Environmental Observations Taken Aboard the OR3

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# Environmental Observations Taken Aboard the OR3

## Abstract

Also See: M001452, The original document contains color images.
Outline

OR3 Environmental Instruments

OR3 Ship Tracks

Temperature and Salinity Profiles

Deep Water Soliton

Shallow Water Soliton Conversion
Towed Environmental Instruments

ADCP

CHIRP SONAR

HFAFV

"TO-YO" CTD

IW SOLITON PACKET

ONR NRL

ASIAEX 2001

Mignerey & Orr
Soliton Radar Expression
OR3 Ship Tracks
OR3 Tracks Leg 1
OR3 Tracks Leg 2
OR3 Tracks Leg 3

Ship Position 135-08:52:22 to 137-14:01:27
Temperature and Salinity Profiles
Temperature

Leg 2
Salinity

Leg 2

Salinity - Run 30 Day AsiaEx 128 1644

Depth (m)

Salinity (PSU)

33.2 33.3 33.4 33.5 33.6 33.7 33.8 33.9 34 34.1 34.2 34.3 34.4 34.5 34.6 34.7 34.8

Leg 2
Temperature
(12\textsuperscript{th} Order Least-Squares Polynomial)
Salinity

(12th Order Least-Squares Polynomial)
Temperature - Salinity
(12th Order Least-Squares Polynomial)
Temperature - Salinity

Leg 1

ASIAEX 2001
Deep Water Soliton
Radar Satellite Image
Up-Slope Current

ONR NRL

ASIAEX 2001

Mignerey & Orr
Temperature

Temperature - Run 30 Day 128 1844

Range (km)

Depth (m)

Temperature

11 C  20 C  28 C

ONR NRL

ASIAEX 2001

Mignerey & Orr
Salinity

Salinity - Run 30 Day 128 1644

Range (km)

Depth (m)

Salinity

33.4 psu 34.0 psu 34.7 psu

ASIAEX 2001

Mignerey & Orr
Shallow Water Soliton Conversion
Radar Satellite Image
Soliton and Ship Tracks

Depth 110 m

Soliton May 7
Soliton May 8
Ship Motion

Soliton Course
Wave Crest

Depth 260 m
Vertical Array Temperature Pods May 7

Temperature String 307 May 7
Soliton Evolution

(a) Leading Soliton
(b) Trailing Soliton

ASIAEX 2001
High-Frequency Flow Visualization May 8

ADCP Velocity Field May 8

Up-Slope Current

- 1.5 m/s  0 m/s  1.5 m/s

~ 5 km

Mignerey & Orr
Soliton Energy Dissipation

![Graph showing the relationship between soliton energy (MJ/m) and range (km). The graph displays a declining trend with data points and a fitted curve.]

ASIAEX 2001  Mignerey & Orr
Shear Instability
Soliton Position
Soliton Width
Summary

Temperature and Salinity Legs 1-3
- Surface water warmed and freshened
- Deep water cooled and freshened
- Thermocline steepened
- Variability lessened

Deep Water Soliton
- 1.5 m/s currents
- 100 m vertical displacement of pycnocline
- Extends 250 m to the bottom

Shallow Water Soliton Conversion
- Conversion of depression solitons to elevation waves was observed
- The internal wave train has alternating circulation cells
- Kinetic energy is 91.2 MJ/m decreasing to 32.3 MJ/m
- Energy dissipation is 0.17 W/m/m with rate coefficient 0.063 km$^{-1}$
- Leading soliton width increases from 500 to 1000 m
Publication

Paper in production at JGR Oceans
Marshall H. Orr and Peter C. Mignerey
“Nonlinear internal waves in the South China Sea - observation of the conversion of depression internal waves to elevation internal waves”
Density - Depth

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Leg 2

Density - Run 30 Day AsiaEx 128 1644
Tow-Yo CTD Depth

![Graph showing depth versus range with labels for Soliton Encounter and Ship Motion.](image-url)