Geophysical Research Abstracts
Vol. 12, EGU2010-2141, 2010
EGU General Assembly 2010

Spatial heterogeneity of mobilization processes and input pathways of herbicides into a brook in a small agricultural catchment

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Soil applied herbicides can be transported from their point of application (agricultural field) to surface waters during rain events. There they can have harmful effects on aquatic species. Since the spatial distribution of mobilization and transport processes is very heterogeneous, the contributions of different fields to the total load in a surface water body may differ considerably. The localization of especially critical areas (contributing areas) can help to efficiently minimize herbicide inputs to surface waters. An agricultural field becomes a contributing area when three conditions are met: 1) herbicides are applied, 2) herbicides are mobilized on the field and 3) the mobilized herbicides are transported rapidly to the surface water.
In spring 2009, a controlled herbicide application was performed on corn fields in a small (ca 1 km2) catchment with intensive crop production in the Swiss plateau. Subsequently water samples were taken at different locations in the catchment with a high temporal resolution during rain events.
We observed both saturation excess and hortonian overland flow during the field campaign. Both can be important mobilization processes depending on the intensity and quantity of the rain. This can lead to different contributing areas during different types of rain events. We will show data on the spatial distribution of herbicide loads during different types of rain events.
Also the connectivity of the fields with the brook is spatially heterogeneous. Most of the fields are disconnected from the brook by internal sinks in the catchment, which prevents surface runoff from entering the brook directly. Surface runoff from these disconnected areas can only enter the brook rapidly via macropore-flow into tile drains beneath the internal sinks or via direct shortcuts to the drainage system (maintenance manholes, farmyard or road drains). We will show spatially distributed data on herbicide concentration in purely subsurface systems which shows how important such input pathways can be.