

Comparison of Runoff characteristics in bare and vegetated headwater catchments, Northern Alps, Japan

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Introduction

Runoff characteristics in alpine zone

- ◆ Few studies focus on vegetation effect on stream runoff in an alpine zone
- ◆ Previous studies only report the role of talus deposits in stream runoff in no-vegetated catchments

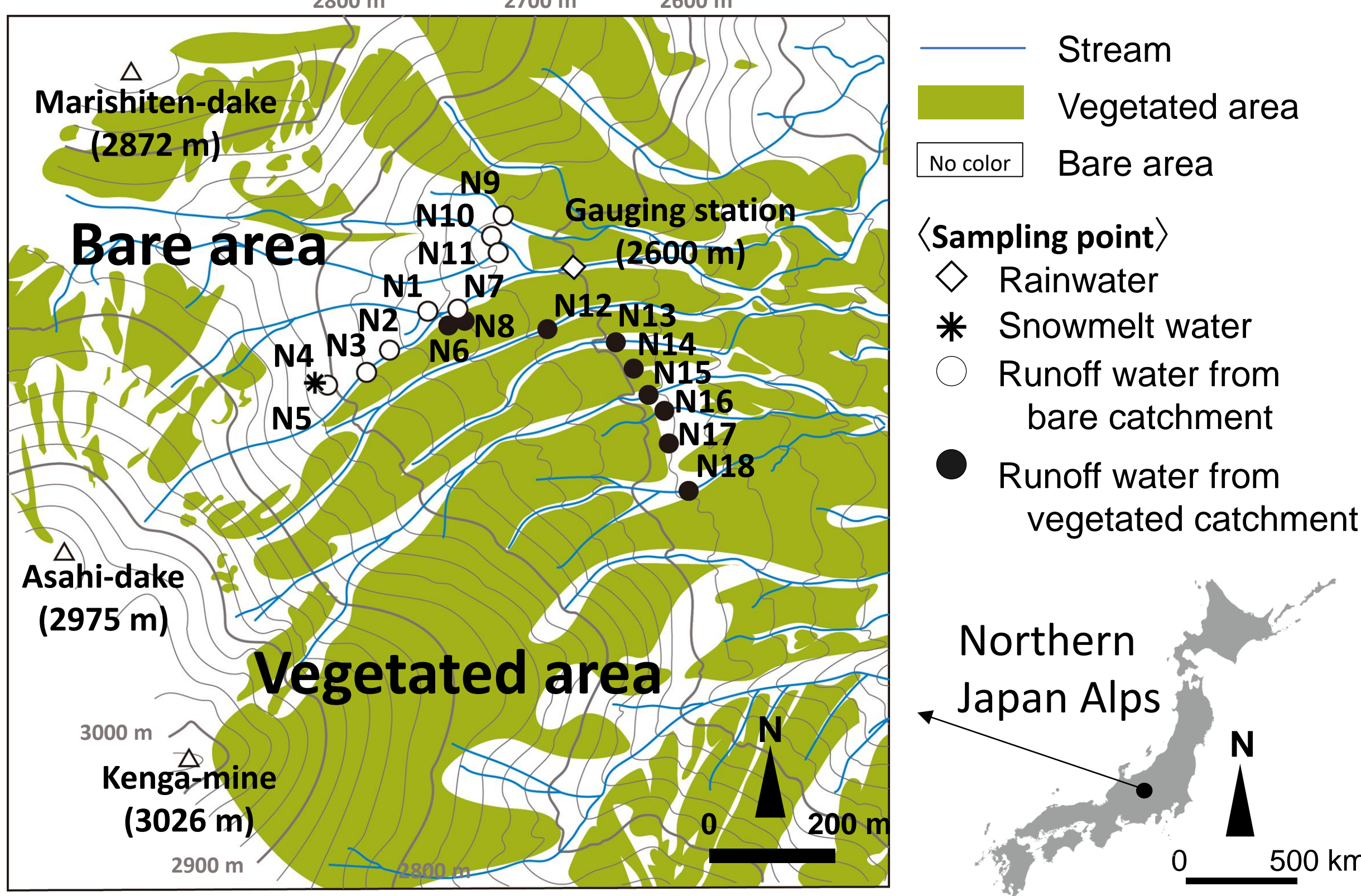
Little is known about
“How does alpine vegetation affect runoff characteristics in alpine headwater?”

Objective

To evaluate the effect of alpine vegetation on water storage and runoff characteristics in alpine zones

Study site & Methodology

◆ Headwater of Mt Norikura (3026–2600 m)



◆ Gauging station

Date: July–October, 2019
 Measurement: Stream water level (every 10 minutes)
 Precipitation (every 0.2 mL)

◆ Sampling event

Date: 17-Aug, 2019 and 5-Oct, 2019
 Sampling water: Runoff (Spring, Stream), Snowmelt, Rain
 Measurements: Water temperature, pH, EC

◆ Analysis

Dissolved ions
 Hydrograph separation

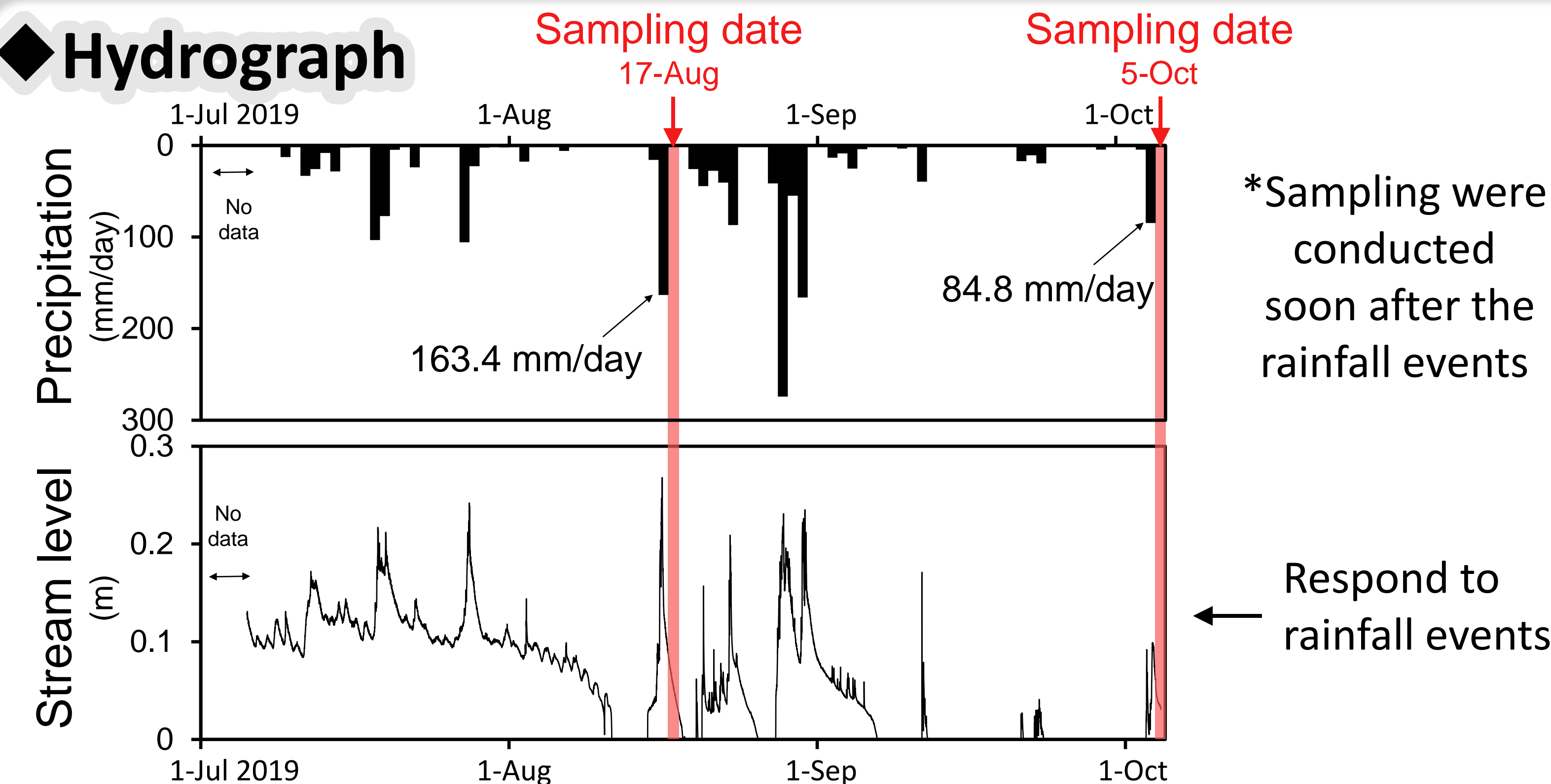
$$R_{GW} + R_P = 1$$

$$C_{GW}R_{GW} + C_P R_P = C_D$$

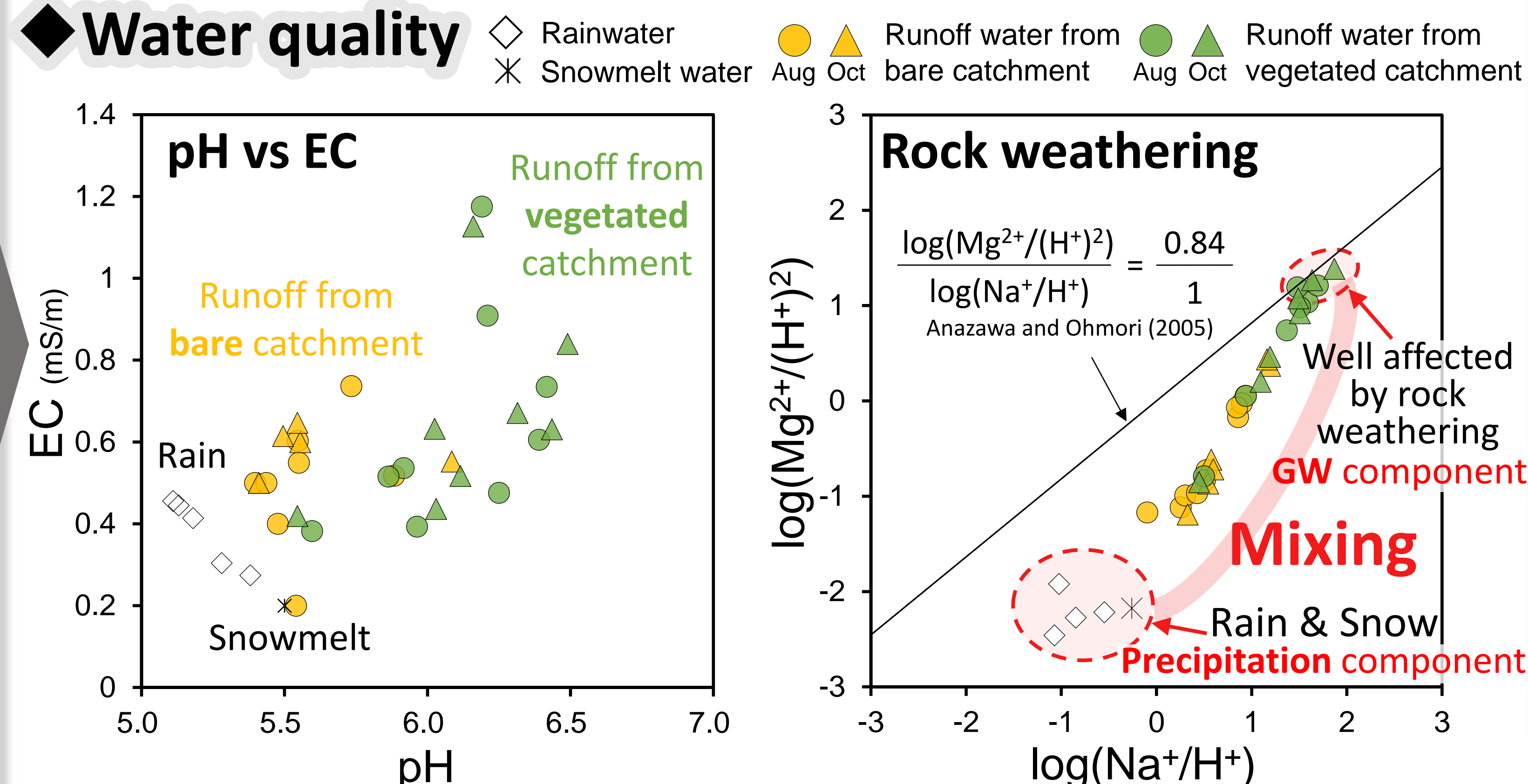
R: contribution of each component
 C: tracer value
 Subscript_{GW}: groundwater
 P: precipitation
 D: runoff water
 Sklash and Farvolden (1979)

Results

◆ Hydrograph



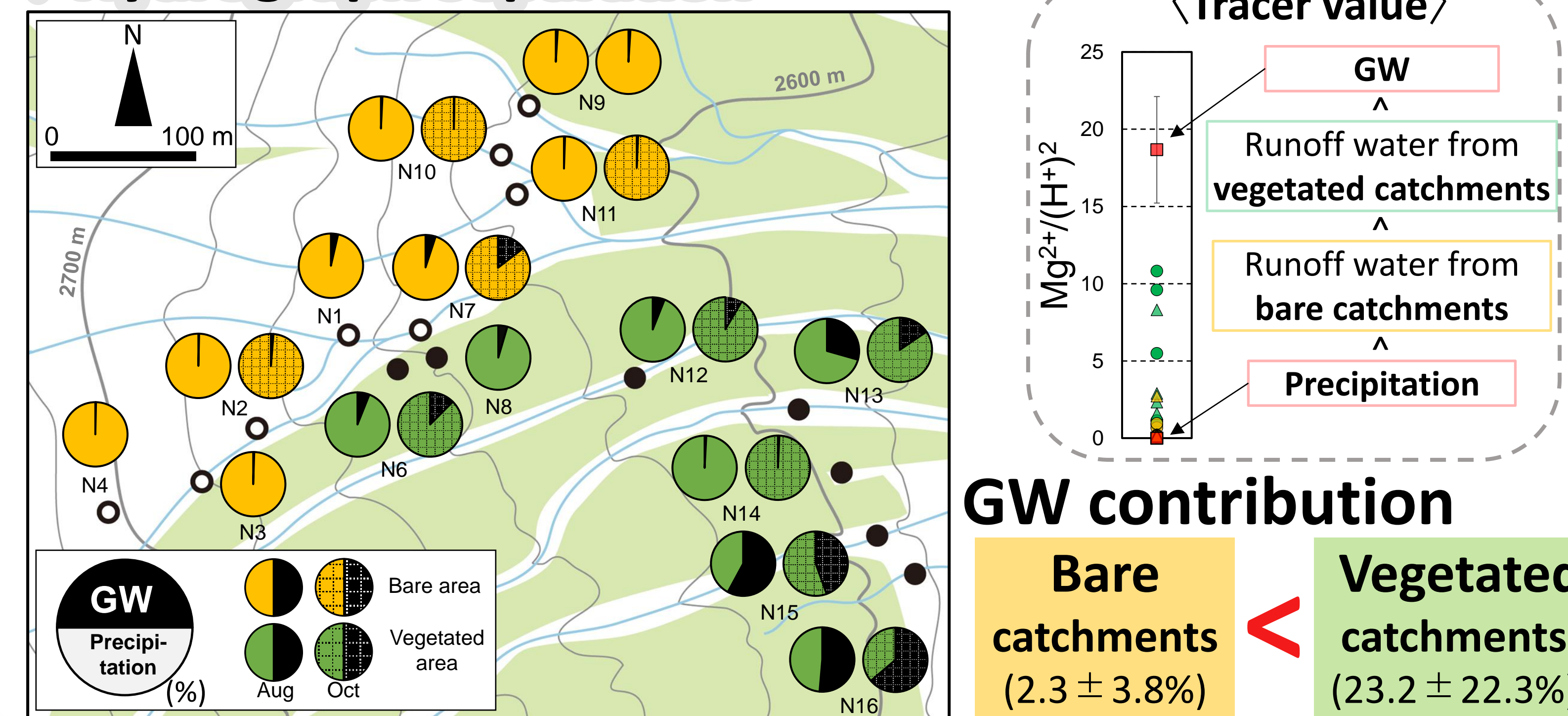
◆ Water quality



→ Effect of water-rock interactions
 Bare area < Vegetated area

→ Runoff water could be a mixture of the two components

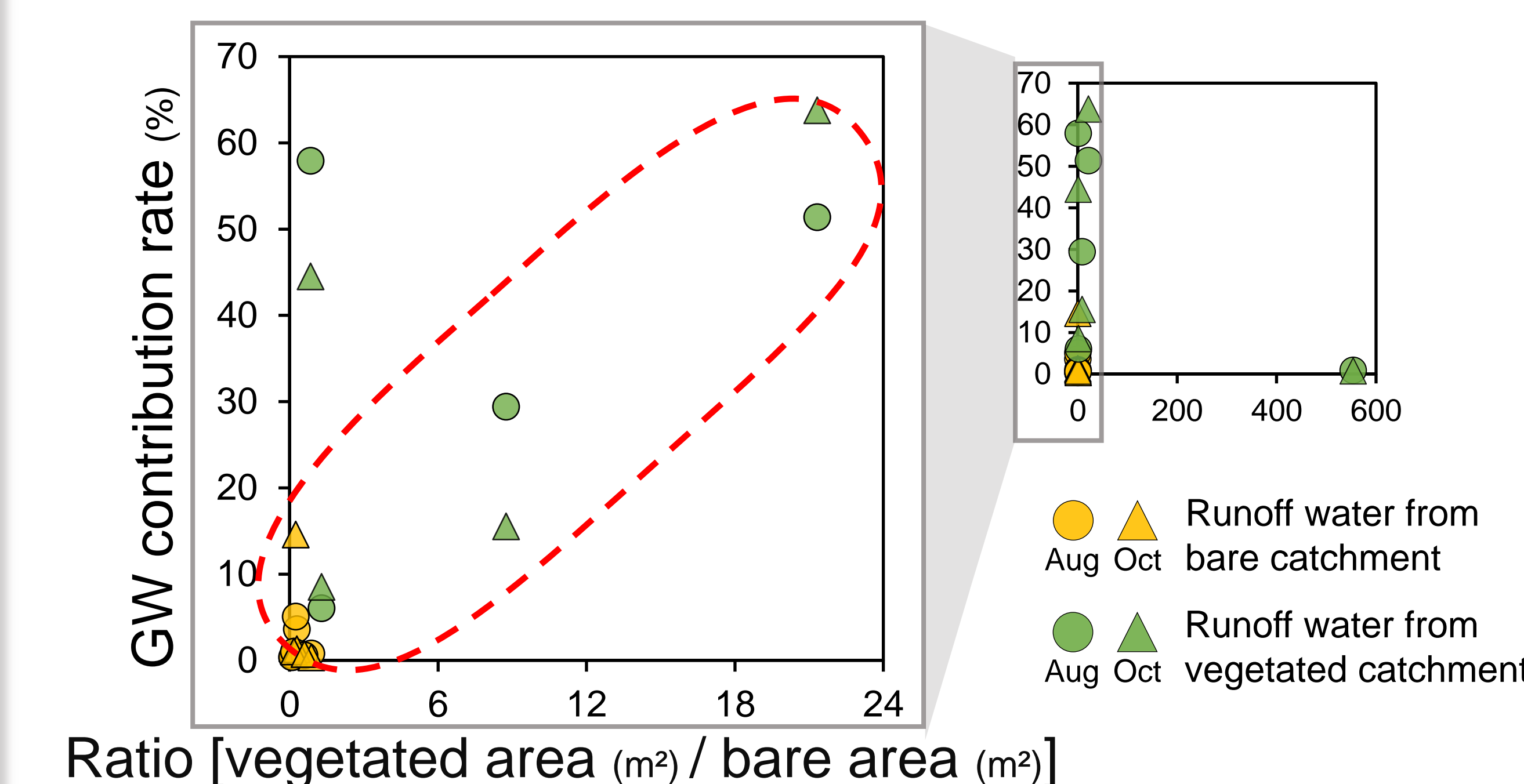
◆ Hydrograph separation



Discussion

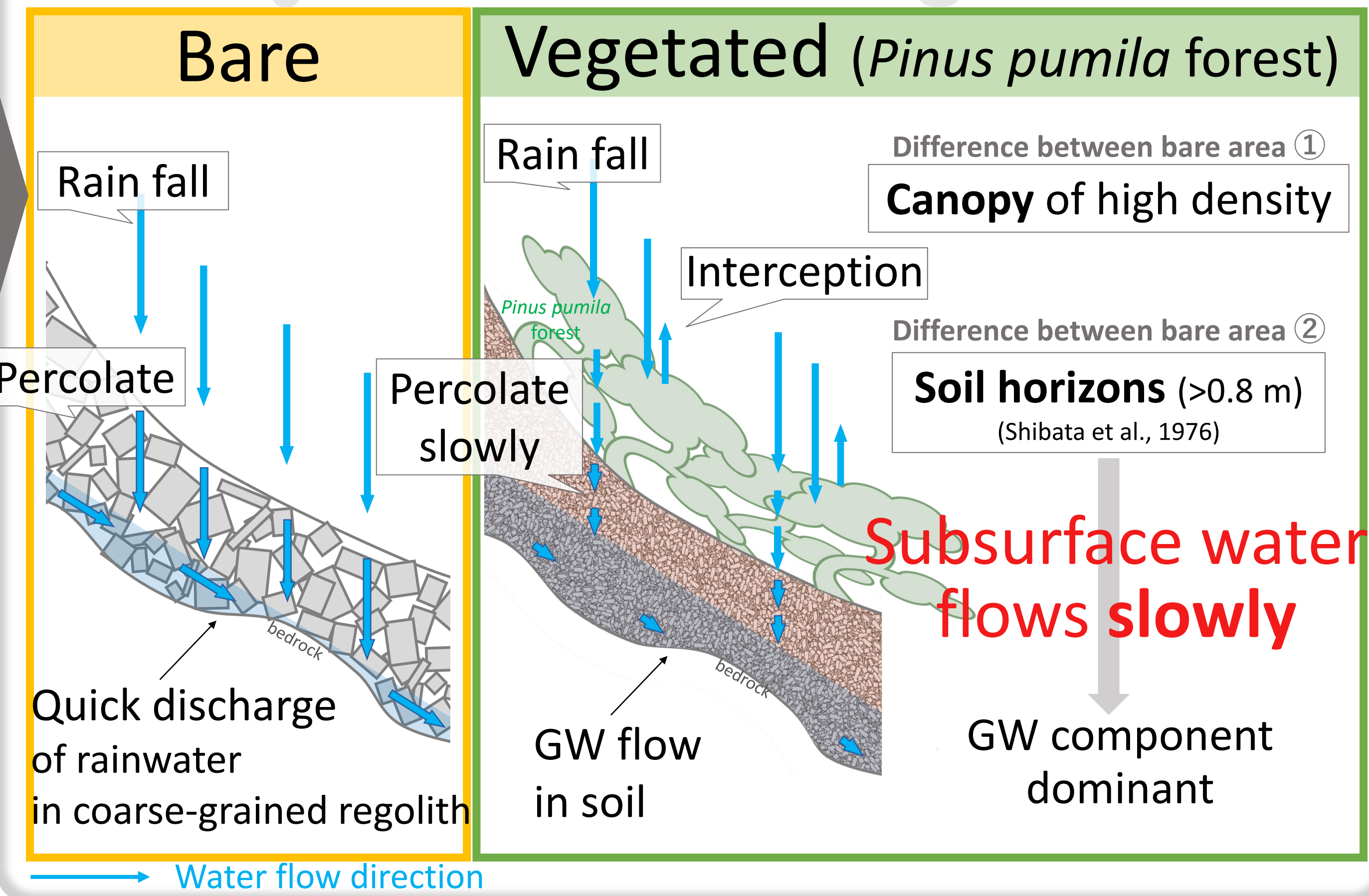
How does land cover affect on runoff characteristics?

◆ Effect of land cover to GW contribution



→ Vegetation increases the possibility that the water has a long transit time

◆ Runoff processes in bare and vegetated area



Conclusion

Effects of alpine vegetation on water storage and runoff characteristics

- ✓ GW contribution to runoff is
 - Higher in vegetated catchments (23%)
 - Lower in bare catchments (2%)
- ✓ The role of GW is more important in the vegetated area than bare area due to existence of thicker soil deposits