

## **Workshop on Hf Radars for Coastal Oceanography**

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### **LONG-TERM GOAL**

To begin an annual workshop series on HF radars that promotes and facilitates interactions among HF radar engineers, scientists and users and publishes new developments with the goal of making HF radars an acceptable and reliable tool for oceanographic applications.

### **SCIENTIFIC OBJECTIVES**

The workshop would provide a forum where participants from around the world could present results and discuss issues concerning HF radars. The workshop goals are:

1. To facilitate communications and exchange ideas and information on radar technology and applications.
2. To build and foster a strong users group.
3. To optimize radar technology jointly with scientists and engineers.
4. To develop algorithms and standards for the analysis of currents, winds and waves as well as other parameters (e.g. bathymetry, salinity).
5. To improve error estimates for modellers.
6. To better understand the physics of the underlying scattering process.

# Report Documentation Page

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## **APPROACH**

We will organize a workshop series which would have an annual meeting hosted by one of the international participants. The first workshop would begin with an overview of activities with HF radars from the various countries such as: USA, United Kingdom, Germany, Australia, Canada, Japan, France, Italy, Taiwan and India. Invited individuals will make these presentations. Our plan is to divide the workshop into four major themes:

- I. INSTRUMENTATION/TECHNOLOGY
- II. PHYSICS
- III. ALGORITHMS
- IV. APPLICATIONS

The four themes are chosen to stimulate discussions in these areas, but also to expose the cross-linkages among them. Some of the issues that should be covered by these themes in the workshops over the next years include:

### **I. INSTRUMENTATION/TECHNOLOGY**

Transmitter design, antenna design, computers and data acquisition system

### **II. PHYSICS**

Radar cross-section, EM propagation and attenuation, noise, surface waves, error statistics

### **III. ALGORITHMS**

Transmitter waveform , antenna pointing, direction finding, Doppler currents

### **IV. APPLICATIONS**

Sub-tidal current maps, tidal currents, wind-driven currents, trajectory analyses, marine forecasts, interannual signals, wave forecasts, modeling

## **WORK COMPLETED**

The 1<sup>st</sup> International Radio Oceanography Workshop was held on April 9-12, 2001 at Timberline Lodge, Oregon.

The workshop brought together for the first time engineers, scientists and users of the HF radar community. The workshop began with a series of presentations introducing new and improved systems as well as new developments from around the world. Surface wave effects remain a critical issue in HF radiometry. Advanced algorithms have been developed to extract directional wave information from radar backscatter, but further studies are needed to determine the role of the Stokes drift and measurement depth of the radar measurements. Several presentations on regional applications of HF radar currents demonstrated the emerging importance of such space-time measurements in coastal oceanography. Efforts are under way to standardize the processing of Doppler spectra and define commonly used parameters. Generic algorithms and software will help to optimize the data analysis. Several examples on data assimilation of HF data showed the impact of the value-added results obtained by this approach. These results are very encouraging and will provide new ways to predict

the coastal circulation with improved accuracy. At higher radio frequencies it is possible to measure very small scale features on the ocean surface. This may have implications for regions with highly variable surface flows and irregular coastlines. Finally, extensive discussions dealt with the associated errors of the radar measurements. Much progress on identifying and quantifying these errors has been made. One of the key concerns of the HF radar community is the allocation of frequencies. A committee with members from the different countries was formed to write a white paper and present this to the FCC. The co-chairs will submit a proposal to SCOR to establish a working group on HF radar. The next meeting will be held at IFREMER, France in May 2002.

## **RESULTS**

The website, <http://cheyenne.rsmas.miami.edu/row2001>, has been established and will serve to inform researchers and users interested in HF radar issues on a regular basis. The website will also inform participants about future workshop dates and locations as well as logistics, program and publication details.

We are in the process of publishing the first set of proceedings.

## **IMPACT/APPLICATION**

The workshop was a great success and future meetings will greatly help to promote HF radar technology. The contributors to these workshops would speed up the process in refining algorithms and determining standards. Furthermore, the publication of the workshop results will expand the awareness of the oceanographic community and interactions with coastal modeling community. A greater interest in HF radars will lead to more routine scientific and operational deployments of HF radar systems and the use of its data as common as data from ADCPs or current meters.

## **TRANSITIONS**

None yet.

## **RELATED PROJECTS**

There have been numerous experiments funded by DoD on both east and west coasts using HF radars for different objectives.