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14. ABSTRACT Our long term goal is to develop multifrequency, high frequency (HF) radar techniques and instrumentation for measuring surface currents, vertical shear, winds, friction velocity and waves in coastal regions and large lakes for scientific, civil and military applications. Our goal includes deployment of HF radar systems for air-sea interaction, coastal oceanography and ship detection research as well as the integration of HF radar measurements into coastal ocean models. A related goal is to investigate and develop ship detection and tracking techniques for multifrequency HF radar.					
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HF Radar Instrumentation for Coastal Air-Sea Interaction Measurements

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LONG-TERM GOAL

Our long term goal is to develop multifrequency, high frequency (HF) radar techniques and instrumentation for measuring surface currents, vertical shear, winds, friction velocity and waves in coastal regions and large lakes for scientific, civil and military applications. Our goal includes deployment of HF radar systems for air-sea interaction, coastal oceanography and ship detection research as well as the integration of HF radar measurements into coastal ocean models. A related goal is to investigate and develop ship detection and tracking techniques for multifrequency HF radar.

OBJECTIVES

The objectives of this project are to purchase multifrequency radar equipment from a commercial source under DURIP funding. The equipment would first be deployed at or near Monterey Bay, California and later to experiment sites to be determined.

APPROACH

This project requires an expert team of engineers and oceanographers from many institutions, including Peter Hansen and Lorelle Meadows (University of Michigan), Calvin Teague (Stanford University), Dan Fernandez (California State University, Monterey Bay), Jeff Paduan (Naval Postgraduate School) and Kenneth Laws, Jessica Drake and Ben Van Houweling (University of California at Santa Cruz). This team designed, constructed, upgraded and deployed the existing multifrequency HF radars (MCRs) at sites on the Atlantic and Pacific oceans as well as the Great Lakes. We continually seek to deploy multifrequency HF radar systems for air-sea and ship observations in both short campaigns and long-term observations. A summary follows:

1. **Investigate existing HF radar system vendors** to determine the range of possible purchase options.
2. **Consider the possible purchase options** in terms of cost-effectiveness, ease of maintenance, future upgrades, access for purchases by the coastal oceanography community, etc.
3. **Select a vendor** and work with them to develop a plan for procuring the most appropriate set of equipment for the available grant funding.
4. **Issue a purchase order and procure the equipment**

WORK COMPLETED

1. **Vendors have been considered , including** Raytheon of Canada, Imaging Science Research, Hetzel GmbH. and Codar Ocean Sensors. The latter vendor is the leading candidate.
2. **Develop purchase plan:** Working with Codar Ocean Sensors we are developing a purchase plan to include two multifrequency HF radars, multiple antenna units, a central data merging platform and software as well as a transponder calibrator.

RESULTS

We have considered the possible vendors, their products and the cost-effectiveness of a purchase within the time and financial limitations of this grant. At this time Codar Ocean Sensors appears to offer the best option. Hence, we are working with them to get a bid for a multifrequency, multi-antenna system that will allow the maximum scope for developing a multifrequency HF radar based on commercially available equipment. We anticipate issuing a purchase order by the end of October 2003.

IMPACT/APPLICATION

Multifrequency HF radars have demonstrated their usefulness in measuring surface currents and current shear in the top few meters of the ocean as well as the vector wind field and friction velocity. We think that the research that will flow from this purchase will make it possible for coastal oceanographers to acquire commercially available equipment that is capable of being used to implement the multifrequency techniques our research group has developed over the last 5 to 10 years, e.g., for estimating the vector wind field, friction velocity field, surface current field, etc.

TRANSITIONS

We anticipate that this purchase will make it possible for the multifrequency techniques that we have developed to be transitioned to commercially available HF radar equipment.

RELATED PROJECTS

1. We participated in the Integrated Coastal Ocean Network (ICON) project (National Ocean Partnership Program), integrating in situ and remote measurements over Monterey Bay.
2. We began participation in the Center for Integrated Marine Technology that brings together physical, chemical and biological oceanographers as well as marine biologists to make and interpret measurements relevant to the Monterey Bay Marine Sanctuary (NOAA)