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Surface-groundwater interactions in karst: overview, concept and mapping

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Under special meteorological and hydrological circumstances, shallow karst areas and karst poljes may experience surface water overflow. As a result, surface- groundwater interaction occurs usually creating intermittent lakes. Although human settlements and activities have traditionally adapted to these natural conditions, extensive temporary floods are classified among the most common natural disasters in karst. On the other hand, intermittent lakes are considered as natural reservoirs of excess recharge and good flood regulators in the lower parts of river basins. Due to specific ecohydrological processes and environmental conditions, these areas host unique wetland ecosystems with high levels of biodiversity and provide various ecosystem services, such as ecological productivity, photosynthesis and carbon storage. Given the dynamic nature of hydrological processes in karst aquifers, a distinctive feature of the phenomena described is its high variability of occurrence and duration. Therefore, the identification, characterization as well as the determination of the spatial dimension of flood levels is a challenging task. Focusing on the Slovenian karst, a literature review and analysis of topographical and hydrological data of the selected study areas was conducted. The hydrological analyses were based on long-term monitoring data from Slovenian Environmental Agency and partly on the authors' own database of field measurements and knowledge of the areas concerned. Consequently, the conceptual framework and the key criterion for the determination and recording of areas subject to temporary flooding were developed. A systematic survey reveals the significance of the extent, duration and frequency of flooding. Evaluation results are useful to designers of various water policies and management mechanisms for flood mitigation and protection of special habitats. Observing trends in the spatial and temporal dynamics of flood levels is also valuable for understanding how and to what extent karst aquifers are vulnerable to environmental changes. Finally, the analyses also enable prediction of the effects of these changes on other parts of the environment (e.g., hydrophilic habitats).