Water and Solute Balances in Small Amazonian Forest and Pasture Watersheds

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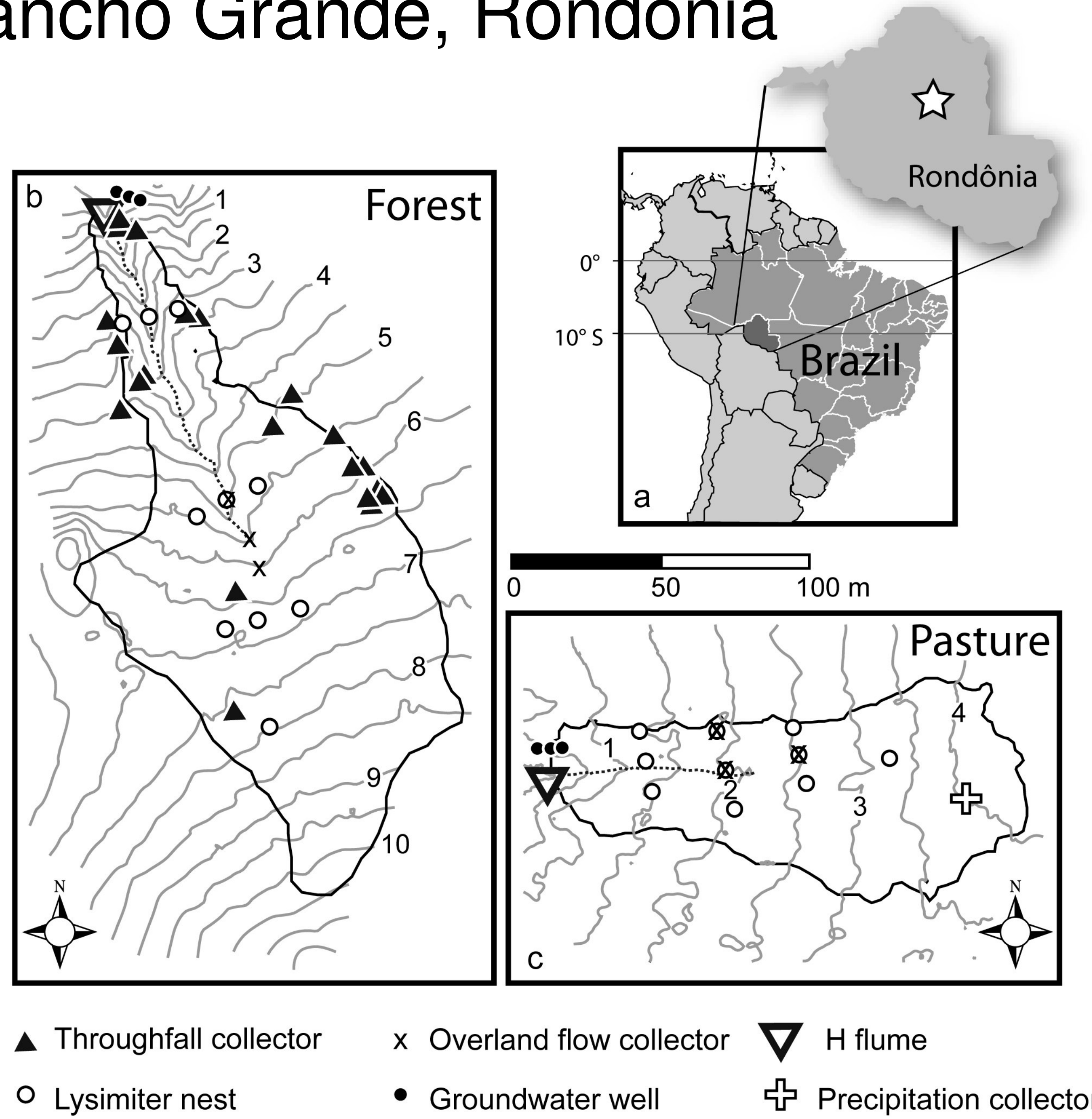

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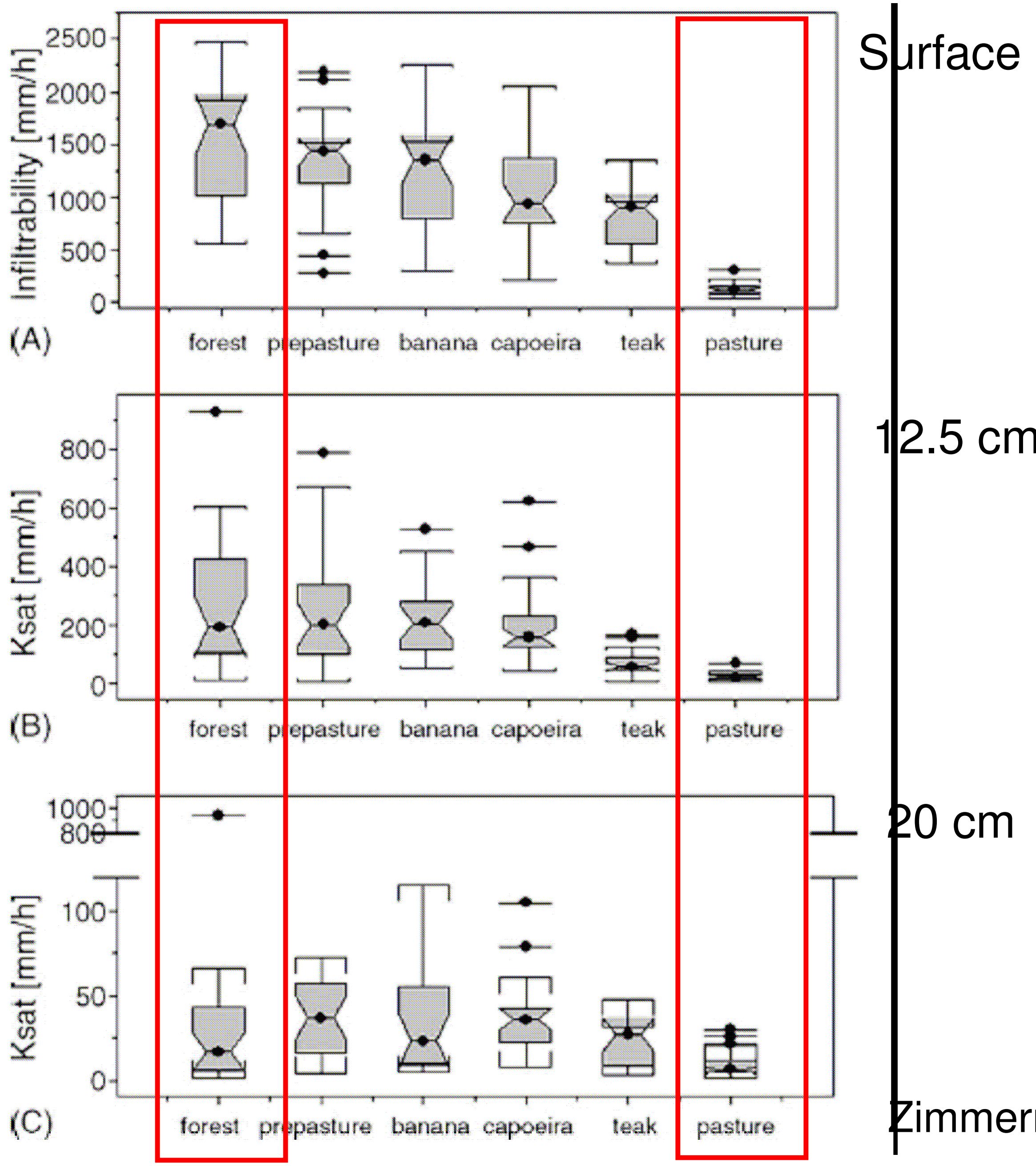
Infiltration and hydraulic conductivity



Zimmermann et al. 2006

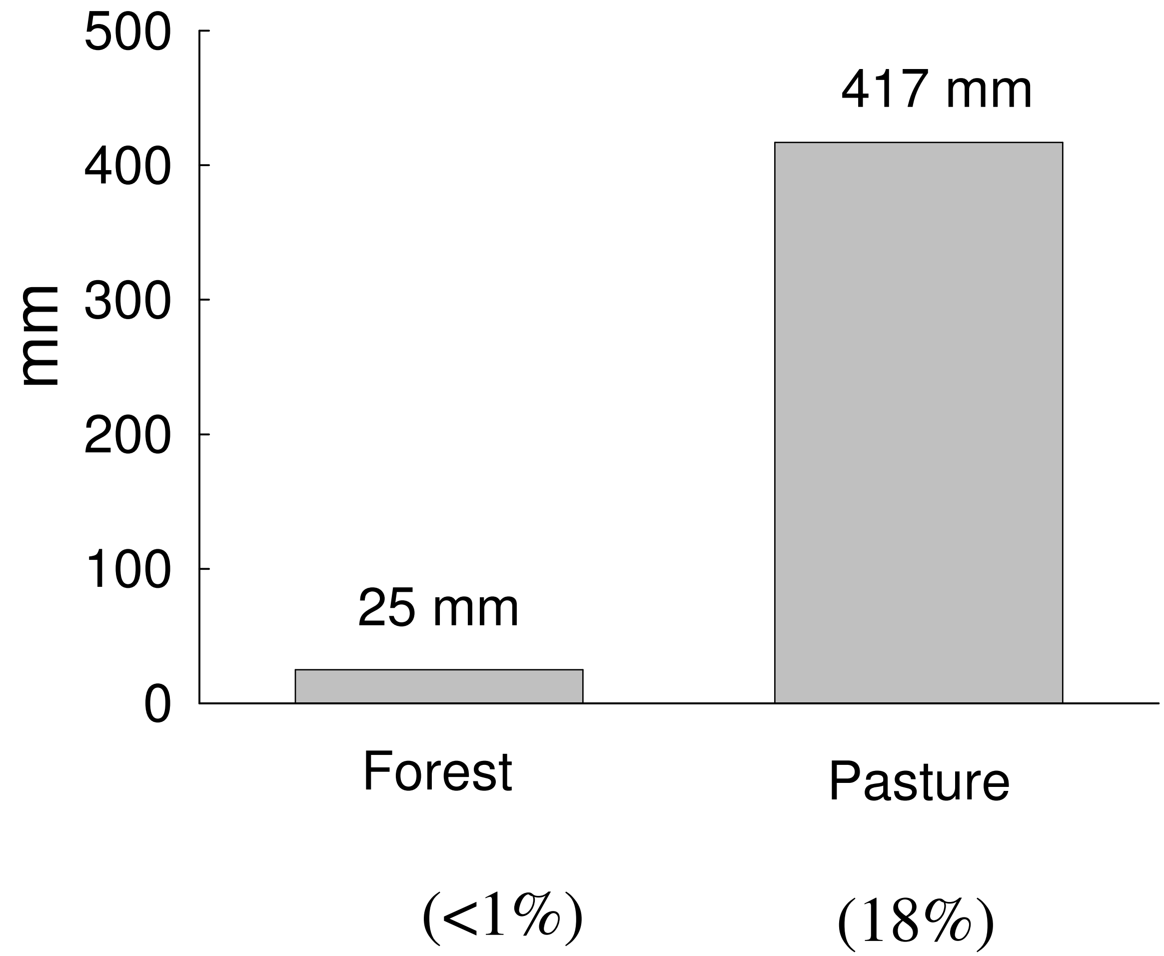
Annual water yield

Rain=2286 mm

176 rainfall events

70 generated flow in pasture

36 generated flow in forest



Quickflow and Baseflow

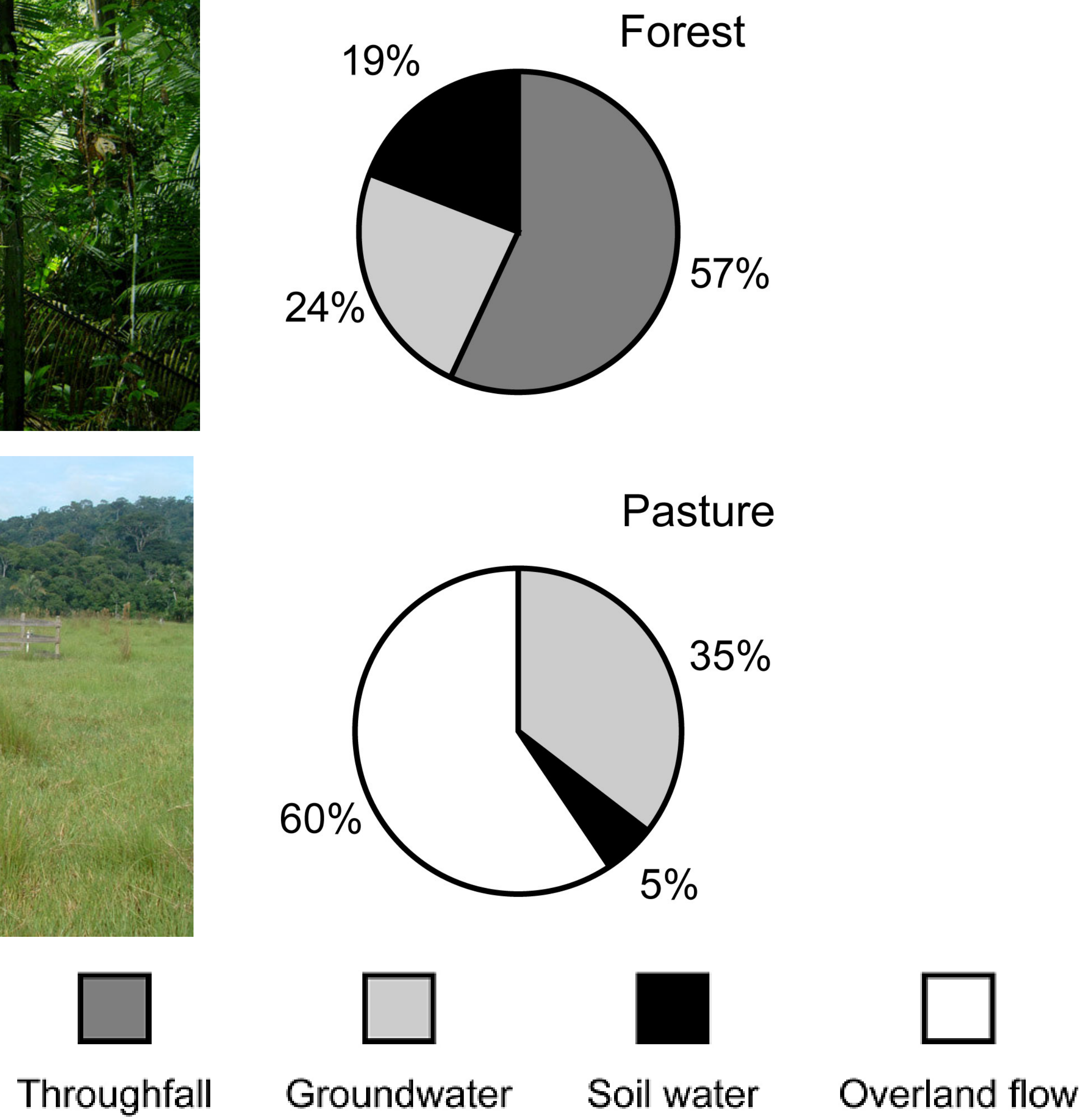
		No. events	Quickflow	Baseflow	Total
			-------------	mm------------------	
Forest	TDWS	11	2	0	2
	WS	25	23	0	23
	Total	26	25	0	25
Pasture	TDWS	12	48	0	48
	WS	58	360	9	369
	Total	70	408	9	417

Germer et al. in prep

Water balance

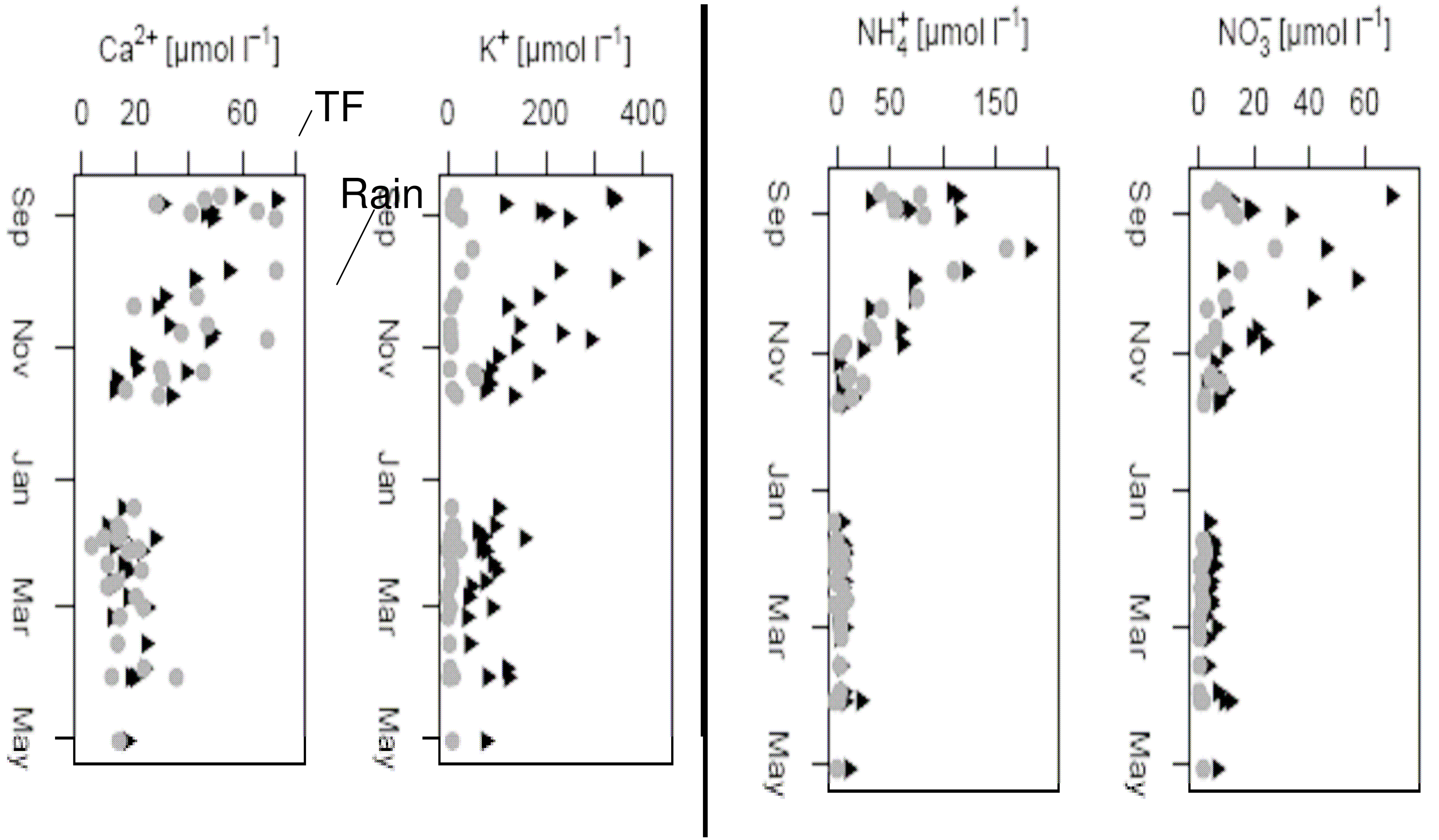
	Forest		Pasture	
	mm (% of precip.)			
Precipitation	2286			
Interception[a]	50	(2.2)	-	
Streamflow	25	(1.1)	417	(18)
Evapotranspiration	1387	(61)	1024	(45)
Groundwater recharge	824	(36)	846	(37)

Partitioning water sources with end member modeling



Chaves et al. 2007

Solute inputs in TF and rain are highly seasonal



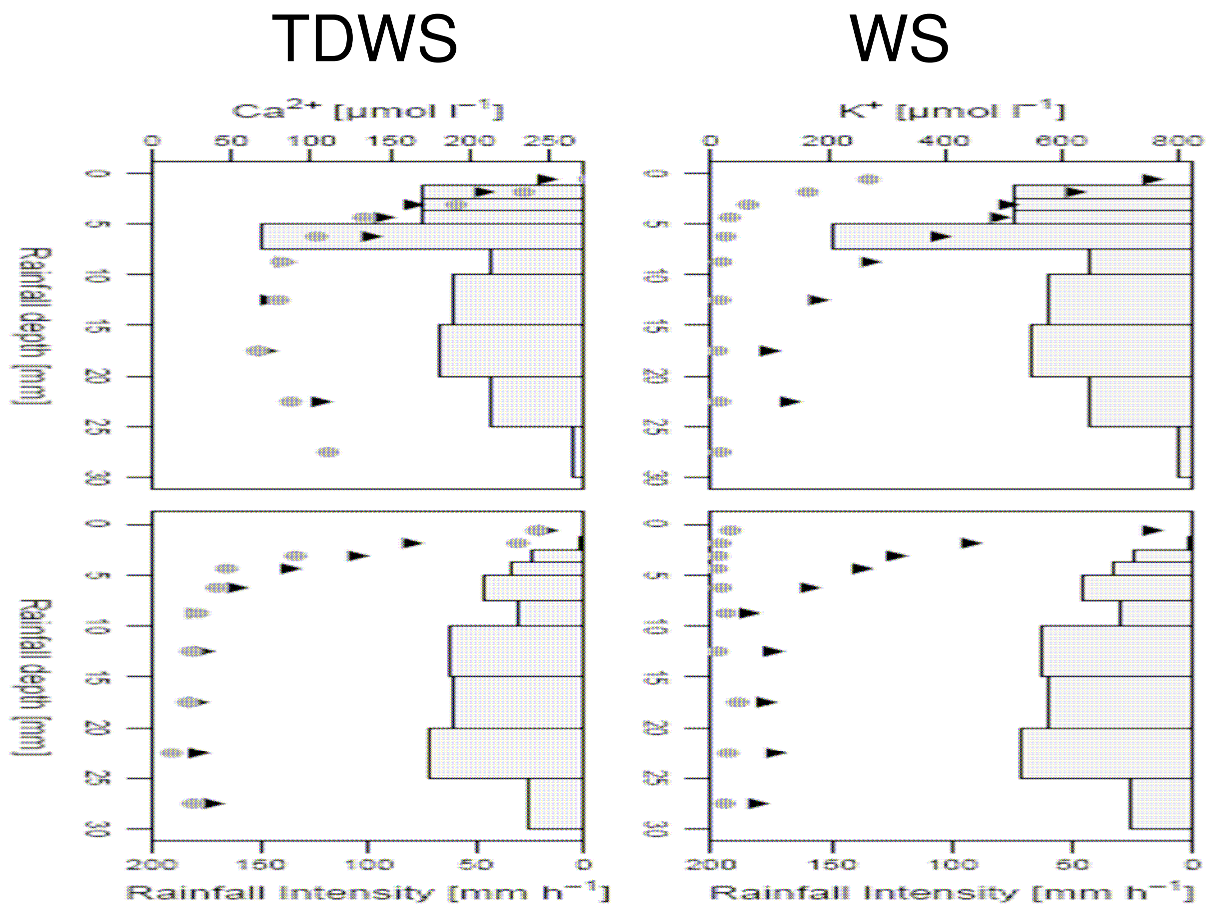
Germer et al. in press

Solute inputs in TF and rain are highly seasonal

	Total Flux ---kg ha^{-1}---		Ratio TDW / W	
	Rain	TF	Rain	TF
K	9	78	1.0	0.9
Ca	18	19	0.9	0.6
NO_3-N	1	2	7	5
NH_4-N	4	5	3	1.3

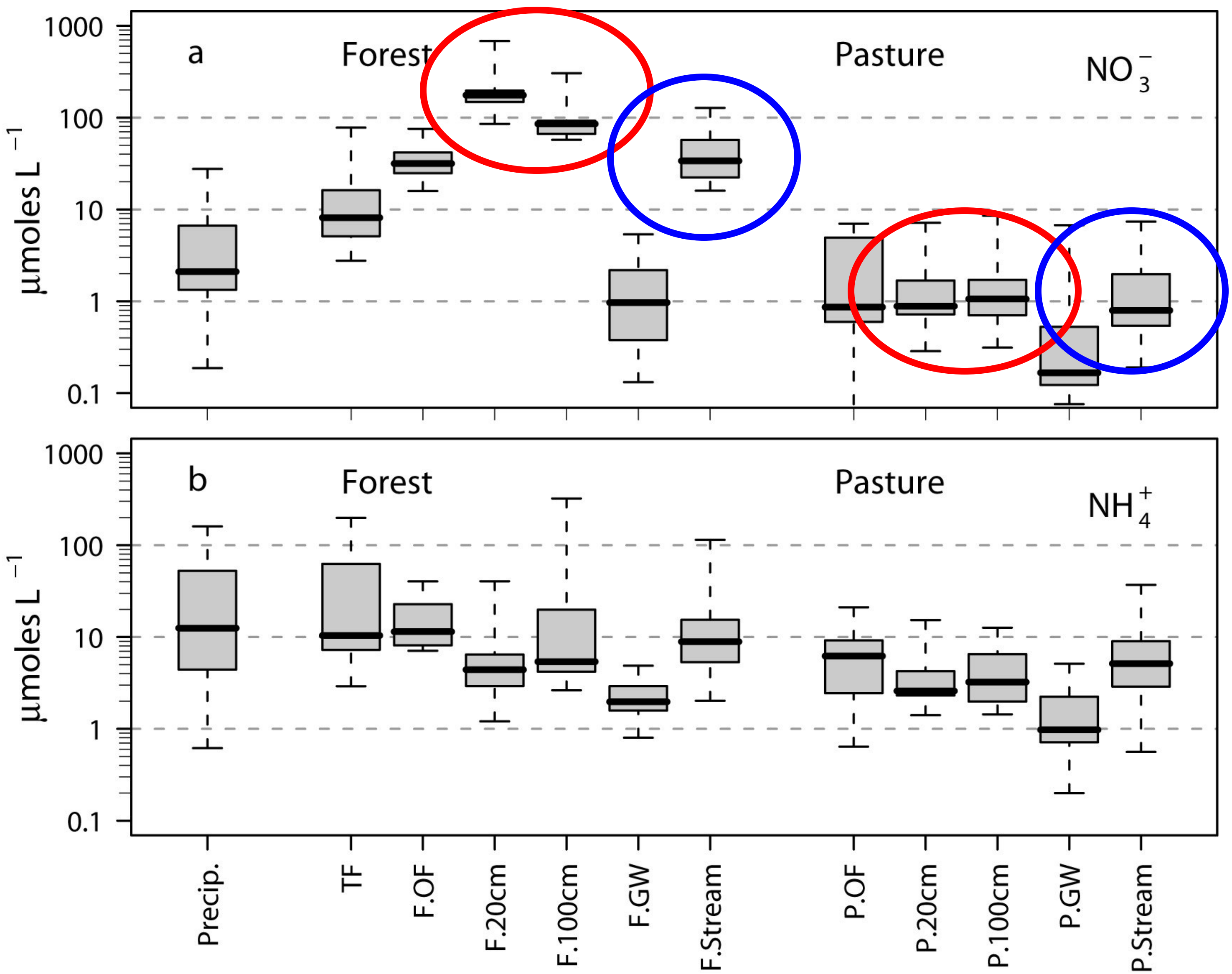
Germer et al. in press

Solute concentrations vary within rain events



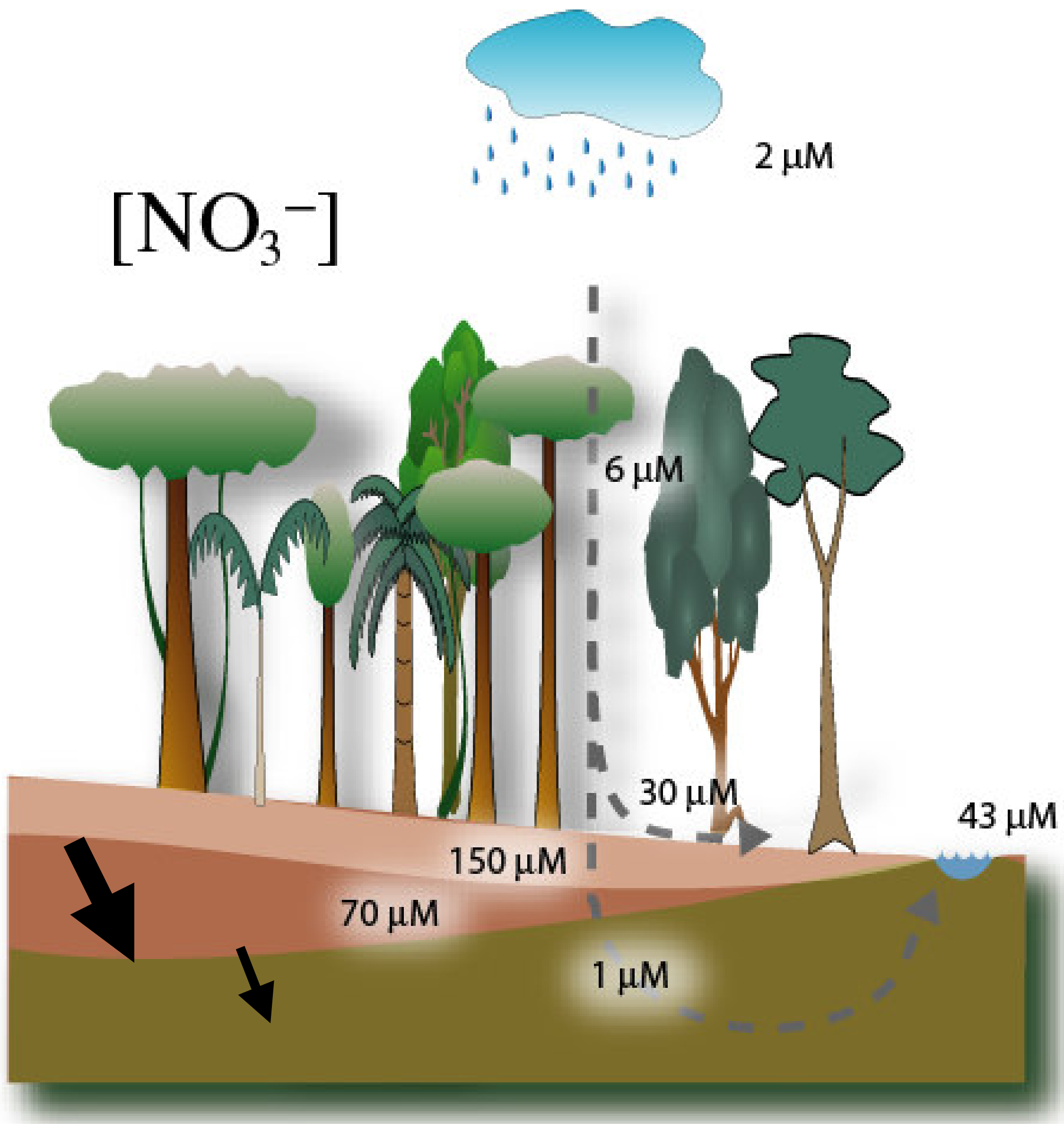
Germer et al. in press

Solute concentrations vary within flowpaths



Chaves et al. submitted

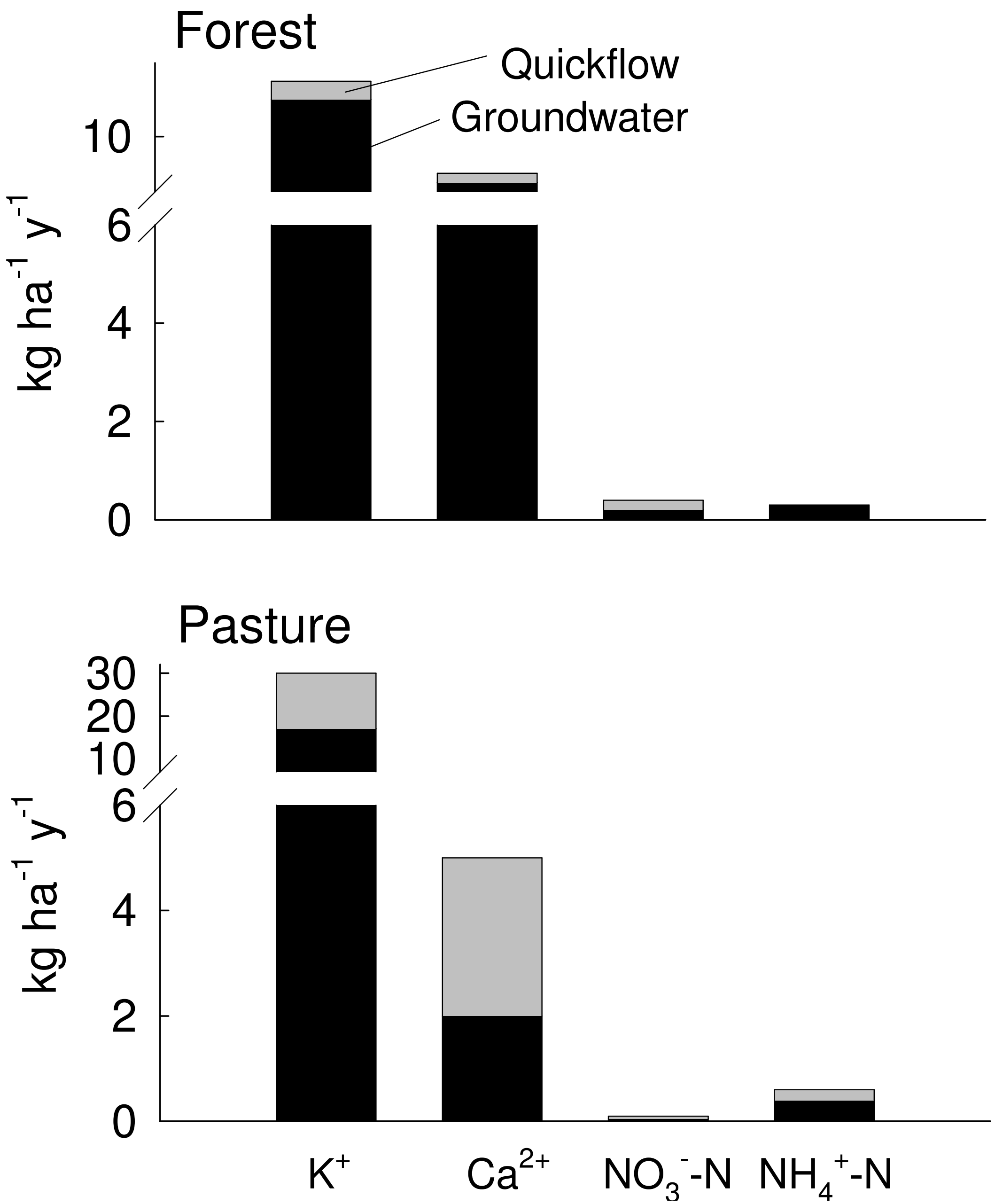
Solute concentrations vary within flowpaths



17.4 kg N ha^{-1}

0.1 kg N ha^{-1}

Pathways of solute export



Germer et al. in prep

Relative solute balances in forest and pasture

	Forest / Pasture
K^+	2.2
Ca^{2+}	0.7
NO_3^--N	0.3
NH_4^+-N	1.8

Germer et al. in prep

Conclusions

1) Large decreases to soil infitrability and permeability lead to 18 x increase in streamflow from pasture

2) Quickflow dominates surface water output in forest and pasture

3) Large seasonal and within-rain event concentrations of most solutes likely related to fragmented regional landscape

4) Large amount of NO_3^- removal between soils and groundwater apparently occurs at soil-groundwater interface

Conclusions

5) Biogeochemical “homogenization” of flowpath chemistry in pasture leads to low DIN export

6) Despite importance of surficial flowpaths to stream flow, most solute export is via groundwater

7) Despite large shifts in runoff generation and differences in flowpath chemistry, differences in total export are surprisingly modest

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DAAD

MBL Biological Discovery in Woods Hole
Founded in 1888 as the Marine Biological Laboratory

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