FLOOD HAZARDS AND MAJOR AFFECTED AREAS

INTRODUCTION
Flooding from high intensity rainfall associated with or without tropical storms and hurricanes, is a major hydro-meteorological hazard affecting Jamaica, the third largest island of the Caribbean. Centred on latitude 18°15' N and longitude 77°20' W, Jamaica has been negatively affected by severe weather and repeated flooding events (2004, 2005, 2008, 2010, 2012 and 2014) which have been very costly in terms of both lives and livelihoods. The island has been affected severely by floods resulting from tropical storms and hurricanes owing to its location in the Atlantic hurricane belt. The Planning Institute of Jamaica estimated that in ten years (2001-2010) the island experienced damage of over US $1.12 Bn due to severe weather systems including hurricanes and tropical storms. Frequencies of floods as well as tropical storms and hurricanes have increased at the end of the 20th century and into the 21st century with the period 1990-2000 having maximum occurrences of flood events (Figures 1).

Figure 1. Map of Jamaica showing the 30Y mean annual rainfall and reported flood events. (Data from WRA, ODPEM, CGAC).

WATERSHEDS UNDER STUDY

RESULTS: SIMULATIONS IN YALLAHS AND HOPE RIVERS FOR TROPICAL STORM GUSTAV

In the present study, emphasis was given to the two major affected watersheds of Hope and Yallahs in Eastern Jamaica. Simulations of flow was done for the two major events i.e. Tropical Storm Nicole in September 2015 and Tropical Storm Gustav in August 2008. The storm caused flooding of the Yallahs & Hope Rivers and US $210 M in Damage & Loss.

METHODOLOGY:
- Used 24-h rainfall data from Mavis Bank gauging station for Yallahs and 15 minute rainfall intensity data from Grove for Hope watershed for Tropical Storm Gustav.
- Used 5 minute rainfall intensity data for Tropical Storm Nicole for Hope watershed.
- NRCC Type II method used to generated hourly rainfall for Yallahs.
- Flows generated from rainfall data using USDA - Soil Conservation System Curve Number method for Loss estimation in HEC HMS models.

44: C) SIMULATION OF FLOW AT GROVE FOR THE HOPE STATION FOR TROPICAL STORM NICOLE - FLOW LIKELY TO IMPACT THE COMMUNITIES AROUND e.g. KINGSTYE (Fig 10)

24-hour rainfall distribution for Mavis Bank Station...Rainfall used as input.
A) 15 Minute rainfall intensity data for Tropical Storm Gustav for Grove station in Hope watershed.
B) 5 Minute rainfall intensity data for Tropical Storm Nicole for Hope watershed. Rainfall used as input into the HEC HMS models.

FUTURE CLIMATE IMPACT FOR YALLAHS

CONCLUSIONS:
- Hydrological modelling of the watersheds shows high runoff from high intensity short duration rainfall. Steep slopes (~30 degree) associated with presence of impermeable rock types (volcanoclastics, volcanics) allows high run off causing flooding in communities located downstream in all the watersheds. Estimation of flows from extreme events was not done previously and hence this offers new insight on the time taken for water to travel downstream as well as the volumes of water involved.
- Flood inundation maps created for the Yallahs watershed show 12-14m of flood depth in the downstream end of the river with only 1 hour difference between the flood peak upstream and downstream. Return period analysis shows that although the flood extents are similar, water depths are up to 2 m higher on the floodplain during a 100-year event compared to a 25-year event.
- Future flood inundation map created with ECHAM 2010-2099 climate data shows no reduction in inundation risk in the valley.

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