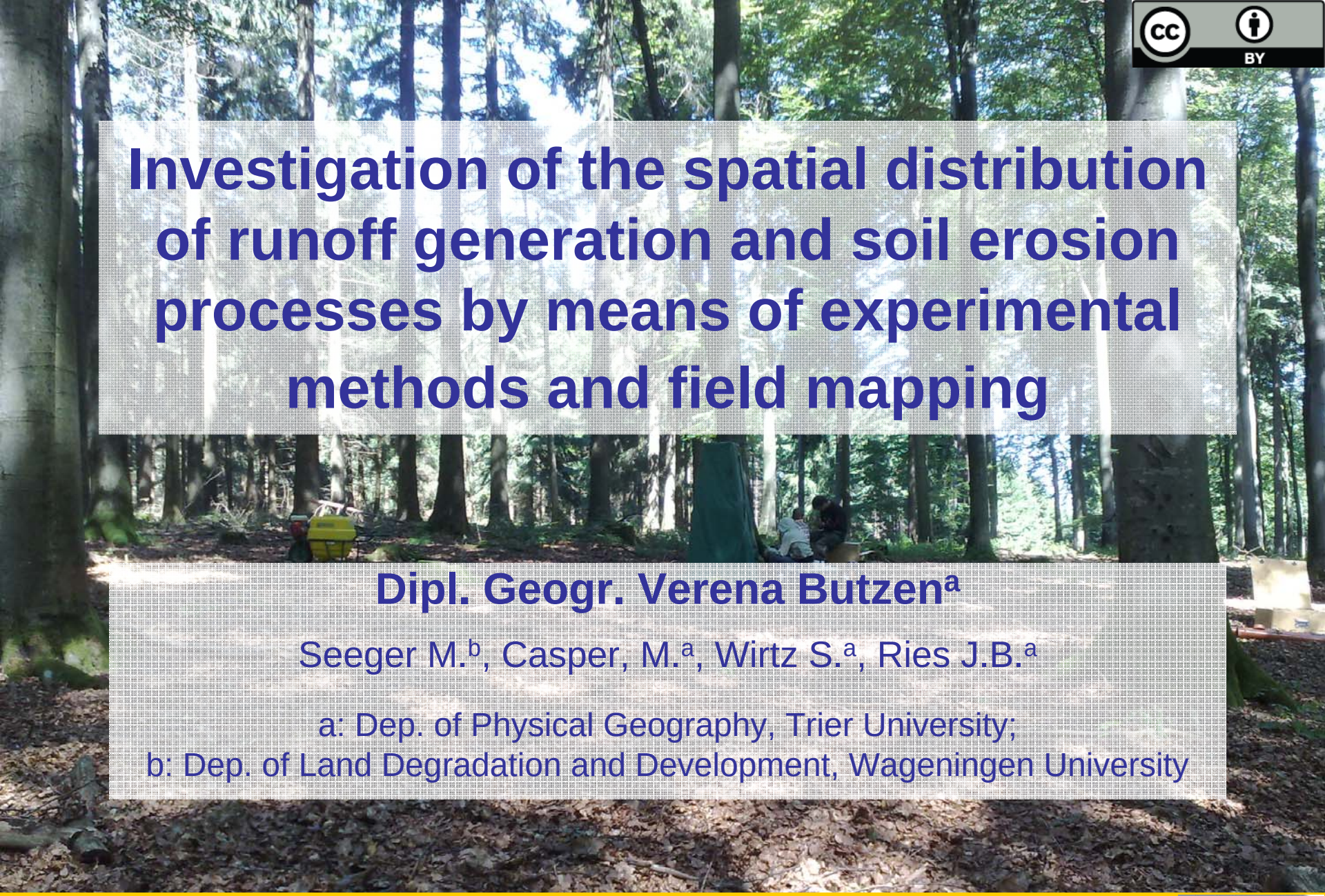

Investigation of the spatial distribution of runoff generation and soil erosion processes by means of experimental methods and field mapping

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ForeStClim

- **ForeStClim:**
- Transnational Forestry Management Strategies in Response to Regional Climate Change Impacts
- Interreg IVB Project

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1) Introduction

- Surface processes are regarded to be negligible under forests
- But:
  - Climate Change:
    - Heavy (summer) rainstorms
    - Large winter rain periods
  - Forest Management changes soils
    - Linear structures
    - compaction

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2) Consequences?

- What is the actual status of surface processes in forests?
- Are the differences due to land management?
- Can relevant factors be identified?
- What has to be changed in land-management?

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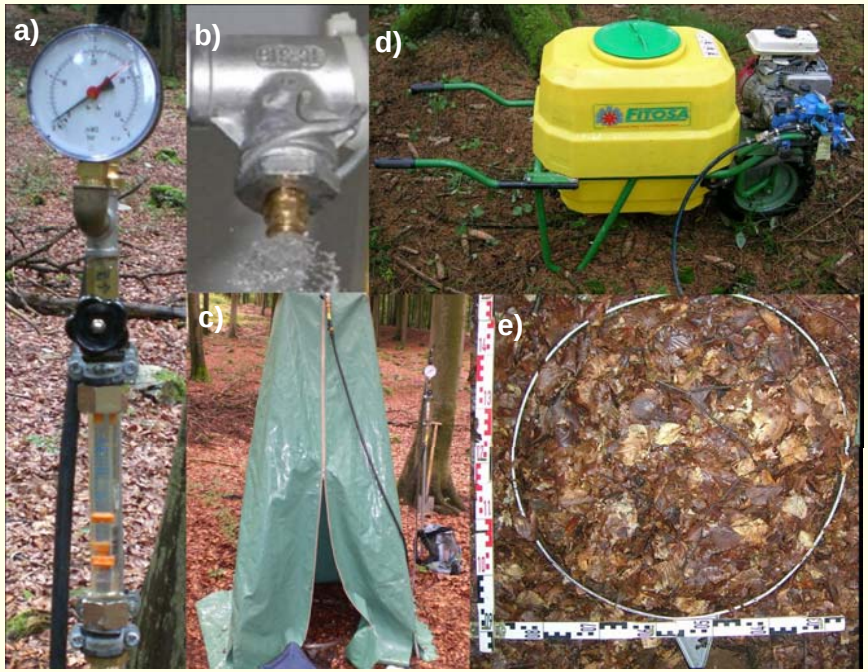
3) Study areas

	1) Holzbach	2) Frankelbach	3) Huewelerbach
Area [km²]	2.2	5	2.7
Precipitation [mm]	1160	800	800
T [°C]	8.7	9	8.5
Bedrock	Quarzite, schist	Permian Sand and Siltstones	Lias Sandstones
Landuse	97% Forest 3% Grassland	23% Agriculture 52% Forest 20% Grassland 5% Urban	93.8% Forest 6.0% Grassland 0.2% Urban

4.1) Method: Small portable rainfall simulator



- Experimental setup:
  - a) flow meter
  - b) nozzle
  - c) wind cover
  - d) motor driven pump
  - e) test plot (60cm diameter)

- simulated rainfall intensity: 40 mm h^{-1}
- experiment duration: 30-60 minutes
- collection of overland flow and suspended sediments

- Holzbach: 17 Rainfall simulations
- Frankelbach: 24 Rainfall simulations
- Huewelerbach: 32 Rainfall simulations **=> 73 Rainfall simulations**

4.2) Method: Rill erosion experiments

Experimental setup:

a) 1000 litre water tank

b) pump with 250-300 l min^{-1} discharge

c) Rill or harvester track with 3 measuring points:
   - water samples for suspended sediment concentration

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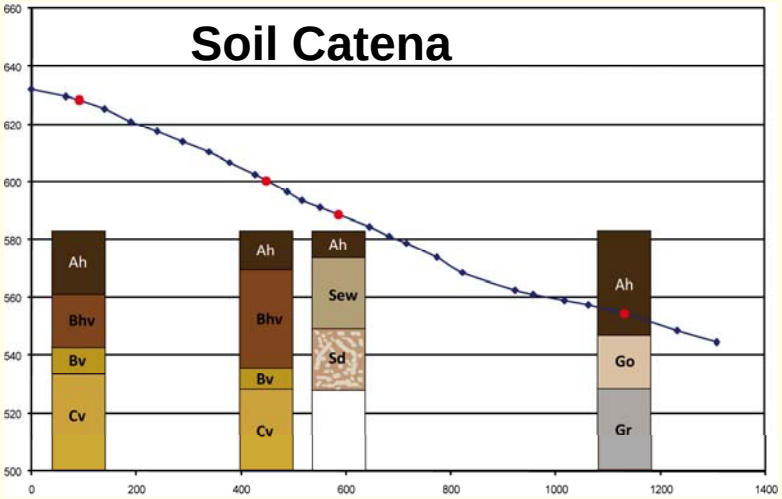
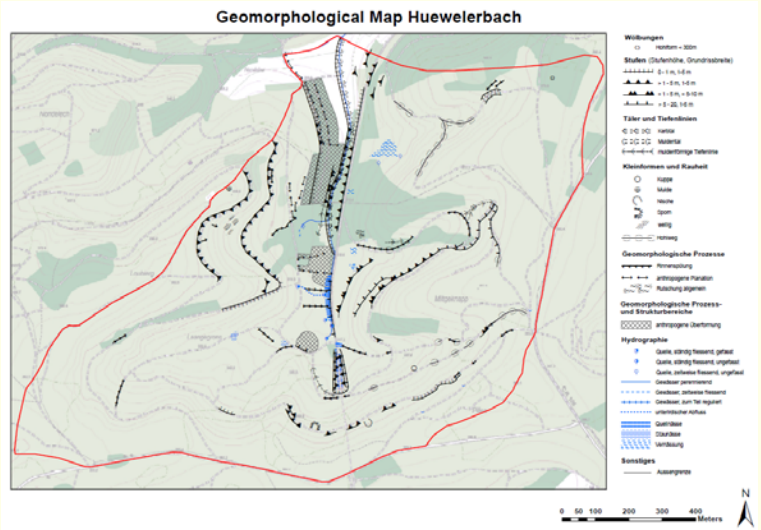
4.3) Method: Mapping

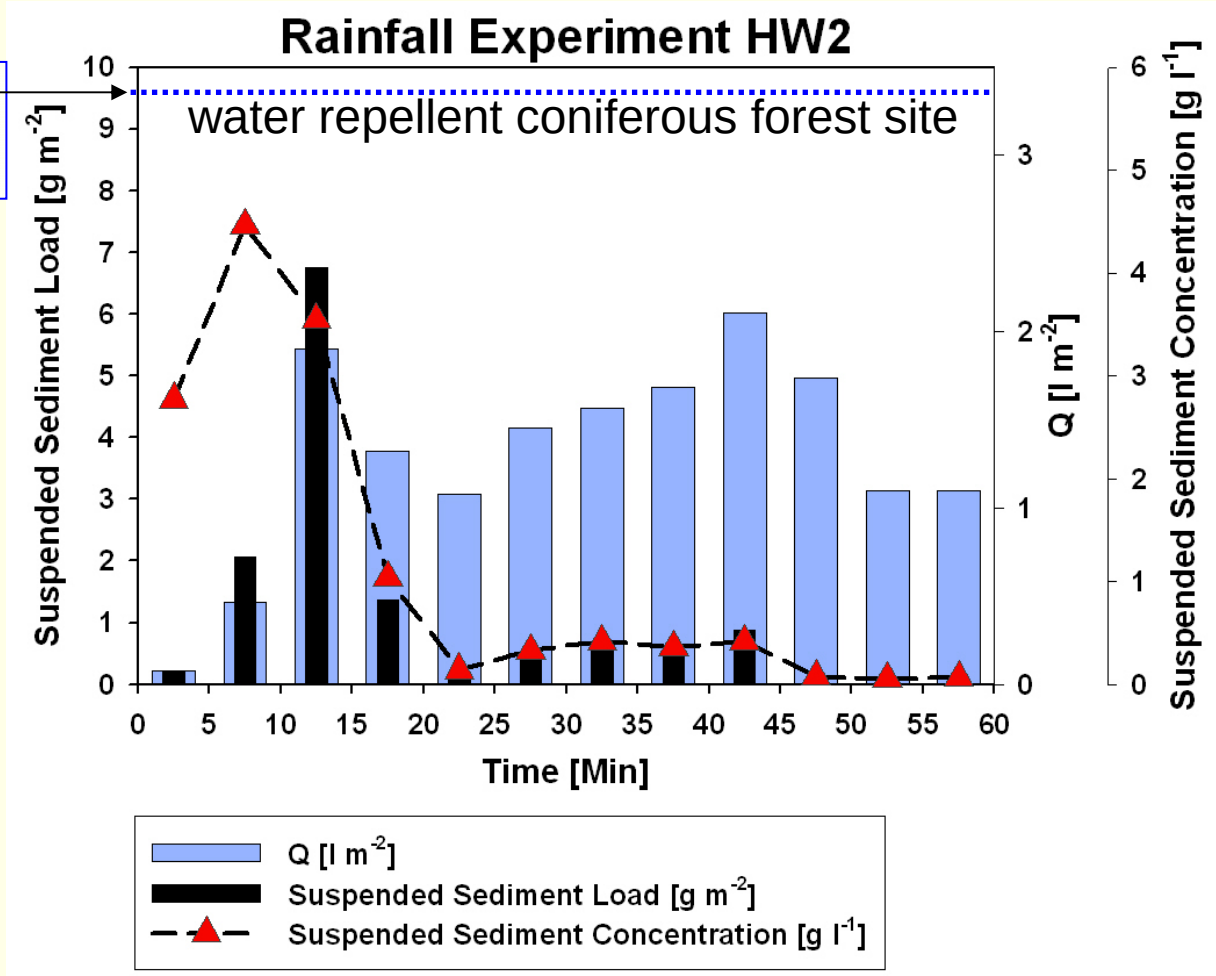




- soil mapping along slope catena
- geomorphological mapping

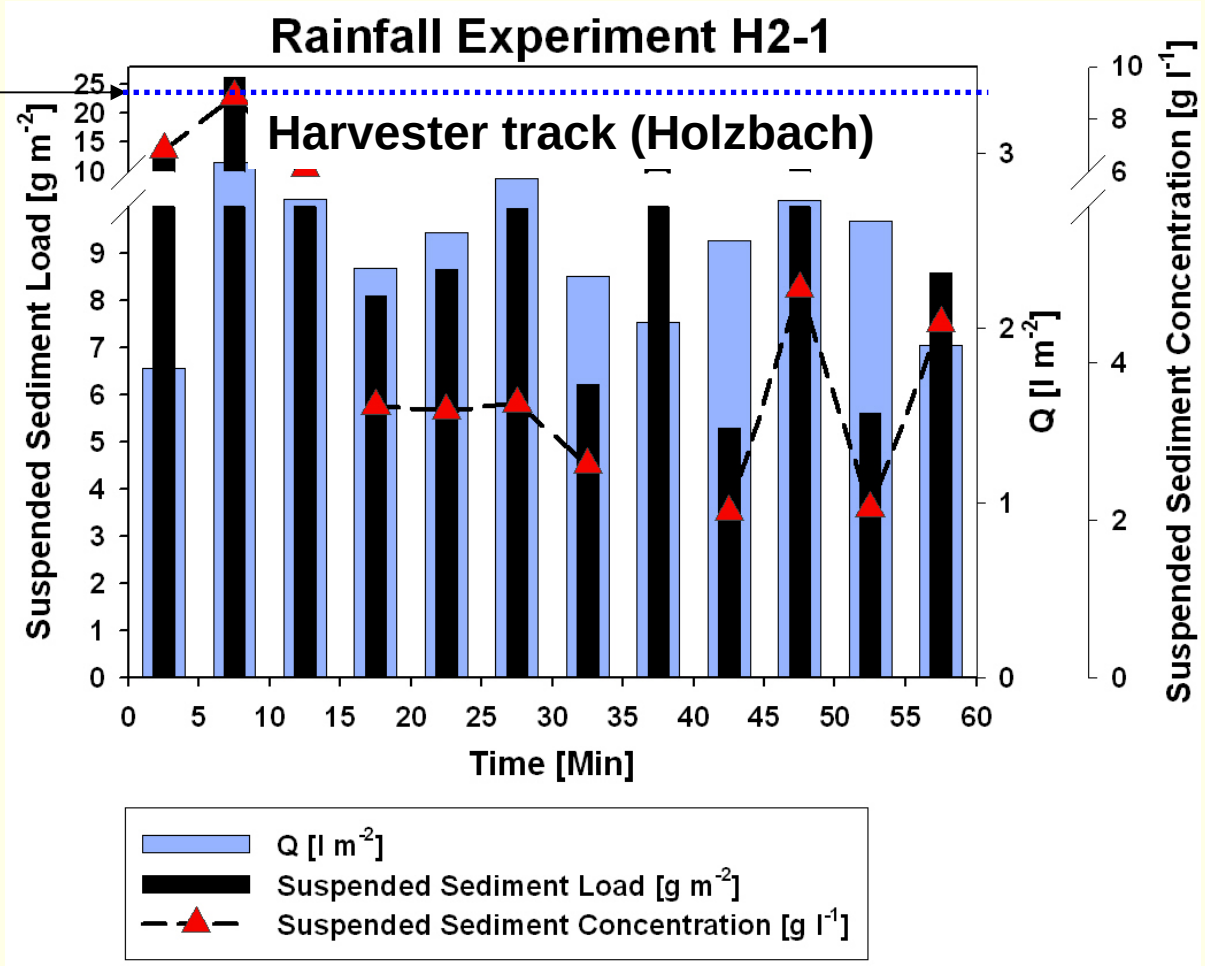
5.1) Results of the rainfall simulations

Rainfall: 40.3 mm h^{-1}
= 3.36 l m^2 in 5 min.



5.1) Results of the rainfall simulations

Rainfall: 40.7 mm h^{-1}
= 3.39 l m^2 in 5 min.



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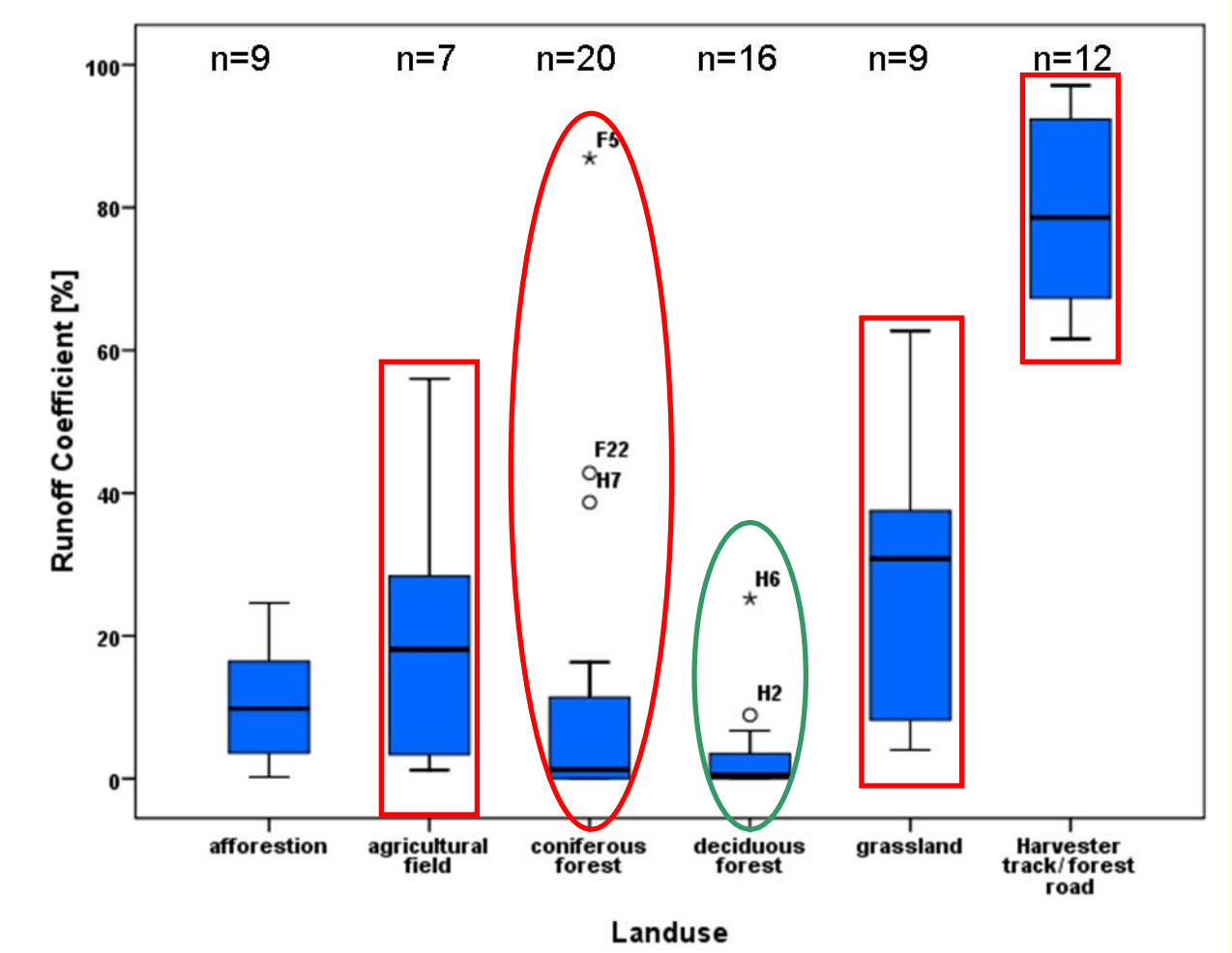

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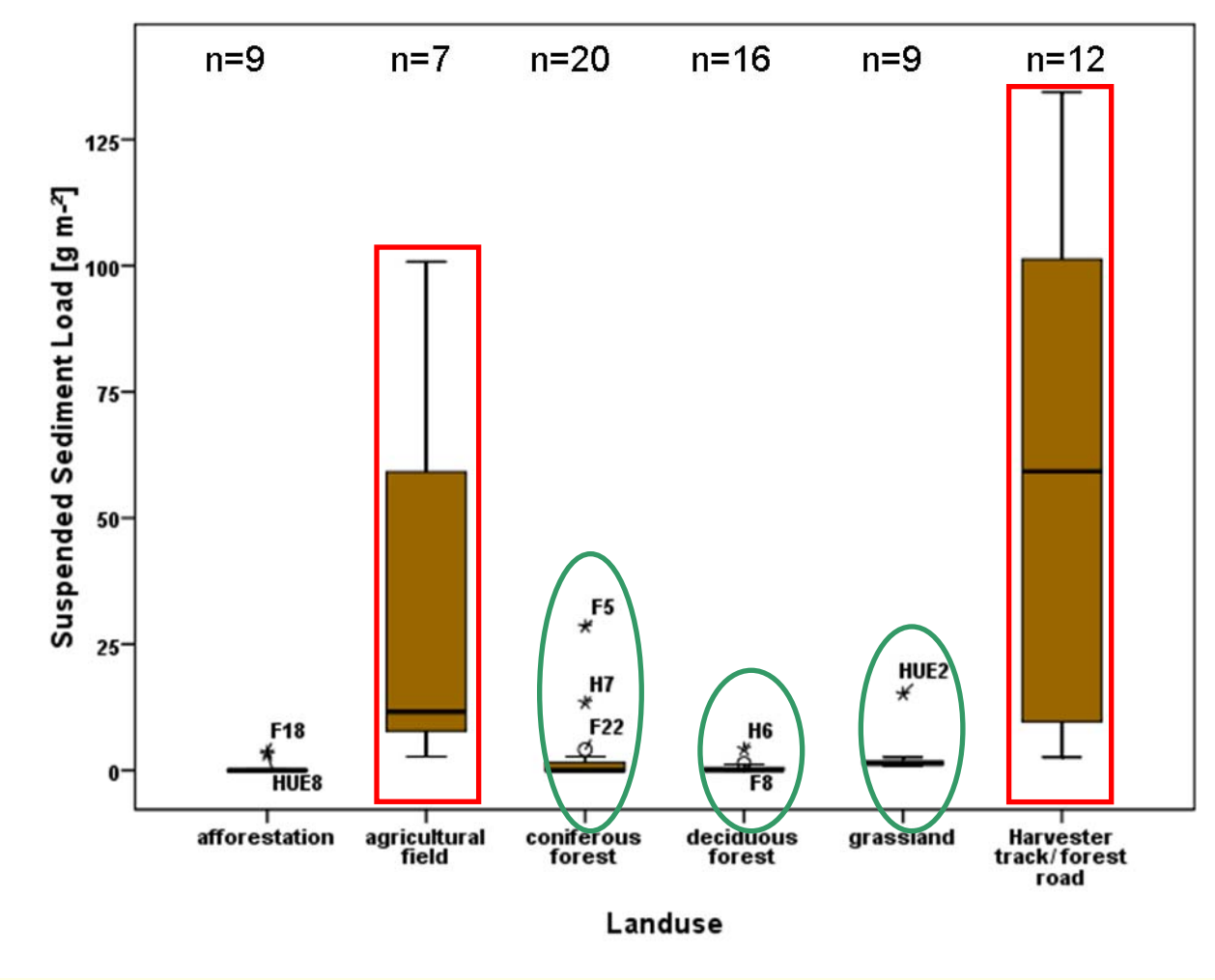

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5.2) Results rill erosion experiments (Holzbach)

Rill erosion experiments		Water amount [l]	Sediment-concentration [g l^{-1}]	Erosion [g m^{-2}]
Harvester track 1	Run A	800	0.50	14.0
Harvester track 2	Run A	1000	1.80	37.0
	Run B	1000	1.70	38.0
rill	Run A	1000	0.15	2.5
	Run B	1000	0.03	0.5
	Run C	1000	0.03	0.5

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5.2) Results rill erosion experiments (Holzbach)

Rill erosion experiments	n [g m^{-2}]
Harveste	14.0
Harveste	37.0
	38.0
rill	2.5
	0.5
	0.5

⇒ In Harvester tracks: high erosion rates possible

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6) Conclusions

- What is the actual status of surface processes in forests?
  - Overland flow generation:
    - In coniferous forests at dry conditions
    - On Harvester tracks and forest roads
  - Soil erosion hot spots:
    - Harvester tracks, forest roads
- Are the differences due to land management?
  - Overlandflow generation only at water repellent coniferous forest sites and in campacted areas like roads and tracks
  - Soil erosion (almost) only on roads and tracks, but high erosion rates!

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6) Conclusions

Photograph: Holzbach August 2009

- What should be considered in land-management?
  - Harvester tracks and roads not in flow direction (if possible)
  - Branches on the harvester tracks for erosion prevention
  - Use of heavy machinery only at rather dry conditions => less compaction

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Thank you very much for your attention!