Soil erosion and overland flow in Japanese cypress plantations: Spatiotemporal variations and a sampling strategy.

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2021/4/27 SSS11.4 EGU21-15740

Introduction

- Soil erosion and overland flow is the crucial problem in Japan especially in unmanaged Japanese cypress plantation.
- Soil erosion and overland flow have large spatio-temporal variation.
- However, there are less studies focused on sampling strategy to obtain the slop scale soil erosion and overland flow.
- The objective of this work is to identify the spatio-temporal variation, and to examine the optimal sample size to measure the slope scale of soil erosion and overland flow.





Obora experimental watershed (Toyota, Aichi, Japan) elevation: 585 m annual rainfall: 2017.5 mm average temperature: 11.2°C geology: granite

 Japanese cypress plantation established in 1991
 tree density: 2,400 trees ha⁻¹
 slope angle: 30.5°

high tree density, and sparse understory vegetation and litter cover





Collection system

• Simultaneous measurements of soil erosion, litter and overland flow using small-sized traps.

•Trap with dimension of 0.15 × 0.25 × 0.20 m (height × width × depth) made by stainless-steel.





Sampling process



sorting process









Sampling interval was once a month





Result 1

15 traps were installed on the slope. (The total width of slope was 15 m.)

 Total soil erosion, litter and overland flow over the 14-month observation period was shown.

 Soil erosion and overland flow showed large spatial variation among 15 traps.





Result 2

 Averaged values and standard deviation of soil erosion, litter and overland flow collected by 15 traps at each month were shown.

 The temporal trend was corresponded with the rainfall seasonality (both total amount and intensity).

• The coefficient of variations CVs (calculated by averaged and standard deviation) for soil erosion and overland flow in wet season (summer and autumn) was smaller than in dry season (winter and spring). \rightarrow opposite trend as compared to rainfall



Result 3 Random sampling analysis



• CV was decreasing as increasing the sample size (number of traps) n.

The difference of CV before and after *n* increasing became moderate over 6 traps.
The total width of 5 traps (1.25 m) was equivalent to about 8 % of the monitored slope width (15 m).

Result 4

Same analysis was conducted on monthly data and the CVs in soil erosion and overland flow were shown with 1, 3, 5, 10 and 15 traps.
CVs in wet seasons is smaller than in dry seasons both soil erosion and overland flow.

•Seasonal variation became moderate as increasing *n*.



Summary

Spatio-temporal variation of soil erosion, litter and overland flow were identified using small-sized traps.
CVs on soil erosion and overland flow were decreasing as increasing the sample size. However, the decreasing ratio of difference of CV became moderate over 6 traps.
→This random sampling analysis revealed that the optimal sample size was 5. This result indicated that at least 8% of the total slope width was necessarily to understand the

slope scale soil erosion and overland flow in our study slope.

Our study also indicated that examination of optimal sample size is important not only to minimize the effect of spatiotemporal variation but also to reduce the maintenance and sample processing cost. This study was supported by the project monitoring the water conservation function as founded by the city of Toyota's government.

More detail information and discussion is in following reference published by us previously.

Full article: Soil erosion and over +				• – @ X
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In this article ABSTRACT 1 Introduction 2 Material and methods 3 Results and discussion	ABSTRACT Many studies have focused on soil erosion in unmanaged Japanese cypress i understory vegetation and litter covering the forest ground enhance soil ero litter, and overland flow measurements were conducted over 14 months to i variation and examine the optimal sample size. Fifteen traps (each 0.25 m w the bottom of a 15-m-wide slope. Soil erosion and overland flow had large sp litter. The temporal coefficient of variation of soil erosion and overland flow while smaller during wet seasons. The random sampling analysis showed the	plantations because the spars ision. In this study, soil erosion identify the spatio-temporal ide) were installed in line alor patial variations as compared was highest during dry seaso at the rate of decrease in	Related articles Recomme read Recomme article Soil conservation service cu determination for forest co runoff data in experimenta to Sangjun Im et al. Journal of Forest Research Published online: 30 Jun 2020	nded Cited by s 1 urve number ver using rainfall and l forests >
4 Conclusions	spatio-temporal variation became moderate as the sample size increased be	eyond six. This result indicated	Influence of seasonality and	d climate on captures