



Simulation of sub-basin sediment yields and river runoffs into Davao Gulf, Philippines

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The Philippines is a country within the Coral Triangle which is known to be the center of the most biologically diverse marine ecosystem in the world. Despite being a crucial area for marine biodiversity, discharge measurements of many rivers in the country are either sparse or non-existent. Such data are important in assessing aspects such as sedimentation which is highly related to the health of the reef community.

Here, we applied SWAT hydrological model in order to simulate the sediment yield of sub-basins and river discharge surrounding Davao Gulf, one of the country's richest zones in terms of fish production. Monthly-averaged results of the model from 2001 to 2018 indicate that the relative maxima of sediment yield coincide with precipitation maxima, and that consecutive rainfall events which start around midyear results to higher erodibility and thus, higher peaks in sediment yield during the second half of each year until the early part of the following year. Dependence of sediment yield on slope class/angle and land use was also observed, identifying the northwestern catchments as critical sources of land surface erosion. Good agreement was obtained between simulations of river discharge and the sparse observed streamflow values during model validation (Davao River: NSE=0.61, $R^2=0.61$, PBIAS = 2.87, $r= 0.78$; Hijo River: NSE=0.62, $R^2=0.90$, PBIAS = -2.1630, $r= 0.95$).

Overall, this modeling study helped fill in the temporal gaps of observed streamflow data from river gauges, and provided estimates of the historical streamflow pattern of those rivers with no river gauges. Outputs of this study can also be used as science-based reference in crafting laws and ordinances for proper land use and Marine Protected Area (MPA) management plans, with emphasized consideration of the likely effects of climate change such as the latitudinal shift of typhoon tracks, increasing temperature, and more pronounced precipitation events which have already been observed in the area during the past two decades.