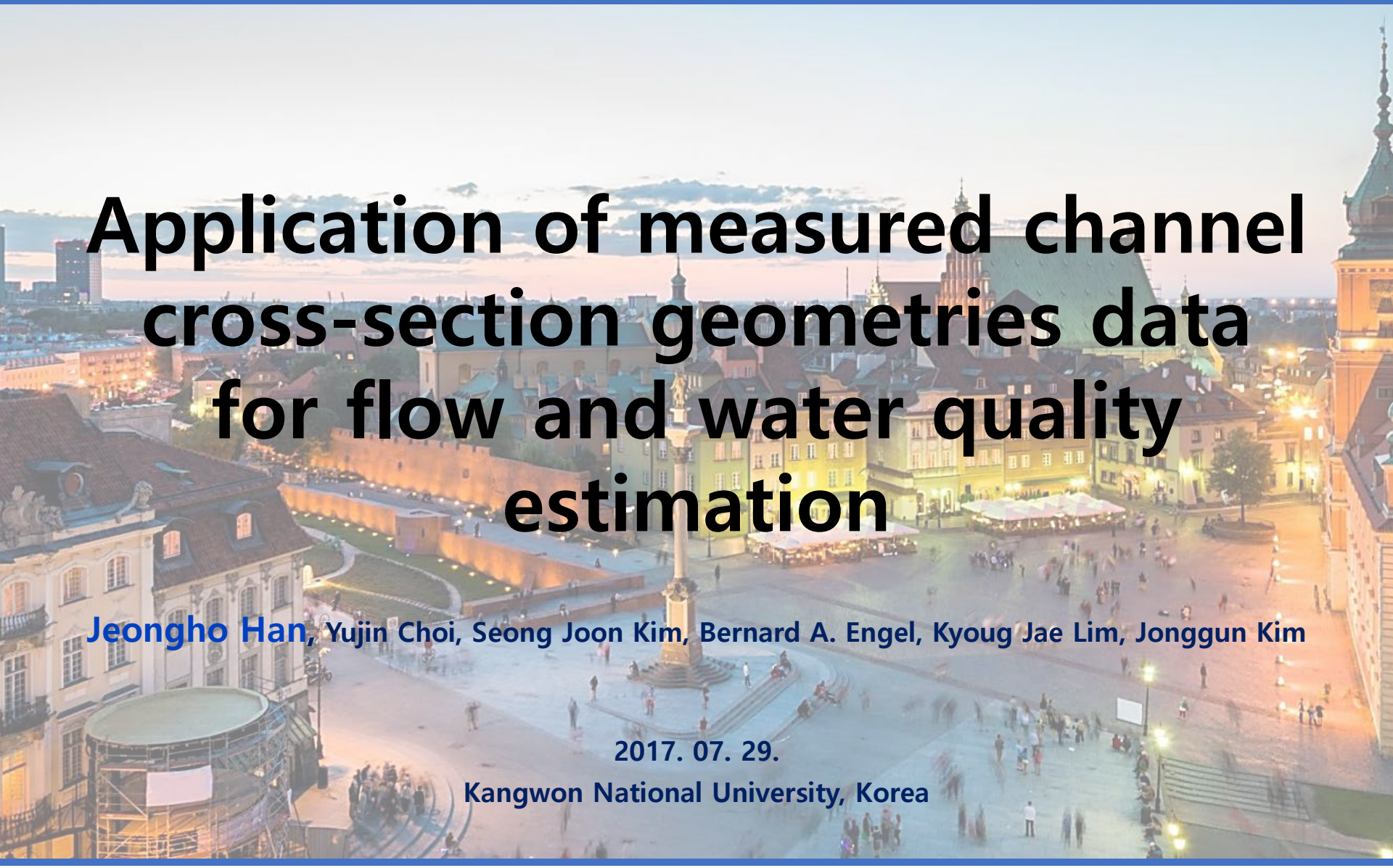


Application of measured channel cross-section geometries data for flow and water quality estimation

Jeongho Han, Yujin Choi, Seong Joon Kim, Bernard A. Engel, Kyoug Jae Lim, Jonggun Kim

2017. 07. 29.

Kangwon National University, Korea

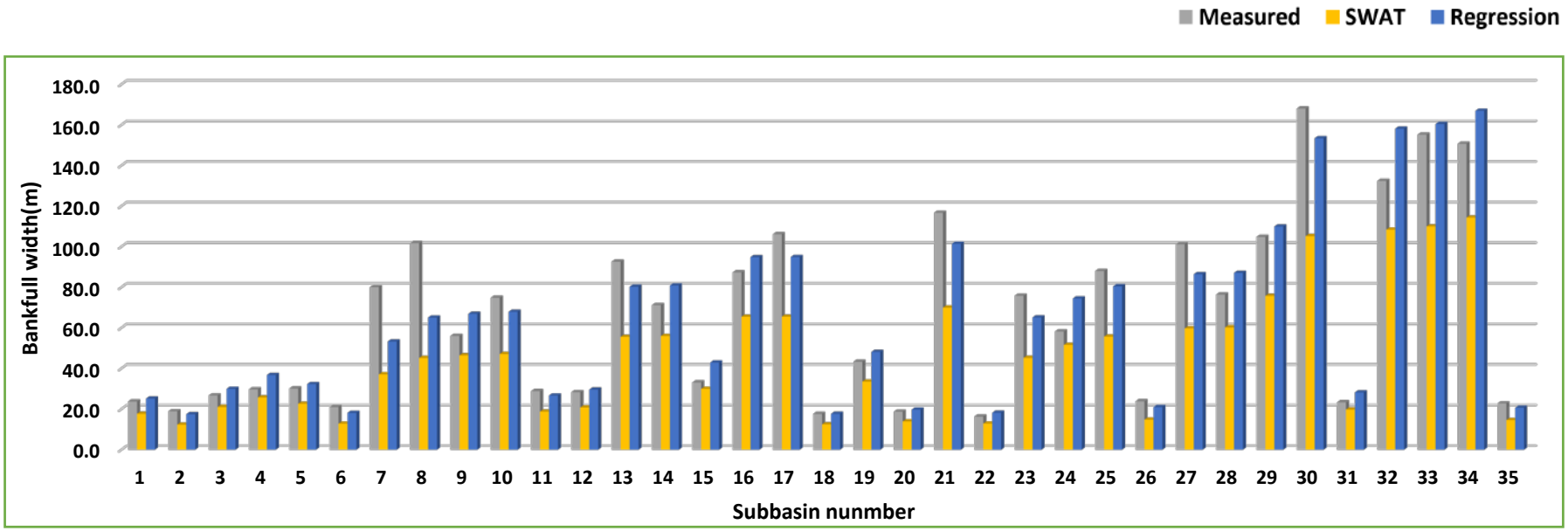
Soil & Water Assessment Tool SWAT

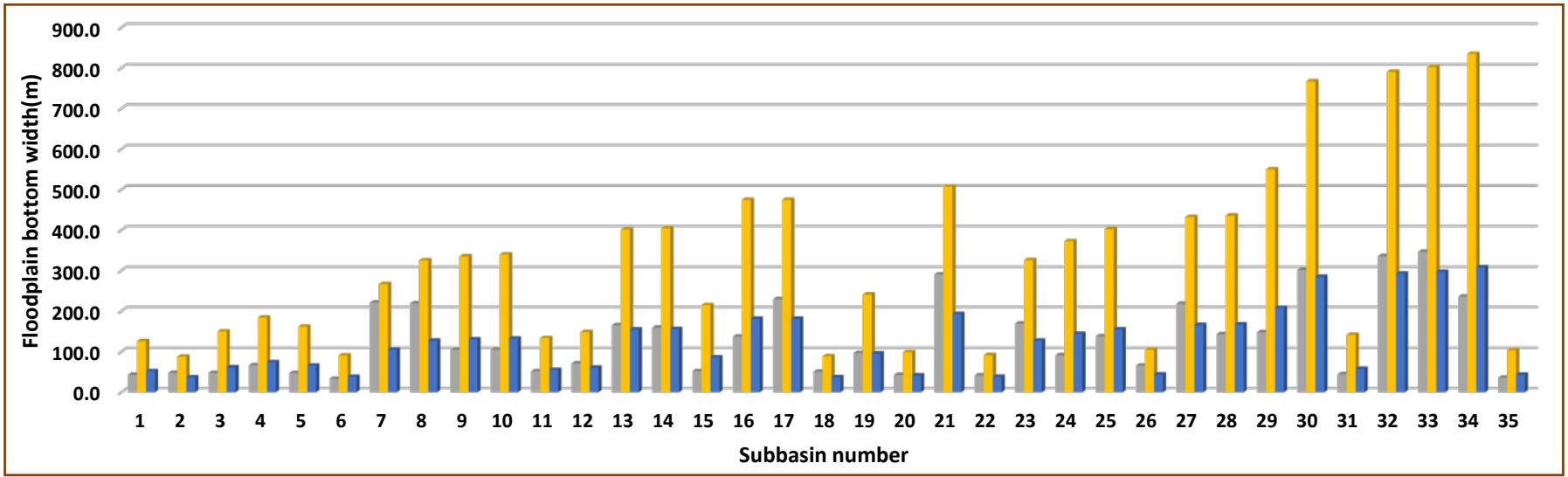
UNIVERSITY OF WARSAW

KNU KANGWON NATIONAL UNIVERSITY

Contents

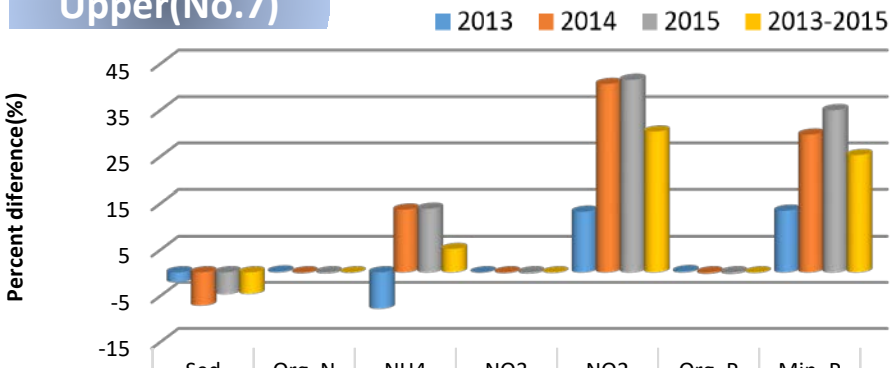
Bankfull width and floodplain bottom width





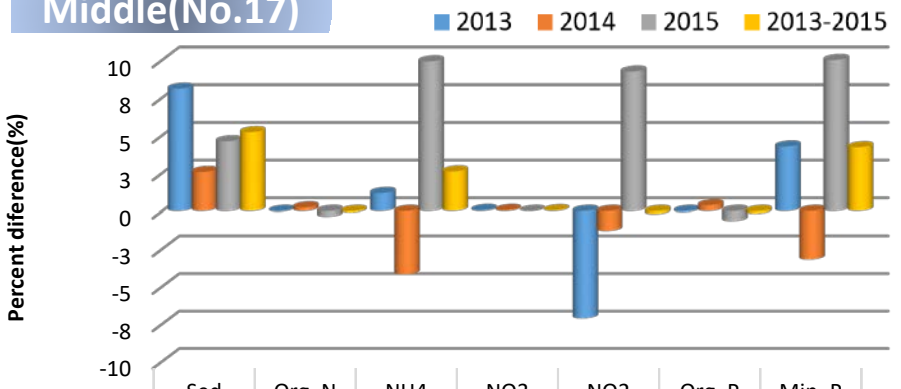
Simulation results: sediment & nutrients

Upper(No.7)



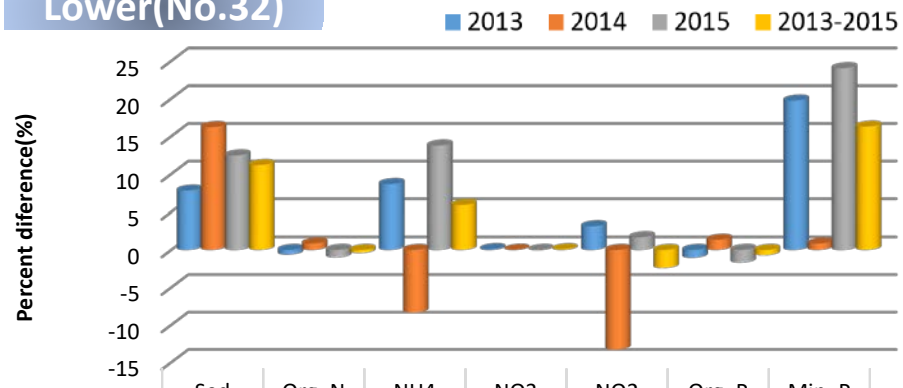
	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	-2.1	0.2	-7.9	0.0	13.1	0.2	13.3
2014	-7.2	-0.2	13.5	-0.2	40.5	-0.3	29.6
2015	-4.7	-0.2	13.7	-0.2	41.4	-0.3	34.9
2013-2015	-4.7	-0.1	5.1	-0.1	30.2	-0.1	25.2

Middle(No.17)



	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	8.1	0.0	1.2	0.1	-7.1	-0.1	4.3
2014	2.6	0.2	-4.2	0.1	-1.3	0.4	-3.2
2015	4.6	-0.4	9.9	0.0	9.2	-0.7	10.4
2013-2015	5.2	-0.1	2.6	0.0	-0.2	-0.2	4.2

Lower(No.32)



	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	7.8	-0.6	8.7	0.1	3.1	-1.0	19.7
2014	16.2	0.9	-8.4	0.0	-13.3	1.4	0.8
2015	12.5	-1.0	13.8	0.0	1.7	-1.7	24.0
2013-2015	11.2	-0.4	5.9	0.1	-2.4	-0.7	16.3

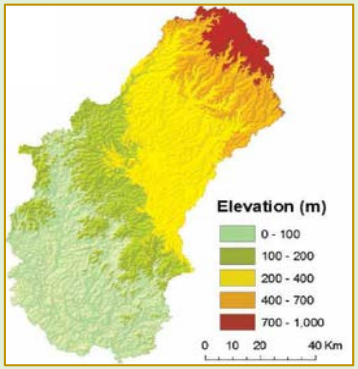
- Hydrological models and input parameters

Streamflow and water quality simulation models

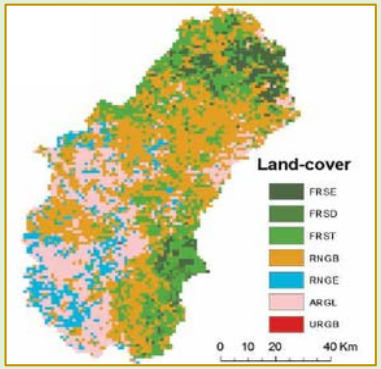
: SWAT, HSPF, APEX, AGNPS, WASP4…

↓

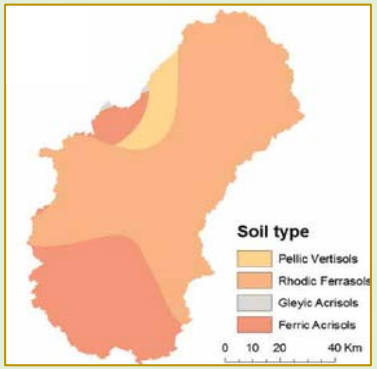
Model input data



DEM



Landuse



Soil

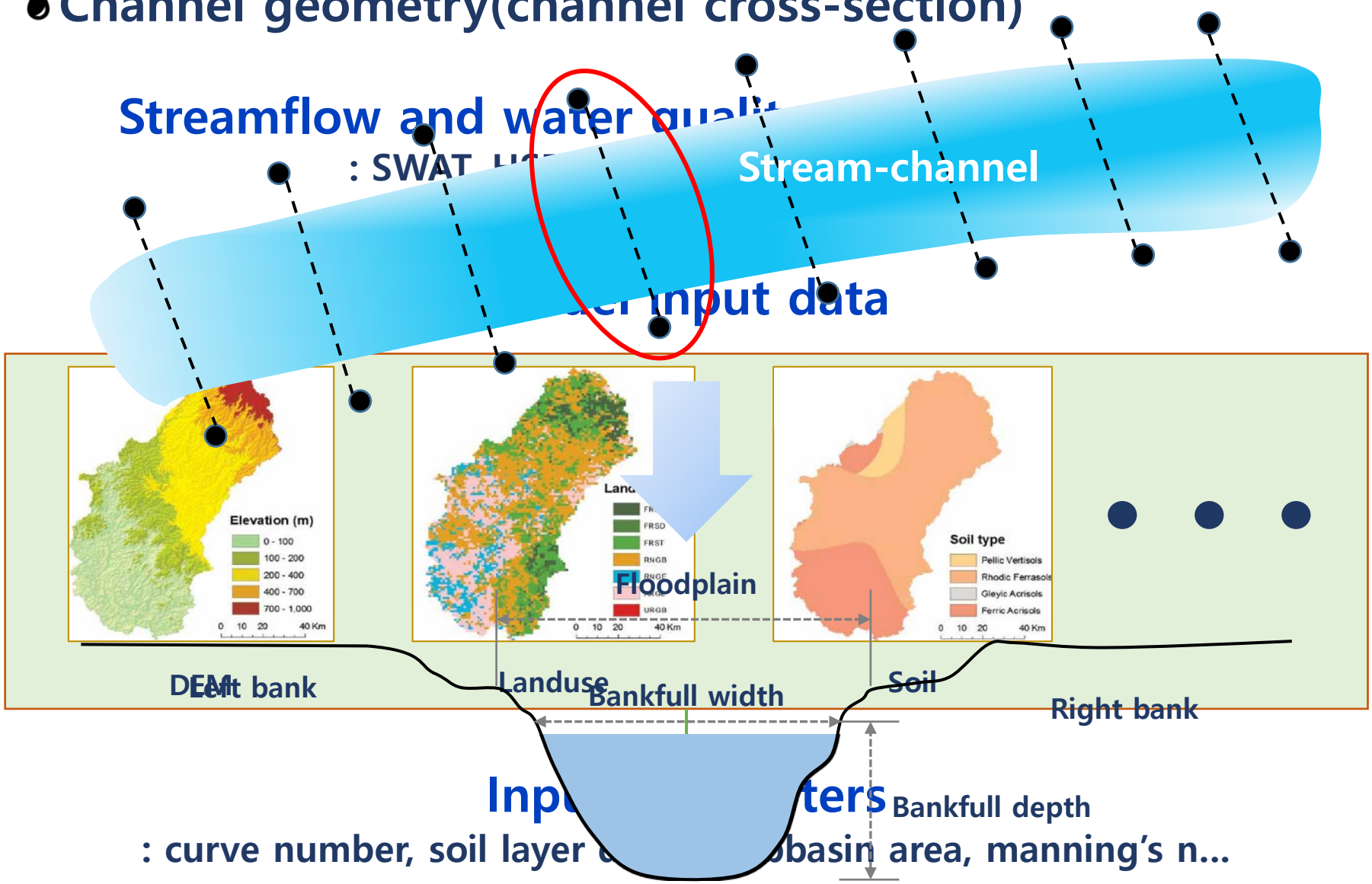
● ● ●

↓

Input Parameters

: curve number, soil layer depth, subbasin area, manning's n…

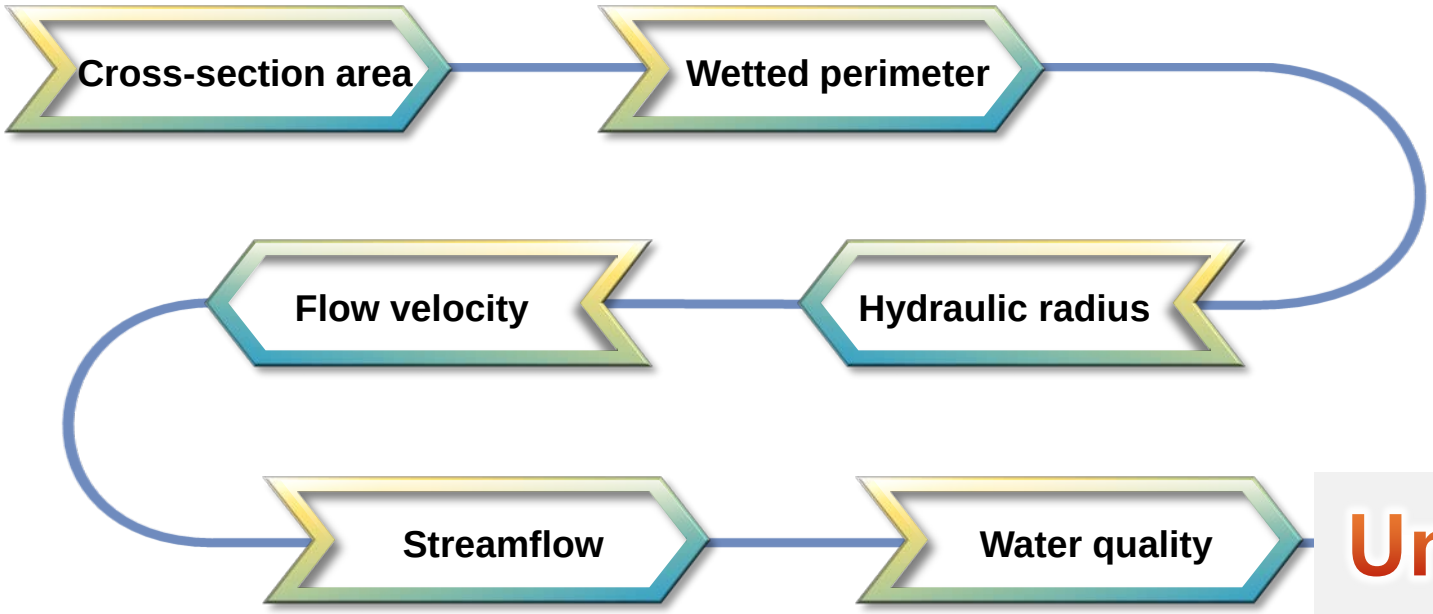
- Channel geometry(channel cross-section)



Inp ters

: curve number, soil layer basin area, manning's n...

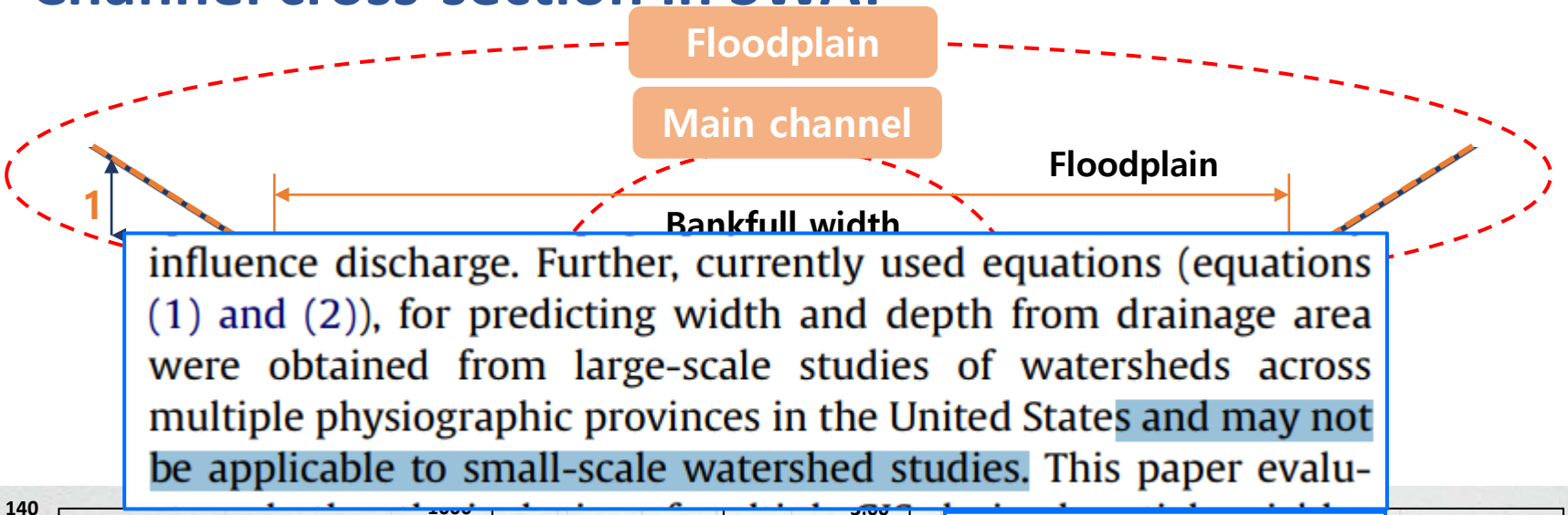
- Channel geometry(channel cross-section)



Uncertainty

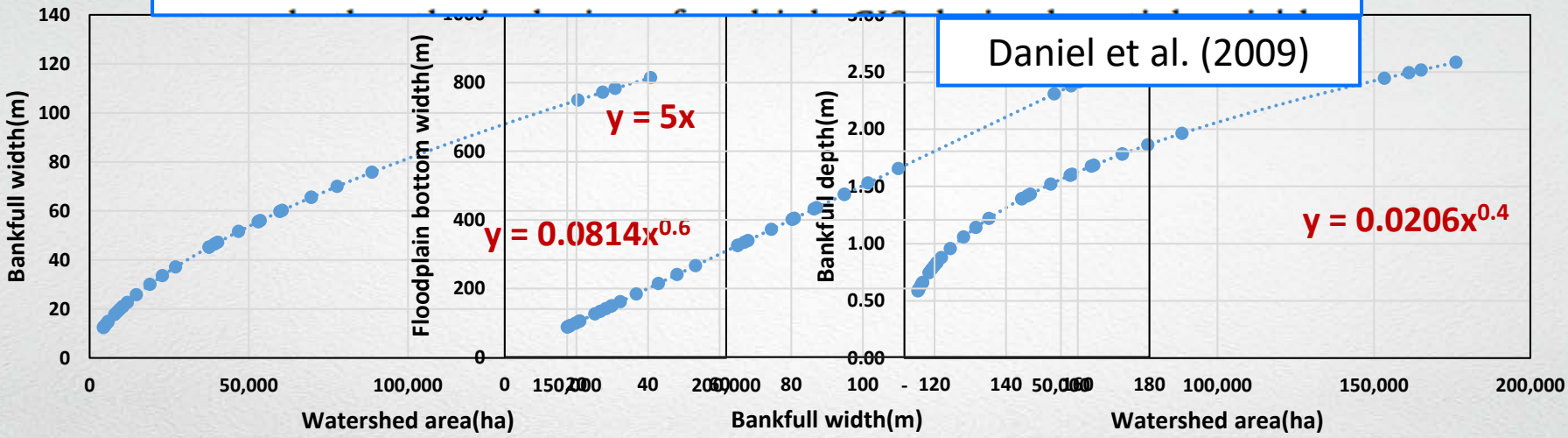
01. Background & Introduction

Channel cross-section in SWAT



influence discharge. Further, currently used equations (equations (1) and (2)), for predicting width and depth from drainage area were obtained from large-scale studies of watersheds across multiple physiographic provinces in the United States and may not be applicable to small-scale watershed studies. This paper evalu-

Daniel et al. (2009)



Bankfull width by watershed

Floodplain bottom width by bankfull width

depth by watershed area

01. Background & Introduction

- **Comparison SWAT and nature channel**

?

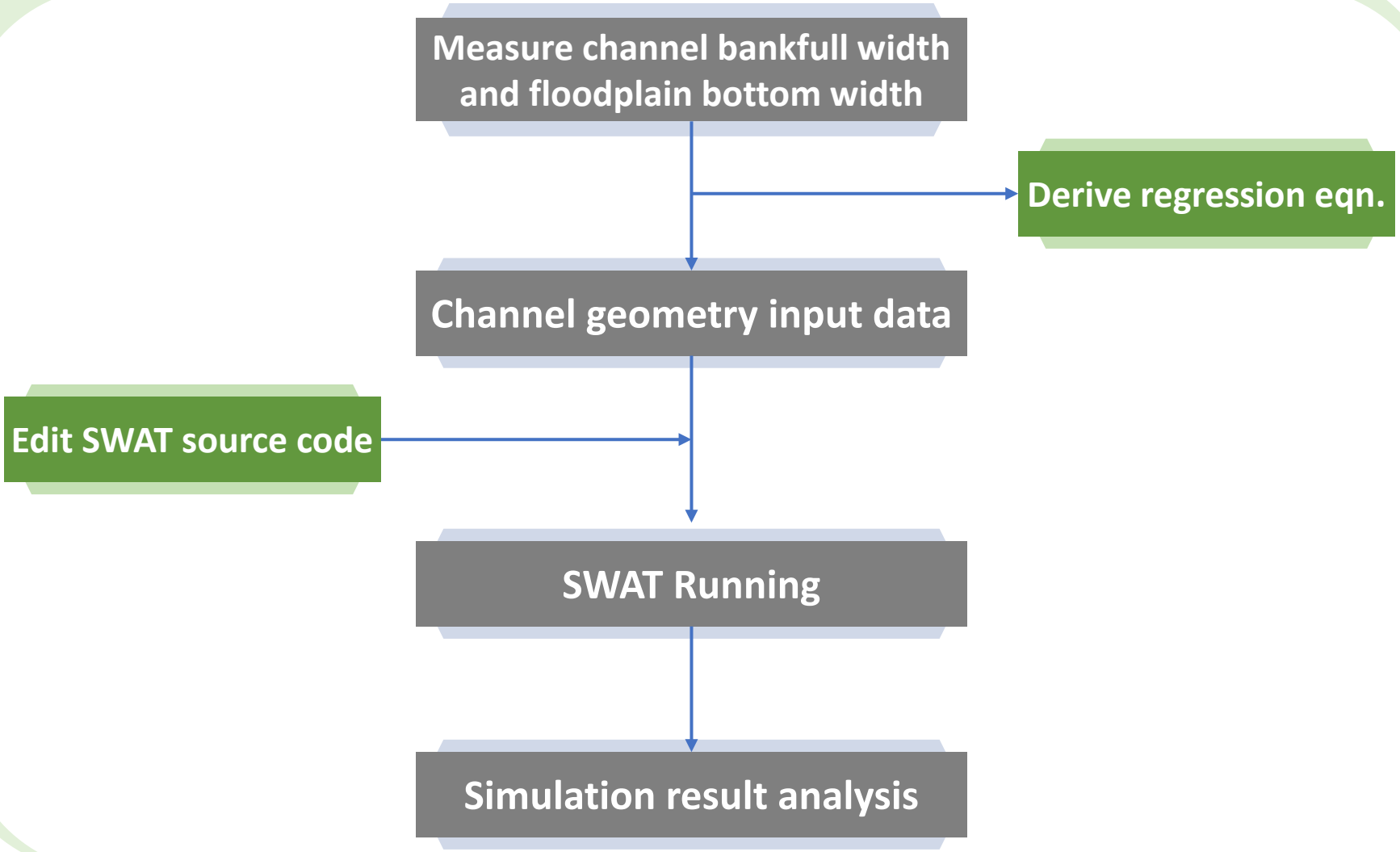
- **Objectives of this study**

✓ **To improve SWAT engine to consider various channel geometry**

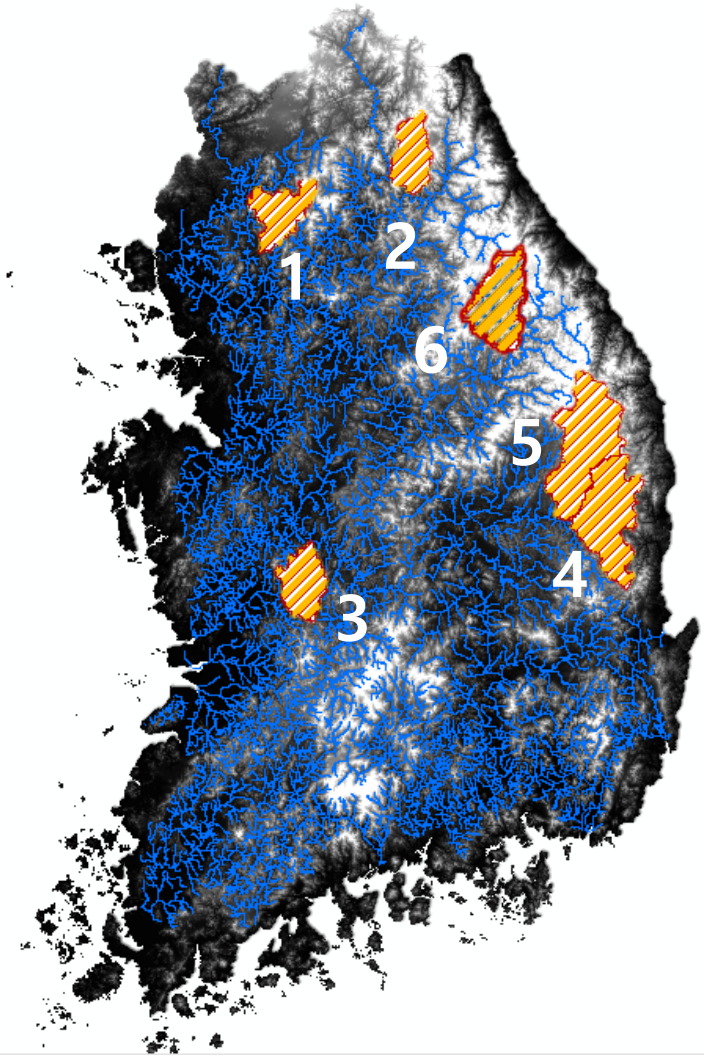
✓ **To evaluate the effect of channel geometry on streamflow and water quality**

Contents

Study flowchart



- Study area 1: application of channel data



1. Yeongpyeong River
2. Yanggu River
3. Upper Guem River
4. Banbyeon River
5. Upper Nakdong River
6. Pyeongchang River(2010-2015)

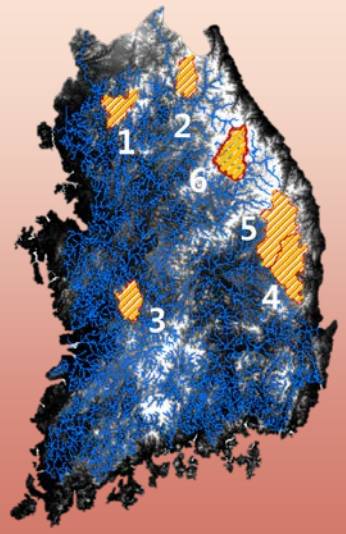
Measure bankfull width and floodplain bottom width

- Regression equations for a small and mountainous watershed

✓ Various aerial images were compared

✓ Regression equations were derived by CurveExpert

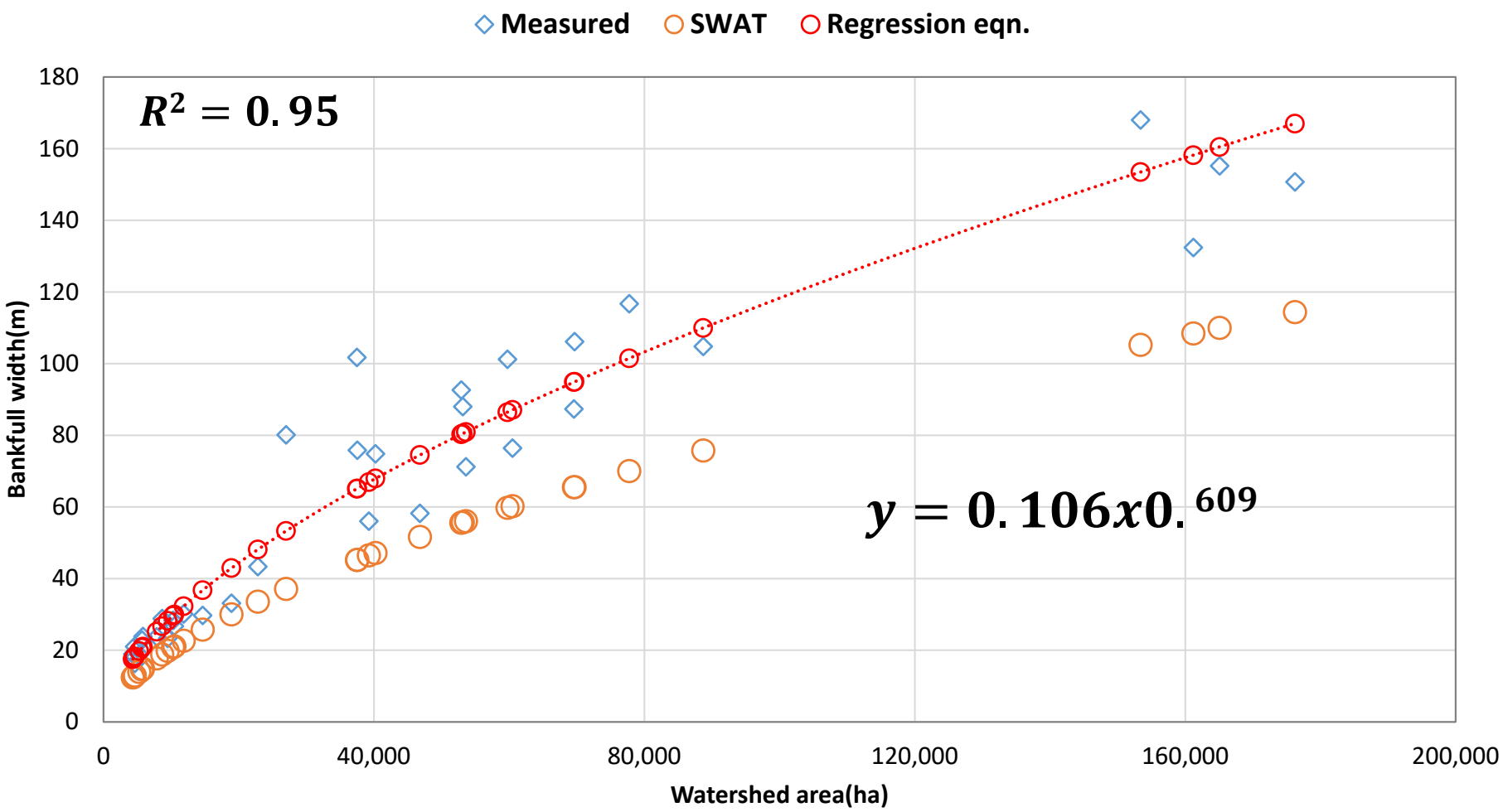
Study area



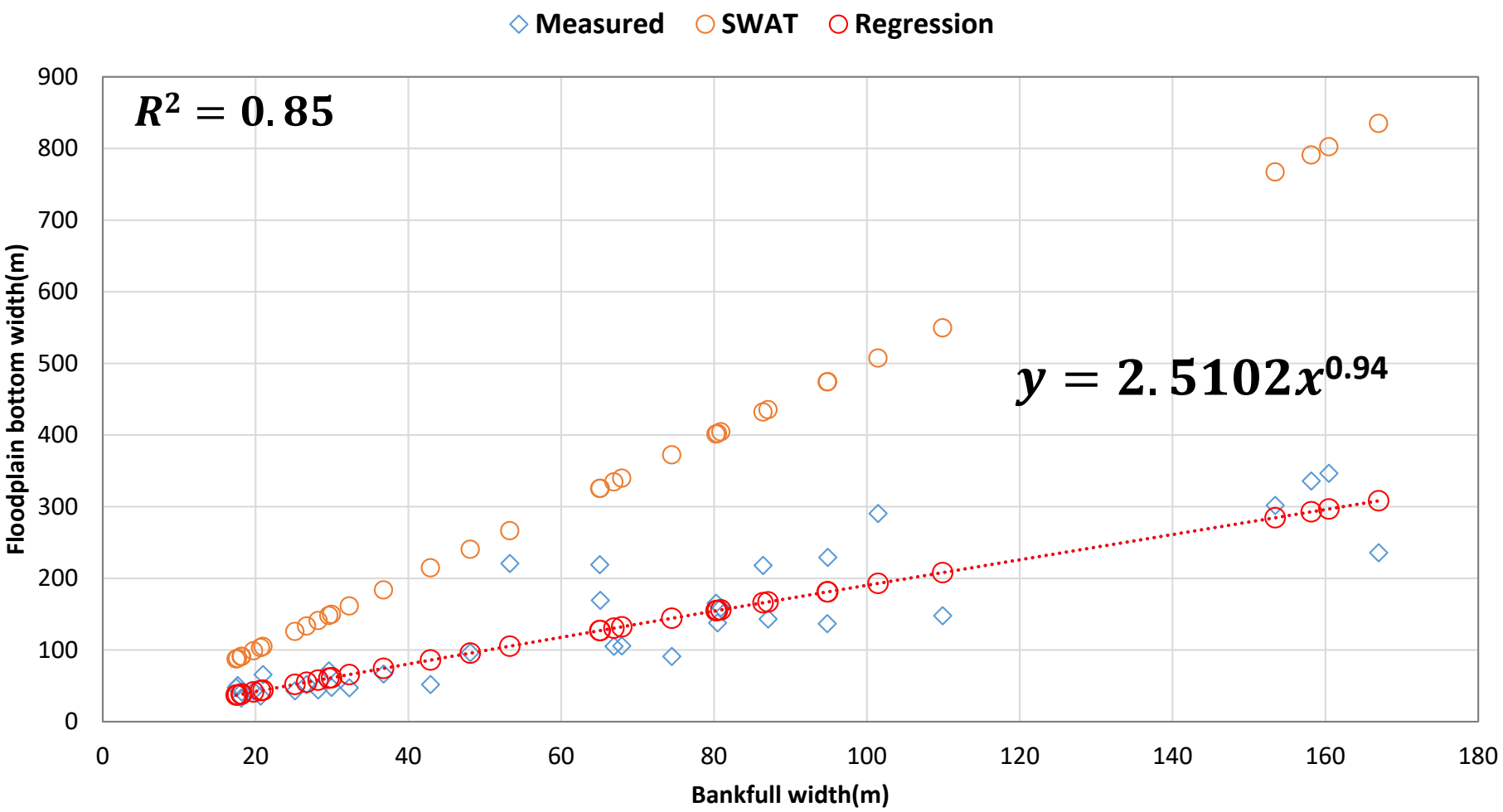
Aerial images

Contents

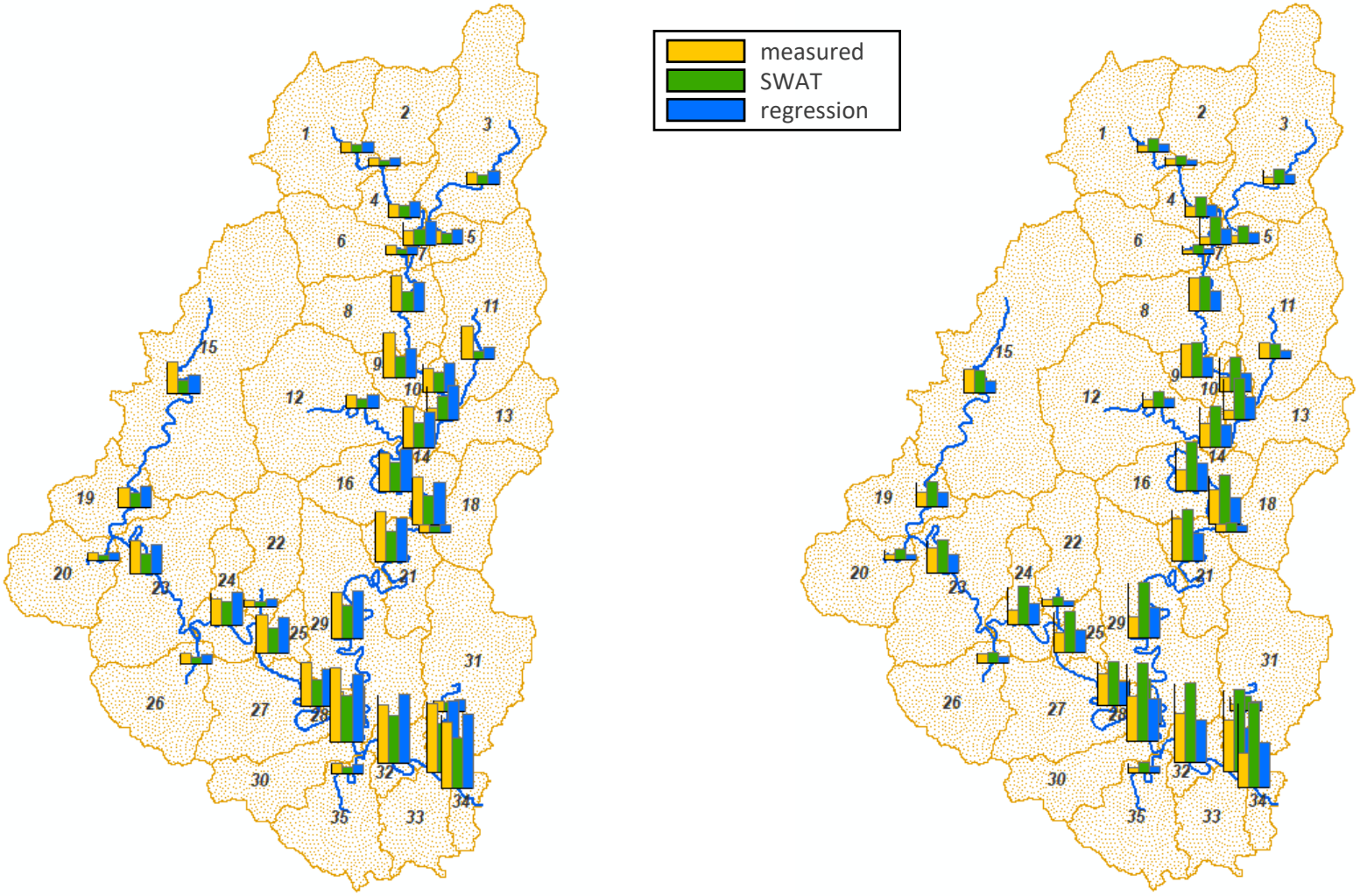
Bankfull width regression eqn.



Floodplain bottom width regression eqn.



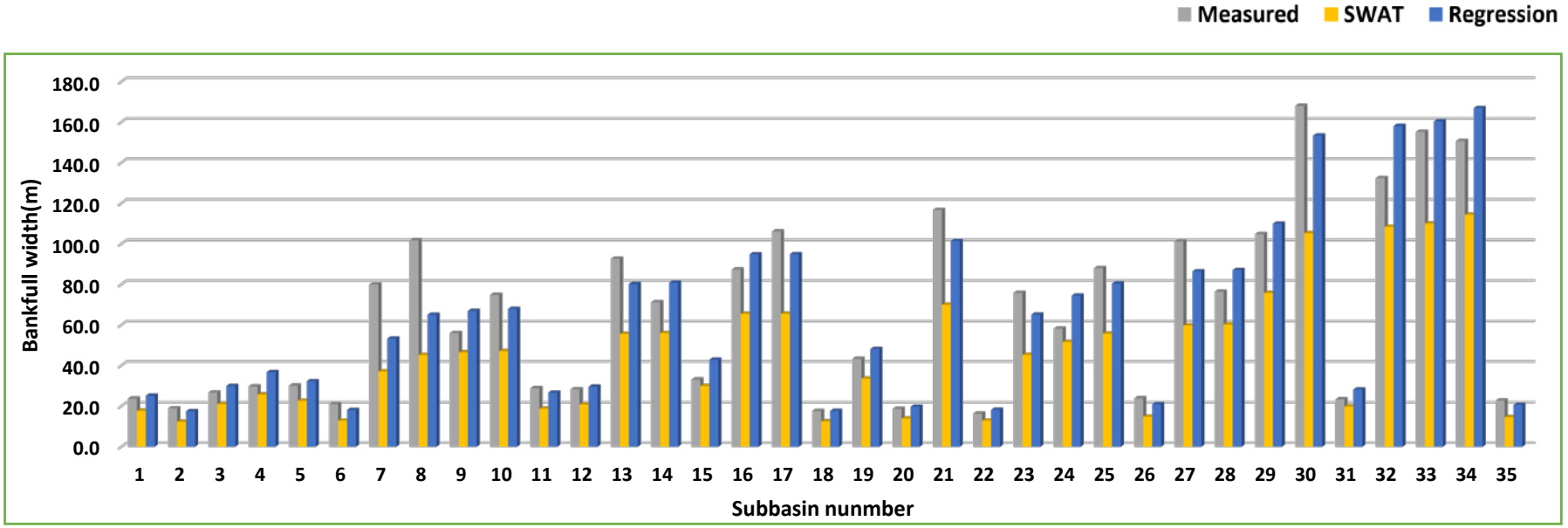
Bankfull width and floodplain bottom width from each mothod

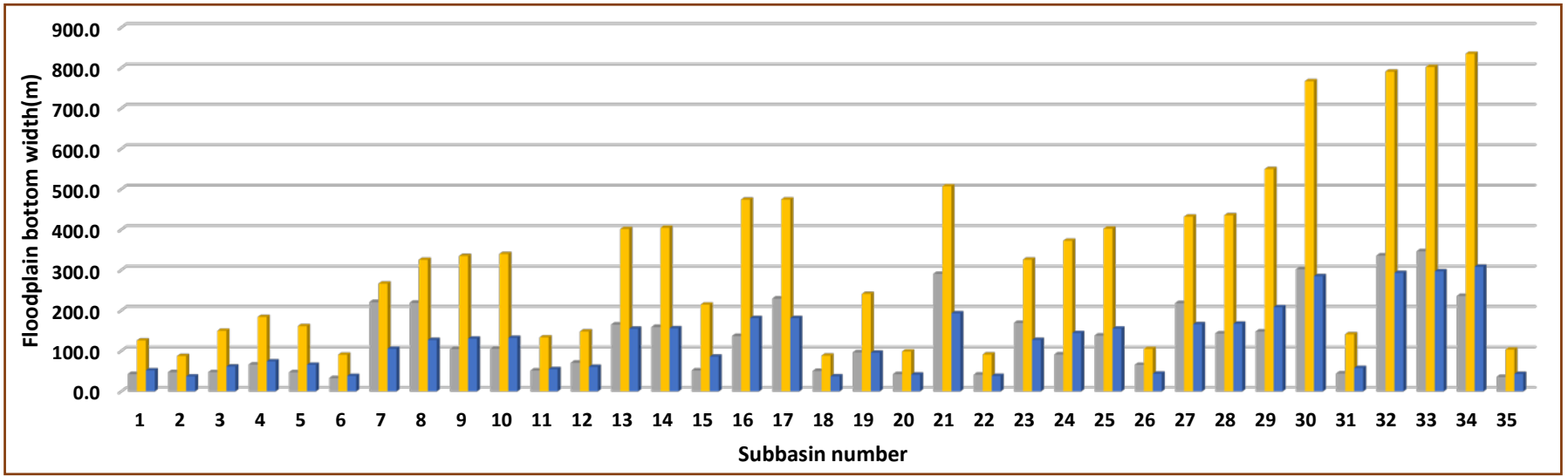


Bankfull width

Floodplain bottom width

Bankfull width and floodplain bottom width from each mothod





03. Results

channel_data.knu - Excel

파일 홈 삽입 페이지 레이아웃 수식 데이터 검토 보기 팀 로그인

맑은 고딕 11 가 가

클립보드 글꼴 맞춤 표시 형식 스타일 셀 편집

C4 Z

	A	B	C	D	E
1	subbasin	KRF	ch-depth	ch-width	Fd-width
2	1	0	0.7	29.8	149.1
3	2	0	0.6	28.7	143.5
4	3	0	Z	30.6	153.2
5	4	0	1.0	31.9	159.7
6	5	0	0.9	31.1	155.3
7	6	0	0.6	28.8	143.9
8	7	0	1.2	39.0	195.2
9	8	0	1.4	39.6	197.9
10	9	1	1.4	39.9	199.4
11	10	1	1.4	30.1	150.3
12	11	0	0.8	30.6	152.9
13	12	0	0.8	43.8	219.0
14	13	1	1.6	44.0	220.0
15	14	0	1.6	33.3	166.3
16	15	0	1.1	35.8	178.9
17	16	0	1.8	48.9	244.5
18	17	0	1.8	48.9	244.6
19	18	0	0.6	28.7	143.6
20	19	0	1.1	34.5	172.4
21	20	1	0.6	29.0	145.0
22	21	0	1.9	51.4	256.9
23	22	0	0.6	28.8	144.0
24	23	0	1.4	39.1	195.3
25	24	0	1.5	41.9	209.5
26	25	0	1.6	43.9	219.3

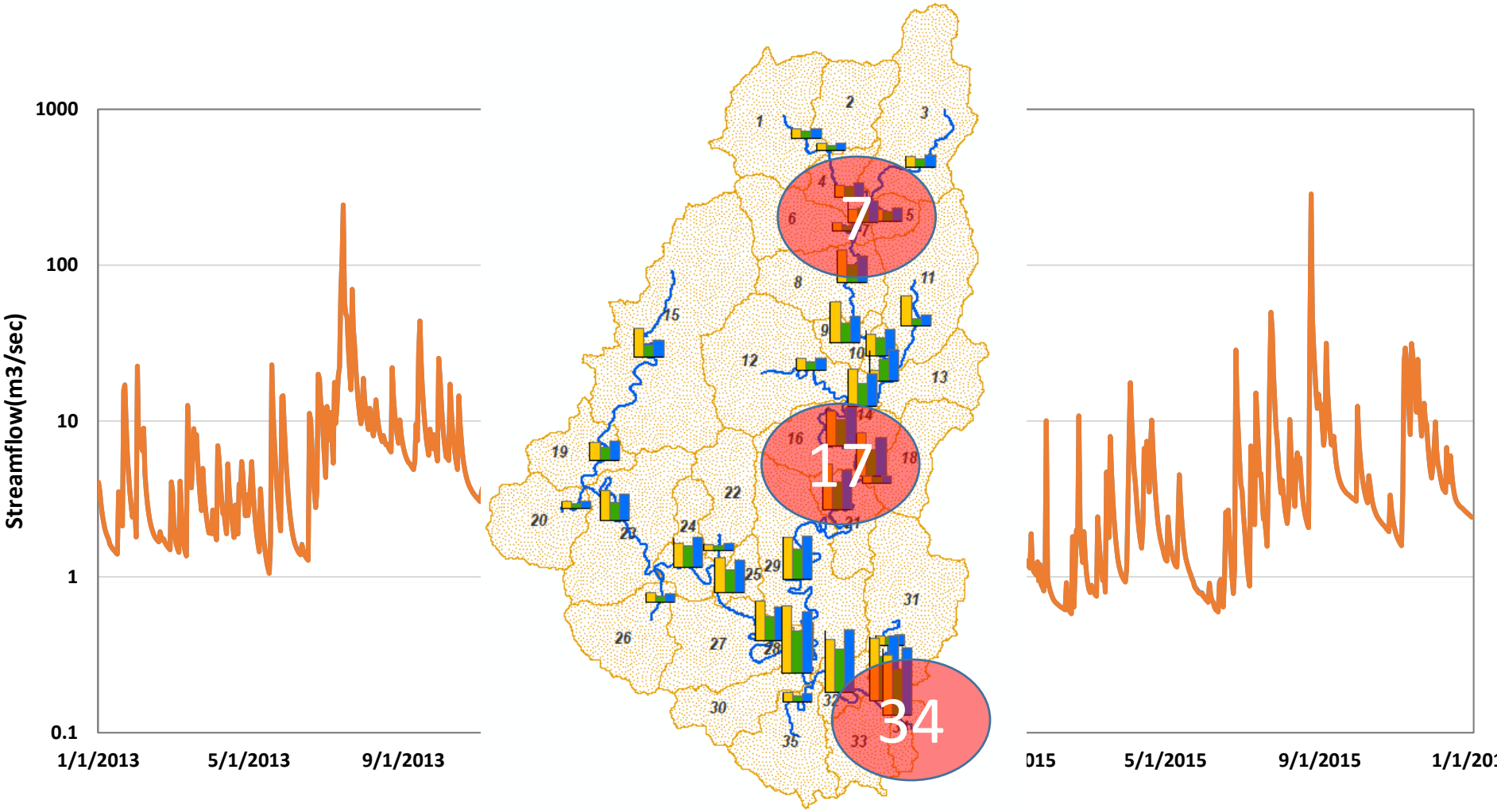
channel_data

입력

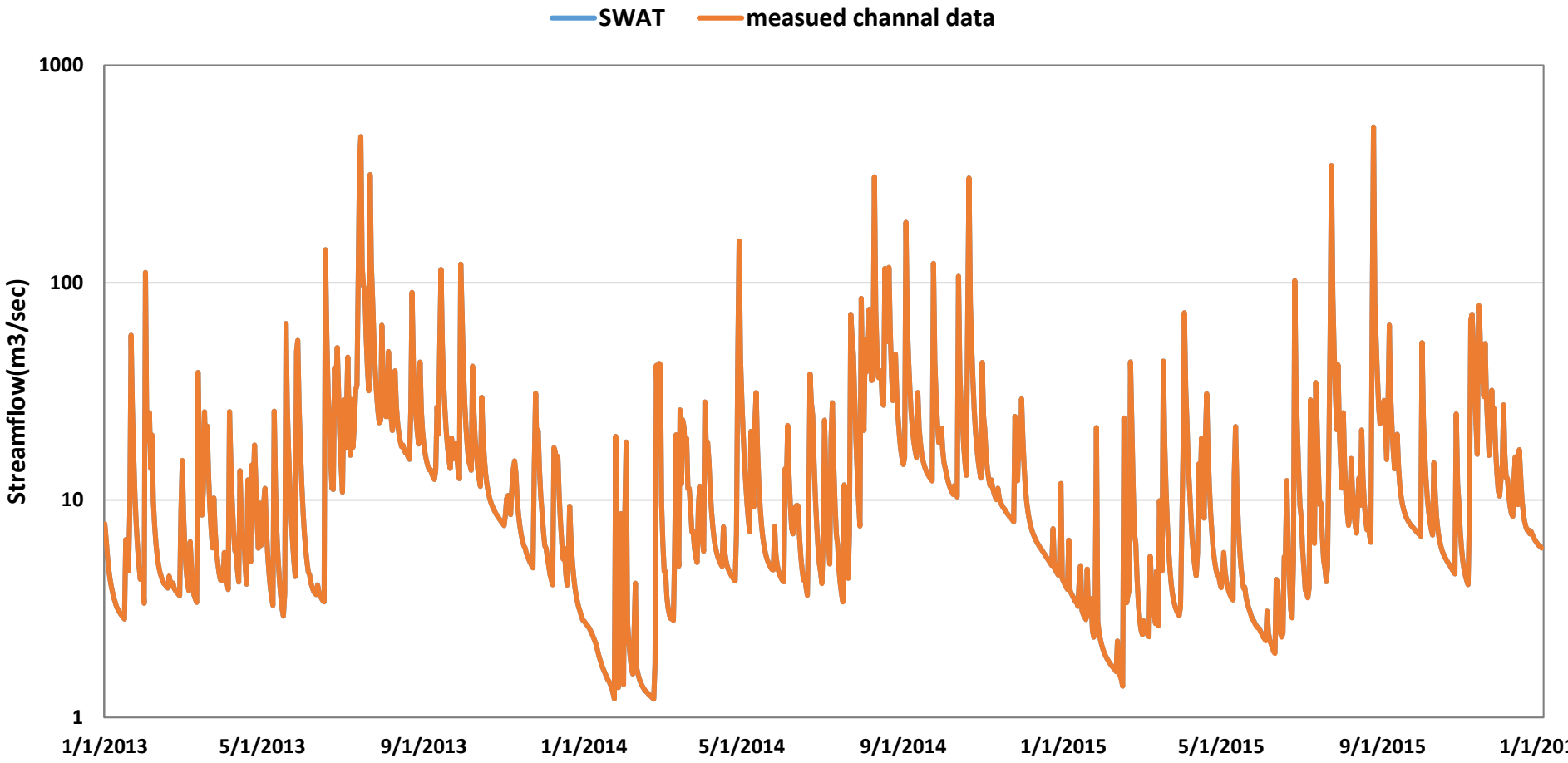
C:₩WINDOWS₩system32₩cmd.exe

```
                SWAT2016
              Rev. 664
     Soil & Water Assessment Tool
              PC Version
 Enhancement of Input action for cross-section of channel
--Modified by Jeongho, Han; Donghyuk, Kum; Kyoug Jae, Lim--
Program reading from file.cio . . . executing
Input channel specific parameters?(Y/N)
Y
 main and tributary channel data is  applied in subbasin No.          1
 main and tributary channel data is  applied in subbasin No.          2
 main and tributary channel data is  applied in subbasin No.          3
 main and tributary channel data is  applied in subbasin No.          5
 main and tributary channel data is  applied in subbasin No.          6
 main and tributary channel data is  applied in subbasin No.         11
 main and tributary channel data is  applied in subbasin No.         12
 main and tributary channel data is  applied in subbasin No.         15
 main and tributary channel data is  applied in subbasin No.         19
 main and tributary channel data is  applied in subbasin No.         18
 main and tributary channel data is  applied in subbasin No.         20
 main and tributary channel data is  applied in subbasin No.         22
 main and tributary channel data is  applied in subbasin No.         26
 main and tributary channel data is  applied in subbasin No.         31
 main and tributary channel data is  applied in subbasin No.         35
 main and tributary channel data is  applied in subbasin No.          4
 main and tributary channel data is  applied in subbasin No.         23
 main and tributary channel data is  applied in subbasin No.          7
 main and tributary channel data is  applied in subbasin No.         24
 main and tributary channel data is  applied in subbasin No.         25
 main and tributary channel data is  applied in subbasin No.         27
 main and tributary channel data is  applied in subbasin No.         28
 main and tributary channel data is  applied in subbasin No.          8
 main and tributary channel data is  applied in subbasin No.          9
 main and tributary channel data is  applied in subbasin No.         10
 main and tributary channel data is  applied in subbasin No.         13
 main and tributary channel data is  applied in subbasin No.         14
 main and tributary channel data is  applied in subbasin No.         16
 main and tributary channel data is  applied in subbasin No.         17
 main and tributary channel data is  applied in subbasin No.         21
```

Simulation results: streamflow

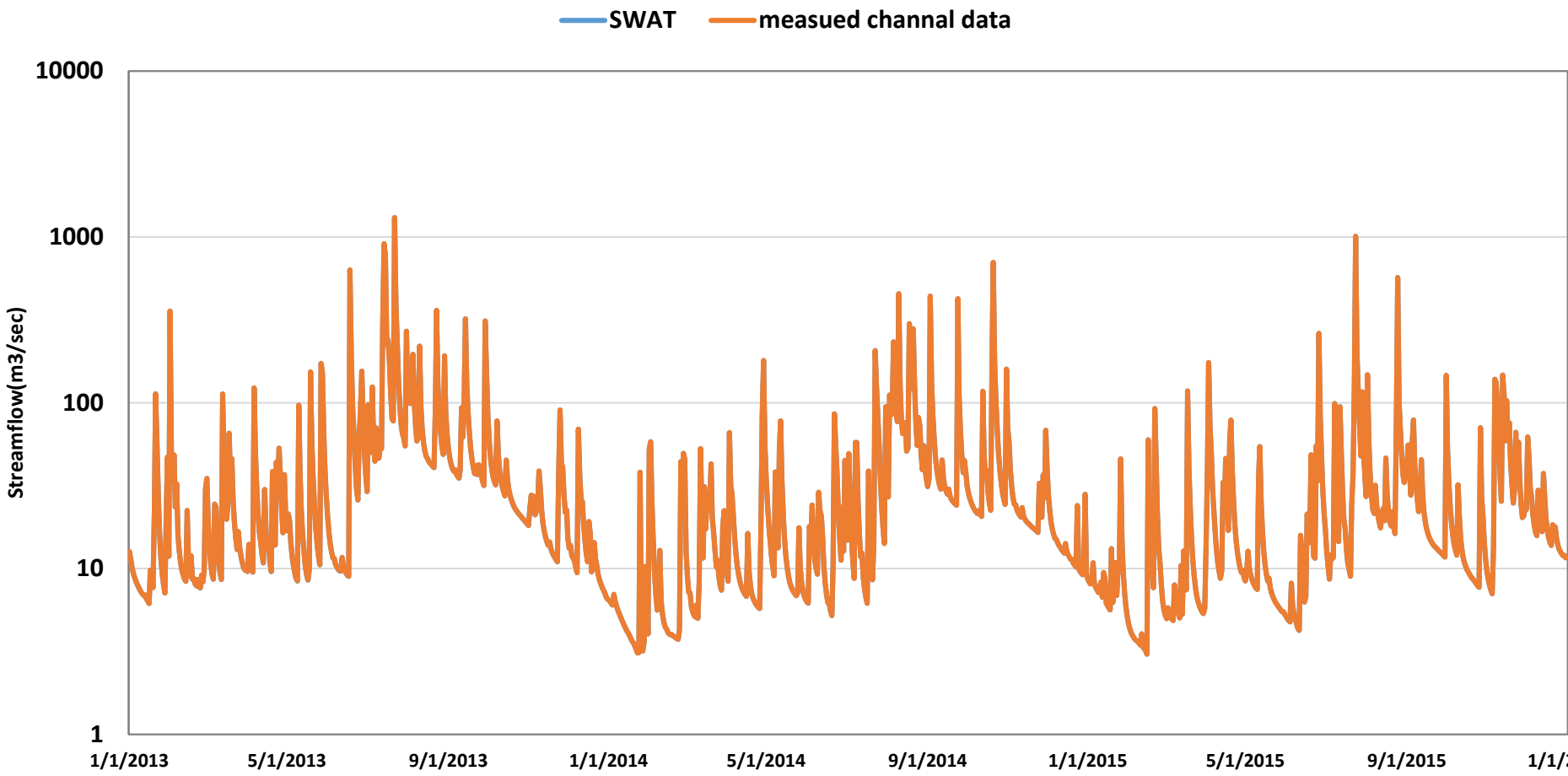


Simulation results: streamflow



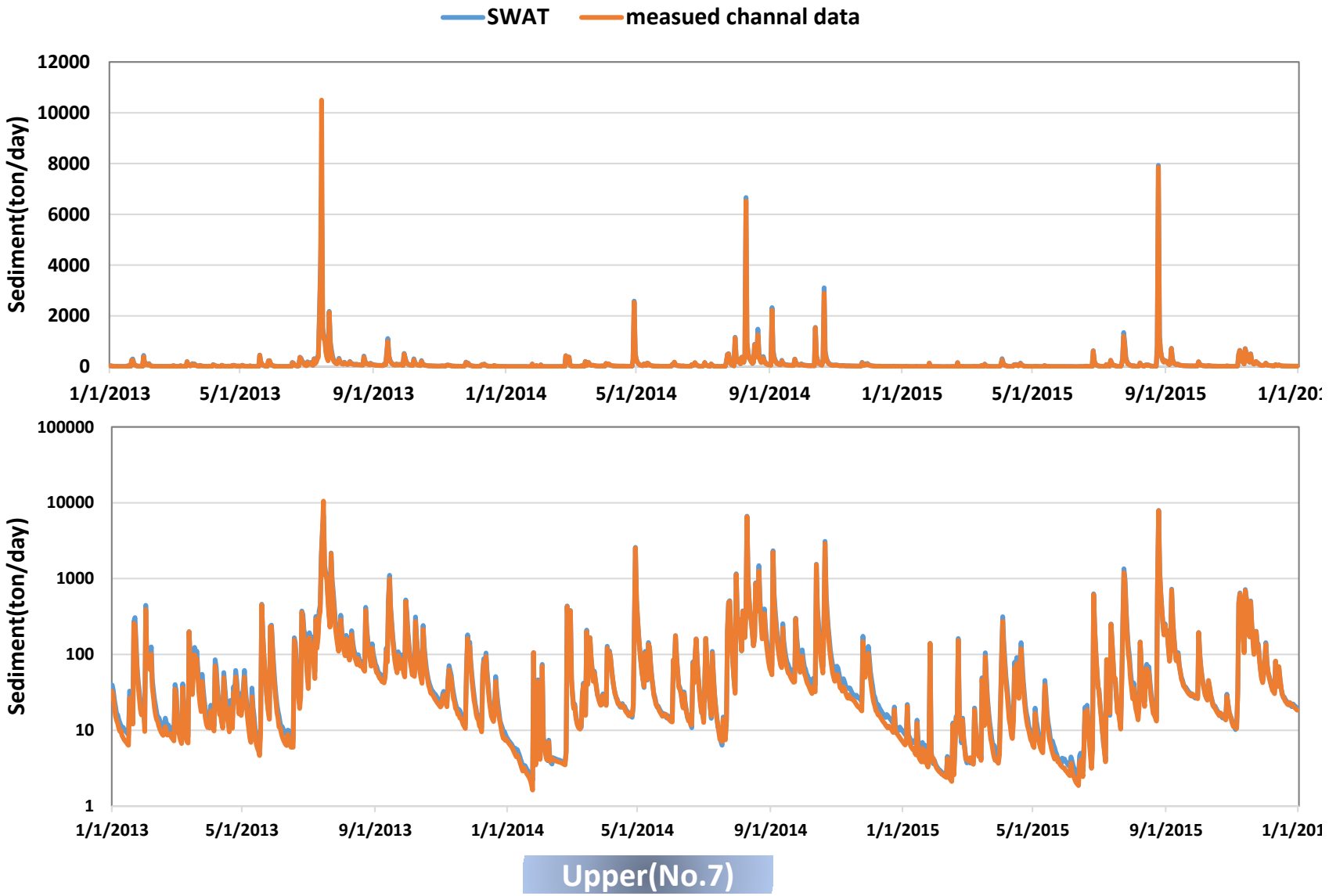
Middle(No.17)

Simulation results: streamflow



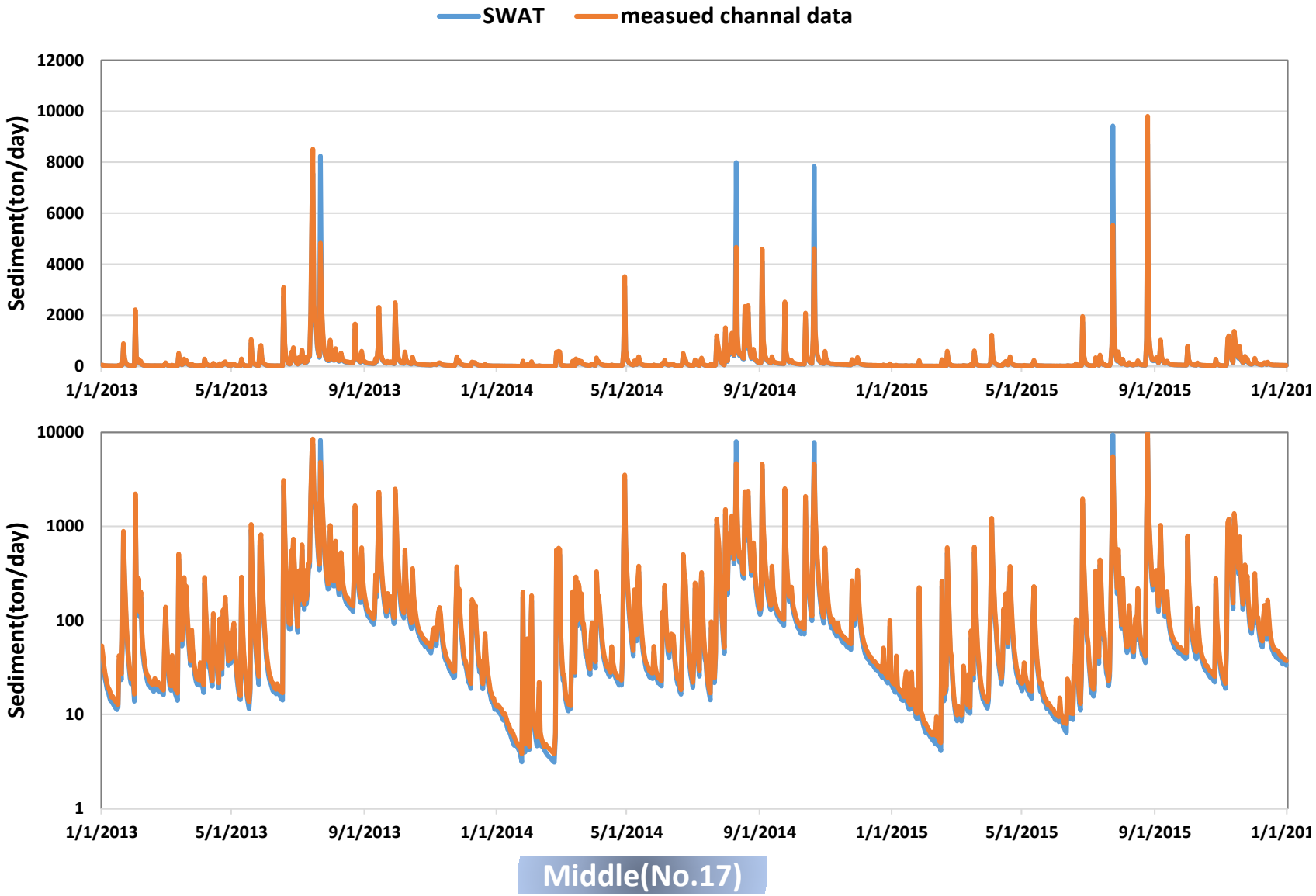
Lower(No.32)

Simulation results: Sediment



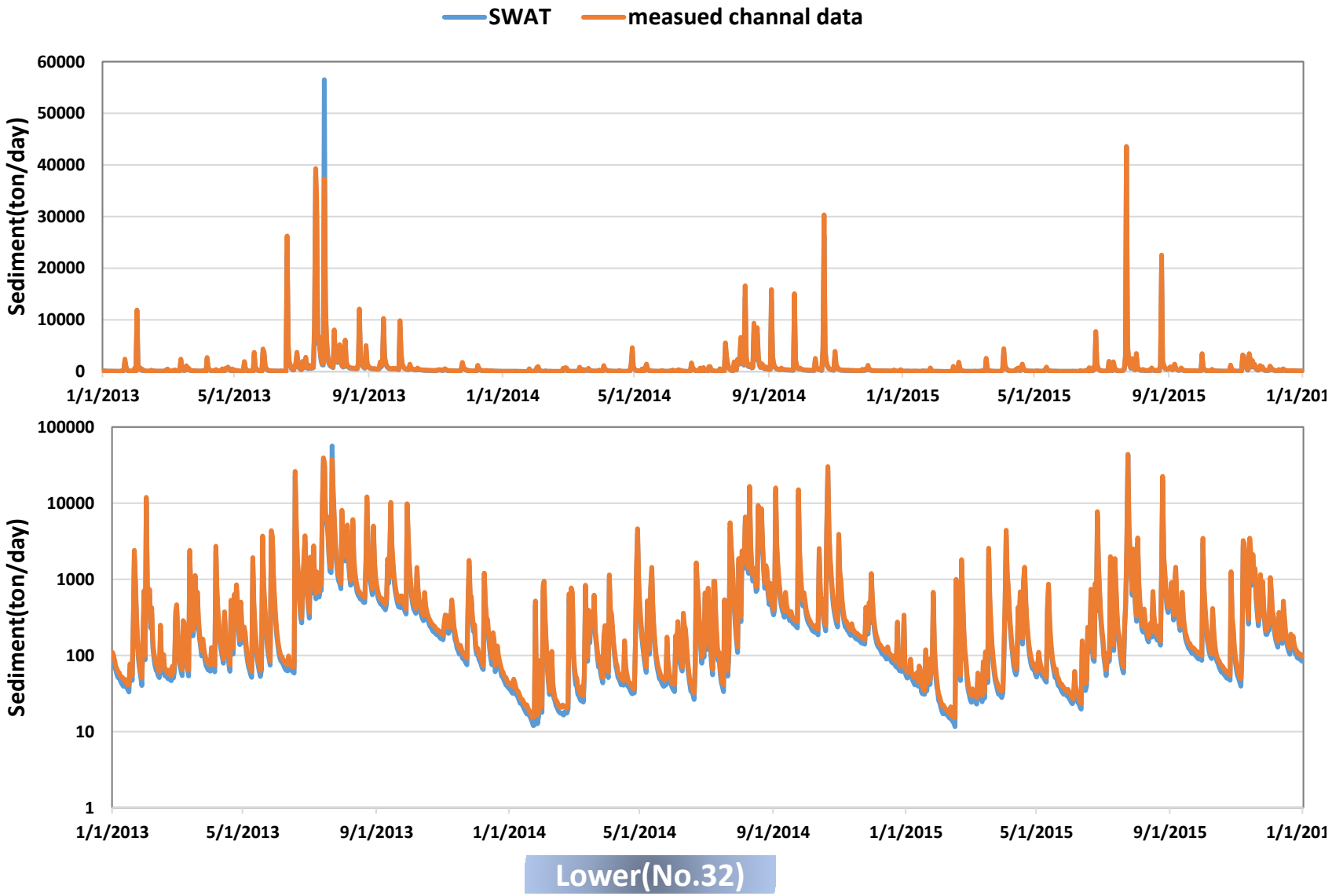
Upper(No.7)

Simulation results: Sediment



Middle(No.17)

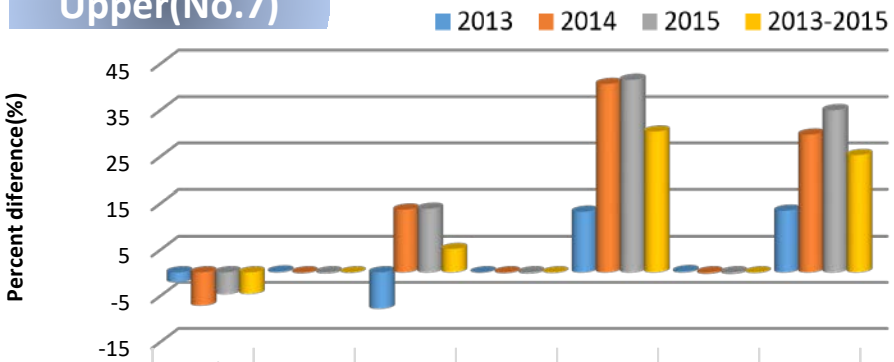
Simulation results: Sediment



Lower(No.32)

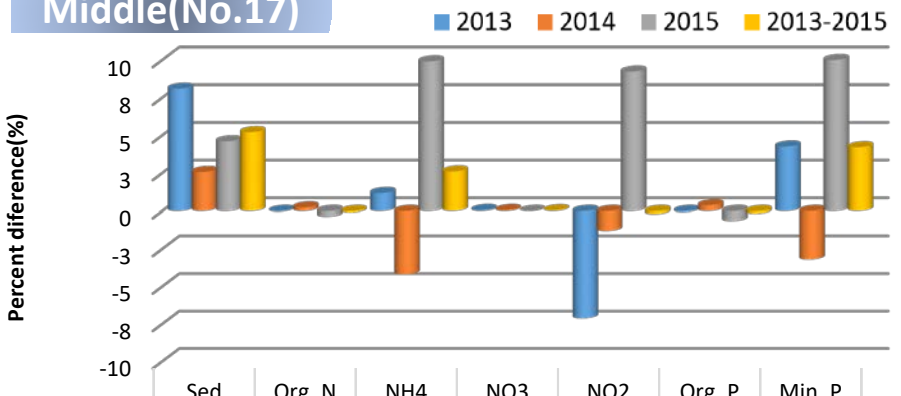
Simulation results: sediment & nutrients

Upper(No.7)



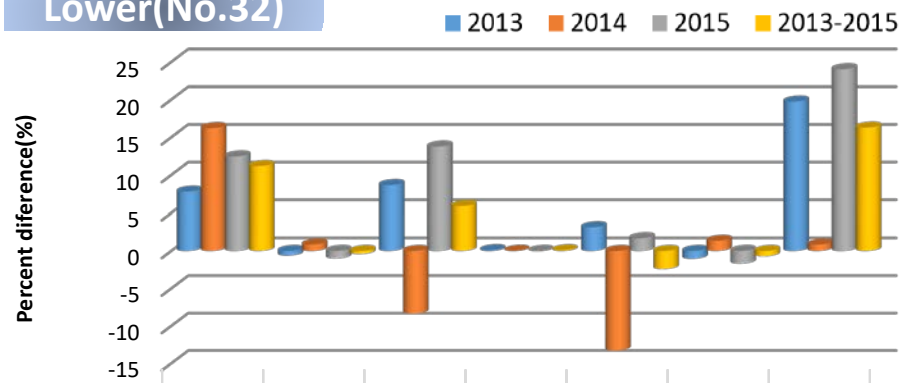
	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	-2.1	0.2	-7.9	0.0	13.1	0.2	13.3
2014	-7.2	-0.2	13.5	-0.2	40.5	-0.3	29.6
2015	-4.7	-0.2	13.7	-0.2	41.4	-0.3	34.9
2013-2015	-4.7	-0.1	5.1	-0.1	30.2	-0.1	25.2

Middle(No.17)



	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	8.1	0.0	1.2	0.1	-7.1	-0.1	4.3
2014	2.6	0.2	-4.2	0.1	-1.3	0.4	-3.2
2015	4.6	-0.4	9.9	0.0	9.2	-0.7	10.4
2013-2015	5.2	-0.1	2.6	0.0	-0.2	-0.2	4.2

Lower(No.32)



	Sed	Org_N	NH4	NO3	NO2	Org_P	Min_P
2013	7.8	-0.6	8.7	0.1	3.1	-1.0	19.7
2014	16.2	0.9	-8.4	0.0	-13.3	1.4	0.8
2015	12.5	-1.0	13.8	0.0	1.7	-1.7	24.0
2013-2015	11.2	-0.4	5.9	0.1	-2.4	-0.7	16.3

Contents

04. Conclusions

- ✓ **Streamflow is not almost affected by channel geometry**
- ✓ **Water quality is influenced largely by channel geometry except organic N, NO3 and organic P**
- ✓ **For a small and mountainous watershed, it is required to develop new equation for channel geometry parameters**


Thank You