

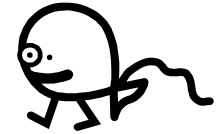


Soil models in regional carbon budgeting



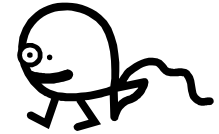
Modelling Party
Koli 2006





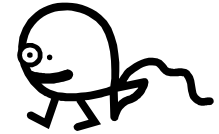
Why to use soil process models..

- ...to estimate soil carbon stock changes?
 - clearly, we don't have enough measured data
- ...instead of statistical models
 - assumptions, conception (and parameterization) of processes thought to be scalable in time and space
 - reflect processes of a changing environment (land use and climate)



Objectives of the party

- To determine the **key processes** and **input data** that are required for reliable predictions of soil carbon stock changes on a regional level aiming at reporting.
 - spatial scale: nation
 - temporal scale: approx. 1 to 10 year
- To seek answers how suitable state of the art soil models are for estimation to fulfill this task



Content of discussions

1. Key processes affecting soil carbon
2. Key processes on a scale of nationwide reporting
3. State of the art of validation data
4. Generality and applicability of model structure on large scales
5. Applicability of models with current data

1. Key processes affecting soil carbon

- Processes and variables affecting soil carbon stocks and stock changes
 - most crucial ones.

2. Key processes on a scale of nationwide reporting

- What processes and variables are relevant at selected scale
 - Different factors affect stock changes at different temporal scales
 - Different factors affect soil carbon changes of a stand and a region
 - Much of the variation on small scale may not be relevant at large scale
 - What data could be left out without losing reliability?

3. State of the art of validation data

- What is the state of the art of validation data at selected scale
 - inventory data
 - temperature + precipitation
 - RS
 - etc.

4. Generality and applicability of model structure on large scales

- Generality of model structure
 - What kind of a model structure is applicable over selected spatio-temporal scale
 - i.e. how general is the process?
 - Many models or just a one generic model (tuned or not)?
- What is too simple model and what are the consequences?
 - (Examples -->)



4. Examples

- **Projections of soil carbon fluxes depend on the structure of the models, e.g. the number of soil carbon pools**
- (Jones et al. 2005): reaction of soil carbon turnover to changing climate: two different models with different amounts of soil carbon pools give different answers. (over simplification of models!!)
- Different model assumptions can result in totally different results. For example Knorr et al. (2005) shows how models assuming only one soil carbon pool largely differ in their projections to models assuming at least three soil carbon pools.
- Davidson et al. (2000) and Fang et al. (2005) suggest that the temperature insensitivity found by Giardina et al. (2000) are undermined by methodological factors and also by their turnover times being estimated on the assumption that soil carbon exists as a single homogeneous pool, which can mask the dynamics of a smaller, temperature-dependent soil-carbon fraction.

5. Applicability of models with current data

- Do state-of-the-art soil models reflect the processes and variables important at selected scale?
 - How they use data available on large scale / nation level?
 - Do available data and model input level?
 - Suitable level of aggregation of data?
- How to optimally combine measured data and models?
- Modularity/transferability
 - potential to implement a model in new system