MODELING COMPOUND FLOODING FROM EXTREME RAINFALL EVENTS IN THE AÑASCO WATERSHED, PUERTO RICO

Eric W. Harmsen[1], Said Majia[2], and Masoud Ghandehari[3]

1. Professor, UPRM, Mayaguez, PR. Email: eric.harmsen@upr.edu
2. Ph.D. Graduate Student, City University of New York (CUNY)
3. Professor, New York University (NYU)

This project's primary goal is to develop a data-driven modeling framework for understanding the complex physical and social vulnerabilities and interdependencies that resulted in the near-total failure of the physical systems in Puerto Rico (PR) during and after Hurricane María (HM). The specific objectives for the UPRM Team were to develop and calibrate a model to evaluate the hydrologic response to HM and other selected extreme weather events. The model can estimate the extent and depth of flooding, informing the infrastructure network model relative to critical water and electrical infrastructure.

The flood model will consider the compound effects of flooding from riverine discharge, rainfall-runoff, tide, and storm surge. Initial work has focused on developing a hydrologic model for the Añasco Watershed in western Puerto Rico. The watershed is composed of a wide diversity of conditions, including urban, agriculture, and forest landscapes, topographic relief of over 1000 meters, a river course with extreme meander, and a sizeable coastal floodplain, part of which includes marshland. There are five interconnected lakes located in the upper part of the watershed (Lagos Toro, Prieto, Guayo and Yahuecas), which transfer water to southwest PR, except during extreme rainfall, when the water is released into the lower Añasco Watershed. A U.S. Geological Survey stream discharge gauge is available for model calibration, located in San Sabastian; however, no gauges are available in the watershed's coastal flood plain portion. Various remote sensing products were used in model development and validation. Preliminary results indicate that HM's flooding exceeded the 100-year flood limits as defined by the Federal Emergency Management Agency (FEMA).