Lower Rio Grande Dynamic Channel Routing

Dr. Jungseok Ho and his student research team conduct research in dynamic channel modeling of the Lower Rio Grande from Penitas to Brownsville. The Lower Rio Grande (LRG) Valley has been issued flood events annually. The tropical weather and geometrical characteristics of the flat watershed near the Gulf of Mexico produce frequent flooding in the area. The Lower Rio Grande Flood Control Project, operated by the International Boundary & Water Commission (IBWC), is the main flood control strategy. The purpose of this study is to evaluate the hydraulic performance of the previously developed channel routing model by IBWC Rio Grande and Floodways model using available water surface elevation data along the LRG during historically maximum flow conditions. With the given levee elevations of the Rio Grande and Floodways, we expect that the hydraulic model will predict encroachment on the levees for these historically maximum flows. The validation model found differences on the water surface level for several locations along the LRGFCP channels. The design flood distribution used for flow boundary conditions, unpredicted lateral inflow and outdated channel geometry data are the assumed reasons of the differences between computed and measured water surface levels.

Discrete Phase Modeling for Stormwater Solids Transport

Discrete phase modeling has been recently adopted to predict stormwater solids transport. Discrete phase model parameters, which significantly affect prediction of particle motion, have not been well introduced to stormwater solids transport. Dr. Jungseok Ho and the undergraduate student research team are researching discrete phase numerical modeling. In this study, we try to determine the most appropriate discrete phase model parameters for particle motion by conducting parameter sensitivity analysis. We test five different stormwater solids classified by particle diameter size, density, and settling characteristics in 6 inches wide experimental flume. We perform sensitivity analysis of the discrete phase model parameters over various types of particles and flow conditions. Three-dimensional CFD (Computational Fluid Dynamics) model which solves the Reynolds-averaged Navier-Stokes equations including the Reynolds stress term, which approximates the random turbulent fluctuations using the finite volume formulation. The Lagrangian frame calculates the discrete phase model in the Lagrangian frame by tracking individual particles through the continuous flow fields computed in Eulerian frame. We also consider central processing unit time required to simulate the models in determining the suitability of the model.