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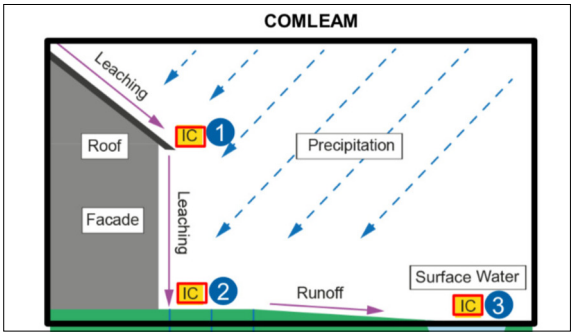
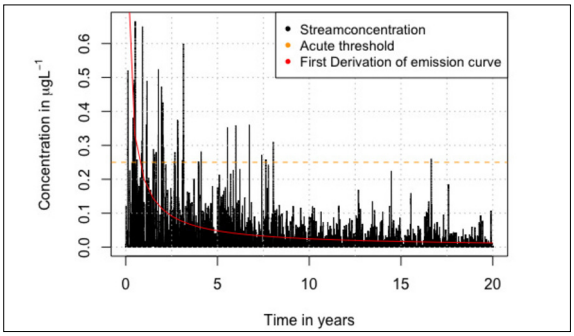
Subject Area	General environmental technology

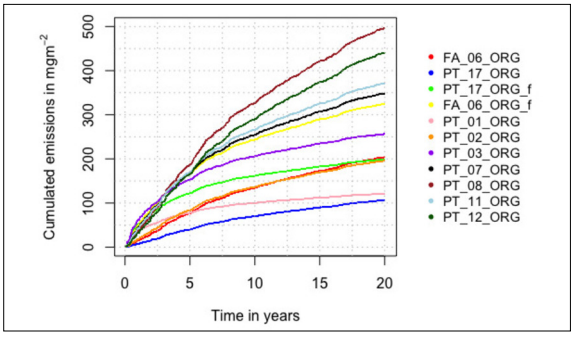
Statistical Data Analysis of Extrapolated Emission Functions



Wind driven rain leads to leaching from façades. The leachate is transported into the environment via runoff.
COMLEAM Workshop 2019 Presentation slides by M. Rohr



Concentration in stream over time with diuron data set number 4. Time points above acute threshold were investigated.
Own presentment



Cumulated emission curves from all 11 diuron data sets based on COMLEAM simulations.
Own presentment

Definition of Task: Substances leaching from construction materials like façade coatings leads to impacts in the environment. Making predictions about these processes is difficult, as they are dependent on weather events over an extended period of time. Using COMLEAM (COnstruction Materials LEAching Model), these predictions can be simplified. A schematic overview of the COMLEAM implementation can be seen in figure 1.
COMLEAM simulations are used to investigate various parameters that influence the leaching of substances from façade coatings into the environment. This is done using the biocide diuron and an extrapolation time of 20 years.

Approach: All 11 diuron data sets were simulated in COMLEAM using a standard house (l x w x h = 17.5 x 7.5 x 2.5 m) and weather data from Zurich over 20 years (1996-2016) with a resolution of 1-hour intervals. An urban scenario within a city was modelled.
The runoff due to precipitation went into a near-by stream with a flow rate of 0.05 m^3/s. Using the acute threshold of diuron (0.25 ug/L), time steps exceeding this threshold were counted. Influencing factors onto this “stream-concentration-peak-pattern” were investigated (as reference compare the black peaks in figure 2).

Result: Initially, it was assumed that the slopes of the emission curves from COMLEAM are a driving factor for the peak pattern in the stream. In figure 3 the emission curves can be seen. But no correlation was found. In figure 2, the first derivation of the emission function is added (red line) and shows a clear correlation. Based on this visual comparison, only the first 0.5 years of the simulation were considered. A strong positive correlation of 0.95 between the number of peaks above the acute threshold and the slope of the emission curves was found. Another example of the many statistical analyses performed is, that the peak pattern over the time period of 20 years is mainly driven by weather events.