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Sensitivity analysis of MOHID-Land model. Calibration and validation of Ulla river watershed.

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Nowadays flood warning systems are extremely important since they can provide critical information that can protect property and save lives. These systems should alert about whether a flood should be expected, when it will occur and how severe it will be.

A warning system can be based on the analysis of historical events and a good monitoring system or it can be based on the capacity of predict the channel flow in key locations. In the second case, these type of systems, known as forecast systems, consider the meteorological predictions as driving forces for a hydrological model which estimates the channel flow for the next few hours and days, considering the processes that take place in a watershed. A hydrological forecast can only be reliable when a good calibration and validation of watershed processes is performed.

This study aims to calibrate and validate the channel flow in Ulla river watershed (Galicia, Spain) using MOHID-Land model considering a sensitivity analysis of some parameters and user's options that can affect model results. MOHID-Land model is a physically based, fully distributed model that considers four compartments or mediums: atmosphere, porous media, soil surface and river network. Water dynamics is computed through the different mediums using mass and momentum conservations equations.

The model was firstly implemented in the studied domain with a resolution of 500 m. Data inputs included the digital Global Digital Elevation Model from NASA with a resolution of 30 m; the Corine Land Cover map from 2012 with a resolution of 100m; the soil hydraulic properties from the multilayered European Soil Hydraulic Database with a resolution of 250 m; hourly meteorological data (precipitation, solar radiation, wind velocity, air temperature, surface pressure and dew point temperature) from ERA5-Reanalysis with a resolution of 31 km; and daily total outflow for three reservoirs present in this watershed.

The sensitivity analysis was performed to test the impact of grid and elevation data source resolution, cross-sections geometry, soil parameters, vertical soil discretization, surface and channel Manning coefficients, the infiltration process and deactivation of different modules such as porous media and vegetation on streamflow. The results of these tests were compared with a reference simulation by the analysis of flow duration curves.

The hydrological model was calibrated and validated in 4 hydrometric stations not influenced by

reservoirs and the river flows considering the reservoirs operation were compared with measured values in 2 hydrometric stations. Four statistical parameters (R2, RMSE, PBIAS and NSE) were used to evaluate model performance at a daily scale which was considered good.