CRUISE REPORT

Repeat hydrography on Line PR6

A. Cruise narrative

A.1. Highlights

a. WOCE designation: PR6

b. Expedition designation: 18DD9505/1

c. Chief scientist:
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d. Ship: John P. Tully

e. Ports of call: Patricia Bay, B.C.; Ucluelet, B.C.

f. Cruise dates: May 8 to May 26, 1995

A.2. Cruise Summary Information

a. Geographic boundaries: Line PR6 starts at the mouth of Juan de Fuca Strait on the west coast of Canada, and heads almost due west for 900 n mi. The terminal station is PRS1, formerly designated Ocean Weather Station Papa (50 N, 145 W).

b. Stations occupied: The stations occupied on the cruise are tabulated by type in Table 1.

Table 1.

	No. of Stations	
shallow rosette/CTD	15	200 m casts on return leg
deep rosette/CTD	6	4000 m maximum depth
CTD only	21	3000 m maximum depth
Uncontaminated Sea Water	29	4 m deep intake
Moorings	5	sediment traps, 5 sites

c. Floats and drifters deployed: A drifting sediment trap line was deployed and recovered after 3 days at Station PRS1.

At PRS1 an in situ drifter was deployed for half the daylight period to measure primary production rates.

d. Moorings deployed or recovered: Sequential sediment traps, each holding 21 sample cups were deployed for one year at stations P4, P12, P16, P20 and P26. Traps were recovered from P4 and P26 after one year in the ocean.

A.3. List of Principal Investigators

Principal Investigator	Parameters	Institution
Howard Freeland	Ocean circulation	IOS
C. S. Wong	Carbonate chemistry	IOS
Frank Whitney	Coordinator	IOS
Philip Boyd	Plankton ecology, JGOFS	UBC

A.4. Scientific Programme and Methods

A CTD survey along Line PR6 was completed except for 2 stations near PRS1. Salinity, oxygen, CFCs and nutrients (NO_3 + NO_2, PO_4 and Si) were analyzed onboard ship from rosette casts at 6 stations.

JGOFS participants sampled water at several stations for phytoplankton studies. Incubated samples from P12 and PRS1 were enriched with iron and incubated under natural light to further test the importance of Fe on phytoplankton growth.

Preliminary Results: Slightly lower nutrient levels than in February and a marked increase in the amount of material in the final cup of our sediment trap indicate that spring growth had recently begun at PRS1. Sea water pCO_2 was consistently below atmospheric levels along Line PR6, much more so nearer the coast. Surface waters characterized by a mixed layer depth of less than 50 m, salinity of less than 32.4 and no nitrate extended about 200 km offshore.

Goals Achieved: repeat hydrography line completed except for 2 CTD stations near PRS1. Sediment traps recovered and deployed at several stations. Onboard chemistries all were successful. JGOFS studies were completed as planned.

A.5. Major Problems and Goals Not Achieved

A winch failure restricted our water sampling at PRS1 to 3000 m.

A.6. Other Incidents of Note

A.7. List of Cruise Participants

Participant	Institute	Participant	Institute
Frank Whitney	IOS	Philip Boyd	UBC
Tim Soutar	IOS	John Berges	Brookhaven
John Love	IOS	Hugh Maclean	UBC
Reg Bigham	IOS	Sarah Thornton	volunteer
Wendy Richardson	IOS	Kate Read	volunteer

B. Underway Measurements

B.1. Navigation and bathymetry

A SAIL (Standard ASCII Interface Loop) system onboard ship poles several sensors at 2 min intervals. Data is stored on a micro computer and is subsequently processed in a format that is accessible for general use. Ship's speed, heading and position are logged.

B.2. Acoustic Doppler Current Profiler (ADCP)

A hull mounted current profiler logged upper layer currents every 5 min throughout the cruise

B.3. Thermosalinograph and underway dissolved gasses

Temperature and conductivity sensors are installed near the intake of a sea water line that is used as a scientific supply in the laboratory. Data is logged on SAIL.

Sea and air pCO_2 concentrations were measured hourly throughout the cruise.

B.4. Expendable bathythermograph and salinity measurements

None.

B.5. Meteorological observations

Logged on SAIL are wind speed, atmospheric pressure and air temperature.

B.6. Atmospheric chemistry

None.

C. Hydrographic Measurements

C.1. CTD profiles

For most stations, when rosette sampling was not required, a Guildline 8705 CTD was used to measure T, S and P to a maximum depth of 3000 m. A rosette mounted Guildline 8737 measured T, S, P and transmissivity at 6 stations along Line PR6. At station PRS1, profiles with each CTD were taken for comparison.

C.2. Water sampling

Two rosette holding 23 or 11-10 L polycarbonate bottles were used for all hydrographic sampling. Go-Flo bottles clamped on Kevlar hydro line were used to collect clean water for plankton studies and iron measurements.

At each station outbound on Line PR6, samples for chlorophyll, salinity and nutrients were collected from the ship's sea water loop (Uncontaminated Sea Water or USW) which pumps water from about 4 m continuously into the laboratory.

Duplicate Niskin bottles were tripped on 12 occasions, and analyses performed on both. The standard deviation for pairs from this sample set is calculated by

$$s_p = \{\Sigma d^2/2k\}^{0.5}$$

where k is the number of pairs and d is the difference between pairs.

	T C	S	O_2 uM/kg	Si uM/kg	NO_3&NO_2 uM/kg	PO_4 uM/kg	F11 pM/kg	F12 pM/kg
s_p	0.0047	0.0011	0.61	0.2	0.28	0.007	0.076	0.049
k	12	12	12	12	12	12	8	8

C.3. Salinity

Samples were collected in glass bottles and analyzed onboard ship using a Guildline Model 8410 Portasal. The Portasal was standardized daily with IAPSO standard sea water Batch P128.

C.4. Oxygen

Samples were preserved and titrated according to the method of Carpenter (1965). A Brinkman Dosimat and Colorimeter were used to automate the titration. Standards were prepared as outlined in WOCE Report 73/91.

C.5. Nutrients

Samples from hydrographic casts were collected in polystyrene tubes, and refrigerated for a maximum of 20 hours before being analyzed. Loop samples (USW) were stored up to 2 days at 4^{o}C before being analyzed. NO_3+NO_2, PO_4 and Si were measured using a Technicon Autoanalyzer.

NO_3+NO_2 samples were reduced with Cd/Cu, then complexed with sulfanilamide and N-Naphthylethylene-diamine to form an azo dye (Technicon Method No. 158-71W/B). PO_4 produces a molybdenum blue complex in presence of acidic molybdate and ascorbic acid (Technicon Method No. 155-71W). Dissolved Si also forms a molybdenum blue complex and oxalic acid removes PO_4 interference (Technicon Method 186-72W).

Concentrated standards were prepared freshly the week before the cruise started from oven-dried (80^{o}C) reagents. Working standards were made every 1 to 2 days by diluting 1 to 6 ml of various stock solutions to 250 ml with 3.2% NaCl (w/v in double run Milli-Q water).

C.6. TCO_2, ^{13}C and Alkalinity

A single profile was collected at PRS1 for all 3 parameters. Samples were fixed with $HgCl_2$ and refrigerated.

C.7. JGOFS sampling

Go-Flo bottles were used to collect water for POC/N, DOC/N, chlorophyll, nano- and microplankton and incubation experiments. Sedimentation rates were measured over a 3 day period using a series of 9 drifting sediment traps to 1000 m. Moored sediment traps measure the yearly flux of particles to deep ocean. Iron enrliched samples were incubated in natural light for up to 8 days to continue work on the importance of Fe in controlling phytoplankton growth in the N.E. Pacific.

D. Acknowledgements

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E. References

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