**NASA DEVELOP National Program**



NASA Jet Propulsion Laboratory

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Louisiana Ecological Forecasting

Examining Historic Trends and Modeling Sediment Transport in Delta Growth within Louisiana’s Wax Lake Delta Using UAVSAR and AirSWOT Instruments to Inform Restoration Efforts

 **Technical Report**

Rough Draft – October 8, 2015

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# I. Abstract

[Placeholder - do not put anything here until the final draft submission. The abstract in the project summary is where the working draft of the abstract should “live”]

**Keywords**

Modeling, Remote Sensing, Sediment Transport, Delta Formation, Coastal Restoration

# II. Introduction

Land loss due to erosion, land subsidence and sea level rise along the Louisiana coast has amounted to 4900 km2 since the 1930’s. This is not only threatening one of the most economically important port systems in the United States, but also the tapestry of unique cultures that contribute to the region’s rich history (Olea & Coleman, 2014). The State of Louisiana’s Comprehensive Master Plan for a Sustainable Coast (2012) confirmed that Louisiana has the potential to lose up to an additional 4500 km2 over the next 50 years unless immediate efforts are taken to combat this trend. Although most of the Mississippi River Delta system is experiencing land loss, the Wax Lake Delta has created over 100 km2 of new deltaic surface since the early 1970s, building at a rate of approximately 5 km2 per year (Kenney et al., 2013). Much work has been done to understand what natural processes contribute to this growth, but these studies are limited by a lack of tested models and key observations. Measurements that do exist are largely boat-based and are inherently limited, both spatially and temporally.

The objective of this study is to use remotely sensed data, *in situ* data, and modeling software suites to model water flow and sediment transport within the Wax Lake Delta in order to predict the future extent of the Delta and obtain a better understanding of why the area is experiencing aggregation. The results will provide crucial data to coastal scientists and managers and offer insight into how to direct coastal restoration projects in areas of Louisiana where coastal marshes are eroding, often at rapid rates. The study area for this project is the Wax Lake Delta in Louisiana, and the study period is from May 2009 to May 2015. This project addresses the ecological forecasting national application area, and by combining AirSWOT data, modeled outputs, and UAVSAR data, restoration efforts within Louisiana will be better informed to promote coastal aggradation.

Some end products of the study will include a calibrated hydrological model of the Wax Lake Delta, modeled sediment transport and water flow data, and a modeled elevation time series. These end products will inform research conducted by our project partners. Those partners include Richard Crout, an oceanographer from the Naval Research Laboratory at Stennis Space Center in Mississippi and Dr. Alexander Kolker from the Louisiana Universities Marine Consortium. Mr. Crout is investigating buoyancy plume modulation of coastal processes in the area impacted by the Mississippi and Atchafalaya River discharge. His project utilizes an ocean circulation model complemented by *in situ* observations but requires water level and discharge rates from the Atchafalaya Bay and Wax Lake outlet region. The products from our project will help strenghten the model.

Dr. Kolker is an academic liaison to Louisiana’s Comprehensive Master Plan for a Sustainable Coast that is being developed for 2017. The products of this project will provide Dr. Kolker with a broad-scale picture of the accretion process to inform the development of an improved sediment distribution algorithm that will help these managers understand how to direct land restoration efforts along the Louisiana coast.

# III. Methodology

Still in Progress.

# IV. Results & Discussion

Still in Progress.

Insert images, graphs, maps, charts, etc. here. Choose the most important results to highlight here. No word cap, but two to six pages is a good range.

Things to discuss:

* Analysis of Results: What can you tell from your graphs, images, etc? What does this mean for your project?
* Errors & Uncertainty: What factors could you not account for, what things didn’t work out like you expected they would, etc.
* Future Work: If this project was to be selected for another term, what would be the focus? What other areas would be of interest?

# V. Conclusions

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Final conclusions. Word count: 200-600 (~a page).

# VI. Acknowledgments

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

This material is based upon work supported by NASA through contract NNL11AA00B and cooperative agreement NNX14AB60A.

# VII. References

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Kenney, M. a., Hobbs, B. F., Mohrig, D., Huang, H., Nittrouer, J. a., Kim, W., & Parker, G. (2013). Cost analysis of water and sediment diversions to optimize land building in the Mississippi River delta. *Water Resources Research*, *49*(6), 3388–3405. http://doi.org/10.1002/wrcr.20139

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Louisiana (2012). Coastal Protection and Restoration Authority. Louisiana ’s Comprehensive Master Plan for a Sustainable Coast.

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# IV. Appendices

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