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Comparison of 2D numerical models for the simulation of river-flooding in a semi-urban area

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Abstract: The study deals with the comparison of three 2D depth-averaged numerical models for the simulation of a flood event. In the comparative study the numerical models MIKE21 FM, HYDRO_AS-2D, RIVERFLOW2D and TELEMAC-2D are used. The four numerical models differ in the spatial and time discretization of the shallow water equations. For a transparent comparison, in the setups of the four models it has been aimed at applying the same parameters in terms of mesh, roughness and turbulence closure. Two flood scenarios have been investigated: unsteady flood hydrograph and steady 100-year-flood. The analysis of the results consisted mainly in the comparison of the computed water depths and the quantitative evaluation of the differences. Although the numerical models produce somewhat similar flood inundation areas, the computed local water depths can differ significantly especially in the flood plains. The study shows the high impact of the chosen numerical discretization scheme on the simulated flow processes. It highlights the required steps and the associated difficulties when comparing different 2D numerical models quantitatively. As a side product, the computation times of the numerical models are compared, too.