Data for application of forest growth model 4C

1   Preliminary remark

For the application of 4C for a special forest stand a variety of data has to provide.

There are different data categories used by 4C:

- Initialisation (= data describing the initial state of the ecosystem at the beginning of the simulation period)
- driving forces (= independent variables driving the development of the system, first of all climatic and deposition time series)
- data used for model validation (= elements of time series or several measurements, i.e. soil water content, basal area)

2   Parameterisation and initialisation

2.1 Plot

- geographical coordinates (degree latitude and longitude)
- elevation (m above sea level)
- slope (degree)
- depth to ground water table (m)

2.2 Soil

Description of the soil type including humus and litter layers (if available); data of **each** soil horizon:

2.2.1 Soil physics

- depth of horizon
- soil texture
- pore volume
- bulk density
- pF-curves
- saturated hydraulic conductivity
- field capacity and wilting point [Vol.-%]
- soil skeleton fraction

2.2.2 Soil chemistry

- N content: N, NH4, NO3 [g/m2]
- C content [g/m2]
- pH - value
- if available:
  - [Ca, Mg, K, Fe, Mn, Al, S]
  - [DOC]

- [CEC, BCE, ACE, base saturation]

2.3 Stand initialisation

Data of first inventory:

- area of inventory plot
- species
- age in the year of inventory
- diameter at breast height for all individual trees or a distribution into diameter classes
- height for all individual trees or for the diameter classes or any indication about a suitable diameter-height relationship
- standing volume and/or allometric relationship used for calculation of bole volume
- number of trees
- bole height or crown length
- distribution of gross and fine roots into the soil layers
- rooting depth
- characterisation of ground vegetation

For more information see 4C_initialization_manual.pdf.

3 Climatic driving variables

Time series generally as daily sum or average

3.1 Physical climate

- air temperature (average, min., max.)
- precipitation
- relative humidity
- global radiation
- air pressure
- wind speed
- snow depth, water equivalent of snow (if available)

3.2 Deposition

- NH_4
- NO_3
- or: N_{total}
- SO_4 or S_{total} (if available)

4 Data for model validation

Similarly to 2. the data should be daily sum s or averages

4.1 Climate/ Weather

- stand precipitation [mm]

- stand air temperature [°C]

- wind speed and eventually wind profile of the stand

- relative humidity [%]

- air pressure

- global radiation [J m^{-2}]

4.2 Deposition

All data like 2.2 within the stand.

4.3 Soil

- soil temperature
- soil moisture (water content, tension, fluxes)
- time series of soil chemical data (see 1.2.2) and element contents in percolation water

4.4 Stand

- chemical needle / leaf analysis (N, S, Ca, K, Mg, P)

- inventory data

- vegetation survey

- wood density

- CO_2 and water fluxes

- phenology, mortality, regeneration for species or stands