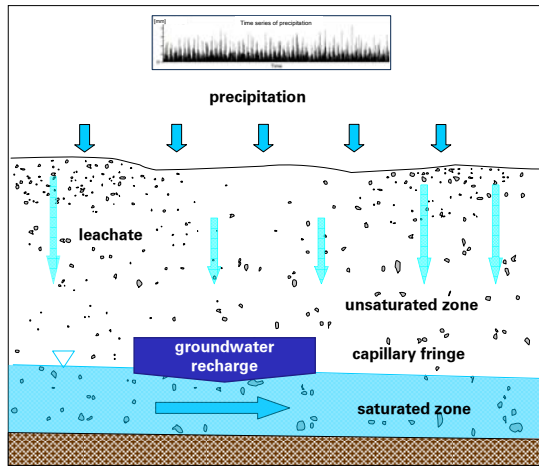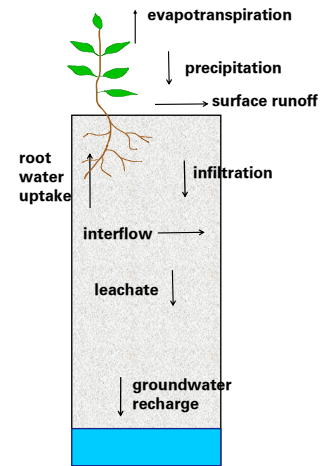# Generation of Synthetic Precipitation Time Series by Weather Generator WettGen


Problem

In the upper unsaturated soil layers, the water balance and transport of substances is mainly affected by precipitation and its intensity. The processes in the soil are simulated by code PCSiWaPro® and the precipitation by WettGen..

For dimensioning and calculation problems (e.g. ground-water recharge, leachate forecast) often the approach of average water balance values is applied. Through the neglect of important time-dependent variables (e.g. the precipitation intensity and distribution) significant mis-interpretations can occur, especially in the face of expected increasing of the precipitation intensity through the climatic change.

With constant mean precipitation amount, events with higher intensity produce increased surface run-off and decreased rates of groundwater recharge because of the limited infiltration capacity of the soil.

Difficulty: Availability of long-term time series of the most important climatic variables (e.g. precipitation, temperature, solar radiation) for the investigated location

Generation of synthetic time series of the most important climatic variables by using a stochastic weather-generator make the transient modeling of the unsaturated zone possible
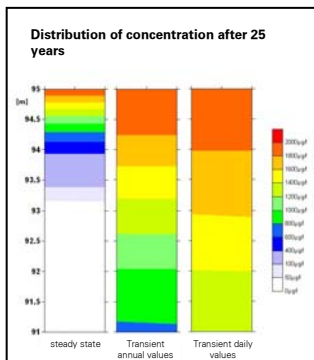
With the help of the computer program we have developed, synthetic time series for precipitation, air temperature and solar radiation can be generated for an unknown location based on recorded data of surrounding gauging stations. The characteristic of these time series is described with statistic parameters. These parameters allow firstly a generation of time series for unknown locations via regional interpolation, and secondly a generation of time series of any length.
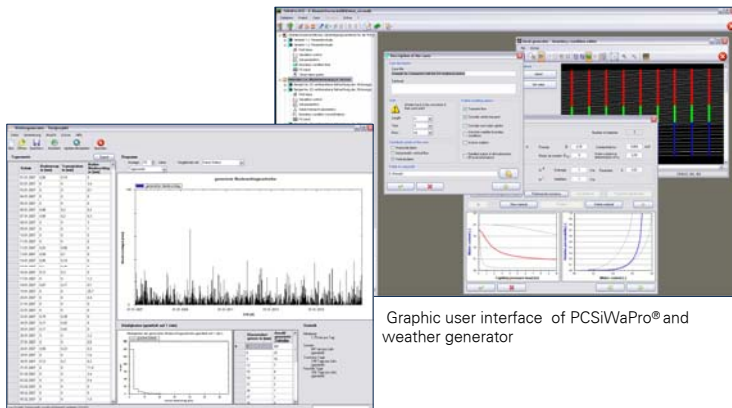
Graphic user interface of PCSiWaPro® and weather generator

Functionality:

- automatic integration of free available climatic data from the DWD over the internet
- assistant-based user request and input of all necessary input data as well as the suggestion of reasonable default values
- Calculation of potential evapotranspiration with the method of TURC- WENDLING
- Integrated modules consider inclination, orientation and land use
- Calculation of interception and transpiration
- Clear illustration and an easy export of generated data
- Coupling with the simulation program PCSiWaPro® (weather generator is fully implemented)

Practical application

For the location „Süptitzer Berg", a former military base in Saxony, it was possible to show that only by using transient infiltration fronts, which are generated by the weather generator, the concentration of contaminants in soil and groundwater could be reproduced with sufficient accuracy

Steady-state and transient simulation for leachate forecast

Further development

The foundation for dimensioning and calculation problems in hydrology and modeling is the data pool of recorded climatic data from the past.

Through the climatic change and the consequential changes of precipitation amount, precipitation intensity and distribution, the prediction capability of currently used methods is only limited.

Through the combination of stochastic generation of time series with given results of global climatic models, the weather-generator should generate time series which include the effect of the climatic change.