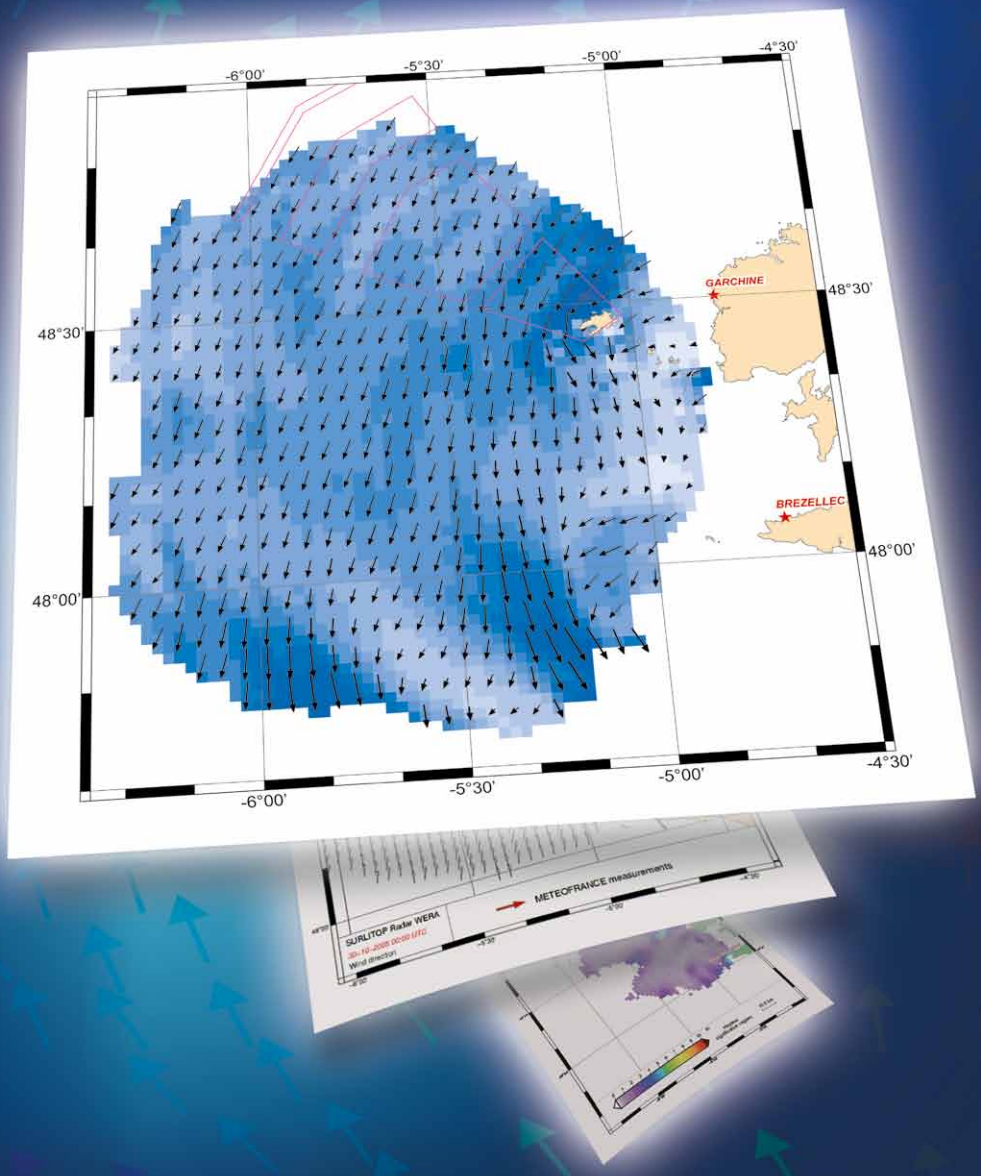
HELZEL
Messtechnik

WERA
Remote Ocean Sensing

Leader in reliable high-quality ocean current, wave and wind mapping



Made in Germany

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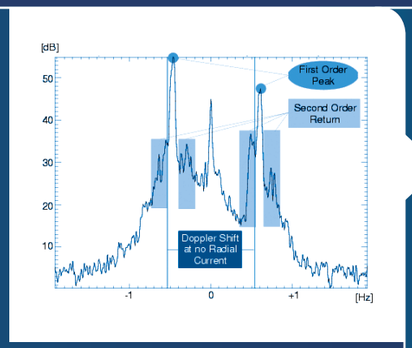
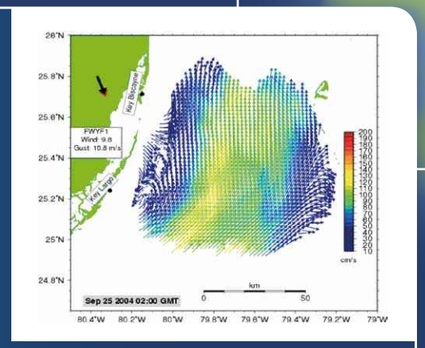
▲ WERA linear antenna array at a public beach on Key Biscayne, USA

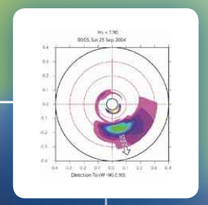


▲ Doppler spectrum



▲ Surface current image during the passage of Hurricane Jeanne, September 2004*

ⓘ This current map was generated with a pair of 16 channel, 16 MHz WERA systems providing a temporal resolution of 10 minutes.



Directional wave spectra can be generated up to half of the maximum range. Time series of current, wind and wave data can be extracted and archived at each grid point as well.

WERA combines all information for modern Coastal Management; measurements with **high spatial** and **temporal resolution** of Surface Currents, Wind Direction and Wave Parameters. WERA is flexible and can be configured for a **compact site geometry** (direction finding) as well as for **array type antenna systems** (beam forming).

Range of operation:

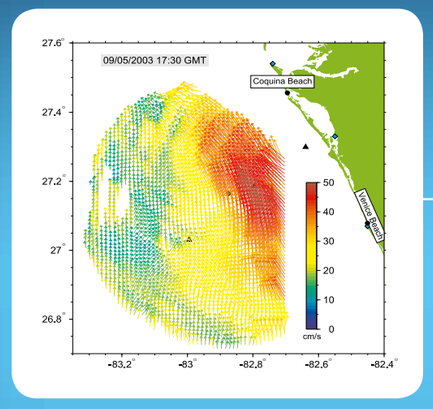
CURRENT
More than 200 km
Range resolution as fine as 250 m
Temporal resolution 3 to 10 min

WAVES
Significant waveheight and directional spectra up to 100 km

WIND
Wind speed and Direction
up to 150 km

SHIP TRACKING
Up to 200 km (non real-time)

RELIABLE

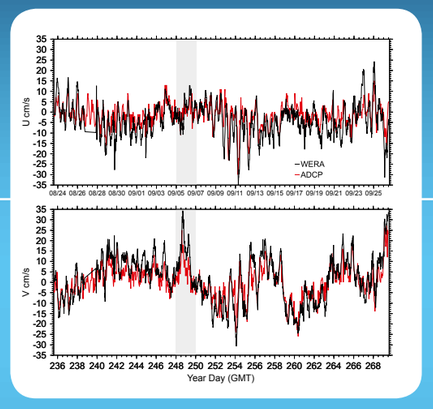


The robust shore based system delivers reliable data even under extreme weather and very dynamic ocean current conditions.

This surface current image was taken during the passage of Tropical Storm Henri on the 5th of September 2003.*

* WERA data kindly provided by Prof. Nick Shay, RSMAS Miami

HIGH QUALITY

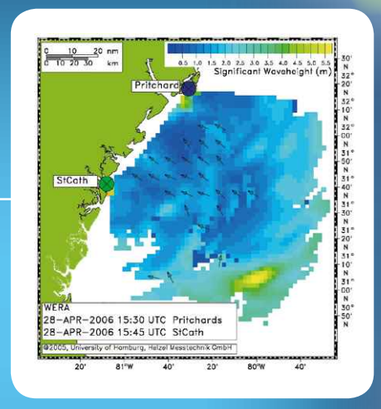


Time series comparison of the surface currents (WERA data in black) and sub-surface currents measured with an ADCP current meter during the experiment at the west coast of Florida.

The grey hatched area depicts the time when Tropical Storm Henri passed north of the HF-radar domain.**

** ADCP data kindly provided by Prof. Bob Weisberg at USF

OCEAN DATA



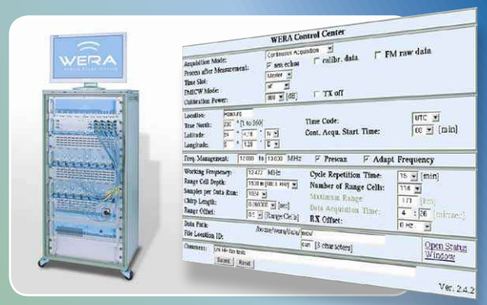
Maps of Significant Wave Height are available for each grid point within half of the radar range.

This wave map was taken at the east coast of South Carolina and Georgia.***

*** WERA data kindly provided by Prof. Dana Savidge at SKIO and Prof. Rich Styles at USC

COASTAL MANAGEMENT

By monitoring with the highest temporal resolution for various applications:



▲ WERA Rack ▲ Screenshot of WERA Control Center

Search & Rescue Operations
can narrow down the search radius for overboard persons or material.

Port authorities
can use the data to improve vessel traffic services.

Scientists
can use the complex current and wave maps for their research.

Met-offices
benefit from WERA real-time data for forecasts.

Fishing Industry
can optimise their operational area.

Environmental Protection
benefits from this information in case of oil spills or lost containers. Data can be used for planning of

Off-shore
installations like wind-farms or oil rigs.

Tourism Centers
can be supplied with information for yachting & recreation divers.

Desasaster Management
will profit from the high resolution data for time sensitive applications

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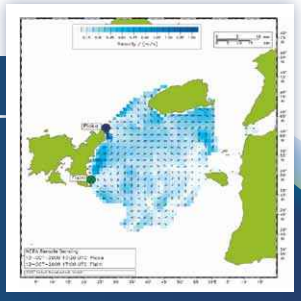
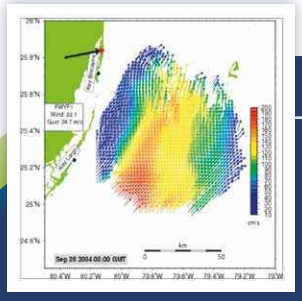
HIGHEST FLEXIBILITY

WERA always provides the best radar configuration for your specific application:

WERA Compact Site Direction Finding		Array Type WERA Beam Forming
• Requires long data collection period to get full coverage, typically 20 to 30 min • Always high risk to have gaps in the map	**Real-time Data**	• 5 to 10 minutes for current maps • 10 to 20 minutes for wave data • Maps are almost free of gaps
• Compact antenna system 3 x 3 to 12 x 12 m square • Easy to find suitable sites and easy to install	**Siting**	• Requires array of 8 to 16 small antennas (array length < 0.1 % of range) • Array can be integrated into existing structures (arbitrary spaced array)
• Mesoscale current features can be measured • Accuracy is limited due to uncertainty in azimuth and long averaging time	**Currents**	• High dynamic ocean current structures can be measured down to sub-mesoscale • Highest temporal resolution possible
• Wave estimates are possible with dedicated software • No access to gridded wave data	**Waves**	• Gridded wave measurements • Directional wave spectra are available for several grid cells
• more than 180° in azimuth (max. 270°) • slightly reduced range compared with BF	**Field of view**	• 120° in azimuth for 12 or 16 channel systems, more with curved array



Current map, Lemnos, Greece
from 13.5 MHz
compact WERA systems
data provided by
V. Zervakis



Dynamic current features
from 16 MHz
array type WERA
data by Nick Shay, RSMAS

Both methods can be combined to provide best coverage for current mapping!

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