CONCEPT FOR THE IMPROVEMENT OF FLOOD WARNING BY DISTRIBUTED SOIL MOISTURE MEASUREMENTS

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Flood events in small or middle size catchments often lead to severe damage due to the fast runoff generation which is difficult to predict. The situation could often be relieved if it were possible to prolong the advance warning time. We expect that persistant operational observation of the catchment's soil moisture condition improves the reliability of flood warning. The soil moisture acts as a state variable controlling the risk of surface runoff, which is assumed to provoke critical floods. We further believe that critical soil moisture conditions can be identified by measurements in certain areas representative for the catchment.

These hypotheses are tested in the german Sulm catchment. The hilly terrain is located in a height from 150 up to 450 m with an average precipitation of 725mm/year. Clayey soils dominate this area of 120 sqkm. Mainly three different landuse classes are defined: forest on the northern -, wine on the southern hillsides and agricultural planes in the valleys. To get the identification of the representative araes the catchment is devided into classes of different soil moisture dynamics to get spatial information about the potential moisture distribution. An appropriate classification is found by means of Landsat TM images. Wet, temporary saturated and dry zones can be identified. The chosen subdivision of the catchment has to be substantiated with field exploration and soil moisture measurements.

Especially the investigation of the temporary saturated zones is important since their wet state indicates a potential risk for high floods, if heavy rainfall occurs.

To estimate the overall condition in the catchment persistent soil moisture measurement facilities are installed in chosen areas assumed to be representative for the different classes of moisture dynamics.

Currently three facilities are installed. The core of each is a time domain reflectrometer (TDR), Tektronix 1502. Up to 47 twin rod probes of different lengths can be connected to the TDR via a multiplexer. The system is controlled by a programmable single board computer (SBC), equipped with a GSM modem to enable remote access. Each measurement facility has a solar power supply. The recorded TDR signals are transmitted to a central host and evaluated to get soil moisture profiles along the wave guides.