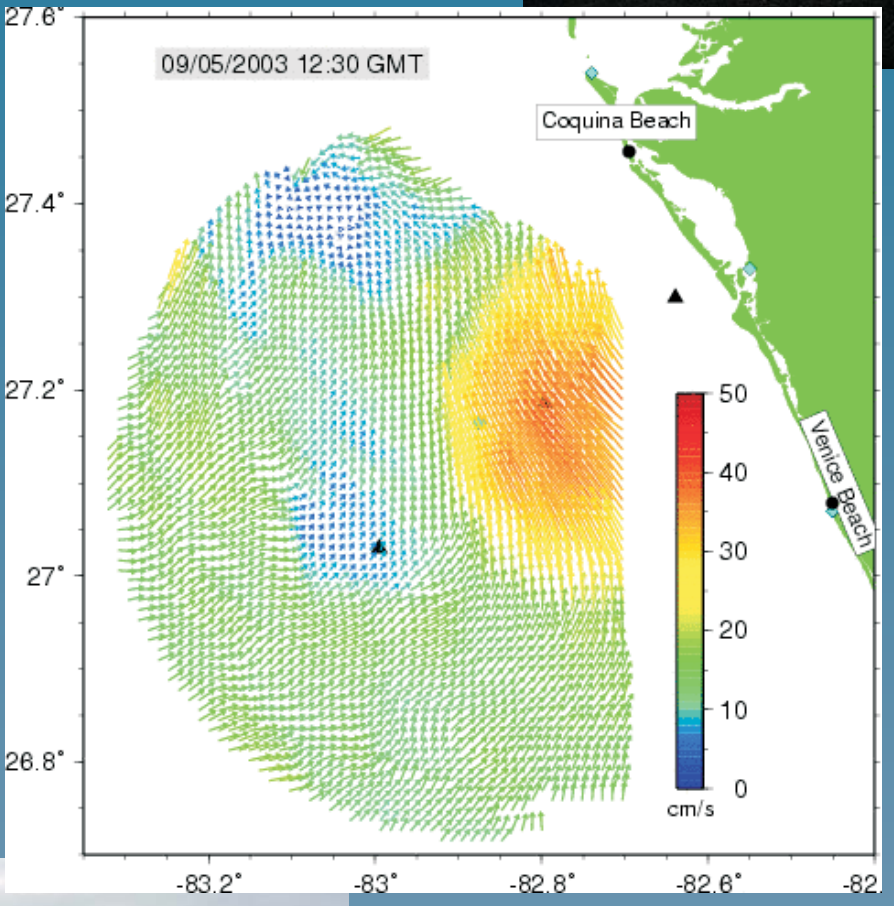
Remote Ocean Sensing for simultaneous measurements of surface currents wind direction & wave parameters

WERA
Remote Ocean Sensing

WERA data kindly provided by Nick Shay at RSMAS.



WERA linear antenna array at Key Biscayne site

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Helzel Intelligente Hochfrequenz Messtechnik

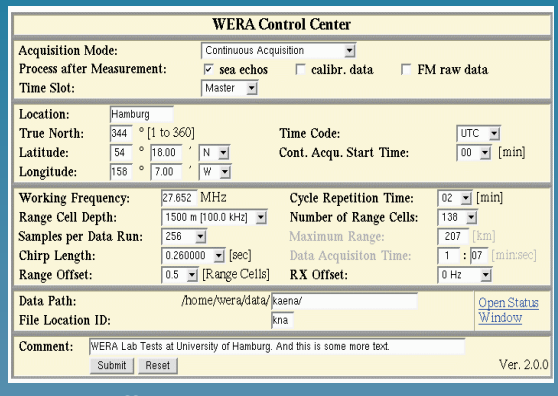
WERA provides simultaneous measurements of

- Surface currents, ocean waves and wind parameters
- Over long distances and large areas
- With good temporal resolution and high spatial resolution

WERA System Rack

Helzel Messtechnik is the exclusive manufacturer of the WERA system, developed in co-operation with the University of Hamburg. The system is designed to fulfill the requirements of commercial users and provides the flexibility for scientific applications. We provide;

- Site planning, installation and maintenance
- Modular hardware system
- Customer specific modifications
- Open interface with access to raw data
- Control and signal processing software



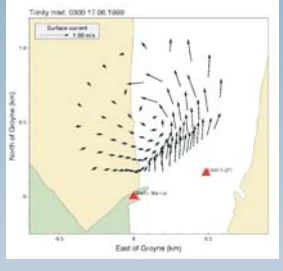
WERA Control

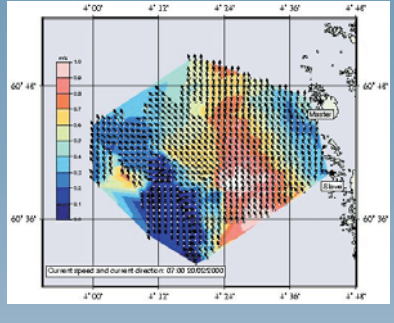
Partners such as
Q-SEC Ltd. and Seaview Sensing Ltd. empower us to offer you systems and services that include;

- High resolution WERA systems operating at up 50 MHz to provide spatial resolution down to 250 m.
- Long range WERA systems operating at lower frequency down to 5 MHz with ranges up to 200 km.
- Software for measuring and creating realtime maps of waves, wind and surface currents.
- Full on-site support, including site-planning, installation and maintenance.
- Worldwide regional support provided through our local agents.

QSEC's PortMap
is the finest resolution current mapping radar, providing ranges of up to 5 km with a spatial resolution down to 50 m. The compact antenna design allows easy deployment.

Current Map depicting ocean surface current vectors at the entrance to Trinity Inlet in the Port of Cairns in North-East Australia.

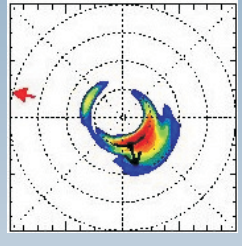




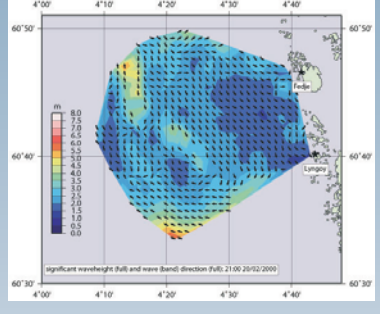
Current measurement taken off Norway using WERA with Seaview Realtime.

Wave map shows clearly at each location the swell dominated seas in the north-east propagating towards the south-east and wind wave dominated seas to the south-west propagating towards the north-west.

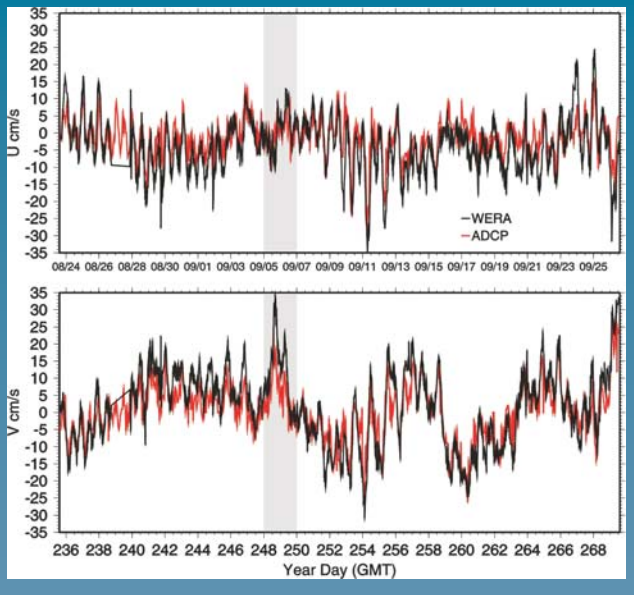
Wave directional spectrum from a location where the swell dominates.



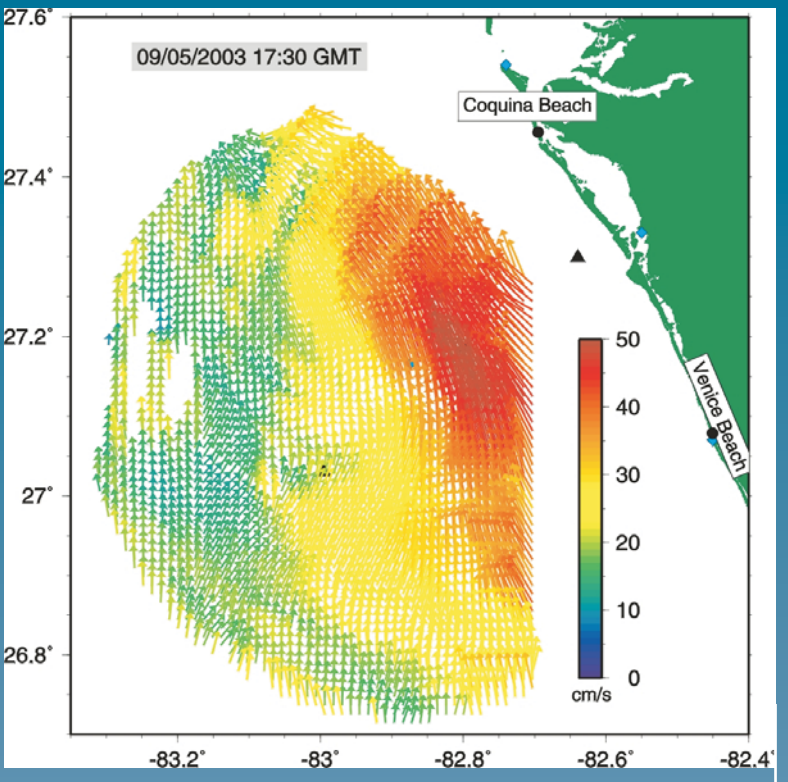
Scaling:
Red at near peak.
Blue, amplitudes at 10 % of the peak value.



Data from two 16 - channel WERA sites on the west coast of Florida

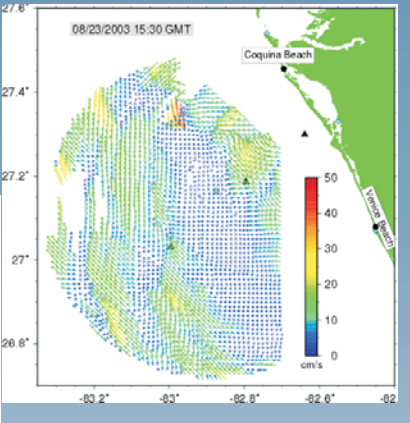


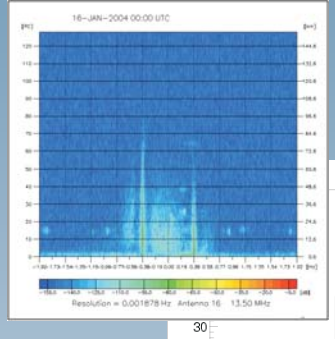
Time Series comparison of the surface currents (red) and 3-m ADCP currents during the experiment for u-component (top panel) and v-component (lower panel) in cm/s. The grey hatched area depicts the time when Tropical Storm Henri passed north of the HF-radar domain.
ADCP data kindly provided by Bob Weisberg at USF.



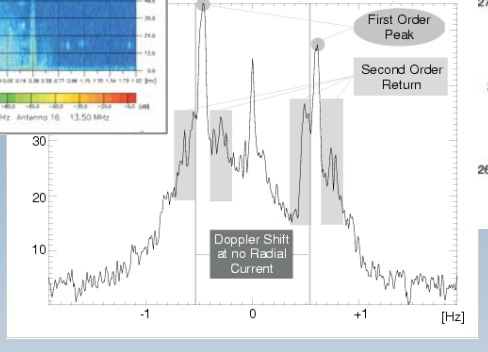
Surface current image during the passage of Tropical Storm Henri on 5th of Sept. 2003 using standard WERA software.

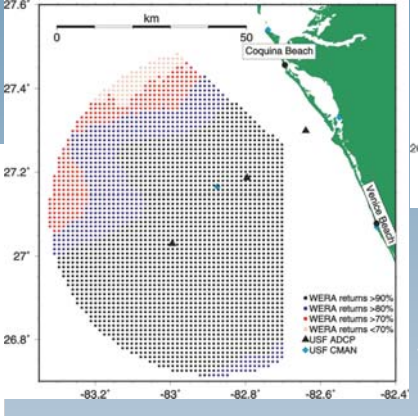
Surface current image in fairly windless conditions.





Bragg spectra
Doppler shift for a single cell (bottom) and for the whole range (left).





Range for surface current measurements.

WERA data kindly provided by Nick Shay at RSMAS.

16 antenna Rx array at Liverpool Bay, UK

WERA
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Comfort
Easy configuration for long-range measurements up to 200 km or high spatial resolution, down to 250 meters.

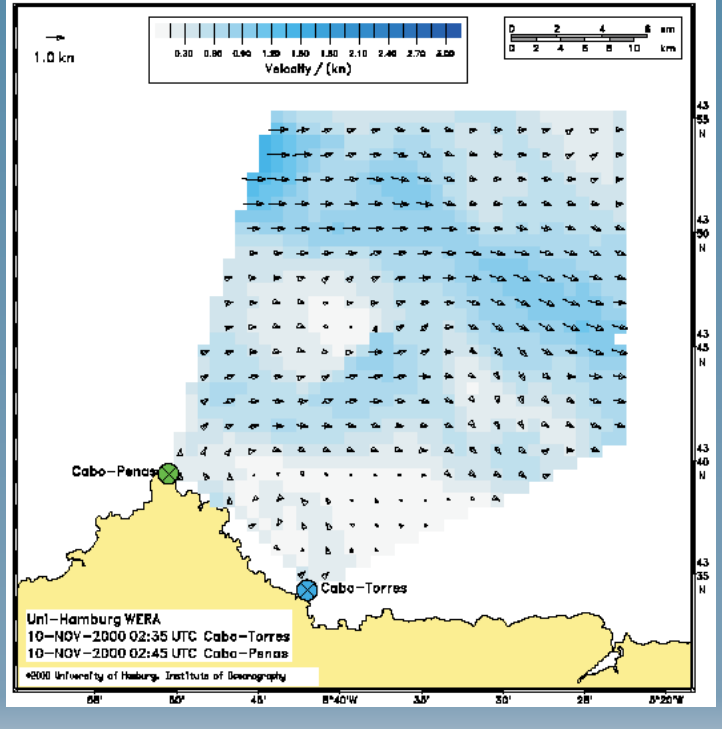
Flexibilty
Flexible antenna and channel configuration, for use with 4 antennas / channels or with a linear phased array of up to 16 antennas, that give the system the full capability, including direction finding and beam forming technique for azimuth resolution.

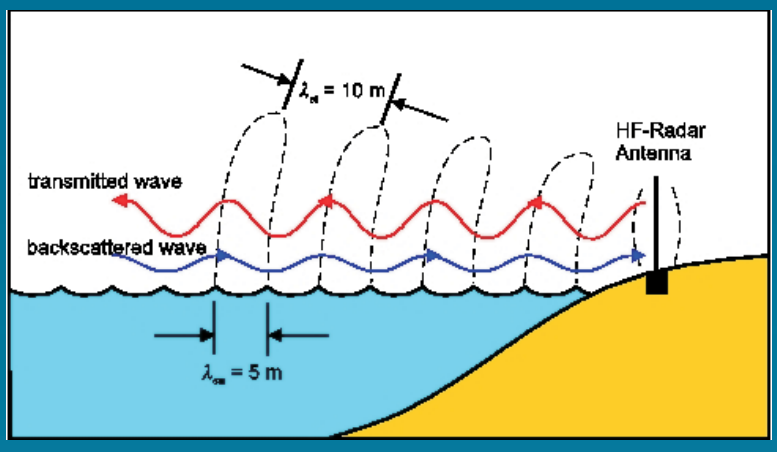
Modularity
Modular in fulfilling customer specifications. The very same system can be changed from a 4 channel direction finding configuration to a beam forming system by just adding additional modules. Likewise, modifying a long range system to be used for a high resolution short range application, replacing the filter modules and antennas is all that is required.

Open Interfaces
Raw data access for research applications allowing easy implementation of signal processing algorithms.

Safety & Stability
Frequency modulated continuous wave signal generation ensures that there is nearly no blind range in front of the radar, reduced impact of radio interference, very low RF-power requirements (7.5 W per transmit antenna), and safe operation as no dangerous voltages occur near antennas.

Current map from the Gijon site, Spain





Technical Data

Operation frequencies	3 MHz to 50 MHz
Signal modulation	FMcw (programmable chirps)
Transmitted RF-power	4 x 7.5 W (typically)
Working range	>150 km @ 12 MHz and 35 psu depending on operation frequency >50 km @ 30 MHz
Wavelength (Bragg scattering)	5,00 m @ 30 MHz 9,35 m @ 16 MHz
Integration depth of current measurement	about 0.5 m @ 30 MHz about 1.0 m @ 16 MHz
Spatial resolution	depends on allocated bandwidth 1.00 km @ 150 kHz 0.25 km @ 600 kHz
Azimuth resolution	
Direction finding	± 2 degrees with 4 antennas
Beam forming	± 3 degrees with 16 antennas
Integration time	less than 10 minutes
Accuracy	of current speed 0.01 to 0.05 m/sec
Accuracy	of wave height typically 15 %
Antenna system	Ground plane-type antennas Transmit: 4 antennas Receive: linear array of 8 to 16 antennas for beam forming, or 4 antennas in a square for direction finding.
Power supply	230 V / 50 Hz or 115 V / 60 Hz
Dimensions	desktop case 482 x 650 x 745 mm

Scientific partners & customers