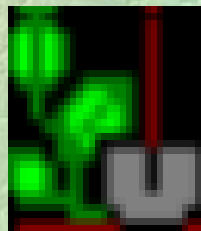


ROMUL: a simulation model of soil organic matter dynamics in forest ecosystems

O. Chertov, A. Komarov, M. Nadporozhskaya,
S. Zudin, S. Bykhovets, A. Mikhailov, E. Zudina



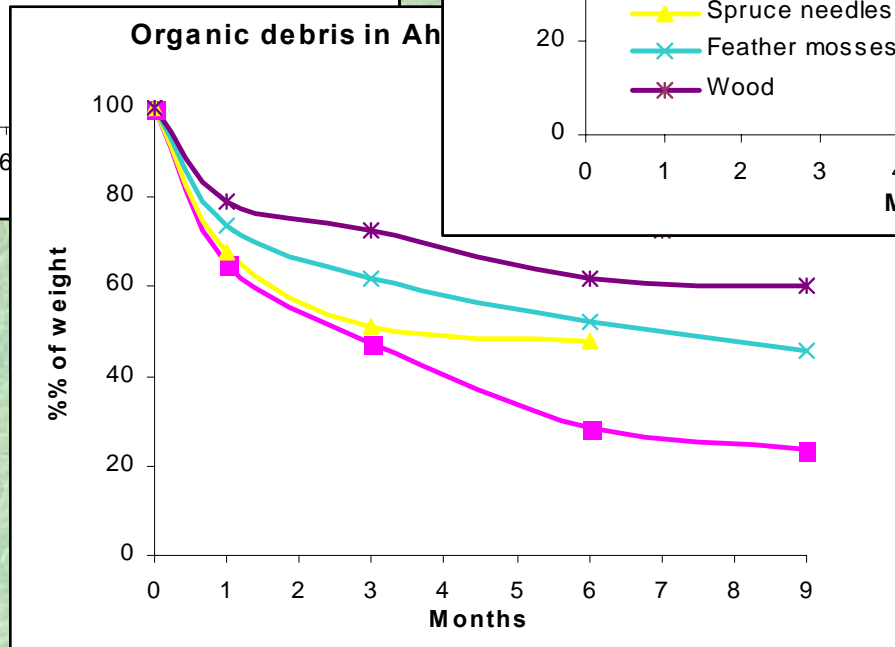
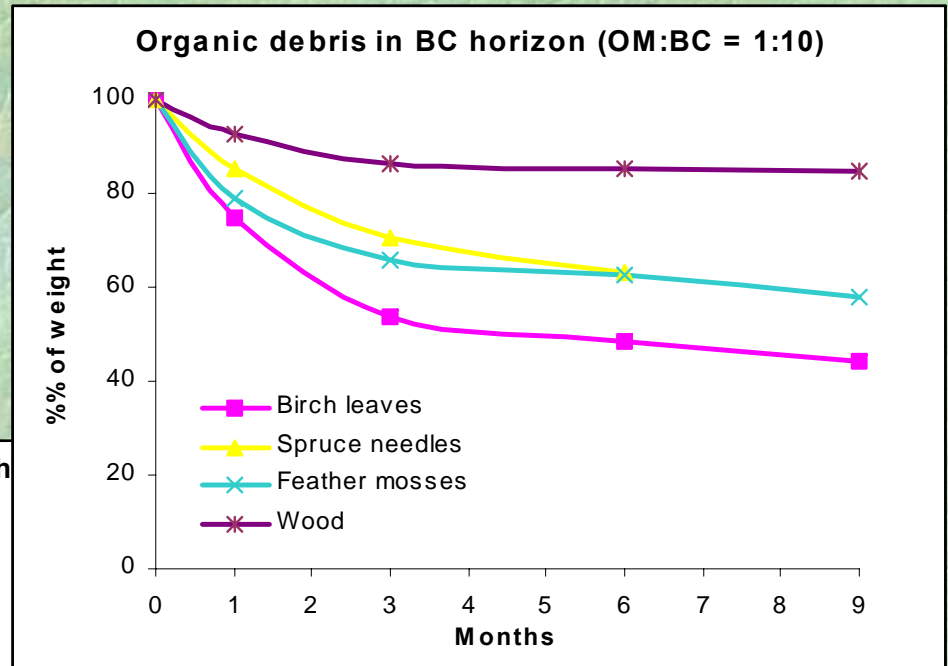
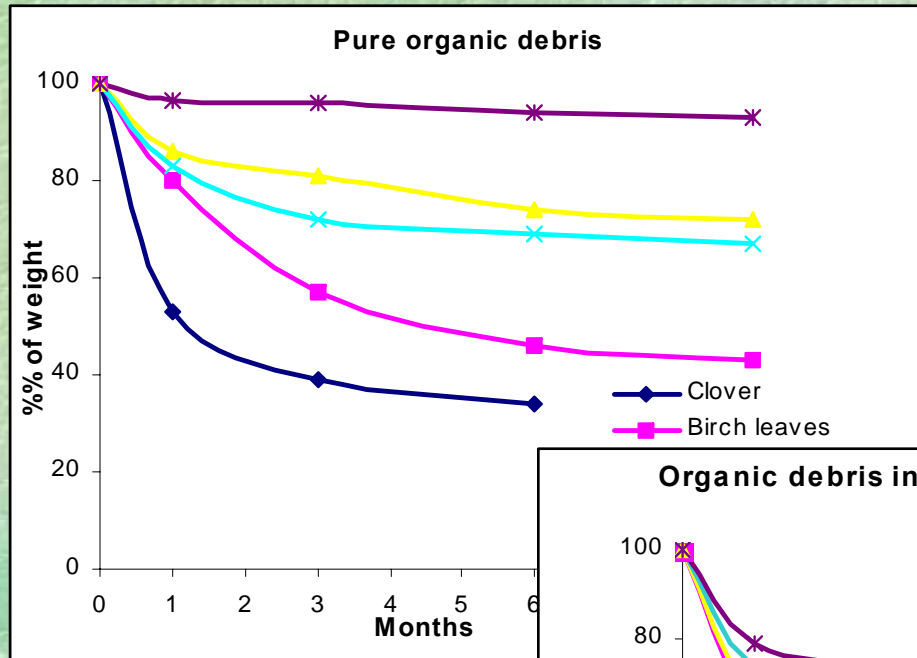
Romul.exe

Experimental basis of the model

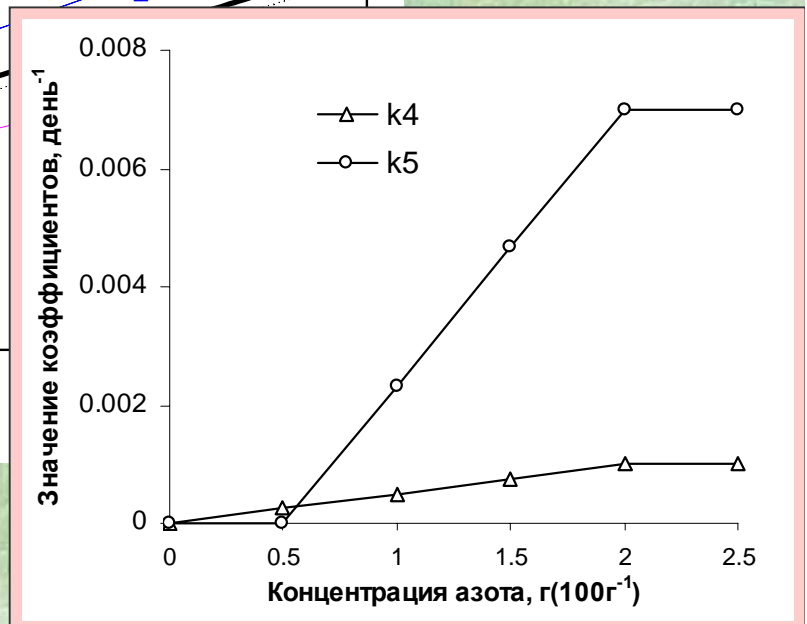
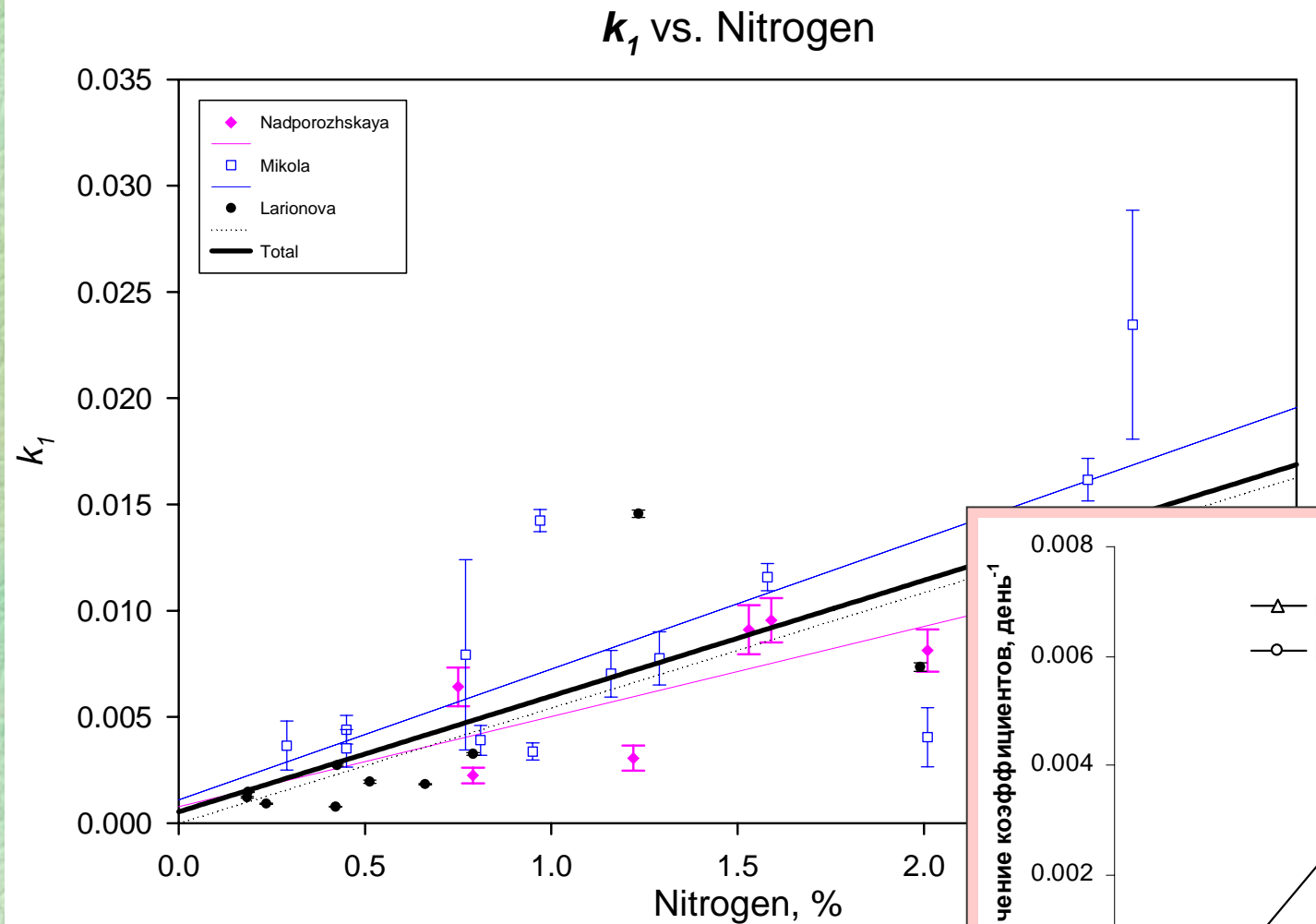
A set of laboratory experiments on the rate of decomposition of plant debris and soil organic matter of definite chemical composition in controlled conditions:

- ☞ previously published data, and
- ☞ results of specially performed experiments in the Lab of Soil Biochemistry, St. Petersburg State University

Experimental curves of organic debris and SOM decomposition in controlled conditions

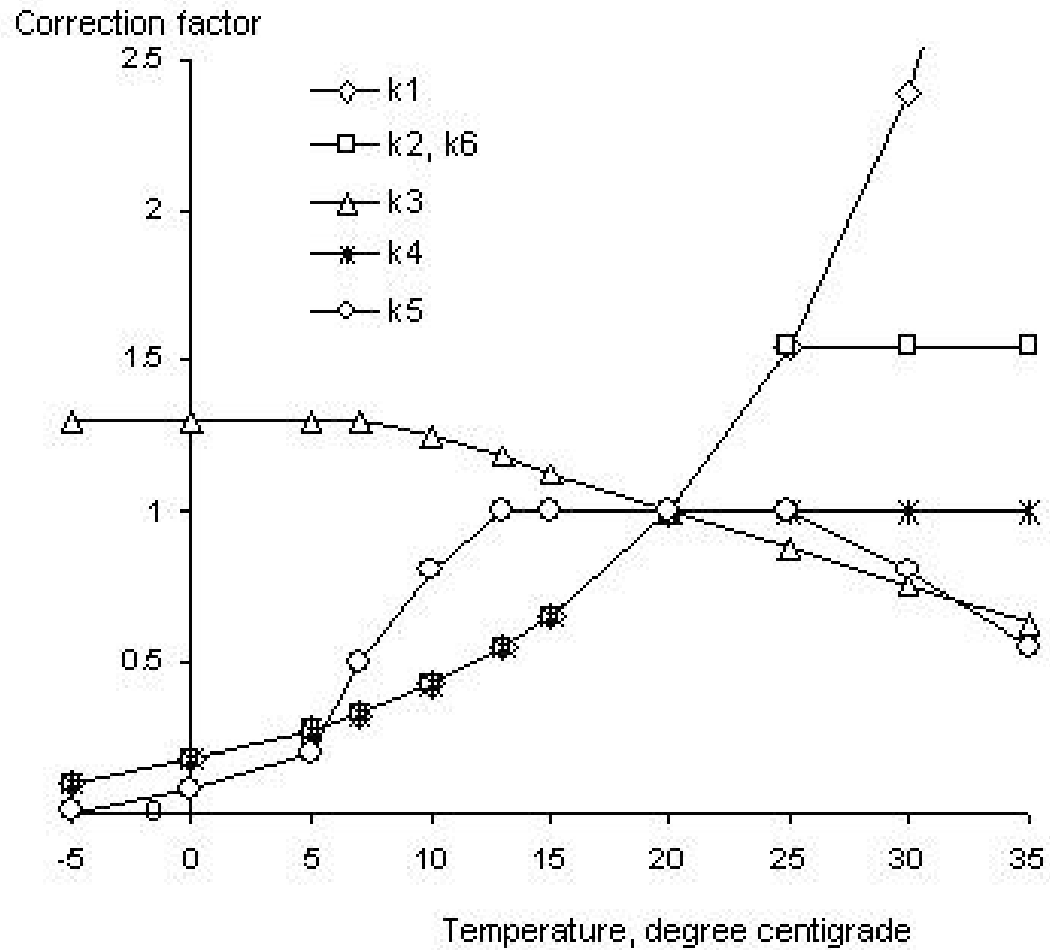


Calculation of kinetic parameters by the results of laboratory experiments

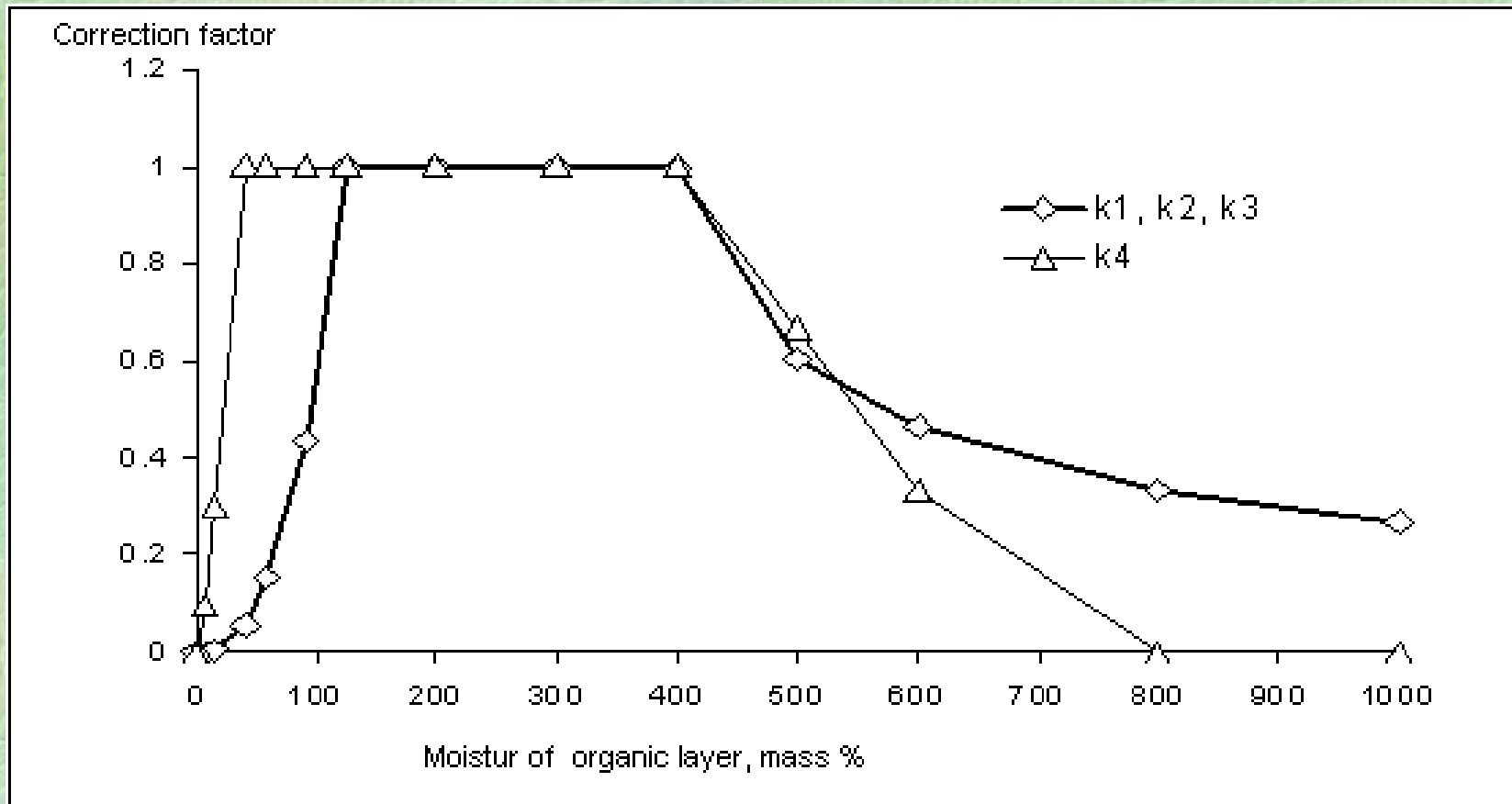


Temperature correction factors for all coefficients

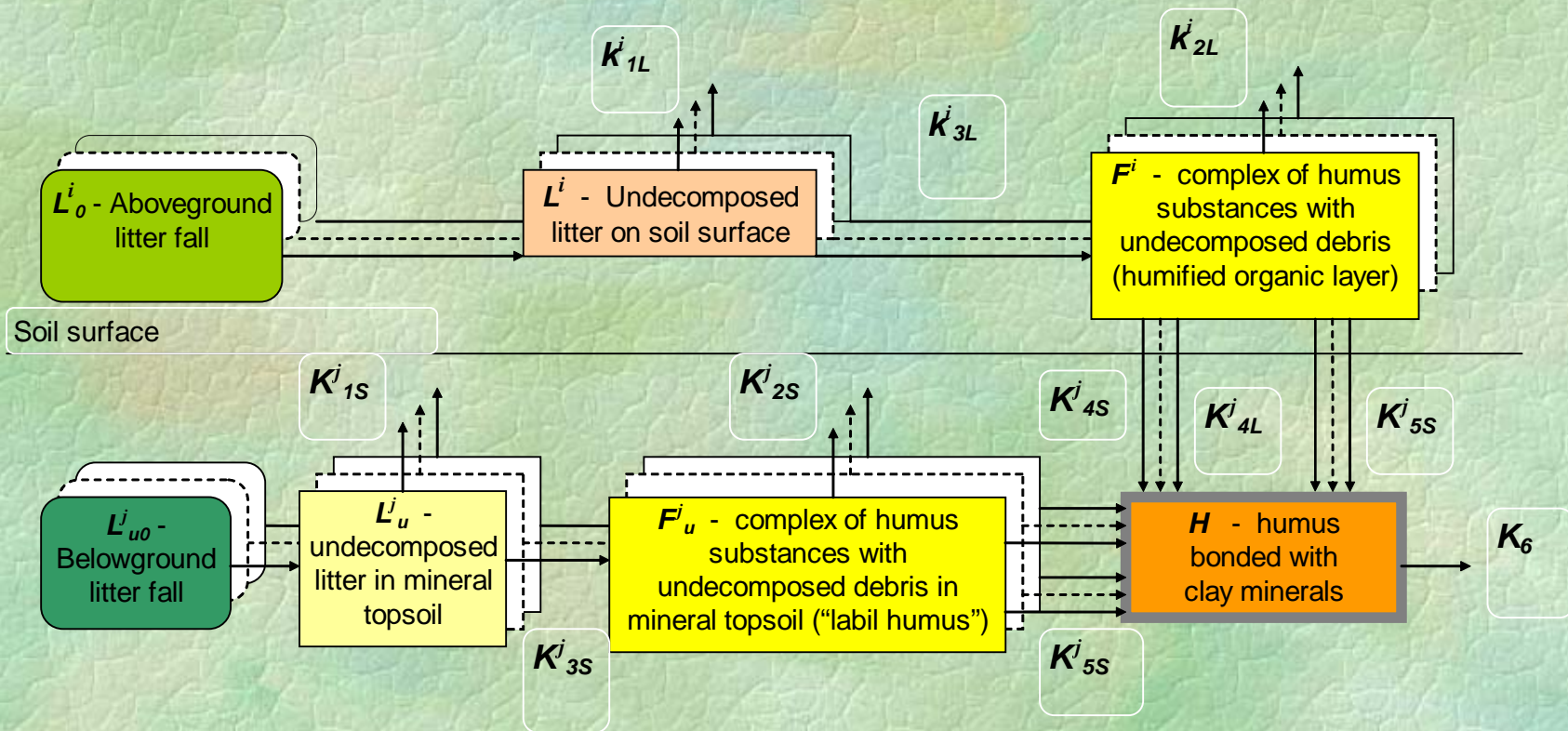
The reference temperature is 20°C



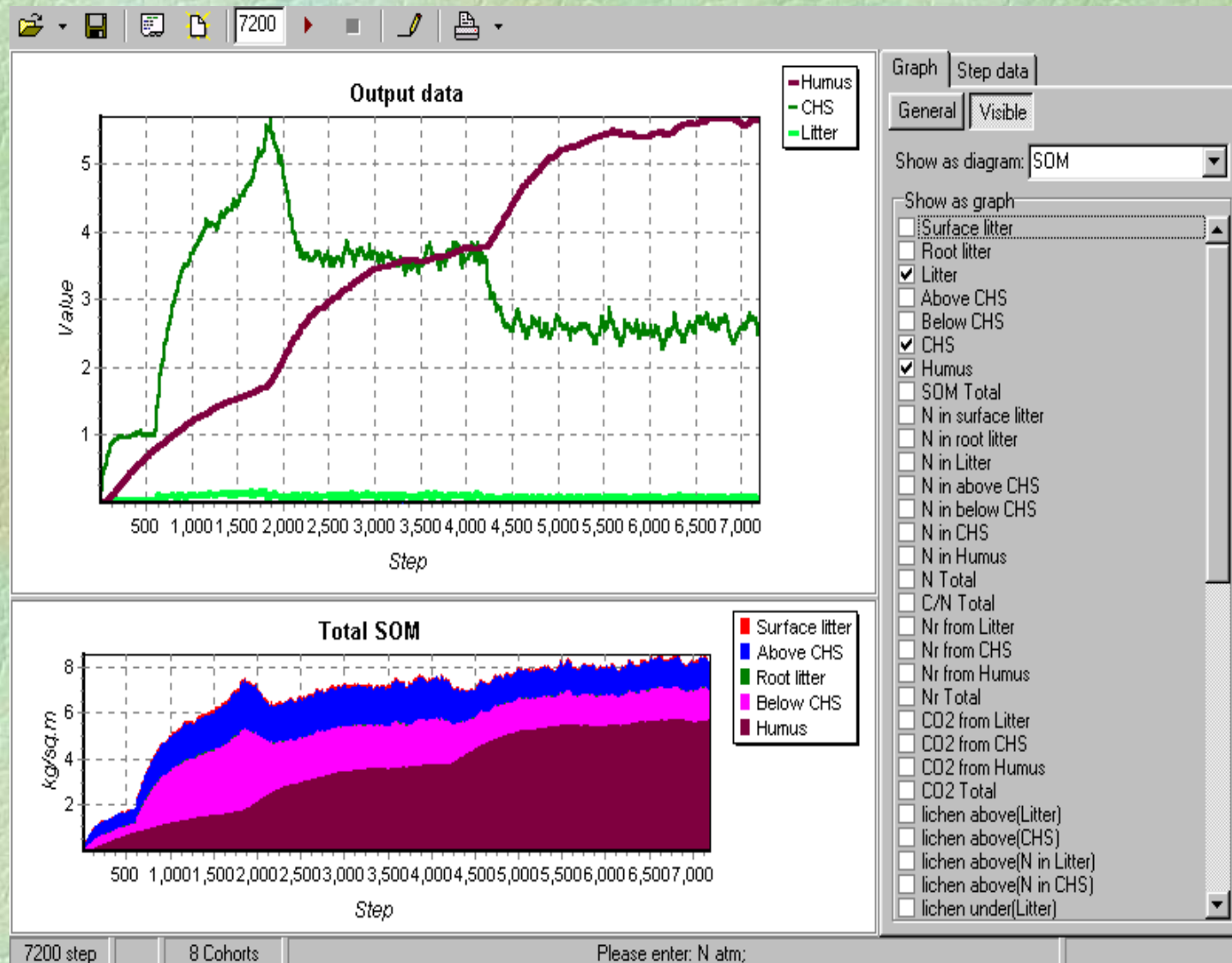
Water response correction factors



ROMUL flow chart



ROMUL interface



ROMUL input parameters:

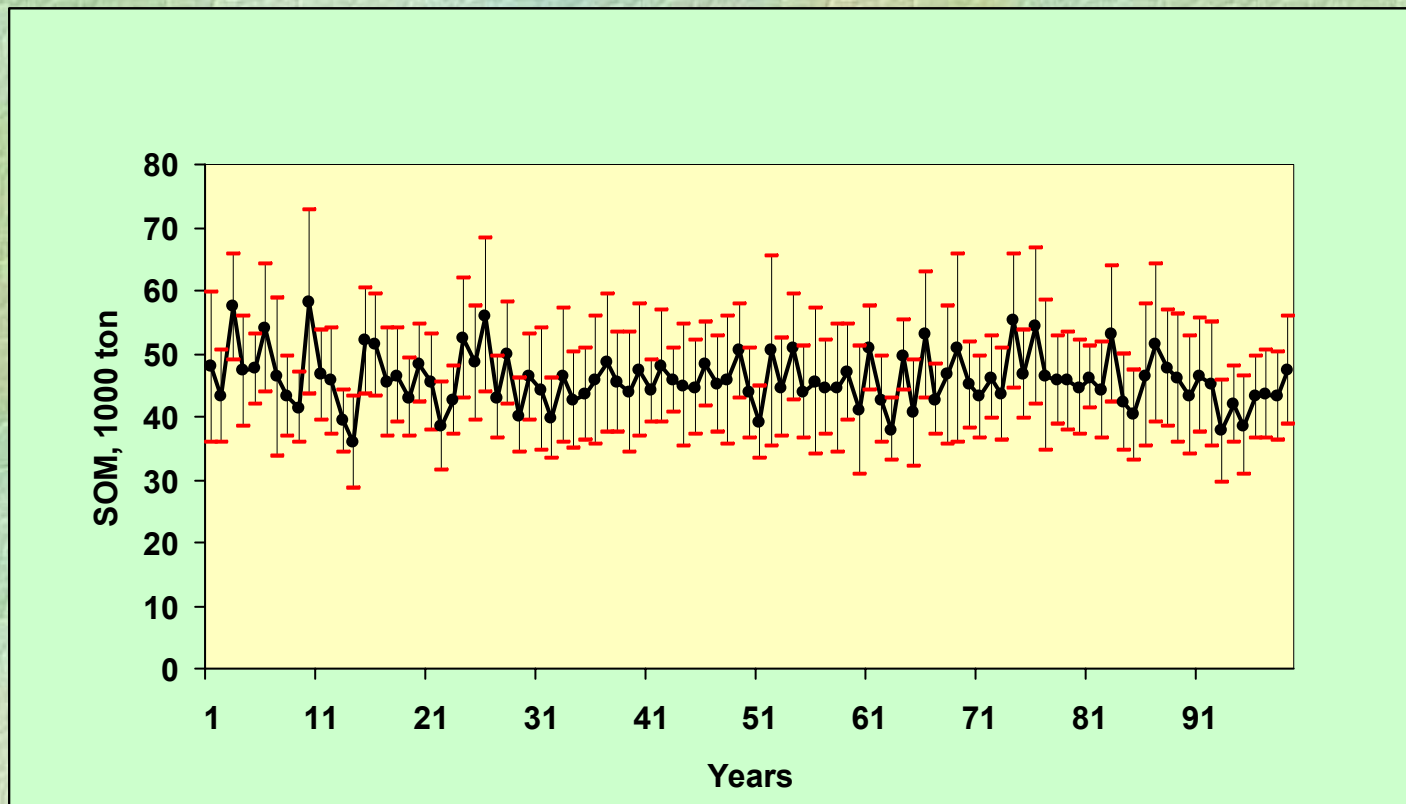
- ☛ Above ground and below ground litter cohorts (including CWD) - amount (by time step), nitrogen and ash concentrations
- ☛ Soil temperature and soil moisture (in mass per cent)
- ☛ Soil hydrological characteristics
- ☛ Pools of soil organic matter and soil nitrogen in organic horizons and mineral topsoil (100 cm layer)

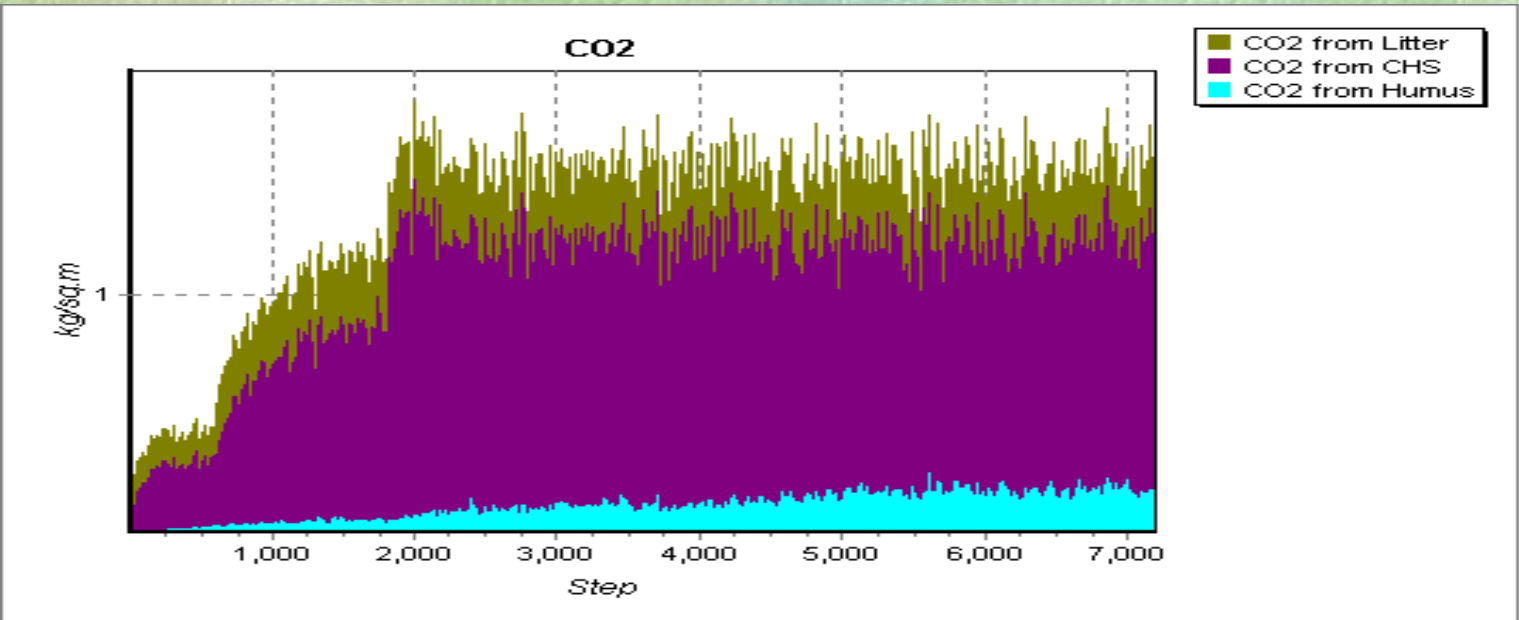
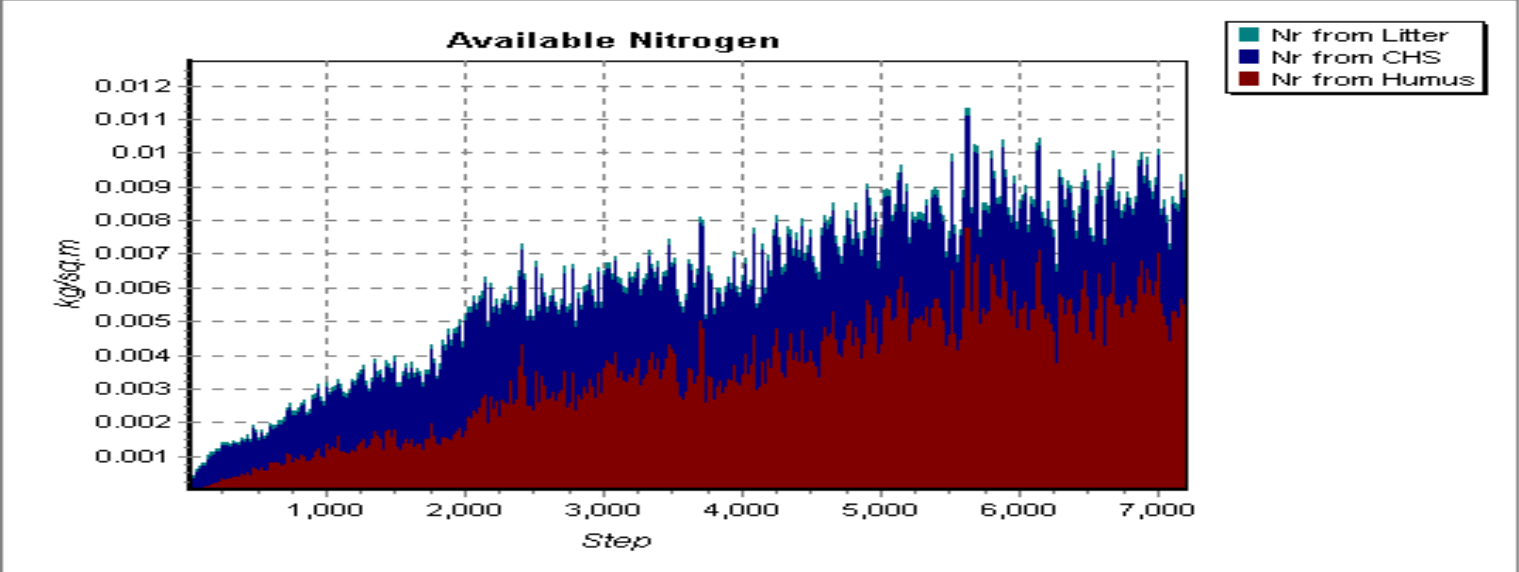
ROMUL output parameters:

- ☛ Pools of soil organic matter and soil nitrogen in organic horizons (for SOM pools originated from every litter cohort) and mineral topsoil for every time step (from a day to centuries)
- ☛ Available for plants nitrogen after full SOM mineralisation (sum of nitrates and ammonium N) originated from every SOM pool
- ☛ Gross carbon dioxide production after full SOM mineralization

Standard representation of output data as mean values and standard deviation at Monte-Carlo simulation

SOM pool of fresh litter in rankers and sandy podsollic soils in forest soils of North-West Russia

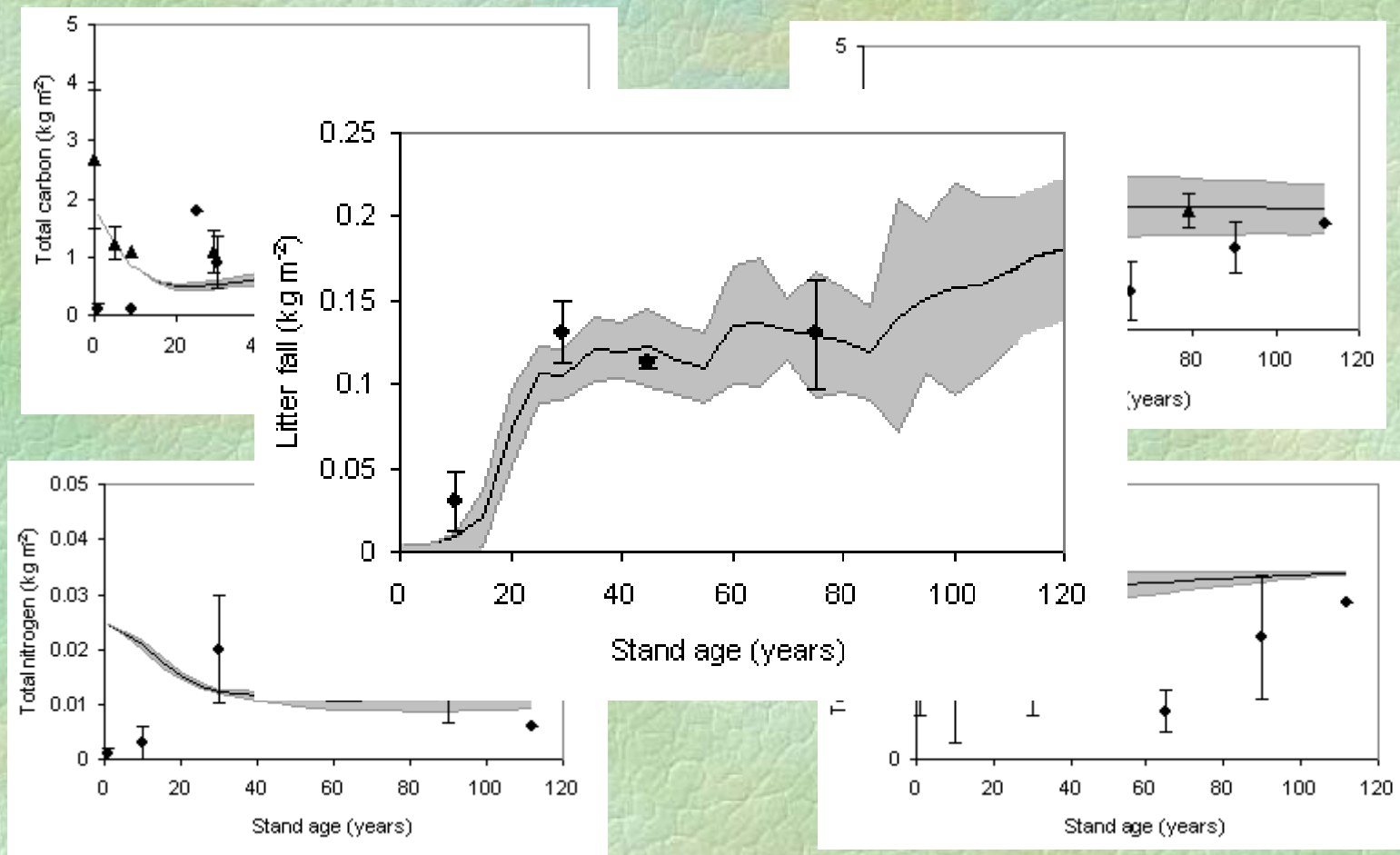




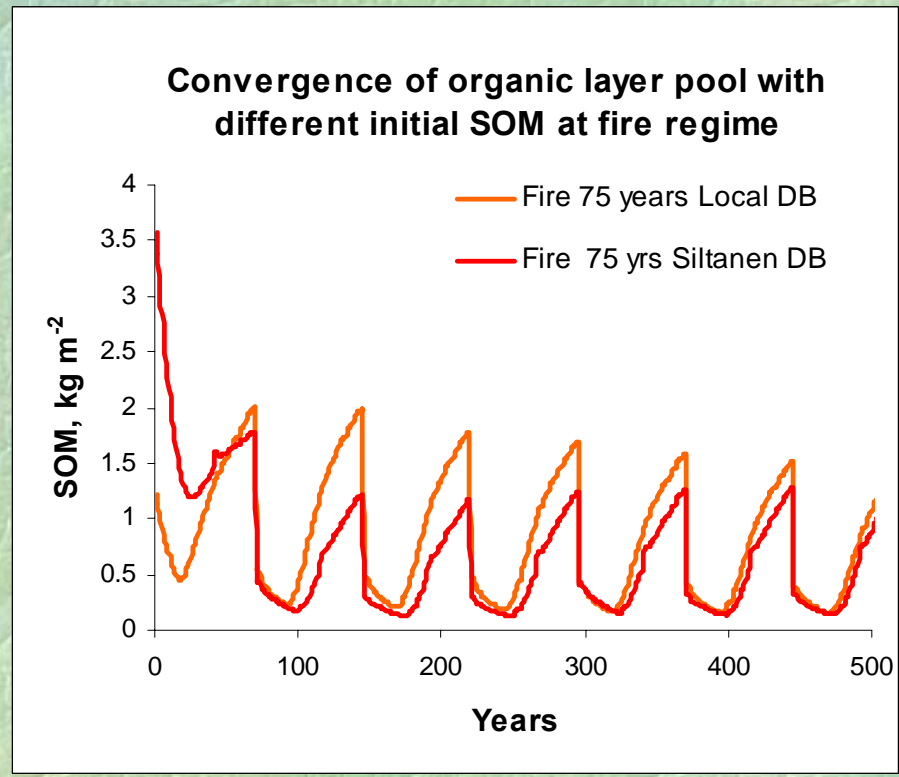
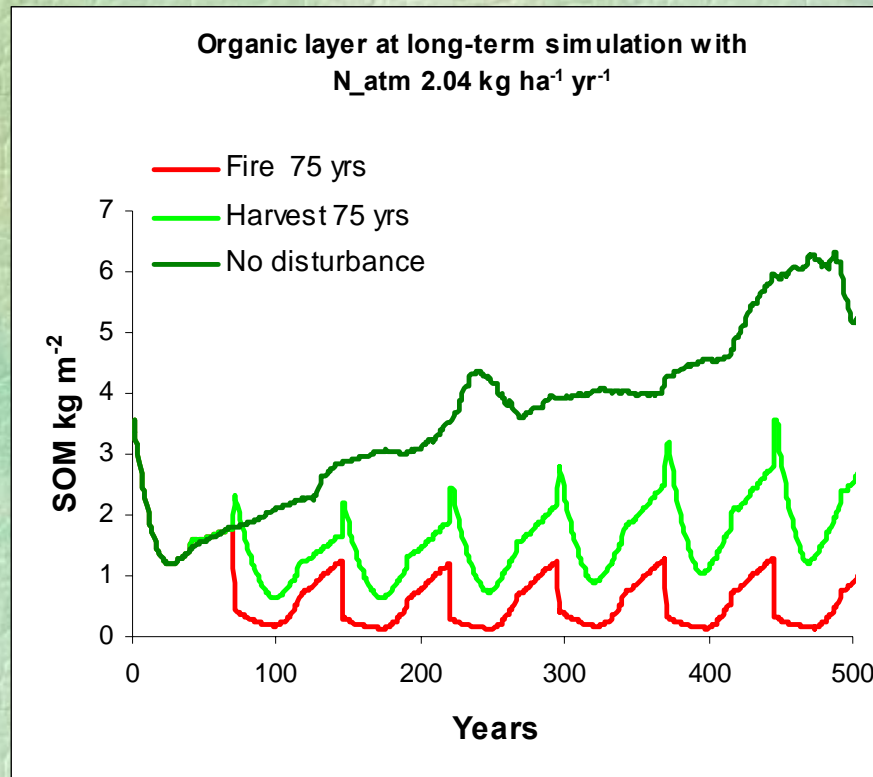
Results of ROMUL application as a module of EFIMOD for Canadian Jack pine forests

Forest floor

Mineral solum



Example of the ROMUL/EFIMOD application at long-term runs in Canadian Jack pine forests



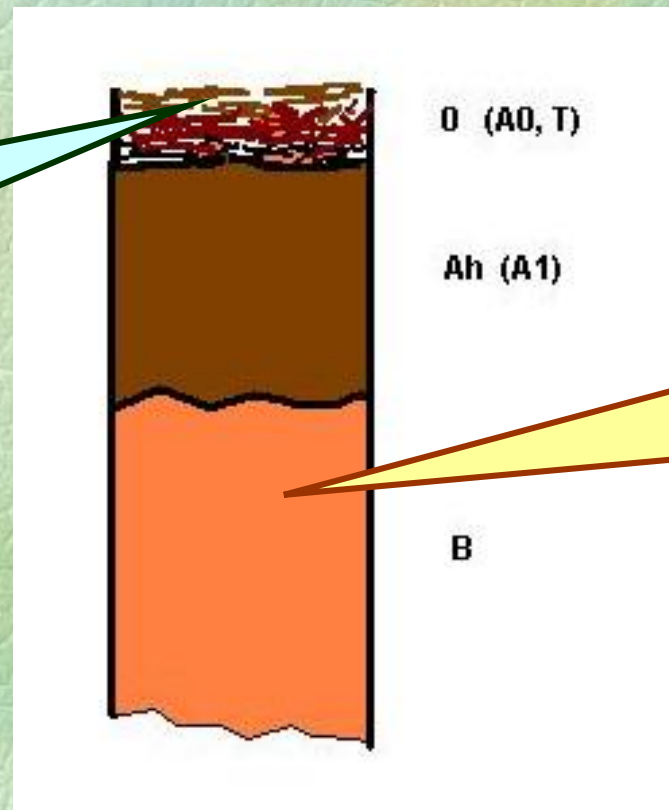
Conceptual scheme of the rate of SOM mineralisation in different soil horizons

Horizon	Rate of mineralisation at 20°C and 60% full saturation day ⁻¹
L, O1: layer of fresh undecomposed litter	$n \cdot 10^{-2}$
F, O2: fermentation layer of partially decomposed litter	$n \cdot 10^{-3} \dots n \cdot 10^{-4}$
H, O3: layer of humified organic horizon (forest floor, peat)	$n \cdot 10^{-4} \dots n \cdot 10^{-5}$
Ah & Ae: SOM in mineral topsoil	$n \cdot 10^{-5}$
B & C: SOM in deep soil	?

SOM pools/compartments in the models should be more corresponding to the morphologically existed SOM types in the soil profile

Few models considering SOM in organic layer

Important for SOM modelling in forests and peat lands



Perhaps no models considering SOM in B-horizon

Important from environmental point of view

THANK YOU !