Engineer Research and Development Center

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Radar Inlet Observing System (RIOS)

Remotely Sensing Waves and Bathymetry to Support Navigation and Dredging

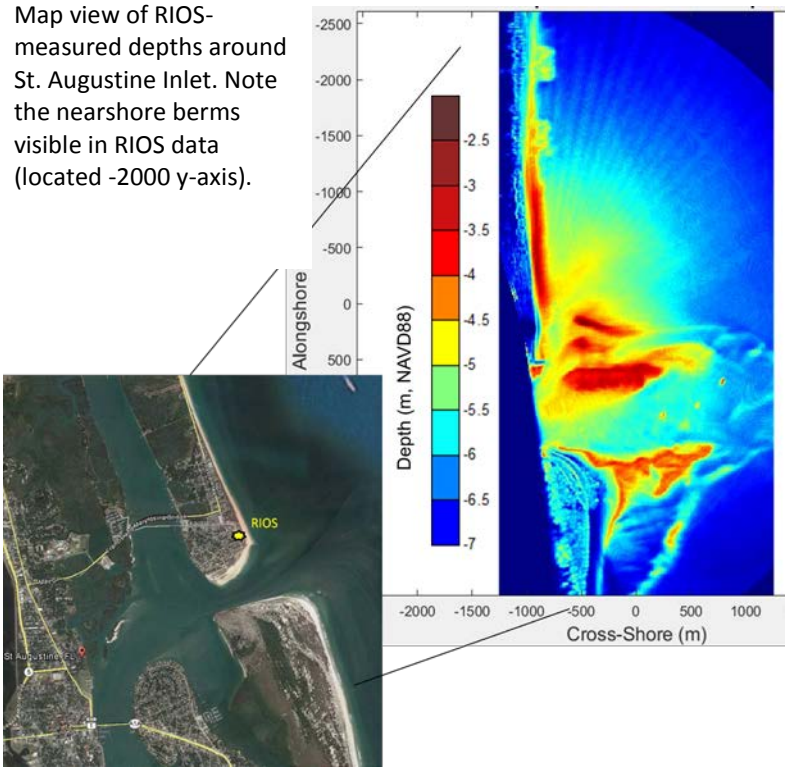
RIOS utilizes X-band radar to measure wave breaking and wave speed. Wave observations are then used to calculate depths through bathymetry inversion and scaling. These measurements are particularly suited to determine the location of channels and shoals across shallow, coastal environments such as tidal inlets. The system is fully automated, and can provide updated results every hour. Developed by Drs. McNinch and Brodie at ERDC's CHL – Field Research Facility.

Problem

The Corps – from both its civil works and military support obligations – need to know the navigability of tidal inlets. Considerable resources are spent annually surveying inlet channels but these efforts are limited by stretched funds and personnel, dynamic channels that may change substantially during storms, and reduced access by traditional surveying vessels either due to treacherous sea conditions or denied regions. Other remote sensing techniques are not viable options in these coastal and brown-water settings where bubbles and turbidity levels are high and signals designed to transit through the water column are often greatly attenuated.

We are tackling these challenges on two fronts: 1) utilizing a radar signal that measures wave behavior, instead of trying to send a signal through the water, and estimating depths from wave conditions, and 2) improving bathymetry inversion algorithms that are more suited for radar data and the altered wave behavior found near very shallow settings.

RIOS is currently configured to measure the position of inlet channels and shoals continuously (hourly) through all conditions, 24-7, and to make results available online within 30min of collection.



Map view of RIOS-measured depths around St. Augustine Inlet. Note the nearshore berms visible in RIOS data (located -2000 y-axis).

Benefit

RIOS provides the following products hourly:

- ascii data file of estimated depths across domain
- georectifed images of wave breaking conditions that identifies navigation conditions near channel entrance
- time-averaged (detided) georectified image of wave breaking conditions that identifies shoals across the domain
- shoreline position within domain
- Nearshore berm monitoring

Specifications/System Requirements

- Range of measurements are limited to within 3km of the RIOS antenna
- Field site must have waves present (not conducive for small lakes or rivers)

Status

- RIOS just returned from a 6-mo deployment at St. Augustine Inlet as part of a joint demonstration with USACE-SAJ
- RIOS will be deployed at Oregon Inlet, NC to assist USACE-SAW beginning in May 2016
- Current deployment rate is $500/day

ERDC Points of Contact

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