

Digital modeling of erosion soil cover patterns development over the last 300 years (Moscow region, Russia)

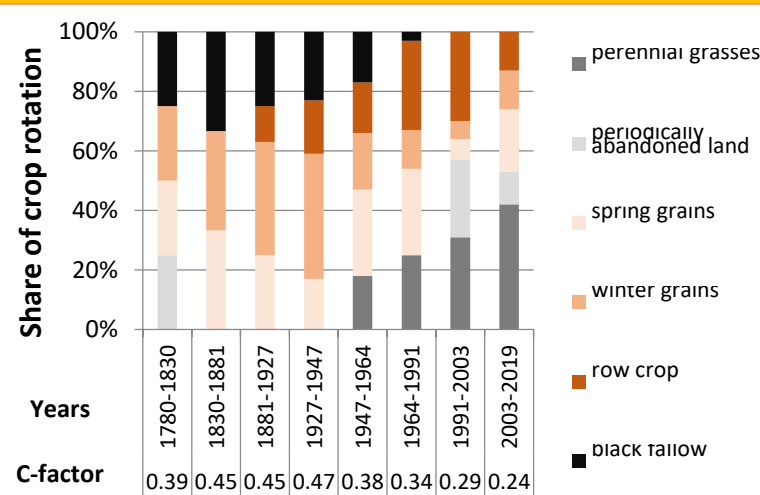
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- Soil erosion in the Anthropocene mainly occurs as a consequence of a combination of natural and human-induced soil erosion processes.
- The intensity of anthropogenic soil erosion depends on changes in land use and varies greatly at different time periods.
- Detailed studies of the history of land use change and the dynamics of soil erosion in the northern (forest) part of the East European Plain are not available

The aim of this work was to study the history of the anthropogenic soil erosion and its impact on the soil cover in the key site in the forest part of Russia.

SIMULATION FACTORS

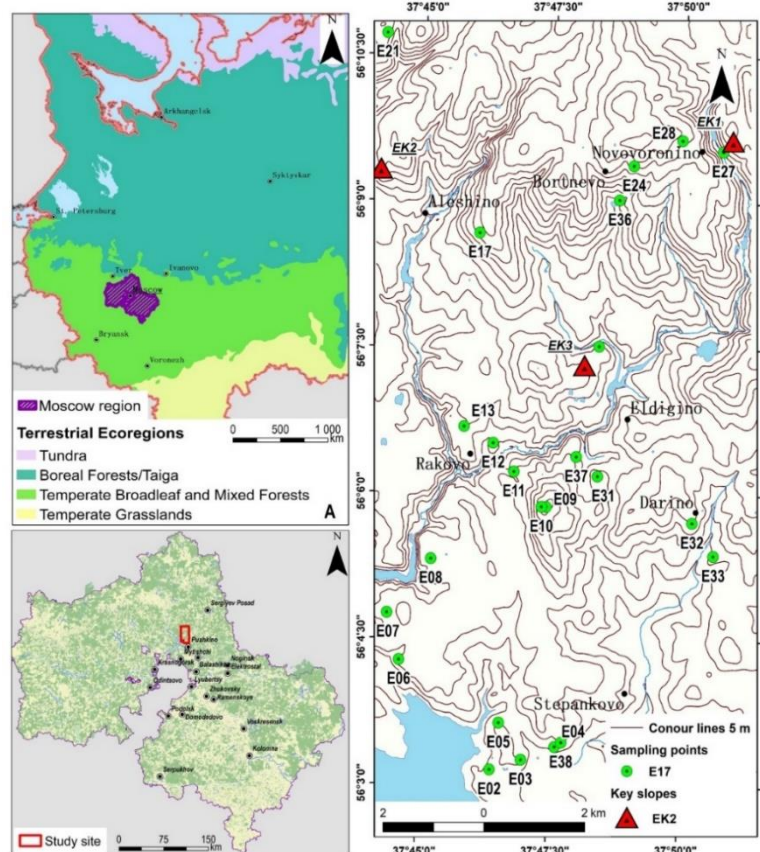
LS-factor	C-factor	R-factor	K-factor	Arable land, ha
	0.39	0.026	0.082	3539
	0.45	0.026	0.082	2654
DEM cell	0.45	0.026	0.082	3309
size of	0.47	0.026	0.082	2143
20 × 20	0.38	0.023	0.082	2816
m	0.34	0.03	0.082	2243
	0.29	0.025	0.082	1862
	0.24	0.029	0.082	945



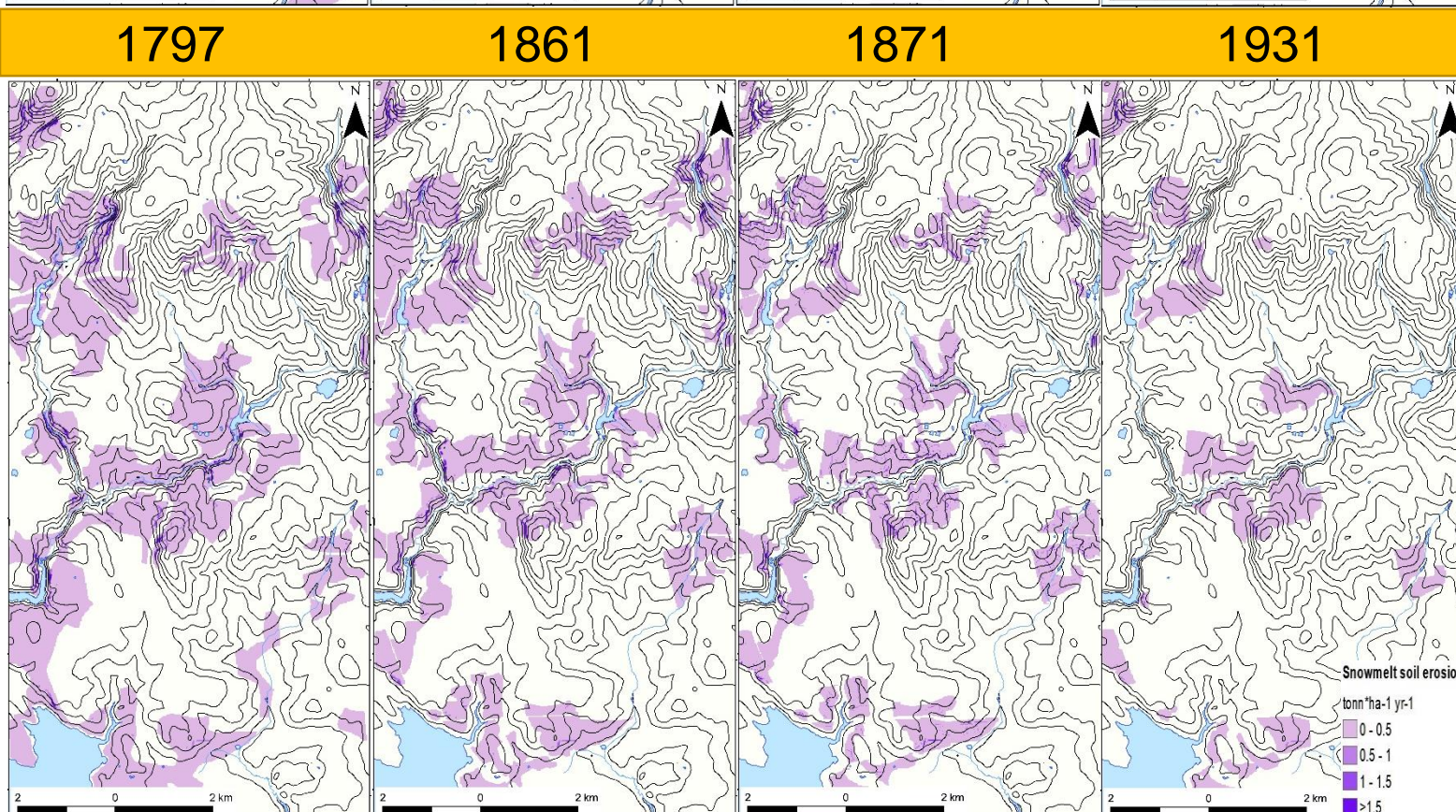
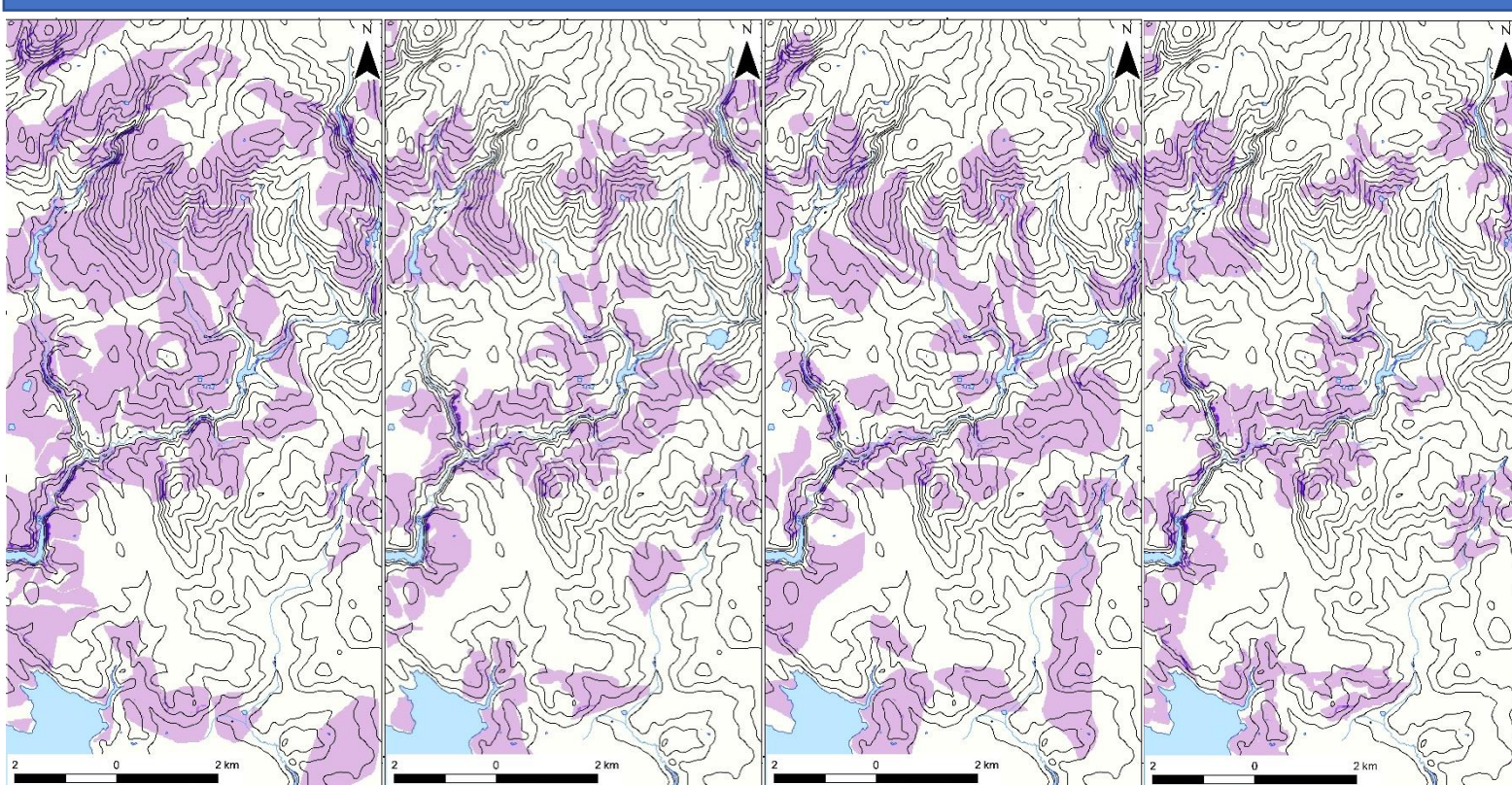
The share of agricultural crops in the crop rotation and C-factor for different periods

MODELS

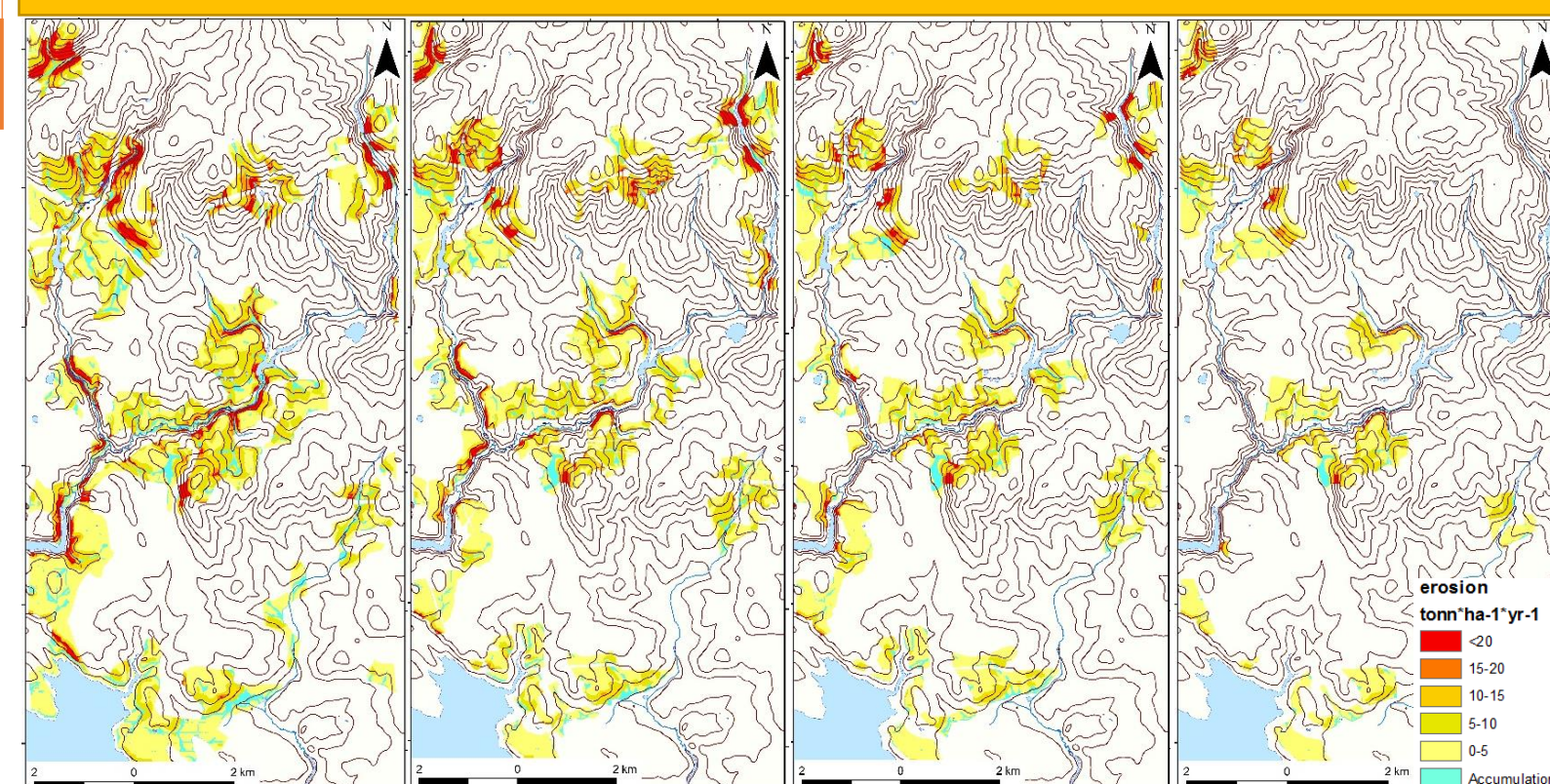
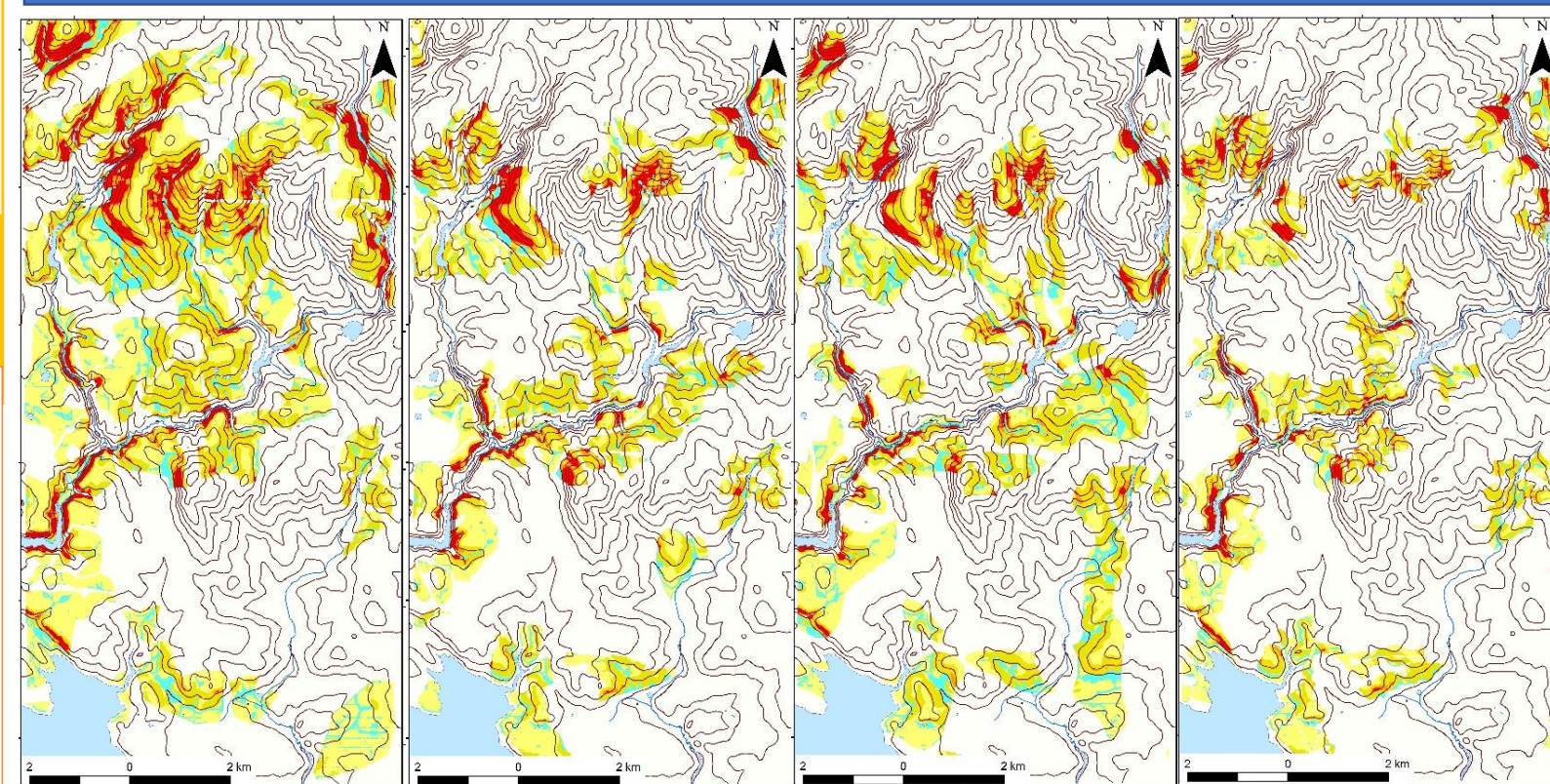
- Rainfall erosion was estimated by the WaTEM / SEDM model (Van Oost et al., 2000; Van Rompay et al., 2001). The calculation algorithm is based on the RUSLE (Renard et al., 1997) and has similar input parameters are presented in the table.
- Snowmelt soil erosion was simulated by regional Russian model of State Hydrological Institute (Instruction..., 1979) in the G.A. Larionov modification (Larionov, 1993; Litvin et. al, 2017). This model has input parameters: H – slope snowmelt runoff layer (mm); K – soil erodibility factor (t / ha · yr); LS – topographical slope and length factor.



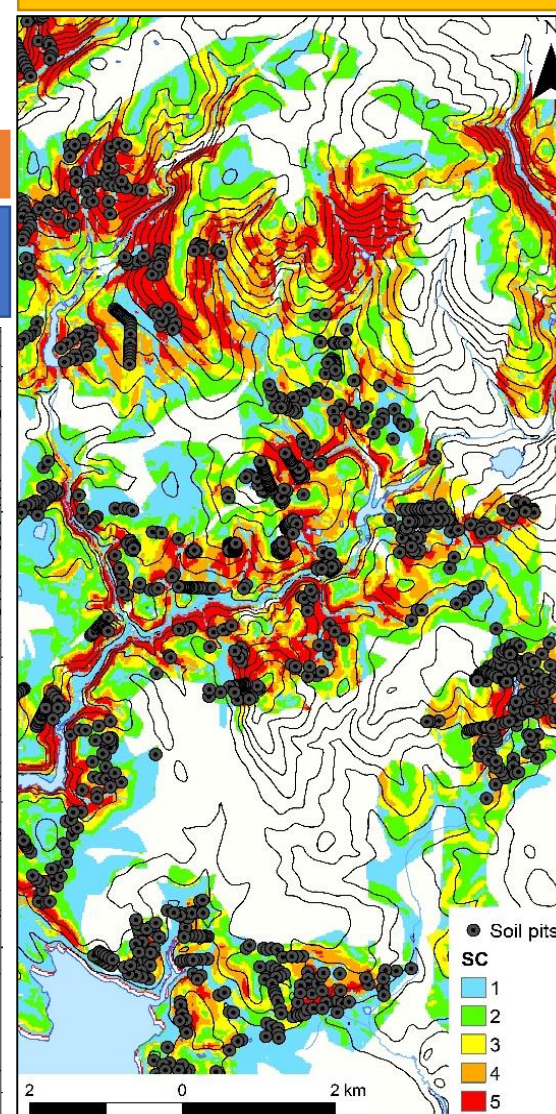
Snowmelt soil erosion



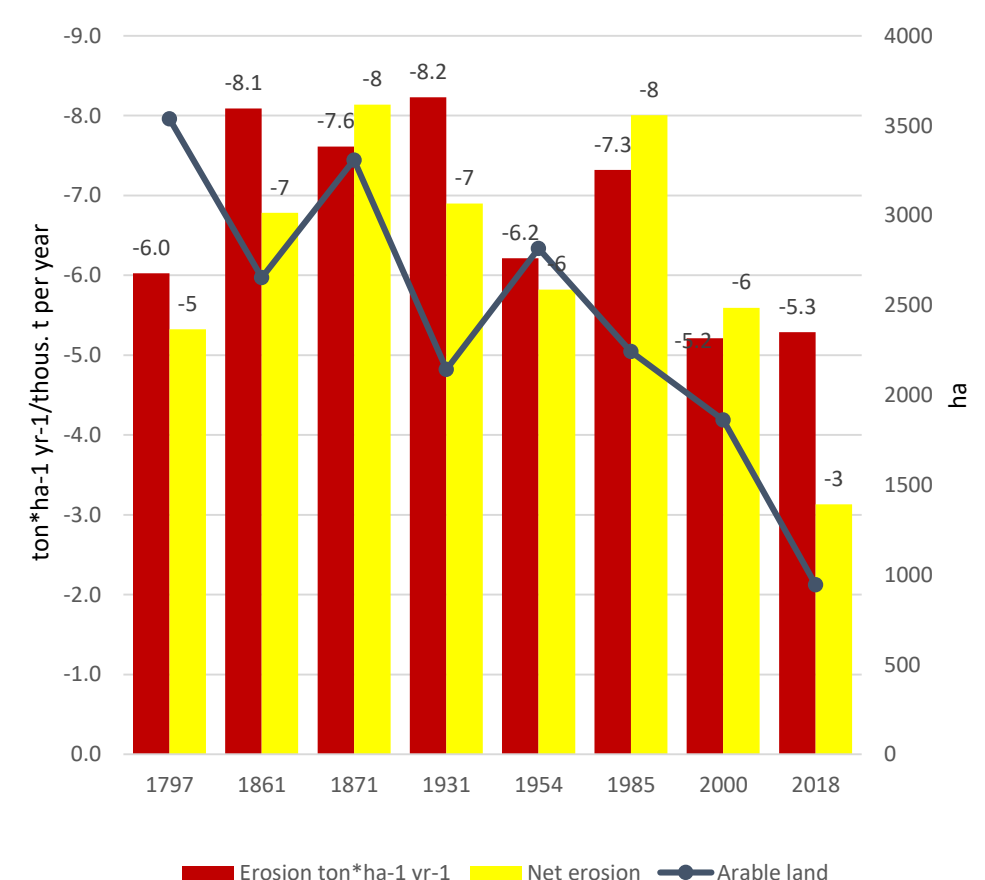
Rainfall soil erosion



The authors have database of soil surveys at 1567 points. The obtained estimated long-term volumes of soil loss were correlated with the data of a field survey of soils. Based on the obtained dependencies between the calculated soil loss volumes and the field survey data, a map of the erosion soil cover structures was constructed.



* SC	CRITERIA OF SOIL COMBINATIONS (SC)	ALLOCATION
1	E0>90%	
2	90%>E0>75%	
3	75%>E0>50%	
4	E0<90%	E1>E2
5	E0<90%	E2>E1



* E0 – non eroded soils E1 – weakly eroded soils E2 – medium eroded soils

CONCLUSIONS

- This study site showed that in the forest zone of Russia the history of land use determines soil erosion and the soil cover patterns.
- The rates and volumes of soil erosion are not directly correlated with the area of arable land.
- The proportion of slopes with sediment deposition and the configuration of arable land determine the intensity of erosion processes.
- The complex history of land use and the frequent change of soil loss zones and sedimentation zones have created complex soil cover patterns in this territory.