ADCP data from RISE2004_RICE, RISE2005_RICE, RISE2006_RICE, RISE2004_RINO, RISE2005_RINO, RISE2006_RINO, RISE2004_RISO, RISE2005_RISO, and RISE2006_RISO moorings in the North East Pacific from 2004 to 2006 (RISE project)

Website: https://www.bco-dmo.org/dataset/3586
Version: 20 December 2011
Version Date: 2011-12-20

Project
» River Influences on Shelf Ecosystems (RISE)

Contributors	Affiliation	Role
Dever, Edward	Oregon State University (OSU-CEOAS)	Principal Investigator, Contact
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Data: RISE - Mooring Data - ADCP
Moorings: RICE, RINO and RISO
Years: 2004, 2005, 2006
ADCP - Hourly - DATE TIME DEPTH U V
Water velocity (m/sec); u = east velocity, v = north velocity, 300 kHz ADC

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Data Files

File
MOORINGS_ADCP.csv (Comma Separated Values (.csv), 471.16 MB) MD5:8ebcc2b8a85bac8215a90b7d74577419 Primary data file for dataset ID 3586

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Parameters

Parameter	Description	Units
Year	Year of data	YYYY
Data_Type	Data Type - ADCP; PRES; TEMP; SBE_TS; WSPD	text
Mooring_Name	Mooring Name	text
Alternate_Mooring_Name	Mooring Alternate Name	text
Lon	Mooring Longitude Position (West is negative)	decimal degrees
Lat	Mooring Latitude Position (South is negative)	decimal degrees
Depth_Mooring	Mooring Depth	meters
Start_Date	Start Date of Data Collection	YYYYMMDD
Start_Time	Start Time of Data Collection	HHMMSS
End_Date	End Date of Data Collection	YYYYMMDD
End_Time	End Time of Data Collection	HHMMSS
Dataset_Id	Mooring Dataset Id based on Data Collection Start/End Dates	text
DATE	Date (UTC)	YYYYMMDD
TIME	Time (UTC)	HHMMSS
DEPTH	Depth of ADCP on Mooring; Measurement depth for U/V velocities	meters
U	East velocity	meters/sec
V	North velocity	meters/sec
Deployment_Id	Mooring Deployment Id (assigned by BCO-DMO Staff)	text

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Instruments

Dataset-specific Instrument Name	Acoustic Doppler Current Profiler
Generic Instrument Name	Acoustic Doppler Current Profiler
Dataset-specific Description	ADCP - Hourly - DATE TIME DEPTH U V Water velocity (m/sec); u = east velocity, v = north velocity, 300 kHz ADCP
Generic Instrument Description	The ADCP measures water currents with sound, using a principle of sound waves called the Doppler effect. A sound wave has a higher frequency, or pitch, when it moves to you than when it moves away. You hear the Doppler effect in action when a car speeds past with a characteristic building of sound that fades when the car passes. The ADCP works by transmitting "pings" of sound at a constant frequency into the water. (The pings are so highly pitched that humans and even dolphins can't hear them.) As the sound waves travel, they ricochet off particles suspended in the moving water, and reflect back to the instrument. Due to the Doppler effect, sound waves bounced back from a particle moving away from the profiler have a slightly lowered frequency when they return. Particles moving toward the instrument send back higher frequency waves. The difference in frequency between the waves the profiler sends out and the waves it receives is called the Doppler shift. The instrument uses this shift to calculate how fast the particle and the water around it are moving. Sound waves that hit particles far from the profiler take longer to come back than waves that strike close by. By measuring the time it takes for the waves to bounce back and the Doppler shift, the profiler can measure current speed at many different depths with each series of pings. (More from WHOI instruments listing).

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Deployments

RISE2004_RICE

Website	https://www.bco-dmo.org/deployment/58754
Platform	RICE Mooring
Start Date	2004-06-21
End Date	2004-09-09
Description	Year: 2004 Mooring_Name: RICE Alternate_Mooring_Name: RC Lon: -124.19540 Lat: 46.16707 Depth: 72 Start_Date: 20040621 Start_Time: 2200 End_Date: 20040909 End_Time: 0000 Dataset_Id: 2004_06_21-2004_09_09 Deployment_Vessel: R/V Sproul Deployment_Dates: 14-25 June 2004 Recovery_Vessel: R/V Sproul Recovery_Dates: 1-15 Sept 2004

RISE2005_RICE

Website	https://www.bco-dmo.org/deployment/58756
Platform	RICE Mooring
Start Date	2005-05-21
End Date	2005-08-20
Description	Year: 2005Mooring_Name: RICEAlternate_Mooring_Name: RCLon: -124.19540Lat: 46.16667Depth: 72 Start_Date: 20050521Start_Time: 0000End_Date: 20050820End_Time: 1200Dataset_Id: 2005_05_21-2005_08_20 Deployment_Vessel: R/V WecomaDeployment_Dates: 16-21 May 2005Recovery_Vessel: R/V WecomaRecovery_Dates: 4-10 Oct 2005

RISE2006_RICE

Website	https://www.bco-dmo.org/deployment/58759
Platform	RICE Mooring
Start Date	2006-05-14
End Date	2006-10-14
Description	Year: 2006Mooring_Name: RICEAlternate_Mooring_Name: RCLon:-124.19552Lat: 46.16678Depth: 71 Start_Date: 20060514Start_Time: 2200End_Date: 20061014End_Time: 1500Dataset_Id: 2006_05_14-2006_10_14 Deployment_Vessel: R/V WecomaDeployment_Dates: 10-17 May 2006Recovery_Vessel: R/V WecomaRecovery_Dates: 12-18 Oct 2006

RISE2004_RINO

Website	https://www.bco-dmo.org/deployment/58752
Platform	RINO Mooring
Start Date	2004-06-22
End Date	2004-09-08
Description	Year: 2004Mooring_Name: RINOAlternate_Mooring_Name: RNLon: -124.30133Lat: 46.43742Depth: 72 Start_Date: 20040622Start_Time: 0400End_Date: 20040908End_Time: 1700Dataset_Id: 2004_06_22-2004_09_08 Deployment_Vessel: R/V SproulDeployment_Dates: 14-25 June 2004Recovery_Vessel: R/V SproulRecovery_Dates: 1-15 Sept 2004

RISE2005_RINO

Website	https://www.bco-dmo.org/deployment/58755
Platform	RINO Mooring
Start Date	2005-05-18
End Date	2005-10-07
Description	Year: 2005Mooring_Name: RINOAlternate_Mooring_Name: RNLon: -124.49190Lat: 46.99970Depth: 72 Start_Date: 20050518Start_Time: 2000End_Date: 20051007End_Time: 1400Dataset_Id: 2005_05_18-2005_10_07 Deployment_Vessel: R/V WecomaDeployment_Dates: 16-21 May 2005Recovery_Vessel: R/V WecomaRecovery_Dates: 4-10 Oct 2005

RISE2006_RINO

Website	https://www.bco-dmo.org/deployment/58757
Platform	RINO Mooring
Start Date	2006-05-14
End Date	2006-10-15
Description	Year: 2006Mooring_Name: RINOAlternate_Mooring_Name: RNLon: -124.49208Lat: 47.01658Depth: 70 Start_Date: 20060514Start_Time: 2200End_Date: 20061015End_Time: 2100Dataset_Id: 2006_05_14-2006_10_15 Deployment_Vessel: R/V WecomaDeployment_Dates: 10-17 May 2006Recovery_Vessel: R/V WecomaRecovery_Dates: 12-18 Oct 2006

RISE2004_RISO

Website	https://www.bco-dmo.org/deployment/58753
Platform	RISO Mooring
Start Date	2004-06-21
End Date	2004-09-07
Description	Year: 2004Mooring_Name: RISOAlternate_Mooring_Name: RSLon: -124.10045Lat: 46.05298Depth: 72 Start_Date: 20040621Start_Time: 0000End_Date: 20040907End_Time: 1900Dataset_Id: 2004_06_21-2004_09_07 Deployment_Vessel: R/V SproulDeployment_Dates: 14-25 June 2004Recovery_Vessel: R/V SproulRecovery_Dates: 1-15 Sept 2004

RISE2005_RISO

Website	https://www.bco-dmo.org/deployment/58760
Platform	RISO Mooring
Start Date	2005-05-21
End Date	2005-08-19
Description	Year: 2005Mooring_Name: RISOAlternate_Mooring_Name: RSLon: -124.10290Lat: 45.50000Depth: 90 Start_Date: 20050521Start_Time: 0000End_Date: 20050819End_Time: 2300Dataset_Id: 2005_05_21-2005_08_19 Deployment_Vessel: R/V WecomaDeployment_Dates: 16-21 May 2005Recovery_Vessel: R/V WecomaRecovery_Dates: 4-10 Oct 2005

RISE2006_RISO

Website	https://www.bco-dmo.org/deployment/58758
Platform	RISO Mooring
Start Date	2006-05-13
End Date	2006-09-26
Description	Year: 2006Mooring_Name: RISOAlternate_Mooring_Name: RSLon: -124.10293Lat: 45.50003Depth: 92 Start_Date: 20060513Start_Time: 2300End_Date: 20060926End_Time: 1200Dataset_Id: 2006_05_13-2006_09_26 Deployment_Vessel: R/V WecomaDeployment_Dates: 10-17 May 2006Recovery_Vessel: R/V WecomaRecovery_Dates: 12-18 Oct 2006

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Project Information

River Influences on Shelf Ecosystems (RISE)

Website: http://www.ocean.washington.edu/rise

Coverage: Northeast Pacific, coastal waters off states of Washington and Oregon

River Influences on Shelf Ecosystems (RISE) - A Study of the Columbia River Plume
A Multi-Institutional Collaborative Project Sponsored by the National Science Foundation

In 2004 an interdisciplinary study "River Influences on Shelf Ecosystems" (RISE) was initiated to determine the extent to which alongshore gradients in ecosystem productivity might be related to the existence of the massive freshwater plume from the Columbia River. RISE was designed to test three hypotheses: - During

upwelling the growth rate of phytoplankton within the Columbia plume exceeds that in nearby areas outside the plume being fueled by the same upwelling nitrate.
- The plume enhances cross-margin transport of plankton and nutrients.
- Plume-specific nutrients (Fe and Si) alter and enhance productivity on adjacent shelves.

Within those constraints, RISE provides the first comprehensive interdisciplinary study of the rates and dynamics governing the mixing of river and coastal waters in an eastern boundary system, as well as the effects of the plume formed by the mixing processes on rates, standing stocks and community structure of plankton in the local ecosystem. The RISE project, includes 4 field and two different numerical model applications. We collected simultaneous measurements of water chemistry, phytoplankton growth and grazing rates, zooplankton populations, water currents, and turbulent mixing. These are being combined with data from satellites, radar, and moorings, as well as detailed numerical simulations, to develop a deeper understanding of this important ecosystem.

The overall RISE sampling strategy was to compare mixing rates, nutrient supply, and phytoplankton production, grazing and community structure within the plume and outside the plume; i.e. on the shelf to the north of the river mouth, presumed more productive, and on the shelf to the south of the river mouth, presumed less productive, as well as in the important "plume lift off" area (the region where the plume loses contact with the bottom) near the river mouth and the plume "near field". The backbone for this project consists of data collected during four cruises that took place in the seasonally high-flow period (May-June) in each of three years (2004-06) and in a low-flow period in the second year (August, 2005). The sampling was spread over three years to attempt to include interannual differences in processes related to wind and river flow variability. The 21-day length of the cruises ensured that a variety of circulation and growth regimes, including upwelling and relaxation/downwelling and neap/spring tides, were observed.

The field studies used two vessels operating simultaneously. The R/V Wecoma obtained primarily biological and chemical rate data: a) at individual stations on cardinal lines north and south of the river mouth (off Grays Harbor, WA and Cape Meares, OR) and near the river mouth; b) at selected process study stations; and c) at fixed stations near the river mouth during strong neap and spring tides (time series). A towed sensor package was used to obtain micronutrient samples near the sea surface on cardinal lines and other selected transects. Underway measurements included macronutrients (N, P, Si), dissolved trace metals (Fe, Mn), supplemented with discrete samples from the underway system (microscopy, FlowCAM and particulate trace metals). At CTD stations vertical profiles (0-200 m where possible; and 500 m at selected stations) of T, S, vertical shear and currents, dissolved O2, in vivo fluorescence, PAR, chlorophyll a, dissolved macronutrients (NO3, NH4, urea, PO4, SiO4), dissolved trace metals, and heterotrophic and autotrophic plankton composition were obtained. Surface drifters were used to follow the mixing of individual plumes and to provide information on surface currents.

On the R/V Pt. Sur, synoptic mesoscale and fine-scale features were sampled with underway measurements of near-surface T, S, velocity, particle size and concentration, PAR, transmissivity and fluorescence and nitrate+nitrite. The Pt. Sur's Triaxus tow fish provided high-resolution sections of T, S, zooplankton (Laser-OPC), PAR and transmissivity, fluorescence, particle size and concentration (LISST-FLOC25X), UV absorption and nitrate (Satlantic ISUS) and radiance/irradiance (7 channels) through the upper water column to 50 m. Rapidly-executed transects of turbulence and fine-structure were also carried out using the Chameleon profiler; these provide full-depth profiles of T, S, optics (880 nm backscatter and fluorescence), turbulence dissipation rates and turbulent fluxes every 1-3 minutes. During selected periods, transects were repeated hourly to capture the high-frequency evolution in the plume's nearfield and river estuary. Acoustics (surface-deployed 1200 kHz ADCP and 120 kHz echosounder) were used to image fine-scale features of the velocity and backscatter fields, resolving fronts, nonlinear internal waves, and turbulent billows.

The temporal context for observed variability was provided by an array of moored sensors deployed in the plume near field as well as on the shelf north and south of the plume (complemented by the pre-existing long-term estuarine and plume stations of the CORIE/SATURN network. To better resolve regional differences, moorings were moved farther north and south to the cardinal sampling lines after the first year of the program. Surface currents were mapped hourly from shore using HF radar with two simultaneously operating arrays, one with a 40 km range and a 2 km range resolution, the other with a 150 km range and a 6 km range resolution. Satellite ocean color, sea surface temperature, turbidity and synthetic aperture radar (SAR) were also obtained when available.

Two modeling systems were developed or enhanced during RISE. The system developed specifically for RISE employed a structured grid model (ROMS) and was used in hindcast mode (MacCready et al., 2008). The CORIE/SATURN modeling system (Baptista, 2006)- based on two unstructured-grid models (SELFE, Zhang and Baptista, 2008; and ELCIRC, Zhang et al., 2004)- was used in both near real-time prognostic mode and multi-year hindcast mode. Both modeling systems incorporated the estuary in the simulation domain (although at

different resolutions) and used realistic river, ocean and atmospheric forcing conditions, tidal forcing, and Columbia River estuary forcing. Wind/heat flux model forcing for ROMS was derived from the 4 km MM5 regional wind/heat flux model. SELFE and LCIRC were also forced by MM5. Conditions on open boundaries were provided by ~9 km resolution models from the Navy Research Laboratory (NRL) (NCOM); ROMS used the smaller domain NCOM-CCS NRL model, SELFE and ELCIRC used the larger domain Global-NCOM model. The biological model is a four-box ("NPZD") nitrogen-budget model that tracks nutrients, phytoplankton, zooplankton, and detritus in every cell of the ROMS grid. The rich RISE biological dataset allowed model validation against not just stocks (chlorophyll, microzooplankton, nutrients) but rates (phytoplankton growth and grazing) directly, a level of validation that is seldom possible. These rate observations also allowed the setting of key model parameters (e.g., zooplankton ingestion rate and mortality) empirically (Banas, et al., 2008).

References:

Banas, N. S., P. MacCready, and B. M. Hickey (2008), The Columbia River plume as cross-shelf exporter and along-coast barrier, doi:10.1016 Cont. Shelf Res., 2008.03.011

Baptista, A. M. (2006), CORIE: the first decade of a coastal-margin collaborative observatory, Oceans'06, MTS/ IEEE, Boston, MA.

Hickey, B.M., and the RISE PIs. River Influences on Shelf Ecosystems: Introduction to the RISE Volume, Cont. Shelf Res., in press.

MacCready, P., N. S. Banas, B. H. Hickey, E. P. Dever, and Y. Liu (2008), A model study of tide- and wind-induced mixing in the Columbia River Estuary and Plume, ,doi:10.1016/j. Cont. Shelf Res. 2008.03.015.

RISE Cruise Reports and Figures:

2004 RISE-1

RISE04W1=R/V Wecoma, W0407A, July 8-28, 2004
Cruise Report
Cruise Track
Stations and Moorings
Wind Events

RISE2004=R/V Point Sur, (tbd), July 8-28, 2004
Cruise Report

2005 RISE-2

RISE05W2=R/V Wecoma, W0505C, May 29-June 21, 2005
Cruise Report
Cruise Track
Stations and Moorings
Wind Events

RISE2005a=R/V Point Sur, (tbd), May 29-June 21, 2005
Cruise Report

2005 RISE-3

RISE05W3=R/V Wecoma, W0508, August 4-August 26, 2005
Daily Cruise Report
Lessard Cruise Report
Peterson/Shaw Zooplankton Report
Cruise Track
Stations and Moorings
Wind Events

RISE2005b=R/V Point Sur, (tbd), August 2-August 27, 2005
Cruise Report
Cruise Log

2006 RISE-4

RISE06W4=R/V Wecoma, W0605B, May 21-June 13, 2006
Cruise Report 1
Cruise Report 2

Cruise Track
Stations and Moorings
Wind Events

RISE2006a=Leg 1, R/V Point Sur, (tbd), May 21-May 31, 2006
Cruise Report Leg 1
RISE2006b=Leg 2, R/V Point Sur, (tbd), June 2-June 12, 2006
Cruise Report Leg 2

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0239089

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