# A SATELLITE-BASED METHOD FOR WETLAND INUNDATION MAPPING

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Hydrologic models of wetlands enable hydrologists and water resources managers to appreciate the environmental and societal roles of wetlands and manage them in ways that preserve their integrity and sustain their valuable services. However, wetland model reliability and accuracy are often unsatisfactory due to the complexity of the underlying processes and the lack of adequate in-situ data. In this research, we demonstrate how MODIS satellite imagery can be used to characterize wetland flooding over time and to support the development of more reliable wetland models. We apply this method to the Sudd, a seasonal wetland in South Sudan that is part of the Nile River Basin. The database consists of 16 years of 8-day composite ground surface reflectance data with a 500 m spatial resolution downloaded from Earth Explorer. After masking poor quality pixels, monthly mean NDWI and NDVI values were extracted. Based on literature and personal accounts describing the Sudd as well as Google Earth imagery, a set of ground truth locations were identified for each land class and monthly distributions of the indices were derived. The indices were then combined in a unique way and statistics of the new distributions were used to classify land types present in the full area of interest. Subsequently, annual statistics were derived from the same indices and used to identify pixels that undergo flooding as well as the timing and duration of flooding for each year (2000–2015). An independent set of ground truth locations were selected for method validation. The combined indices demonstrate high land classification accuracy and outperform the individual indices as well as other existing land classification algorithms. The derived monthly inundation series agrees well with upstream flow records and anecdotal observations. This information is currently being used to develop wetland models as part of a comprehensive modeling system for the Nile River Basin. The new method is general and can be used in Georgia and other regions, such as the Florida Everglades, to develop improved wetland models and support better river basin management. Other potential applications of the method include flood mapping in data scarce areas, snow cover mapping, and satellite-based estimation of hydrologic and water quality variables.

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