Abstract: In this talk, we will focus on recent advances in storm surge modeling, with a specific focus on applications effecting the Houston-Galveston region. We will describe the components of the Advanced Circulation (ADCIRC) storm surge modeling framework, the algorithmic and computational science issues faced in the development of this model, and its performance on HPC systems. We will also discuss recently proposed mitigation options for storm surge in the Houston area, and how these options are being evaluated through the use of computer modeling.