

2D Surface Flow Model in The Biebrza Floodplain

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Abstract : We applied a two-dimensional surface water flow model with irregular wet boundaries. In this model, flow equations are in the form of a 2-D, non-linear diffusion equations which allows to account spatial variations in flow resistance and topography. Calculation domain to simulate the flow pattern in the floodplain is congruent with a Digital Elevation Model (DEM) grid. The rate and direction of sheet flow in wetlands is affected by vegetation type and density, therefore the developed model take into account spatial distribution vegetation resistance to the water flow. The model was tested in a part of the Biebrza Valley, of an outstanding heterogeneity in the elevation and flow resistance distributions due to various ecohydrological conditions and management measures. In our approach we used the highest-possible quality of the DEM in order to obtain hydraulic slopes and vegetation distribution parameters for the modelling. The DEM was created from the cloud of points measured in the LiDAR technology. The LiDAR reflects both the land surface as well as all objects on top of it such as vegetation. Depending on the density of vegetation cover the ability of laser penetration is variable. Therefore to obtain accurate land surface model the “vegetation effect” was corrected using data collected in the field (mostly the vegetation height) and satellite imagery such as Ikonos (to distinguish different vegetation types of the floodplain and represent them spatially). Model simulation was performed for the spring thaw flood in 2009.

Keywords : floodplain flow, Biebrza valley, model simulation, 2D surface flow model

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