

# Committee on Radio Frequency (CORF)



Oceanographic uses of the radio frequency spectrum.

RVTEC to lead on providing ocean science information.



# Background

- ✍ NSF/OCE and UNOLS “learned” about radio frequency spectrum management last year.
- ✍ Spectrum managers at NSF and within the science community are primarily interested in protecting passive use of the spectrum (radio astronomy) and remote sensing (satellite observation systems) although they should represent all scientific use.
- ✍ The National Academies *Committee on Radio Frequency (CORF)* is a voice for the scientific community to regulators and policy makers.
- ✍ CORF is made up primarily of radio astronomers with one Oceanographer - Dr. Otis Brown (RSMAS).

## Issues & Action Items for UNOLS

- ✍ Oceanographic community needs to maintain a stronger relationship with frequency spectrum managers within NSF, NOAA, Navy and with CORF.
- ✍ CORF relationship can be maintained through Dr. Brown during his term.
- ✍ Need to identify and characterize the oceanographic community's use of the radio spectrum in order to protect it and to prevent mutual interference with other scientific communities and within our own.

# Request for assistance from Dr. Brown



May 3, 2005

Dr. Peter Wiebe  
C/O UNOLS  
Moss Landing Marine Laboratories  
8272 Moss Landing Road,  
Moss Landing, CA 95039

Dear Peter,

Thank you for your letter of November 1, 2004 concerning UNOLS radio frequency matters and the presentation by the NAS/CORF representation to UNOLS. I apologize for the delay in responding to your letter: CORF just had its first meeting since your letter and I presented an overview of the various ocean science uses of the RF spectrum ranging from buoy telemetry, ship communications, coastal remote sensing (CODAR/WERA) to low Earth orbit active and passive sensing (microwave to millimeter wavelengths).

It was clear that the CORF was not aware of ocean sciences' broad and growing use of the RF spectrum. Tomas Gergely from the NSF and I discussed ways of improving coordination. Clearly the ocean science community and the NSF spectrum management staff need to work much more closely than we have in the past.

I appreciate your offer of UNOLS assistance in this endeavor: would UNOLS be willing to outline the usages (location/frequency/use) alluded to in your letter?


Thanks again for your interest in the CORF. It will take all our efforts to move this forward.

Best regards,

A handwritten signature in blue ink, appearing to read "Otis B. Brown".

Otis B. Brown  
Dean





**From:** Otis Brown <[obrown@miami.edu](mailto:obrown@miami.edu)>  
**Date:** Thu, 8 Sep 2005 15:52:40 -0400  
**To:** Peter Wiebe <[pwiebe@whoi.edu](mailto:pwiebe@whoi.edu)>  
**Cc:** Otis Brown <[obrown@miami.edu](mailto:obrown@miami.edu)>  
**Subject:** Some thoughts on starting an interaction with the CORF

Peter,

Thanks again for the phone call and reminding me that we have unresolved issues between the ocean science community and the passive spectrum folks.

I think the easiest way to start an interaction with CORF would be to provide them with maps of current ocean systems and the characteristics of the emissions. The UNOLS RVTEC group is probably the best community-wide resource for such information...

Let's take coastal ocean radars as an example. A map of all current sites in the US with an appendix of site characteristics is needed. Site characteristics should include latitude, longitude, emission type, frequency, duration, power, antenna, antenna pattern (if known), etc. It might also help to show a map of projected/potential sites.

Similarly we should provide the emission characteristics of the ARGO floats, probable attributes and locations of the global observing system, information on other systems in use by ocean research, e.g., bi-directional cellular coms (IRIDIUM) and so on.

Best,

Otis

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Presentation by Otis Brown

Report on Oceanographic uses of  
the spectrum at the April 28, 2005  
meeting of CORF

[next 6 slides]



# Overview

- ✍ Ocean Sciences has increasing needs for the use of radio frequency spectrum, both active and passive
- ✍ Uses include: passive LEO space-based remote sensing, satellite telecommunications (uni-and bi-directional), ocean surface current and wave estimation from radar, traditional ship communications, surface radar, etc.
- ✍ Surface RFI is affecting passive space and surface observations
- ✍ Satellite downlink congestion at X-Band

# Space based sensing

## ✍ Passive microwave -L/S & X-Band DLs

- ✍ Traditional DMSP and NOAA Instruments (e.g., SSM/I, AMSU-A/B -channels: 23GHz- 89GHz/89GHz-183GHz)
- ✍ Earth science instruments (AMSR-E, AQUARIUS (1.4GHz/5GHz/Scat 1.26GHz))
- ✍ NPOESS Instruments (>2010)
- ✍ Limitations due to surface RFI



## Space based sensing - continued

### ✍ Active microwave

- ✍ Synthetic Aperture Radar (L (1.3GHz), C (5GHz), and X (9.65GHz))
- ✍ Altimetry (5GHz & 13GHz)
- ✍ Rainfall mapping (10.65GHz)
- ✍ Surface vector wind estimation (13.5GHz)
- ✍ Cloud winds (CloudSat, 94GHz)
- ✍ X-Band DL Congestion (Wende, CORF 2003 brief)

# Communications/Location Fixing

- ✍ Autonomous instrumentation (ARGOS, IRIDIUM)
- ✍ Vessel comms/ coordination (Intelsat/MARISAT, C-Band, ...)
- ✍ Fixed sites (C/Ku Band, IRIDIUM, ...)
- ✍ Atmospheric profiling (400MHz service)
- ✍ GPS
- ✍ Ship Radar (S-Band)

# Surface Observing Systems

- ✍ Ocean surface current/wave radars (CODAR/WERA (5-50MHz))
- ✍ Atmospheric Profiling Systems (50MHz, 400MHz, 1GHz, ...)
- ✍ Passive infrared/microwave profilers
- ✍ Cloud/rain/aerosol finding radars

## ... Radio Frequency Interference (RFI) Impacts

- ✍ Limits most space based observations to greater than 50Km from coasts
- ✍ Interference with surface wave/current finding systems
- ✍ Immediate need for improved frequency coordination!

# Dr. Brown's concerns

- ✍ CORF members were surprised by the breadth and magnitude of radio frequency use by ocean scientists
- ✍ They were concerned about the possibility of interference, especially from active systems such as CODAR.
- ✍ Dr. Brown and others are equally concerned about the possibility of interference between systems we use.
- ✍ Also concerned about potential problems with the possible unlicensed use of the radio spectrum.

## ... What can RVTEC/UNOLS do to help?

- ✍ Start the process of creating a comprehensive list of ocean science systems that use radio frequency.
- ✍ Get input from the science community.
- ✍ Expand the list into a table with characteristics of these systems.
- ✍ Map some that might have interference issues.

# Example Table of RF info

Type of System	Area of use	Emmission Type	Freq range	Duration	Power	Comments
Active remote sensing - uses RF as measurement tool						
CODAR	Coastal					
WAMOS (waves)						
Ship RADARS	Worldwide					
Telemetry and Communications						
VHF Radio						
INMARSAT						
ARGOS						
Space and Aircraft based passive remote sensing						
SST satellite						
Hyperspectral						

# Draft Task Statement for RVTEC

- ✍ Form a small RVTEC subcommittee (with a Chair) to oversee this activity.
- ✍ Subcommittee should review table (prev. slide) to determine if any additional information is needed and refine as necessary.
- ✍ The Chair should communicate with Otis Brown and keep the UNOLS office in the loop.
- ✍ Develop a brief on-line form to collect the data that is needed to complete the table.
- ✍ Request input from all RVTEC members to complete the form.
- ✍ Request input from appropriate members of the scientific community.
- ✍ Subcommittee will then compile all the input received into the table or other appropriate report.
- ✍ Post the findings for RVTEC comment.
- ✍ Provide the findings to Otis Brown.
- ✍ General Task - stay engaged with Otis Brown and provide input as needed.