Releasing Scientific Software in GitHub: A Case Study on SWMM2PEST
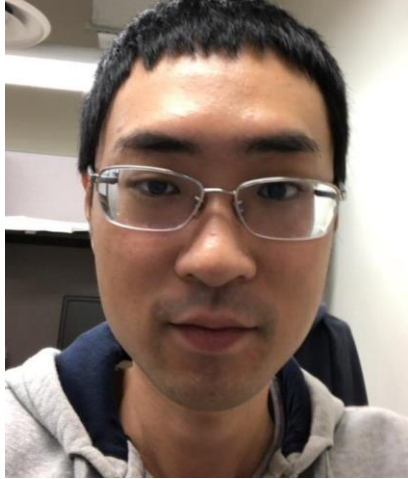
Xuanyi Lin (linx7@mail.uc.edu)

Department of EECS, University of Cincinnati, OH
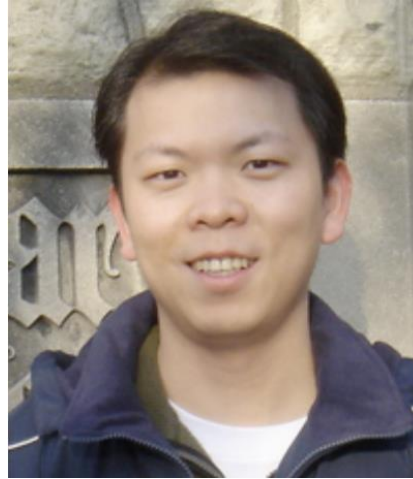
SE4Science, Montreal, Canada
May 28, 2019

Acknowledgments

Xuanyi Lin

PhD Student
University of Cincinnati

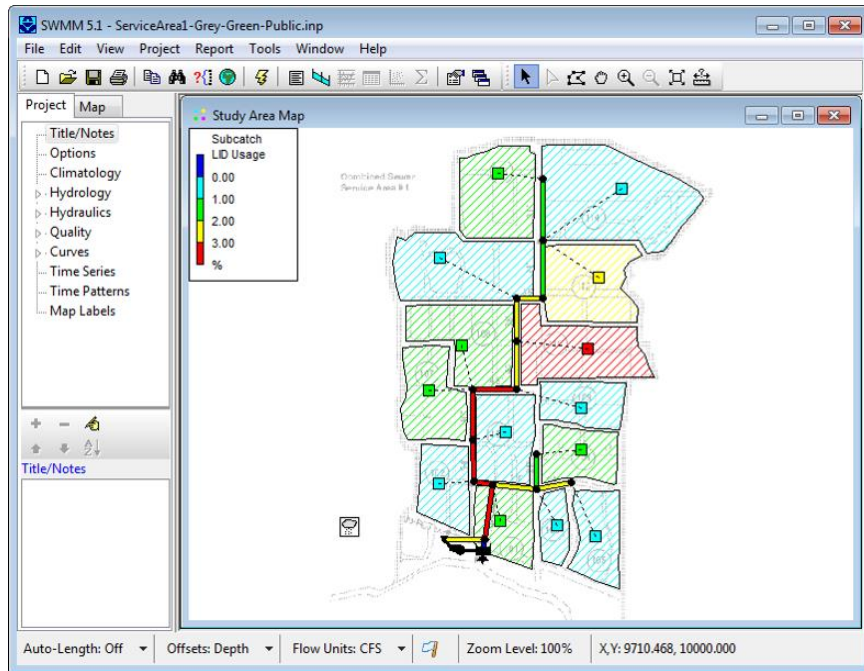Nan Niu

Associate Professor
University of Cincinnati

Michelle Simon

Associate Director
US EPA

Storm Water Management Model (SWMM)

Partial statistics on using SWMM for research in 2018 based on Google Scholar

The scientific software we are releasing
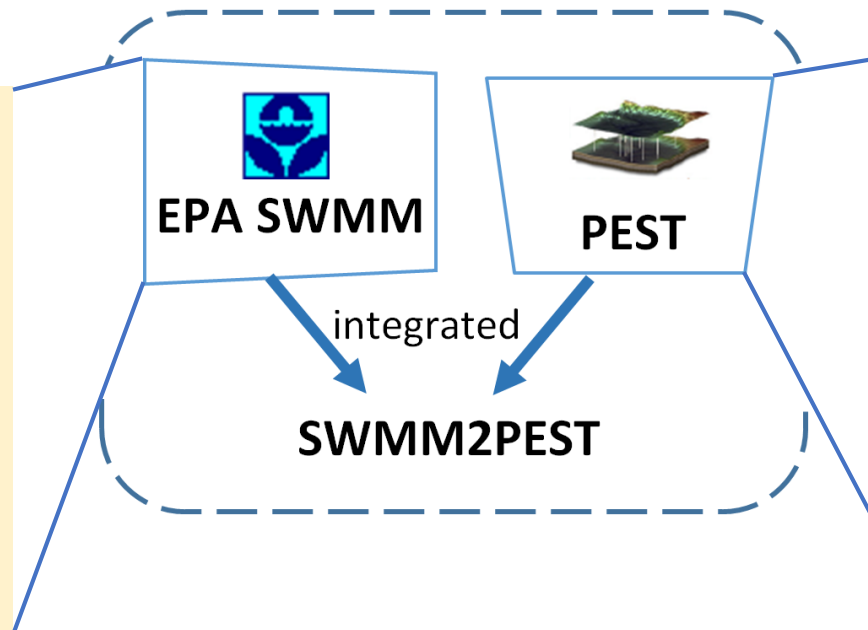
SWMM2PEST

An integration of the SWMM and PEST scientific programs

Dynamic rainfall-runoff simulation model

Version 5.1.013 was released in 2018

Computational engine is written in C & the UI in Delphi.XE2
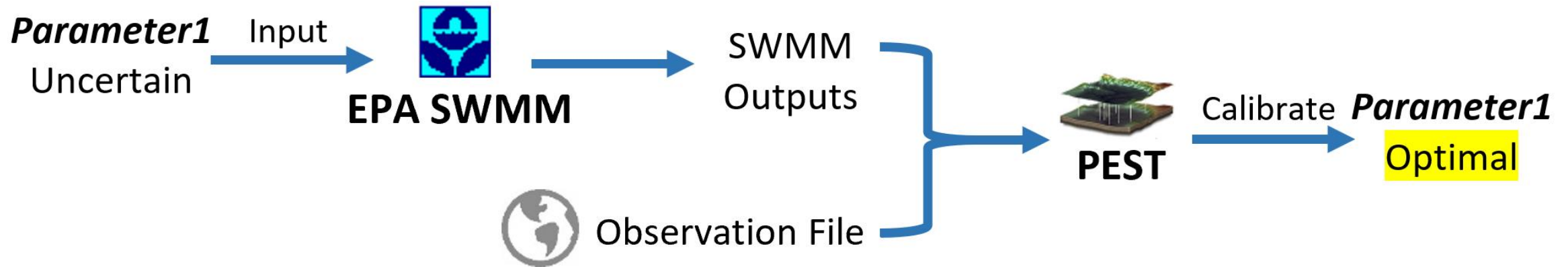
About 45,500 LoC

Model-Independent Parameter Estimation and Uncertainty Analysis

Version 15 was released in 2018

FORTRAN code

About 210,000 LoC

SWMM2PEST

SWMM2PEST: Automatic calibration for SWMM parameters

EPA concerns

Best practice of releasing scientific software?
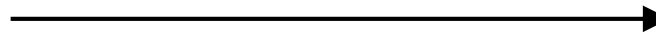
SWMM2PEST 1.0 to 2.0

Changes around 50%

Added & modified lines (source code)	Deleted lines (source code)	Added & modified UI files	Deleted UI files
1029	696	5	2

SWMM2PEST 1.0

- ✓ Metamorphic testing
- ✓ Bugs fixed
- ✓ Restructured
- ✓ New features added

SWMM2PEST 2.0

Developed by Suraj Kamble

Python 3.5.4&PyQt 5

About 3,300 LoC

Developed by Xuanyi Lin

Python 3.5.4&PyQt 5

About 3,200 LoC

Release workflow
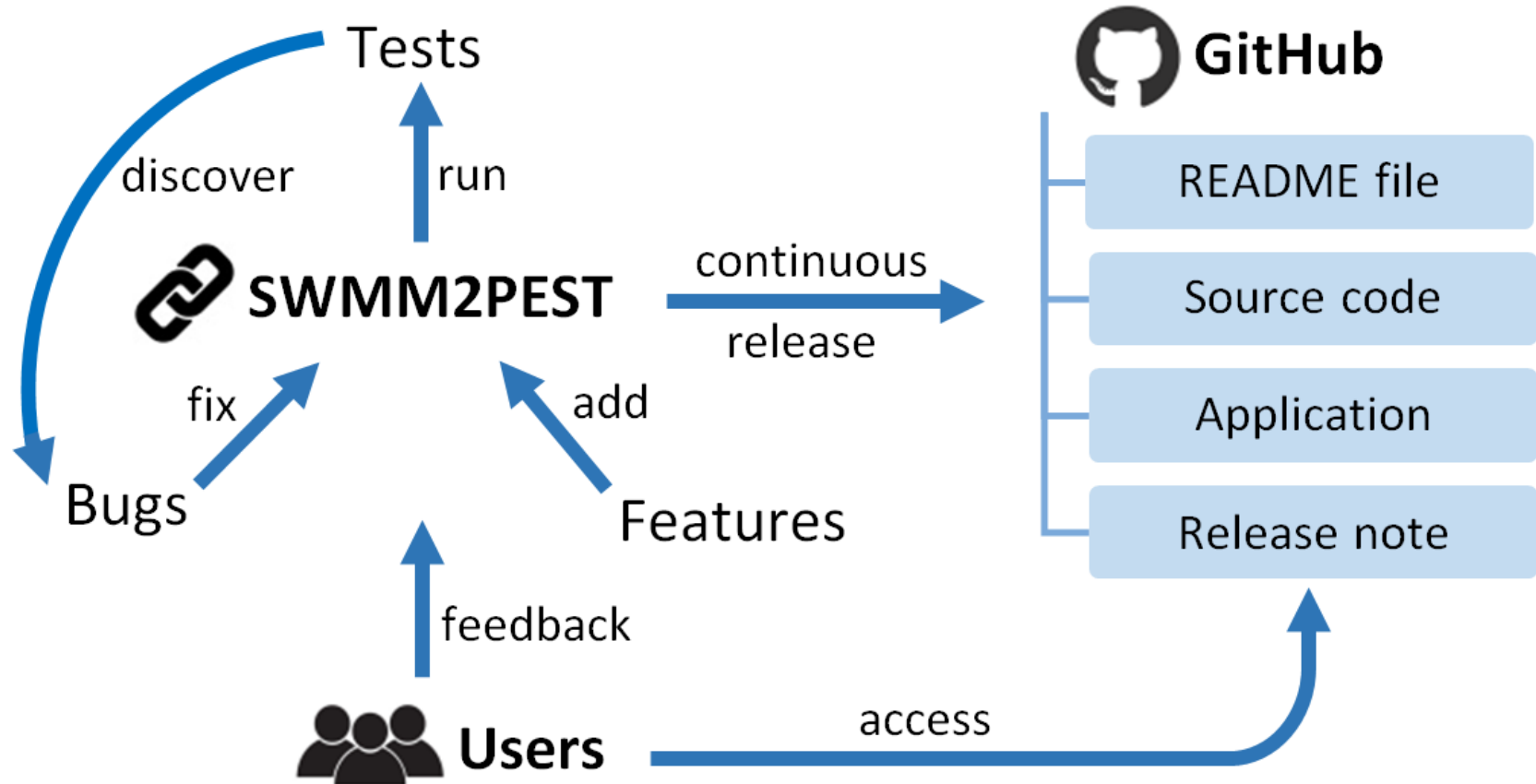
GitHub-driven release process

Releasing in GitHub

Releasing in GitHub

Source Code

Release software

Strategy 1: Changes between versions

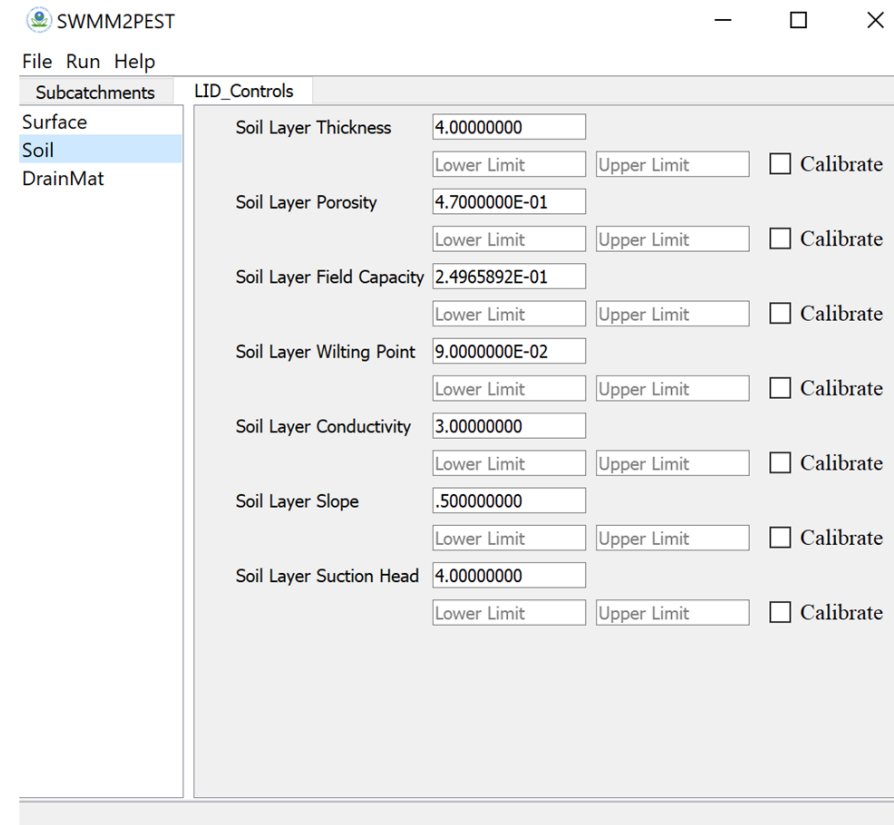| SWMM2PEST		SWMM2PEST 1.0	SWMM2PEST 2.0	SWMM2PEST 2.1
	SWMM	*5.1.10*	*5.1.10*	*5.1.13*
	PEST	13.3	14.2	14.2

SWMM 5.1.10

SWMM 5.1.13

4 places differed

Strategy 2: Improvements as requirements change
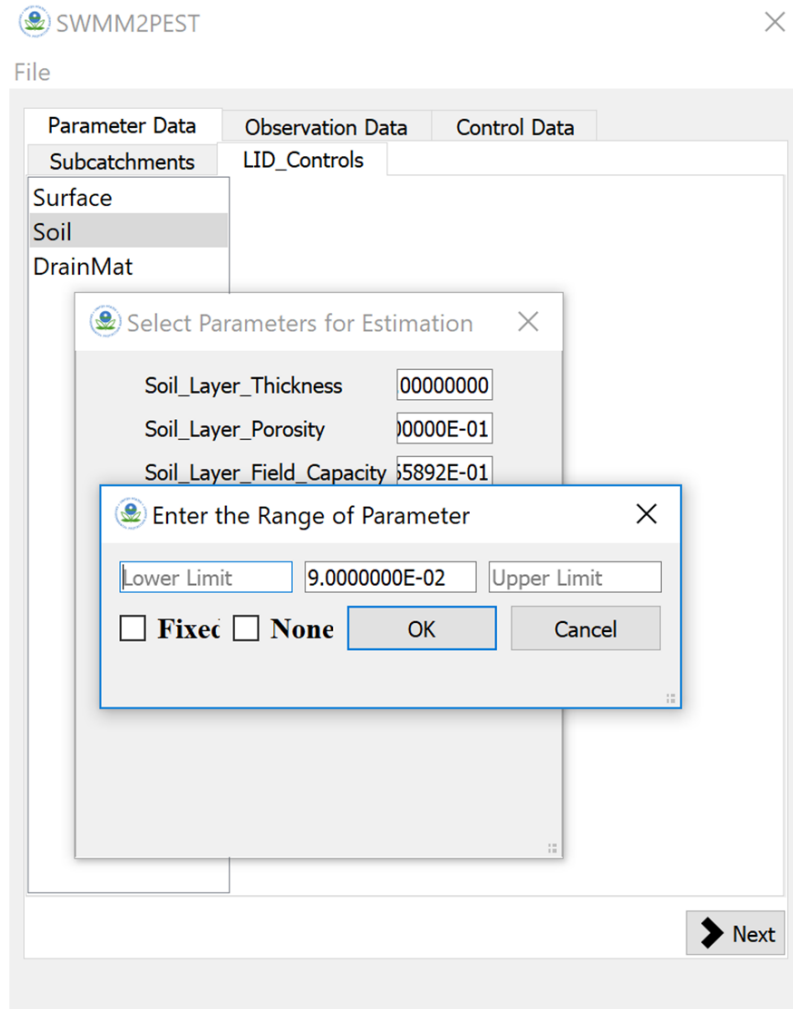
SWMM2PEST 1.0 UI

SWMM2PEST 2.0 UI

Insights

- Release as *required*
- *Connector* versus *connectee* release
  <mark>*SWMM2PEST*</mark>   <mark>*SWMM & PEST*</mark>

- Release to help automated *testing*

Future work

- Investigate other repositories
- Continuous release with more comprehensive user feedback and other developers' opinions

Thank you

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A Case Study on SWMM2PEST