Supplement of

Building hazard maps with differentiated risk perception for flood impact assessment

Punit K. Bhol et al.

Correspondence to: Punit K. Bhol (punit.bhol@tum.de)

The copyright of individual parts of the supplement might differ from the CC BY 4.0 License.
Table S1. Parameters of the LARSIM water balance model including initially calibrated ranges (Data source: Based on Haag et al., 2016). Eight sensitive parameters (in bold) identified in Beg et al. (2018) were used in this study to generate discharge ensemble forecasts.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Description</th>
<th>Ranges (L-U)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External forcing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KG</td>
<td>[-]</td>
<td>Correction factor for the areal precipitation</td>
<td>0.9 – 1.1</td>
</tr>
<tr>
<td>KWD</td>
<td>[-]</td>
<td>Correction factor for the available amount of water including snowmelt</td>
<td>0.9 – 1.1</td>
</tr>
<tr>
<td>Nkor</td>
<td>[-]</td>
<td>Correction factor for rainfall measurements error</td>
<td>0.9 – 1.1</td>
</tr>
<tr>
<td><strong>Snow storage</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T_Gr</td>
<td>[°C]</td>
<td>Mean temperature of the transition zone from snowfall to rain</td>
<td>-3 – 2</td>
</tr>
<tr>
<td>ScRa</td>
<td>[mm/h]</td>
<td>Soil heat flow as potential melting rate</td>
<td>0.01 – 0.05</td>
</tr>
<tr>
<td>Abso</td>
<td>[-]</td>
<td>Absorption coefficient of the snowpack for short-wave radiation</td>
<td>0.02 – 0.25</td>
</tr>
<tr>
<td>A0</td>
<td>[W/m² °C]</td>
<td>Heat exchange at the snow line, independent of the wind</td>
<td>0.5 – 3.5</td>
</tr>
<tr>
<td>A1</td>
<td>[J/m³ °C]</td>
<td>Heat exchange at the snow line, dependent on the wind</td>
<td>0.8 – 2.5</td>
</tr>
<tr>
<td>SRet</td>
<td>[%]</td>
<td>Coefficient for the retention of liquid water in the snow pack</td>
<td>5.0 – 47.0</td>
</tr>
<tr>
<td><strong>Soil storage and runoff generation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>[mm/h]</td>
<td>Threshold value for fast and slow surface runoff</td>
<td>0.5 – 4.0</td>
</tr>
<tr>
<td>BSF</td>
<td>[-]</td>
<td>Exponent of the soil moisture saturation area function</td>
<td>0.01 – 0.5</td>
</tr>
<tr>
<td>Dmax</td>
<td>[-]</td>
<td>Calibration factor for lateral drainage to the interflow storage at saturated conditions</td>
<td>0 – 10</td>
</tr>
<tr>
<td>Dmin</td>
<td>[-]</td>
<td>Calibration factor for lateral drainage to the interflow storage at field capacity</td>
<td>0 – 5</td>
</tr>
<tr>
<td>β</td>
<td>[1/d]</td>
<td>Drainage index for deep percolation from the lower soil storage</td>
<td>0.0000002 – 0.1</td>
</tr>
<tr>
<td>WZPf</td>
<td>[-]</td>
<td>Threshold value for the lower soil storage as a fraction of the total soil storage</td>
<td>0.25 – 0.75</td>
</tr>
<tr>
<td>WZBo</td>
<td>[-]</td>
<td>Threshold value for the middle soil storage as a fraction of the total soil storage</td>
<td>0.35 – 1.05</td>
</tr>
<tr>
<td>Mauf</td>
<td>[mm/d]</td>
<td>Maximum rate of capillary rise</td>
<td>0.9 – 1.1</td>
</tr>
<tr>
<td>KFeld</td>
<td>[-]</td>
<td>Correction factor for the field capacity</td>
<td>1.0 – 1.4</td>
</tr>
<tr>
<td><strong>Runoff concentration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQD2</td>
<td>[-]</td>
<td>Calibration variable for the retention constant of the fast surface runoff storage</td>
<td>10 – 1000</td>
</tr>
<tr>
<td>EQD</td>
<td>[-]</td>
<td>Calibration variable for the retention constant of the slow runoff storage</td>
<td>50 – 5000</td>
</tr>
<tr>
<td>EQI</td>
<td>[-]</td>
<td>Calibration variable for the retaining constant of the interflow storage</td>
<td>200 – 15000</td>
</tr>
<tr>
<td>EQB</td>
<td>[-]</td>
<td>Gauging size for the retaining constant of the basis discharge storage</td>
<td>5000 – 10000</td>
</tr>
<tr>
<td><strong>Flood routing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EKM</td>
<td>[-]</td>
<td>Calibration factor for the roughness coefficient in the main river bed</td>
<td>0.3 – 3.0</td>
</tr>
<tr>
<td>EKL / EKR</td>
<td>[-]</td>
<td>Calibration factors for the roughness coefficients on the flood plains</td>
<td>0.3 – 3.0</td>
</tr>
</tbody>
</table>
Table S2. 2D hydrodynamic model properties and roughness. Data source: Bhola et al (2018a) and Bhola et al. (2018b).

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HD model properties</strong></td>
<td></td>
</tr>
<tr>
<td>Model area</td>
<td>11.5 km²</td>
</tr>
<tr>
<td>Total number of cells</td>
<td>430,485</td>
</tr>
<tr>
<td>(\Delta t)</td>
<td>20 s</td>
</tr>
<tr>
<td>Minimum cell area</td>
<td>6.8 m²</td>
</tr>
<tr>
<td>Maximum cell area</td>
<td>59.8 m²</td>
</tr>
<tr>
<td>Average cell area</td>
<td>24.8 m²</td>
</tr>
<tr>
<td>Downstream boundary condition slope</td>
<td>0.0096</td>
</tr>
<tr>
<td><strong>HD model roughness ([s/m^{1/3}])</strong></td>
<td></td>
</tr>
<tr>
<td>Water bodies</td>
<td>0.022</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0.043</td>
</tr>
<tr>
<td>Forest</td>
<td>0.189</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.014</td>
</tr>
<tr>
<td>Urban</td>
<td>0.074</td>
</tr>
</tbody>
</table>