RENCI @ East Carolina University
Center for Coastal Systems Informatics and Modeling (C-SIM)
A Regional Engagement Center

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Renci Renaissance Computing Institute @ East Carolina University

RENCI@East Carolina University Center for Coastal Systems Informatics and Modeling (C-SIM)

Motivation

- **Nationwide coastal counties represent 13% of the land and are home to more than 50% of the population.**

- **$1.2 trillion of our capital stock is no more than 3 meters above sea level. (Nordhaus, 2005)**

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Core Operations

- **Program Director:** Jamie Brown Kruse, PhD
- **ECU Div. of Research and Graduate Studies liaison:** Ernie Marshburn, Director of Strategic Initiatives

- **Administrative Assistant:** TBA
- **Technology Support:** TBA
- **Outreach Director:** Donna Kain, PhD
- **IT Director:** Tom Allen, PhD
- **Advisory Committee:** TBA

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Mission: To support research and outreach that improves understanding of the interaction between physical, biological, and human processes in North Carolina's Coastal Region especially as the processes relate to coastal disasters.

Vision Statement: The RENCI@ECU Center for Coastal Systems Informatics and Modeling will 1) support focused research on the relationship of physical, biological and human coastal systems to disasters that transcends any single research discipline and 2) engage the public of eastern North Carolina to identify important needs and implement solutions.

Year 1 Research Areas:

- **Coastal disaster impact on public health and at-risk populations.**
- **Coastal environmental modeling.**
- **Pollution in coastal environments.**
- **Coastal hazards and human dynamics.**

Coastal Disaster Impact on Public Health: at-risk populations (PHS)

Project Leadership Team:
Lloyd Novick MD, Wayne Cascio MD, Walter Pories MD
Brody School of Medicine

This project focuses on the information and disaster response requirements of at-risk and conditional at-risk populations in the coastal counties of North Carolina. These populations pose important challenges in the event of a natural or human caused disaster. They are less likely to survive the event in their current location and may be unable to evacuate using methods available to the general population. Further specialized care requirements dictate the locations capable of hosting these special needs evacuees. Once evacuated, alternate sources of medical care are required and access to pharmaceuticals must be arranged. Transfer of medical information or records is vital to the success of these efforts. There are unique aspects to disaster recovery that may well determine when and if these populations can return to their living arrangements present before the disaster. Experts have pointed out that dealing with individuals in the disaster region with chronic disease may be the greatest single challenge.

Coastal Environmental Modeling Project (CEM)

Project Team:

Enrique Reyes PhD (leader) (Biology), J.P. Walsh PhD (Geology), Reide Corbett PhD (Geology)

The goal of the Coastal Environmental Modeling Project is to *produce an integrated forecast* of environmental consequences of coastal storms aimed to aid natural resource managers. This project will focus on the integration of the hydrodynamic model (the Coastal Flooding Model (CFM) developed by the NOAA Coast Survey Development Lab (CSDL)) with a series of ecological sub-models that represent the Pamlico, Bogue and Back Sounds and their estuaries. We have initiated development of an ecological model for the coast of North Carolina. This project team will collect, organize and synthesize habitat change and land use information into different models working using various time scales for eastern North Carolina. The information will then be integrated into a landscape model that uses the CFM as basis for hydrodynamic calculations.

Pollution in Coastal Environments (PCE)

Project Team: Lee Bartolotti PhD (leader) (Chemistry), Paul Fletcher MD (Brody School of Medicine) , Yumin Li PhD(Chemistry), Robert Morrison PhD(Chemistry), Andy Sargent PhD(Chemistry)

In this project, high level computational chemistry methods will be used to investigate thermodynamic and kinetic properties of a number of gas phase Hg reactions in atmospheric chemistry. The list of reactions to be studied include binary gas phase reactions of Hg compounds with the free radicals Cl, ClO, Br, BrO, O3, NO3, NO2, NO, OH, HO2, CH3O2 and CH3O. The list, while not inclusive, contains many of the gas phase reactions that are thought to be important in atmospheric chemistry for predicting the oxidation rates of Hg0 to HgII compounds. The thermodynamic data developed in this work will be used to identify reactions that may be contributing to speciation of mercury in the atmosphere.

The calculated thermo-chemical, kinetic and aerosol data will provide important input into the models used in simulations needed for the prediction of the environmental impact of mercury. This project will bring together a diverse group of computational and experimental scientists to investigate the fate of mercury in the atmosphere, land and waterways. The results of this study have the potential to contribute to the development of new technologies to prevent mercury from poisoning the coastal plains and will expedite the removal of existing contaminates.

Coastal Hazards and Human Dynamics (HHD)

Project Leadership Team: Jeff Johnson PhD (leader) (Sociology), Tom Crawford PhD (Geography), Craig Landry PhD (Economics), Jamie Kruse PhD (Economics)

This research focuses on human perceptions and knowledge of natural hazards in coastal North Carolina, human behavior in response to hazard risks (i.e. mitigation, social capital formation, etc.), and the socioeconomic impact of natural hazard events. The behaviors of socioeconomic agents have dramatic implications for vulnerability to and recovery from hazard events. Individuals are typically exposed to risk in their choice of location for residence, employment, and recreation. But these choices are made under constraints attributable to family ties, experience, labor markets, transportation costs, and other historical, social, and economic limitations. Hazard impacts may be the direct result of an event that occurs in North Carolina or from catastrophic events that have an indirect effect (eg. the impact of Hurricane Katrina on flood and property insurance in North Carolina). Long term monitoring will allow for an improved understanding of the interaction between human social and economic dimensions and the development of spatial patterns which influence vulnerability to natural hazards and society's ability to adapt and recover.

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- **Article contains a youtube film clip that motivates parts of our research**
- **http://content.hamptonroads.com/story.cfm?story=117653&ran=162970**

- **Youtube file clip**
- **http://www.youtube.com/watch?v=qLm_OeOiXUU**

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