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Simplified methodology for floodplain inundation modelling using LiDAR DEM

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Abstract Flood inundation assessment is essential for emergency response under high flow conditions. It is also an important part of environmental planning and management. A simplified flood inundation modelling framework using LiDAR DEM is developed for rapid assessment of flood inundation area, volume and depth for high flow events. The LiDAR DEM is used together with climate and soil hydraulic data to simulate floodplain inundation area and volume for a given river stage height. The modelling methodology accounts for multiple flood runners as well as overbank flow onto the floodplain, and constrains the total spatial extent of inundation area based on maximum available water. It also accounts for floodplain evaporation, infiltration and return flows to the river. The methodology has been tested across several floodplain reaches in the Lower Murrumbidgee and Macquarie region in southeast Australia for estimating floodplain inundation extent and volume for some recent flood events. The spatial inundation extents estimated using this newly developed methodology are compared to those derived from high resolution satellite imagery and on-ground measurements to assess the suitability and applicability of the method for inundation modelling. The estimated volume and depth are also compared to those from a fully distributed hydrodynamic model. The results indicate that the methodology is capable of providing reasonably good estimates of flood inundation spatial extent, volume and depth. This methodology can be easily implemented across a number of river reaches and therefore it can be used to carry out scenario modelling under various future climate conditions.

Key words river reach; floodplain inundation; flooding; overbank flow; floodplain storage