

Hurricanes are an incredibly dangerous natural disaster that can affect the environment as well as society. They affect large swaths of land and can drastically change the hydrological conditions that previously existed. Modeling these large watersheds is often challenging and can be made even more so when the areas involved are complex river systems with a lack of land-based observation stations for hydrologic data collection. Similarly, the modeling software itself takes years of experience to use effectively. This study seeks to demonstrate the process of model development in depth in as much detail as possible.

To achieve this, multiple surface water-groundwater (SW-GW) models were developed looking at the impacts from Hurricane Michael of 2018 on a 169 mi² watershed on flooding and changes to hydrological conditions. Satellite remote sensing data from 2016 and 2022 was implemented into the models to assess changes that may have occurred in land cover, land use, and imperviousness. This data showed significant changes in surface conditions largely due to tree loss in the study area.

The results showed a 256% increase in flooded area due to Hurricane Michael when a 25 year 24 hour storm event was simulated. These results were then validated and calibrated by simulating an average storm event with data pulled from a rain monitoring station nearby. Through running different variations of the model, it was found that the majority of flooding was caused by a change in groundwater levels although the surface conditions changing did affect this as well.

