

The background of the slide is a close-up photograph of soil and dry, brown grass. The soil is dark brown and appears to be a mix of fine particles and small clumps. The grass is dry and brittle, with some green blades still visible on the right side. The overall scene suggests a natural, possibly high-altitude or mountainous, environment.

**Soil – hydrologic conditions
after the windstorm 2004 in the Tatra Mts**

Peter Fleischer

**Research station and Museum of TANAP
Tatranska Lomnica**

The Tatra Mts – huge mountain barrier

specific climate

- downslope winds
- precipitation regime

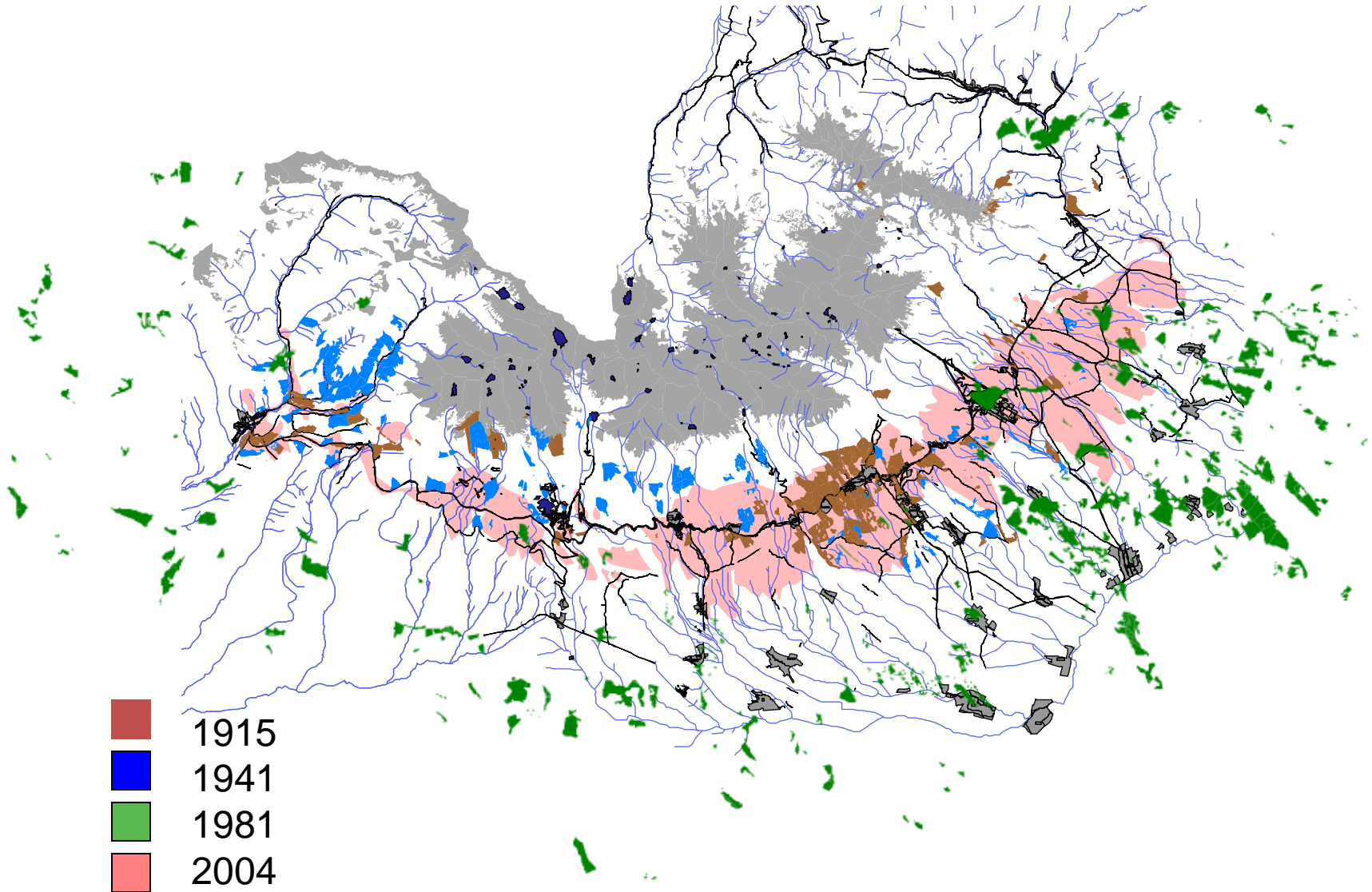


Windstorm November 19, 2004

windfall 12 000 ha
volume 2,3 mil m³
wind gusts 230 km/h

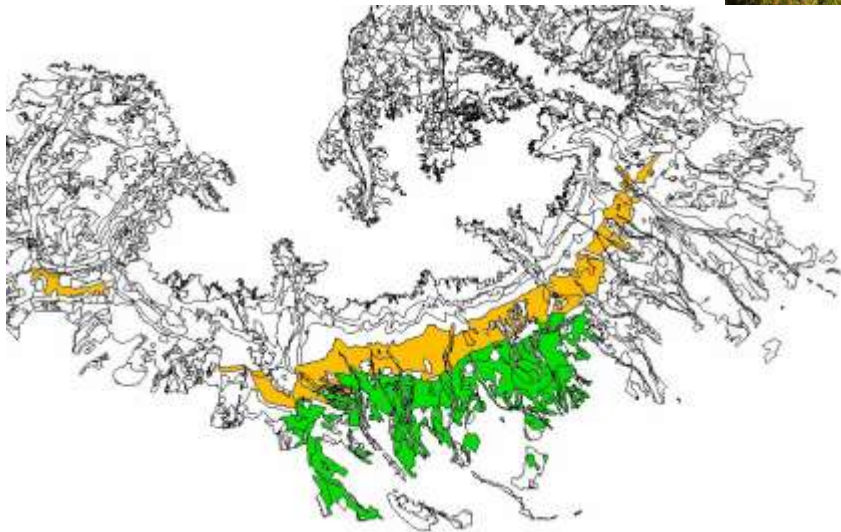
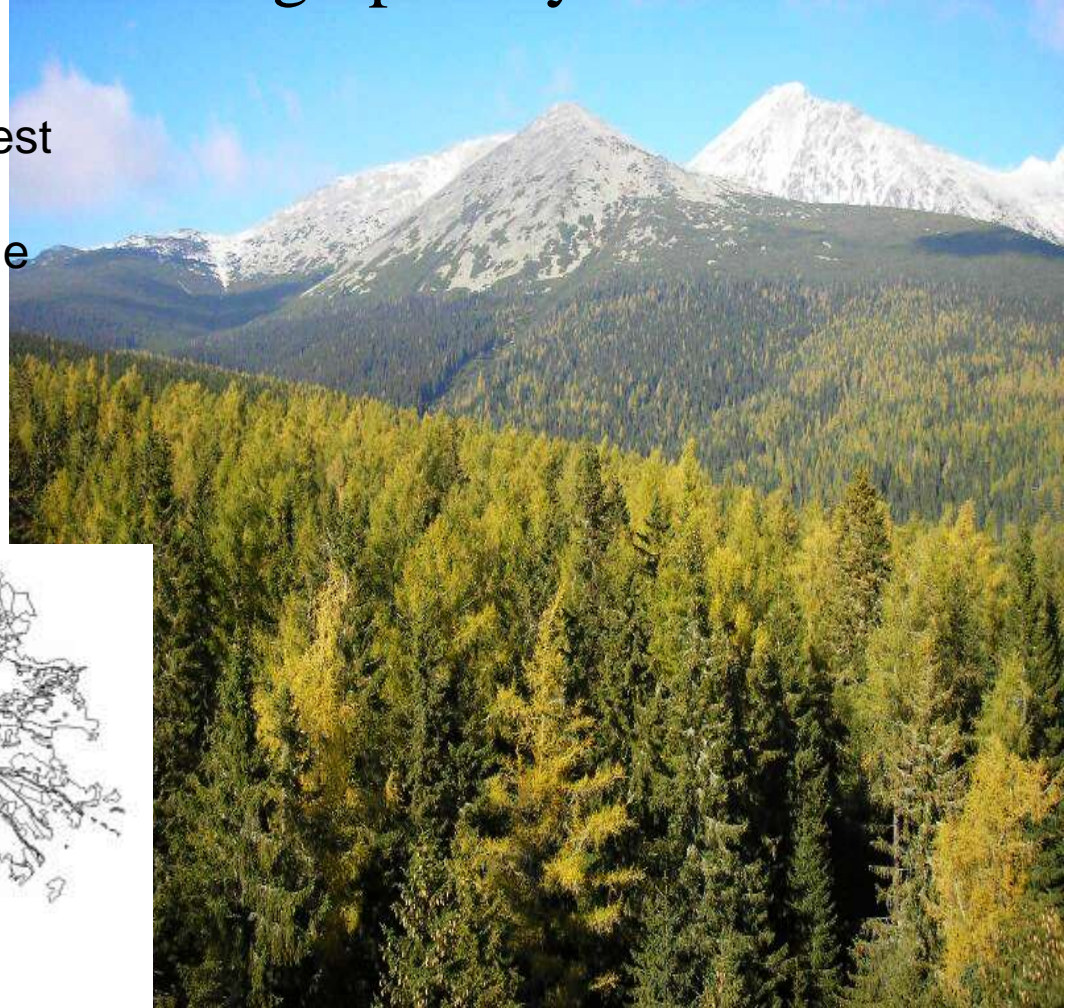


History of large-scale windfalls since 1915



The Tatra Mts as an anemo-orographic system

- regional scale: spruce –larch forest
- succesional stage
- blocked forest development cycle
- no climax
- microsite scale:
- pit and mound formation



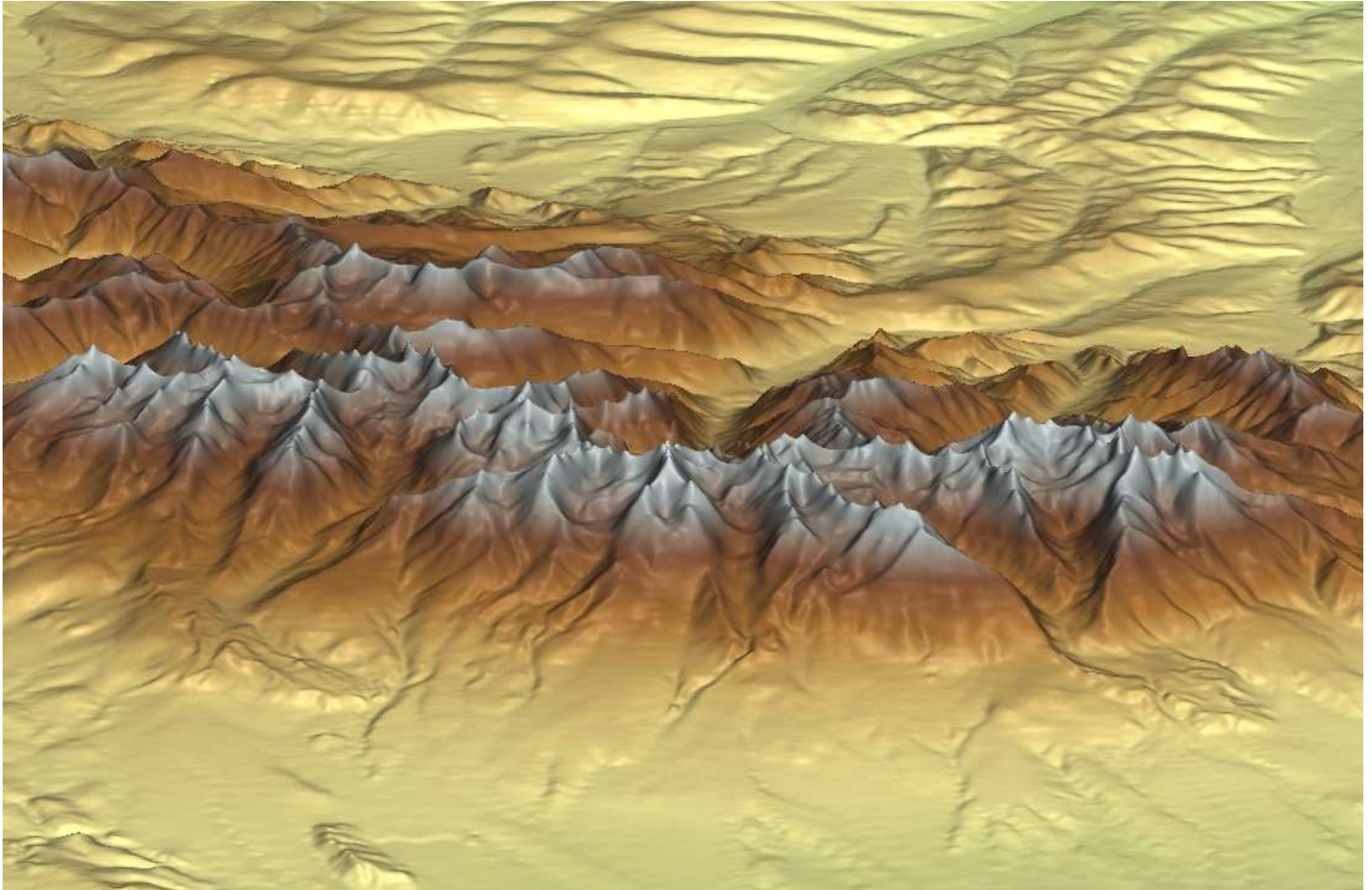
20 km

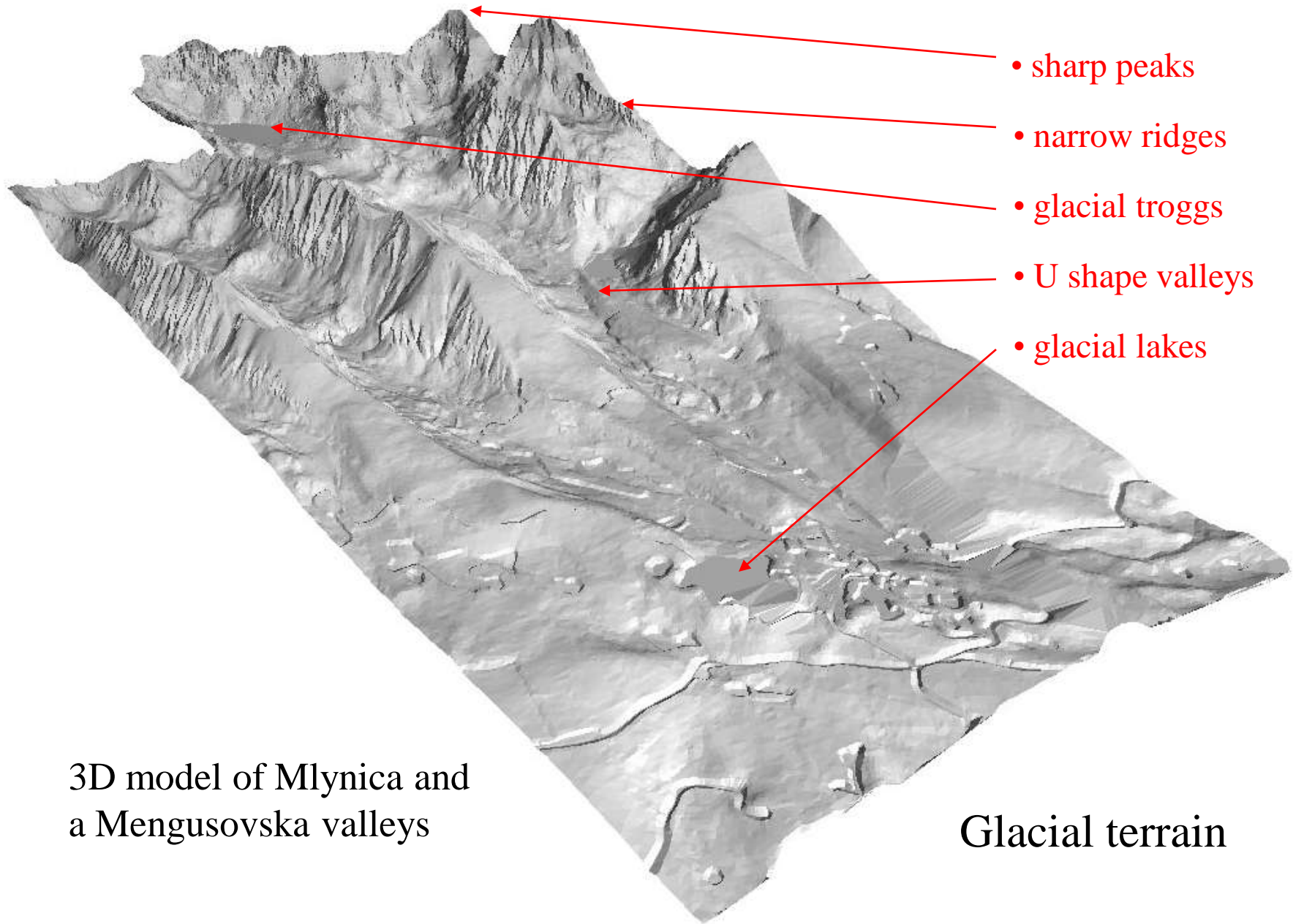
The Tatra Mts

precipitation pattern

precipitation shade

vertical gradient



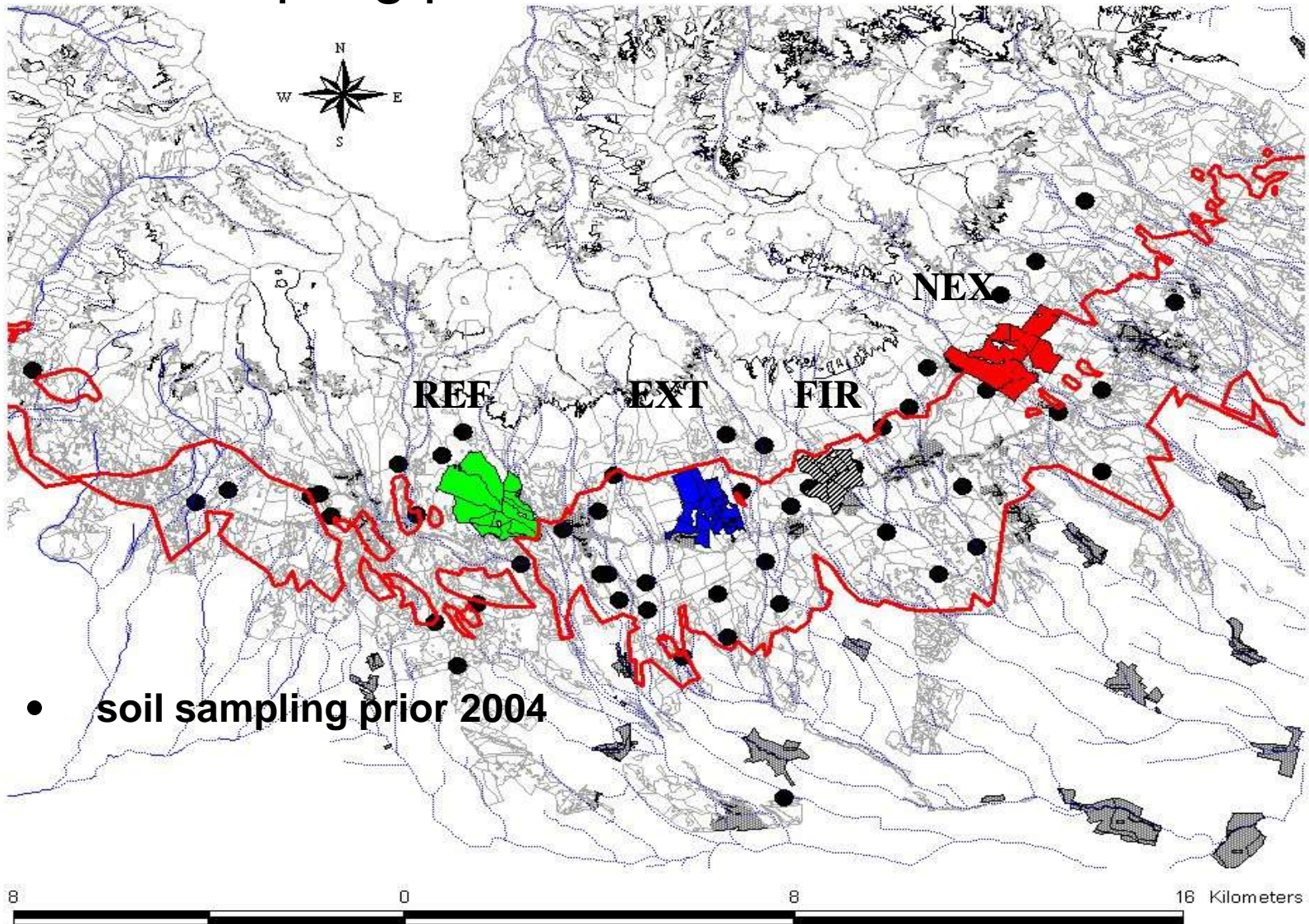


- sharp peaks
- narrow ridges
- glacial troughs
- U shape valleys
- glacial lakes

3D model of Mlynica and
a Mengusovska valleys

Glacial terrain

Soil sampling prior and after 2004



Soil properties (before 2004) on current windfall

Type: Podzolic cambisol

Humic podzol

Organic humus layer 6-10 cm (p 0.05)

Stones: A 33%

B 44%

Particle size: loam (A, B)

Humus cont. : A 16% (2-28)

B 7%

C:N ratio: A 18 (10-22)

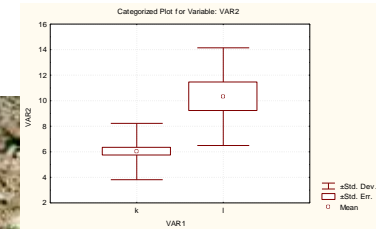
B 16

pH (H₂O) A 3.1 – 4.4 (med 3.7)

B 3.2 – 4.6 (med 4.0)

Confirmed by post-windstorm analysis

*Novak et al, Simonovicova et al., Gomoryova et al.,
MPI Jena*



Interception in closed Norway spruce forest

>50%



Soil –hydric conditions as a part of Windfall reserach

multidisciplinary ecological research and monitoring on consequences caused by windfall on forest ecosystems and their surrounding under different management

FE components

atmosphere

soil

water

vegetation

fauna

microorganisms

H:

humus mineralisation and reduction

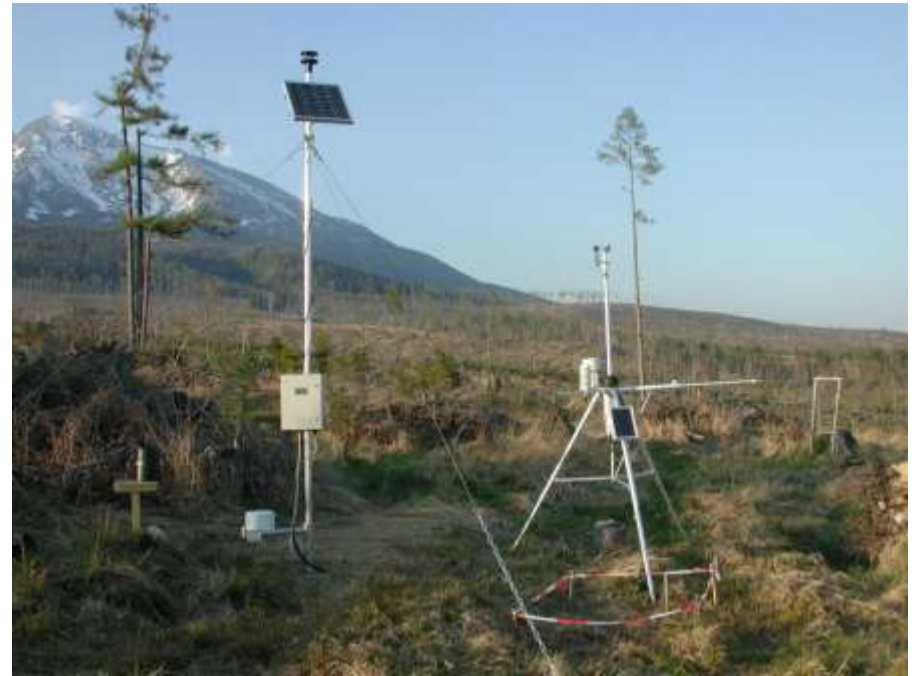
nutrient leaching, water quality, N

erosion

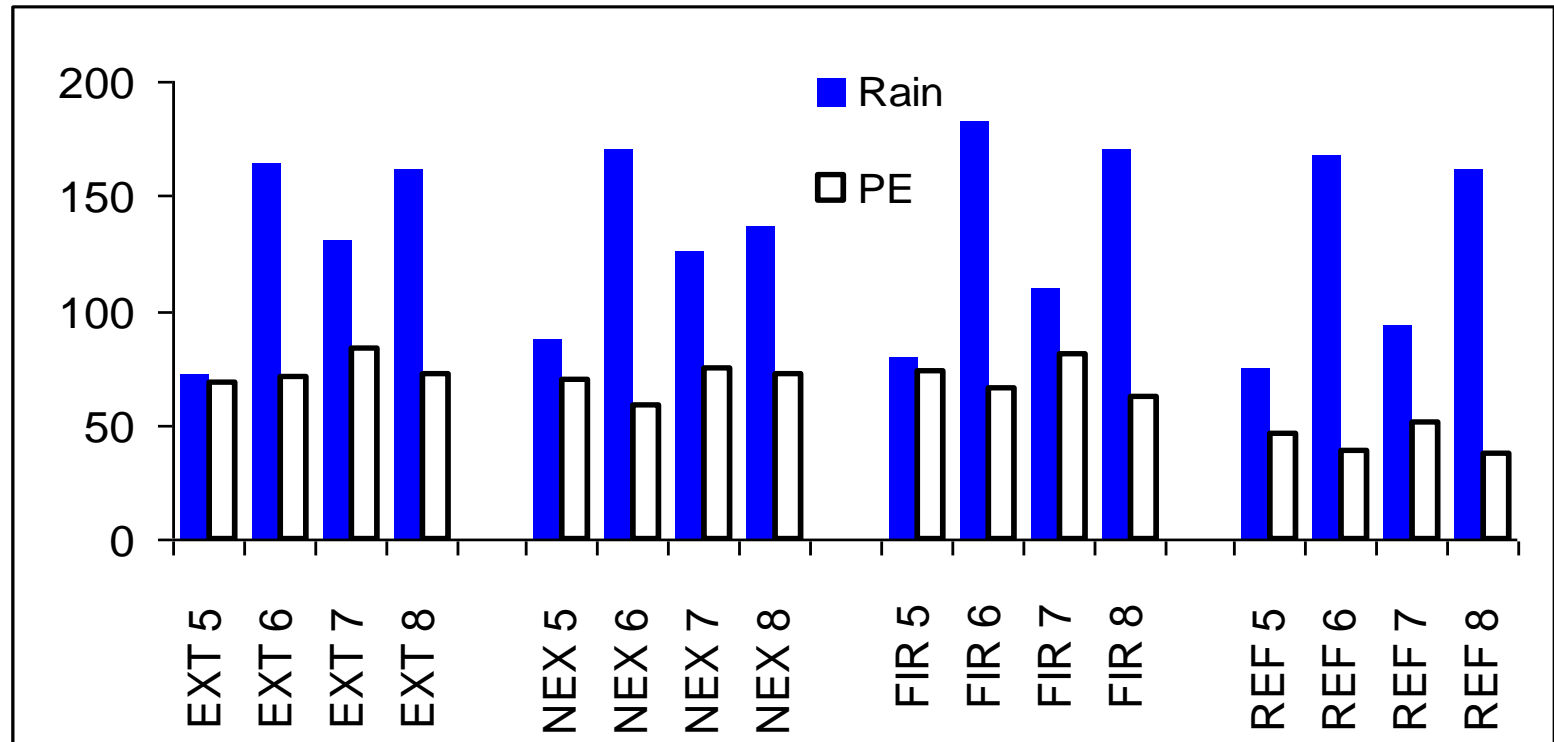
extremal hydric regime, moist-wet, dry-very dry

top soil overheating

deeper and longer soil frost



Potential evapotranspiration



based on 2009 (V-VIII) monthly avg AT and RH (Ivanov's method)

Soil temperature and moisture

each site equipped with:

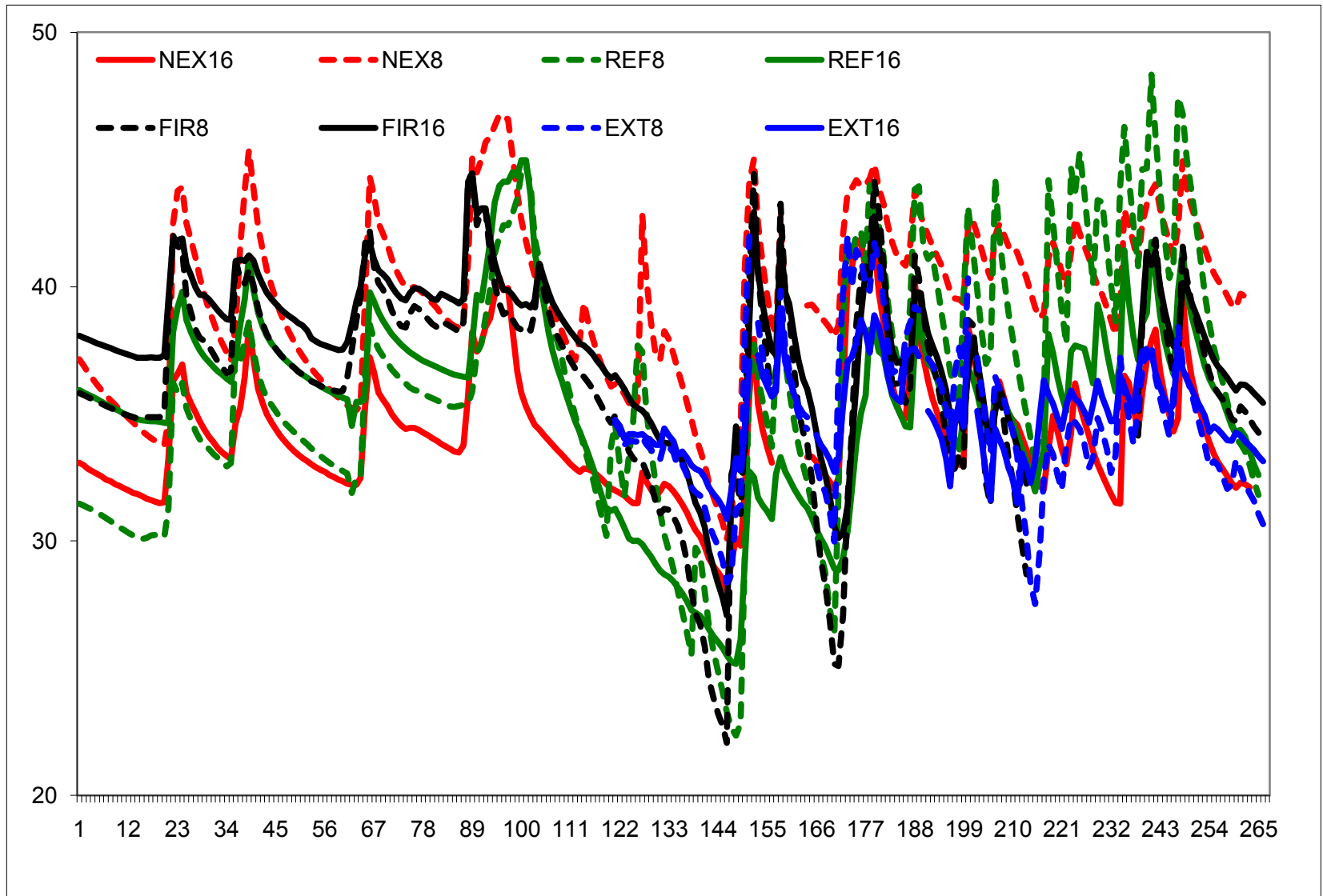
- thermometer (PT100, PT108)
in 8 and 16 cm depth
- theta Delta ML2x, impedance meth.

manual verification

- precise laboratory thermometer
- portable ML2x
- gravimetry

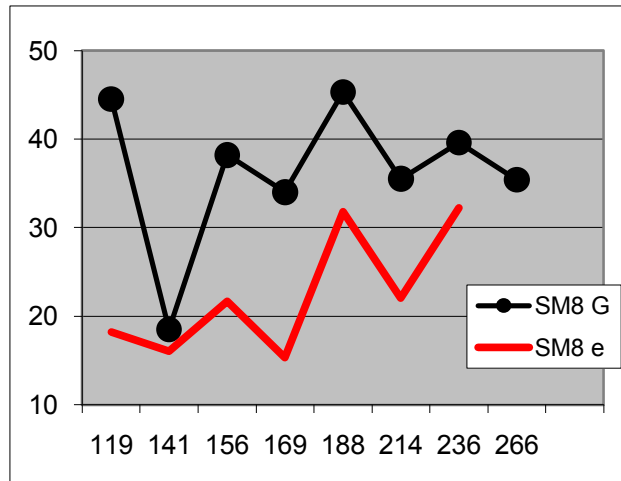


Soil moisture (% V) in 2009, all localities

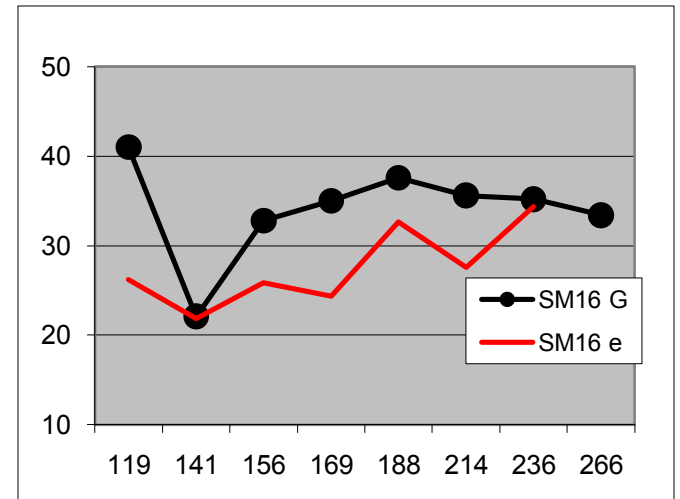


FIR 2009 SM % (V) vs G

FIR 2009 SM8

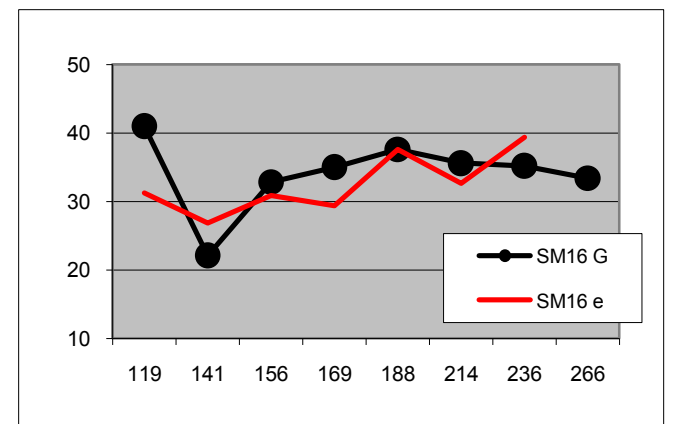
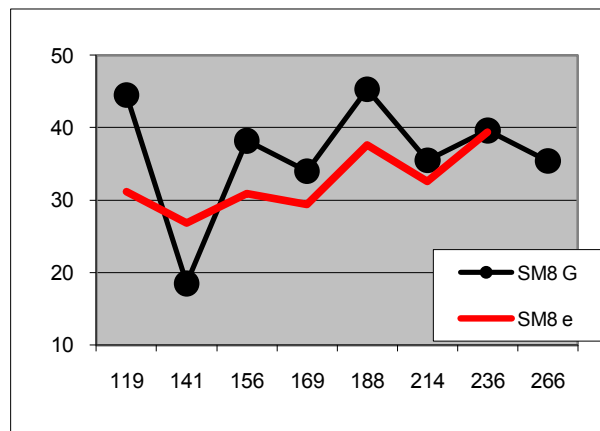


FIR 2009 SM16

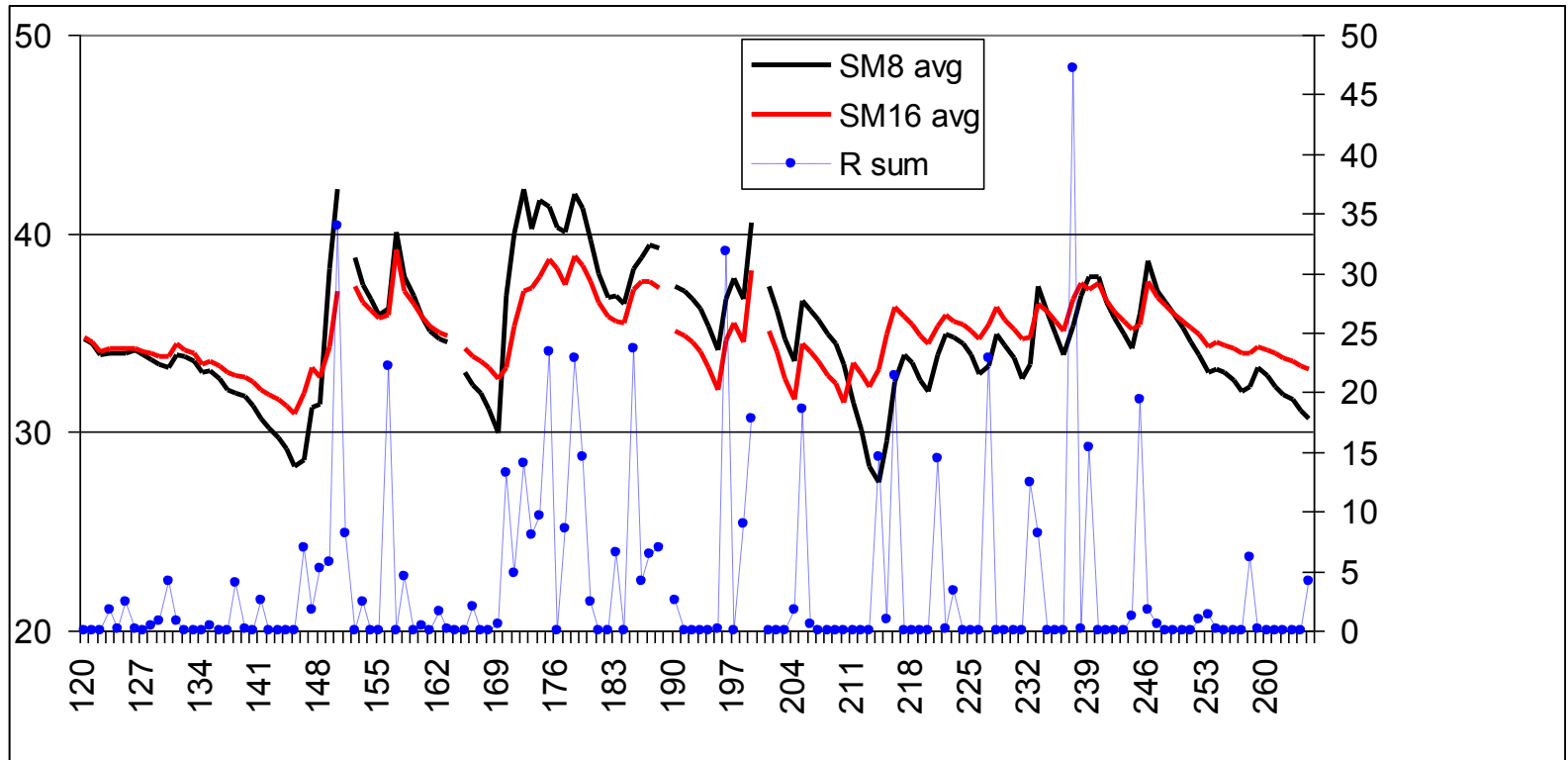


prior humus
content corr

after humus
content corr

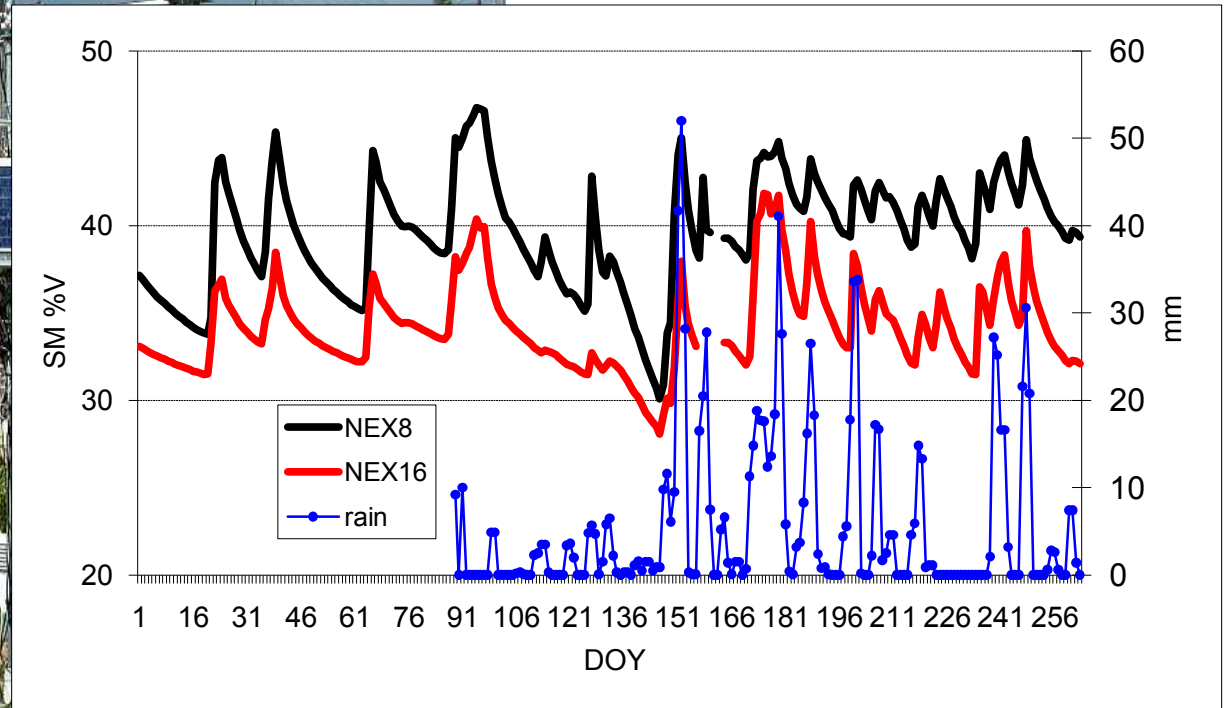
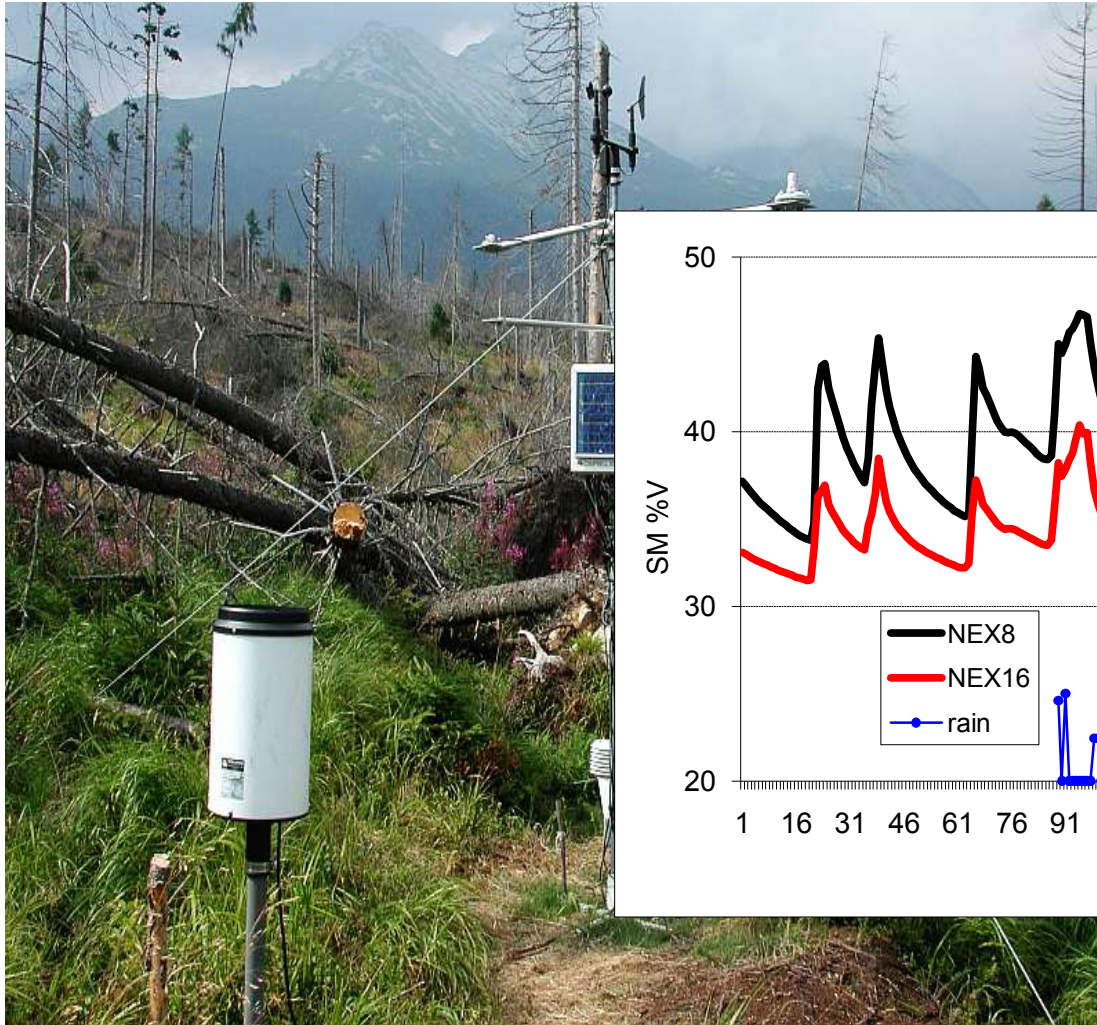


EXT 2009 SM8, SM16 and Rain



dense grass vegetation
A loam
B loam

NEX 2009 SM % (V) and R



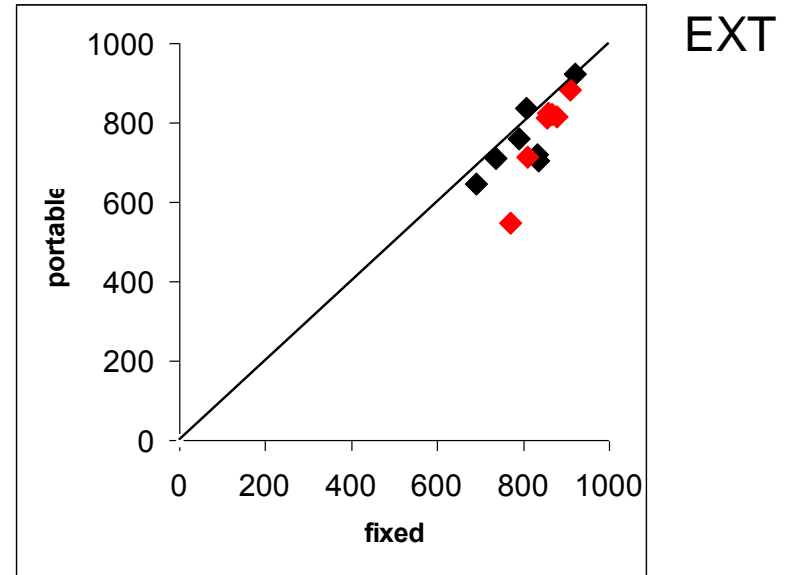
sparse vegetation

A – loam

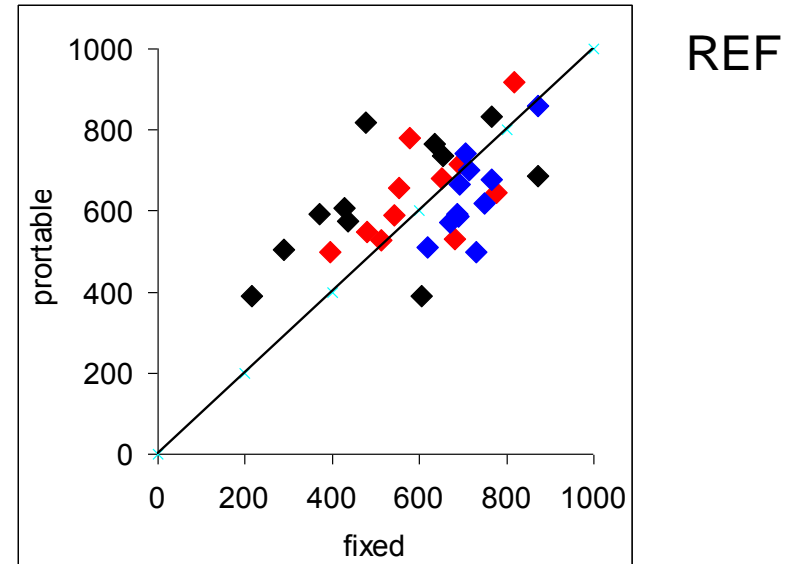
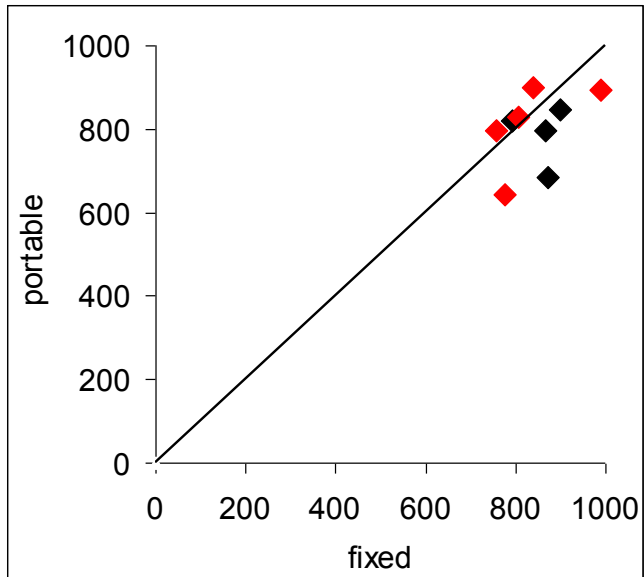
B1- sandy loam

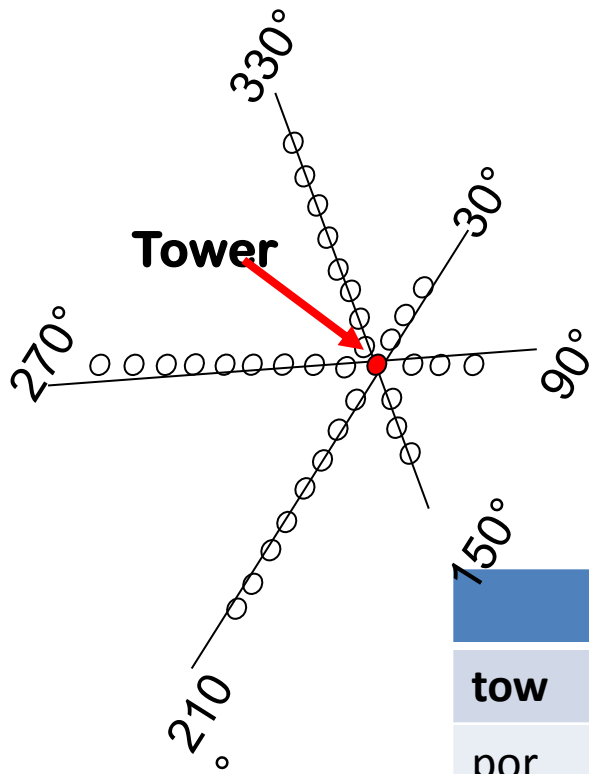
B2- sandy

Soil moisture verification



NEX





Aquater300
(capacitance)
Saturation %

REF 24 08 2009

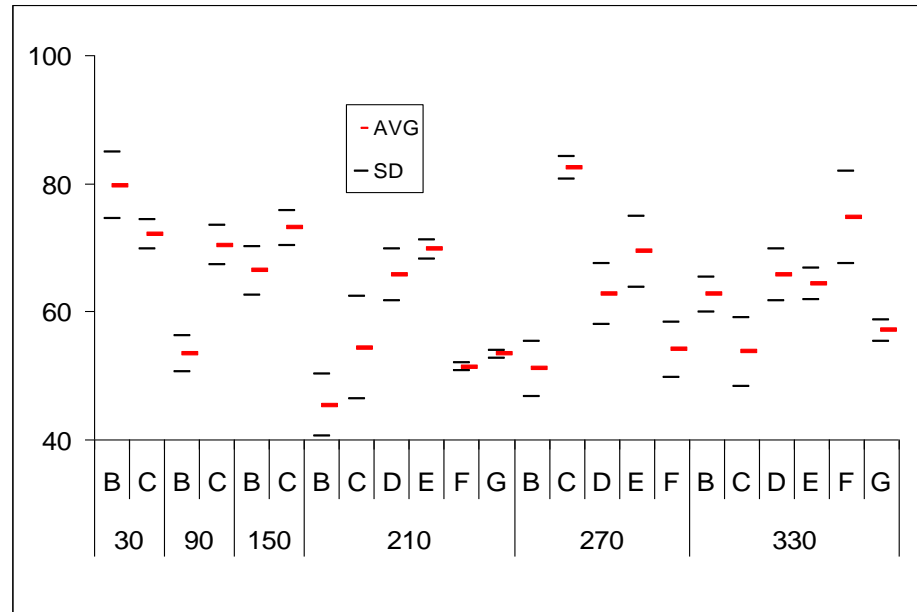
Delta theta
(impedance)
ML2X

	8	16	32
tow	32	39	39
por	39	34	35
	34	34	34
	41	35	31
	35	37	40
avg	37	36	35
Grav	39	35	30

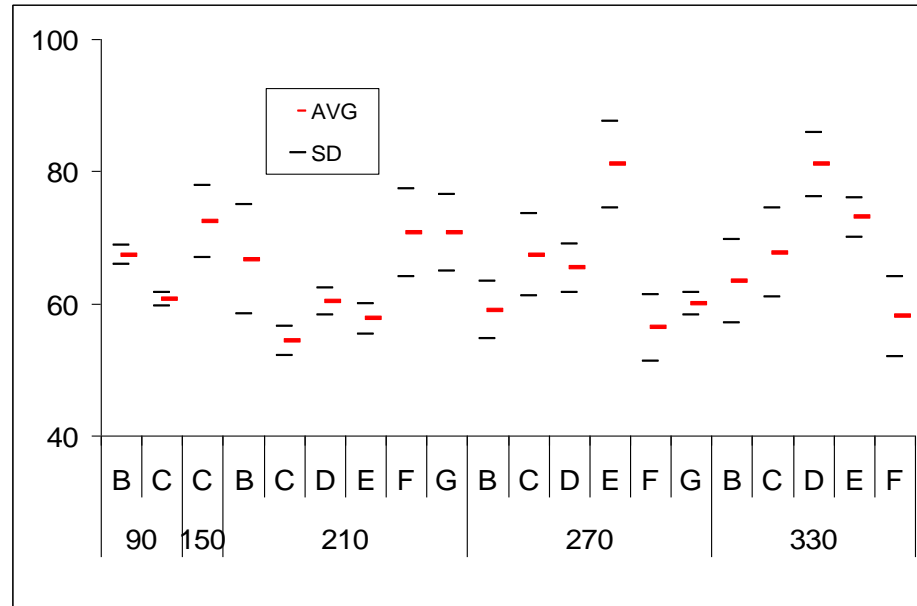
	1	2	3	Av	sd
270b	51	68	58	59	7
270c	74	53	75	67	10
270d	57	70	69	65	6
270e	66	91	86	81	11
270f	55	47	67	56	8
270h	58	64	58	60	3
330b	78	55	57	63	10
330c	83	62	58	68	11
330d	85	70	88	81	8
330e	76	77	66	73	5
330f	72	50	52	58	10
90b	69	64	69	67	3
90c	60	63	59	61	2
150c	66	85	66	72	9
210b	49	82	69	66	14

Soil saturation

REF site



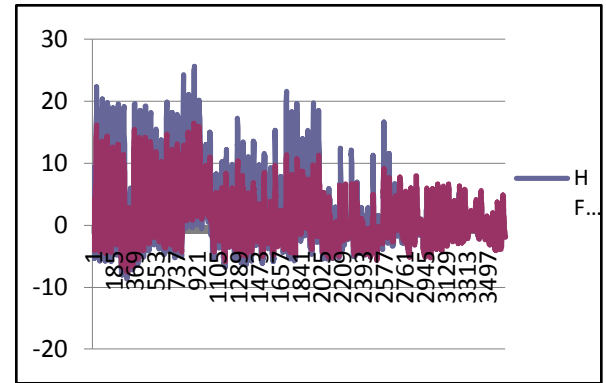
moisture heterogeneity
a key for natural succession



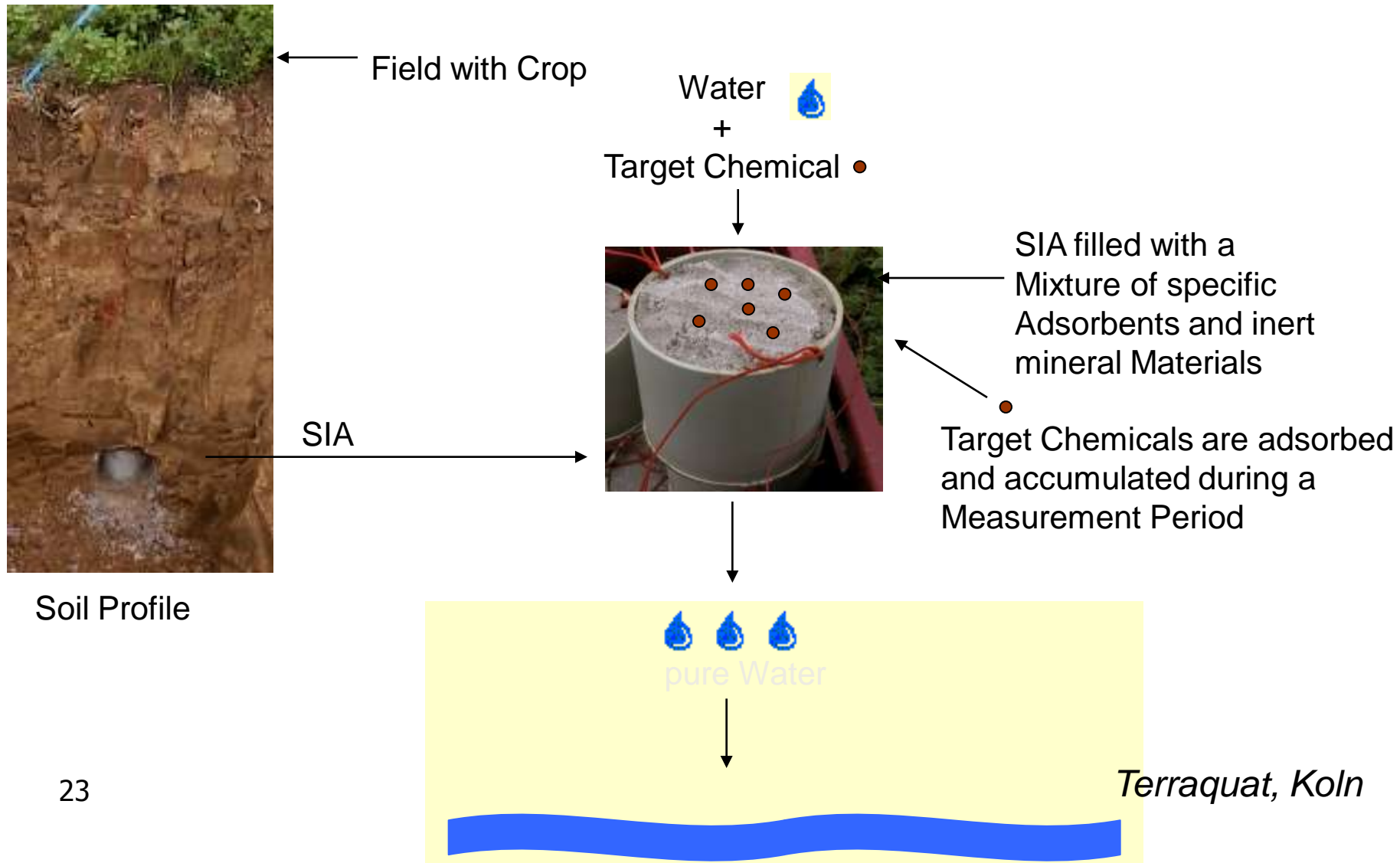
Regeneration – an indicator of status improvement



FIR 2005-2008 vegetation succession



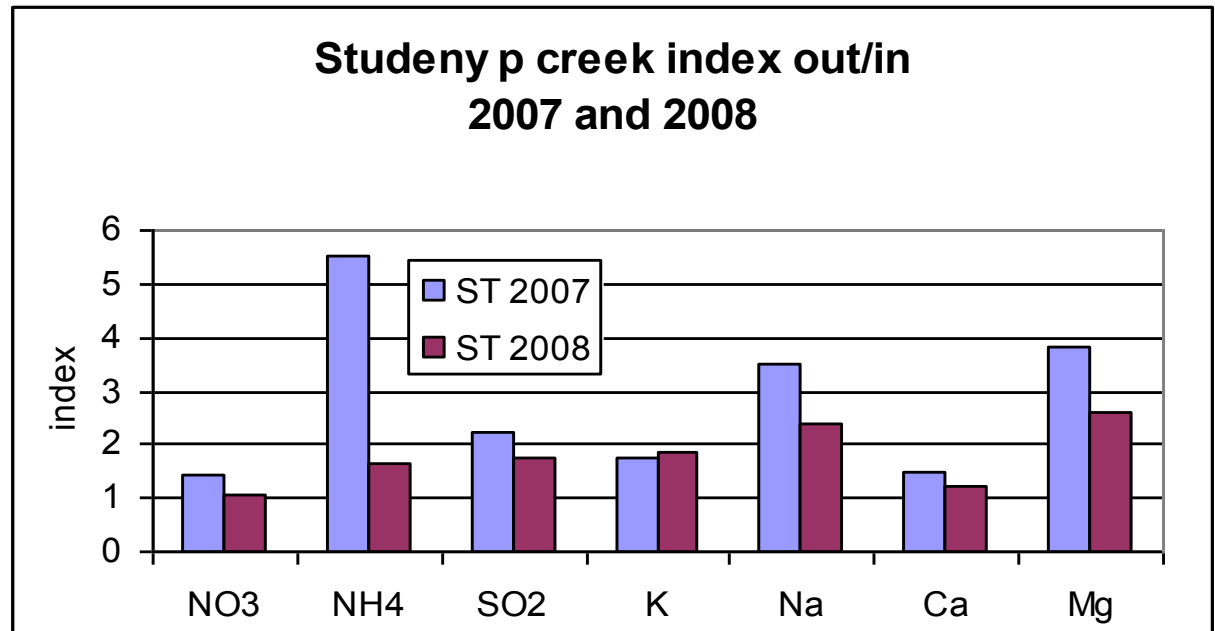
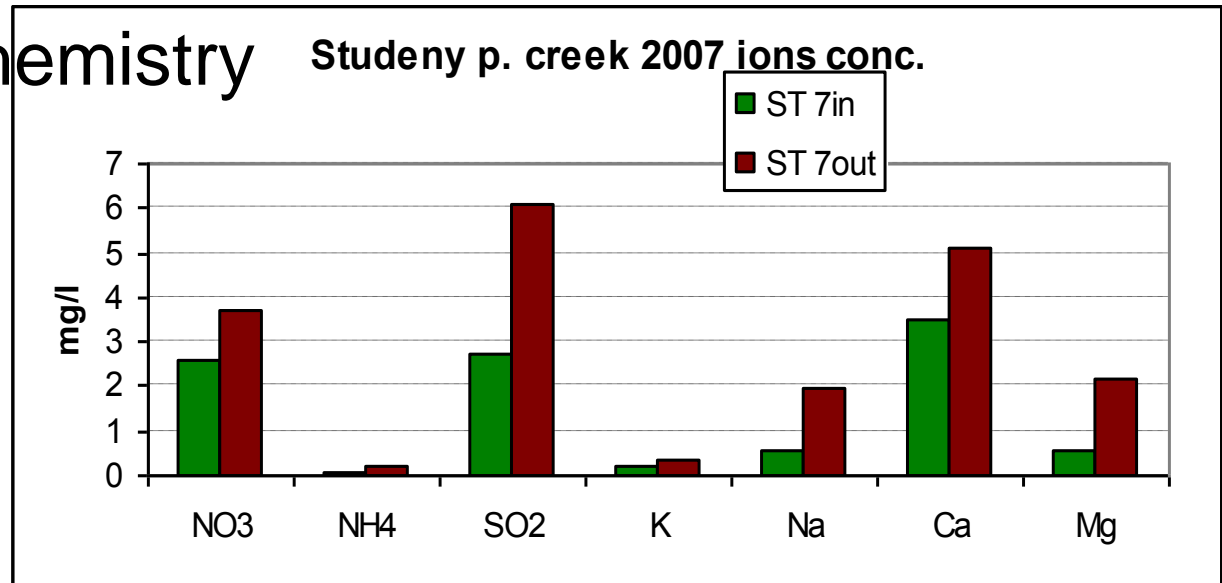
Mineralisation and Nutrient leaching



Stream water chemistry

ion concentration measured bi-weekly showed increased values when passing windfall in 2007 index of enrichment 1.5 – 5.5.

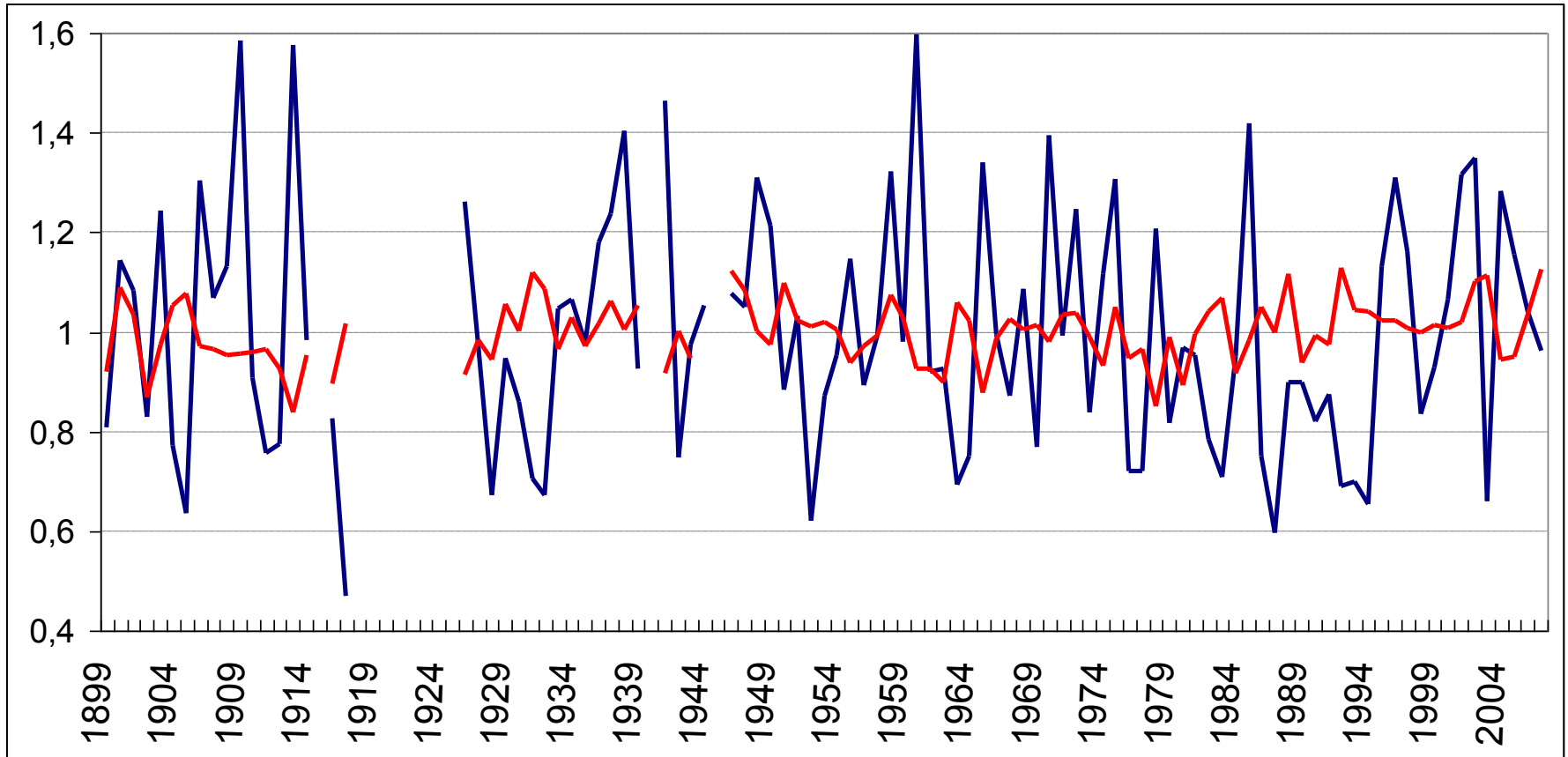
In 2008 notable decline, index 1.1-2.3



Urgent problems



Precipitation and air temperature index 1899-2007



Growing season temperature trend, T. Lomnica 830 m a.s.l

