SOIL MOISTURE MEASUREMENT SYSTEM FOR AN IMPROVED FLOOD WARNING

W. Schaedel, R. Becker

Institute of Water Resources Management, Hydraulic and Rural Engineering, University of Karlsruhe, Germany, (Contact: wolfram.schaedel@iwk.uni-karlsruhe.de /Fax: +49-721-661329)

Precipitation-runoff processes are correlated with the catchment's hydrological preconditions that are taken into account in some hydrological models, e.g. by pre-precipitation index. This statistically generated variable is unsuitable in case of extreme flood events. Thus a non-statistical estimation of the catchment's preconditions is of tremendous importance for an improvement in reliability of flood warning. This can be achieved by persistent operational observation of the catchment's soil moisture condition. The soil moisture acts as a state variable controlling the risk of surface runoff, which is assumed to provoke critical floods. Critical soil moisture conditions can be identified by measurements in certain areas representative for the catchment. Therefore a measurement arrangement that does not effect the structure of soils is realised with twin rod probes. Spatial resolution algorithms result in soil moisture profiles along the probe rods. In this set up a quasi three dimensional soil moisture distribution can be interpolated with point measurements of up to 47 twin rod probes per cluster, connected via multiplexer. The large number of probes per cluster is of use for detailed observation of small-scaled moisture variability. As regionalized grid cell moisture the cluster information calibrates the default, state depending soil moisture distribution of the catchment. This distribution is explained by diverse soil moisture influencing properties, which are found by Landsat satellite image. Therefore the image is processed with principal component analysis to extract the soil moisture distribution. The distribution is calibrated by the detailed measurements, acting as ground based truth. Linear multiple regression operated on the calibrated distribution identifies the mentioned properties. In this fashion the catchment status can be determined and combined with precipitation forecasts, thus allowing for the comprehensive risk calculation of critical floods.