Geophysical Research Abstracts
Vol. 16, EGU2014-9892, 2014
EGU General Assembly 2014

Macro-scale assessment of areas sensitive to changes in flood magnitudes for Austria

Mathew Herrnegger, Benjamin Apperl, Tobias Senoner, and Hans-Peter Nachtnebel
University of Natural Resources and Life Sciences, Institute of Water Management, Hydrology and Hydraulic Engineering, Vienna, Austria (mathew.herrnegger@boku.ac.at)

This contribution presents a GIS-based method for the identification of areas sensitive to changes in flood magnitudes on the basis of existing flood maps and topographic features of flood plains. The approach enables the identification of flood prone river sections for large areas, as no additional hydrodynamic simulations are necessary or available. In our case an area of $\sim$ 84.000 km^2, including about 26.000 km of rivers and streams, is analysed.

Even though the results of climate models are uncertain regarding the prediction of future changes in frequency and magnitude of floods, the recent accumulation of extreme flood events in parts of Austria makes it inevitable to account for possible changes in runoff characteristics. Therefore, an enhanced impact assessment of these changes and the identification of flood sensitive areas is necessary.

The existing HORA data set (Natural Hazard Overview & Risk Assessment Austria) indicates flood plains for recurrence intervals of 30, 100 and 200 years for the entire area of Austria under current climate conditions. A variable climate change allowance is applied to the corresponding discharges of the 200 years return period data set (HQ_{200}), with the aim of generating modified runoff values of equal recurrence intervals for all flood values (HQ_{cc}). This procedure guarantees a consistent data set, based on the underlying Gumbel flood statistics of the original data set.

The HORA-data sets includes points with the information on discharge and water depth for the existing recurrence intervals. Based on the simplifying assumption of (1) a rectangular cross section, (2) the water depth for the HQ_{200} discharge value and (3) the modified HQ_{cc} value, a new water depth (h_{cc}) and the change in water depth (Δh) can be calculated for these locations. Changes in water depth are aggregated for municipalities by calculating a weighted mean depth change, using discharge as the weighting value. Based on the derived water depth changes, the existing flood areas are enlarged on the basis of the digital terrain model with a resolution of 10x10 m.

For every existing boundary point $P_i(x_i,y_i,z_i)$ of the HORA-HQ_{200} flood plain a change in water depth Δh is added to the elevation value z_i. For this point P_i all Points $P_{k,i}$ in the surrounding area r are identified, where the elevation value z_k is lower than $z_i + \Delta h$. The surrounding area r, where valid points $P_{k,i}$ can be situated, is defined by the drainage area of the existing boundary point P_i. P_i therefore represents an outlet point of a local subbasin. It is assumed, that points within the drainage area are inundated with rising water levels beginning from the outlet point. Local flows are thereby neglected. The derived flood plains look plausible and will be compared with 2-D hydrodynamic simulations for three case study areas in an on-going project.