

Environmental Observations Taken Aboard the OR3

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Outline

OR3 Environmental Instruments

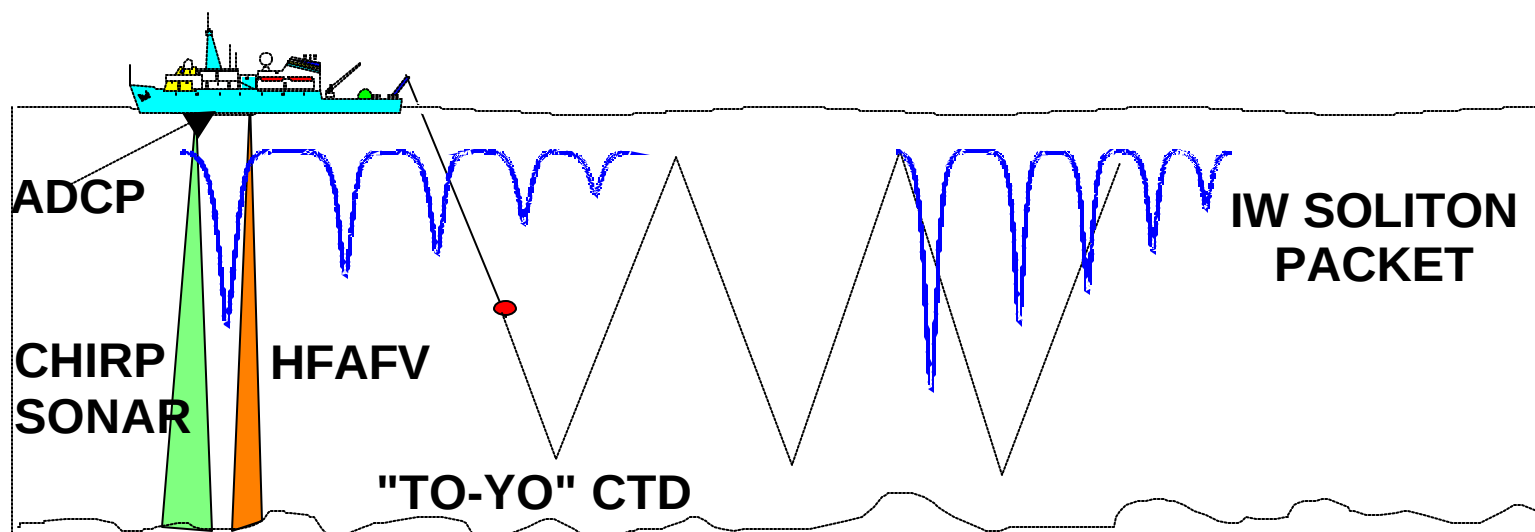
OR3 Ship Tracks

Temperature and Salinity Profiles

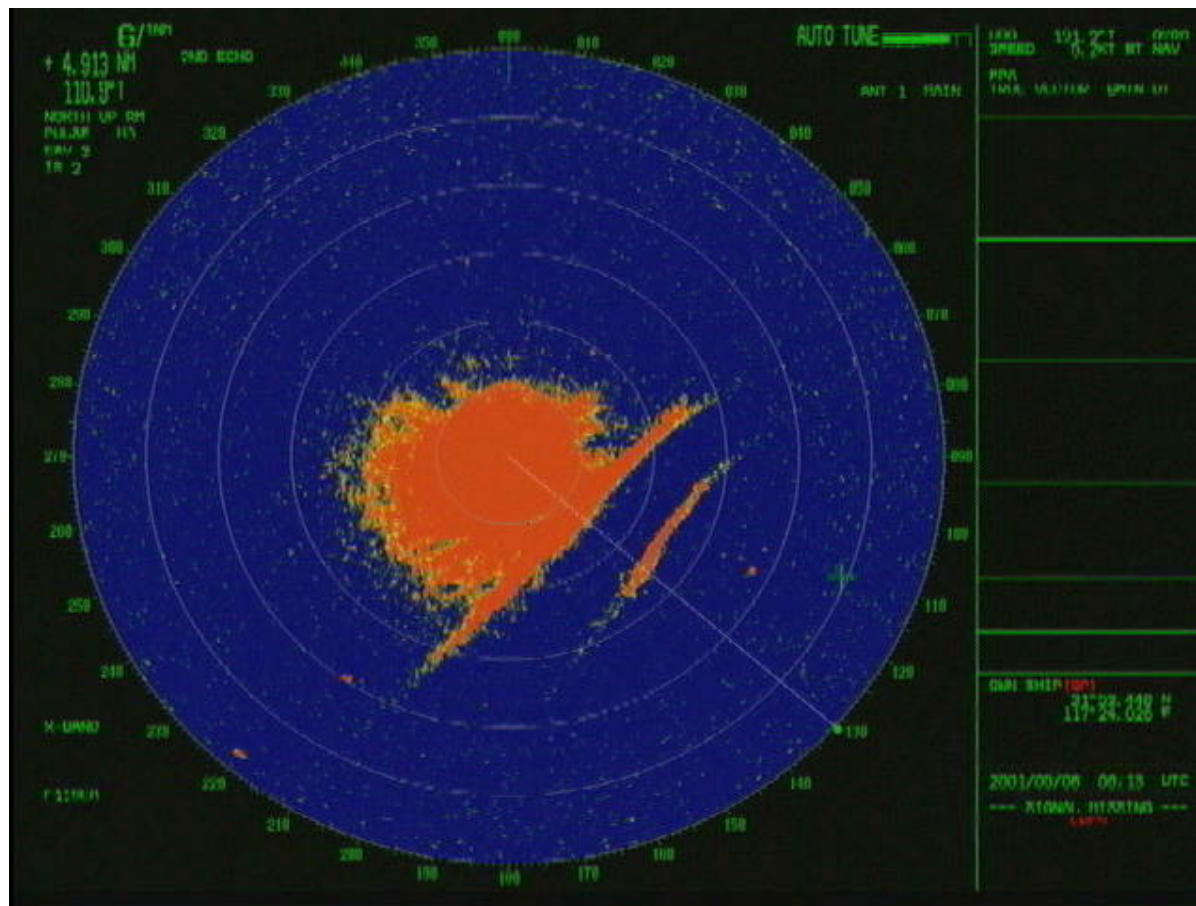
Deep Water Soliton

Shallow Water Soliton Conversion

Towed Environmental Instruments



Soliton Radar Expression

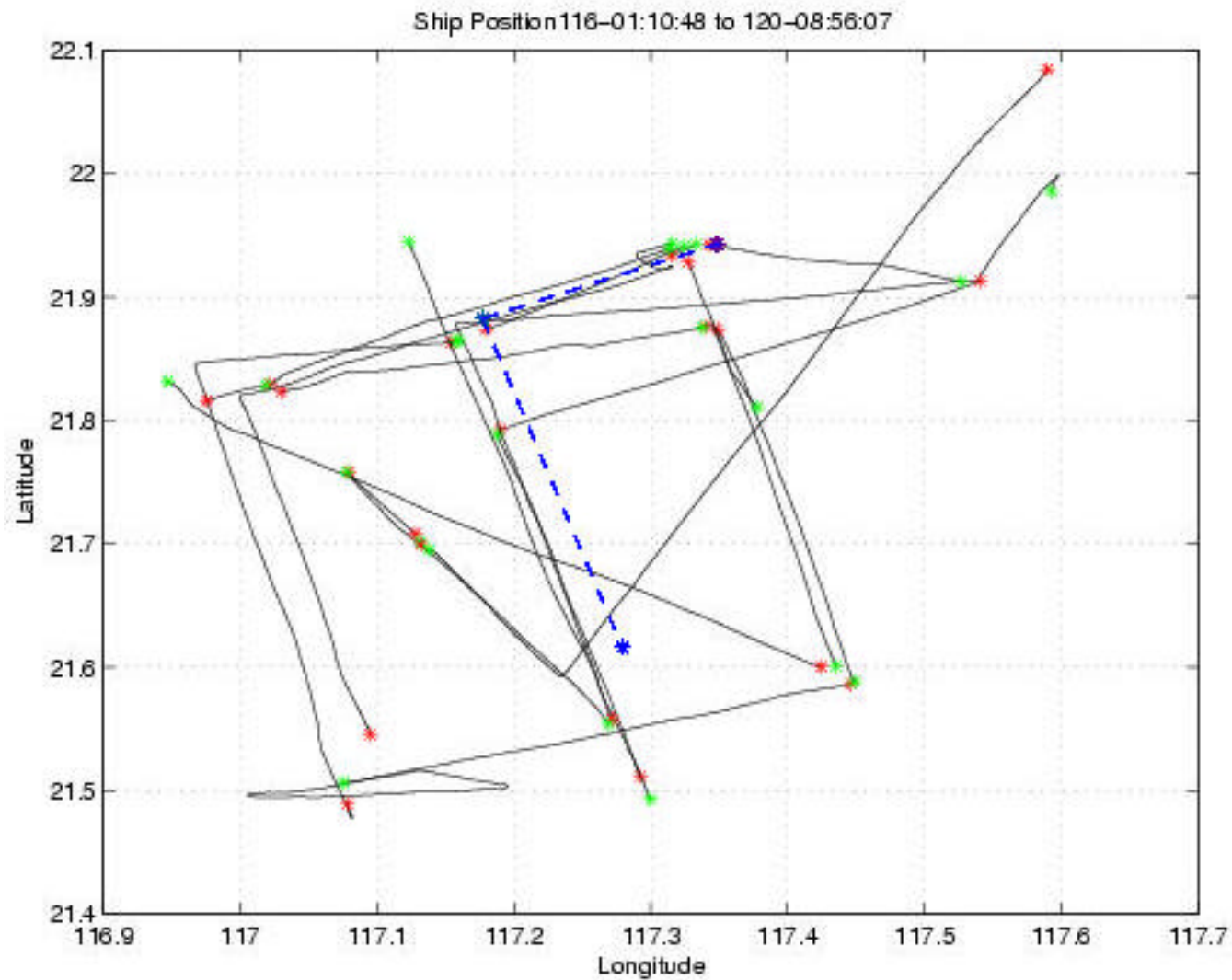


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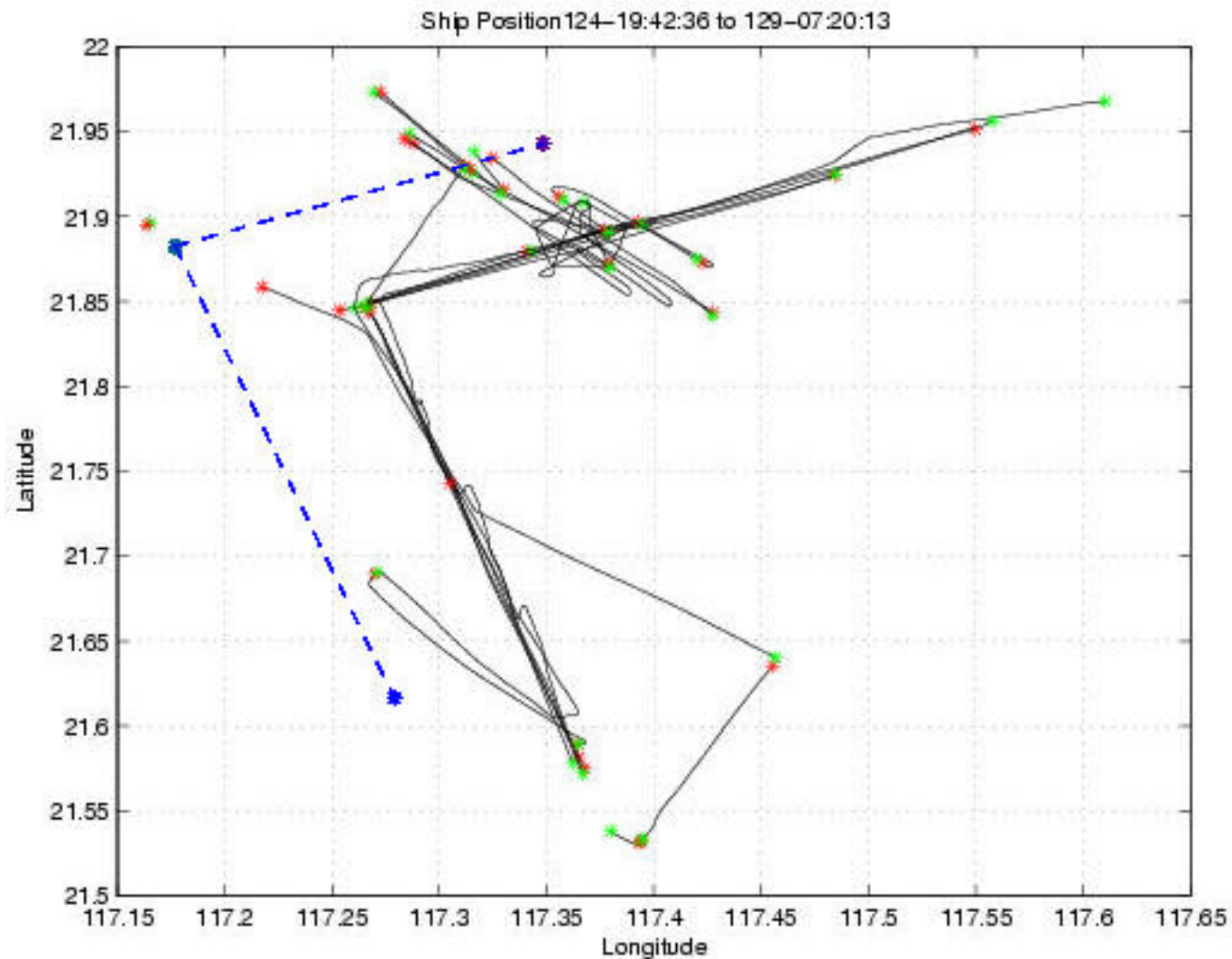
NRL

OR3 Ship Tracks

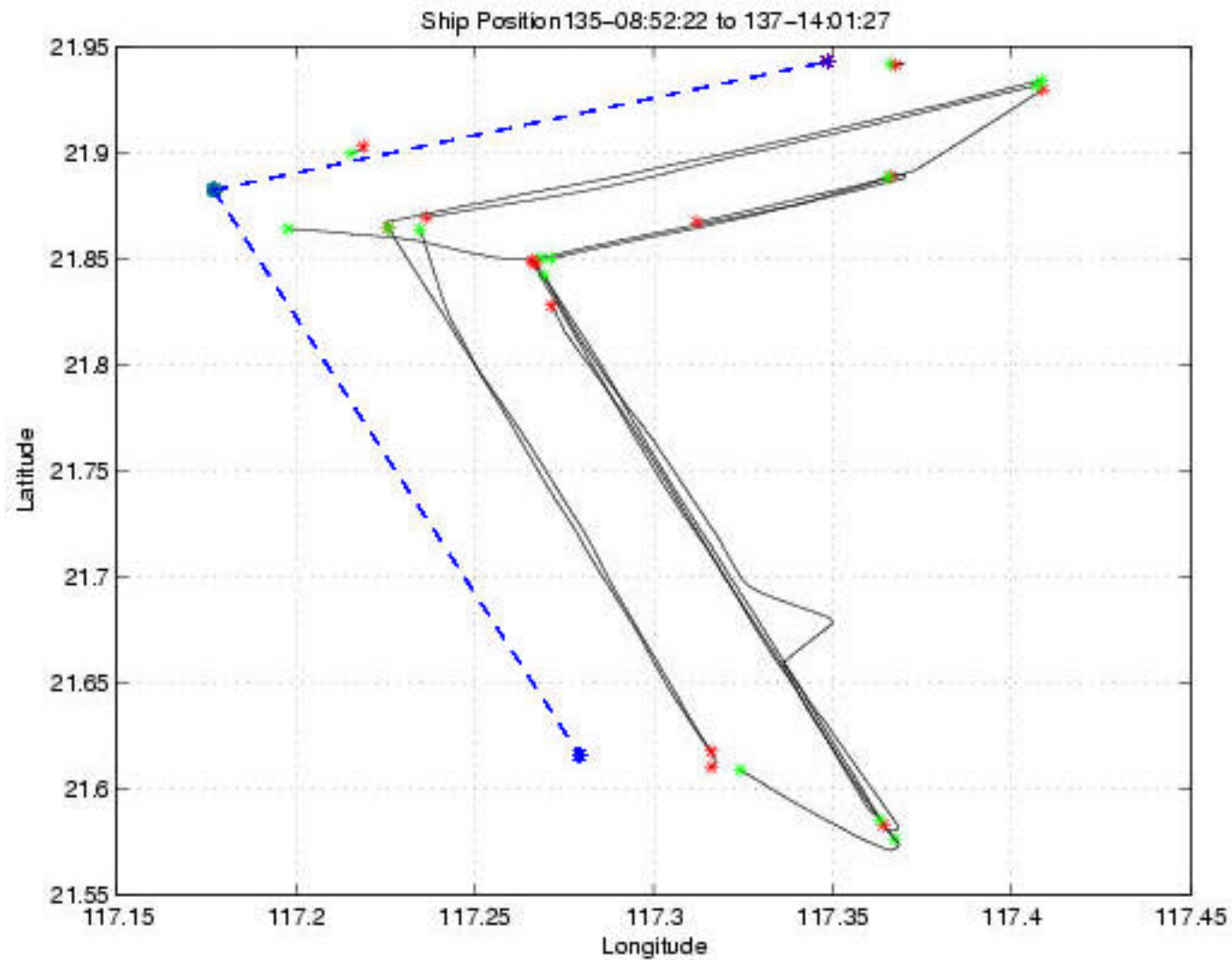
OR3 Tracks Leg 1



OR3 Tracks Leg 2

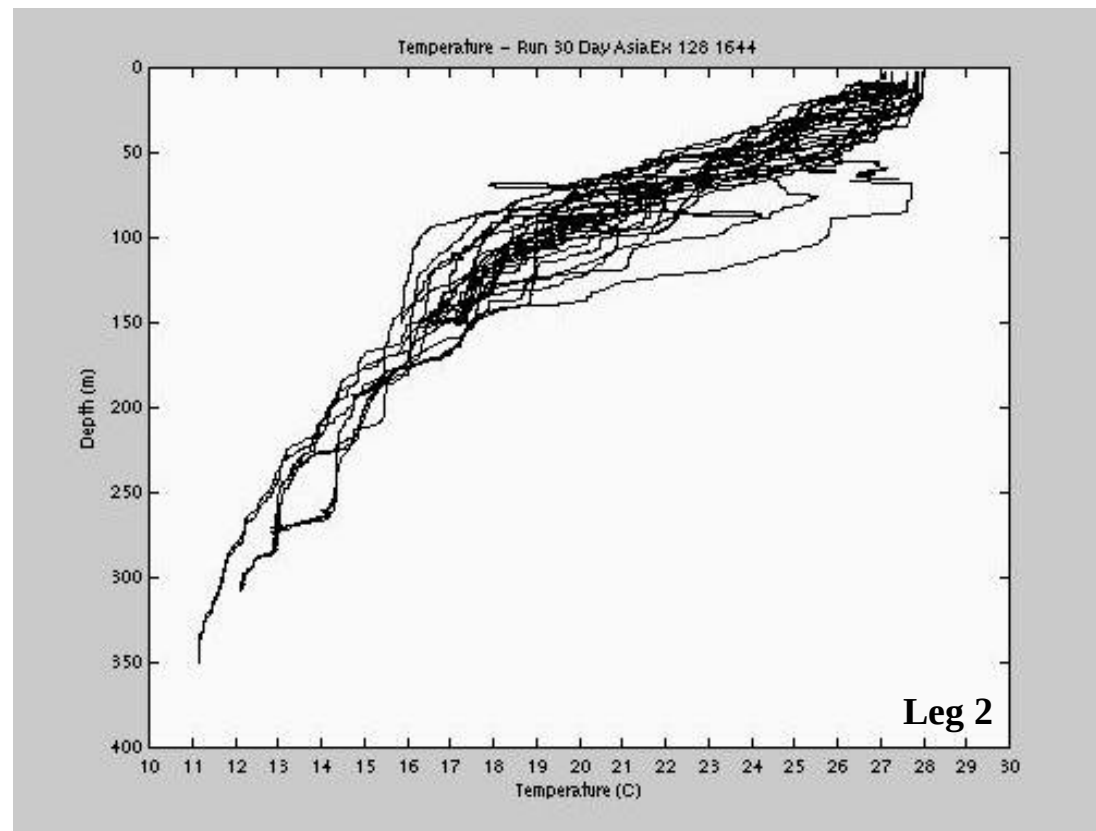


OR3 Tracks Leg 3



Temperature and Salinity Profiles

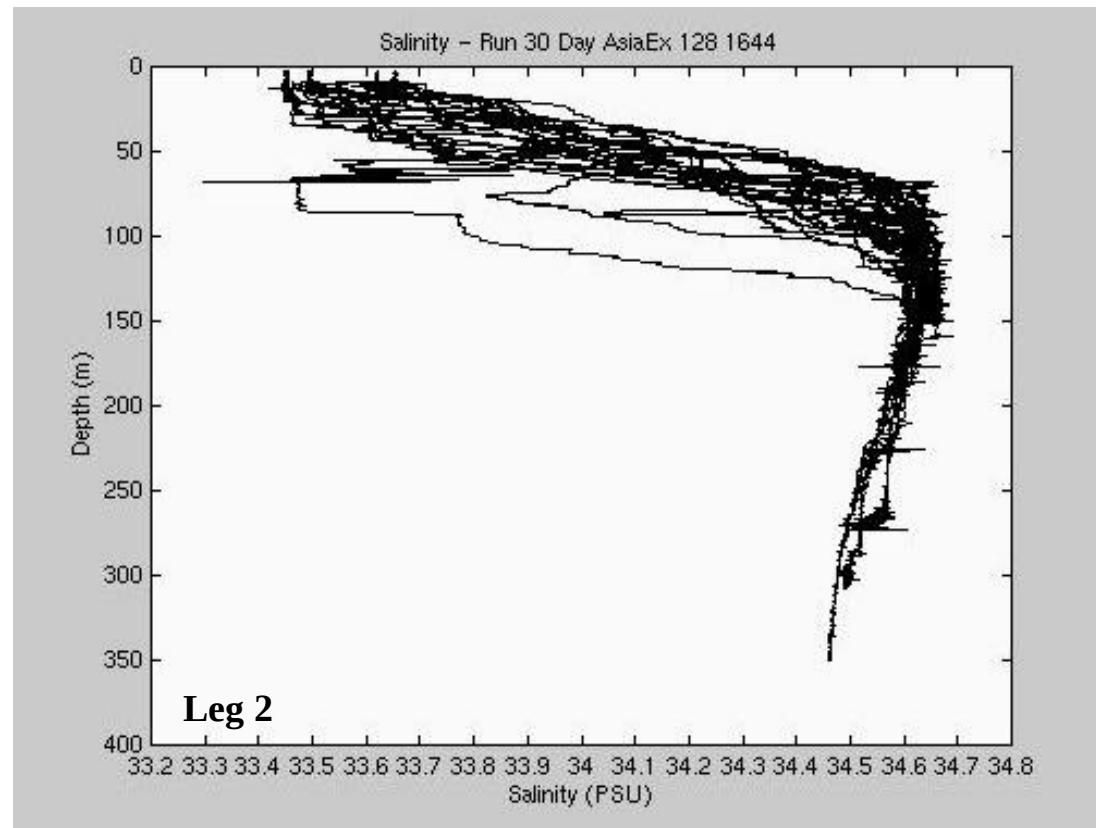
Temperature



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Salinity

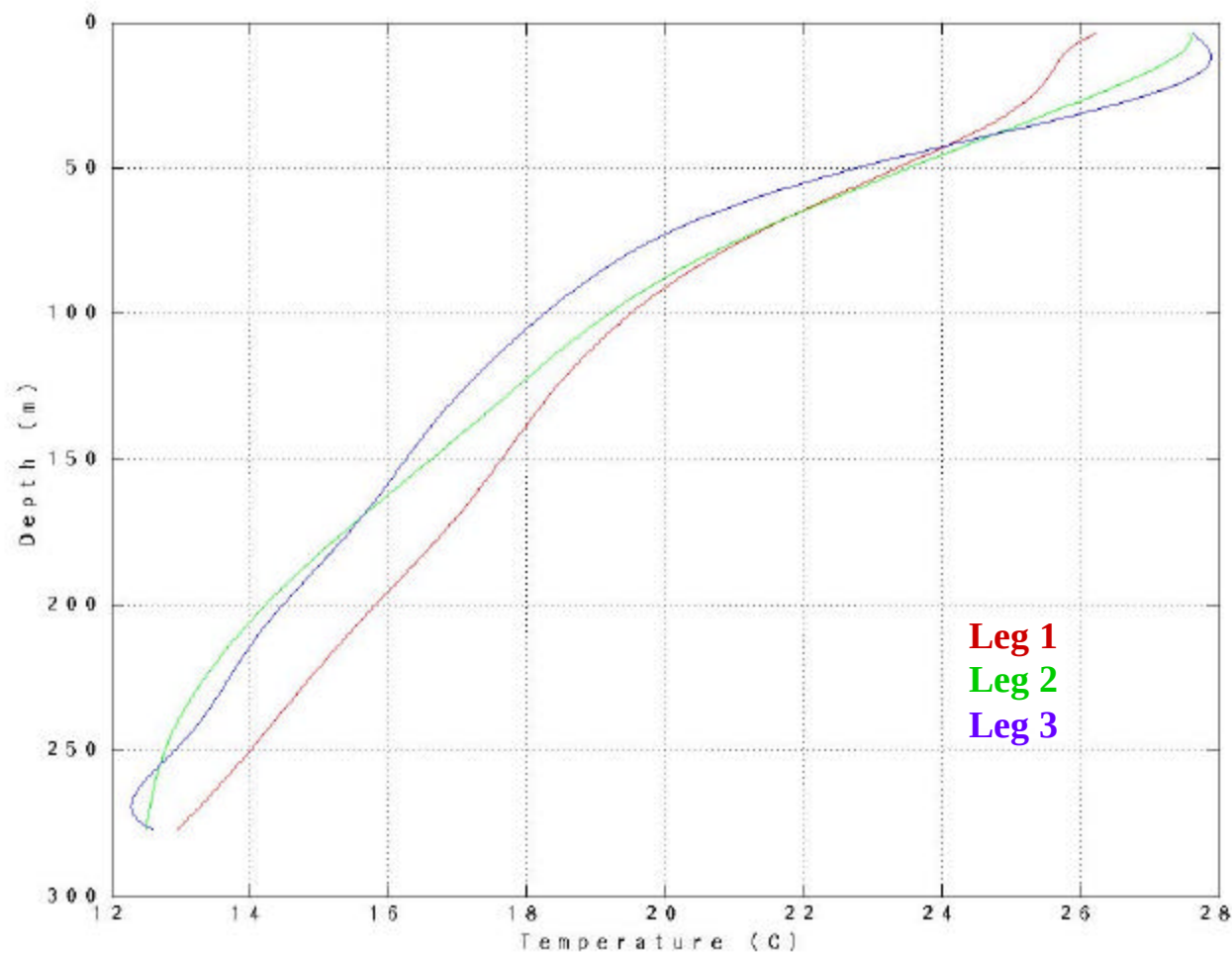


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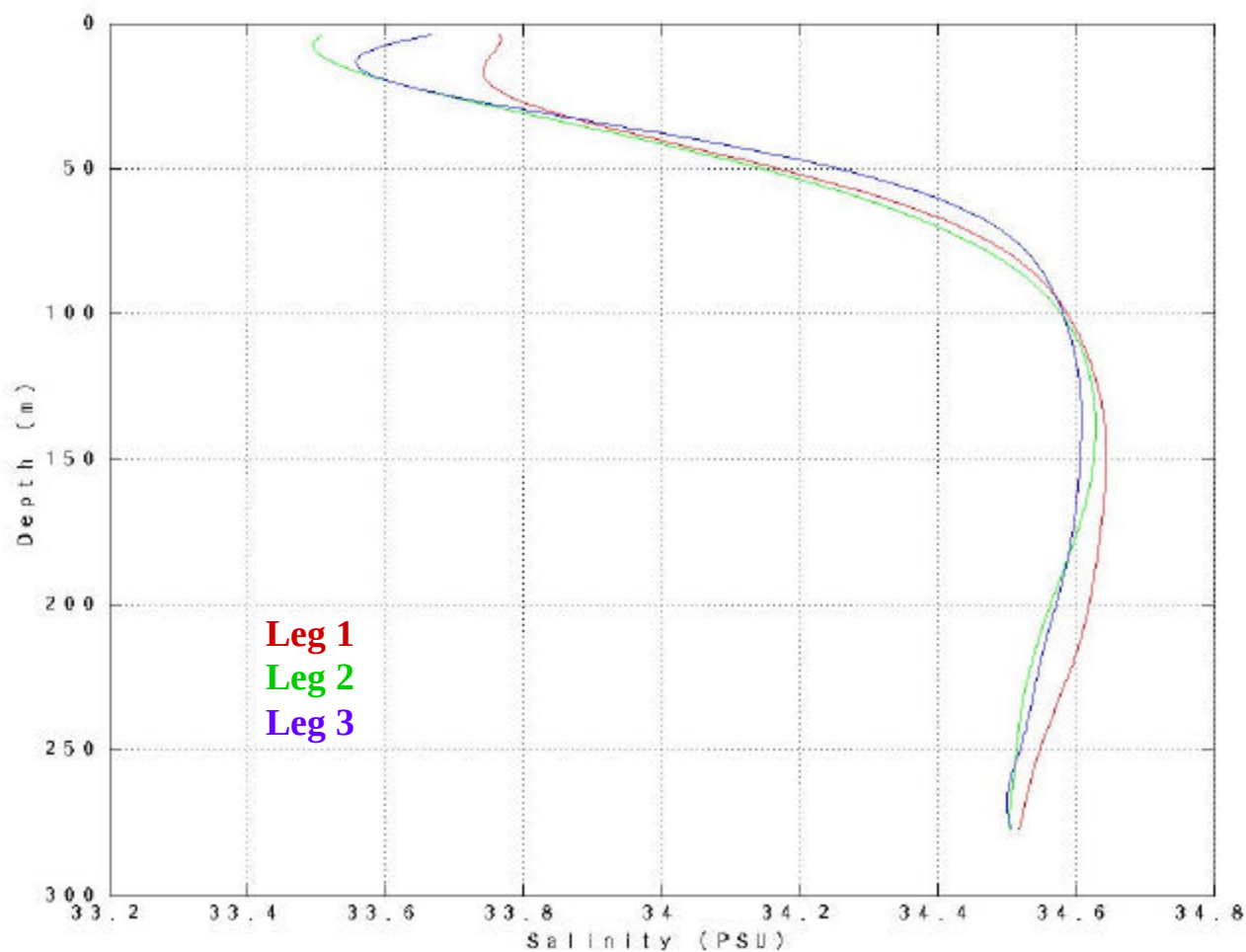
Temperature

(12th Order Least-Squares Polynomial)



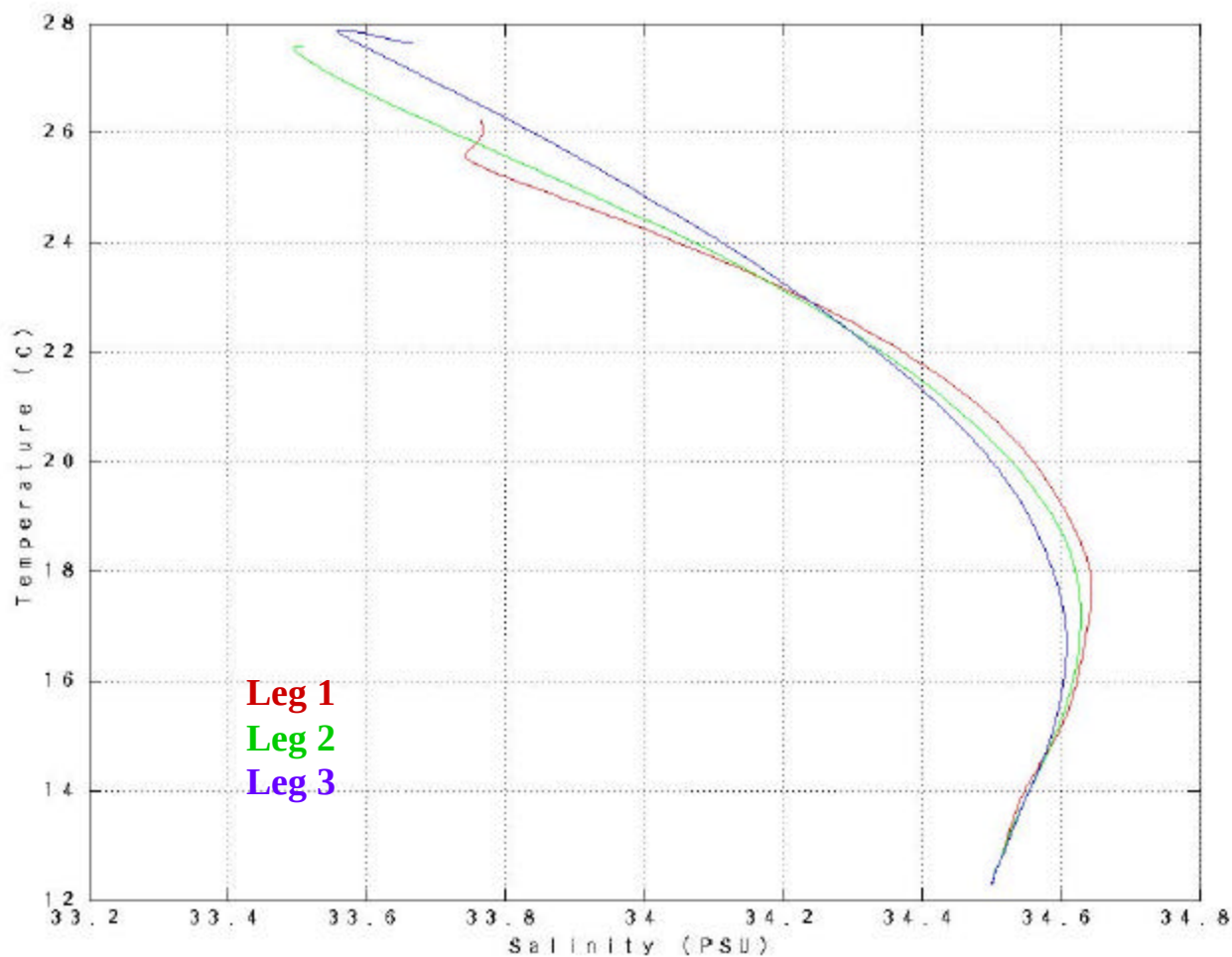
Salinity

(12th Order Least-Squares Polynomial)

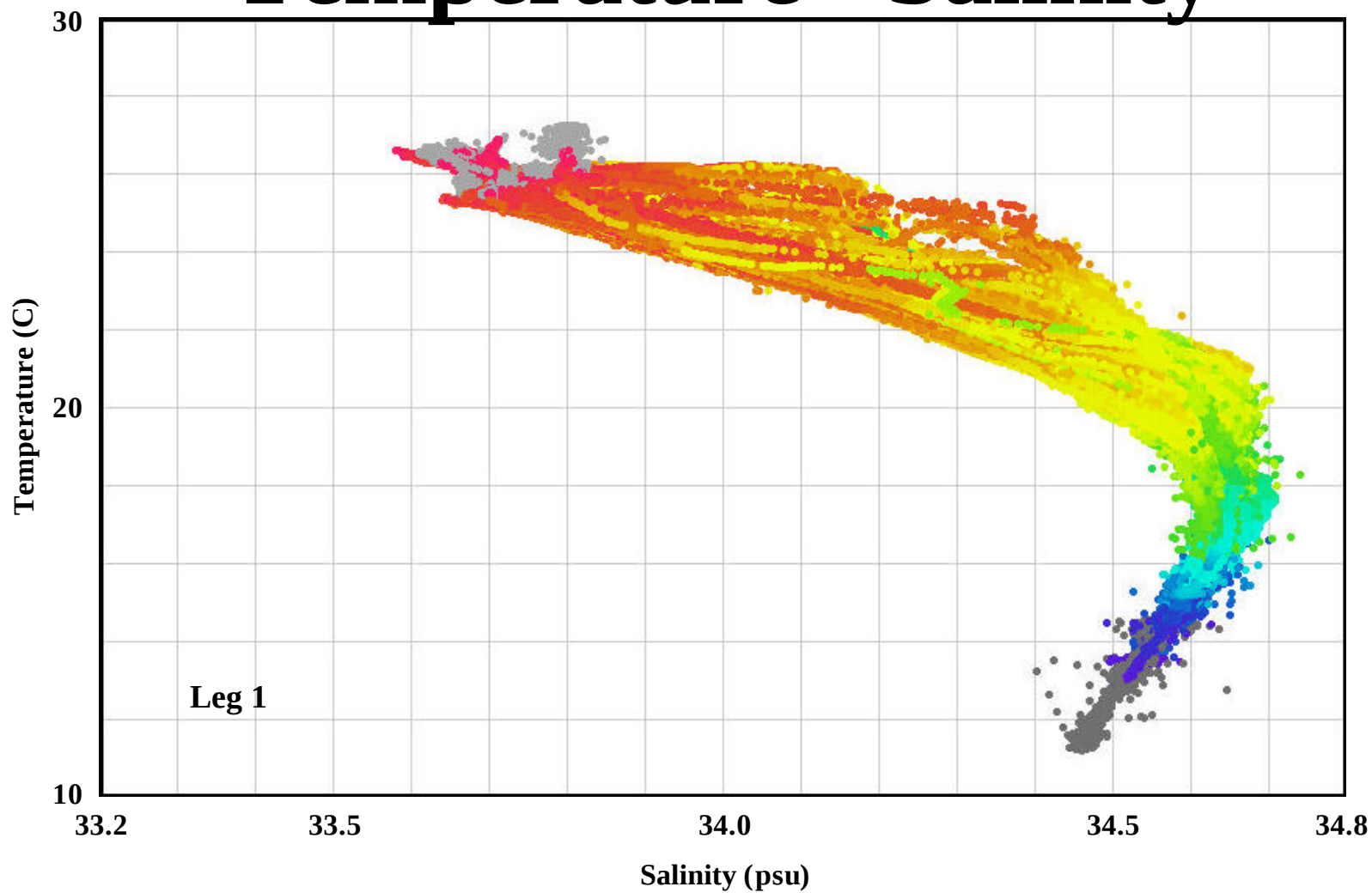


Temperature - Salinity

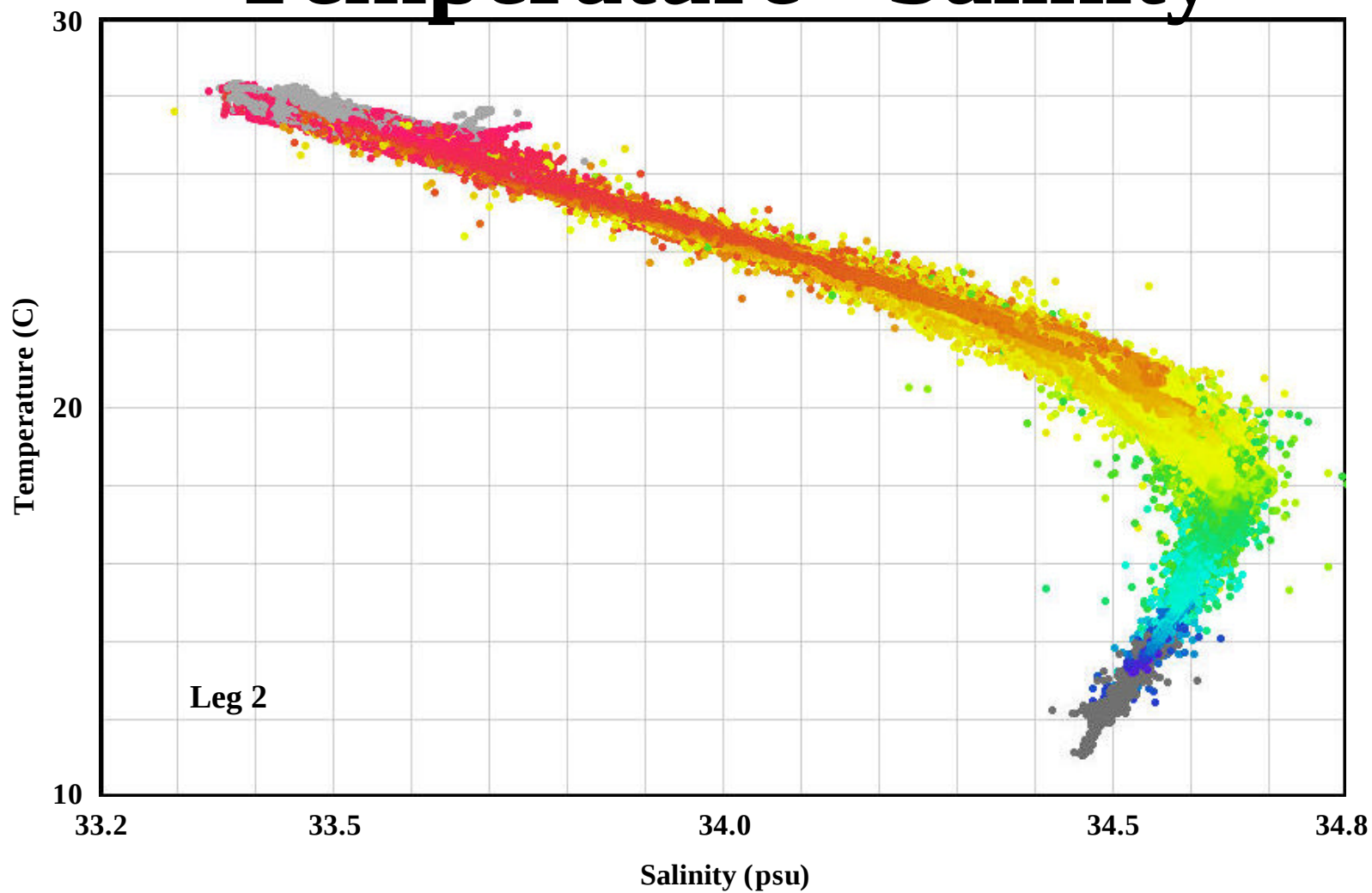
(12th Order Least-Squares Polynomial)



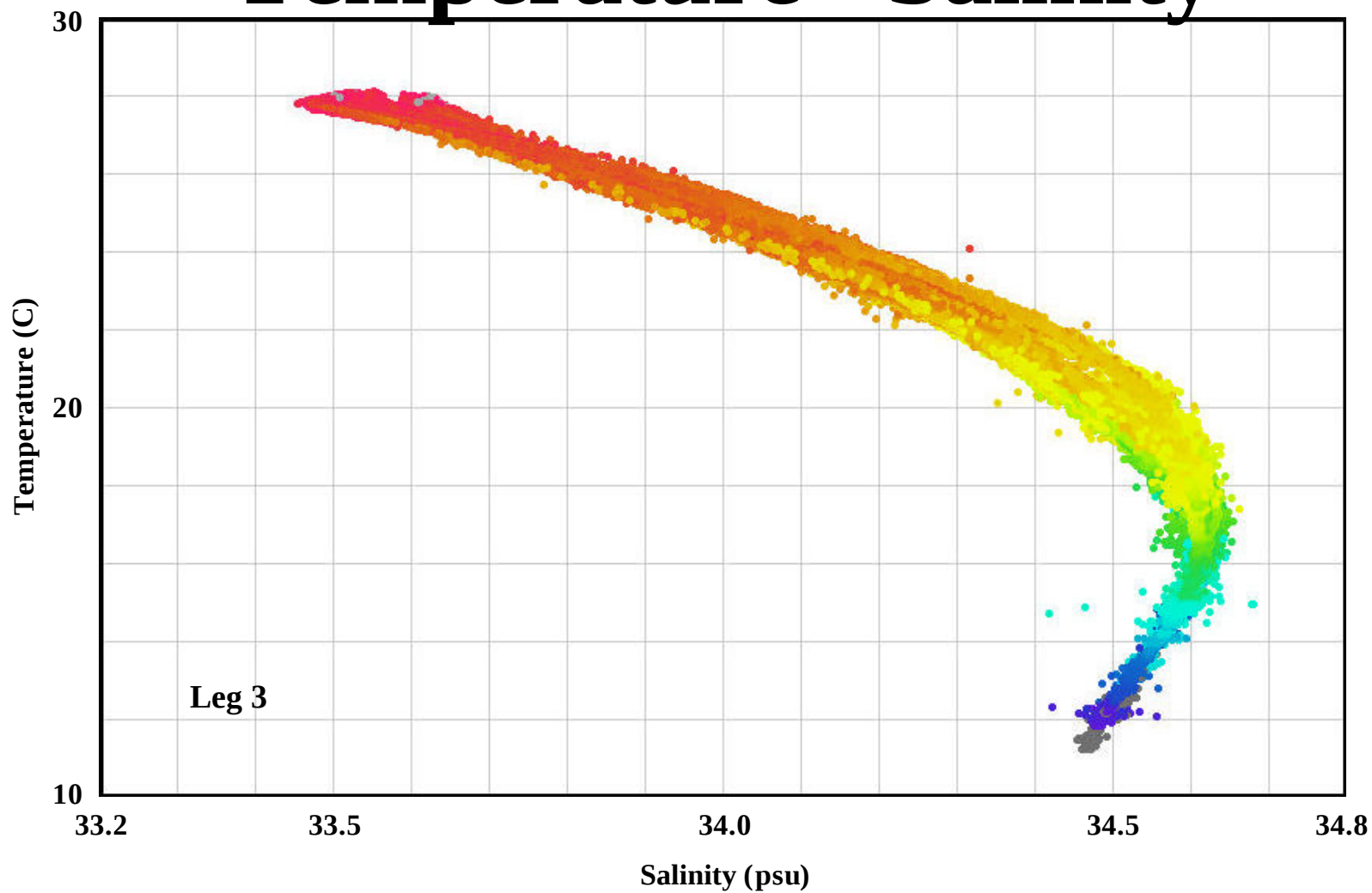
Temperature - Salinity



Temperature - Salinity



Temperature - Salinity

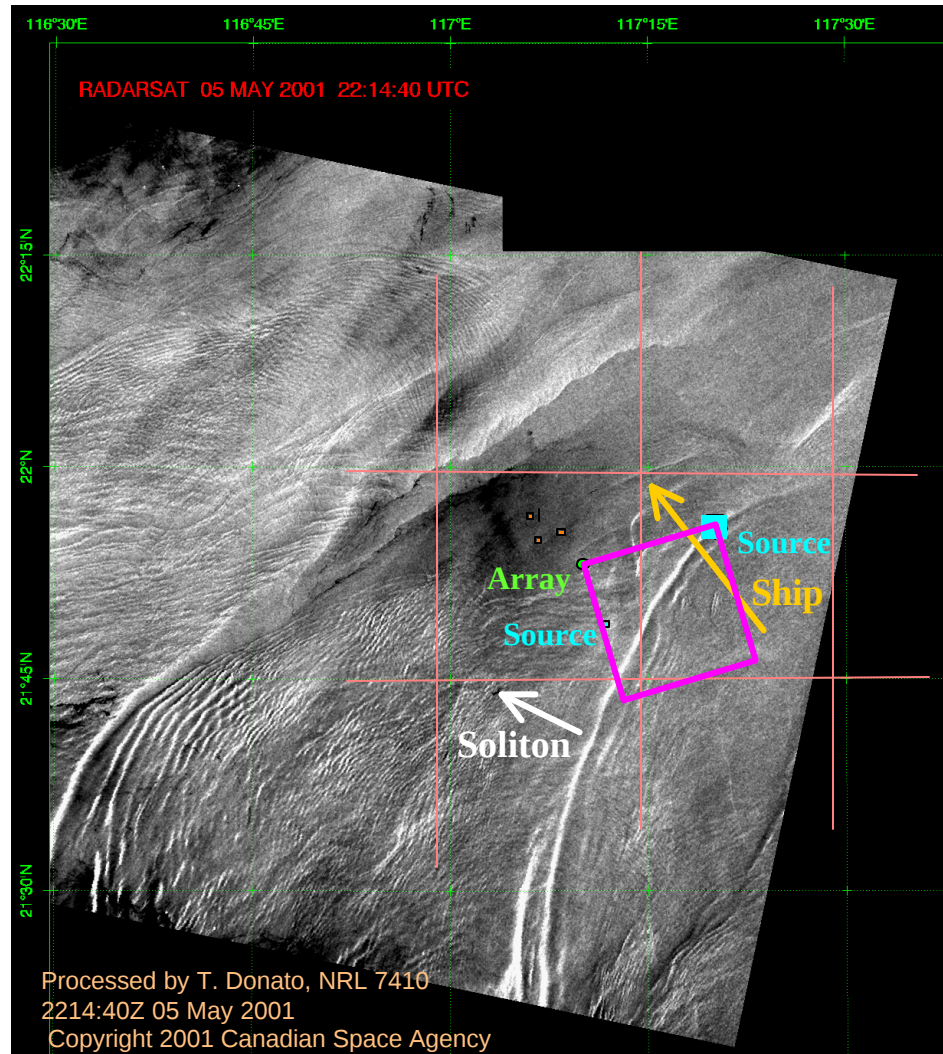


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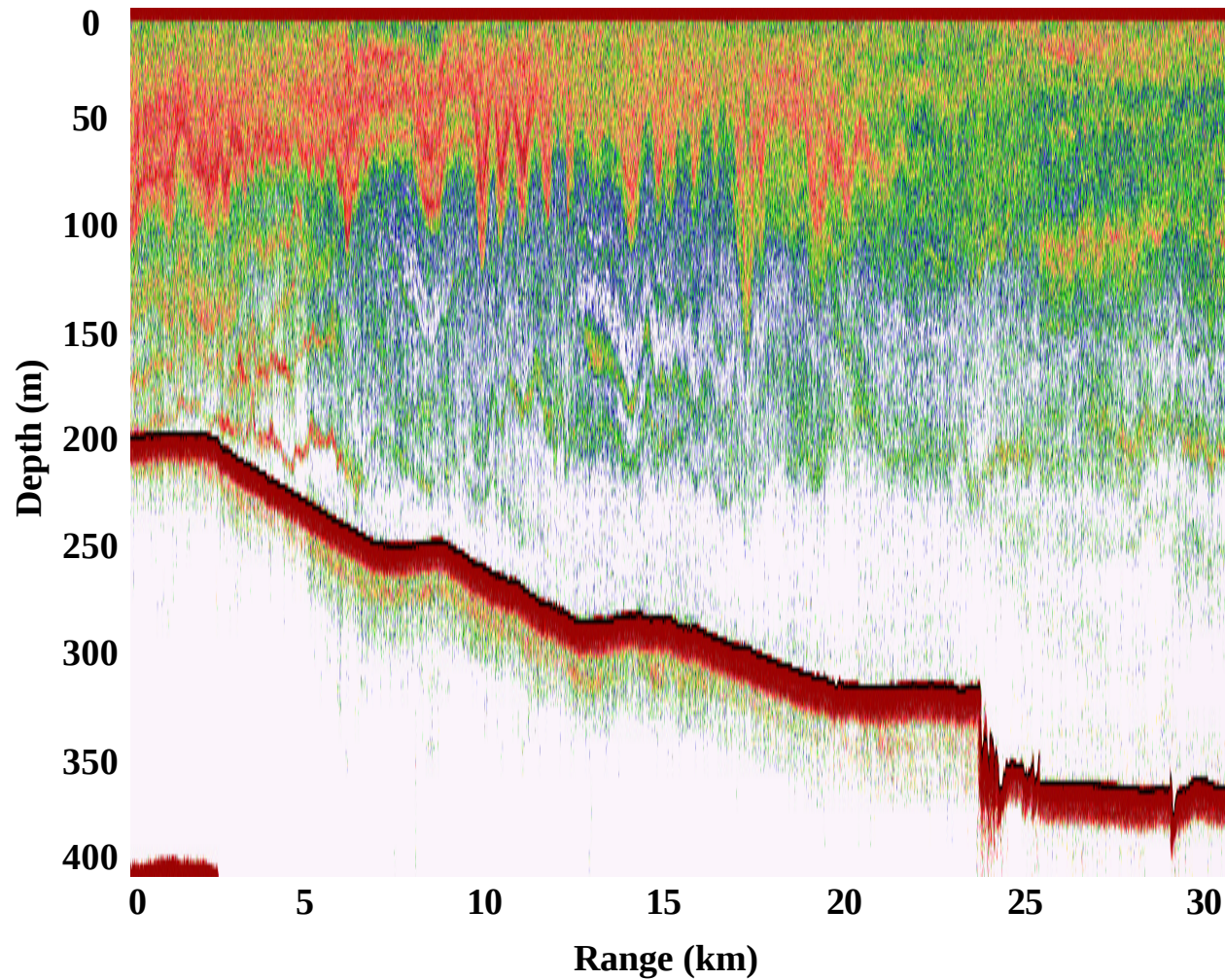
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Deep Water Soliton

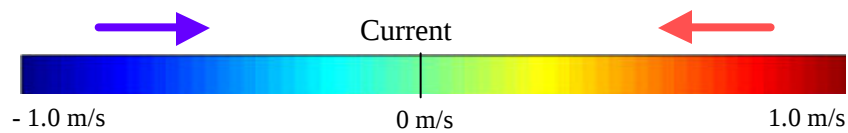
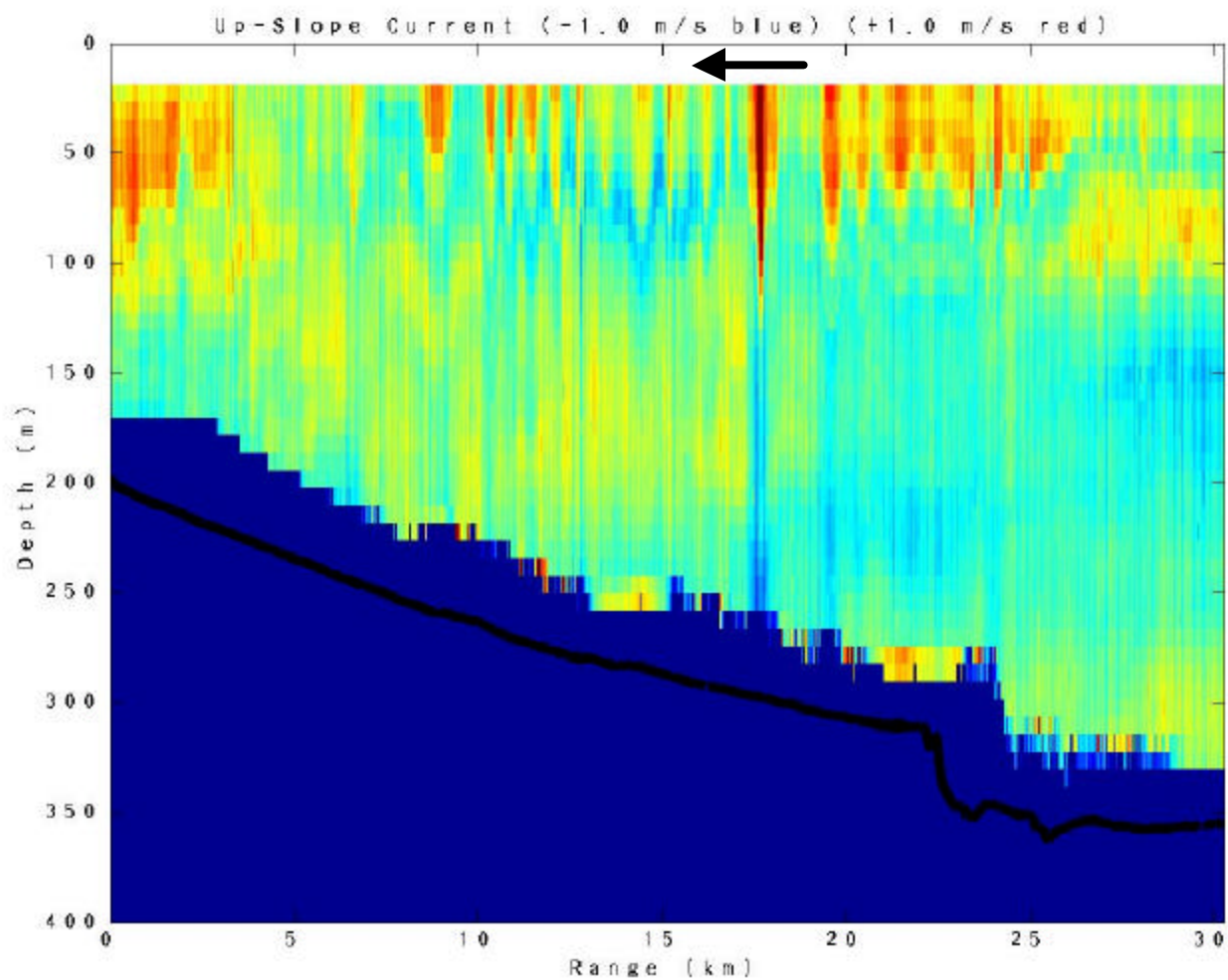
Radar Satellite Image



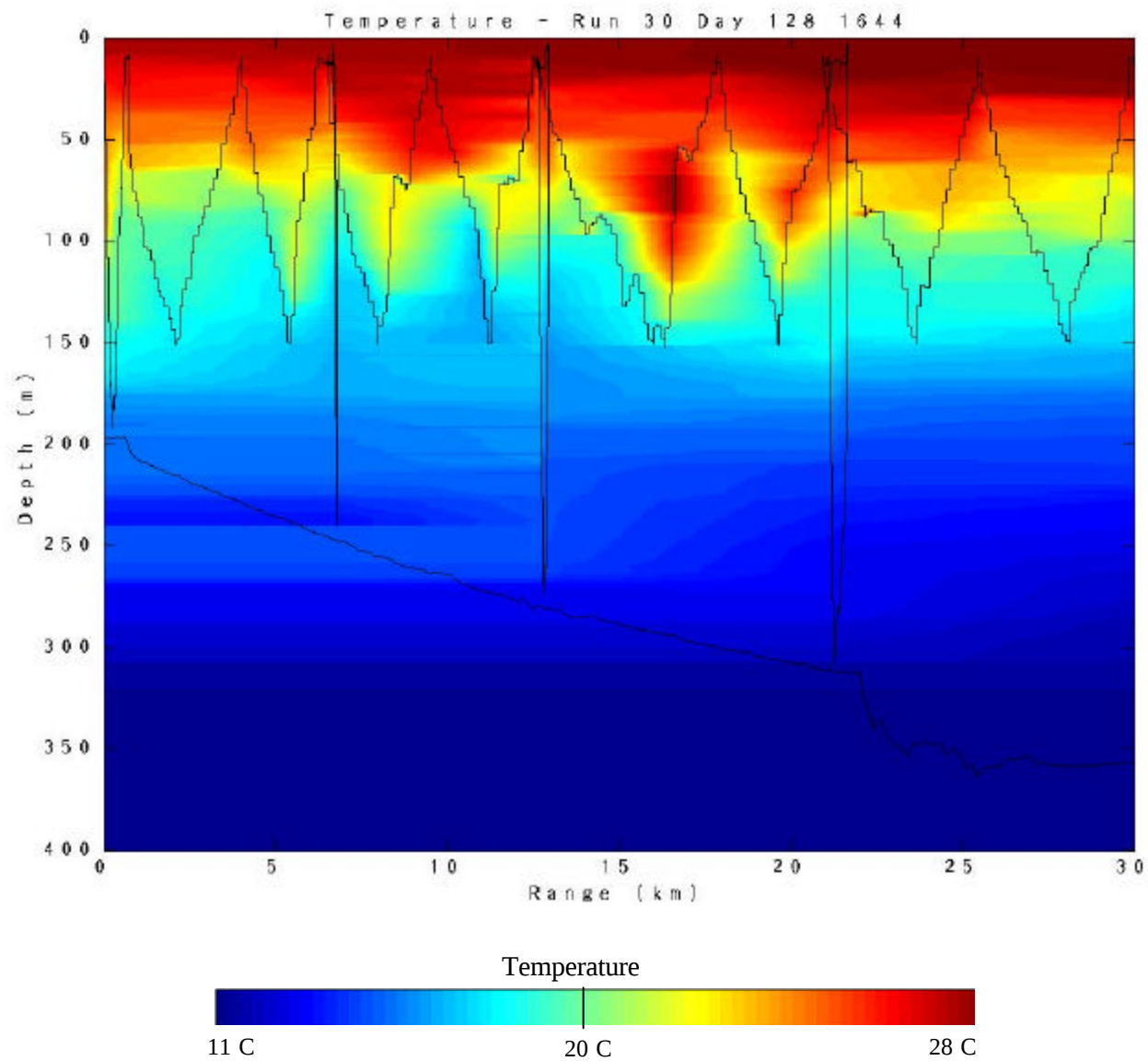
EP500 Echosounder



Up-Slope Current



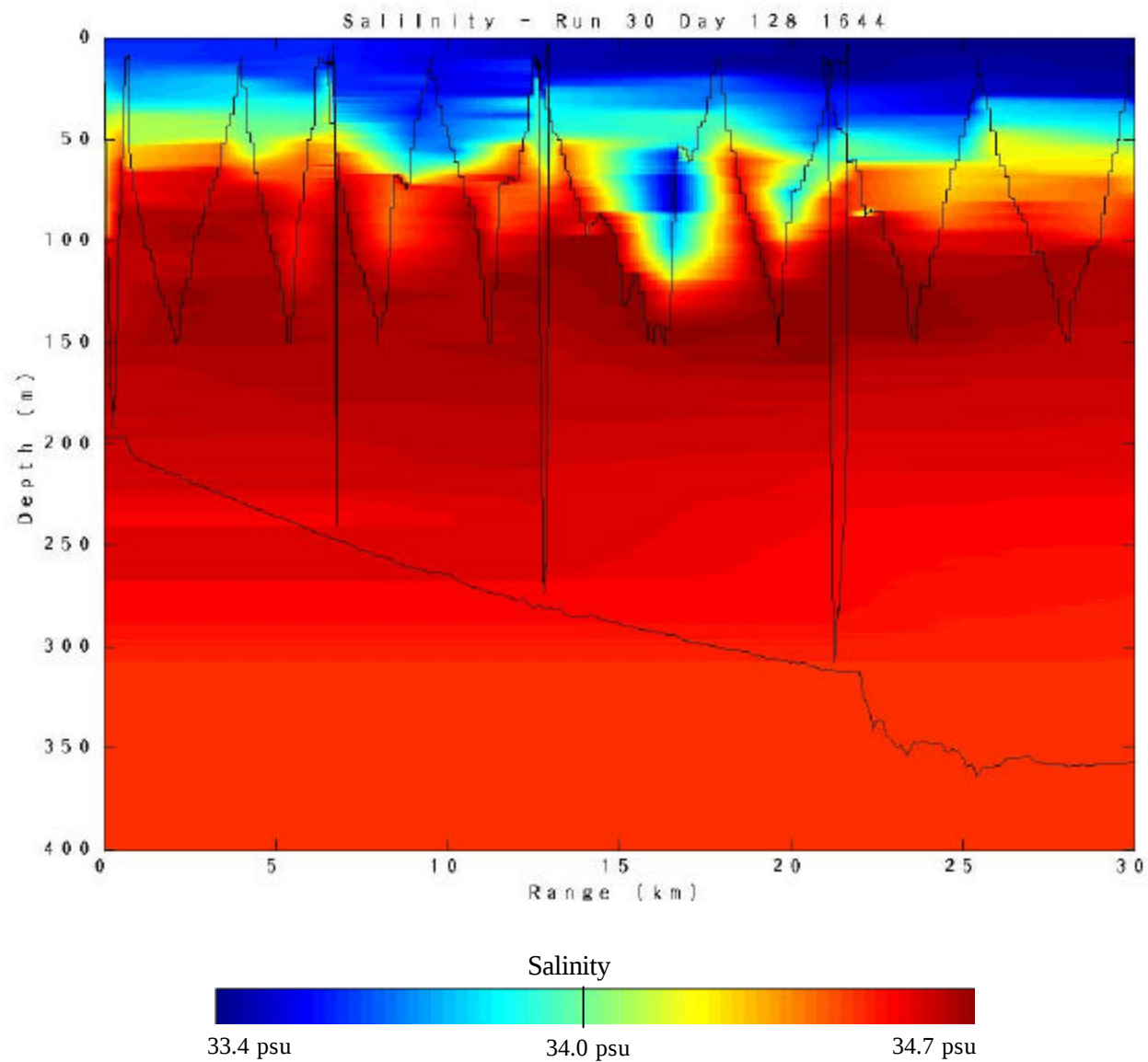
Temperature



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Salinity

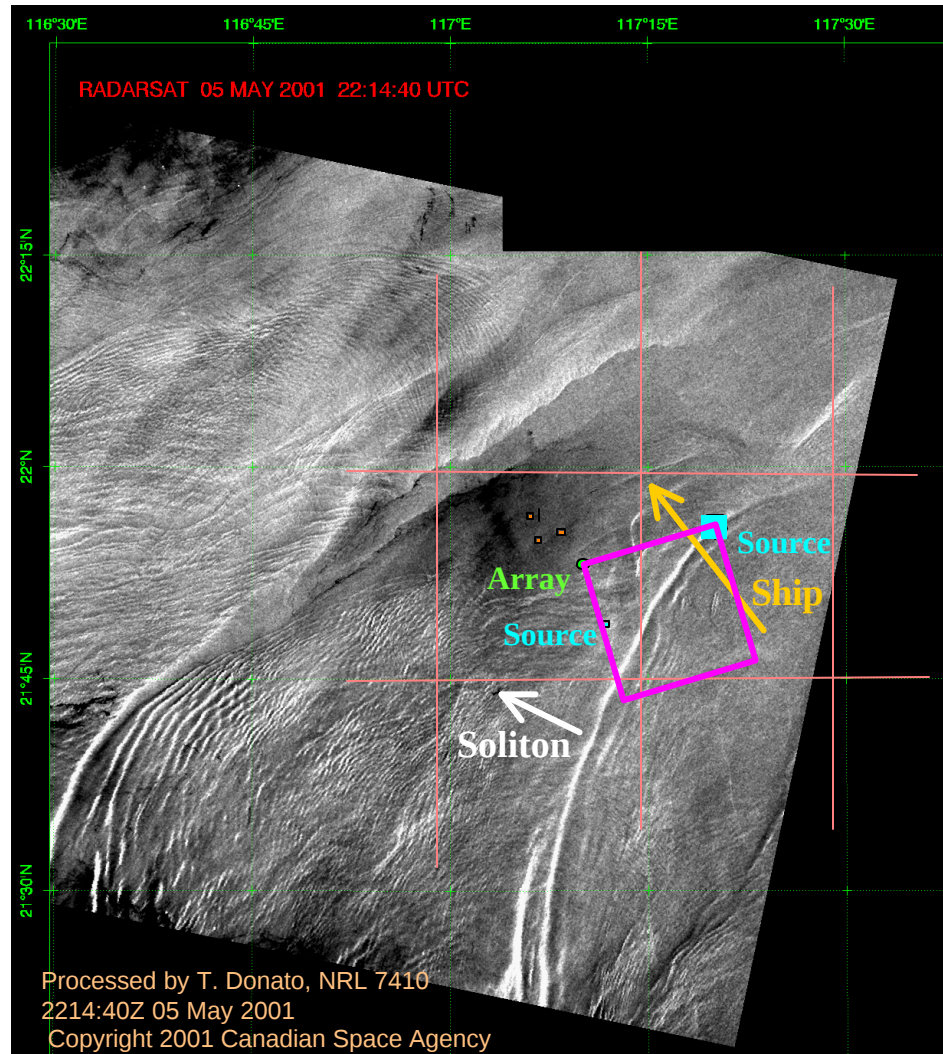


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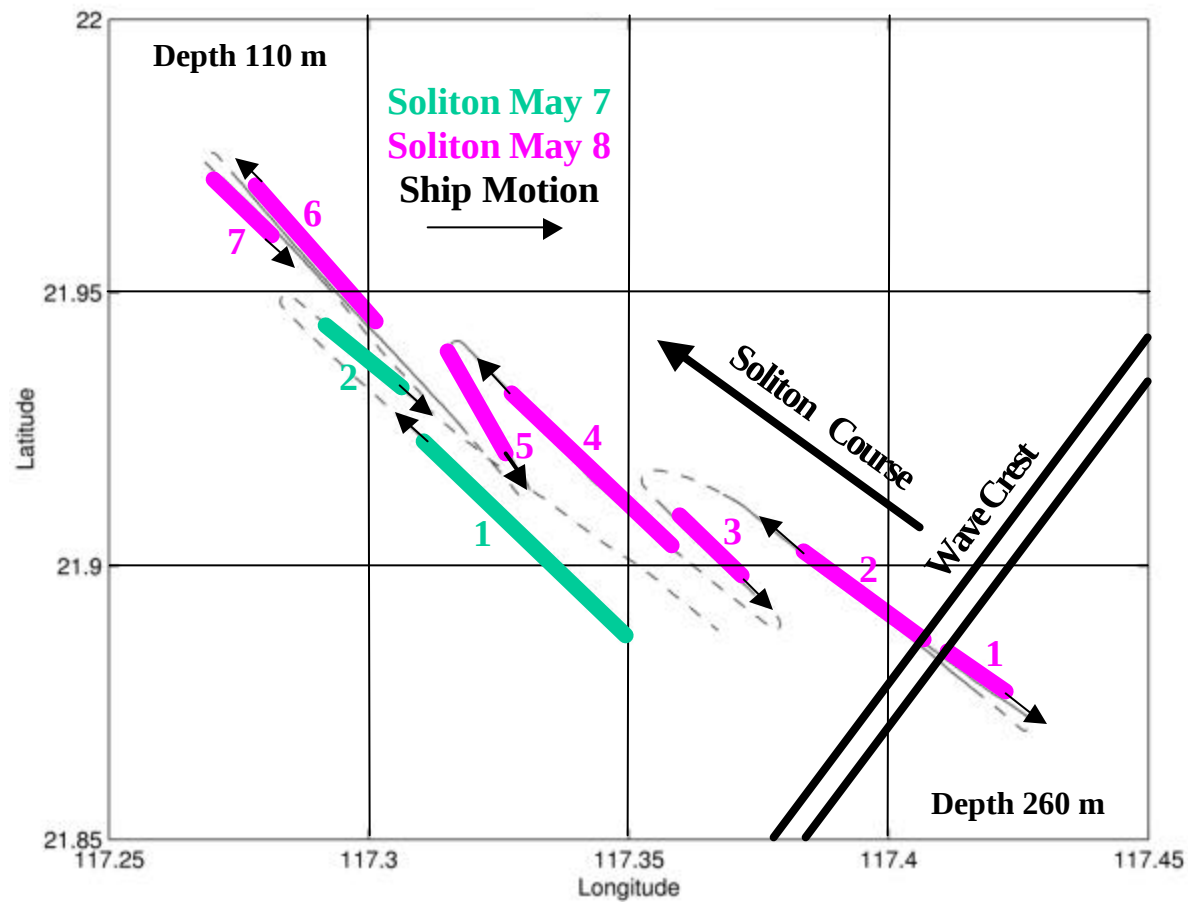
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Shallow Water Soliton Conversion

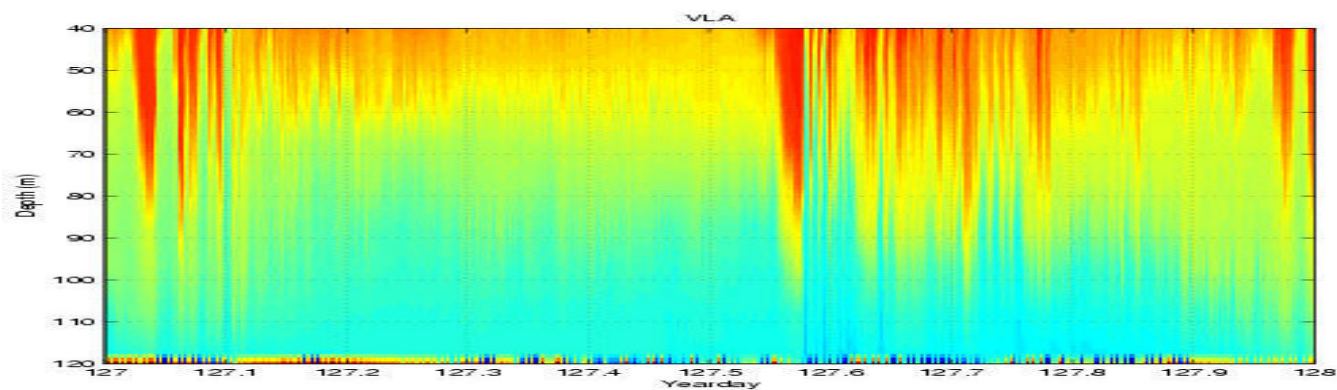
Radar Satellite Image



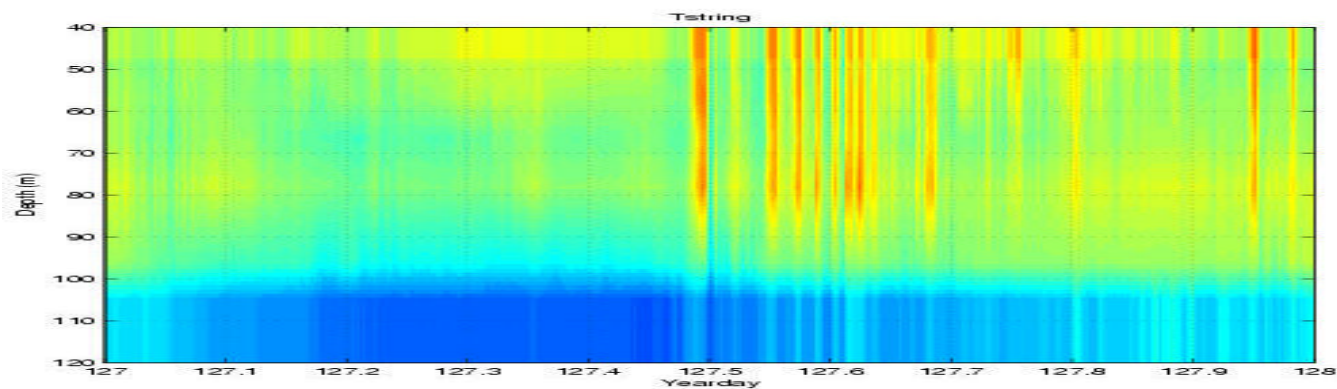
Soliton and Ship Tracks



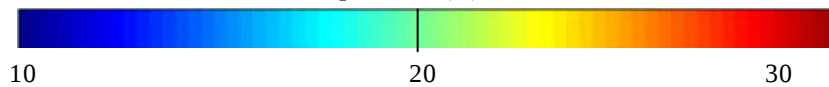
Vertical Array Temperature Pods May 7



Temperature String 307 May 7

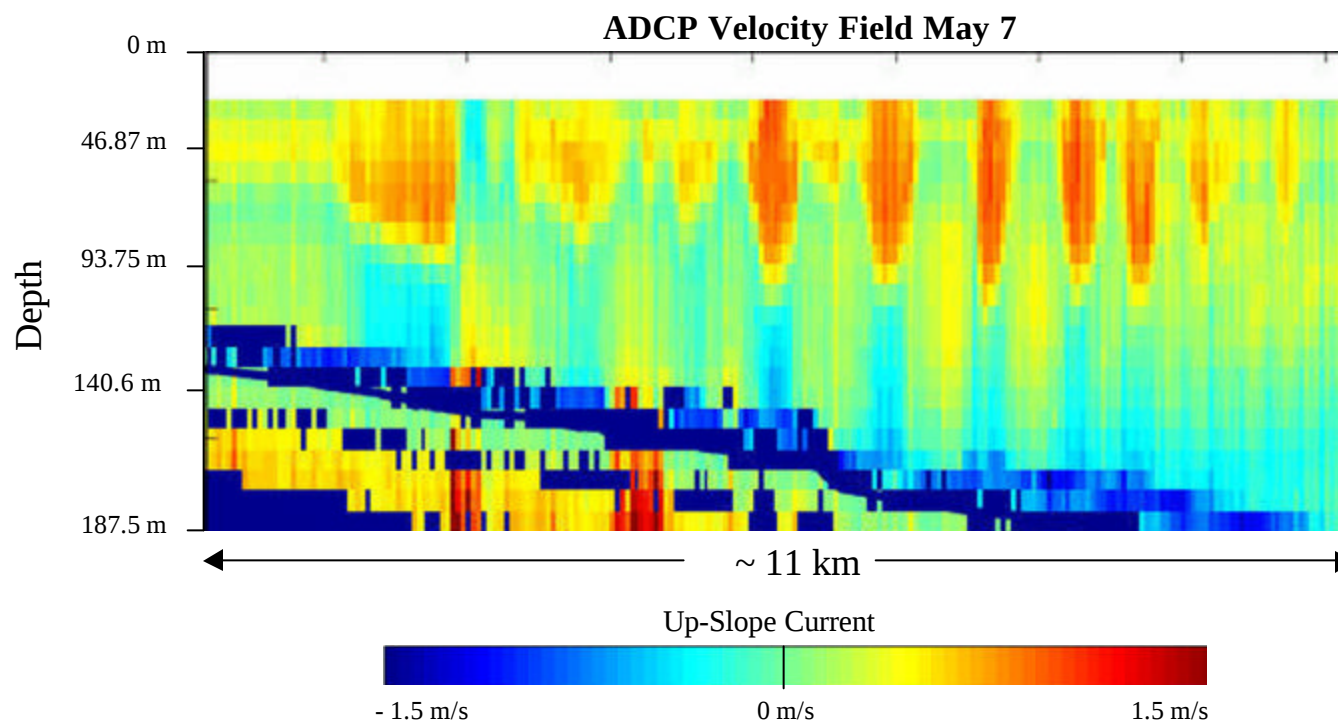
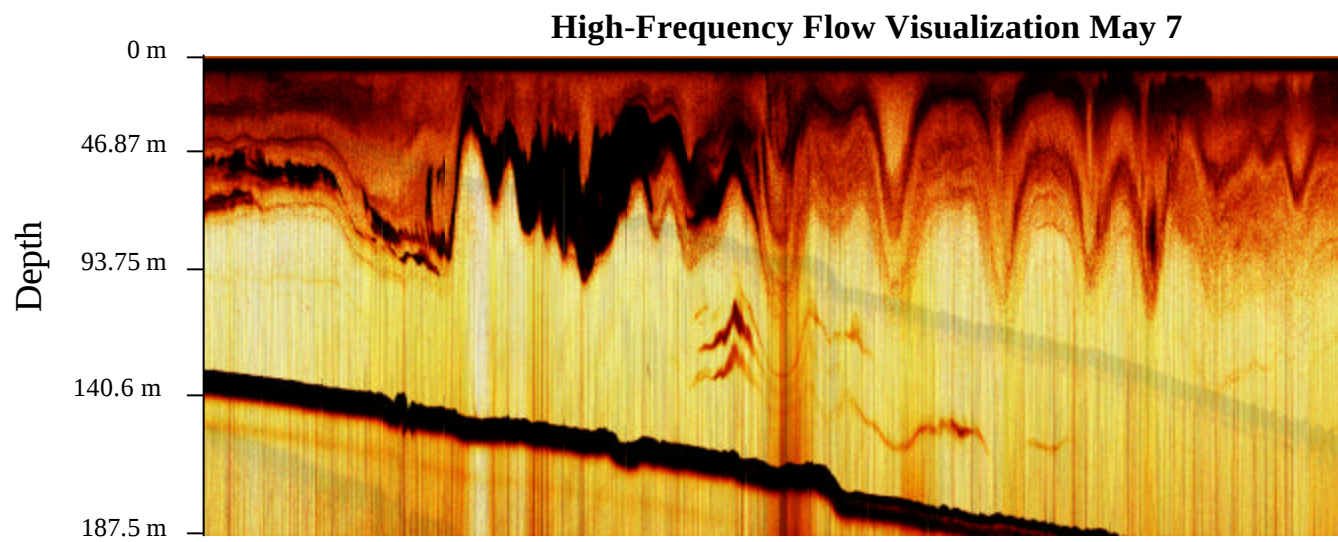


Temperature (C)



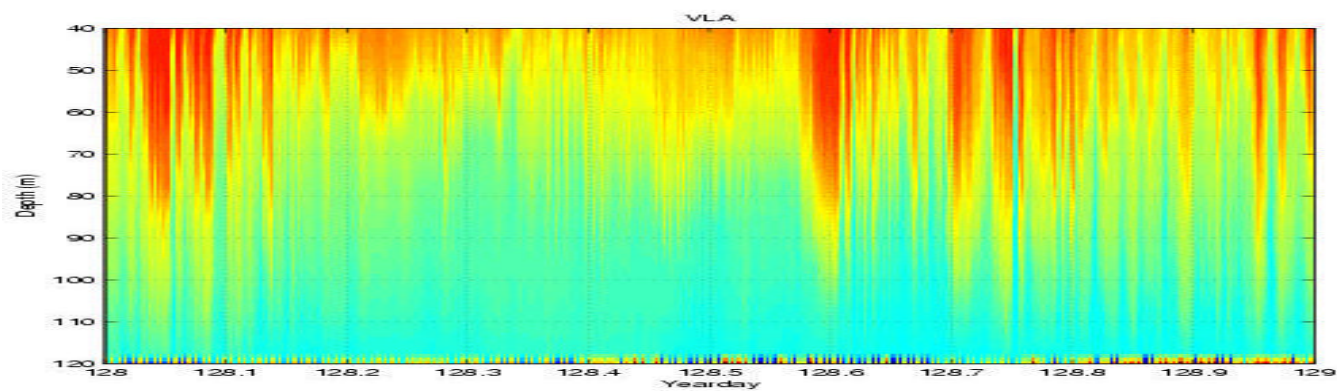
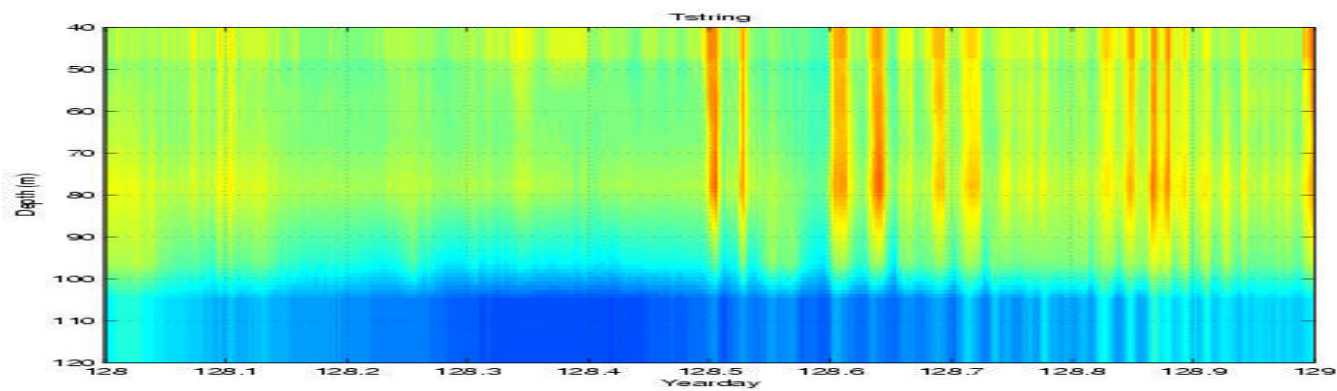
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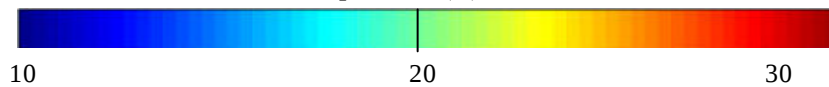


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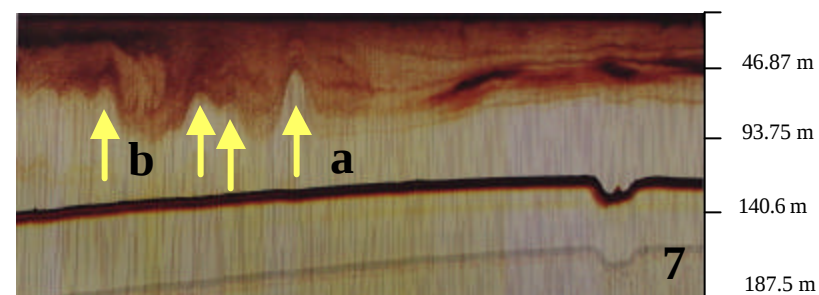
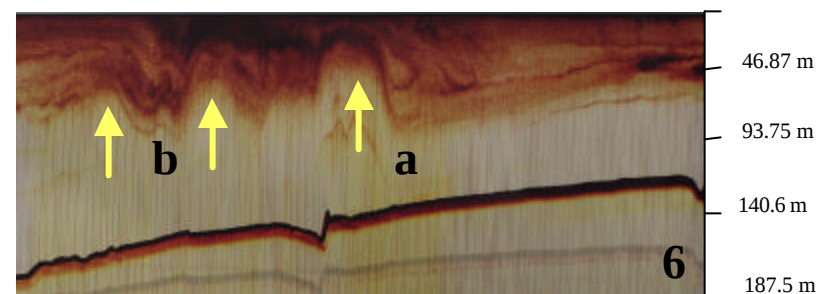
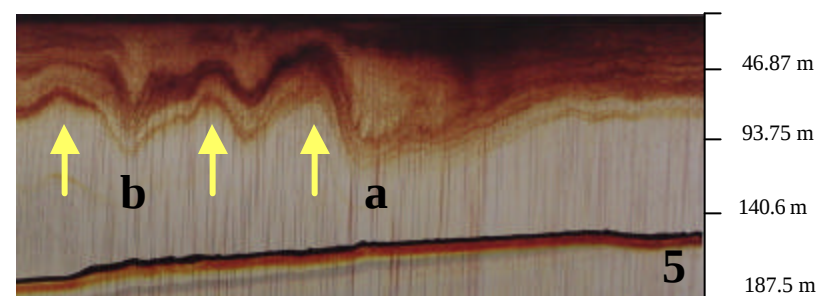
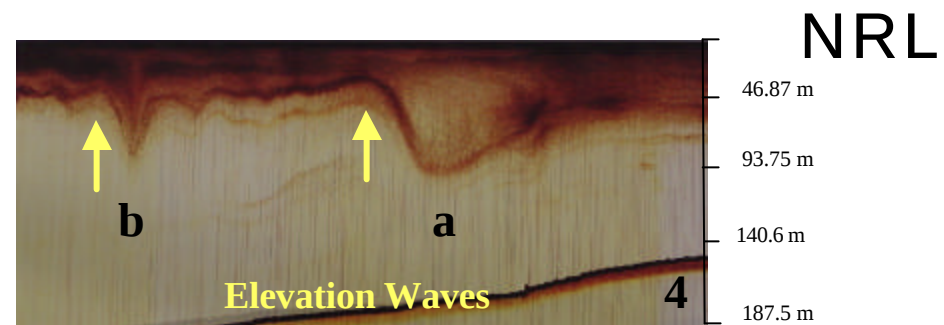
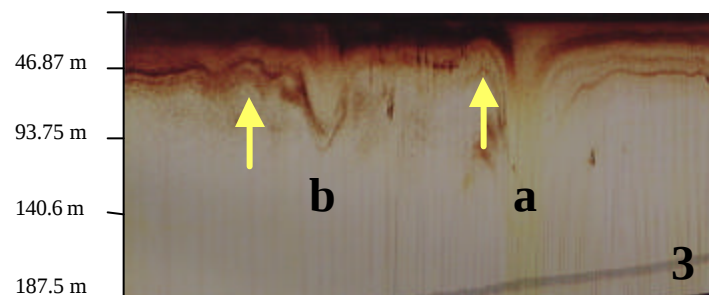
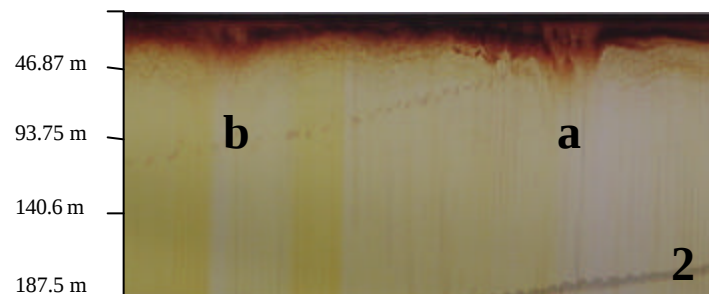
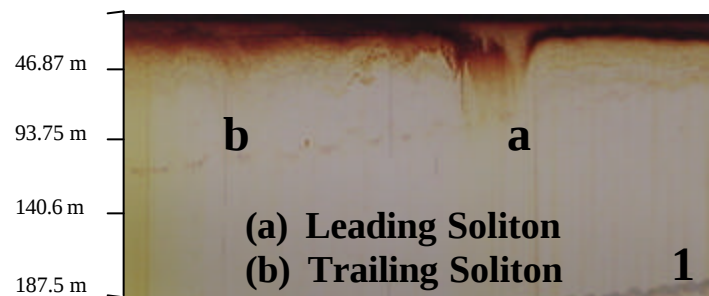
Vertical Array Temperature Pods May 8**Temperature String 307 May 8**

Temperature (C)



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Soliton Evolution



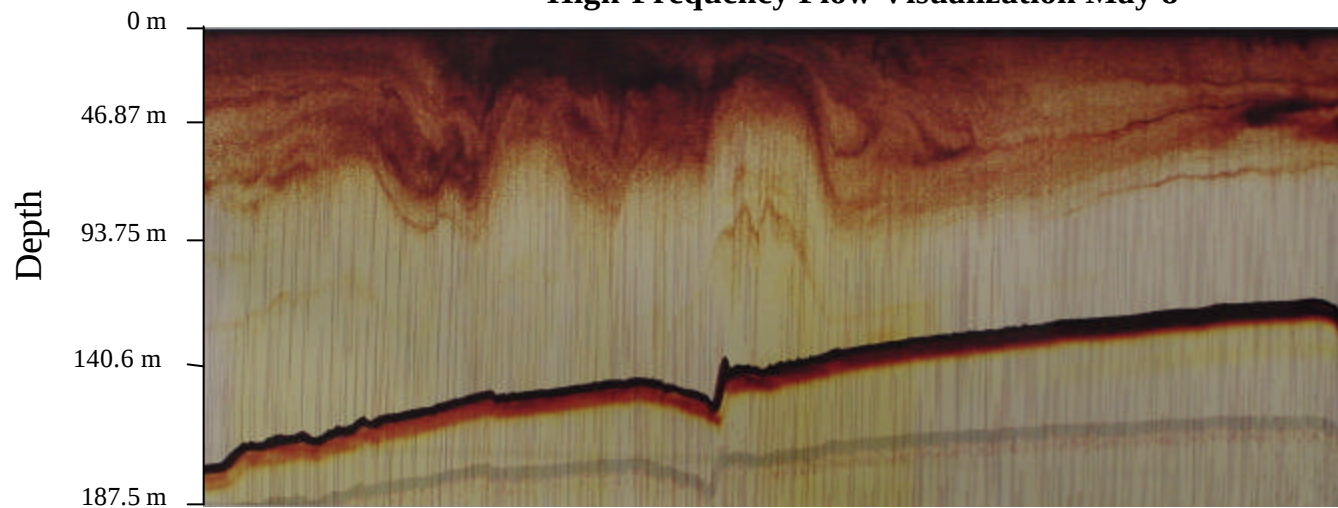
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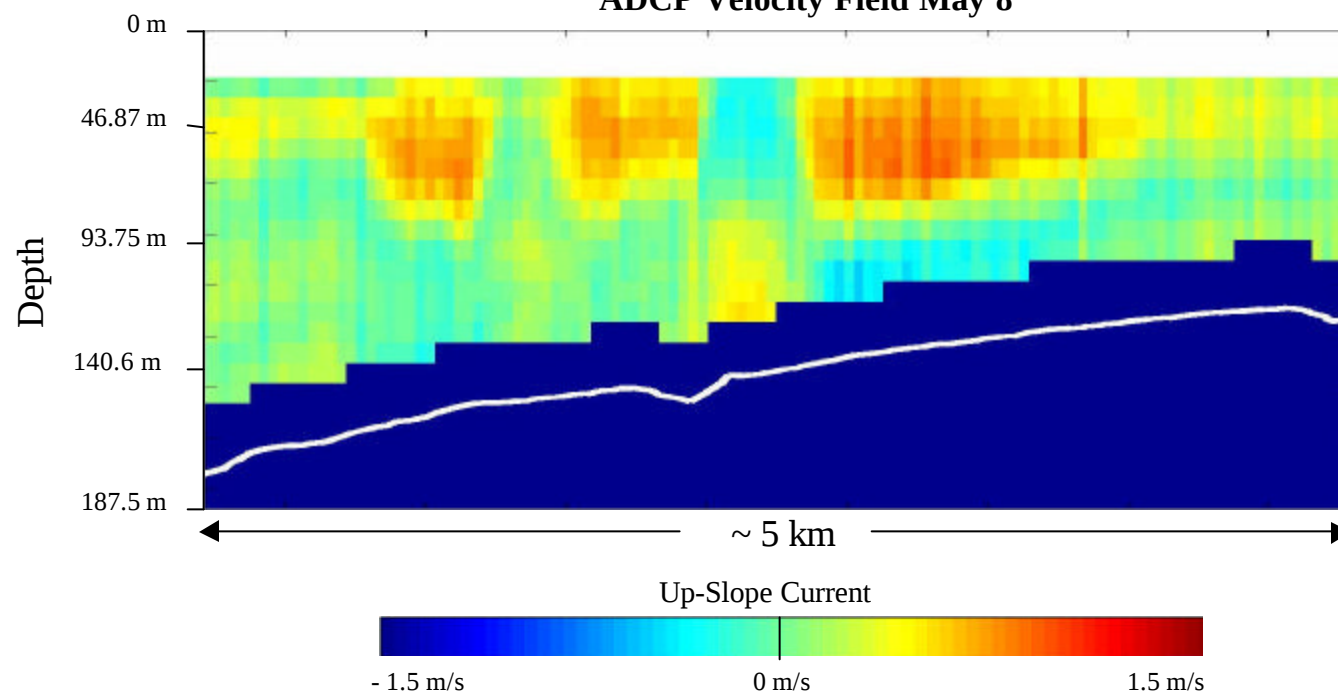
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High-Frequency Flow Visualization May 8



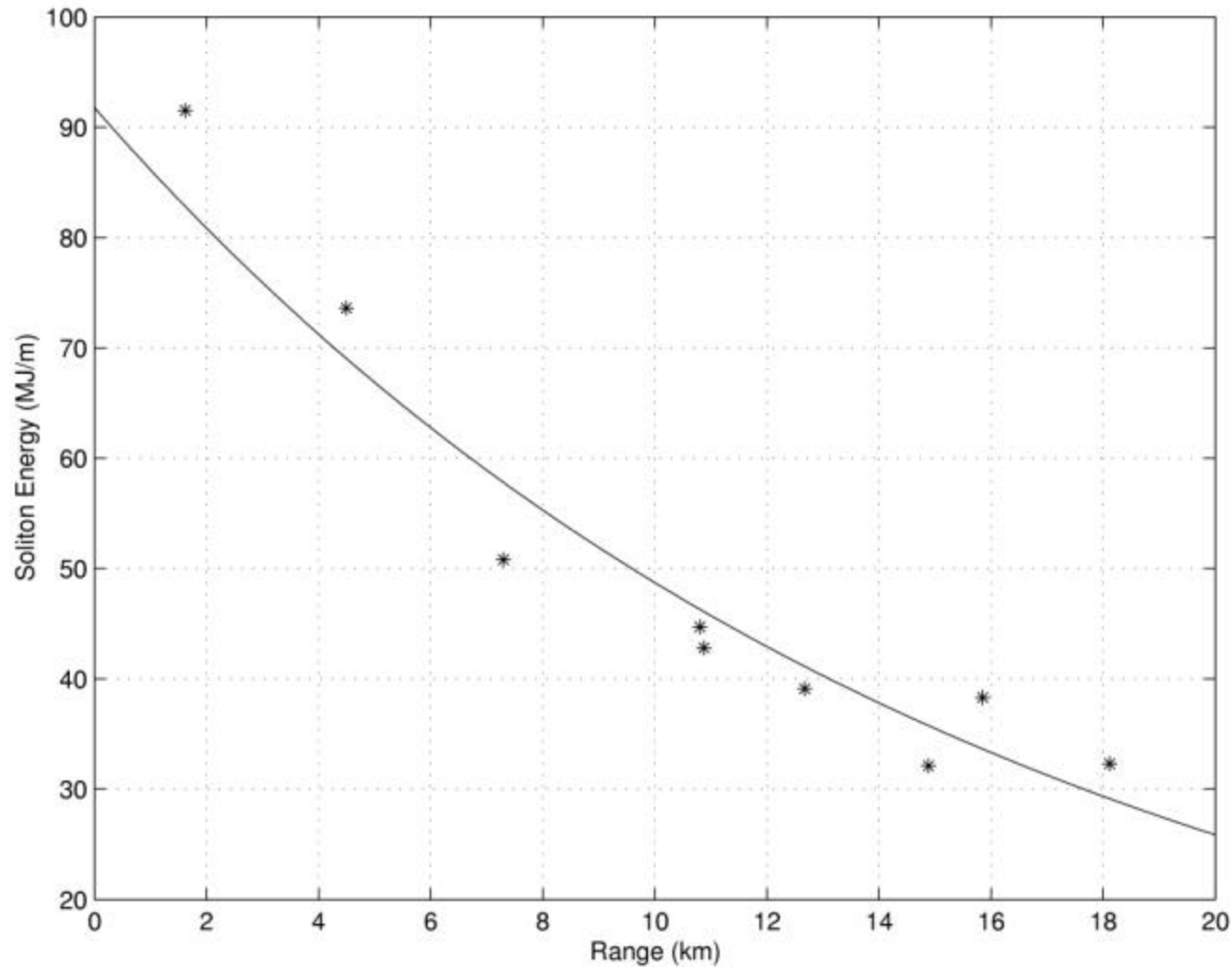
ADCP Velocity Field May 8



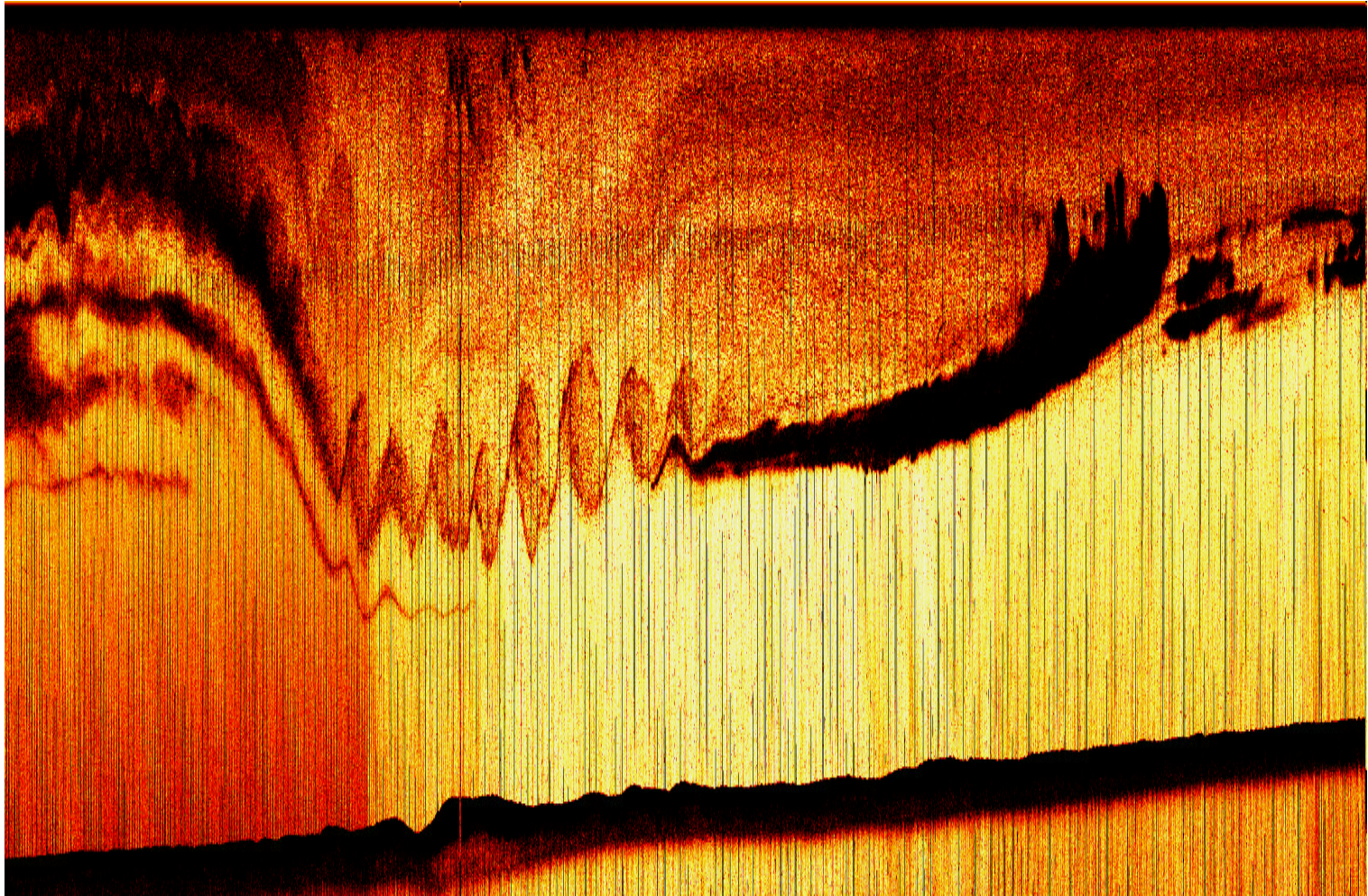
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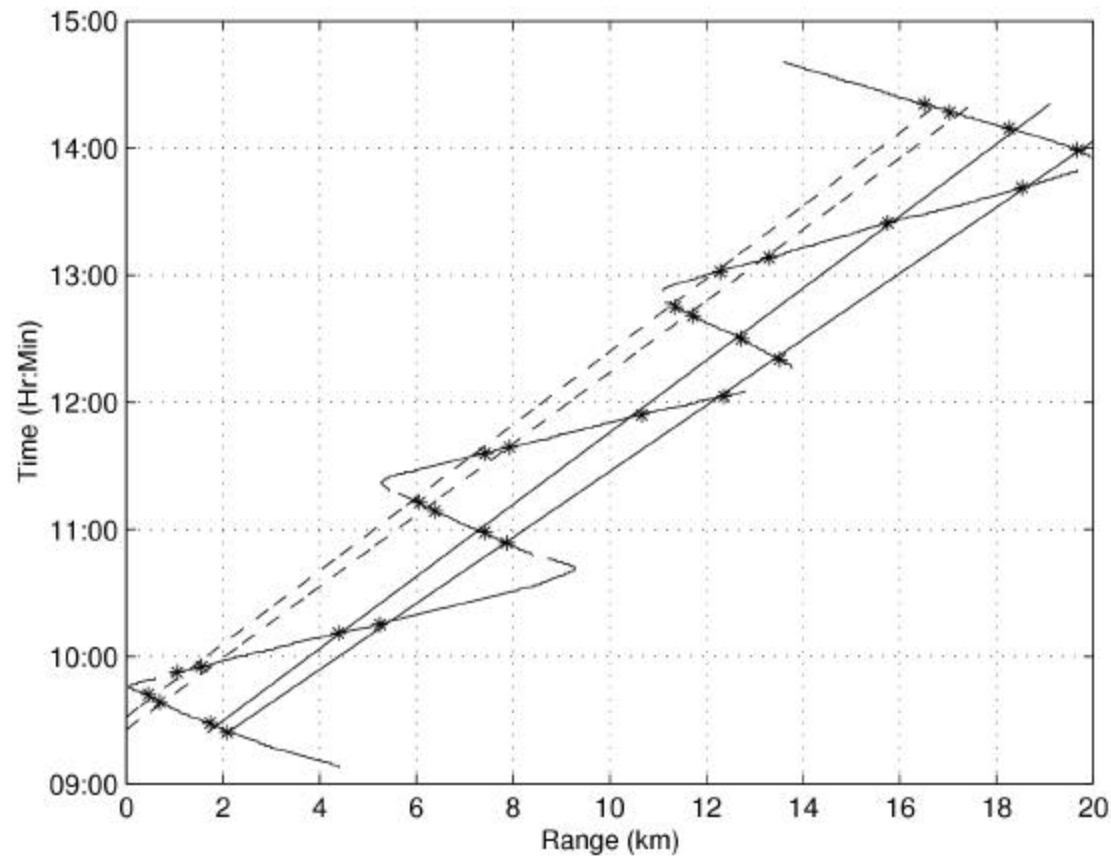
Soliton Energy Dissipation



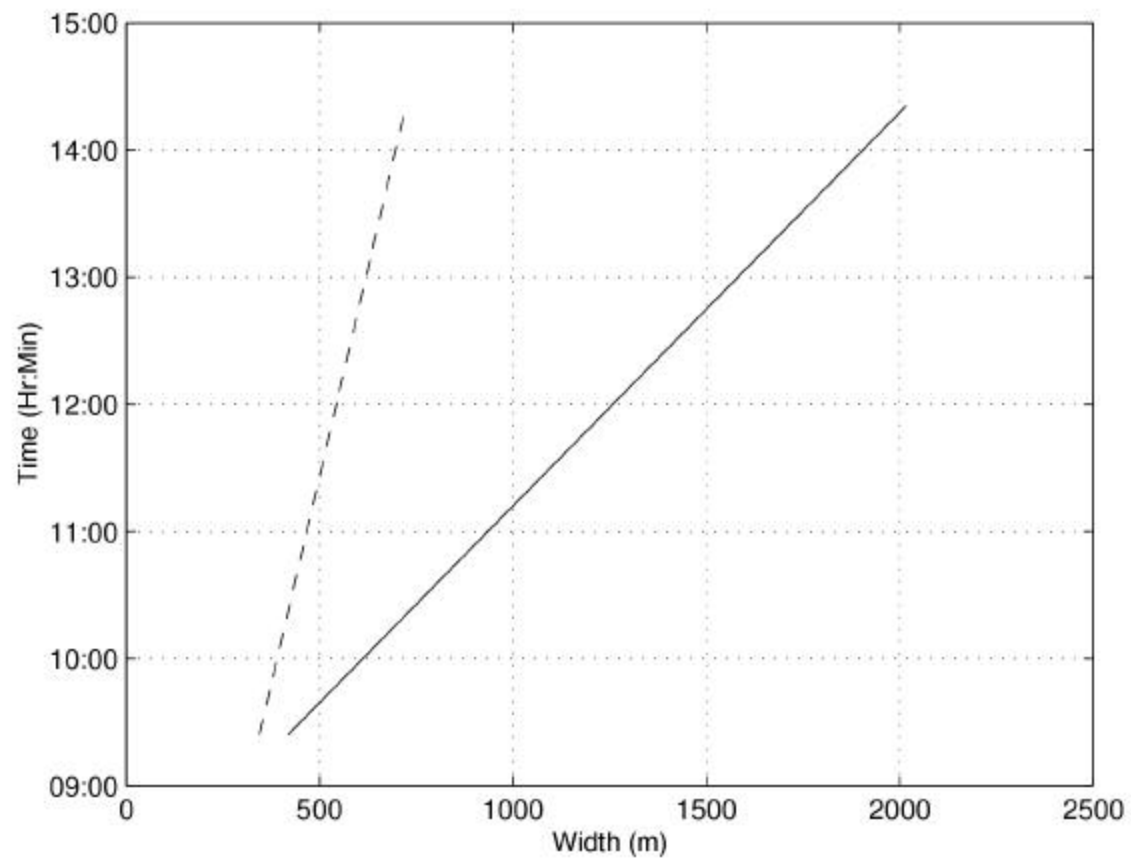
Shear Instability



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

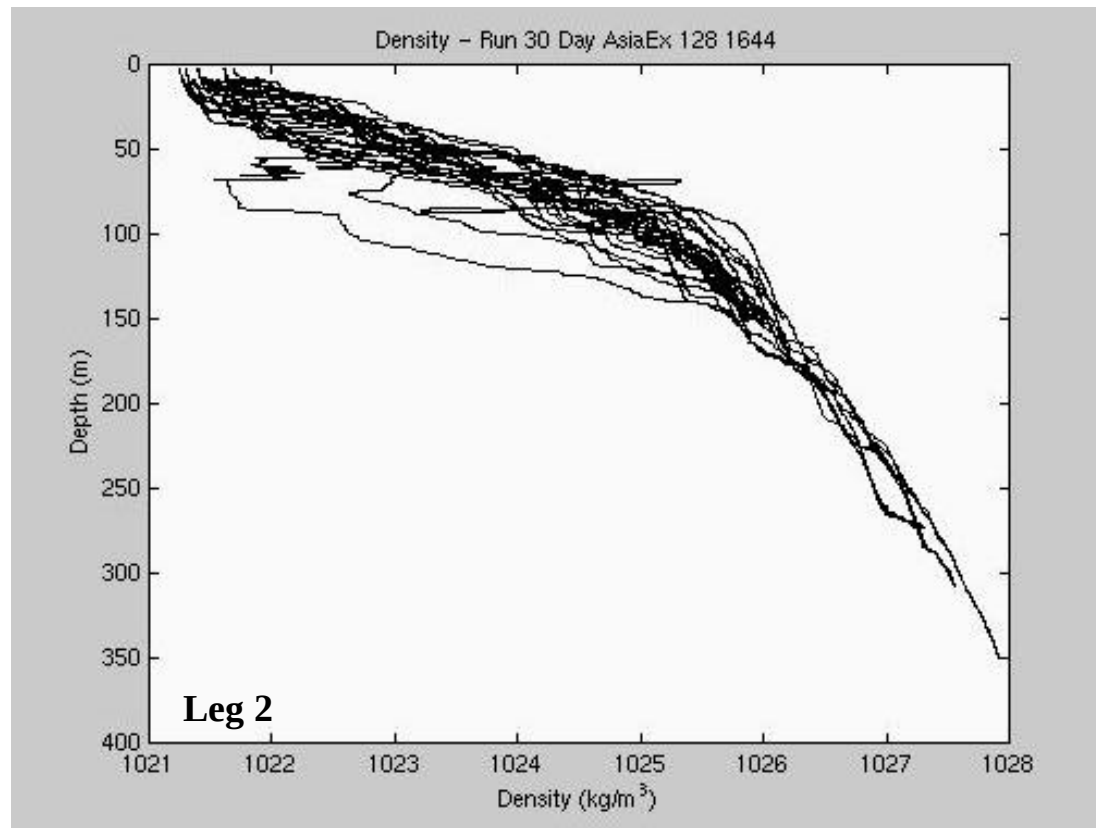
Publication

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



Tow-Yo CTD Depth

