# Local scale analysis for water resources and flood management

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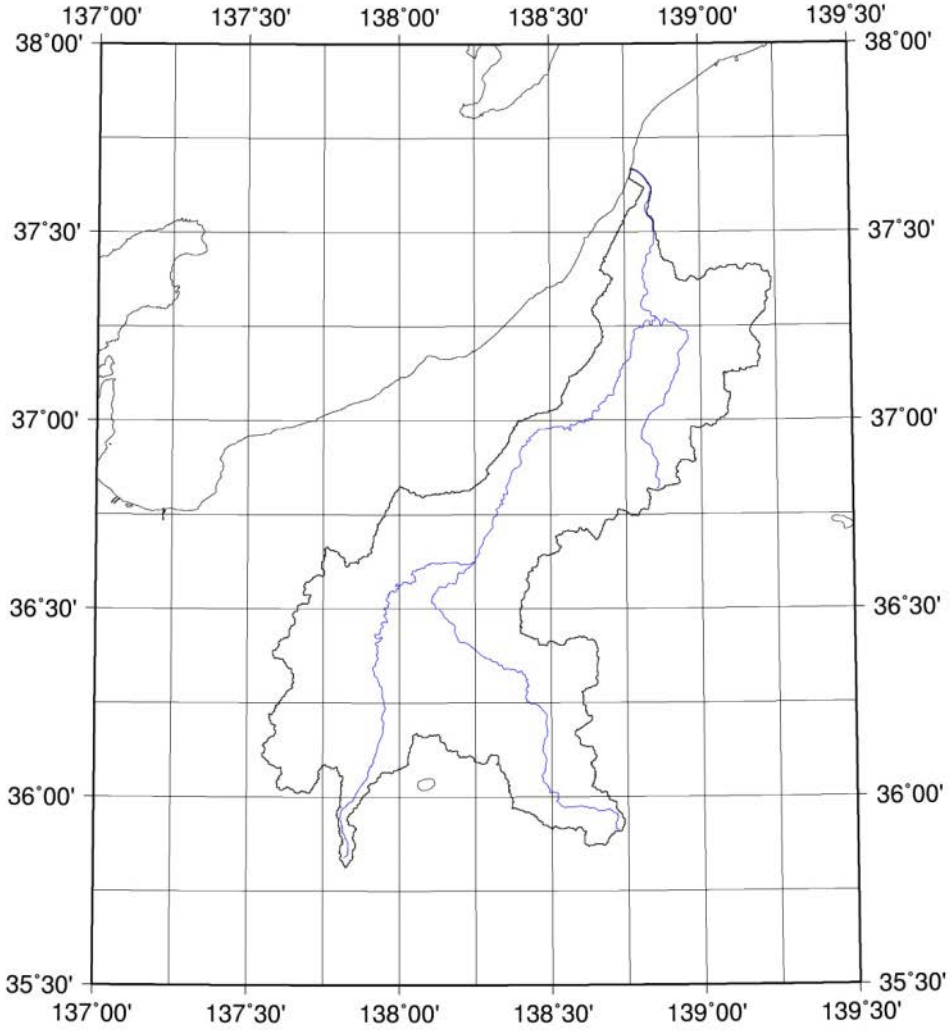
AIM
ASIA-PACIFIC INTEGRATED MODEL

# Background & Objective

Toward the impact assessment of climate change on flood and water resources managements in local scale

- We developed distributed hydrological model (prototype) in Shinano river basin.
  case example: 2006 and 2011 flood.
  point at issue: expression of narrow pass section in this model structure
- Preliminary experiment
  We assessed the impact assessment of climate change on inflow to Sagurigawa-dam within Shinano river basin.

# Shinano river basin




Length: 367 km

Area: 11,900 km$^2$

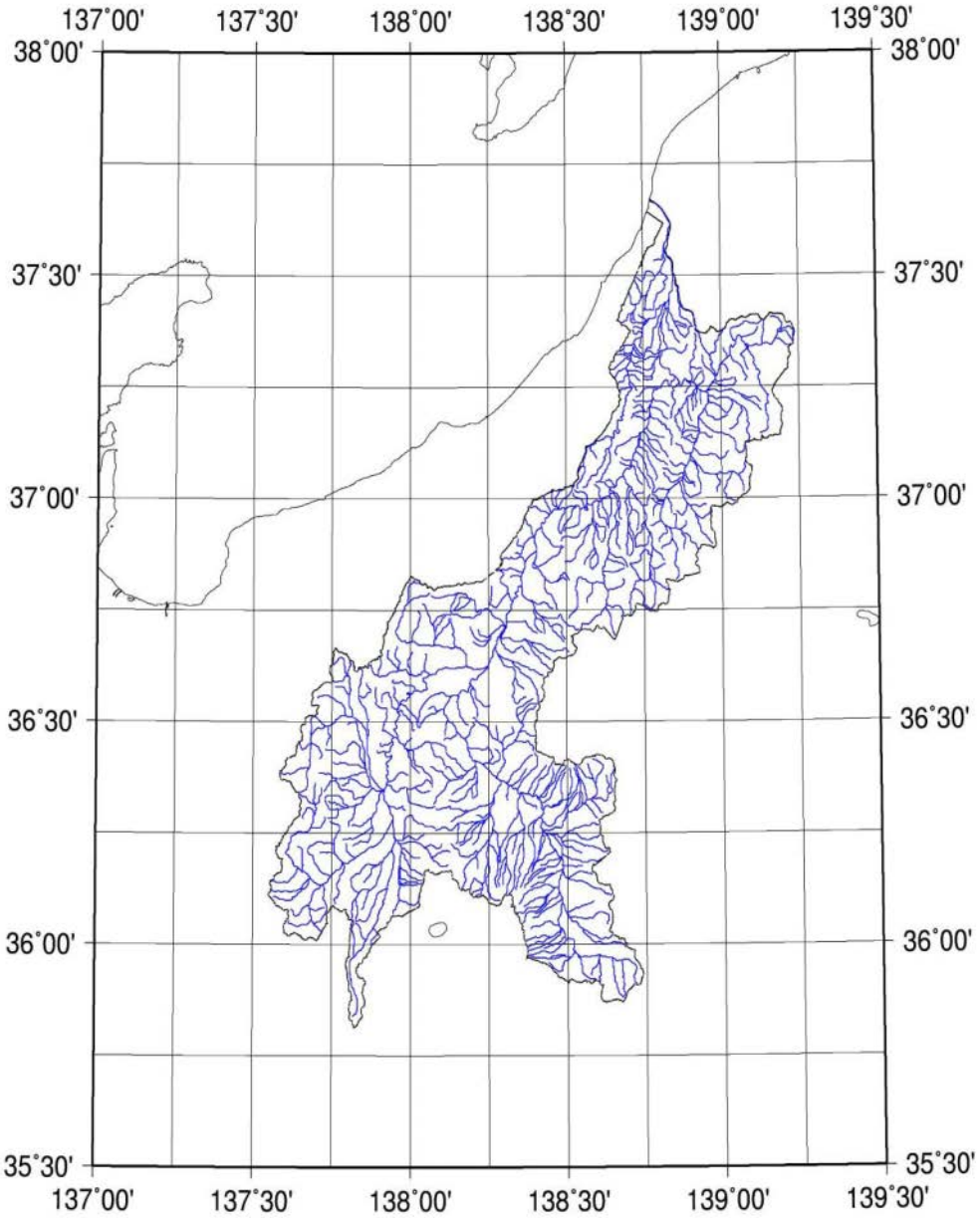
<u>Grid-based river channel</u>

- grid size 250m x 250m
- include large, medium, and small sized river

<u>Hydrological model</u>

- rainfall-runoff module
  Xinanjiang model
- river channel routing module
  Kinemaic wave method

# Shinano river basin

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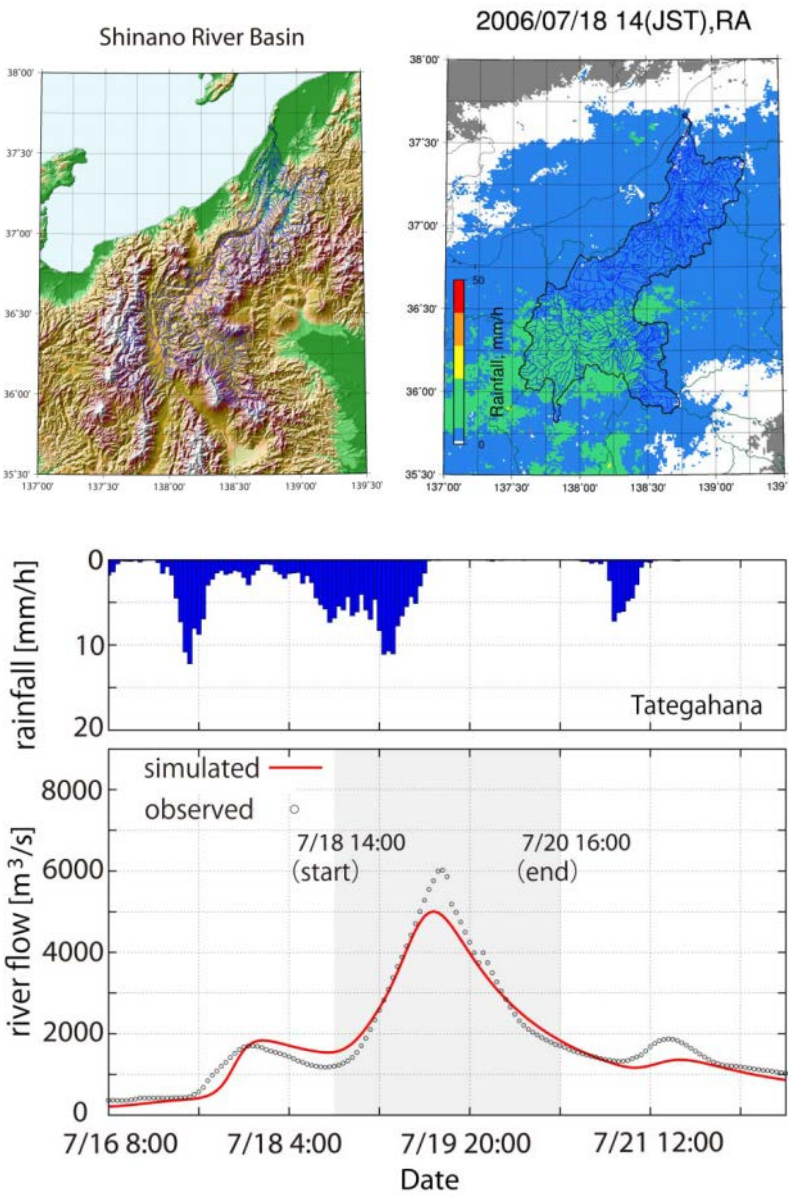
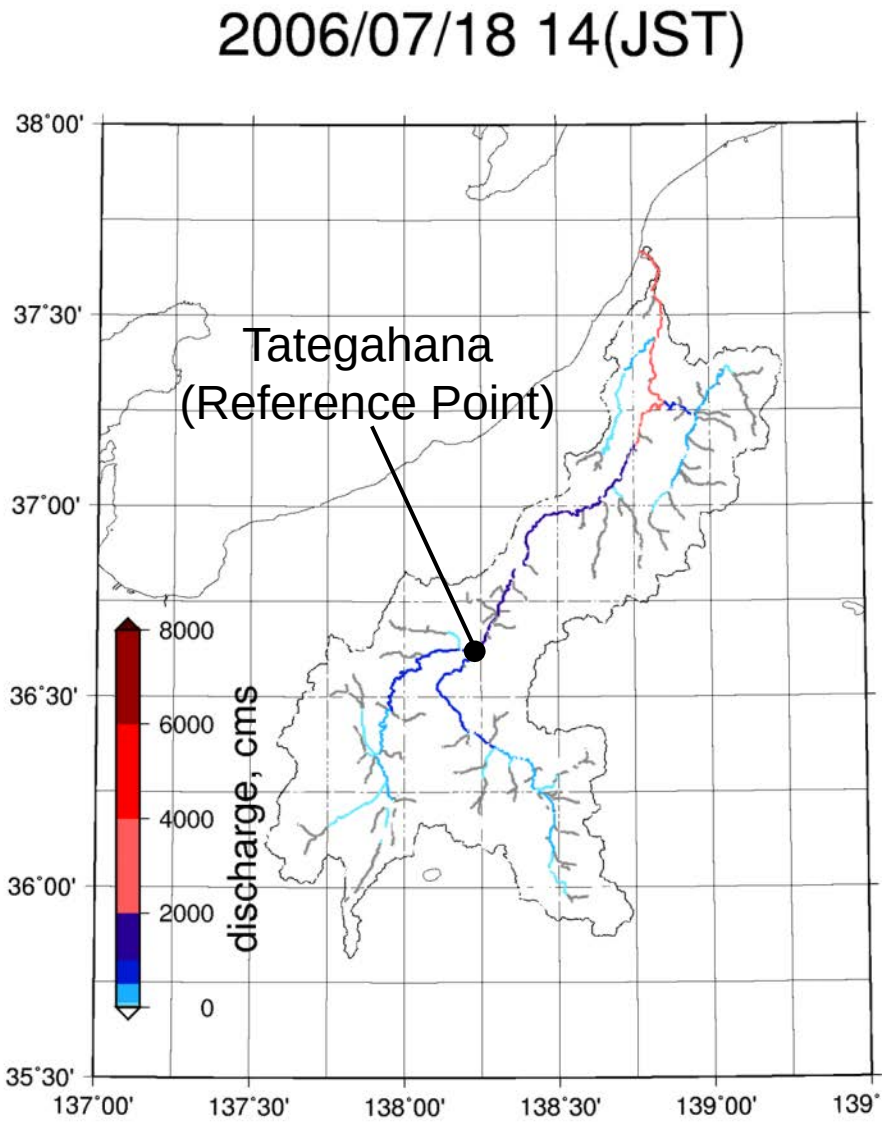
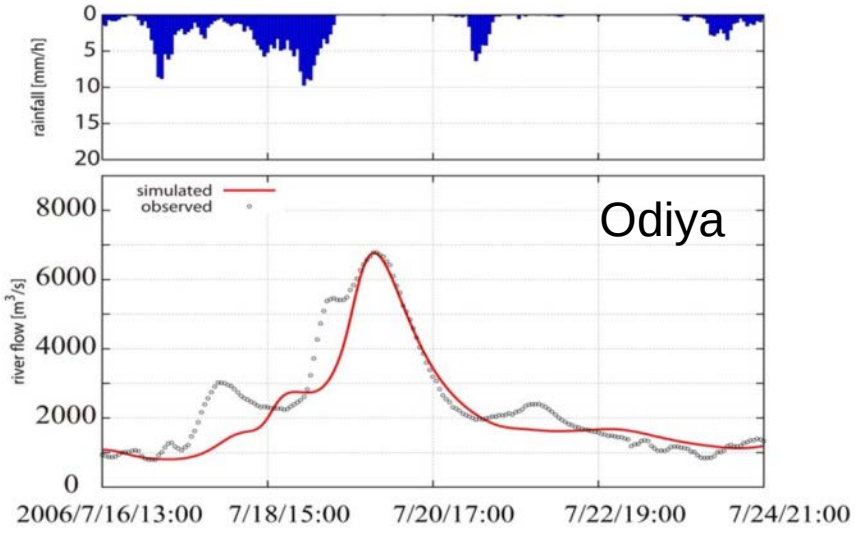
# Demonstration in 2006 storm

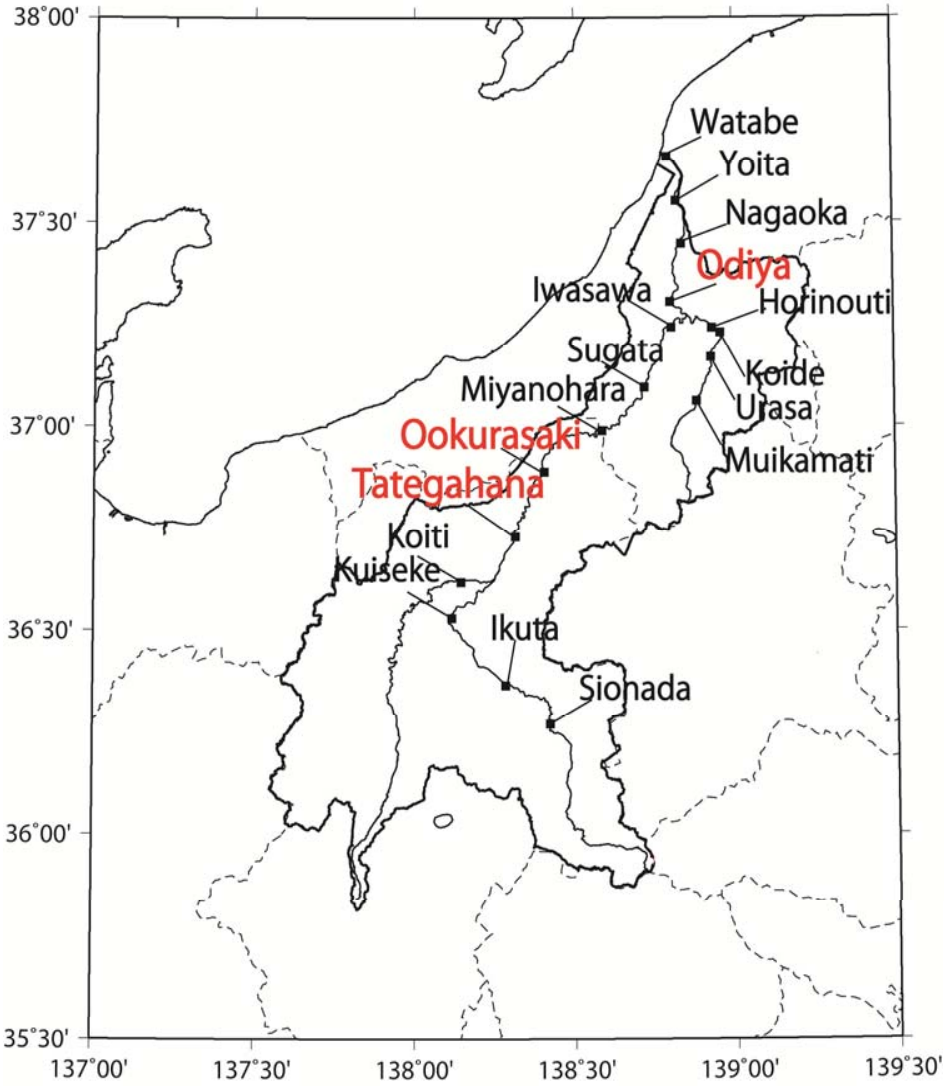


# Parameters calibration

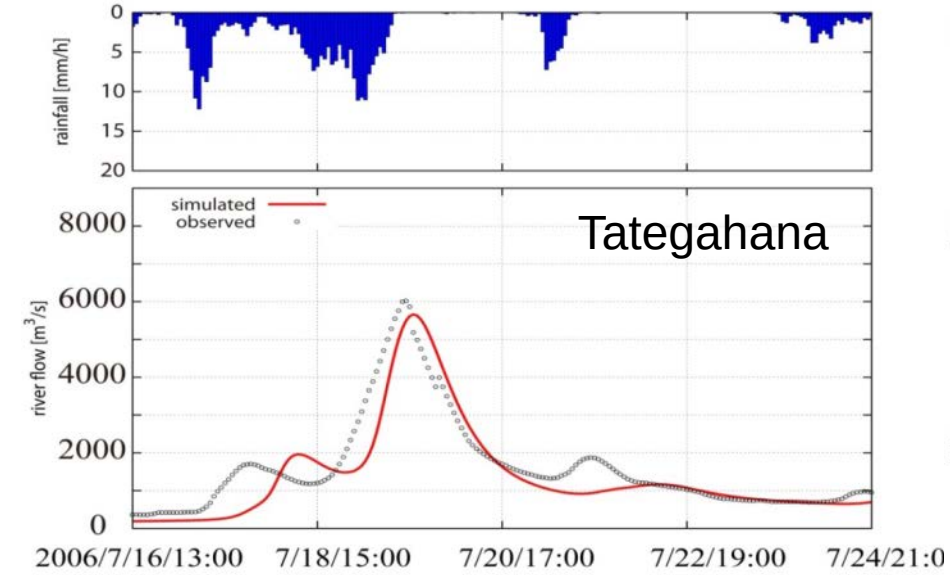


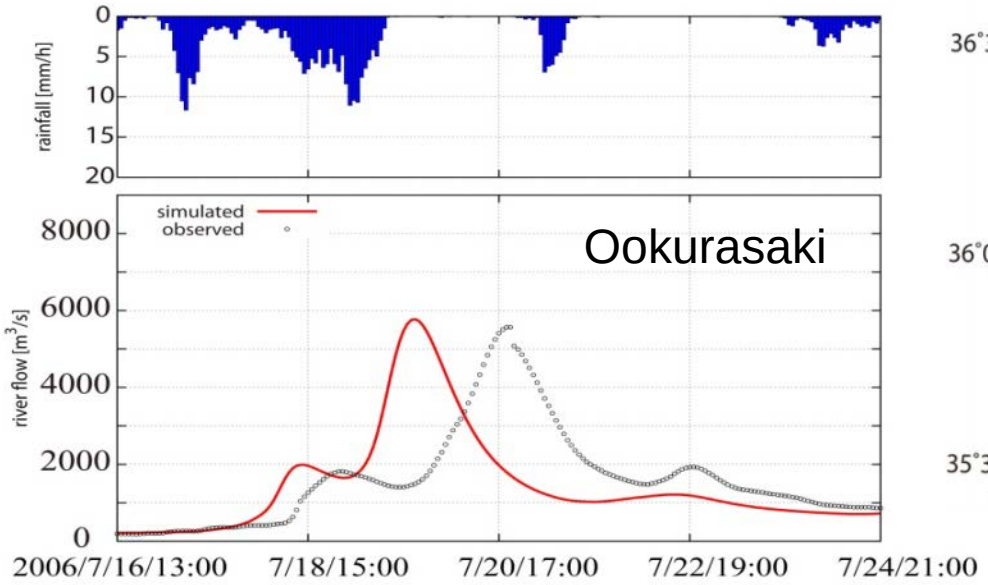

Manning roughness (n) of river: 0.16
(The realistic value: 0.01～0.08)

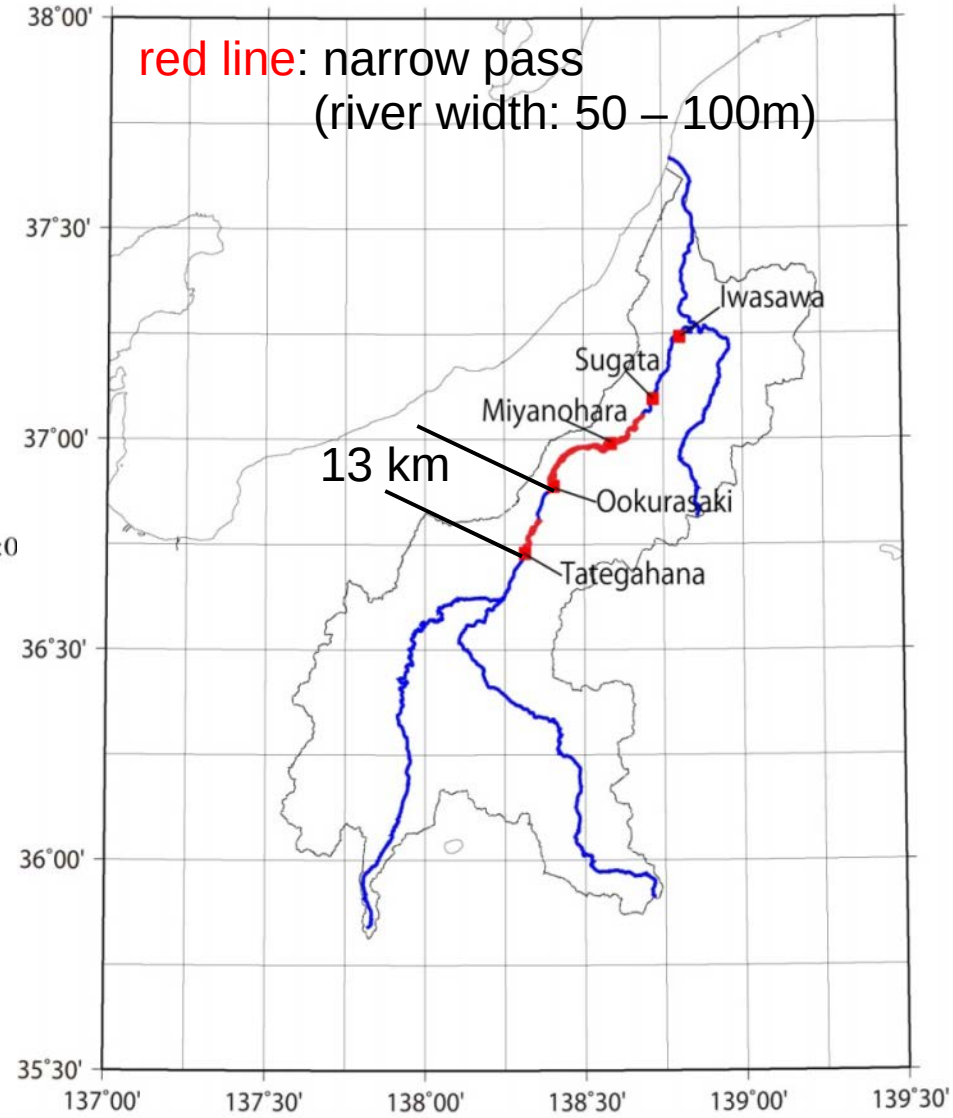



■ discharge station

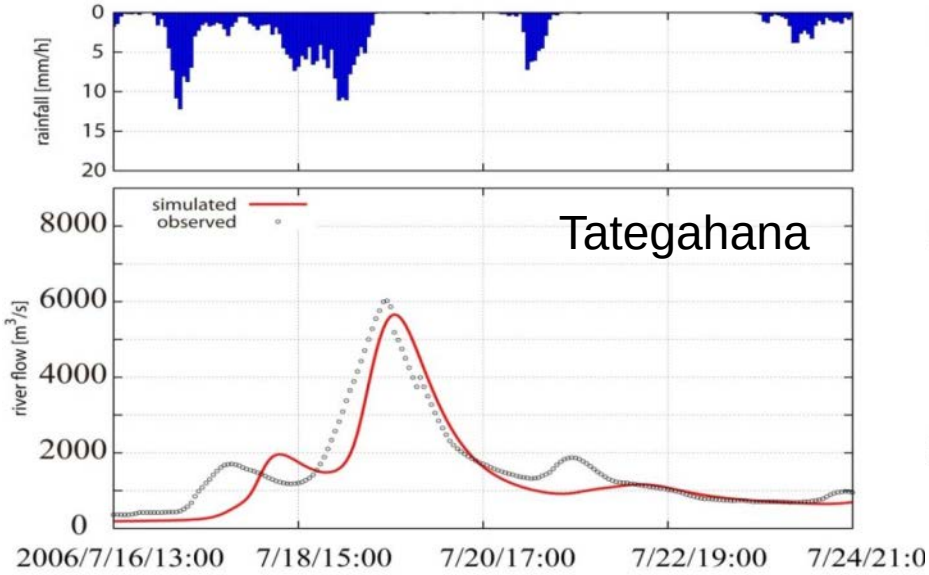
# Effects of narrow pass



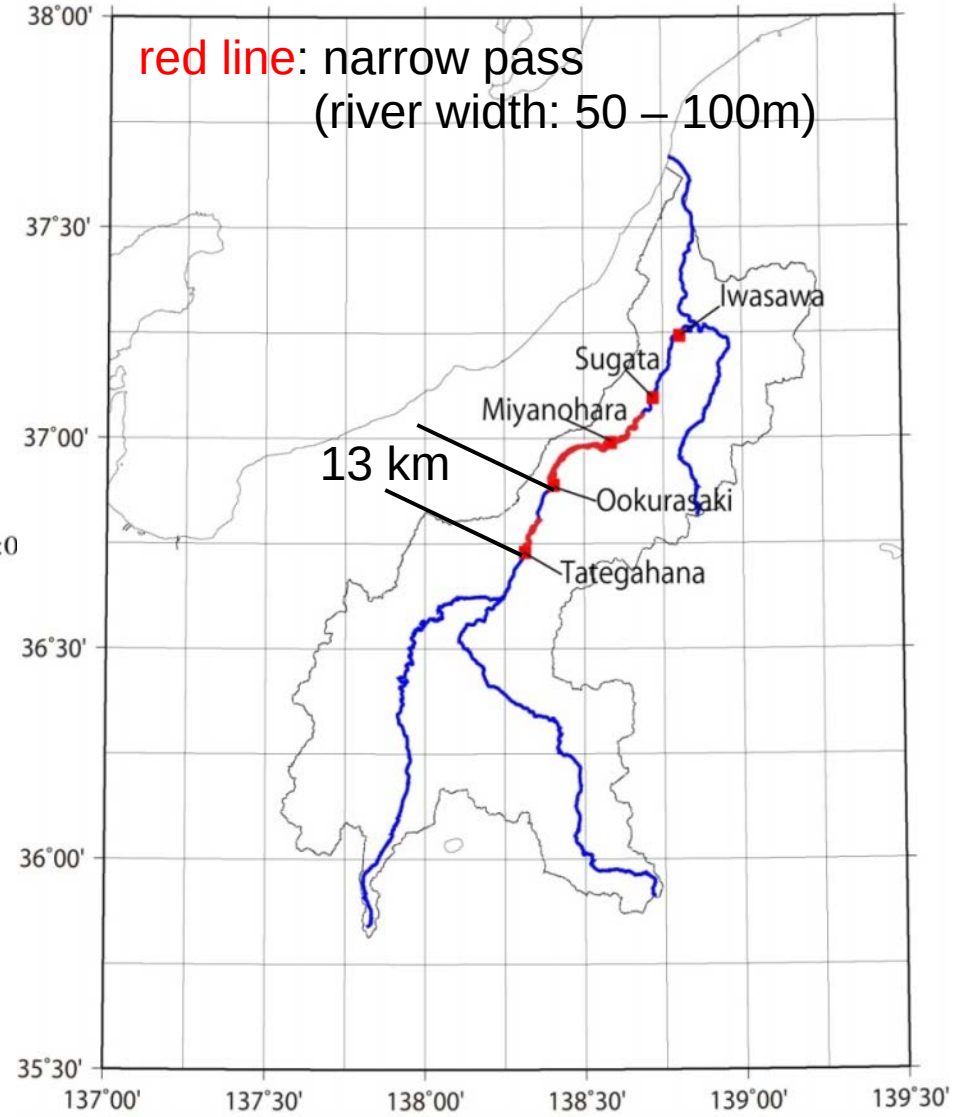



# Effects of narrow pass

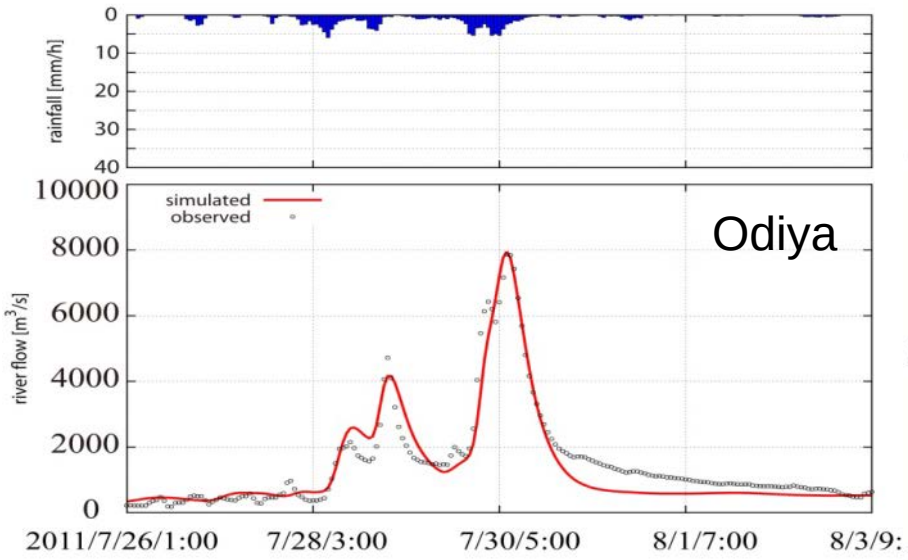




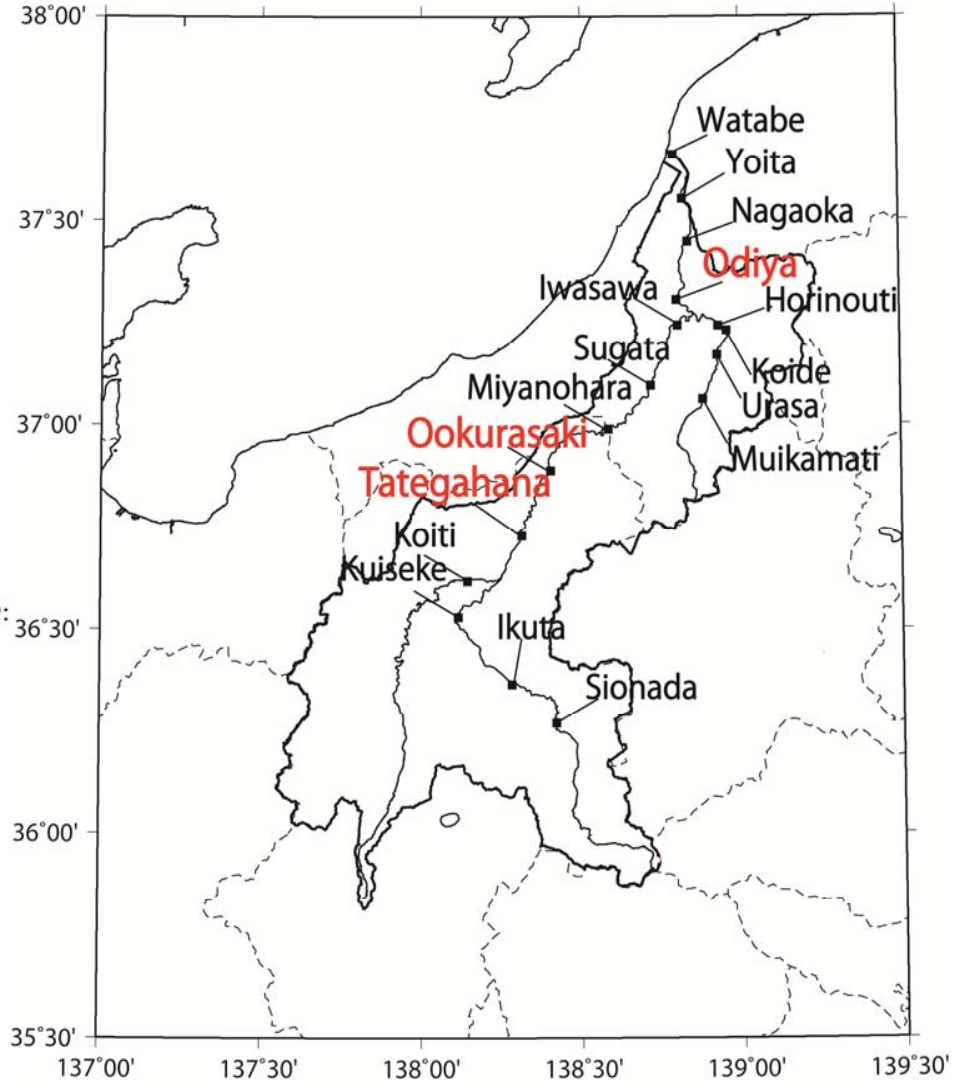



(MLIT, Japan)

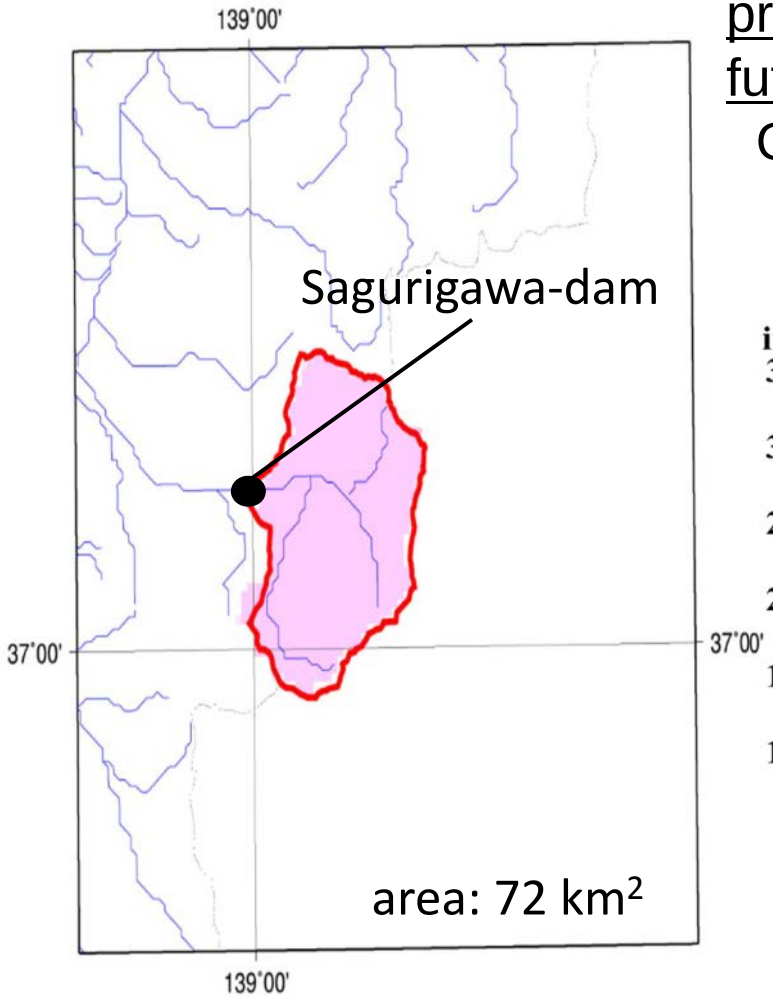
# Manning roughness




Manning roughness (n) of river: 0.04
(The realistic value: 0.01～0.08)



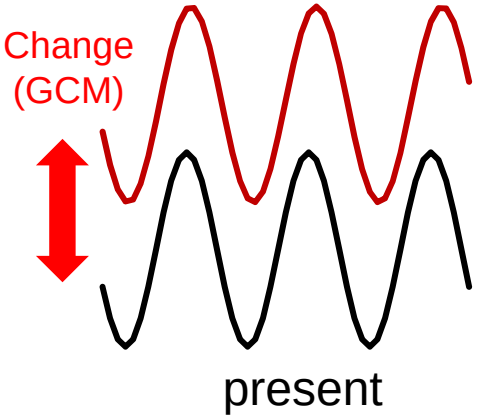
# Preliminary experiment

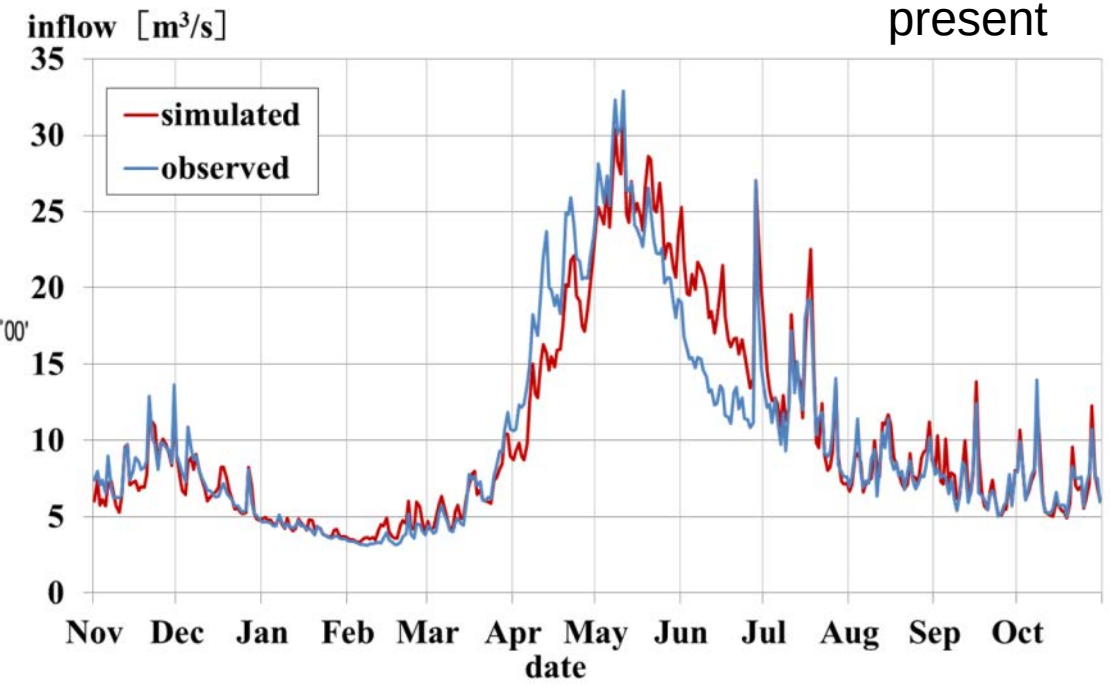



Upper basin of Sagurigawa-Dam within Shinano river basin

present climate: 1996-2007
future climate: 2080-2090

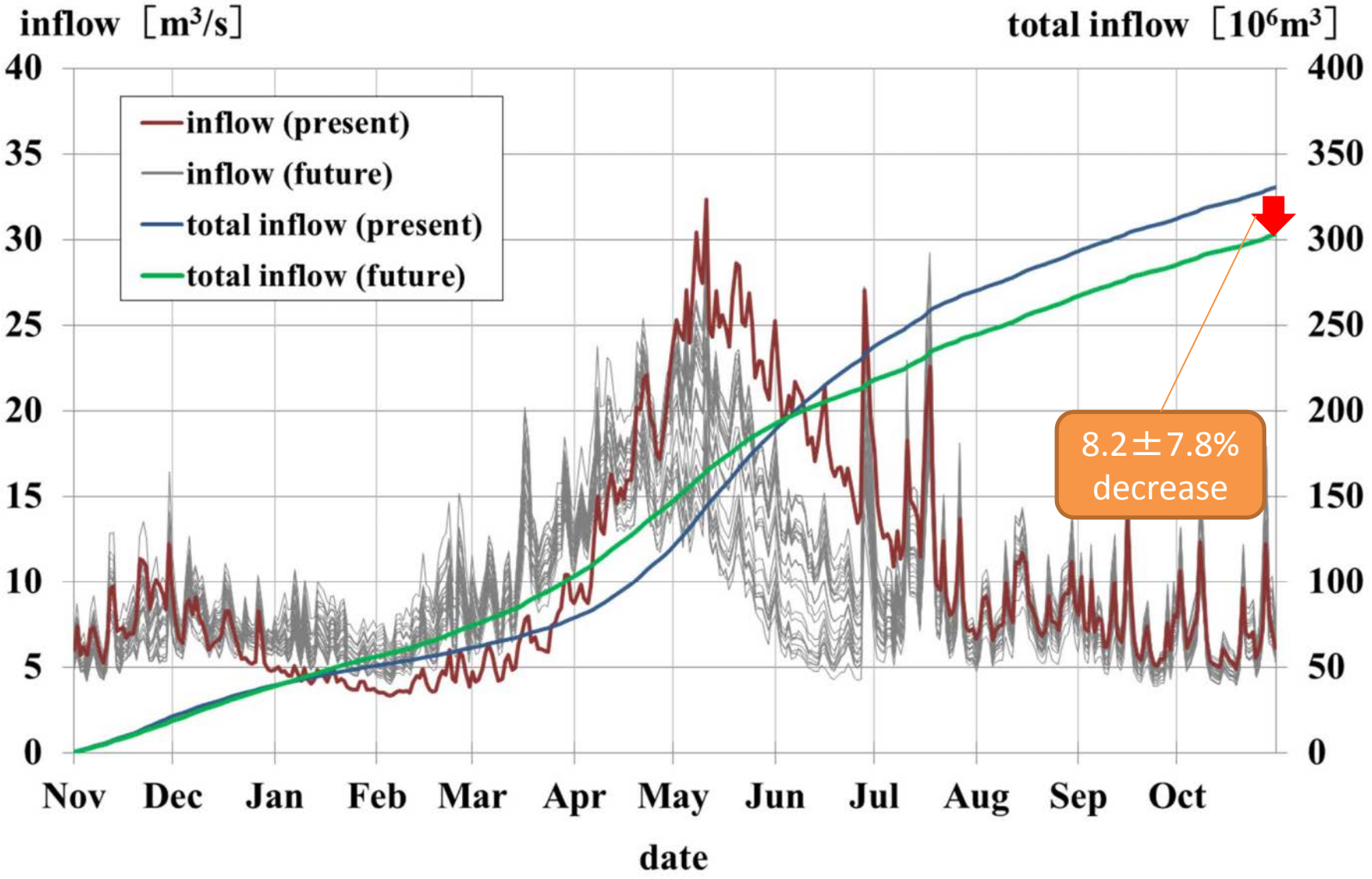
GCMs results are used.
-Air temperature (shifted)
-Precipitation (scaled)



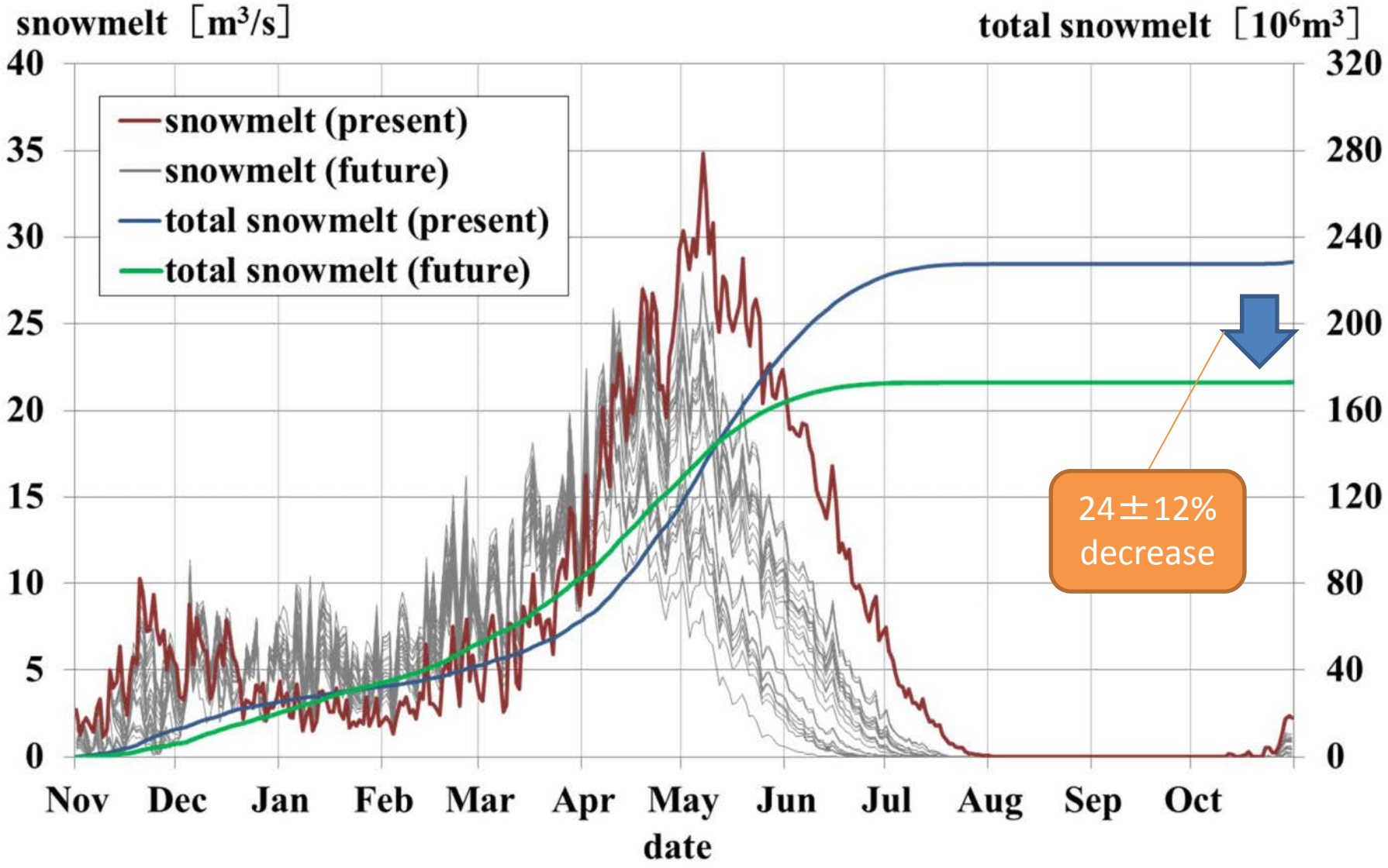




Reproducibility of inflow in present climate (1996-2007)

# Result


inflow ［m³/s］
total inflow ［10⁶m³］
inflow (present)
inflow (future)
total inflow (present)
total inflow (future)
8.2±7.8%
decrease
40
35
30
25
20
15
10
5
0
400
350
300
250
200
150
100
50
0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
date

# Result


snowmelt［m³/s］
total snowmelt［10⁶m³］
snowmelt (present)
snowmelt (future)
total snowmelt (present)
total snowmelt (future)
40
35
30
25
20
15
10
5
0
320
280
240
200
160
120
80
40
0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
date
24±12%
decrease

# Summary

## Summary

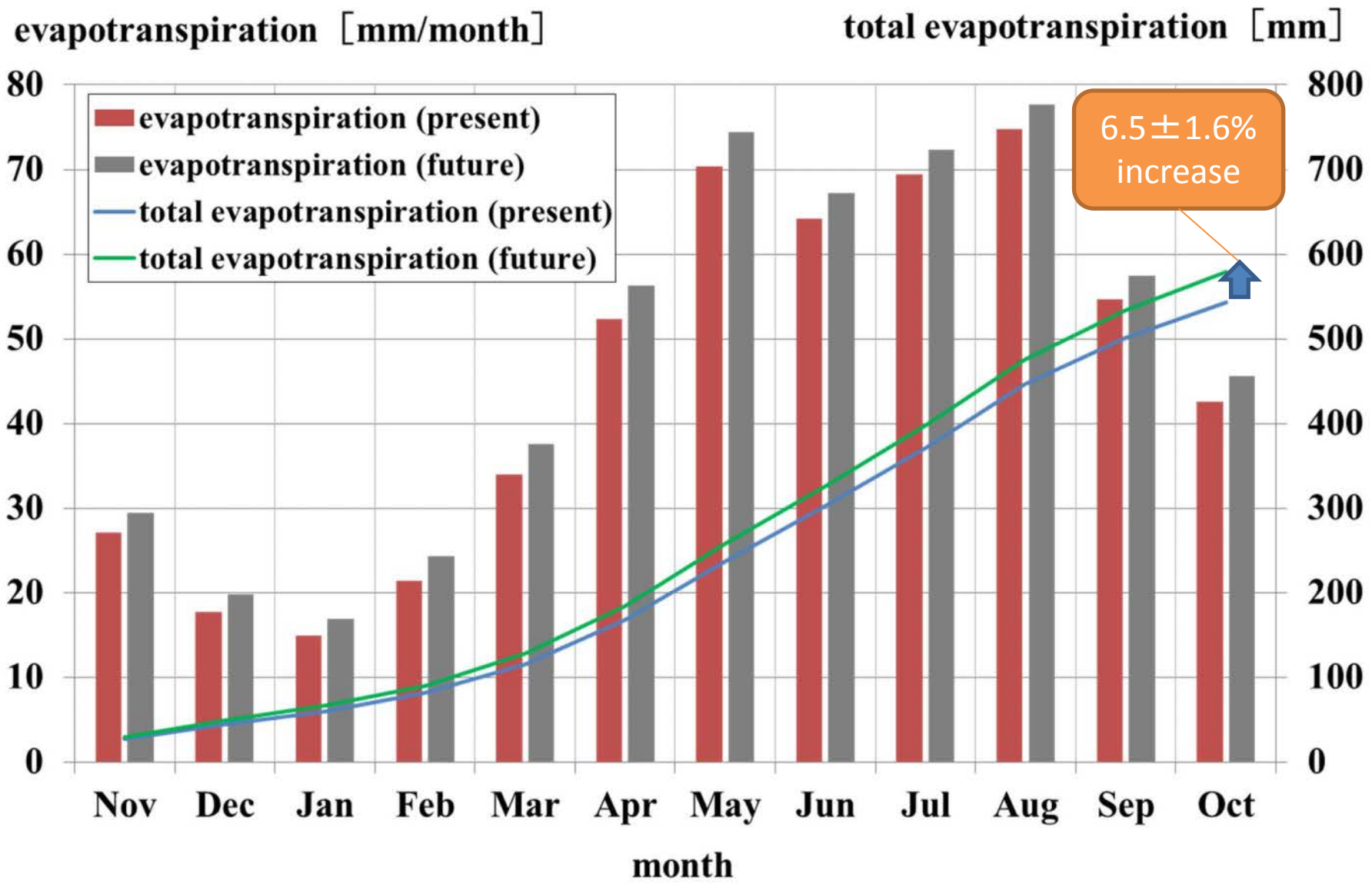
- We developed distributed hydrological model (prototype) in Shinano river basin.
- annual Inflow to Sagurigawa-dam decreased 8.2±7.8% in future climate.

## Future works

Toward the impact assessment of climate change on flood and water resources managements

- Highly-development of distributed hydrological model
- Modeling of hydraulic facilities (reservoir etc. )
- The facilities operation modeling in future climate

# Evaporation



# Precipitation