

Integrated Coastal Emergency Response

FY 2004 Proposal to the NOAA HPCC Program

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Proposal Theme: **Disaster Planning, Mitigation, Response and Recovery**

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Integrated Coastal Emergency Response

Proposal for FY 2004 HPCC Funding

Prepared by: John Proni

Executive Summary:

In FY02 the High Performance Computing and Communication (HPCC) Office provided funding to the Atlantic Oceanographic and Meteorological Laboratory (AOML) to develop a system which could provide, in near-real time, critical data on environmental parameters, including ambient water currents, needed in bay and coastal water disaster responses. Such a system provides crucial, timely information used to address critical public health emergencies and coastal environmental emergencies which NOAA has been called upon to address by city, county, state, and federal public officials. The progress on the development of the system is presented in the project report entitled "Integrated Coastal Emergency Response" (ICER). The present proposal builds upon the previously funded HPCC work effort and brings the total emergency field data and analysis system to a state of readiness for use by emergency managers. Key to the success of this project is the active participation of emergency managers (or their designees) in the development of the presentation format of the field data and attendant NOAA analysis so as to make the data most useful for emergency decision making. In the proposed work effort, a rapidly field-deployable, real-time communicating sensor / communication / comprehensible presentation system prototype design, construction and testing will be completed. Work previously funded by HPCC determined optimum system design and work previously funded by AOML field tested several system components in multiple environments, e.g. rain, rough water, obstacle blockage. Input from cooperating investigators suggested initial formats for data display and analysis. To facilitate emergency manager acquisition of the near real-time field data, an Internet website serves as a portal for near real-time data. In due time, this website may be incorporated into the general NOAA emergency/disaster website. AOML will provide substantial auxiliary equipment and testing (as it has done for the previously funded HPCC work effort) for this project. The proposed work effort will result in a high performance data communication and analysis presentation system coupled with a unique rapidly deployable sensor system for addressing a key nationwide problem in bay and coastal waters. This system will become part of broad NOAA capabilities to address emergency public health and environmental circumstances. The benefits to the nation will be substantial at very modest costs to NOAA. What is sought from HPCC is continued support for a high tech solution to providing near-real time coastal environmental data to emergency managers. The proposed effort has a substantial impact both inside and outside of NOAA. The problem addressed is common to all regions having coasts, lakes, and rivers.

Problem Statement:

An information/data handling and transmission system for making ambient coastal water measurements, available in near-real time during severe public health emergencies to municipal, county, state, and federal emergency managers is needed. Such measurement data is to be presented to managers in an easily comprehensible format.

NOAA constituents and public health officials have called upon NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) in the past, and continue to look to AOML for assistance during public health emergencies. Recent public emergencies have included raw sewage pipe breakage and escape of 25 – 35 million gallons of sewage into Biscayne Bay, and a ship grounding carrying dangerous liquids and gas.

The proposed effort seeks to transition NOAA data and analysis products and services for use within the emergency management community in a highly timely (near-real time) fashion. The format of the information delivered to emergency managers will be developed in conjunction with the emergency managers (through their appointed cooperating investigators) so as to assure its utility. The proposed work effort clearly seeks to enhance analysis for disaster preparedness, mitigation, and response. NOAA analyses are required to help guide emergency manager decisions; a typical question requiring analysis by NOAA using ICER data is – “Are ambient currents likely to transport raw sewage from a pipe break in Biscayne Bay to Miami Beach?” The present proposal seeks to augment and advance the efforts carried out under the funded FY02 effort. The proposed effort clearly fits within the NOAA-HPCC program objectives of providing greater access to NOAA information, products, and services in a more usable form and in a more timely manner through the use of advanced technologies associated with the internet.

Proposed Solution: AOML will build upon its prior year effort to continue to develop an integrated sensor and communications system that is portable and easy to deploy in coastal waters where an emergency situation occurs. The integrated sensor / communication / data presentation system will directly address the key data and analysis needs of emergency managers. Prior year effort incorporated the leveraging opportunity of utilizing system design and testing carried out for two of AOML's state of the art coastal ocean and bay environmental data gathering systems: the Coral Reef Early Warning System (CREWS) and the Florida Bay Current Measurement (FBCM) system. Both of these systems are discussed in the prior HPCC effort project report (ICER, June 2003). The FBCM system model was chosen as it has the capabilities which most closely approach the capabilities needed in the ICER. For the present proposed work effort, AOML will proceed to implement a near-real time environmental measurement / communication / and data presentation system for emergency managers. A key feature of the work effort will be active participation by environmental managers or their designees in data formatting and presentation to insure greatest utility of the information for key decision making.

Specific major activities for this project are:

- (a) Proceed to implementation of a near-real time environmental monitoring and reporting system using satellite Packet Data Transmission (PDT) technology already developed and deployed in ongoing programs.
- (b) Coordinating PI's will develop working strategies for data presentation, interpretation, and use.
- (c) Web applications will be developed to process and present data and web activities will be coordinated with existing NOAA emergency management sites.

Analysis:

The proposed solution builds upon accomplishments of the prior year's effort. In particular, prior year's analysis has shown that an ICER system incorporating satellite PDT technology is superior to other candidate data communication / transmission capabilities. A principal advantage of the proposed solution is the direct involvement of emergency managers in data format selection. Emergency managers came to NOAA hoping that NOAA would consider making its key coastal data and products available to them. The proposed solution brings state of the art sensor, data communication, data analysis, and data presentation directly to the managers in a format they themselves have deemed to be most useful.

The use of PDT technology has been tested and implemented at AOML in the Florida Bay monitoring program. Packet Data transmitters are presently in use on buoys and have proven to be dependable. PDT technology has been widely used in the trucking industry for some years now and is a well developed and mature technology. The use of this technology requires only the purchase of the PDT. The only equipment needed to retrieve the data is a computer with Internet access.

The table below shows a comparison of several alternatives to Packet Data Transmission

Technology	Availability	Recurring Cost	Transmission System	Coverage
PDT	24 hr	Charge per Kb	Satellite	Unlimited Range
GOES Sat	Assigned times	free	Satellite	Unlimited Range
Cell Phone	24 hr	Charge per Kb	Cellular System	Range Limited
VHF Modem	24 hr	free	Receiving Modem	Range Limited

The PDT system is the only system with the advantages of being available 24 hours per day with unlimited range offshore. Data bandwidth is not particularly large, and transmissions are short, so Kb charges are not prohibitive.

There is no other identified viable alternative to electromagnetic radio transmission of data from rapidly deployed sensor packages in coastal waters. The benefits of the selected solution include a reliable, easily deployed, near real-time sensor/ communications system which links to the Internet via satellite and provides near real-time data to emergency managers in their offices.

Performance Measures:

- (i) delivery of progress and final reports as specified in the deliverables section of this proposal
- (ii) delivery of a complete prototype field system, integrated communications system and formatted data presentation system acceptable to emergency manager
- (iii) expressions of satisfaction in work accomplished by NOAA by public officials and NOAA constituents.

Milestones

- Month 03 – Complete review meeting with cooperating investigators as to data formats
- Month 06 – Complete software development of web based applications in chosen formats
- Month 09 – Complete assembly of prototype field system
- Month 12 – Perform field deployment of system with emergency managers and begin training of emergency managers

Deliverables

- Field Deployable Prototype Integrated Coastal Emergency Response (ICER) System
- Operator's Manual detailing procedures for operation and maintenance of ICER system.
- Web site accessible by Emergency managers with data formatted to their needs.
- Training and materials for Emergency Managers providing instruction on use of ICER resources.
- Final report on implementation of the ICER system and its impact on emergency management.