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SENSITIVITY ANALYSIS ON AN ADAPTIVE NEURO FUZZY INFERENCE SYSTEM (ANFIS) FOR HYDRAULIC HEAD INTERPOLATION: ORGEVAL EXPERİMENTAL SITE/ FRANCE

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Summary. The aim of this study is to investigate the efficiency of ANFIS (adaptive neuro fuzzy inference system) for interpolating hydraulic head in a 40 km2 agricultural catchment of the Orgeval (France). Inputs of ANFIS are Cartesian coordinates and the elevation of the ground. All ANFIS estimates are compared to a reference hydraulic head distribution assessed by Kriging with a 50m-square Digital Elevation Model (DEM) as an External Drift (KED). Hydraulic head in 70 wells were measured during a snapshot campaign on April 2009, which characterizes high water levels in the aquifer unit. The dataset was then split in three subsets: a calibration one (65%) , a training one (20%) and a test one (15%). First, sensitivity of ANFIS to the type and number of membership functions (MF) was tested. Gaussian, General bell and triangular type of MF were used with 2, 3, 4 and 5 If-Then rules. All configuration provide satisfactory results in the test phase (R2 ~ 0.98). To discriminate the best ones, interpolation on a 50m-square grid was done with every models at the basin scale and hydraulic head was compared to the DEM. Errors (hydraulic head > soil surface) were counted. The best ANFIS simulator is built on triangular MF with four rules. Performances of this interpolator equal the KED one, which is satisfactory. Sensibility of ANFIS interpolator with triangular MF was done on the interpolation grid. For this purpose, Cartesian coordinates were increase and decrease of 10m, whereas the soil elevation was transformed within +/- 2m which is within the uncertainty of differential GPS. Results reveal that ANFIS remains stable to errors propagation of both types with a higher sensitivity to soil elevation.