ROLE OF ANTECEDENT PRECIPITATION ON THE EXTREME FLOODING IN CAGAYAN RIVER BASIN, PHILIPPINES DURING TROPICAL CYCLONE VAMCO (ULYSSES)

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ABSTRACT

The Philippines is vulnerable to different types of hydrometeorological hazards including Tropical Cyclones (TCs). Tropical cyclones are low-pressure systems that develop over tropical waters and are made up of well-structured thunderstorms. They can bring heavy rainfall over land which can induce extreme flooding. River basins, being drainage areas for rivers and tributaries, are particularly susceptible to flooding. Various factors have been found to influence TC-induced flooding in river basins, one of which is antecedent precipitation. In the Philippines, river basins have been affected by flooding during TCs; however, only a few studies have investigated the role of antecedent precipitation on TC-induced flood events.

As such, this study will be exploring the contribution of antecedent precipitation on a river basin flooding during a particular TC. The focus will be on the role of preceding rainfall on the extreme flooding in Cagayan River Basin during the 2020 TC Vamco (TY Ulysses). The area was specifically chosen due to the following reasons: 1) the Cagayan River Basin has been massively affected by flooding during a TC event (i.e., TC Vamco); 2) various rainfall events have occurred in the basin prior to the flood-producing TC; and 3) these preceding rainfall events have been argued as among the major reasons behind the flooding.

This study will be investigating the contribution of the antecedent precipitation to the flooding in Cagayan River Basin during TC Vamco as well as analyzing the streamflow response of the basin channels when the preceding rains are excluded. Three scenarios will be tested: 1) flooding with both antecedent rains and TC Vamco; 2) flooding without TC Vamco; and 3) flooding without antecedent rains. The Soil and Water Assessment Tool (SWAT model), a hydrological model, will be used to determine the relationship between the antecedent rains and flooding. The SWAT model is a physically-based, continuous model that has been used extensively in watershed to river basin modeling. It has been used in simulating the hydrology of river basins in the Philippines including the Cagayan River Basin.

Incorporating the potential impacts brought by previous rains on floods, particularly in flood-prone areas such as the Cagayan River Basin, could help in predicting floods in the future and employing appropriate preparation and mitigation measures for flood hazards.

Keywords: antecedent precipitation, Typhoon Ulysses, flooding, SWAT, hydrological modeling