Derek Loftis' Potential Future Flood Modeling Plans

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INTRODUCTION

This started out as a shortened bullet point list of what I envisioned could be achieved in the long run with the combination of my predictive flood model, VIMS' TideWatch Gauge Network, and the Sea Level Rise (SLR) Mobile App. As my thoughts materialized, I began to categorize them into this organizational table ranging from local to global in terms of application (arranged by columns), and from near to far in terms of implementation timetables (arranged by rows).

REGION OF INTEREST

Local → Global

TIME: Near → Far

	Newport News, Norfolk, and Hampton			Hampton Roads			U.S. East and Gulf Coasts			The World		
	Flood Model	VIMS TideWatch	SLR App	Flood Model	VIMS TideWatch	SLR App	Flood Model	VIMS TideWatch	SLR App	Flood Model	VIMS TideWatch	SLR App
Near	-Develop a street-scale hydrodynamic model grid from recent lidar elevations (2013), the model would start by including all regions of Newport News, Norfolk, and Chesapeake within 5m above sea level at 5m grid resolution as a starting point. -Apply for grant funding from NOAA, HUD, FEMA, and NSF to fund future project phases. -Continue to meet with city working groups to update on advancements achieved with available funding.	-Model results could be compared with existing gauges in James River -New gauges could be established with funding to better understand influences of tidal flooding. -Weigh potential sensor options with Newport News local government and implement establishment protocols.	-During tidal flooding events, GPS data points could start being collected in Newport News with the establishment of a local user group dedicated to collecting data throughout Newport News during flood events in 2016.									
	-Finish preliminary calibrations of hydrodynamic model grid and expand to cover areas at 10m above sea level to better cover regions that would be flooded in the event of storm surges resulting from greater than Category 2 hurricanes. -Begin preliminary release of GIS model predictive flooding rasters for unique flooding events (precipitation, tidal flooding, extratropical storm surge, and tropical storm surge) -Compare these maps with emergency managers for verification with new hurricane evacuation plans and establish protocols.	-Establish New VIMS TideWatch Gauges, which can be used to drive the flood model and verify results, but also in real time to detect problem flooding areas. -Potential installation locations: 1) Newport News Creek 2) Salters Creek 3) Warwick River near Ft. Eustis 4) Southern Branch of Back River to cover floods through Hampton along Newmarket Creek. -Calibrate any newly established gauges or sensors. -Incorporate data into VIMS TideWatch web interface for interactive download access	-Follow up with user groups near local areas of flood risk and coordinate flood assessments via the 'Sea Level Rise' mobile App. -Continue to collect measurements and train new users to insure efficacy of the data and that an emergency action plan is in place to help collect data efficiently and safely during tidal flooding events and from surveying of wrack lines after a hurricane event. -Be sure users are dedicated to collecting data throughout Newport News during flood events in 2016-2017.	-Develop flood model gridded domains beyond coverage of the Elizabeth and Lafayette Rivers to include the James and Lynnhaven Rivers. -Continue to meet with city working groups to update on advancements achieved with available funding. -Continue to meet with interested parties and local governments to foster our collaboration efforts.	-Maintain existing gauges -Install new gauges in the region, and update to Stage I for local tidal datum recalibration.	-Establish greater user base presence beyond Elizabeth and Lafayette Rivers in Norfolk, to collect maximum tidal flooding GPS extents throughout Norfolk with expansion into the Cities of Newport News, Chesapeake, and Portsmouth.					
	-Upon establishment of new water monitoring gauges, data assimilation into the flood model could predict water levels with greater accuracy if strategically deployed in the 4 high risk areas (then others) noted under VIMS TideWatch column in previous phase. -New post-processing architecture and scripts could be written to automate model outputs and provide the results of iterative forecast simulations via a geoserver for data dissemination via the SLR App (or another platform) -Review quality of predictions & improve 10% from Phase 2.	-Maintain newly installed gauges and benchmark results for assimilation into the model's predictions to enhance model predictive performance. -Review accessibility of data from the existing gauge network, and provide additional accessibility options for the data from the new gauges for Newport News officials and emergency responders. -Regularly verify TideWatch forecasts as quality control and adjust tidal datums appropriately for new monitoring locations.	-Now that a year's worth of tidal flooding events have been monitored successfully via the established user base: -Interpolated high water mark GPS measurements collected via the App can be used to generate non-event specific future Perigean shoreline products that could be released to localities for planning purposes. -With the new water level sensors installed and calibrated, model predictions could be released via the App (or a derivative platform) to be more relevant for citizens and emergency responders.	-Update local municipalities on the current working progress of the model development effort. -Develop flood model gridded domains for regions **highlighted in orange** of Figure 3 from this conference publication. -Finish model calibration of James and Lafayette Rivers, and begin operational efficiency tests as a final step before open release of model predictions. -Review and draw up legal statements to prompt users who access GIS Data Delivery Portal of efficacy of data.	-Maintain existing gauges -Expand into stage II of anticipated TideWatch tidal datum updates for existing network of gauges. -Review potential influences of local semi-annual (Ssa) and annual (Sa) seasonal trends for incorporation into water level forecasts.	-Expand user base into Hampton, York County and south into Suffolk and Virginia Beach. -These sites will be used to help determine the effectiveness of model's tidal flooding predictions in these newly-expanded regions for this phase. -Perform follow-up with multiple user groups previously established in the Cities of Newport News, Chesapeake, Portsmouth, and Norfolk to ensure quality control and unveil a new data collection option of inclusion of depth data entry fields.	-Expand model grid development from New York Grid from 2012 Hurricane Sandy, and Washington, D.C.; continue development of Charleston, SC, and Savannah, GA models to cover the southern East Coast -Finalize Publication of Hurricane Ike in Galveston, TX as a platform to expand coverage of the grid along the Gulf Coast. -Present demonstration of modeling capabilities at relevant conferences	-Extend Coverage from the Hampton Roads Region to cover a greater area of the Chesapeake Bay into Maryland with the introduction of gauges near: 1) Tangier Island 2) and near the Tidal Node in the Central Chesapeake Bay near Bishop's head. -Expand into coastal embayments along the U.S. East and Gulf Coasts integrating tidal data into VIMS TideWatch forecasts	-Build upon recent success in Norfolk to increase presence of monitoring user groups along the U.S. East Coast, then focus on the Gulf Coast communities. -Already established a successful East Coast Pilot monitoring event during Perigean Spring tide flooding event in Fall of 2015 including: -Cape Cod, MA -NYC, NY -Avalon, NJ -Norfolk, VA -Nags Head, NC -Tybee Island, SC -Brunswick, GA -Key West, FL		
Far	-Work to improve accessibility to model predictions for citizens, decision makers, and scientists alike via the App (or another derivative platform). -Tailor the user experience/ utility of the release platform to the interests of the user via establishment of the operational: **'Hampton Roads Predictive Flood Modeling Network'**: -With this interface, users could either create a profile or enable location services to show their current location on the App's flood map. -Shows any area with the model's animations showing at their location up to 36 hours in the future. -A user profile feature could also allow customization for adding pre-loaded locations of interest to specific users like home, work, car, parents' home…	-Incorporate additional sensors over land into TideWatch Network in areas potentially prone to flooding from rapid precipitation accumulation. -Sensors could be implemented on traffic light poles and connected to uninterruptable power supply for real-time monitoring and rapid response during events: -Review accessibility of data from new gauges and interface for increased utility for Newport News officials and emergency responders. -Partner in this effort and compare predictions with NWS or other predictive models to release ensemble of predictions via simultaneous flood model predictions with different predictive drivers for comparison and to increase predictive certainty.	-Include Gauge locations with water level forecasts from VIMS TideWatch. -Transcend the utility of being merely a data collection/ crowdsourcing App to provide detailed data to users. -Include these features: -**For citizens:** Be able to visualize the expected high water level surrounding their property, together with the date and time when that level may be reached. -**For emergency responders:** Interface shows the street-level flooding picture in the worst case, with date and timestamp, also depicts an animation of streets flooding over time. -**For scientists/researchers:** Interface includes access to GIS layers, and statistical tables for model-predicted vs. observations at TideWatch gauges. This is critical for benchmarking, and for encouraging future collaboration!	-Finalize calibrations of modeled regions covered in the previous integration of the **'Hampton Roads Predictive Flood Modeling Network'.** -Develop flood model gridded domains for regions **highlighted in yellow** of Figure 3 from this conference publication. -Begin full event calibration of covered regions for high resolution flood predictions. -Solicit feedback from emergency managers regarding the model's utility as part of their decision support process during emergency flood conditions. -Review quality of predictions & improve 10% from Phase 3.	-Maintain existing gauges -Expand into stage III of anticipated TideWatch tidal datum updates for existing network of gauges. -Unveil new online data platform for users to retrieve water level record data and forecast data.	-Train users in remaining regions of Hampton Roads with significant flood risk. -Perform GIS layer zoom-able maps for data integration from operational forecast flood model results for display within mobile App. -Evaluate accuracy of forecasts from newly established **'Hampton Roads Predictive Flood Modeling Network'.** -Solicit feedback from users and emergency managers regarding model forecast data integration, and depth data field entry option established in previous phase. -Incorporate VIMS TideWatch Gauge data into App.	-Review model development strategy and incorporate overlapping tidal flooding regional domains along the U.S. East Coast first, then the Gulf Coast Regions for tidal flood prediction (branching out from previous phases' established coastal flood model gridded domains). -Continue development of New York City, NY, Washington, D.C., Charleston, SC, and Savannah, GA, and Galveston, TX model grids. -Develop and refining grids for prominent population centers -Continue to present demonstration of modeling capabilities at conferences	-As new gauges are tidally-analyzed and integrated into the VIMS TideWatch Network publically available data are shared via the SLR App. -Continue facilitating expansion into coastal embayments along the U.S. East and Gulf Coasts integrating tidal data into forecasts from the following East and Gulf coast monitoring networks: -NOAA -USGS -FEMA -NASA -OOS and TCOON -Federally-established Flood Control Networks (e.g. HCFCD) -Local University Institutions	-Improve upon established successes, in East Coast Pilot and launch pilot on Gulf Coast Regions. -Release predictive flood model results via the App platform upon review of regional legal implications for dissemination of such data. -Review recruitment for user groups for data collection, emphasizing vested interests for storm water drainage, engineering, chiefs of police and fire depts., and residents in flood-prone areas to increase awareness for App. -Quality Control for East Coast and update users on effective data collection practices	-Establish large scale Ocean Model SCHISM grid to cover U.S. East and Gulf Coasts to drive high-resolution inundation models of coastal regions at high risk of inundation due to tidal or storm surge related flooding. -Begin model calibration using U.S. government-installed tide gauges	-Prepare VIMS TideWatch network for assimilative data extrapolation from known tidal datums of shared tide gauge monitoring networks in Europe and Asia. -Begin analysis of data to prepare tidal predictions after one month of past data has been analyzed for each gauge added to the network.	-Begin international flood monitoring efforts sponsored by partnering governments

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