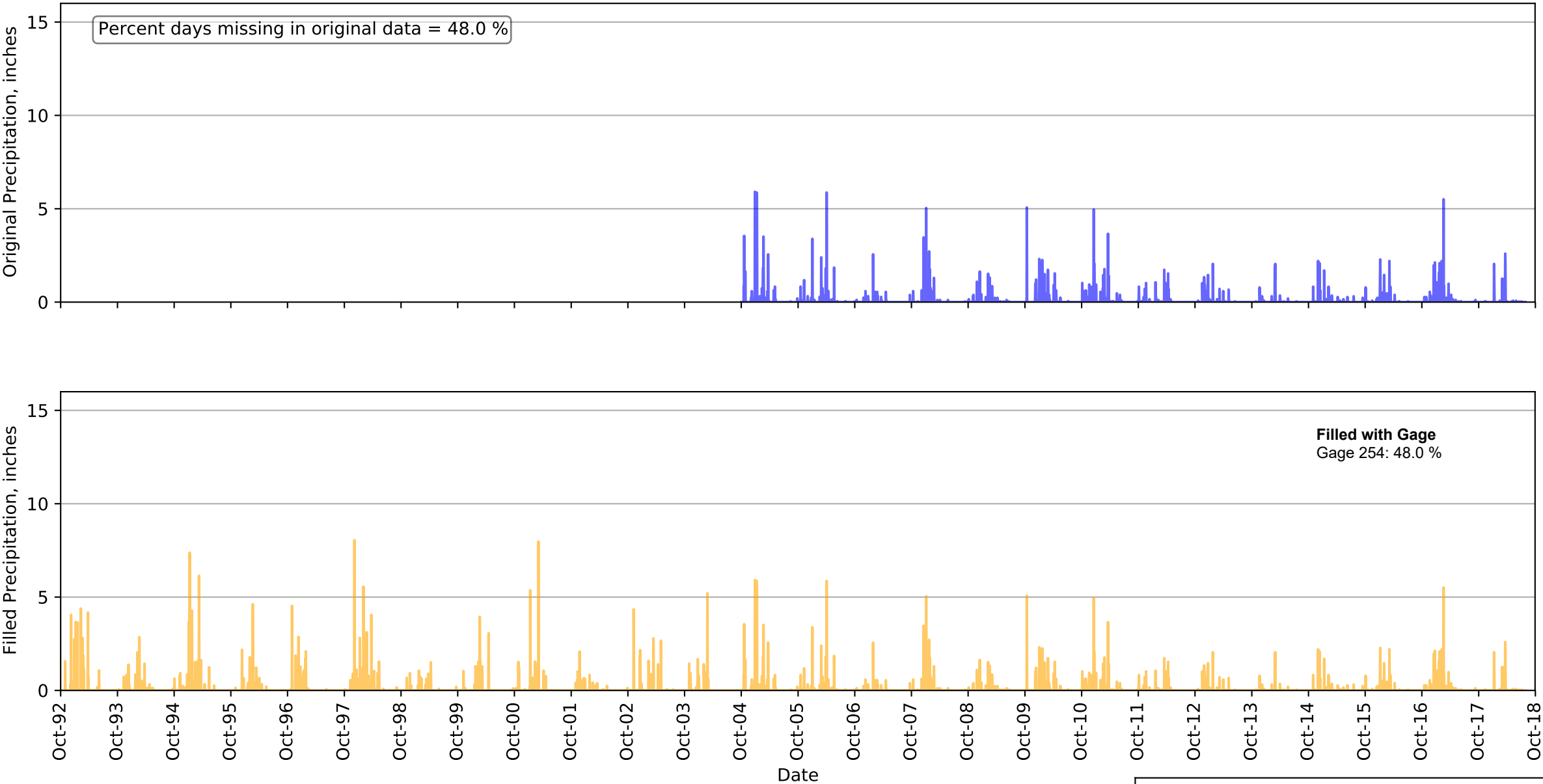
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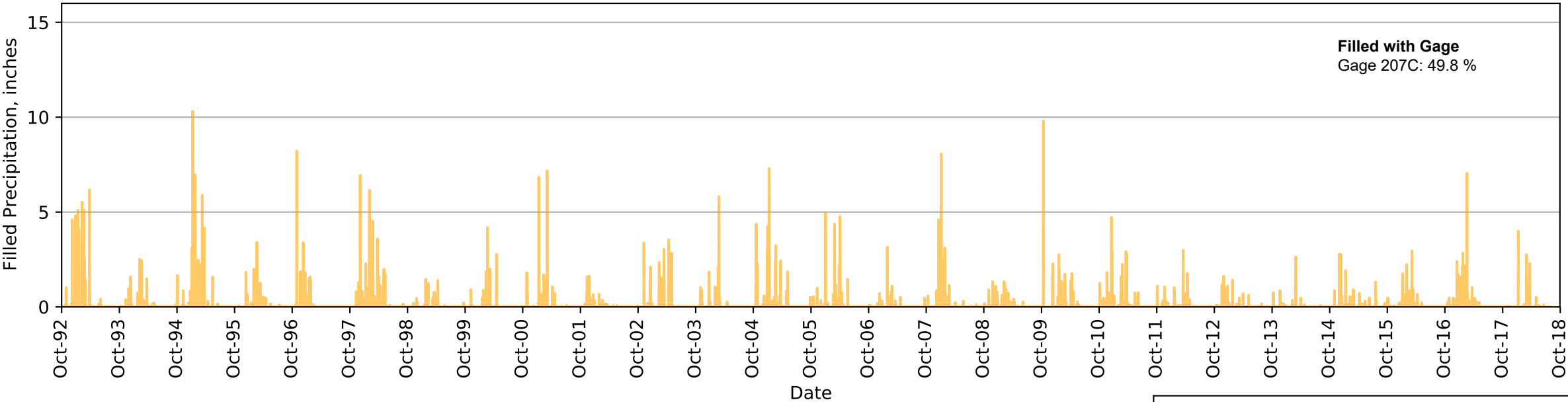
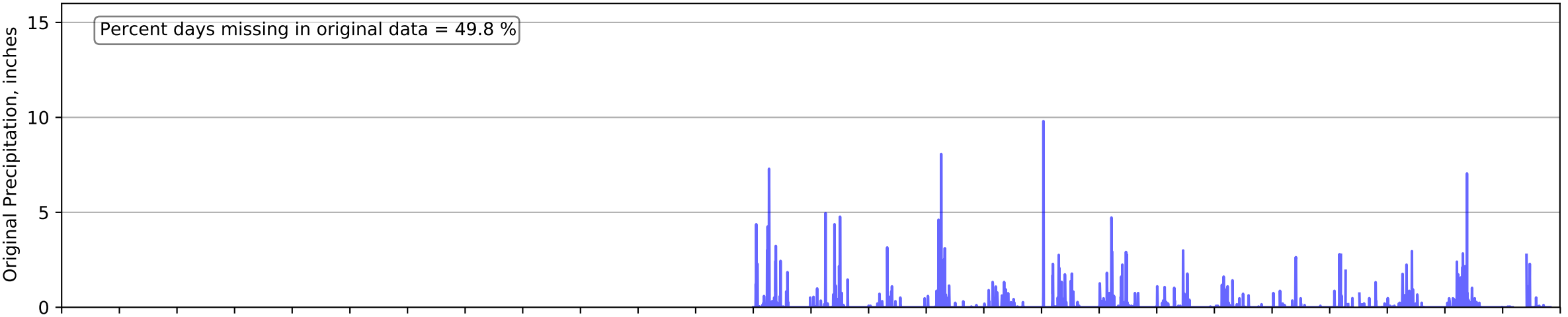




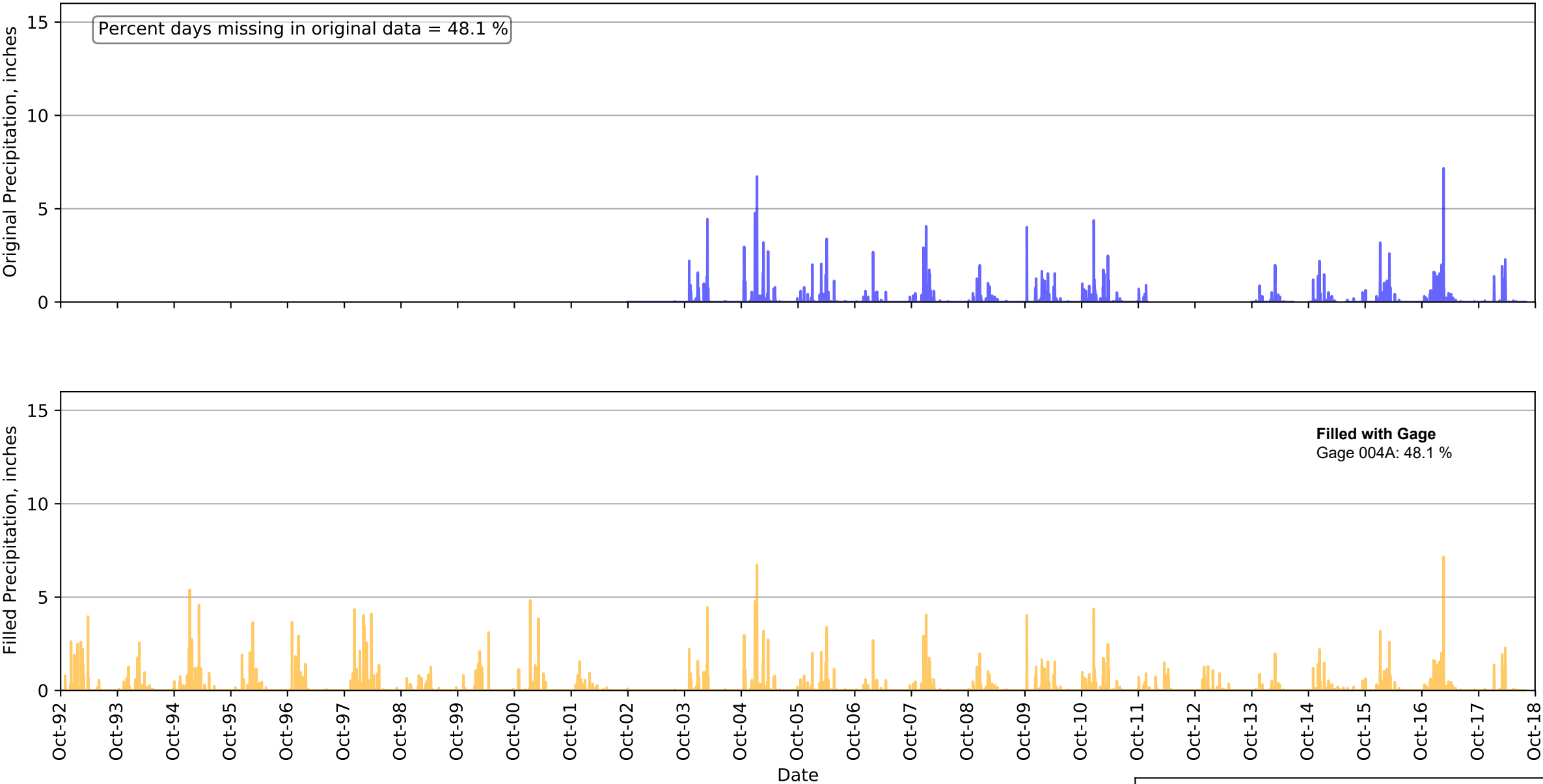
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Santa Barbara	December 2021	

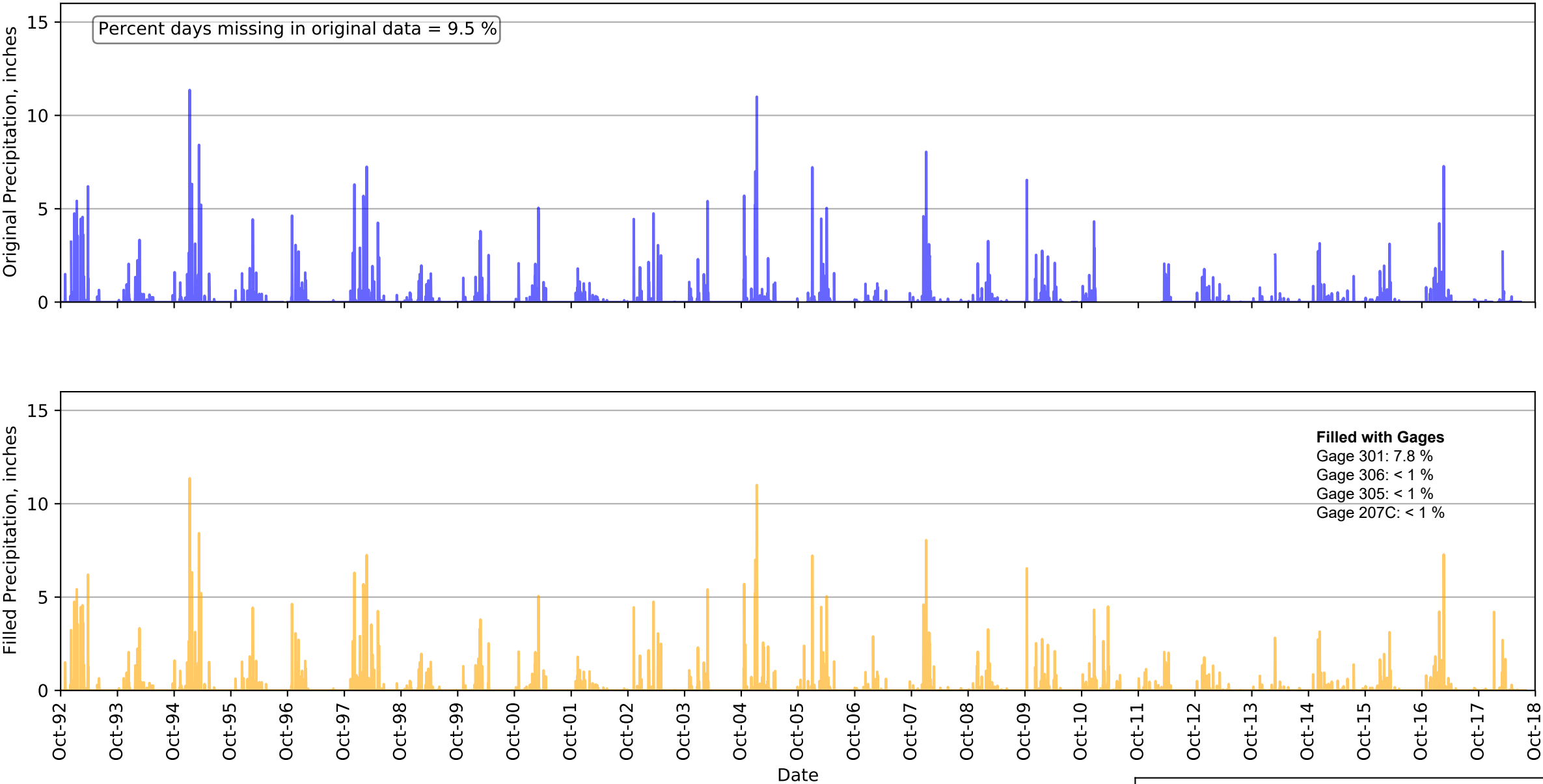




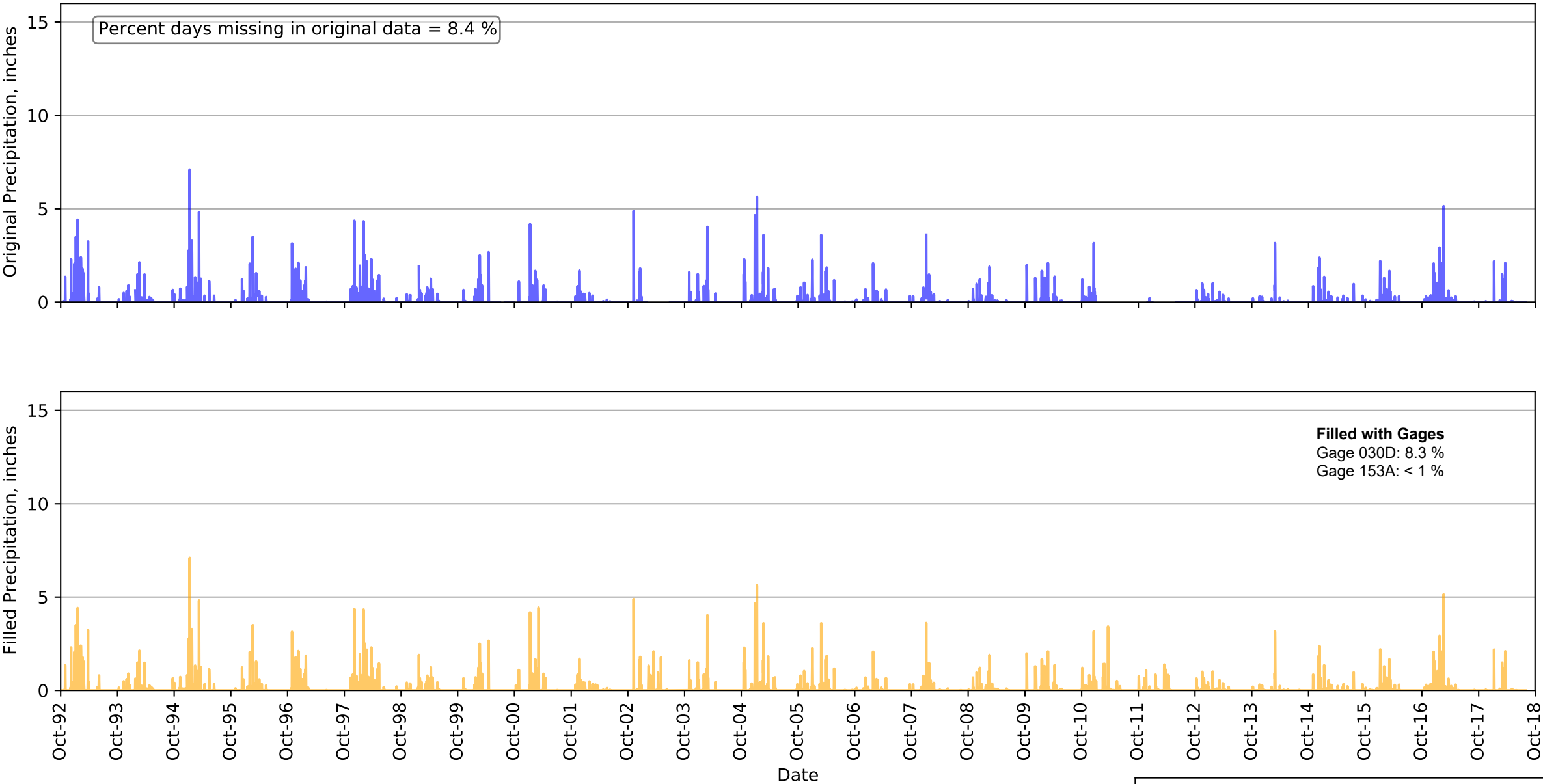


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Santa Barbara	December 2021	

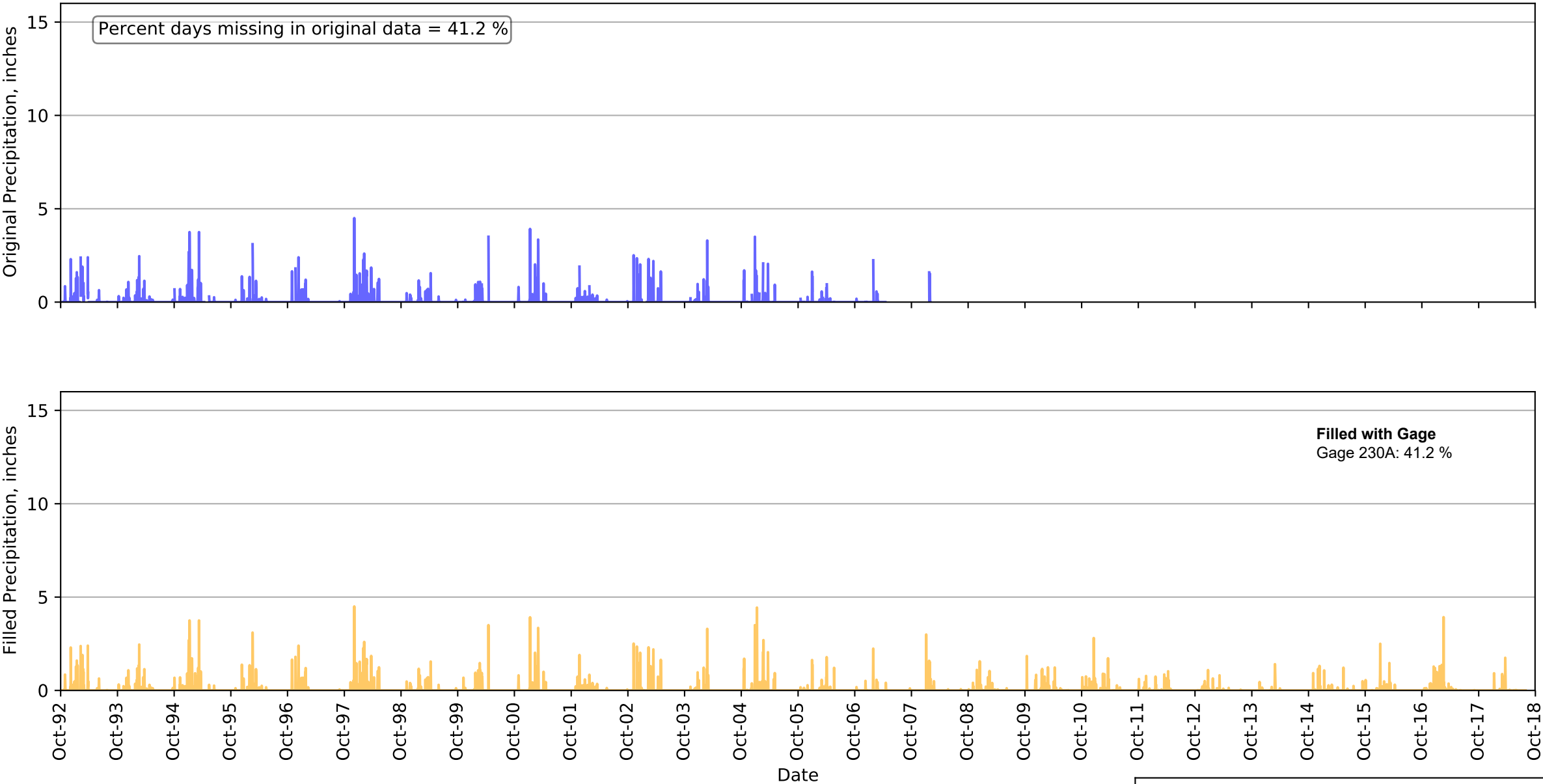


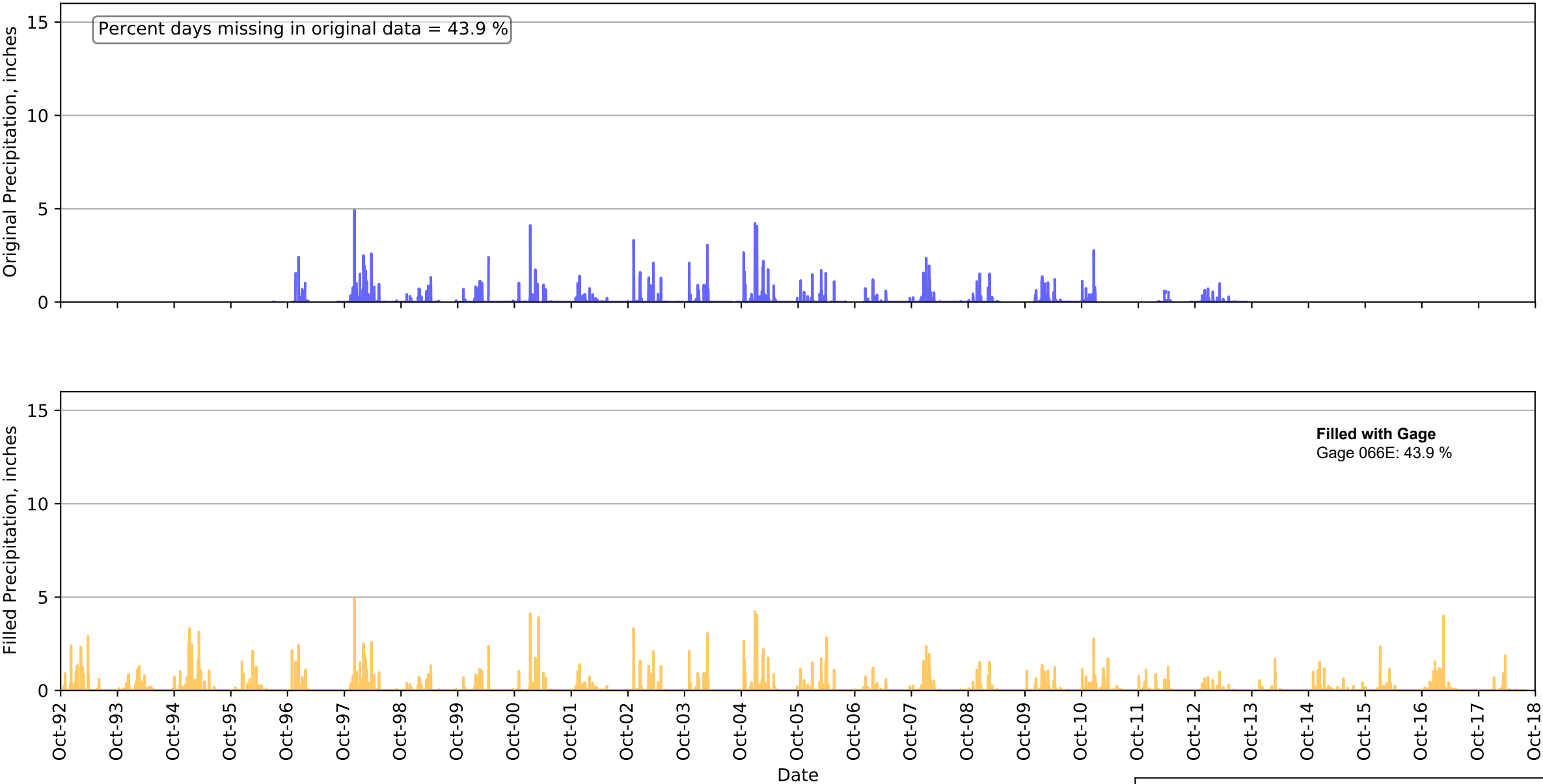


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Santa Barbara	December 2021	



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Santa Barbara	December 2021	



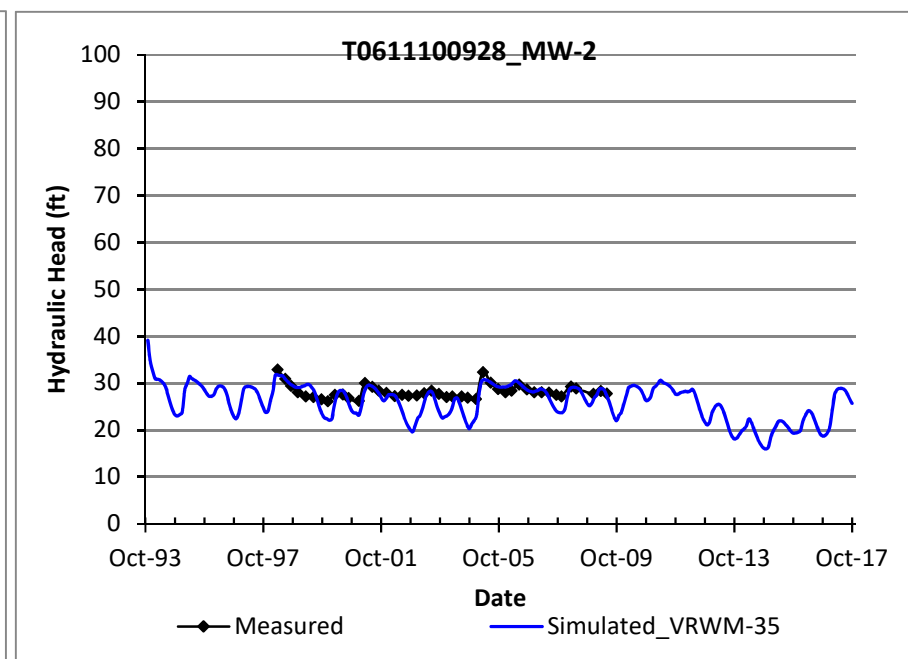
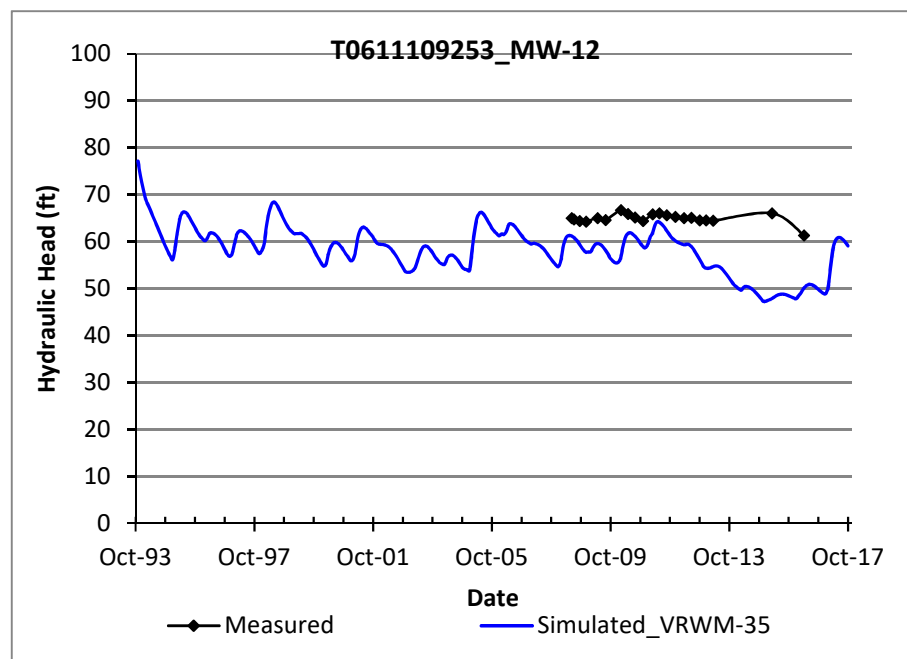
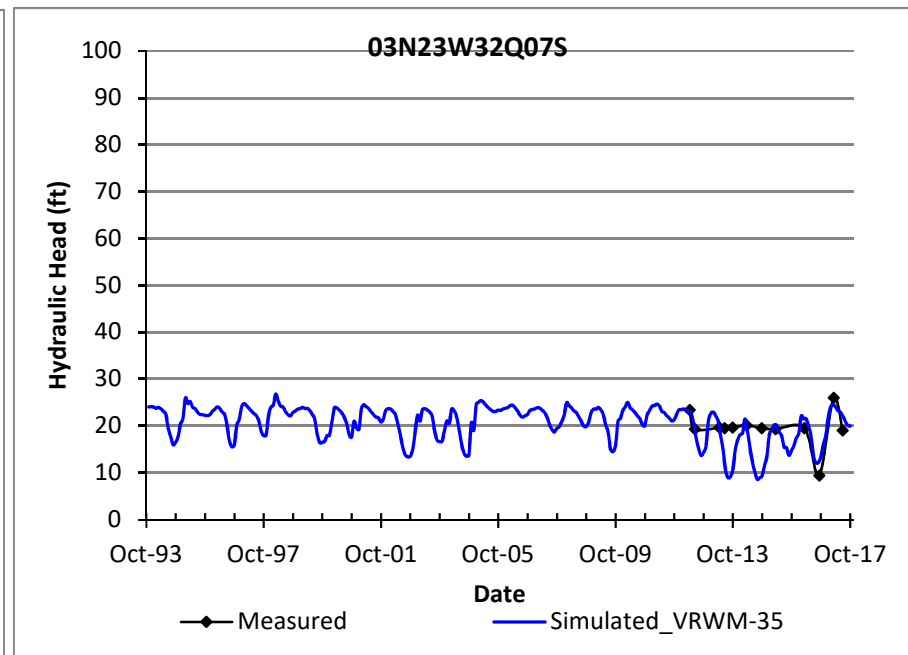
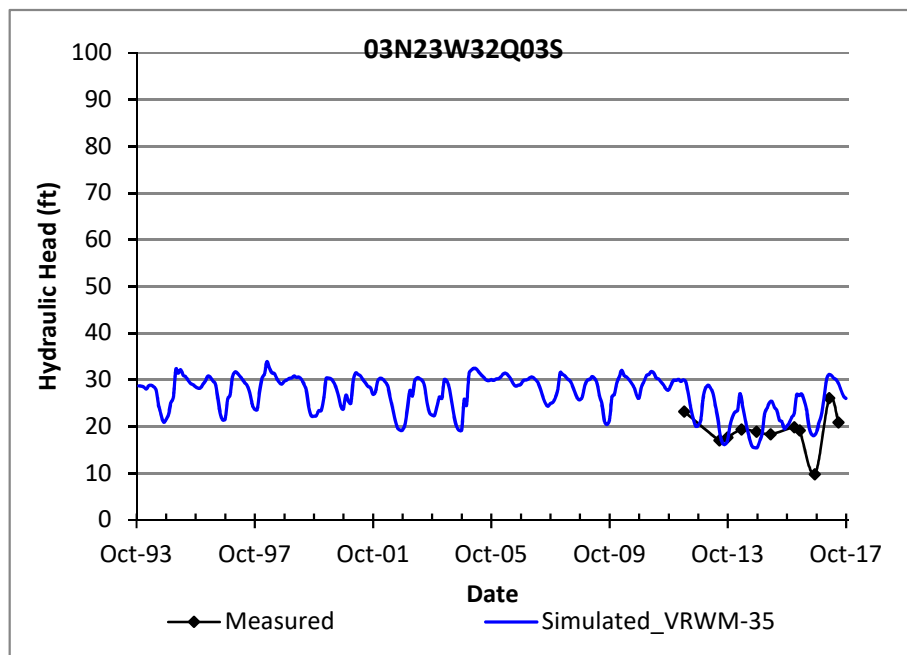


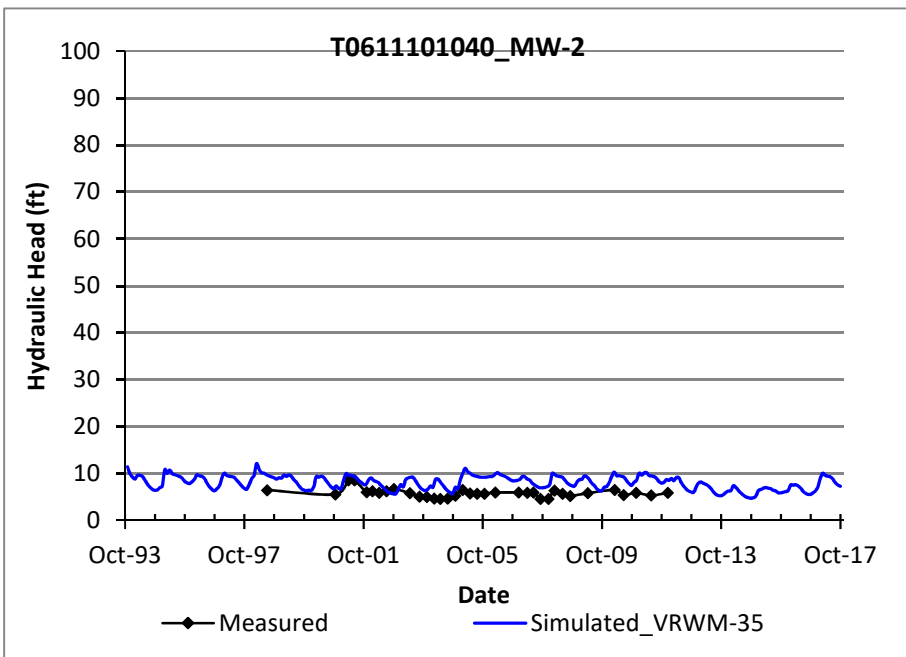
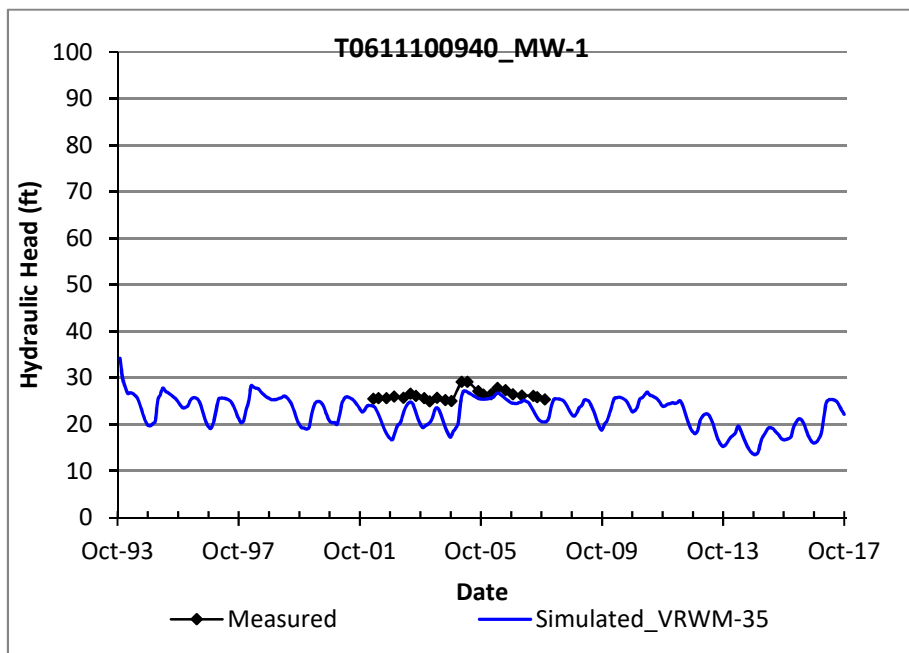
APPENDIX D: GROUNDWATER CALIBRATION HYDROGRAPHS

Appendix D presents comparisons of measured (black) and calibrated/validated (blue and yellow) hydraulic head hydrographs at 61 wells in the Ventura River watershed, Matilija Reservoir, and Lake Casitas. Each hydrograph plots measured and calibrated/validated hydraulic head, in feet above mean sea level, for water years 1993 to 2017. Some hydrographs do not have a complete measured dataset for the modeling period. Well locations are mapped in Figure 5.3. 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.

VRW GW-SW Model Report

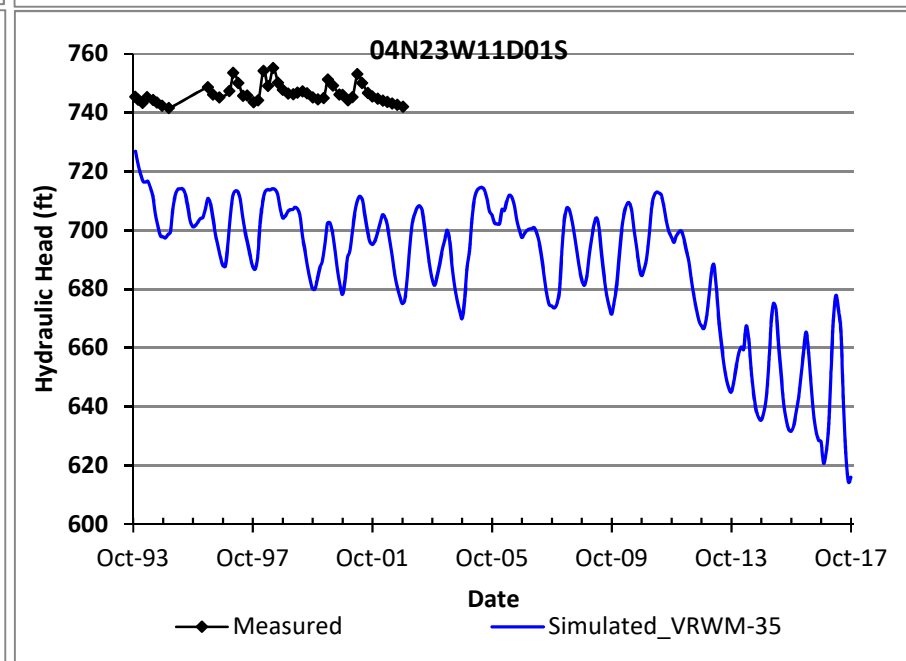
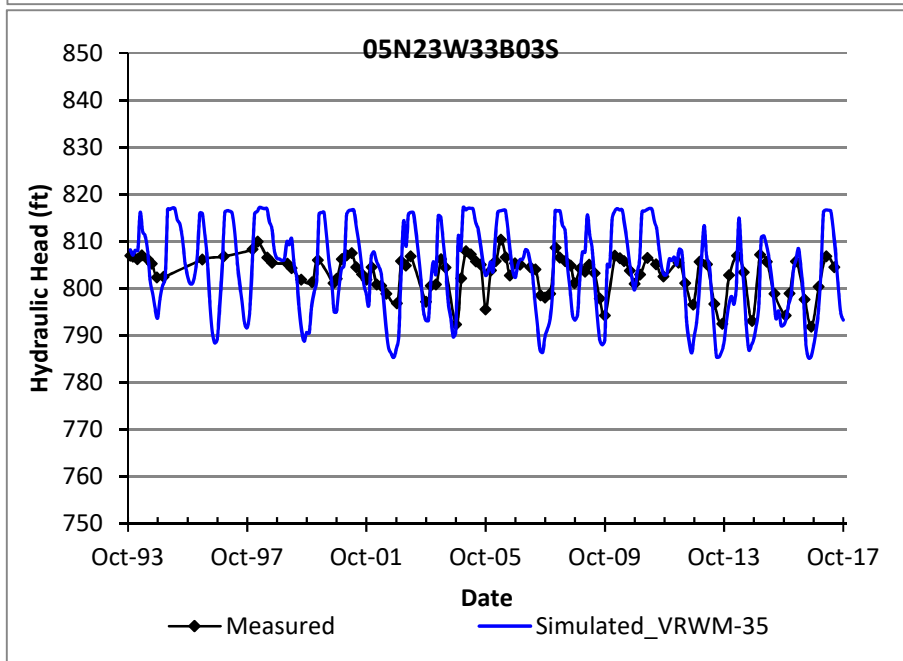
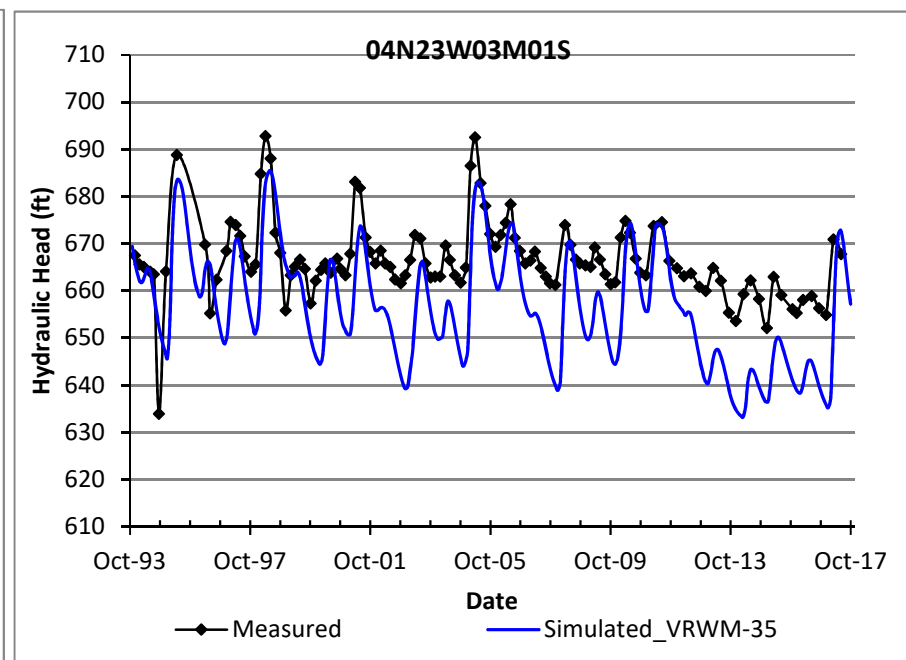
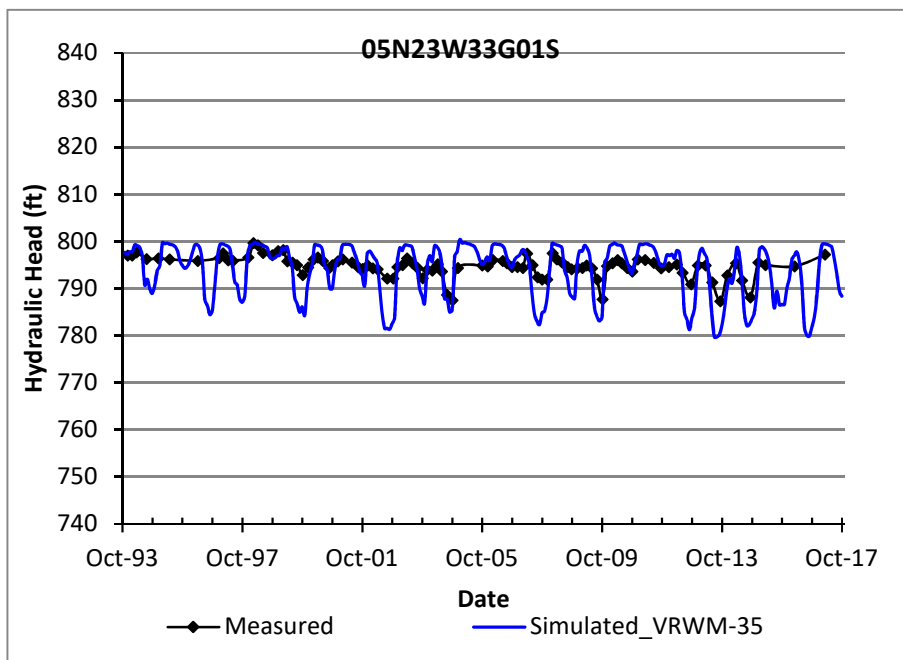
Lower Ventura River Valley Basin

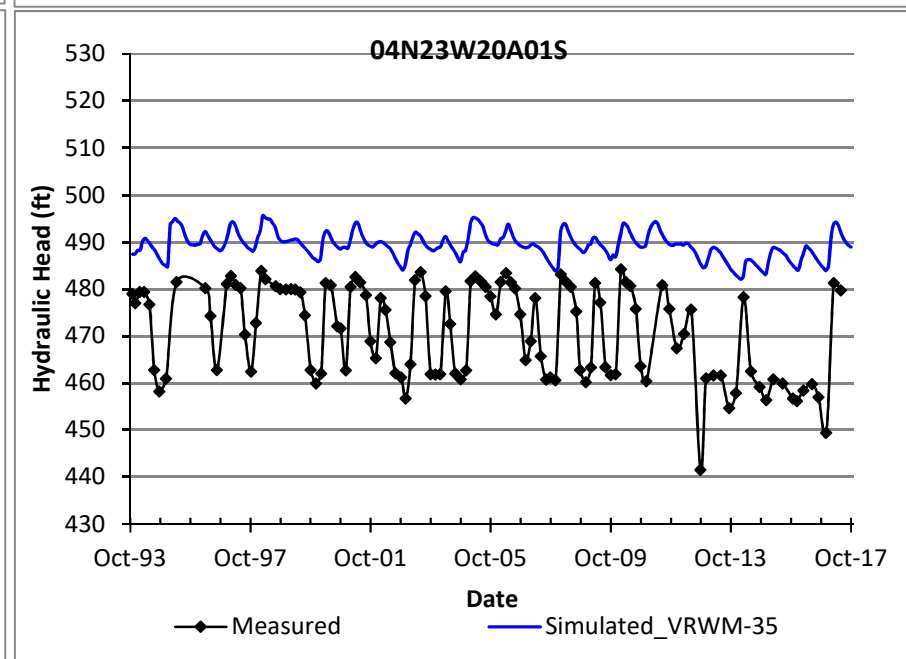
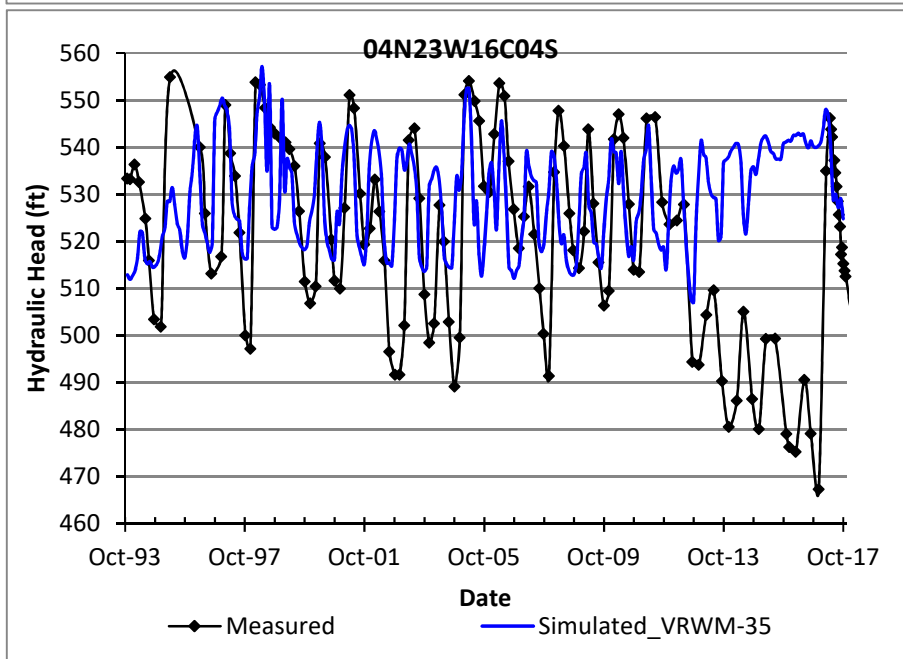
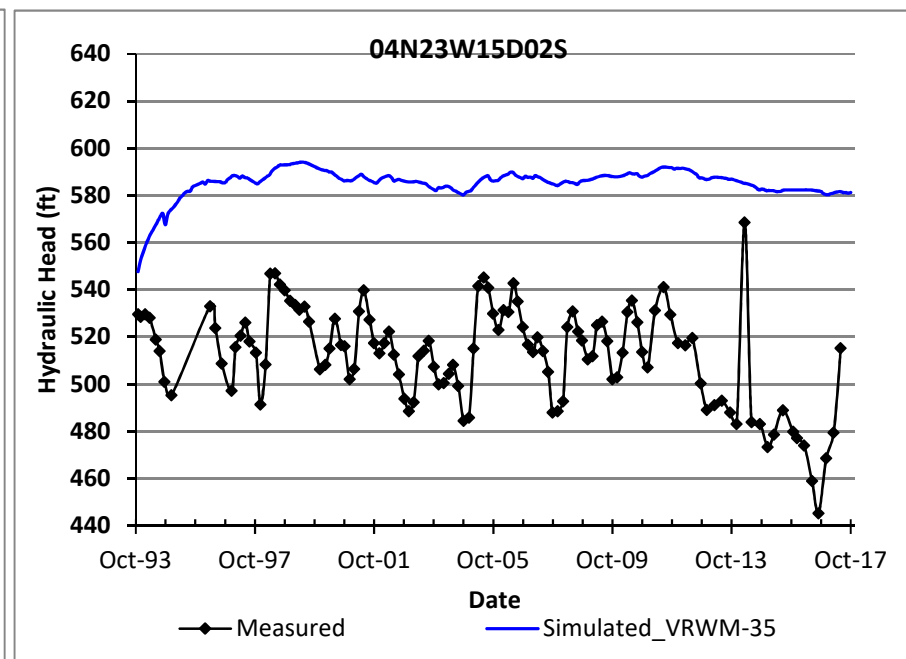
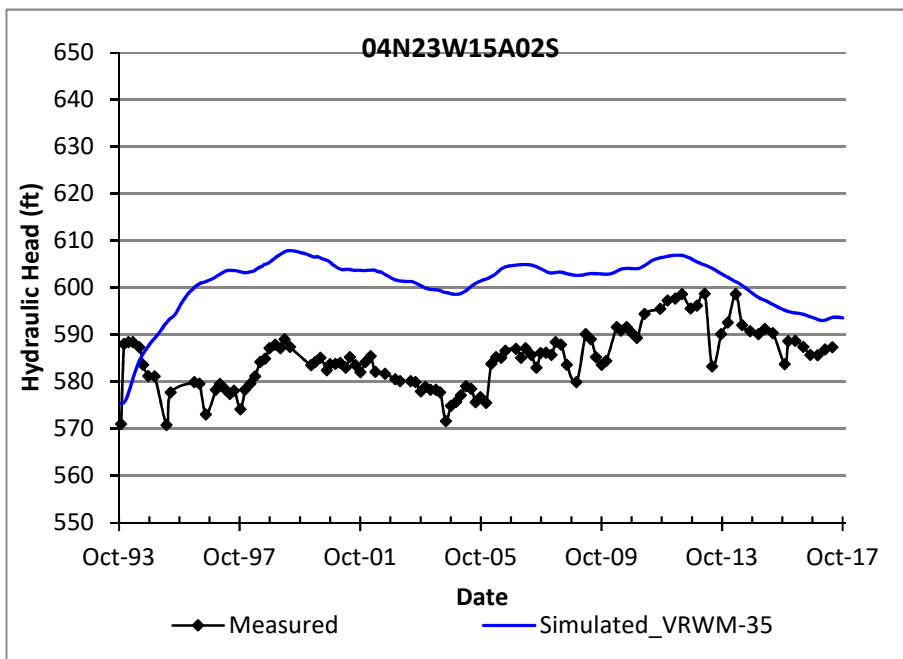


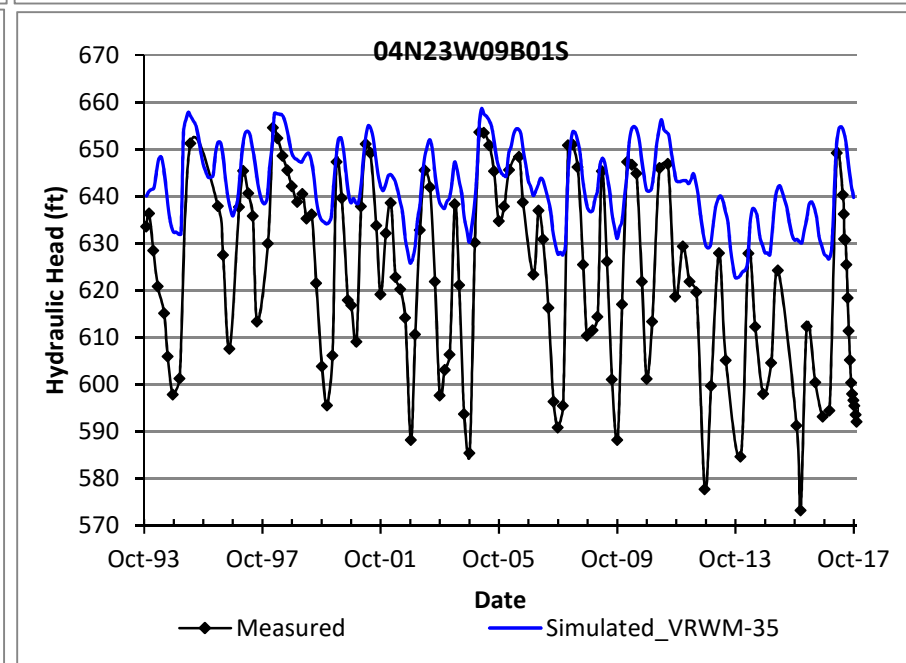
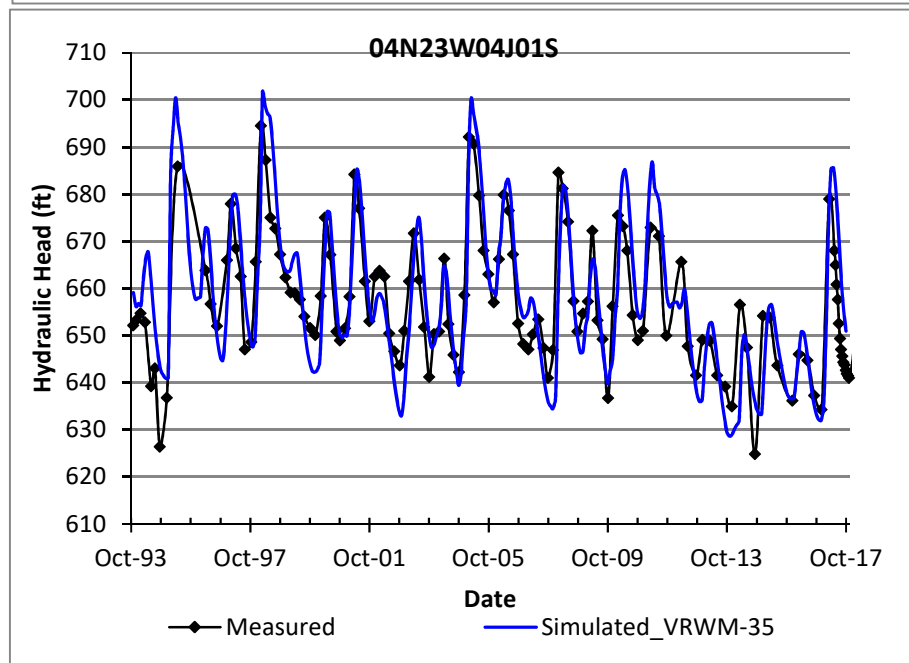
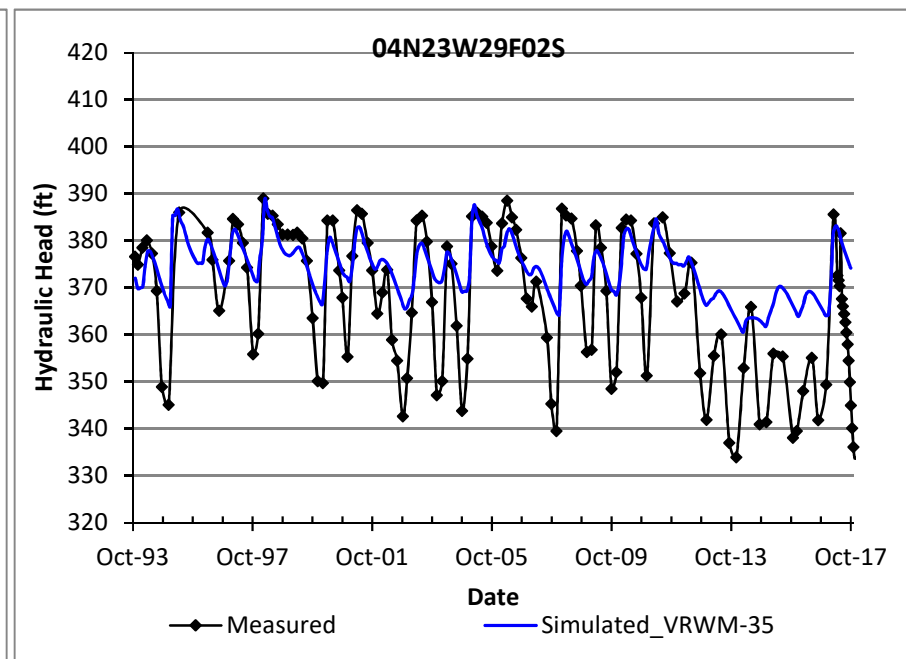
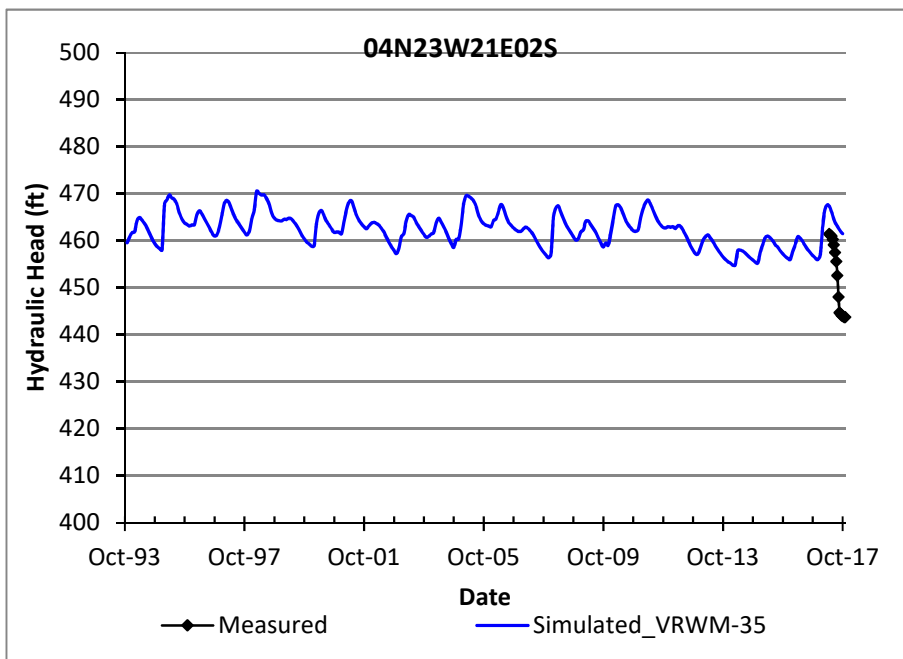


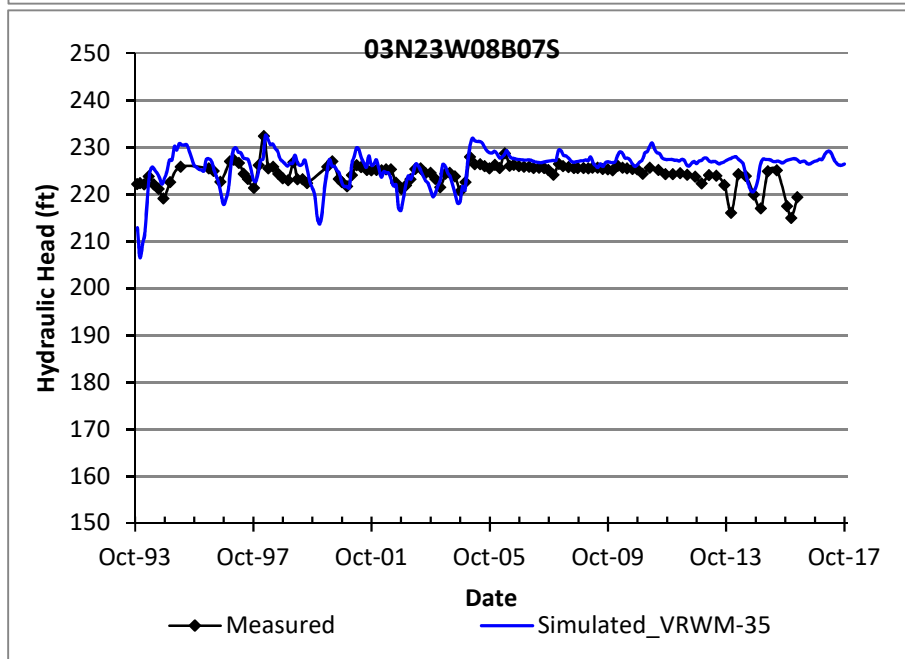
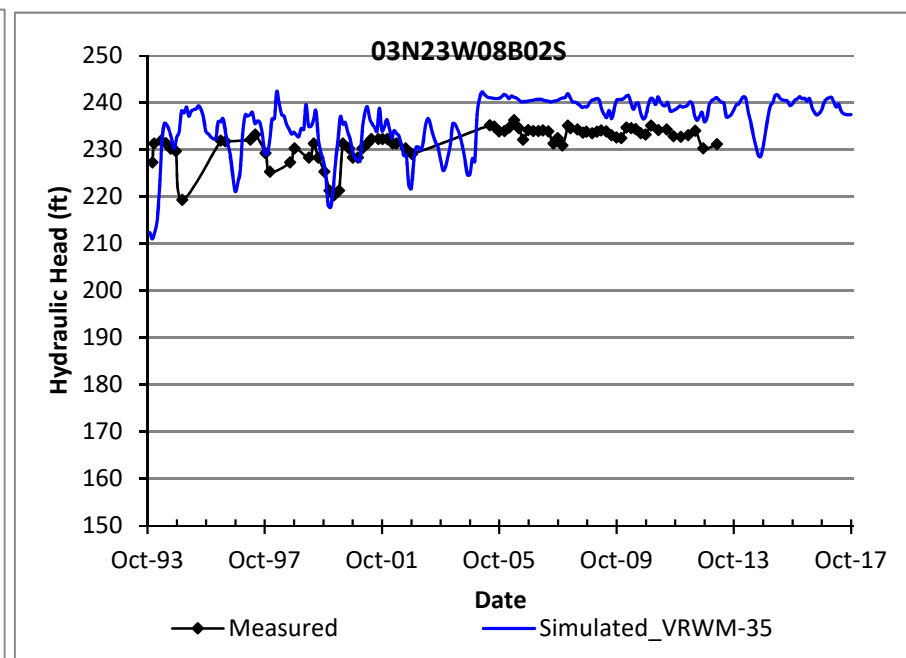
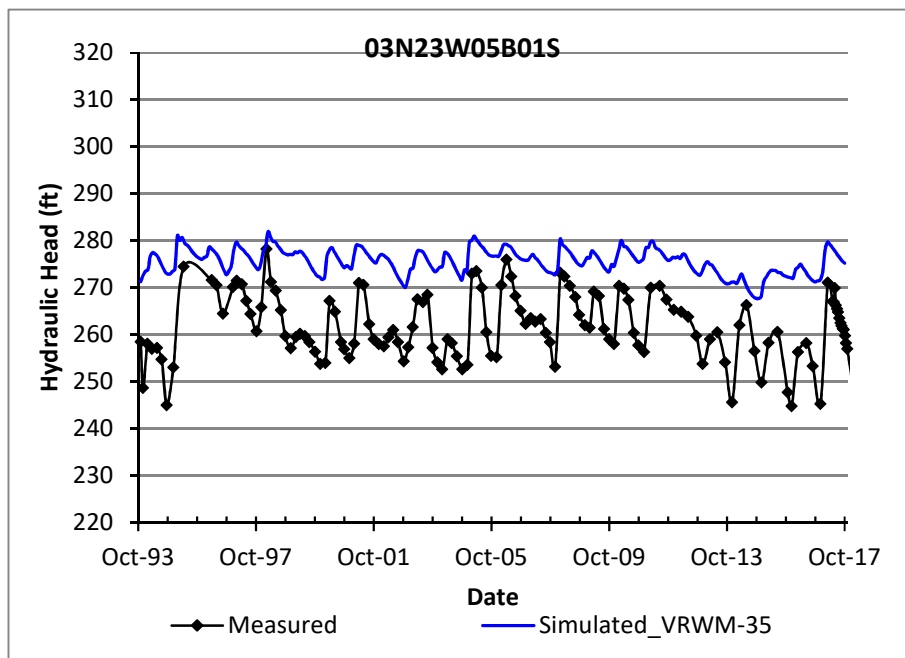
VRW GW-SW Model Report

Upper Ventura River Valley Basin



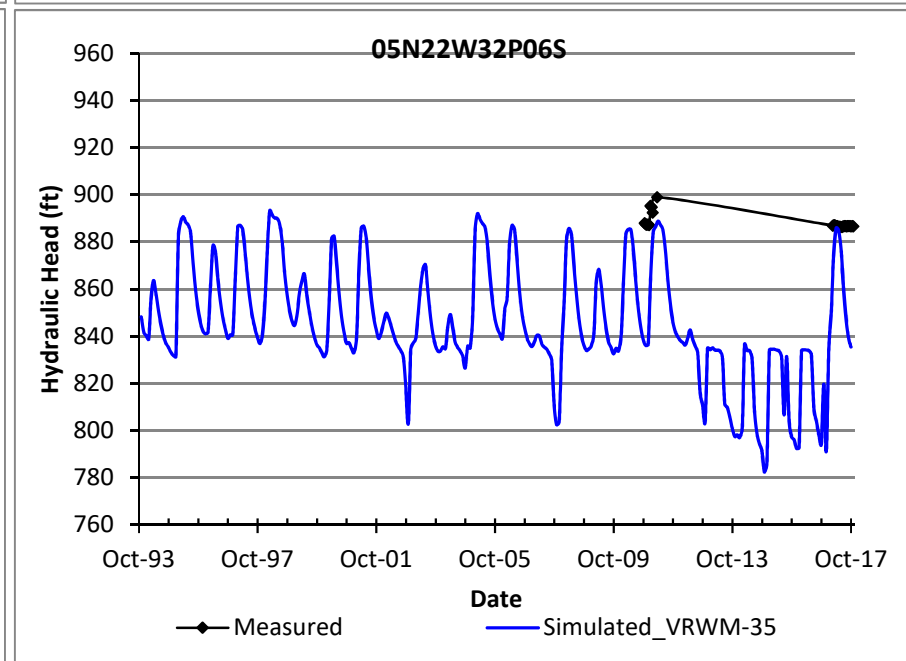
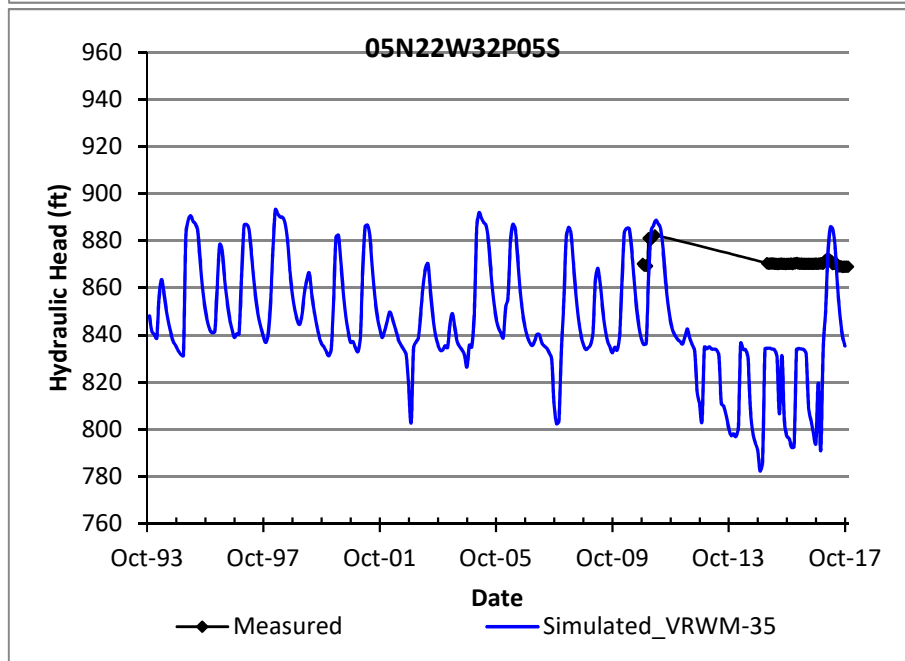
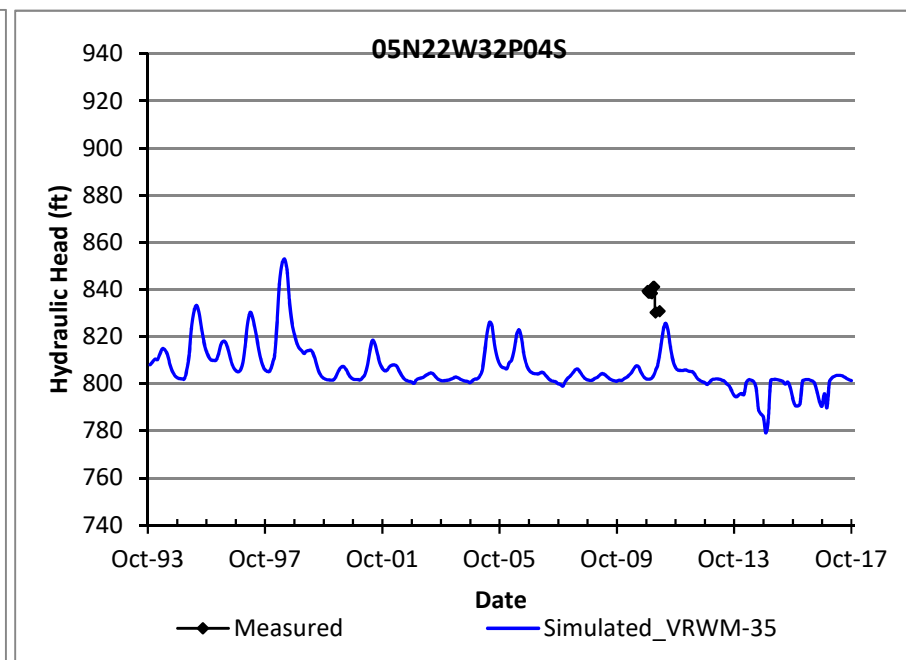
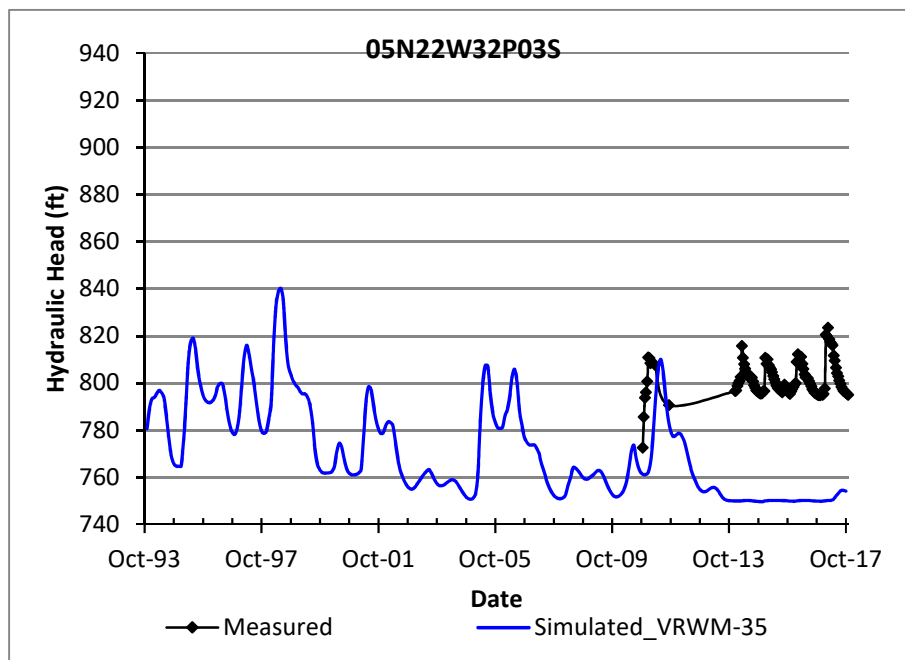


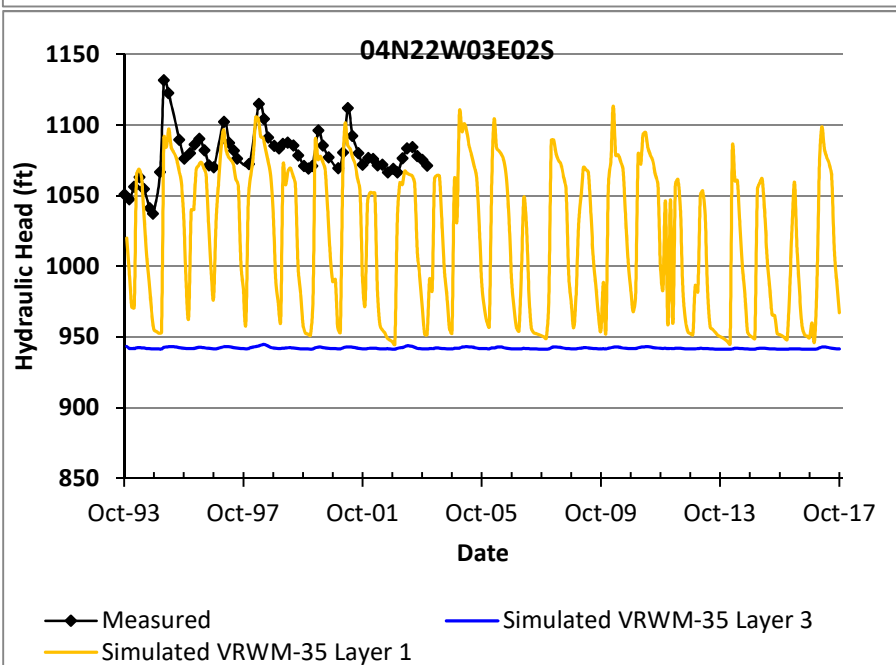
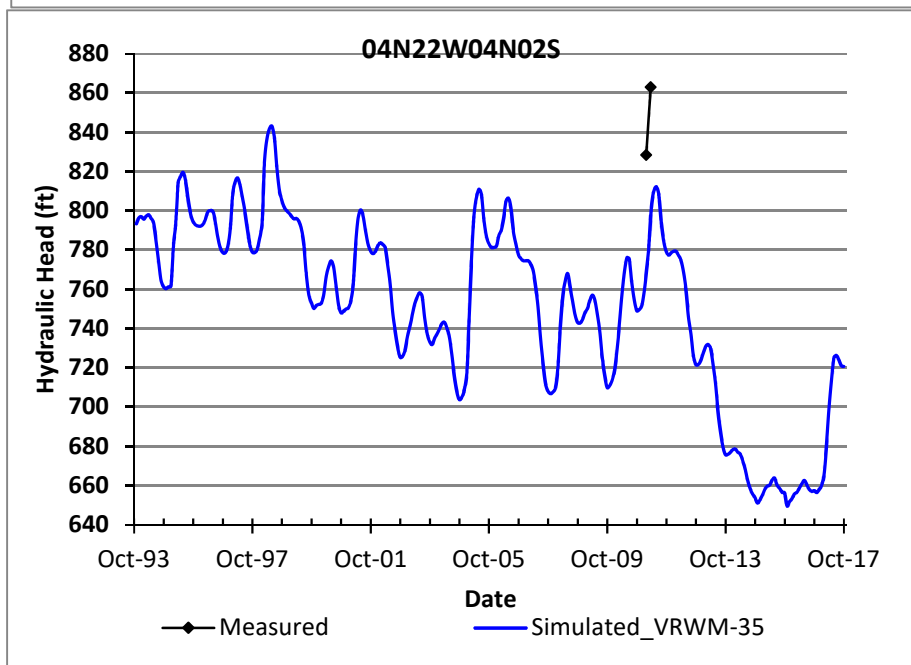
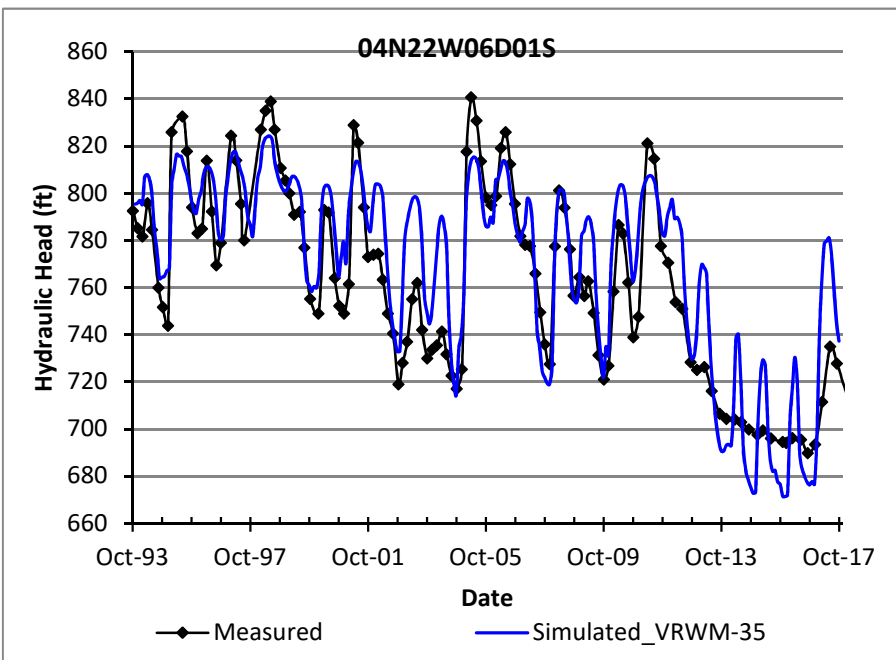
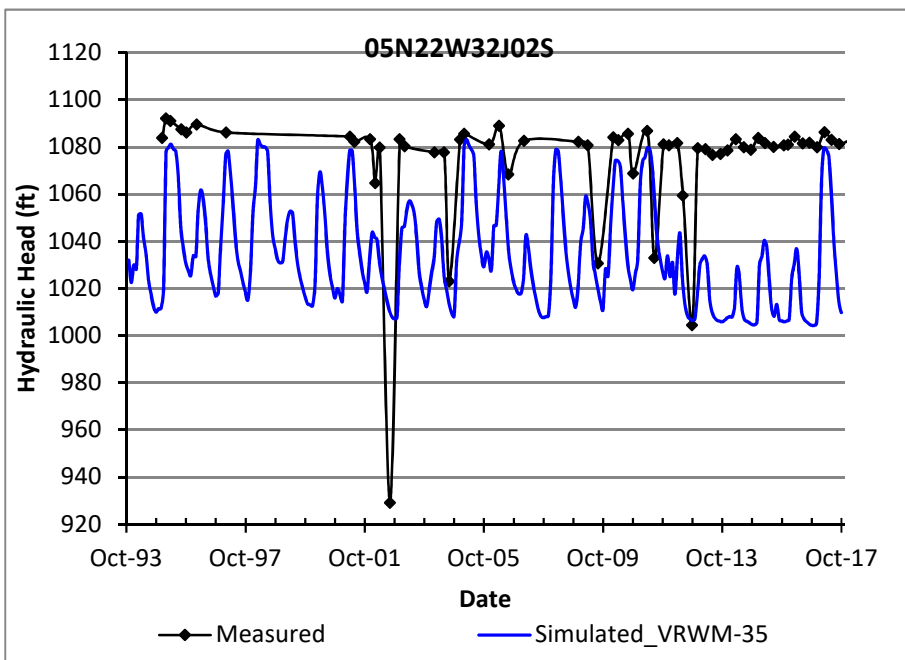


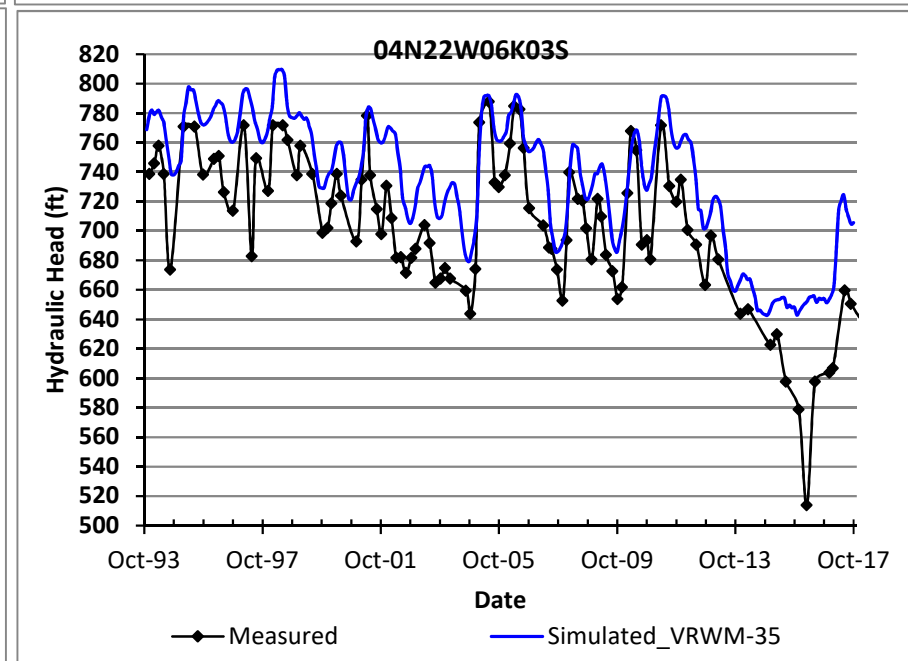
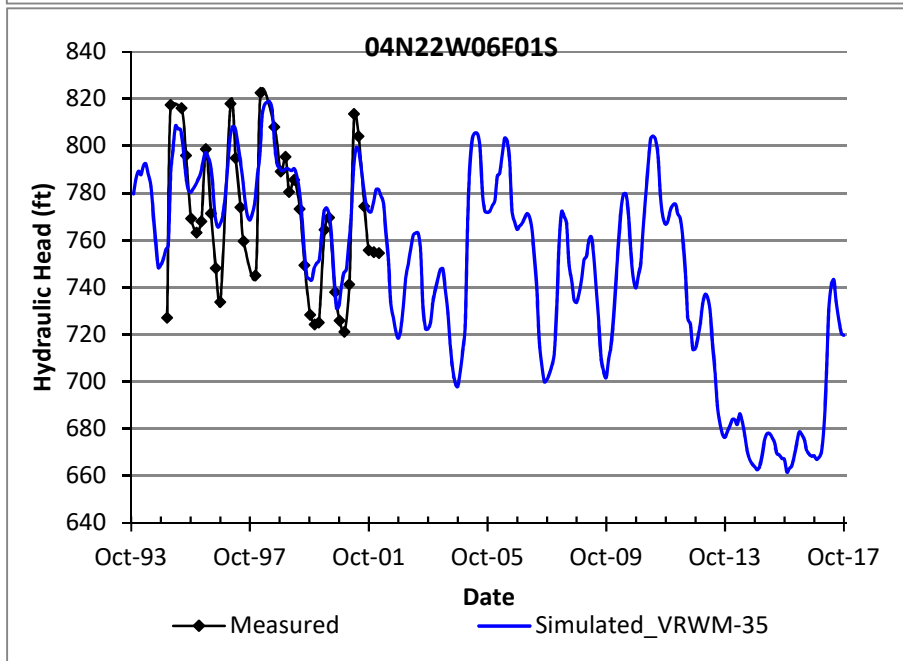
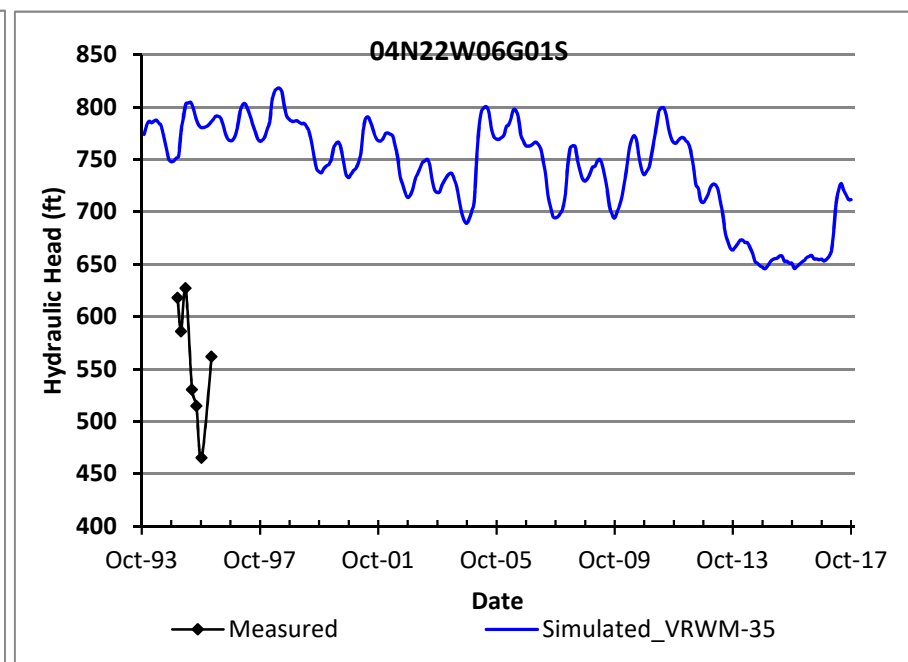
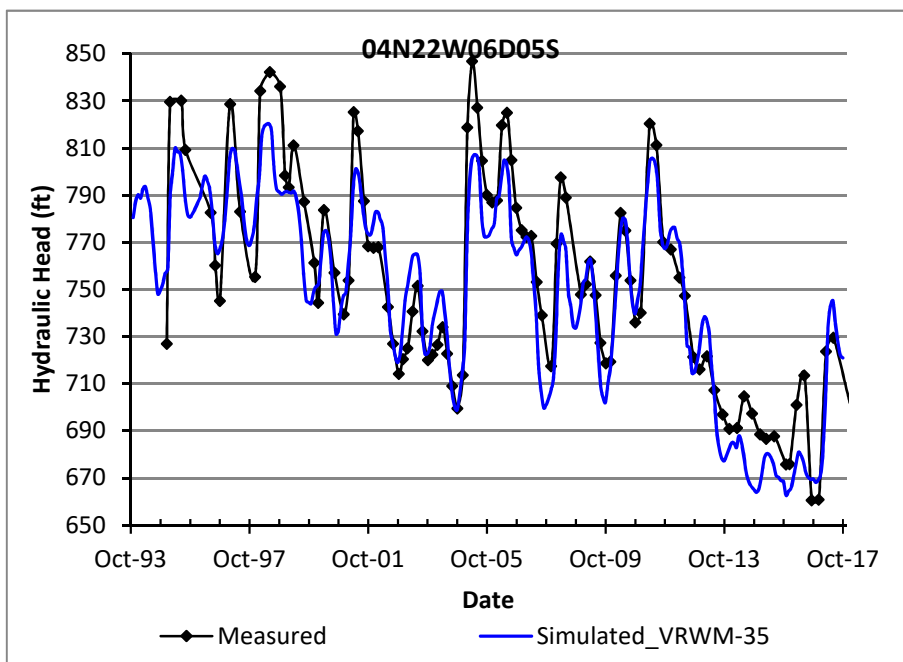


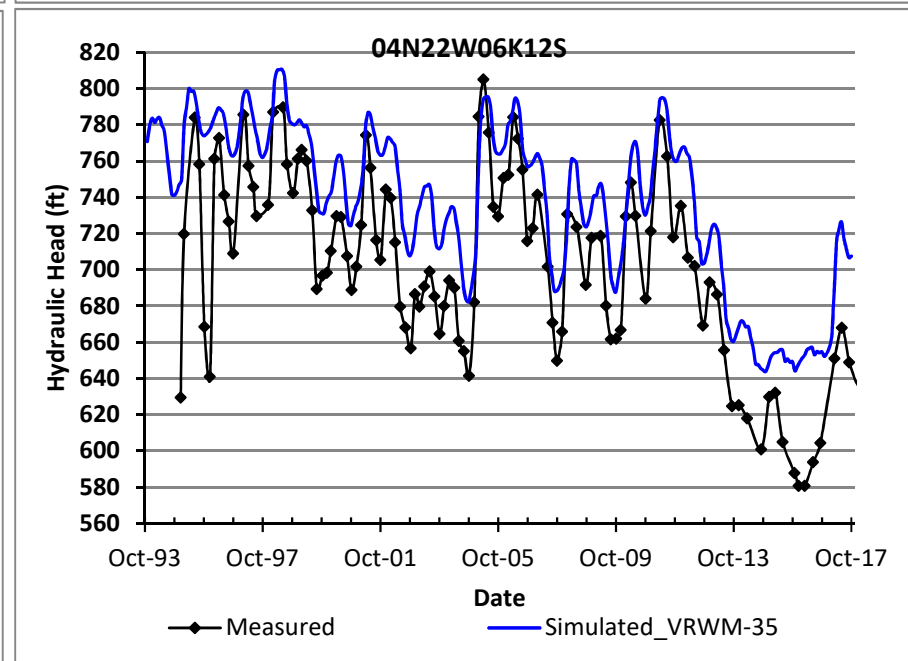
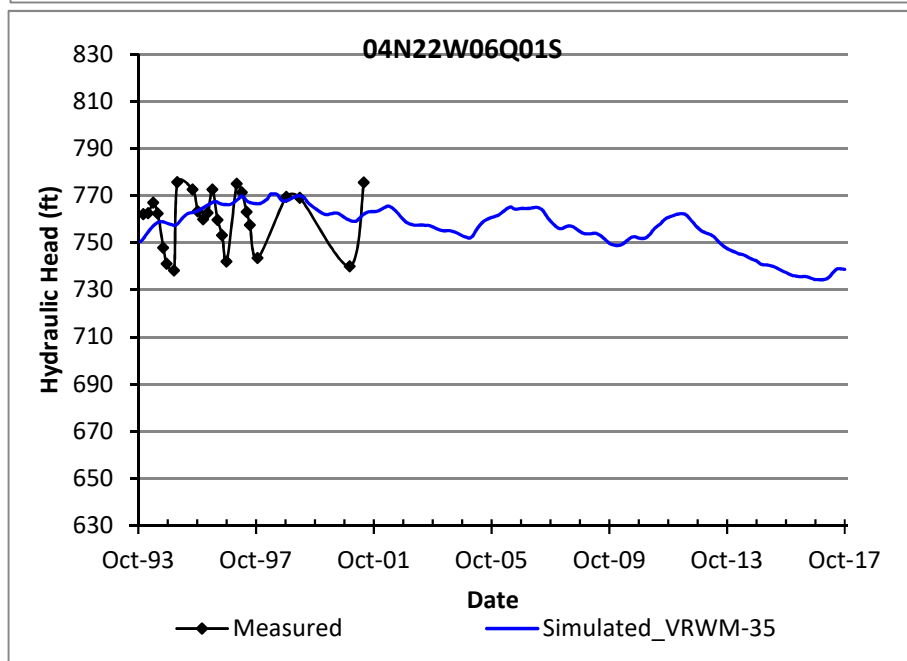
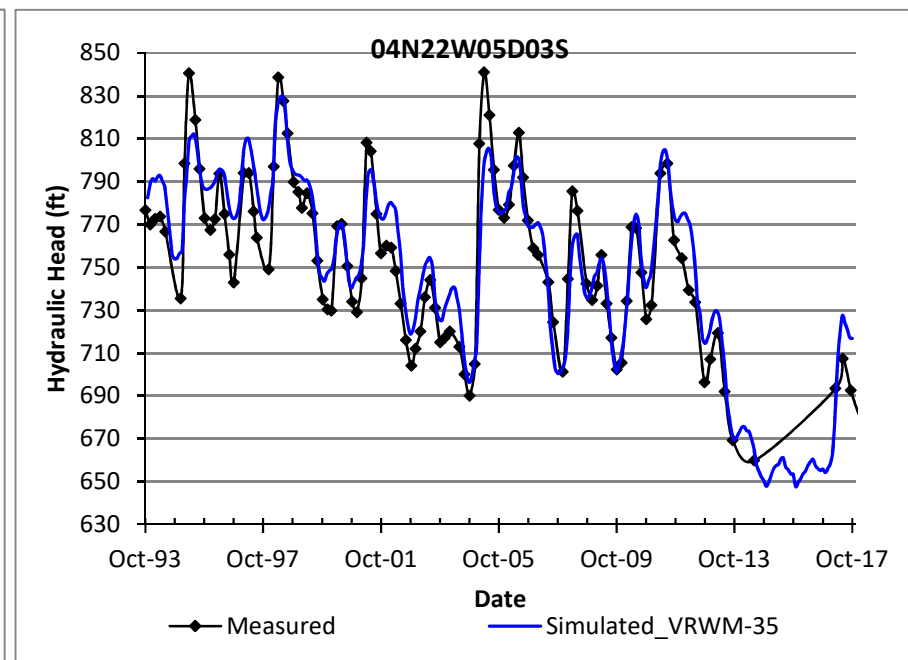
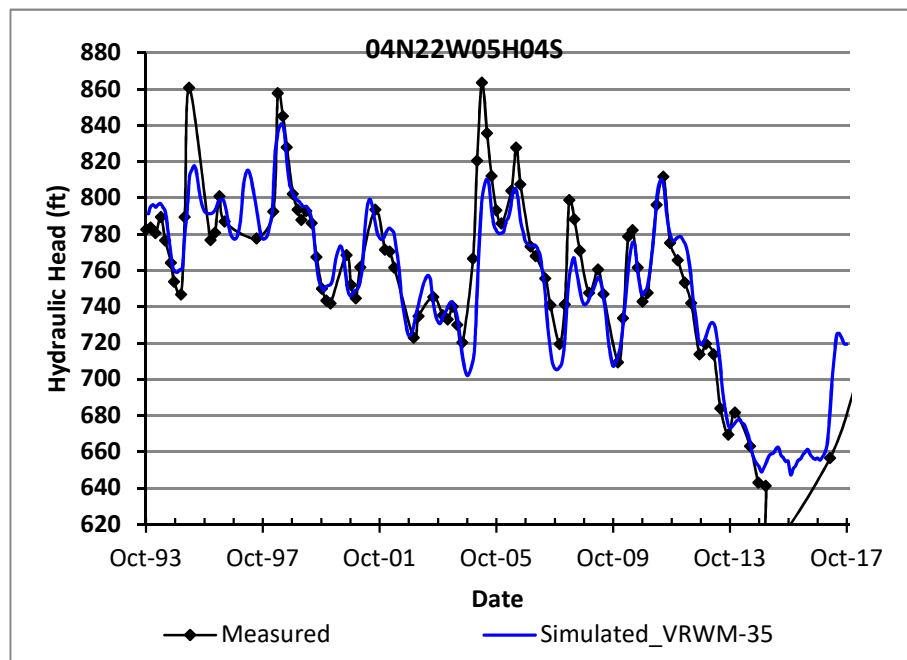
VRW GW-SW Model Report

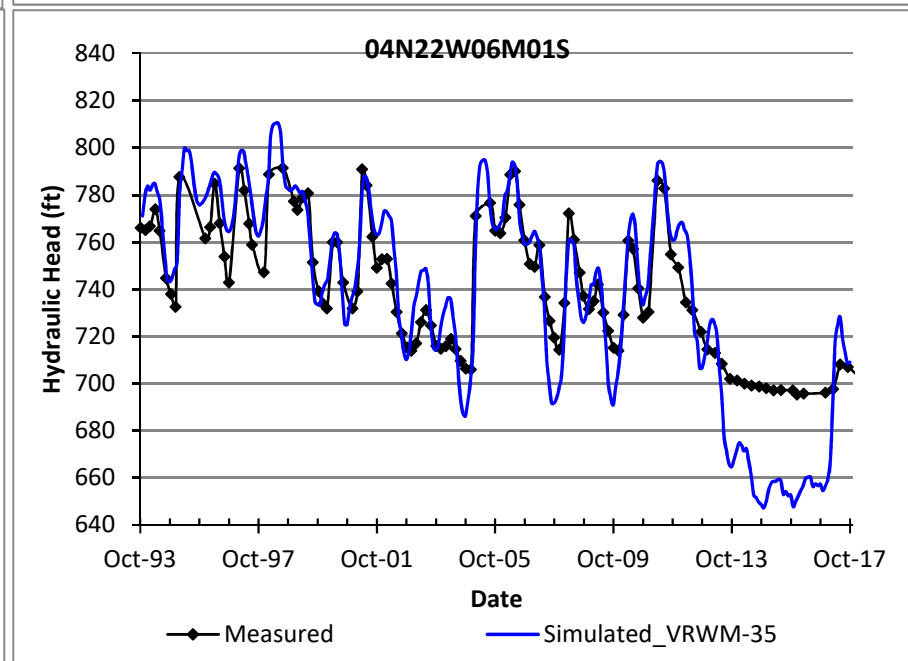
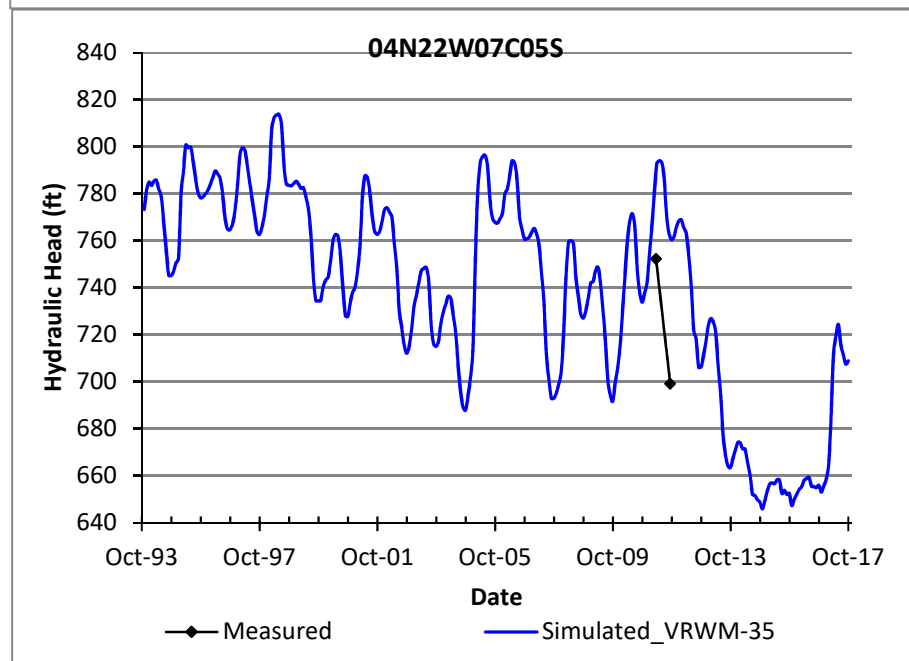
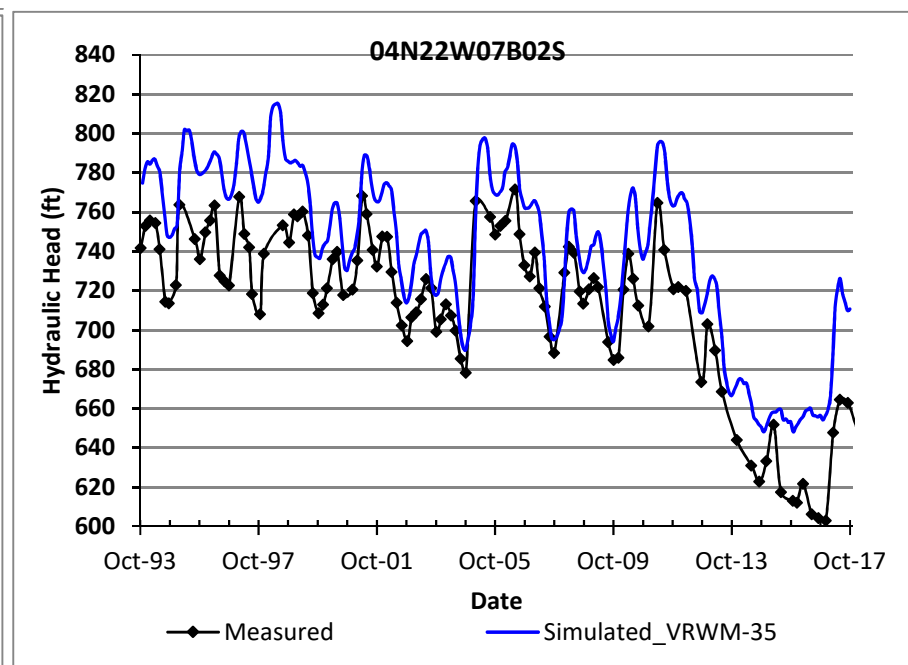
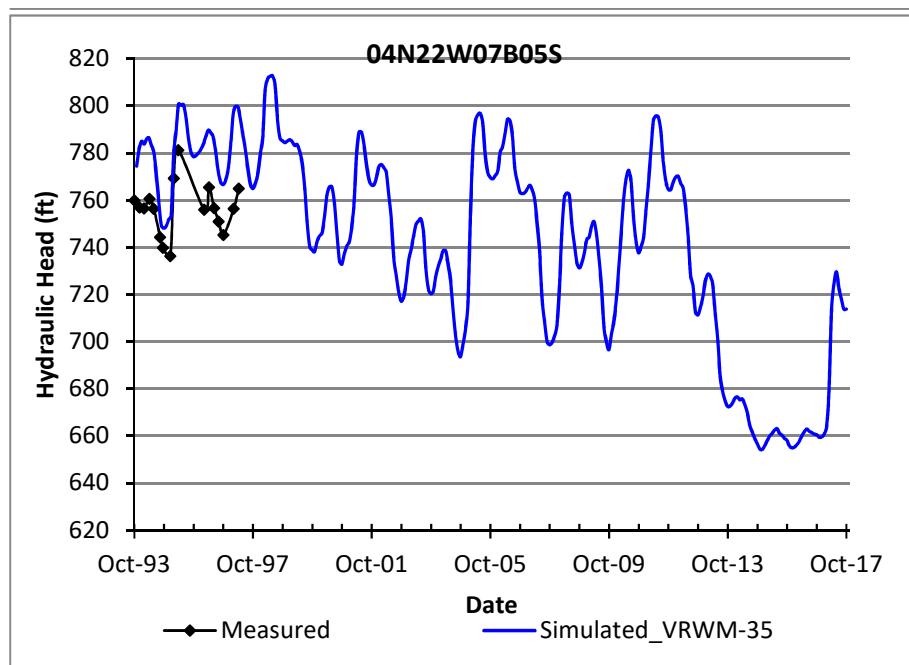
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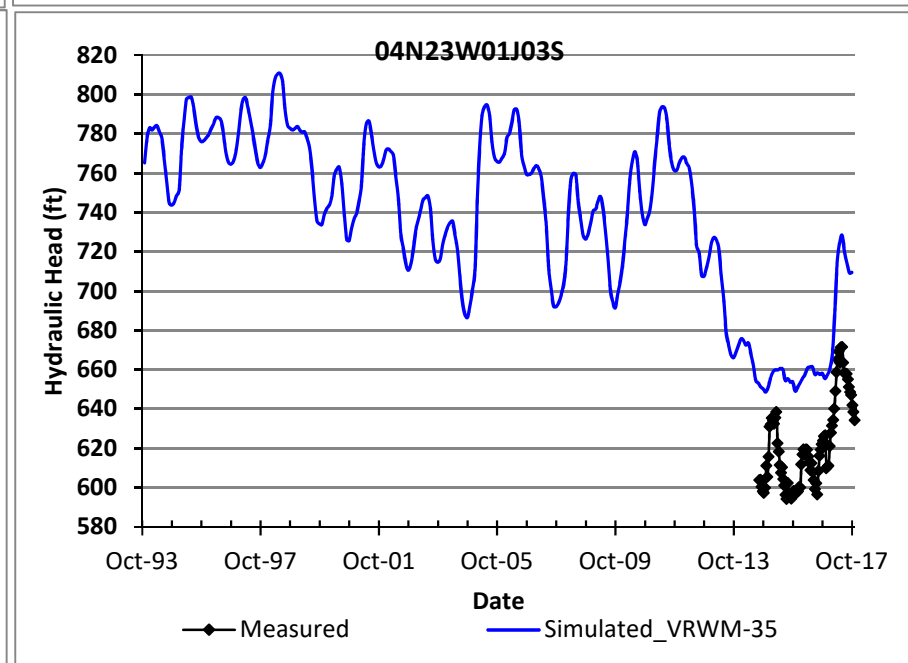
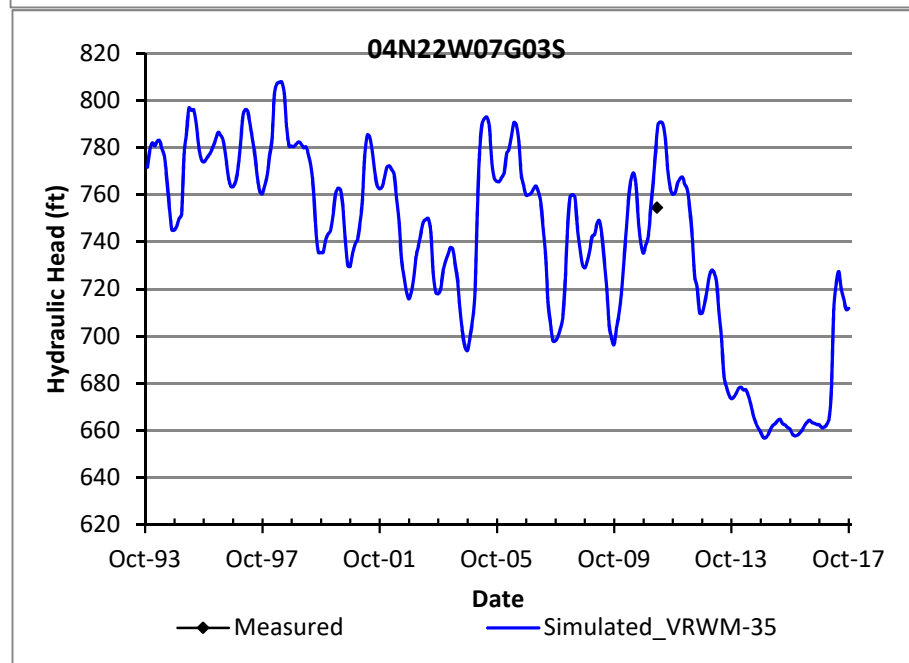
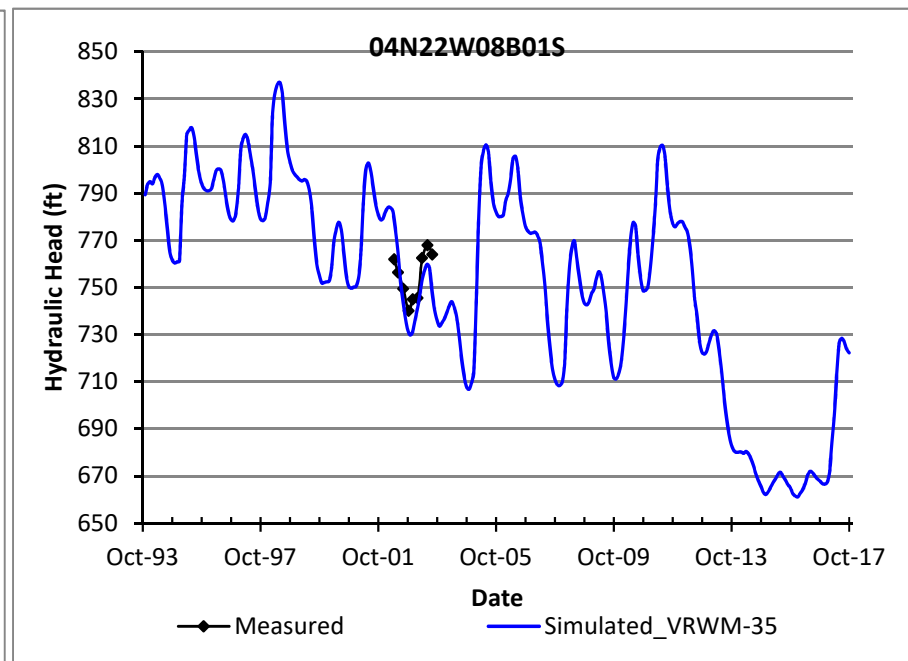
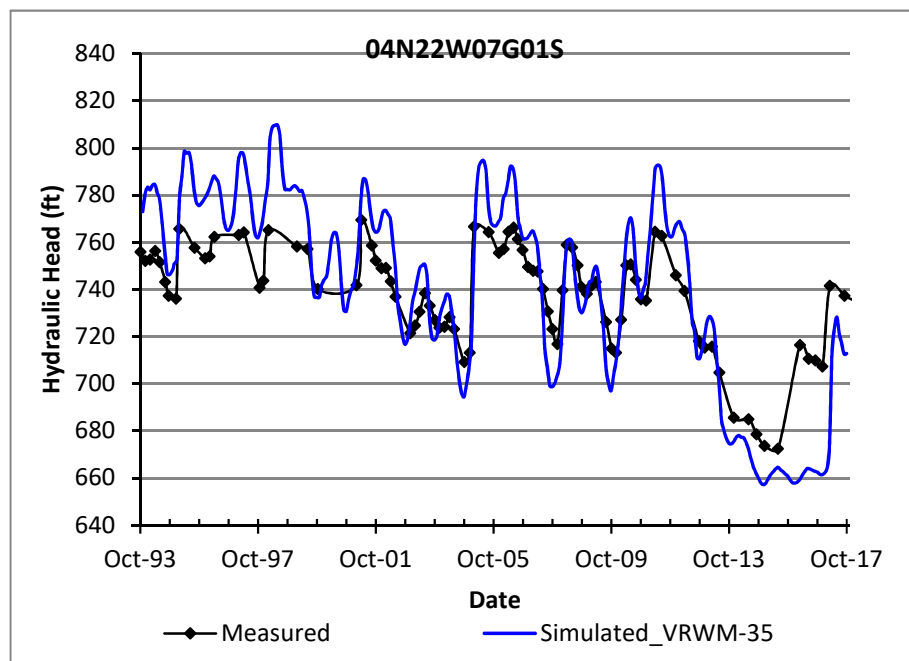


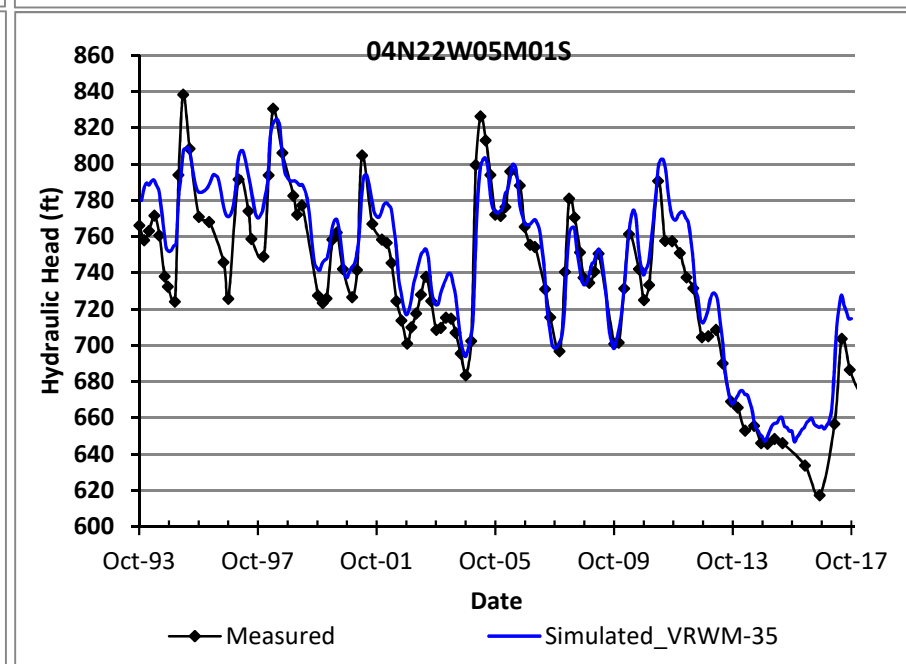
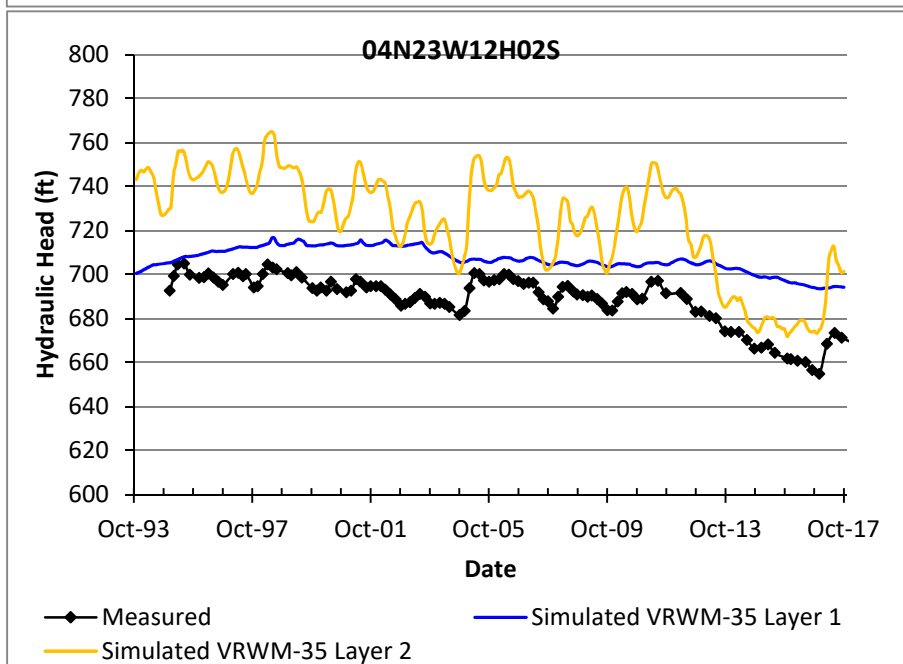
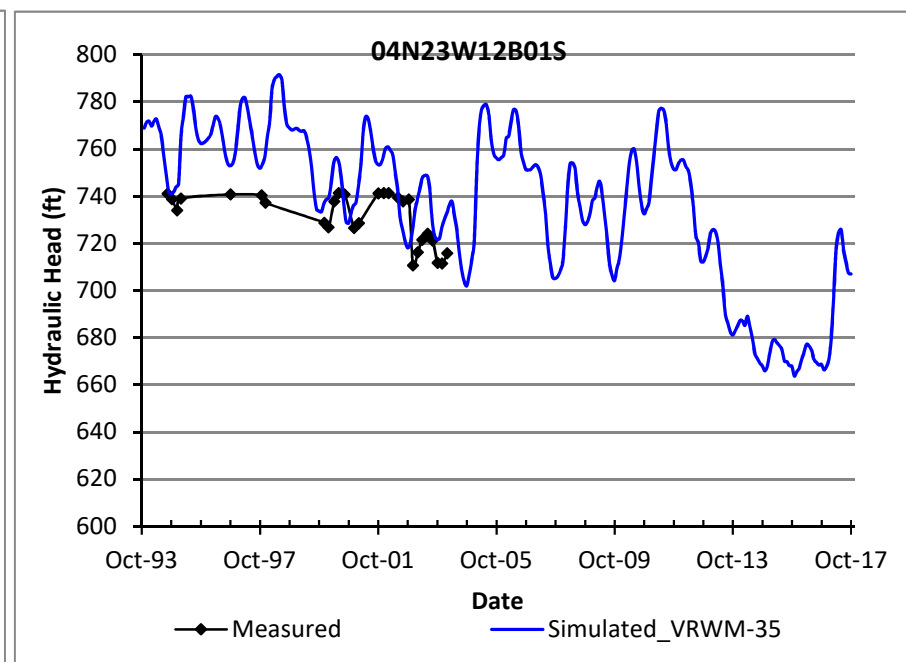
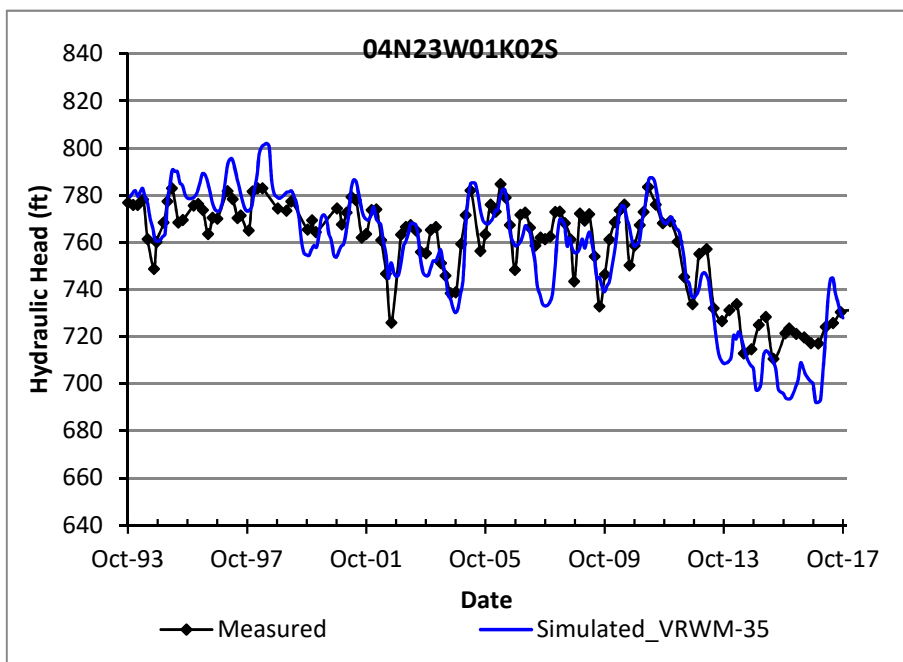


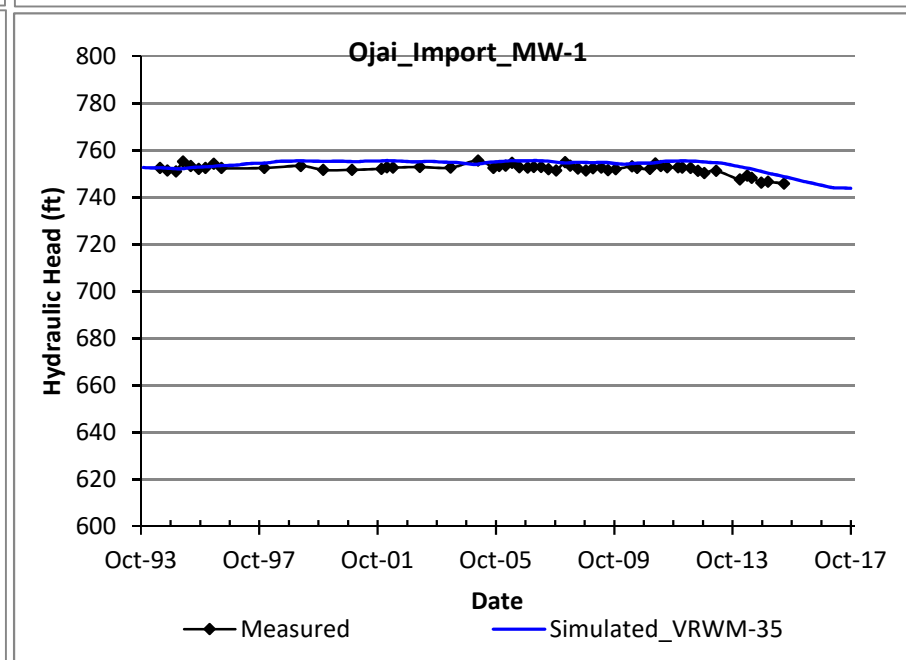
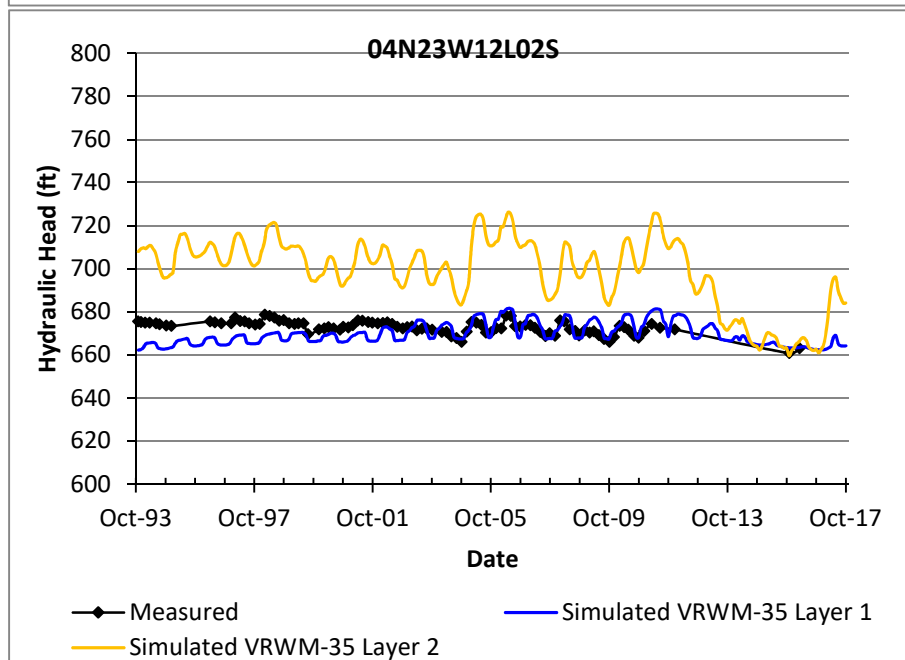
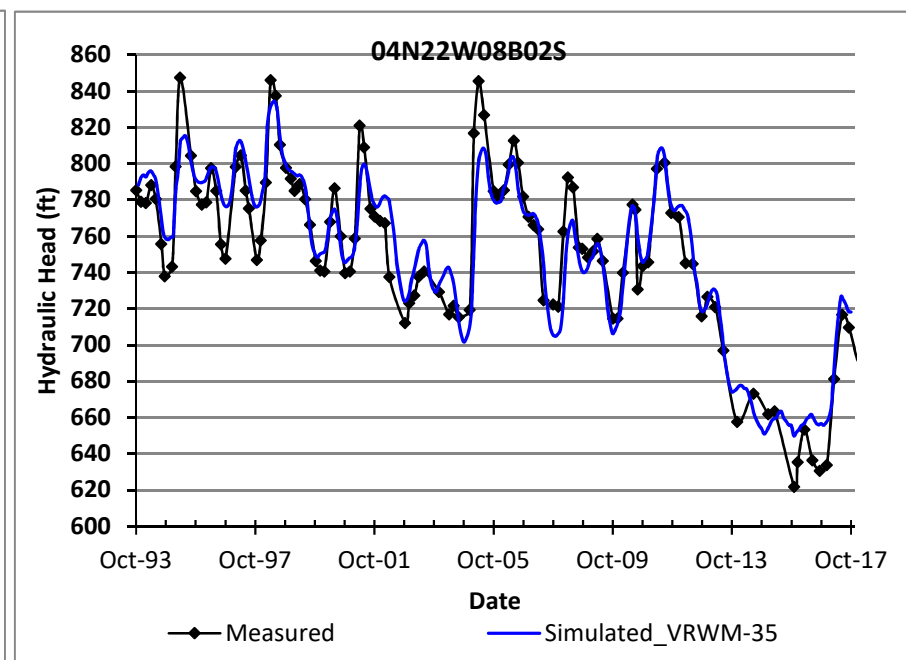
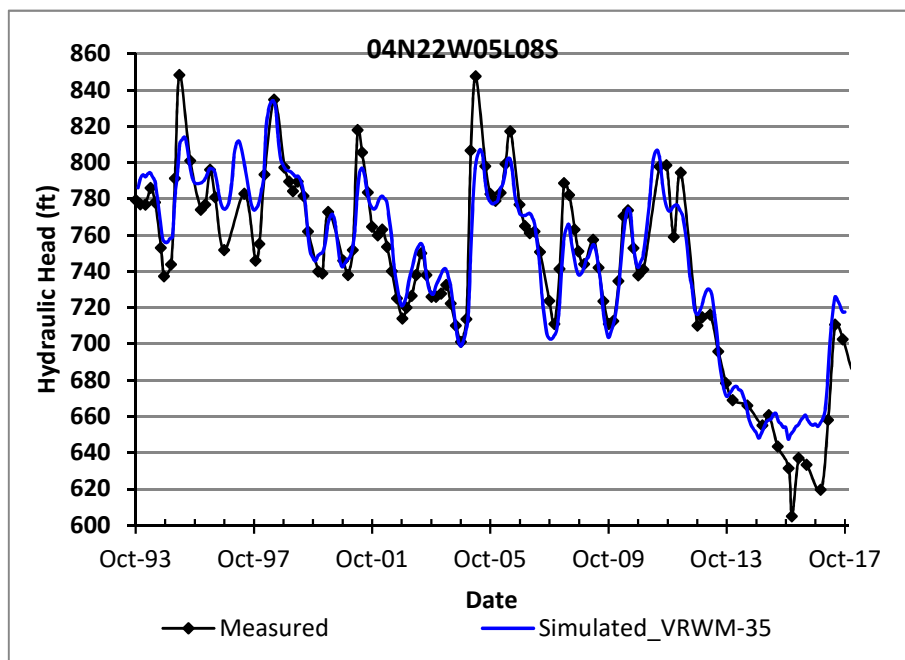






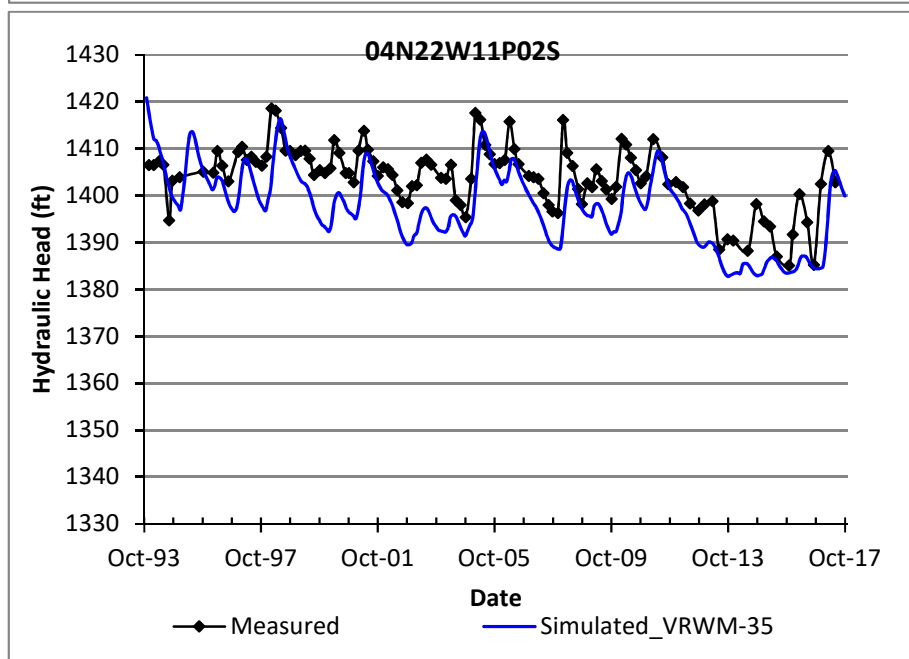
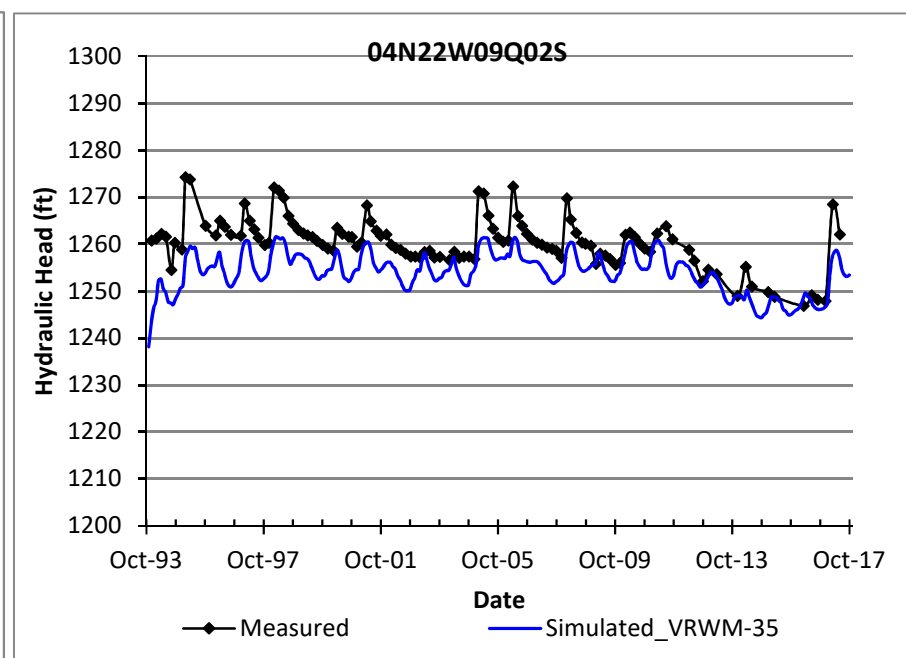
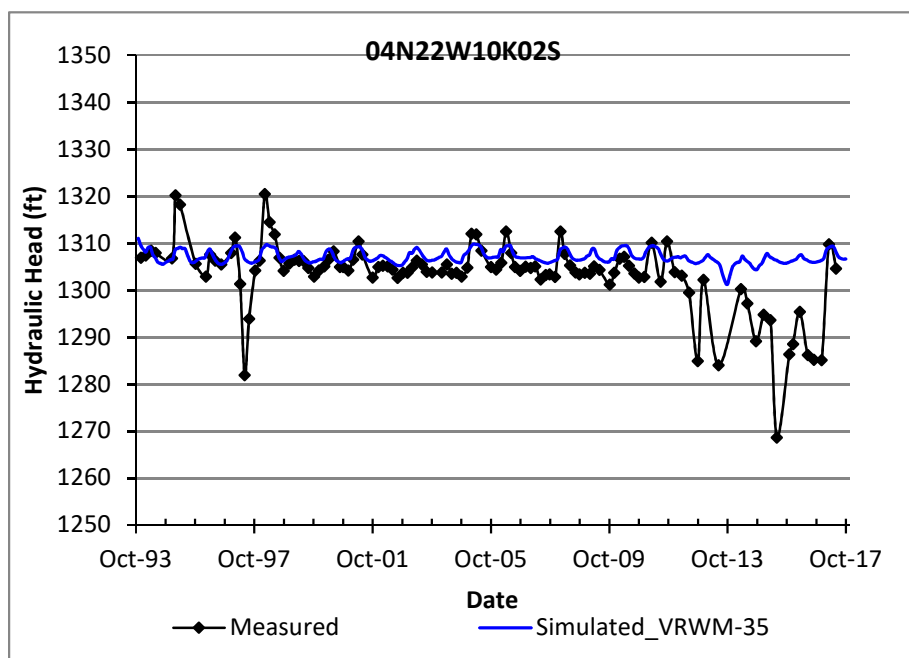






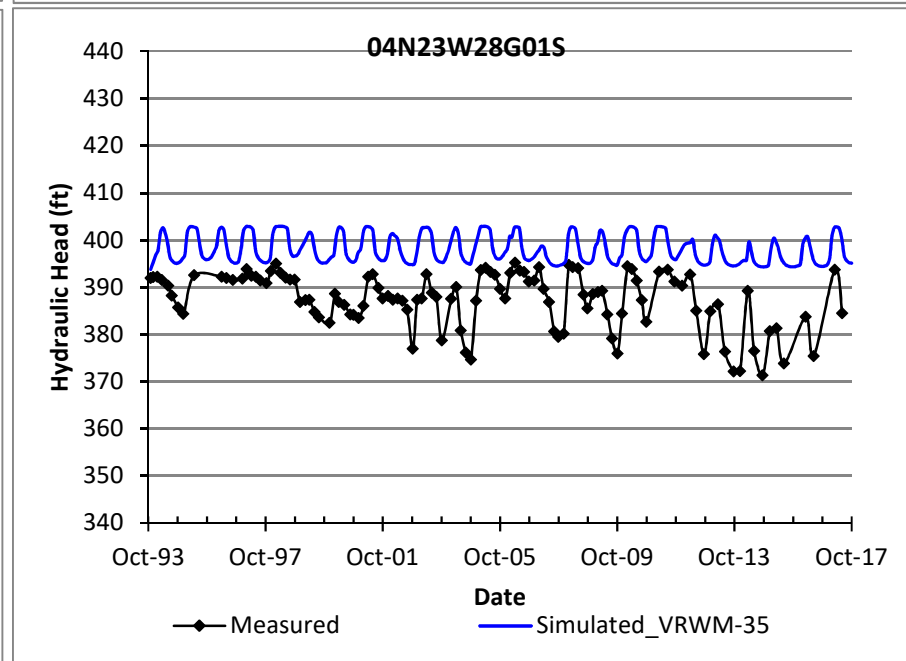
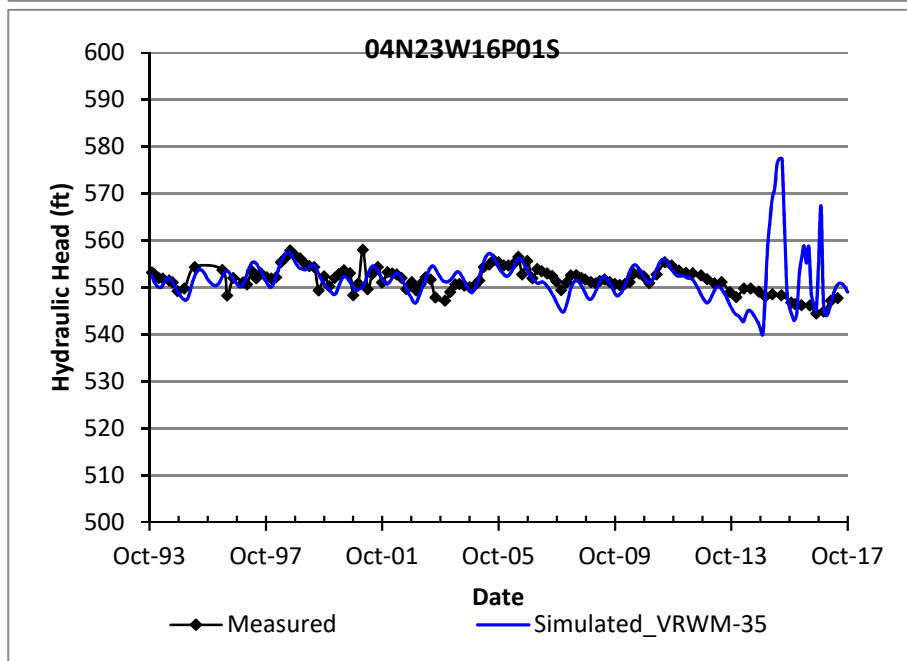
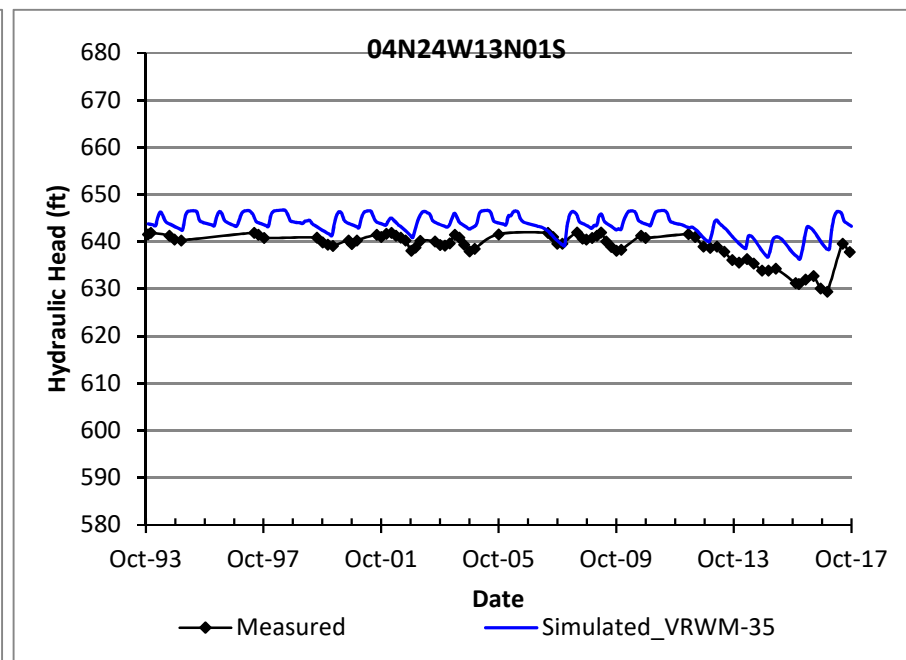
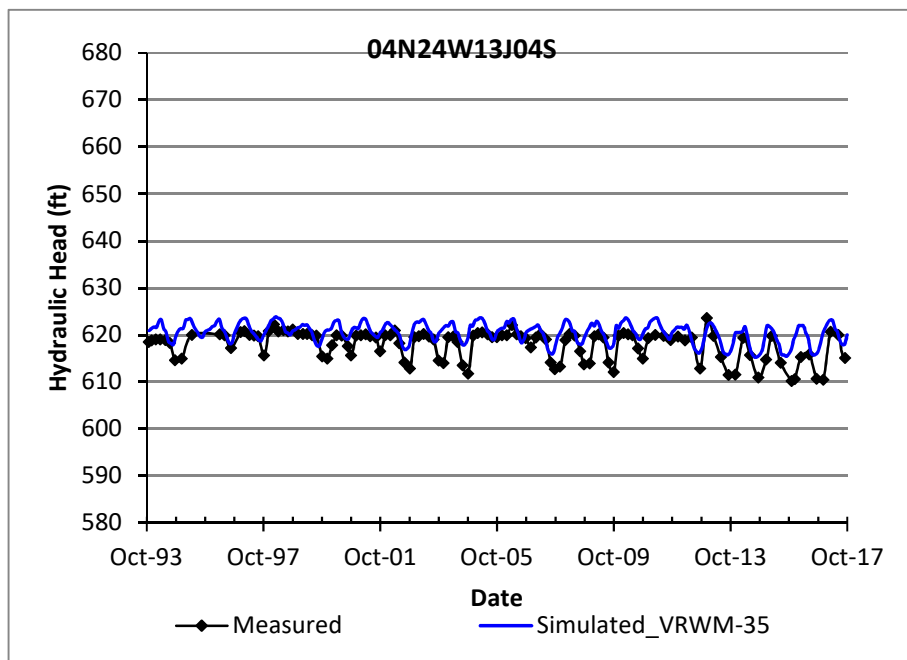
VRW GW-SW Model Report

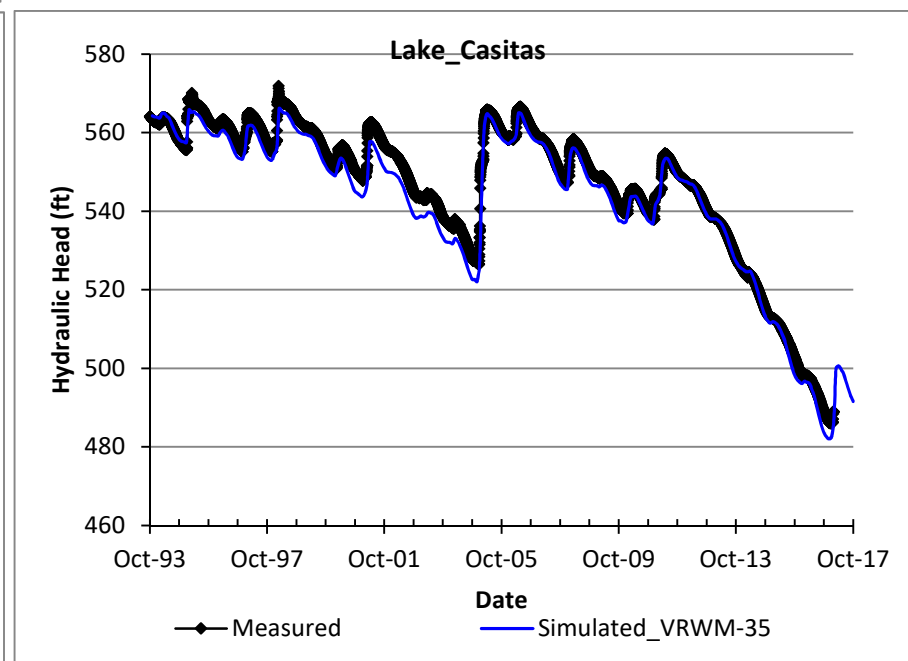
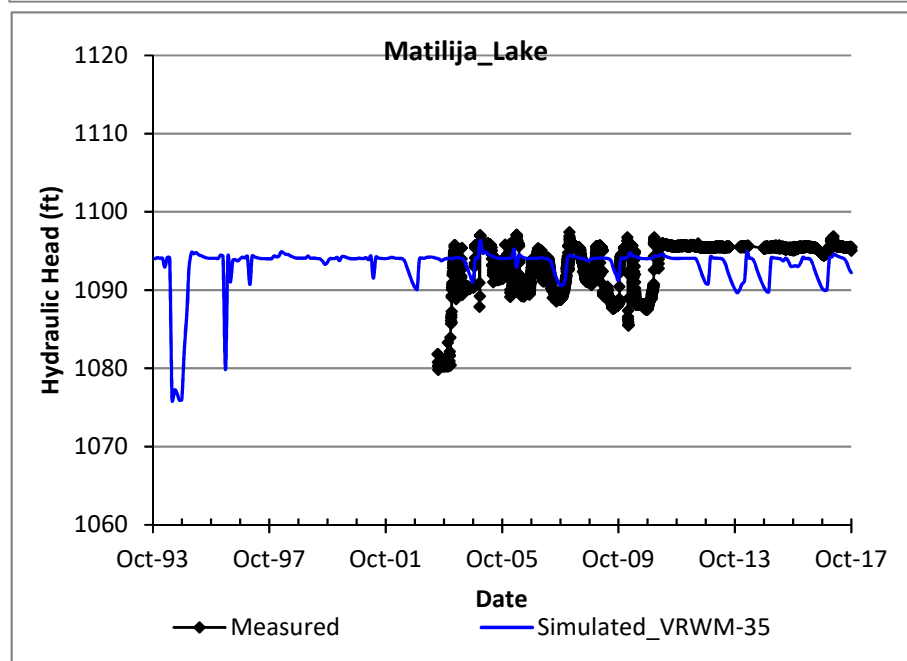
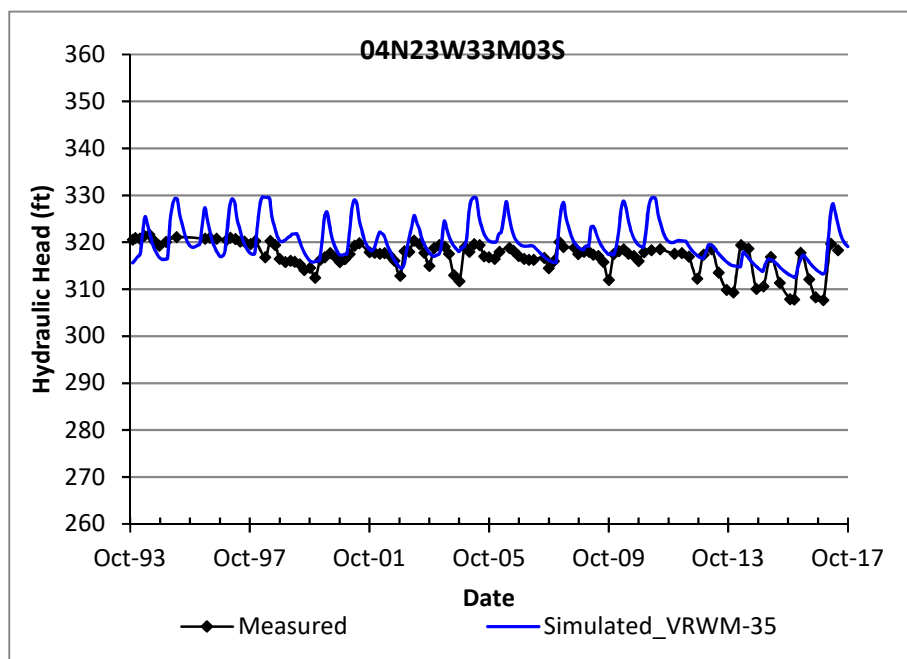
Upper Ojai Valley Basin



VRW GW-SW Model Report

Outside the basins

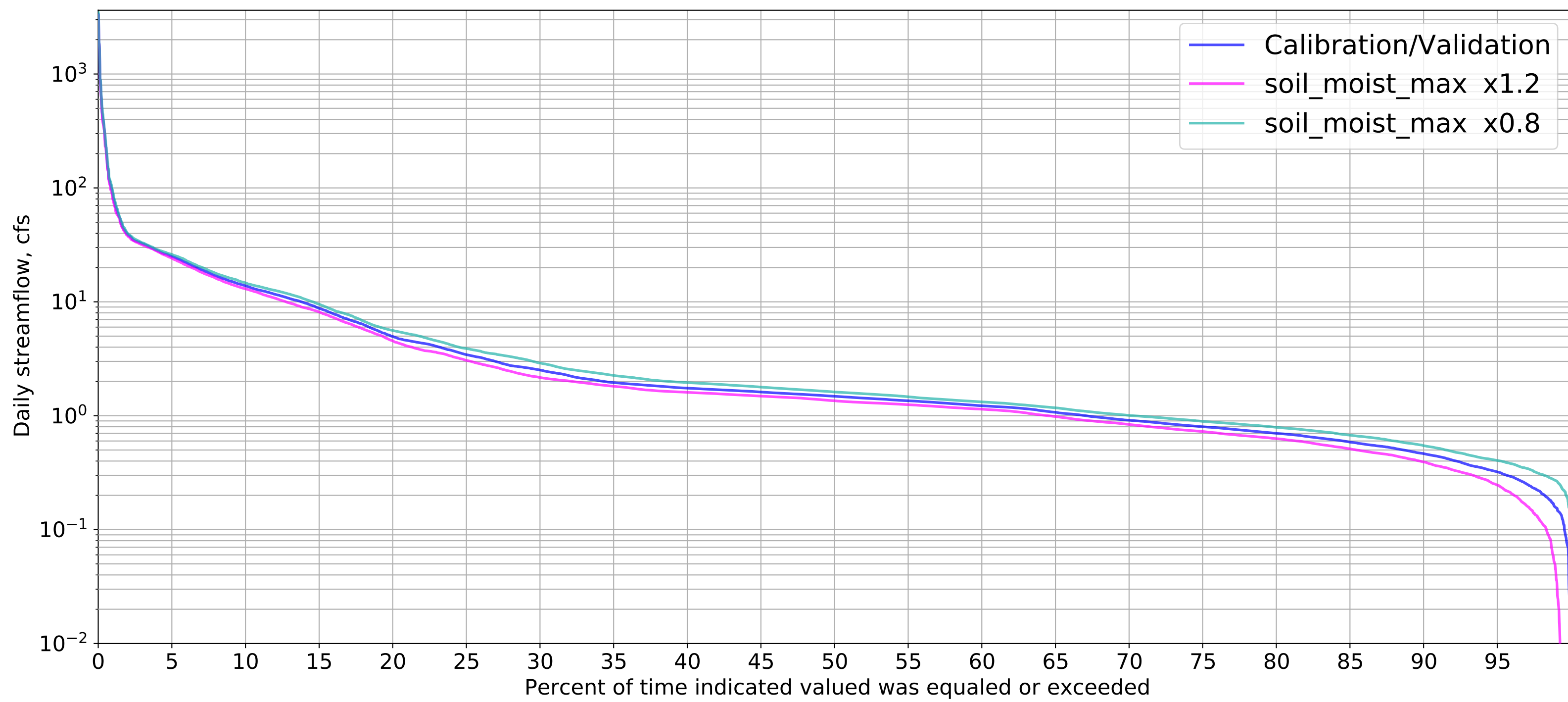
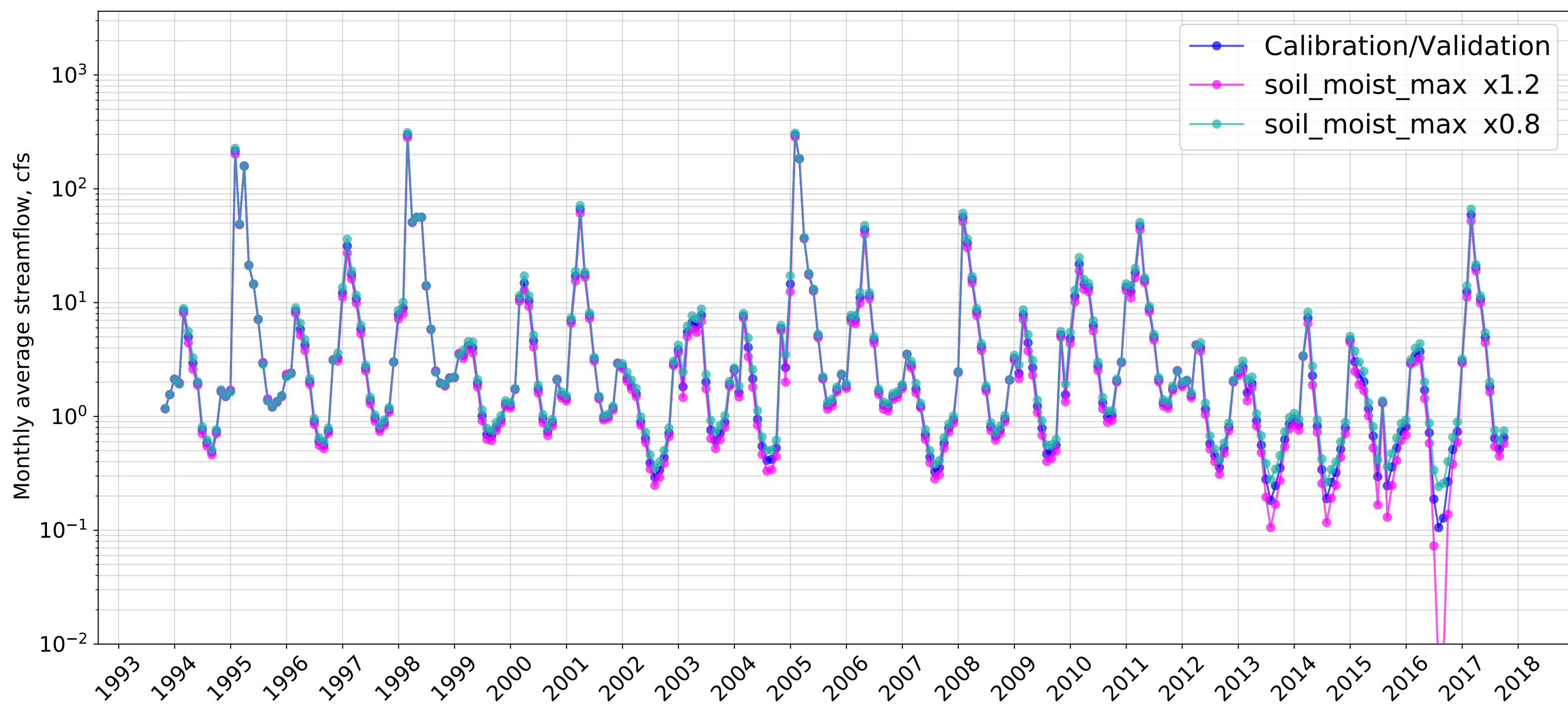
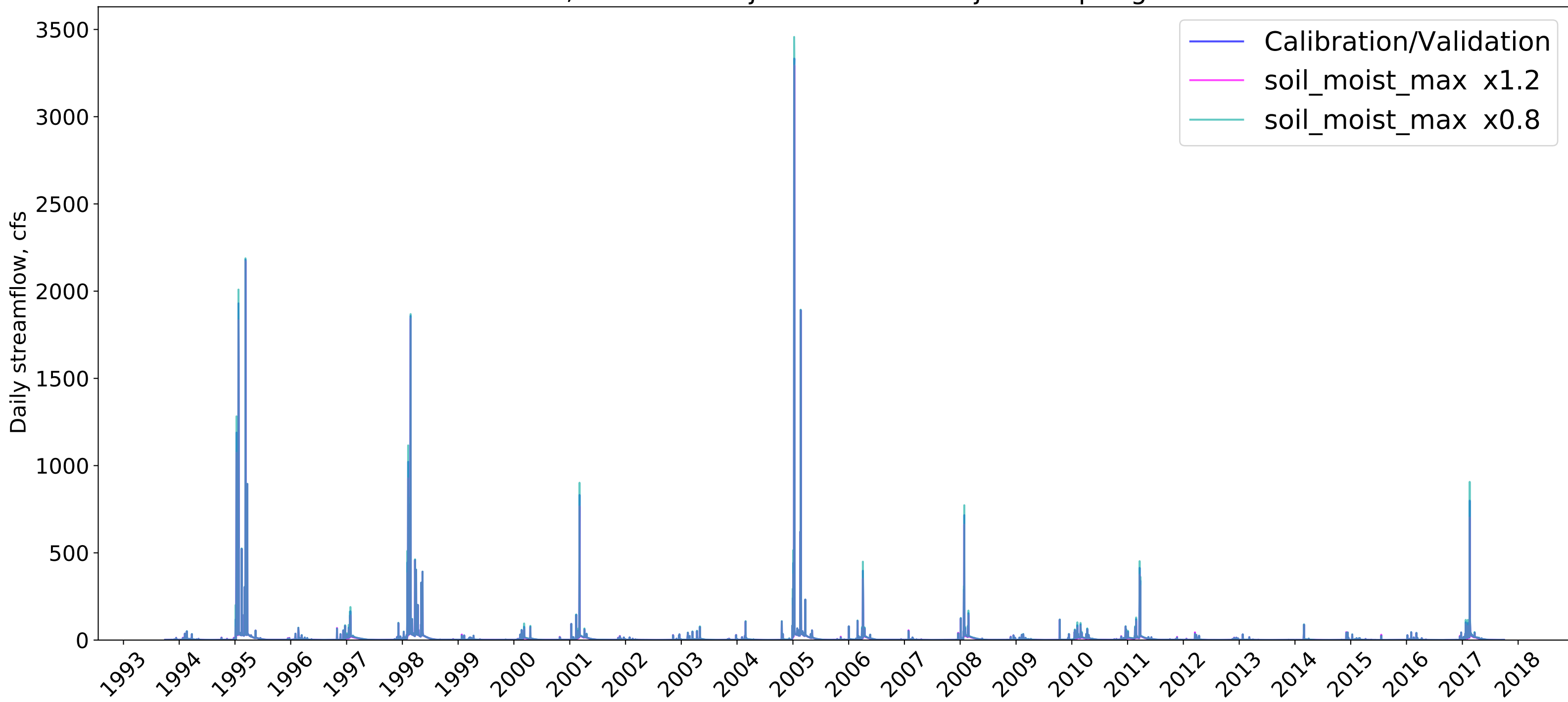




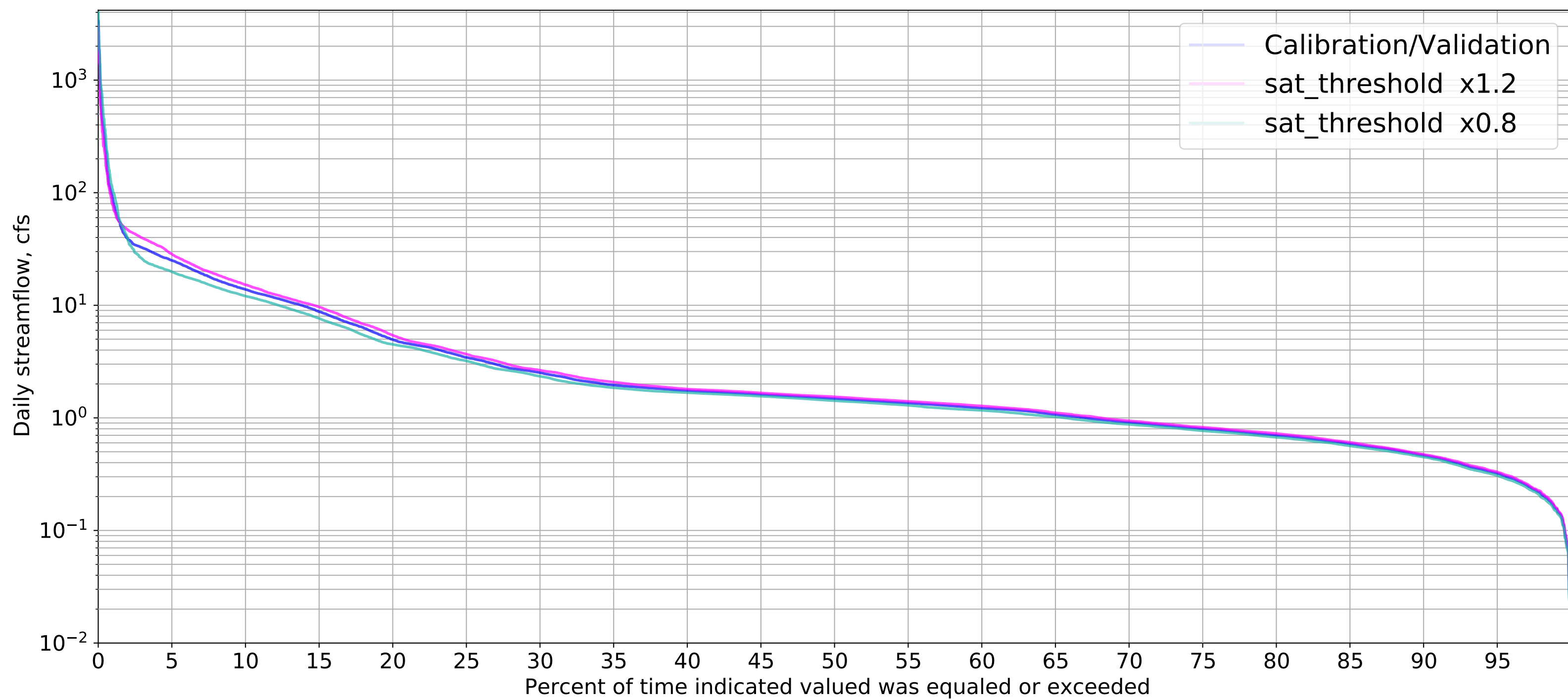
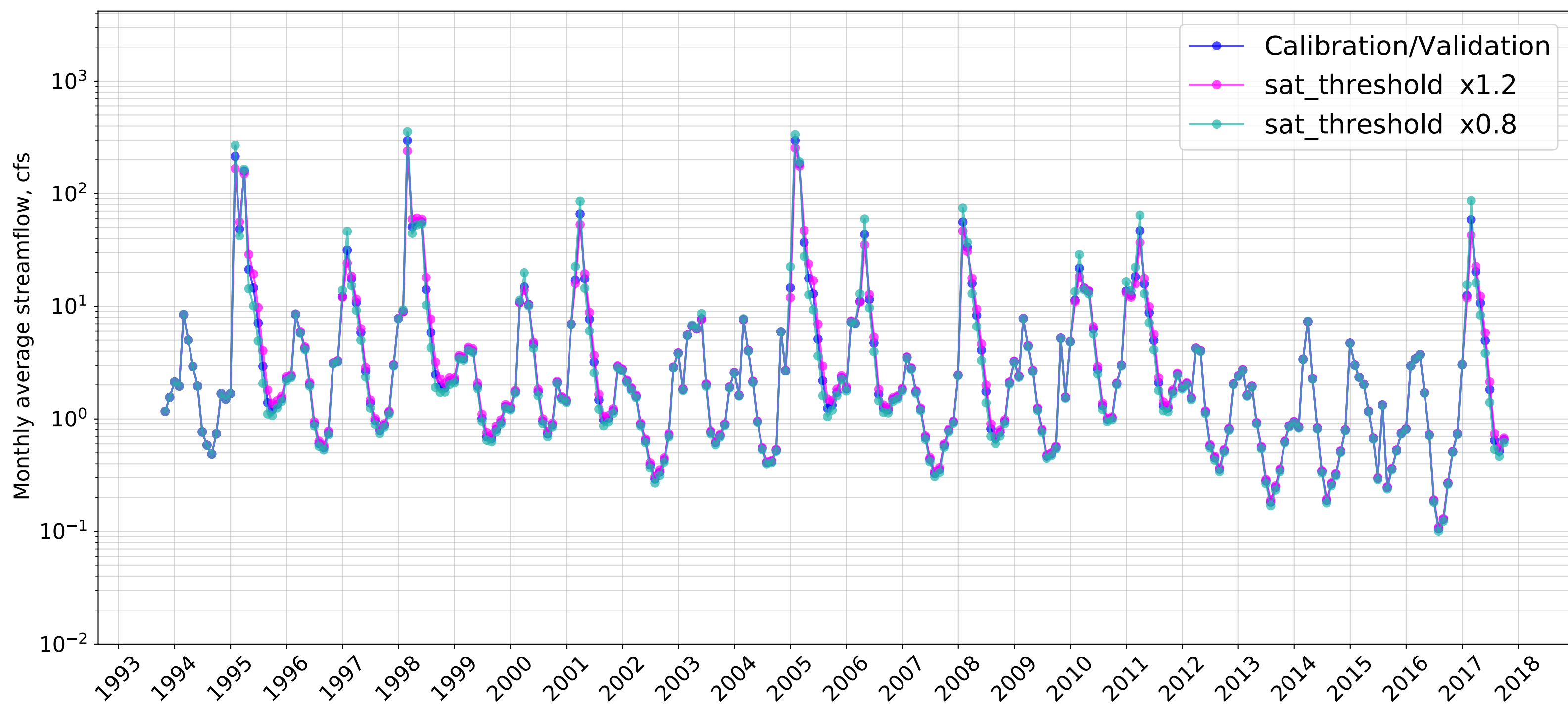
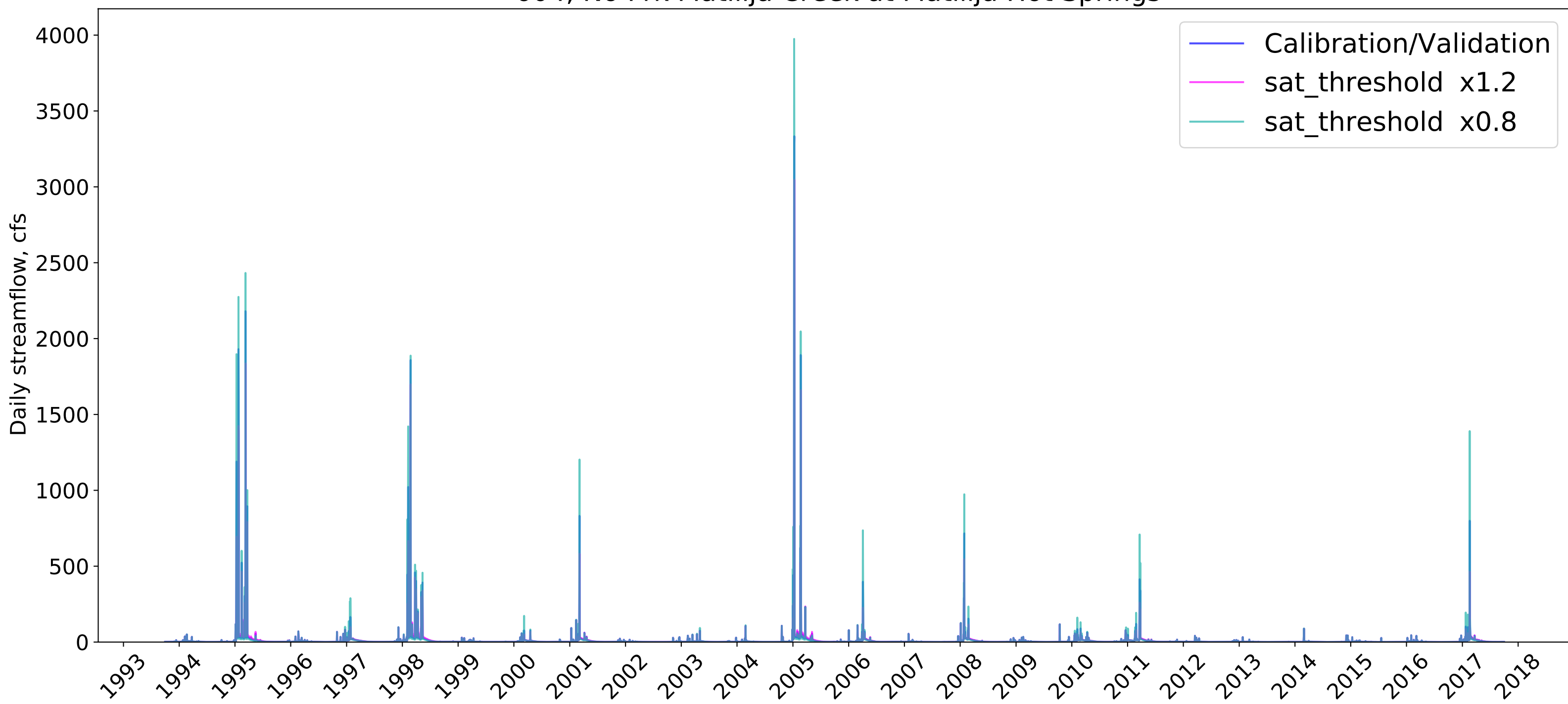
APPENDIX E: SENSITIVITY ANALYSIS STREAMFLOW PLOTS

Appendix E presents the sensitivity analyses results for streamflow. Fifteen model parameters were increased and decreased. Results are presented for four streamflow gages, in cubic feet per second (cfs), for water years 1993 to 2017. Each page of the appendix has three hydrographs that plot results of modifying one parameter at one streamflow gage as daily streamflow (top), monthly average streamflow (center), and daily streamflow exceedance probability curves (bottom). Each hydrograph plots the calibration/validation results (blue) and the results for increasing (pink) and decreasing (green) a model parameter. Streamflow gage locations are mapped in Figure 3.1. If you need accessibility assistance with the information presented in this appendix, please contact the State Water Board at instreamflows@waterboards.ca.gov.

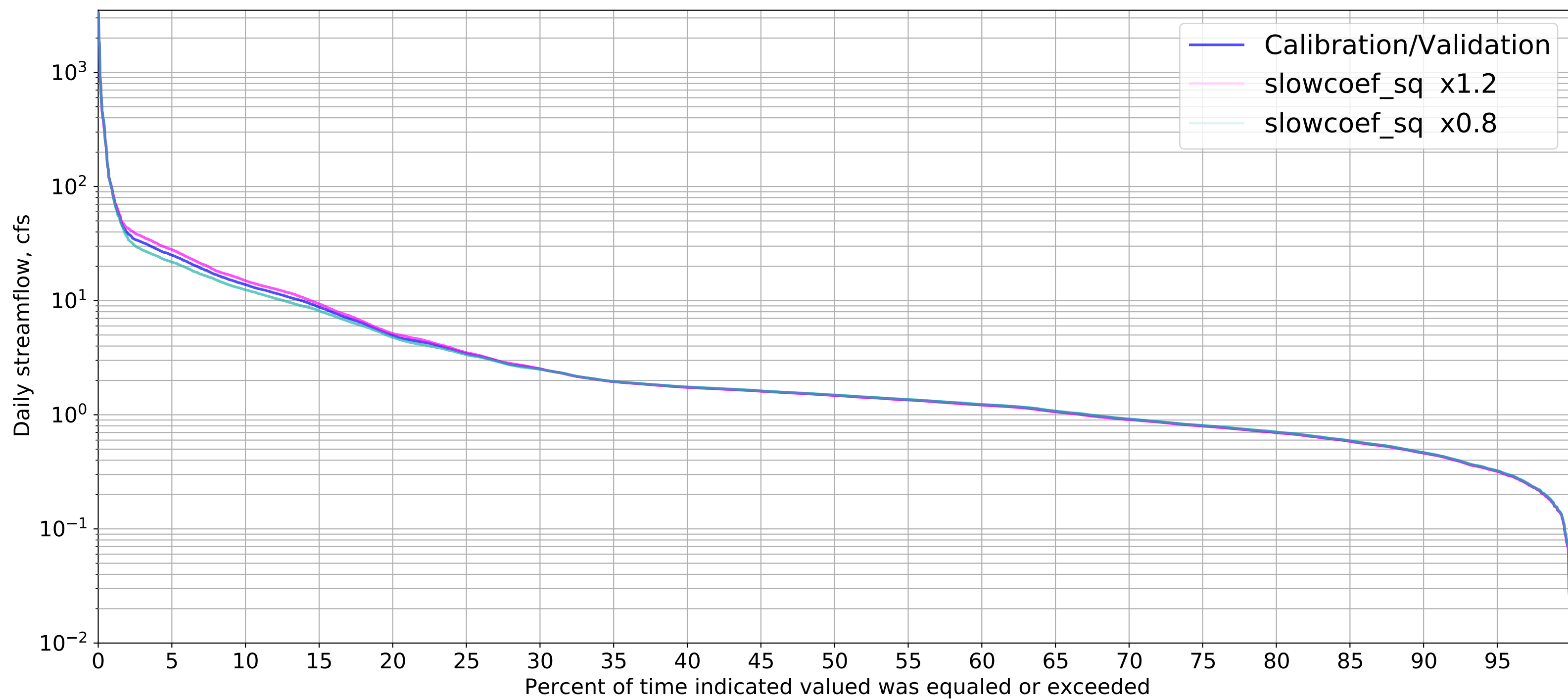
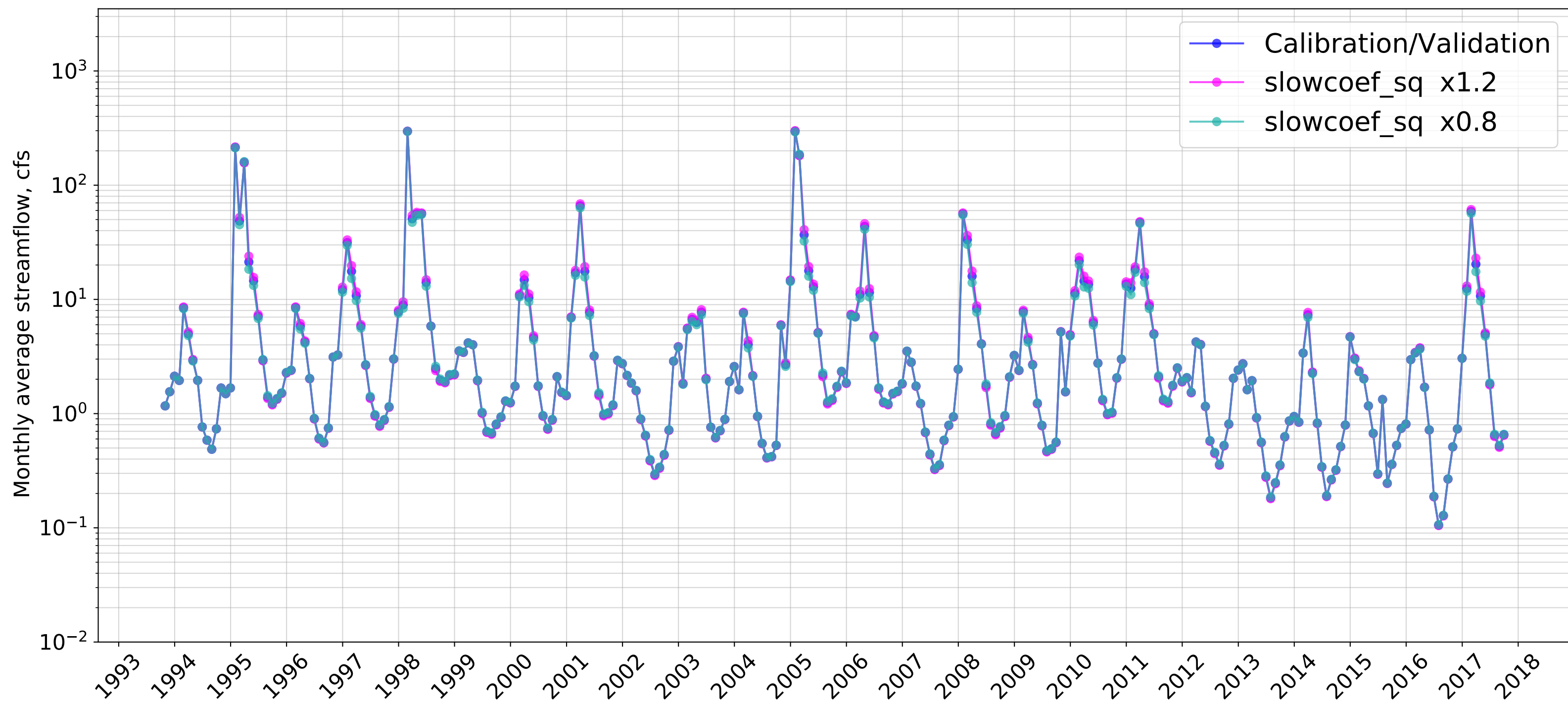
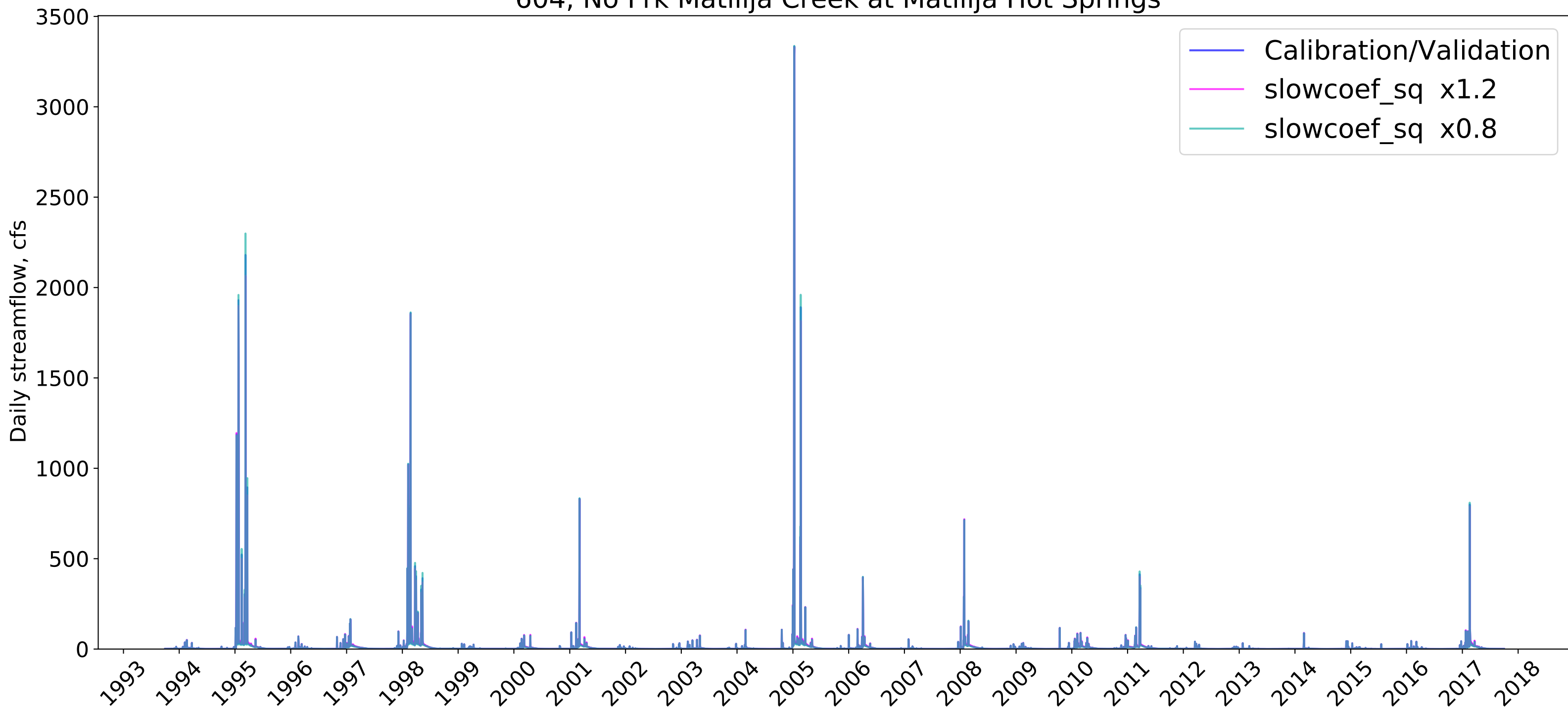
604, No Frk Matilija Creek at Matilija Hot Springs



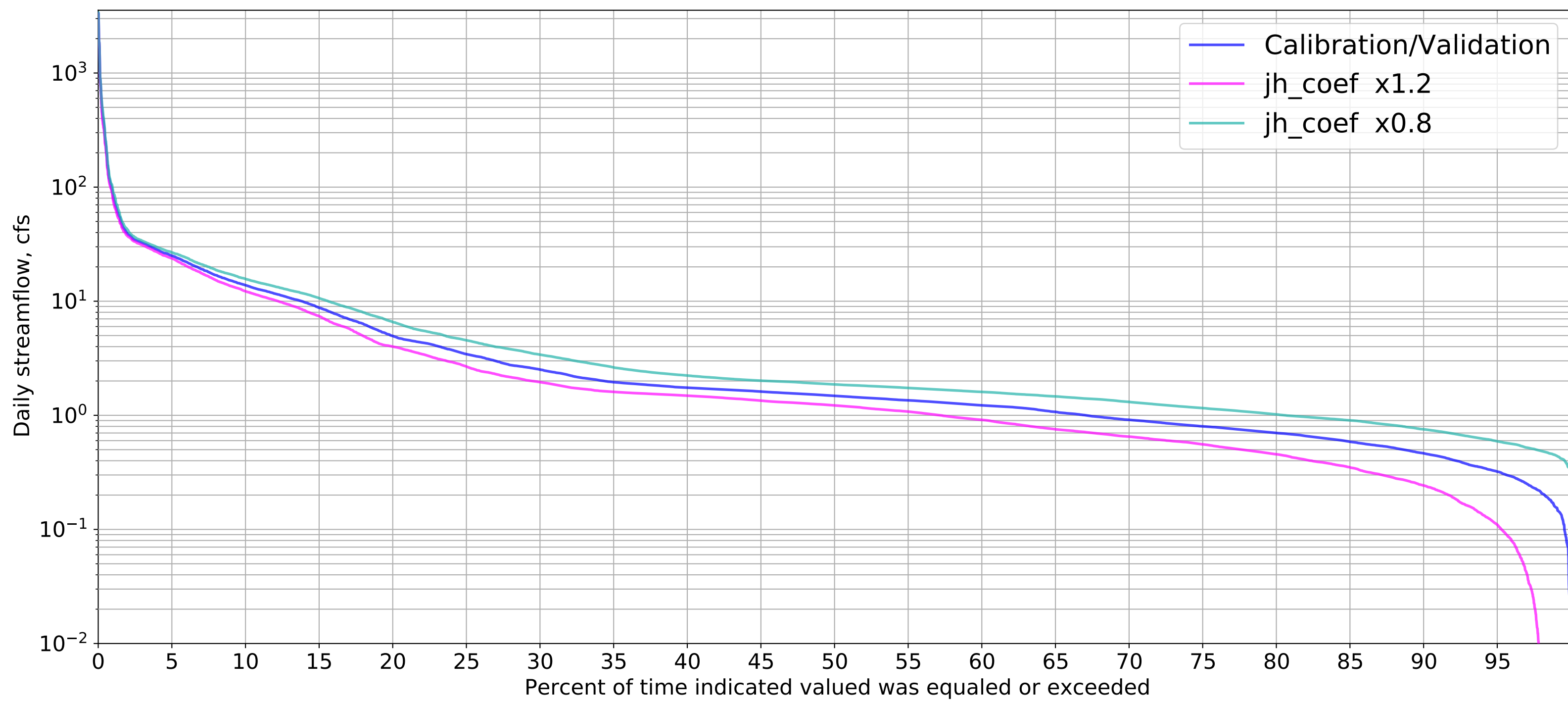
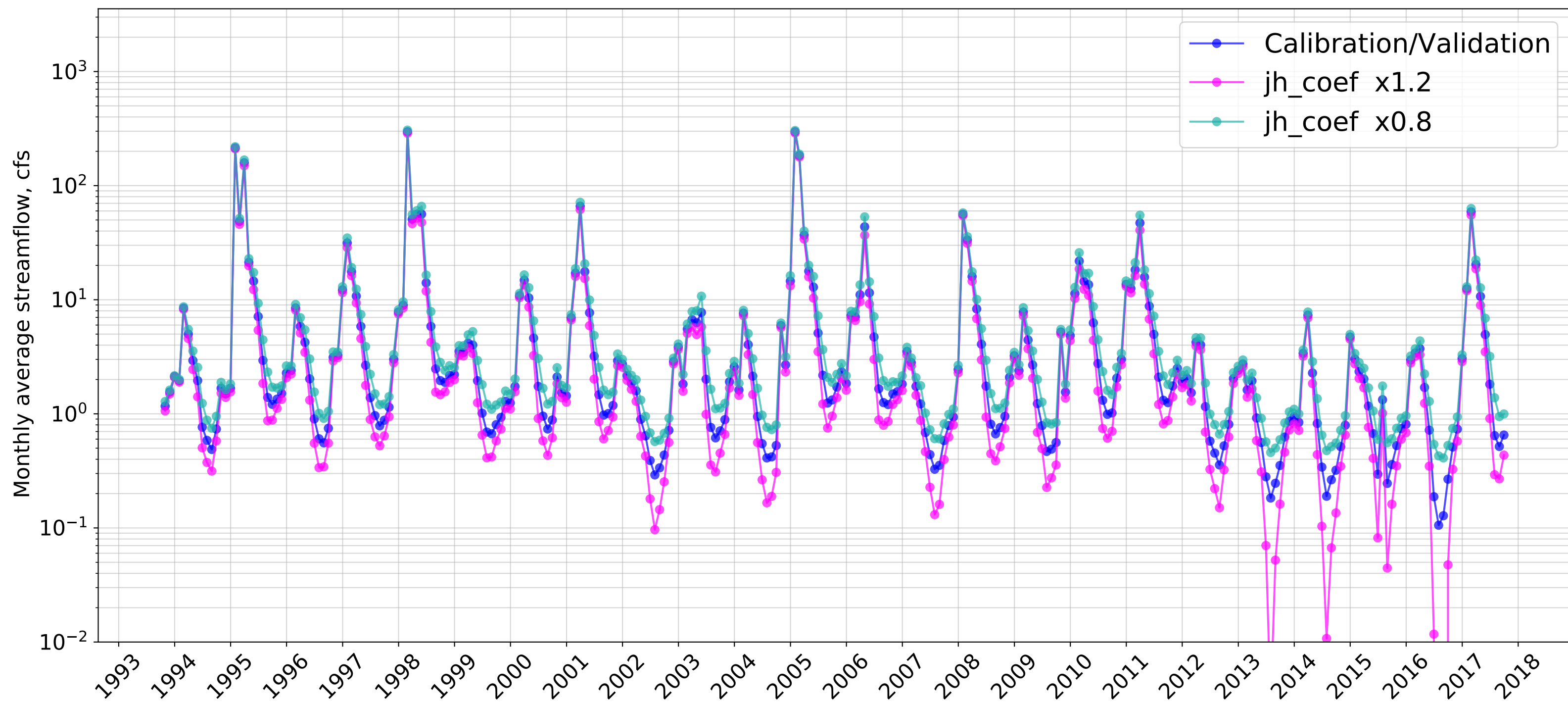
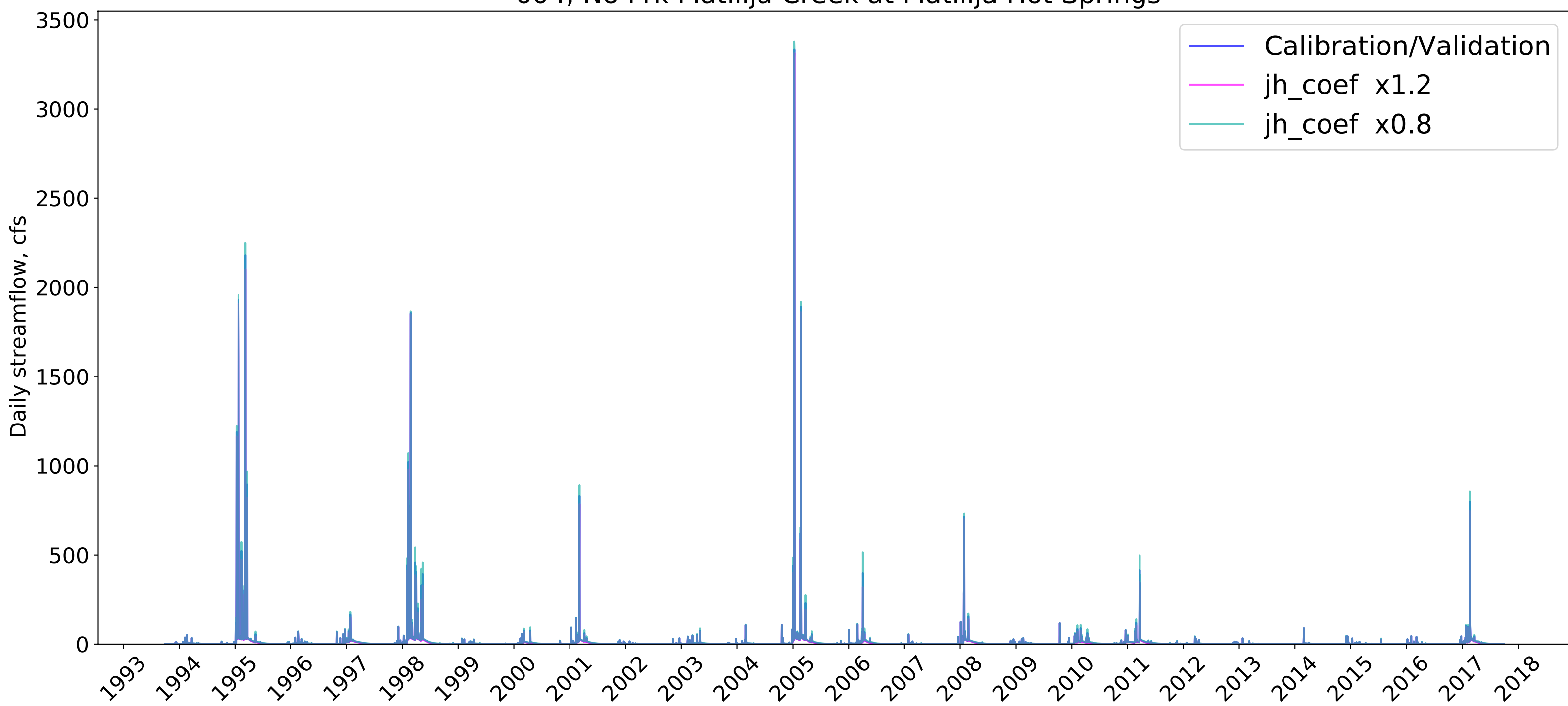
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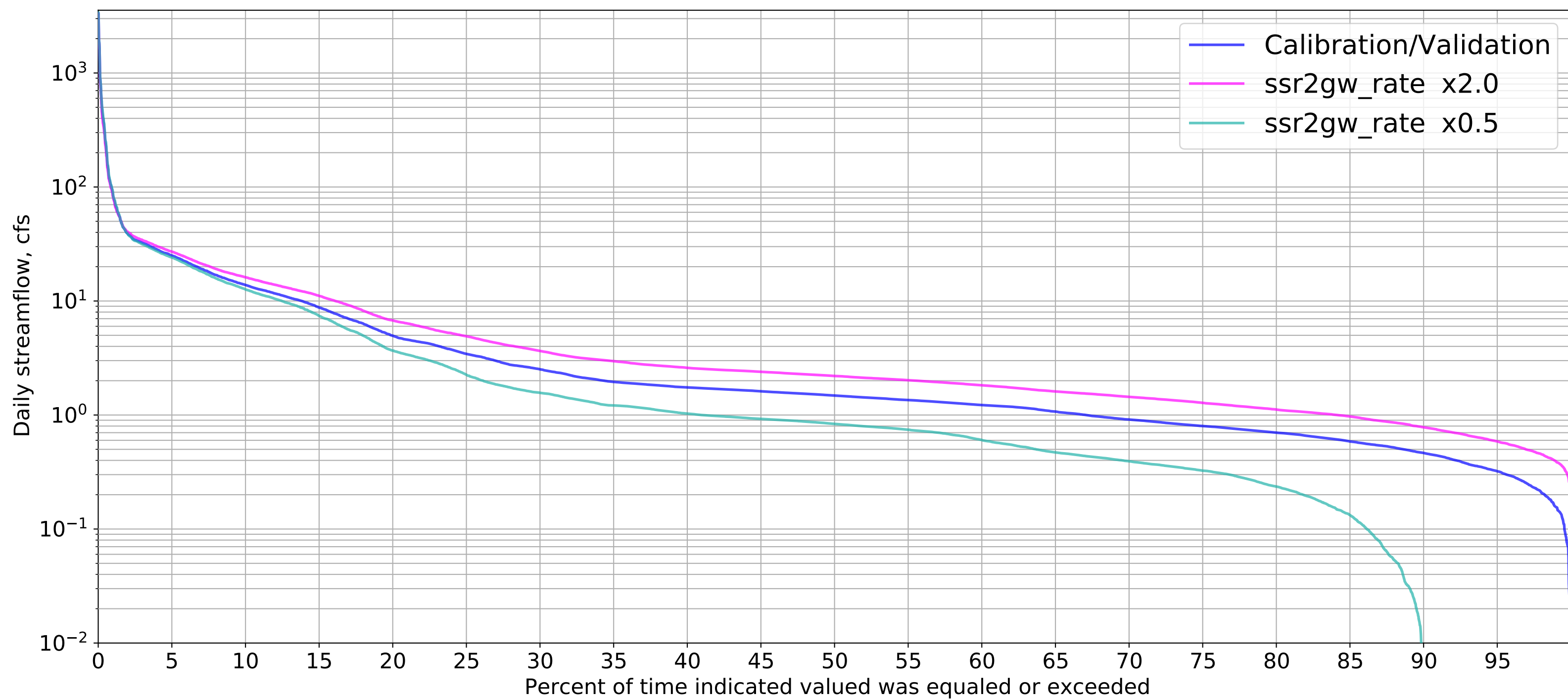
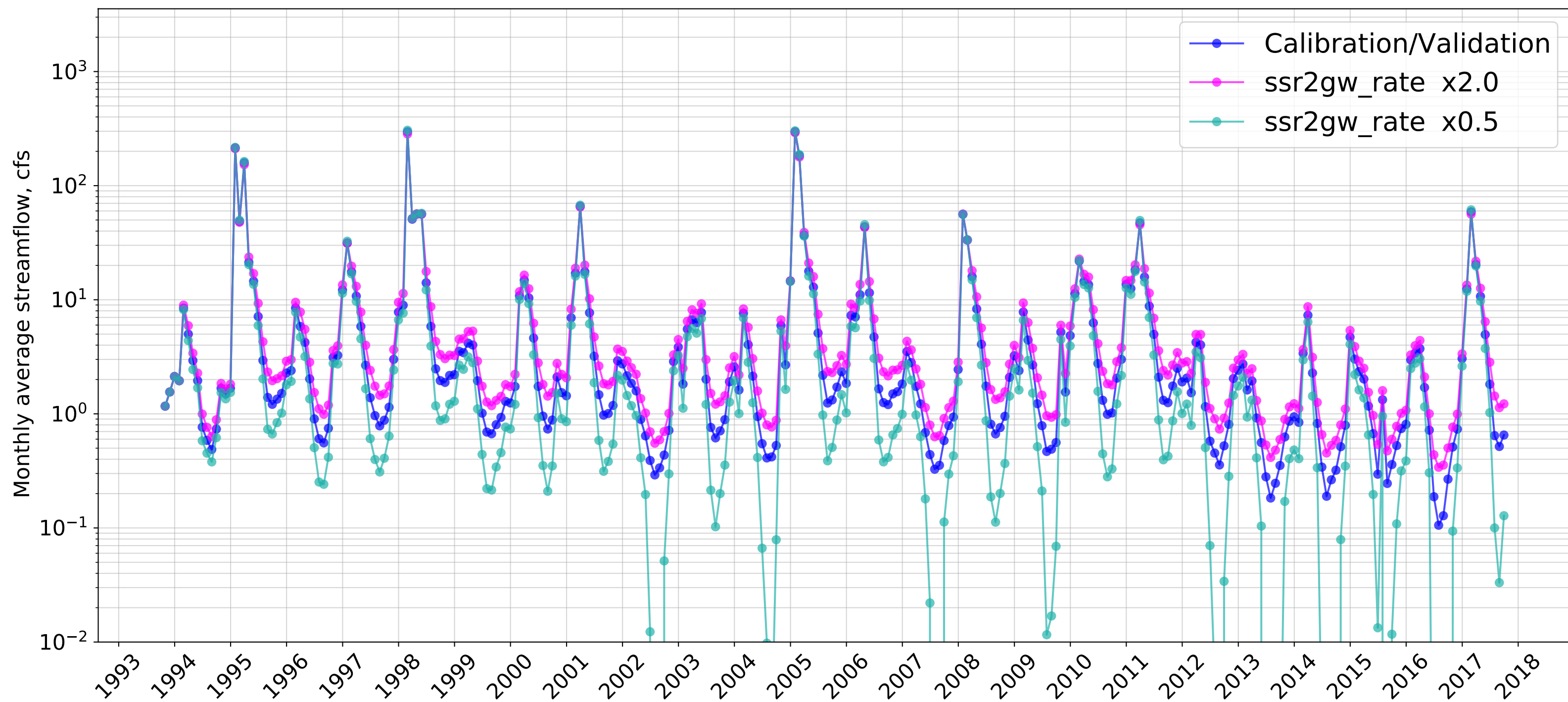
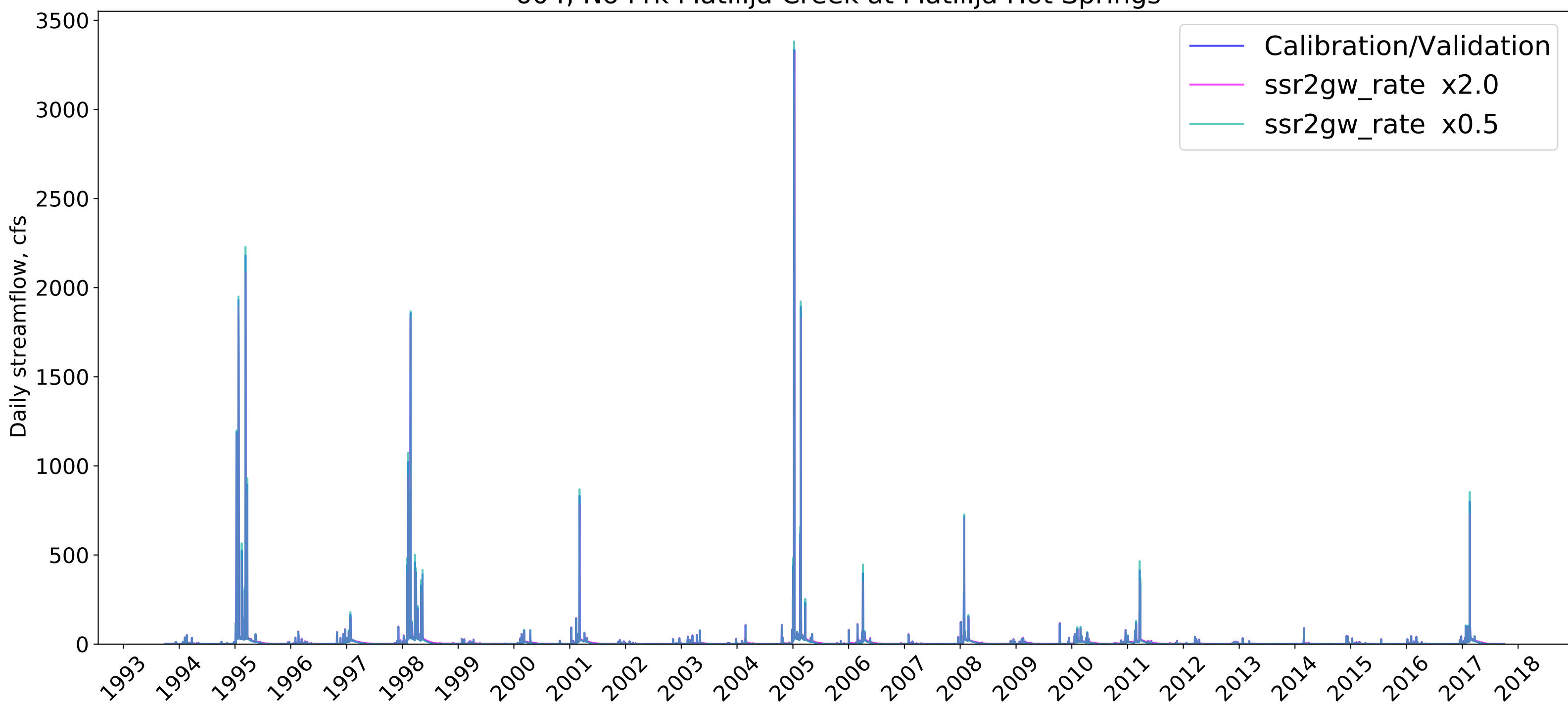
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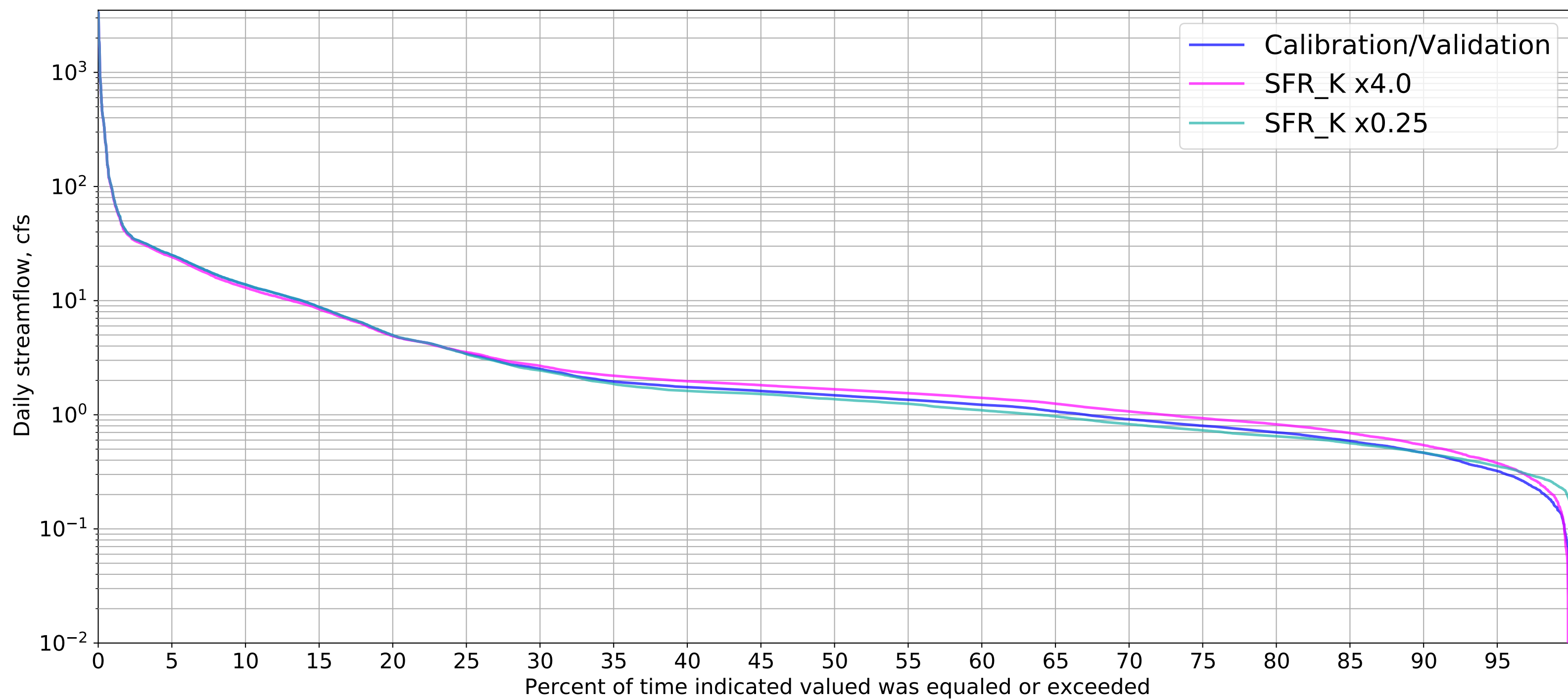
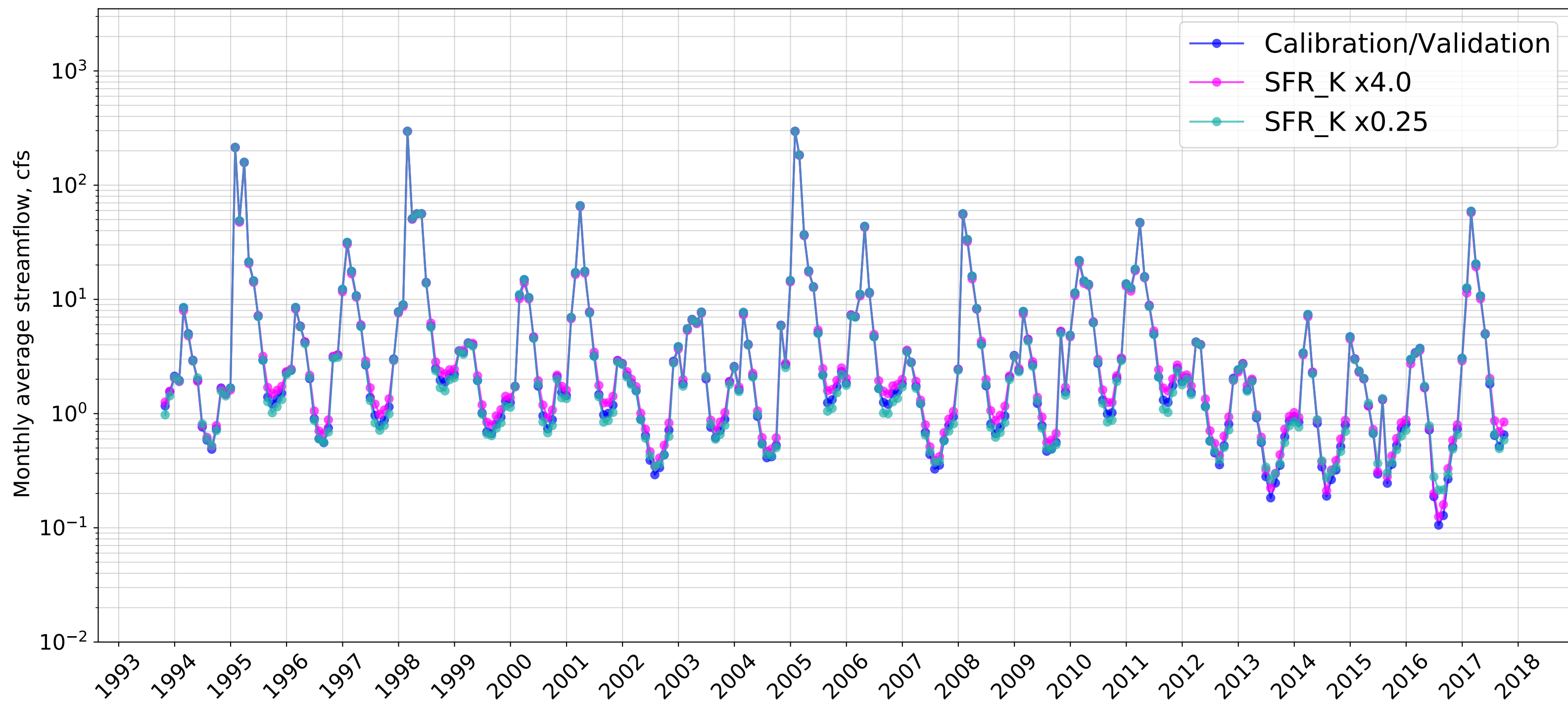
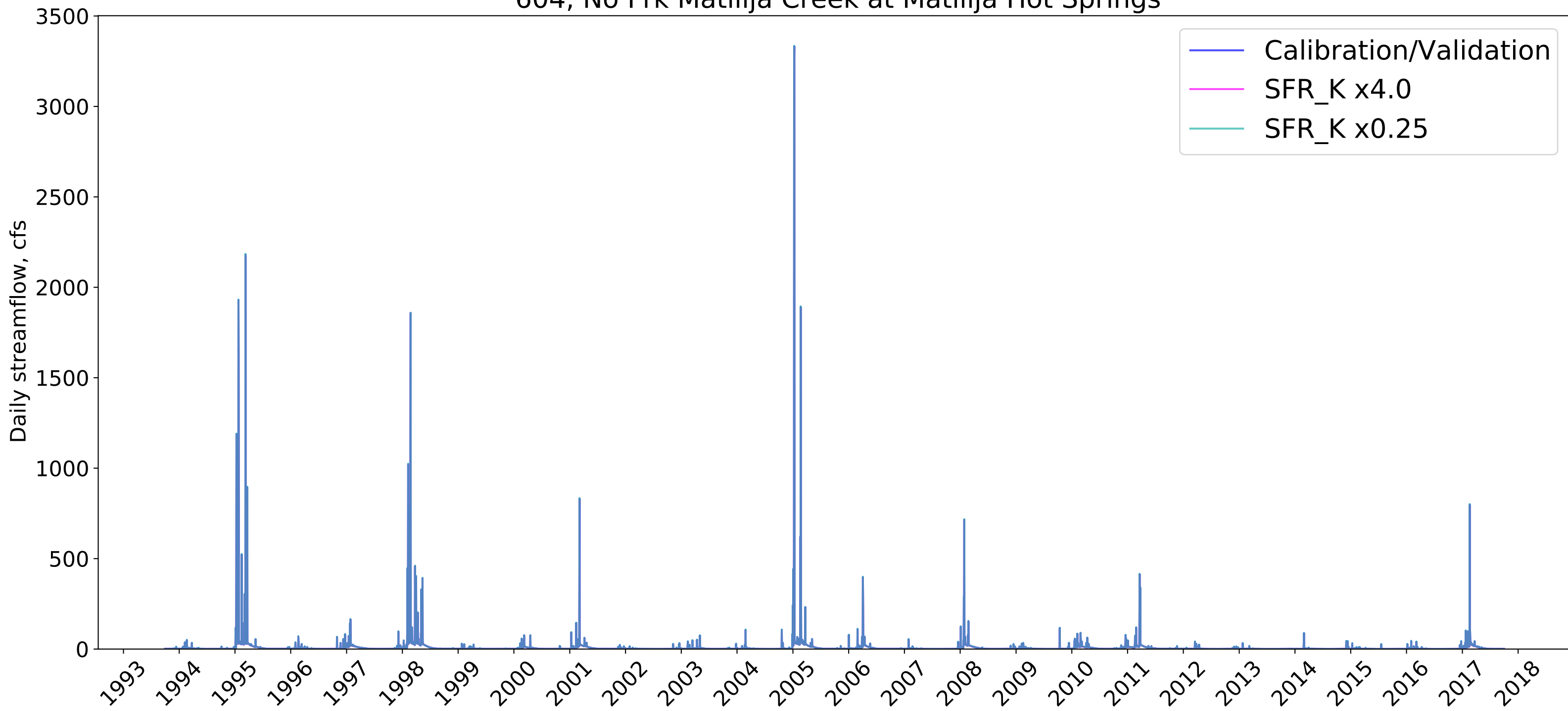
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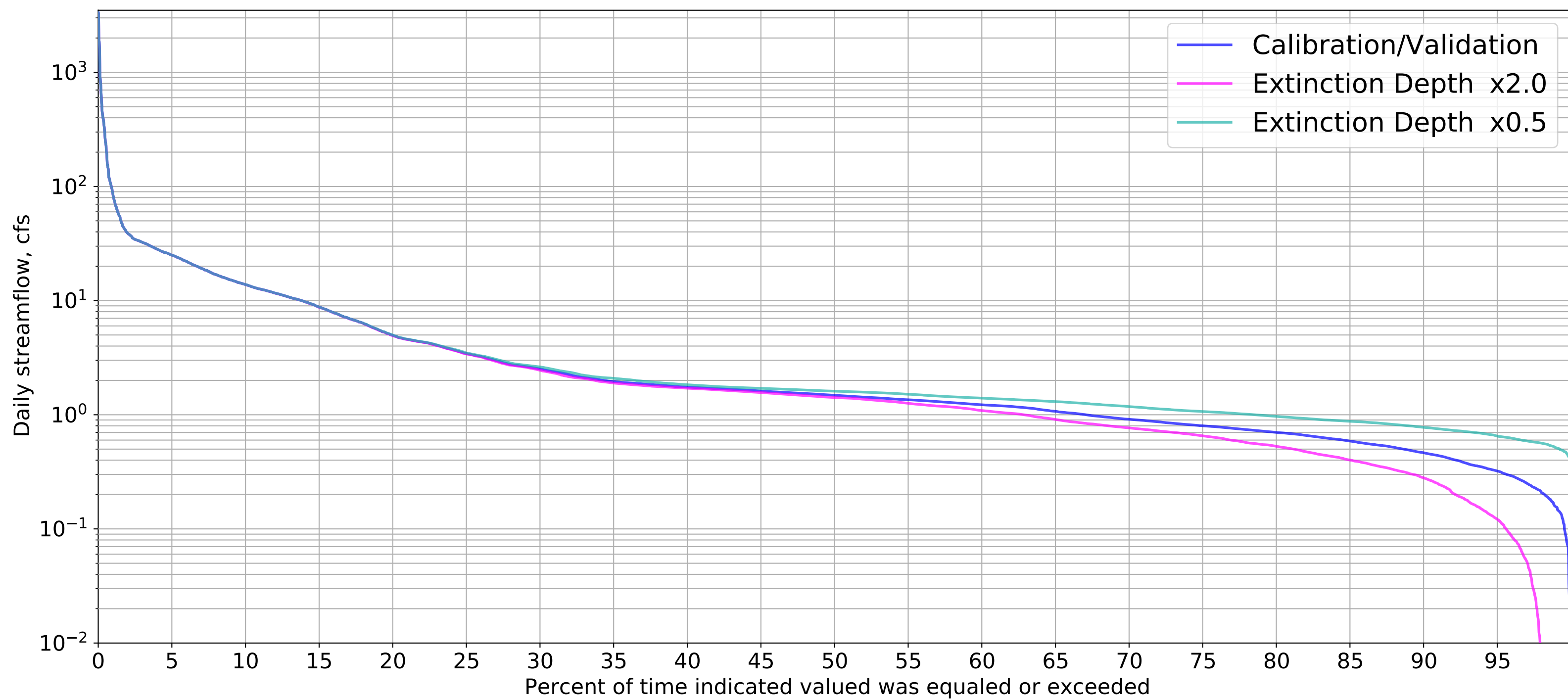
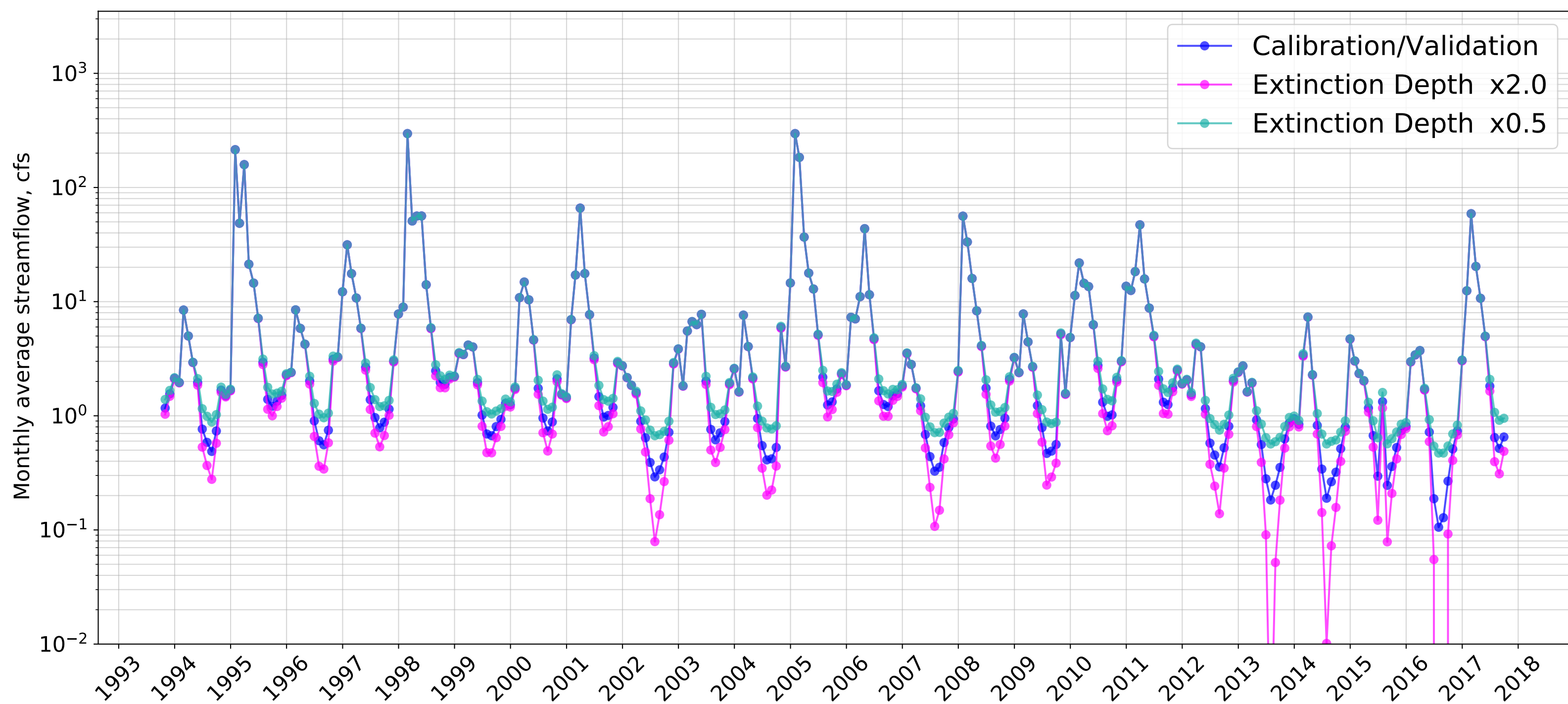
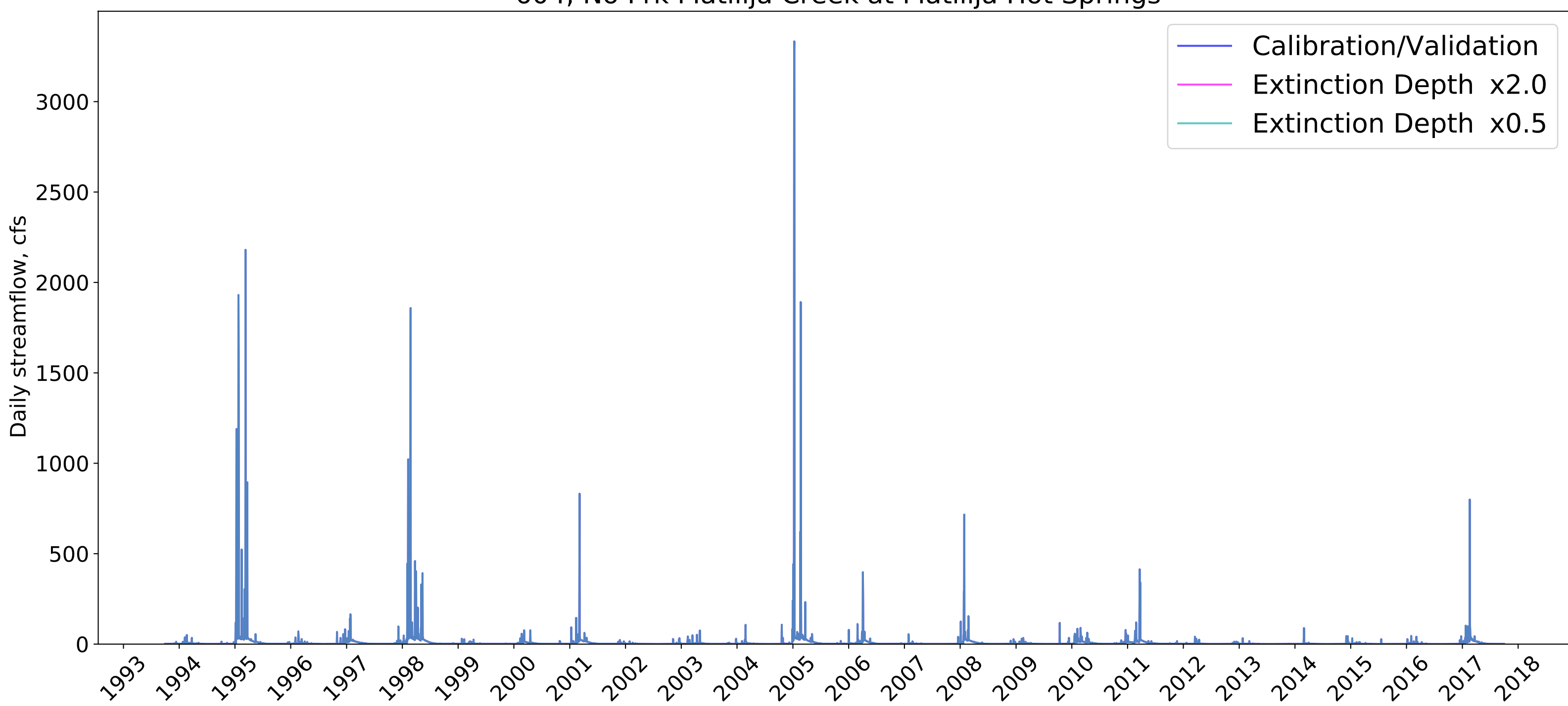
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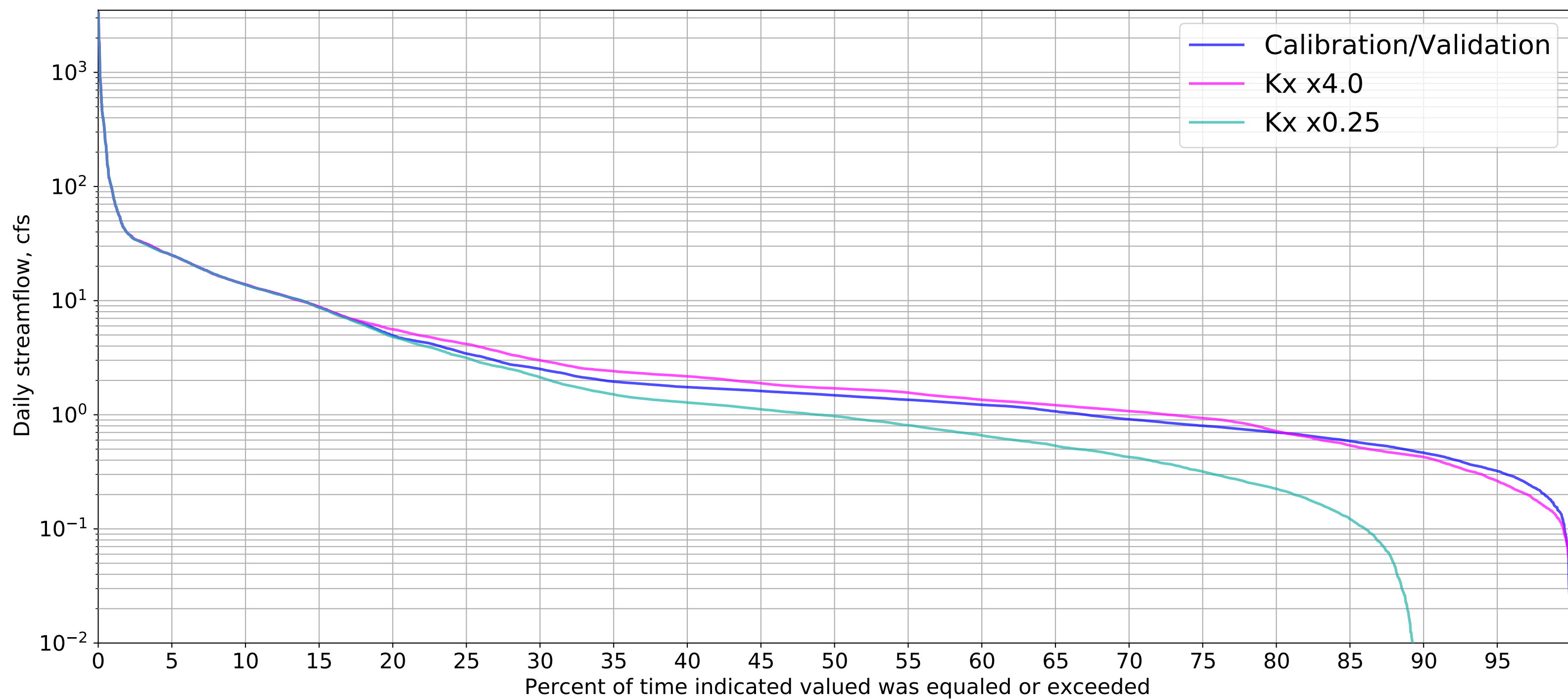
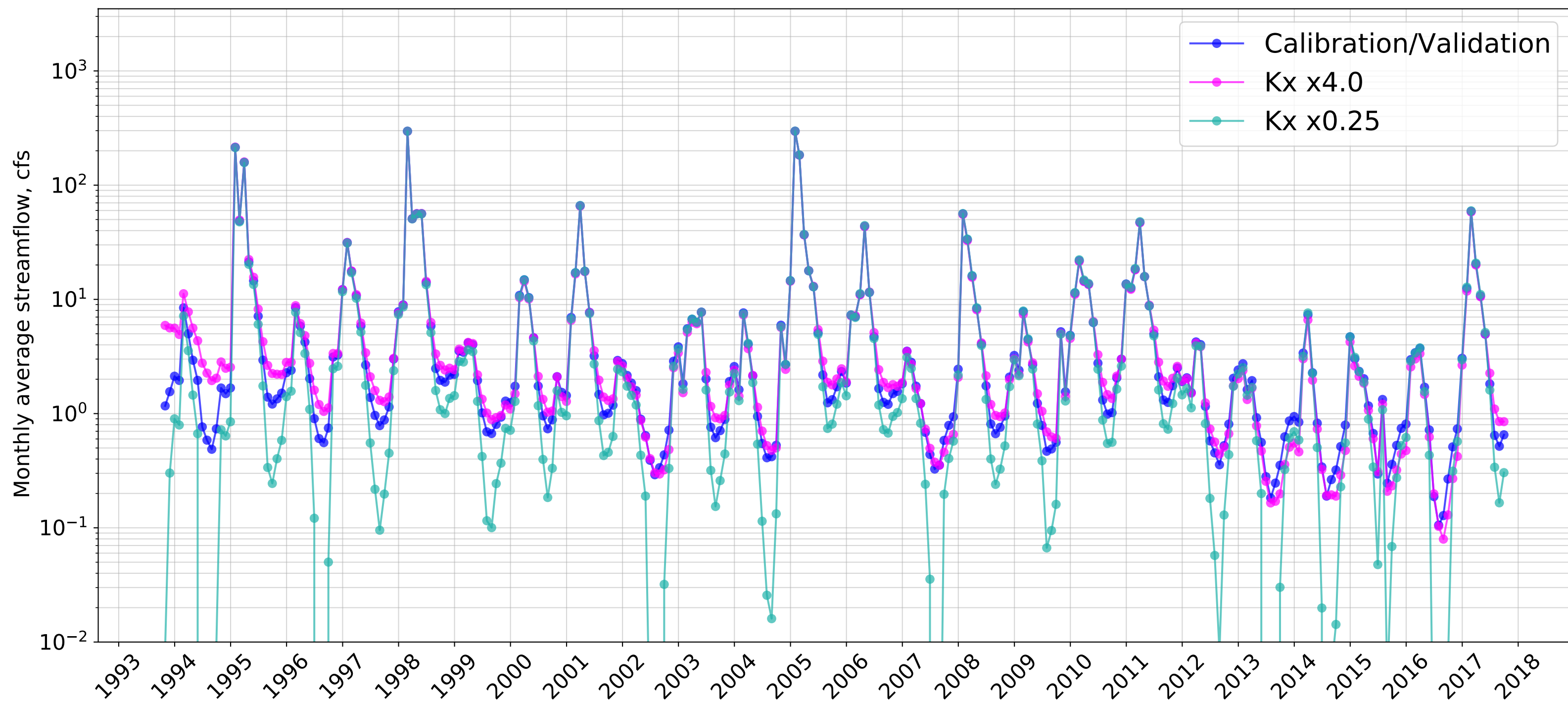
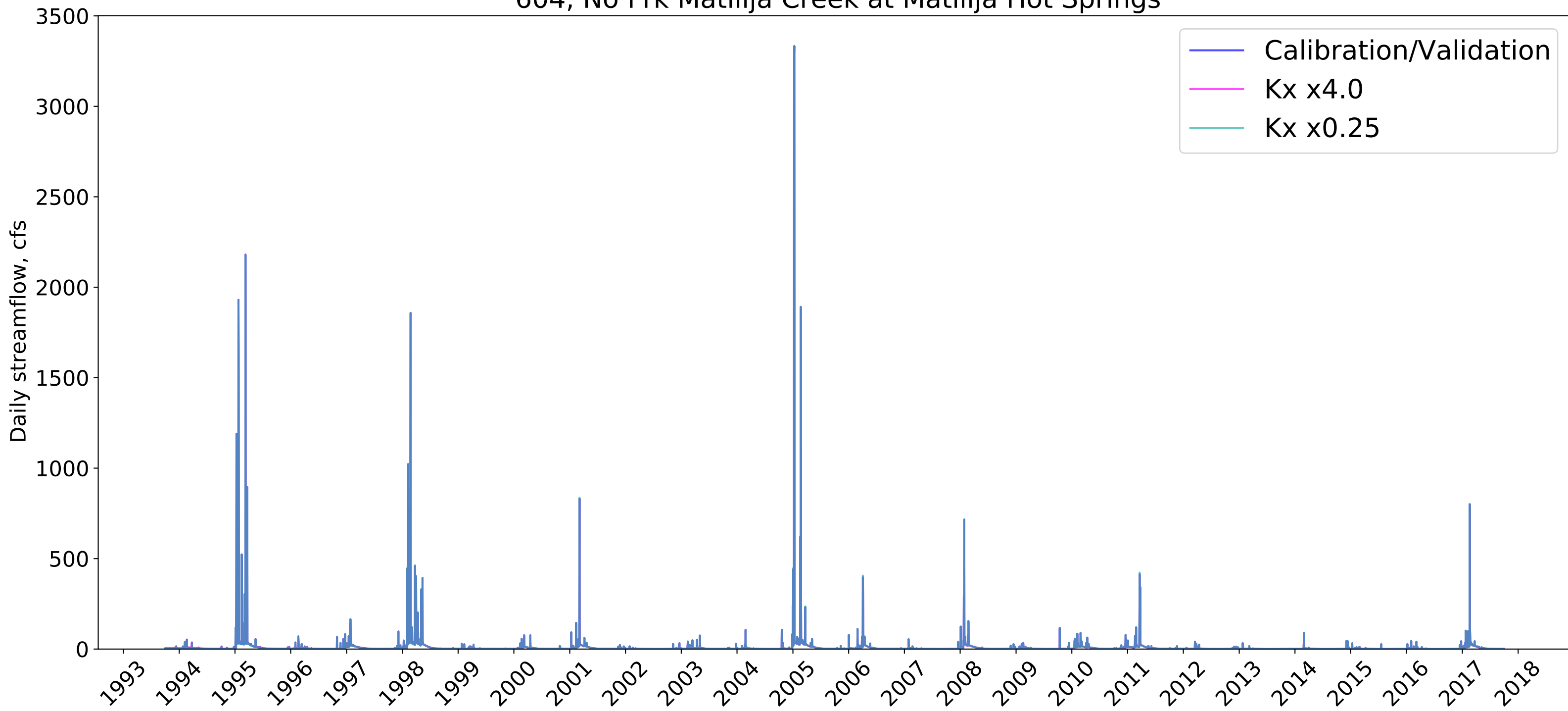
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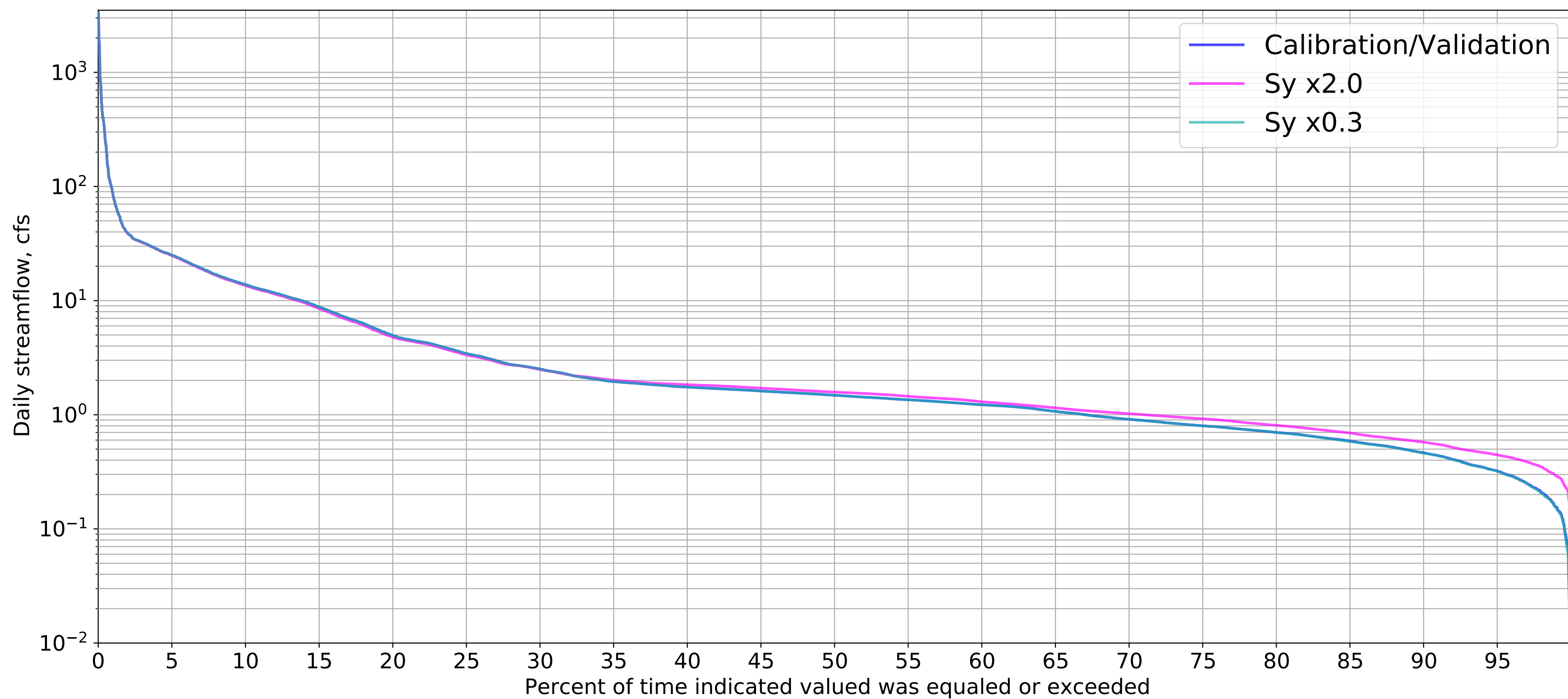
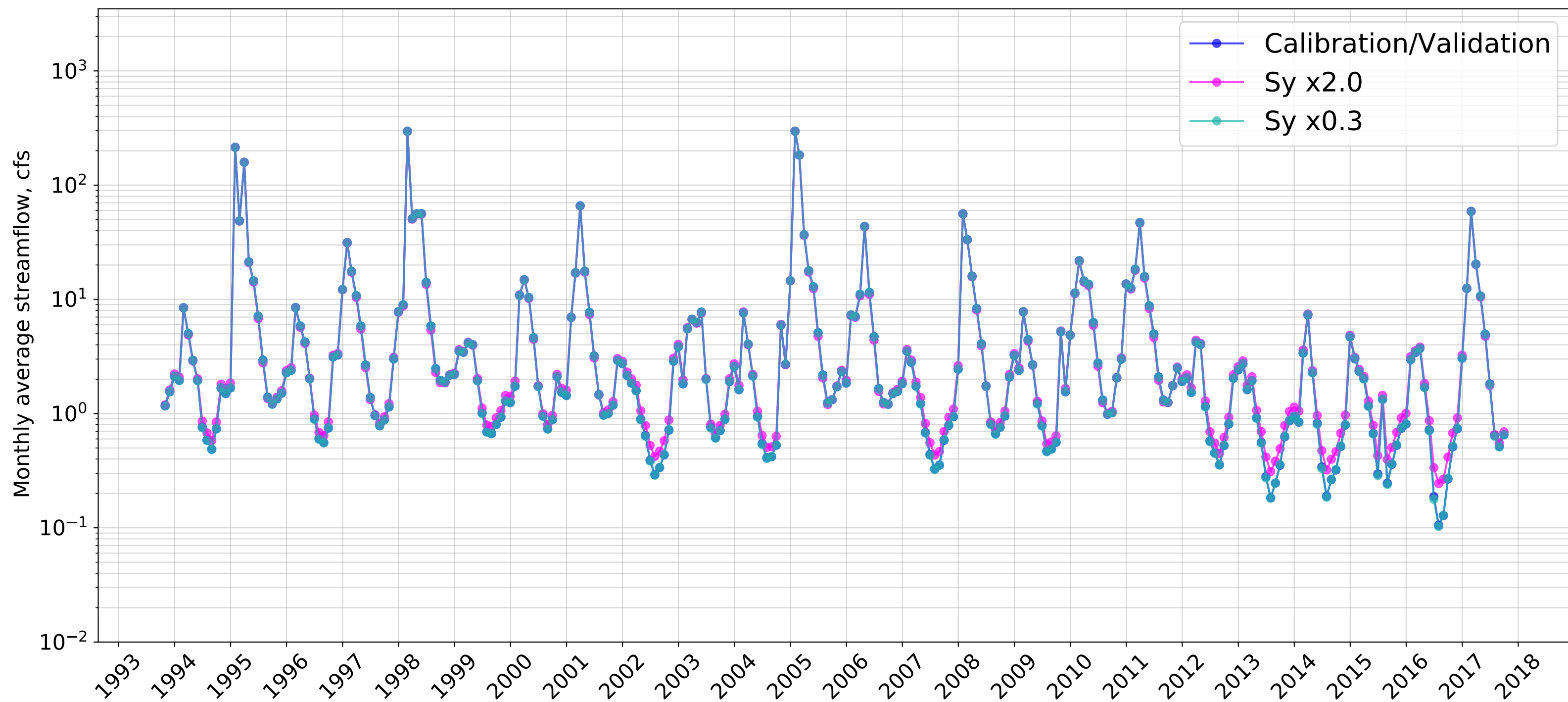
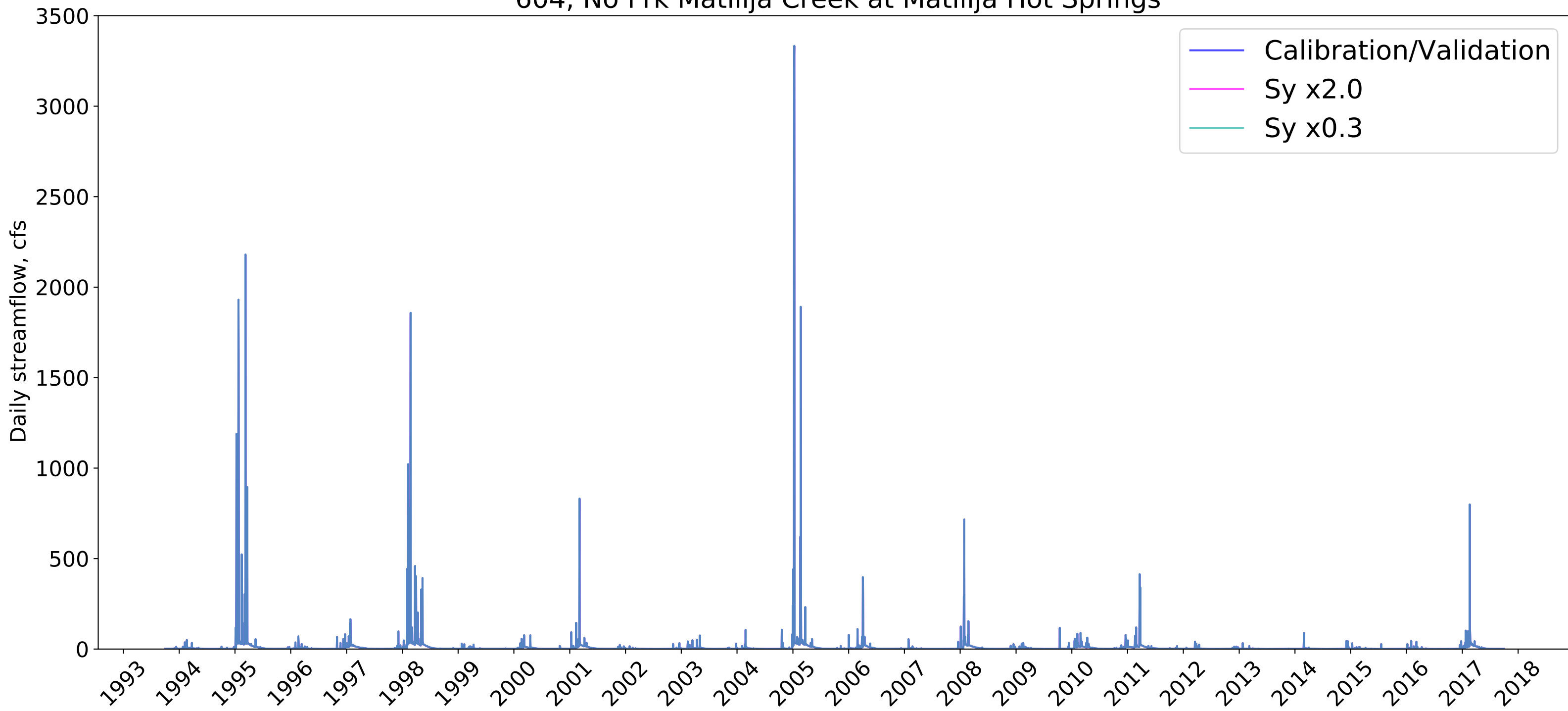
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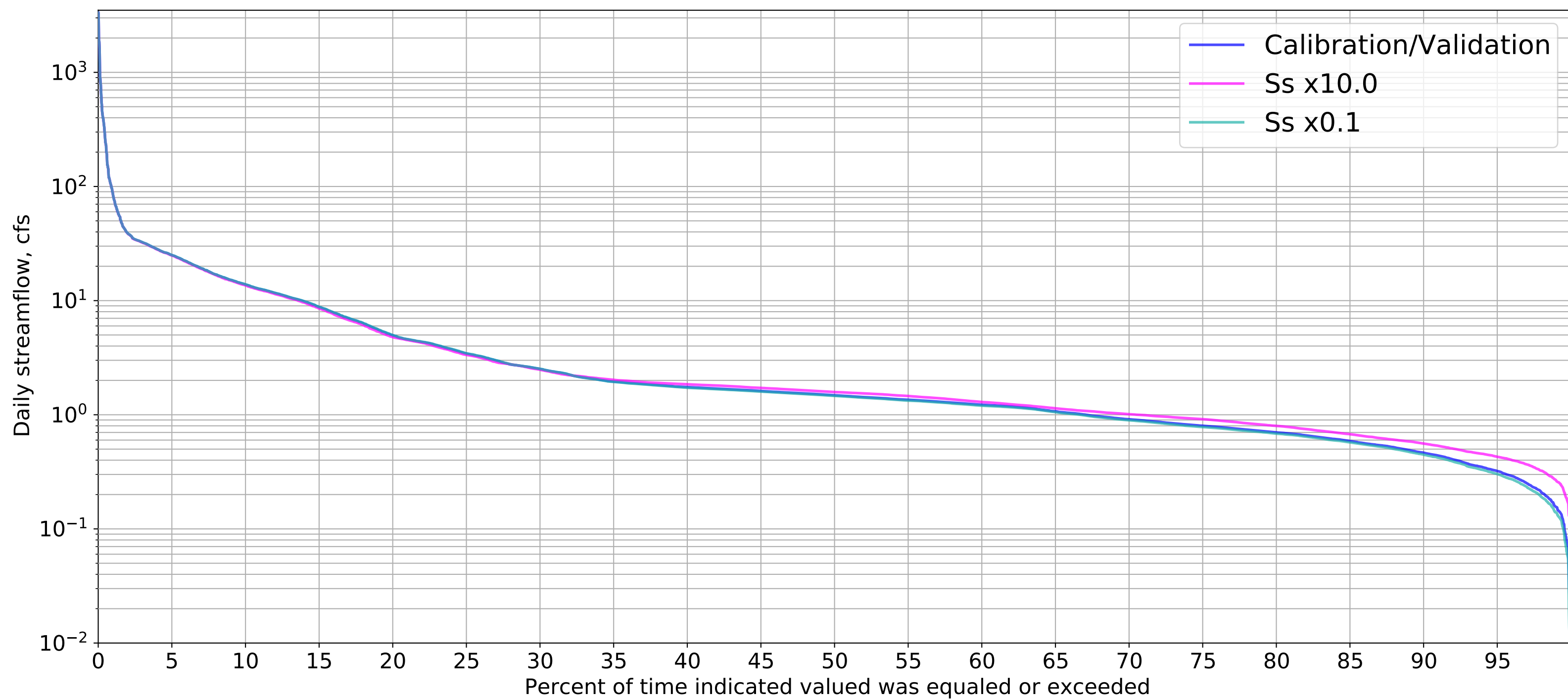
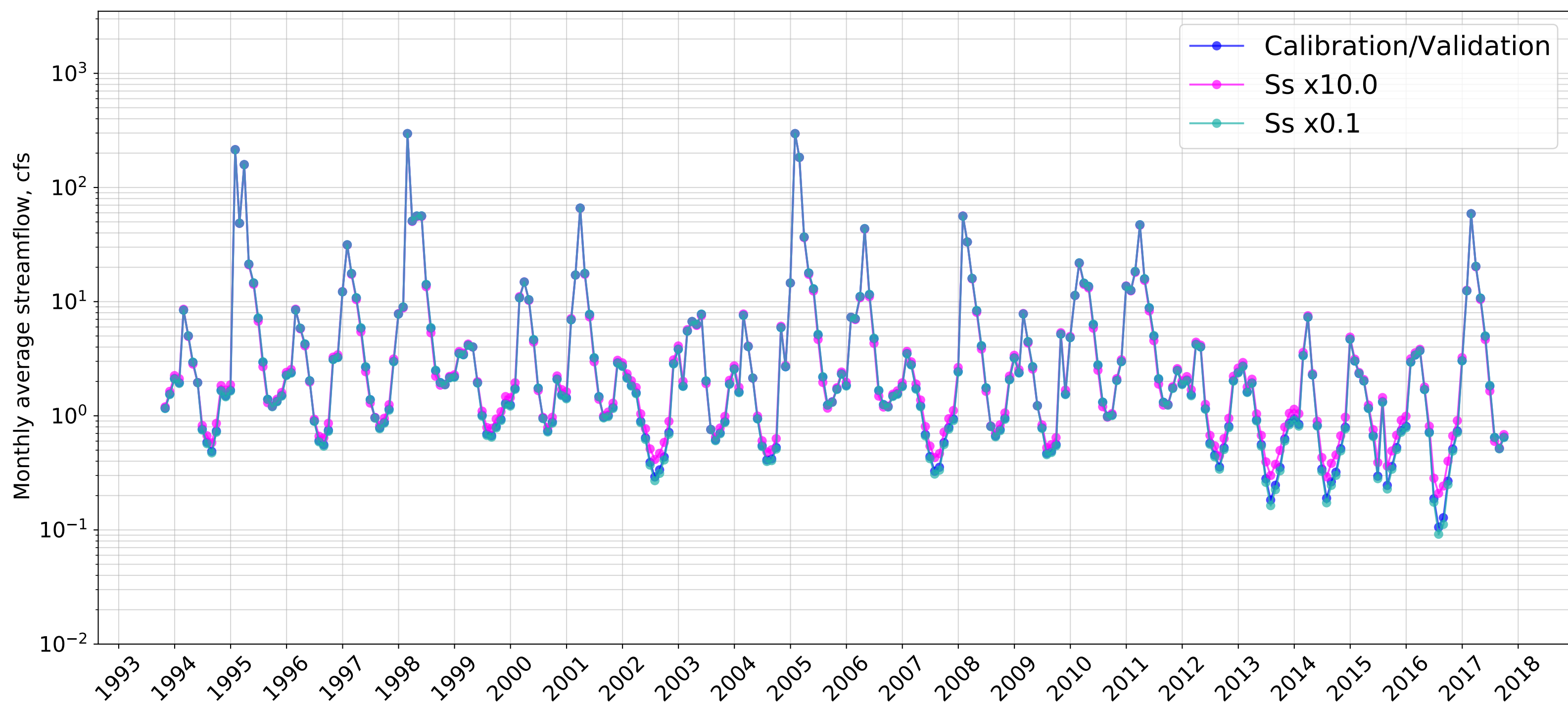
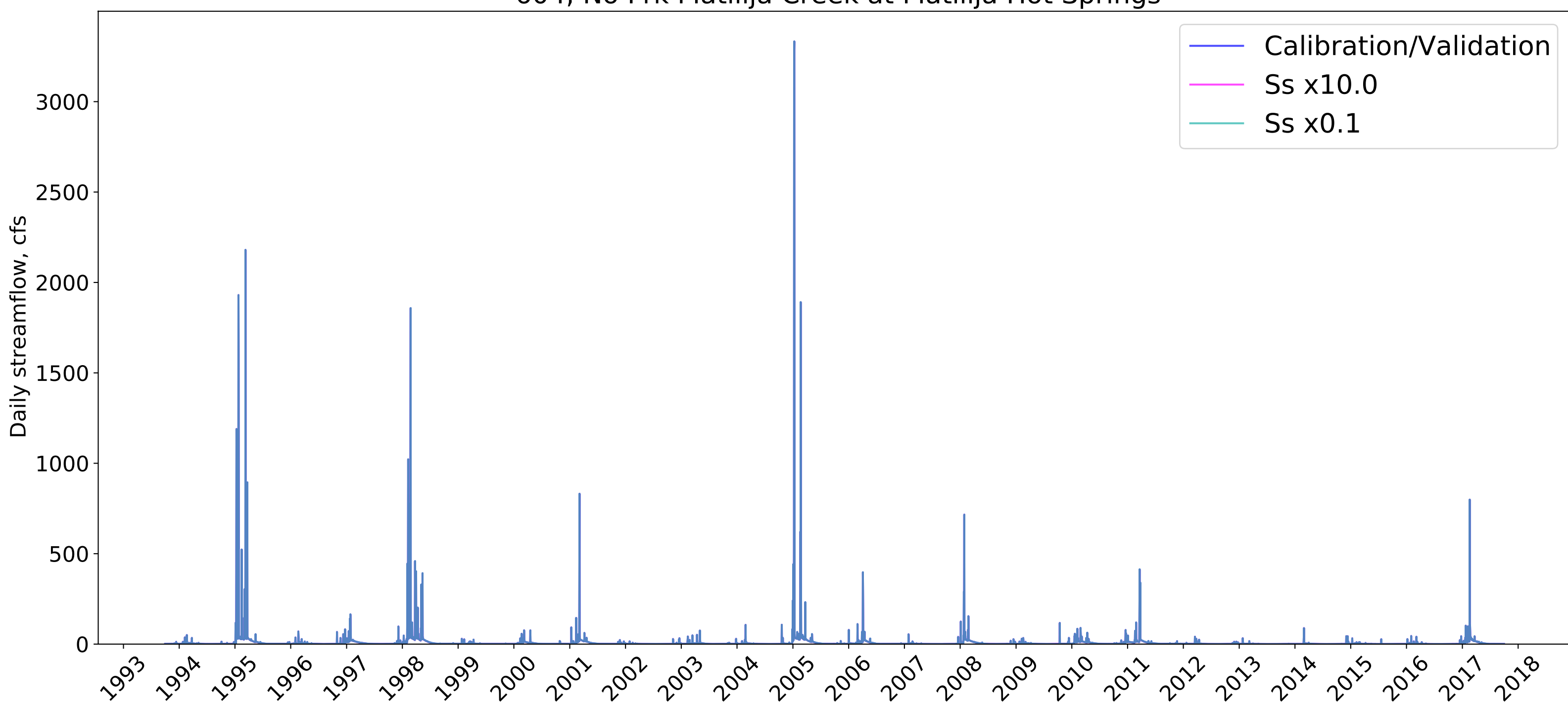
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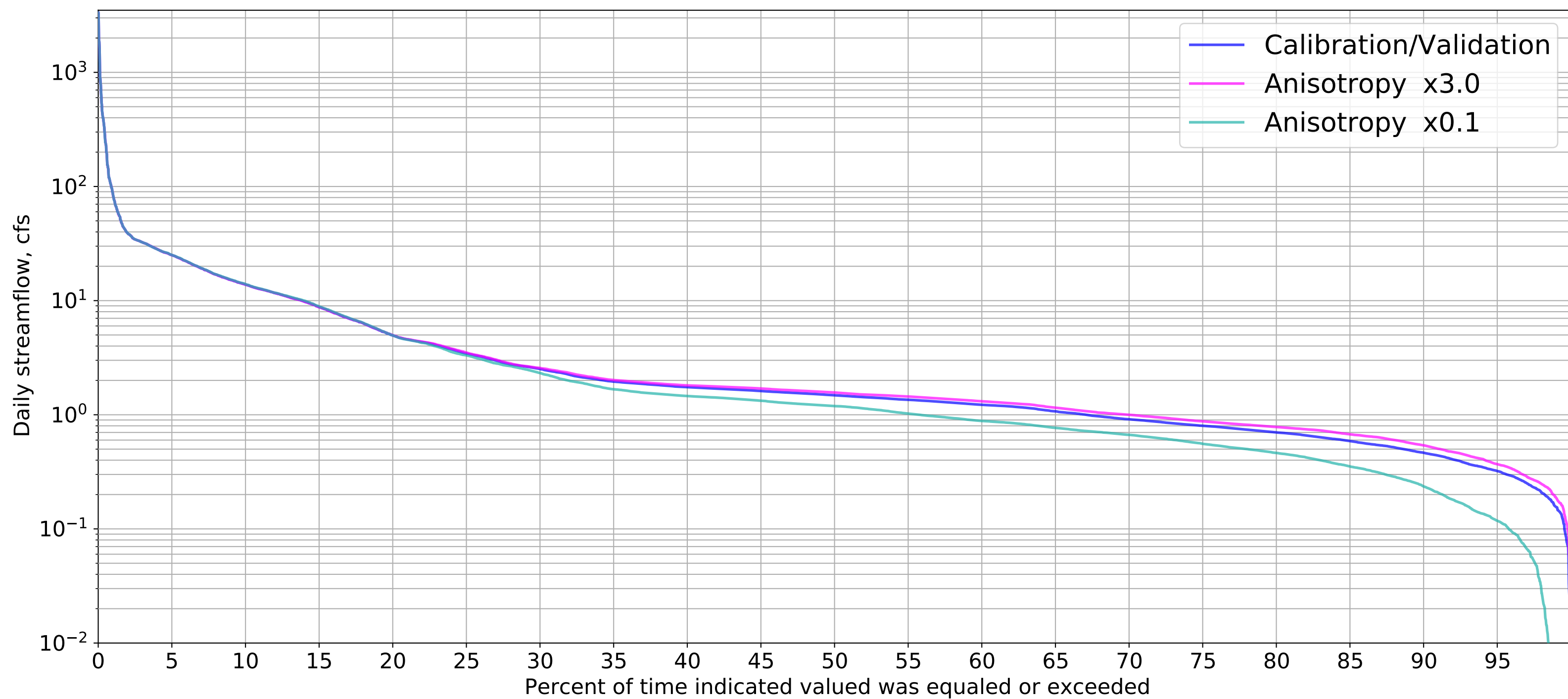
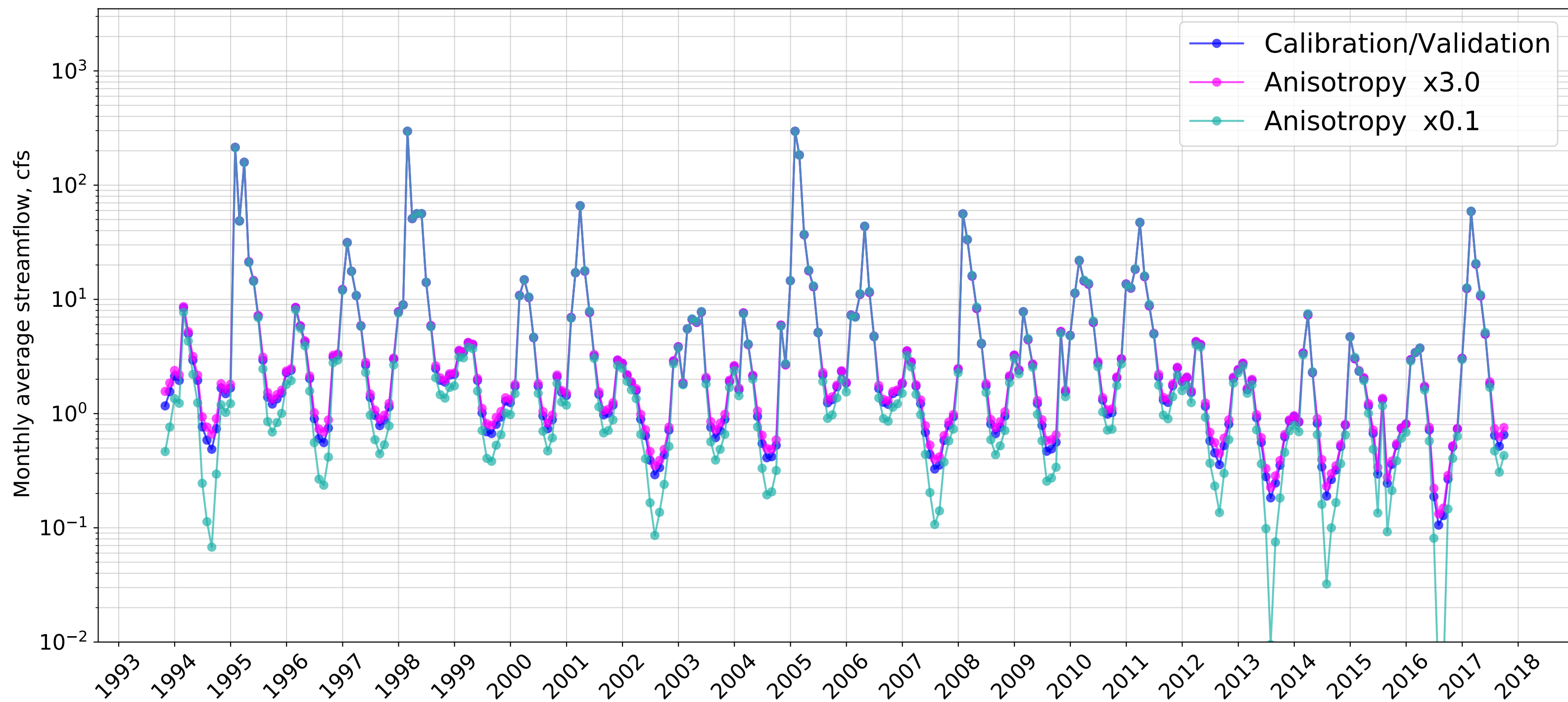
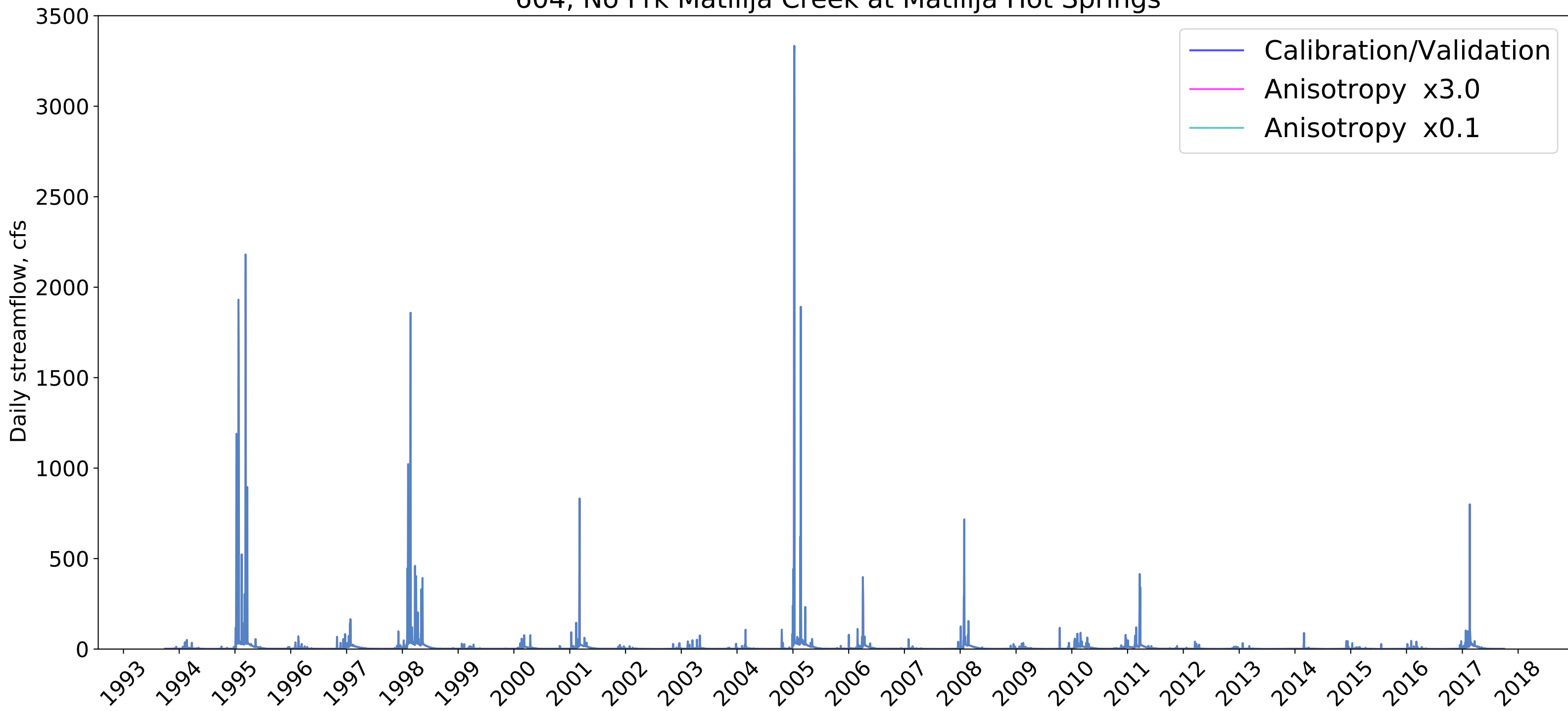
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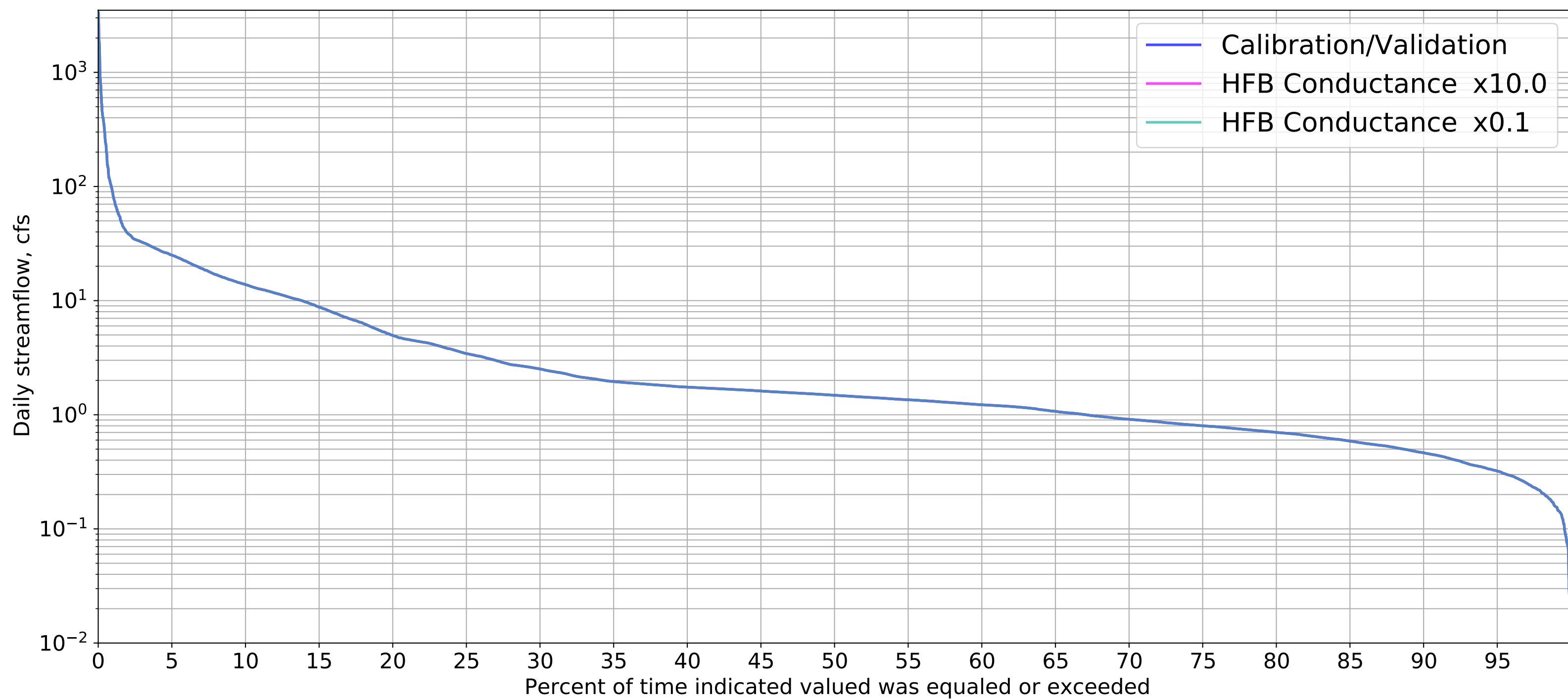
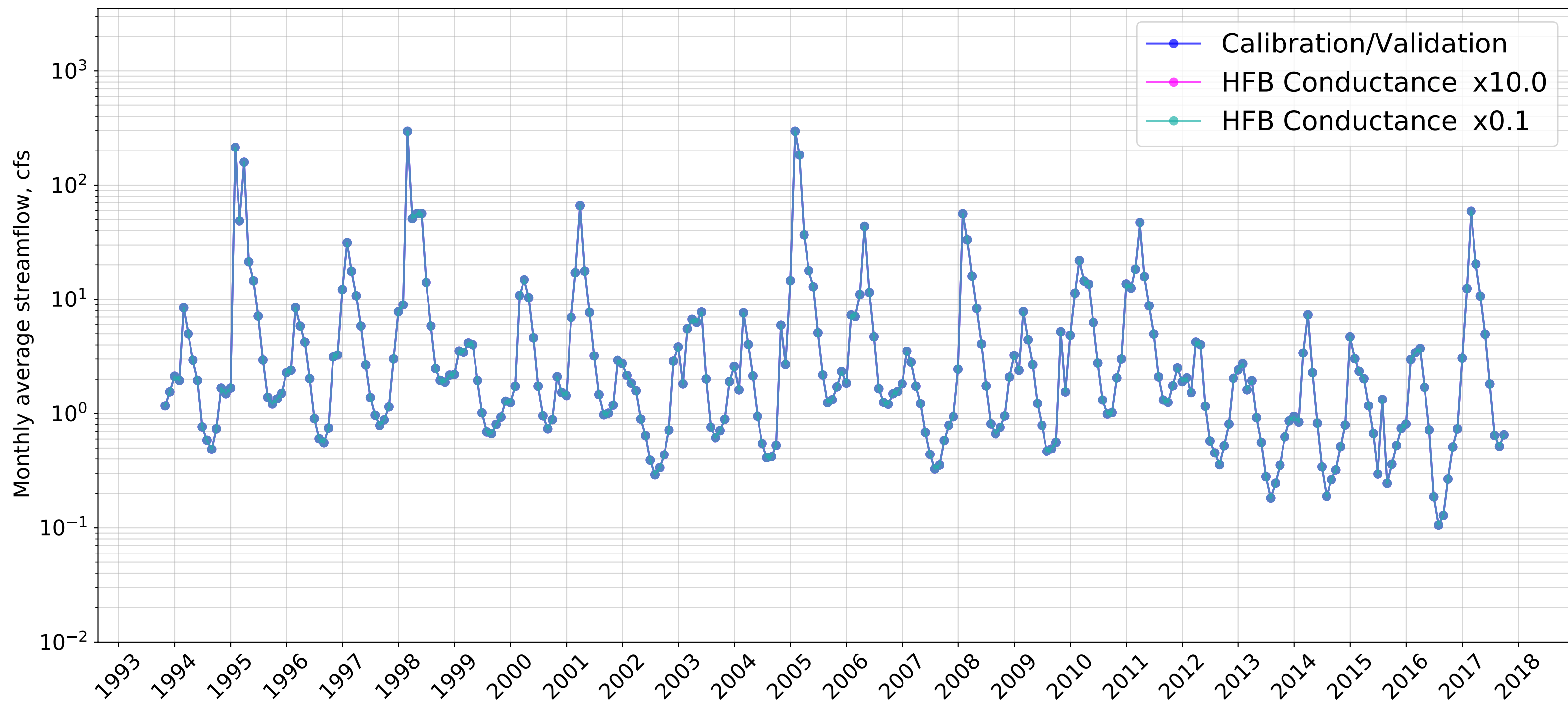
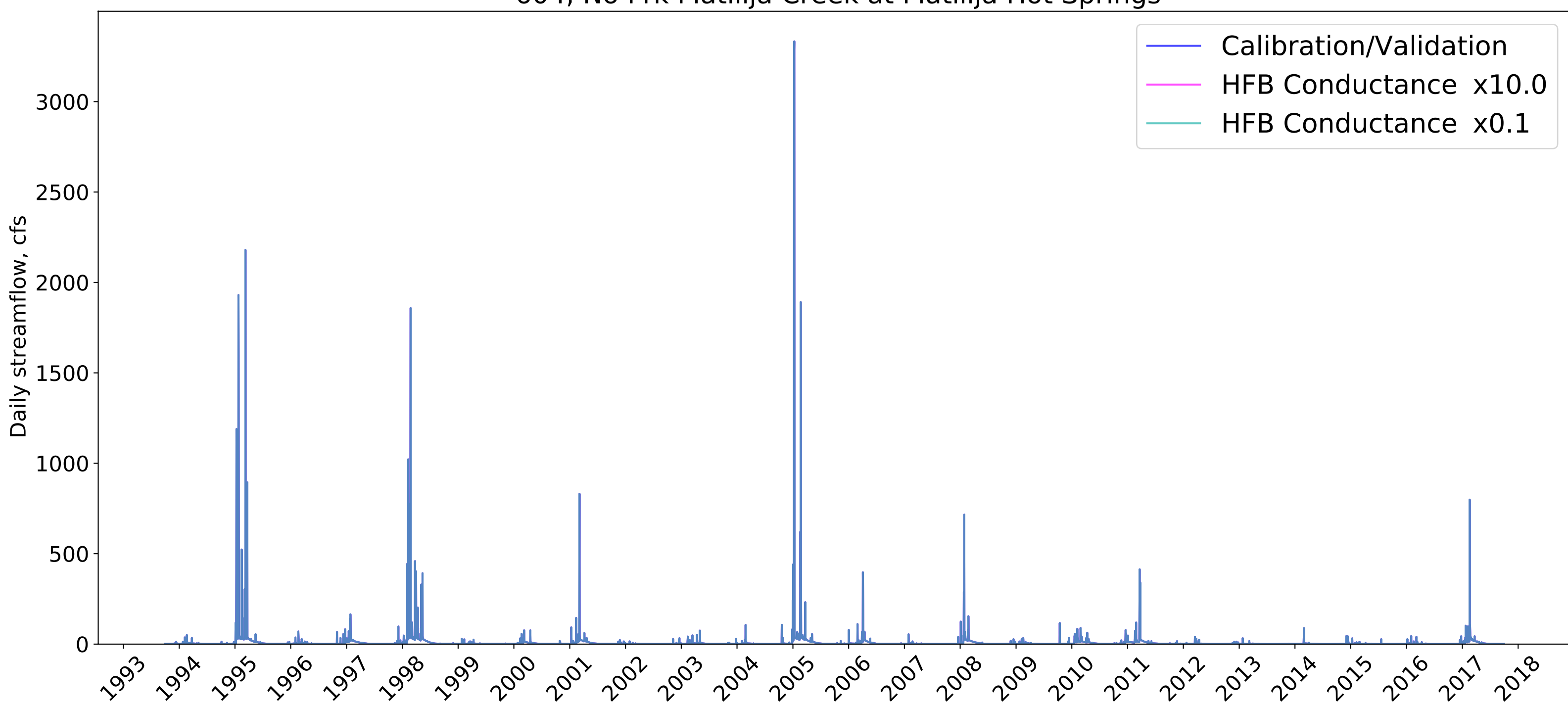
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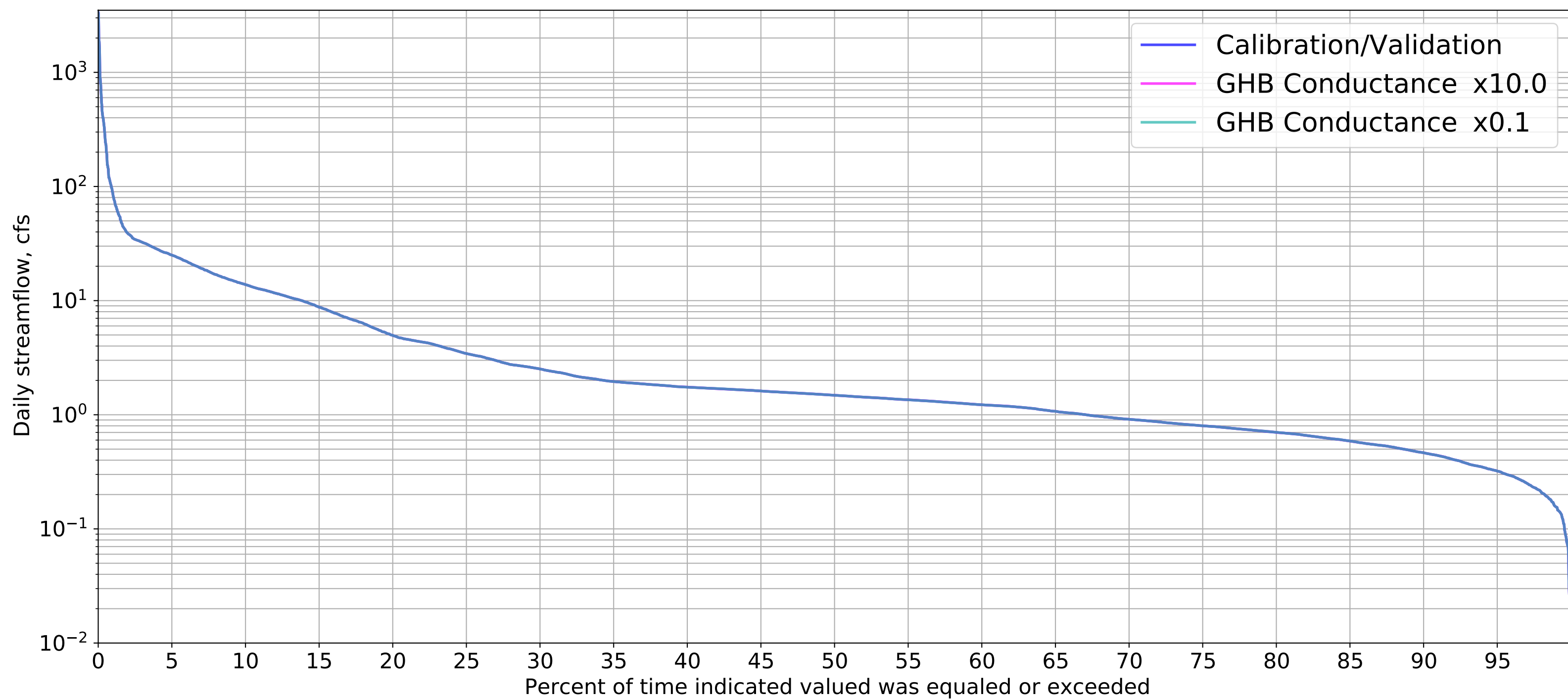
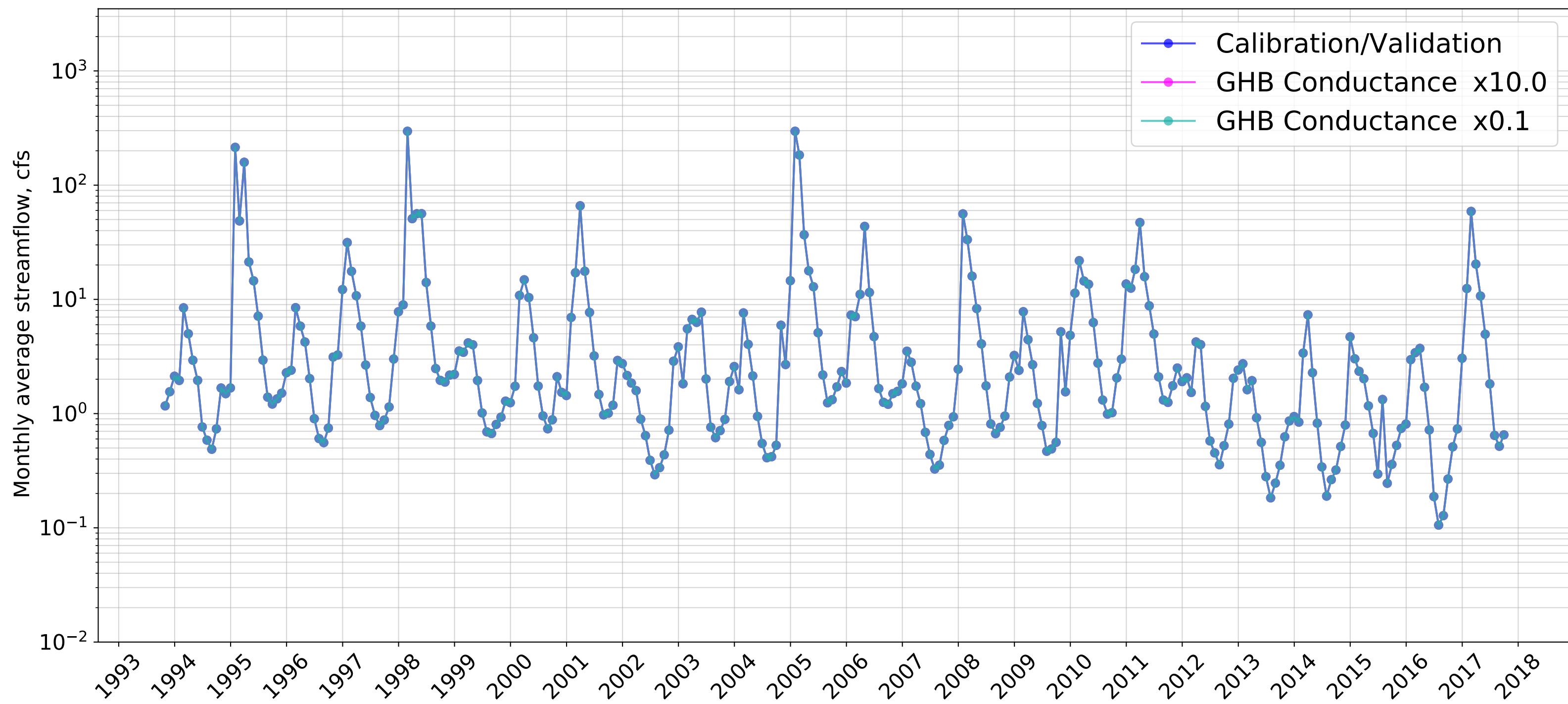
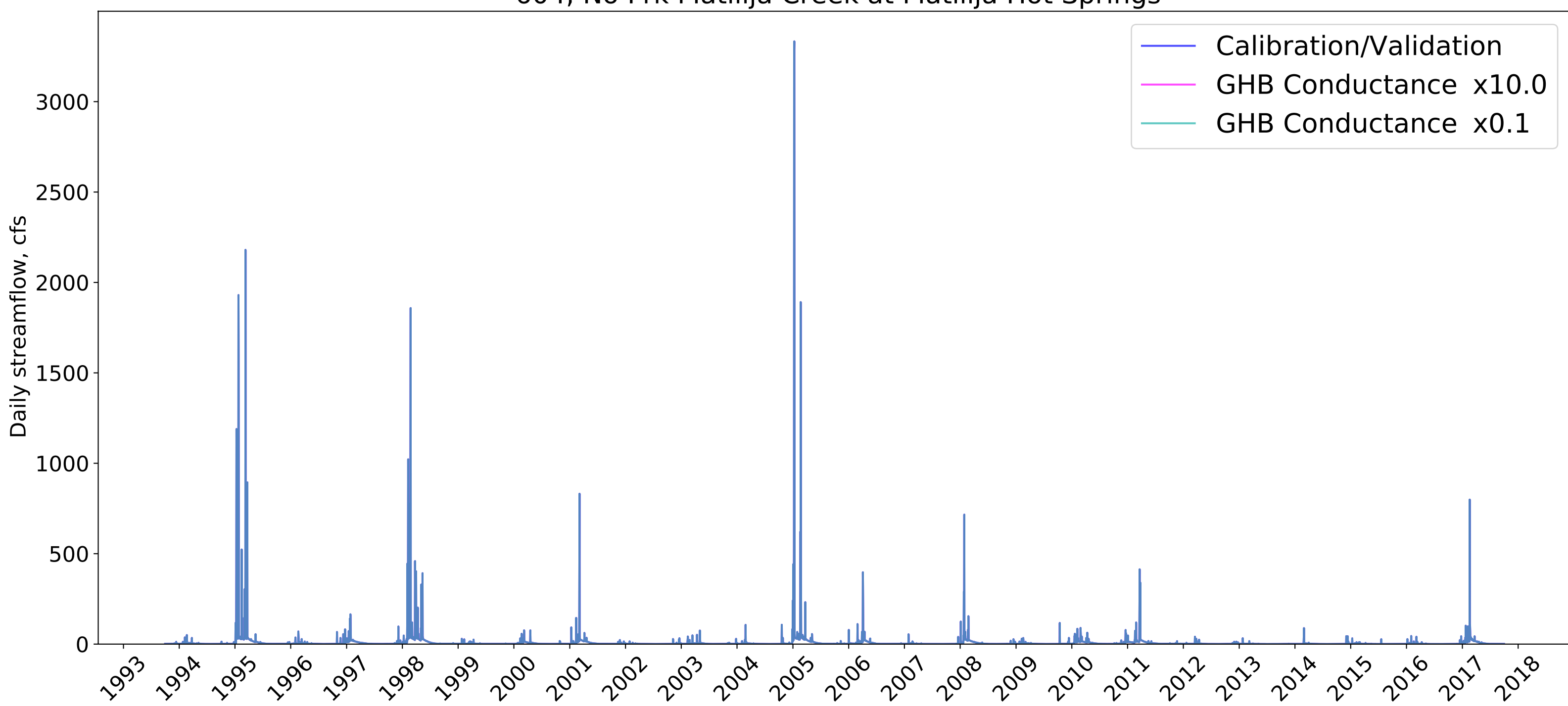
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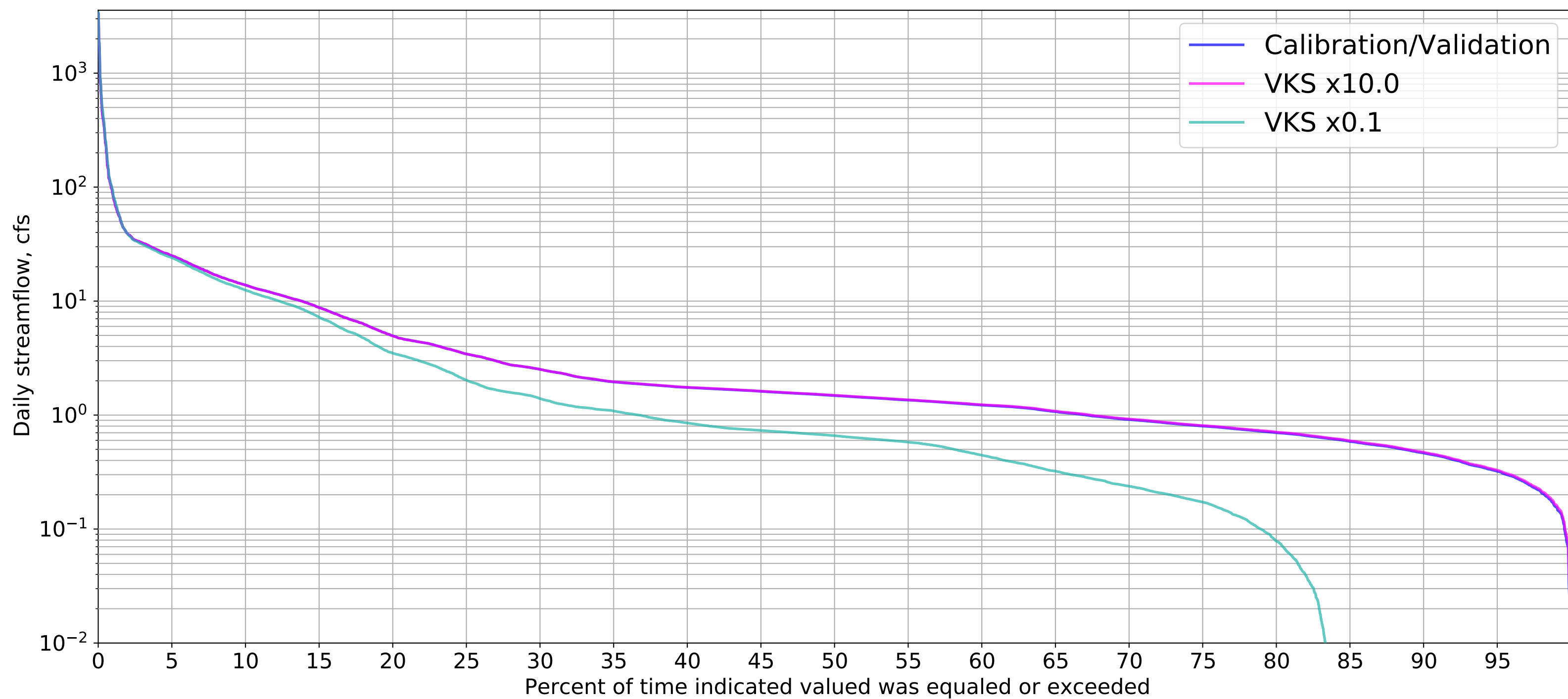
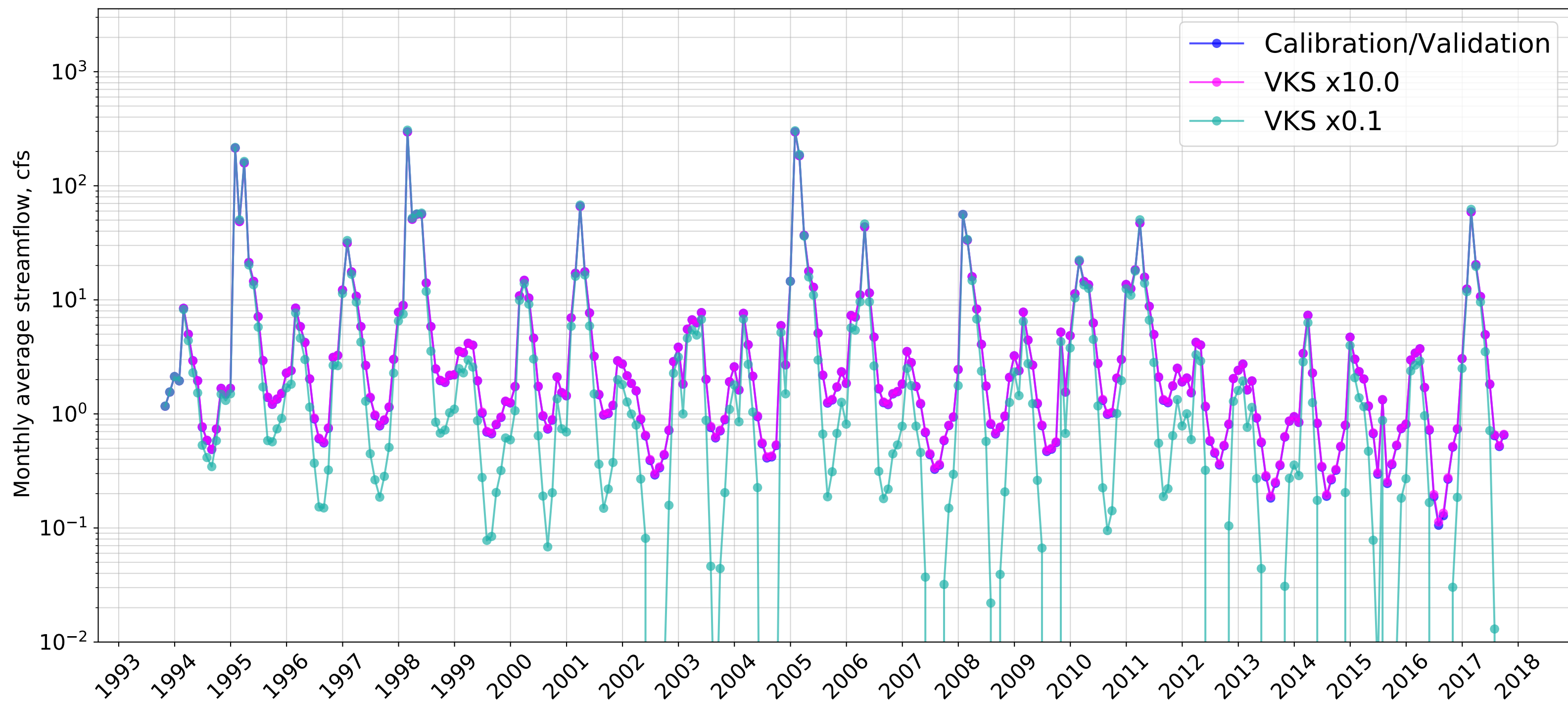
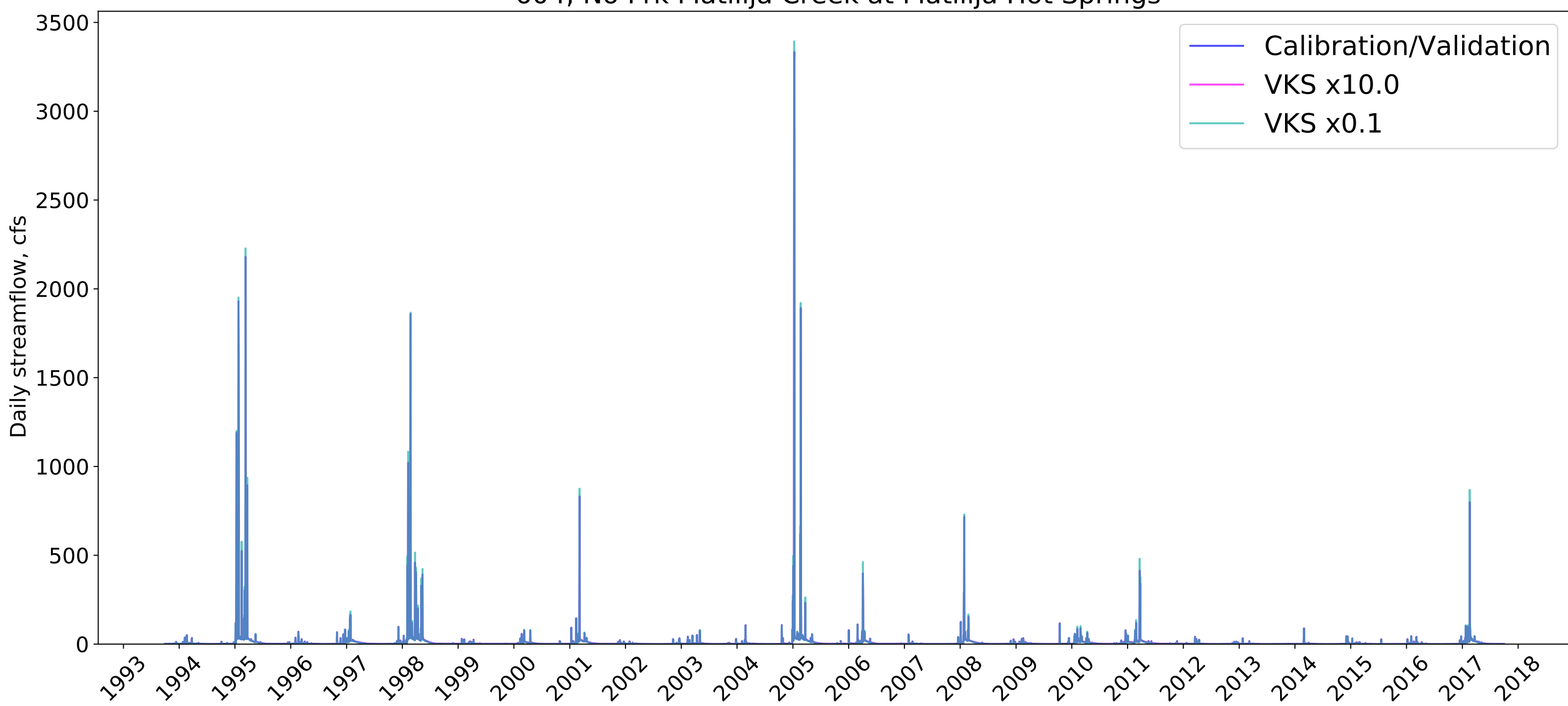
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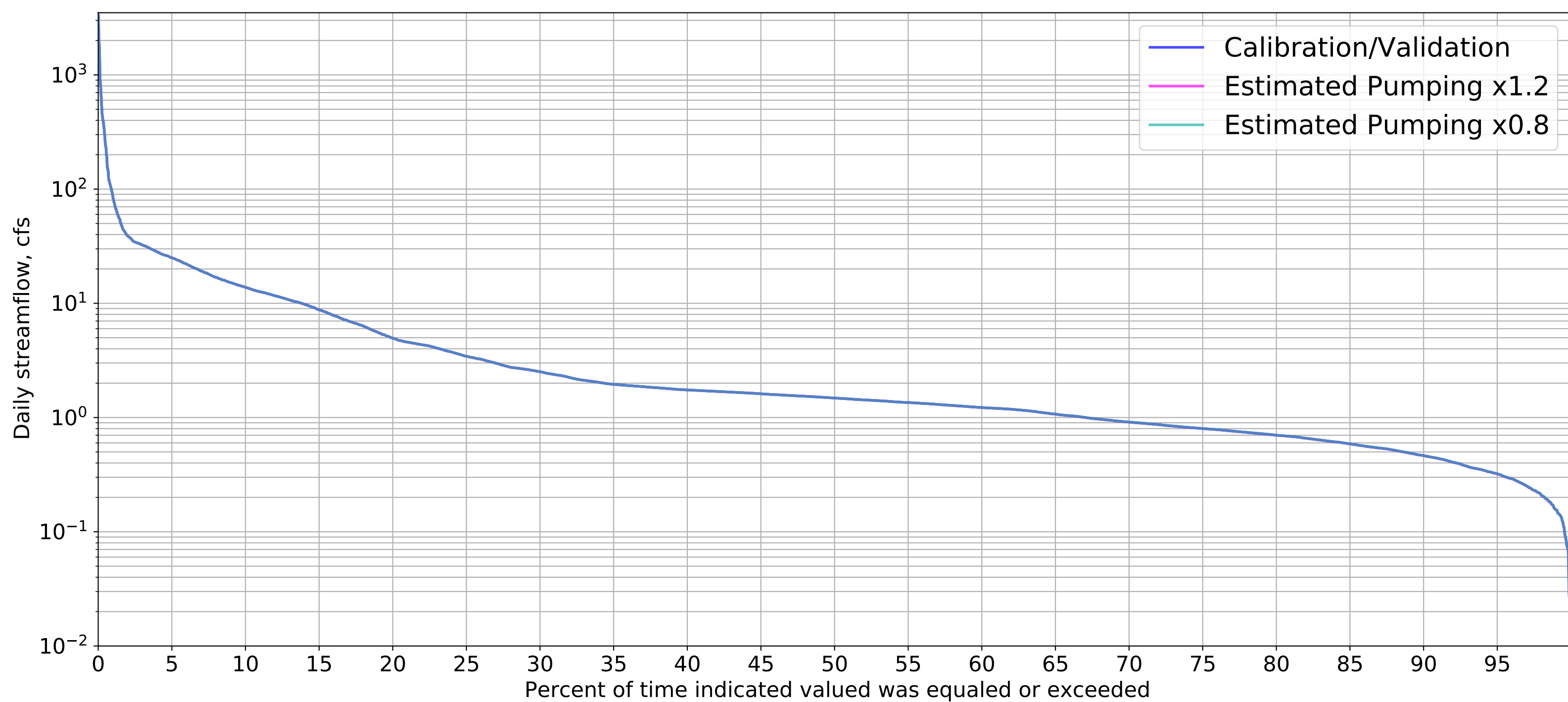
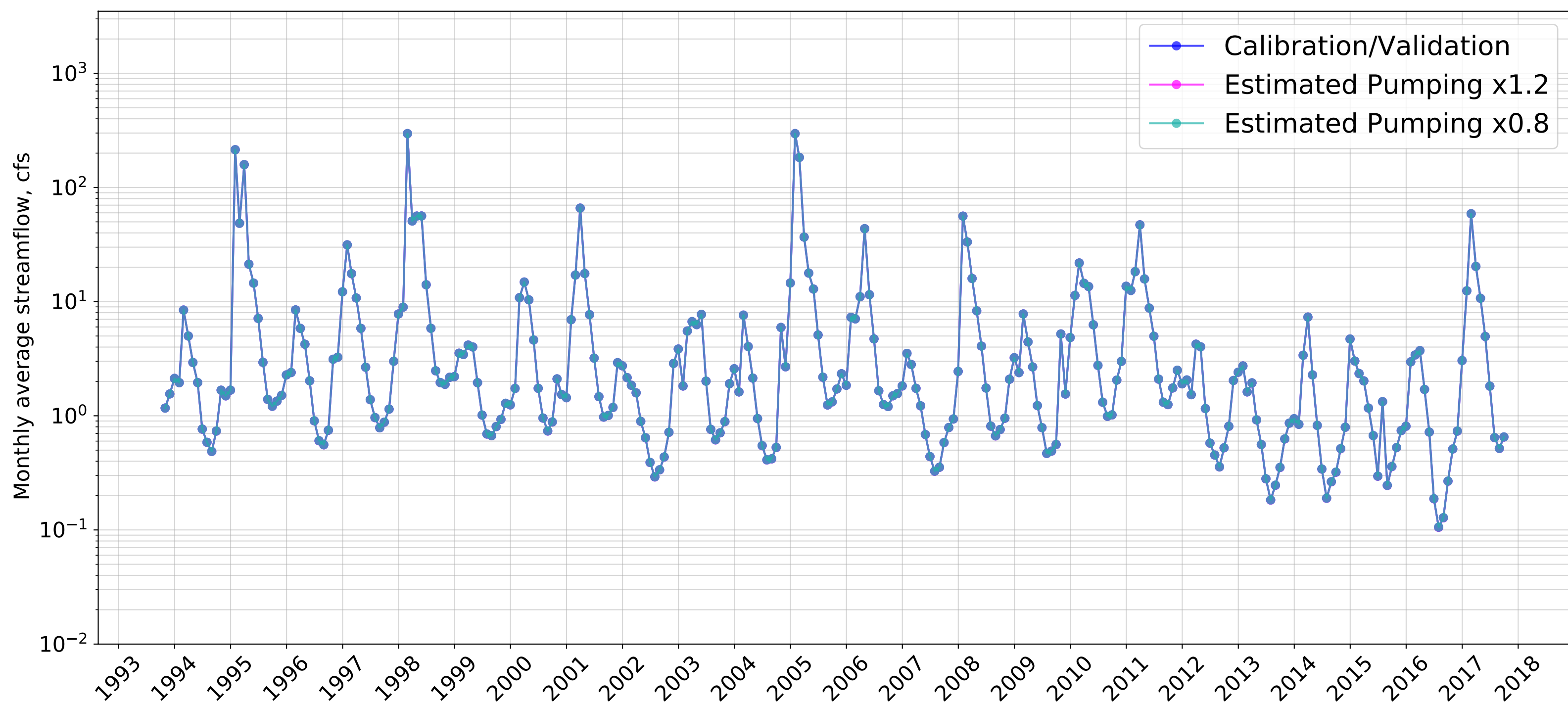
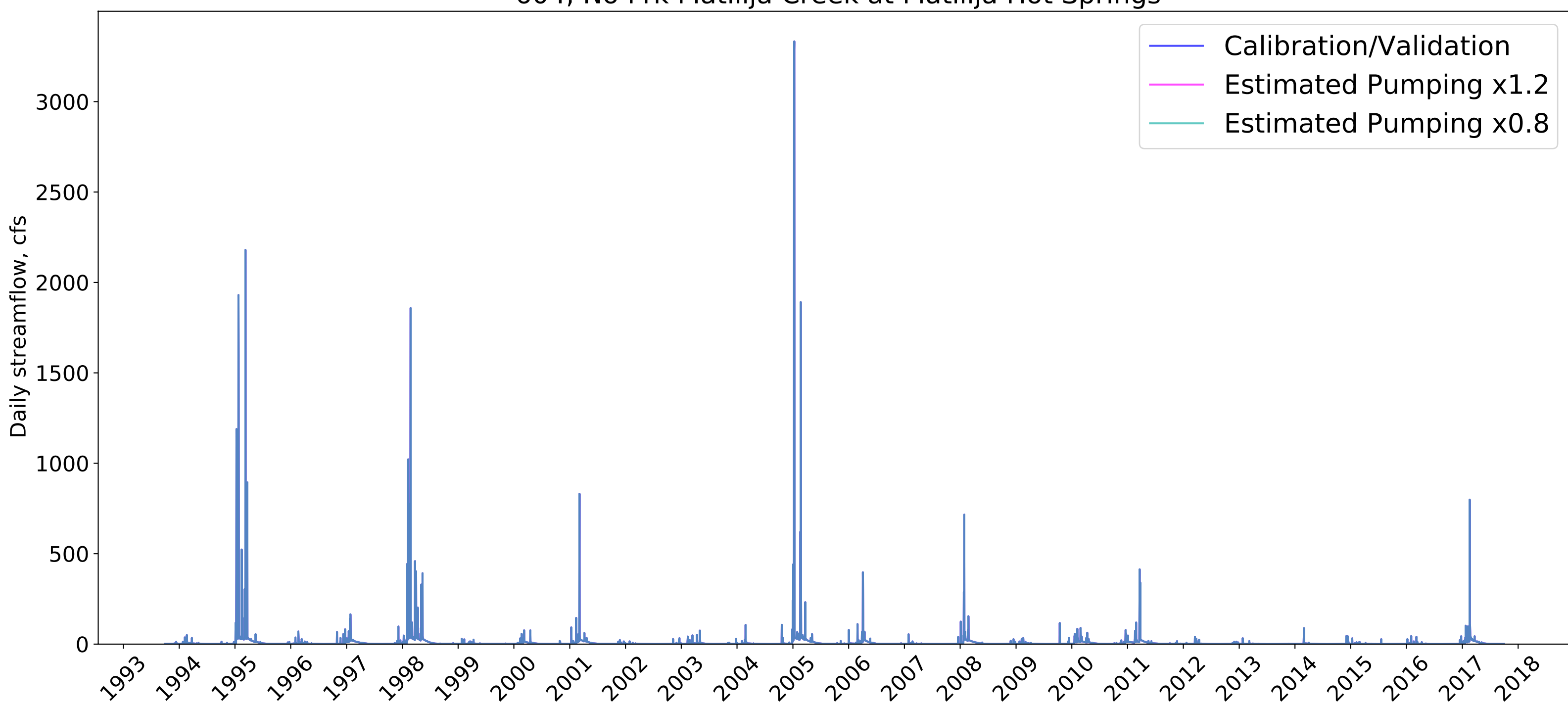
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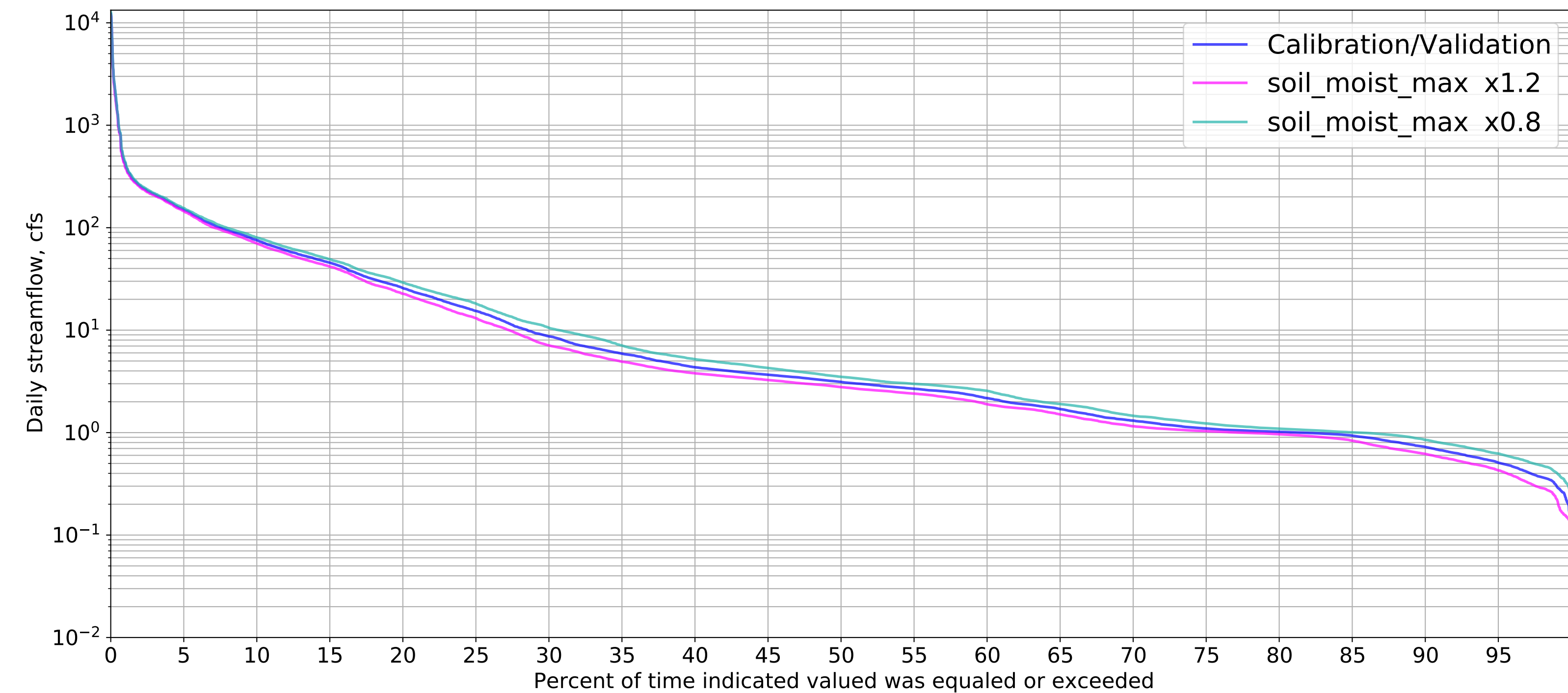
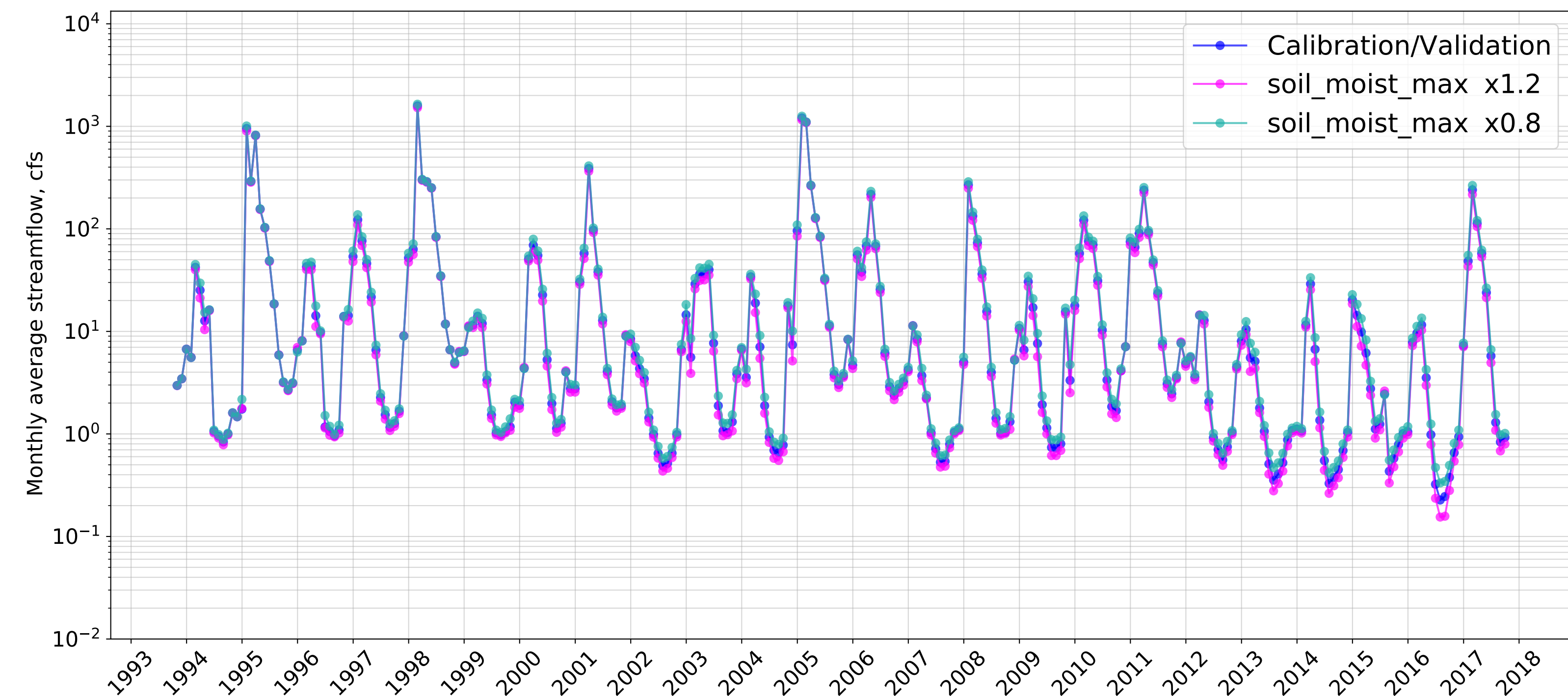
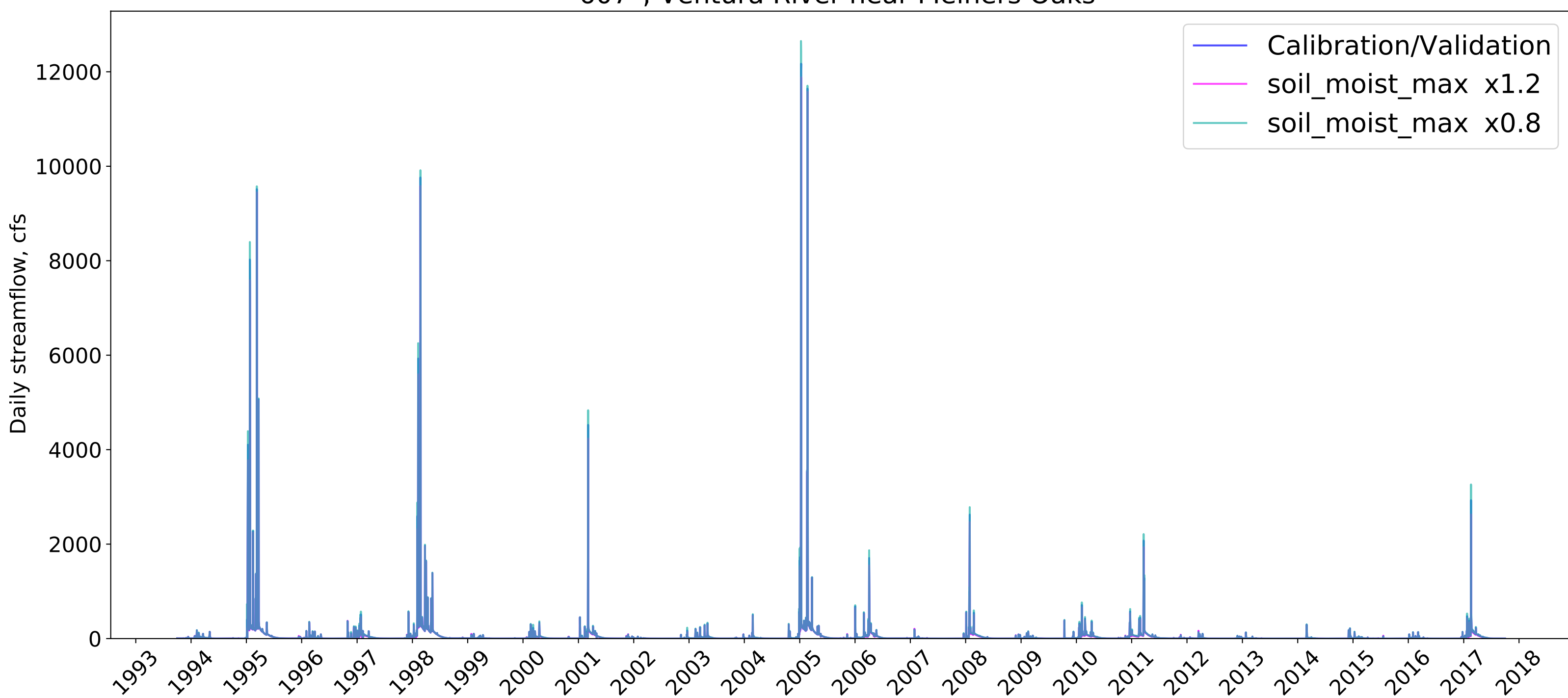
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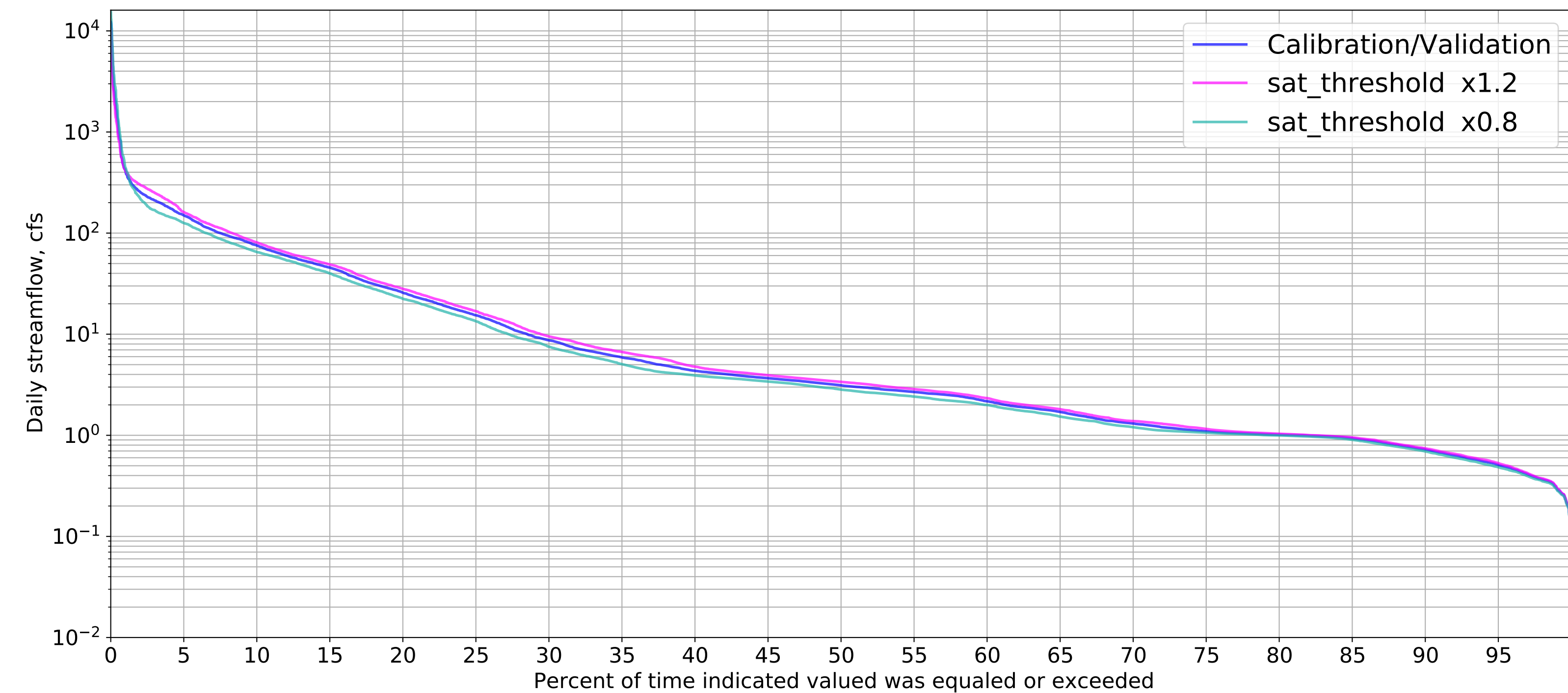
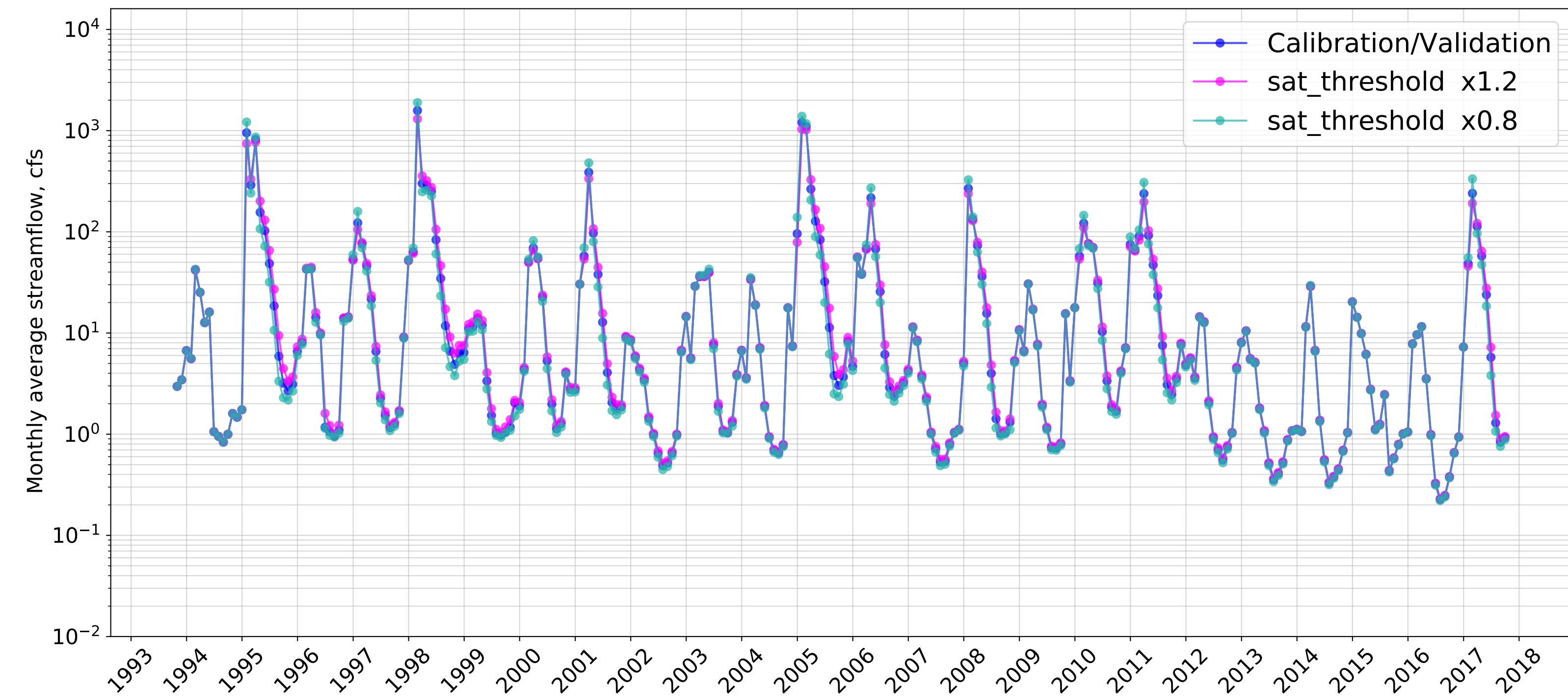
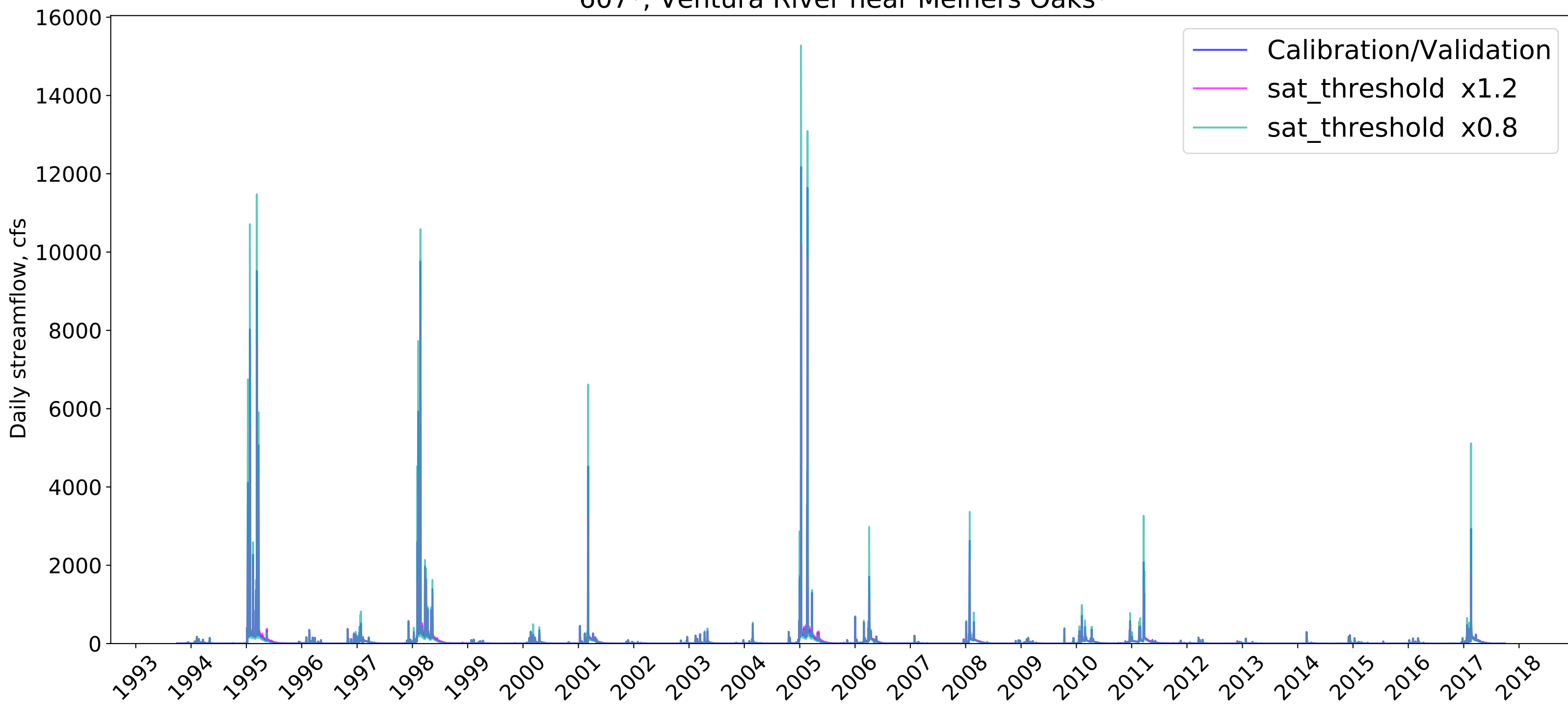
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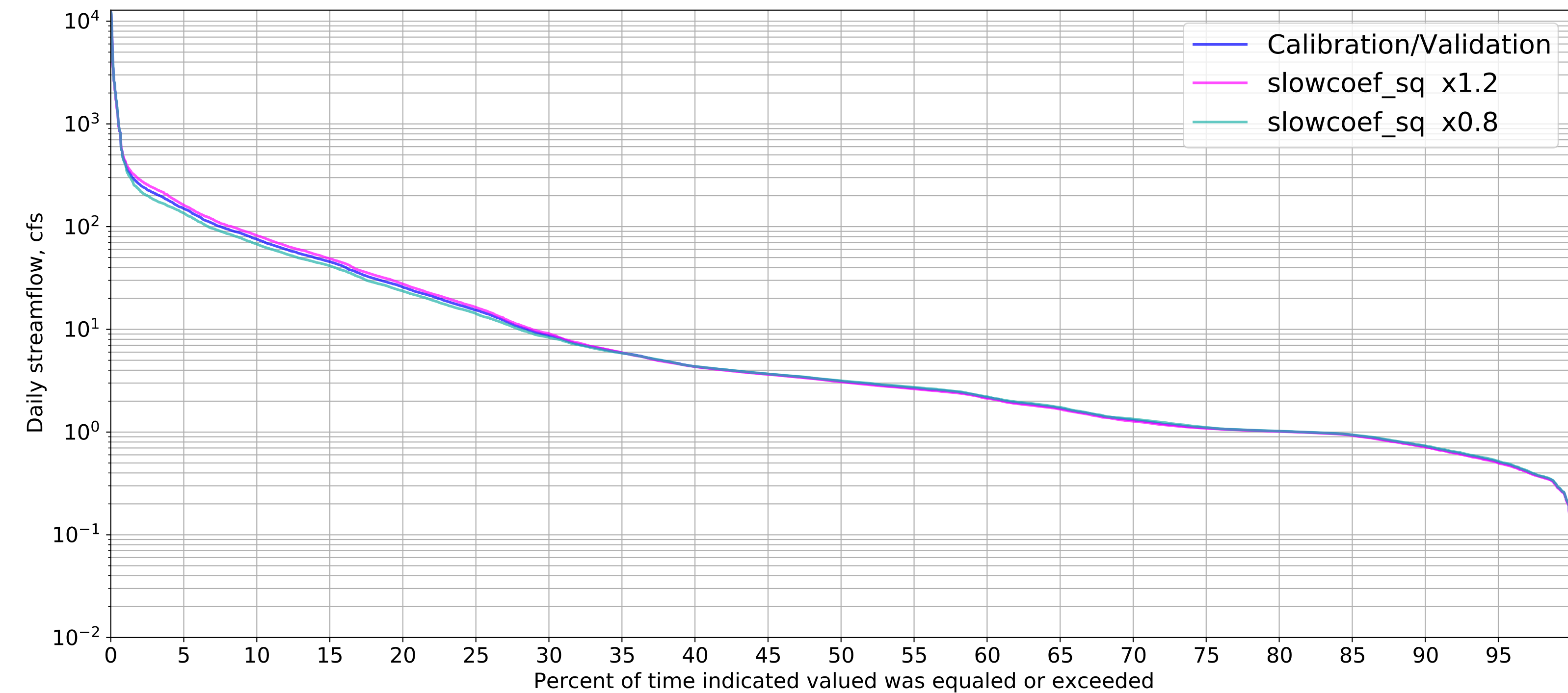
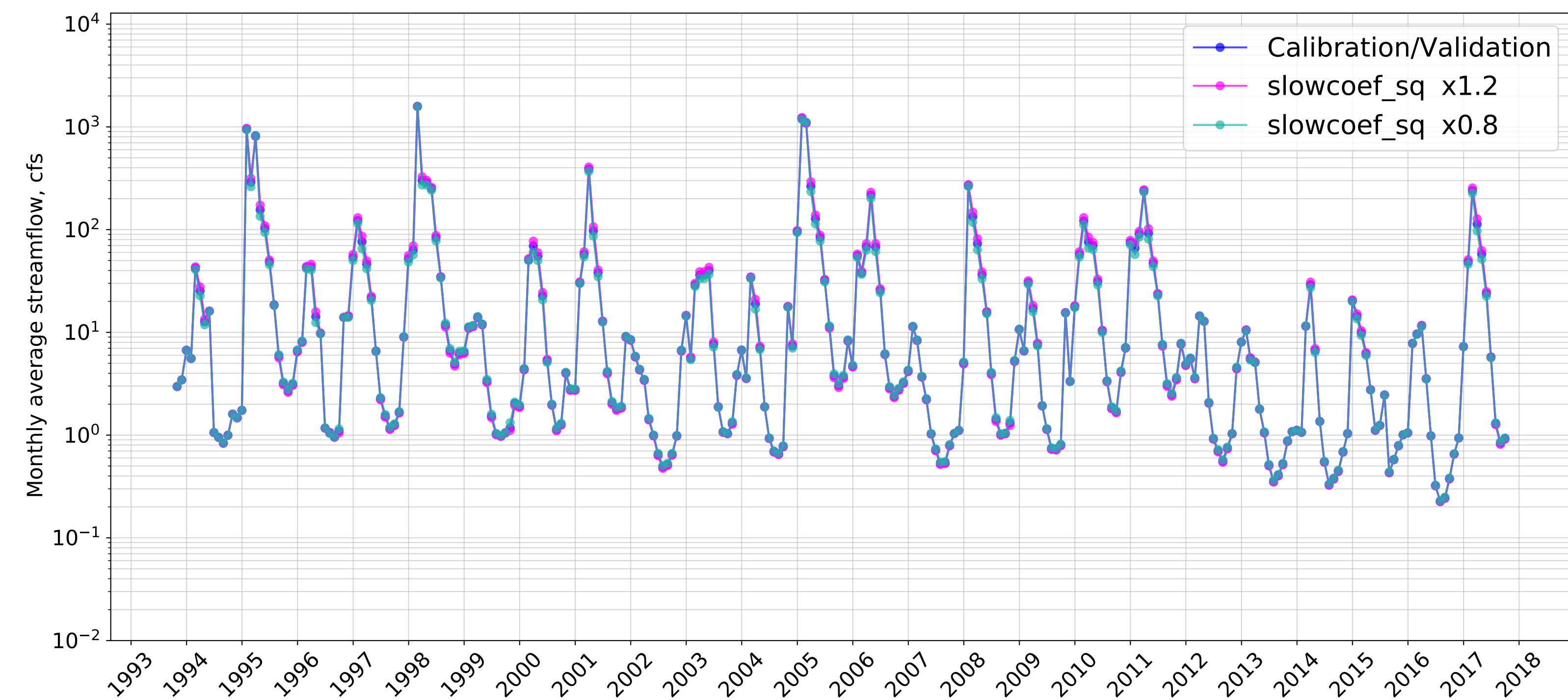
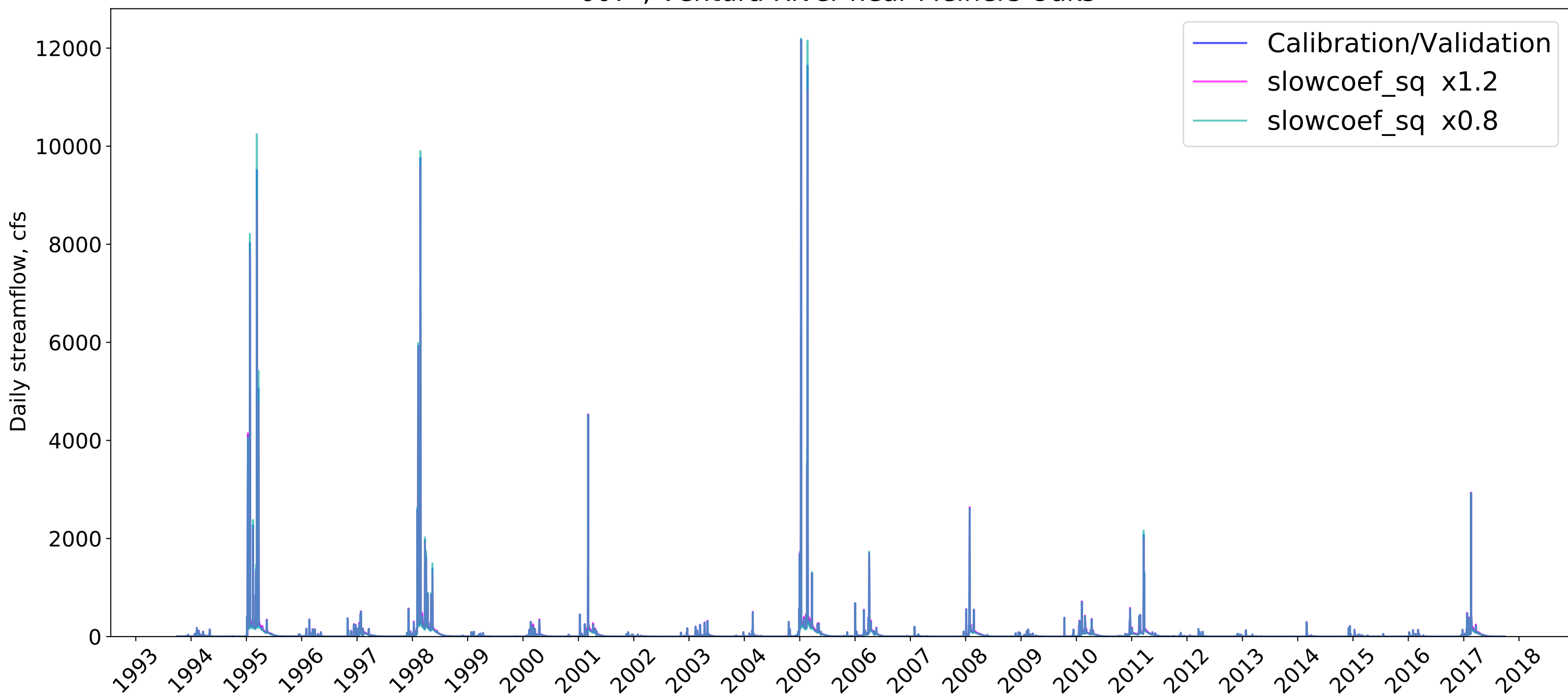
607*, Ventura River near Meiners Oaks*



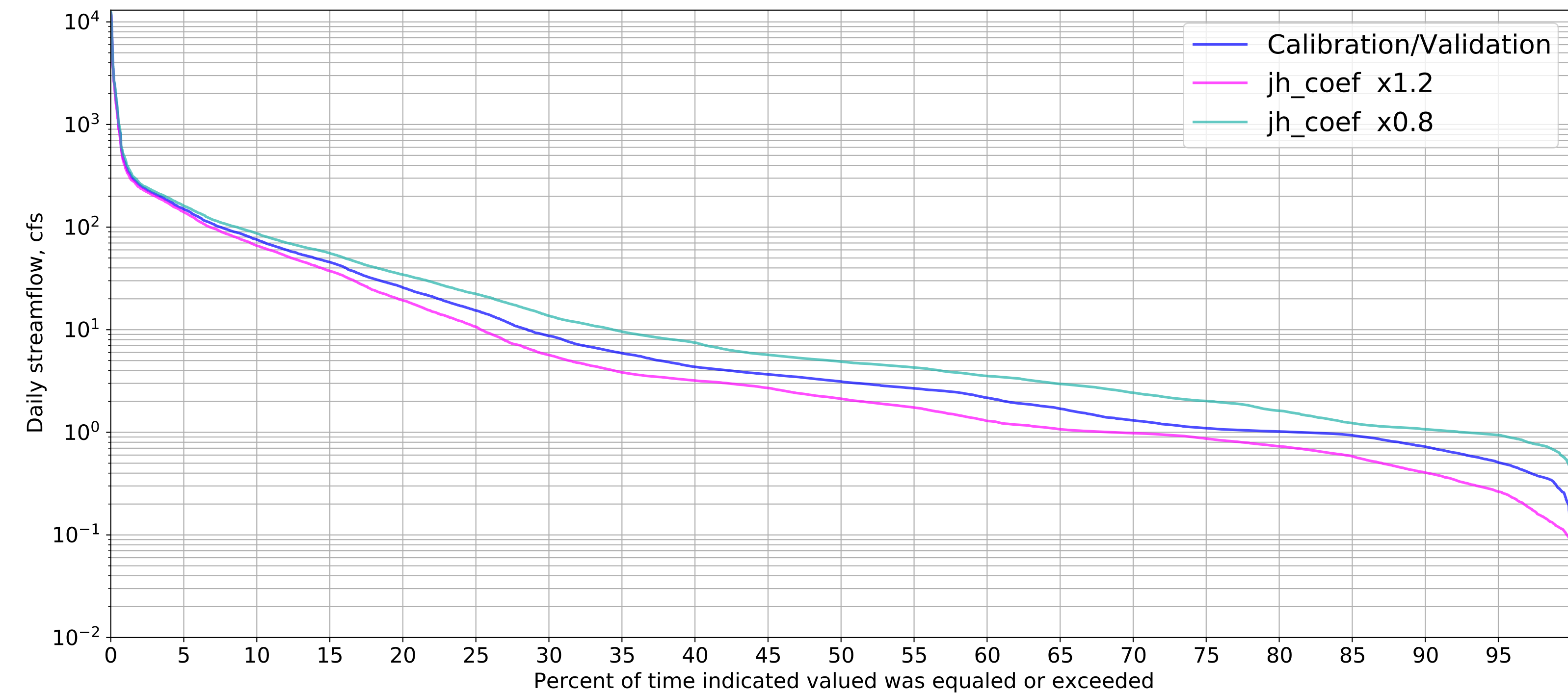
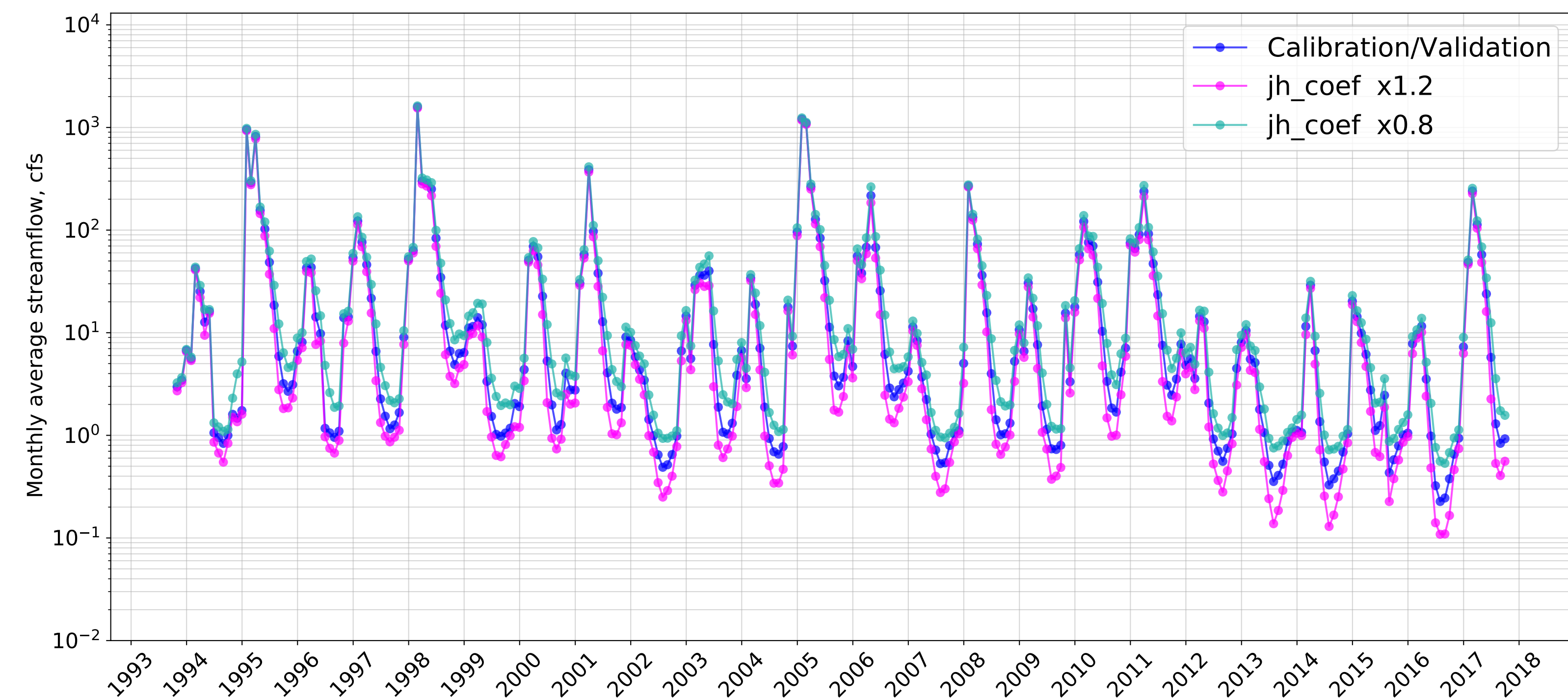
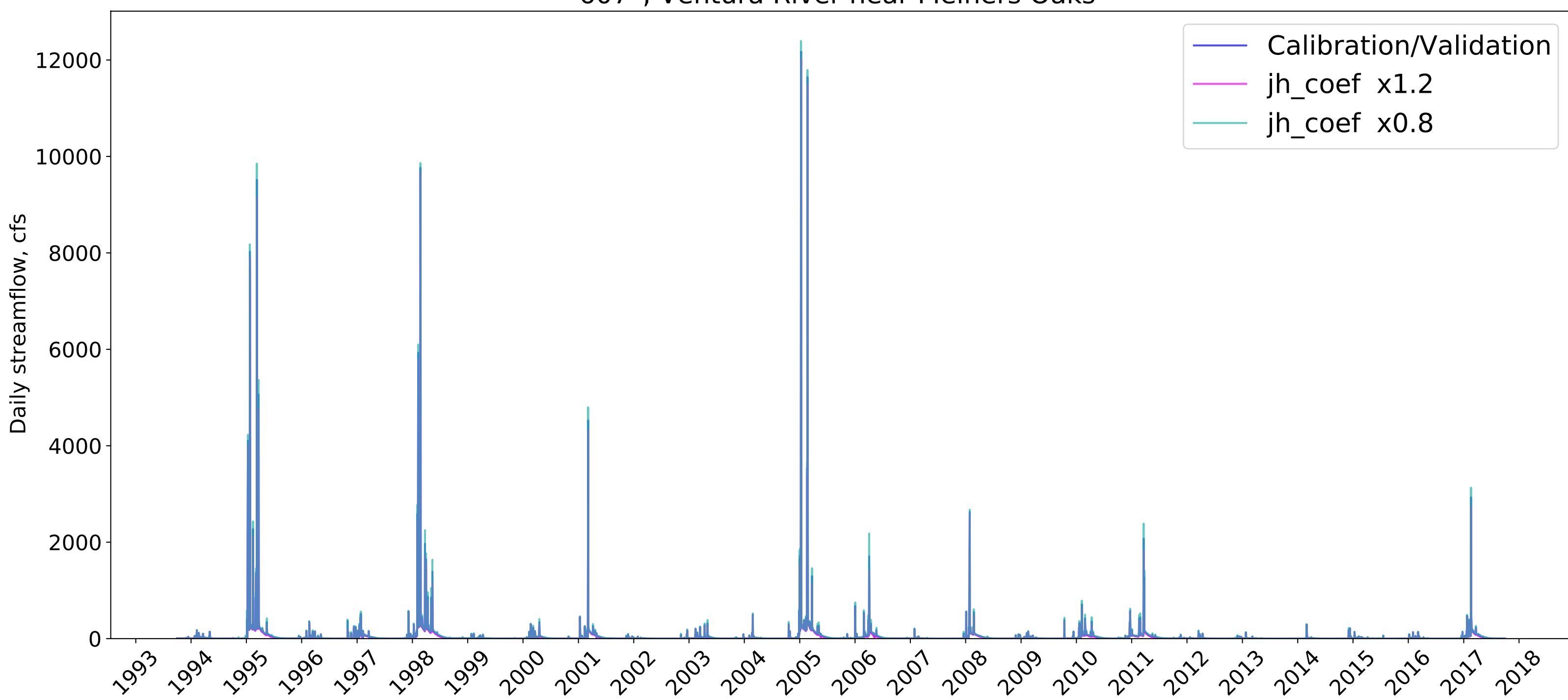
607*, Ventura River near Meiners Oaks*



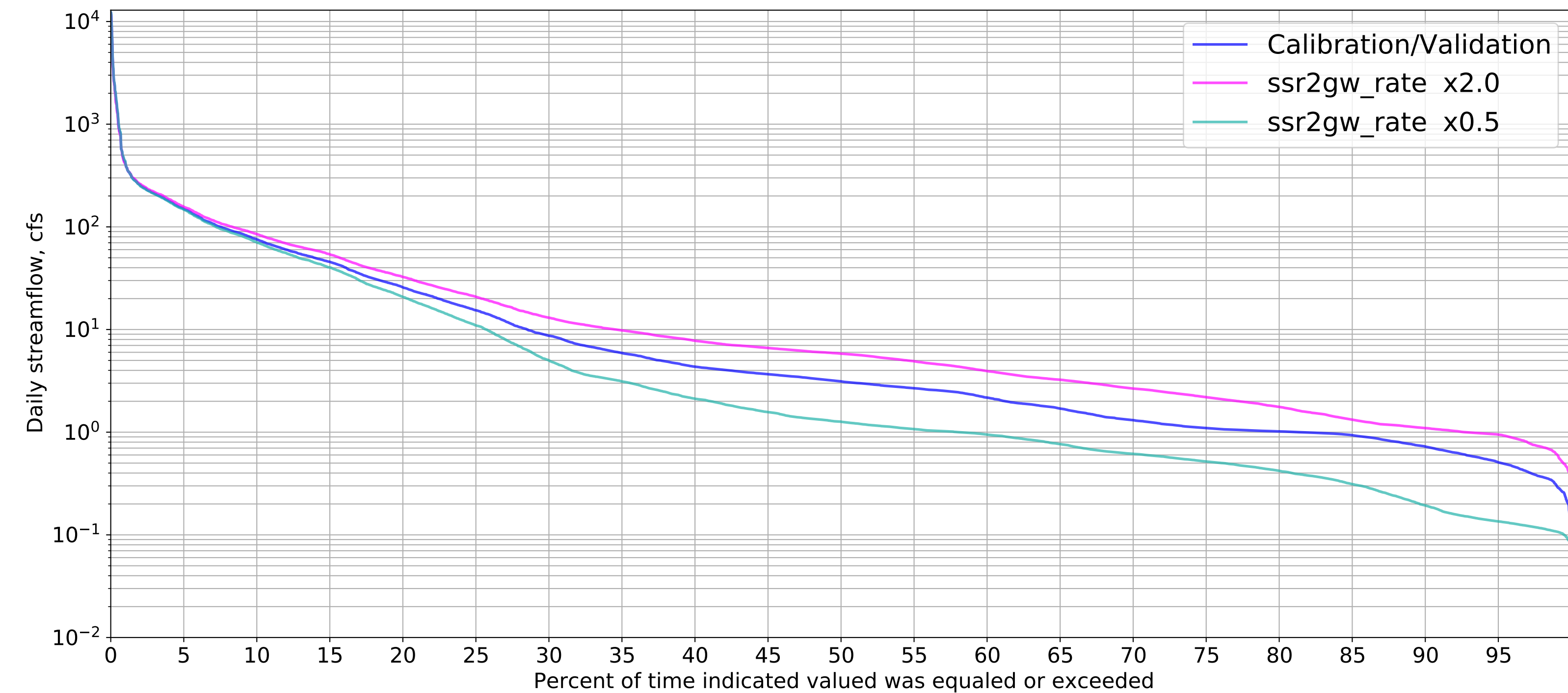
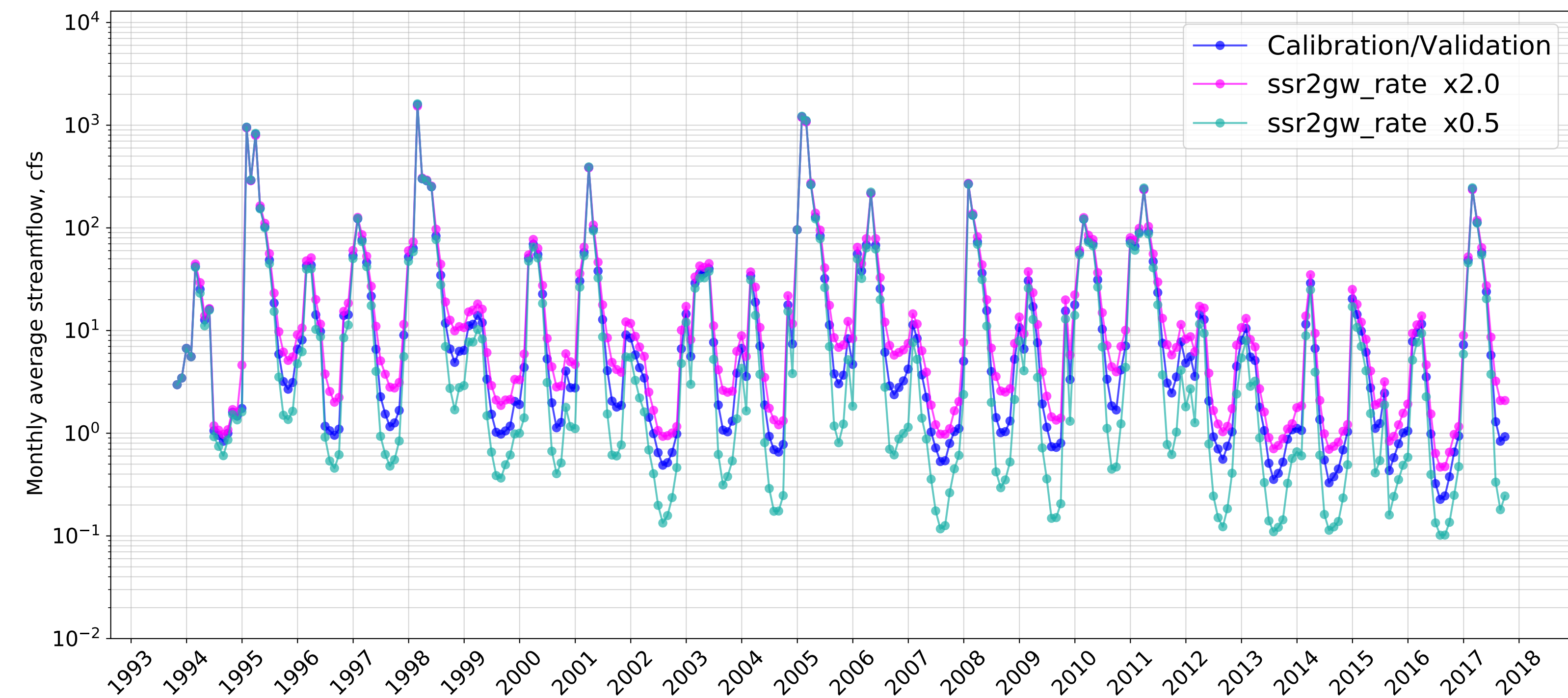
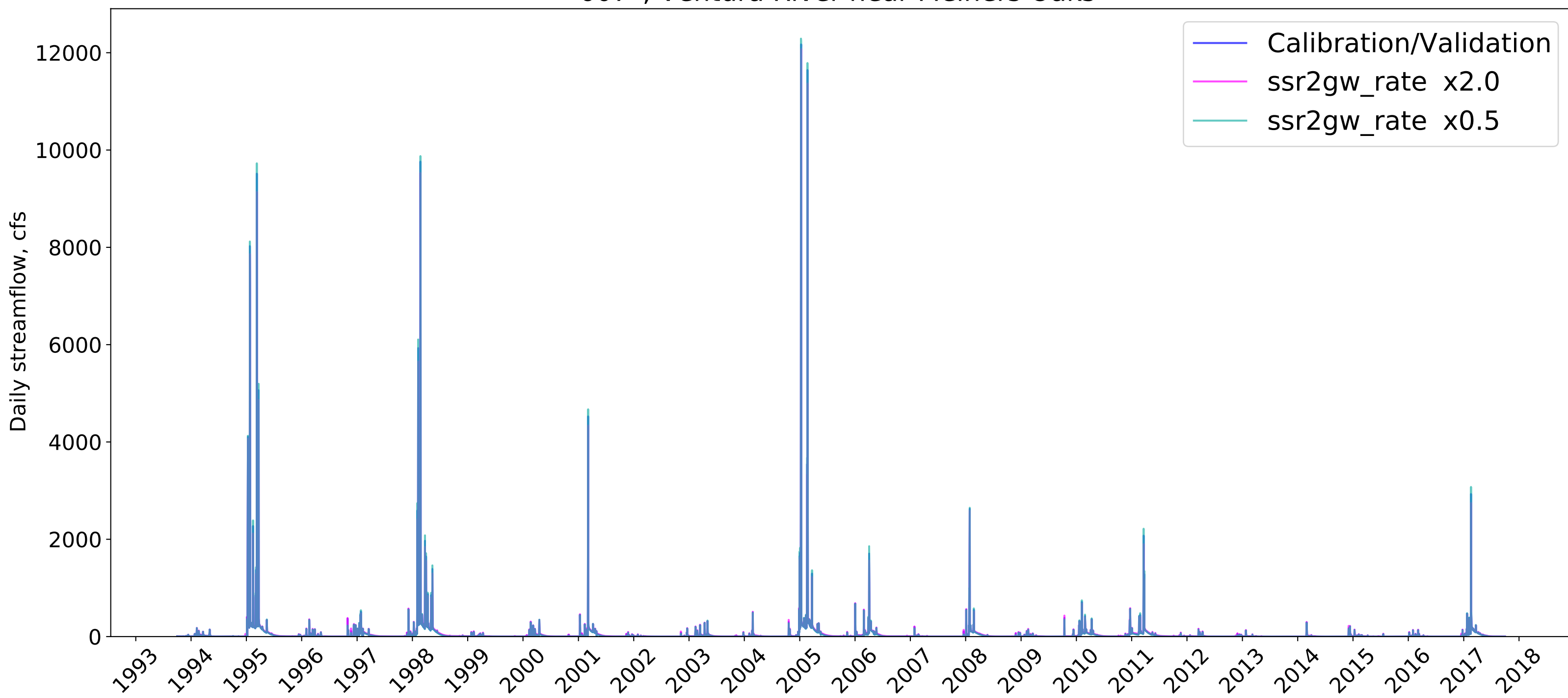
607*, Ventura River near Meiners Oaks*



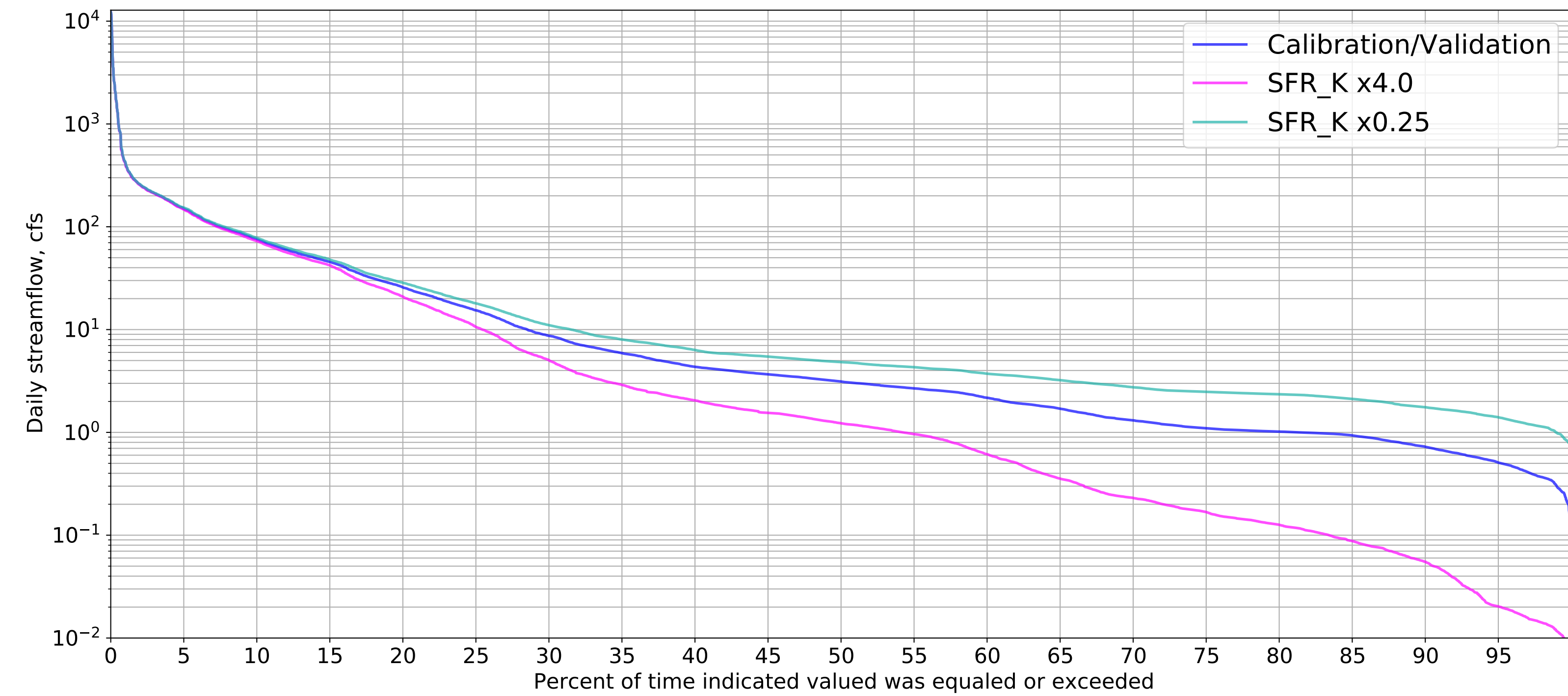
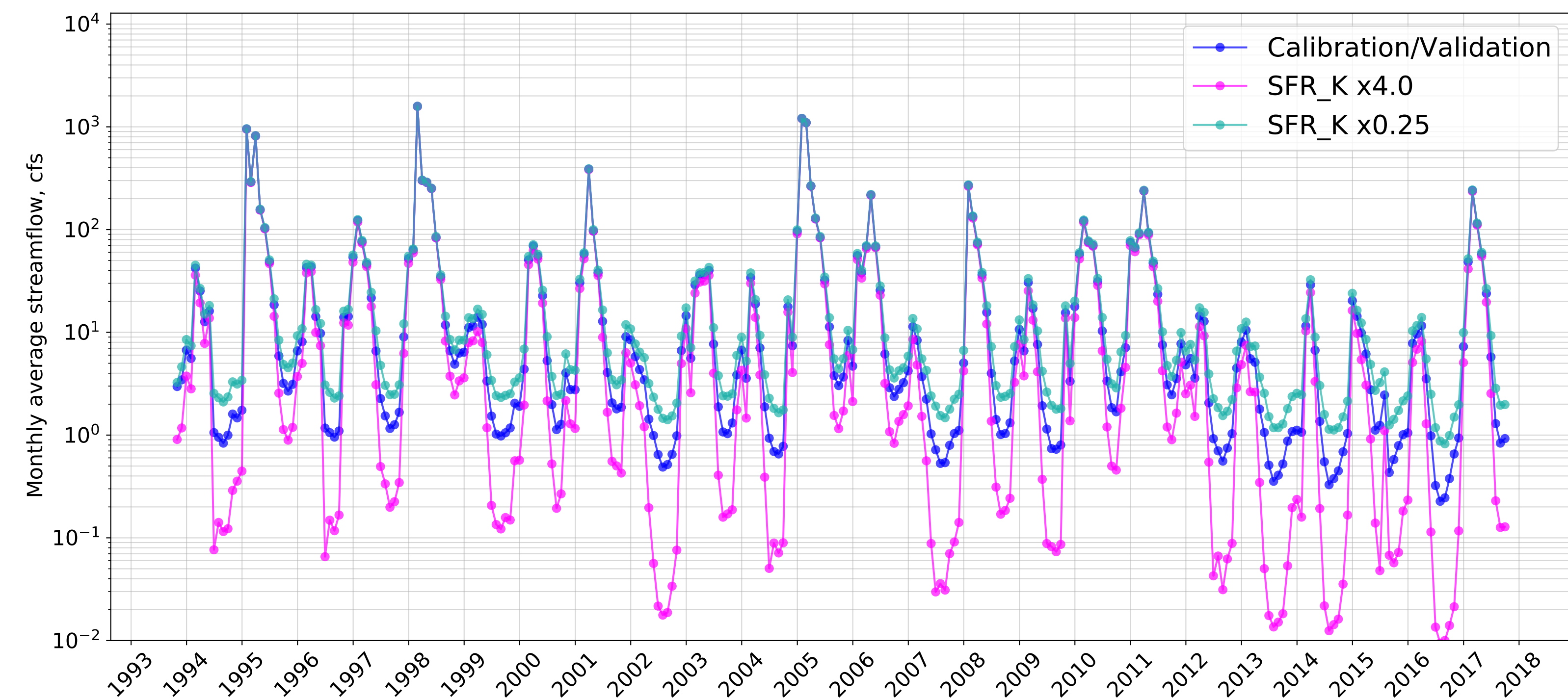
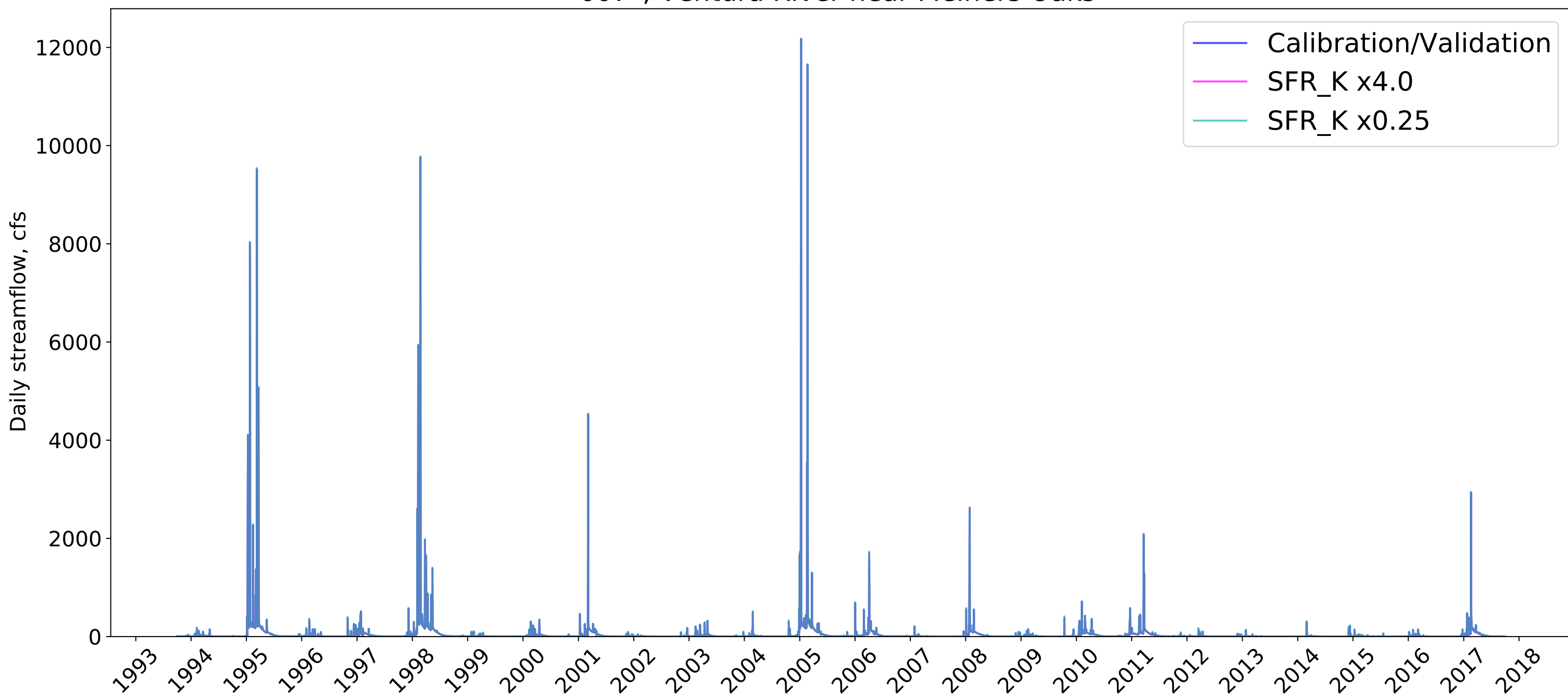
607*, Ventura River near Meiners Oaks*



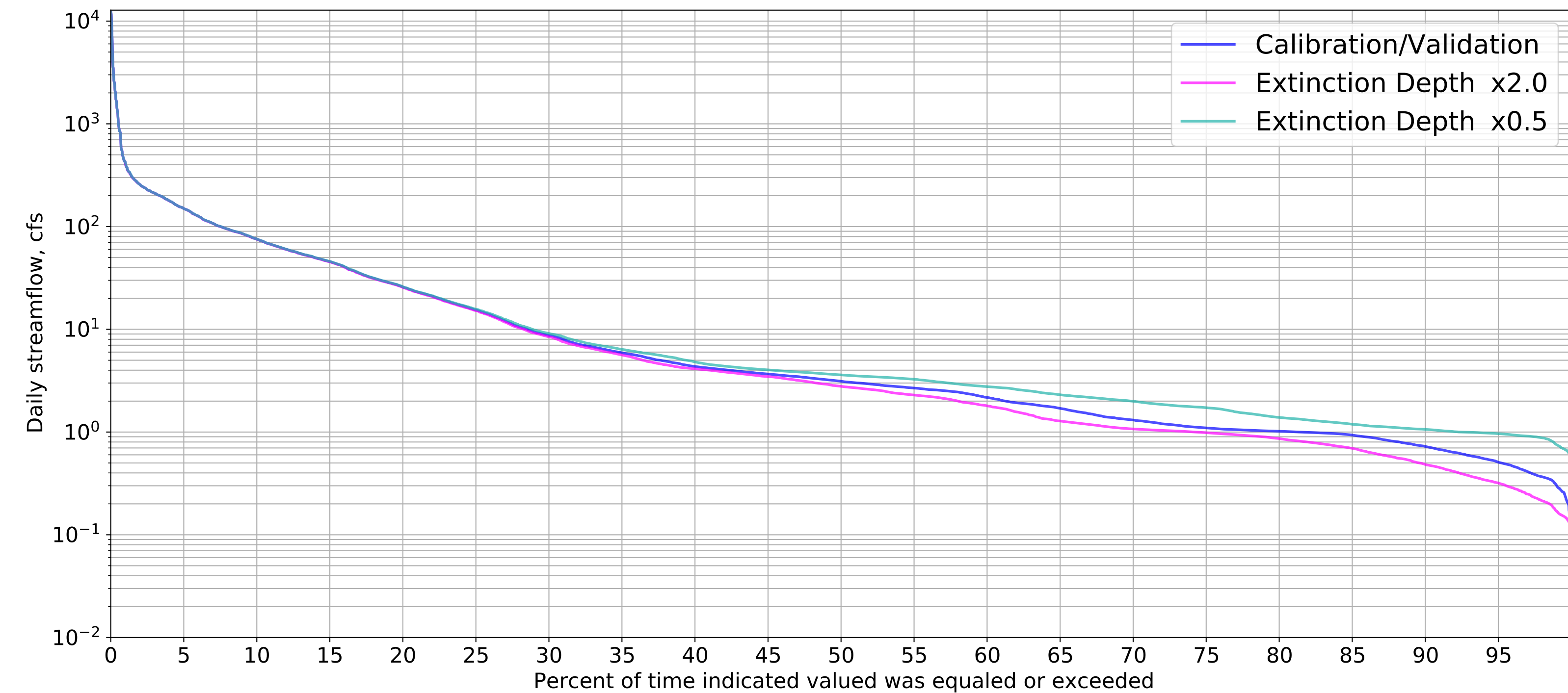
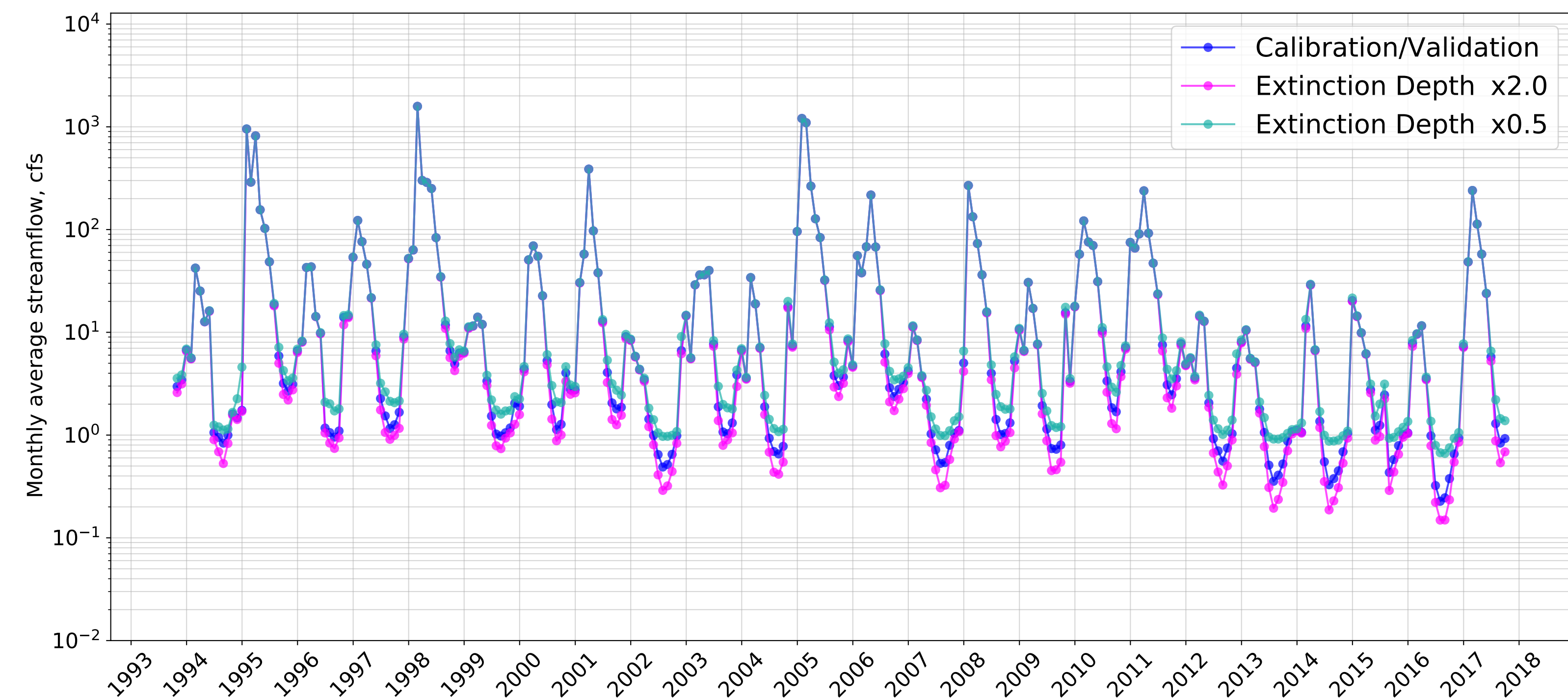
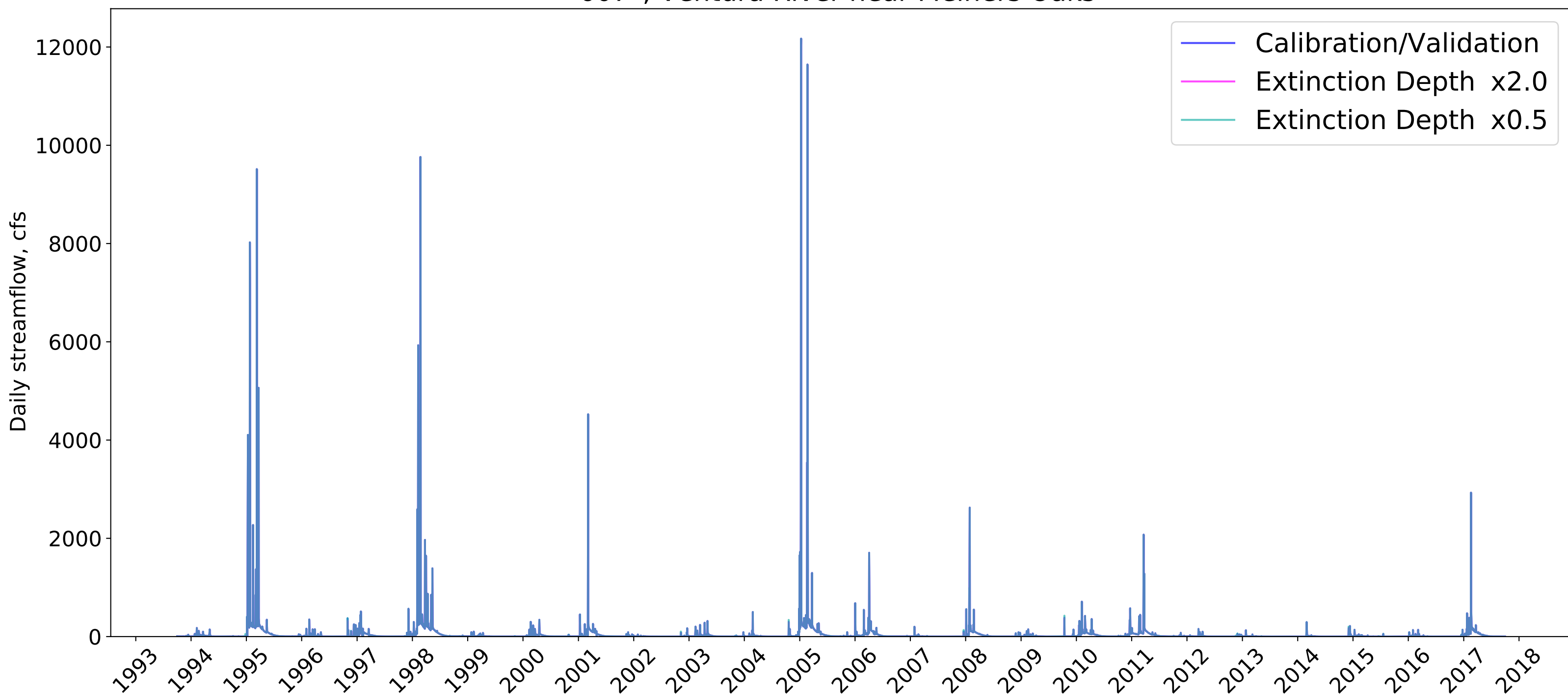
607*, Ventura River near Meiners Oaks*



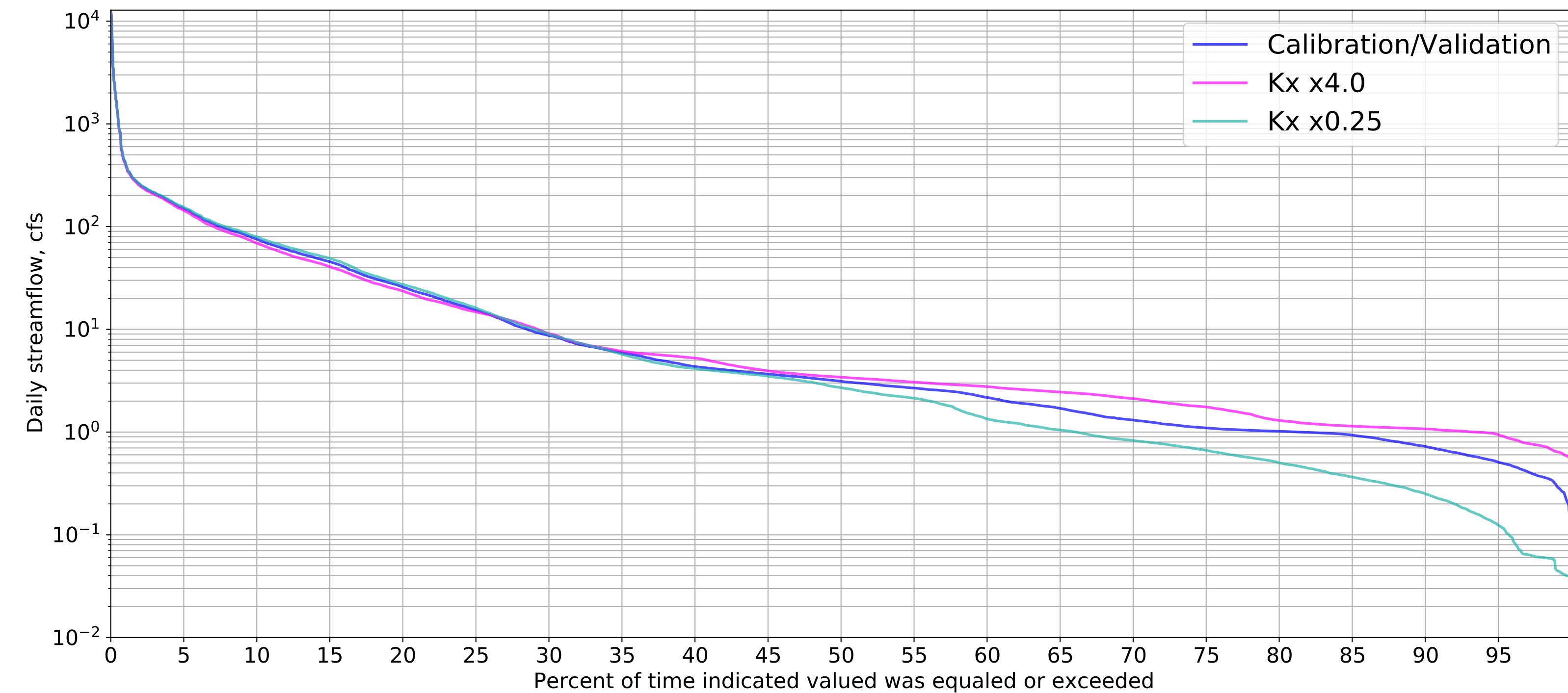
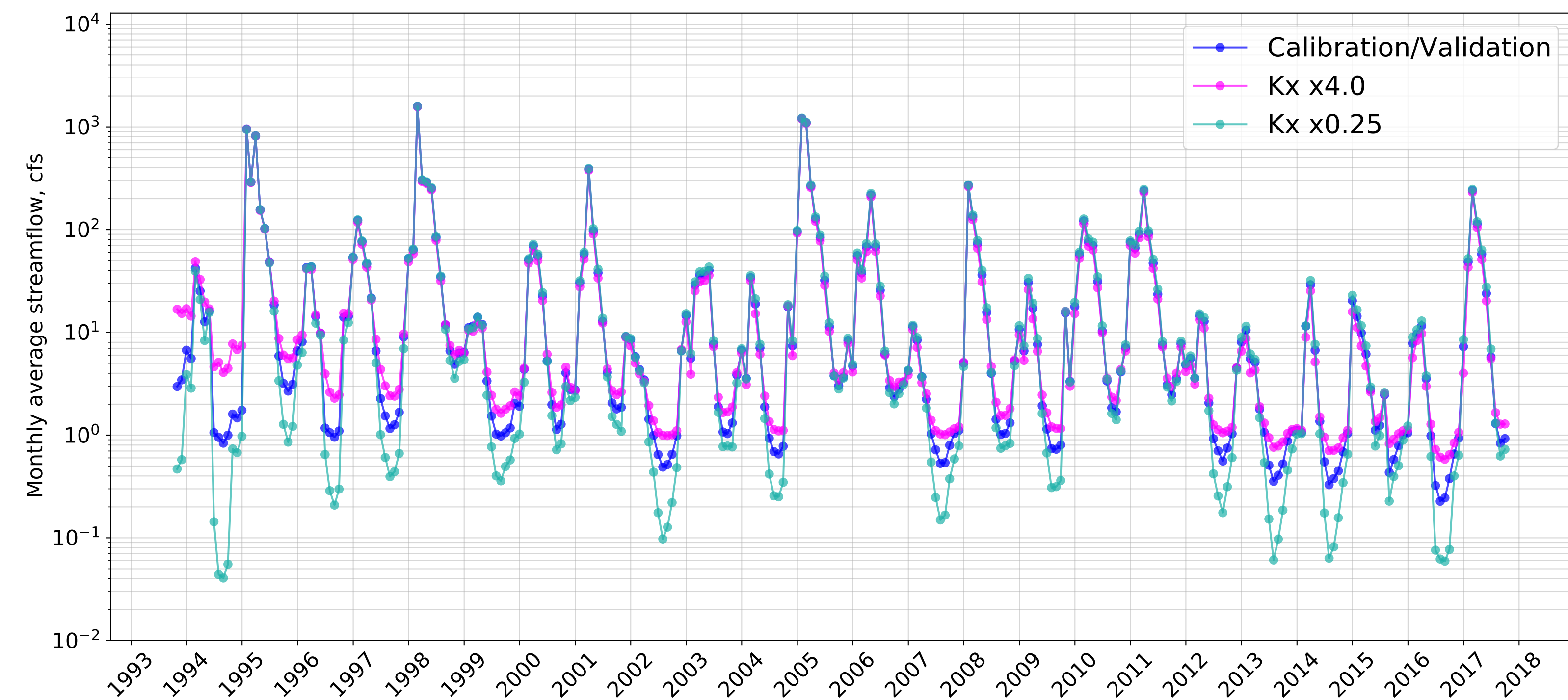
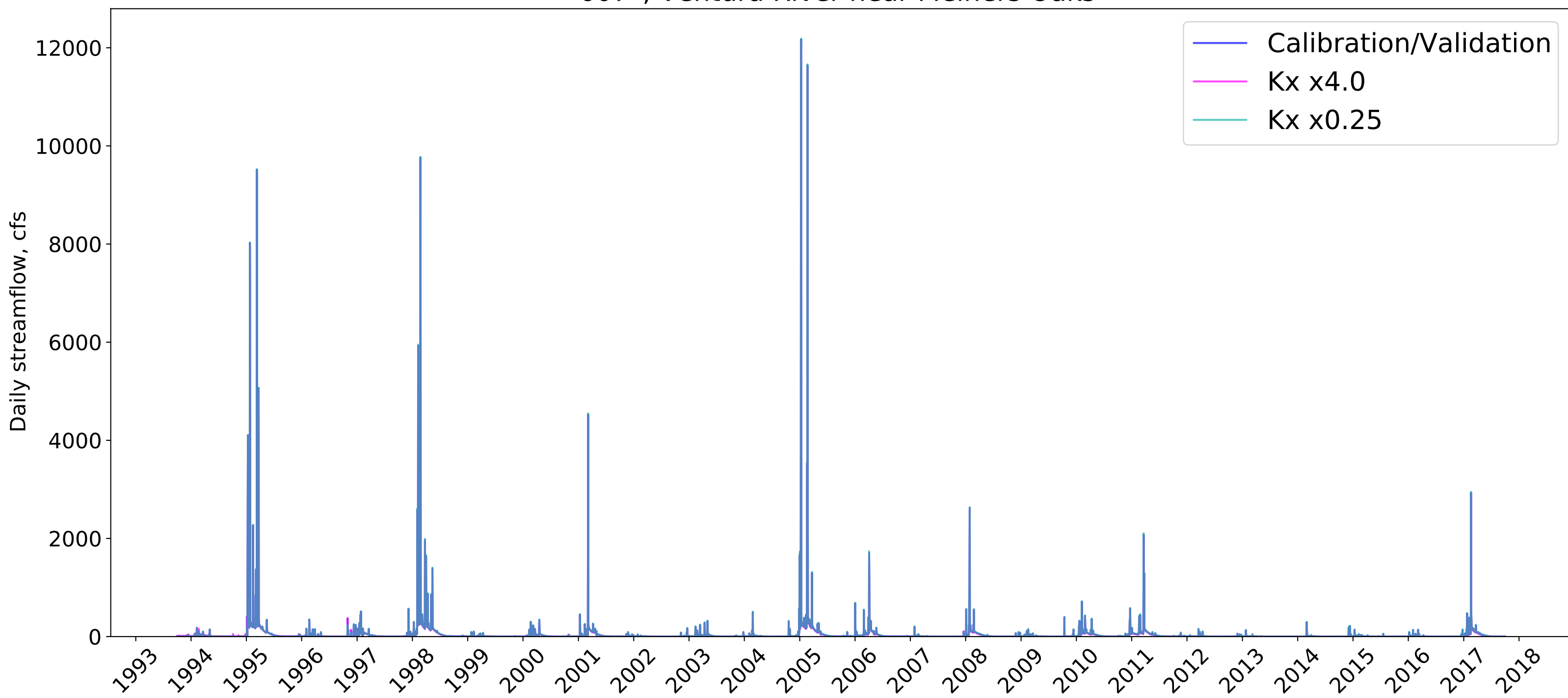
607*, Ventura River near Meiners Oaks*



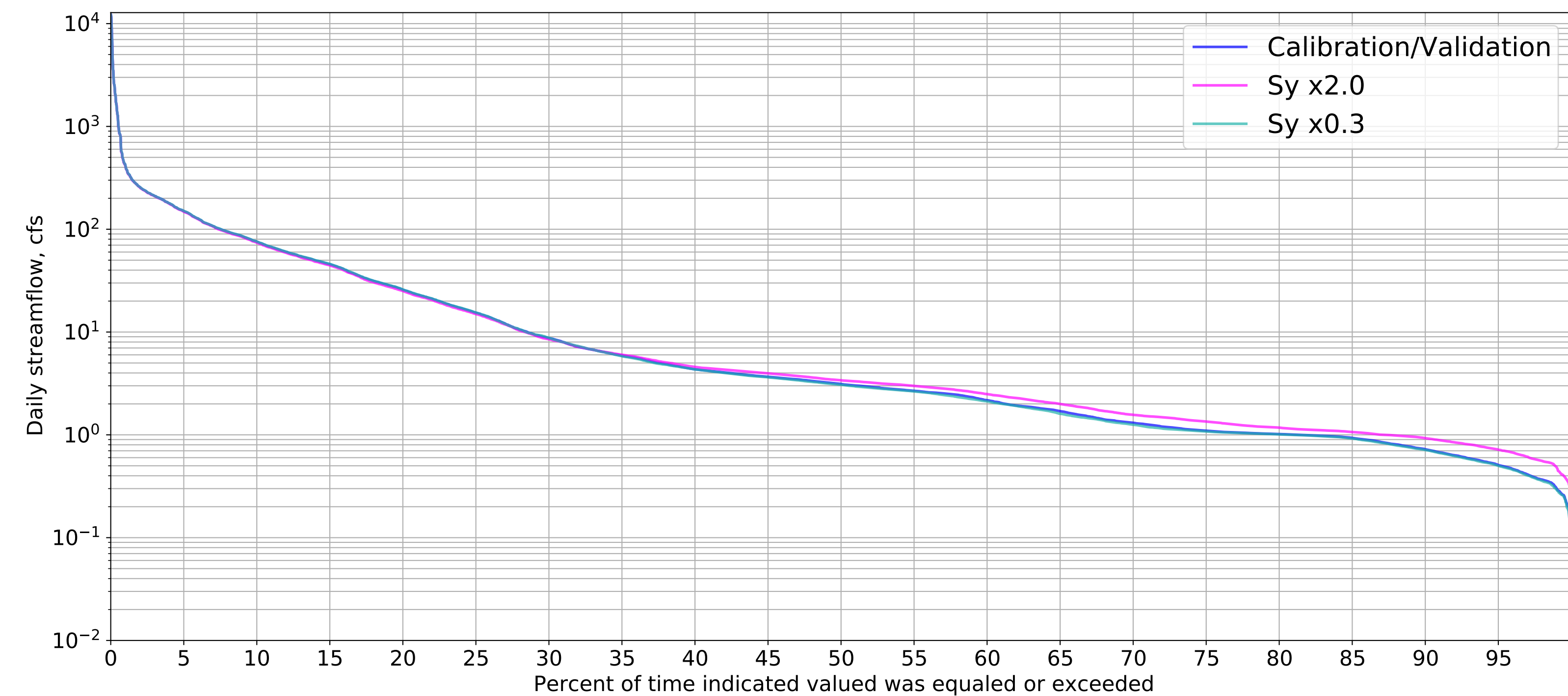
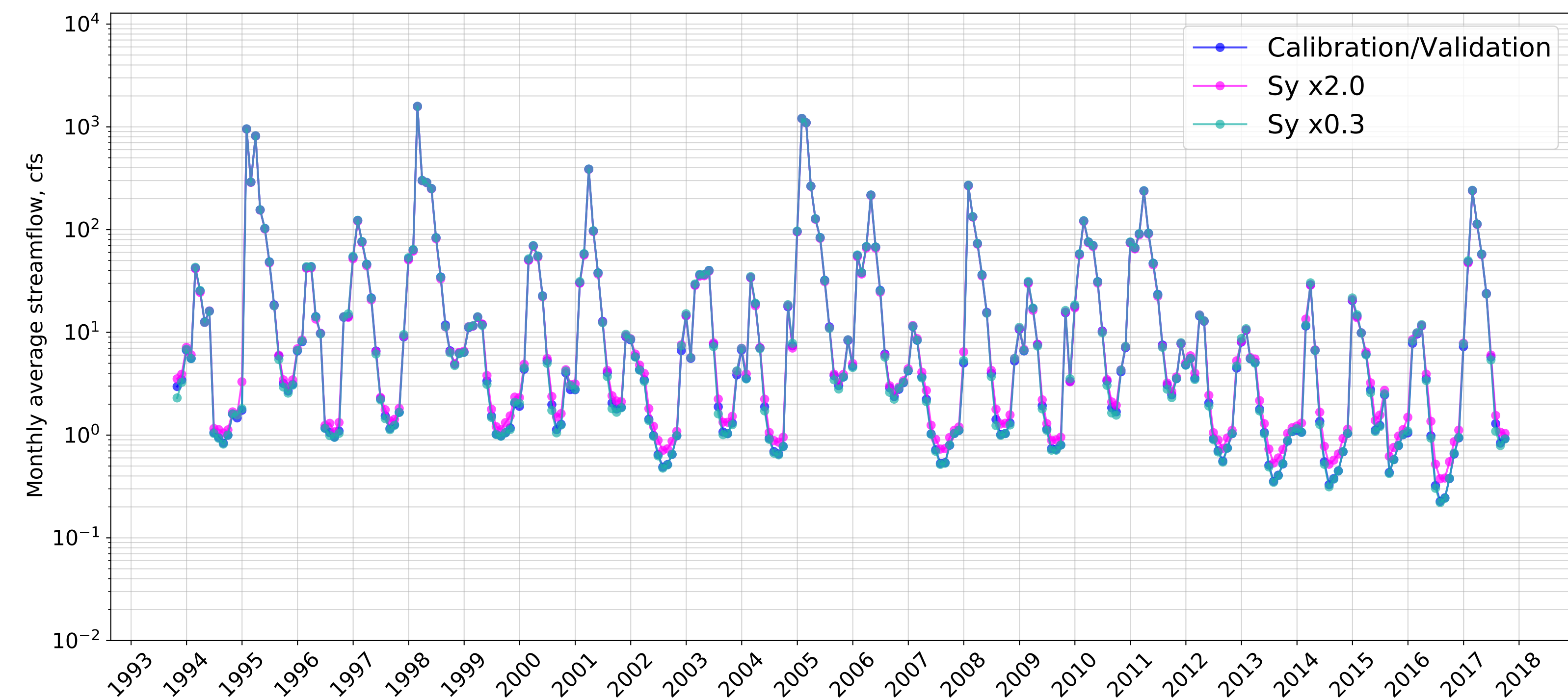
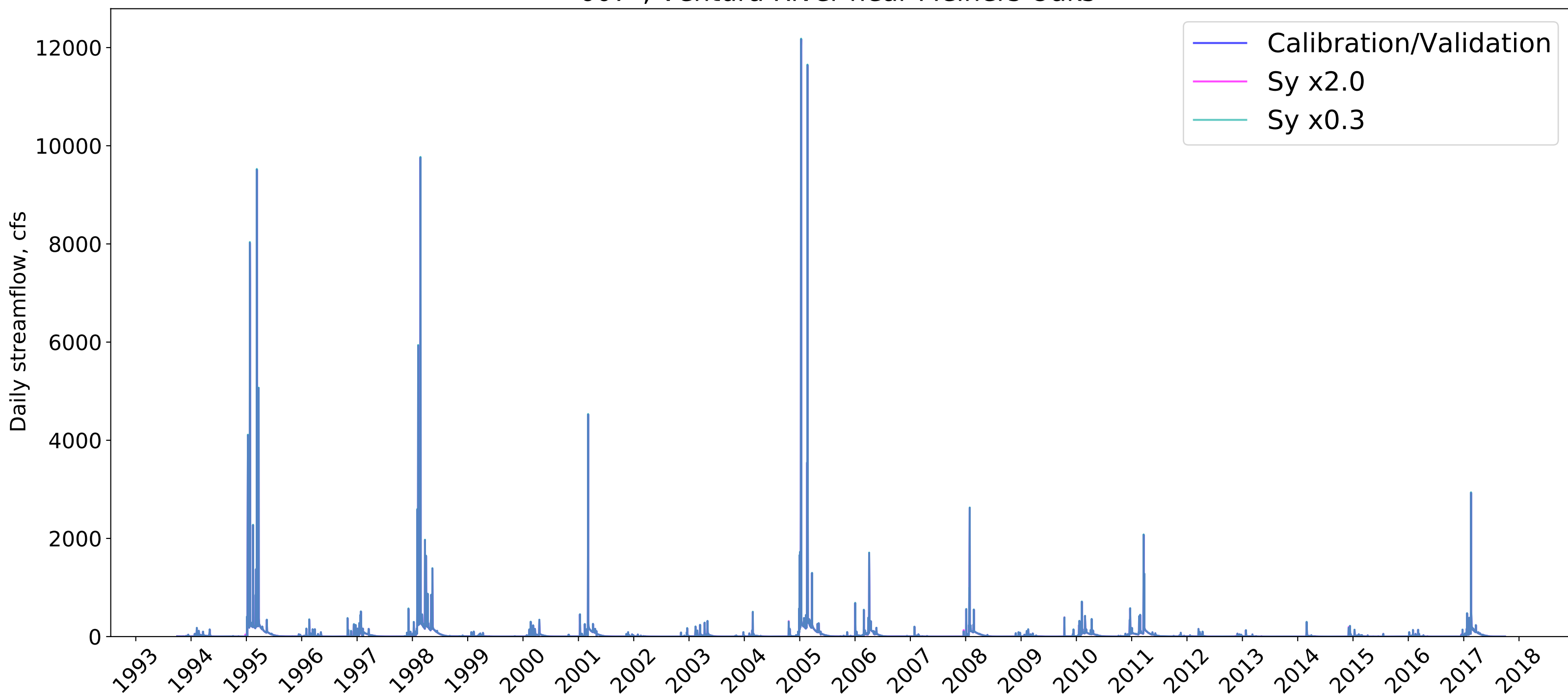
607*, Ventura River near Meiners Oaks*



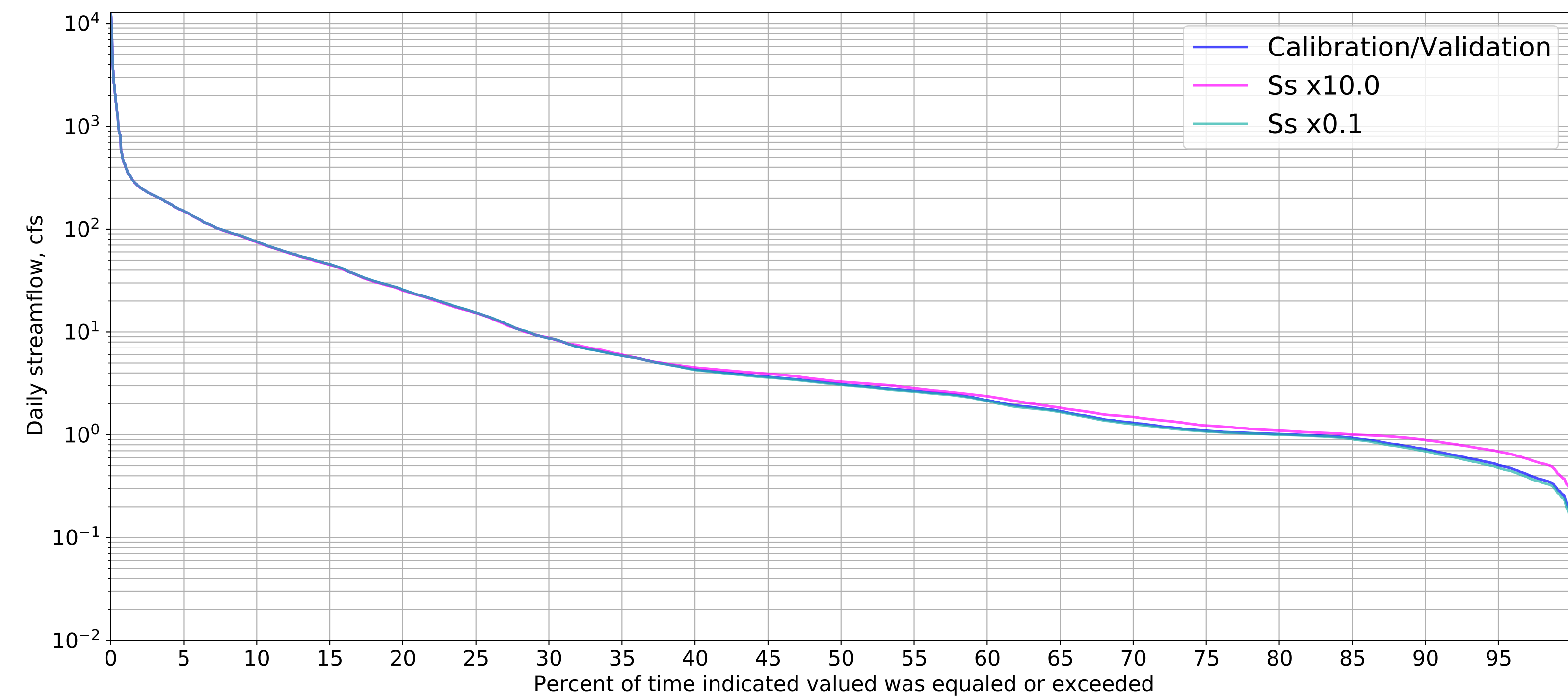
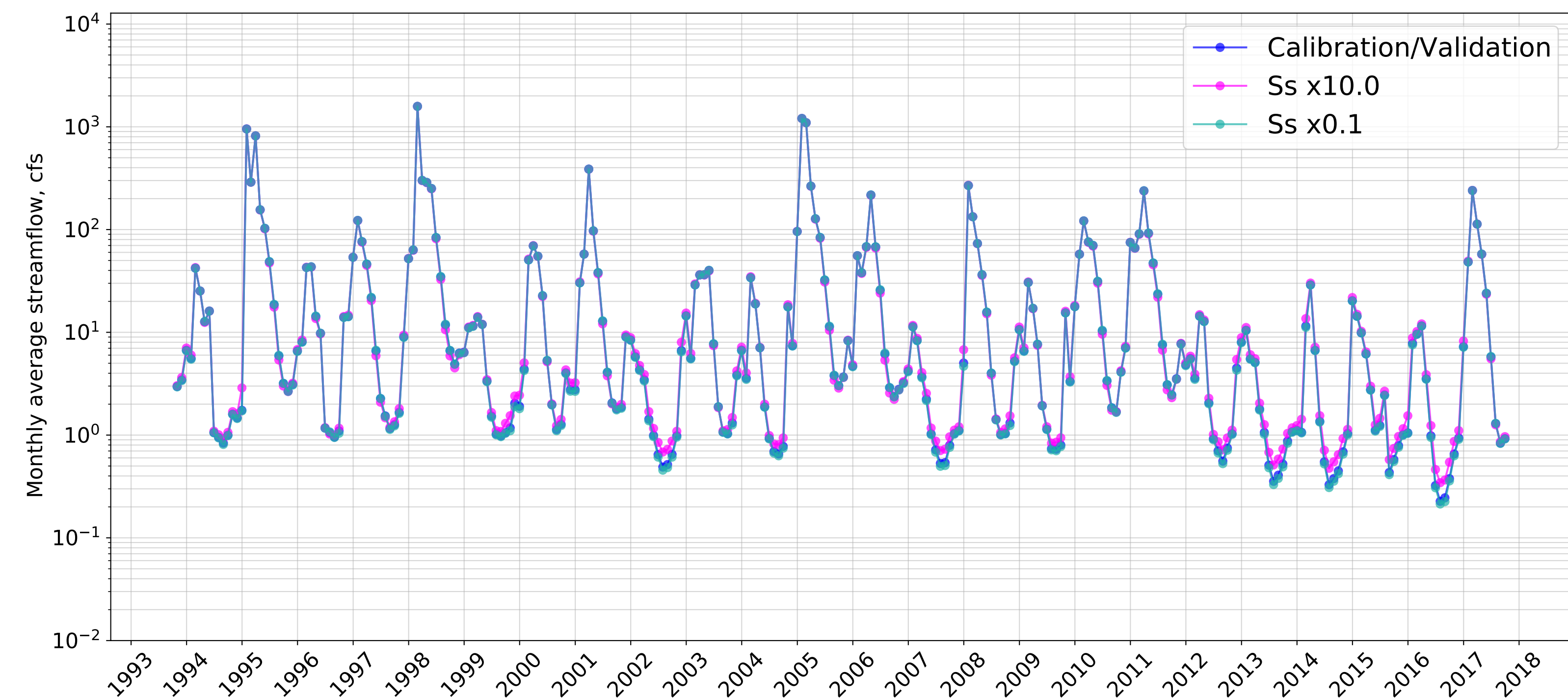
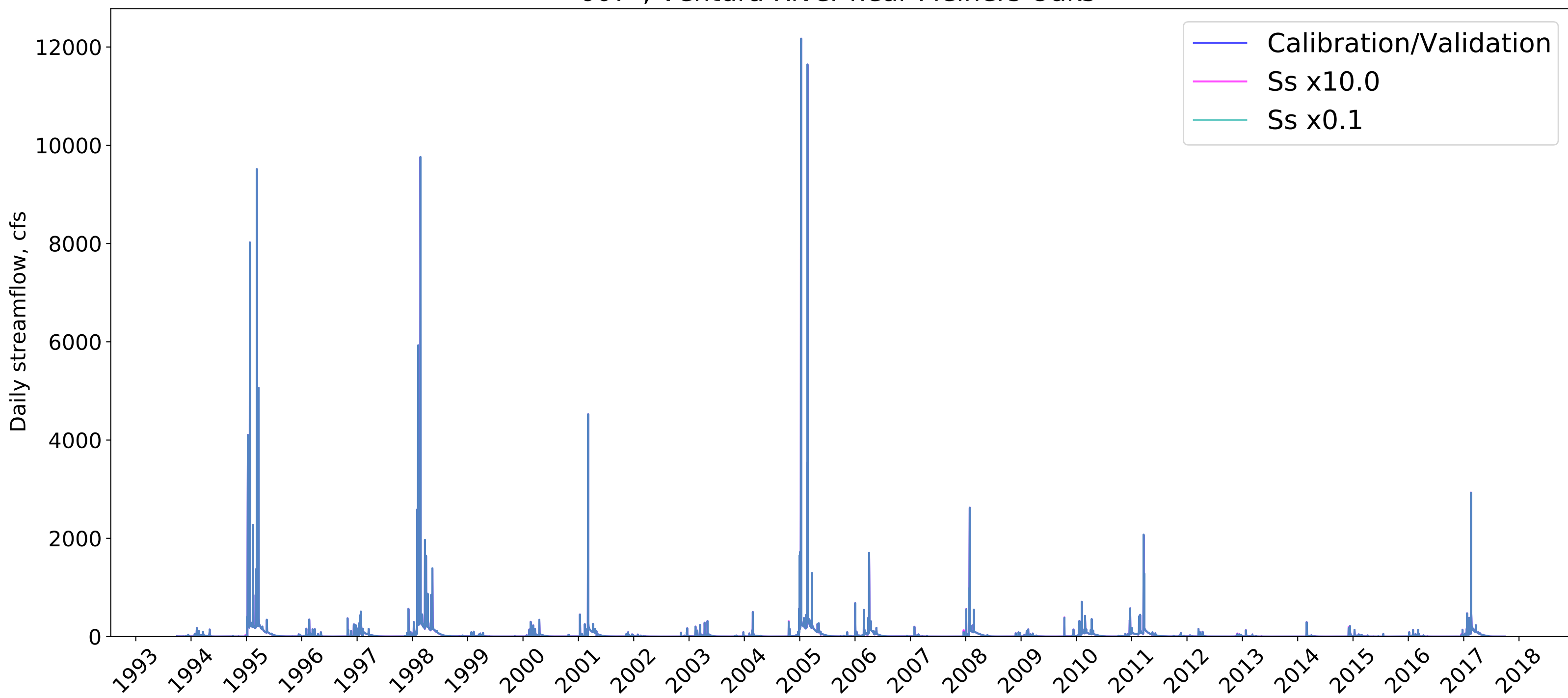
607*, Ventura River near Meiners Oaks*



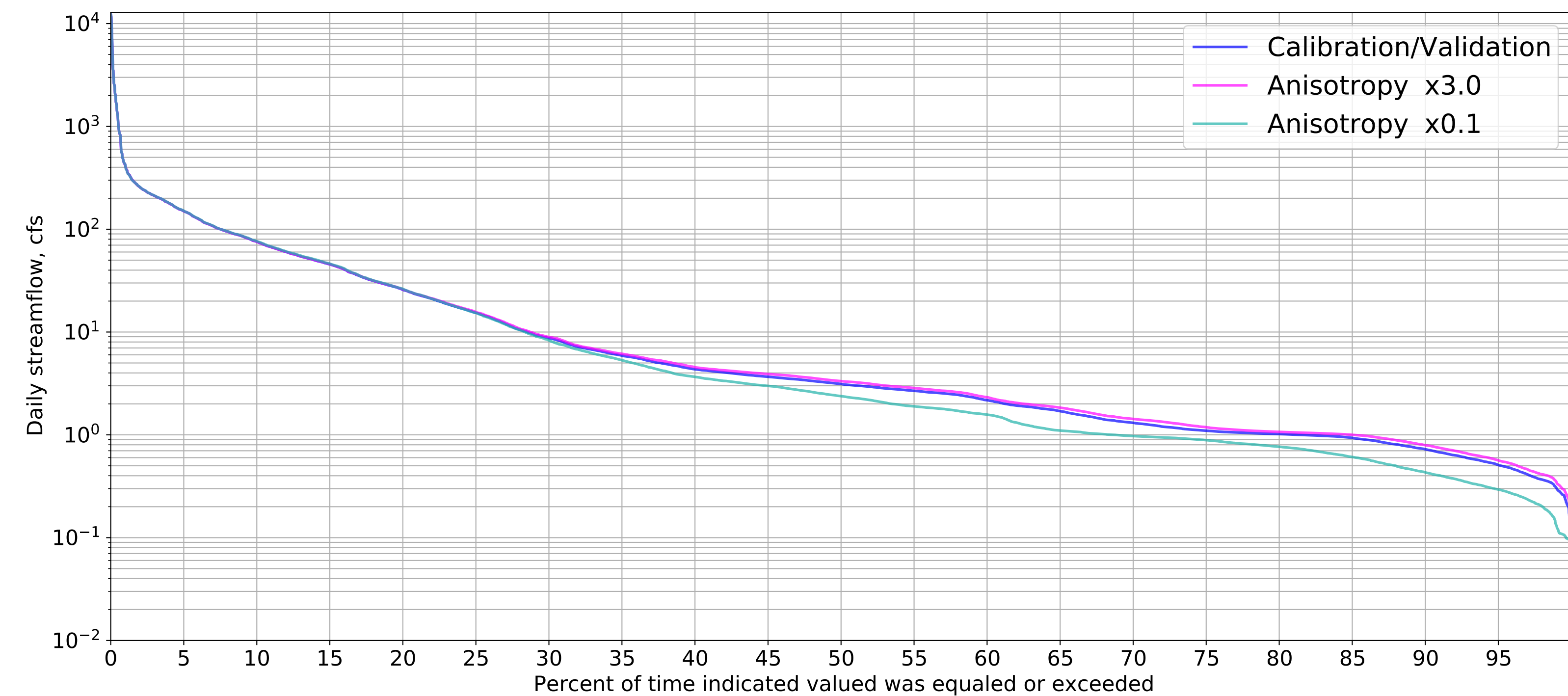
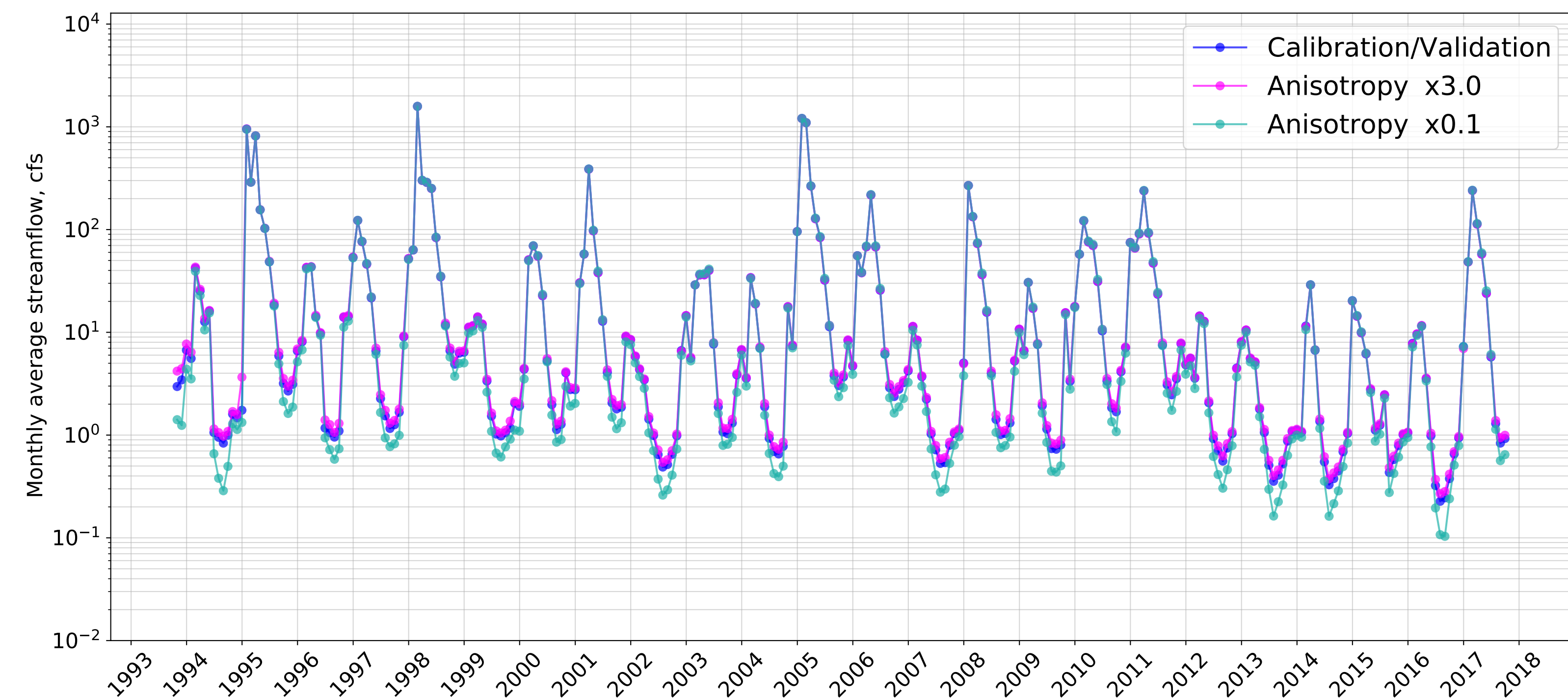
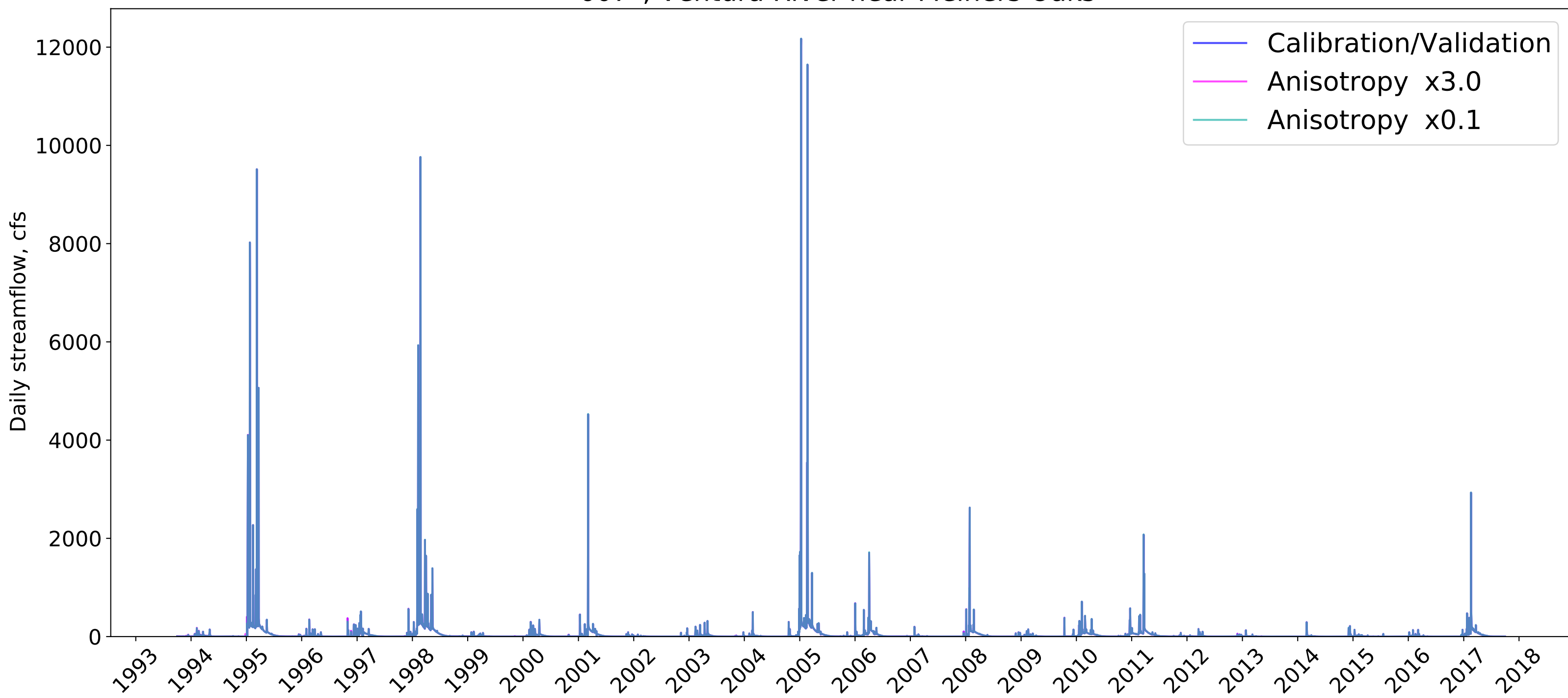
607*, Ventura River near Meiners Oaks*



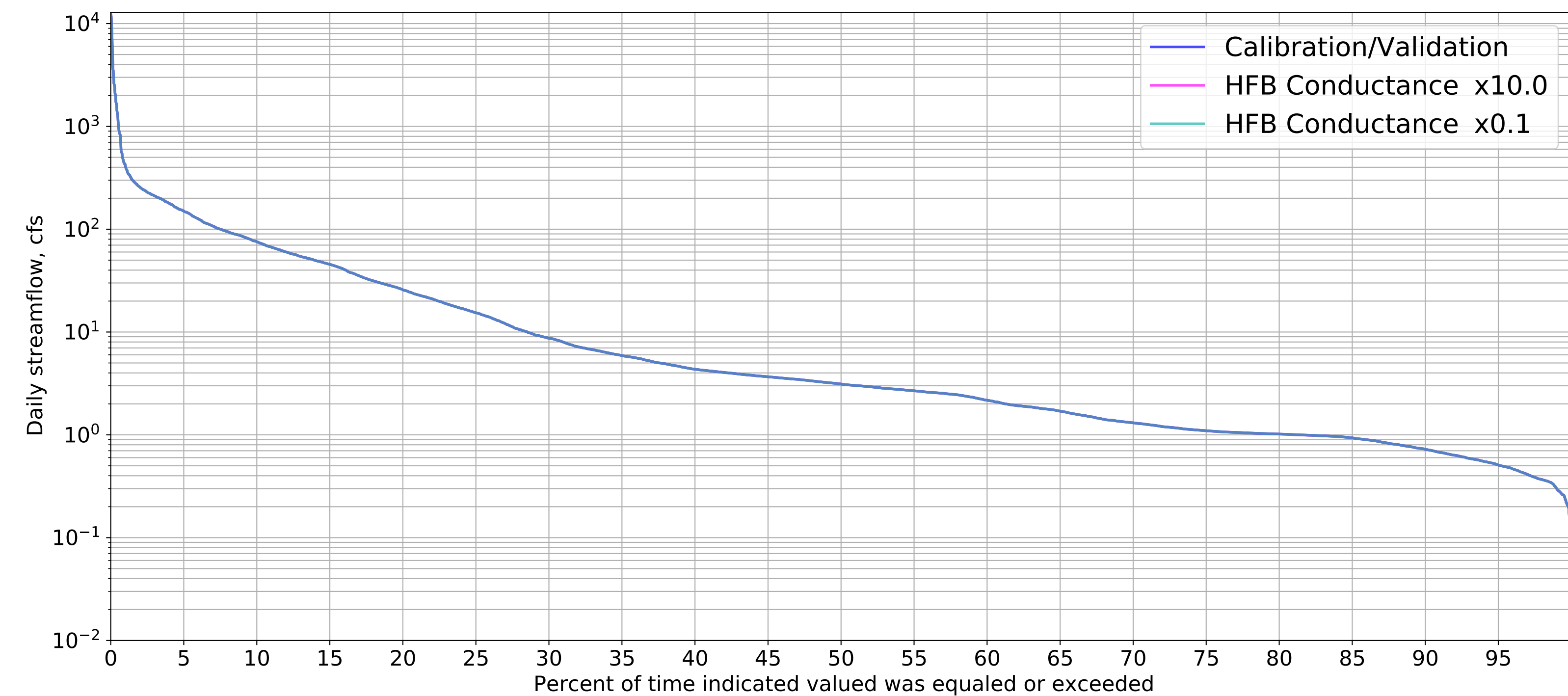
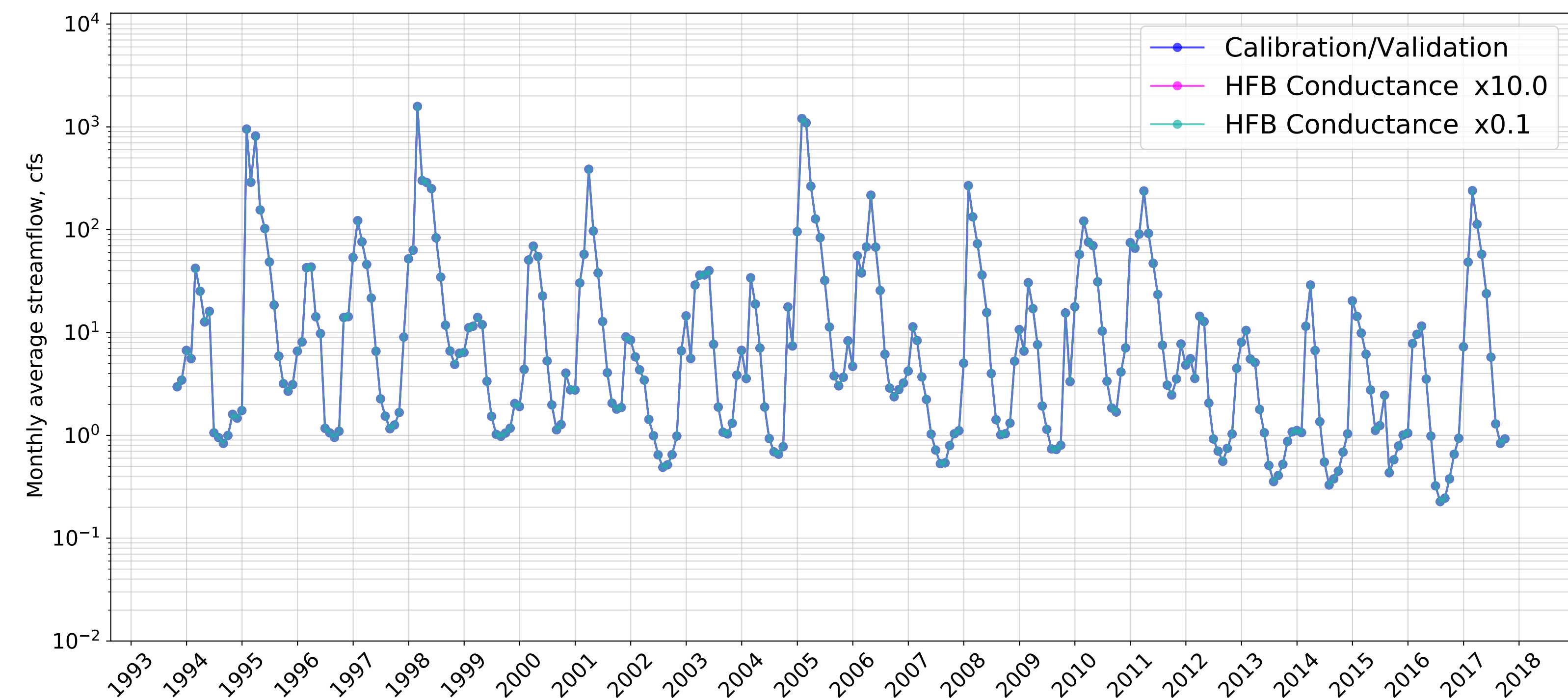
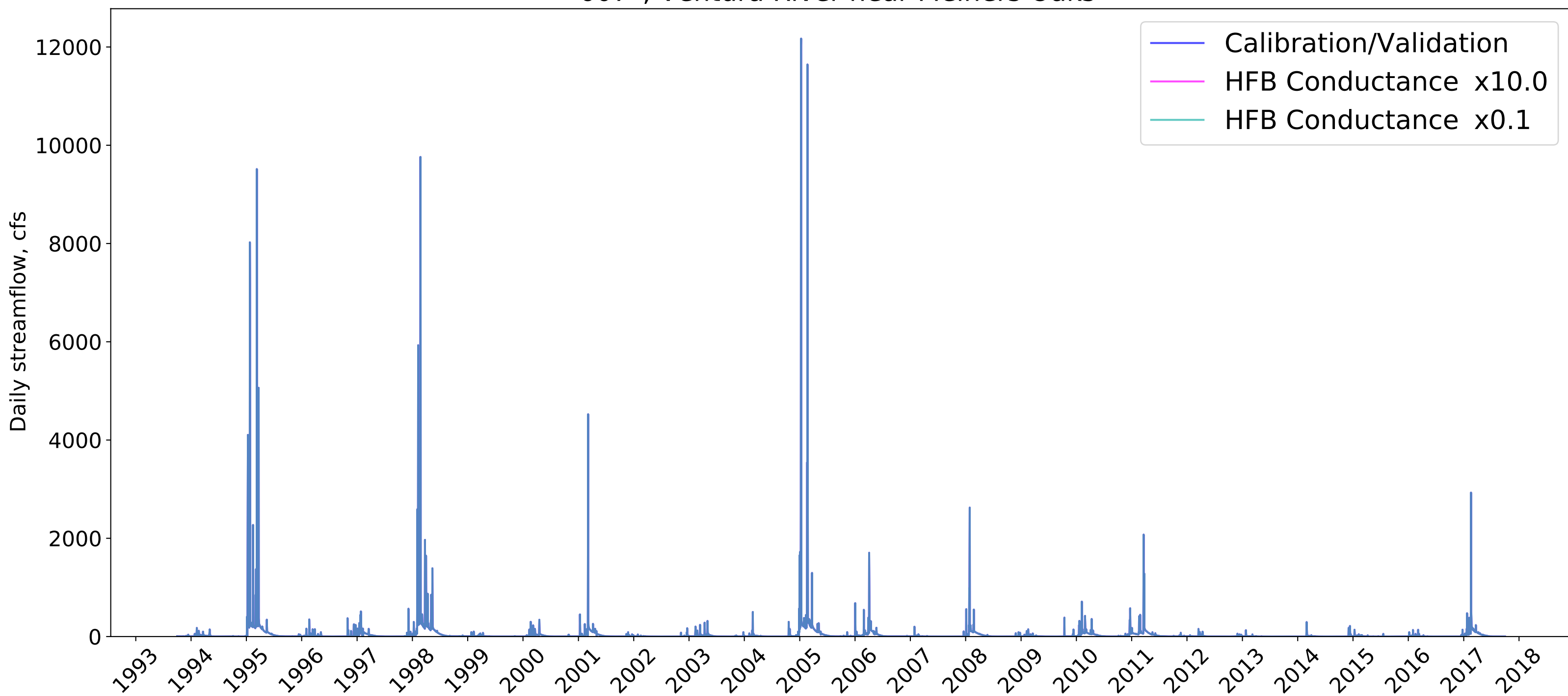
607*, Ventura River near Meiners Oaks*



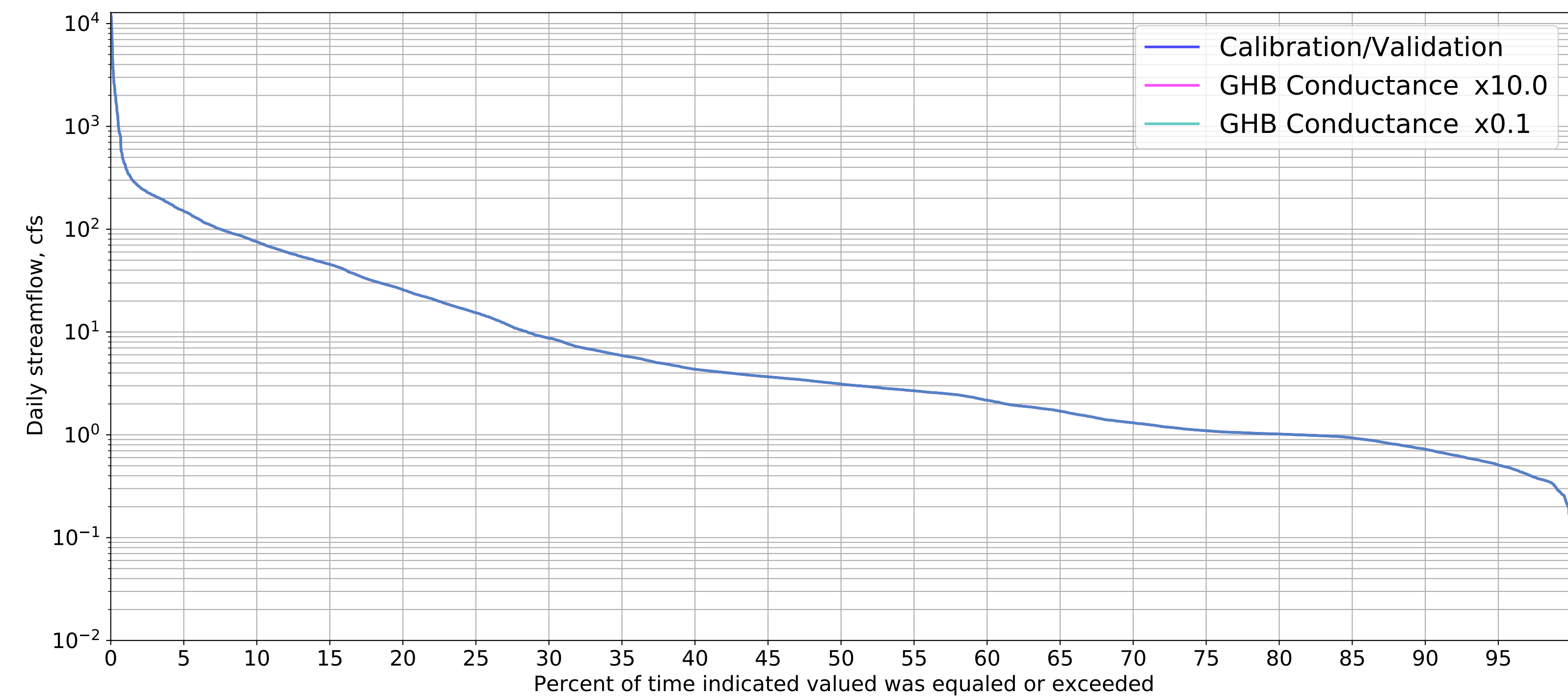
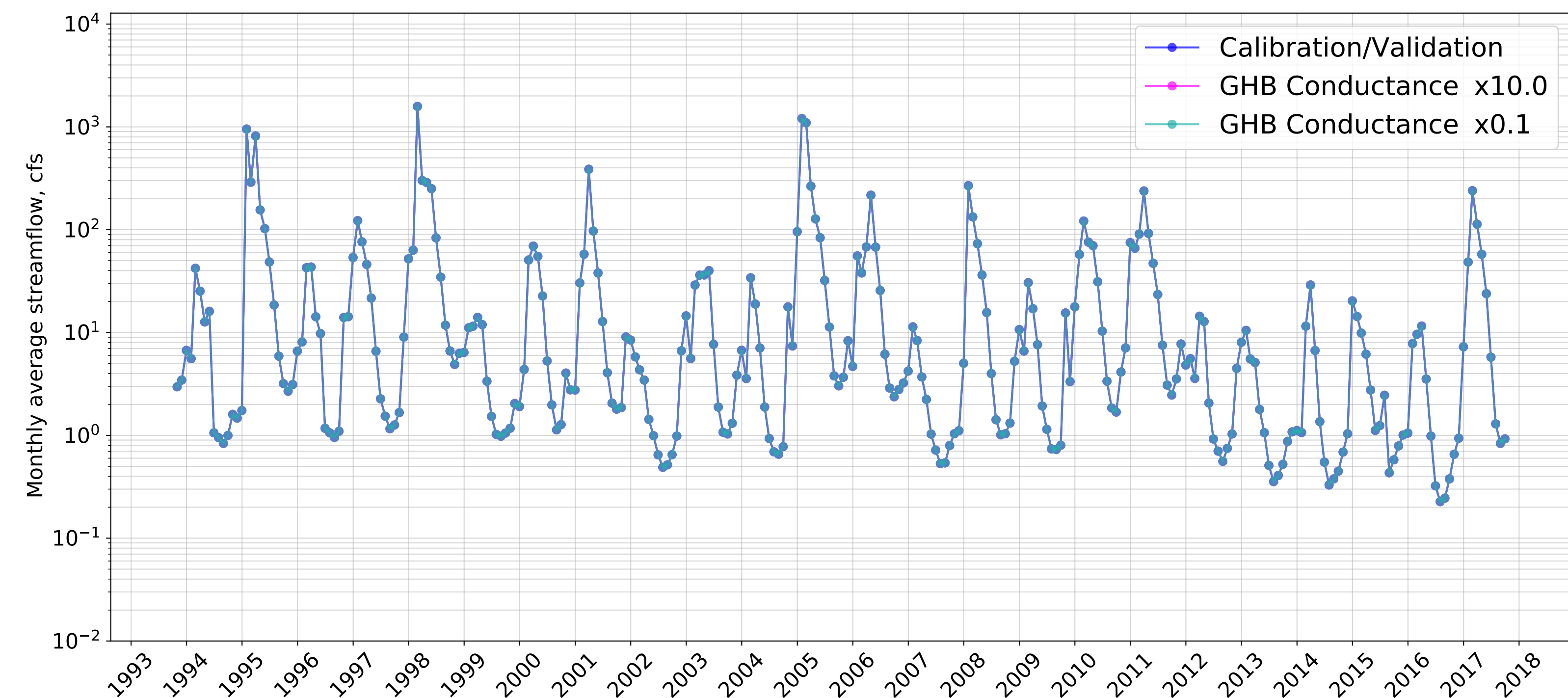
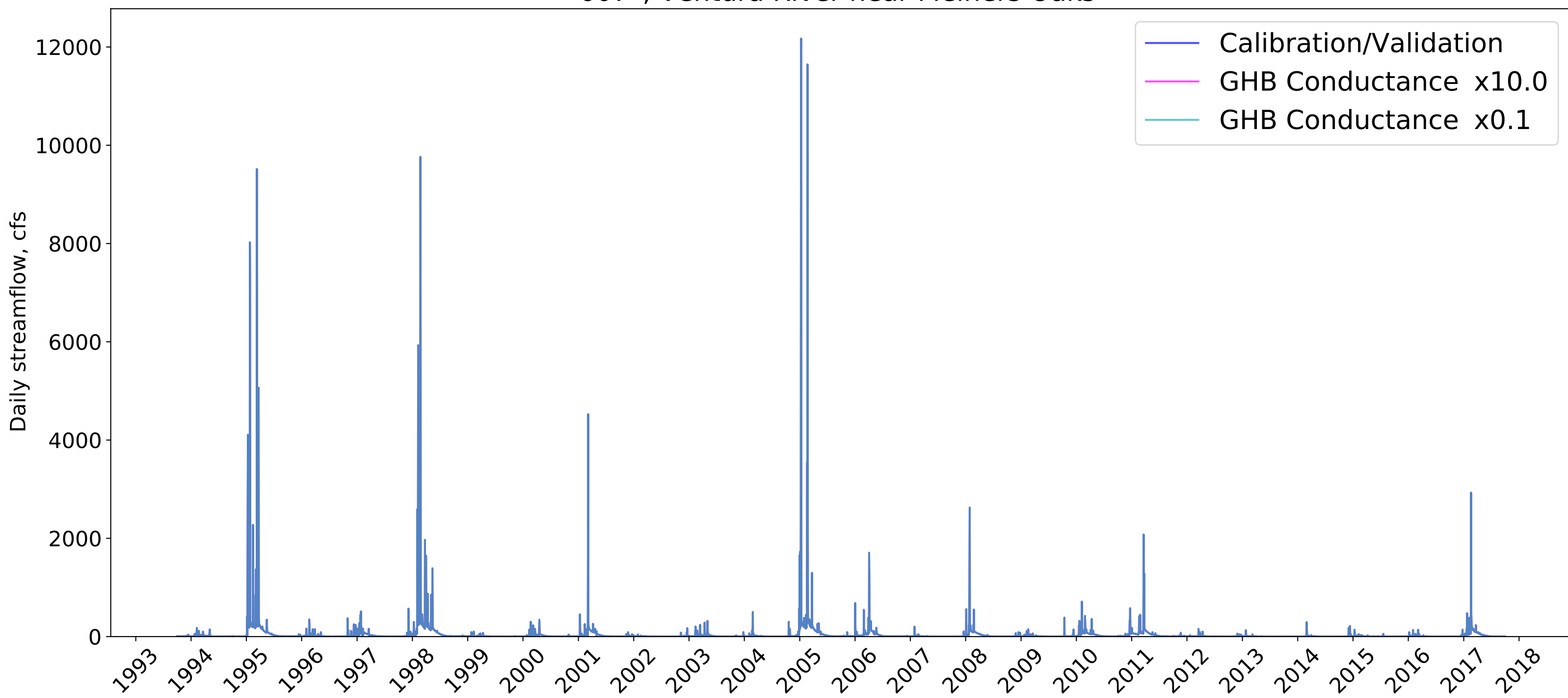
607*, Ventura River near Meiners Oaks*



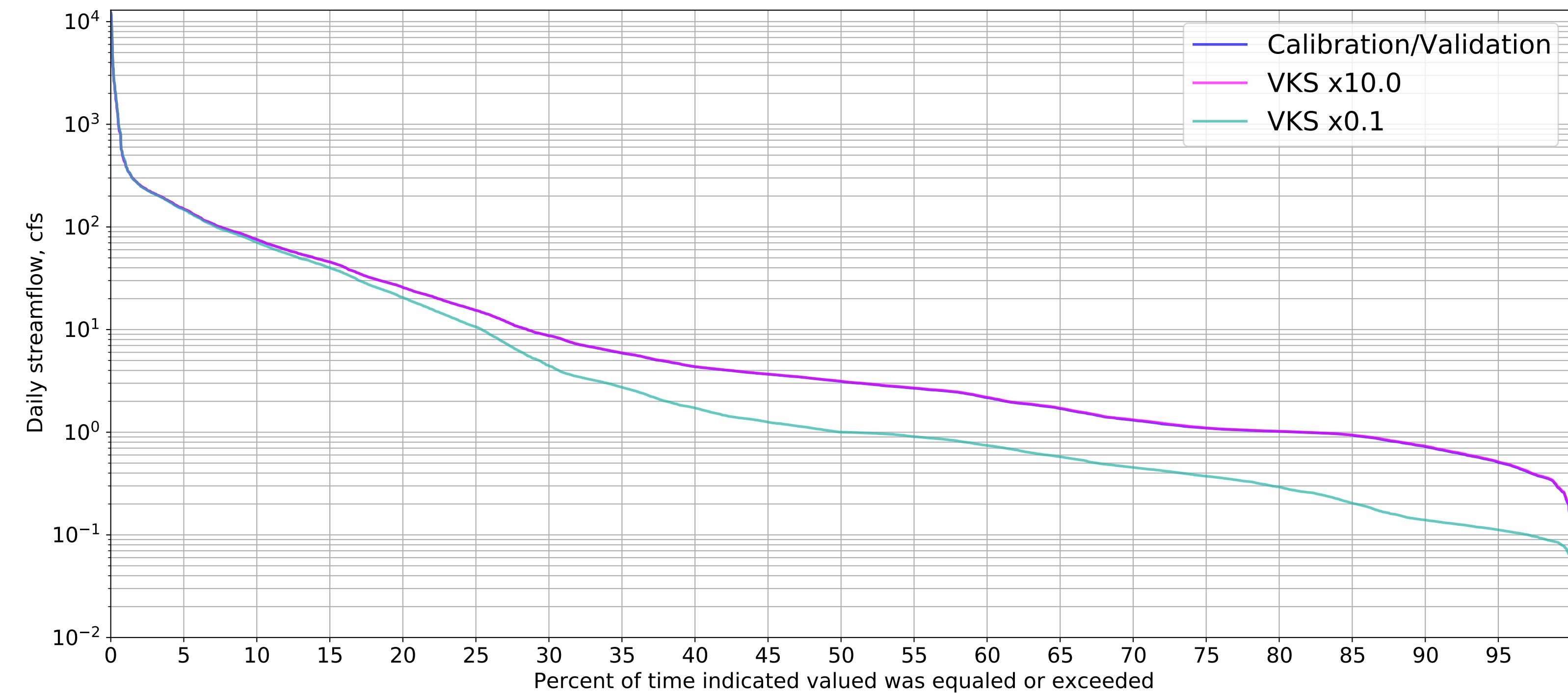
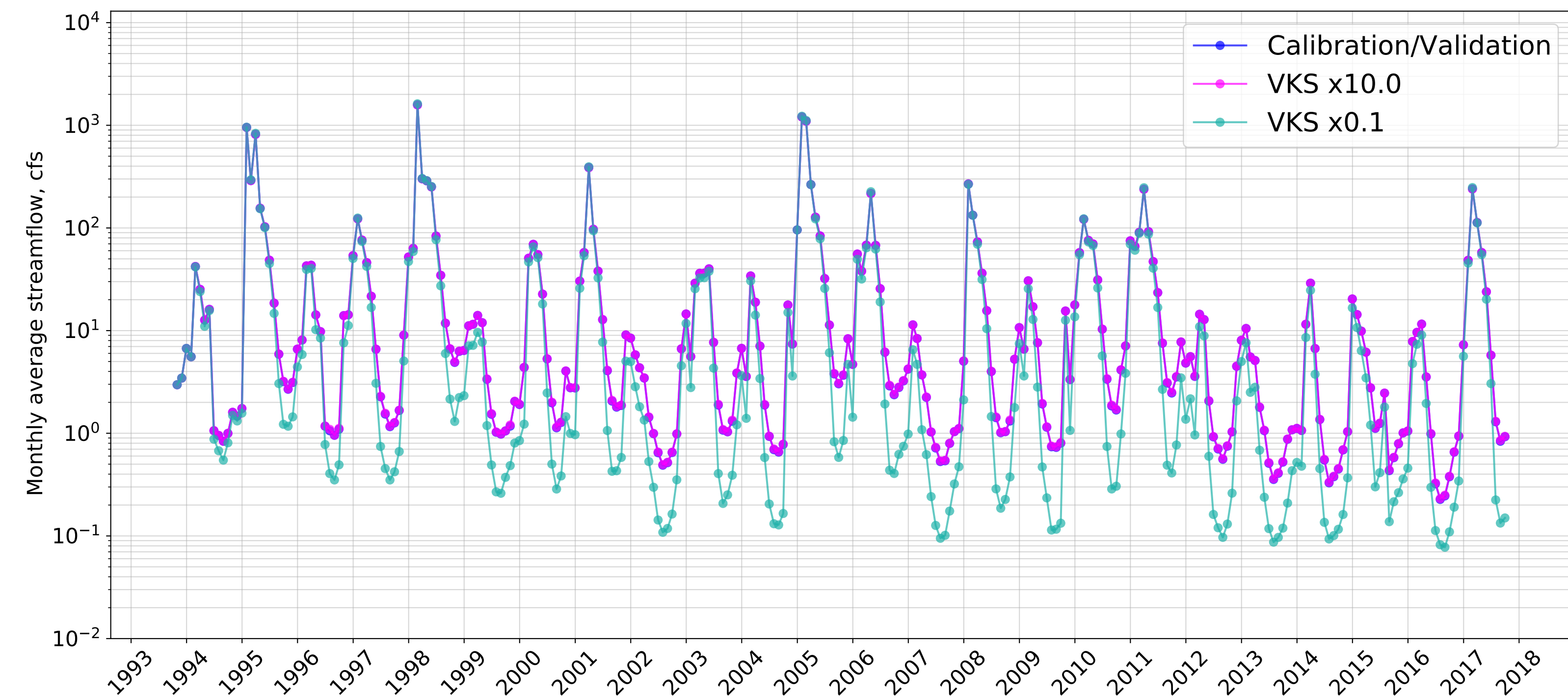
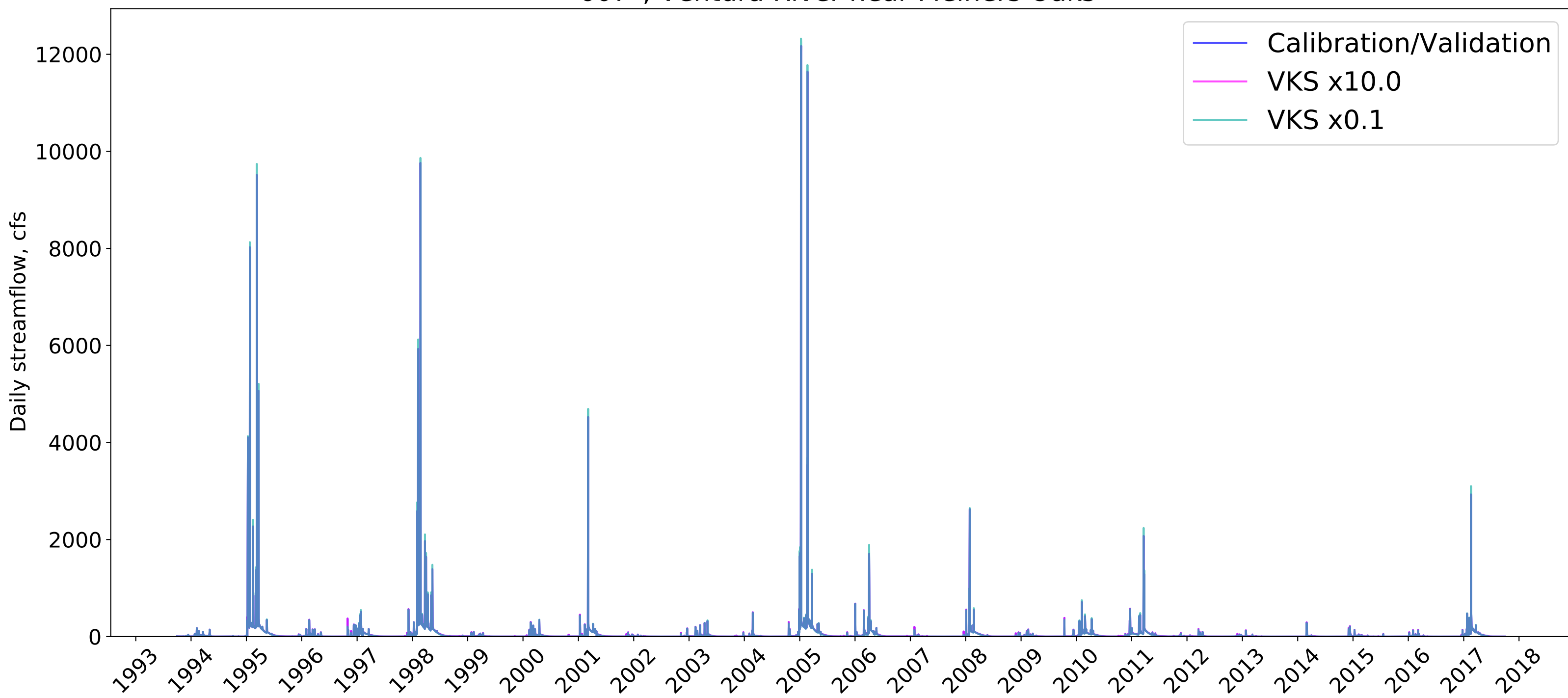
607*, Ventura River near Meiners Oaks*



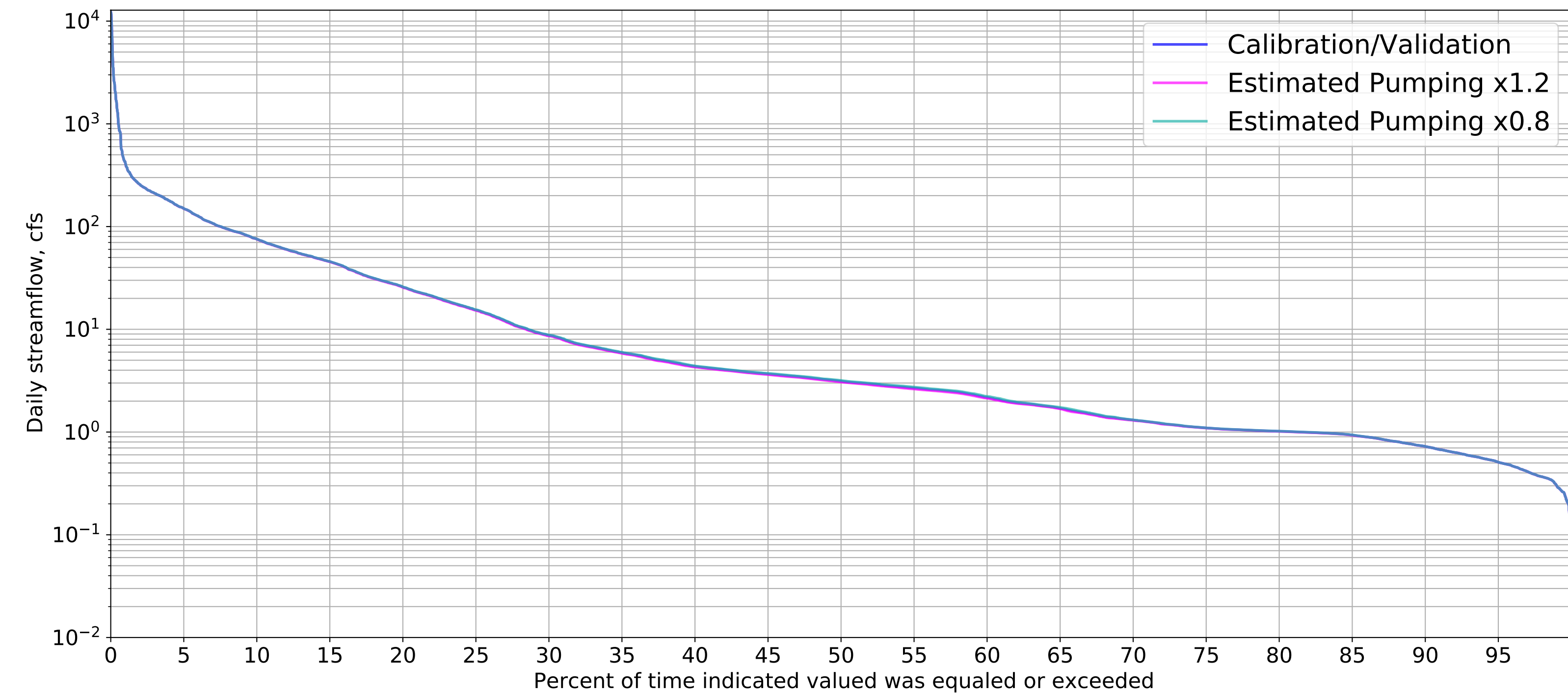
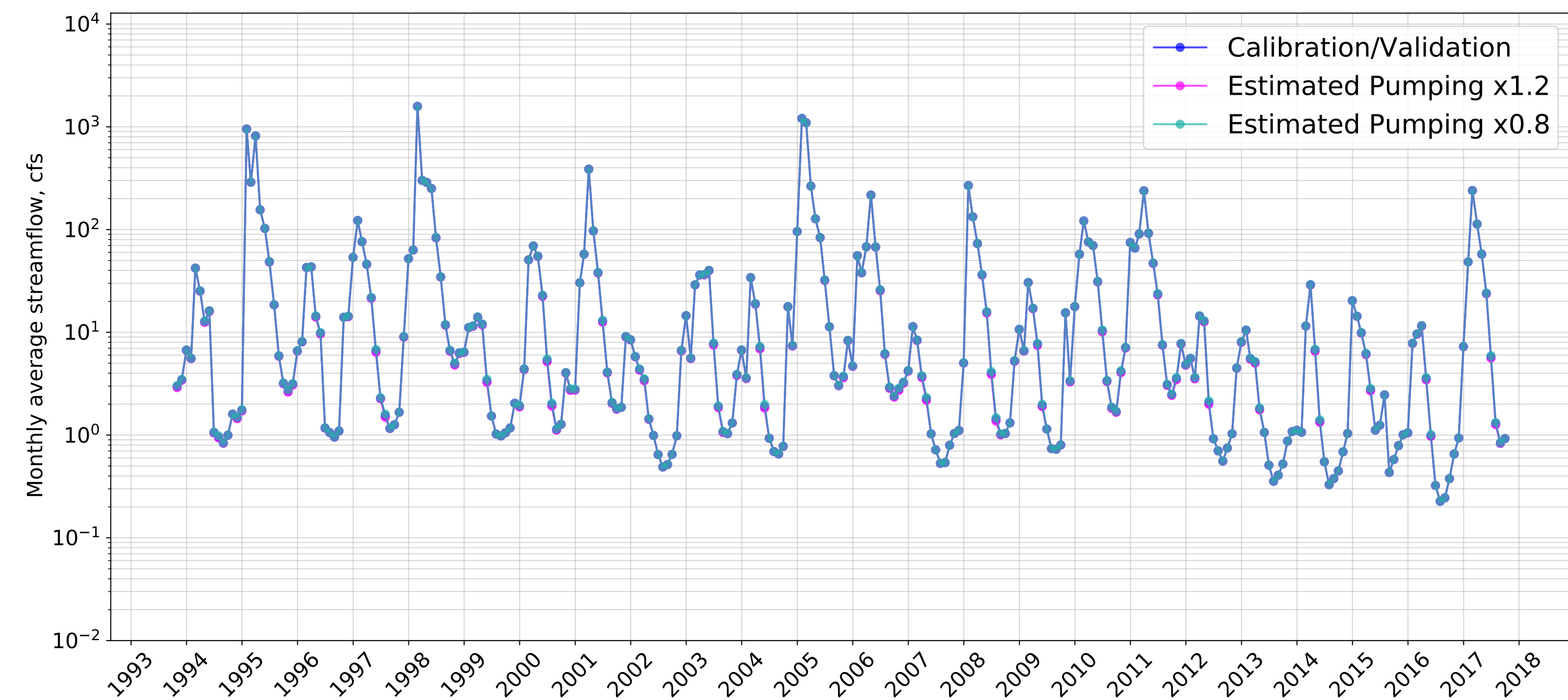
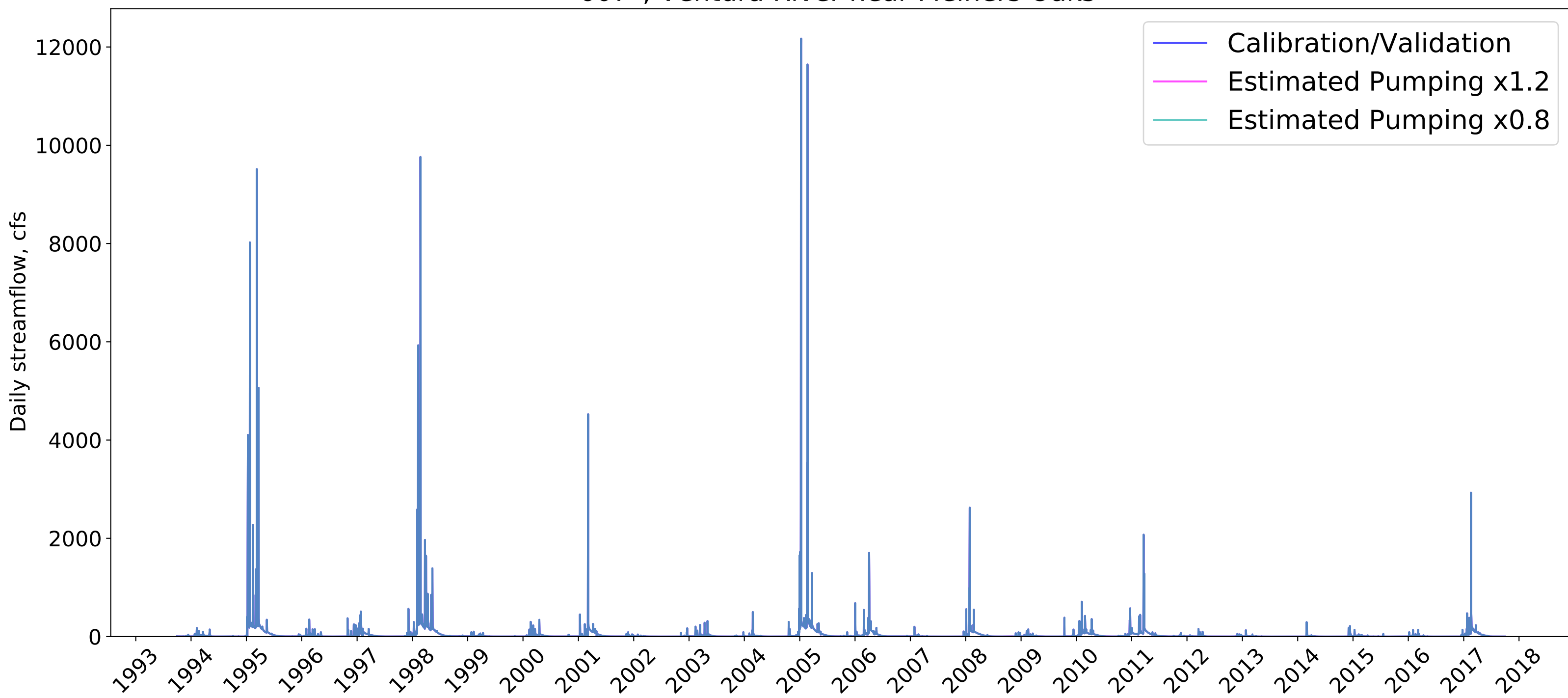
607*, Ventura River near Meiners Oaks*



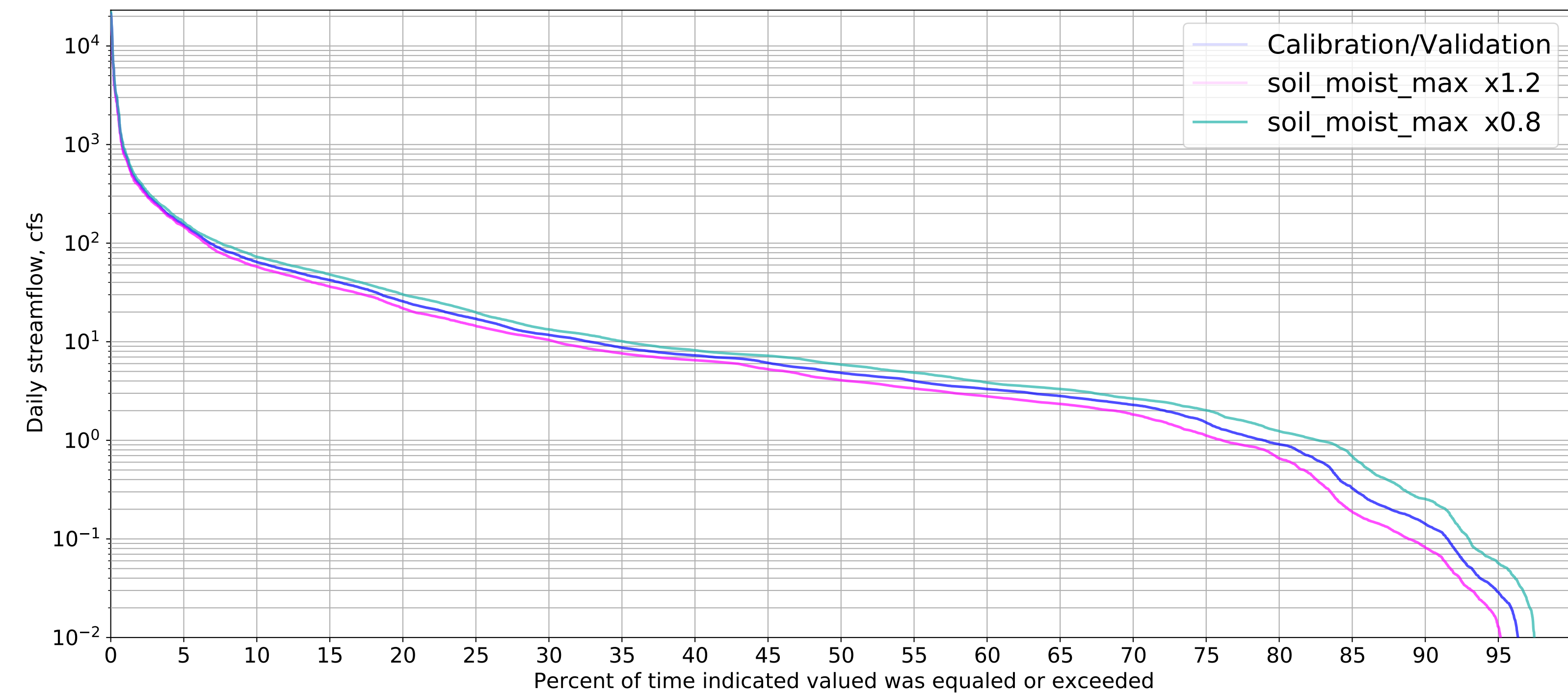
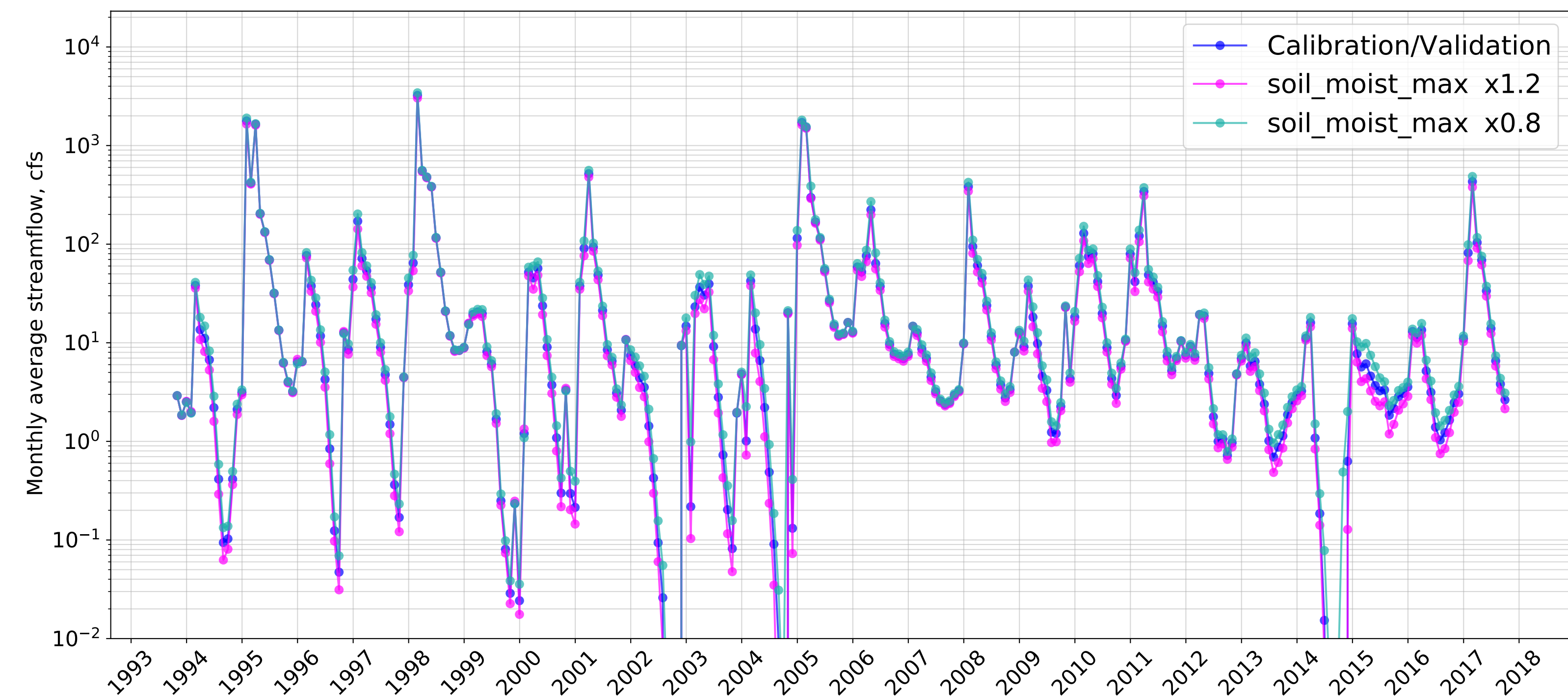
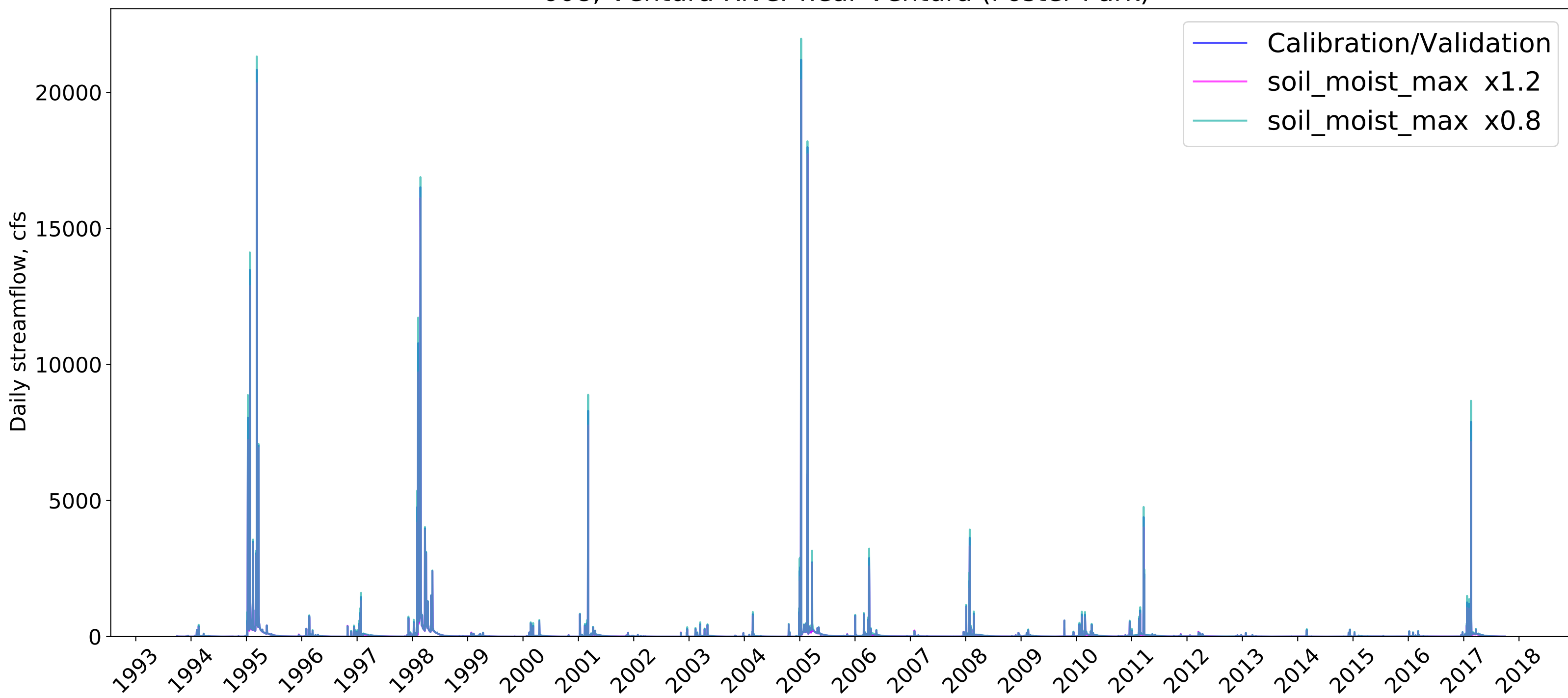
607*, Ventura River near Meiners Oaks*



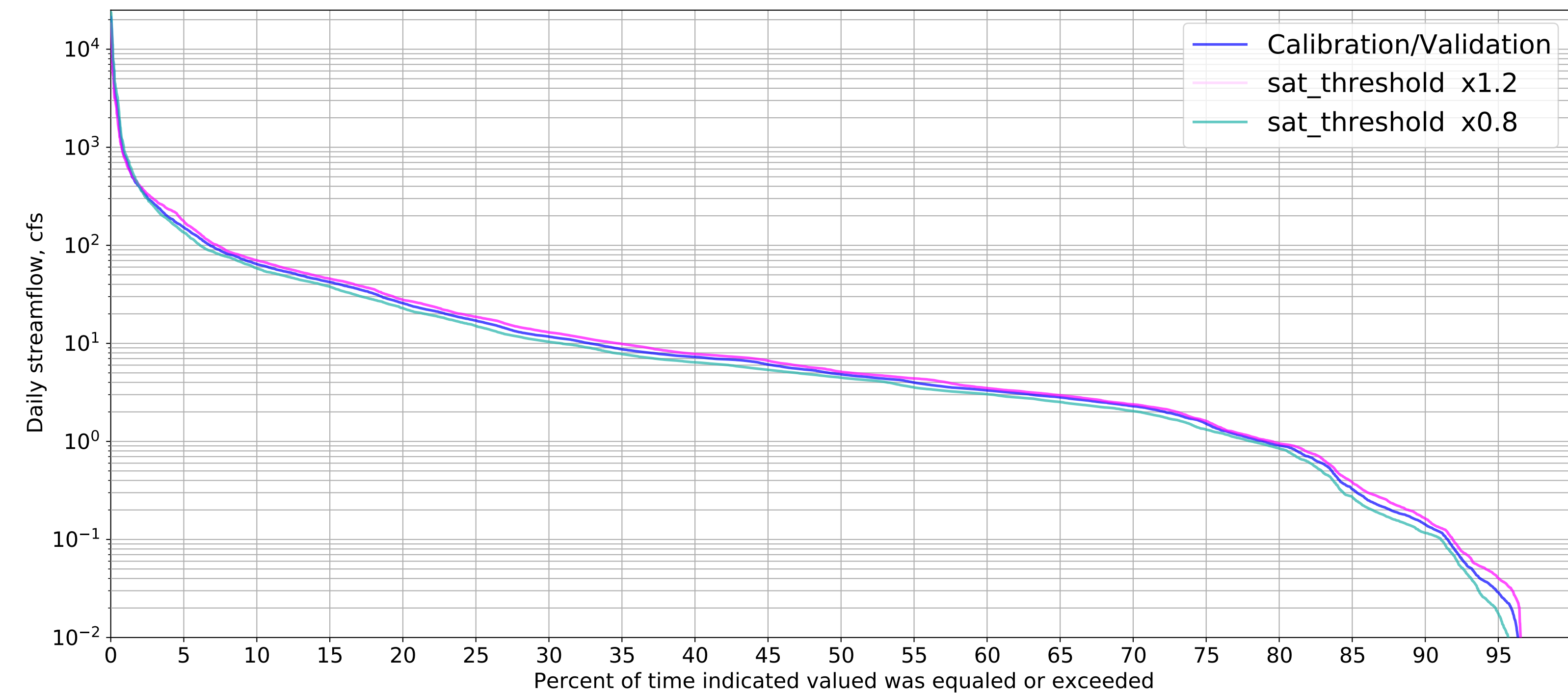
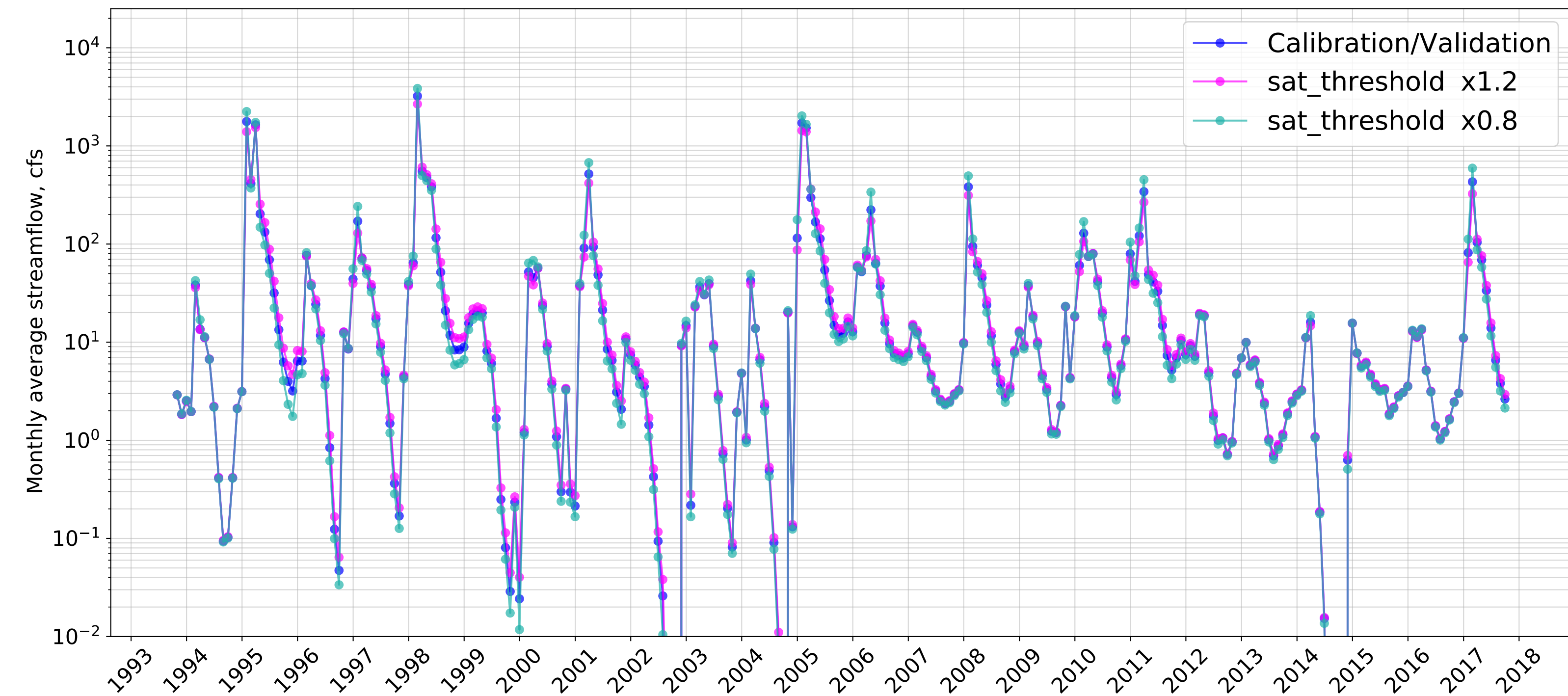
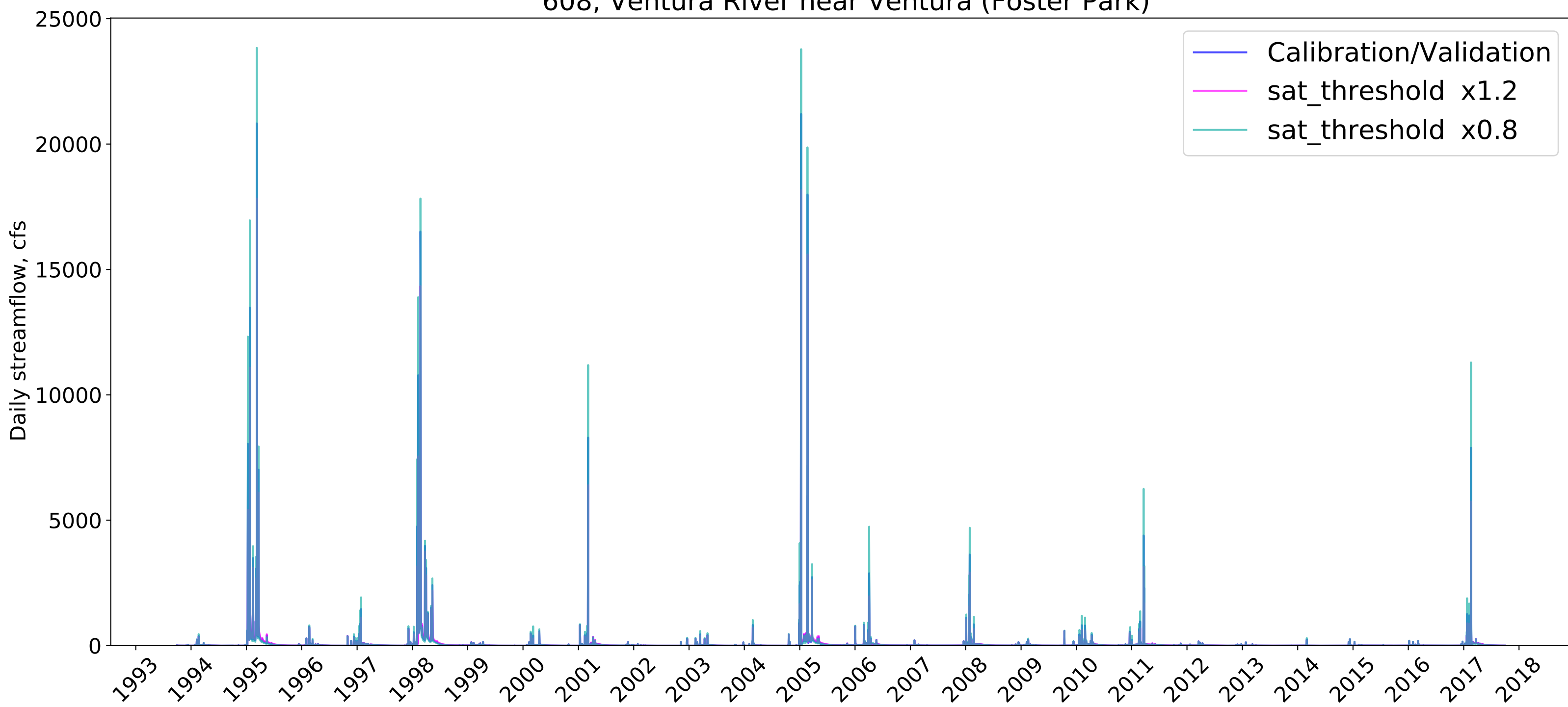
607*, Ventura River near Meiners Oaks*



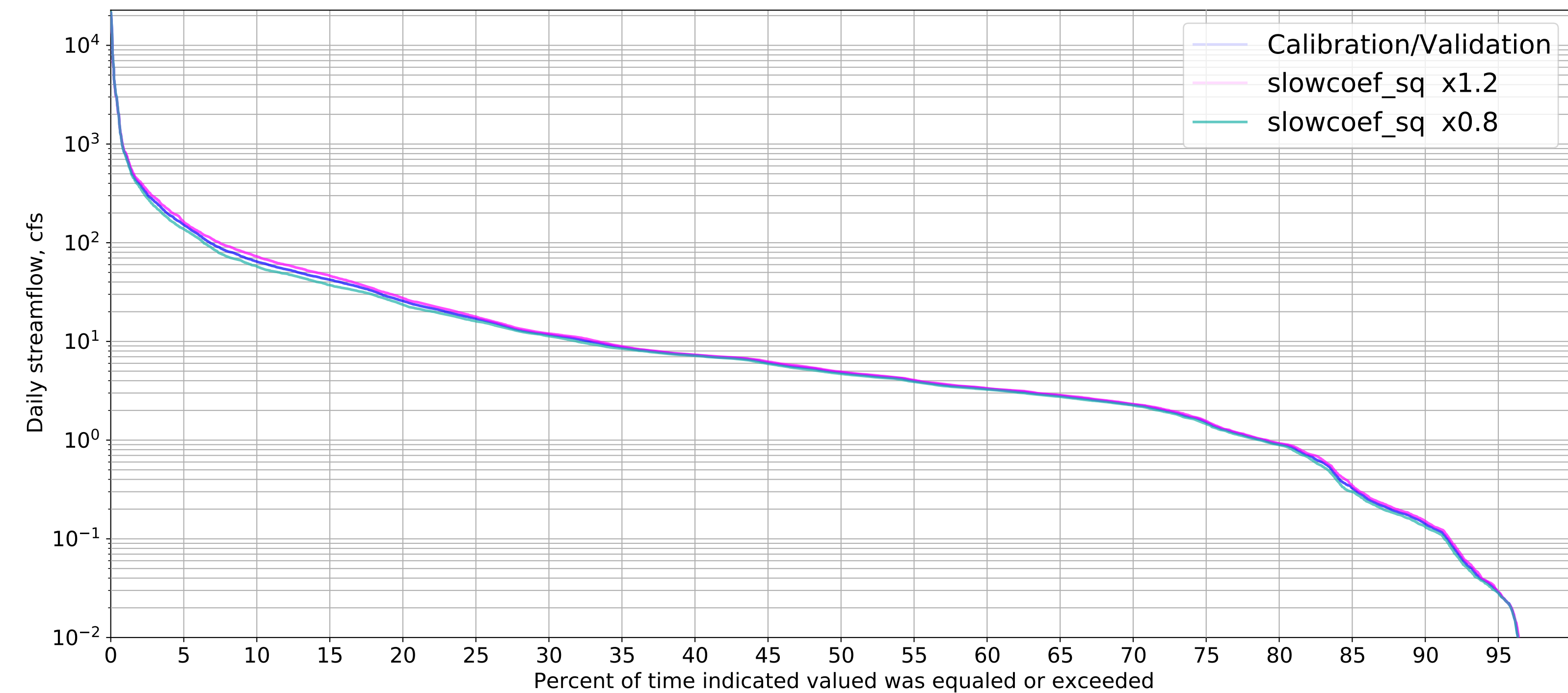
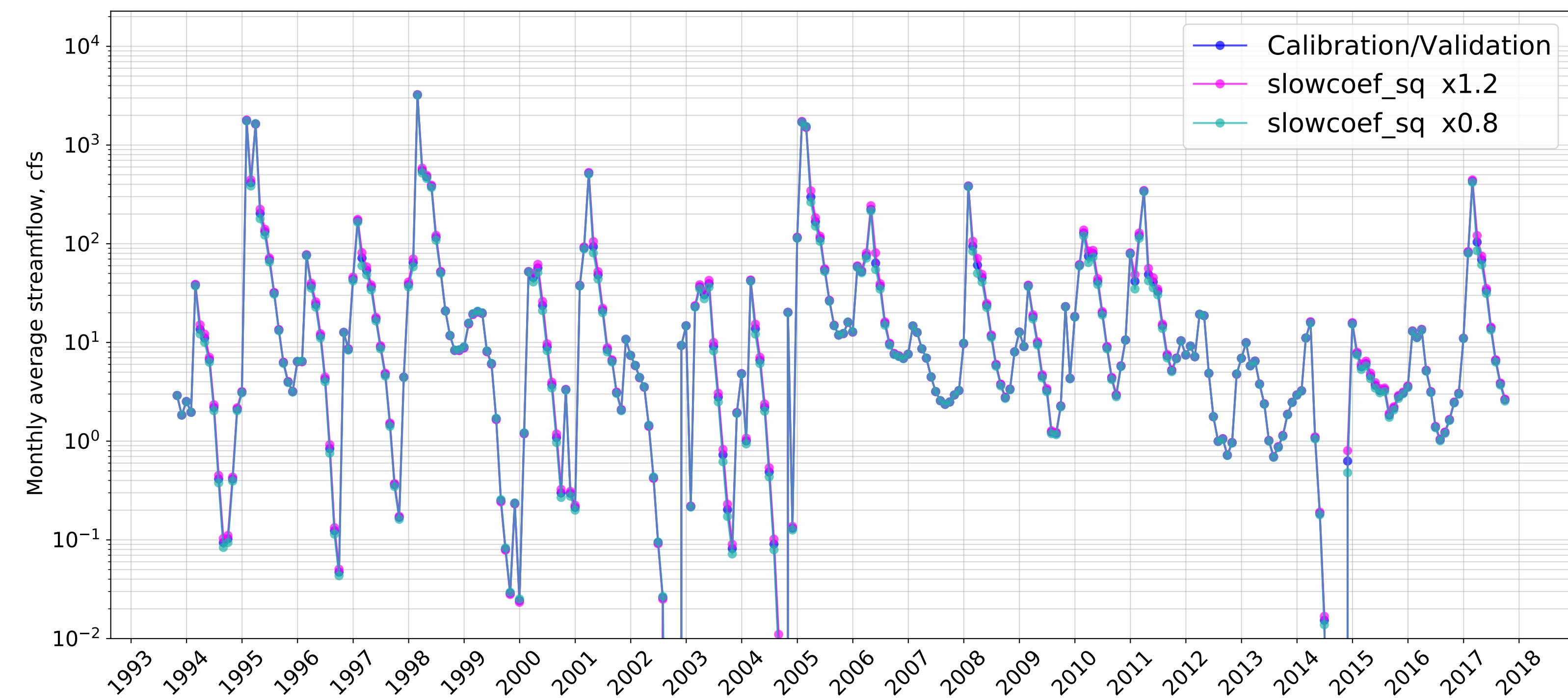
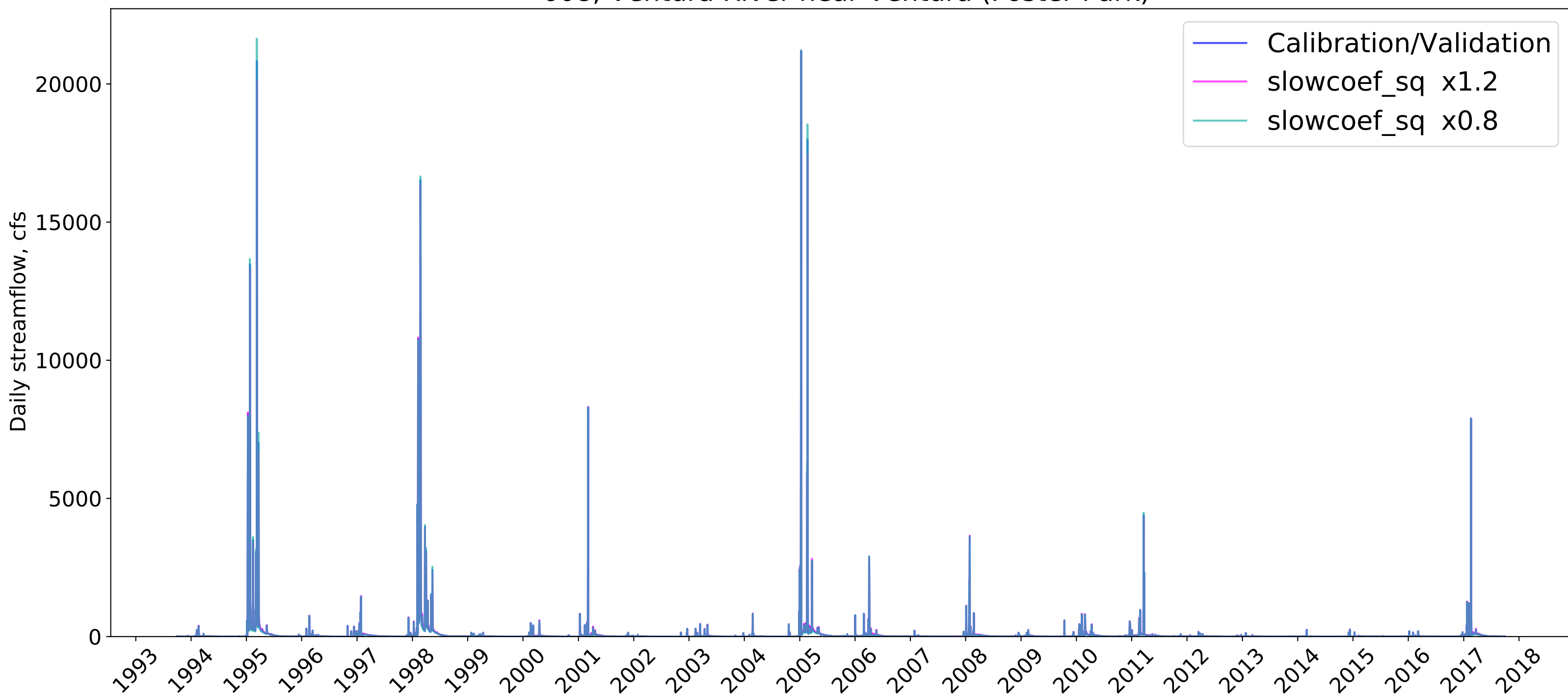
608, Ventura River near Ventura (Foster Park)



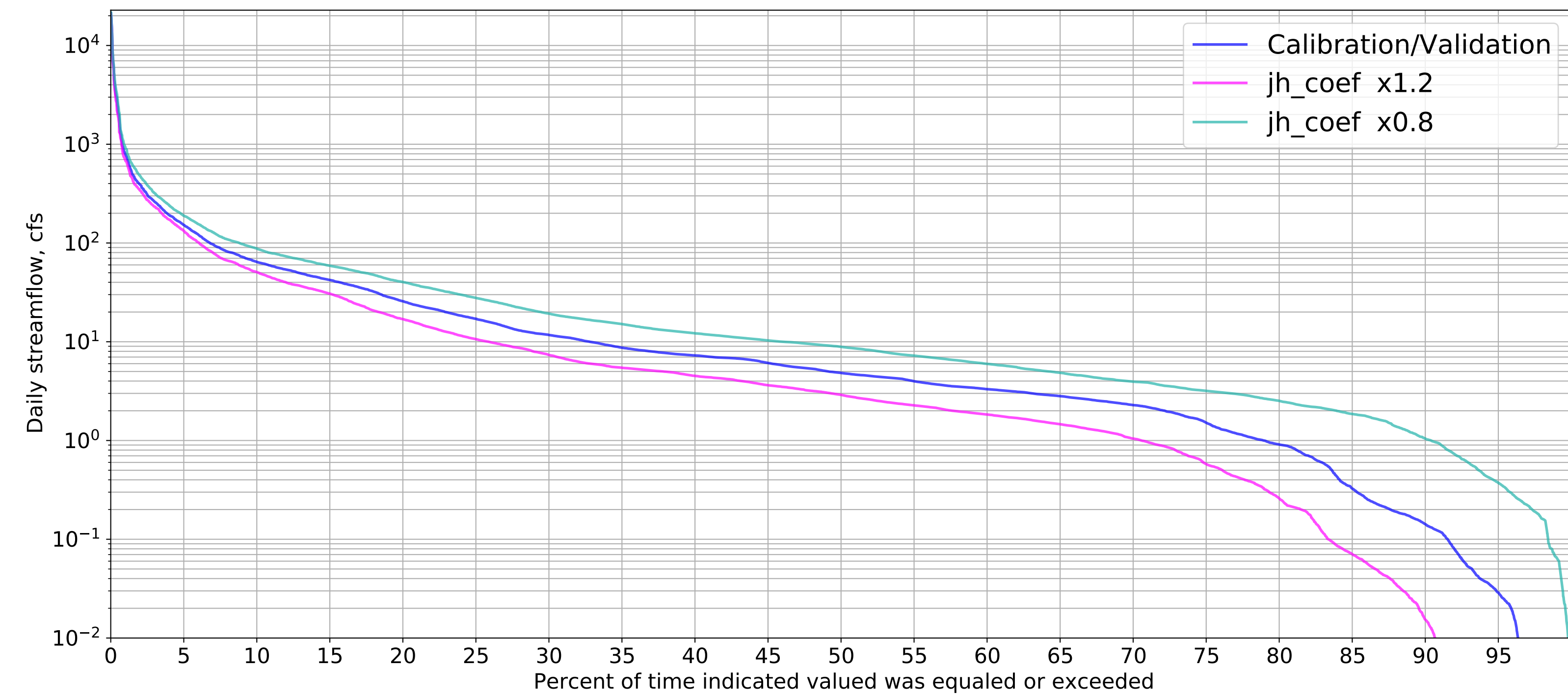
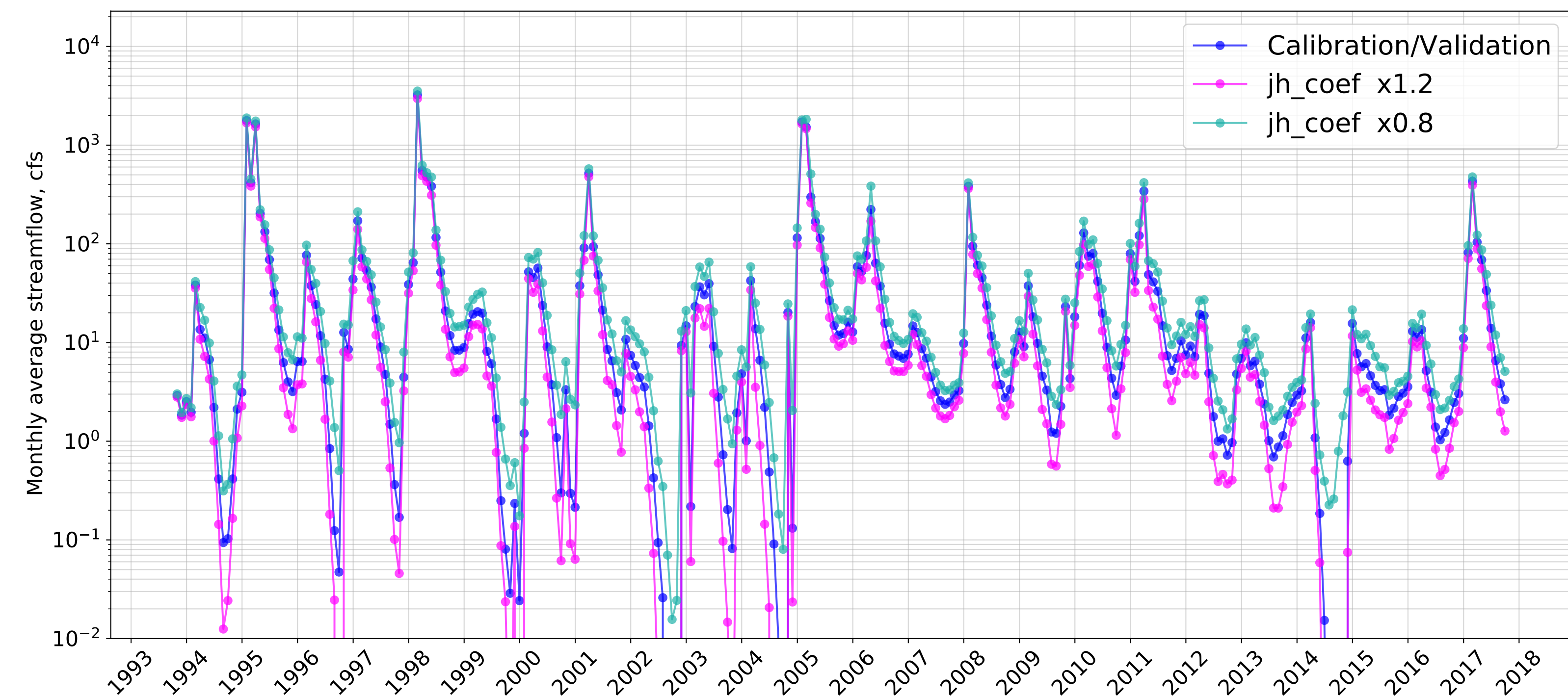
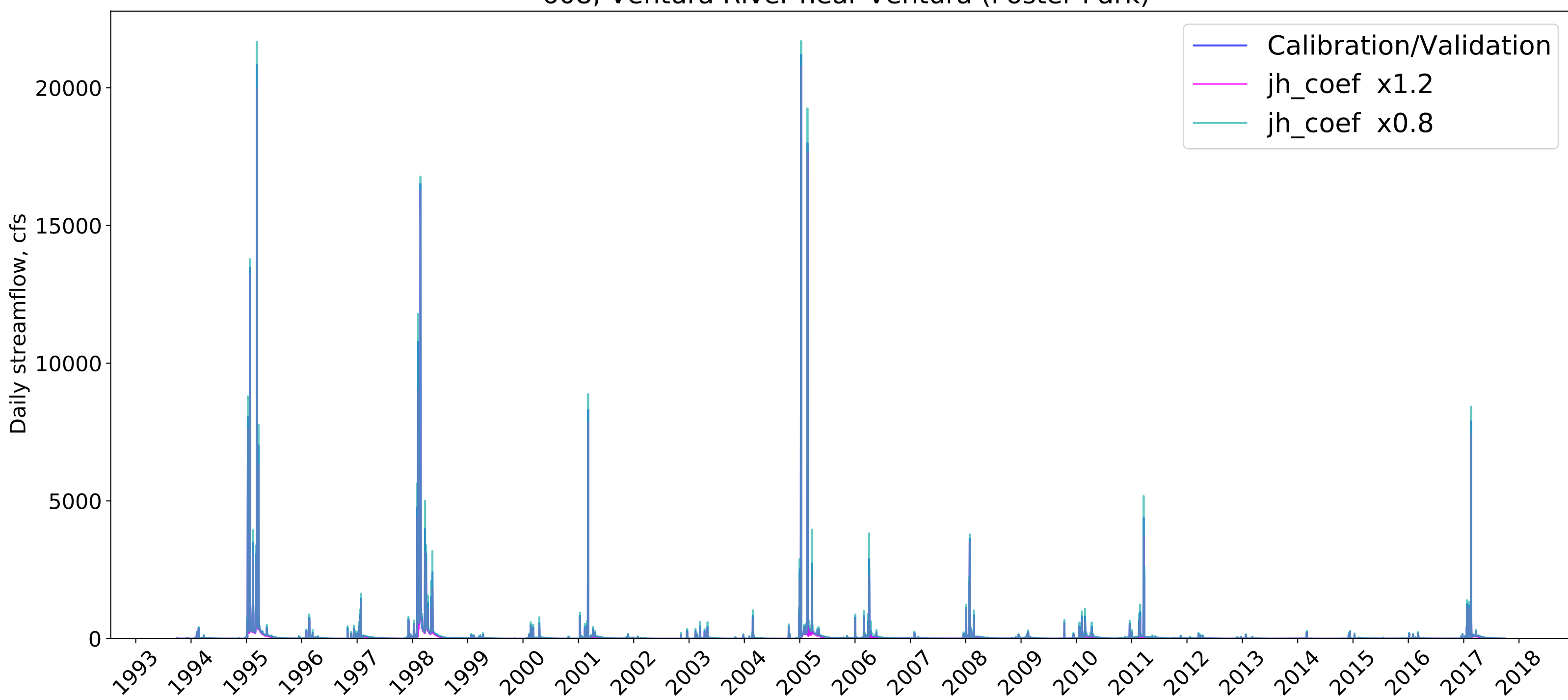
608, Ventura River near Ventura (Foster Park)



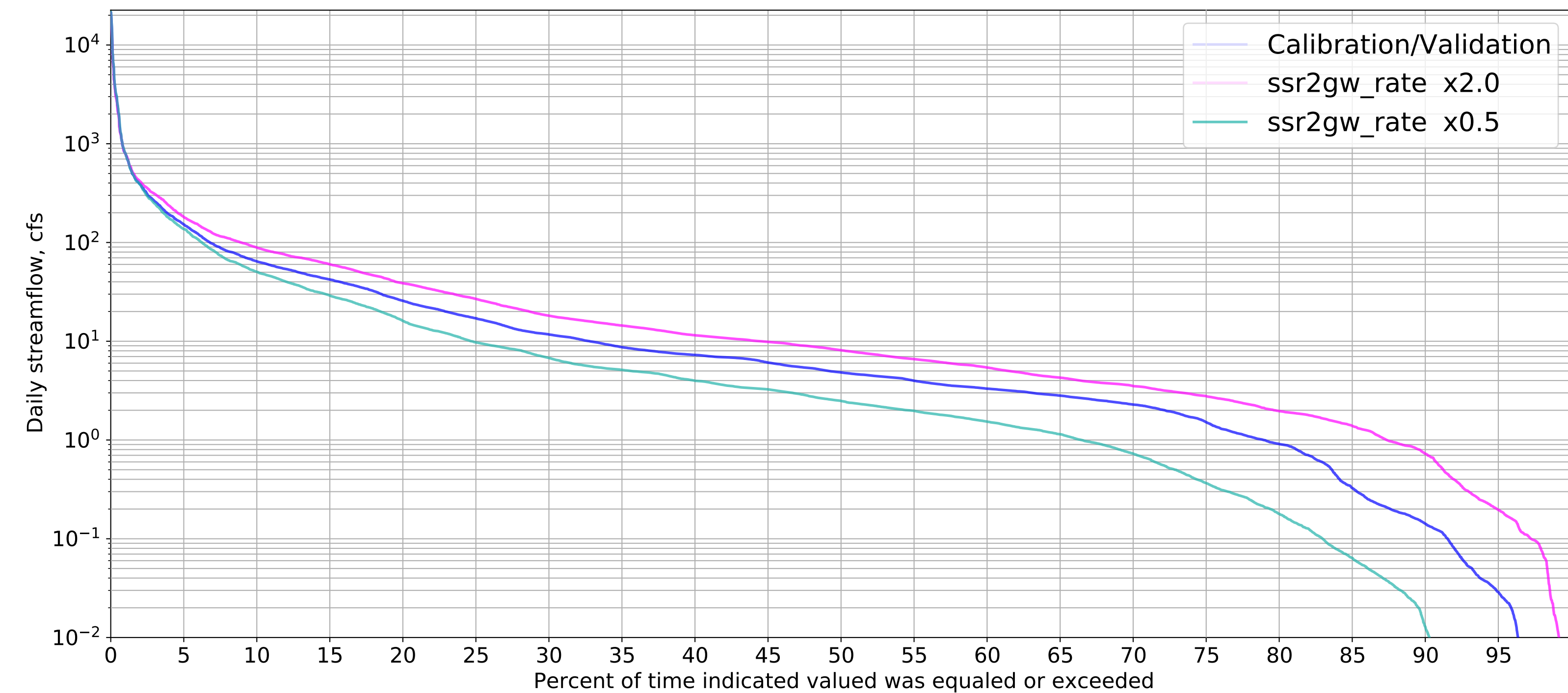
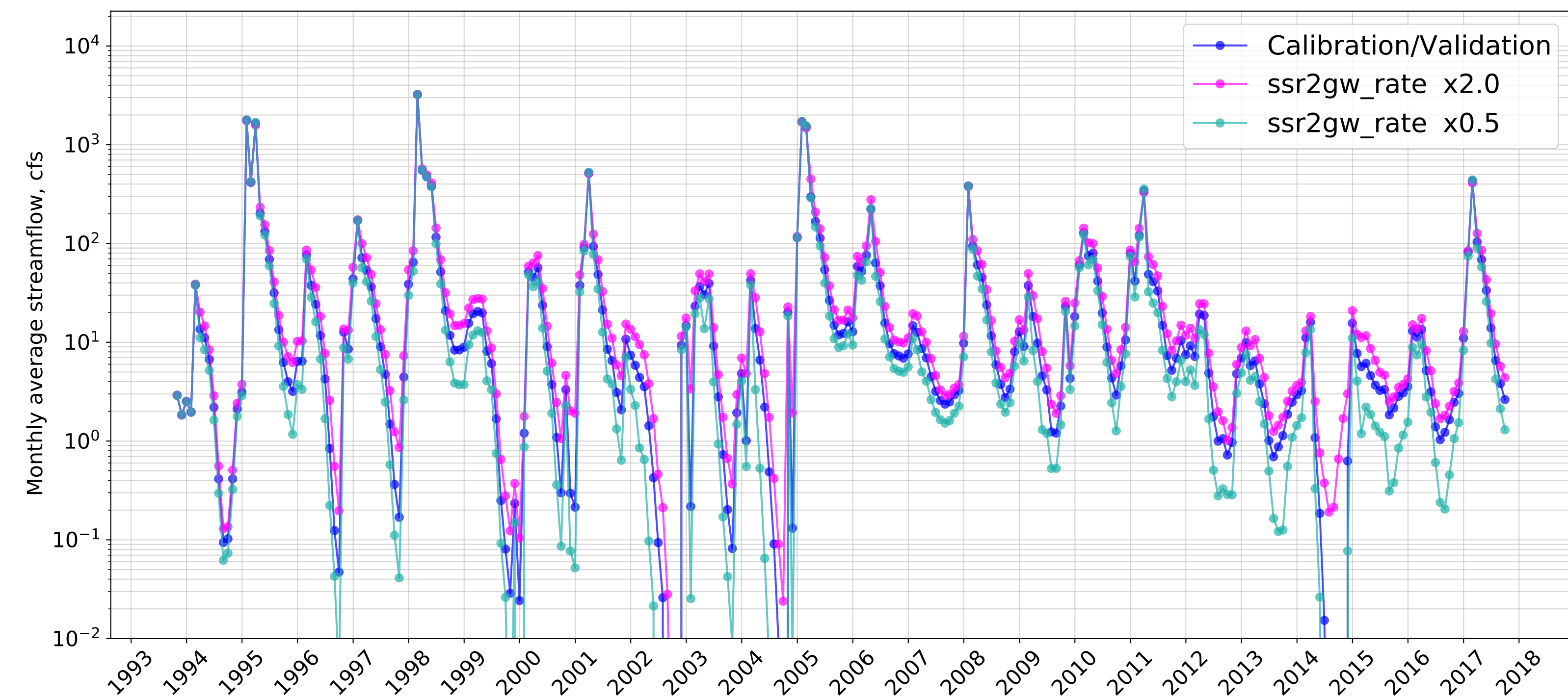
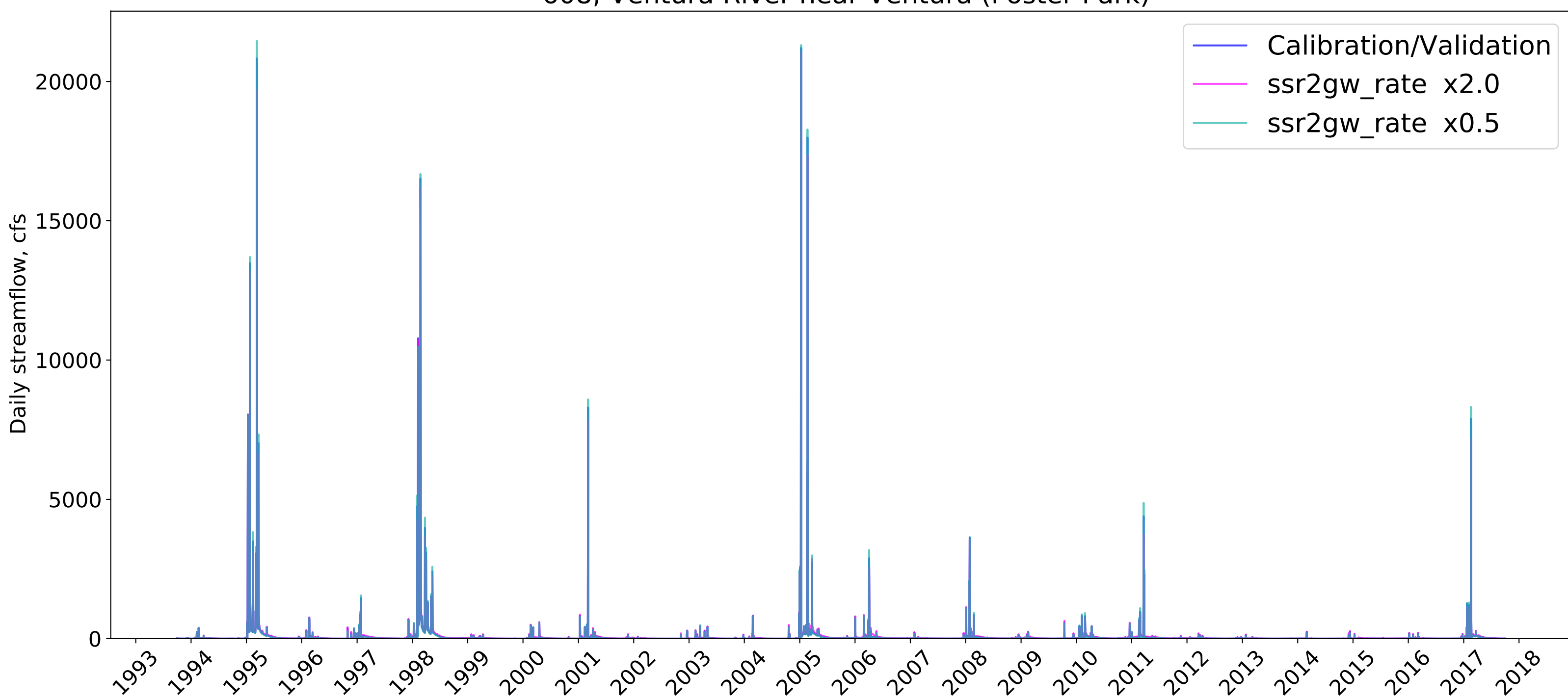
608, Ventura River near Ventura (Foster Park)



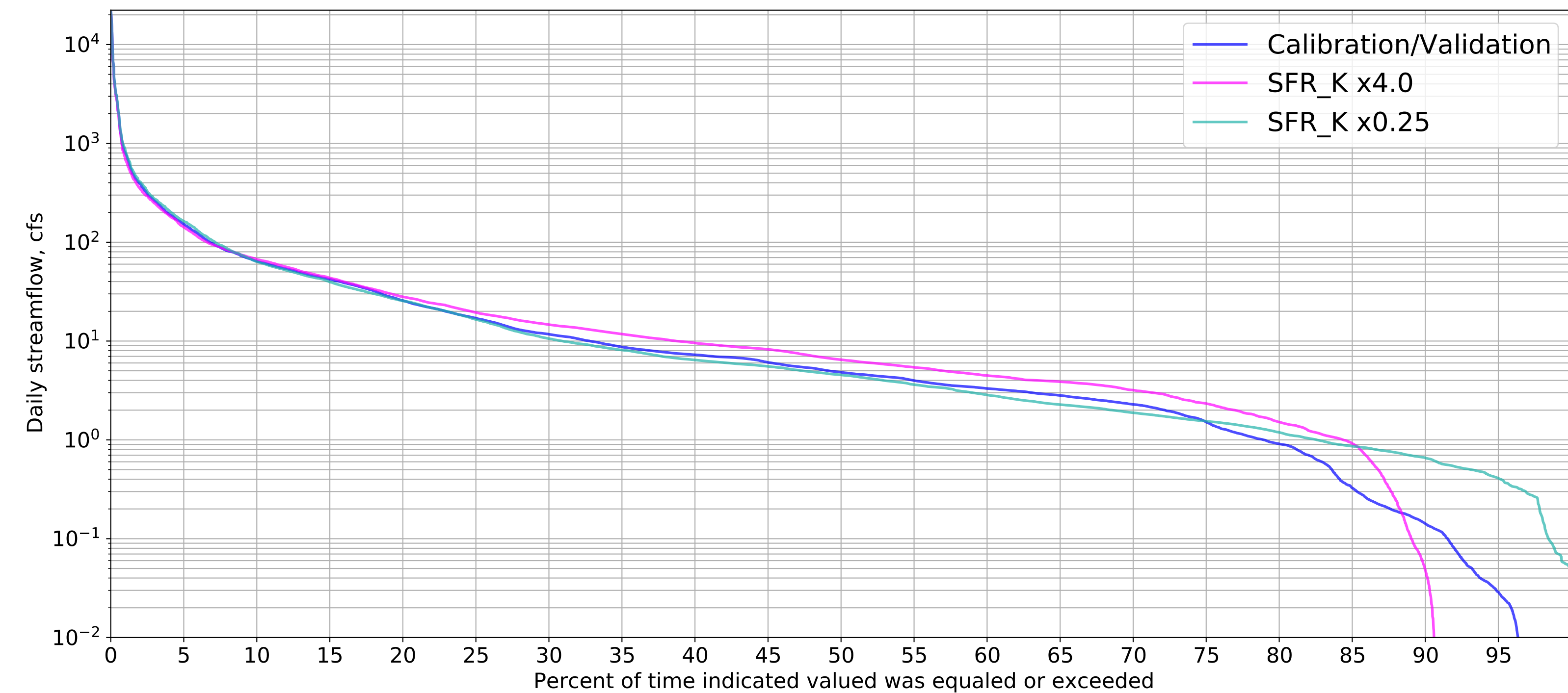
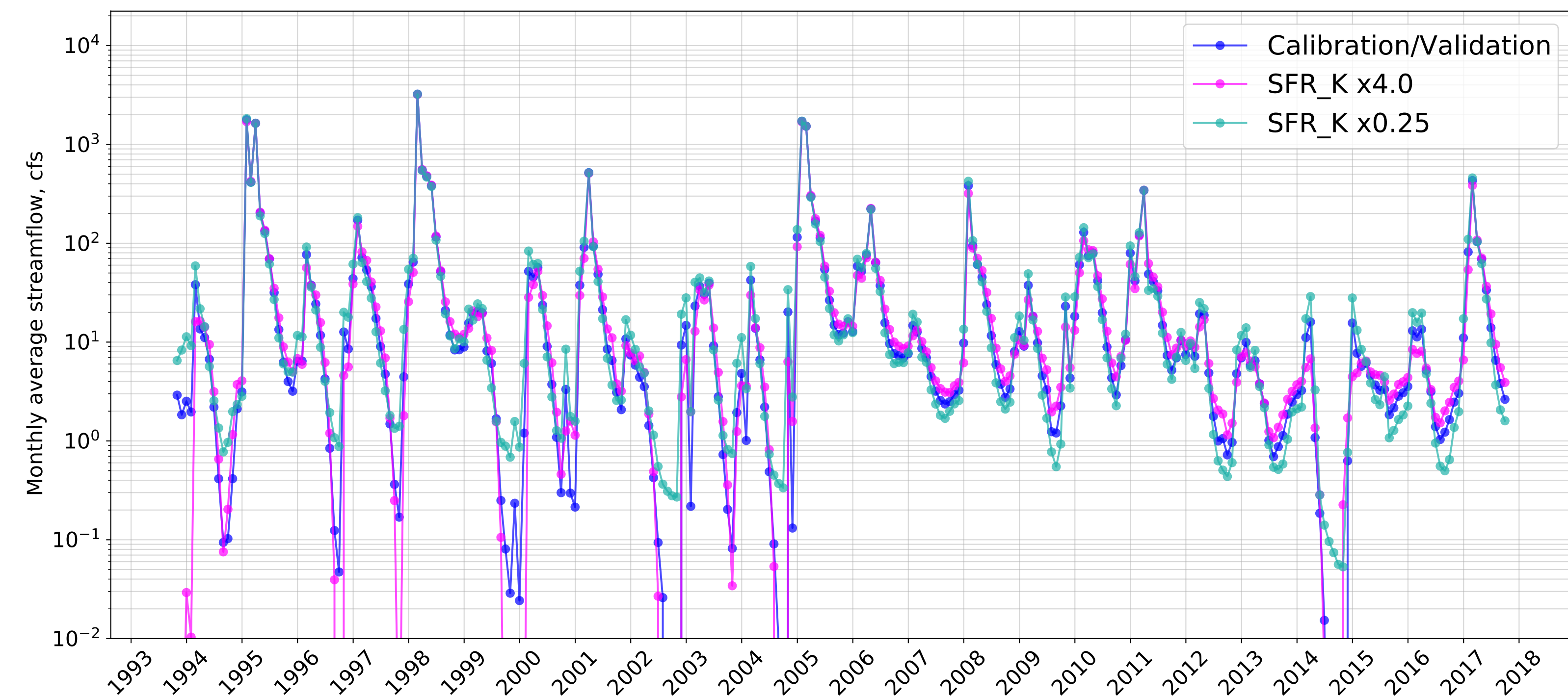
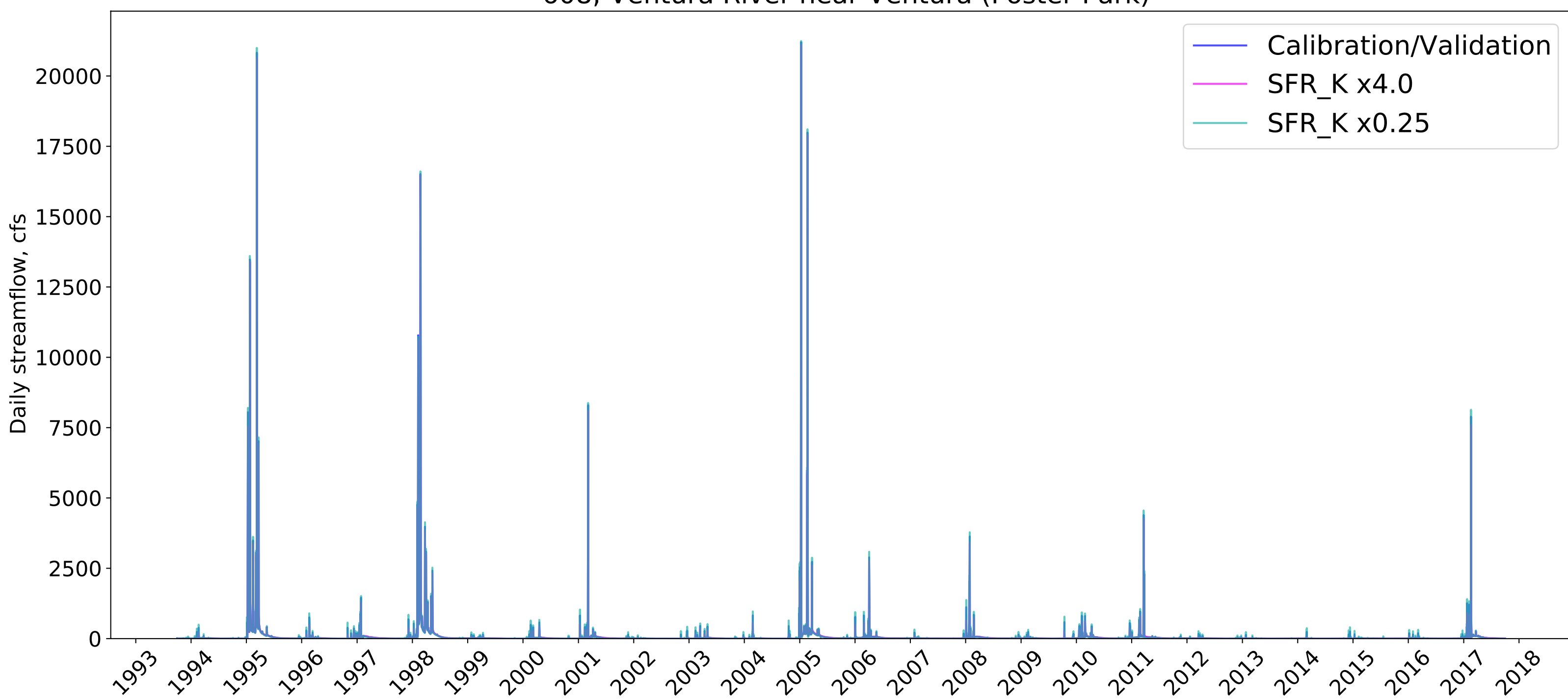
608, Ventura River near Ventura (Foster Park)



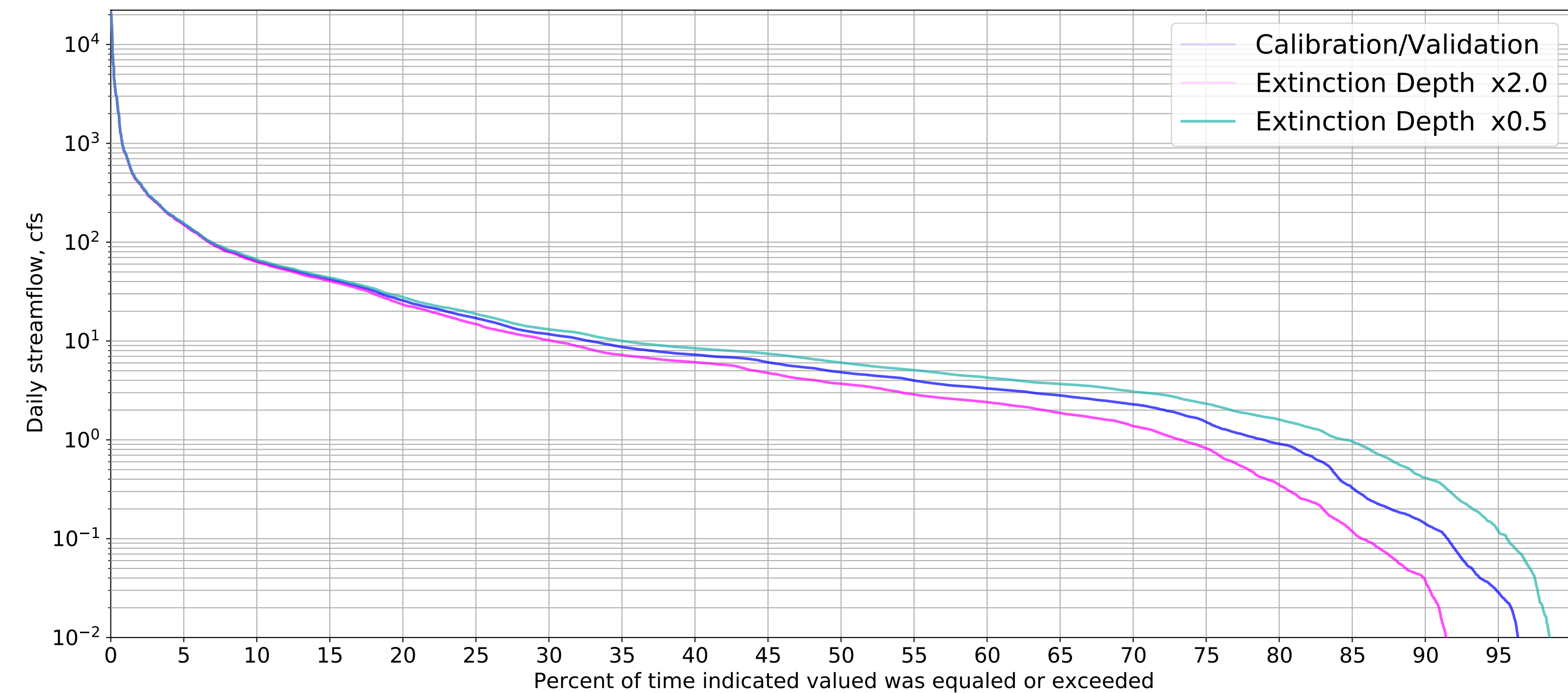
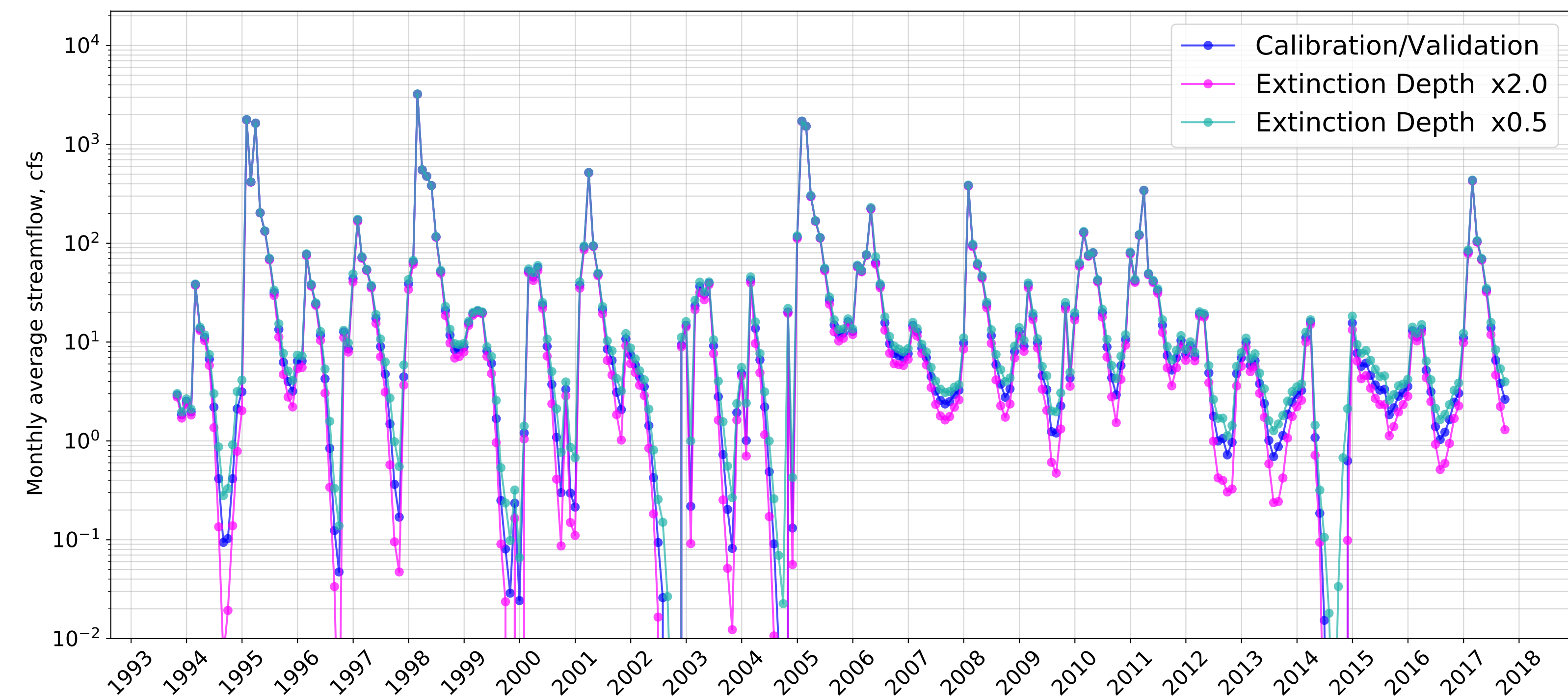
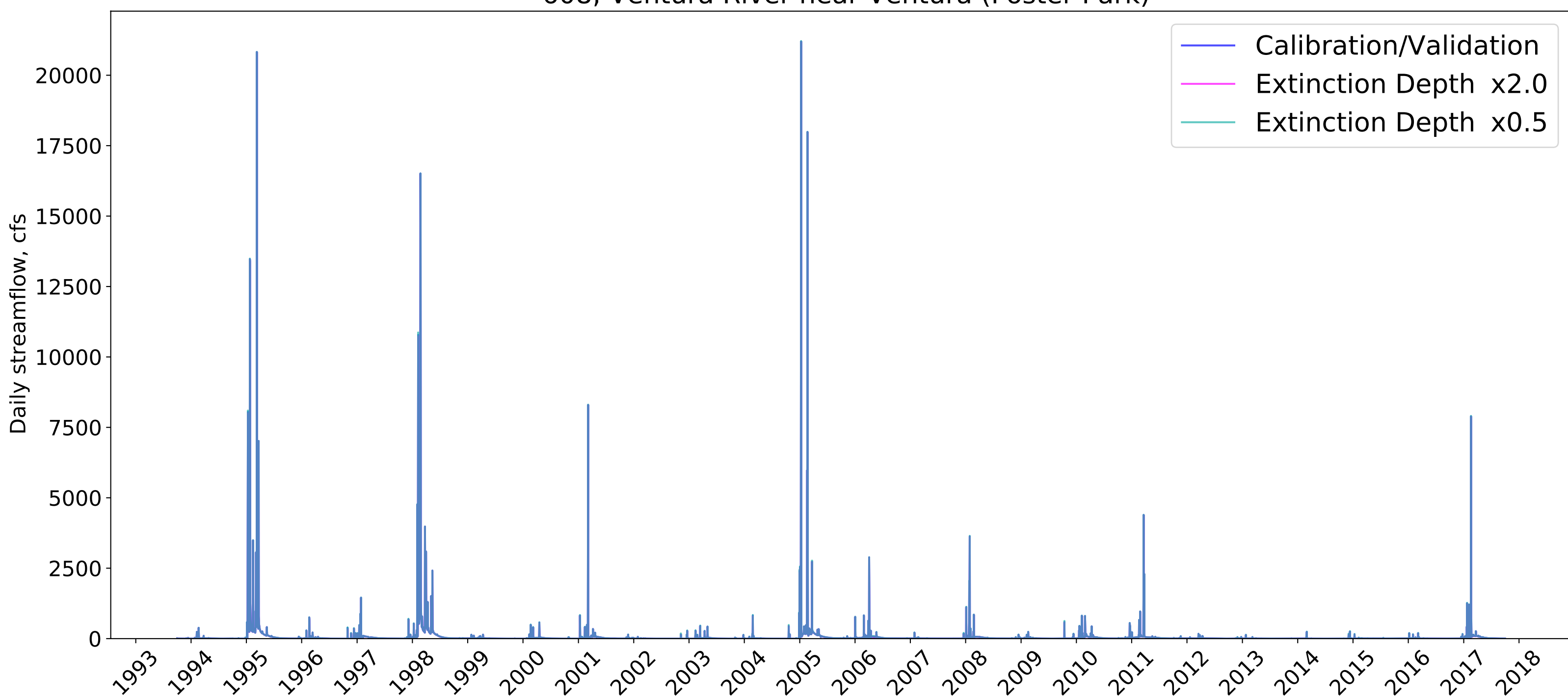
608, Ventura River near Ventura (Foster Park)



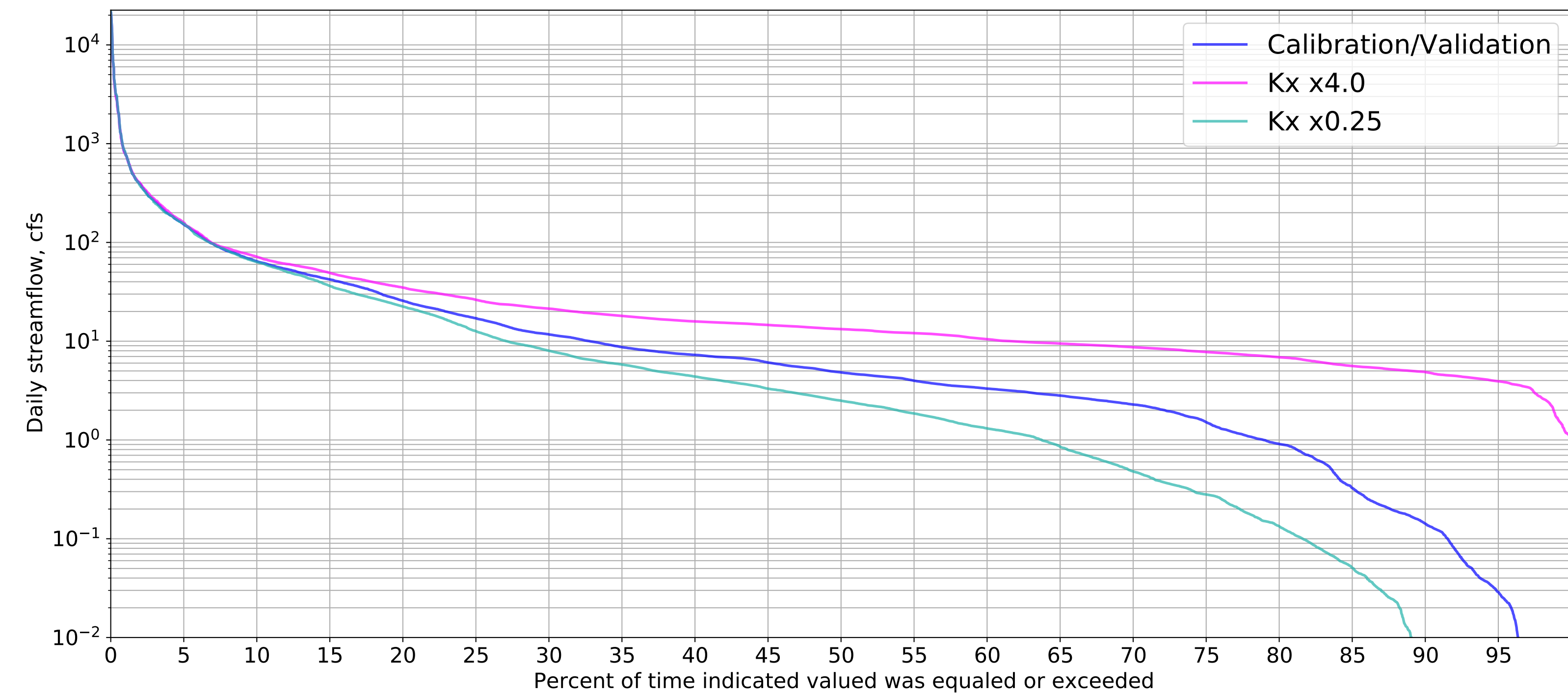
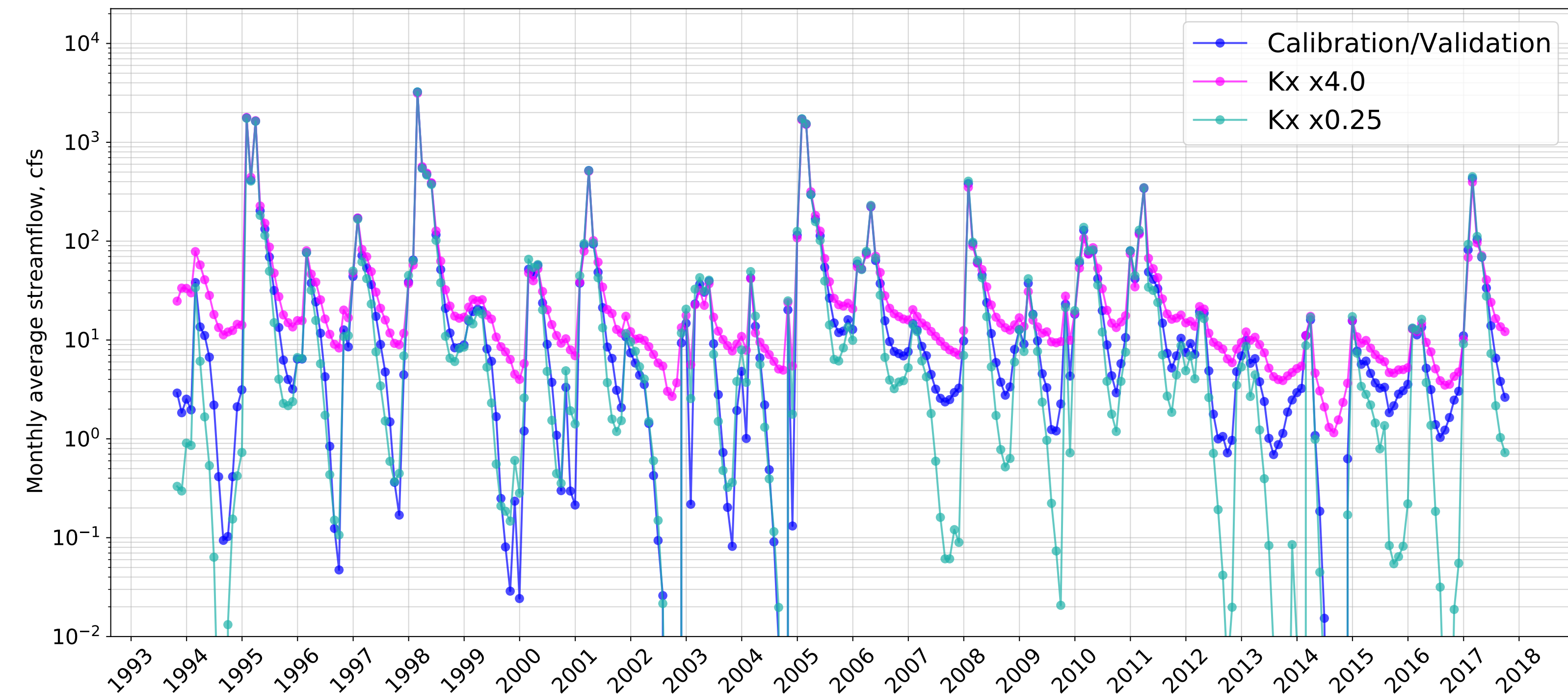
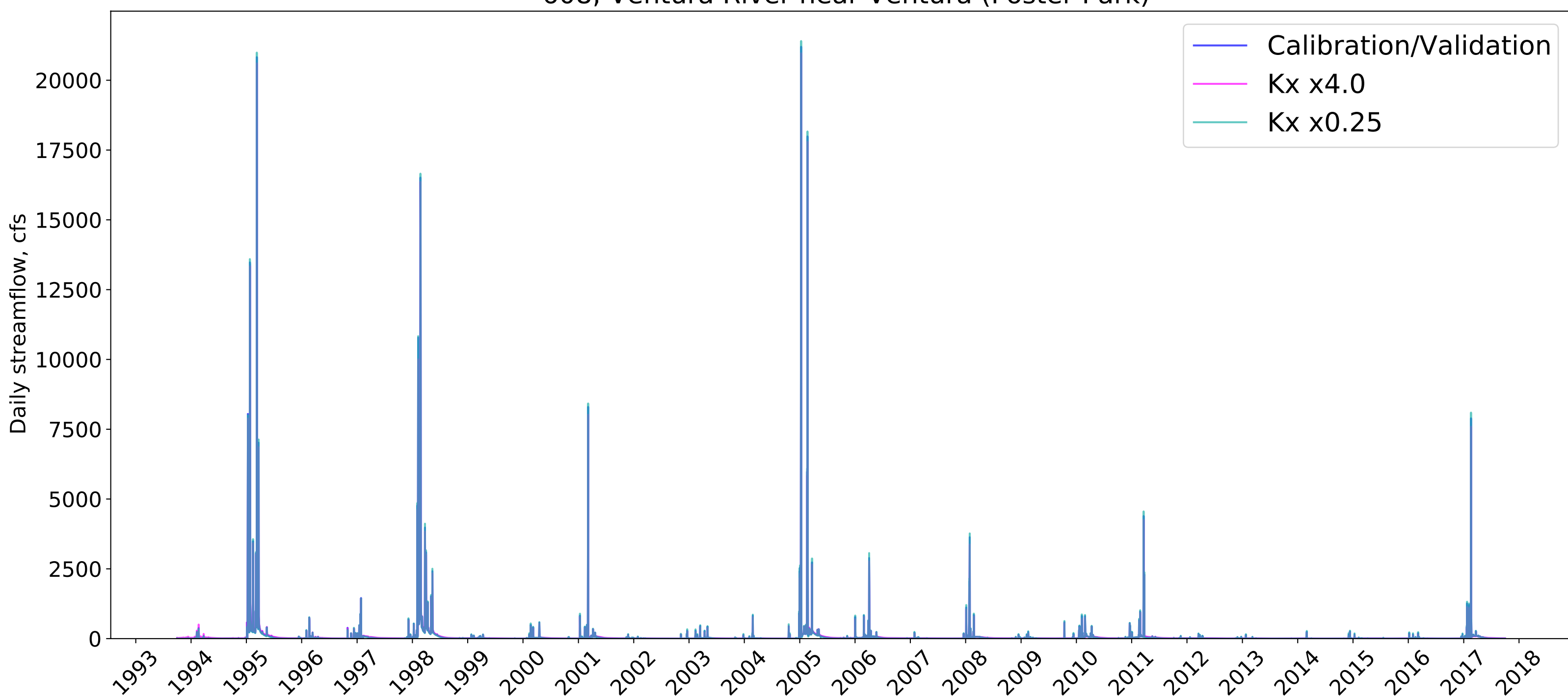
608, Ventura River near Ventura (Foster Park)



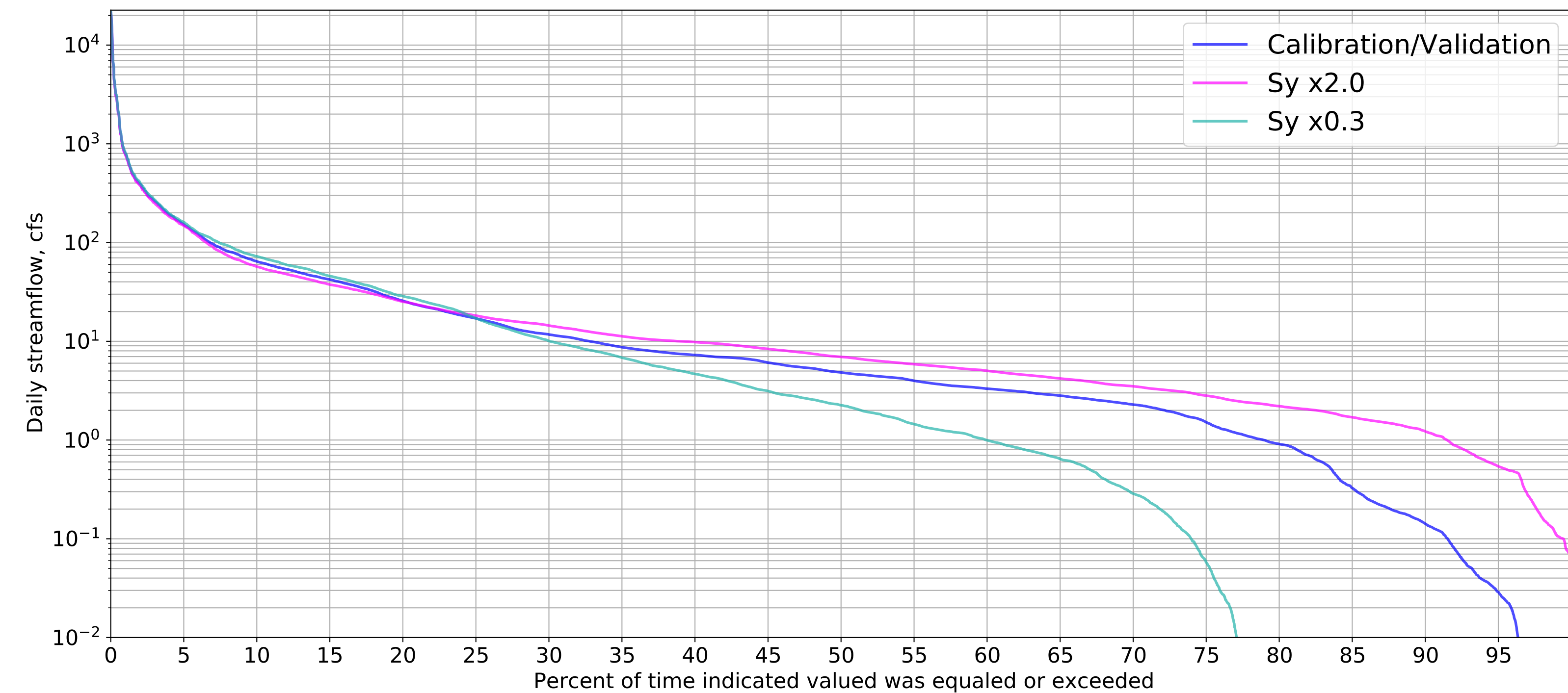
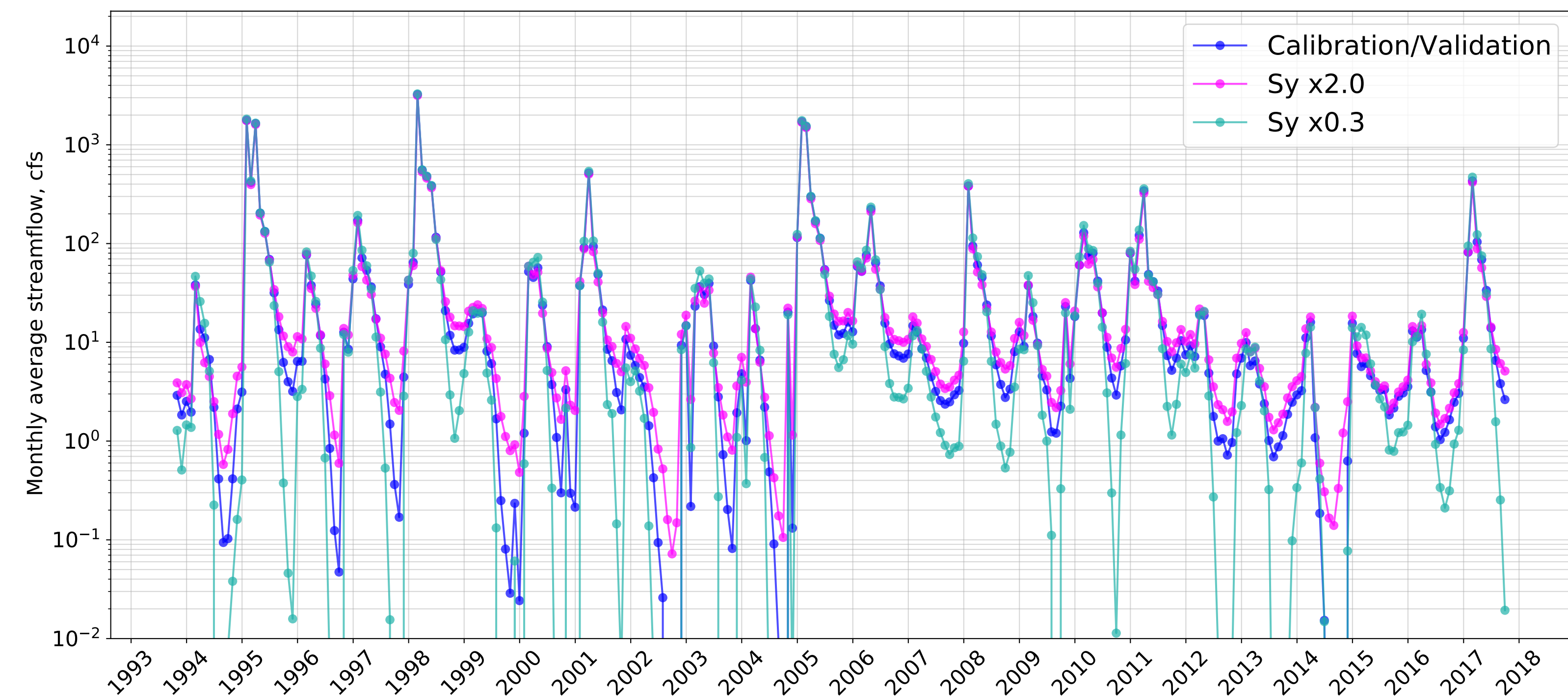
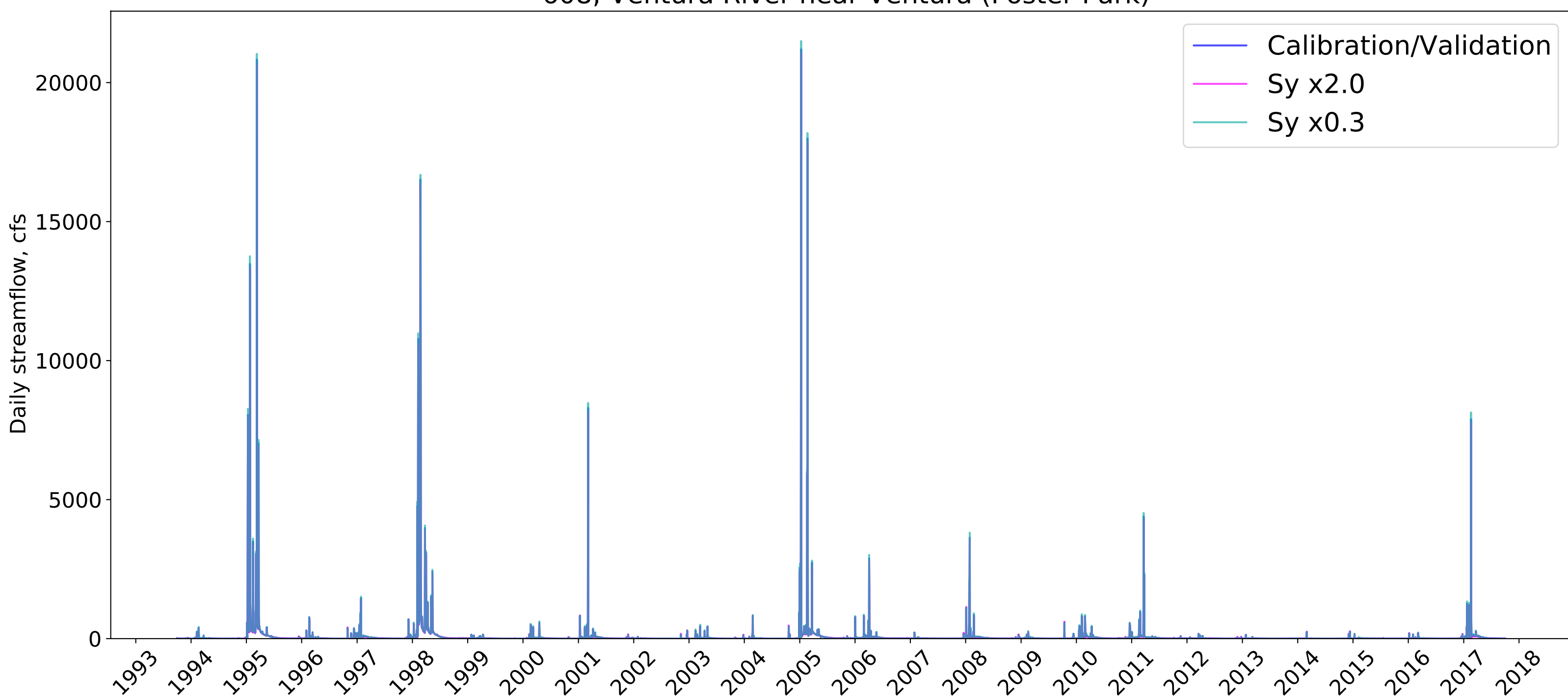
608, Ventura River near Ventura (Foster Park)



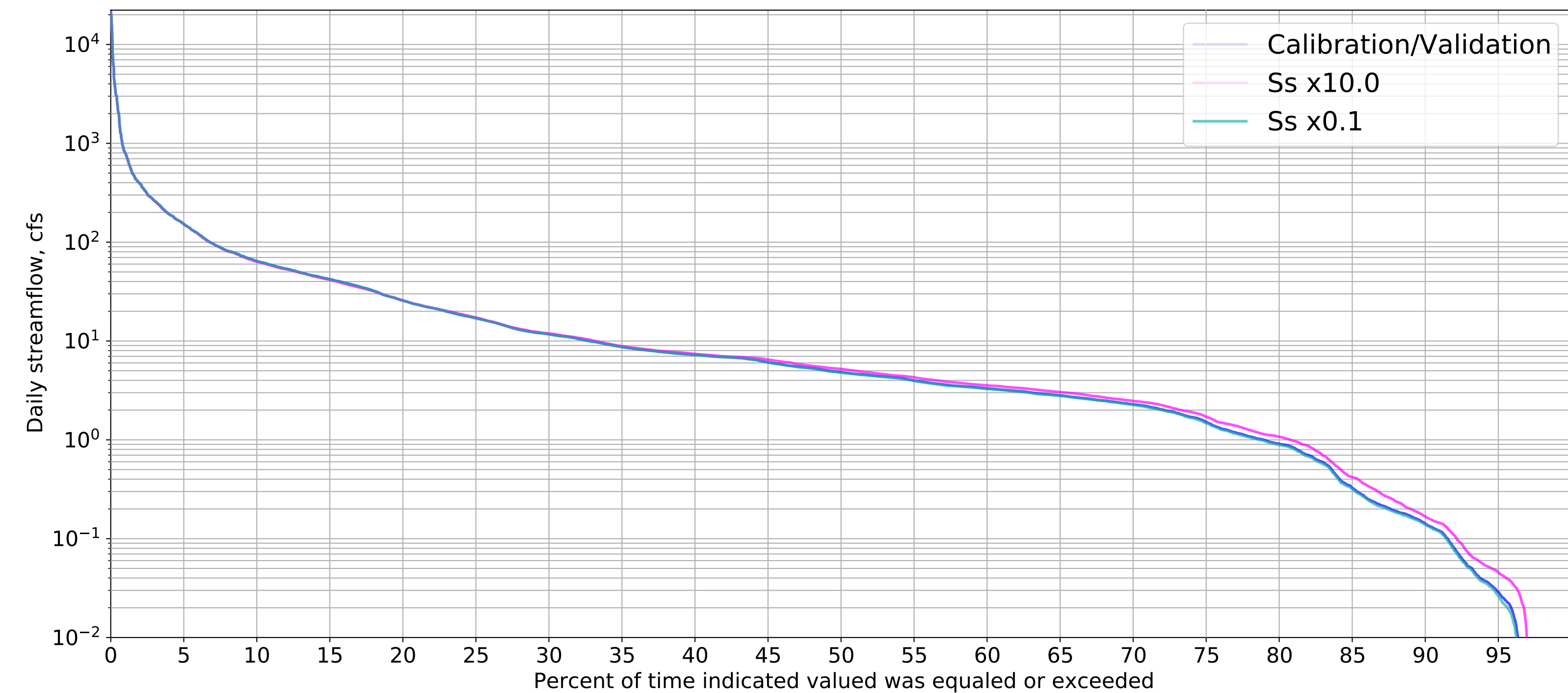
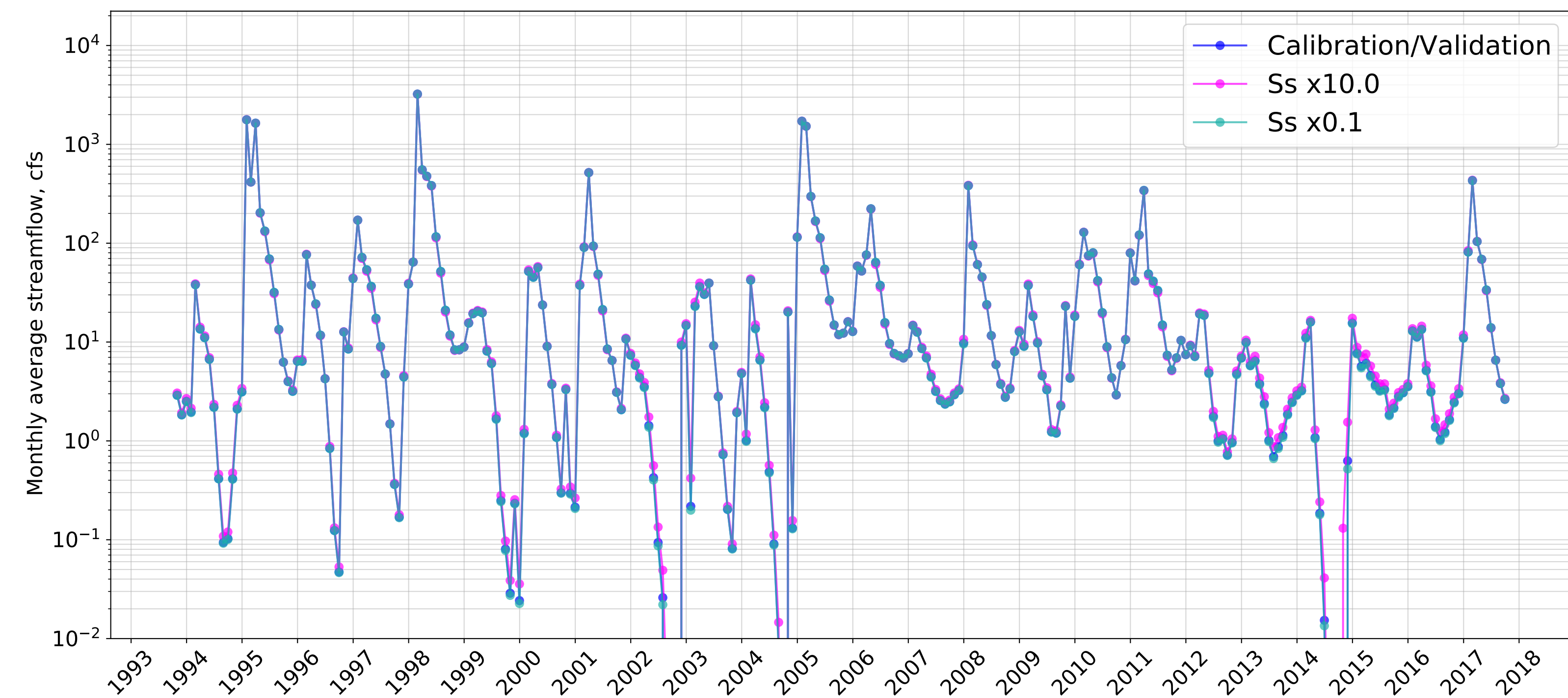
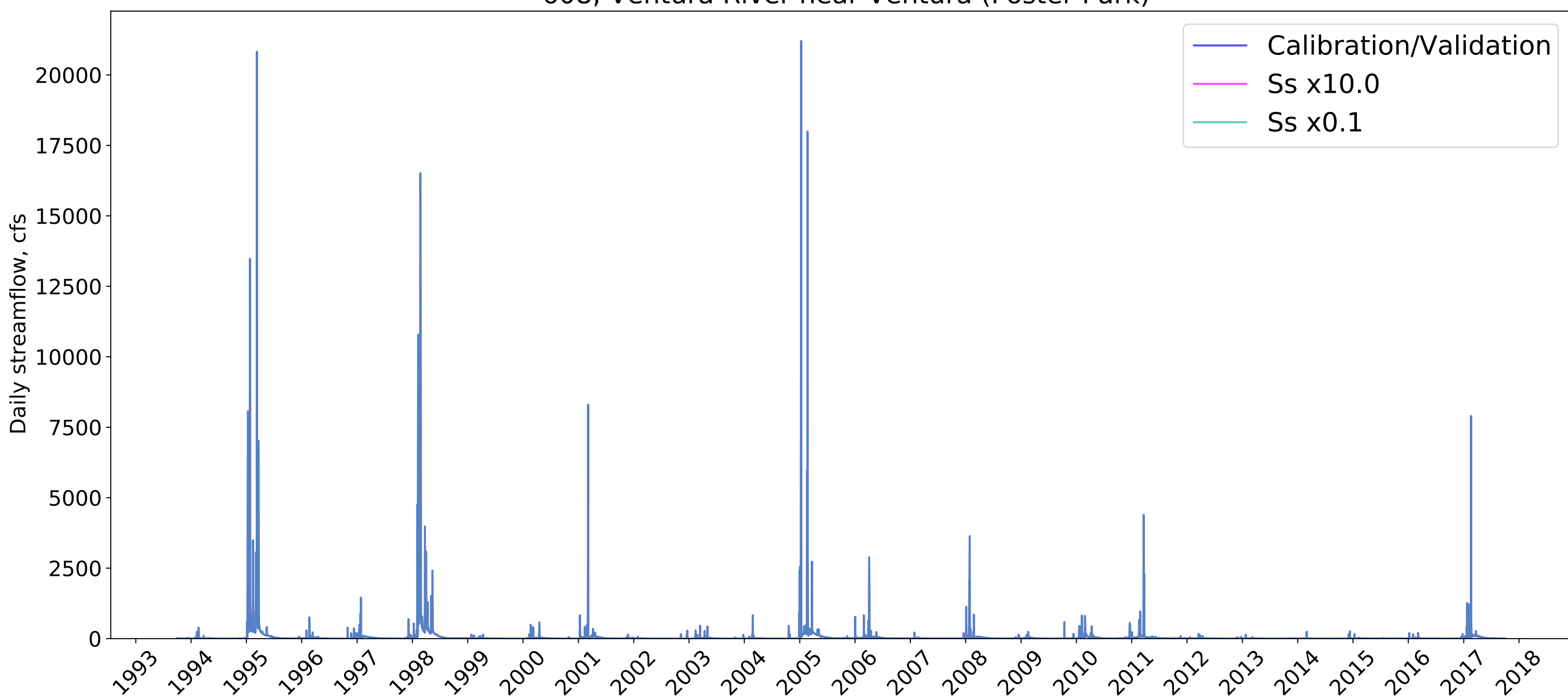
608, Ventura River near Ventura (Foster Park)



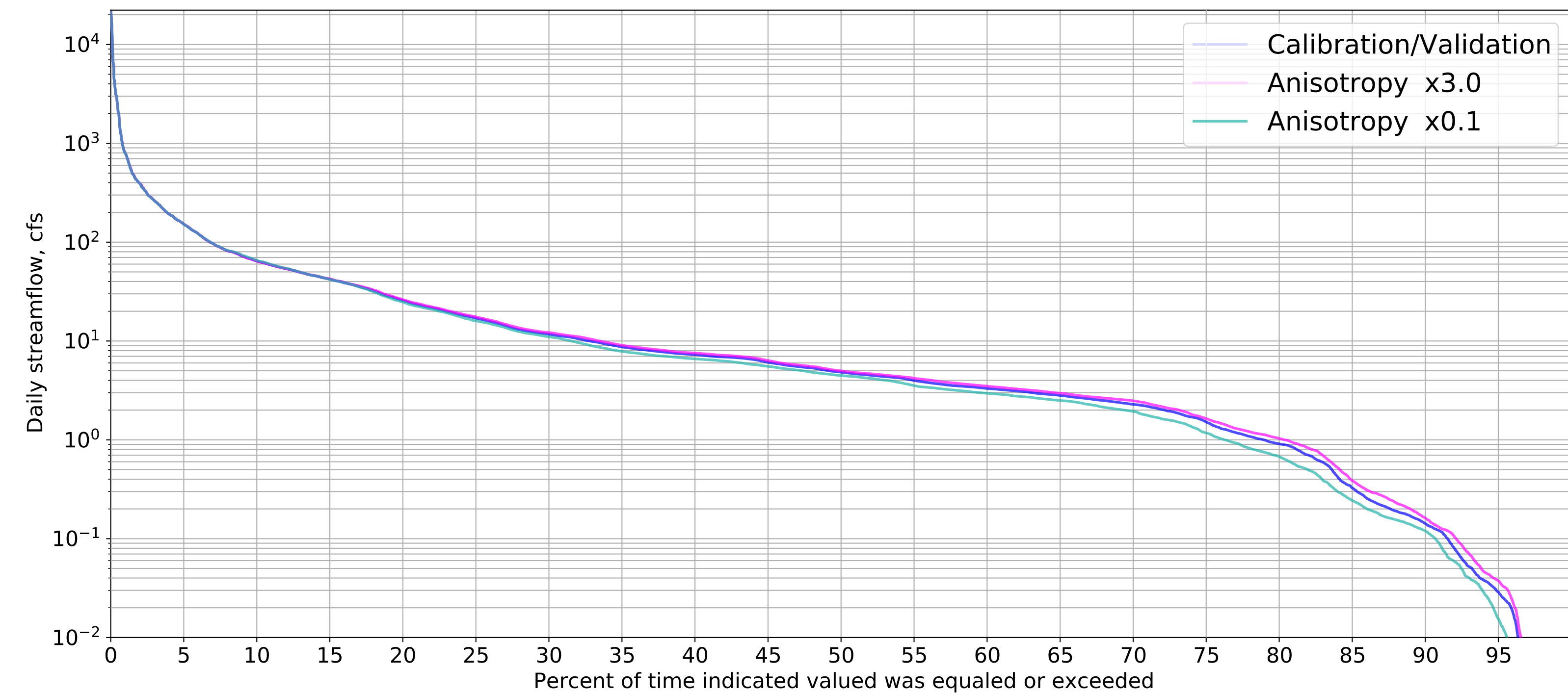
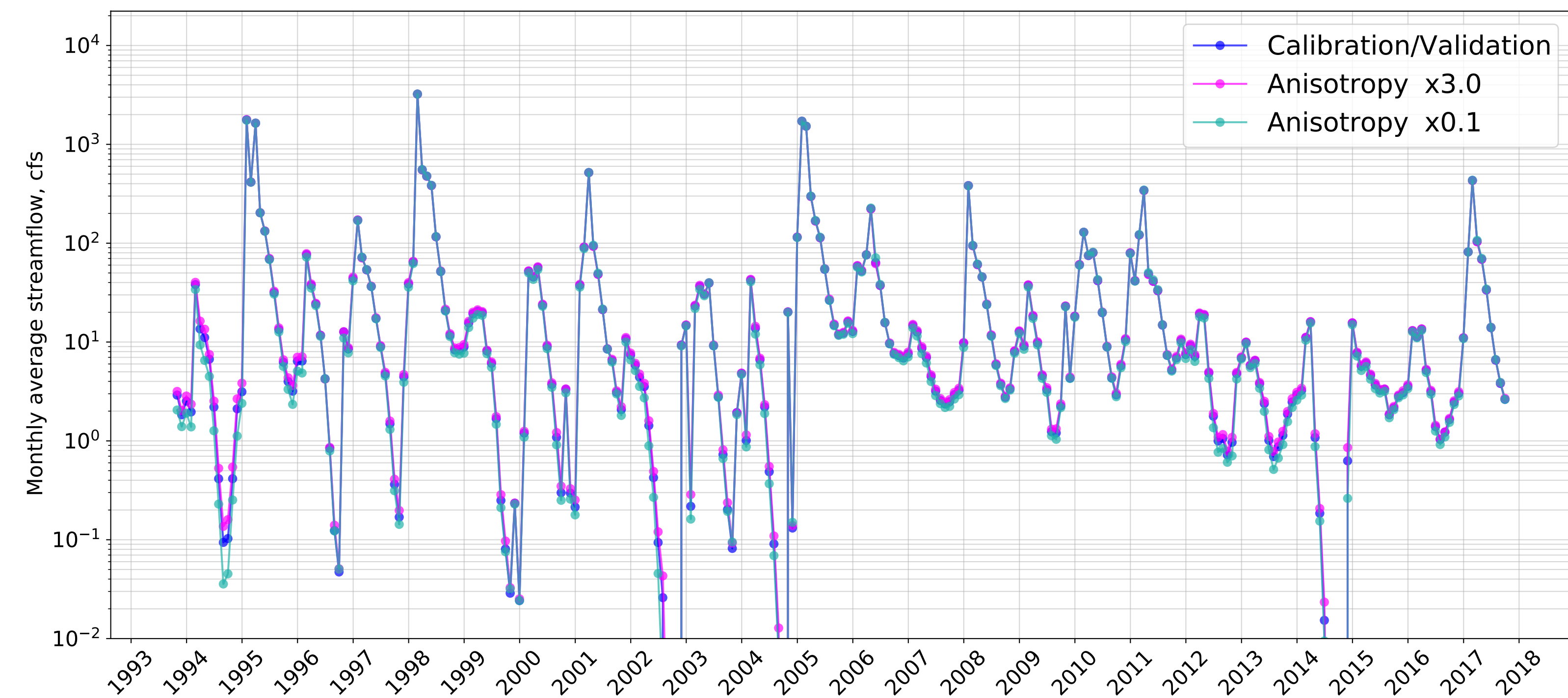
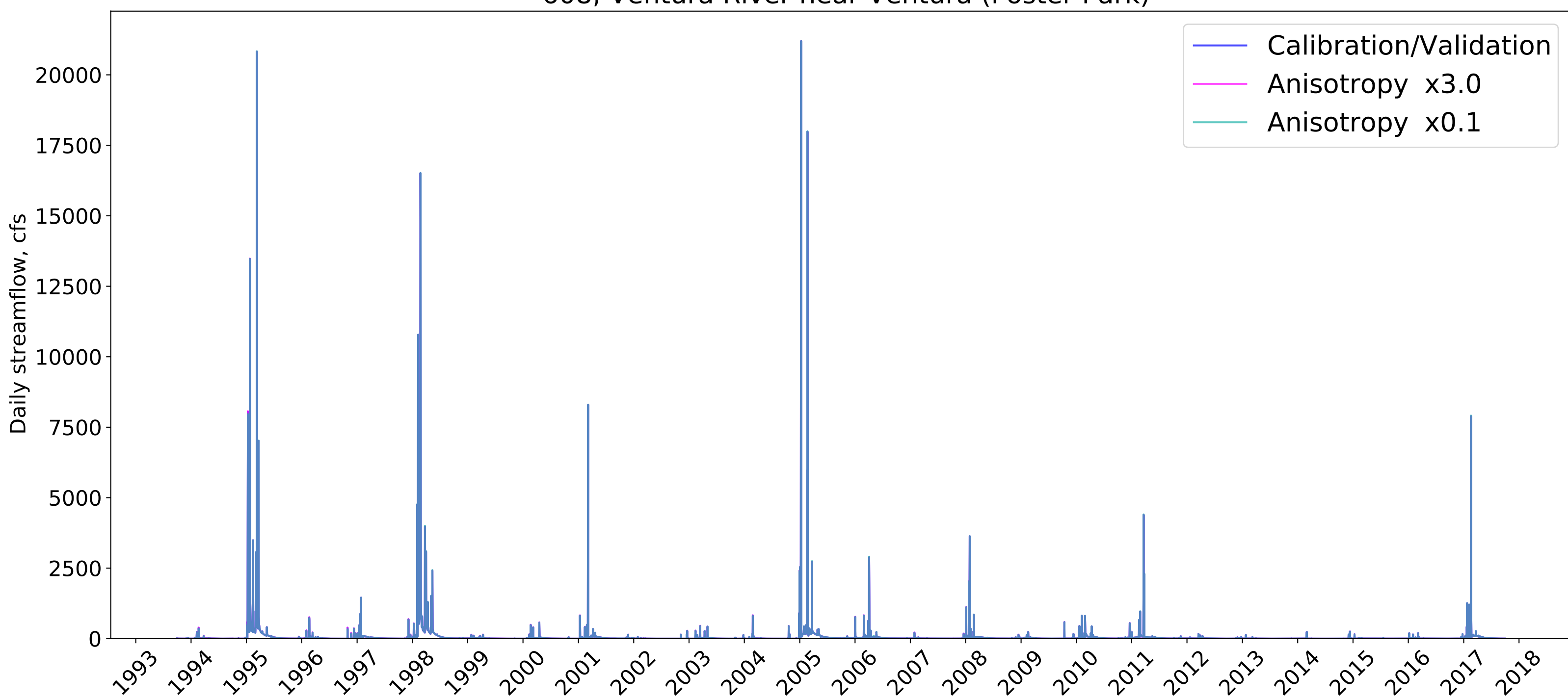
608, Ventura River near Ventura (Foster Park)



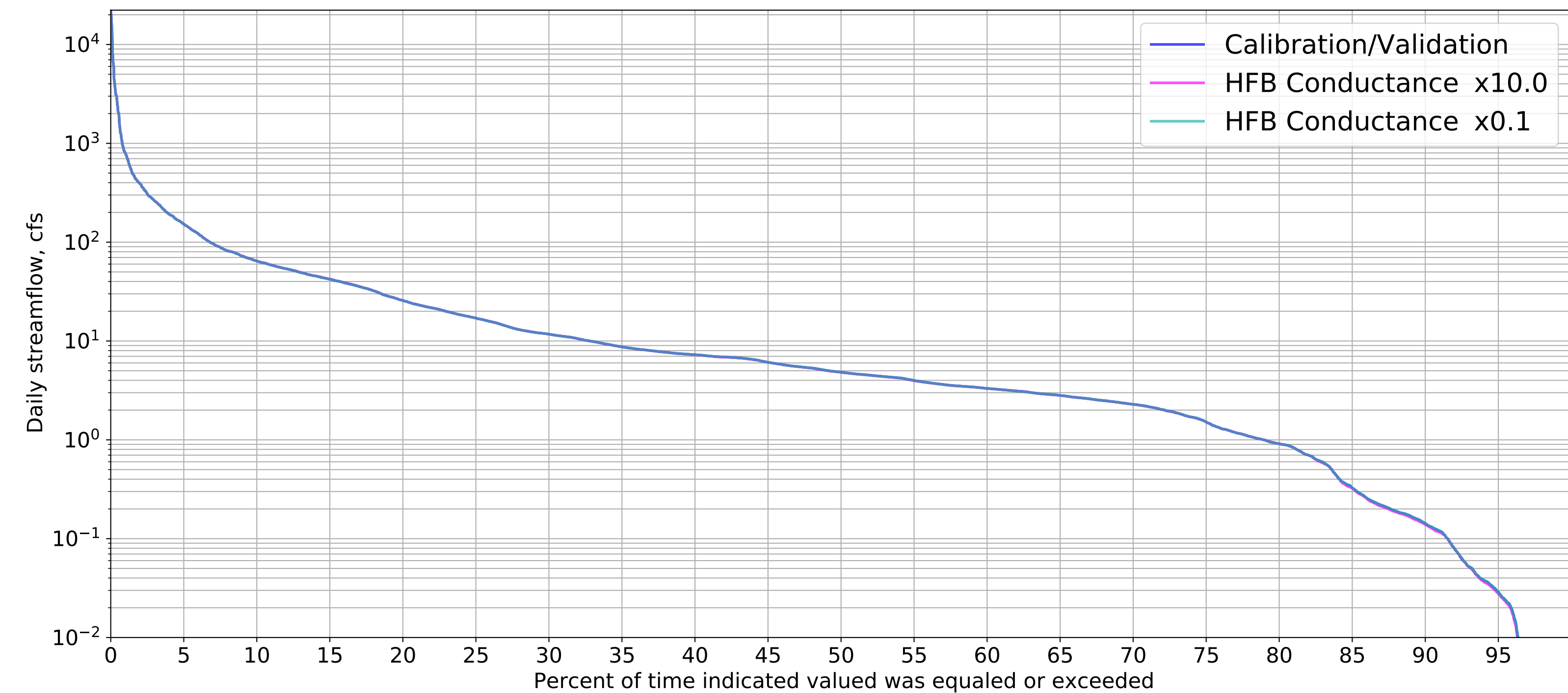
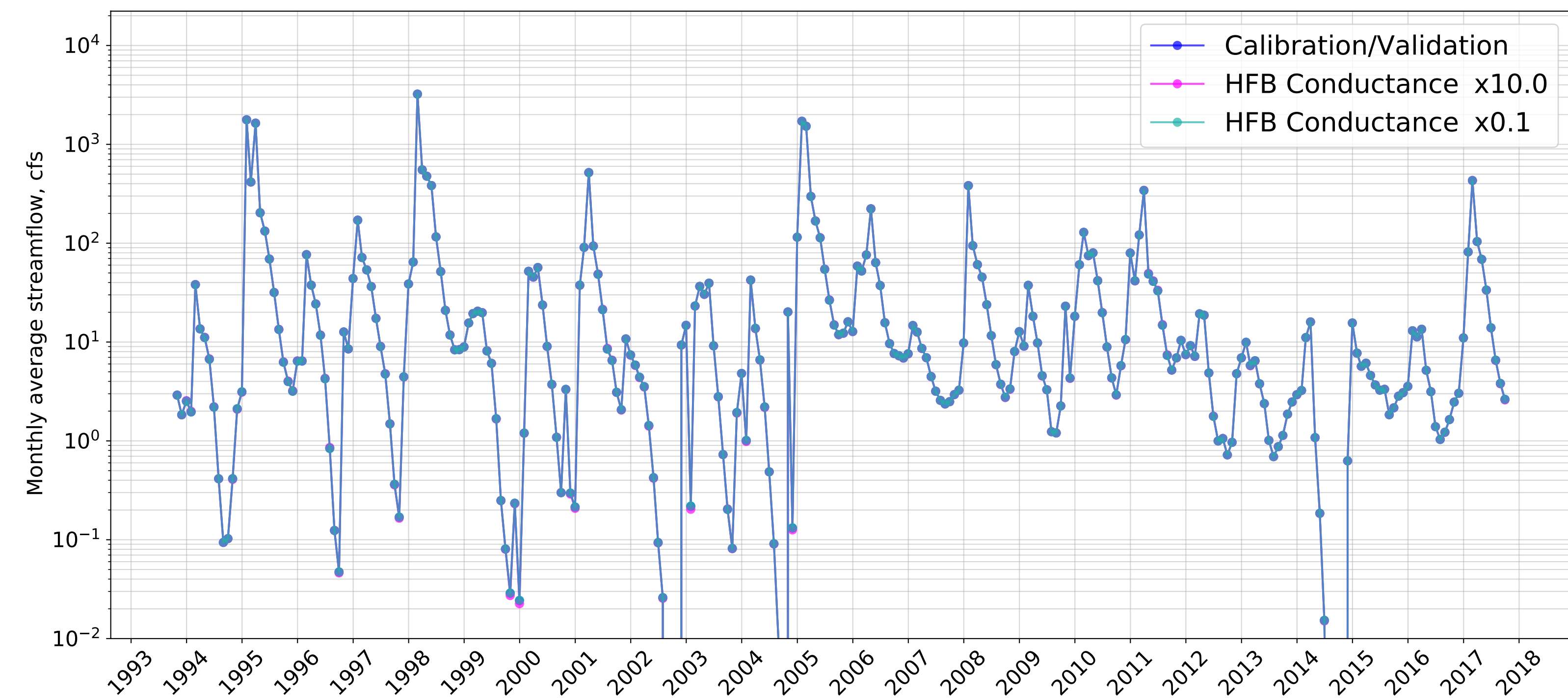
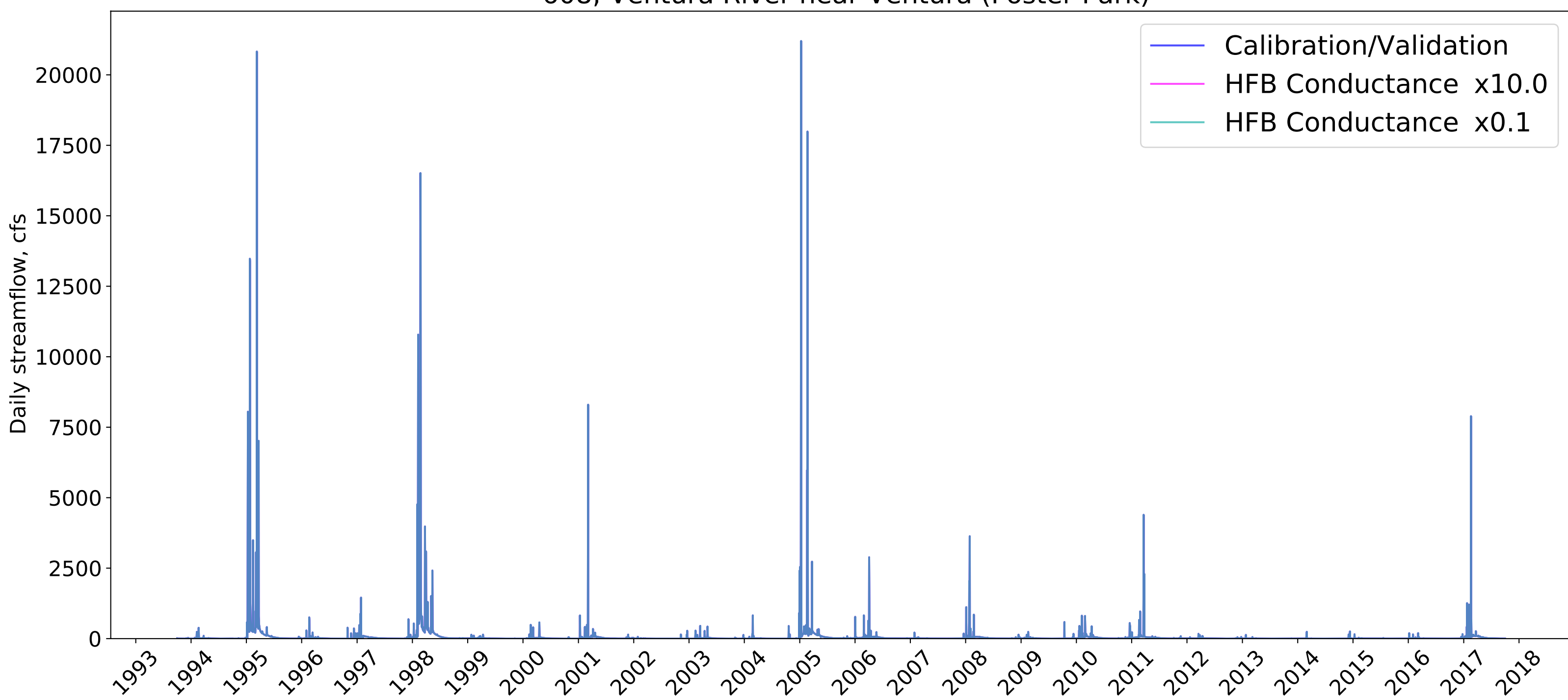
608, Ventura River near Ventura (Foster Park)



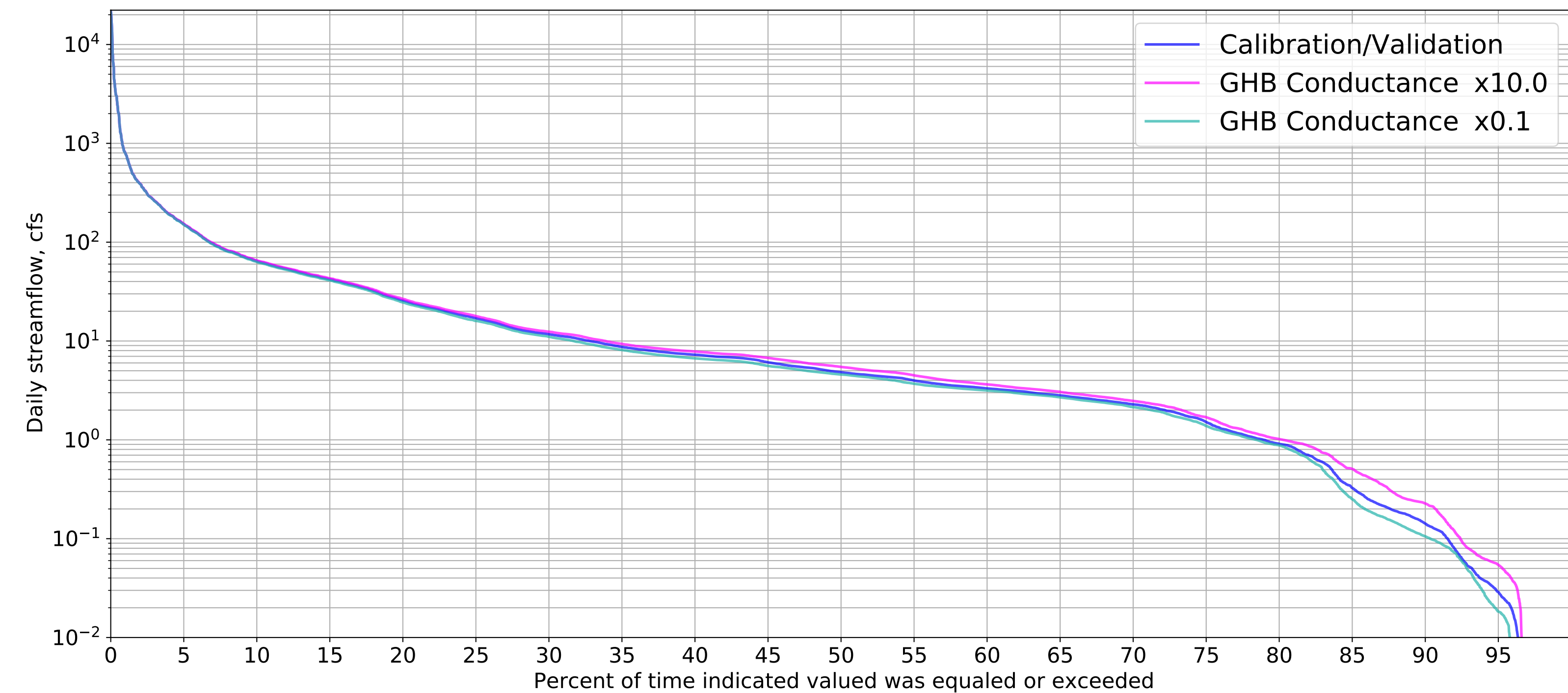
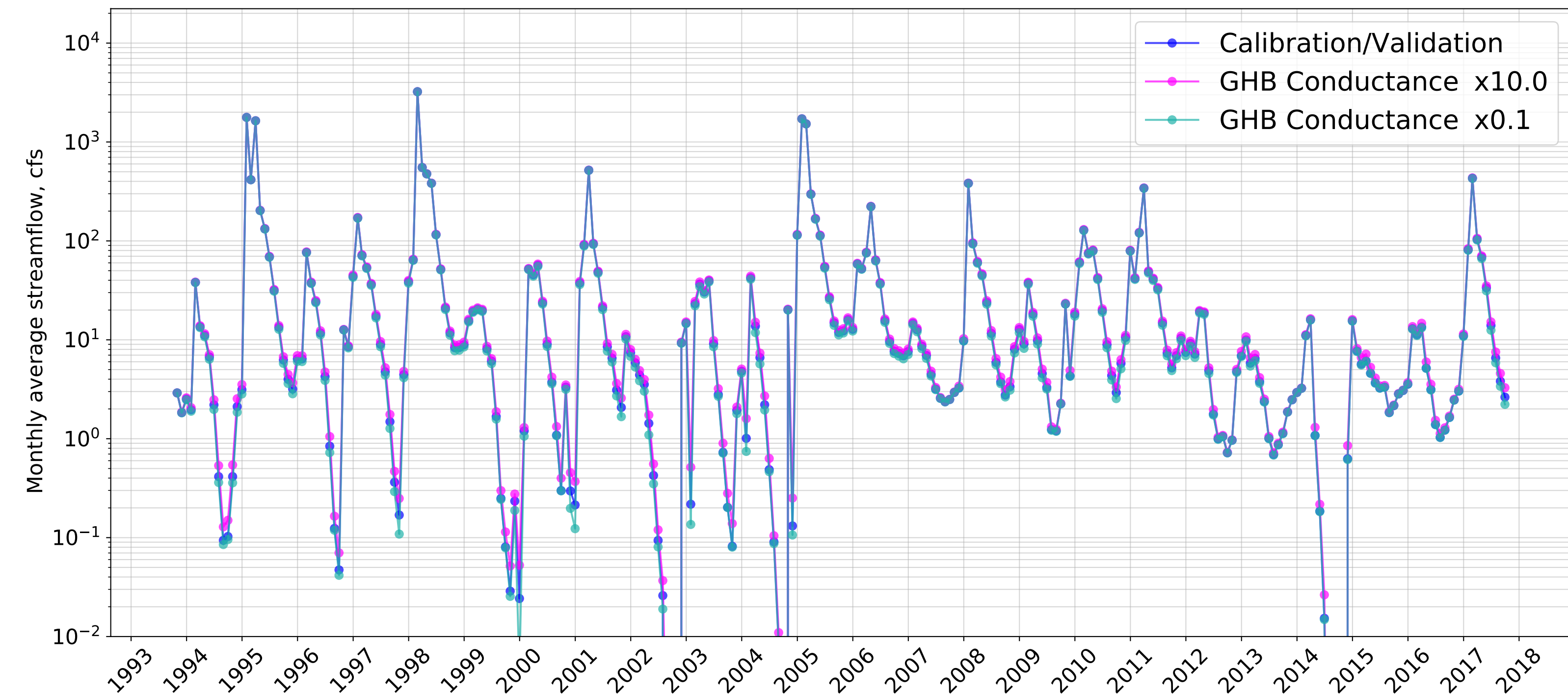
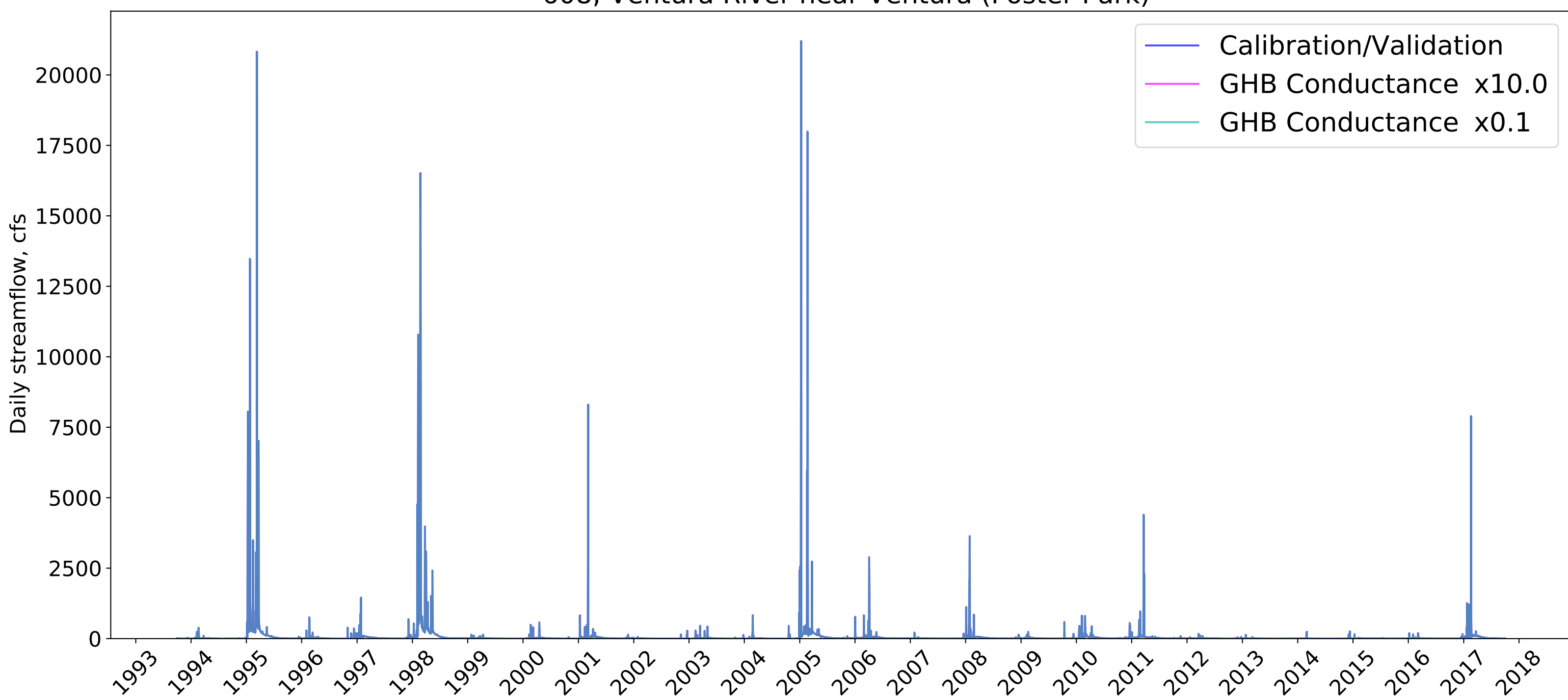
608, Ventura River near Ventura (Foster Park)



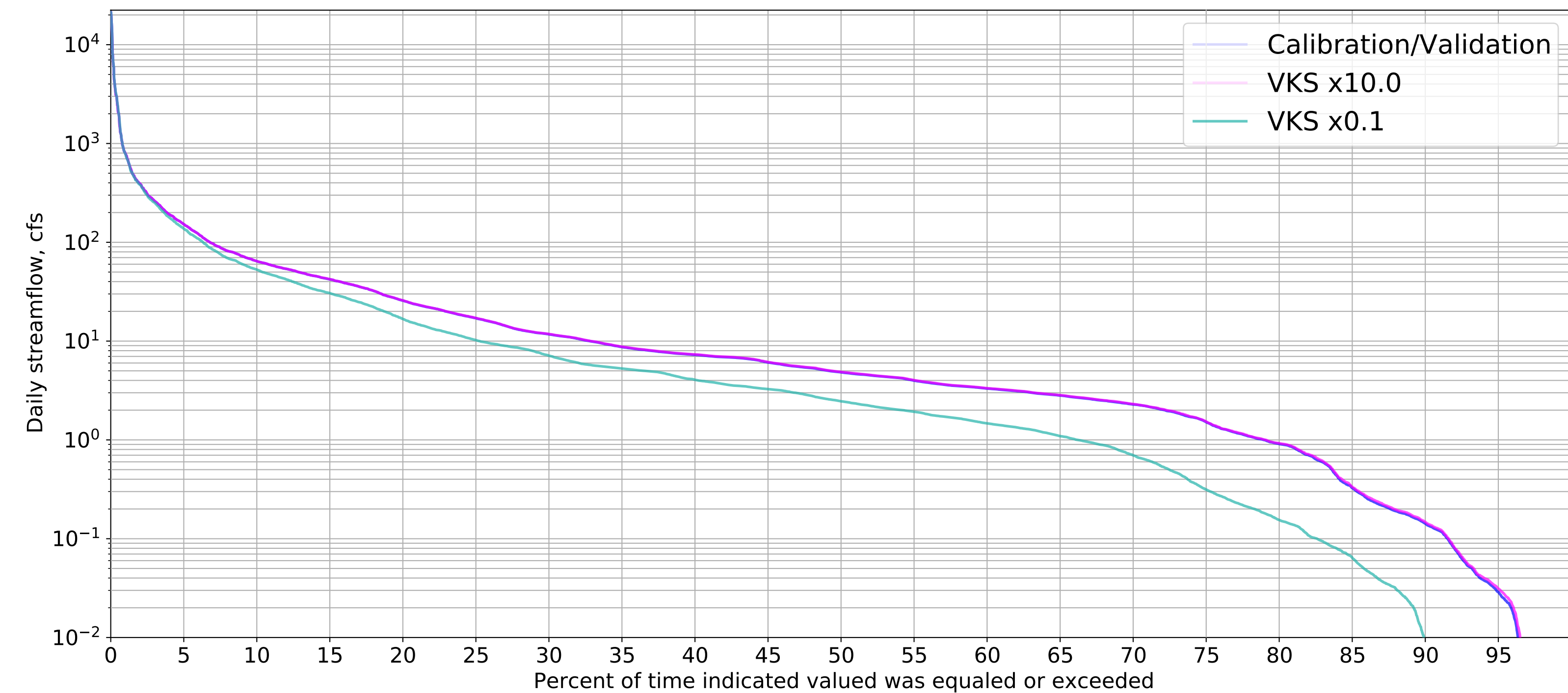
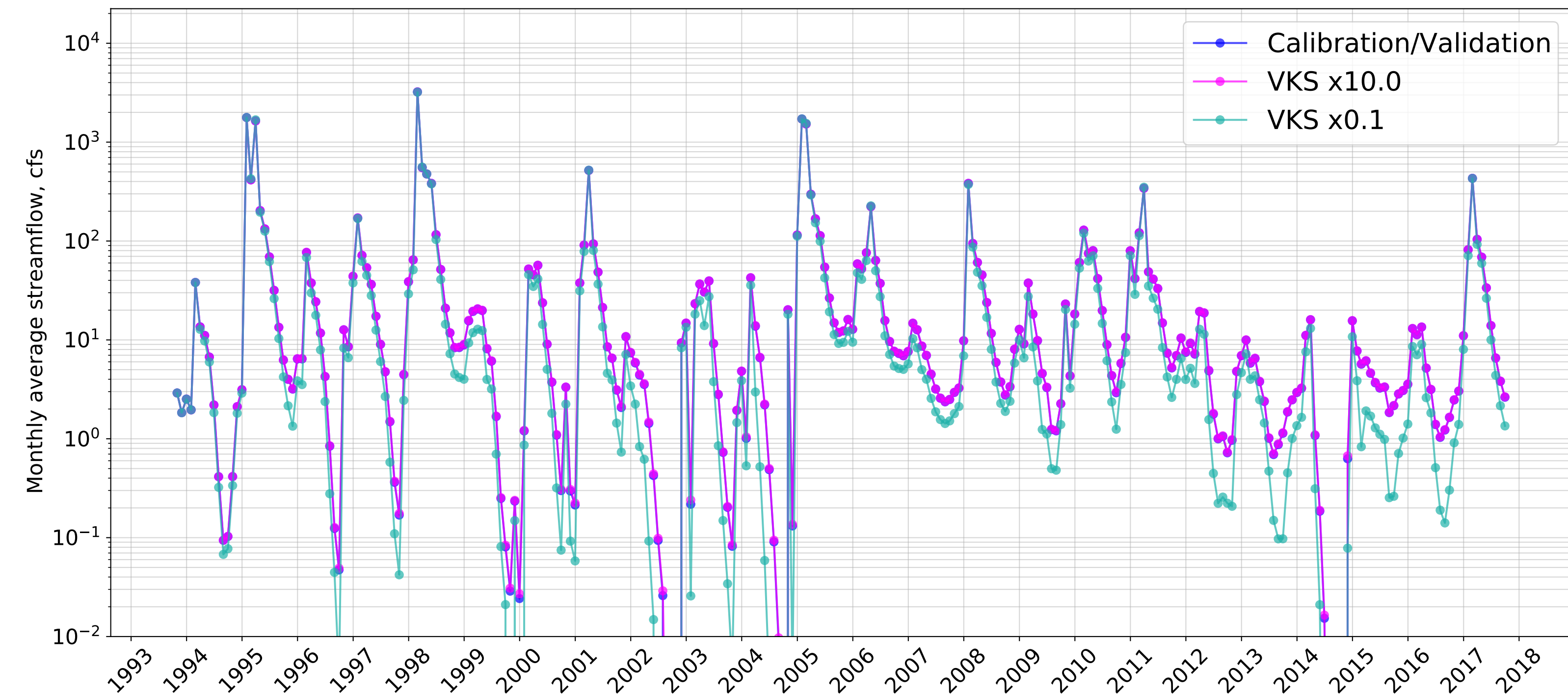
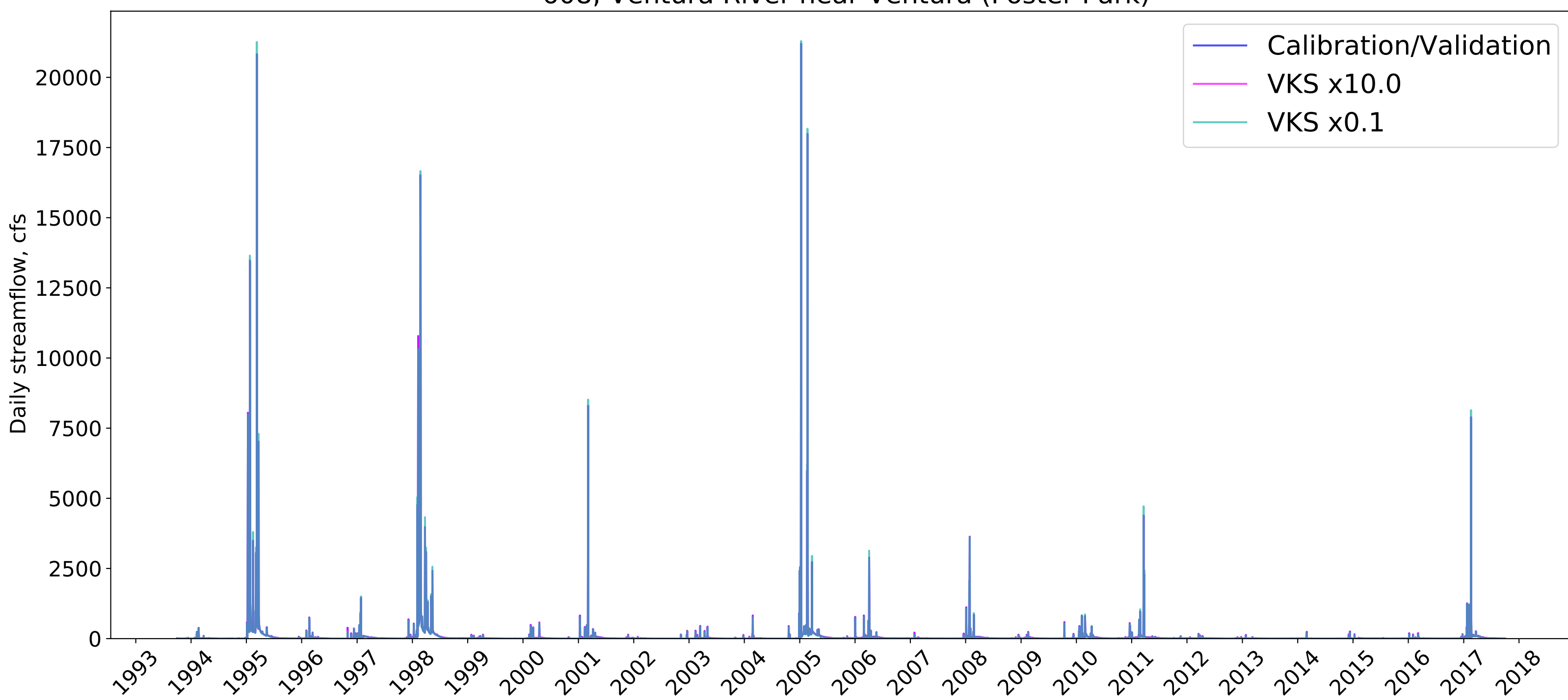
608, Ventura River near Ventura (Foster Park)



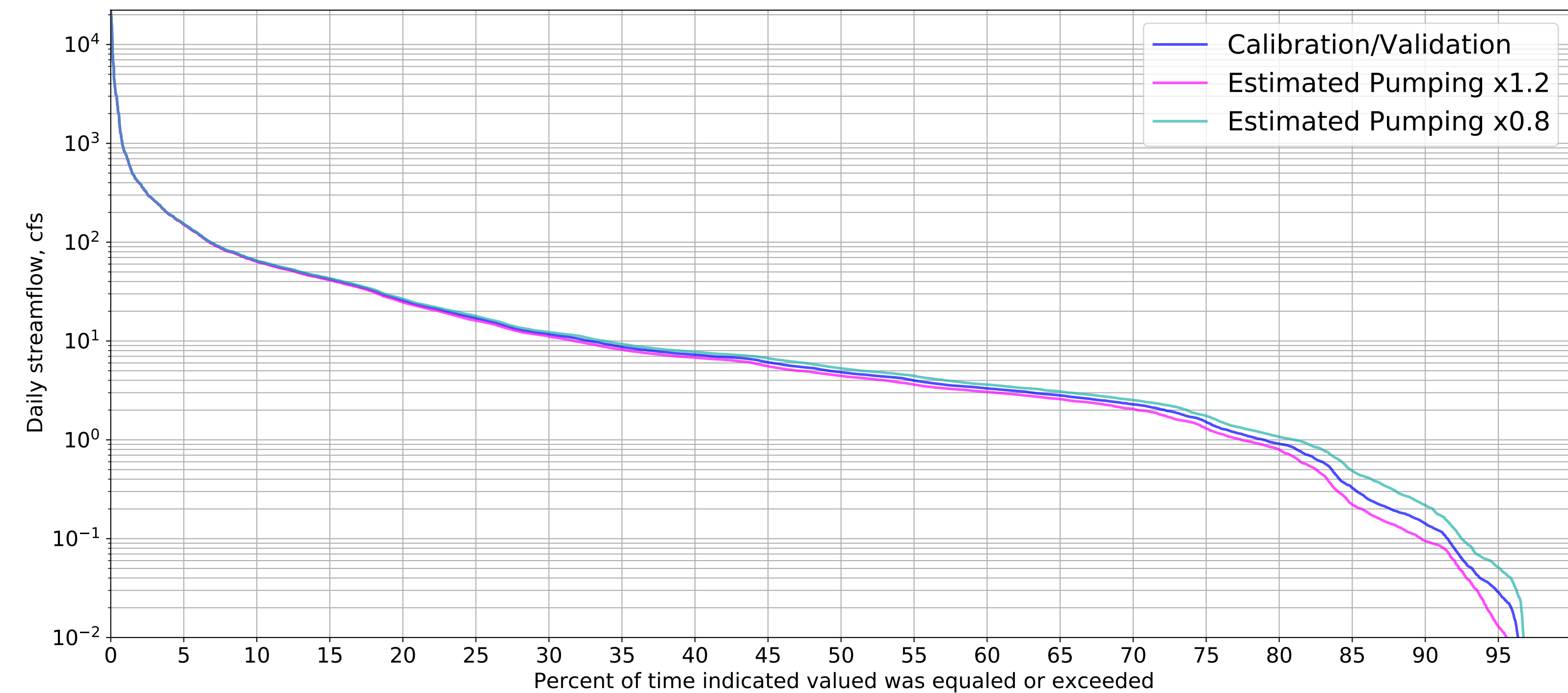
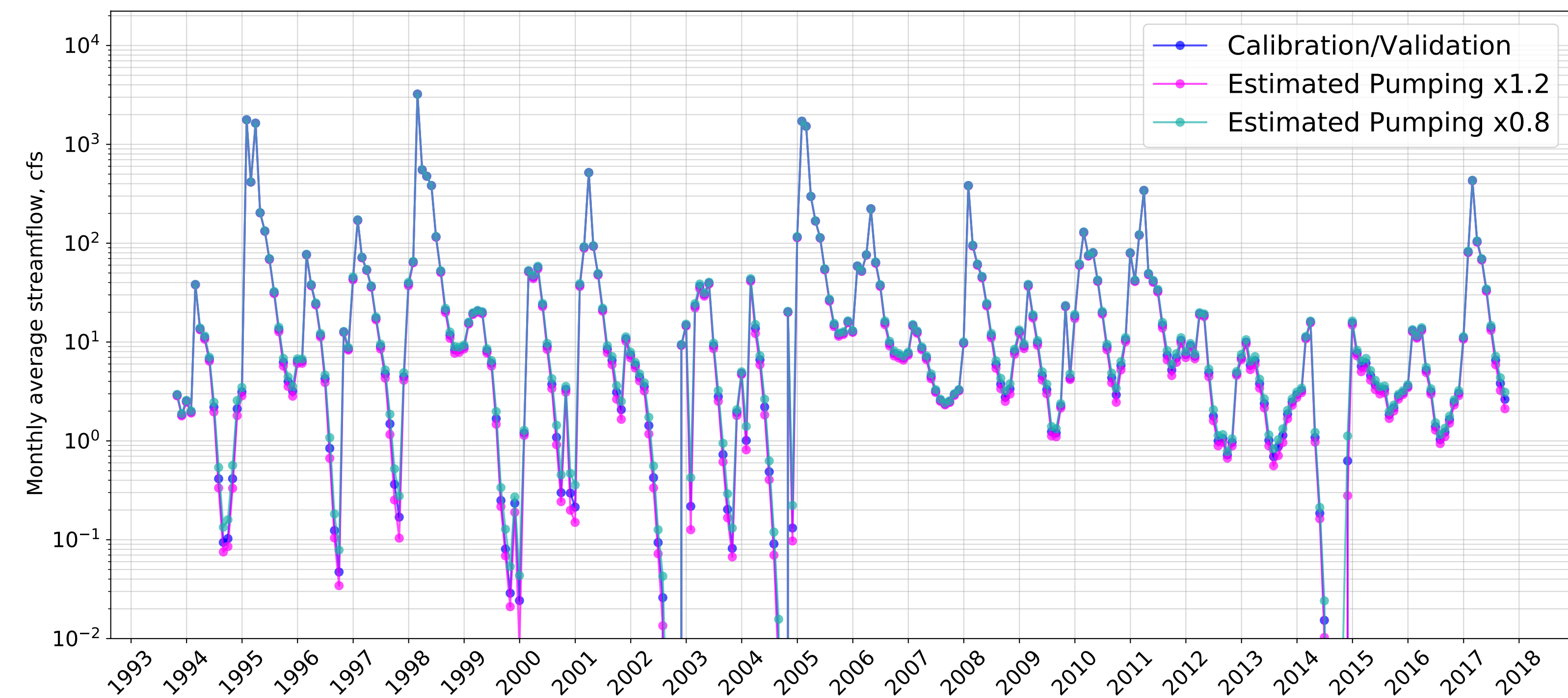
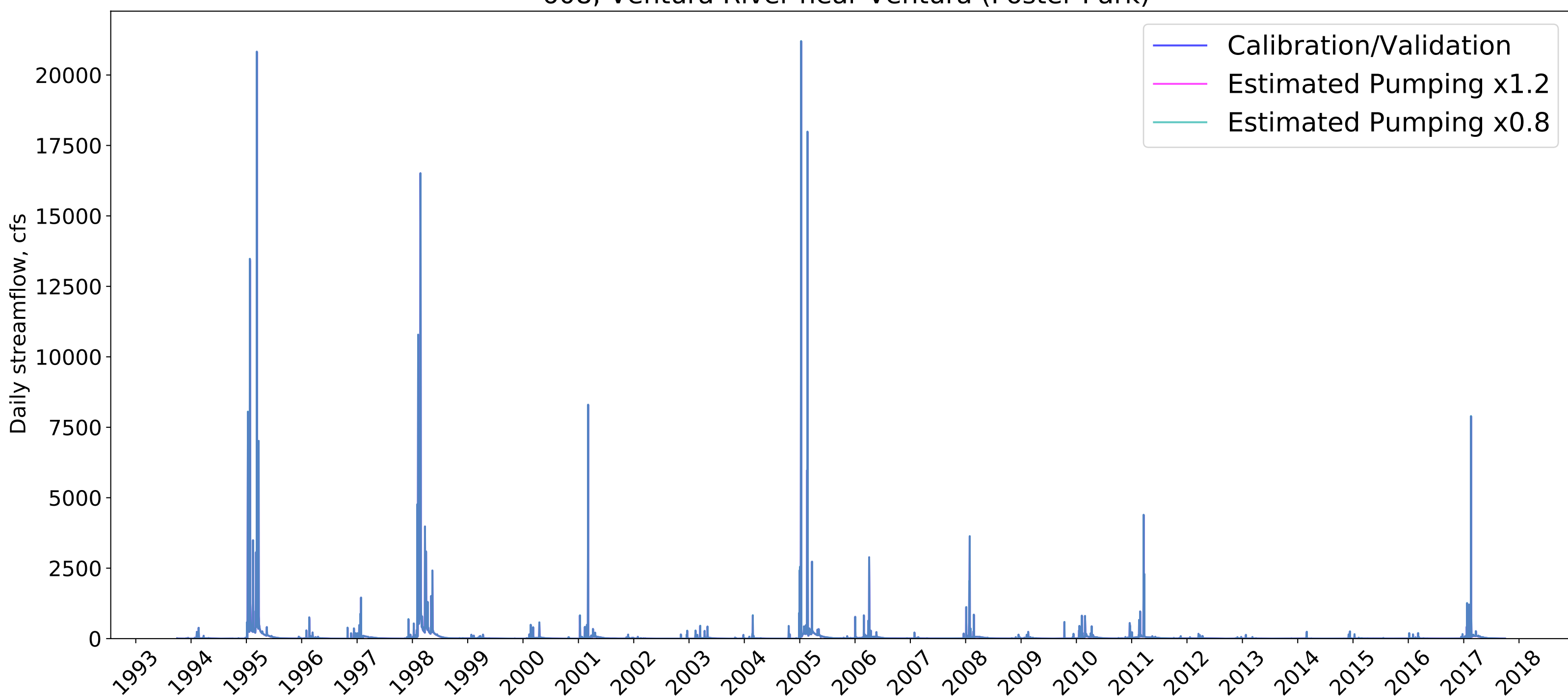
608, Ventura River near Ventura (Foster Park)



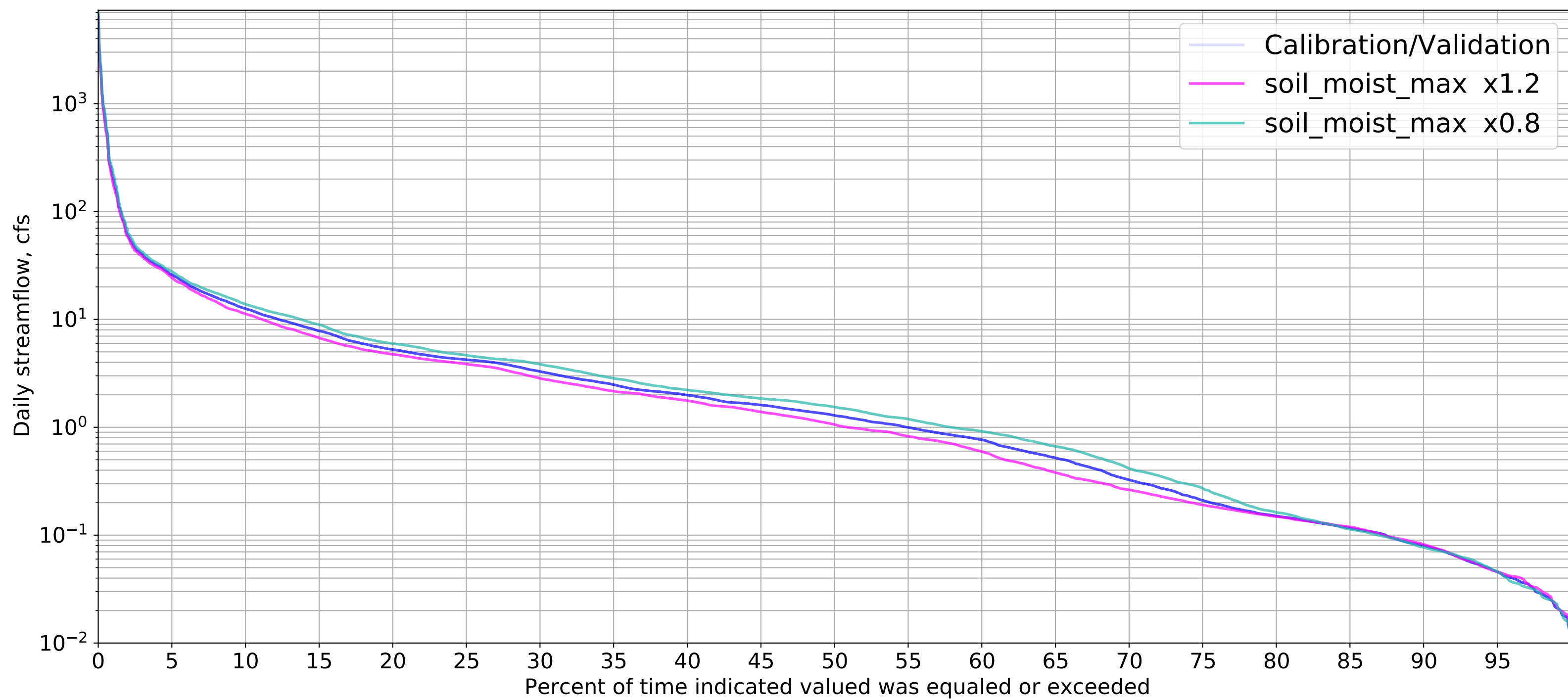
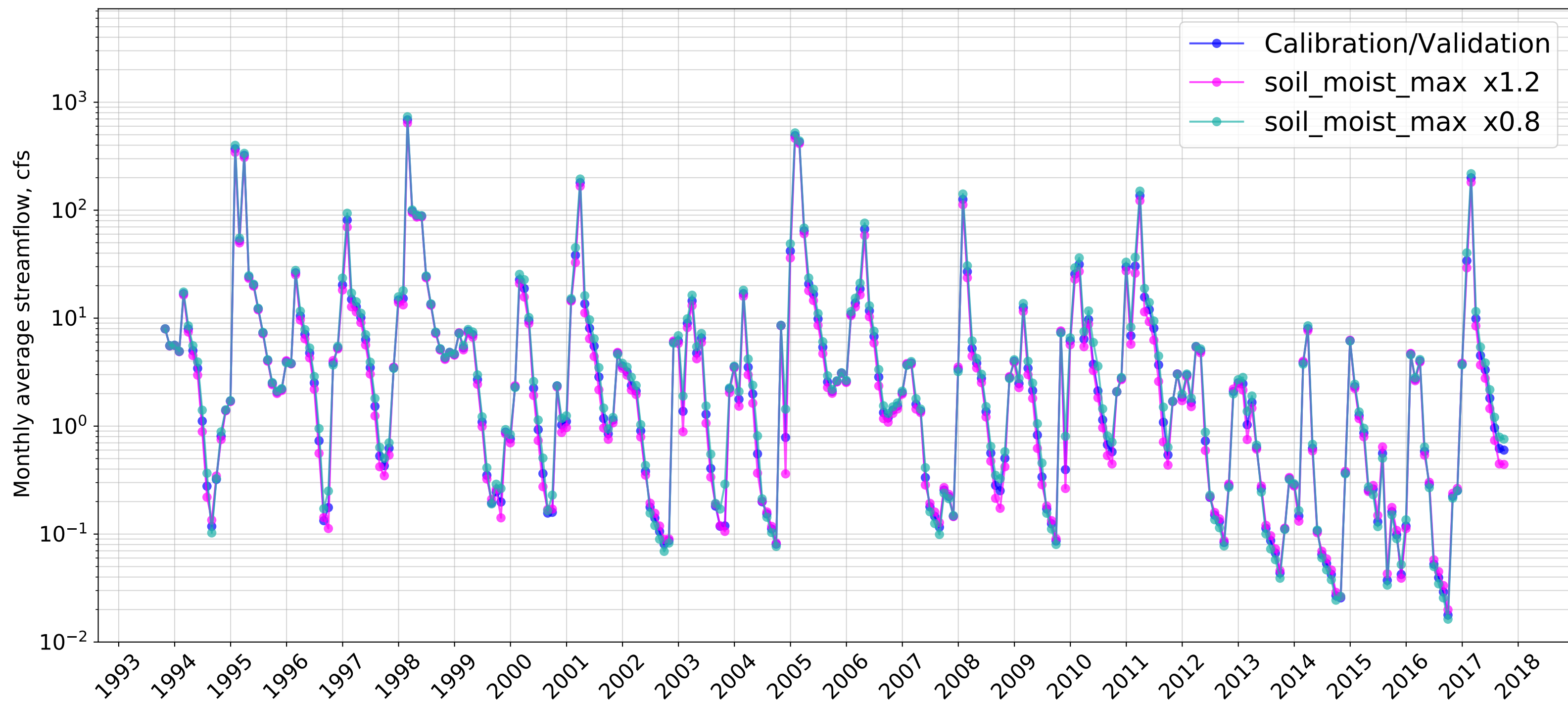
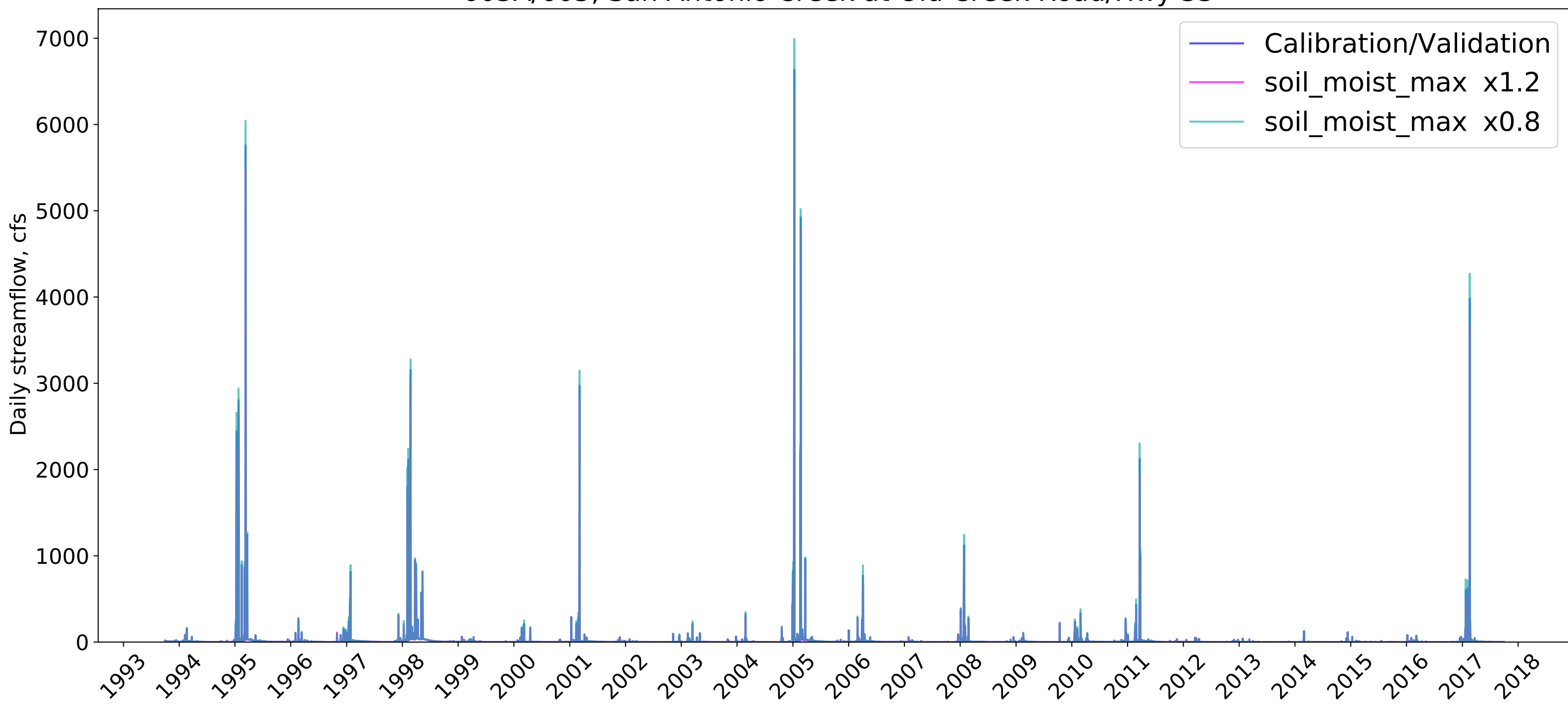
608, Ventura River near Ventura (Foster Park)



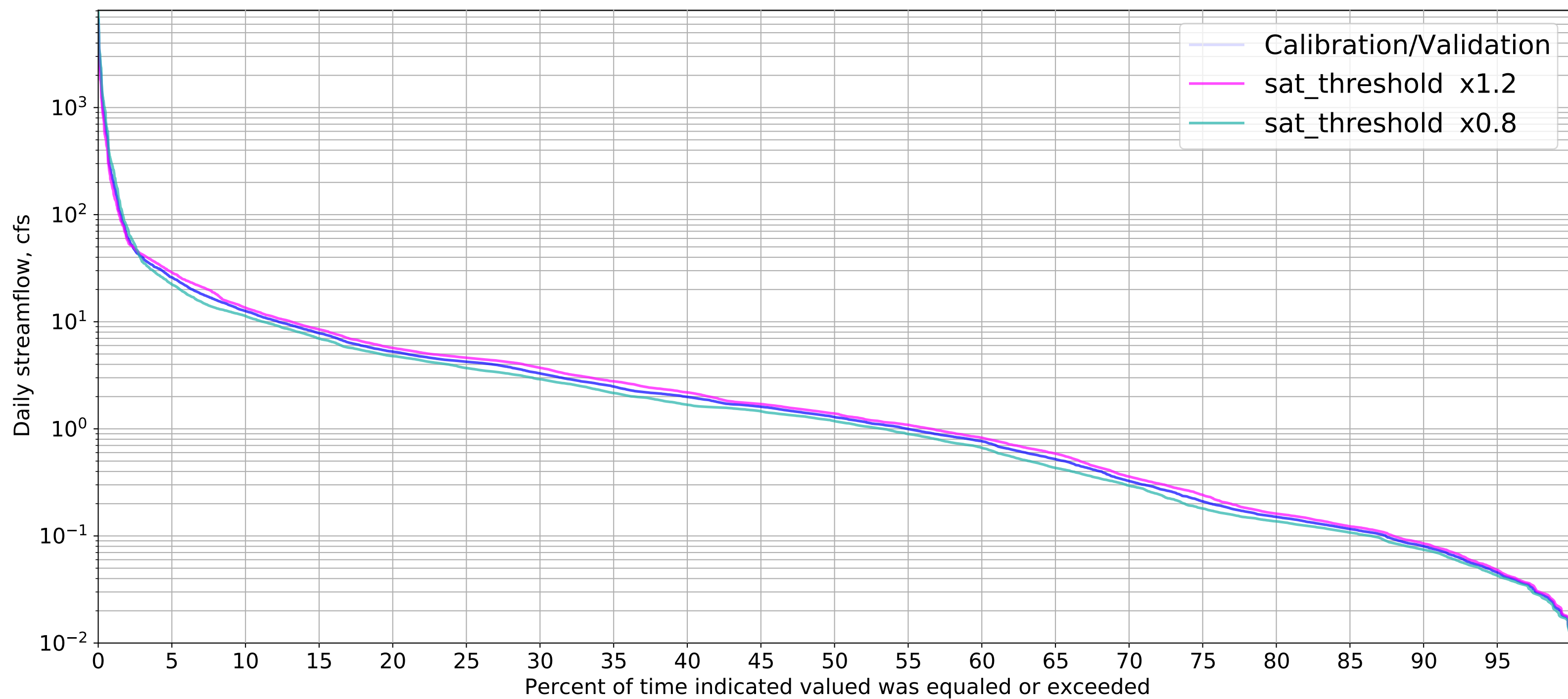
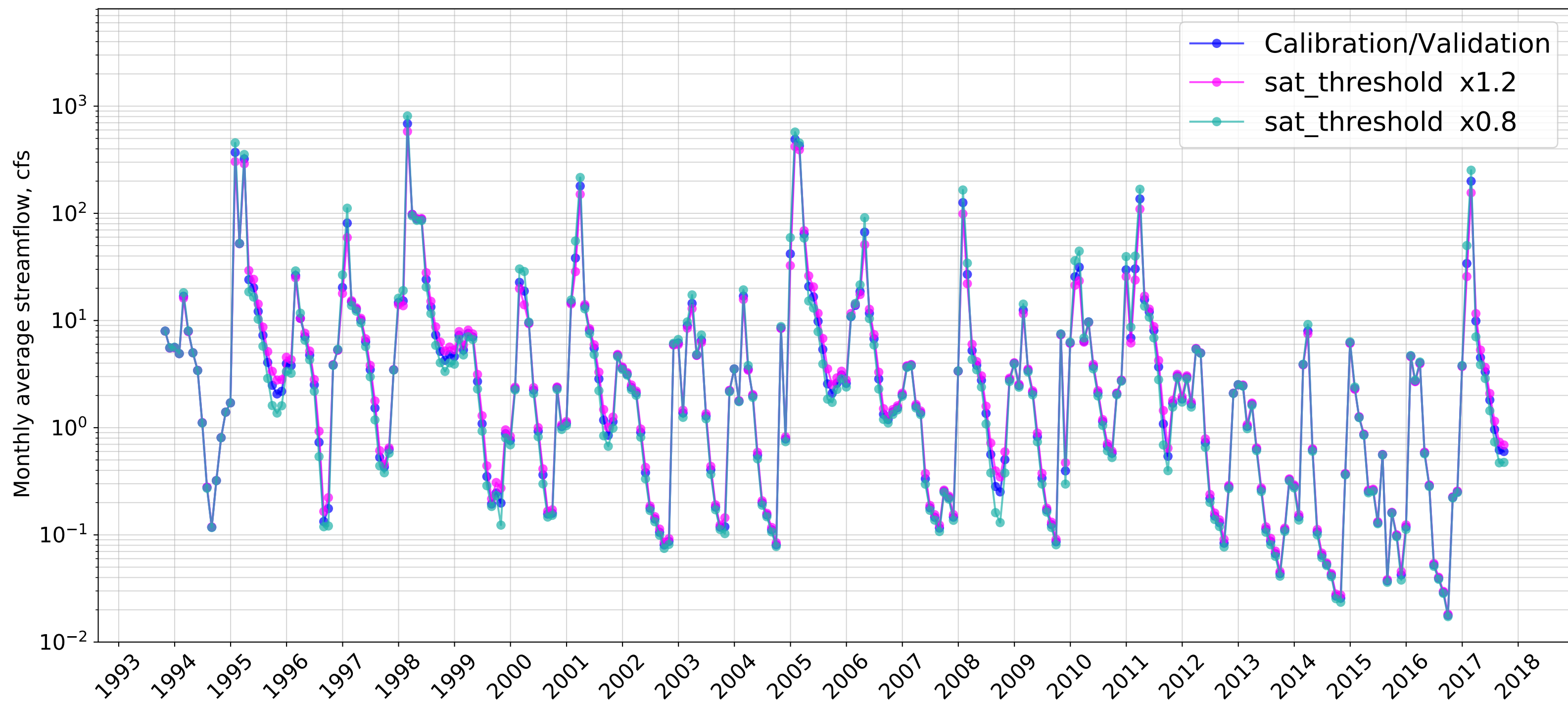
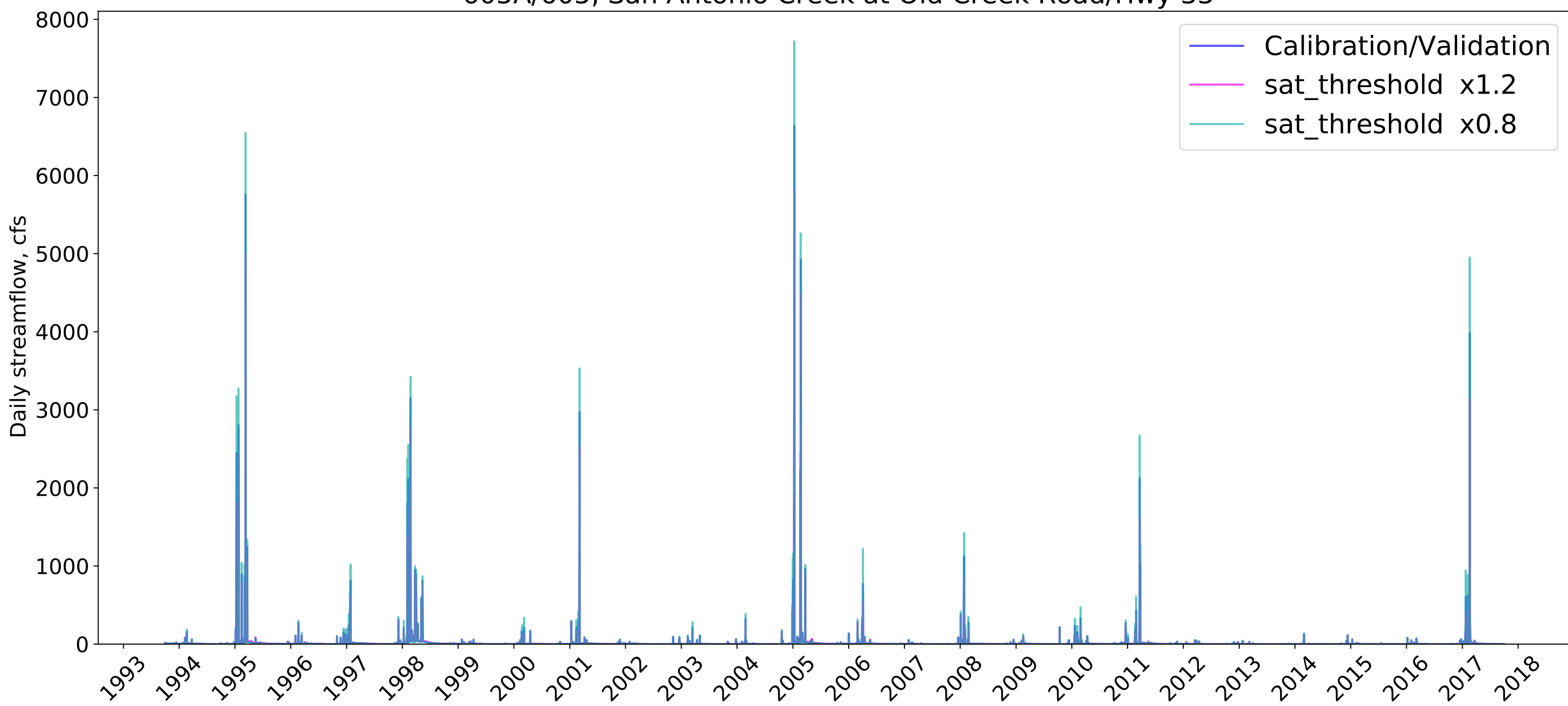
608, Ventura River near Ventura (Foster Park)



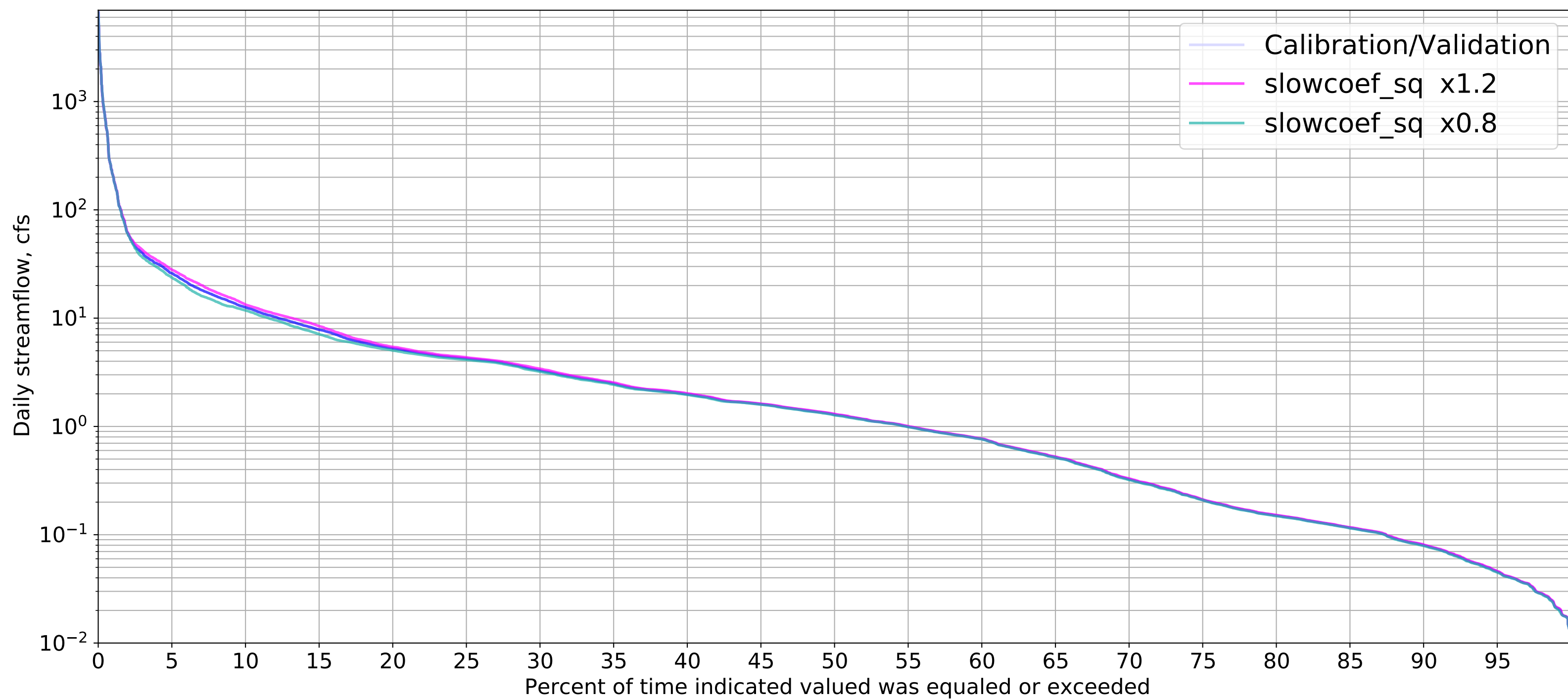
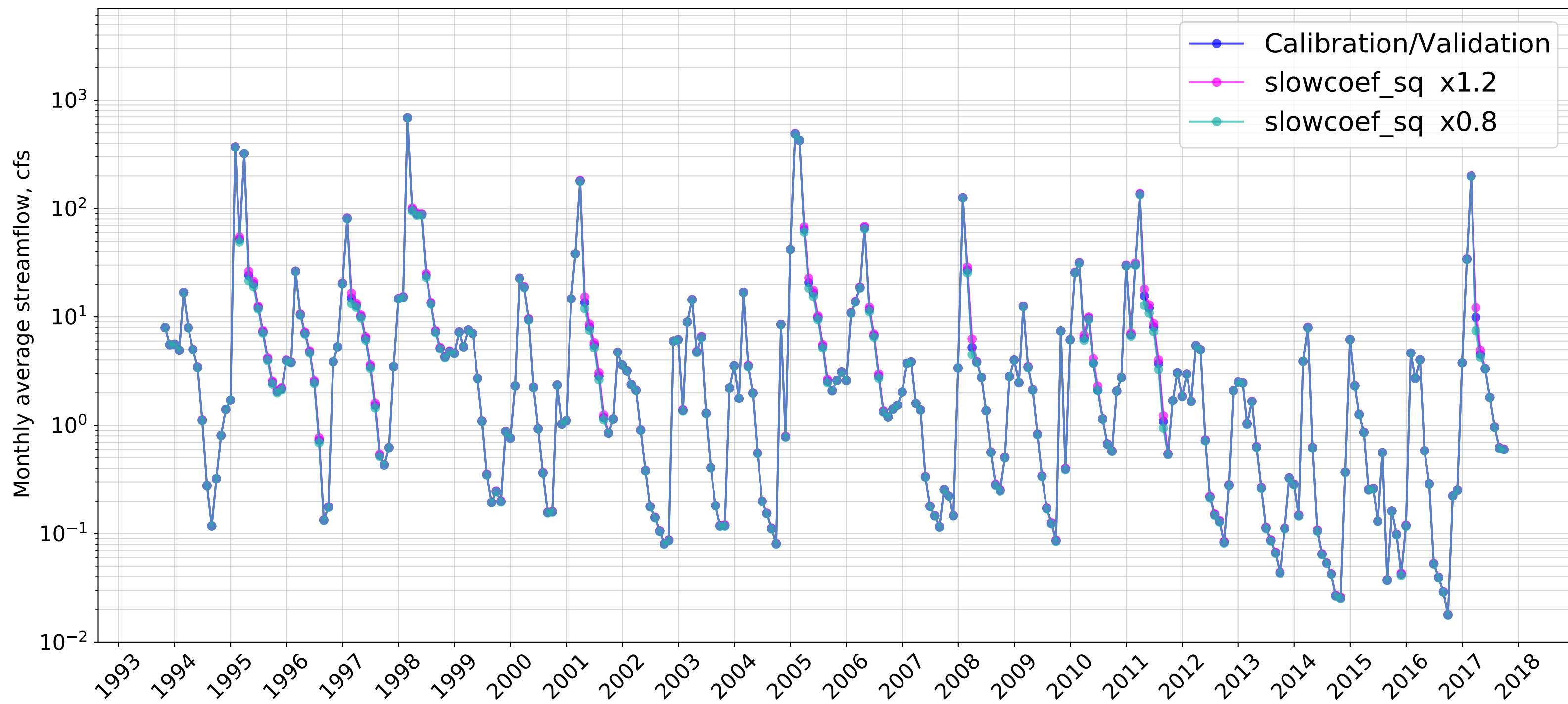
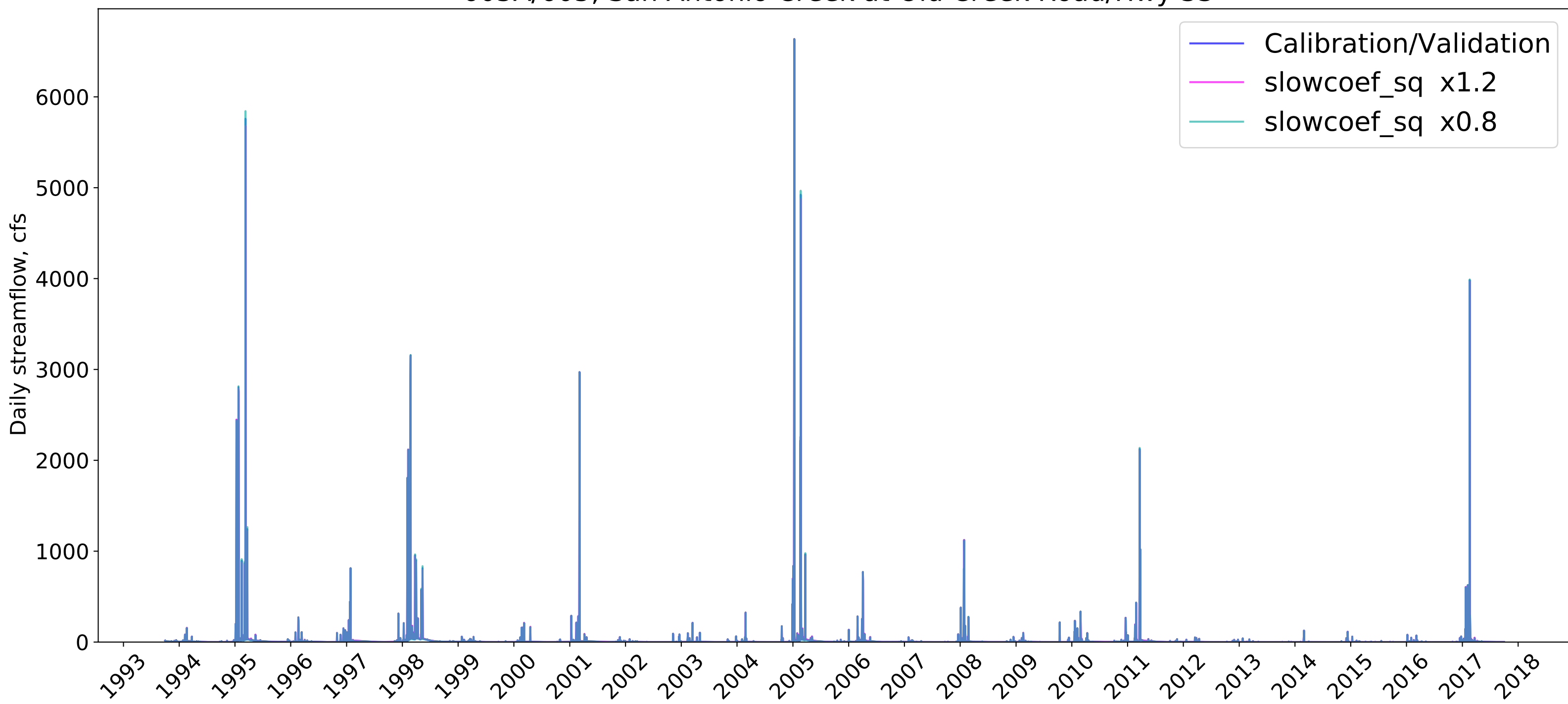
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



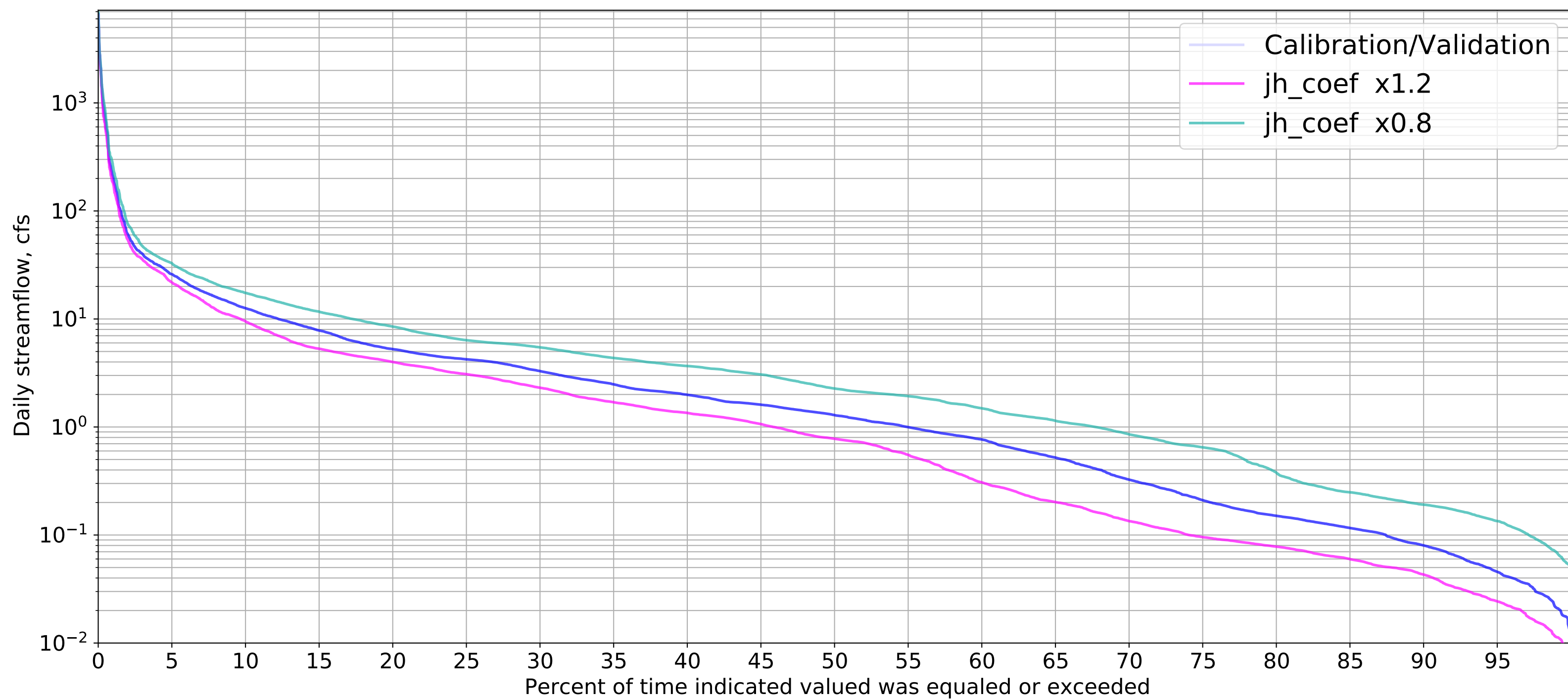
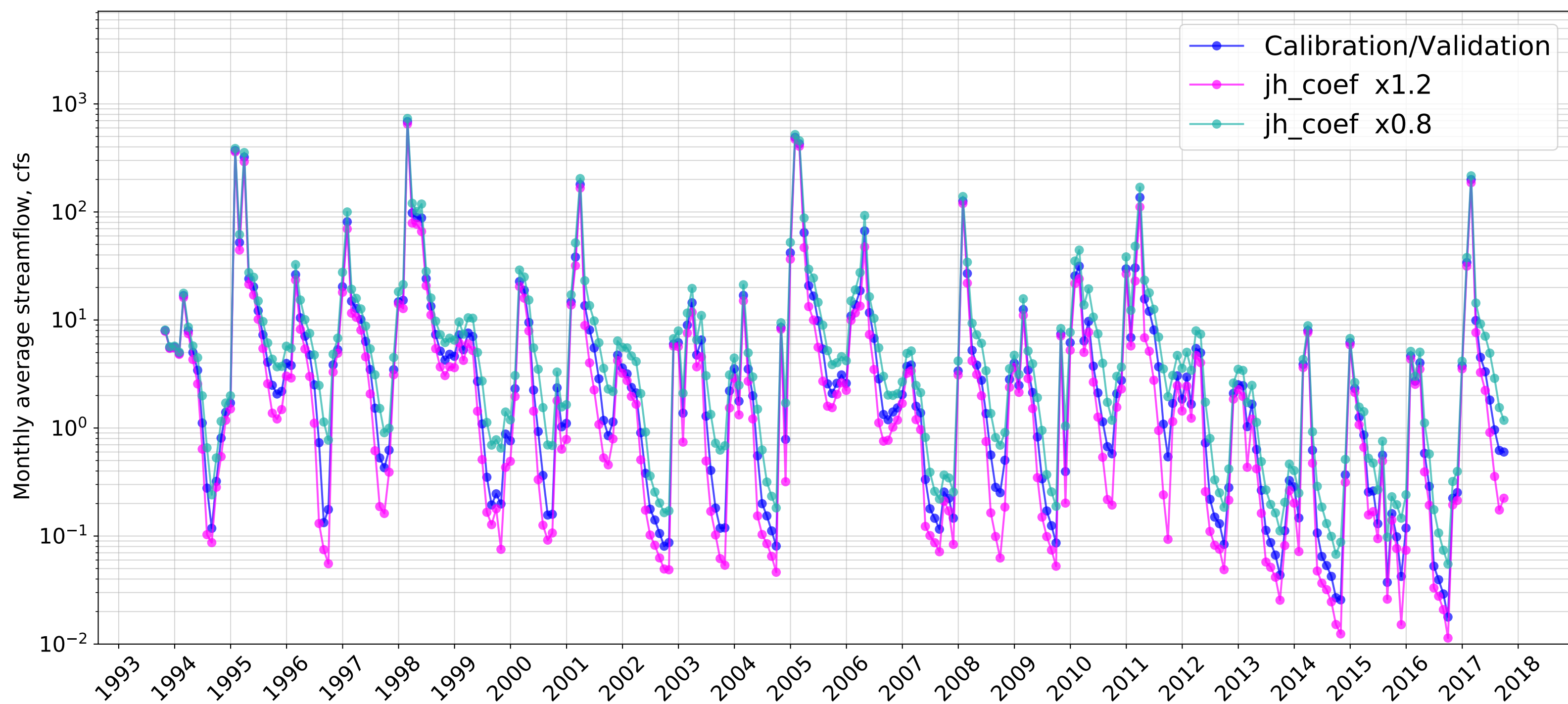
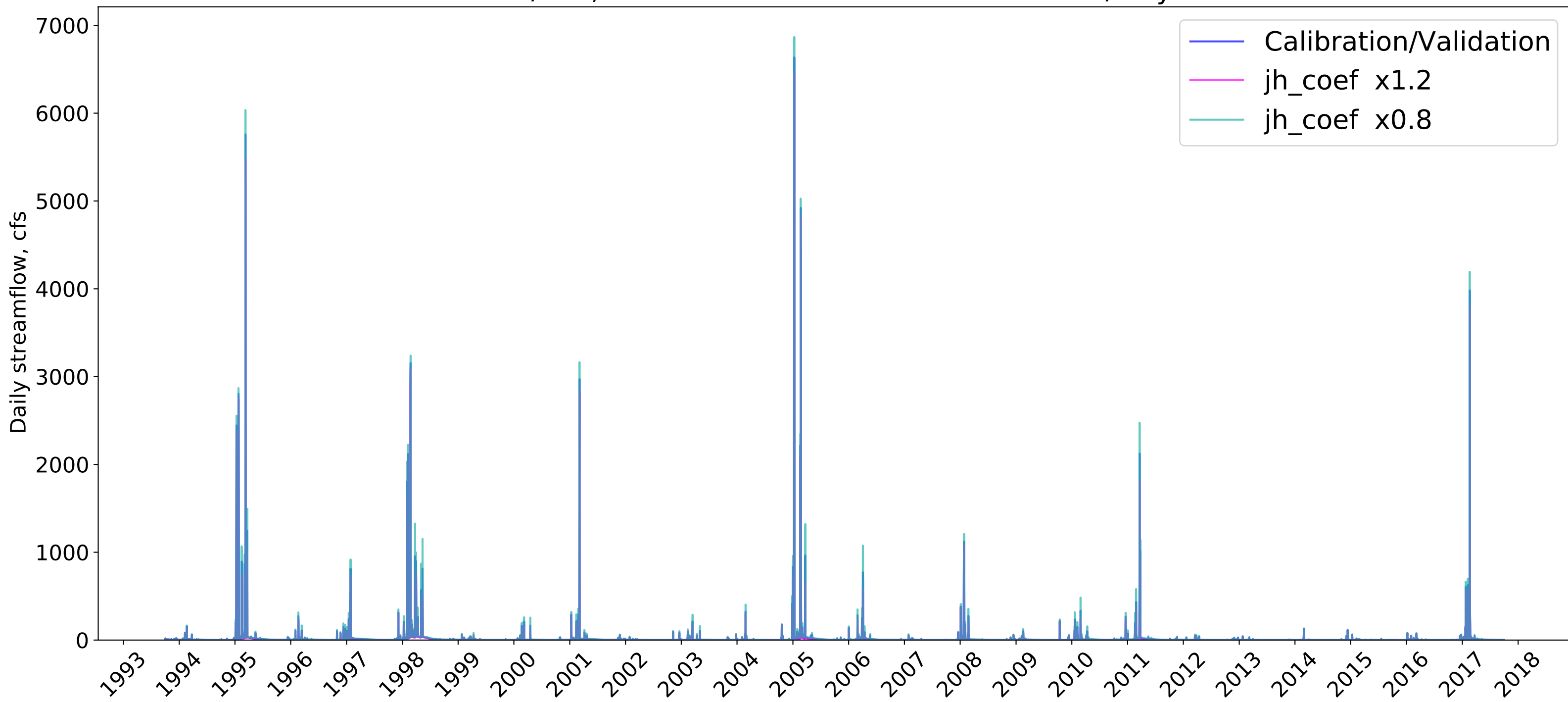
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



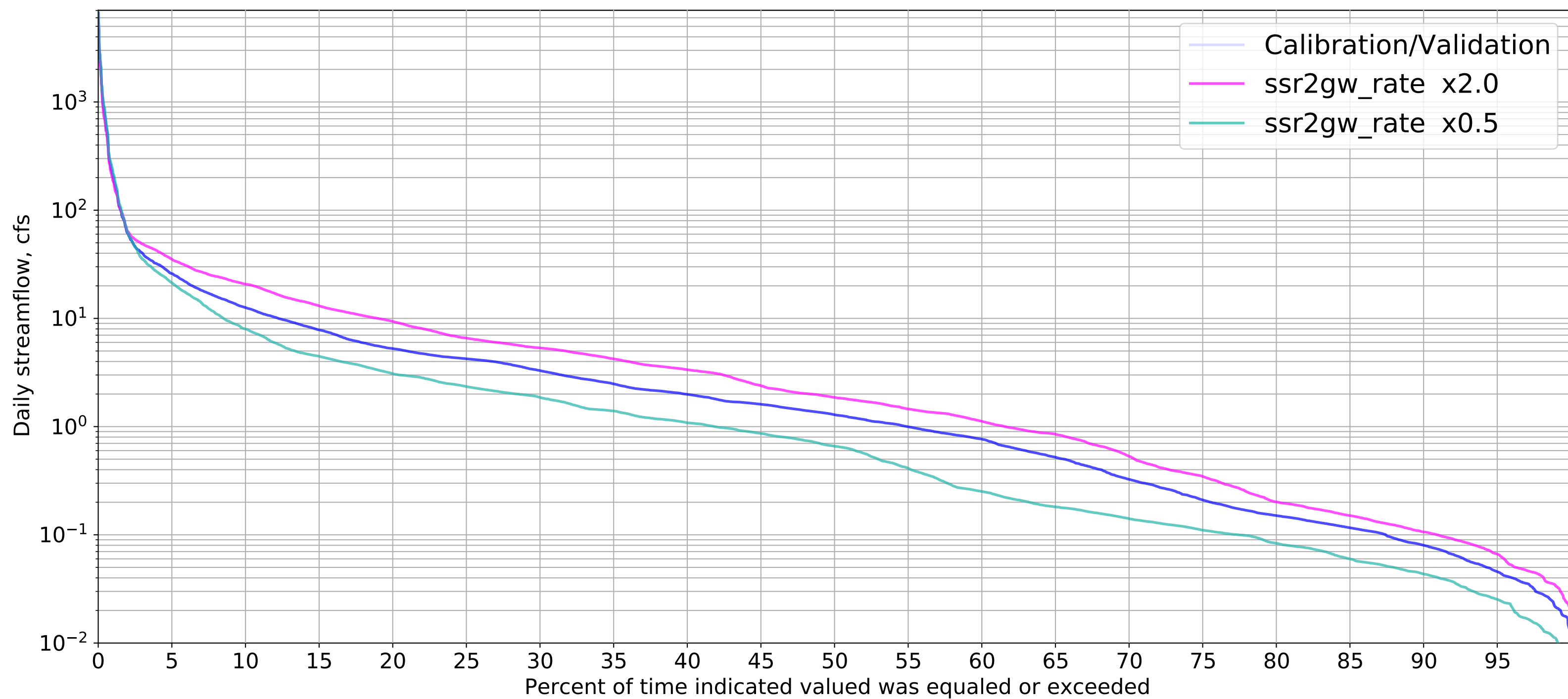
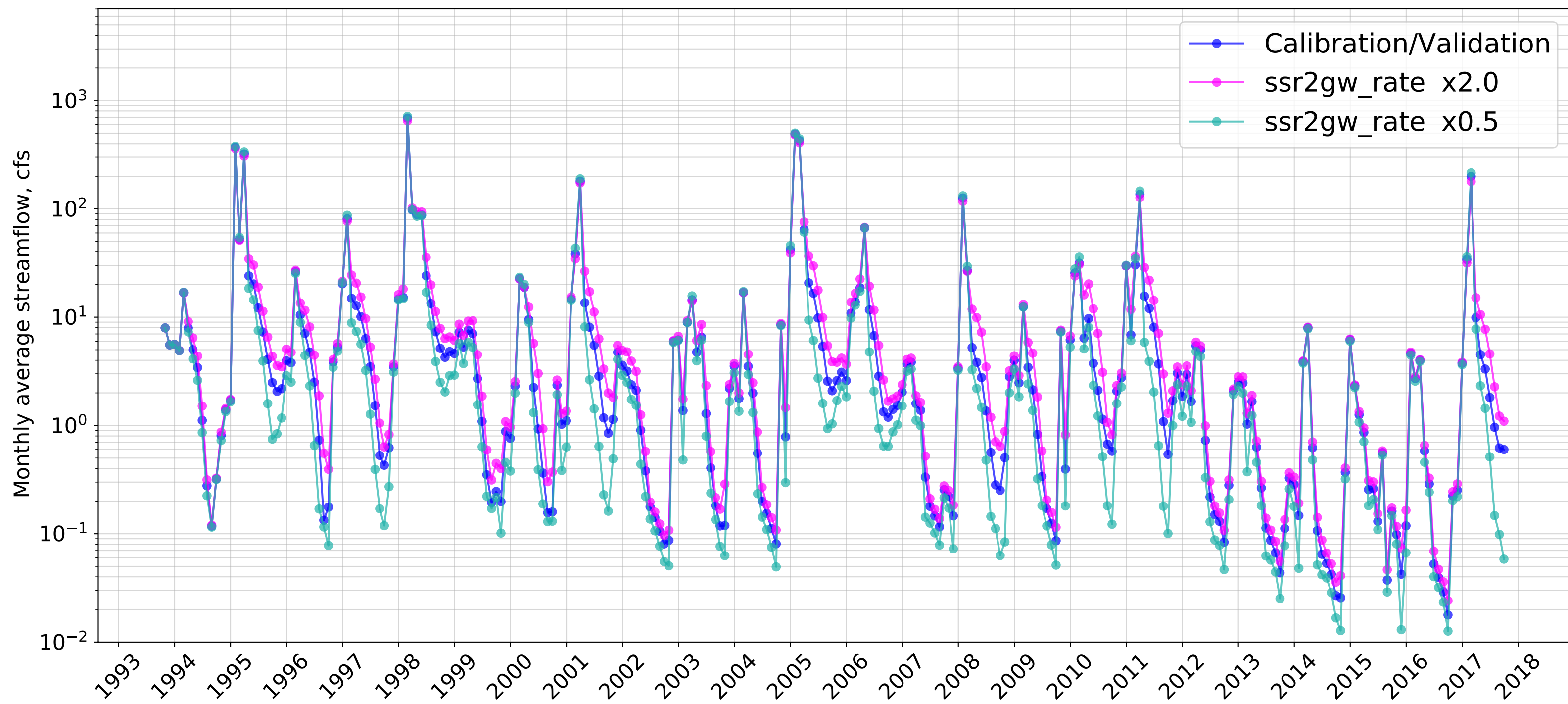
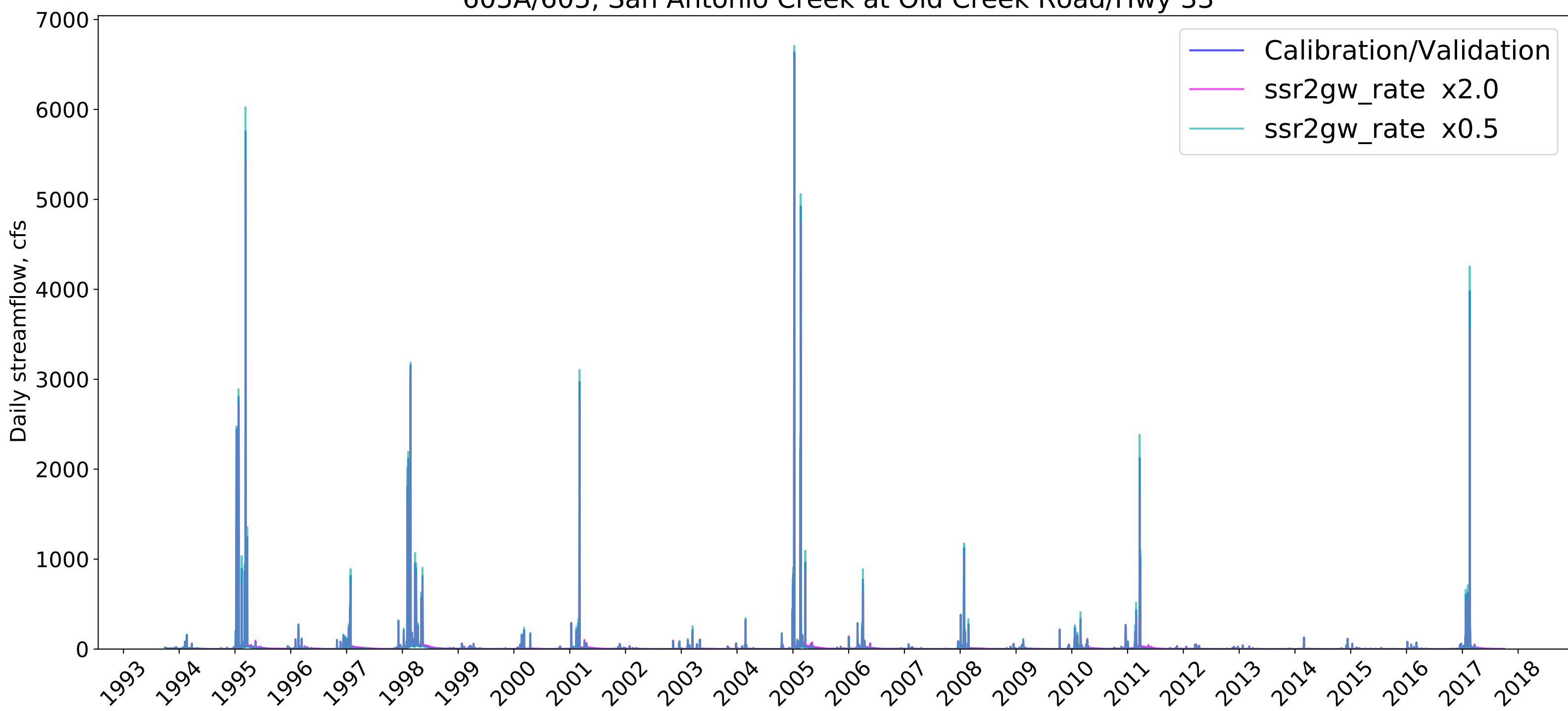
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



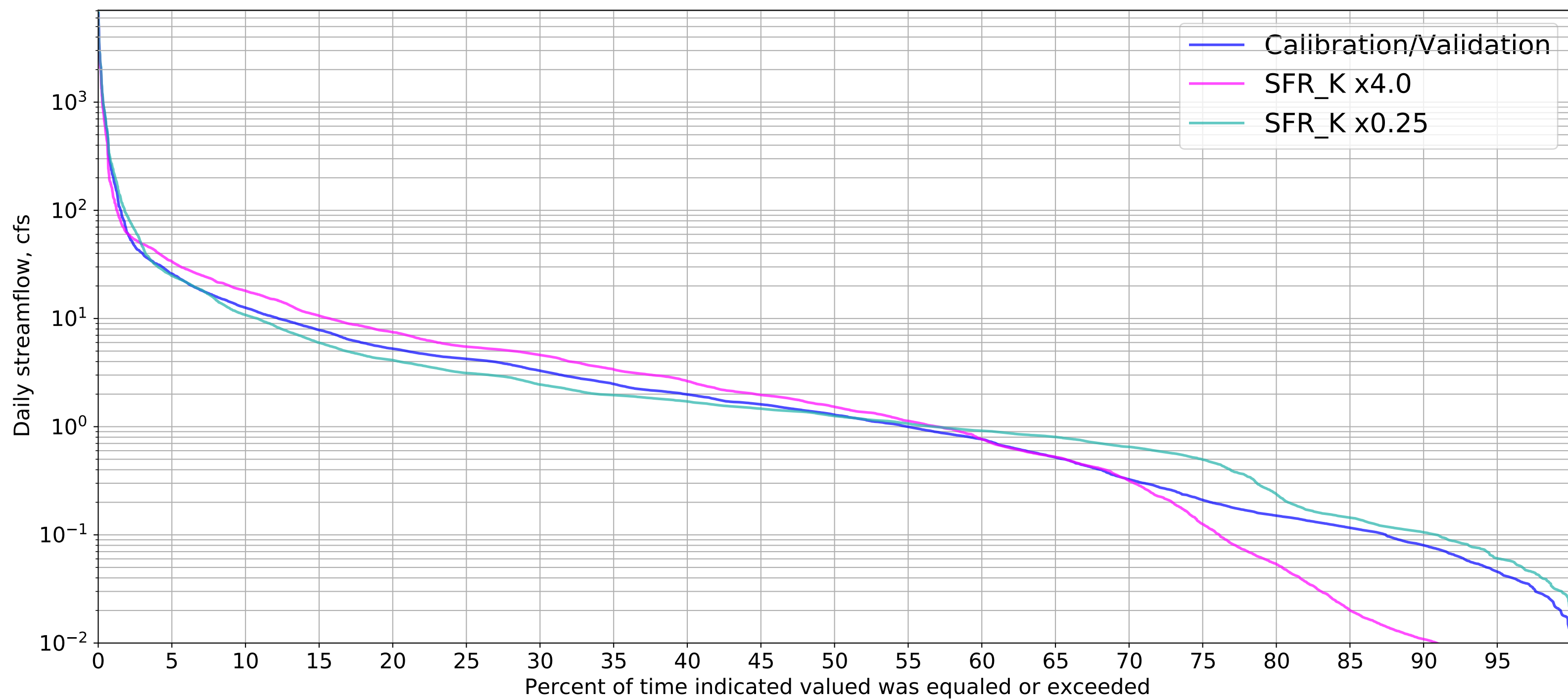
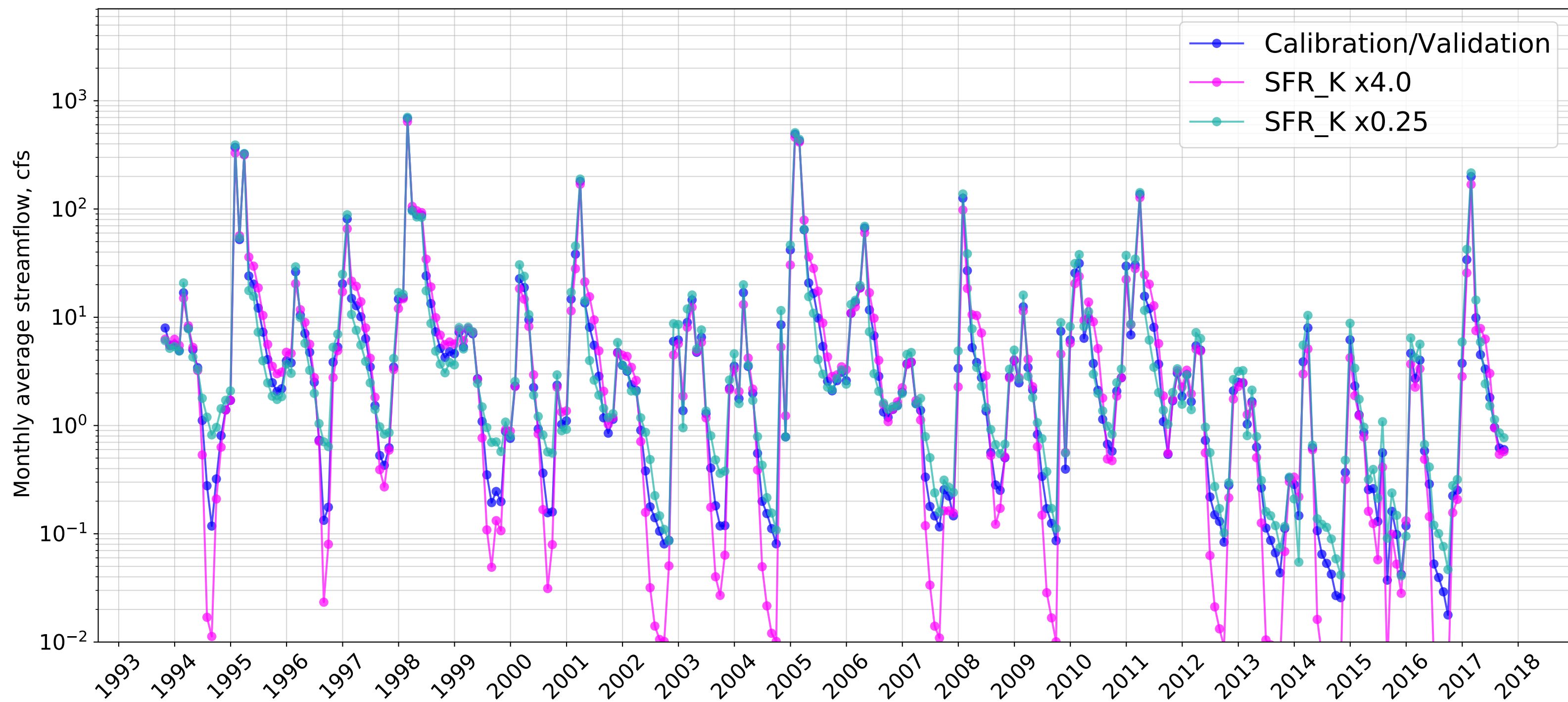
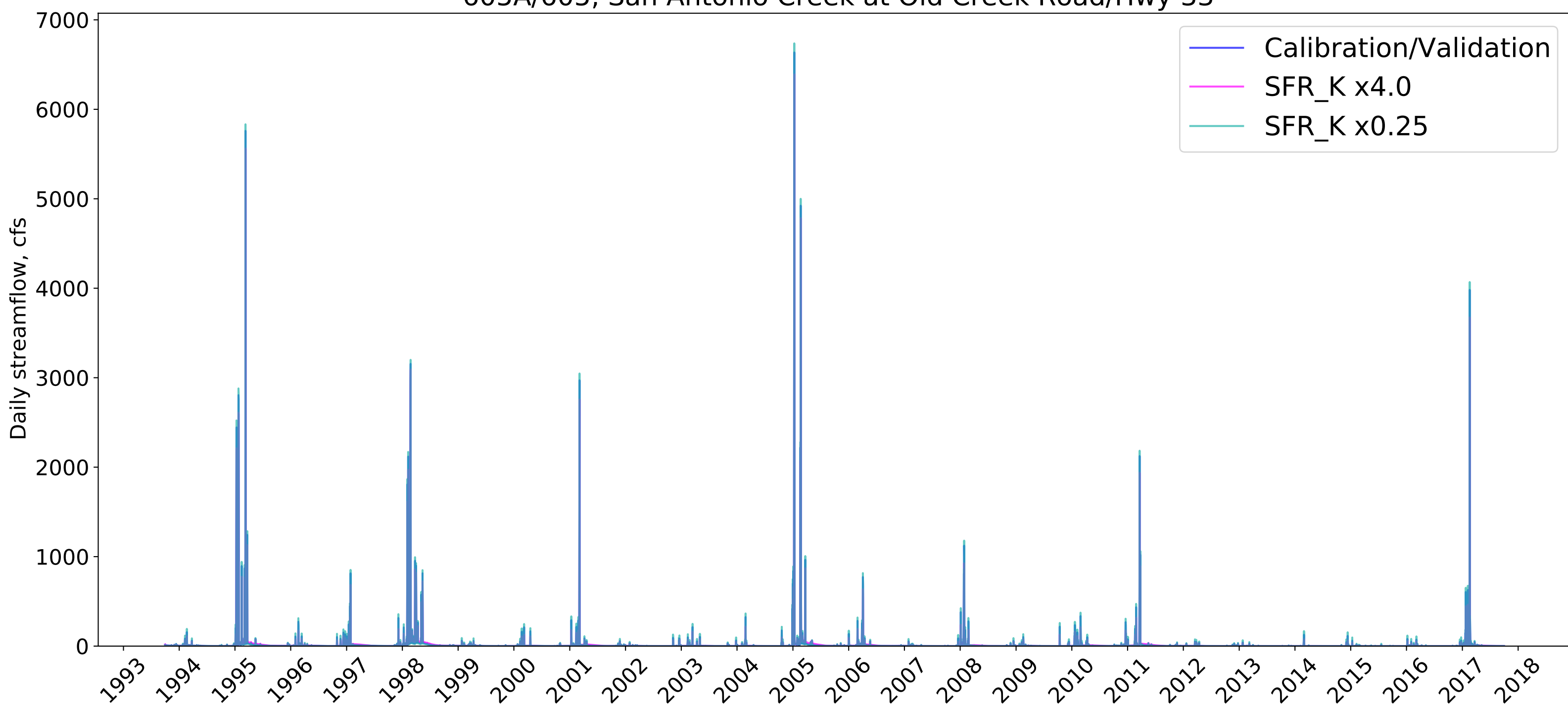
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



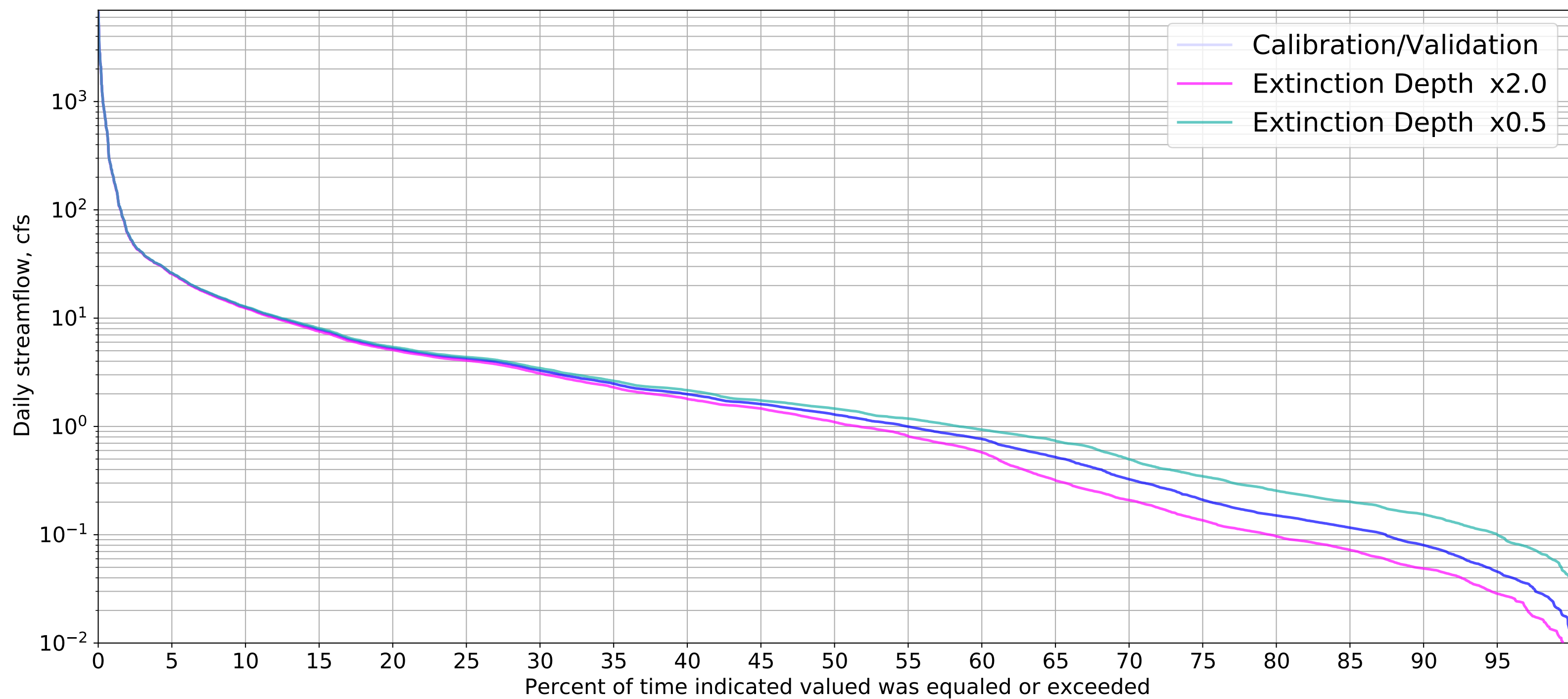
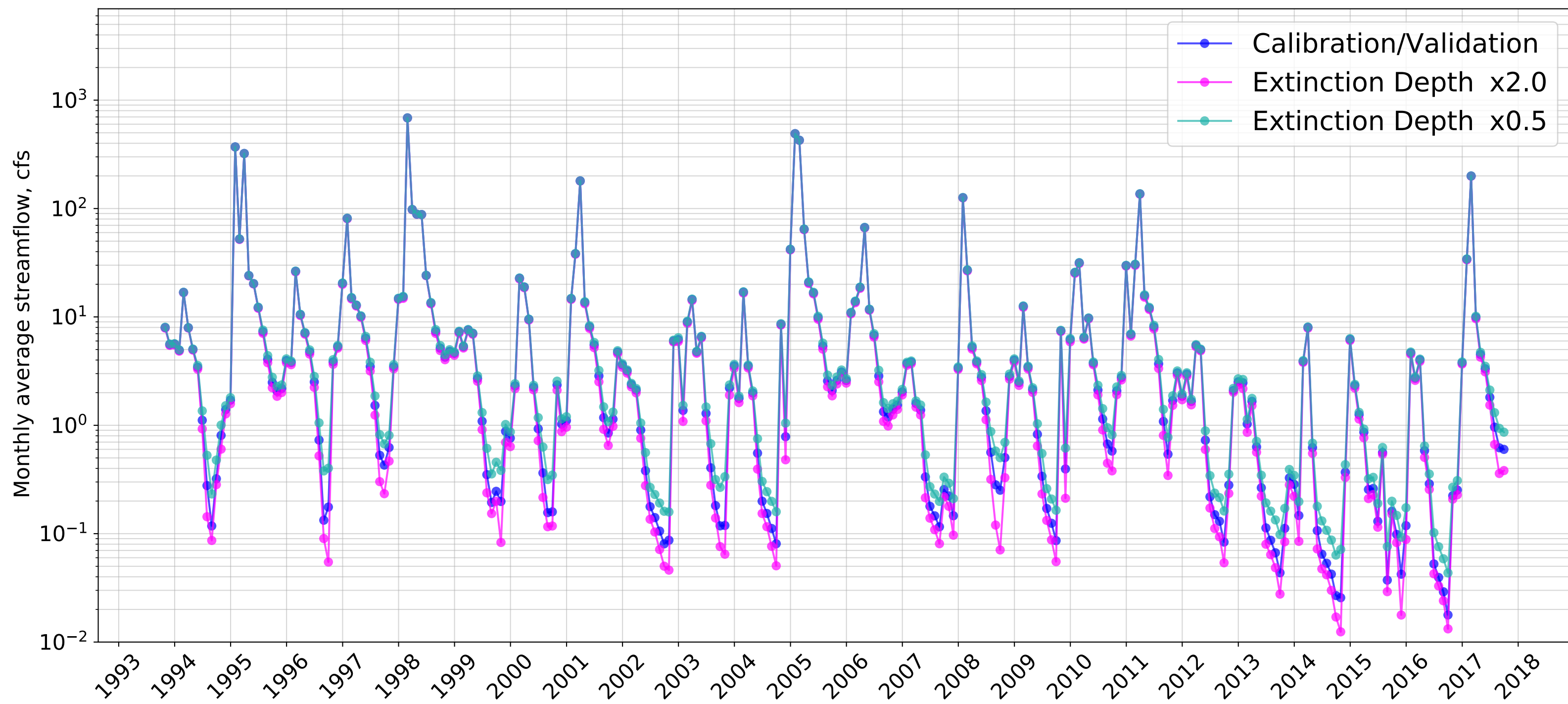
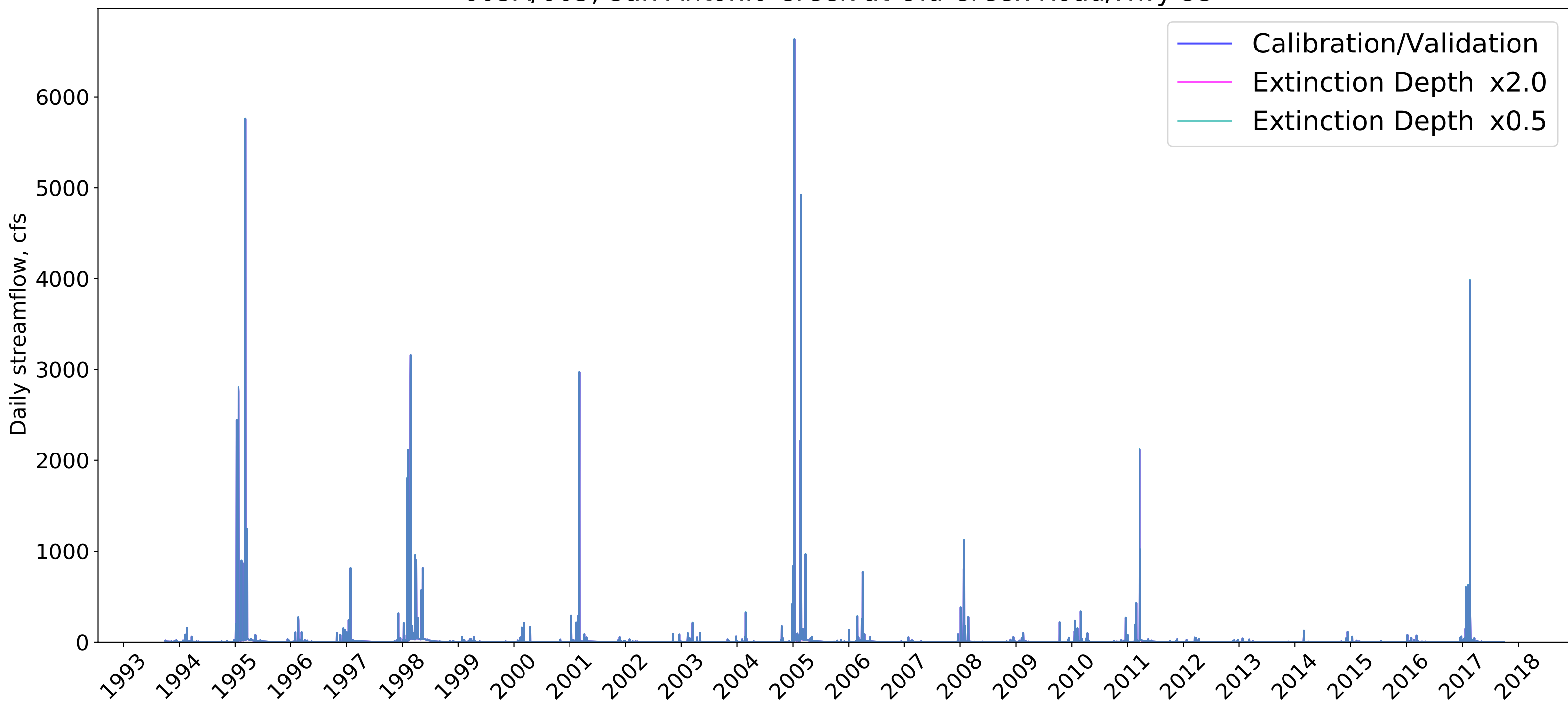
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



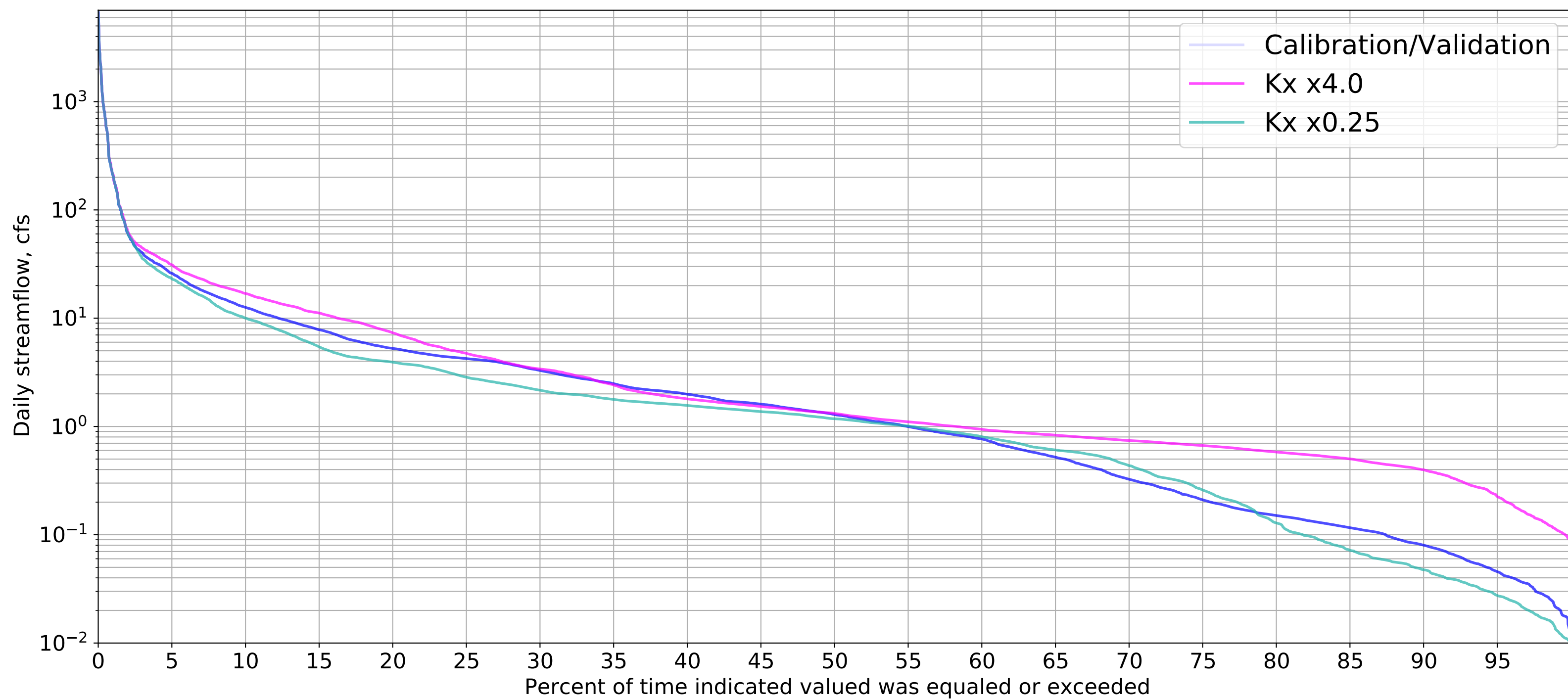
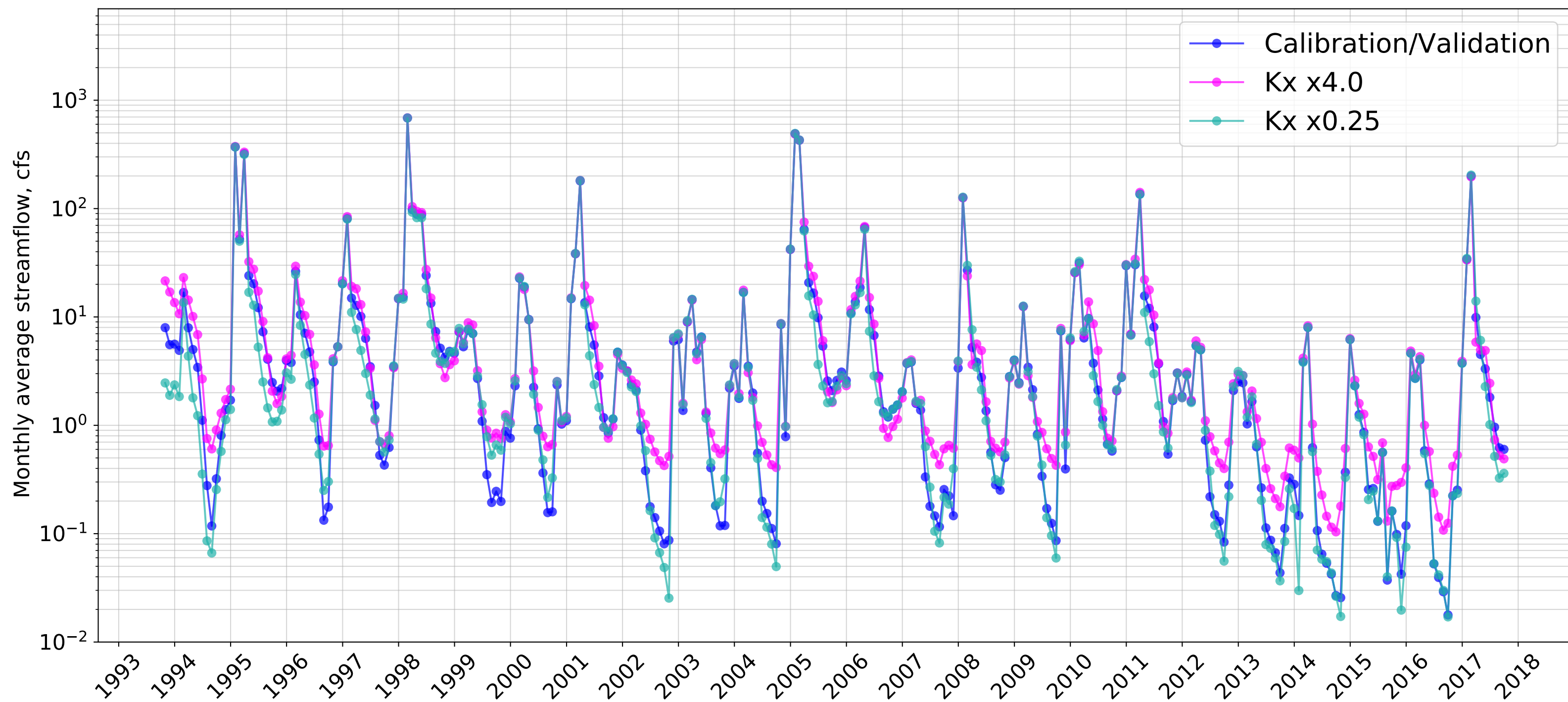
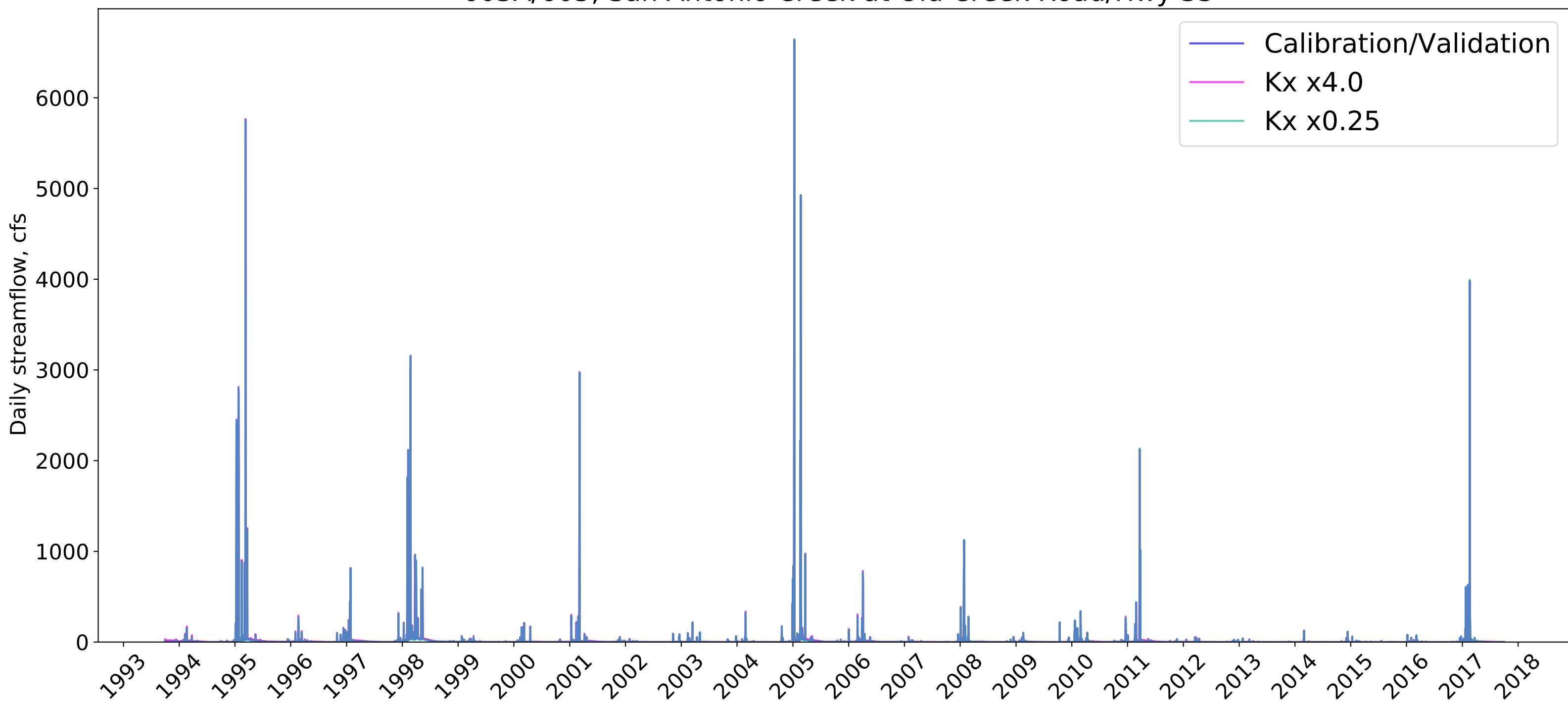
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



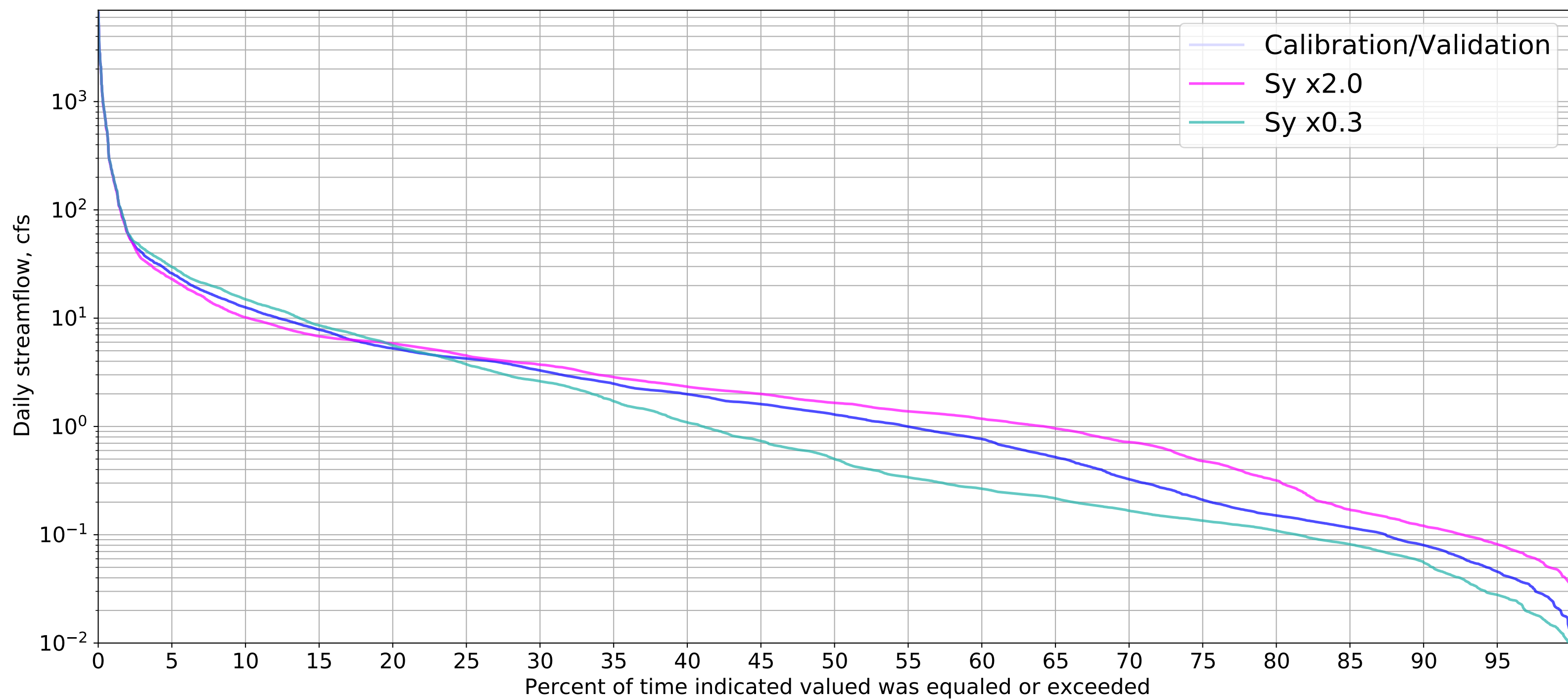
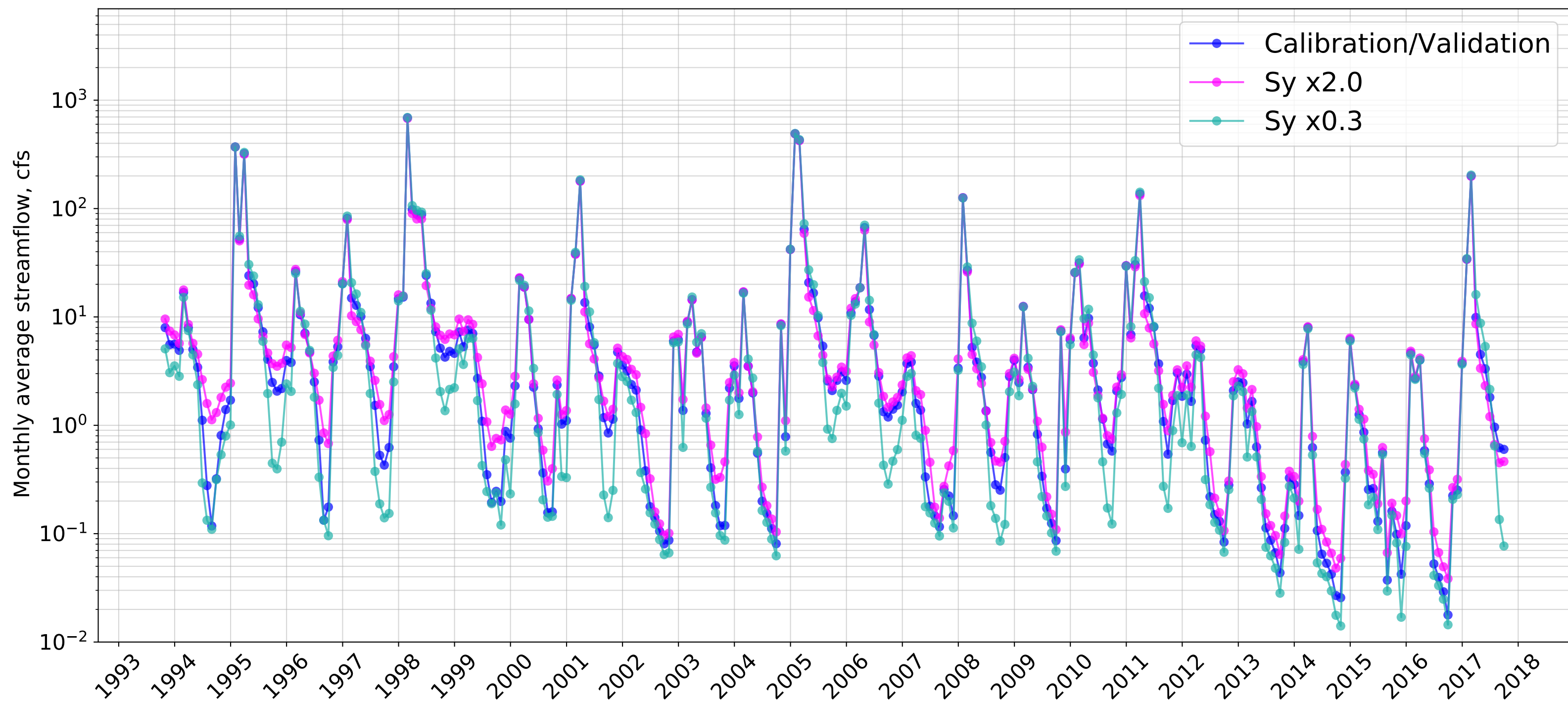
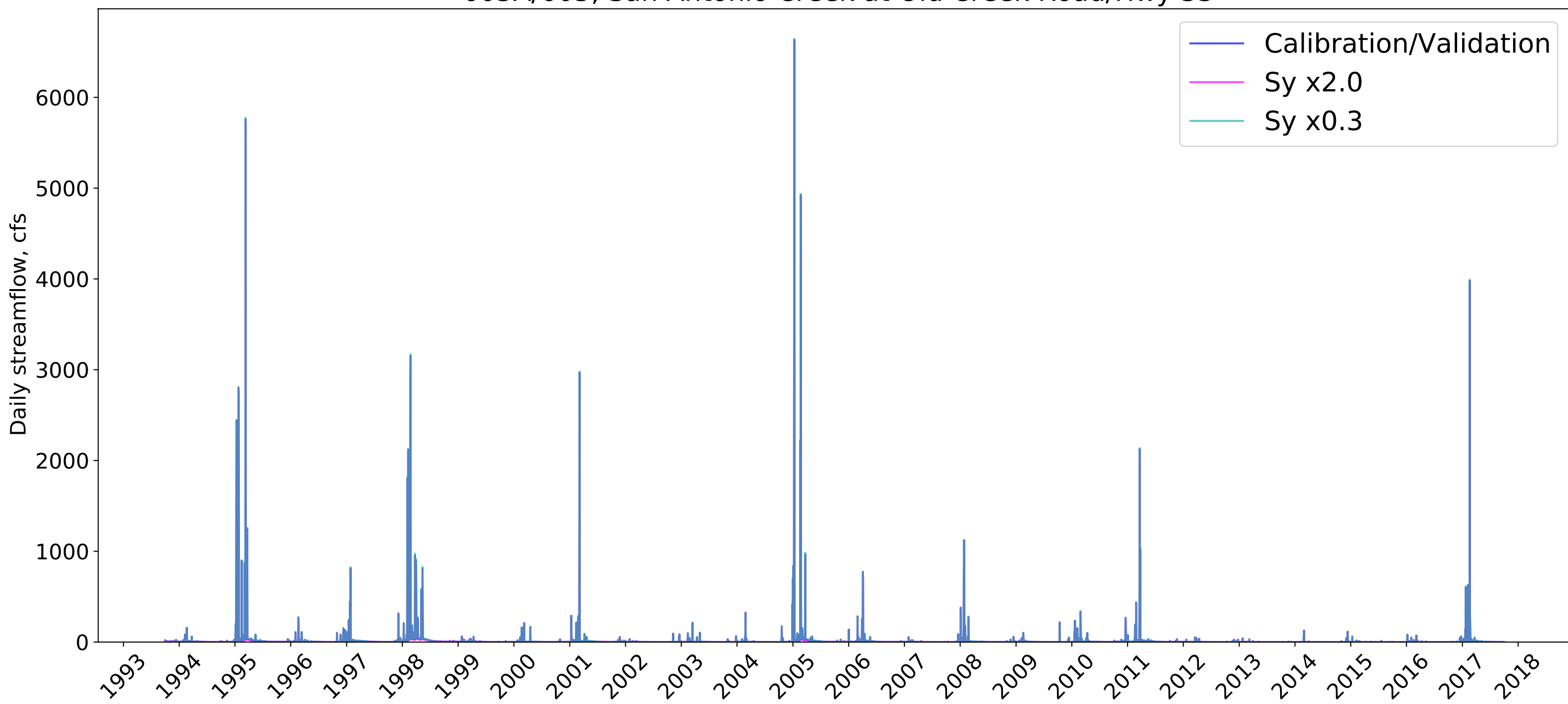
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



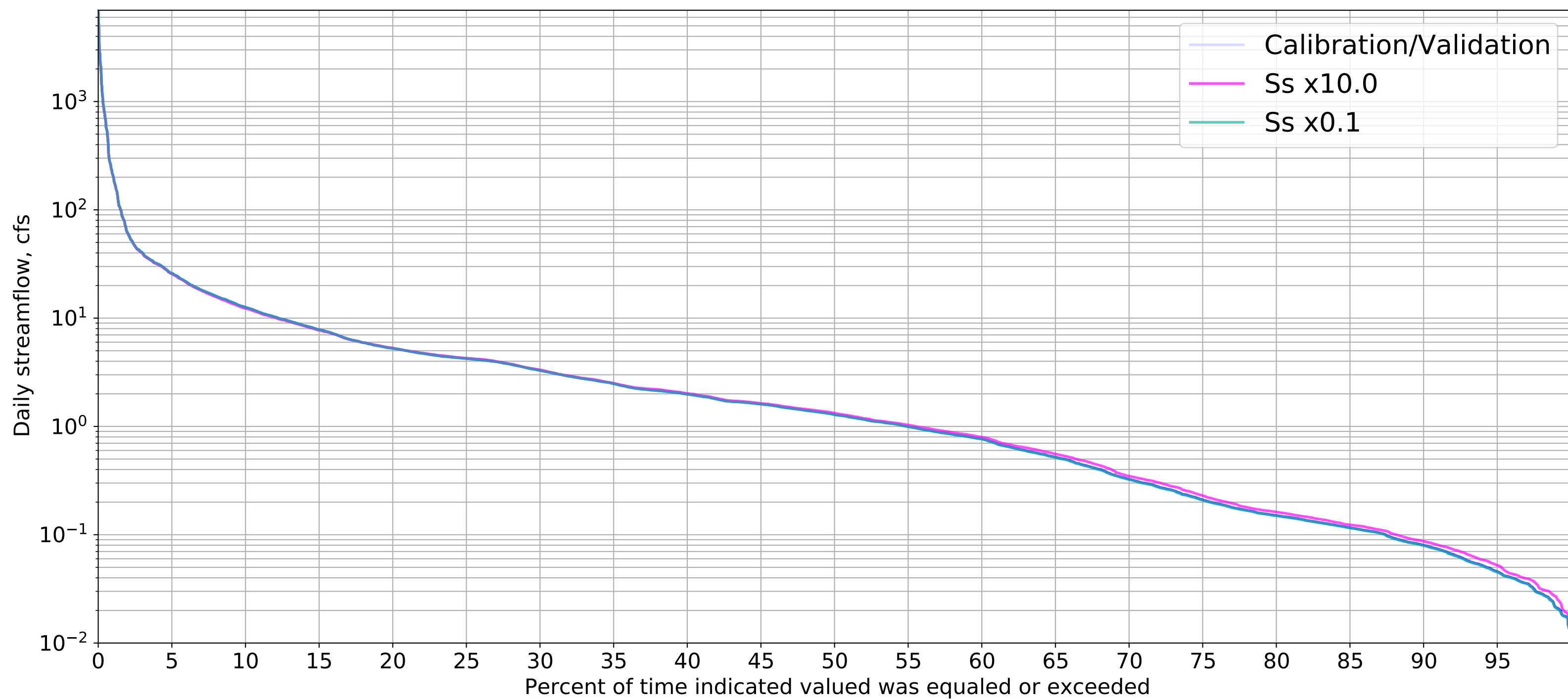
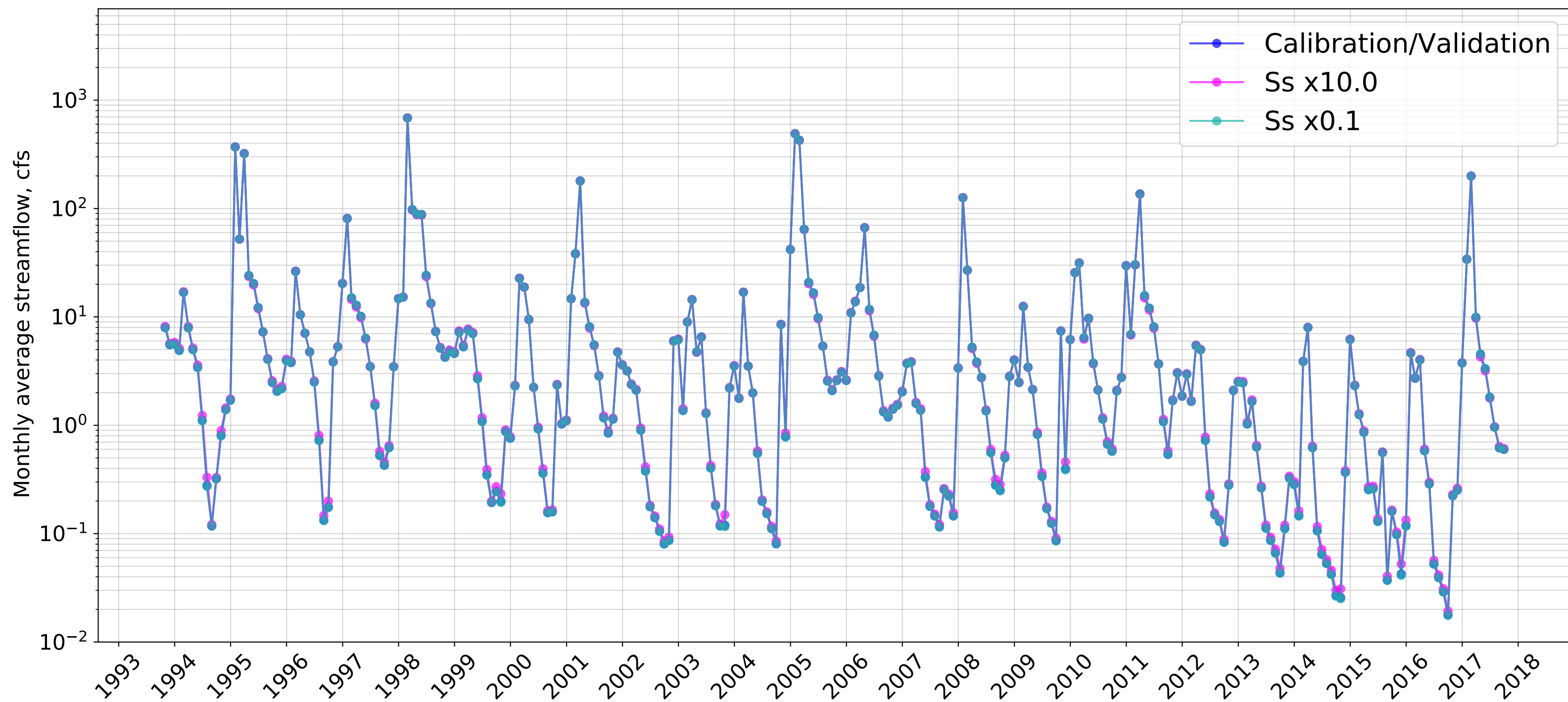
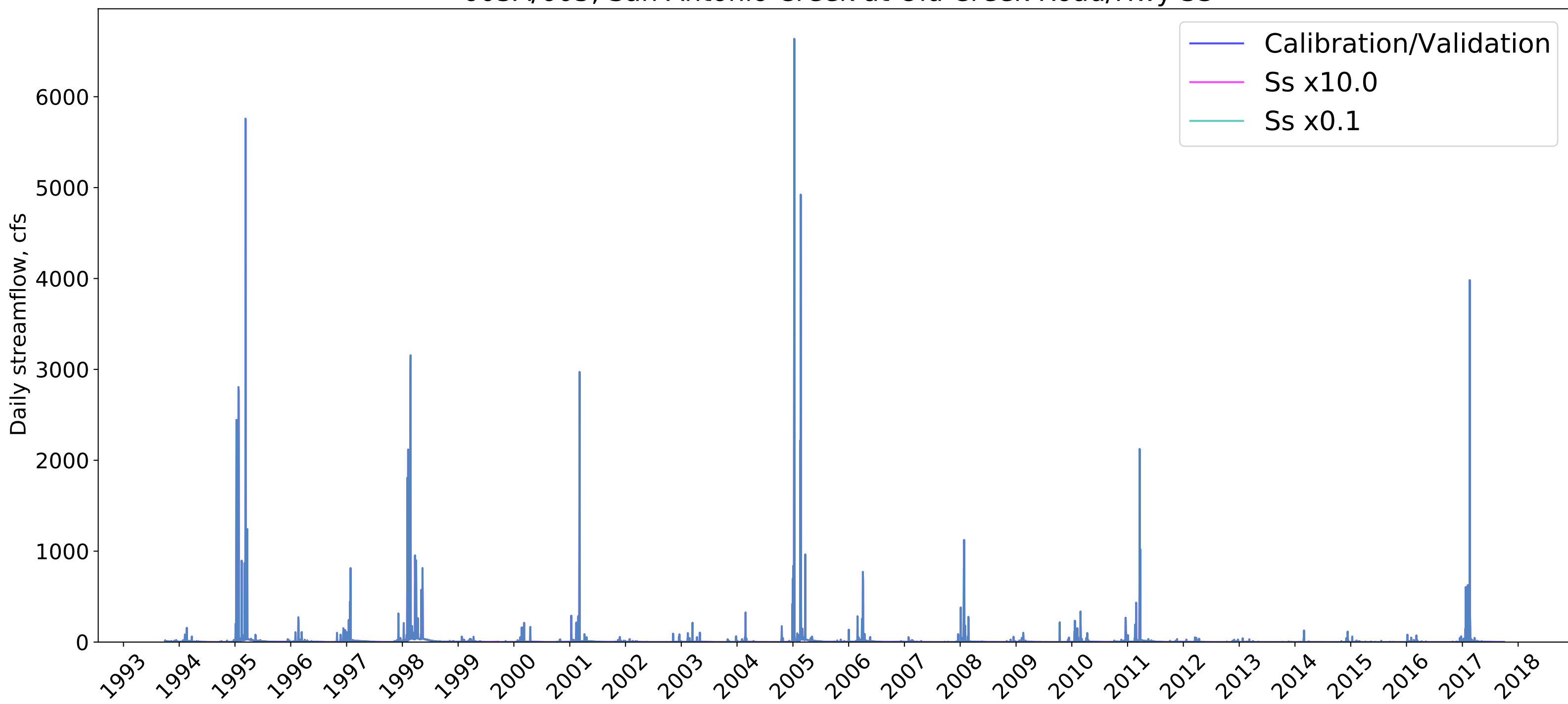
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



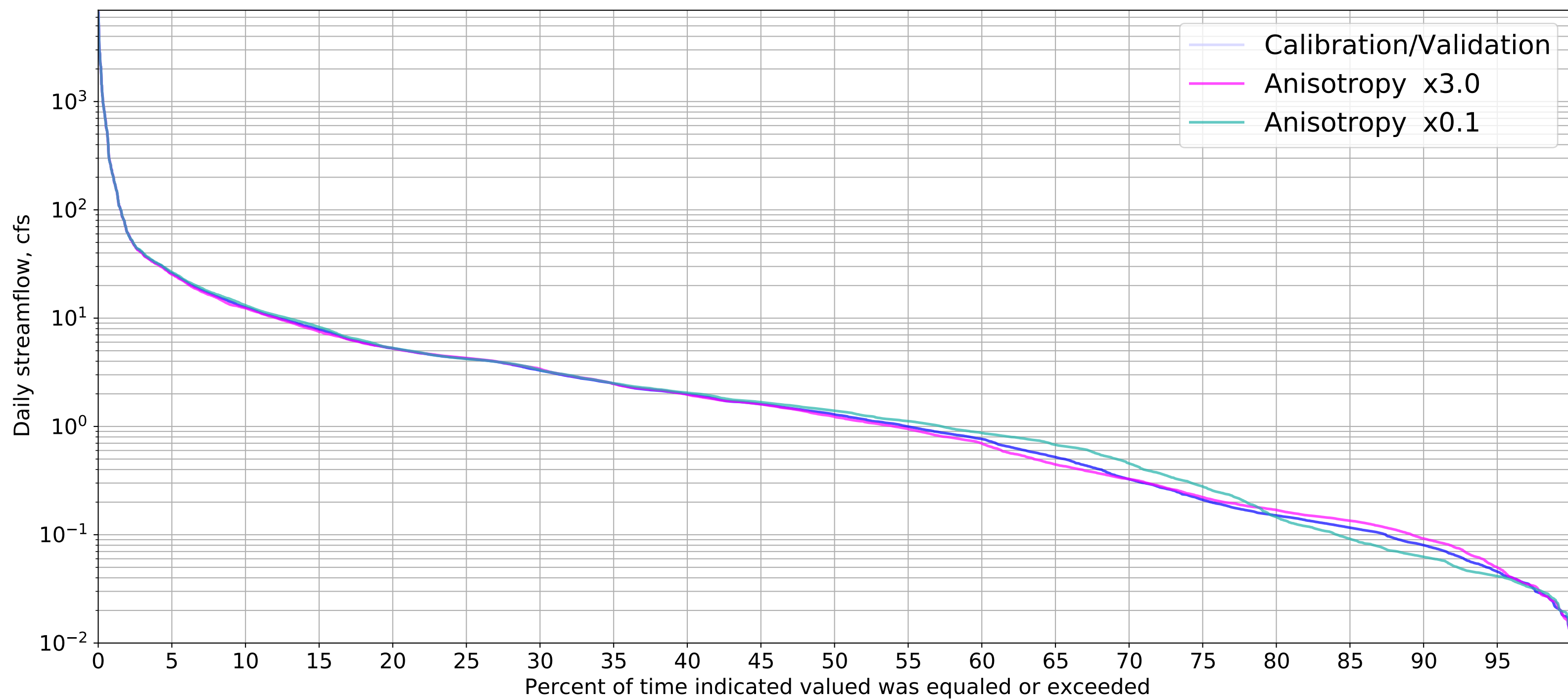
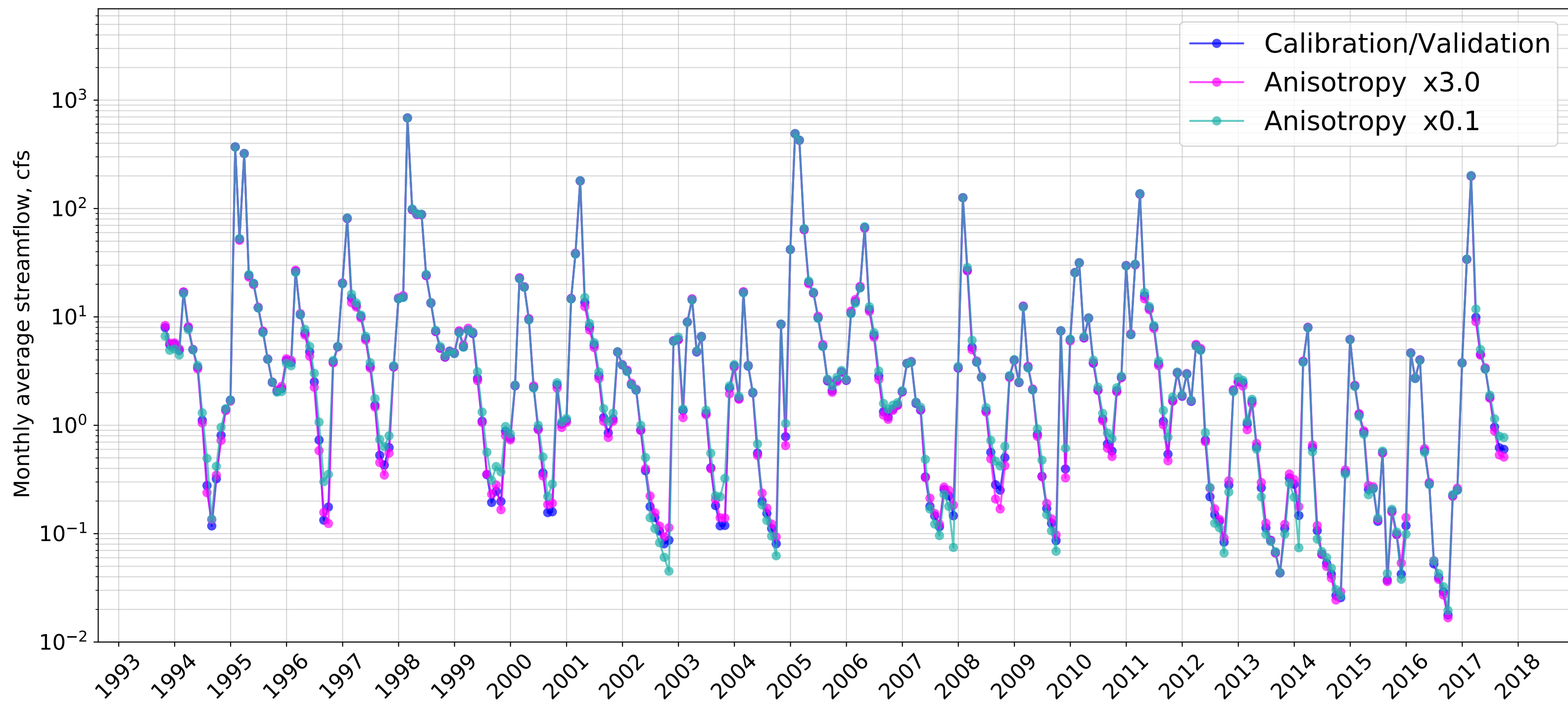
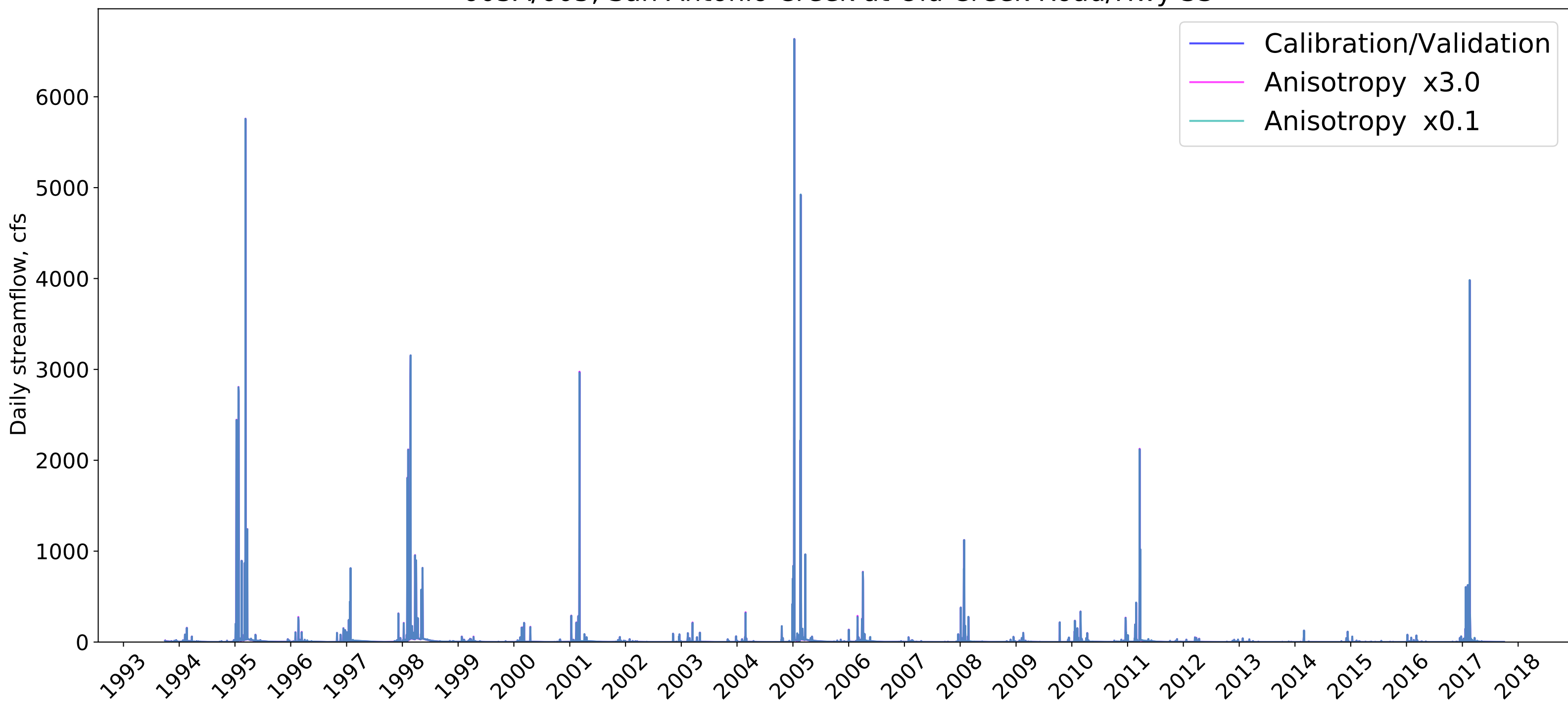
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



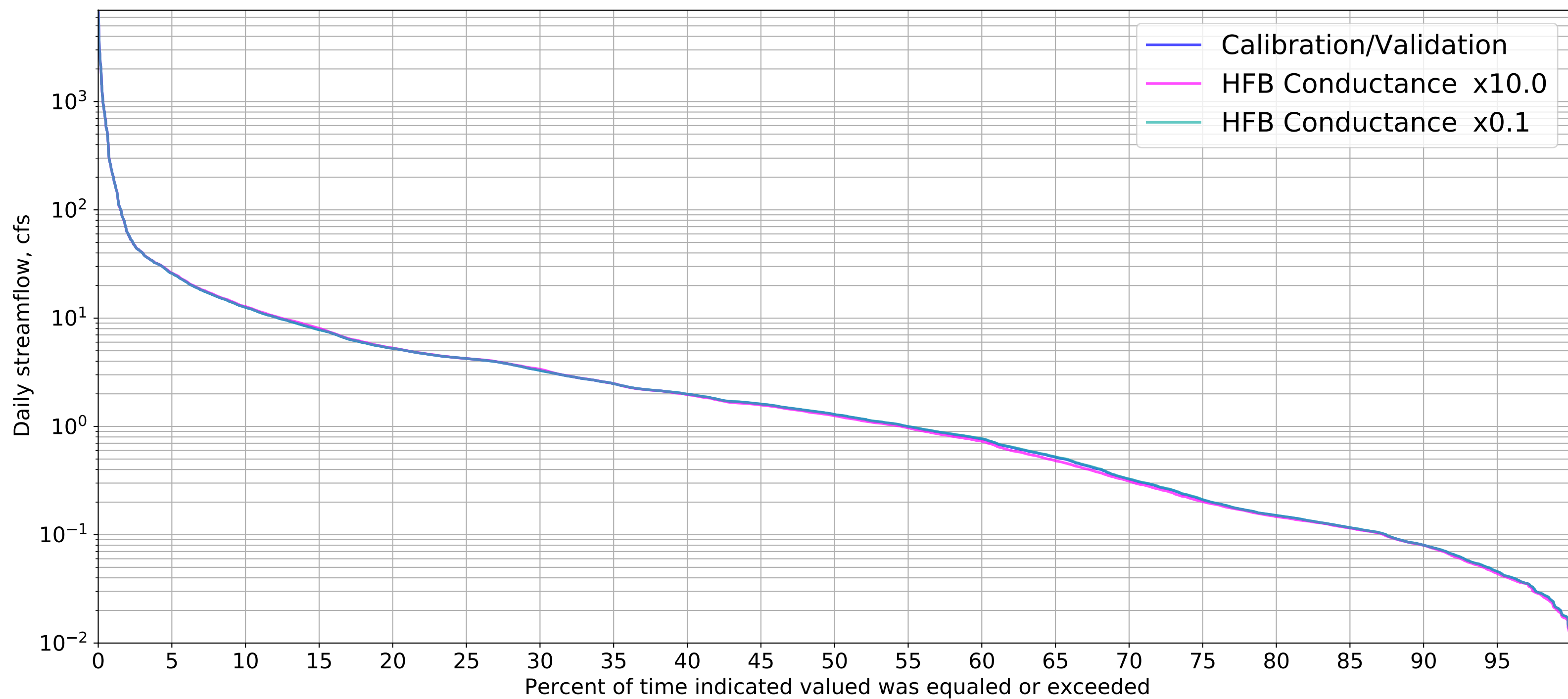
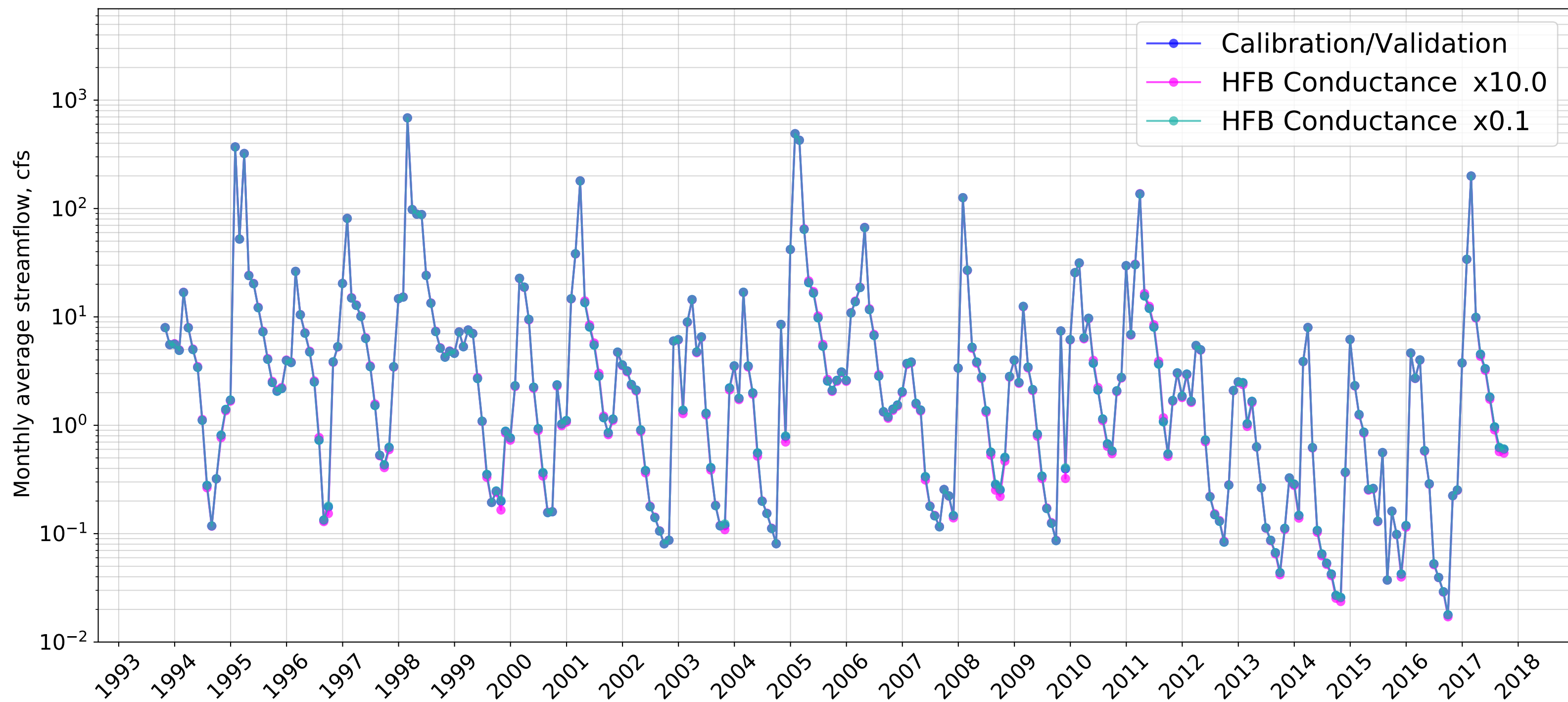
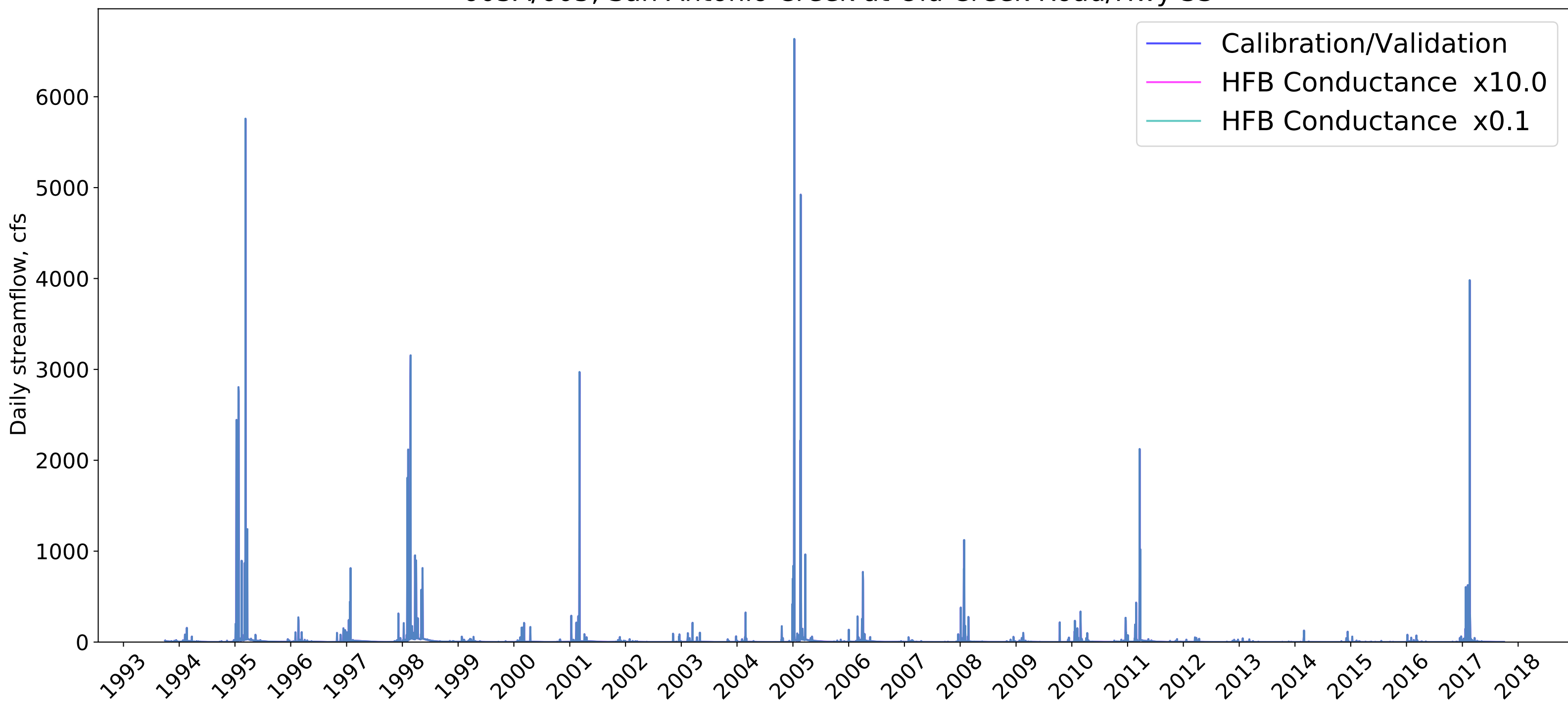
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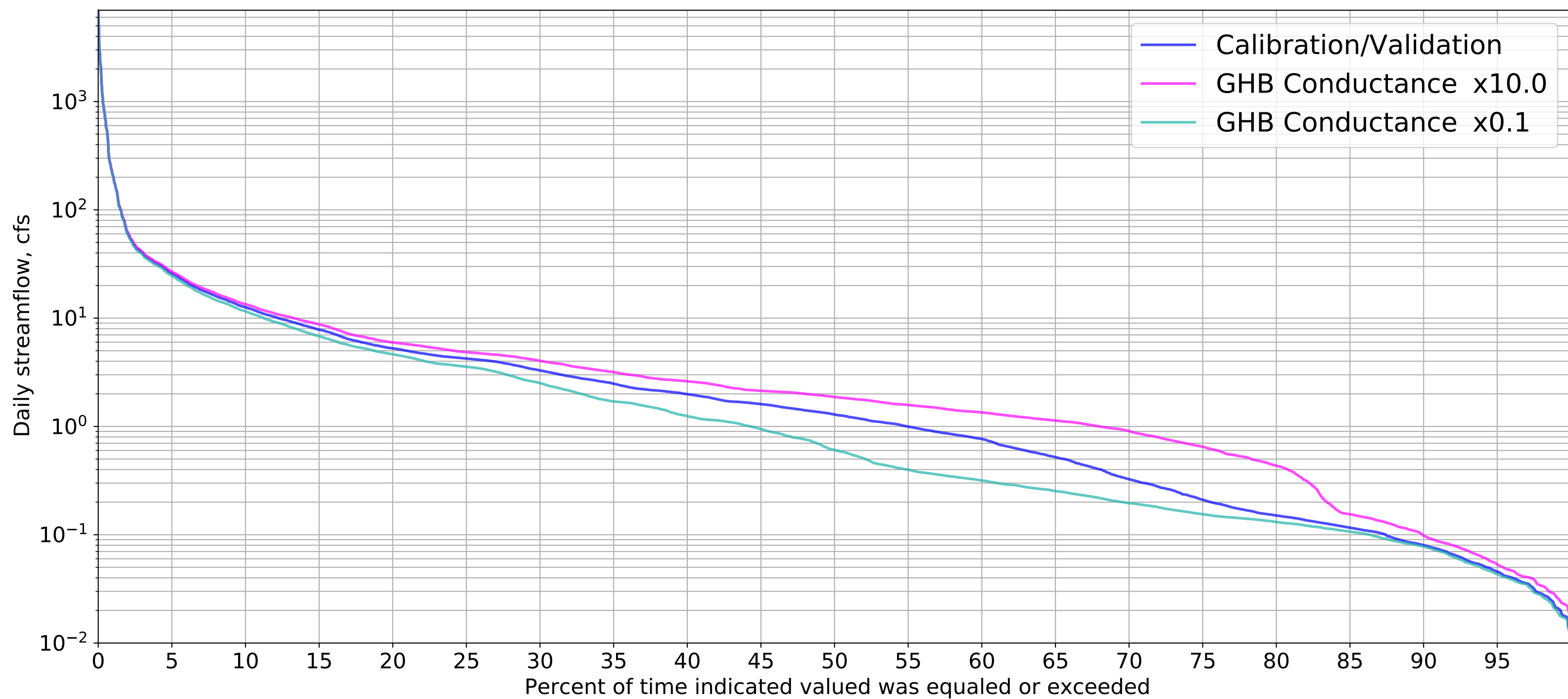
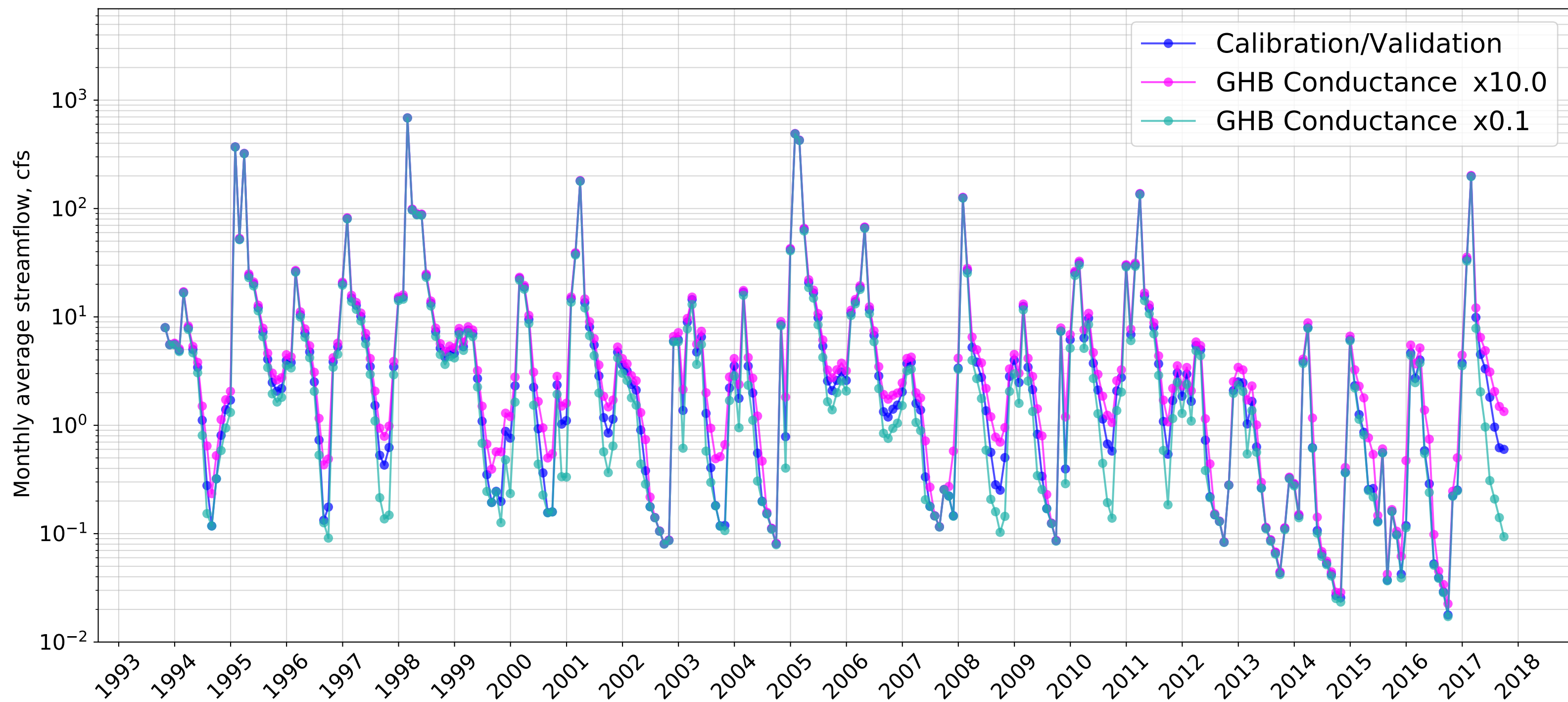
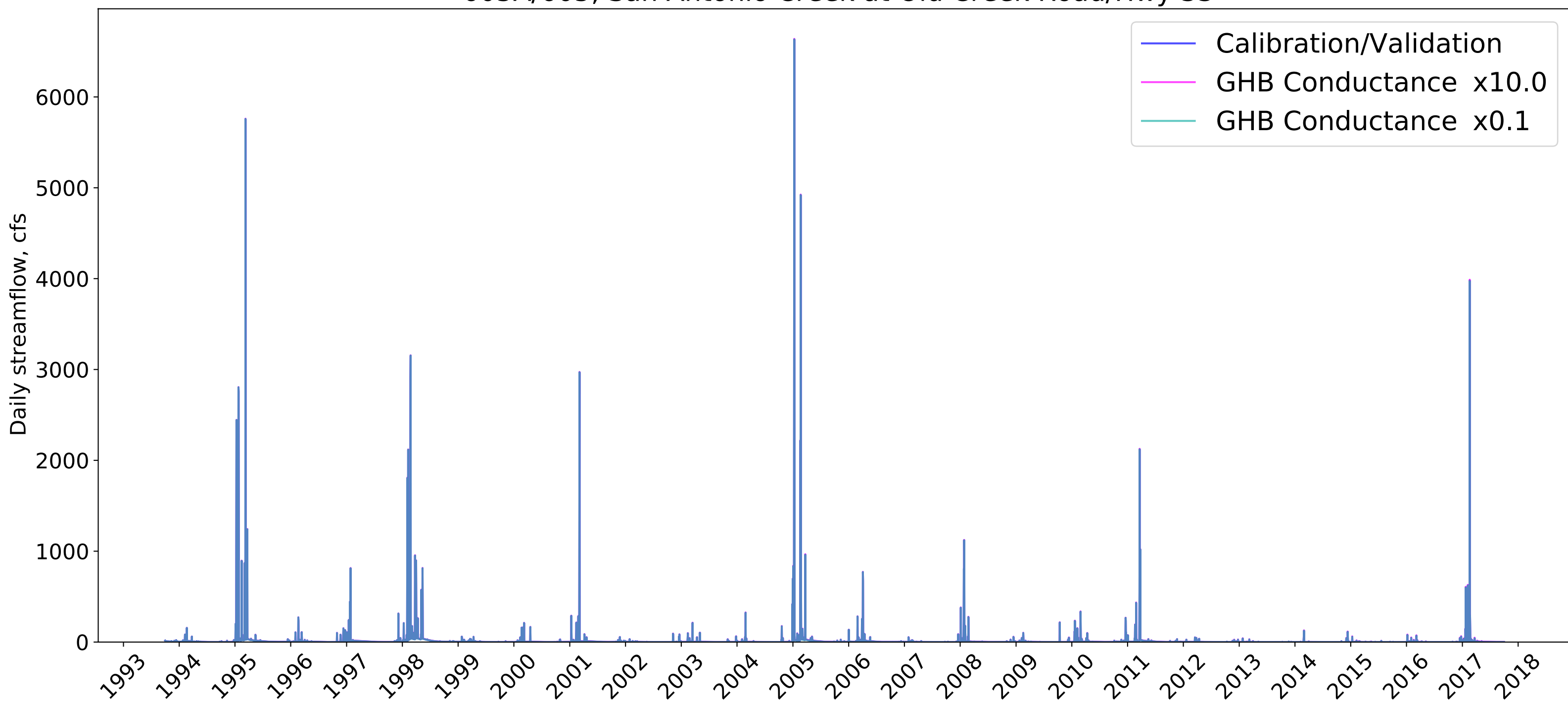
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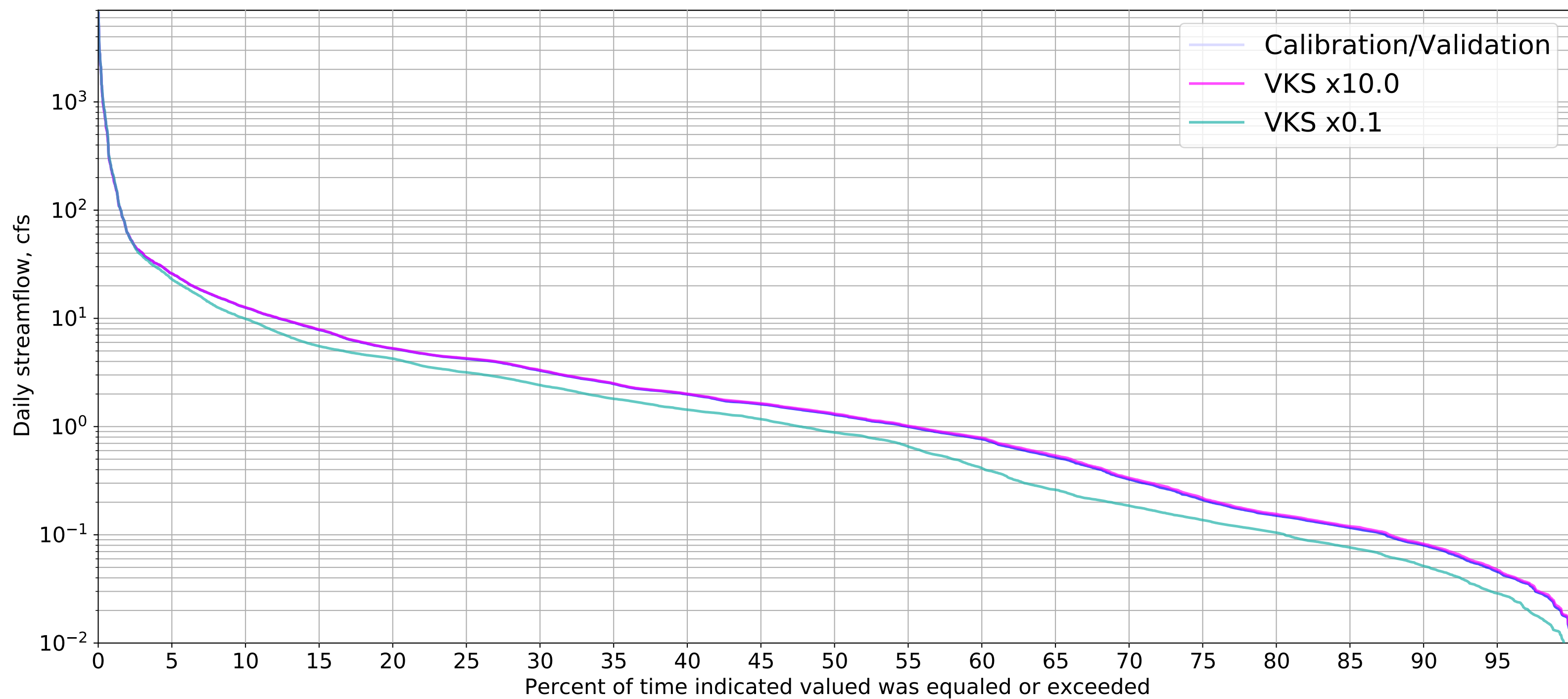
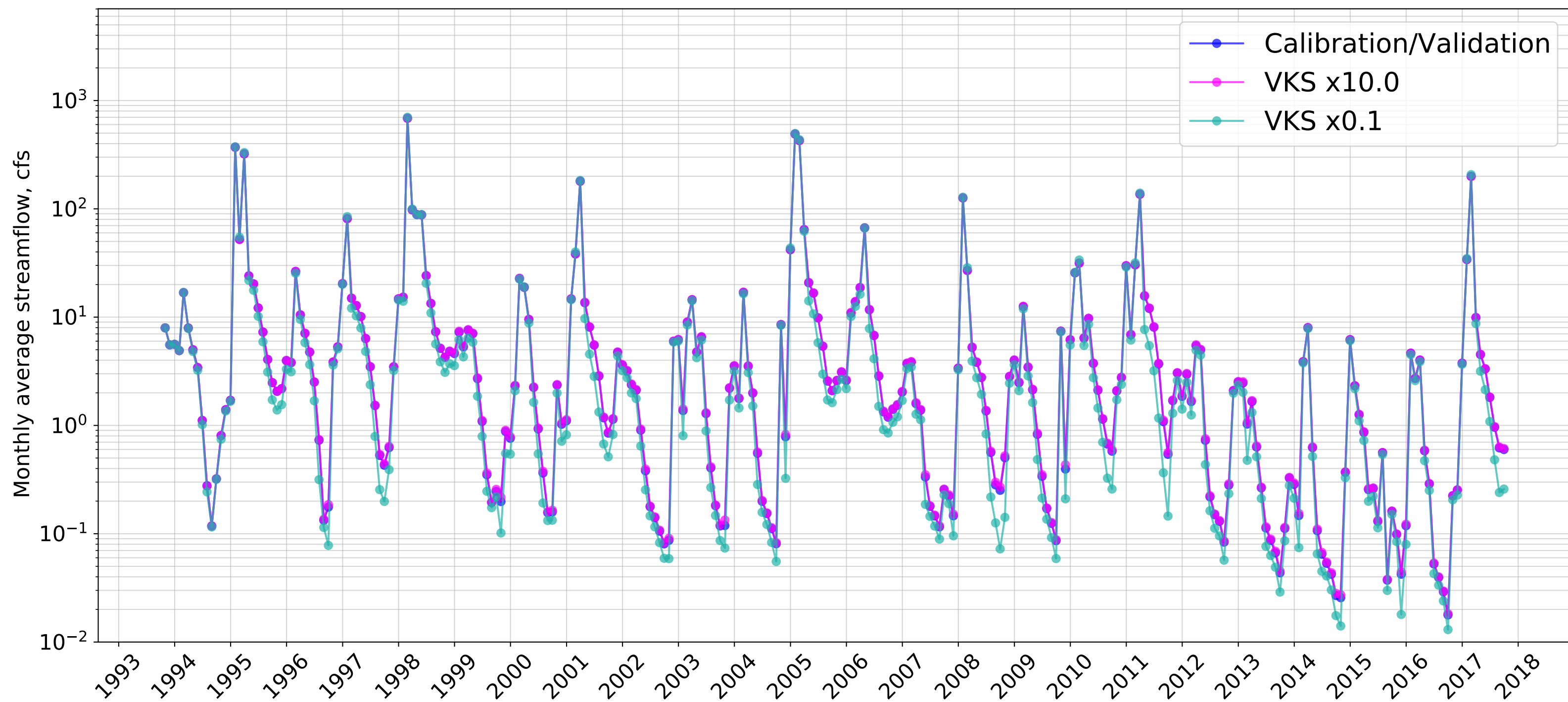
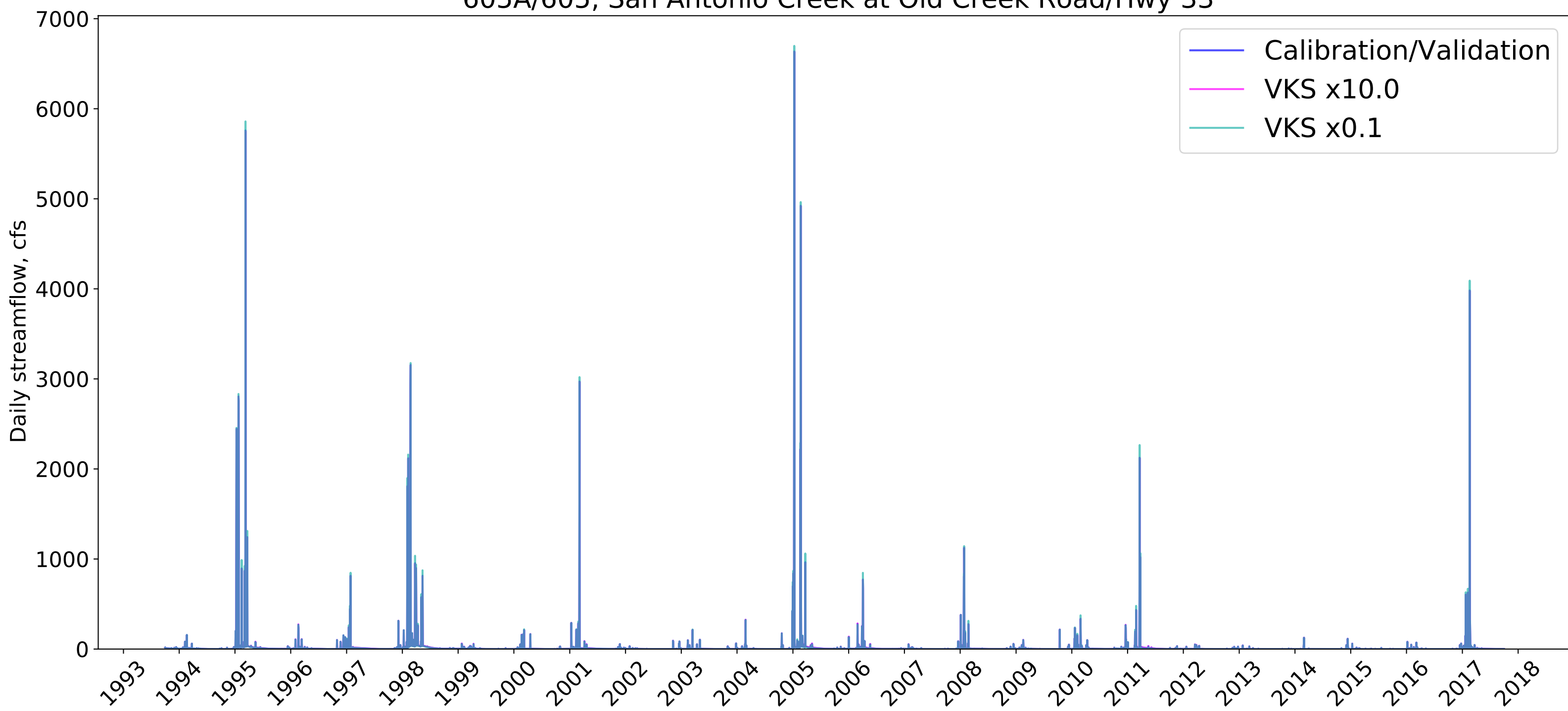
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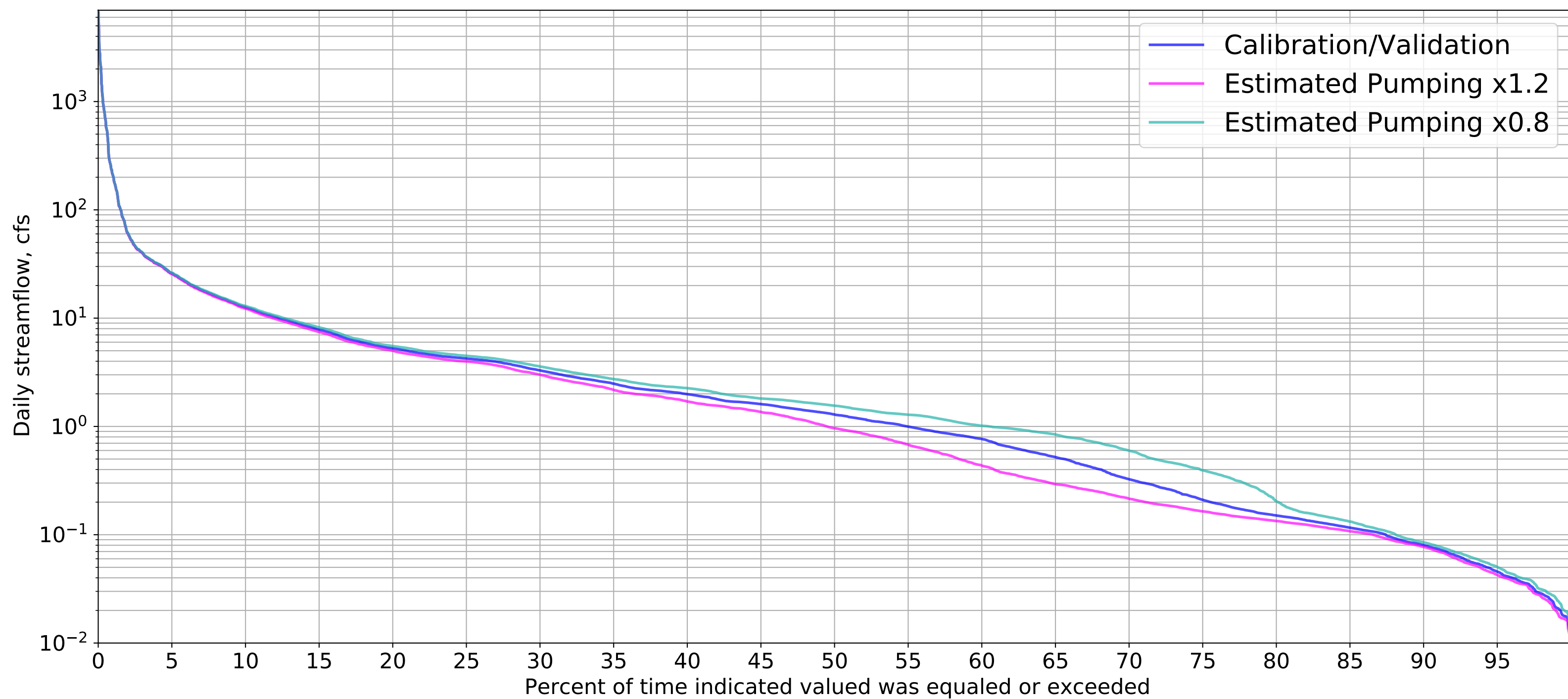
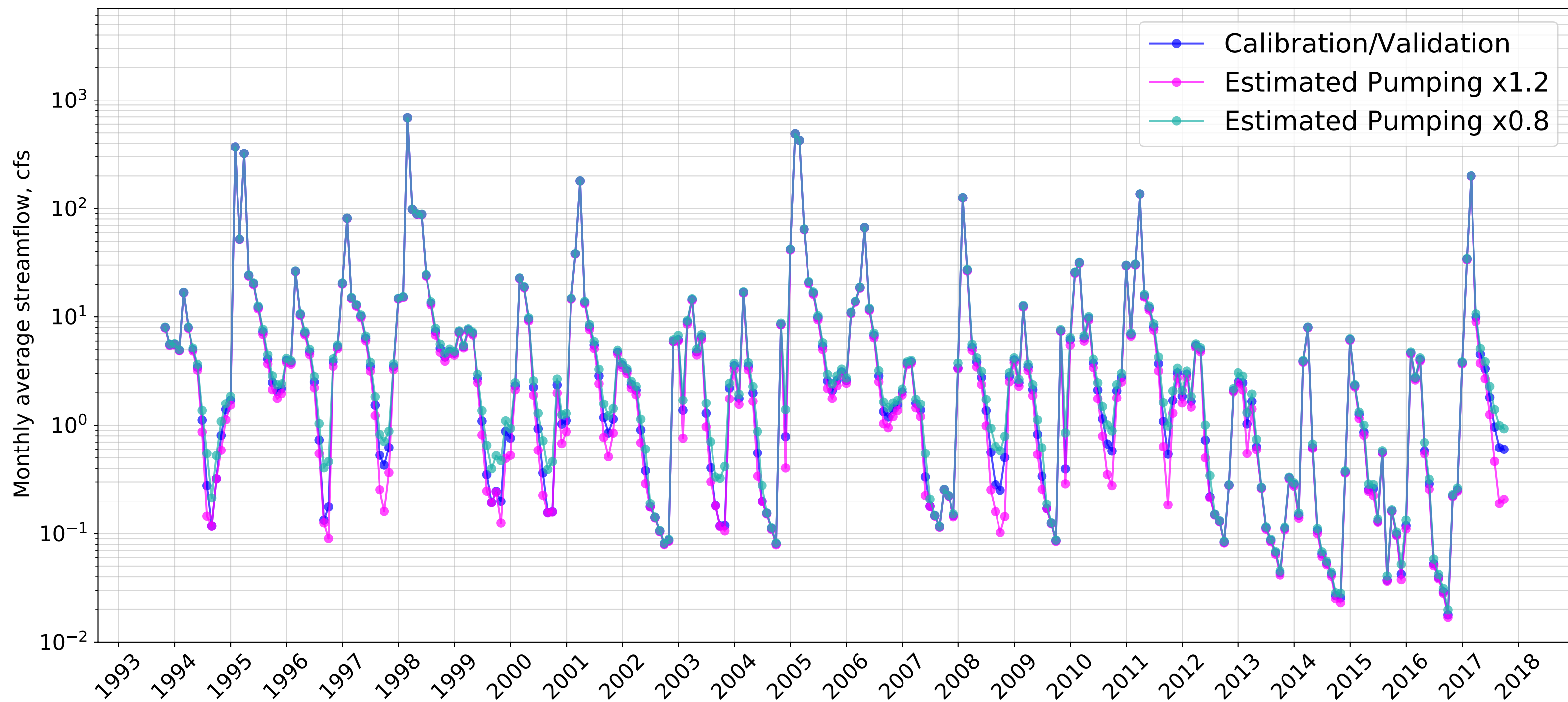
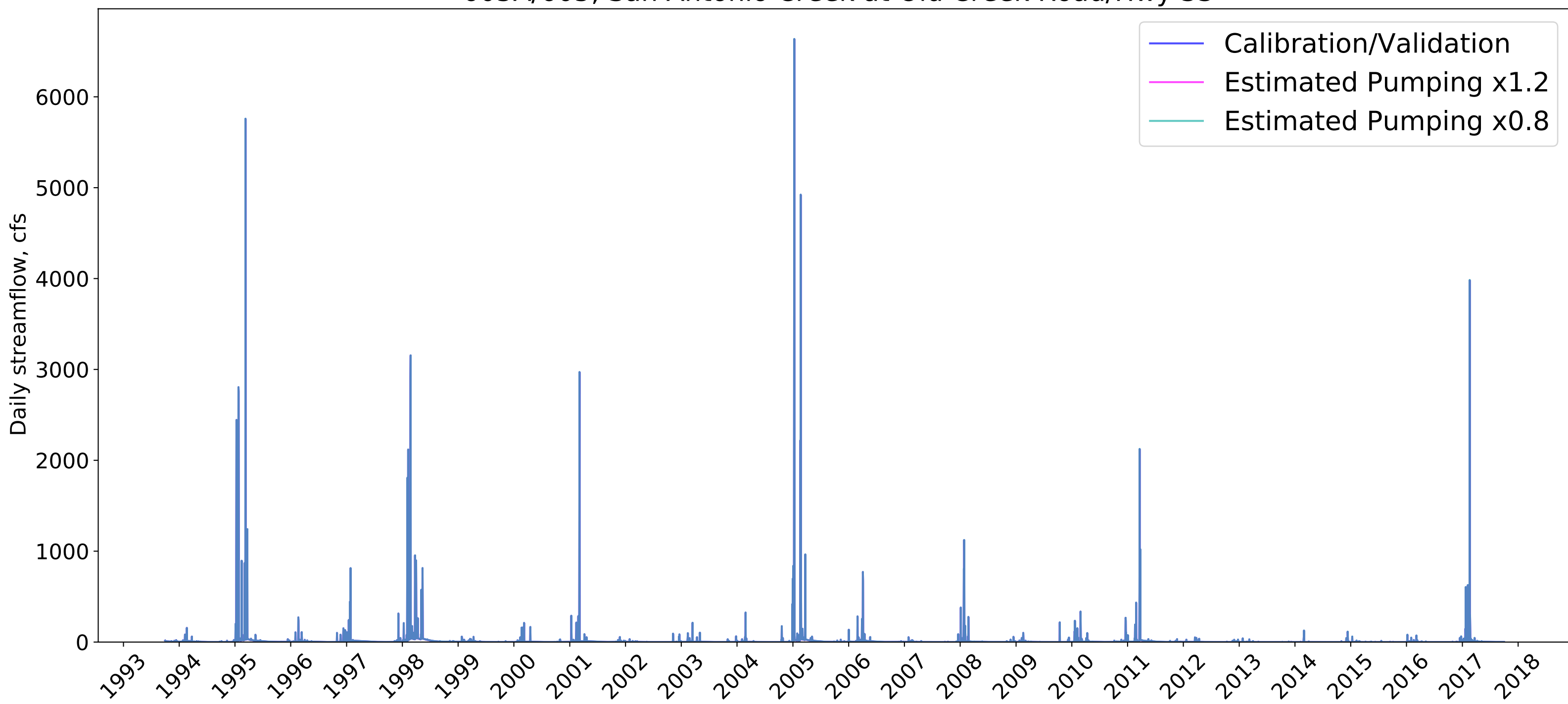
605A/605, San Antonio Creek at Old Creek Road/Hwy 33



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



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

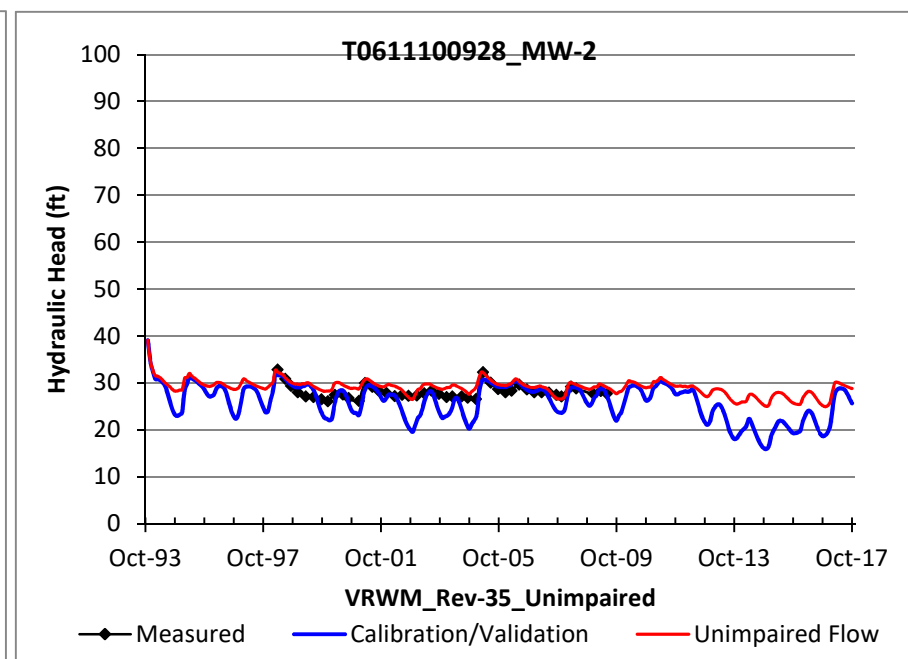
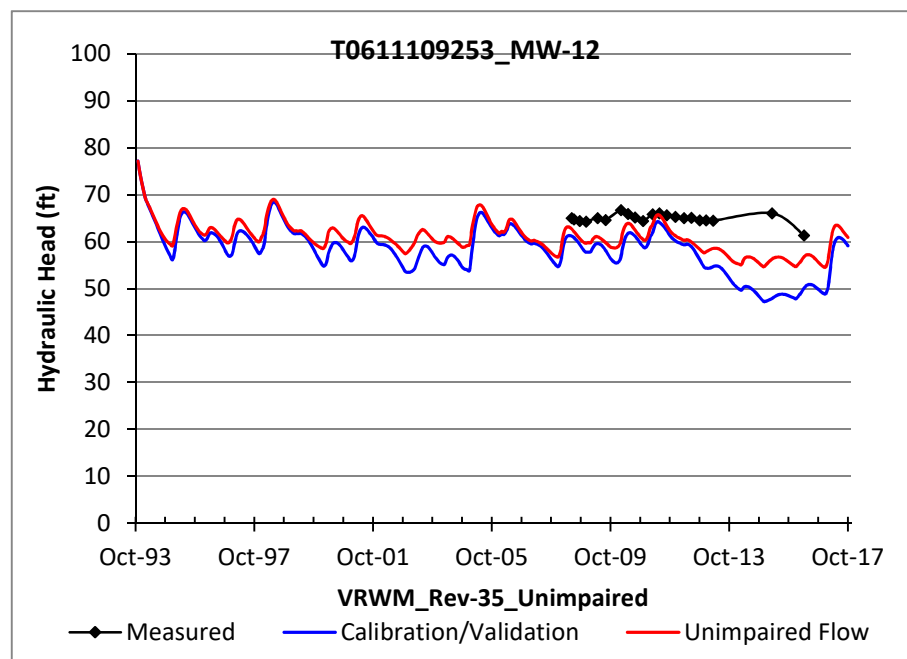
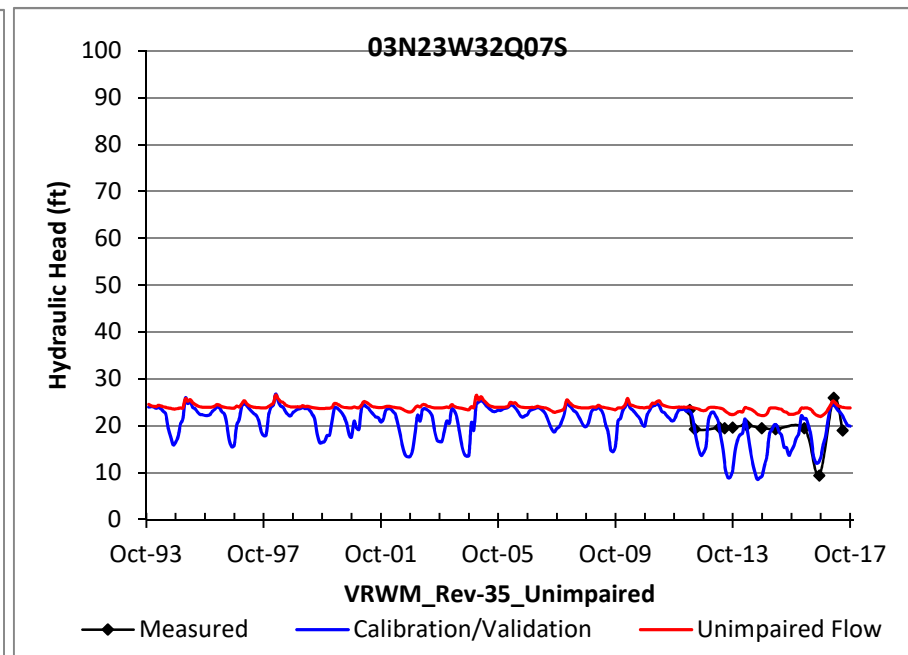
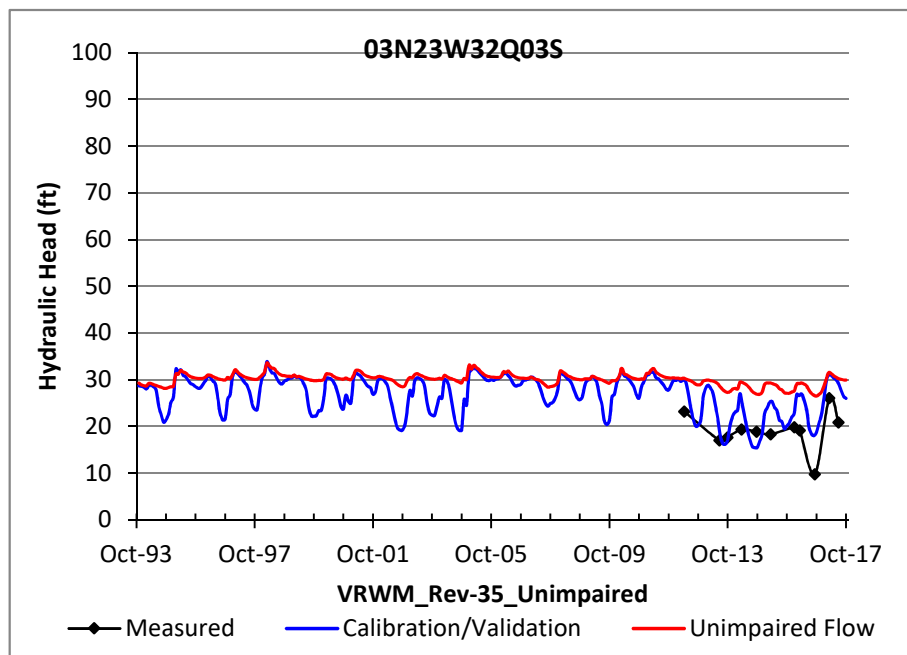


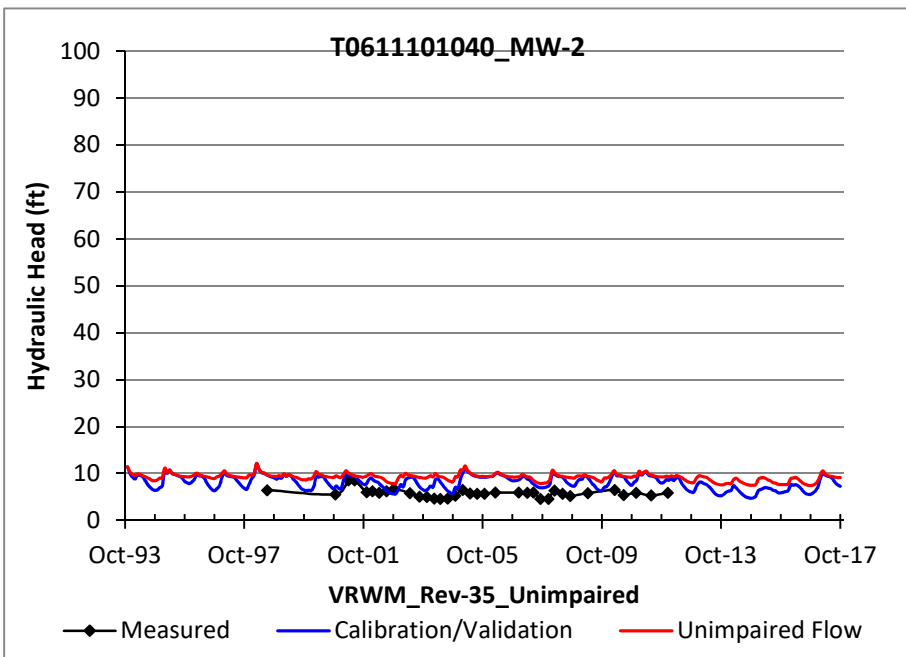
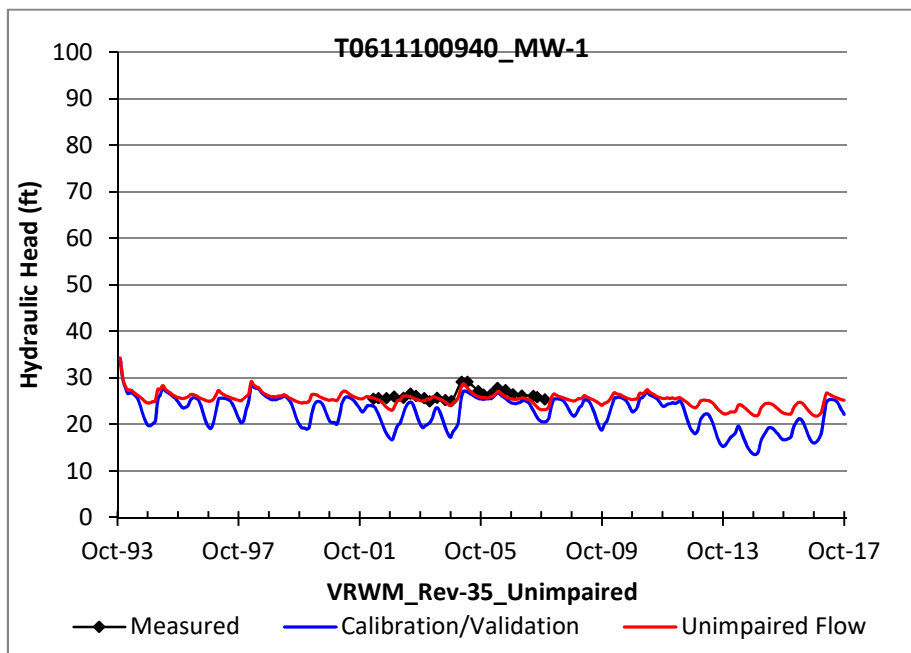
APPENDIX F: GROUNDWATER UNIMPAIRED FLOW HYDROGRAPHS

Appendix F presents comparisons of measured (black), calibrated/validated (blue), and unimpaired flow (red) hydraulic head hydrographs at 61 wells in the Ventura River watershed, Matilija Reservoir, and Lake Casitas. Each hydrograph plots measured, calibrated, and unimpaired hydraulic head, in feet above mean sea level, for water years 1993 to 2017. Some hydrographs do not have a complete measured dataset for the modeling period. Well locations are mapped in Figure 5.3. The measured 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.

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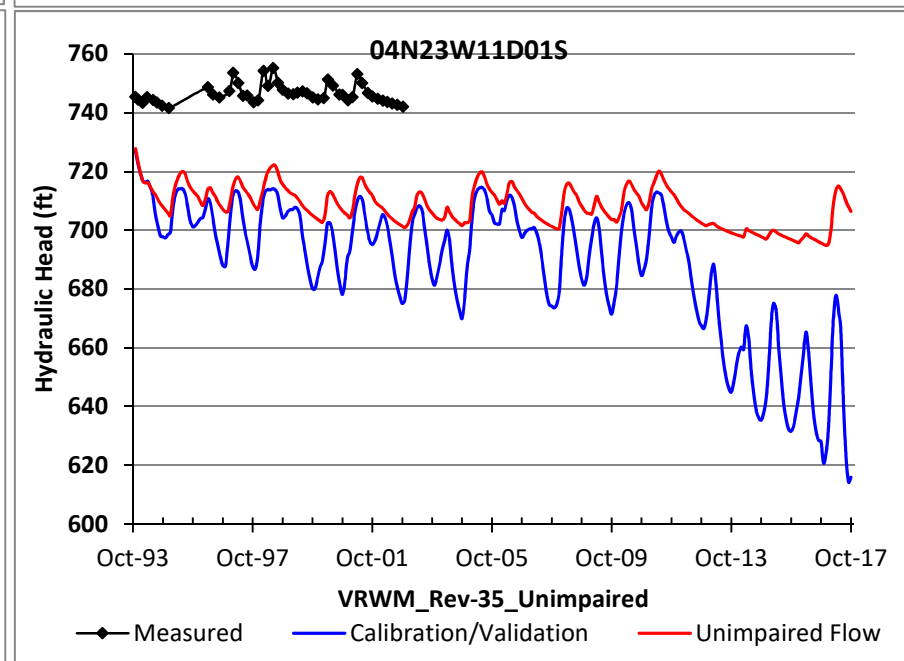
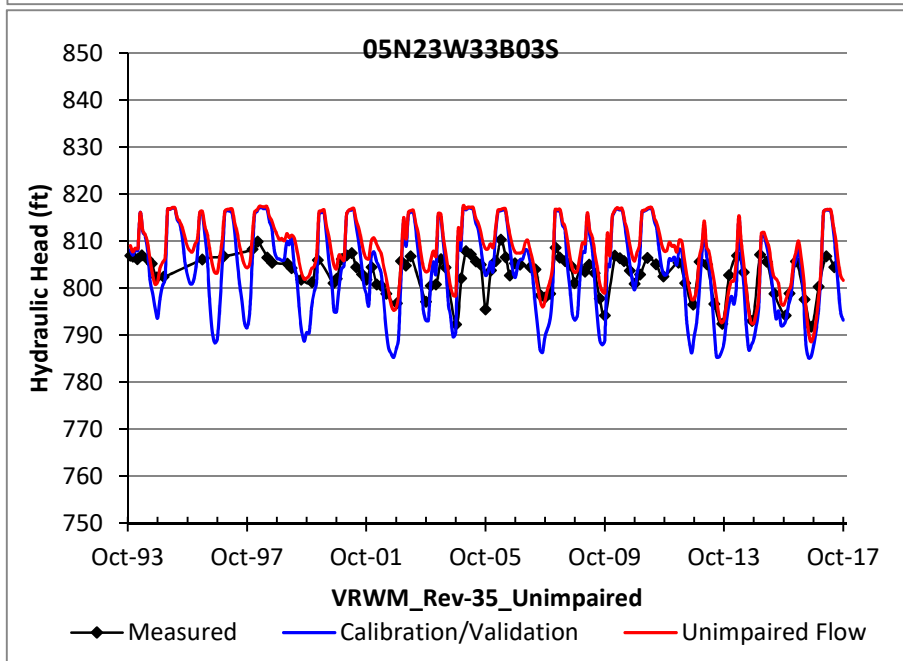
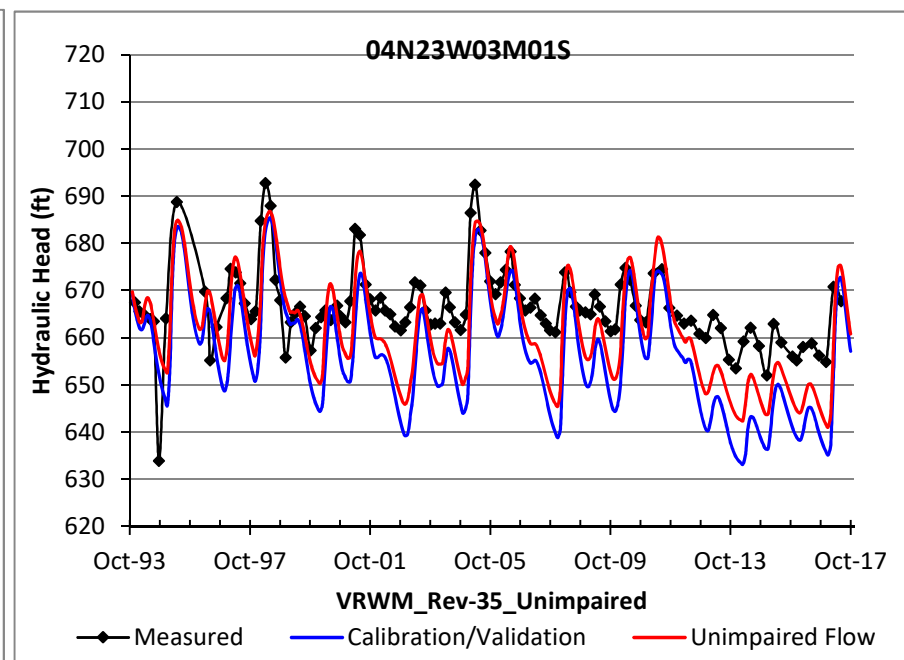
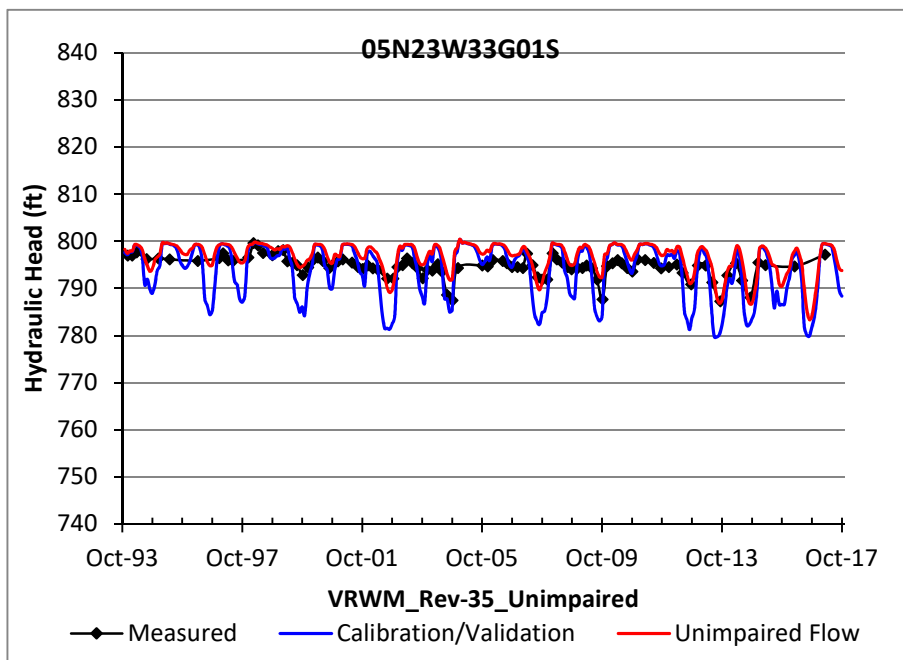
Lower Ventura River Valley Basin

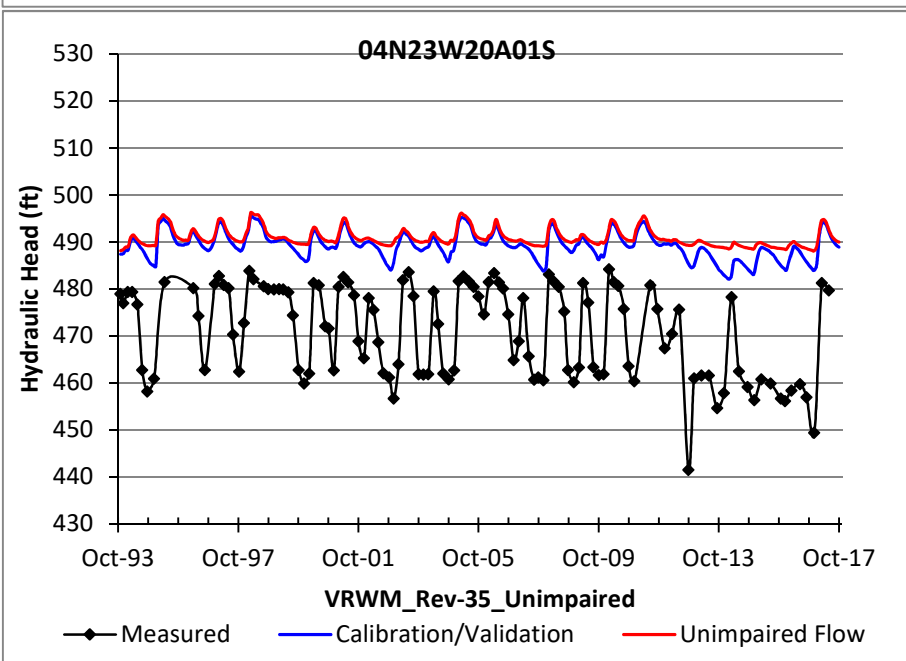
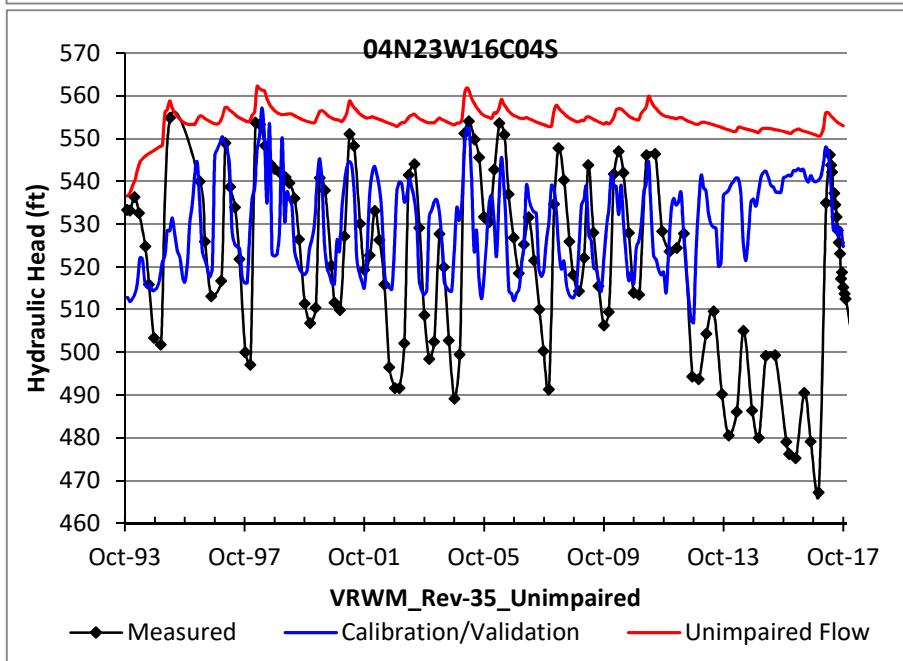
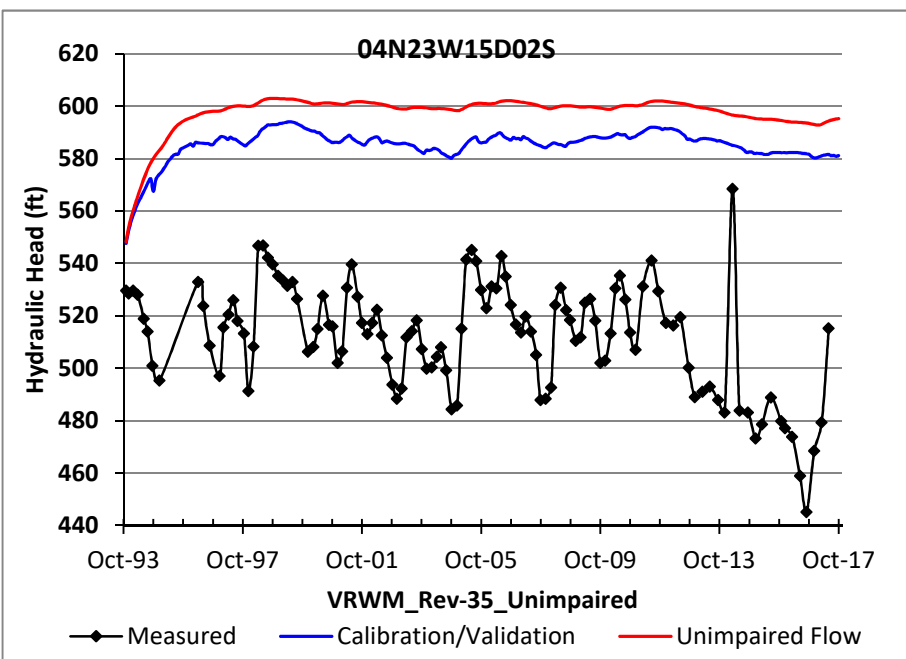
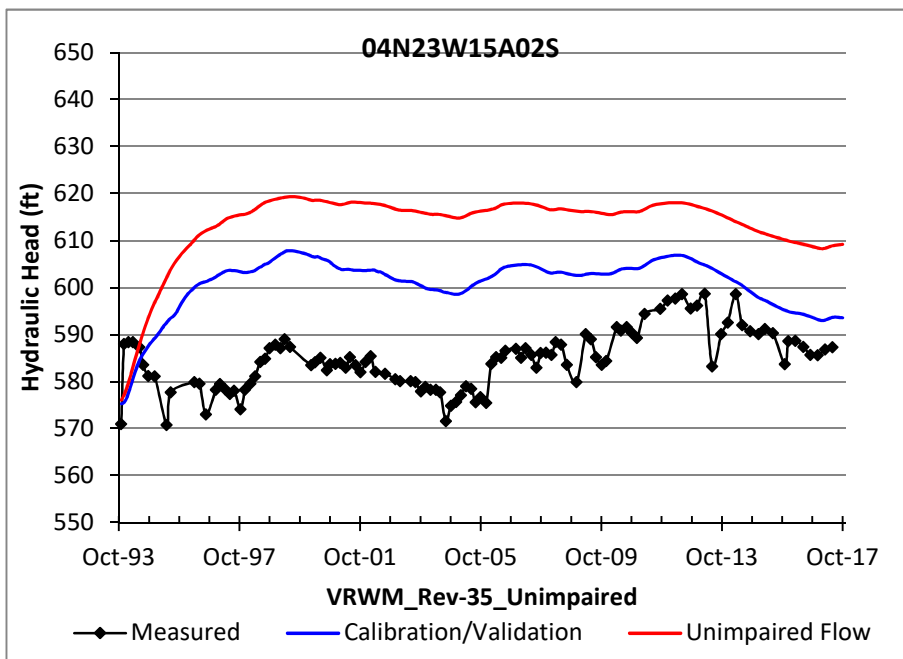


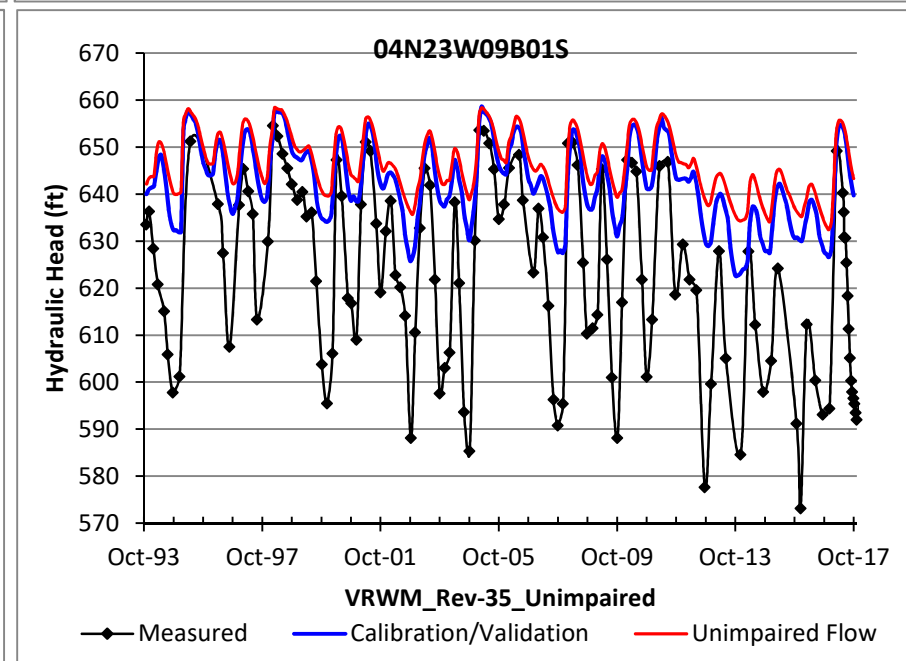
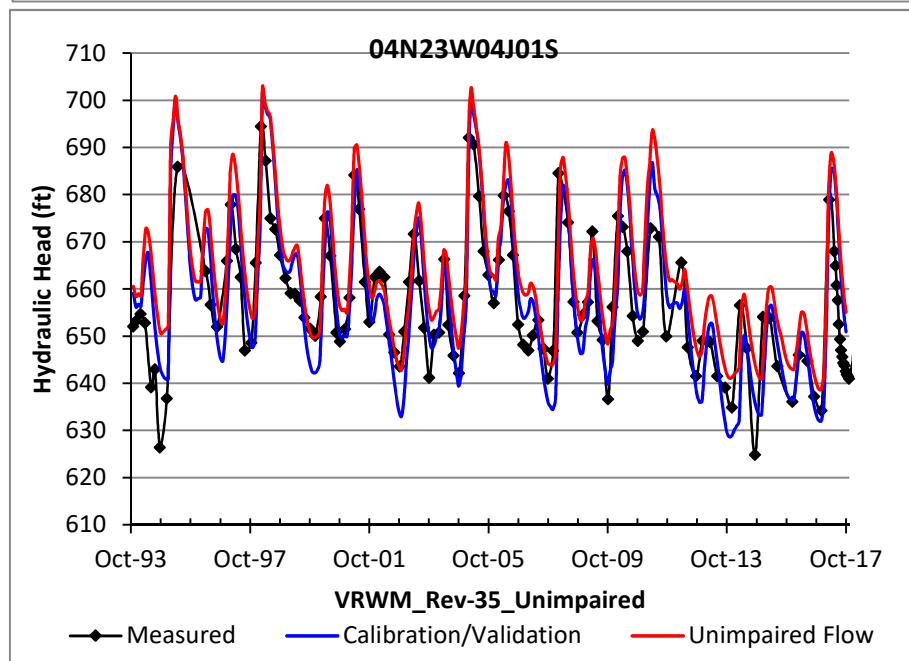
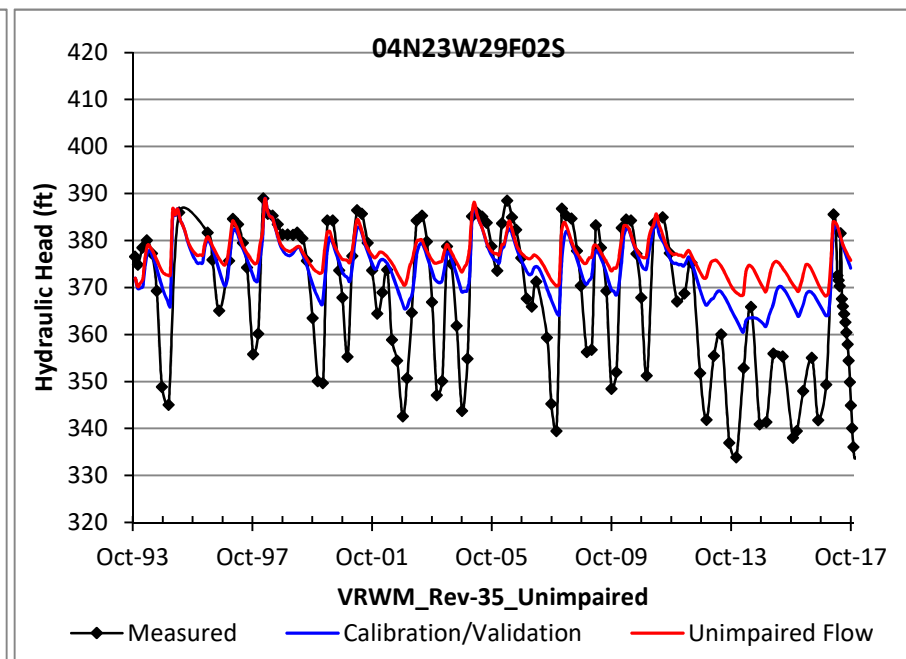
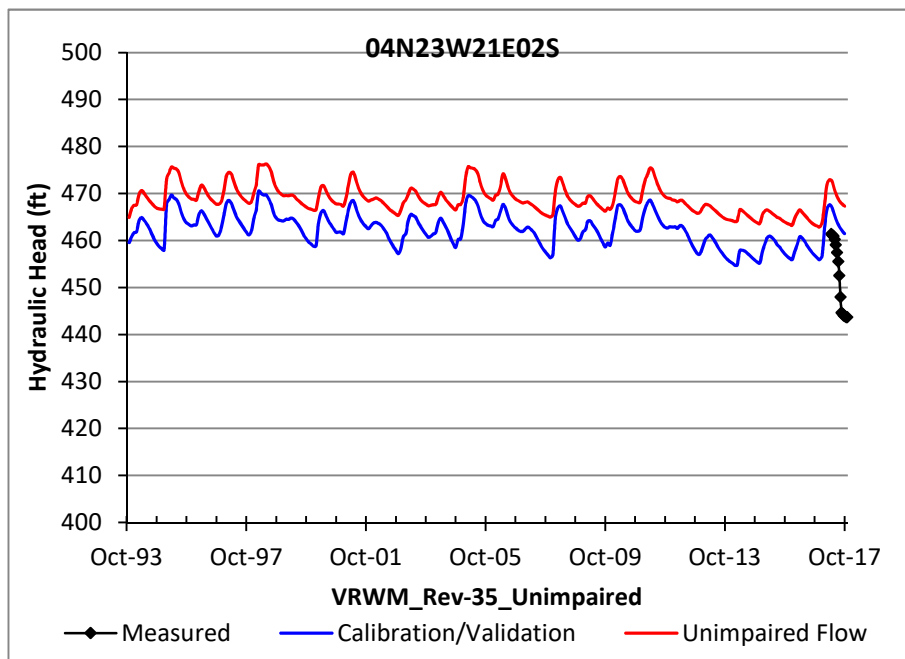


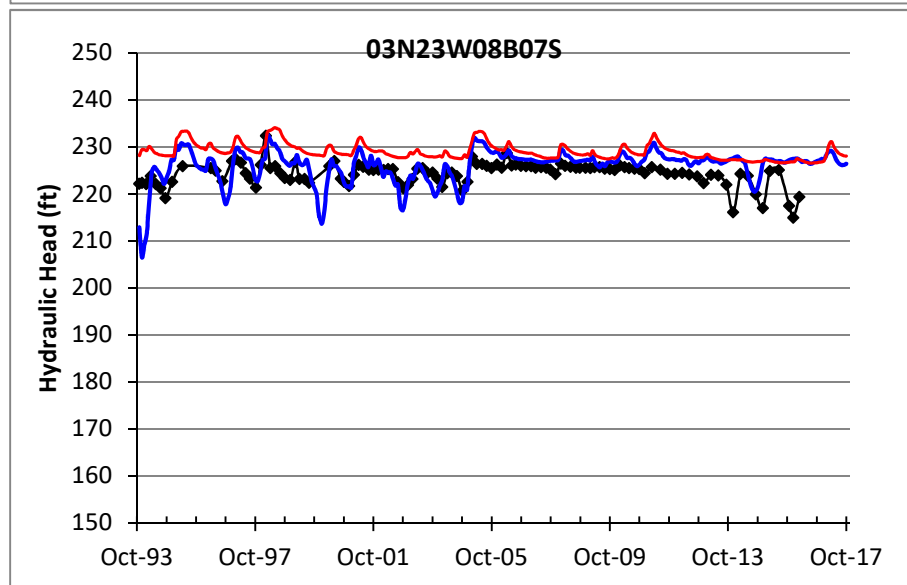
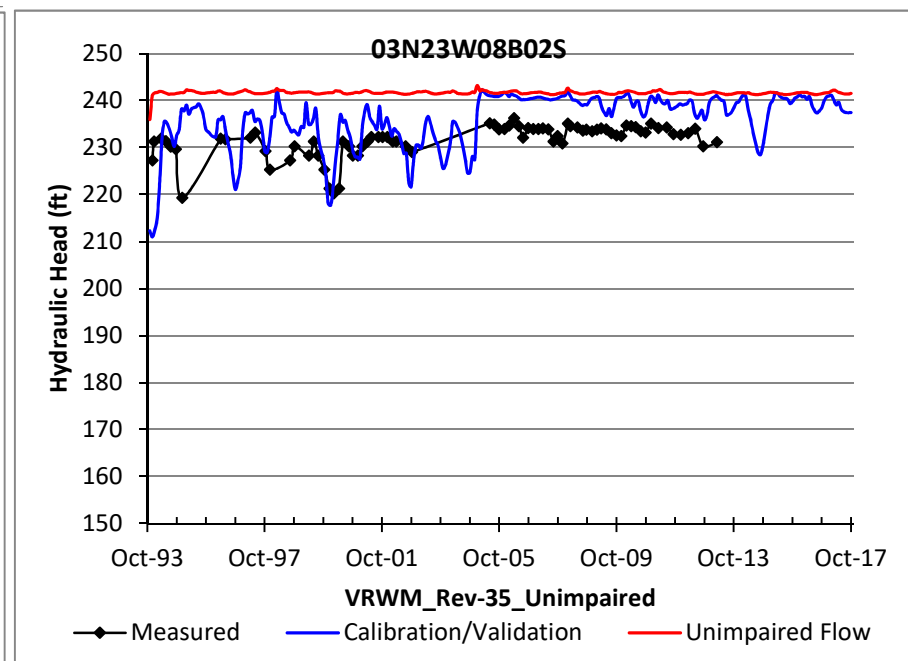
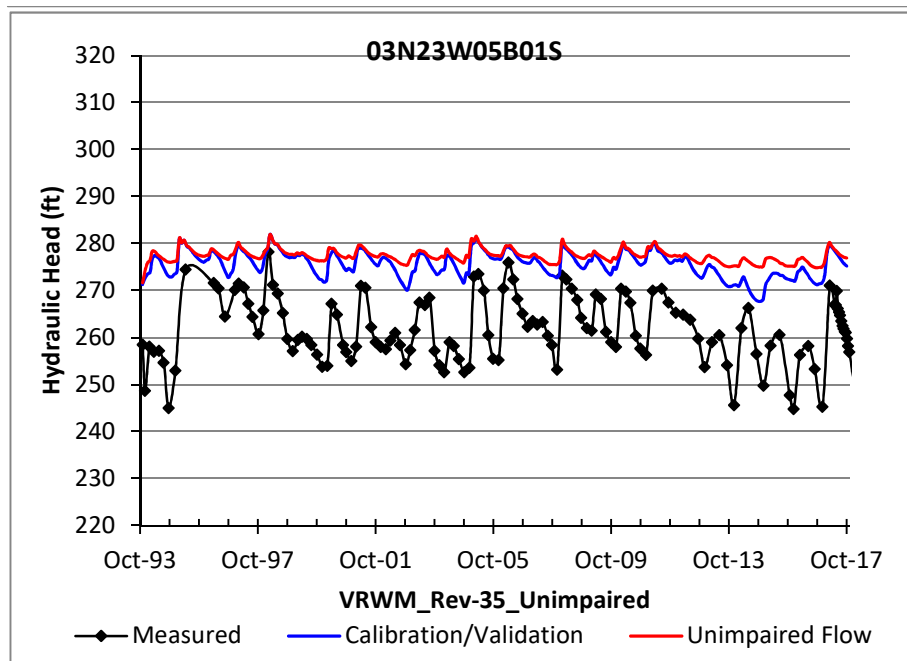
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Upper Ventura River Valley Basin



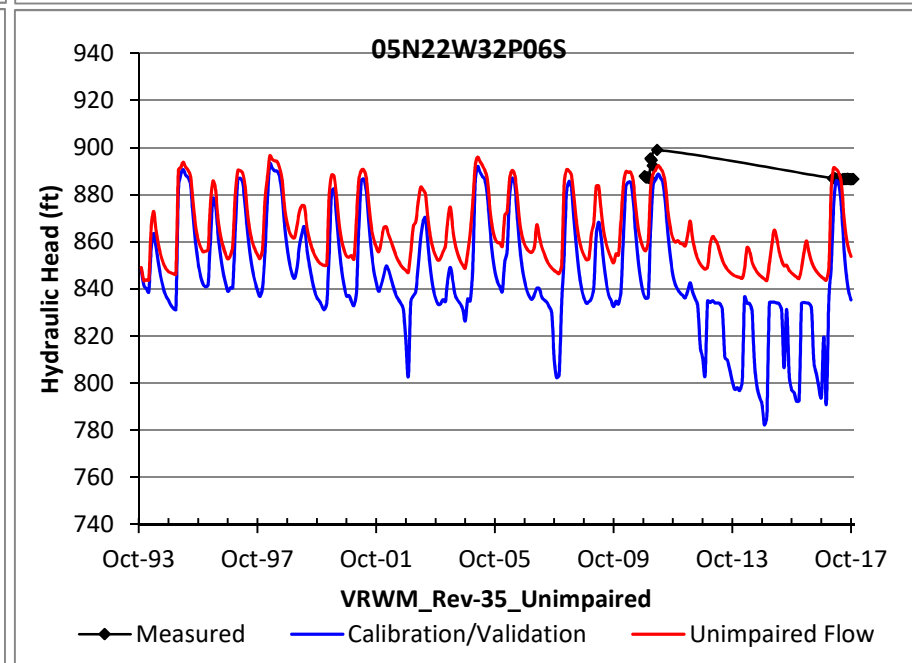
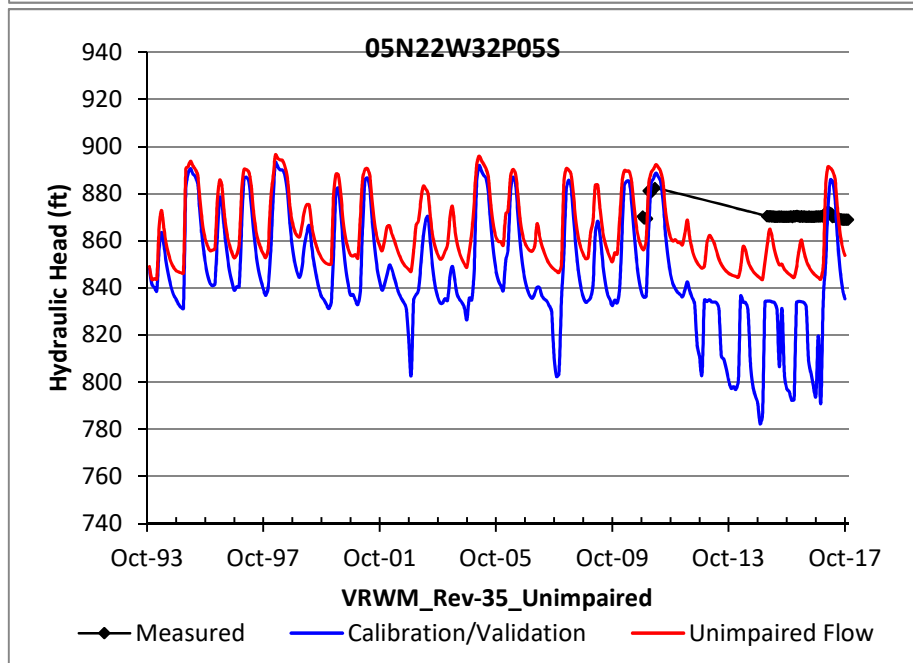
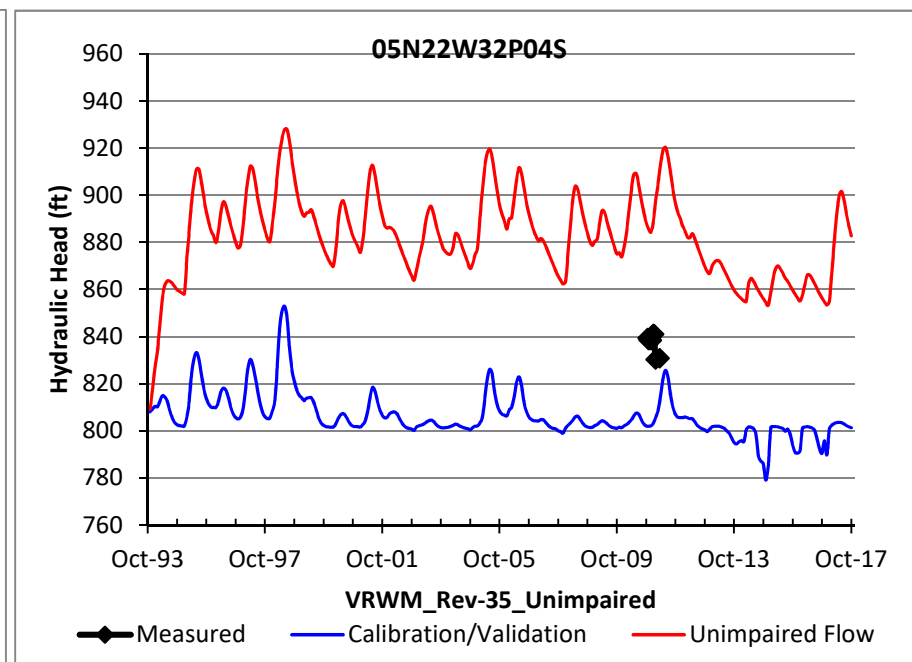
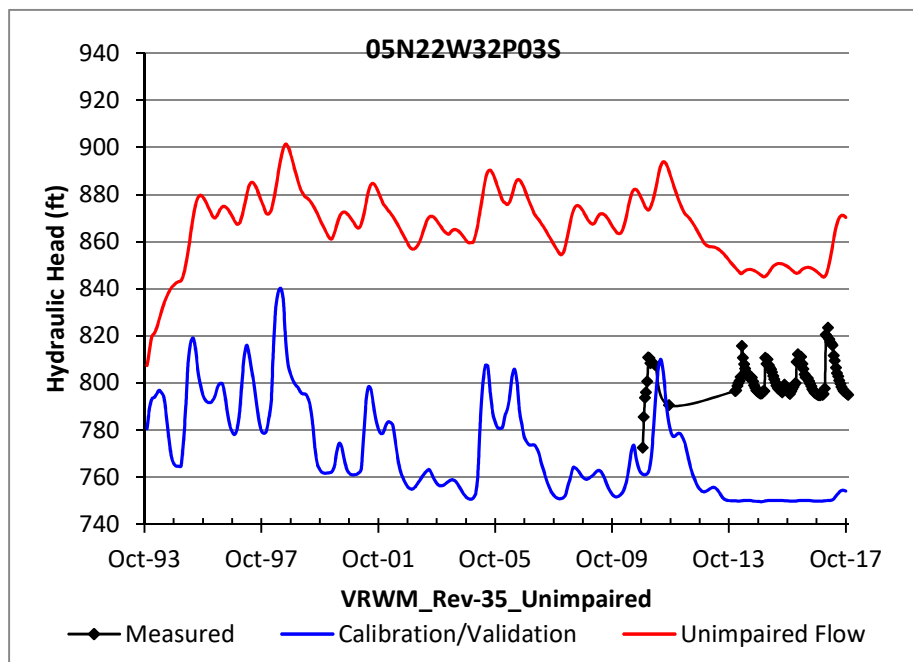


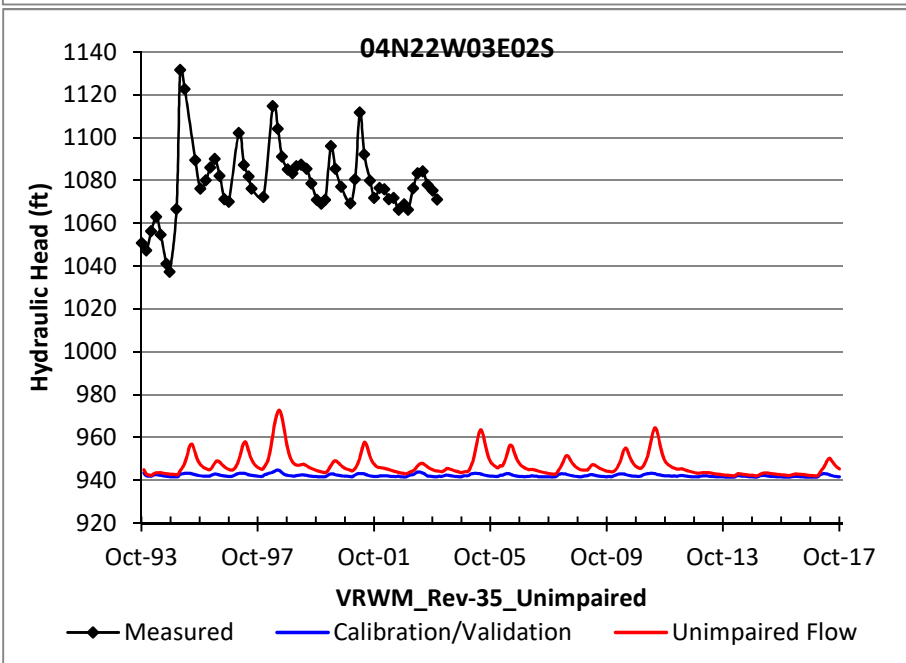
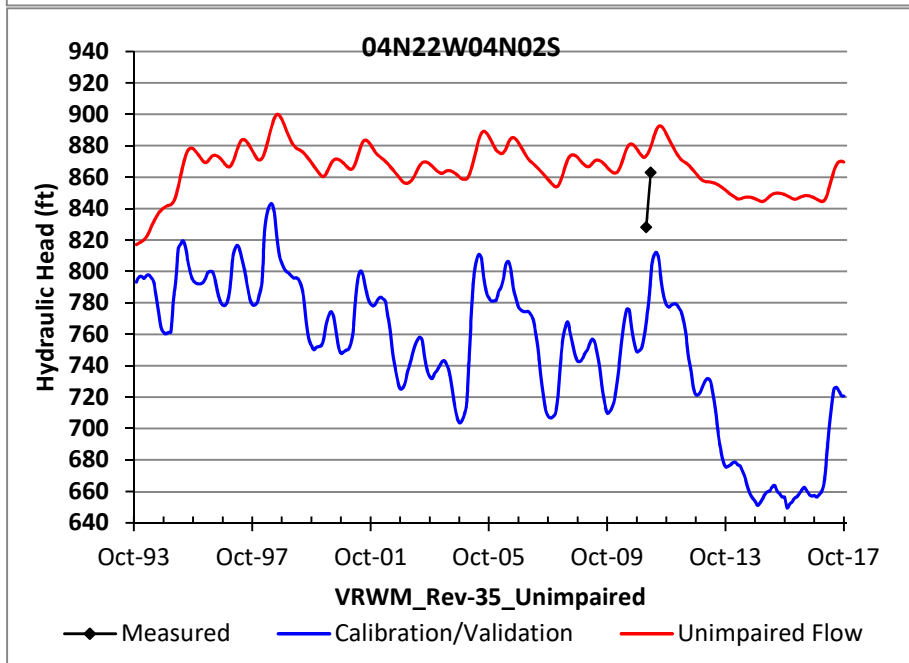
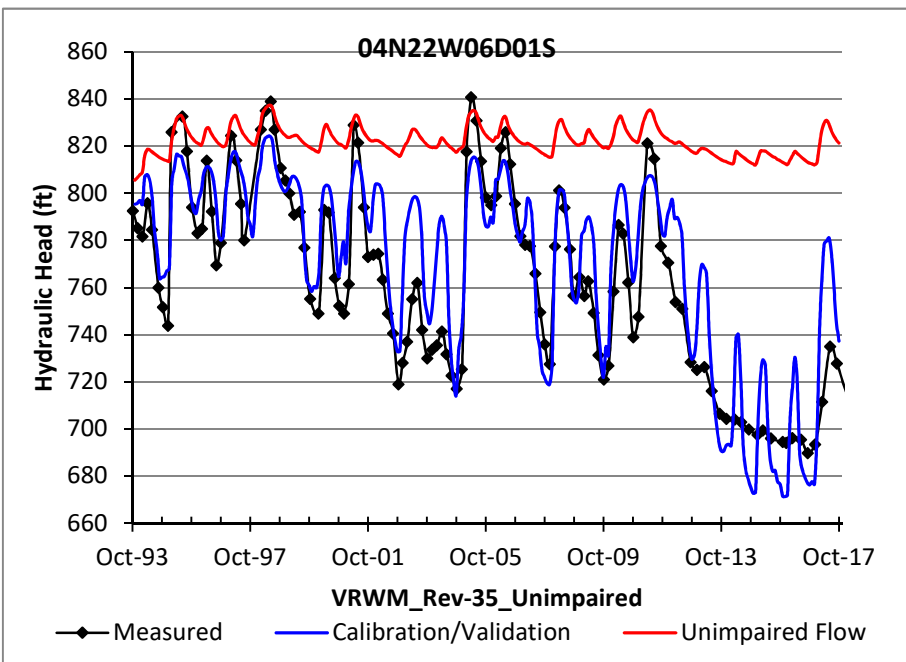
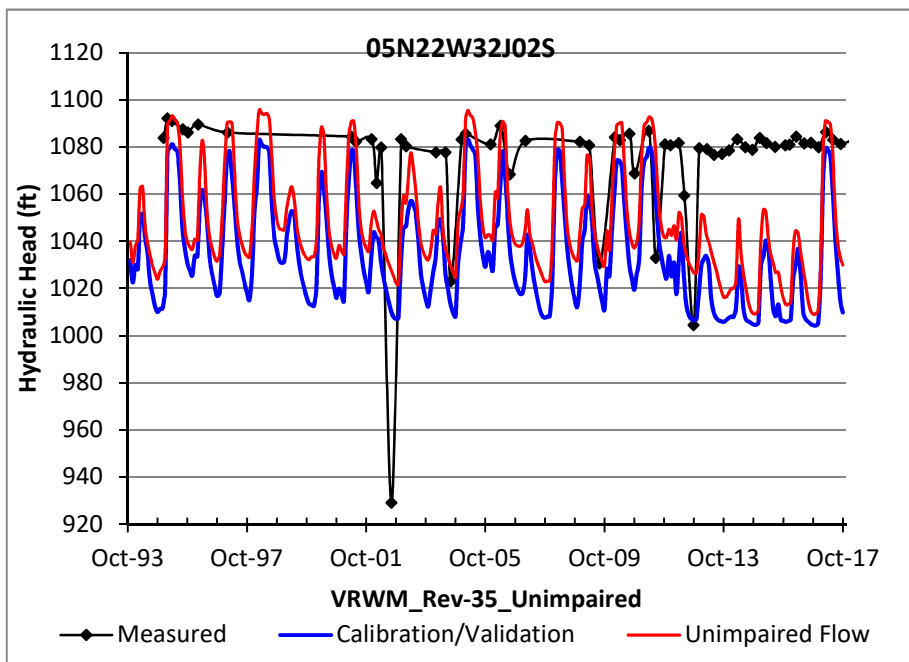


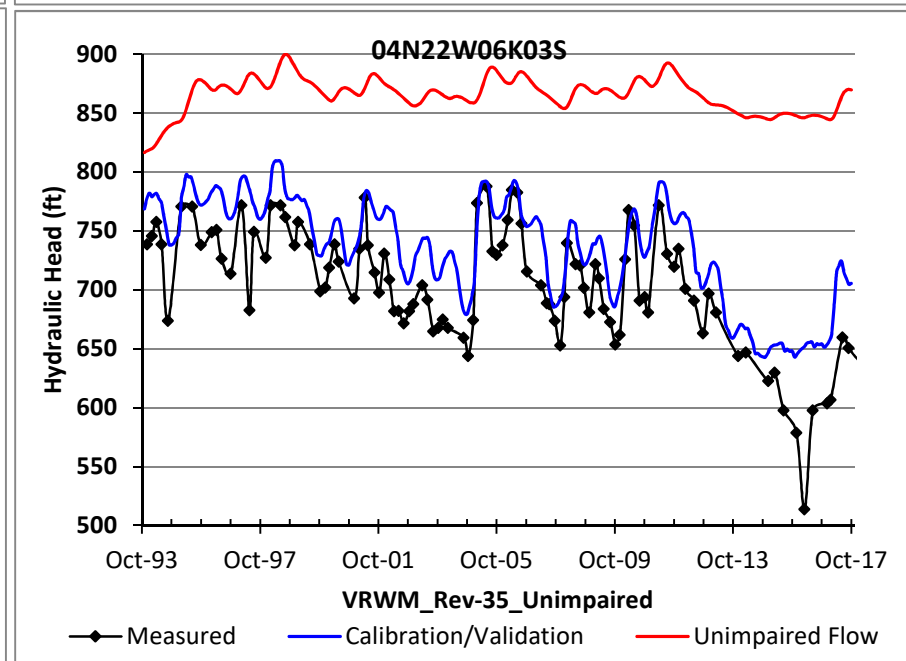
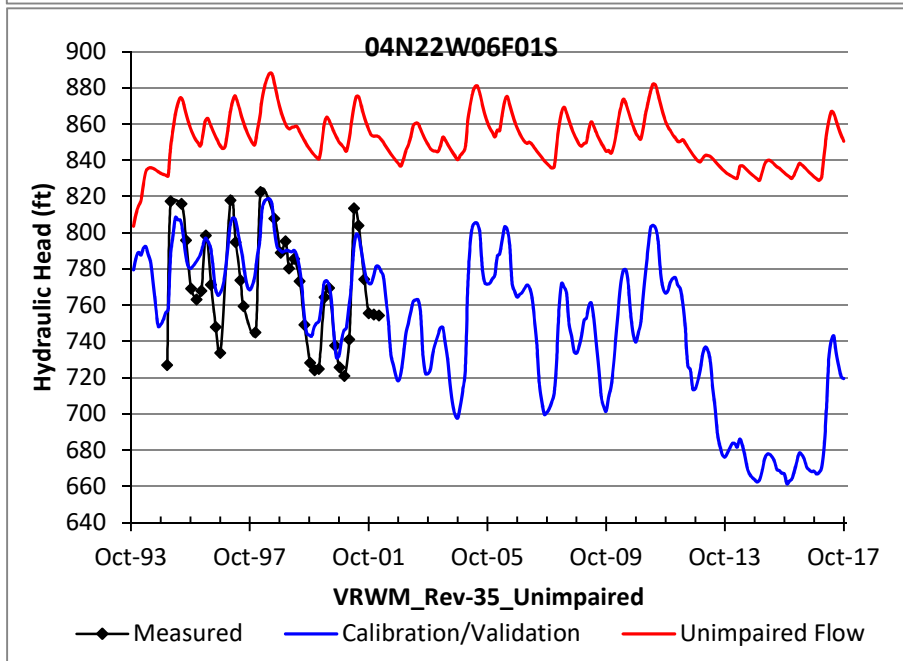
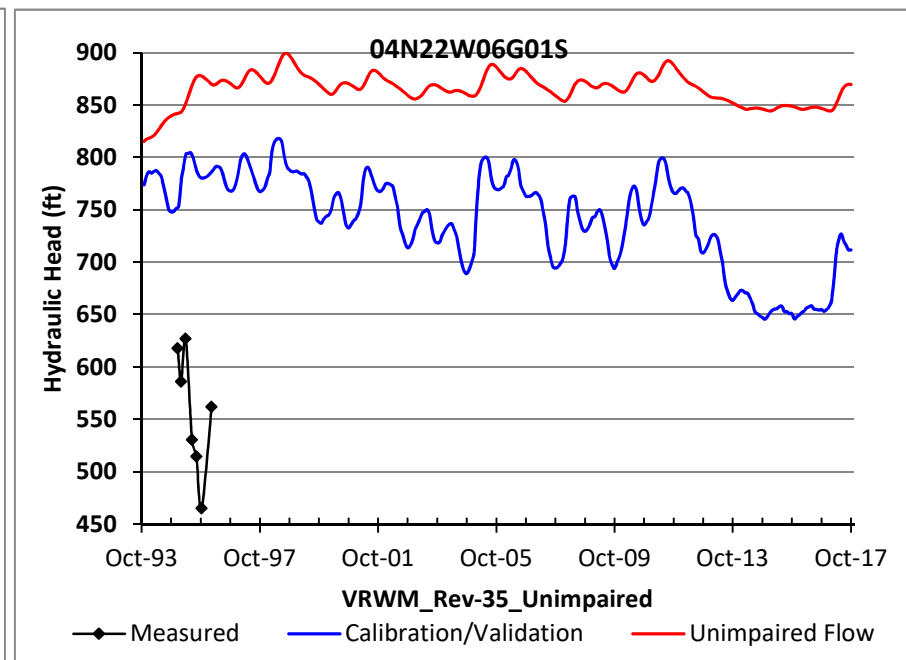
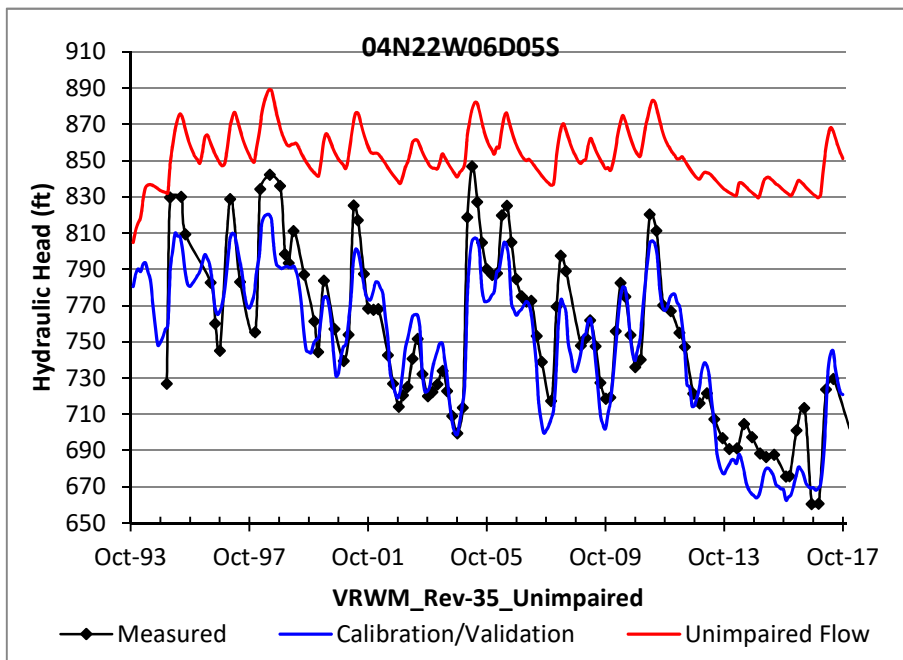


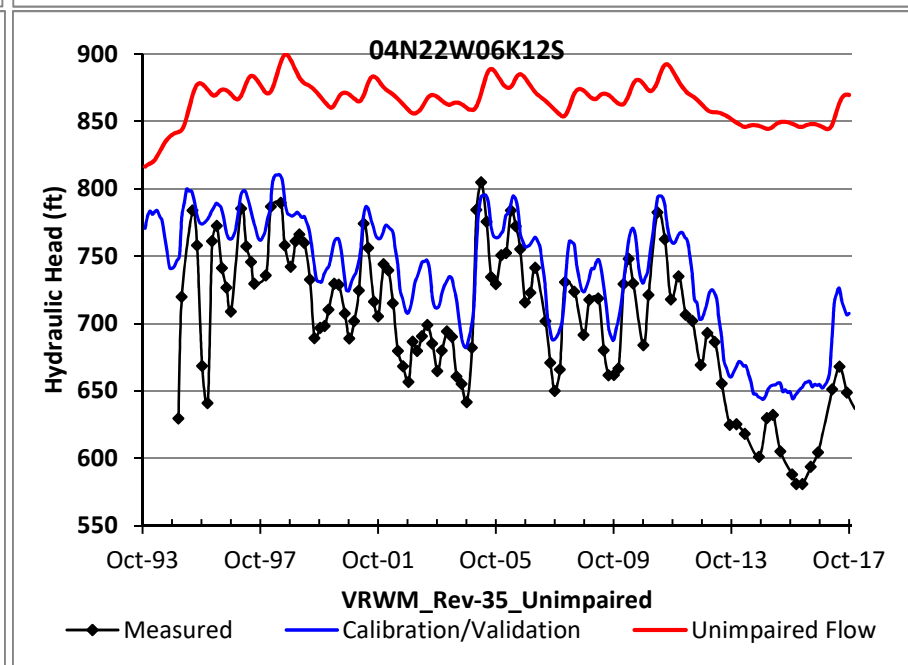
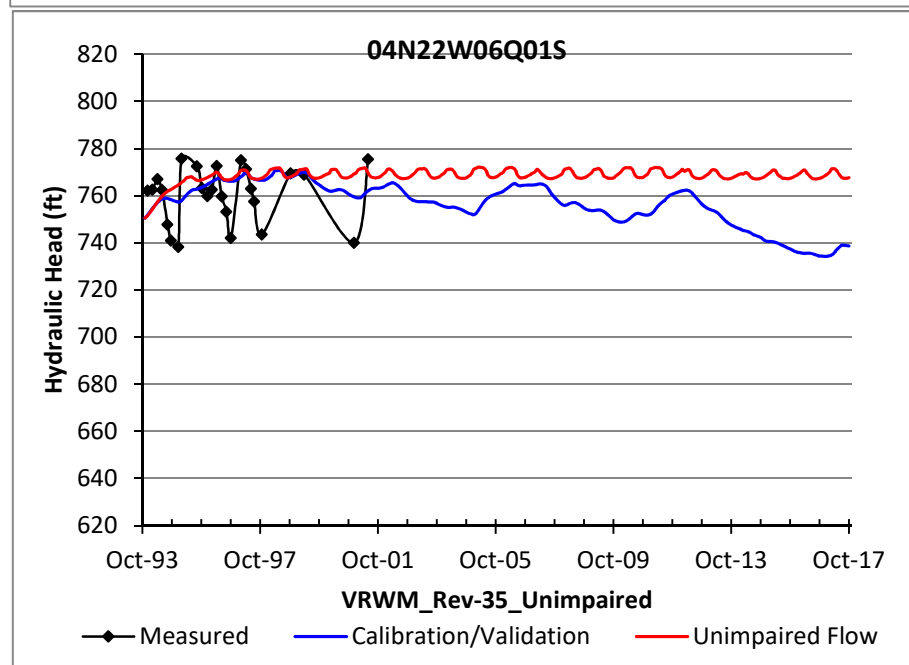
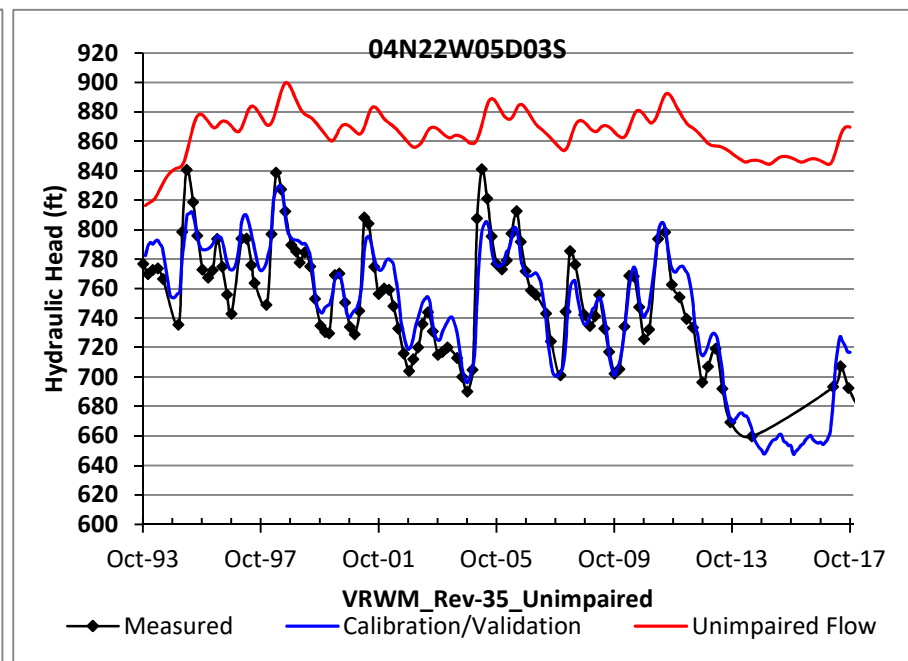
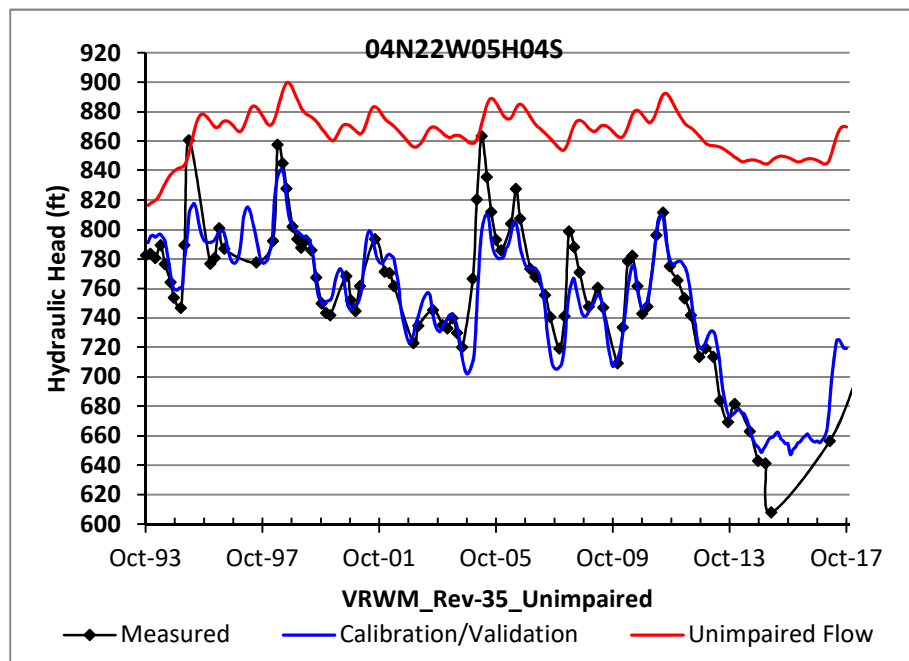
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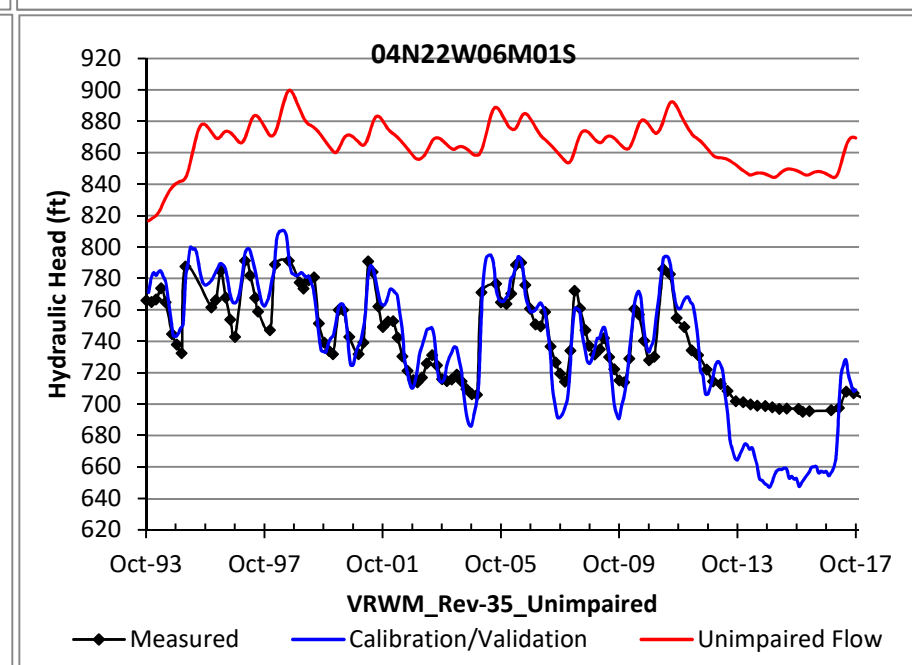
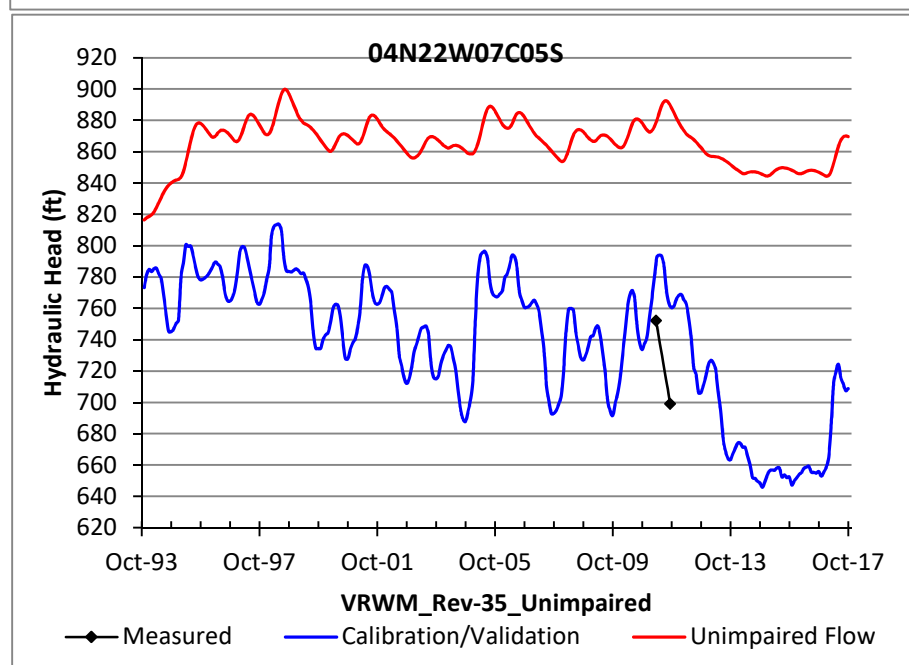
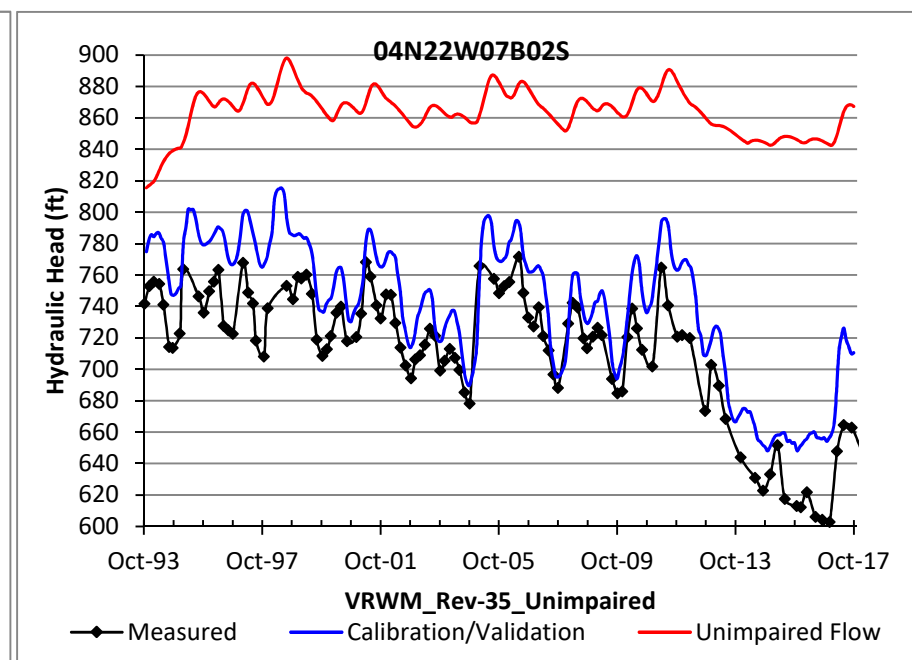
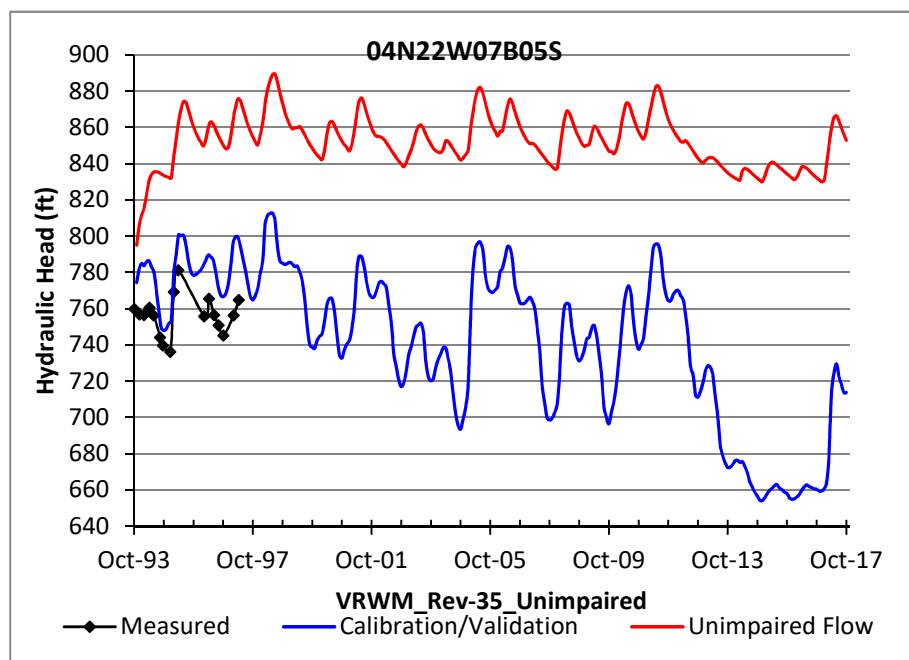
Ojai Valley Basin

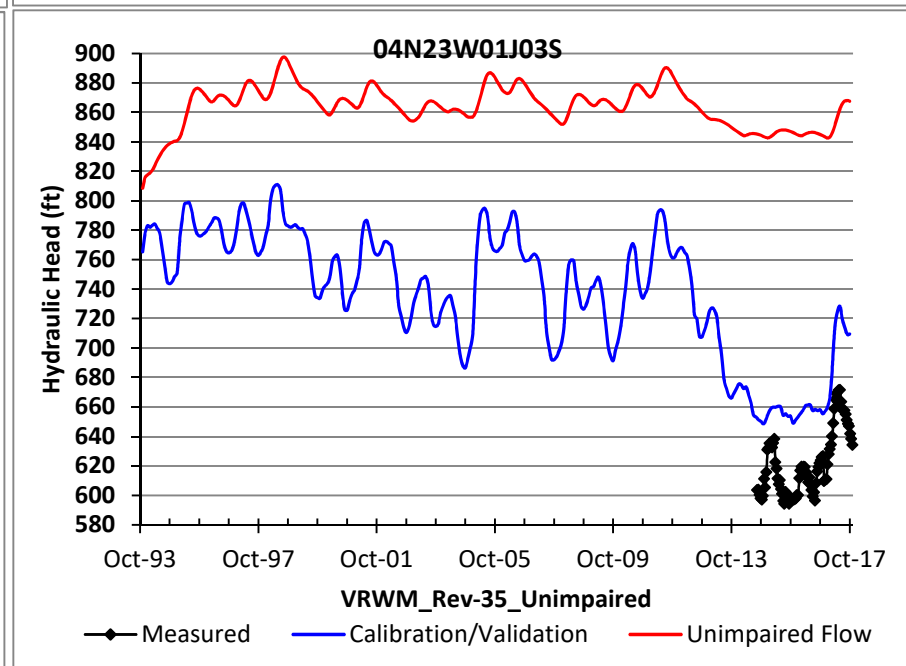
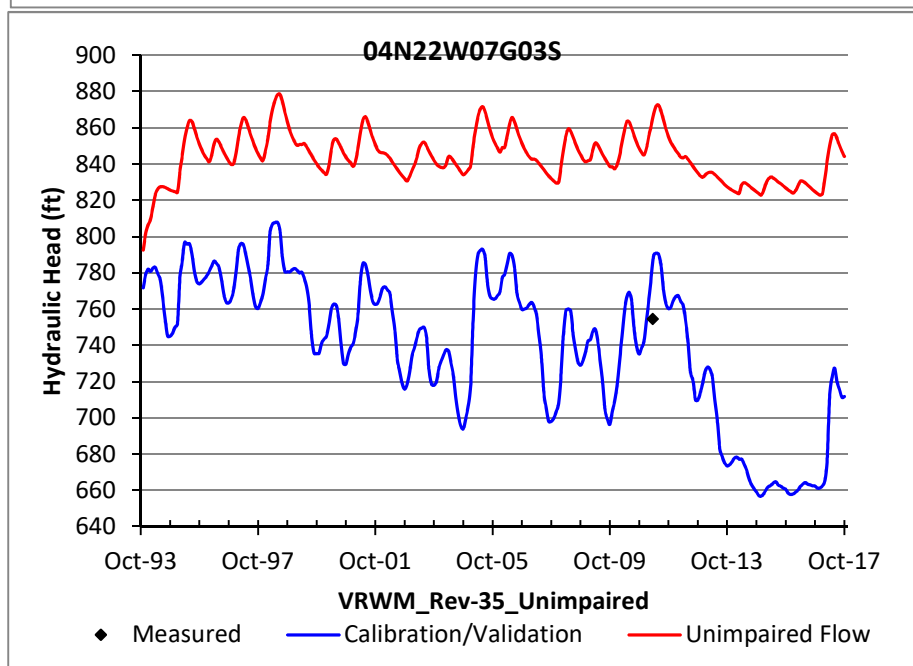
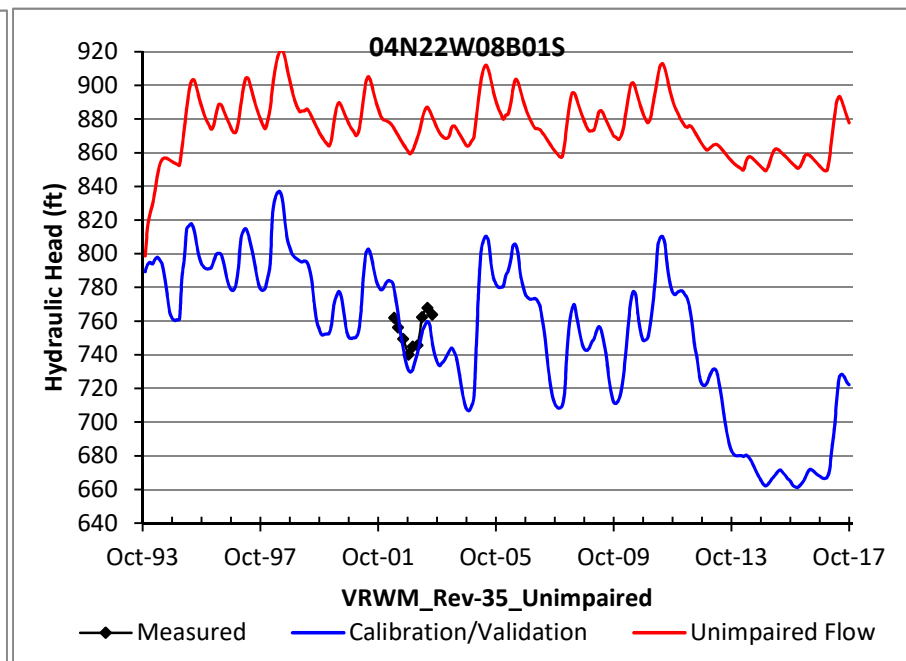
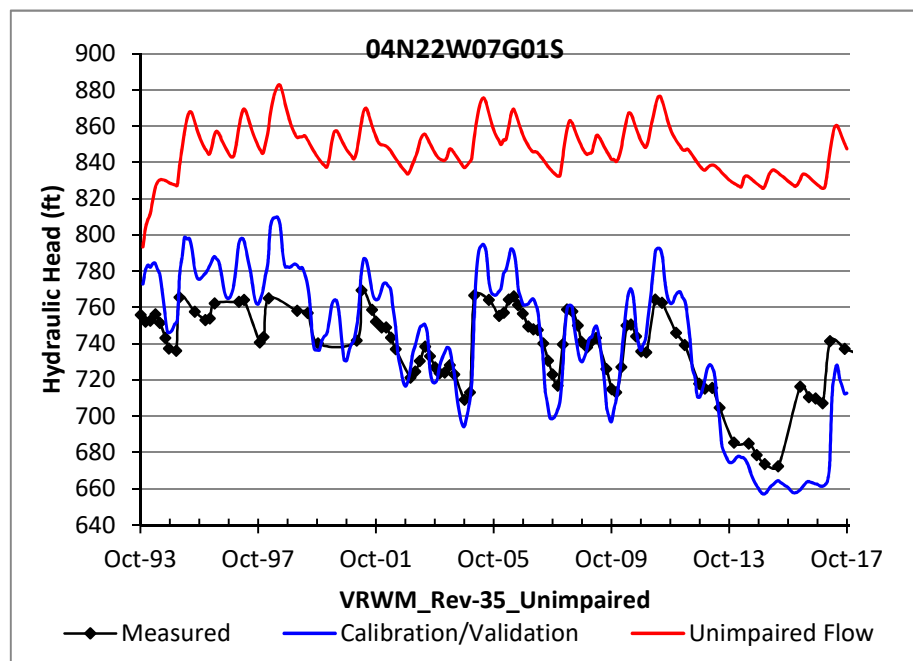


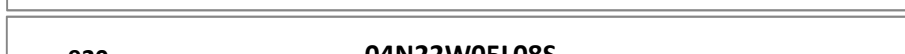
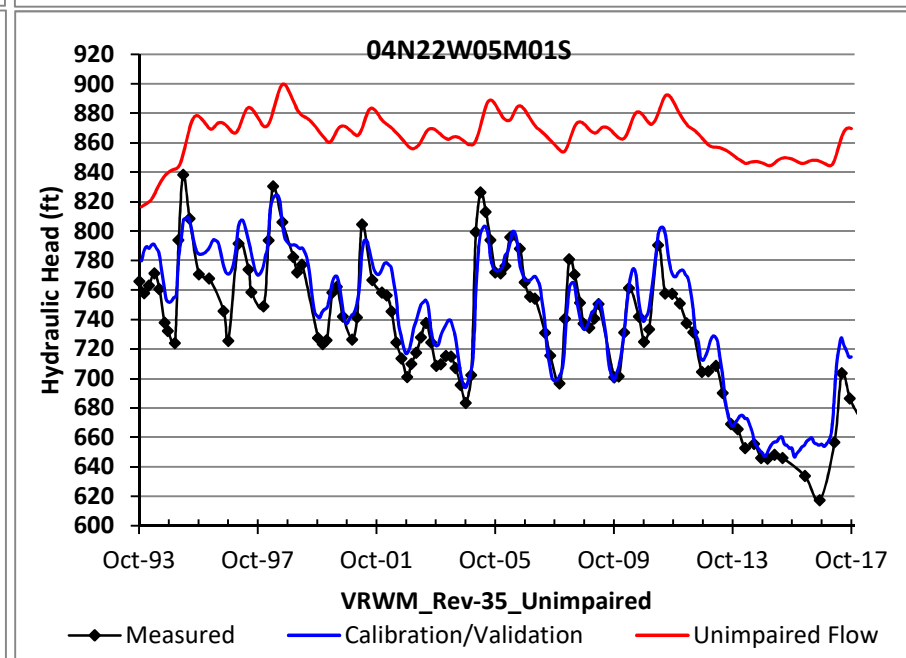
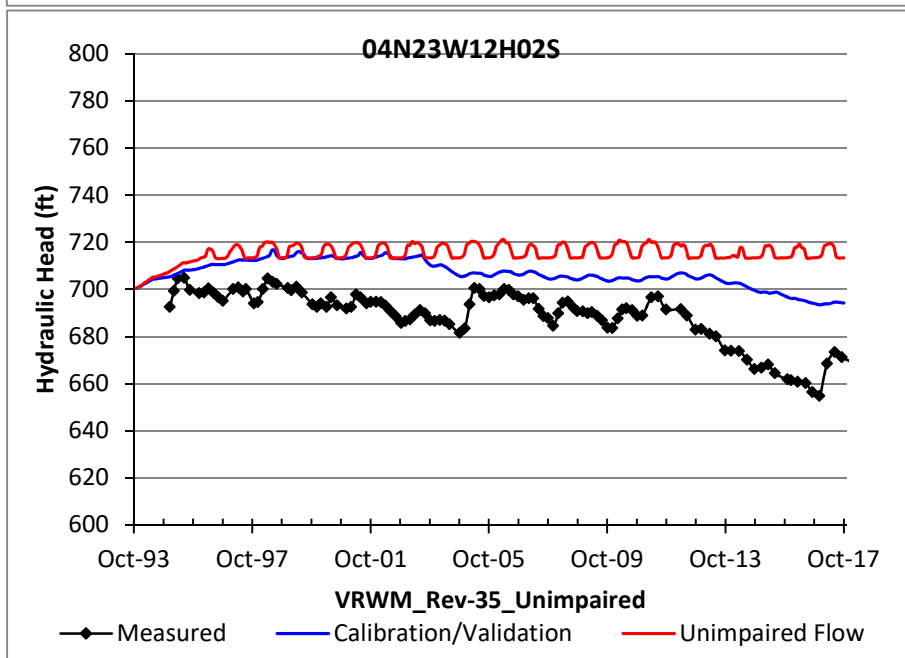
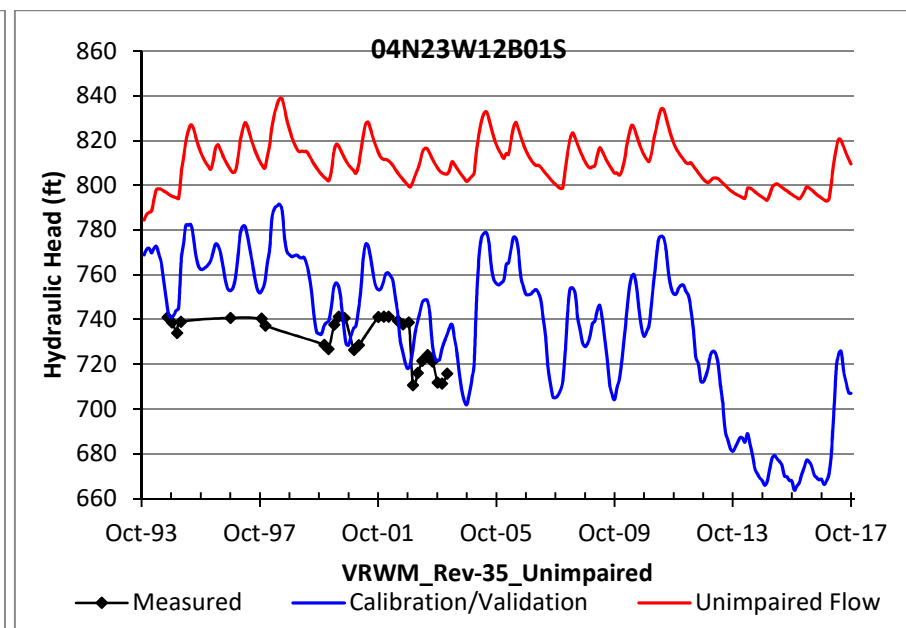
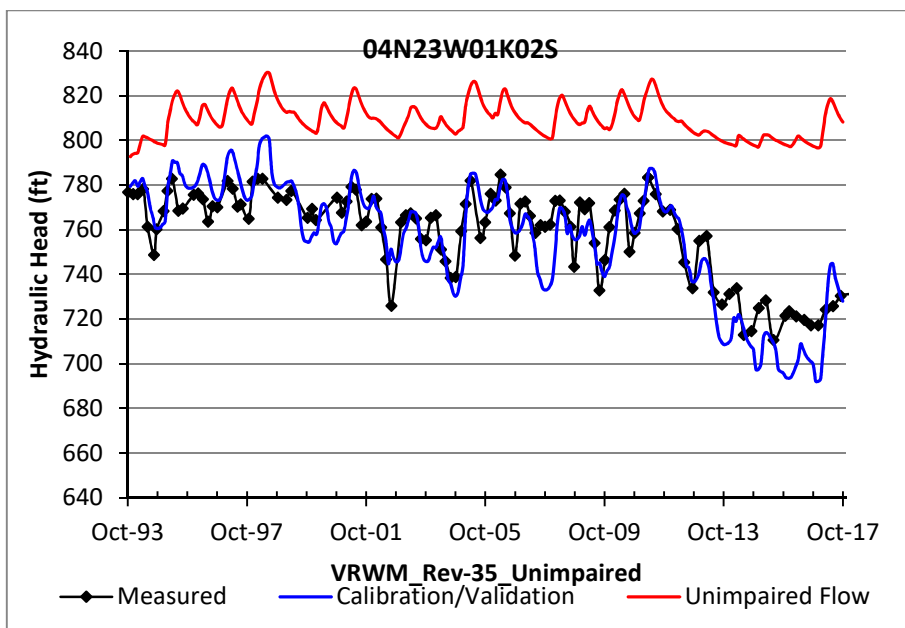


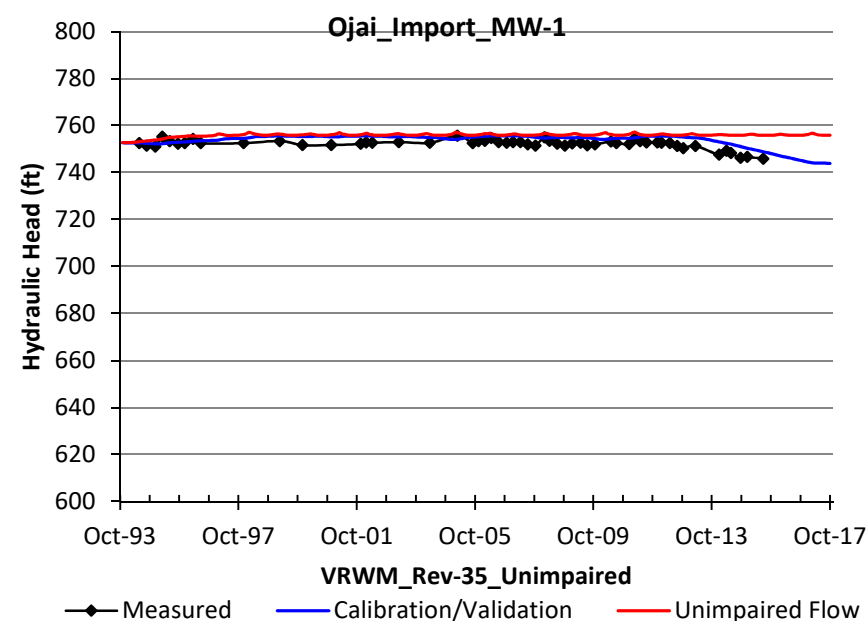
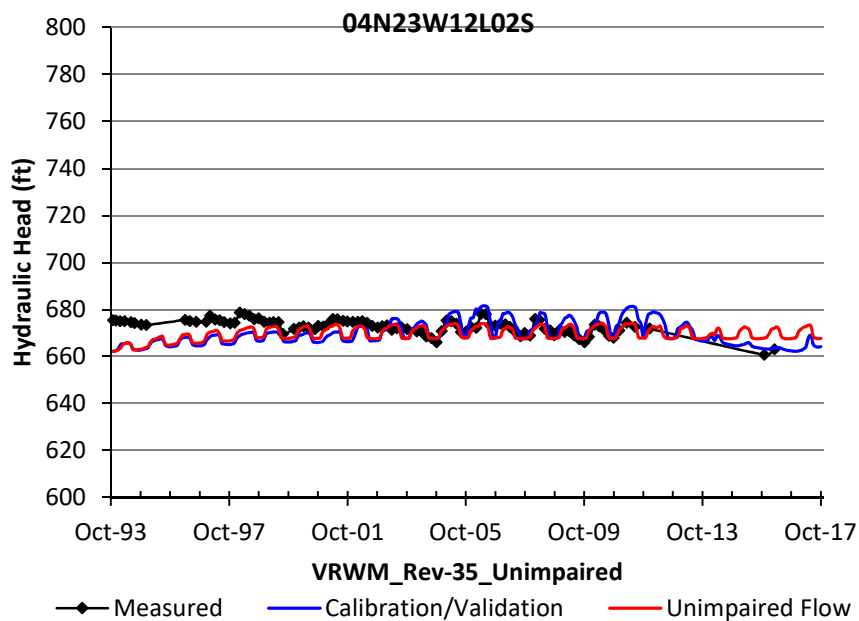
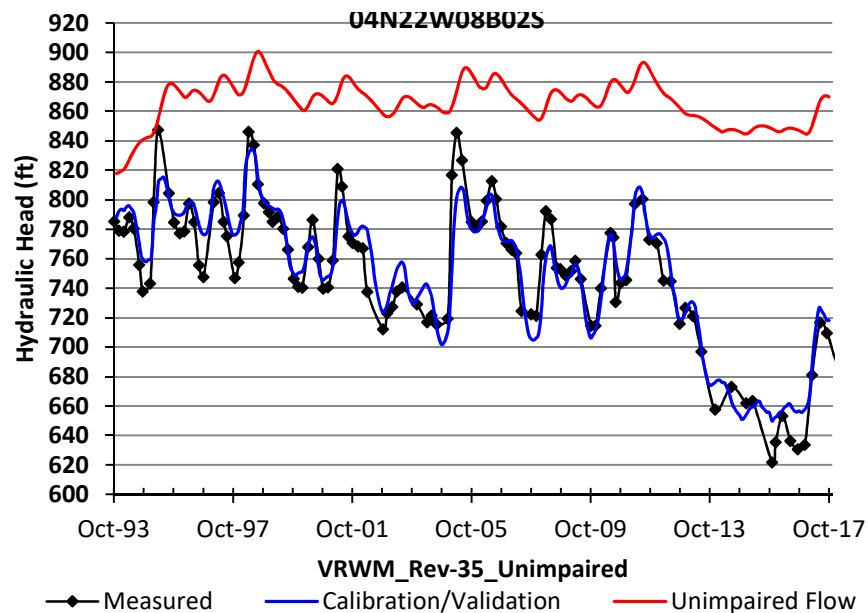
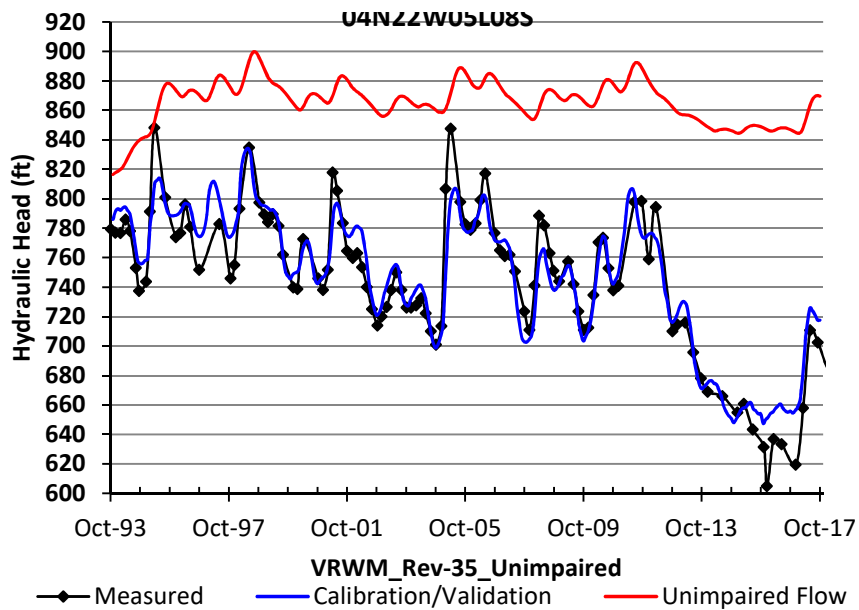






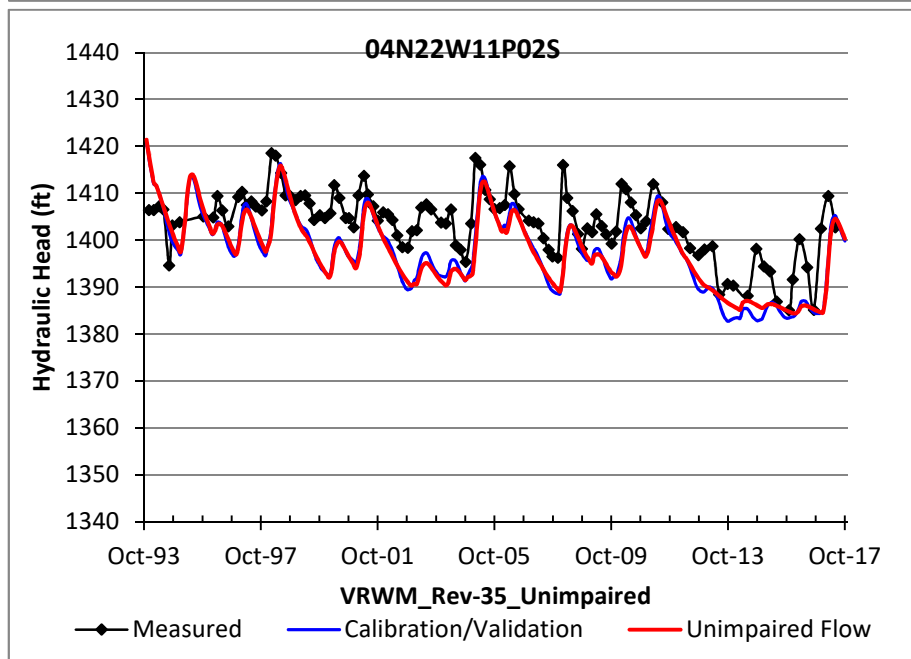
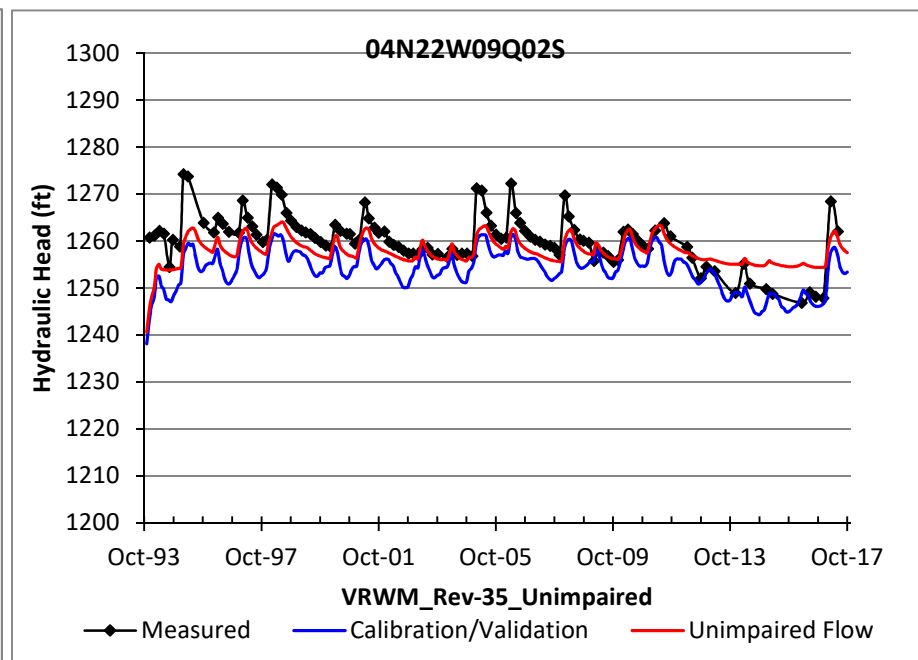
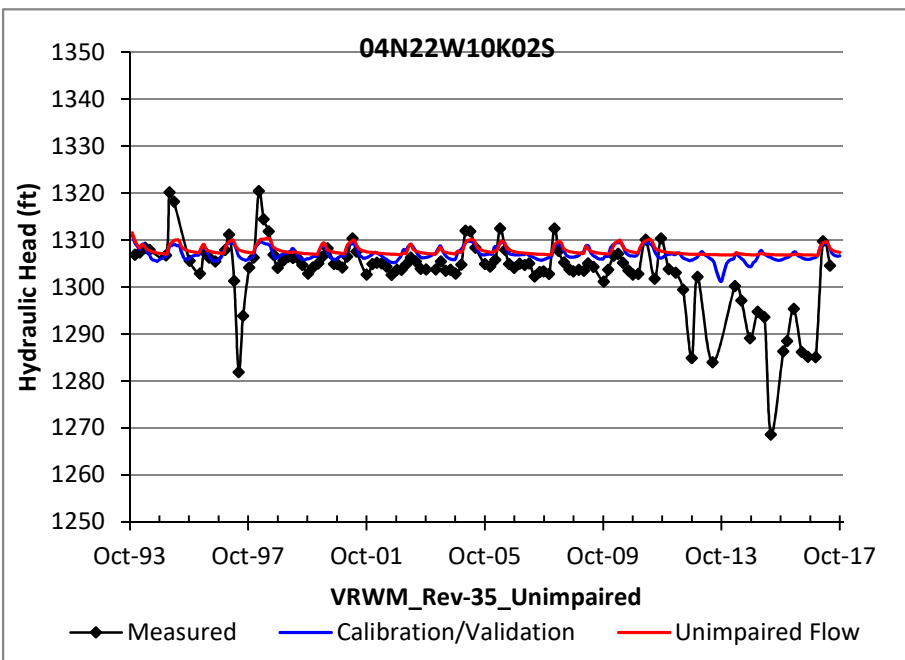






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Upper Ojai Valley Basin



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Outside the basins

