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Understanding and Quantifying Carbon Export to Coastal Oceans through Deltaic Systems

SMD

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This project focuses on critical carbon processes at the interface of human-natural ecosystems, addresses the transport of carbon through the land-sea interface, and supports the NASA major strategic goal to advance understanding of Earth. Lateral export of carbon from delta-dominated systems to the coastal ocean is still largely unknown. This carbon export driven by river discharge is considered in global carbon budgets a â€œleakageâ€ from the biosphere-atmosphere interaction that eventually ends buried in marine sediments and stored over long timescales. We propose to investigate two contrasting coastal sites across one of the world's most dynamic systems o the Mississippi River Delta plain - to evaluate carbon cycle at different stages of delta evolution: 1) the Barataria Bay region where the coastline is experiencing significant subsidence and land loss, and 2) the Wax Lake Delta region where a fast prograding delta is expanding. These two sites are analogues of contrasting response to climate change, sea-level rise, and human activity. Understanding these two contrasting environment is critical to assess the role of delta systems in carbon export to the coastal oceans at a global scale.

The objectives of this project are to (1) Quantify different forms of carbon (dissolved vs. particular, organic vs. inorganic) and nitrogen fluxes from two deltaic sites to the coastal ocean; (2) Evaluate carbon transformation along salinity gradients; (3) Connect delta carbon and nutrient export to the coastal ecosystem using a coupled numerical modeling approach; (4) Improve satellite algorithms to couple remote sensing information with biogeochemical processes in land and oceanic environments; and (5) Use state-of-the-art remote sensing data to evaluate coastal wetland (above ground) biomass and carbon storage. We plan to achieve these objectives by combining remote sensing, oceanography, carbon cycling, and biogeochemistry to understand key biogeochemical processes regulating water and carbon cycling in subtropical deltaic/coastal systems and to project water and carbon cycle's response to climate change.

The work will leverage and bolster existing NASA investments in observations and modeling of physical and biogeochemical ocean processes. In particular, we address Earth Science objectives 3 (â€œDetecting and predicting changes in Earth's ecosystems and biogeochemical cycles, including land cover, biodiversity, and the global carbon cycleâ€) and 4 (â€œEnabling better assessment and management of water quality and quantity to accurately predict how the global water cycle evolves in response to climate changeâ€) under the NASA Strategic Goal to â€œAdvance understanding of Earthâ€ as identified in the NASA 2014 Science Plan. This work is also aligned with the area of interests of several NASA centers including the Goddard Space Flight Center and Jet Propulsion Laboratory. Project outcomes will contribute to the development of systematic approaches for exploiting next-

generation remote sensing missions with higher spatial, temporal, and waveband resolution. The project will forge collaborative partnerships between Louisiana State University, the â€œflagshipâ€ university of Louisiana, and Southern University - Baton Rouge, lead institution for the largest Historically Black Colleges and Universities (HBCU) system in the nation. This project emphasizes students and faculty exchange, benefit teaching and research effectiveness, promotes diversity, and enhances scientific and technological understanding on the United States coast that is most vulnerable to the changing climate.