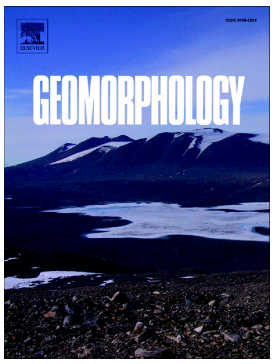

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Abstract

Karst sinkholes (dolines) play an important role in a karst landscape by controlling infiltration of surficial water, air flow or spatial distribution of solar energy. These landforms also present a limiting factor for human activities in agriculture or construction. Therefore, mapping such geomorphological forms is vital for appropriate landscape management and planning. There are several mapping techniques available; however, their applicability can be reduced in densely forested areas with poor accessibility and visibility of the landforms. In such conditions, airborne laser scanning (ALS) provides means for efficient and accurate mapping of both land and landscape canopy surfaces. Taking the benefits of ALS into account, we present an innovative method for identification and evaluation of karst sinkholes based on numerical water flow modelling. The suggested method was compared to traditional techniques for sinkhole mapping which use topographic maps and digital terrain modelling. The approach based on simulation of a rainfall event very closely matched the reference datasets derived by manual inspection of the ALS digital elevation model and field surveys. However, our process-based approach provides advantage of assessing the magnitude how sinkholes influence concentration of overland water flow during extreme rainfall events. This was performed by calculating the volume of water accumulated in sinkholes during the simulated rainfall. In this way, the influence of particular sinkholes on