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Assessment of monitored tile drainages discharge data

U. Hirt, A. Wetzig

Institute of Freshwater Ecology and Inland Fisheries, Dept. of Lowland Rivers and Shallow Lakes, Berlin, Germany (hirt@igb-berlin.de / Phone: +49 30-64181691)

Tile drainages are installed to remove excess water from soils so that they may be used for agriculture. Such tile drainages are e.g. present on 13% of the agricultural land in Germany (De la Cueva Bueno 2006). It is highly relevant to consider tile drainages for the modelling of water fluxes, because they affect all components of the water balance. Important input information for models is: time of the tile drainage discharge after a rainfall event, the share of tile drainage discharge from precipitation, and detection of seasonable differences in tile drainage discharge. These data are usually not available.

Therefore, a literature research and a subsequent data acquisition were processed successively for Germany, Europe and worldwide to derive precipitation and tile drainage discharge data from monitoring stations at high temporal resolution. Although we contacted a total of 192 scientists and 70 scientific institutions, we received only 11 datasets of tile drainage monitoring stations and three of rainfall simulations on drained fields, and learned that monitoring of such areas was rare. There are daily tile drainage data from three different study sites in Germany, one from each of Denmark, Ireland, Scotland, Sweden, Slovenia, and two datasets from USA; one hourly resolution dataset came from France.

When comparing the situation in the summer term with that in winter term (November to April), the proportion of the precipitation that is evident in the tile drainage in average is in summer 16% and in winter 62%. In summer the tile drainage responds in average to 37% of precipitation events, whereas tile drainages respond to 53% in winter. Three datasets with irrigation to simulate rainfall (two from Germany and one from the USA) indicated that tile drainages responds either within the first hour (20%) or at least in the span of time of 3.6 hours (80%). Two of the study sites were ir-

rigated till field capacity was reached, before the simulated rainfall was started. But the drainage response was not much slower during these irrigations before the rainfall simulation started.

Regarding soil texture, one could see that at all locations a fast-reacting tile drainage discharge was detectable. This is in contrast to common drainage discharge (or seepage water) calculations, which usually calculate for unstructured sandy soils a faster seepage water reaction than for structured e.g. loamy soils. The fast reaction in unstructured soils is due to macropores in structured soils.

Literature

De la Cueva Bueno, P. (2006): Identification of agricultural areas in Europe subject to different types of field drainage. MSc by Research, Cranfield University at Silsoe.

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