

Application of Phase 6 Watershed Model to Conowingo Infill

Modeling Workgroup Conference Call – November 2017

Gopal Bhatt¹ and Gary Shenk²

¹ Penn State, ² USGS

Presentation outline

- Calibration of time-variable Conowingo infill
- Changes in the delivery of nutrients and sediment with dynamic equilibrium (*no net long-term trapping*)

Calibration of Conowingo infill

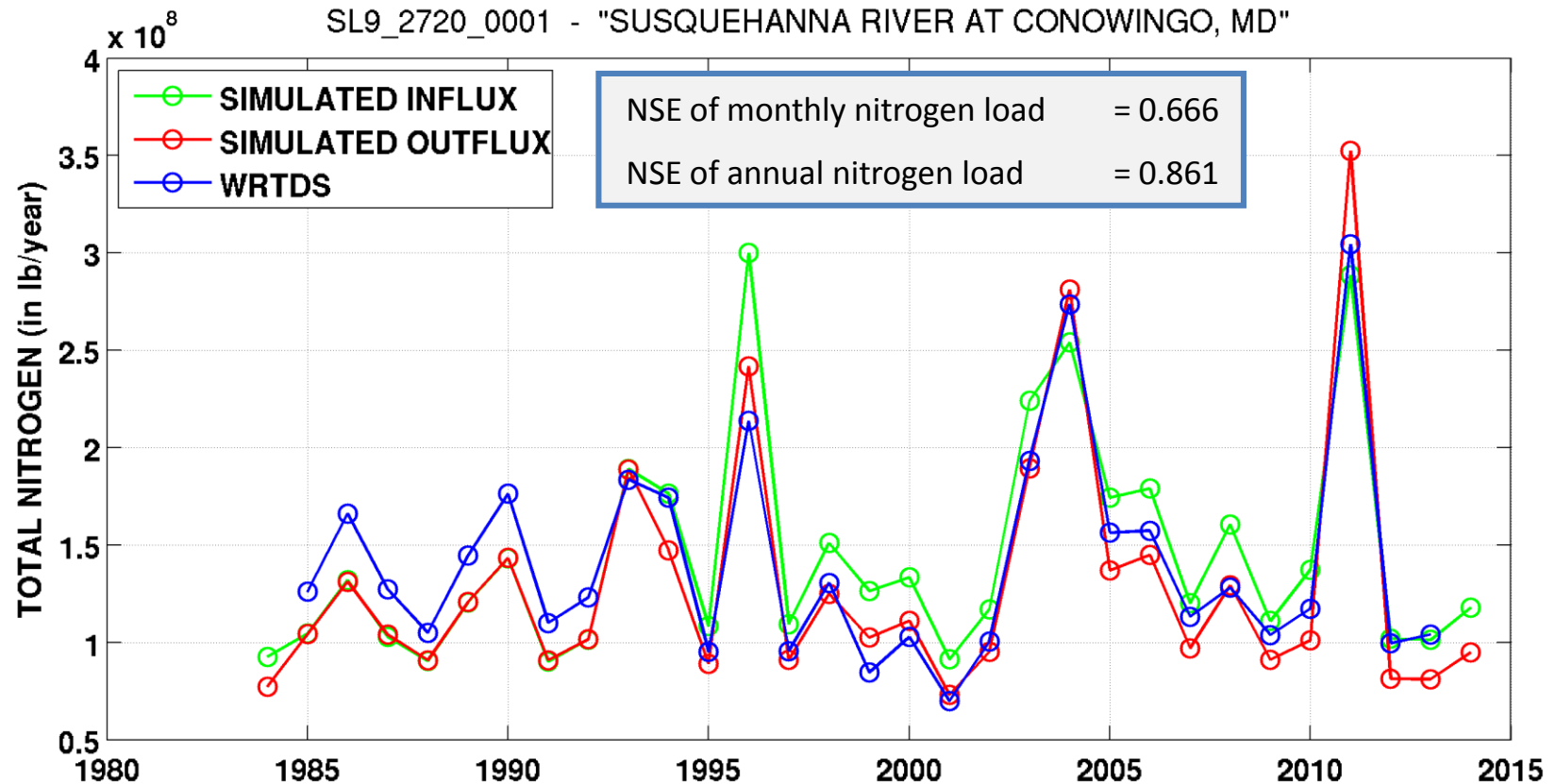
- The four step calibration approach established over the beta developments and its applications were used ^{[1][2][3]}.
- The four steps calibration of Conowingo infill uses multiple data sources (e.g., Stationary WRTDS models, mass-balance analyses, Coupled SFM-CPMBM, WRTDS, monitoring data) in the model parametrization, while achieving a balanced representation of all in the model:
 - Step 1: calibrate for the late-1980/1990 infill state.
 - Step 2: calibrate changes in deposition leading up to the 2010 infill state.
 - Step 3: calibrate changes in scour leading up to the 2010 infill state.
 - Step 4: use the weight of evidence approach to allow model parameters to change over the calibration period.

[1] https://www.chesapeakebay.net/channel_files/24281/20161004_-_bhatt_-_cbp_-_mwqm_-_simulation_of_conowingo_infill.pdf

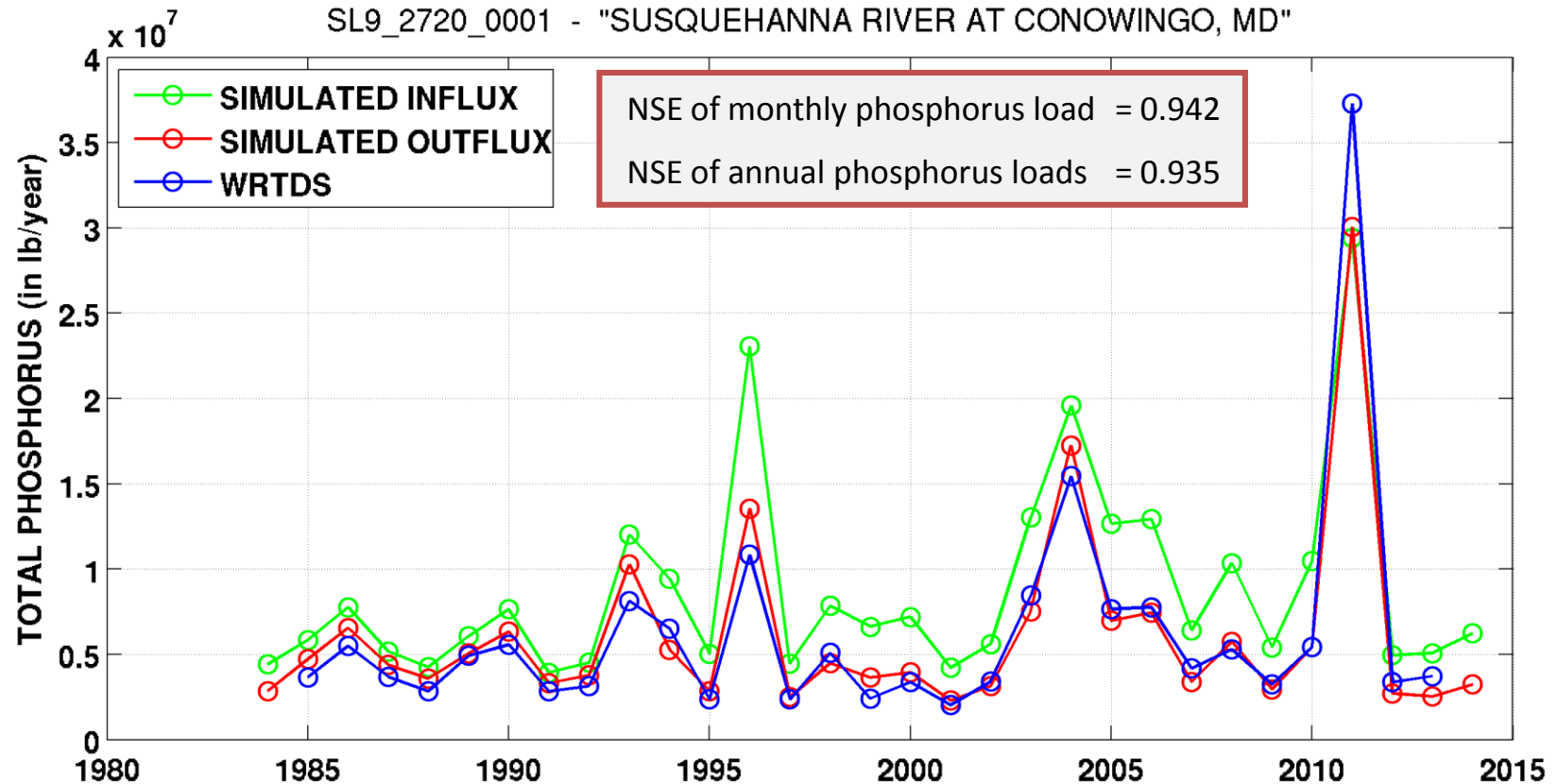
[2] https://www.chesapeakebay.net/channel_files/25164/20170615_-_bhatt_kh_-_cbp_-_mwcc_-_draft_phase_6.pdf

[3] https://www.chesapeakebay.net/channel_files/24720/20170725_-_bhatt_-_cbp_-_mwqm_-_draft_phase_6_applications.pdf

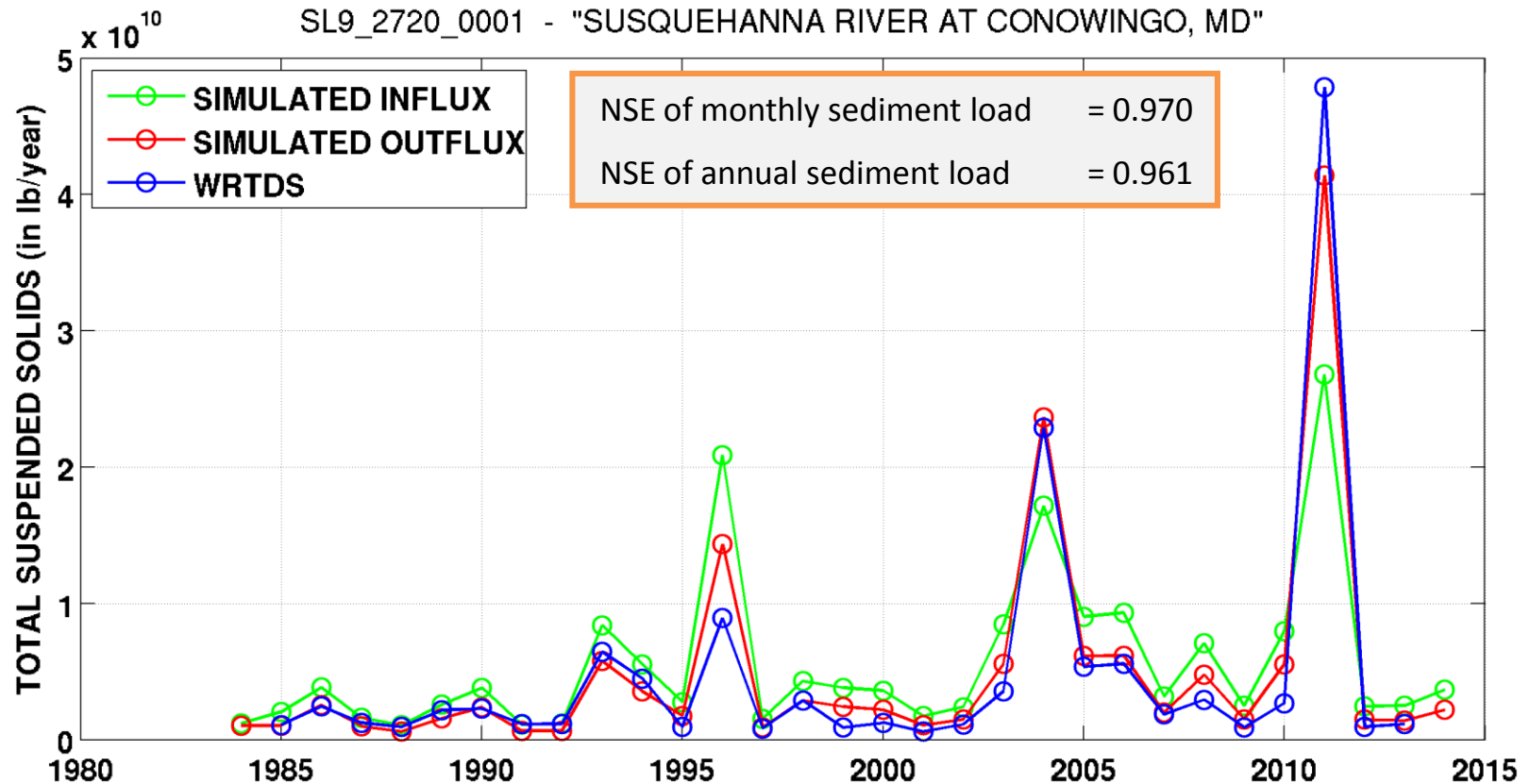
Model performance - Nitrogen

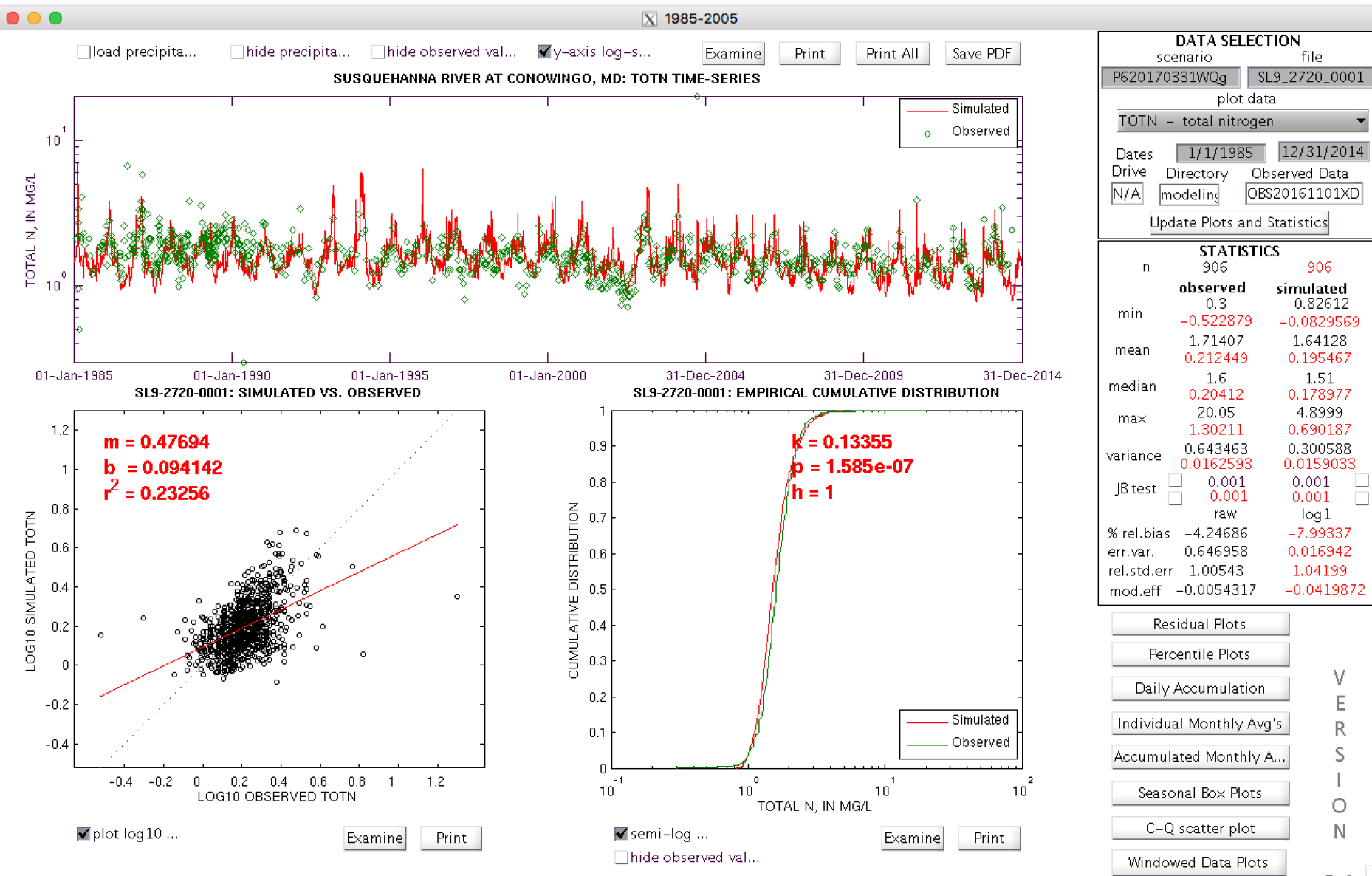


Model performance - Phosphorus



Model performance - Sediment

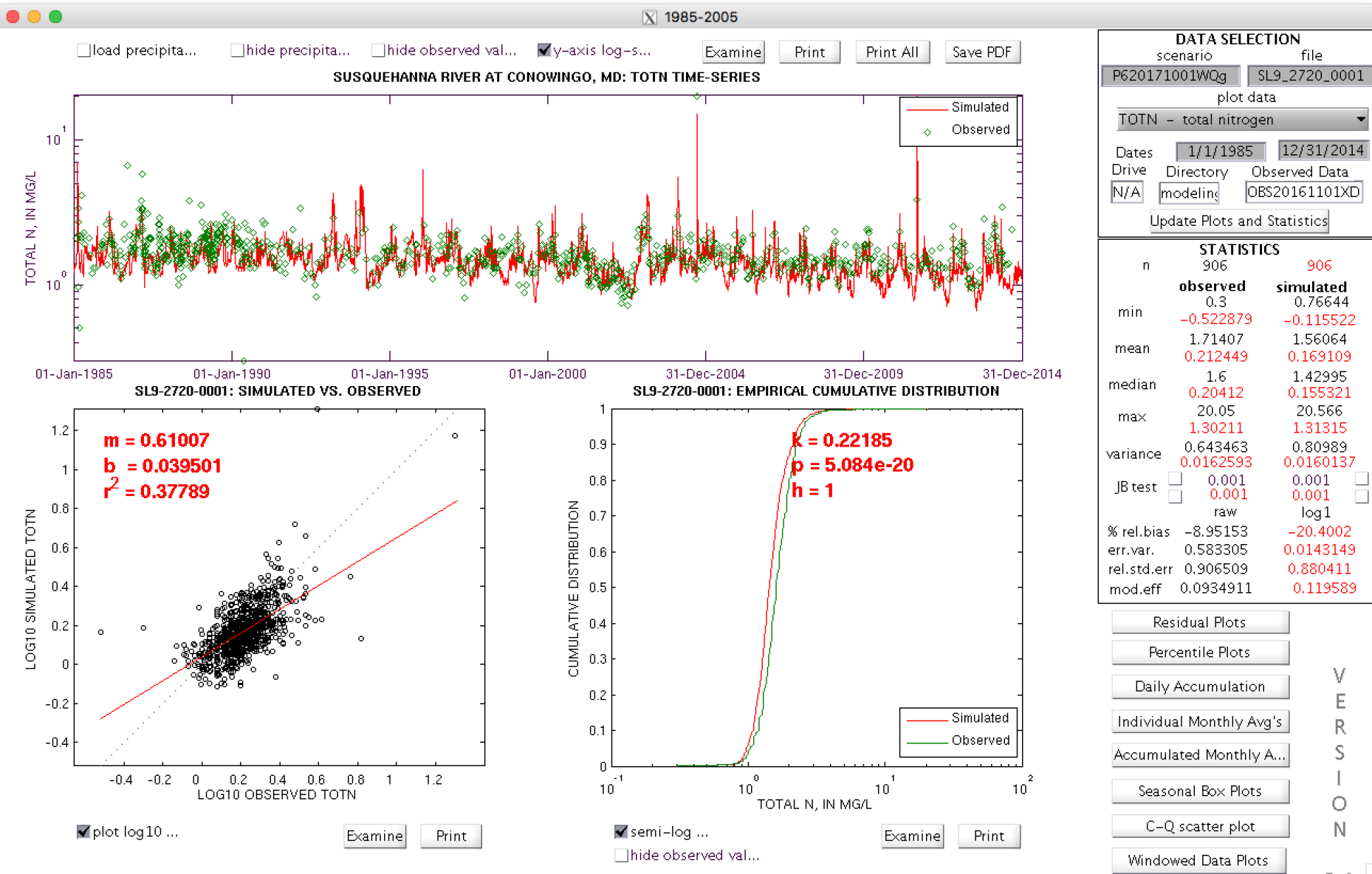


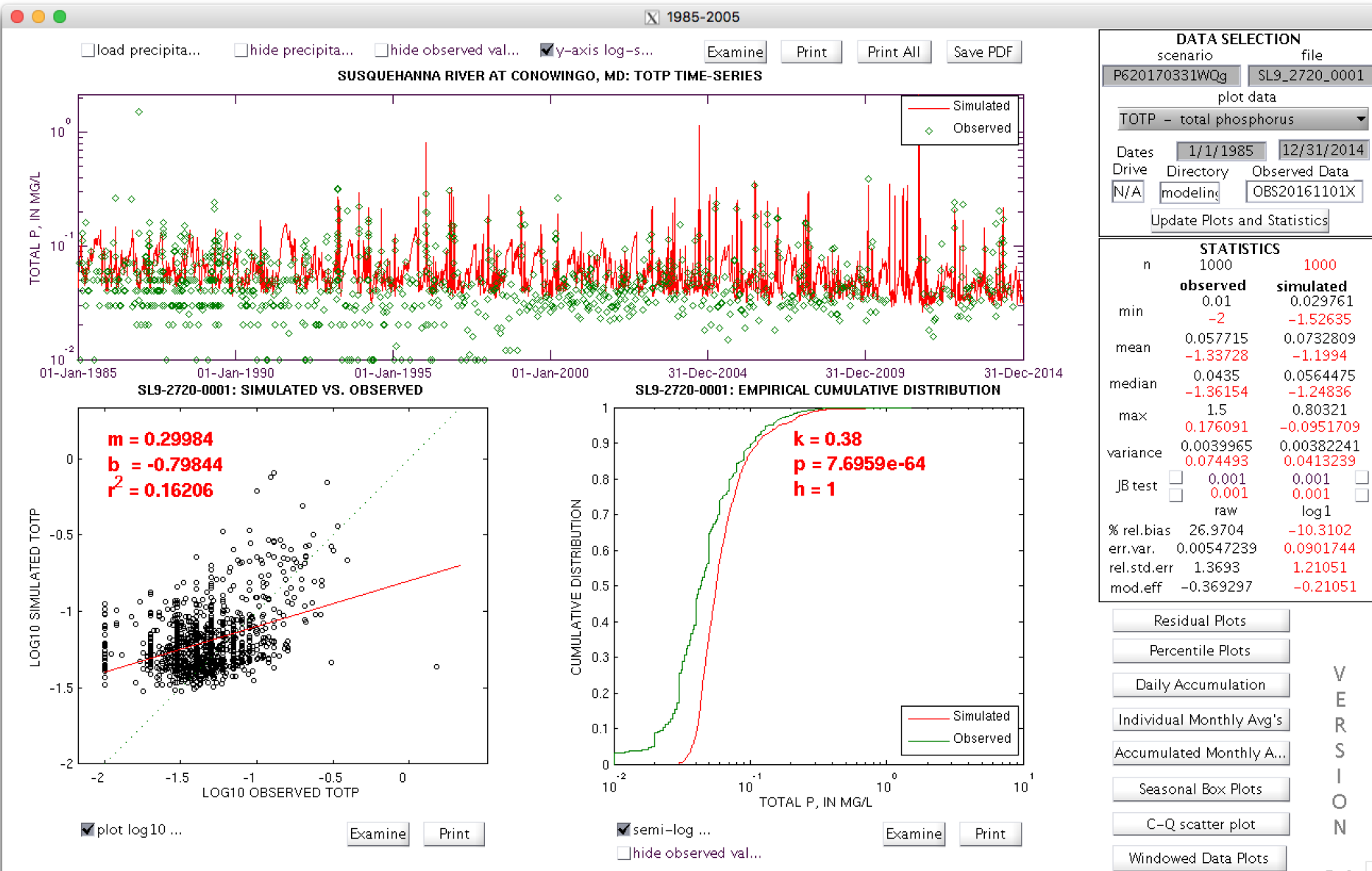


Phase 6

SUSQUEHANNA RIVER

NITROGEN

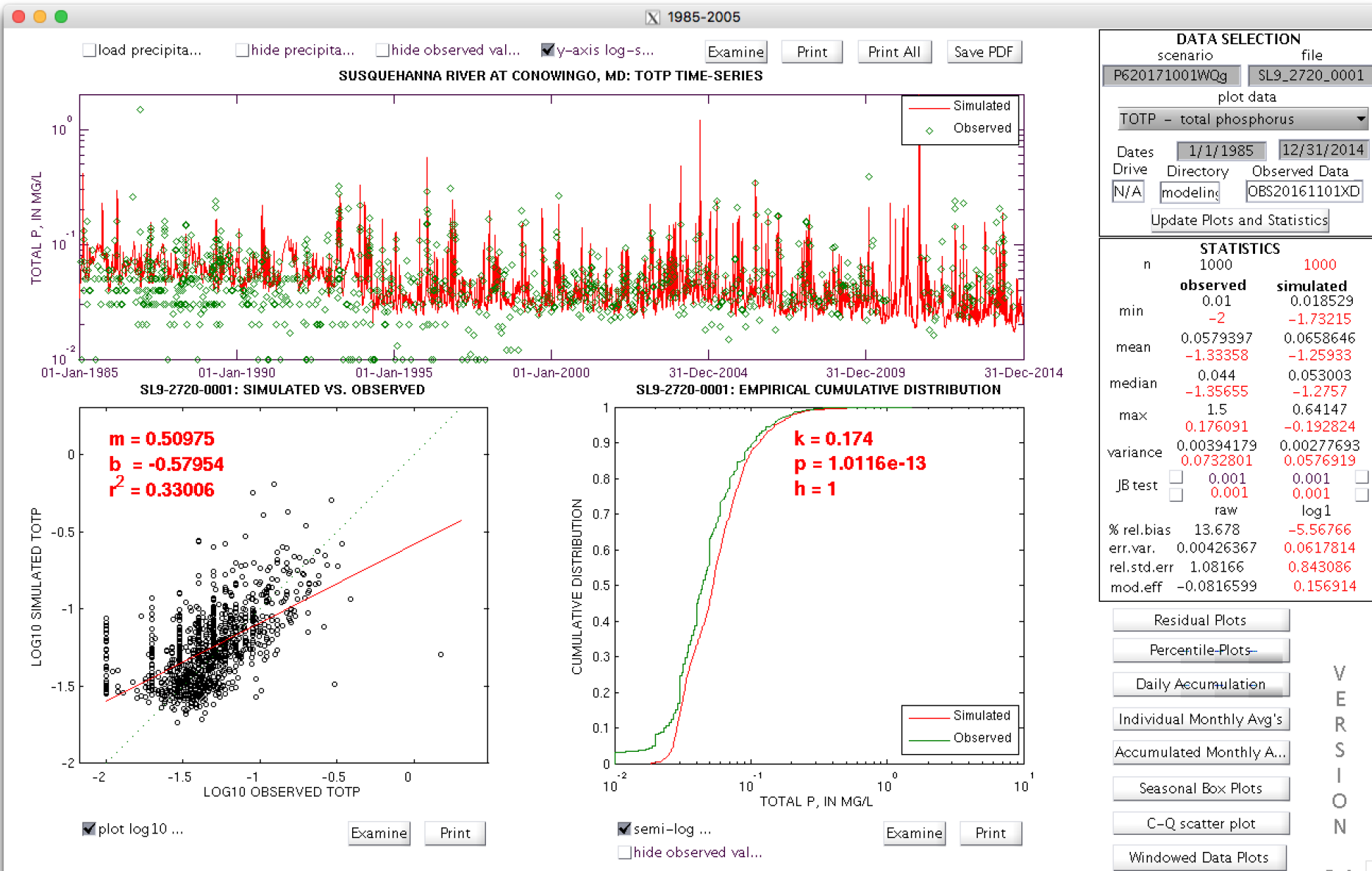


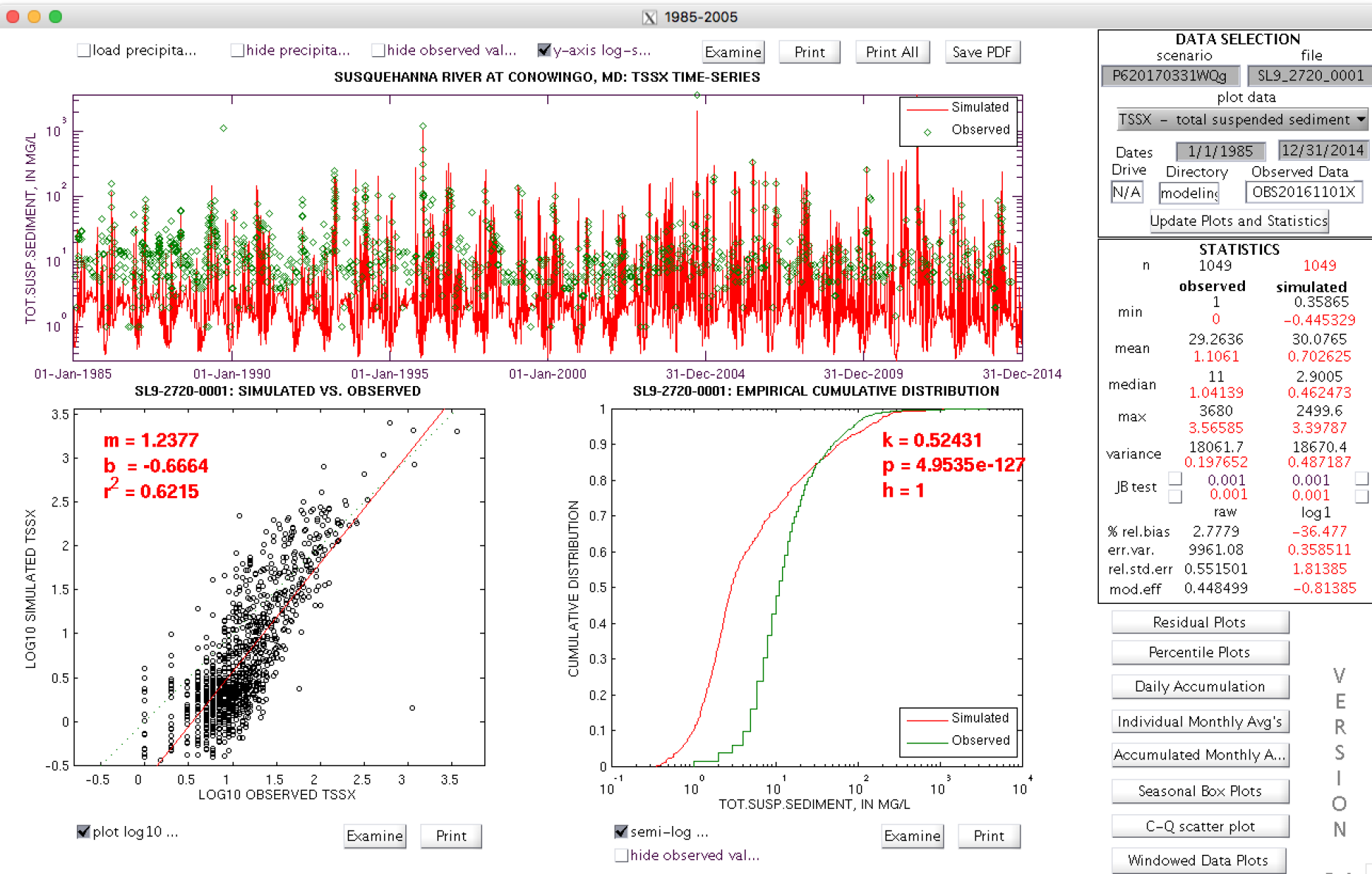


Phase 6

SUSQUEHANNA RIVER

PHOSPHORUS

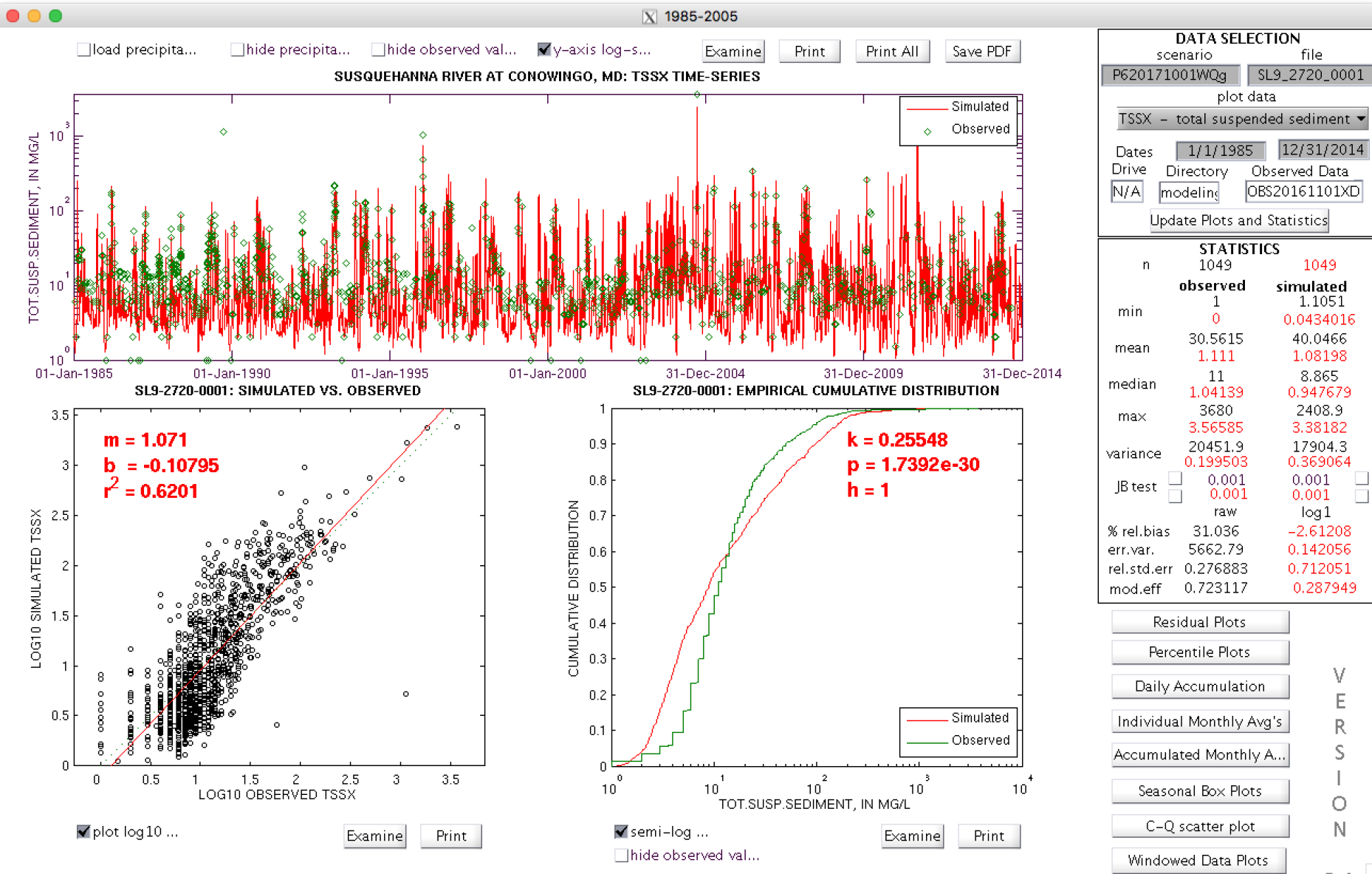




Phase 6

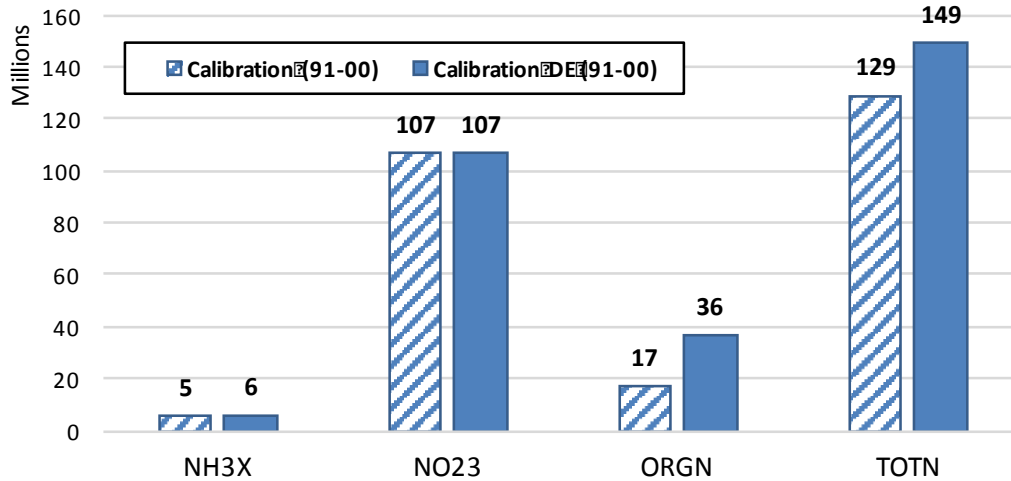
SUSQUEHANNA RIVER

SEDIMENT

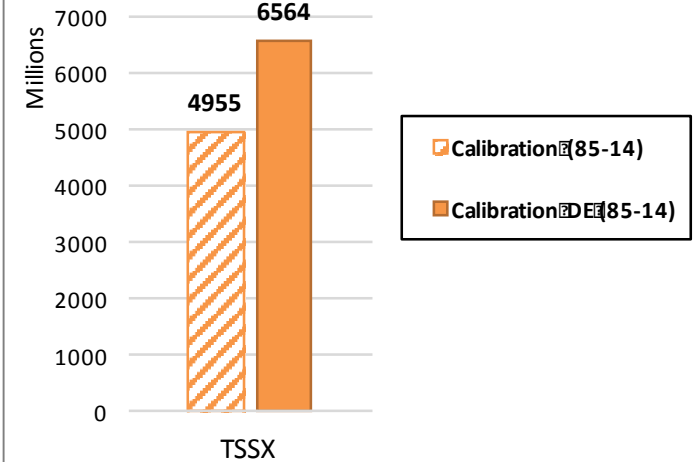


Dynamic equilibrium (DE)

Conowingo Average Annual Nitrogen Delivery



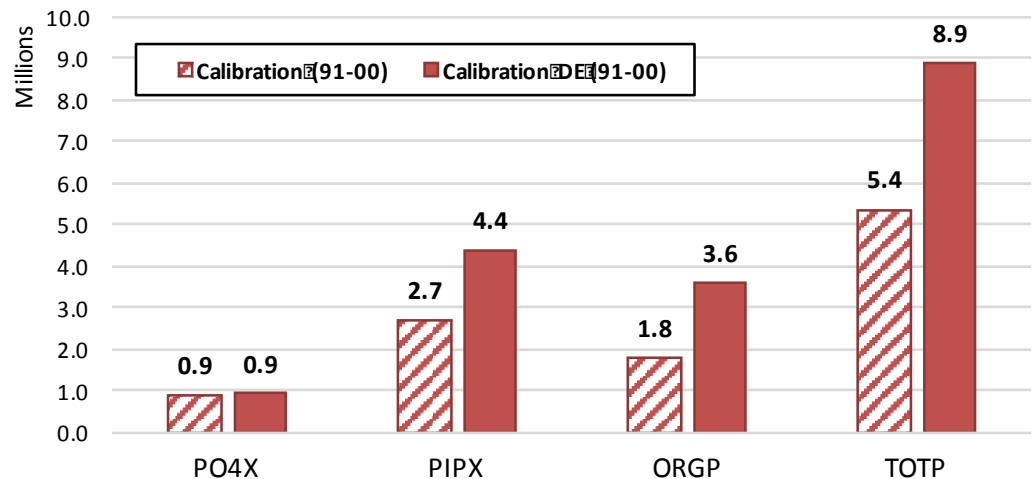
Conowingo Average Annual Suspended Solids Delivery



Changes in the delivery of nutrients and sediment between 1990s infill and dynamic equilibrium are shown in lbs.

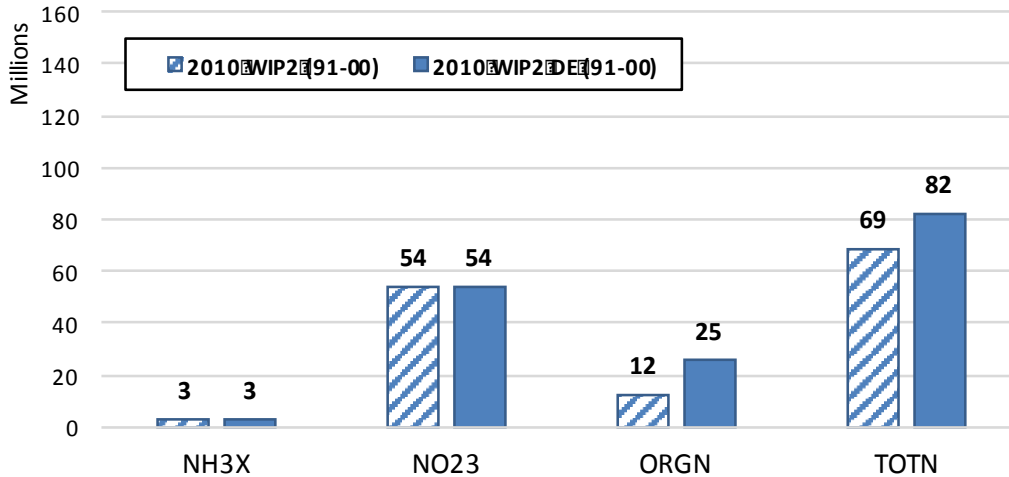
Under calibration loading condition

Conowingo Average Annual Phosphorus Delivery

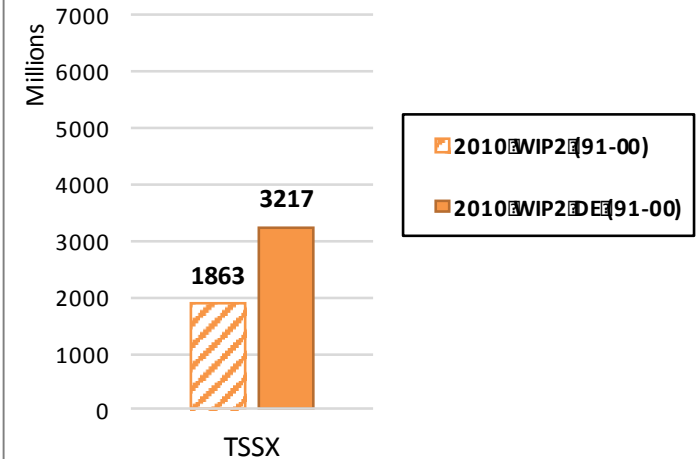


Dynamic equilibrium (DE)

Conowingo Average Annual Nitrogen Delivery



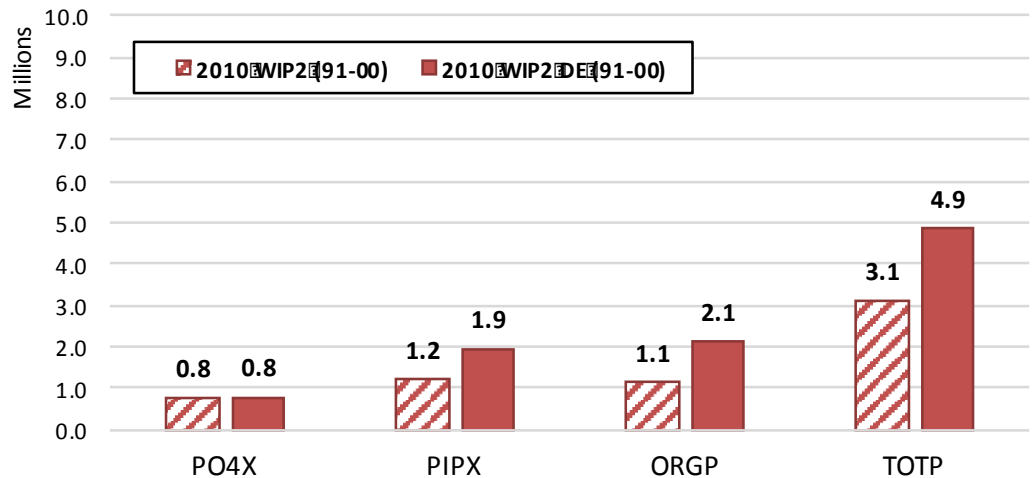
Conowingo Average Annual Suspended Solids Delivery



Changes in the delivery of nutrients and sediment between 1990s infill and dynamic equilibrium are shown in lbs.

***Under
2010 WIP2
loading
condition***

Conowingo Average Annual Phosphorus Delivery



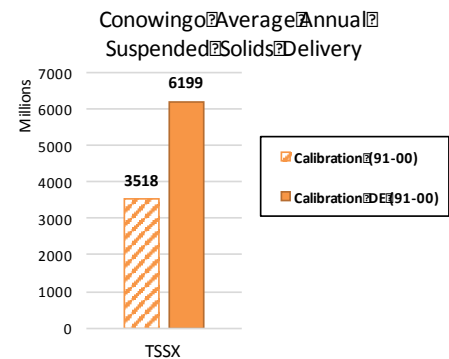
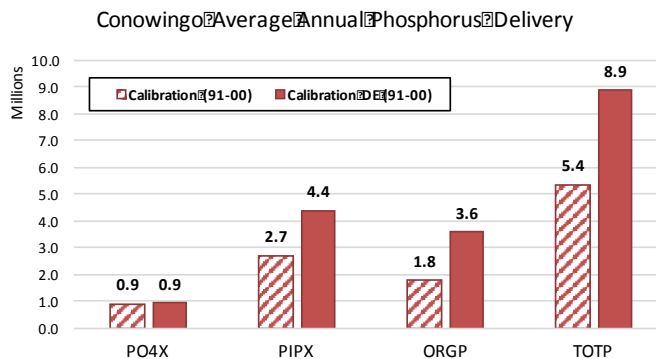
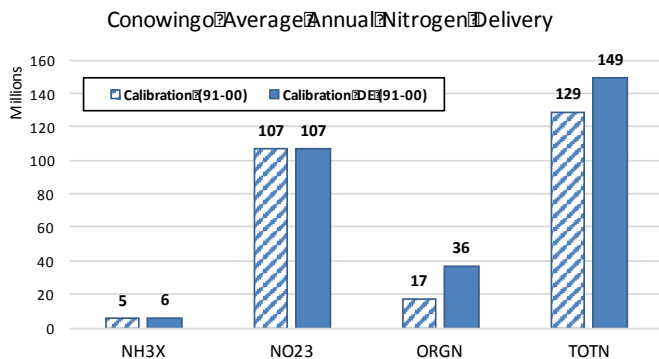
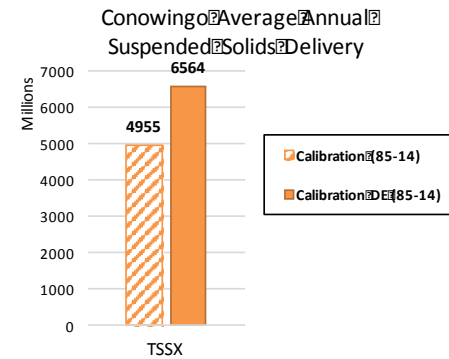
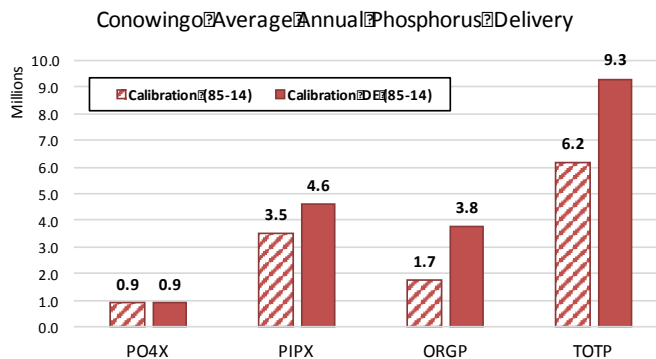
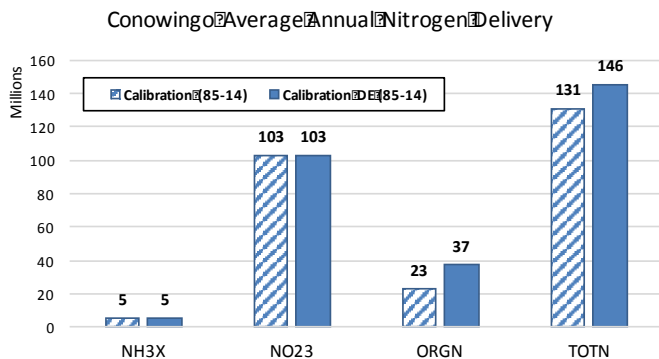
Summary and Conclusions

- The calibration of time-variable Conowingo infill was reviewed, where the calibrated model showed good model performance with respect to WRTDS loads as well as observations.
- The changes in the delivery of nutrients and sediment between 1990s infill and dynamic equilibrium (no net long-term trapping) were estimated.
- Under the 2010 WIP2 loading, the delivery of nitrogen increased by approx. 10 Mlbs, phosphorus by approx. 1.75 Mlbs, and sediment by approx. 1350 Mlbs.

Appendices

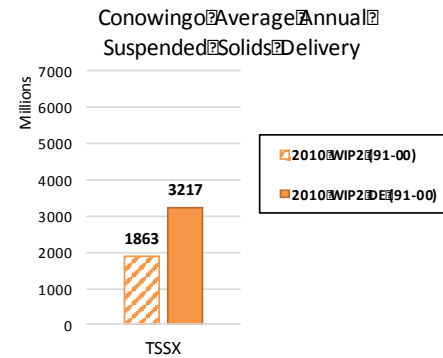
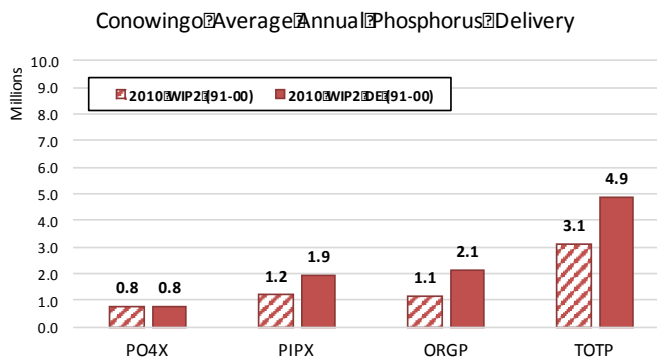
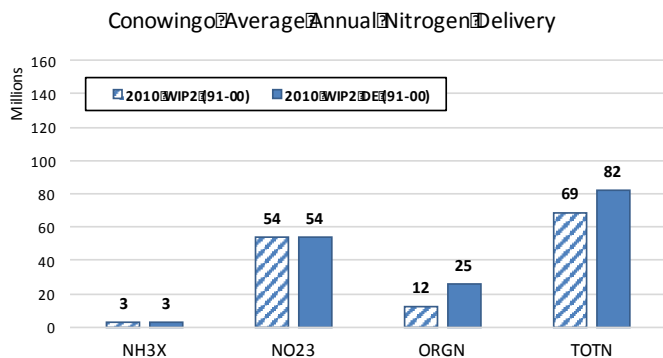
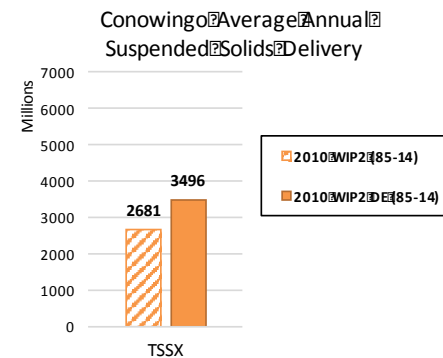
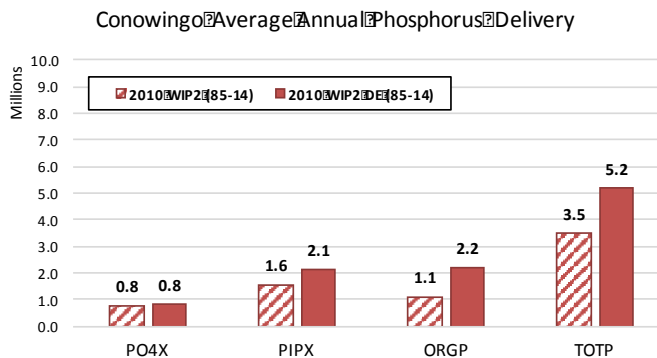
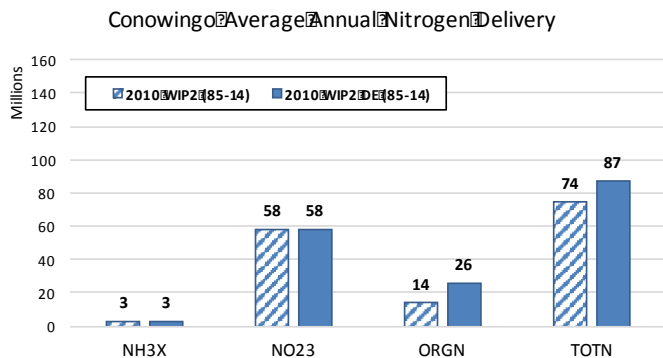
Changes in the delivery of nutrients and sediment between 1990s infill and dynamic equilibrium are shown in lbs.

Under calibration loading condition

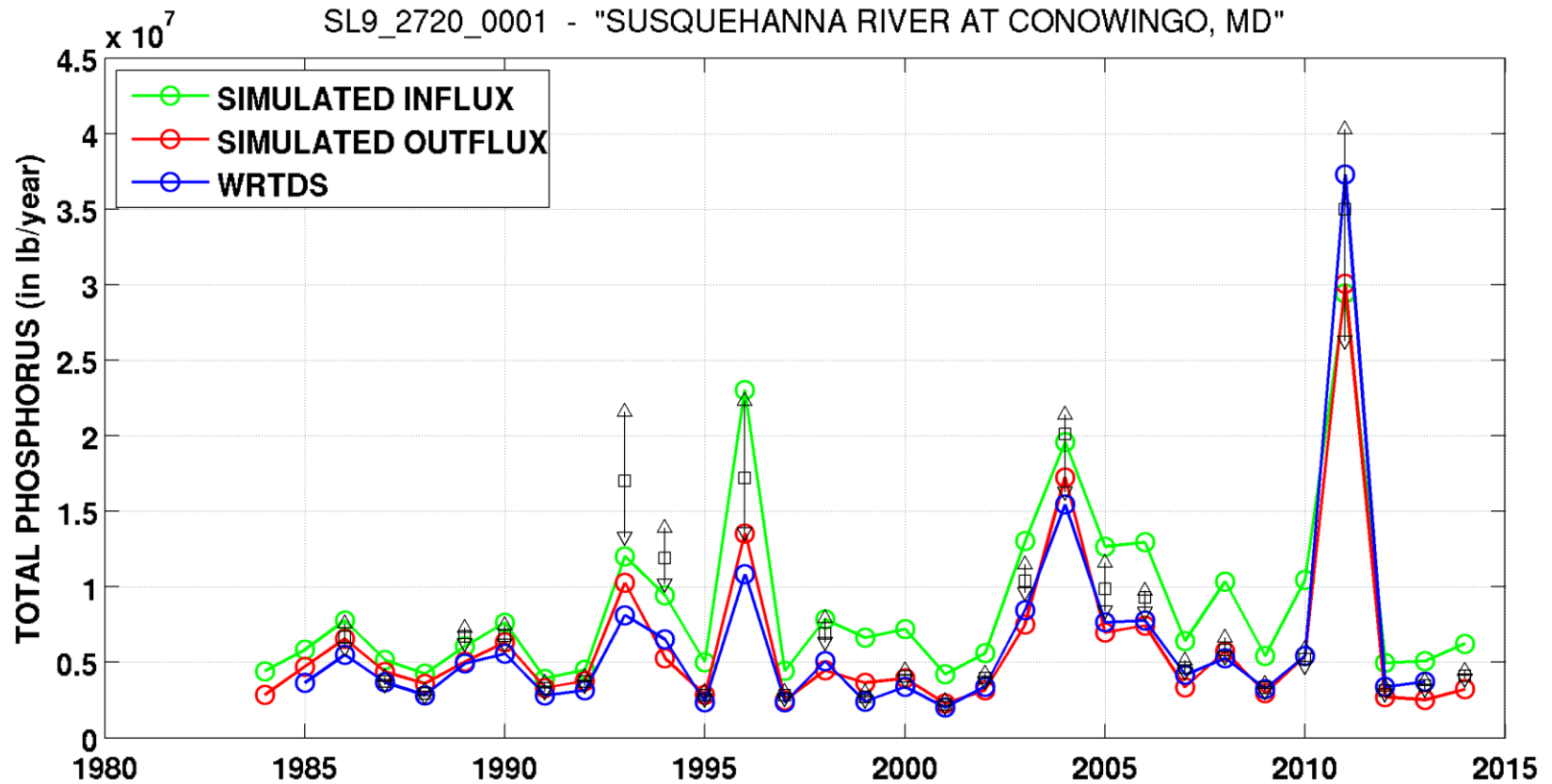


Changes in the delivery of nutrients and sediment between 1990s infill and dynamic equilibrium are shown in lbs.

Under 2010 WIP2 loading condition



- Squares and arrows show delivery estimated by Stationary WRTDS model for 2010 infill



- Squares and arrows show delivery estimated by Stationary WRTDS model for 2010 infill

