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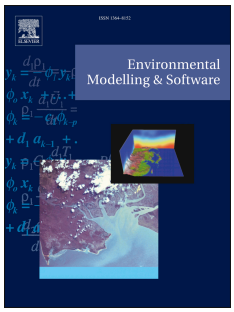

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Modeling the extent of surface water floods in rural areas: lessons learned from the application of various uncalibrated models

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Abstract

Surface water floods (SWFs) do not only increasingly threaten cities, but also affect rural areas. So far, little research has been dedicated to the prediction of SWFs in rural environments, although in practice the process is already being considered in deterministic flood hazard assessments. To test the validity of such assessments, we select four raster-based models with differing complexity and evaluate whether they reliably predict inundated areas by SWF in rural areas. The uncalibrated models are first applied to four artificial surfaces and second, to eight case studies covering manifold geographical and meteorological settings. For the case studies, the models' prediction skills are assessed based on inundated areas inferred from various sources. The models' performance is rather low for all case studies, which highlights the necessity for calibration and/or validation of such models. Moreover, the case studies provide more general conclusions concerning the modeling of SWFs in rural areas.

Keywords: surface water flood, rural environment, flood inundation model, uncalibrated, validation

Software availability

- FLO-2D (cf. Sect. 2.1.1)
  - Details: FLO-2D Pro (Build No. 16.06.16)
  - Developers: FLO-2D Software Inc. (P.O. Box 66, Nutrioso, AZ 85932, United States)
  - Requirements: Windows 7 or higher
  - Cost: $995.00
  - URL: `https://www.flo-2d.com/flo-2d-pro/`
- FloodArea (cf. Sect. 2.1.2)

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[1] Abbreviations: DEM, digital elevation model; GA, Green-Ampt; SWF, surface water flood; UAV, unmanned aerial vehicle