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Hurricane Effects on South Florida Water Management System: A Case Study of Hurricane Wilma of October 2005

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Abstract

An unprecedented eight hurricanes (Charley, Frances, Ivan, Jeanne, Dennis, Katrina, Rita and Wilma) affected South Florida in 2004 and 2005. These storms resulted in high property losses, high rainfall, high surface water flows, rise in lake water levels and damage to water management infrastructure. The last storm to hit was Hurricane Wilma which passed through the central section of South Florida from the west to the east as a Category 2 hurricane with gust wind speed as high as 180 km h⁻¹ and widely affected the area. Apart from the extensive costly wind damage, rainfall from Wilma affected the South Florida Water Management System. One of the risks associated with hurricanes in South Florida is the potential for wave erosion damage to the Herbert Hoover Dike on Lake Okeechobee and consequences of a breach. The Herbert Hoover Dike was damaged by Hurricane Wilma. Analysis of wind direction and speed over the region and estimated storm surge and wave setup of 4.68 m on the Lake Okeechobee levee corresponds with water mark and levee damage observations. Water level data is presented showing the lake drawdown at upwind and the wave setup downwind. Atmospheric pressure change over the region during the hurricane is presented. Water quality of the lake was affected due to settled sediment re-suspension and increase in phosphorus in the water column. Spatial monthly mean total suspended solids concentration increased from 19 mg L⁻¹ to 131 mg L⁻¹ (689 percent), while spatial monthly mean total phosphorus concentration increased from 201 µg L⁻¹ to 305 µg L⁻¹ (152 percent). The hurricane uprooted and dislocated vegetation from wetlands and littoral zones of lakes. Canals and water control structures were filled with uprooted vegetation and other debris resulting in limited flood conveyance.

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Keywords

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