

# Dynamics of the Columbia River Plume 1990–1994

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The purpose of this project was to determine the dynamics of the formation of the Columbia River plume and the role of mixing processes in plume formation. In order to do this 22 current meter arrays (14 surface and 8 subsurface moorings) were deployed in the vicinity of the mouth of the Columbia River from Oct. 1990 through Feb. 1991. Most sites were paired with a surface mooring and a subsurface mooring located within the same vicinity. Positions for the sites and their mooring ID are shown on the figure below. In most cases surface and subsurface moorings for the same location were deployed within a quarter mile of each other and are represented as one station on the chart. If the distance between the surface and subsurface moorings was greater than a quarter of a mile an average position was used to plot that station. Surface moorings are designated by the mooring ID followed by an 'S' to indicate surface while the subsurface moorings have an 'A' appended to the mooring ID. Contour lines for 25, 50, 100, 250, 500 meters are shown.

Equipment on moorings consisted of 6 Acoustic Doppler current meters, 9 Vector measuring current meters, 9 InterOcean systems inc. S-4 meters, 5 water level recorders, 30 Aanderaa current meters, 4 wind recorders and 6 T-Chains. Not all instruments returned data.

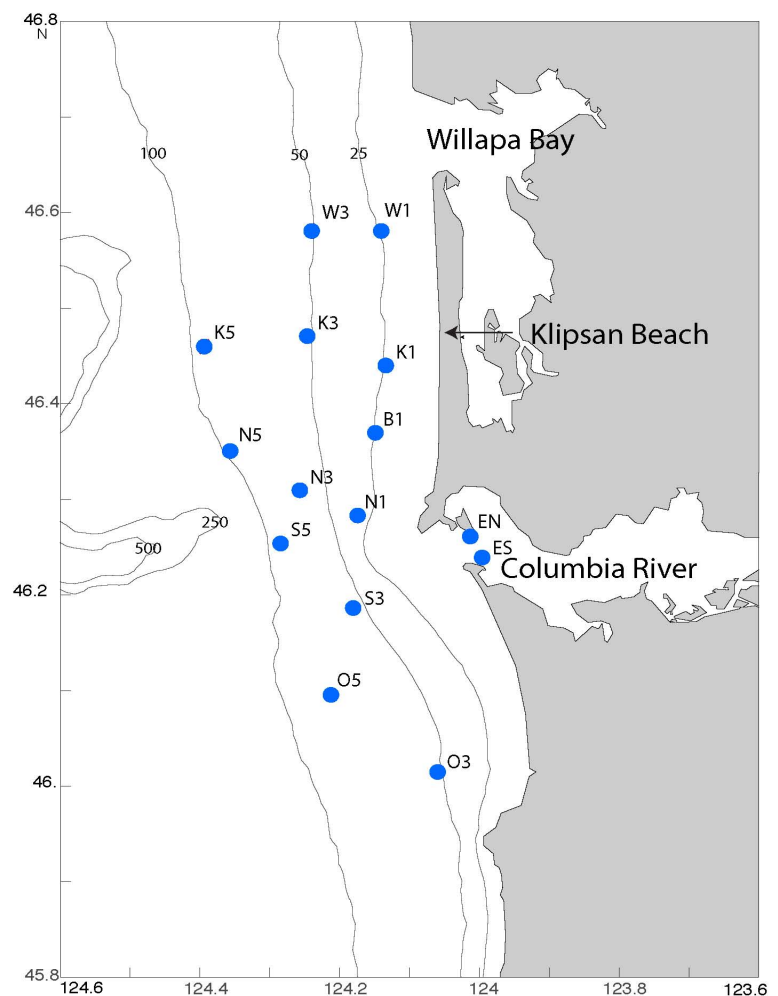
Abbreviations and units are:

Depth, m, meters,  
Speed, spd, cm/sec,  
Direction, D, degrees, true north,  
u component (eastward), u, v component (northward), v, cm/sec, true North,  
Temperature, T, ° C,  
Pressure, P, PSI, or decibars, db,  
Conductivity, C, mmho/cm or mS/cm.

Acoustic Doppler current meter, ADCP,  
Aanderaa current meter, AA,  
Vector measuring current meter, VMCM,  
InterOcean systems, inc., S-4 current meter, S4,  
Aanderaa Water level recorder, WLR,  
T-Chain, TChain.

Recovery and deployment information is in PST.  
Add 8 hours to convert to Greenwich mean time (GMT).

With the exception of the ADCP data files, the time series data are generally in the following format. Data files consist of ASCII tab delimited files, one per meter. File names include the mooring ID and instrument serial number followed by a processing indicator. For this data it is 'L' to indicate the data has



been lo passed filtered. The first few records provide information about the data.

Record 1: mooring ID followed by the instrument serial number and depth in meters, Latitude, Longitude and the number of hours needed to adjust the time base to GMT. For lo passed data, time base is usually converted to GMT.

Record 2: start date and time and end date and time in MMDDYYHHMM followed by the sample interval in minutes.

Record 3: indicates the number of processing records to read before the time series starts.

For each processing record there is a date and short description of what was done.

See readme files for each type of instrument for format and specific comments about data in the table below.

<a href="#">AAreadme</a>	<a href="#">VMCM readme</a>	<a href="#">S4 readme</a>
<a href="#">WLR readme</a>	<a href="#">ADCP UW readme</a>	<a href="#">ADCP NCSU readme</a>

Mooring: W1S

Position: 46° 34.84'N, 124° 08.43'W

Bottom depth: 27m

Deployed: 1019 Oct. 22, 1990

Recovered: Broke free Dec. 18, 1990, found off Northern tip of Vancouver Island Feb. 11, 1991

Actual Depth	Variables	Instrument/Comments
<a href="#">1</a>	T,C	AA, s/n 7260. Salinity computed using a suggested T adjustment of -1.2°, constant 1 decibar used for pressure.
<a href="#">5</a>	u,v	S/4, s/n 919. Note- mooring broke free 12/18/90, data needs to be trimmed on end.
5-10	T	TChain, s/n 751.

Mooring: W3S

Position: 46° 34.84'N, 124° 14.38'W

Bottom depth: 54.5m

Deployed: 1027 Oct. 12, 1990

Recovered: 1103 Feb. 6, 1991

Actual Depth	Variables	Instrument/Comments
<a href="#">1</a>	T,C	AA, s/n 8410. Constant 1 decibar used to compute salinity.
<a href="#">5</a>	u,v,T	VMCM, s/n 100509.
<a href="#">10</a>	u,v,T	VMCM, s/n 100609.

Mooring: K1S

Position: 46° 26.52'N, 124° 08.06'W

Bottom depth: 27.5m

Deployed: 1807 Oct. 8, 1990

Recovered: Broke free Dec. 2, 1990, found at Fort Canby State Park

Actual Depth	Variables	Instrument/Comments
<a href="#">1</a>	T,C	AA, s/n 3140. Constant 1 decibar used to compute salinity.

Mooring: K1A Position: 46° 26.39'N, 124° 08.02'W  
 Bottom depth: 27.5m  
 Deployed: 1141 Oct. 17, 1990  
 Recovered: Broke free Dec. 1, 1990, found on Long Beach Peninsula

Actual Depth	Variables	Instrument/Comments
<u>26</u>	u,v	ADCP, s/n 442, upward looking, u, v profile. Note time base is PST(+8). See ADCP NCSU readme.

Mooring: K3S Position: 46° 28.25'N, 124° 14.73'W  
 Bottom depth: 55m  
 Deployed: 0915 Oct. 17, 1990  
 Recovered: Broke free 12/18/90, recovered Dec. 21, 1990

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 5762. Salinity computed using a suggested T adjustment of 0.02°, constant 1 decibar used for pressure.
<u>2</u>	u,v,T	ADCP, s/n 187, downward looking, u, v profile. T near surface. Note time base is PST(+8). See ADCP UW readme.
<u>5</u>	u,v,T	S4, s/n 868. Suggested T adjustment +0.65°, not made to data file.
5-10	T	TChain- No data available.

Mooring: K5S Position: 46° 27.77'N, 124° 23.57'W  
 Bottom depth: 95.5m  
 Deployed: 1058 Oct. 11, 1990  
 Recovered: Broke free Jan. 31, 1991, recovered near mouth of Strait of Juan de Fuca 0845 Feb. 3, 1991.

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 1908. Constant 1 decibar used to compute salinity.
<u>5</u>	u,v,T,C	S4, s/n 860. T and C were adjusted. Constant 5 decibars used to compute salinity. See S4 Readme information.
<u>5</u>	u,v,T,C	S4, s/n 860. Note this file does not have the T, C adjustments. See S4 Readme information.
<u>10</u>	u,v,T	VMCM, s/n 100208.

Mooring: K5A Position: 46° 27.33'N, 124° 23.76'W  
 Bottom depth: 95.5m  
 Deployed: 1303 Oct. 11, 1990  
 Recovered: 1220 Feb. 8, 1991

Actual Depth	Variables	Instrument/Comments
93.5	u,v,P	ADCP, s/n 146, upward looking, u, v profile. P near bottom. No data available.

Mooring: B1S

Position: 46° 22.14'N, 124° 08.92'W

Bottom depth: 27.25m

Deployed: 1620 Oct. 12, 1990

Recovered: Dec. 28, 1990

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 2127. Major problems with time base from 11/18/90 0400 through 12/17/90 2200. Values have been set to zero within that time period. A large drop in temperature at both the N5 and B1 site was used to align the remainder of the file, 12/17/90 to the end. Suspect temperatures were recorded near the end of the record. Constant 1 decibar used to compute salinity.
5	u,v	VMCM, s/n 600102. No data available.
10	u,v,T	VMCM, s/n 100709. No data available.

Mooring: N1S

Position: 46° 17.07'N, 124° 10.42'W

Bottom depth: 34.5m

Deployed: 1043 Oct. 8, 1990

Recovered: Broke free Dec. 7, 1990, recovered Dec. 9, 1990

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 2254. Salinity computed using a suggested T adjustment of 0.125°, constant 1 decibar used for pressure.
T	T	TChain

Mooring: N1A

Position: 46° 16.98'N, 124° 10.43'W

Bottom depth: 35.5m

Deployed: 1254 Oct. 8, 1990

Recovered: Recovered by divers ~11:00 Feb. 24, 1991

Actual Depth	Variables	Instrument/Comments
<u>33.5</u>	u,v	ADCP, s/n 145, upward looking, u, v profile. Note time base is PST(+8). See ADCP NCSU readme.

Mooring: N3S

Position: 46° 18.56'N, 124° 15.46'W

Bottom depth: 69m

Deployed: 1030 Oct. 9, 1990

Recovered: Broke free Dec. 9, 1990, recovered Dec. 12, 1990

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 3139. Salinity computed using a suggested T adjustment of 0.125°, constant 1 decibar used for pressure.
2	u,v	ADCP, s/n 188, downward looking, u, v profile. No Data available.
<u>5</u>	u,v,T	S/4, s/n 869.
5-15	T	TChain, s/n 851- Data questionable.

Mooring: N5S

Position: 46° 21.02'N, 124° 21.35'W

Bottom depth: 100m

Deployed: 1006 Oct. 14, 1990

Recovered: Broke free Jan 31, 1991, recovered near mouth of Strait of Juan de Fuca ~1115 Feb. 3, 1991.

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 1906. Salinity computed using a suggested T adjustment of 1.2°, constant 1 decibar used for pressure.
<u>5</u>	u,v,T	VMCM, s/n 100108. Pressure data unreliable, zeroed out. Suggested T adjustment +0.42, not included in file.
<u>10</u>	u,v,T	VMCM, s/n 100408.
11-14	T	TChain, s/n 498- Data questionable.

Mooring: S3S

Position: 46° 11.10'N, 124°10.8'W

Bottom depth: 63.5m

Deployed: 1627 Oct. 9, 1990

Recovered: 0823 Feb. 7, 1991

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 1905. Salinity computed using a suggested T adjustment of -0.285°, C +1.0, constant 1 decibar used for pressure.
5	u,v,T	S/4, s/n 765. No data available.
<u>30</u>	u,v,T	ADCP, s/n 200, upward looking, u, v profile. T near 30m. Note time base is PST(+8). See ADCP UW readme.

Mooring: S3A

Position: 46° 11.28'N, 124° 10.8'W

Bottom depth: 61m

Deployed: 1705 Oct. 11, 1990

Recovered: 1000 Feb. 7, 1991

Actual Depth	Variables	Instrument/Comments
<u>41</u>	S,D,T,P,C	AA, s/n 2249. Pressure range was 0–200 PSI, accuracy +/- 1% of range, resolution 0.1% of range.
<u>46</u>	S,D,T	AA, s/n 1297.
<u>51</u>	S,D,T	AA, s/n 2491. Note the change in u, v components beginning 12/10/90. This sudden drop is not reflected in the other meters on this mooring. Questionable.
<u>56</u>	S,D,T,P	AA, s/n 3440. Pressure range was 0–1000 PSI, accuracy +/- 1% of range, resolution 0.1% of range.
58	P	WLR s/n 369. No data available.

Mooring: S5S

Position: 46° 15.32'N, 124° 17.12'W

Bottom depth: 92m

Deployed: 0844 Oct. 15, 1990

Recovered: Broke free ~0123 Feb. 2, 1991, Surface buoy found on Vancouver Island

Actual Depth	Variables	Instrument/Comments
2	T,C	AA, s/n 2506. No data available.
<u>5</u>	u,v,T,P,C	S4, s/n 766. T and C were adjusted. Pressure data unreliable. Do not use. Constant 5 decibars used to compute salinity.
<u>5</u>	u,v,T,P,C	S4, s/n 766. Note this file does not have the T, C adjustments. See S4 Readme information.

Mooring: S5A

Position: 46° 15.20'N, 124° 17.08'W

Bottom depth: 92m

Deployed: 1457 Oct. 17, 1990

Recovered: 0935 Feb. 16, 1991

Actual Depth	Variables	Instrument/Comments
<u>35</u>	S,D,T,C	AA, s/n 7103. Constant 31 decibars used to compute salinity.
<u>45</u>	S,D,T	AA, s/n 5100.
<u>65</u>	S,D,T,P,C	AA, s/n 5213. Pressure range was 0–1000 PSI, accuracy +/- 1% of range, resolution 0.1% of range.
<u>87</u>	S,D,T	AA, s/n 3218. Pressure no good, zeroed out.
<u>89</u>	T,P	WLR, s/n 709.

Mooring: O3S

Position: 46° 00.99'N, 124° 03.55'W

Bottom depth: 55m

Deployed: 1803 Oct. 19, 1990

Recovered: Broke free ~1200 Dec. 4, 1990, recovered Dec. 10, 1990

Actual Depth	Variables	Instrument/Comments
<u>1</u>	T,C	AA, s/n 7366. Constant 1 decibar used to compute salinity.
<u>5</u>	u,v	S4, s/n 242.
<u>20</u>	u,v,T	VMCM, s/n 100308.

Mooring: O3A

Position: 46° 00.92'N, 124° 03.57'W

Bottom depth: 55.5m

Deployed: 1941 Oct. 19, 1990

Recovered: 1720 Feb. 7, 1991

Actual Depth	Variables	Instrument/Comments
<u>35</u>	T	AA, s/n 2520. Multiple large gaps in speed. Temperature variable OK.
		AA, s/n 4922. Constant 45 decibars used to compute salinity. On 12/02/90 temperature

<a href="#">45</a>	S,D,T,C	values bad, T & C zeroed out. Compass reading constant beginning 12/27/90, no velocities after that.
<a href="#">50</a>	S,D,T	AA, s/n 7655.
<a href="#">51</a>	P	WLR, s/n 564.

Mooring: O5S

Position: 46° 05.70'N, 124° 12.76'W

Bottom depth: 92m

Deployed: 1036 Oct. 19, 1990

Recovered: 1454 Feb. 6, 1991

Actual Depth	Variables	Instrument/Comments
<a href="#">1</a>	T,C	AA, s/n 2256. Constant 1 decibar used to compute salinity.
<a href="#">5</a>	u,v	S4, s/n 241.
10	u,v	VMCM, s/n 204105. No data available.

Mooring: ENS

Position: 46° 15.66'N, 124° 00.63'W

Bottom depth: 20m

Deployed: 1114 Oct. 16, 1990

Recovered: 1152 Feb. 13, 1991

Actual Depth	Variables	Instrument/Comments
<a href="#">1</a>	T,C	AA, s/n 1907. Constant 1 decibar used to compute salinity.
<a href="#">5</a>	u,v,T,C	S4, s/n 819. Constant 5 decibars used to compute salinity.
5-10	T	TChain, s/n 555- Data questionable.

Mooring: ENA

Position: 46° 15.65'N, 124° 00.75'W

Bottom depth: 20m

Deployed: 1320 Oct. 31, 1990

Recovered: 1000 Feb. 13, 1991

Actual Depth	Variables	Instrument/Comments
<a href="#">8</a>	S,D,T,P,C	AA, s/n 6526. Constant 8 decibars used to compute salinity. Note the speed shows a significant die off on 12/3/90. The u, v components were zeroed out because the speed is questionable. Per mooring notes the rotor and gimble were broken when retrieved. The pressure average changed at 1/18/91 0500 indicating the mooring may have been moved into deeper water. Data may be questionable.
<a href="#">13</a>	S,D,T	AA, s/n 7104. Note the pressure channel from the 8m instrument indicates the mooring may have moved into deeper water. Data may be questionable.
<a href="#">16</a>	T	AA, s/n 0525. Note the pressure channel from the 8m instrument indicates the mooring may have moved into deeper water. Data may be questionable.
<a href="#">17</a>	P	WLR, s/n 568.

Mooring: ESA

Position: 46° 14.34'N, 123° 59.74'W

Bottom depth: 15m

Deployed: 0739 Nov. 1, 1990

Recovered: 1125 Jan. 30, 1991

<b>Actual Depth</b>	<b>Variables</b>	<b>Instrument/Comments</b>
<u>8</u>	S,D,T,P	AA, s/n 2521. Pressure range was 0–200 PSI, accuracy +/- 1% of range, resolution 0.1% of range. Conductivity out of sensor range; no useful C data.
<u>12</u>	T	AA, s/n 1566. Speeds went to 0.9, only temperature useful.
<u>13</u>	T,P	WLR, s/n 912.

Last updated 08/10/2017 to include more data sampling detail in readme files and zero out VMCM 5m pressure at N5.