Environmental Research
Department of Physical and Environmental Sciences

**Sediment Paleo-geochemistry**

*Chatham Rise*

Off the eastern coast of New Zealand on the Chatham Rise TAMU-CC is teaming with University of Auckland and University of Southern California to assess the paleo record of pock mark formations and relation to deep sediment carbon dioxide. This effort is a 7 year IODP planning that takes three phases, phase 2 planning is currently under review.

POC: Richard Coffin, richard.coffin@tamucc.edu

**Ocean Acidification**

We work on:

1. hydrological changes induced estuarine carbon cycle and acidification;

2. Coastal ocean acidification that is caused by the additive effect of both carbon dioxide increase in the atmosphere and eutrophication.

POC: Xinping Hu, xinping.hu@tamucc.edu

**Coastal Hydrology**

The Hydrology group is conducting research related to: 1- understanding groundwater contributions to water quality and habitat degradation in coastal embayments; 2- understanding the role of groundwater nutrients in system-wide nutrient budgets; and 3 - implications of climate and anthropogenic changes on decreased freshwater inflows to coastal embayments and increased salinities in surface water and groundwater in coastal areas; 4 – water resource evaluation (includes quality and quantity; 5 – flooding impacts on the groundwater resources and the associated socio-environmental dynamics.

POC: Dorina Murgulet, dorina.murgulet@tamucc.edu

**Fates of Terrestrial Organic Matter**

Related to the global carbon cycle, fate of terrestrial dissolved organic matter (tDOM) transport to the ocean has been studied for the last three decades. Estimates of removal processes accounts for ~20-35% of tDOM in coastal regions; far from closing the gap between the riverine fluxes and amount of tDOM measured in the open ocean. Two possibilities that could explain this dilemma; 1) a component of tDOM is escaping the detection windows of all the tDOM tracers that had been used, or 2) other important removal processes not accounting for removing significant portion of tDOM.

POC: Hussain Abdulla, hussain.abdulla@tamucc.edu
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Severe Weather and Global Precipitation

During past two decades, space borne radars in the NASA Tropical Rainfall Measuring Mission (TRMM) and the Global Precipitation Mission (GPM) provide a global view of severe weather and precipitation. NASA supported research at TAMUCC focuses on the properties and variations of global precipitation systems which improves our understanding of severe weather, hydrology, and the global water cycle. Using these unique satellite observations, we are also supported by NSF to understand the role of thunderstorms in the global electric circuit, which is the continuous flow of electric current between the ionosphere and earth’s surface.

POC: Chuntao Liu, chuntao.liu@tamucc.edu

Low Cloud Study from Satellite Measurements

The highly reflective shallow clouds produce profound radiative cooling effects and their feedback mechanism remains a primary uncertainty in global climate model projections. We use numerous satellite observations to study the physical processes controlling the low cloud and air-sea interaction over the eastern ocean.

POC: Feiqin Xie, Feiqin.Xie@tamucc.edu

Geophysics

We apply integrated (geophysics, remote sensing, numerical modeling, GIS) approaches to investigate a wide range of complex hydrological, geological, and environmental problems. Our current research activities involve the use of spaceborne, airborne, and terrestrial geophysical data (GRACE, gravity, magnetic, seismic, GPR, resistivity), remote sensing data (visible, thermal, radar, GRACE, TRMM, GPM, SMAP), numerical modeling (SWAT, CESM), statistical approaches (artificial neural network), as well as GIS techniques to monitor availability and variability of freshwater resources in arid and semi-arid environments (e.g., Texas, Middle East, Africa).

POC: Mohamed Ahmed, mohamed.ahmed@tamucc.edu

Reactive Nitrogen Biogeochemistry

The Felix Research Group focuses on using stable isotope techniques to investigate reactive nitrogen sources, transport, and exchange between the biosphere, atmosphere, geosphere and hydrosphere in the Gulf Coast region. The research aims to increase knowledge of nutrient loading, processing and abatement techniques in the Gulf Coast region in an effort to understand and minimize negative anthropogenic impacts. POC: J. David Felix, Joseph.Felix@tamucc.edu


**Compound Specific Isotope Analysis of Amino Acids in Oceanography and Ecology Research**

The Aquatic Isotope Biogeochemistry Group is using compound/position specific isotopic ratios in ammonium, nitrate, and amino acids to study how inorganic nitrogen (N) is incorporated into organic N and transferred through the food web. Current project funded by NSF is using N isotope ratios in individual amino acids liberated from sinking particles and surface sediments to reconstruct N sources, utilization patterns, and trophic structures in the ephotic zone of Gulf of California, Equatorial Pacific, and Sargasso Sea.

**POC:** Lin Zhang, lin.zhang@tamucc.edu

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**CONCORDE Synthesis Model**

Ocean coupling interactions with nutrient distribution, plankton biology, river plume dynamics, wetland evolution, and atmospheric entities are a fundamental aspect of research in the department. Research experience with hurricanes, the Deepwater Horizon oil spill, and multi-scale ocean connections are ongoing activities in the program. This multidisciplinary approach, combined with university consortiums and NOAA scientist collaborations, are providing new insight into hurricane intensity prediction, storm surge, oil spill transport/impact, salinity patterns, hypoxia, and wetland resilience. Software tools include a synthetic ocean model, storm surge model suite, analysis techniques, and public domain databases.

**POC:** Pat Fitzpatrick, patrick.fitzpatrick@tamucc.edu

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**Ecosystem Studies and Modeling Laboratory**

Research focuses on coastal management, benthic processes, ecoinformatics, ecosystem modeling, environmental flows, hypoxia, acidification, and Integrating natural science and socioeconomics. Balancing human needs for water resources with ecological sustainability is our major focus. Environmental flow studies have been performed with the U.S. State Department, Agency for International Development.

**POC:** Paul A. Montagna, PENS Professor, HRI Endowed Chair, E-mail: paul.montagna@tamucc.edu

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**Sulfur Fates and Biochemistry**

Sulfur is an essential element but is toxic to many species in the form of sulfides (H₂S). We use a combination of genetic, stable isotope, and metabolomic techniques to trace the fates of sulfur in these keystone species. Our aim is to gain a greater understanding of sulfur metabolism in coastal plants, and the role of genetic variation in resistance to sulfide toxicity.

**POC:** Patrick Larkin, Patrick.Larkin@tamucc.edu