

## WERA User Group Meeting

1<sup>st</sup> of June in Cancun  
following the ROW-7, 28<sup>th</sup> to 31<sup>st</sup> of May

The venue for the WERA User Group Meeting is the same as for ROW-7, the Hotel Le Meridien in Cancun. Further information can be found on the ROW web site: [www.radiowaveoceanography.org](http://www.radiowaveoceanography.org)

For the ROW the main goals are to bring together scientists and experts in using radio wave remote sensing for measuring oceanographic parameters, such as ocean surface currents and waves. This workshop is very attractive for scientists who are using or plan to use oceanographic radar. It is a very efficient workshop since there are no parallel sessions organised and the typical time slots of 30 minutes per presentation gives enough room for discussions.

In addition to the scientific program, a seminar for new operators of HF radar instruments is planned for Sunday, May 27<sup>th</sup>.

For the **WERA User Group Meeting**, we are collecting topics. Please send us a list of the subjects you are interested to discuss about. The agenda will be announced in the next newsletter.

### WERA at CONFERENCES & EVENTS 2007

#### March 27 – 29

Ocean Business 2007  
Southampton, UK  
[www.oceanbusiness2007.com/](http://www.oceanbusiness2007.com/)

#### May 28 – 31

ROW-7 Radiowave Oceanography  
Workshop in Cancun, Mexico  
[www.cencalcurrents.org/row](http://www.cencalcurrents.org/row)

#### June 1

WERA User Group Meeting following  
the ROW-7 in Cancun, Mexico

#### June 18 - 21

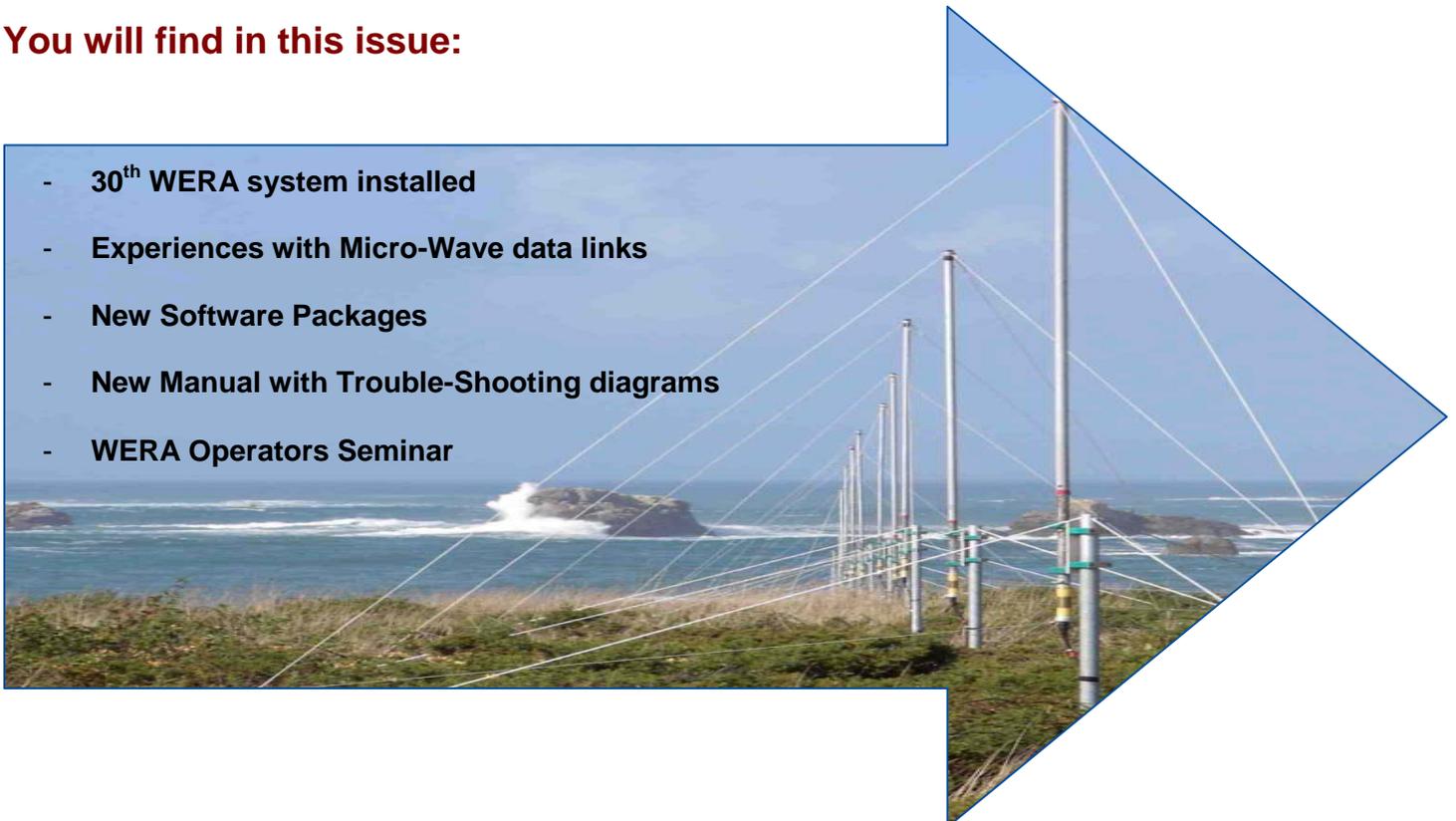
IEEE Oceans 07  
Aberdeen, Scotland  
[www.oceans07ieeeaberdeen.org](http://www.oceans07ieeeaberdeen.org)

#### September 29 – October 4

Oceans 2007 MTS/IEEE  
Vancouver B.C., Canada  
[www.oceans07mtsieevancouver.org](http://www.oceans07mtsieevancouver.org)

### You will find in this issue:

- 30<sup>th</sup> WERA system installed
- Experiences with Micro-Wave data links
- New Software Packages
- New Manual with Trouble-Shooting diagrams
- WERA Operators Seminar



## 30<sup>th</sup> WERA system installed in Oman

The Directorate General of Civil Aviation and Meteorology of the Sultanate Oman has installed together with Helzel Messtechnik GmbH and their partner IBL GmbH and Seaview Sensing Ltd. two WERA systems near the city of Sur next to a LNG harbour.

Sur is located in the Northeast of the Sultanate Oman at the passage from the Arabian Sea to the Gulf of Oman, about 150 km away from the capital Masqat.

Both radar stations are very remote located and were connected with the central processing server via two Micro-Wave (wifi) links (42 km and 3 km distance).

In partnership with Seaview Sensing Ltd. the WERA systems provide continuous, real-time maps of ocean surface current and significant wave height.



Microwave (wifi) antennas at the WERA container



WERA tx-array near LNG-harbour

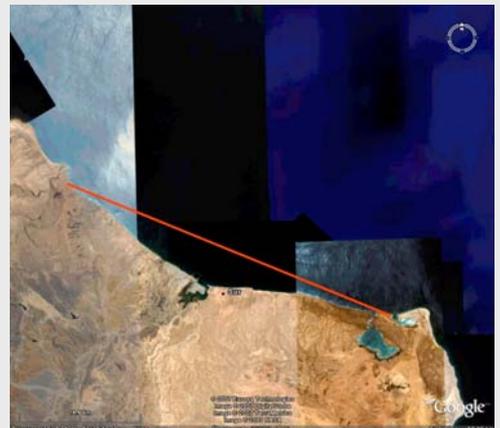
## First experiences with Micro-Wave data links

This data link is set-up with standard, commercial available components for WLAN connections. For this 42 km Micro-Wave link, we used a parabolic die-cast antenna with 24 dBi gain and a 2.4 GHz bi-directional amplifier with 15 dB gain in receiving and transmitting direction for each site. The maximum output power of the amplifier is 1 Watt. The antennas are mounted at a level of 7 m above ground (15 m above sea level).

To connect the amplifier with the WERA system, we used a standard 54 MBit WLAN access point with a single antenna output. With the configuration described above we were able to transmit a data rate of 110 kBit/sec. The WERA data files (9 MByte) generated every 20 min can be transmitted with this data rate within 11 min.

Data links over such a long distance are possible only if the transmitting direction is over sea. The high humidity above the ocean surface acts like a wave guide and helps the Micro-Wave to travel along with the curvature of the earth.

A helpful link for planning WLAN connection can be found at:  
[http://home.deds.nl/~pa0hoo/helix\\_wifi/linkbudgetcalc/wlan\\_budgetcalc.html](http://home.deds.nl/~pa0hoo/helix_wifi/linkbudgetcalc/wlan_budgetcalc.html)



## RFI (Radio Frequency Interference Reduction) Software

Klaus-Werner Gurgel and Thomas Schlick in co-operation with Yves Barbin have developed some new WERA software modules that allows the reduction of radio frequency interference (RFI). This new software involves the following steps:

### Avoid RFI when ever possible: Scan for the best frequency band

A first very important step is to avoid RFI by selecting a clean frequency band. Prior to each WERA acquisition, the radar starts a 1 min frequency scan (transmitter off, only receive mode active). This frequency scan is used to find the radar operating frequency with minimum RFI. This option is supported by the latest version of WERA Desk V2.4

### Derive the structure of the RFI and remove RFI from the sea echo

The structure of the remaining RFI can be derived from the measured data using a special technique. A distorted Range-Doppler Spectrum is containing sea echoes and RFI. The new processing technique gives the structure of the RFI without the sea echoes. This information can be used to remove some kind of noise patterns caused by RFI from the Range-Doppler Spectra.

The latest CL7 software package includes these options and provides additional information regarding the RFI structure. This is passed to the processing routines by adding a .RFI file to the .SORT files. If you don't want to use the RFI reduction software, please modify the used scripts to delete the .RFI files as they occupy some disk space and us the old programs: wera16\_grid and wera16\_spec\_cwrad or wera16\_beam.

The Fortran processing software picks up the .SORT and .RFI files when processing spectra on the grid by wera16\_grid\_rfi and wera16\_spec\_cwrad\_rfi.

Because it is not easy to install and various boundary conditions need to be taken into account please contact [wera@helzel.com](mailto:wera@helzel.com) if you would like to install these packages on your system.

## Curved Array

Klaus-Werner Gurgel and Thomas Schlick in co-operation with Mal Heron have now modified the Beam-Forming software to handle data from a curved receive array. The simulated beam forming pattern are already available and the first WERA site with a slightly bent array is just up and running. First results we hope to see at the upcoming ROW or WERA meeting.

## Short Linear Array

Along with simulations of the resulting beam forming patterns for different angles it was found that for short arrays, in-particular 8 channels, the quality of the beam degrades extremely for angles wider than 45°. For a 8 channel system the error at 60° is more than 6° and the beam width is more than 30°. For 12 channels the error at 60° is 5° and the beam width about 20°.

Furthermore it was found that the "Hamming" window function will provide better results for a 8 channel array than the normally used "ultra spherical" window (that is best for longer arrays). There is almost no difference between these two window functions for a 12 channel system.

## Trouble Shooting Diagrams

In the new manual there are two new chapters:

### #13 Installation steps

We have prepared a table with a list of the installation steps as keywords with the reference to the related chapter of the manual. Furthermore for all steps there is a brief description enclosed to this chapter.

### #14 Trouble shooting

The trouble shooting description is structured like a simple software program. Up to now we have described the topics listed below:

- *Error:* System is continuously waiting until a running cycle stopped
- *Error:* System internal communication problem (timeout)
- *Error:* Strange or no signal on one channel (Antenna problems)
- *Error:* Strange or no signal on one channel (WERA Rack connection problems)
- *Error:* No or Strongly Reduced Output Signal Level (Test of Power Amplifier)
- *Error:* Defective Power Amplifier

Please give us your feedback when you have used this documents for trouble shooting.

These new chapters and the complete manual can be downloaded from:

<http://helzel.com/helzelmed/manual/> User: WERAusers Password: manual

## WERA Operators Seminar

We at Helzel Messtechnik offer to give a one week seminar for interested WERA operators or future operators. The topics (lessons) should be:

- |   |       |
|---|-------|
| - Radar and WERA basics (to provide a stable base of theoretical background)        | ½ day |
| - Basics for WERA site planning   | ½ day |
| - WERA hardware structure to understand the system                                  | ½ day |
| - WERA software concept   | ½ day |
| - Software user training for the Linux based tool box                               | ½ day |
| - Different options for data communication with the site                            | ½ day |
| - Theoretical installation and trouble shooting lessons                             | ½ day |
| - Tools and tips for operation and quality assurance                                | ½ day |
| - Practical training at our site at the coast (with real trouble shooting training) | 1 day |

We offer this seminar for free for up to two guys per WERA user. Future WERA users please contact us regarding seminar costs. Lunch, refreshments and coffee are included.

The idea is to provide the first seminar this summer, the exact date is not defined yet. If you are interested, please contact Birgit Hansen at [hansen@helzel.com](mailto:hansen@helzel.com)