Calibration and Application of LOUM in Southern Guam Watersheds

Funded by:
US Geological Survey, Water Institute Program

Principal Investigators:
Charles Luo and Shahram Khosrowpanah

Funding: $25,971

The Large-scale, Unified and Optimization Model, LUOM (Luo, 2007) is a fully physically based, 2-dimensionally distributed watershed model simulating the hydrologic cycle on a watershed scale. The model discretizes the watershed into rectangular grid cells and makes use of DEM (Digital Elevation Model) data, vegetation data and climate input data, mainly precipitation, temperature and wind speed, to generate one-dimensional output – discharge hydrographs and two-dimensional hydrologic quantities such as evapotranspiration, infiltration, soil moisture, groundwater table and surface water depth. Simulating impacts of land use (vegetation) transformation and global climate changes are within the model's capability.

During the preceding project, Calibration and Application of LUOM (Luo, 2007) in Southern Guam Watersheds With and Without Flow Data, DEM, vegetation, soil, rainfall and streamflow data have been collected, hydrologic watershed boundaries and stream networks have been delineated, and LUOM has been calibrated in the Ugum watershed and 4 other watersheds with both rainfall and flow data, and 7 other watersheds without flow data. Combining all available climate stations in southern Guam provided 54 years of rainfall data from which time series of flow data were generated by the calibrated model for all 12 watersheds.

The objective of the project described herein, is to continue the calibration and application of LUOM in the rest southern Guam watersheds that were not covered in the previous project. Using the data collected in the preceding project, LUOM will be calibrated in Talofofo, Ylig, Pago and other watersheds with available streamflow data. The calibrated model will be used to provide any missing data for these watersheds as well as for other southern Guam watersheds without streamflow data.

The benefits of this project will be enormous not only to Guam but also to other islands in Western Pacific. Researchers will be able to implement various watershed management practices within the watershed. For example, by having flow data, researchers studying the impact of various watershed management practices, can develop a correlation between stream flow, rainfall, and turbidity at various sections of a watershed. The model will also assist the Guam Waterworks Authority (GWA) with future explorations for potential sources of potable surface water in southern Guam. Finally, by providing flow data for the 16 ungaged streams on island, potential sites for small dam construction may be identified.