**NASA DEVELOP National Program**

****NASA Jet Propulsion Laboratory

**Fall 2015**

**Short Title: Louisiana Ecological Forecasting**

**Subtitle:** 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

**VPS Title:** Modeling Sediment Transport to Inform Wetland Restoration in Coastal Louisiana

**Project Team & Partners**

**Project Team:**

Emily Beck (Project Lead), Emily.C.Beck@JPL.NASA.gov

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**Advisors & Mentors:**

Dr. Cathleen Jones (NASA Jet Propulsion Laboratory)

Dr. Marc Simard (NASA Jet Propulsion Laboratory)

**Past or Other Contributors:**

N/A

**Partner Organizations:**

Naval Research Laboratory (End-User), POC: Richard Crout; Supervisory Oceanographer

Louisiana Universities Marine Consortium (Collaborator/Boundary Organization), POC: Alexander Kolker; Assistant Professor

**Project Details**

**Applied Sciences National Applications Addressed:** Ecological Forecasting

**Study Area:** Wax Lake Delta, Louisiana

**Study Period:** May 2009 – May 2015

**Earth Observations & Parameters:**

UAVSAR, NASA Gulfstream III – vegetation biomass

AirSWOT, NASA King Air B200 – water height

AVIRIS – vegetation type

**Ancillary Datasets Utilized:**

* DNR Strategic Online Natural Resources Information System (SONRIS) – bathymetric data
* DNR Strategic Online Natural Resources Information System (SONRIS) – infrastructure
* CPRA Coastal Information Management System (CIMS) - accretion estimates
* USGS National Land Cover Dataset (NLCD) - land cover

**Models Utilized:**

* University of South Carolina Marsh Equilibrium Model (MEM)
* TELEMAC - MASCARET modeling software
* Deltares Delft3D modeling suite

**Software Utilized:**

ArcGIS – raster manipulation, model input preparation and map creation

QGIS – radiometric correction of UAVSAR data

ENVI – classification, image analysis and enhancement of AVIRIS data

TELEMAC –modeling sediment transport within the Delta

Delft-3D – modeling sediment transport within the Delta

**Project Overview**

**80-100 Word Objectives Overview:**

To use remotely sensed data, in-situ data and three different 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.

**Abstract:**

Insert here (150 - 250 words, preferably one paragraph)

* The abstract should be fully contained and give the reader a good grasp of the project.
* While there is a maximum word limit, if you can say it with fewer words, do so.
* State the most important information first.
* Avoid passive words like “might” or “could” – use powerful language.
* Use key words and phrases that will quickly give the reader an idea about the content and focus of the work (ex. Navajo Nation, drought, TRMM, PRISM).
* Don’t include citations.
* Don’t define terms.
* Read other projects’ abstracts for inspiration.
* Any major restrictions or limitations on results (if results are included) should be stated.
* Reread the abstract – did it answer who, what, where, when, and why? If it didn’t, then revise it!

**Community Concerns:**

* Land loss due to erosion, land subsidence and sea level rise along the Louisiana coast has amounted to 4900 km2 since the 1930’s, threatening one of the most economically important port systems in the United States.
* 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

**Current Management Practices & Policies**:

Currently, restoration decisions are based on findings from ~400 projects identified by experts, citizens and government studies. Restoration efforts can take the form of structural protection, bank stabilization, oyster barrier reefs, ridge restoration, shoreline protection, barrier island restoration, marsh creation, sediment diversion, and hydrological restoration. Nearly all of these projects rely on moving or trapping sediment, yet Louisiana has limited supplies of, or access to, renewable sediment. It is, thus, imperative to understand the dynamics of delta building to maximize the use of the limited sediment available. These dynamics are currently studied using spot field measurements and labor-intensive boat-based surveys.

**Decision Support Tools & Benefits:**

|  |  |  |
| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Time Series of AirSWOT data | AirSWOT | Information on where and how restoration is conducted |
| Modeled Elevation Time Series | UAVSAR, AVIRIS | Illustrates where risk zones are located |
| Comparison of Different Datasets | UAVSAR, AirSWOT, AVIRIS | Information on where and how restoration is conducted |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (Please submit your image as a separate .jpeg as well as inserting it in this document)

**Software Release Requirements**

What category do the tools your project is creating fall within? [Category I to V]

Category I

If your decision support tools fall within Category IV, fill out this section:

**Software Title:** Insert here (ex. DEVELOP National Program Python Package)

**Software Abbreviation:** Insert here (ex. dnppy)

**Technical Point of Contact:** Insert full name, permanent email, and node here. Also include whether employed through SSAI or Wise County. (Team member who knows the most about the software.)

**Brief Description of the Software:** Insert here (ex. The dnppy package will be used to functionalize common programming tasks in the geospatial community, specifically for working with NASA data products. It will include functions for processing satellite data and assist in structuring analysis to reduce the startup time for DEVELOP teams to learn programming and create tools for end users.)

**Type of Code:** *Executable Code* and/or *Source Code* (Select one or both)

**Will the software include any embedded computer databases?** *Yes* or *No* (Select one)

**Does the software use or call any open software or libraries?** *Open Source* and/or *Proprietary/Commercial* (Select one or both)

**List the software or libraries used, under what license they were obtained, and the URL for the license in the table below:**

|  |  |  |
| --- | --- | --- |
| **Name** | **License** | **License URL** |
| Ex. Arcpy module | Ex. group license through ArcGIS | http://www.esri.com/software/arcgis |
| Ex. Python | Ex. Open source license | http://opensource.org/licenses/Python-2.0 |
|  |  |  |

**Full Software Description and Plan**

**Introduction/Objective:**

What motivated the creation of this software, what problem does it address?

**Applications and Scope:**

Where and how will this software be used to influence decisions?

**Capabilities:**

What can it do better than what was previously available?

**Interfaces:**

How is one expected to use the software? For example, command line, GUI, script execution, etc.

**Assumptions, limitations, & Errors:**

What areas that the software could be improved upon in the future? This is where limitations of the theory, model, science, etc. should be briefly documented. If the tools only work for a specific scenario, say so.

**Testing:**

What validation techniques and testing strategy will be used to build confidence in the software?