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Exact solution of the Linear Parabolic Approximation for flow-depth based diffusive flow routing

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1 **Exact solution of the Linear Parabolic Approximation for flow-depth based diffusive flow**
2 **routing**

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10 **Keywords:** Diffusive wave; Analytical solution; Backwater effects; Boundary conditions; Channel routing;
11 Simplified model.

12
13 **Abstract**

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15 *The Linearized Parabolic Approximation of the Saint Venant Equations is often used for flood*
16 *routing, but the corresponding analytic solutions usually neglect the downstream boundary*
17 *conditions. This is an issue because the presence of hydraulic structures at the end of a river reach,*
18 *or natural morphologic conditions, may influence the wave propagation. In order to take into*
19 *account realistic boundary conditions, namely a stage-hydrograph upstream and a stage-discharge*
20 *relationship downstream, a new set of exact solutions of the Linearized Parabolic Approximation of*
21 *the Saint Venant Equations with uniformly distributed lateral inflows is presented. This exact*
22 *solution is demonstrated by using it as a building block in a simplified flood routing model, whose*
23 *numerical results are compared with those supplied by laboratory experiments from literature.*
24 *Finally, the new solutions are used to analyze the range of validity of semi-infinite channel models.*
25 *The comparison shows that semi-infinite channel models are accurate when convective effects are*
26 *prevailing on diffusive effects, and the downstream boundary condition corresponds to uniform flow*
27 *conditions. In addition, the results show that semi-infinite channel models based on the knowledge*

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