Environmental and Water Resources Engineering Seminar Series Presents:

TEXAS

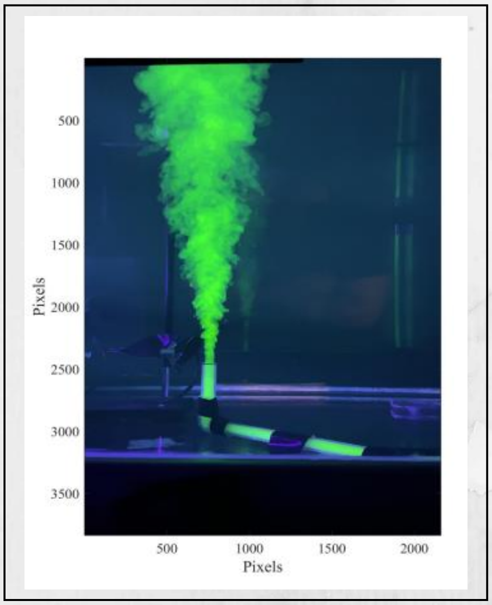
Thursday, May 5 2022, 3:30-4:30pm

Characterizing the Visual Structures and Velocity Statistics of a Buoyant Plume

James Holyoke

BS in Civil Engineering, University of Deleware

Advisor: Dr. Blair Johnson



Buoyant plumes are found in many settings, and they are often dangerous to their surrounding environments. Whether it be underwater oil blowout wells, chimney smokestacks, or volcanic eruptions, predicting their movement is important to hazard management. Unfortunately, due to their turbulent and often harmful nature, quality in-situ measurements are difficult to obtain. Thankfully, video recordings of buoyant plume dispersion are readily available, and image processing techniques can be used to gather the necessary measurements. To prove the effectiveness of image processing techniques, an experimental setup was designed to mimic the dispersion of a buoyant plume. Time-lapse images were collected while the plume rose in the water column, and velocity measurements at the plume outlet were collected simultaneously. Due to the existence of turbulence, structures develop on the edges of the plume, and the sizes of these structures were computed. Ultimately, this research strives to determine the relationship between the above measurements to better understand the physical transport mechanisms that can be determined using remote measurements.

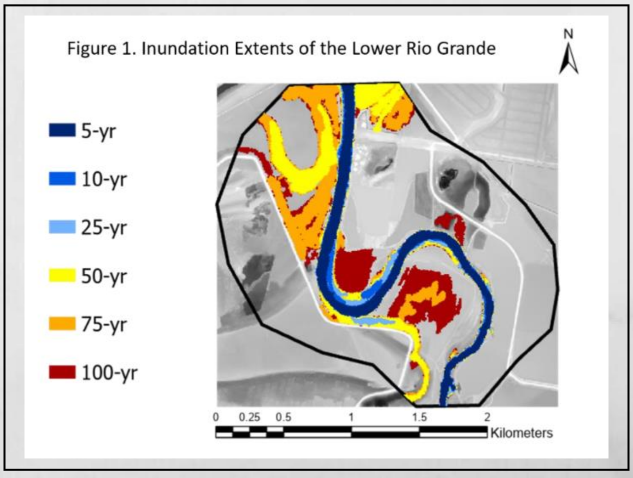
Quantifying River-Floodplain Connectivity of the Lower Rio Grande

Sara Davila

B.S Civil Engineering, The University of Texas Rio Grande Valley

Advisor: Dr. Lina Sela and Dr. Paola Passalacqua

Characterizing river-floodplain connectivity can provide useful information for land and flood management, as well as ecological enhancement. The Lower Rio Grande River is controlled by anthropogenic features designed for energy generation, agricultural production, and water diversion for regions like the Rio Grande Valley (RGV), Texas, USA, and the state of Tamaulipas in Mexico. An increase in flood events along the RGV causes concern over the riverine interactions with the adjacent floodplains during periods of high discharges and/or rainfall. We aim to identify what locations along the study domain get inundated and what depths, residence times and lateral exchange are associated with the inundation patterns. We use a finite-volume, 2D hydrodynamic model to better understand river-floodplain connectivity in the Lower Rio Grande in correspondence of discharges over a range of return periods.



We found that high vegetative areas and levees influence river-floodplain interaction by acting as buffers along the floodplain. Additionally, we found that residence times are highest at lower return periods, while lateral exchange is highest at high return periods. These data can inform the public about riverine interaction with the floodplain and integrated in decision-making tools to ultimately make river systems more resilient under future climate scenarios.

EWRE Seminar Committee Members: Erik Vosburgh, Mekayla DePaolis, James Holyoke, Kade Kearney, Sara Karimaghaei
Supervising Faculty: Dr. Ben Hodges & Dr. Kerry Kinney