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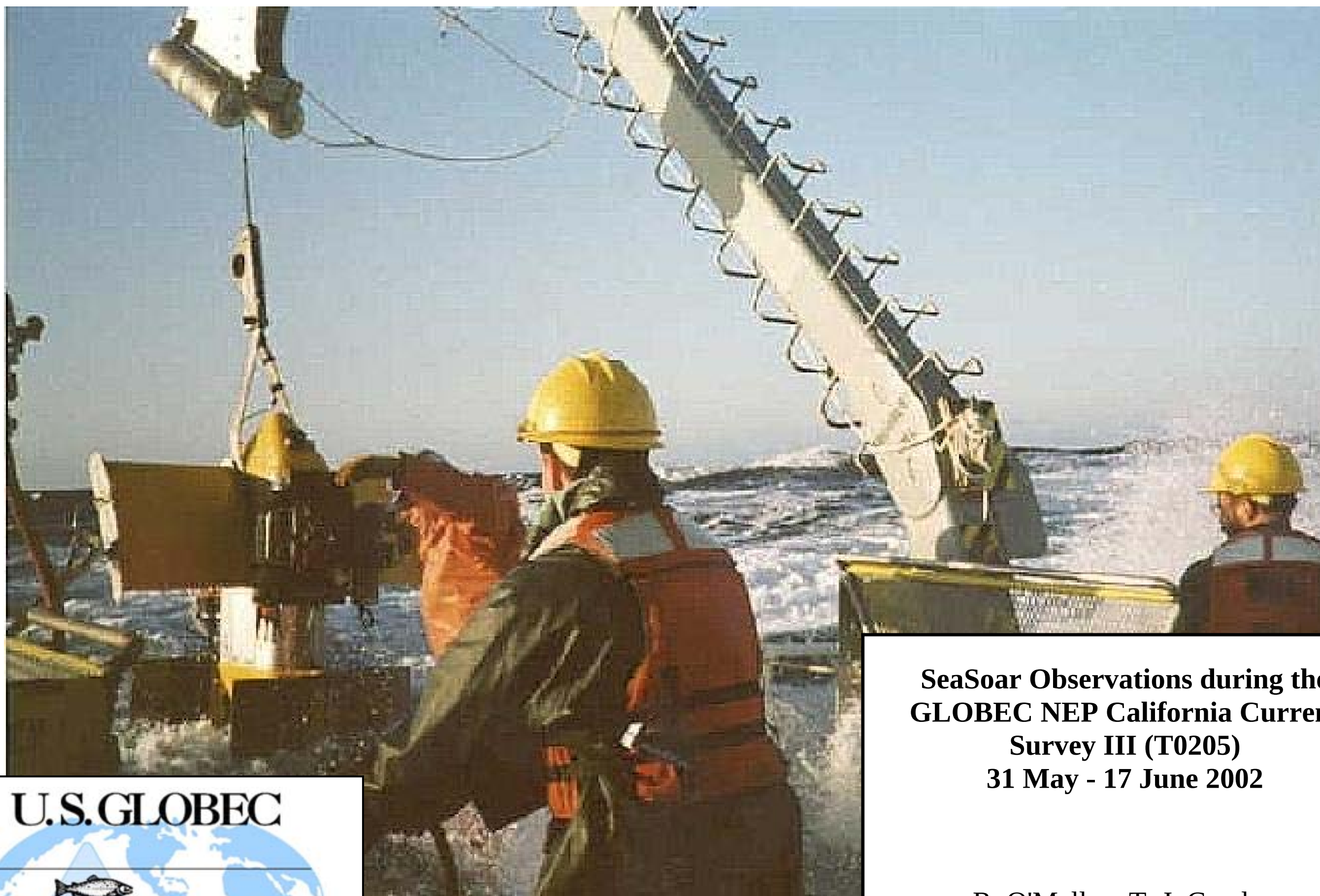

SeaSoar Observations during the GLOBEC NEP California Current Survey III (T0205)
31 May - 17 June 2002

R. O'Malley, T. J. Cowles
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Data Report 196
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OREGON STATE UNIVERSITY

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http://damp.coas.oregonstate.edu/globec/nep/seasoar

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Introduction

As part of the GLOBEC NEP collaborative research project on the California Current (CC), this was the first of two cruises in 2002 to study the physical and biological oceanographic distributions and processes that influence juvenile zooplankton and salmonid habitats along the Oregon and northern California coast. The 2002 cruises followed similar cruises in 2000 in an effort to assess inter-annual variability in the northern CC, hence the "Survey III" designation for this cruise. The goal was to understand how physical circulation features (such as upwelling fronts, coastal jets, and circulation around submarine banks) influence distributions of phytoplankton, zooplankton and larval fish. We conducted two mesoscale surveys over the project area, with two finescale surveys in between: one finescale survey to the north over Heceta Bank, and the other to the south, bracketing Cape Blanco (Figure 1).

We used a variety of instruments on this project. A towed, undulating vehicle (SeaSoar) was equipped with a CTD package to measure temperature (T), salinity (S) and pressure. It also had three fluorometers to measure phytoplankton fluorescence, colored dissolved organic matter (CDOM) fluorescence, and fluoroscein dye, along with an optical plankton counter (OPC) for zooplankton, and a nine-channel bio-optical sensor (ac-9). The shipboard Acoustic Doppler Current Profiler (ADCP) was used to measure water velocity, and a towed, four-frequency acoustics unit (HTI) was used to detect large zooplankton and larval fish. Surveys of the bird and mammal populations were made during daylight hours. Bio-optical drifters were released at the northern ends of our survey grids, with the expectation that they'd drift through the study area as we sampled with the SeaSoar. All drifters were tracked via ARGOS. Bio-optical measurements using a Tethered Spectral Radiometer Buoy (TSRB) and the vertically profiling bio-optics package were made near the surface drifters to characterize the optical properties of the finescale vertical structure. GPS and bottom depths from the echosounder were also integrated with T, S, and chlorophyll fluorescence from the R/V *Thomas G. Thompson*'s flow-through system. Two ac-9s, a Fast Repetition Rate Fluorometer (FRRF), chlorophyll fluorometers and CDOM fluorometers were installed into the underway flow-through seawater system in the main lab, downstream of a vortex debubbler. We also worked in close coordination with the R/V *Wecoma* and the F/V *Frosti*, both conducting net sampling in our study region. Satellite sea-surface temperature and ocean color images of the study area were downloaded daily to assist in our planning.

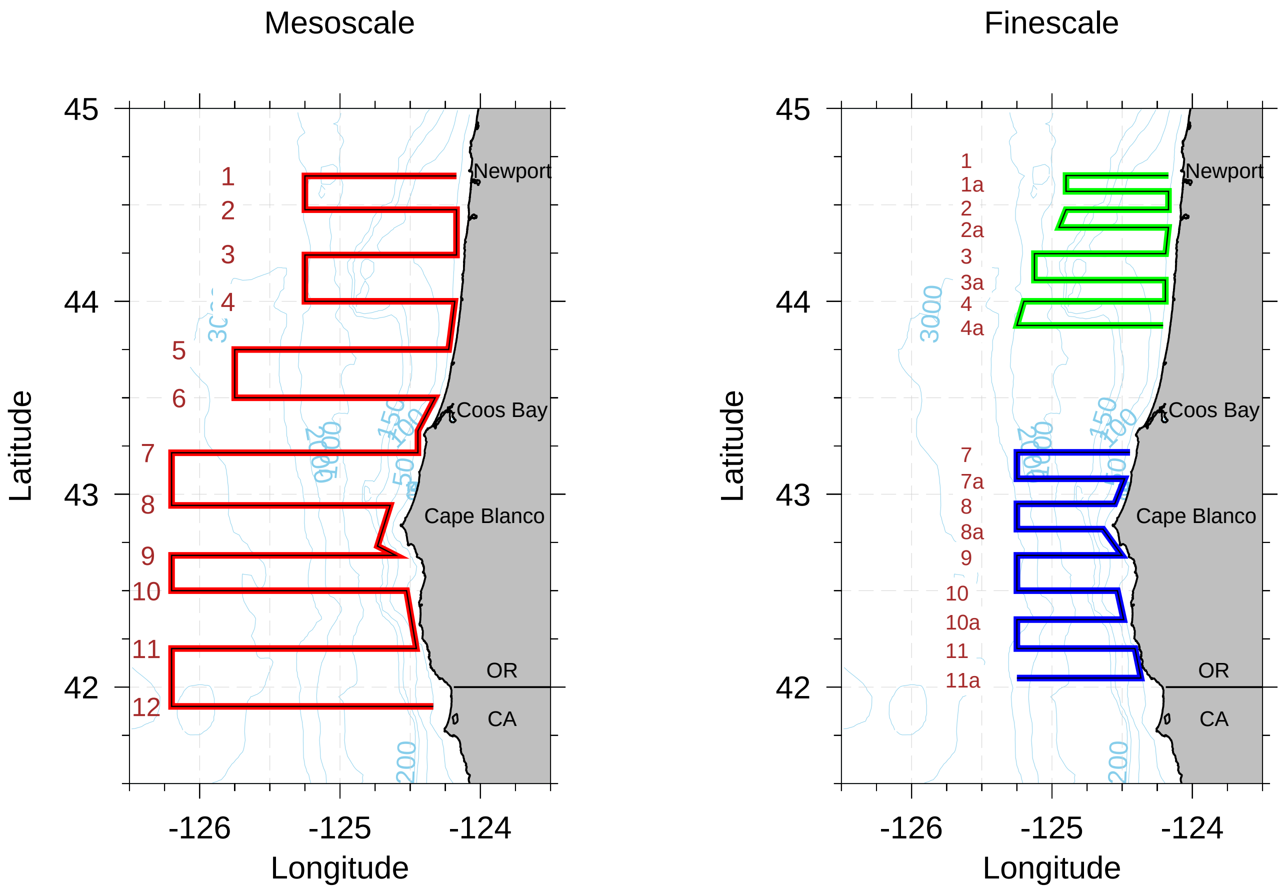

Figure 1: Map of the central Oregon continental shelf and slope showing the proposed survey grid for the mesoscale surveys (left) and the northern and southern finescale surveys (right). Line numbers are to the left of each E-W line.

We towed the SeaSoar and the HTI bioacoustics instrument on a grid of east-west sections ranging from 44.65 to 41.90N and from about the 45-m isobath to 60-160 km offshore (Figure 1). The winds started with a moderately strong upwelling favorable (southward) wind during the initial Mesoscale 1 mapping survey (Figure 2). As the cruise went on, the wind speed diminished at times, but it was generally in a state of upwelling. During the South SeaSoar survey the winds reversed, and we finished our study in downwelling conditions. Each of the SeaSoar/ADCP/HTI sampling grids is indicated by blue shading in Figure 2, and the timing of CTD stations, bio-optics profiling, and our rendezvous with the R/V *Wecoma* and F/V *Frosti* for bio-optics calibration with their net tows is shown on the plot.

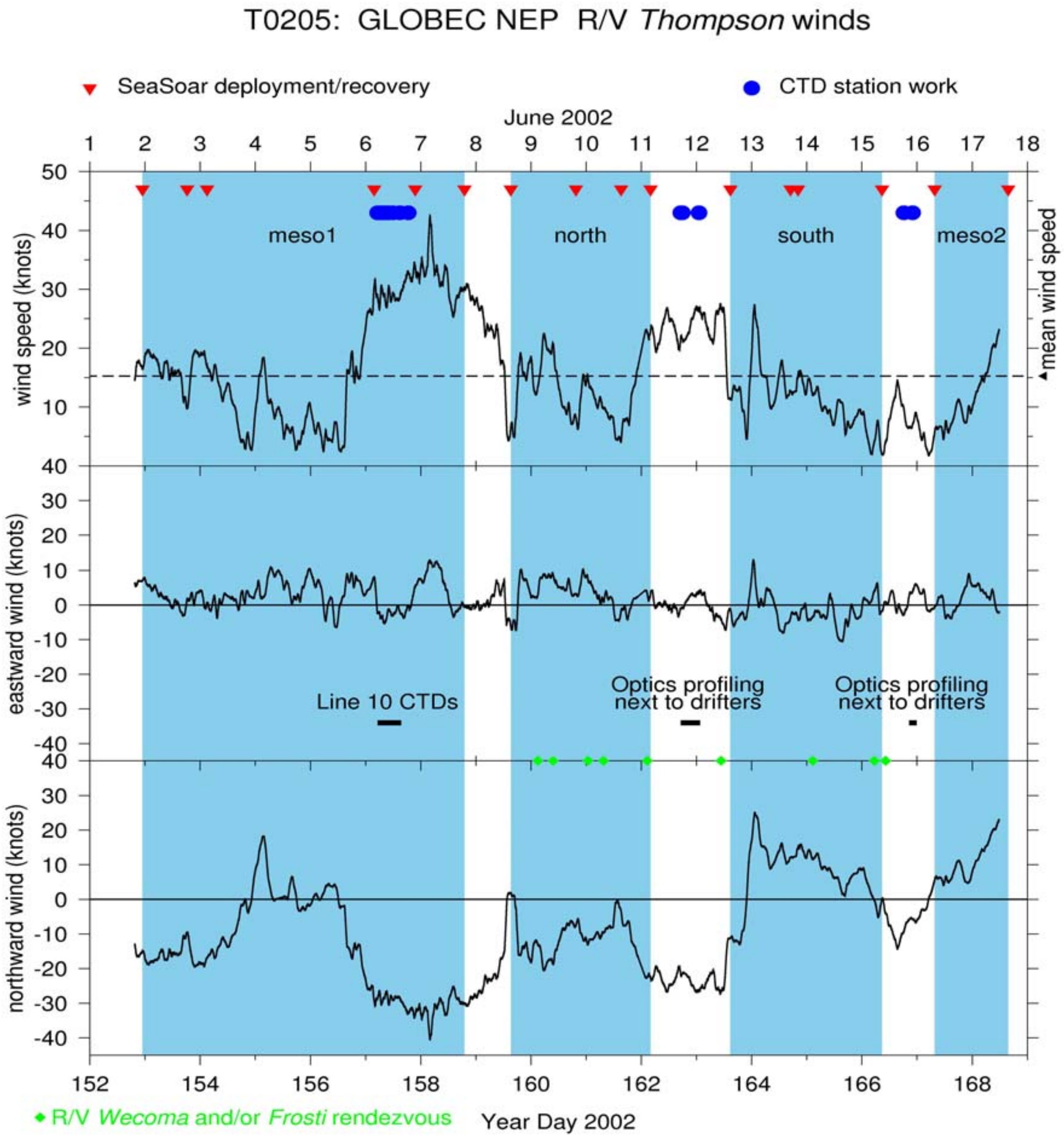

Figure 2: Wind as measured from the R/V *Thomas G. Thompson* and cruise activities.

The SeaSoar (Pollard, 1986) instrument suite was similar to that used during previous OSU field work (e.g., Barth et al., 2001), with the exception that an optical plankton counter (OPC) was mounted on the bottom. A Sea-Bird Electronics (SBE) 9/11+ conductivity-temperature-depth (CTD) instrument was mounted inside SeaSoar with dual, pumped T/C sensors mounted pointing forward out of the nose of SeaSoar. A Western Environmental Technology Laboratories (WET Labs) nine-wavelength light absorption and attenuation instrument, ac-9, was mounted on top of the SeaSoar in a rigid saddle and with a streamlined nose cone to minimize drag (Barth and Bogucki, 2000). Water for the ac-9 was pumped from an inlet/outlet just above the CTD T/C sensors in the nose of SeaSoar. A WET Labs Chlorophyll WETStar fluorometer (with an excitation wavelength of 470 nm, recording pigment fluorescence at 685 nm) and a WET Labs CDOM WETStar fluorometer (with an excitation wavelength of 370 nm and recording colored dissolved organic matter fluorescence at 460 nm) were mounted alongside the ac-9 on top of SeaSoar and received the same pumped water as the ac-9. A photosynthetically active radiation (PAR) sensor was mounted on the top surface of the SeaSoar vehicle's tail fin. A Seapoint fluorometer tuned to detect fluoroscein dye was mounted underneath SeaSoar's tail fin. The SeaSoar vehicle was also equipped with an engineering package measuring pitch, roll and impellor rotation rate. The three engineering sensors were connected to the analog-to-digital channels of the SBE CTD.

The SeaSoar vehicle was towed on a faired cable from a trawl winch installed on the fantail of the R/V *Thomas G. Thompson*. The vehicle profiled from the surface to around 220 m and back in approximately 12 minutes at the deep ends of the east-west survey lines, and it took about 1.5 minutes to cycle down to 40 m and back at the shallow, inshore ends of the lines.

Cruise Narrative

Mesoscale Survey 1 (June 1 – June 7, 2002)

June 1-2. We departed Newport at 1930 UTC (1230 local) with a scientific party of 26 onboard (Table 1) (all subsequent times UTC unless otherwise noted). We conducted a brief survey for crab pots at the eastern end of line 1 of the mesoscale grid, and then deployed the HTI bioacoustics system and the SeaSoar. We began towing along Line 1 about 2330 on June 1.

Table 1: T0205 cruise participants

Dr. Tim Cowles	OSU	Chief Scientist
Dr. Stephen Pierce	OSU	S
Dr. Cyndy Tynan	NOAA	S
Dr. David Ainley	H.T. Harvey & Associates	S
Dr. Michael Ott	OSU	S
Dr. Patrick Ressler	NOAA	S
Dr. Russell Desiderio	OSU	T
Mr. Robert O'Malley	OSU	T
Mr. Marc Willis	OSU	T
Ms. Linda Fayler	OSU	T
Mr. Toby Martin	OSU	T
Mr. Chad Waluk	Cal State, Monterey	T (MATE Intern)
Mr. Roberto Venegas	OSU	GS
Ms. Amanda Ashe	OSU	T
Ms. Angel White	OSU	GS
Ms. Megan Carney	OSU	GS
Ms. Rachel Sanders	OSU	GS
Ms. Amanda Briggs	OSU	GS
Ms. Di Wu	Univ. of Massachusetts	GS
Mr. Jay Peterson	Univ. of Massachusetts	GS
Mr. Michael Newcomer	NOAA	T
Mr. Todd Pusser	NOAA	T
Mr. Tom Ryan	NOAA	T
Mr. Charles Alexander	NOAA	T
Mr. Ed Ulrich	Linn-Benton Comm. College	UG
Mr. Aaron Kaiser	US Naval Academy	UG

(S=scientist; T=technician; GS=graduate student; UG=undergraduate student)

Winds were moderate and upwelling favorable during this first day of work. We had strong SW flow over the shelf on Line 1, extending from the inshore end of Line 1 to 124.7° W, about 40 km offshore. A thin lens of low salinity water (S < 32) extended across the entire line. We observed moderately high chlorophyll concentrations in the upper 15 m over the shelf, with a slightly deeper chlorophyll maximum at 25 m depth beyond the shelf break (west of 124.9° W).

The bioacoustics and Optical Plankton Counter (OPC) data revealed zooplankton concentrations in the upper 20 m over the shelf, along with some indication of increased biomass within 20 m of the bottom.

June 3. We observed strong SW flow (0.4 m s^{-1}) across Line 3, with a clear expression of a jet centered over the shelf break. There was a broad lens of Columbia River plume water (15 m thick, S < 32) that extended from the offshore end of each line to within 10-15 km of the beach. ADCP data from Line 3 revealed a classic upwelling velocity pattern, with 0.2-0.3 m s^{-1} offshore flow in the upper 20 m.

Fluorometer data from the SeaSoar revealed that phytoplankton biomass was concentrated within the upper 20-25 m over the shelf, deepening slightly to 25-35 m offshore. Bioacoustics and OPC data suggested that zooplankton biomass was associated with the phytoplankton in the upper 30 m, with additional zooplankton biomass located within 20-30 m of the bottom over the continental shelf.

June 4. We continued our SeaSoar mapping work across Lines 5 and 6 within the mesoscale grid, and completed Line 6 about 1600 GMT. We then turned west on Line 7, just south of Cape Arago. Weather conditions remained calm, with light winds and afternoon sunshine following morning fog near the coast.

The boundaries in the ocean color imagery from June 3 matched well with what we saw in the flow fields derived from the shipboard ADCP. The upwelling jet tracked the bottom topography from Line 1 through Line 4, with an offshore boundary of higher velocities near 125° W. A meander was evident south of Heceta Bank and west of 124.7° W, with a cyclonic feature centered about 124.4° W. The ADCP revealed southerly flow close to the coast south of 44° N.

Consistent with our observations of the more northern lines, Lines 5 and 6 showed thin lenses of low salinity water in the upper 15-20 m, extending to within 10-15 km of the inshore ends of each E-W line. We found higher chlorophyll concentrations (based on fluorescence) inshore and at the base of the low salinity water over the shelf. That biomass deepened to 30-40 m and became less concentrated west of the shelf break. Mammal sightings increased on Line 5 near 125° W, close to the higher velocity region of the upwelling jet, and near the offshore edge of higher ocean color values seen in the SeaWiFS imagery.

June 5 - 6. We continued our SeaSoar survey of the southern sections of the mesoscale grid. We completed lines 1-10 by 0100 June 6 (GMT). Weather conditions remained calm for the first five days of the cruise, although some moderate increase in wind speed was experienced late on June 5.

We observed strong SW flow over the shelf along line 8, with evidence of a northward undercurrent hugging the continental slope. There was also strong WNW flow extending from 125.3° W to 125.6° W. Surface salinities along Line 8 were less than 32 across the entire line, with surface temperatures 12 13° C inshore, 13-14° C offshore. Considerable phytoplankton biomass was concentrated in the upper 20 m over the inshore section of the shelf, deepening to 25-35 m at the shelf break and further offshore.

Recent upwelling had brought cooler water to the surface at the inshore end of line 9 (10° C, salinity of 32.8), nearly 2° C cooler than observed on Line 8. The influence of the Columbia River plume was apparent west of 124.9° W. Higher phytoplankton biomass was shifted westward relative to Line 8, with moderate surface concentrations extending from 124.7° W to 125.1° W along line 9.

Estimates of zooplankton concentrations from bio-acoustics and the OPC data continued to indicate that the shelf break is the position of local maxima in signal.

We had to replace the hydraulic unit in the SeaSoar vehicle after line 9, so we conducted CTD operations along Line 10 on June 6 during the repairs (Table 2 and Figure 3).

June 7. The repaired SeaSoar performed well, permitting completion of the two most southerly lines (Lines 12 and 11, in that order) of the mesoscale grid. We experienced 36 hours of strong winds from the north, reinforcing the upwelling conditions along the coast south of Cape Blanco. Steeply upward-sloping isopycnals showed that upwelling was well established, with the 26.0 isopycnal at the surface near 124.6° W and 8° C water within 15 km of the coast.

The strong winds of the past two days pushed the upwelling jet from an earlier upwelling event farther offshore. Two distinct biological fronts (local increases in fluorescence) along Line 12 (at 124.7° W and 125.0° W) supported this observation of the shifting position of the upwelling jet. The influence of the Columbia River plume was seen west of 124.9° W.

The stronger winds and higher sea state of June 6 and 7 limited the mammal and bird observations along Lines 12 and 11. The cumulative bird and mammal observations over the mesoscale grid suggested that hotspots of top trophic activity were concentrated along the inshore edge of the upwelling jet along lines 4, 5 and 10.

Table 2: CTD stations during T0205

Cast	Name	Date (2001)	Time (UTC)	Latitude (N)	Longitude (W)	Water Depth (m)
1	RR3	06 June	0515	42 29.89	124 42.32	133
2	RR4	06 June	0638	42 29.86	124 48.37	590
3	RR5	06 June	0816	42 29.99	124 54.27	1020
4	RR6	06 June	0953	42 29.87	124 59.91	1802
5	RR7	06 June	1148	42 30.08	125 12.20	3007
6	RR8	06 June	1453	42 30.12	125 36.13	3096
7	Line11W	06 June	1831	42 12.22	125 36.25	3088
8	drift sta1	11 June	1710	44 00.38	124 58.34	663
9	drift sta1	11 June	1748	44 00.11	124 58.33	705
10	drift sta1	12 June	0105	43 55.93	125 00.32	662
11	drift sta2	15 June	1815	42 14.70	125 03.43	1761
12	drift sta2	15 June	2202	42 10.33	125 05.05	1845

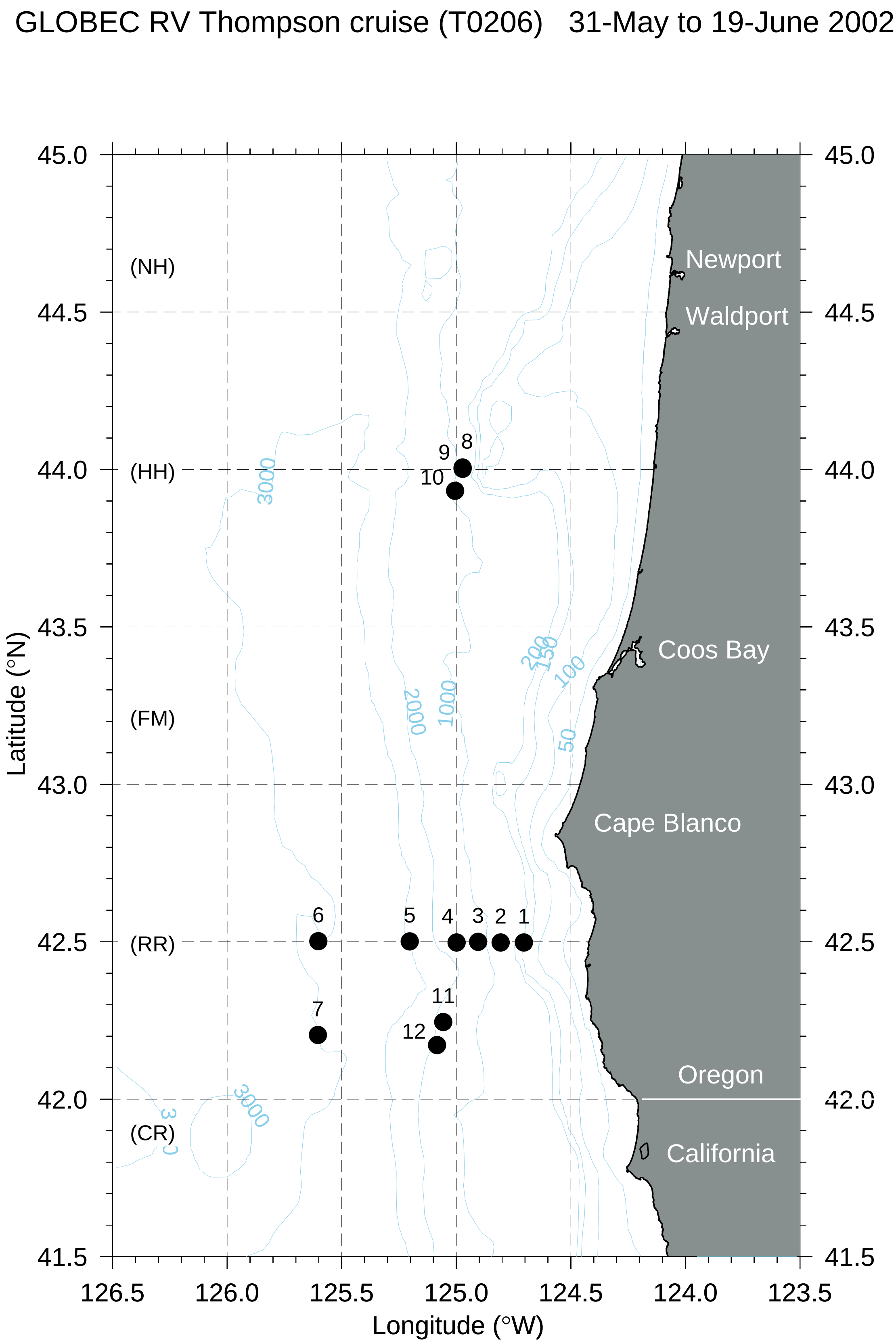

Figure 3: CTD station locations during T0205. Bottom topography in meters

Following discussions with Bill Peterson, Chief Scientist on the R/V *Wecoma*, we agreed to shift the northern finescale survey one line to the south--we, therefore, began on Line 1A instead of Line 1 (NH). We coordinated our positions with the R/V *Wecoma* and the F/V *Frosti* so that we could pass by them with the HTI bioacoustics system while they were towing for zooplankton and fish.

North Survey (8-11 June)

June 8 - 9. Although the density of crab pots was high near Newport, we found a gap that allowed clear passage just north of Line 1A. We enjoyed the spectacle of all three research vessels clustered at the inshore ends of lines 1 and 1A as we began the Northern Finescale Survey (NFS).

We deployed four optical drifters in rapid succession at the 150 m isobath during our SeaSoar survey of line 1A, then monitored the drifter tracks via Argos over the course of the next 2 days.

We met the R/V *Wecoma* and F/V *Frosti* at the 80 m isobath along Line 2a, and conducted a bio-acoustics fly-by while F/V *Frosti* was trawling and R/V *Wecoma* was towing MOCNESS. We did a loop around the R/V *Wecoma* as she was towing--a beautiful sight 1 hour before sunset. We then met R/V *Wecoma* again at 0900 GMT for another calibration fly-by at the shelf break on Line 3.

We found extremely high phytoplankton concentrations between Lines 3-3A. The WetStar fluorometer saturated at 5 volts, indicating that chlorophyll concentrations were in excess of 20 μg/l.

June 10. The Seasoar and cable were recovered to repair damage to the cable. During the repairs and retermination, we completed a survey of Line 3A with ADCP, HTI, and underway systems, and conducted an acoustics rendezvous with R/V *Wecoma* and F/V *Frosti* at HH5, just east of the offshore end of Line 4. We conducted bio-acoustic fly-bys of each vessel as they were towing (daylight, 1000 m water depth). We provided target depths for MOCNESS sampling based on real-time assessment of the HTI data. We repeated this operation with R/V *Wecoma* and F/V *Frosti* at midnight (0000 local, June 10) over the shelf break on Line 4 at station HH4.

June 10 - 11 (end of NFS). After some delays for repairs to the SeaSoar cable, we completed the northern finescale grid by towing offshore on Line 4 and inshore on Line 5. We completed another nighttime acoustics fly-by around R/V *Wecoma* and F/V *Frosti* near station HH4 (Line 4), then steamed past them while they were towing.

We conducted an ADCP and HTI survey enroute to our rendezvous point with the optical drifters near the offshore end of line 5. This survey provided nighttime HTI data to match the daytime data obtained earlier today over the same track.

Phytoplankton concentrations within the NFS box were extremely high from mid-shelf to inshore along each of the lines. There was a visible surface manifestation of Columbia River water at the offshore end of Line 4, with a distinct difference in surface roughness and a change in water color. This matched a sharp gradient in surface salinity and temperature.

Dr. Steve Pierce predicted the location of the drifters with considerable accuracy. Tom Ryan and Todd Pusser of the mammal observation team spotted all four drifters and provided visual confirmation of all four ID#s, in spite of overcast skies and many whitecaps. All the drifters were spotted and identified within 1 hour, within 2 nautical miles of each other, near 44° 01.4'N and 124° 59'W, in about 700 m of water (western end of Line 4). Following identification of the drifters, we conducted CTD casts, optical profiles, and TSRB deployments near the drifters.

South Survey (June 12 – June 15)

June 12. We spent most of the day within a few hundred meters of one of the four optical drifters deployed on June 8. We deployed the TSRB under a thin overcast to obtain measurements of the bulk absorption properties of the upper water column. We did two CTD casts adjacent to the drifter--one in late morning, and one in late afternoon. The two CTD profiles were quite distinct, with a 10-fold increase in fluorescence (0.4 volts to 4.0 volts) at the chl max between morning and evening.

During our work near the optical drifters, Jay Peterson isolated the signal problem that had been plaguing the OPC during the previous SeaSoar sections. We were subsequently able to obtain reliable OPC data for the remainder of the cruise.

We launched the SeaSoar and HTI to begin the Southern Finescale Survey (SFS). We completed Lines 7 and 7A under foggy conditions with winds of 15 knots. We observed high concentrations of phytoplankton in the upper 20 m over the shelf, and strong southward flow close inshore on Line 7. Beyond the shelf break, we encountered a band of northward flow that appeared to be bounded on the west by the extension of the jet observed at the western ends of Lines 4 and 5.

We conducted another bioacoustics calibration with the R/V *Wecoma* last night as they were doing a MOCNESS tow, using the HTI signal pattern as a guide for the sampling intervals of the MOCNESS.

We deployed two more optical drifters in strong southward flow as we crossed the shelf on Line 7.

June 13. We completed line 8, south of Cape Blanco, under moderate downwelling favorable winds. Even with downwelling winds, we observed strong southward flow over the shelf along this line, with extremely low surface temperatures of 7.5° C, and salinity of 34.1 at the inshore end of line 9.

June 14. Winds were light to moderate from the south during the surveys of lines 7-10, and conditions around Cape Blanco were quite calm. In spite of the relaxed wind state, we continued to observe strong upwelling signatures over the shelf along each line. The northward undercurrent was present over the entire shelf along Line 7A. We also found surface temperatures < 8° C and surface salinities > 34 at the inshore end of these lines. Phytoplankton concentrations remained high, but lower than was observed north of Cape Blanco.

The R/V *Wecoma* and F/V *Frosti* towed adjacent to us along segments of lines 7, 8, and 10 for additional bioacoustic / zooplankton / fish calibration work.

There was considerable bird and mammal activity along Line 10 during the late afternoon, beginning on the inshore side of the shelf break, with bird concentrations highest within a narrow band over a temperature gradient near the shelf break. Numerous humpback whales were spotted inshore of the 200 m isobath.

Our observations along line 11 confirm the significant surface layer concentrations of phytoplankton indicated in the SeaWiFS image obtained on June 11. The sections from Lines 7-10a, especially the ADCP, illustrated a complex interaction between the upwelling jet and the vertical extent of the undercurrent over the shelf. There was very strong horizontal shear over the shelf in this region, with the indication of significant transport of surface phytoplankton to depth along sloping isopycnals.

June 15. We increased the western extent of line 11a and 12 to capture the full expression of the coastal jet, as suggested to us via email from Dr. Jack Barth, based on his interpretation of recent AVHRR imagery. We extended the western end of line 11a past 125.5° W, and found that the temperature, salinity, and chlorophyll signals all showed that we had moved west of the jet boundary along line 11a, so we turned east on Line 12 at that point. We observed significant phytoplankton biomass within the upper 30 m out to 40 nautical miles in this offshore region.

Mesoscale Survey 2 (June 16 – June 17)

June 16. Following completion of the SFS, we shifted operations to the optical drifters that had been deployed on line 7 on June 12. Steve Pierce incorporated ADCP data with recent satellite fixes to provide good predicted positions, but a western turn by the upwelling jet near line 10 carried the drifters a bit further west than predicted. This pair of drifters had been moving at speeds of 0.6 m s^{-1}. CTD and optical profiles showed high phytoplankton biomass between 20-40 m beneath the optical drifters.

We conducted additional bioacoustic calibrations with the R/V *Wecoma* along line 12 under perfectly calm conditions.

June 17. Following our work near the optical drifters on June 16, we developed a plan for an abbreviated mesoscale survey during the final day of the cruise. This short survey includes line 7, line 4, and the NH line on our way into Newport.

During this abbreviated survey, we passed through a dramatic surface expression of the Columbia River plume about 15 nautical miles offshore along Line 4, with extensive bands of slicks and swirling water. Several humpback whales were observed within a few hundred meters of the front--on the cooler, saltier side. We observed surface salinities less than 29 within this feature.

We recovered the SeaSoar and the HTI system over the mid-shelf just west of Newport during the mid-morning hours of June 17, satisfied that we had obtained a remarkable data set.

The SeaSoar operation successfully completed three major surveys, mapping physical and bio-optical properties, along with OPC zooplankton counts, along 32 cross-shelf sections. The coincident ADCP and HTI datasets provide an unprecedented coupling of the physical and biological patterns of this region. The mammal and seabird observation teams logged hundreds of hours, and found distinct patterns of distribution. Over 300 sightings of cetaceans and 10 sightings of pinnipeds were obtained during the cruise, representing 11 species of cetaceans and 5 species of pinnipeds. The underway sampling team mapped surface bio-optical properties continuously, obtaining a unique collection of phytoplankton physiological indices using the Fast Repetition Rate Fluorometer (FRRF) and absorption meters.

The cruise officially ended with our arrival at the dock in Newport on June 17 at 1200 local time (1900 GMT).

CTD Data Acquisition, Calibration and Data Processing

All 12 CTD/rosette casts (Table 2) were made with an SBE 9/11-plus CTD system equipped with dual ducted temperature and conductivity sensors (Table 3). The calibration dates for the sensors are shown in Table 3 . Prior to cast 8 the fluorometer was replaced with another SeaTech /

WetLabs fluorometer (S/N 848). Prior to cast 11 the SBE-9 underwater unit was replaced; the new pressure sensor had a S/N of 43434.

The pressure sensor, a Digiquartz pressure transducer, and the Sea-Bird temperature and conductivity sensors were calibrated by Sea-Bird. The deck unit provided a correction for the time lag between T0 and C0, and no correction for the lag between T1 and C1. No samples were collected for *in situ* calibration of the conductivity sensors, and the data were processed based on their latest manufacturer's calibration.

Table 3: Instruments and sensors used during T0205 for CTD/Rosette sampling, and date of most recent manufacturer's pre-cruise calibration.

System (Instrument)	Sensor	SN	Pre-Cruise Calibration
T0205 CTD/Rosette SBE 9/11 plus	P*	34901	10 September 1999
	P**	43434	07 July 1999
	T0	2060	01 November 2000
	T1	2131	03 November 2000
	C0	1824	31 October 2000
	C1	1371	31 October 2000
	SeaTech Fluorometer***	122S	08 July 2001
	SeaTech Fluorometer****	84S	08 July 2001
	Transmissometer	CST-402DR	27 October 2000
	Oxygen	0023	15 August 2001
	altimeter	207	
	Irradiance (PAR)	4173	20 August 1998

Pressure sensors: * used for casts 1-10; ** used for casts11-12;
Fluorometers: *** used for casts 1-7; ****used for casts 8-12

CTD data were processed using the Sea-Bird SEASOFT software, and included all of the normal steps, i.e., using SEASOFT modules DATCNV, ALIGNCTD, WILDEDIT, CELLTM, FILTER, LOOPEDIT, DERIVE (to calculate salinity), and BINAVG to obtain 1-dbar average values of pressure, primary and secondary temperature, primary and secondary conductivity, the voltages for the SeaTech fluorometer and transmisometer, the PAR voltage, and the oxygen saturation. The ALIGNCTD module was run with the T-C offset for the primary sensor pair as 0.000 sec, and the T-C offset for the secondary sensor pair as 0.073 seconds; oxygen was advanced 8.0 seconds relative to pressure. The primary sensor pair were selected as the preferred sensors. Derived parameters, including salinity, potential temperature (theta), density anomaly (sigma-theta) and specific volume anomaly were computed from the processed and calibrated 1-dbar values of temperature and conductivity using standard algorithms (Fofonoff and Millard, 1983). Plots of the profiles are shown in the CTD Data section starting on page 33.

SeaSoar Data Acquisition and At-Sea Processing

The Chelsea Instruments SeaSoar vehicle was equipped with a SBE 9/11-plus CTD with dual temperature and conductivity sensors (Table 4). The inlets and outlets of both dual T/C ducts were plumbed pointing forward through a hole in the nose of the SeaSoar (Barth et al., 1996). Data from the WetLABS ac-9 was sent through the high-speed modem channel on the CTD, and was subsequently extracted as a serial stream from the CTD deckunit.

Raw 24-Hz CTD data from the SeaSoar vehicle were logged and distributed by a PC-based acquisition system. The acquisition software allowed for user placement of flags in the data stream to mark, for example, heading changes along sampling lines. The GPS data was logged by the CTD acquisition system as an incoming serial stream, and merged with the incoming CTD data.

The acquisition system logged the raw 24-Hz CTD data and any additional serial streams onto an internal hard disk. The logged file was also echoed to a SUN SPARCstation by serial stream, and the receiving program made a redundant copy of the original file to disk. The SPARCstation was used to process the data in real-time, producing one-second averages of the CTD data and all possible A/D channels. Position information was supplied by the merged GPS data. For real-time examination of the data, fixed offsets between the T and C time series were applied, along with a fixed amplitude and time constant for the thermal mass corrections for each sensor pair.

Time-series and vertical profile plots of the one-second data were made at the end of each hour for science analysis and to monitor data quality. The lags between the T and C time series for each up- and down-trace of the SeaSoar were also calculated and plotted hourly as part of the quality control. The 1-Hz real-time data were used to calculate twelve-minute average temperature and salinity values in two-db vertical bins. These gridded values were used for at-sea analysis of the changing three-dimensional structure observed in the study areas.

Table 4: Instruments and sensors used during T0205 for SeaSoar sampling, and date of most recent manufacturer's pre-cruise calibration.

System (Instrument)	Sensor	SN	Pre-Cruise Calibration
T0205 SeaSoar CTD SBE 9/11 plus SN 428* & SN 258**	P*	64256	28 March 2001
	P**	50506	10 February 1999
	T1	2127	26 March 2002
	T2	2128	26 March 2002
	C1	1737	26 March 2002
	C2	1738	26 March 2002
	ac-9	152	
	WetStar fluorometer (CHL)	741	
	WetStar fluorometer (CDOM)	811	
	SeaPoint fluorometer (fluoroscein dye)		
	PAR		

* used for tow 1

** used for tows 2-8

Post-processing of SeaSoar Data

Salinity data derived from SeaBird ducted temperature and conductivity sensors are subject to errors from three separate sources (Larson, 1992): (1) poor alignment of the 24-Hz temperature and conductivity data, (2) poor compensation for the transfer of heat between the mantle of the conductivity cell and the water flowing through it, and (3) mismatch of the effective time constants of the temperature and conductivity measurements. High-speed pumps, ducted-flow geometry, and sensor design to match response times are hardware measures which help to reduce these errors. Software is then used to align the temperature and conductivity data by some offset (typically 1.75 scans); a two-point recursive formula is applied to correct for the thermal mass of the conductivity cell (Lueck, 1991); and, in the case where one wishes to examine fine-scale features with high-frequency data, digital filtering can be applied to assure response function matching between the temperature and conductivity sensors (N. Larson, 1992, personal communication). For the results reported here, only the thermal mass correction and the offset between T and C were applied in post-processing.

The primary complication for processing CTD data from the SeaSoar is that the sensors may experience a variable flow rate (Huyer *et al*, 1993). Although this variability is diminished with the use of the forward pointing sensors, it is still present in the data (Barth *et al*, 1996). Variable flow rate has been attributed to dynamic pressure differences, partly between the inside and outside of the vehicle and partly along the exterior of the vehicle nose where duct inlet and outlet ports may be on different streamlines. Possible sources of such pressure gradients include high dive/climb rates (sometimes greater than 3m s^{-1}, superimposed on a horizontal tow speed of 4m s^{-1}) and perturbations of the flow field around the vehicle, associated perhaps with a persistent roll angle or strong cross-currents. Rather than having a constant offset between the T and C signals, we correct for a variable lag. The variable flow rate also impacts the thermal mass correction, where the amplitude and time constant of the correction are inversely proportional to flow rate (Lueck, 1991; Morrison *et al*, 1994). Note that biology may further impact the calculated lags between T and C, independent of flow rate. The time response of the thermistor can be lengthened due to the presence of thin film on the temperature probe, resulting in a decrease in the observed lags between T and C (Kosro *et al*, 1995), which returns to normal if the film clears.

However, in environments where growth is possible, the time response can gradually change over a period of days. Such fouling often precludes the use of data from those sensors, and is one of the reasons for monitoring the lags hourly at sea, as the surveys progress.

Because of the repeated sampling of the water column by the SeaSoar, it is possible to examine the T-S plots of consecutive profiles to determine the effects of the thermal mass correction. This was done qualitatively in the early SeaSoar reports to determine the scaling of the amplitude of the thermal mass correction (α) to the observed lags, given a fixed time constant (τ) (Huyer *et al*, 1993; Kosro *et al*, 1995). It has been done quantitatively since then (Barth *et al* 1996; Barth *et al*., 2000) and allows both α and τ to be variables, which is consistent with Morrison *et al* (1994). Using the hourly T-S diagrams we can find the optimal proportionality of α and τ to the lags (described below).

Before the data can be post-processed, three preliminary steps are required: (1) the sensors are processed using recent calibrations from the manufacturer (see Table 4), (2) the time-series of lags between 24-Hz temperature and conductivity data are computed and cleaned (see below), and (3) the optimal proportionality values between the observed lags and the thermal mass correction variables are determined. Once these steps are completed, the SeaSoar data can be post-processed. The time-series of lags are used to dynamically offset the temperature and conductivity signals; and a thermal mass correction is applied to the data, where the thermal mass variables α and τ are scaled proportional to the observed lags. The final data are output as 1-Hz values, using a 24-point boxcar filter on the input (24-Hz) data.

Calculation of the time-series of lags between first-differenced temperature and conductivity has been described in previous reports (e.g. Huyer *et al*, 1993). We now use an iterative statistical method to initially clean the values. A single depth zone was applied to the SeaSoar data, extending from 1 meter down to 150 meters. Lags are calculated in this zone for each ascending and descending trajectory. The time series of ascending or descending lags is then examined with a (101-pt) moving window. Any lag value more than three standard deviations away from the window's mean is nulled and removed from the set. After we pass through all the lags once, removing the outliers, we then iterate through again. This continues until all remaining lags are within 3 sigma of the mean. Then the nulled values are replaced with the average from the neighboring +/- 50 points. These statistically cleaned lags are then plotted and examined; sometimes the statistical properties abruptly change during a tow, and averaging across those changes is inappropriate.

Ascending lags are applied until the SeaSoar reverses direction and dives, and descending lags are applied until the SeaSoar hits a maximum depth and starts to climb, etc. While at sea, the final lags are examined to initially determine the preferred sensor pair. It has been our experience that the sensor pair with the least noisy time-series of lags often yields the most reliable T-S diagrams. Final determination of the preferred sensor pair comes from examination of the hourly T-S diagrams. The area (in T-S space) for both sensor pairs is calculated for each hour of data; the preferred sensor will predominantly have the smallest area for all the hours of data. Temporary clogging may require the use of the alternate sensor pair. For this survey, the primary sensor was the preferred sensor for tows 2, 3, 4, and 5; the secondary sensor was used for tow 6; and both sensors were used in tows 1, 7 and 8. The final lags for the preferred sensor pair of each tow are shown in Appendix I of this report.

To apply a thermal mass correction we follow Lueck (1991), who presented a two-point recursive formula involving an amplitude (α) and a time constant (τ). We implement this with a recursive algorithm provided by SeaBird:

$$\Delta C_n = -bC_{n-1} + a(dC/dT)(T_n - T_{n-1}),$$

where

$$a = 2\,\alpha / (2 + \beta\,\Delta t)$$

$$b = 1 - 2a / \alpha$$

$$\beta = 1 / \tau$$

$$dC/dT = 0.1(1 + 0.006(T_n - 20)),$$

and ΔC_n is the conductivity correction at time n, C_{n-1} is the conductivity (in S m^{-1})at the preceding time, T_n and T_{n-1} are the temperatures (^oC) at times n and n-1, and Δt is the time between scans (1/24 sec). The amplitude of the correction is α and τ denotes the time constant.

Lueck suggested that α was inversely proportional to flow rate, and that τ was weakly proportional to the inverse of the flow rate. Morrison *et al* (1994) developed this further: α is inversely proportional as before, but now τ is inversely proportional to the square root of the flow rate. Since the observed T-C lag is also inversely proportional to flow rate, α is then directly proportional to the T-C lag, and τ is directly proportional to the square root of the lag.

Suppose we did not correct for the thermal mass of the conductivity cell. During a down trace the cell would be warmer than the water and would be leaking heat into the water within the conductivity cell; the measured conductivity would then be higher than the conductivity of the surrounding water. If no thermal mass correction is applied, then salinity is too high during descent, and too low during ascent. This has the appearance of a hysteresis loop when plotted on a T-S diagram. If a thermal mass correction is applied by systematically increasing the amplitude (α) and the time constant (τ), the hysteresis loop would diminish until the up-trace lies on top of the down-trace, yielding the best estimates for α and τ. If the thermal mass correction is too strong (α and τ too large, for instance) the hysteresis loop would reappear on the other side, with the salinity now too low during descent.

If we calculate the area (in T-S space) between successive up- and down-traces, then the optimal thermal mass correction is the one which minimizes this area. We seek optimal settings for the slopes and offsets of α and τ, where

$$\alpha = \alpha_{offset} + (\alpha_{slope} * lag)$$

$$\tau = \tau_{offset} + (\tau_{slope} * \sqrt{lag})$$

If we consider the area in T-S space as our function and the slopes and offsets as variables, optimal settings are found by minimizing this function of four variables. There are well established routines for this. We chose to use one from the International Math and Science Library (IMSL), which uses a quasi-Newton method and a finite-difference gradient (routine UMINF).

Each tow was optimized for its thermal mass correction. Some tows can be very short, in which case the results from a nearby tow were applied to them. Test hours were chosen for each tow and optimizations run on both sensor pairs. This test data set was then processed with an initial slope and offset for α and τ, and the area in T-S space between every successive up- and down-traces was computed for each test hour, and then summed as a whole. The IMSL routine was used to modify the values for the slopes and offsets until a minimum of the summed area was found. The slope and offset for both α and τ, which minimized the area for the test data were then applied as the settings for the appropriate tows. The results are summarized in Table 5.

Table 5: Optimized thermal mass corrections

Survey	tow	preferred sensor	α slope	α offset	τ slope	τ offset
T0205	1	T1, C1	0.00	1.51622E-02	1.33967	7.14941
		T2, C2	1.25519E-02	2.85359E-03	1.31590	7.13246
	2	T1, C1	0.00	1.35395E-02	1.33946	7.14976
	3	T1, C1	8.83634E-06	1.52954E-02	1.33693	7.14354
	4	T1, C1	0.00	1.57201E-02	1.33997	7.14973
	5	T1, C1	0.00	1.47634E-02	1.34397	7.14965
	6	T2, C2	7.71230E-03	8.21928E-03	1.34373	7.15523
	7	T2, C2	4.09748E-03	9.67812E-03	1.33929	7.15770
		T1, C1	1.29223E-03	5.35417E-03	1.33729	7.16323
	8	T2, C2	3.34316E-03	1.32289E-02	1.34260	7.15280
		T1, C1	3.45307E-04	8.63981E-03	1.34687	7.15174

Using the variable lags (shown in Appendix I) and the optimal thermal mass slopes and offsets (Table 5), realigned and corrected 24-Hz temperature and conductivity data were obtained and used to calculate 24-Hz salinity, and these were averaged to yield 1-Hz values stored in hourly files. A repeated statistical cleaning was then applied, which checked the difference of the primary and secondary sensor salinity estimates against the average and standard deviation for each hour of data. This was done until the automated cleaning began to impact more than the obvious clogs and surface breaches. Hand cleaning the data to remove any obvious outliers in T-S space was the final step in processing the data.

Data Presentation

The final 1-Hz data files contain unfiltered GPS latitude and longitude; pressure; temperature, salinity and sigma-t from the preferred sensor pair; date and time (in both decimal day-of-year and integer year, month, day, hour, minute, second); an integer representing various flags (thousands digit of 1 indicates collection of a water sample from the 5-m intake, hundreds digit of 1 indicates the beginning of a new ascending or descending profile, tens digit of 1 indicates missing GPS data filled by linear interpolation, and ones digit indicates preferred sensors from the port side (0) or the starboard side (1) of the forward-pointing intakes).

We summarize the results of the conventional CTD casts and the thermohaline and chlorophyll data from the SeaSoar tows in the following sections. For the CTD stations, we provide plots of the vertical profiles of temperature, salinity, and $\sigma_{t,}$ vertical profiles of fluorescence, oxygen, and light transmission, and listings of observed and calculated variables at standard pressures.

For the SeaSoar observations, we split the tow data into the mapping surveys (see Table 6 and Figure 4). Maps of temperature, salinity, and sigma-t are shown for every ten meters between 5 and 55 meters depth, and then every 20 meters between 55 and 115 meters depth. The mesoscale maps have additional plots at 155 meters depth. Data used in the maps were obtained by first binning the data into 2-db bins in the vertical, and 2.0-km bins in the horizontal. Then, the depth of interest was extracted from the appropriate sections for the maps. Contour maps were then created by gridding these data using "zgrid" (Crain, 1968, unpublished). The meso1 and meso2 grids used a spacing of 0.063^o longitude (5.0 km) in E-W spacing, and 0.090^o latitude (10.0 km) in N-S spacing. The small north and south grids used the same E-W spacing of 0.063^o longitude (5.0 km), but used a finer N-S spacing of 0.045^o latitude (5.0 km). Any grid point more that two grid spaces away from a data point was set to be undefined.

Vertical sections of temperature, salinity and sigma-t are shown for each of the SeaSoar lines, along with sections of chlorophyll and CDOM. These sections are countoured using "zgrid" from the 2.0-km, 2-db averaged data. They are displayed at two different depth ranges: 0 to 130-db (for comparison with other GLOBEC NEP sections), and 0 to 250-db (to show the full section).

Acknowledgements

We thank the OSU Marine Technician group, led by Marc Willis and including Linda Fayler and Toby Martin, who were responsible for the highly successful SeaSoar operations. Chad Waluk from the Monterey Peninsula College's Marine Advanced Technology Education Center (MATE) program assisted with the SeaSoar operations. The officers, mates and crew of the R/V *Thomas G. Thompson* contributed greatly to the success of the cruise. The bridge officers and ABs were particularly helpful in guiding us through regions of intensive fishing activity, both gear deployed in the water and clusters of small vessels. We would also like to thank Christopher Wingard for the chlorophyll calibrations used in this report. This work was funded by the National Science Foundation Grant OCE-0001035 as part of the GLOBEC NEP California Current program.

Table 6: Section Times

	Section name	Start time	Stop time
Meso 1	meso1.line1	02/06/01 22:54:22	02/06/02 06:01:48
	meso1.line1_2	02/06/02 06:01:49	02/06/02 07:54:28
tow 1	meso1.line2	02/06/02 07:54:29	02/06/02 16:15:01
	meso1.line2_3	02/06/02 16:15:02	02/06/02 18:17:28
	…	…	…
tow 2	meso1.line3	02/06/03 02:59:09	02/06/03 09:33:33
	meso1.line3_4	02/06/03 09:33:34	02/06/03 11:16:00
	meso1.line4	02/06/03 11:16:01	02/06/03 18:17:38
	meso1.line4_5	02/06/03 18:17:39	02/06/03 20:09:43
	meso1.line5	02/06/03 20:09:44	02/06/04 04:59:26
	meso1.line5_6	02/06/04 04:59:27	02/06/04 06:56:37
	meso1.line6	02/06/04 06:56:38	02/06/04 15:45:44
	meso1.line6_7	02/06/04 15:45:45	02/06/04 18:16:04
	meso1.line7	02/06/04 18:16:05	02/06/05 00:52:14
	meso1.line7_8	02/06/05 00:52:15	02/06/05 02:56:20
	meso1.line8	02/06/05 02:56:21	02/06/05 09:59:34
	meso1.line8_9	02/06/05 09:59:35	02/06/05 12:44:18
	meso1.line9	02/06/05 12:44:19	02/06/05 18:49:07
	meso1.line9_10	02/06/05 18:49:08	02/06/05 20:17:16
	meso1.line10	02/06/05 20:17:17	02/06/06 03:44:06
	…	…	…
tow 3	meso1.line12	02/06/06 21:34:11	02/06/07 06:25:57
	meso1.line12_11	02/06/07 06:25:58	02/06/07 10:01:08
	meso1.line11	02/06/07 10:01:09	02/06/07 16:58:16
	meso1.line11_10	02/06/07 16:58:17	02/06/07 19:01:33
North	north.line1_1a	02/06/08 15:13:02	02/06/08 15:51:52
	north.line1a	02/06/08 15:51:53	02/06/08 19:54:57
tow 4	north.line1a_2	02/06/08 19:54:58	02/06/08 20:36:30
	north.line2	02/06/08 20:36:31	02/06/09 00:55:23
	north.line2_2a	02/06/09 00:55:29	02/06/09 01:42:52
	north.line2a	02/06/09 01:42:53	02/06/09 06:53:30
	north.line2a_3	02/06/09 06:53:31	02/06/09 08:13:08
	north.line3	02/06/09 08:13:09	02/06/09 14:32:56
	north.line3_3a	02/06/09 14:32:57	02/06/09 15:43:42
	north.line3a	02/06/09 15:43:43	02/06/09 19:30:36
	…	…	…
tow 5	north.line4	02/06/10 15:10:37	02/06/10 20:52:48
	north.line4_5	02/06/10 20:52:49	02/06/10 22:42:33
	north.line5	02/06/10 22:42:34	02/06/11 04:02:20

Table 6: Section Times (continued)

South	south.line7	02/06/12 14:44:56	02/06/12 19:30:45
	south.line7_7a	02/06/12 19:30:46	02/06/12 20:28:17
tow 6	south.line7a	02/06/12 20:28:18	02/06/13 00:28:32
	south.line7a_8	02/06/13 00:28:33	02/06/13 01:44:08
	south.line8	02/06/13 01:44:09	02/06/13 06:03:01
	south.line8_8a	02/06/13 06:03:02	02/06/13 07:40:06
	south.line8a	02/06/13 07:40:07	02/06/13 12:42:09
	south.line8a_9	02/06/13 12:42:10	02/06/13 14:30:55
	south.line9	02/06/13 14:30:56	02/06/13 16:54:50
	…	…	…
tow 7	south.line9 (cont)	02/06/13 20:10:56	02/06/13 21:40:46
	south.line9_10	02/06/13 21:40:47	02/06/13 23:12:37
	south.line10	02/06/13 23:12:38	02/06/14 03:49:48
	south.line10_10a	02/06/14 03:49:49	02/06/14 05:15:03
	south.line10a	02/06/14 05:15:04	02/06/14 09:52:52
	south.line10a_11	02/06/14 09:52:53	02/06/14 11:08:45
	south.line11	02/06/14 11:08:46	02/06/14 16:31:47
	south.line11_11a	02/06/14 16:31:48	02/06/14 17:49:28
	south.line11a	02/06/14 17:49:29	02/06/14 23:25:51
	south.line11a_12	02/06/14 23:25:52	02/06/15 01:38:55
	south.line12	02/06/15 01:38:56	02/06/15 08:41:43
Meso 2	meso2.line7.start	02/06/16 07:42:31	02/06/16 08:14:08
	meso2.line7	02/06/16 08:14:09	02/06/16 13:24:17
tow 8	meso2.line7_6	02/06/16 13:24:18	02/06/16 16:48:17
	meso2.line6_4	02/06/16 16:48:18	02/06/16 22:24:27
	meso2.line4	02/06/16 22:24:28	02/06/17 04:45:58
	meso2.line4_1	02/06/17 04:45:59	02/06/17 09:53:26
	meso2.line1	02/06/17 09:53:27	02/06/17 15:39:36

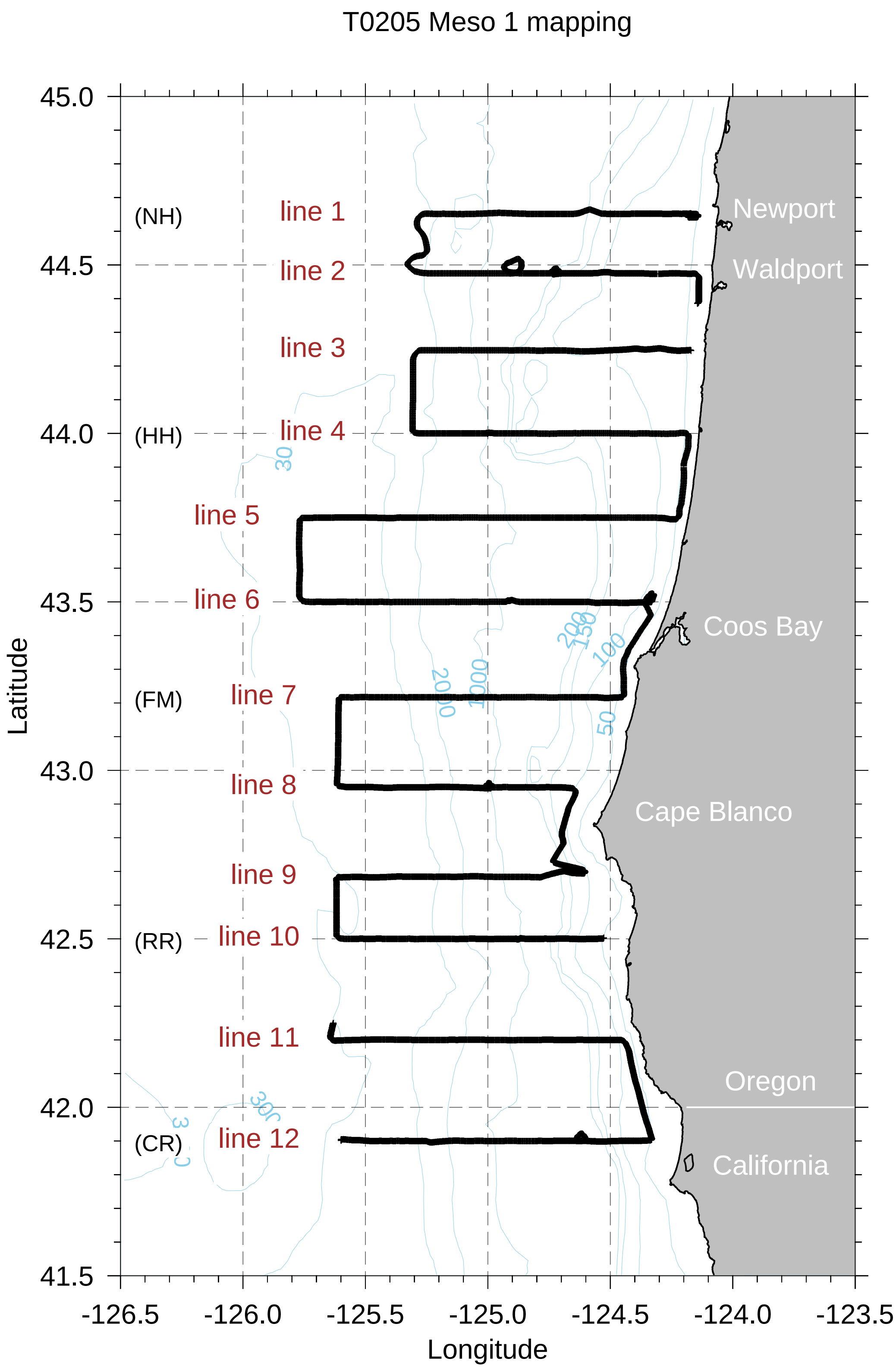

Figure 4a: Cruise tracks during the T0205 SeaSoar surveys. See Table 6 for individual line start and stop times.

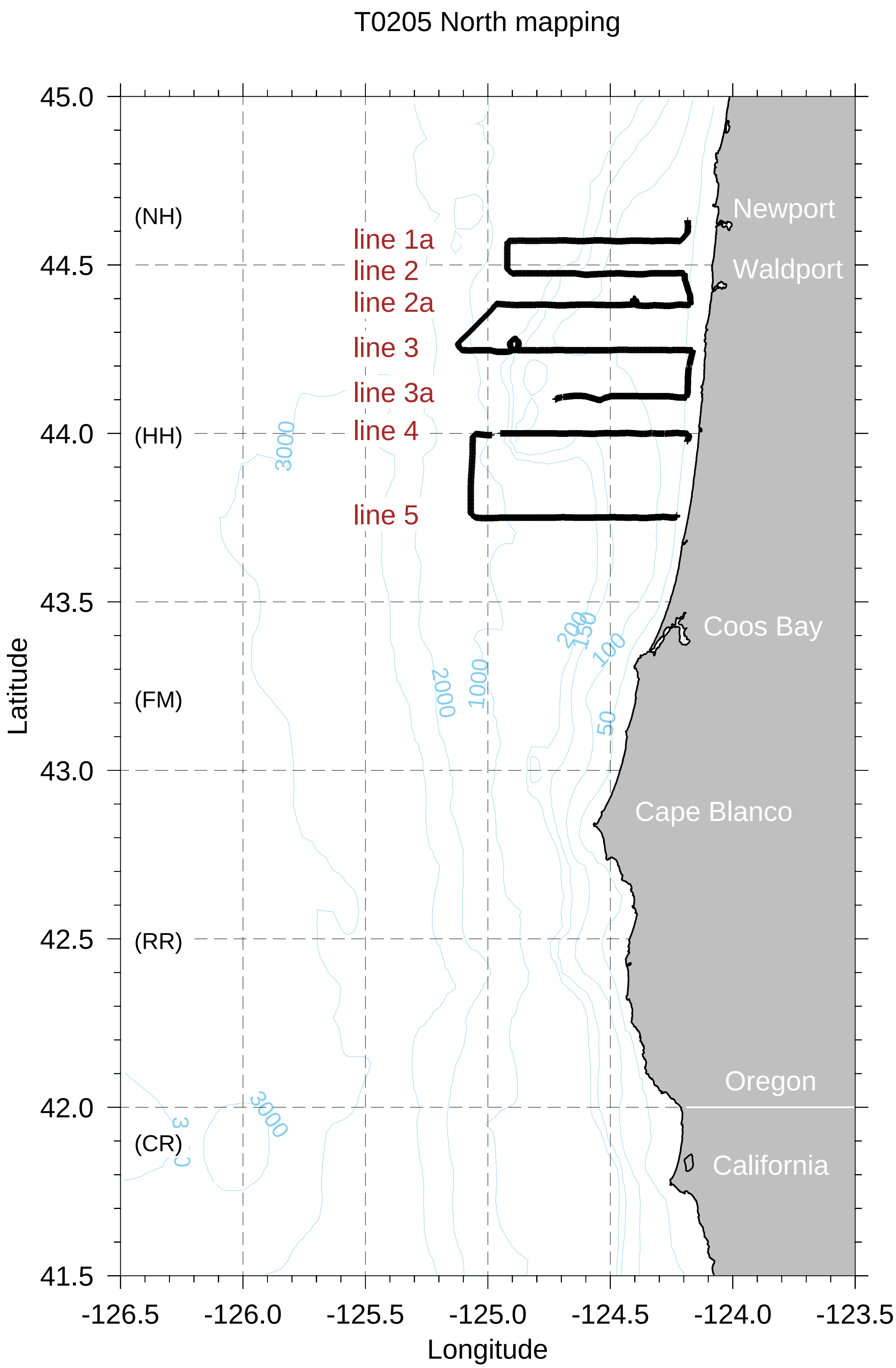

Figure 4b: Cruise tracks during the T0205 SeaSoar surveys. See Table 6 for individual line start and stop times.

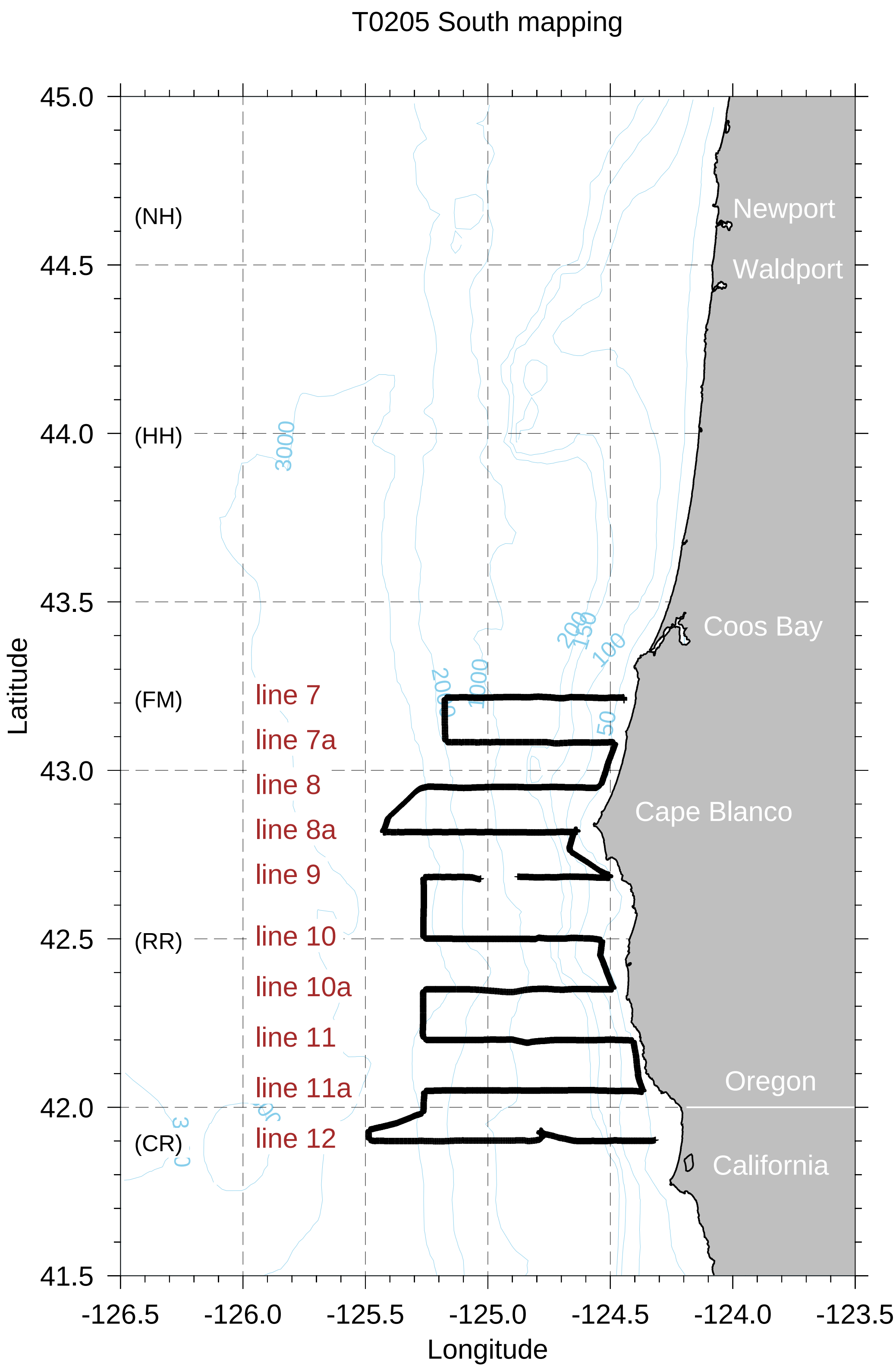

Figure 4c: Cruise tracks during the T0205 SeaSoar surveys. See Table 6 for individual line start and stop times.

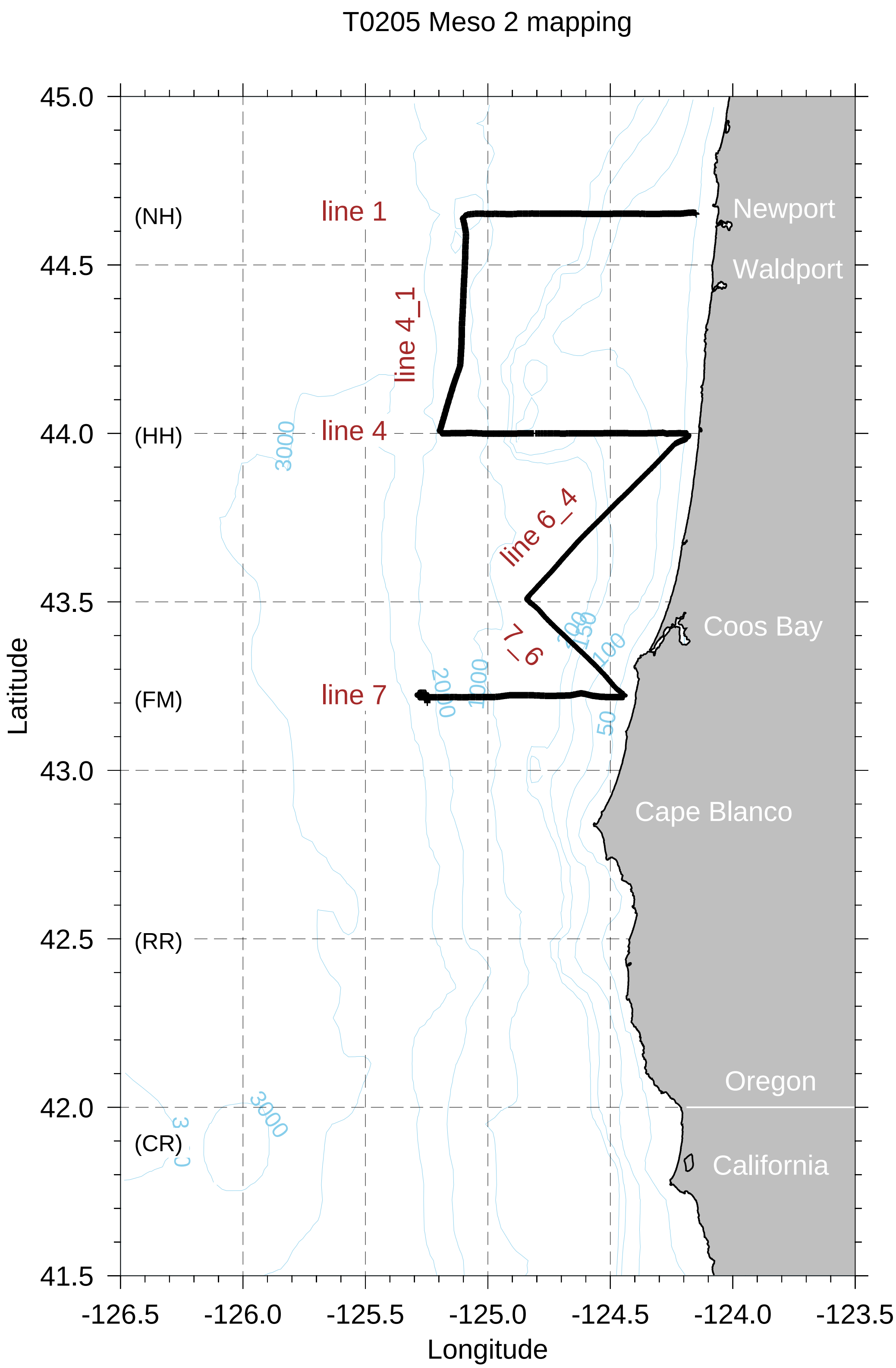

Figure 4d: Cruise tracks during the T0205 SeaSoar surveys. See Table 6 for individual line start and stop times.

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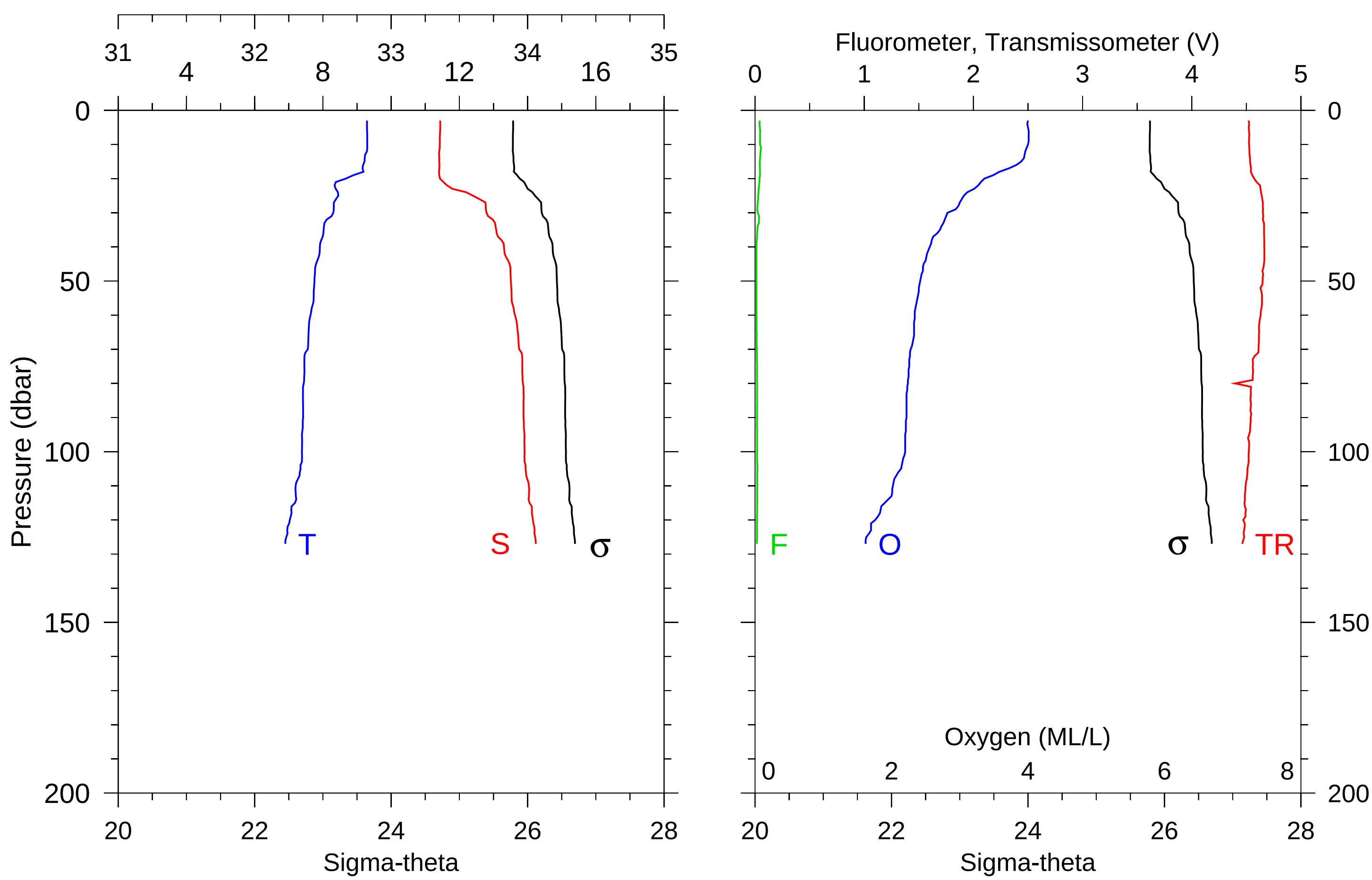
CTD Data

Profiles of Temperature, Salinity, and Density Anomaly

Profiles of Fluorescence, Light Transmission, Oxygen, and Density Anomaly

Tabulated Values at Standard Depths

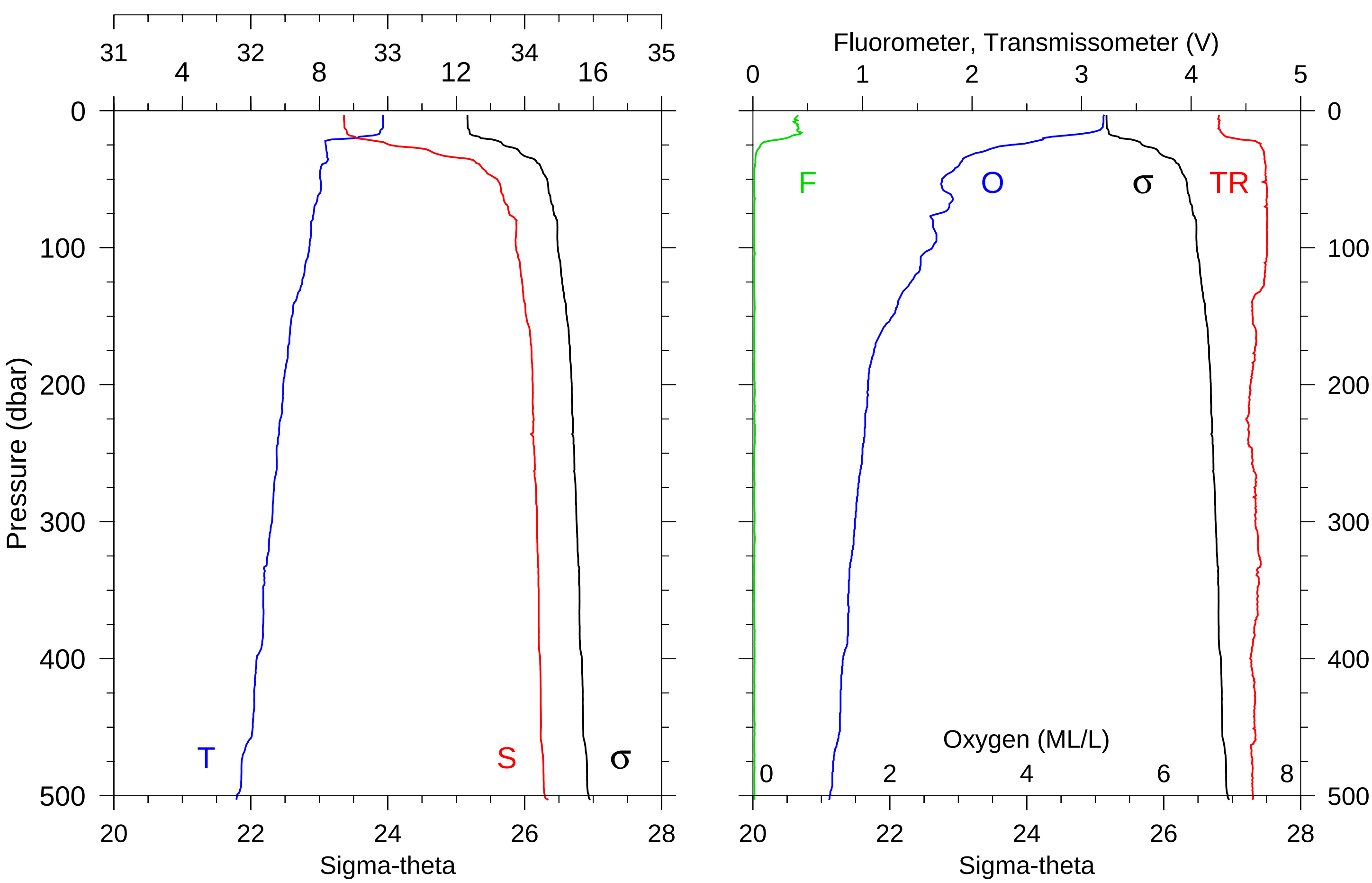
Station 1



STA NO LAT: 42 29.9 N LONG: 124 42.3 W
06 Jun 2002 0515 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	9.292	33.359	9.292	25.787	0.066	0.04	4.52
10	9.299	33.356	9.298	25.784	0.220	0.05	4.53
20	8.669	33.358	8.667	25.885	0.439	0.04	4.57
30	8.304	33.699	8.301	26.207	0.630	0.02	4.65
40	7.911	33.827	7.907	26.367	0.802	0.01	4.66
50	7.753	33.877	7.748	26.429	0.964	0.01	4.65
60	7.635	33.907	7.630	26.470	1.123	0.01	4.63
70	7.557	33.938	7.551	26.505	1.277	0.02	4.61
80	7.438	33.965	7.430	26.544	1.427	0.02	4.40
90	7.420	33.970	7.411	26.550	1.576	0.02	4.54
100	7.384	33.978	7.375	26.562	1.724	0.02	4.52
110	7.201	34.009	7.191	26.612	1.871	0.02	4.49
120	7.029	34.039	7.018	26.659	2.012	0.02	4.47
127	6.899	34.060	6.888	26.694	2.108	0.02	4.46

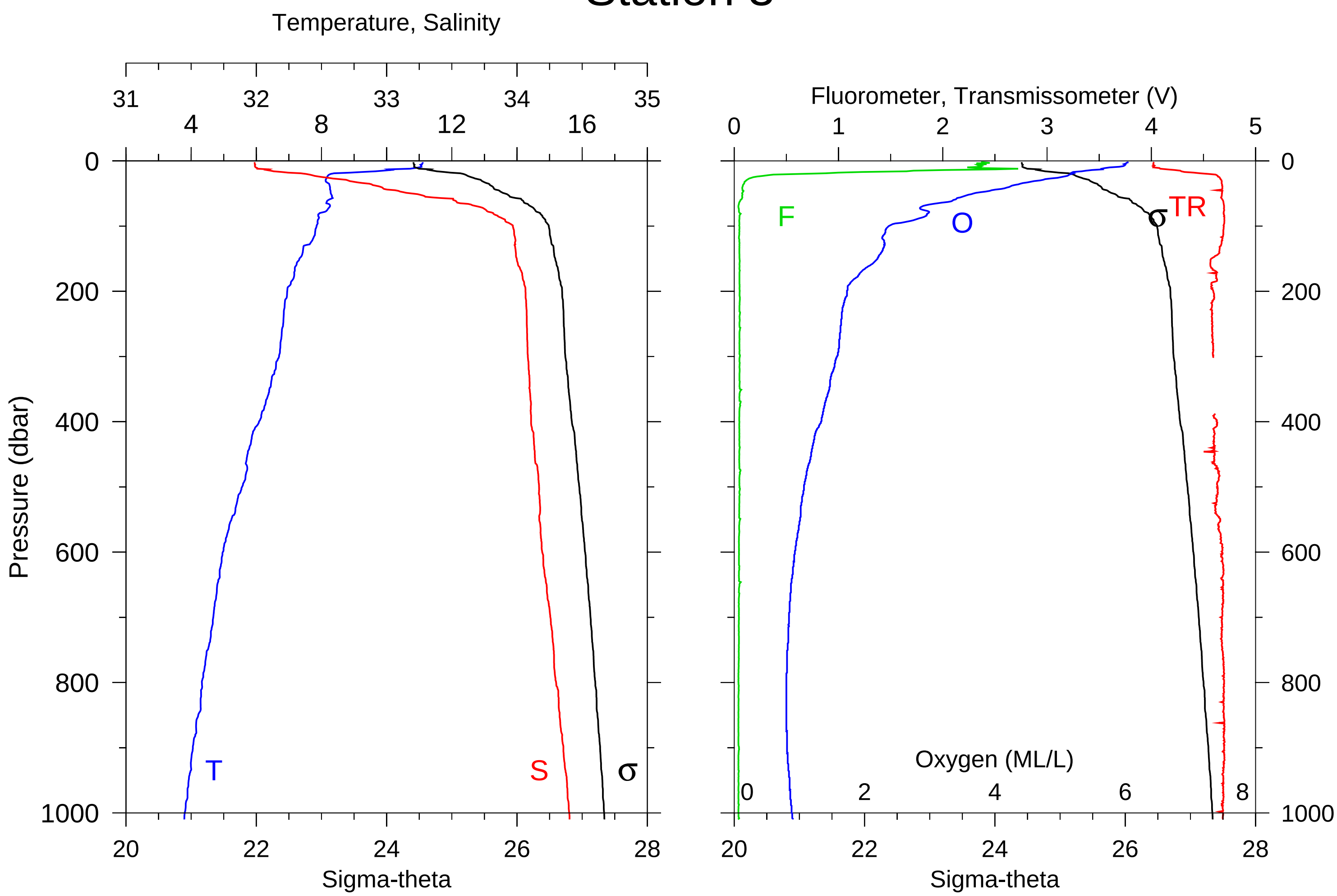
Station 2



STA NO LAT: 42 29.9 N LONG: 124 48.4 W
06 Jun 2002 0638 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	9.864	32.681	9.864	25.164	0.084	0.41	4.26
10	9.865	32.683	9.863	25.166	0.279	0.41	4.25
20	9.092	32.766	9.090	25.356	0.554	0.31	4.39
30	8.216	33.321	8.213	25.924	0.781	0.03	4.66
40	8.067	33.676	8.063	26.225	0.973	0.02	4.68
50	8.033	33.800	8.028	26.328	1.148	0.01	4.68
60	8.028	33.831	8.022	26.352	1.316	0.01	4.69
70	7.856	33.878	7.849	26.415	1.481	0.01	4.67
80	7.792	33.942	7.784	26.475	1.640	0.01	4.70
90	7.756	33.938	7.747	26.477	1.796	0.01	4.69
100	7.708	33.938	7.698	26.484	1.952	0.01	4.69
110	7.606	33.963	7.595	26.519	2.107	0.01	4.69
120	7.550	33.973	7.539	26.534	2.258	0.01	4.67
130	7.447	33.986	7.434	26.559	2.408	0.01	4.64
140	7.271	33.999	7.258	26.595	2.555	0.01	4.56
150	7.197	34.012	7.183	26.615	2.700	0.01	4.56
175	7.082	34.050	7.065	26.661	3.053	0.01	4.58
200	6.949	34.059	6.930	26.687	3.400	0.01	4.54
225	6.861	34.066	6.840	26.705	3.744	0.01	4.50
250	6.752	34.070	6.729	26.723	4.084	0.01	4.56
275	6.680	34.082	6.655	26.742	4.420	0.01	4.58
300	6.618	34.090	6.591	26.757	4.752	0.01	4.59
350	6.366	34.102	6.335	26.800	5.404	0.01	4.61
400	6.172	34.112	6.137	26.834	6.048	0.01	4.54
450	6.058	34.119	6.019	26.854	6.675	0.01	4.58
500	5.594	34.146	5.552	26.934	7.280	0.01	4.56
503	5.582	34.173	5.539	26.956	7.315	0.01	4.56

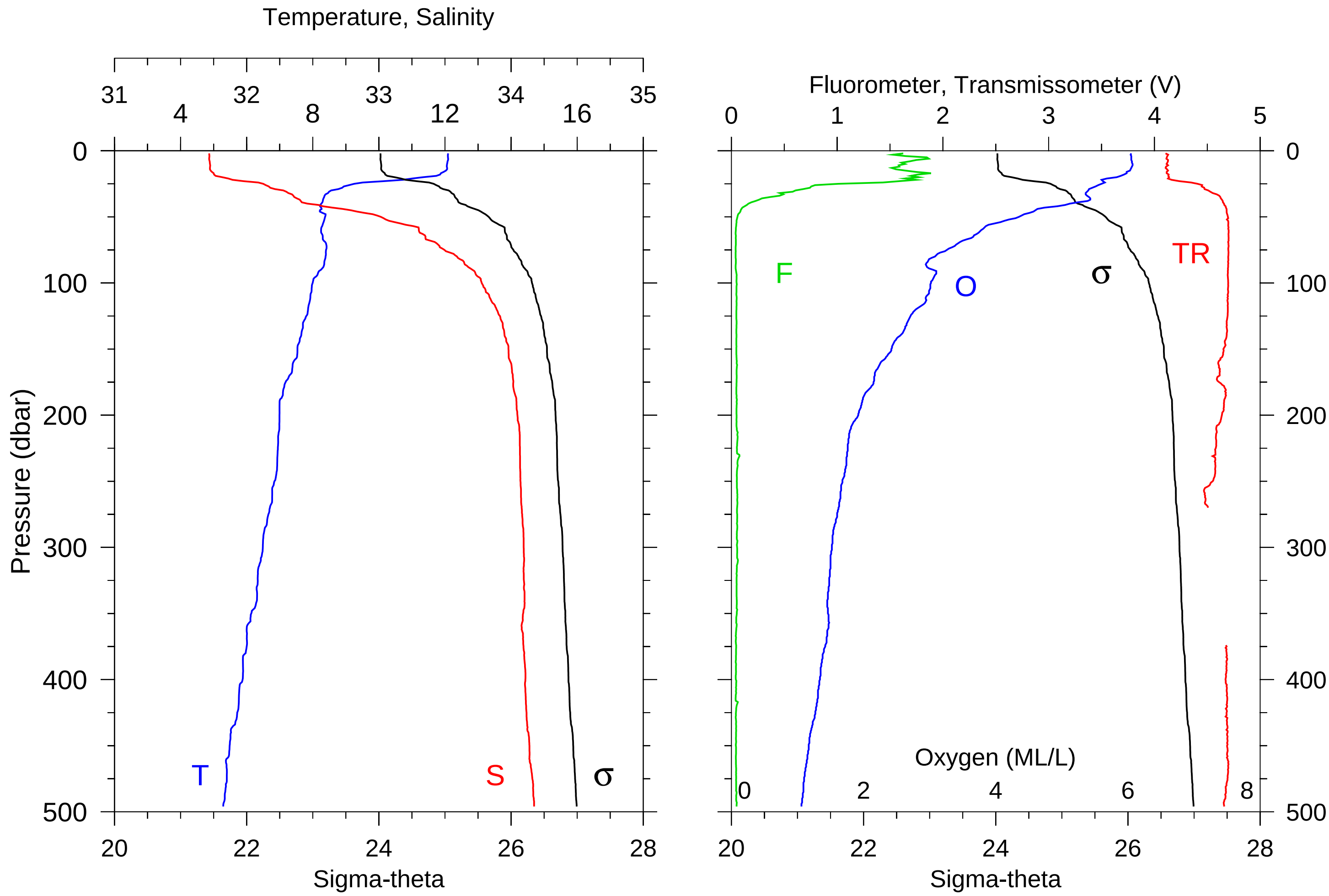
Station 3



STA NO LAT: 42 30.0 N LONG: 124 54.3 W
06 Jun 2002 0816 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
2	11.107	31.988	11.107	24.413	0.070	2.37	4.03
10	10.993	31.995	10.992	24.438	0.350	2.24	4.02
20	8.285	32.380	8.283	25.176	0.668	0.63	4.55
30	8.129	32.704	8.126	25.453	0.934	0.11	4.67
40	8.261	32.956	8.257	25.631	1.178	0.08	4.68
50	8.286	33.194	8.281	25.814	1.406	0.08	4.68
60	8.212	33.511	8.206	26.074	1.613	0.06	4.68
70	8.258	33.701	8.251	26.217	1.801	0.04	4.70
80	7.944	33.817	7.937	26.355	1.975	0.05	4.69
90	7.892	33.908	7.883	26.434	2.139	0.05	4.70
100	7.850	33.968	7.840	26.487	2.297	0.05	4.70
110	7.803	33.978	7.793	26.502	2.452	0.05	4.69
120	7.733	33.987	7.721	26.519	2.605	0.05	4.68
130	7.463	33.983	7.450	26.555	2.757	0.05	4.67
140	7.427	33.991	7.414	26.566	2.905	0.05	4.65
150	7.321	33.998	7.307	26.587	3.053	0.05	4.57
175	7.164	34.040	7.148	26.643	3.412	0.05	4.62
200	6.948	34.065	6.930	26.692	3.760	0.05	4.59
225	6.866	34.072	6.846	26.709	4.102	0.05	4.58
250	6.824	34.075	6.801	26.718	4.441	0.05	4.58
275	6.754	34.079	6.729	26.730	4.778	0.05	4.59
300	6.698	34.083	6.671	26.741	5.114	0.05	4.59
350	6.402	34.097	6.371	26.792	5.772	0.05	-----
400	6.081	34.108	6.046	26.842	6.409	0.05	4.63
450	5.729	34.136	5.691	26.908	7.018	0.05	4.61
500	5.561	34.169	5.520	26.956	7.606	0.05	4.63
600	4.969	34.193	4.921	27.045	8.721	0.05	4.68
700	4.679	34.256	4.624	27.128	9.760	0.05	4.66
800	4.330	34.300	4.269	27.201	10.731	0.04	4.70
900	4.052	34.356	3.984	27.276	11.639	0.05	4.70
1010	3.793	34.403	3.718	27.340	12.566	0.05	4.69

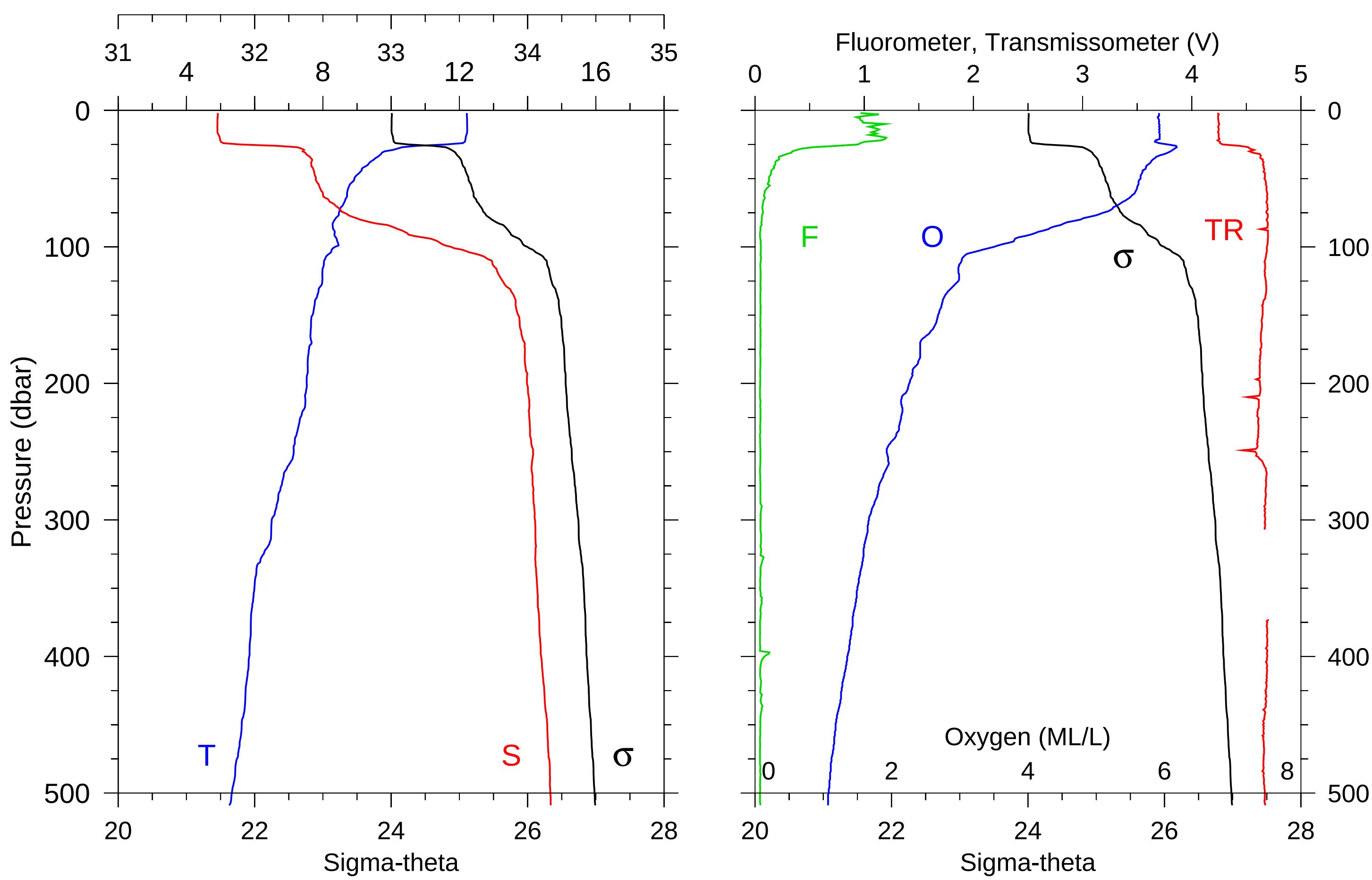
Station 4



STA NO LAT: 42 29.9 N LONG: 124 59.9 W
06 Jun 2002 0953 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
2	12.097	31.716	12.097	24.023	0.078	1.62	4.11
10	12.063	31.722	12.061	24.034	0.388	1.64	4.11
20	11.335	31.815	11.333	24.238	0.771	1.77	4.14
30	8.557	32.277	8.554	25.055	1.093	0.61	4.51
40	8.259	32.460	8.256	25.242	1.374	0.16	4.66
50	8.372	33.015	8.366	25.661	1.624	0.06	4.70
60	8.251	33.302	8.245	25.905	1.844	0.04	4.70
70	8.400	33.437	8.393	25.989	2.051	0.04	4.70
80	8.386	33.591	8.378	26.112	2.248	0.04	4.70
90	8.248	33.707	8.238	26.223	2.434	0.04	4.70
100	7.996	33.778	7.986	26.316	2.609	0.05	4.70
110	7.927	33.835	7.917	26.371	2.778	0.05	4.70
120	7.857	33.890	7.845	26.425	2.942	0.05	4.69
130	7.704	33.935	7.691	26.483	3.101	0.05	4.68
140	7.648	33.951	7.634	26.504	3.256	0.05	4.68
150	7.536	33.980	7.522	26.543	3.409	0.05	4.65
175	7.178	34.017	7.161	26.622	3.778	0.05	4.61
200	6.992	34.048	6.973	26.673	4.130	0.05	4.64
225	6.943	34.067	6.922	26.694	4.474	0.05	4.58
250	6.839	34.071	6.816	26.713	4.817	0.05	4.55
275	6.656	34.084	6.631	26.747	5.153	0.05	-----
300	6.488	34.095	6.462	26.779	5.482	0.05	-----
350	6.138	34.091	6.108	26.821	6.124	0.05	-----
400	5.876	34.108	5.842	26.868	6.747	0.04	4.67
450	5.484	34.139	5.447	26.940	7.346	0.04	4.69
496	5.289	34.174	5.248	26.992	7.870	0.05	4.66

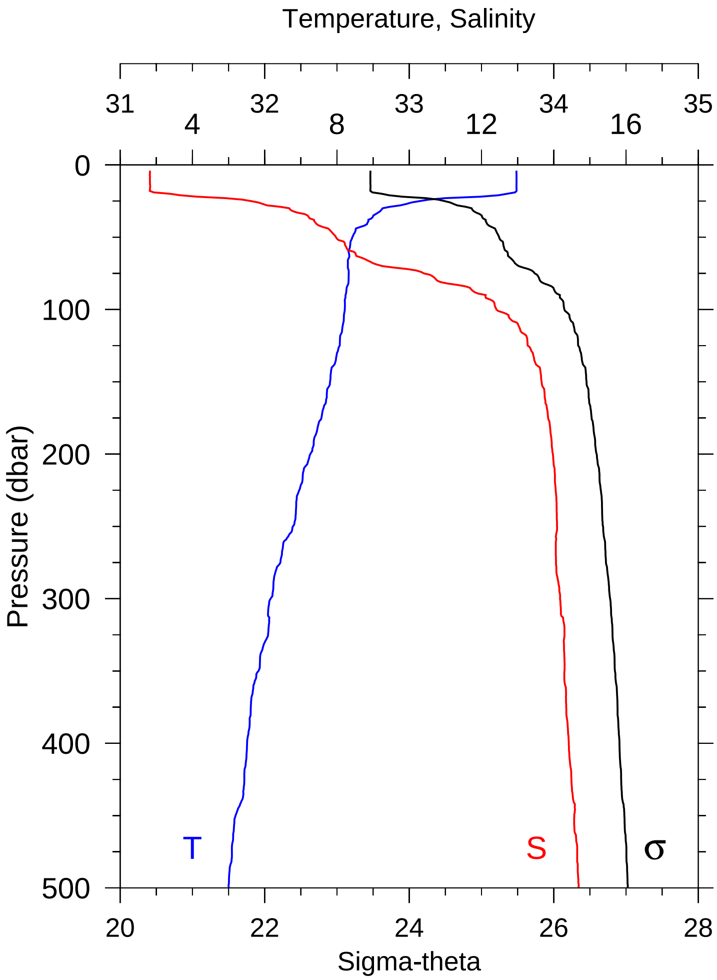
Station 5

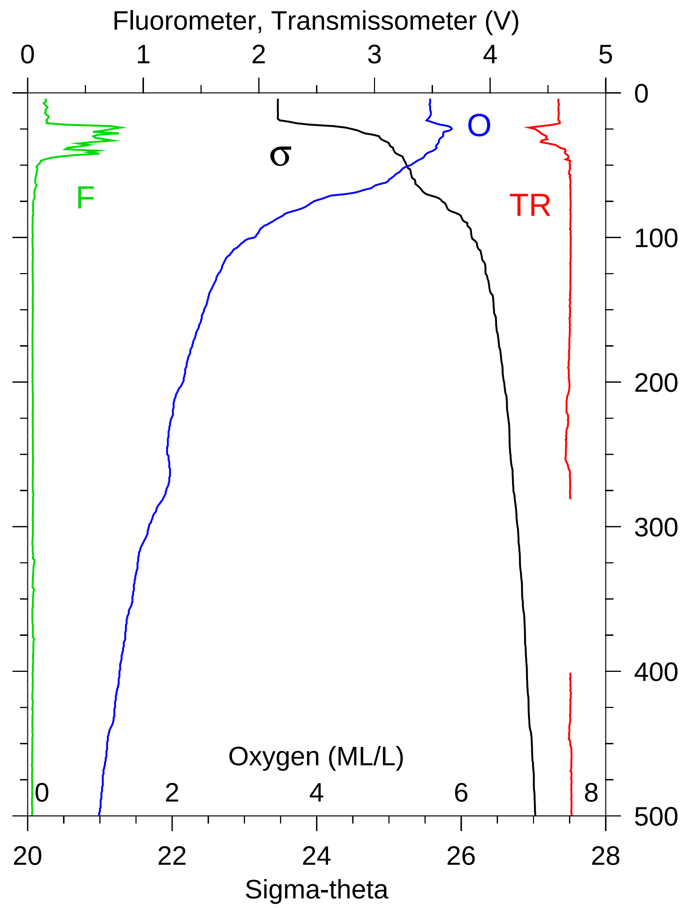


STA NO LAT: 42 30.1 N LONG: 125 12.2 W
06 Jun 2002 1148 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
2	12.220	31.729	12.220	24.009	0.078	0.97	4.24
10	12.227	31.727	12.226	24.007	0.389	1.19	4.25
20	12.184	31.744	12.182	24.028	0.779	1.20	4.25
30	9.809	32.352	9.806	24.917	1.131	0.34	4.53
40	9.315	32.416	9.310	25.047	1.426	0.18	4.65
50	8.921	32.448	8.916	25.134	1.713	0.13	4.66
60	8.710	32.498	8.703	25.206	1.993	0.09	4.69
70	8.570	32.594	8.563	25.302	2.265	0.07	4.69
80	8.351	32.772	8.343	25.475	2.526	0.06	4.68
90	8.344	33.119	8.335	25.748	2.761	0.05	4.70
100	8.354	33.439	8.344	25.997	2.975	0.05	4.69
110	8.037	33.736	8.026	26.277	3.162	0.05	4.67
120	7.982	33.787	7.970	26.326	3.335	0.05	4.67
130	7.892	33.859	7.880	26.396	3.504	0.05	4.68
140	7.765	33.913	7.751	26.457	3.665	0.05	4.66
150	7.693	33.932	7.678	26.482	3.823	0.05	4.65
175	7.591	33.980	7.574	26.535	4.208	0.05	4.63
200	7.525	33.995	7.506	26.557	4.586	0.05	4.62
225	7.339	34.013	7.318	26.597	4.958	0.05	4.61
250	7.145	34.040	7.121	26.646	5.320	0.05	4.58
275	6.781	34.038	6.756	26.694	5.671	0.05	4.68
300	6.499	34.054	6.473	26.744	6.011	0.05	4.67
350	5.991	34.071	5.961	26.823	6.662	0.05	-----
400	5.840	34.099	5.806	26.865	7.284	0.09	4.69
450	5.619	34.144	5.582	26.928	7.886	0.05	4.65
500	5.329	34.167	5.289	26.981	8.462	0.05	4.67
509	5.254	34.170	5.213	26.993	8.563	0.05	4.68

Station 6

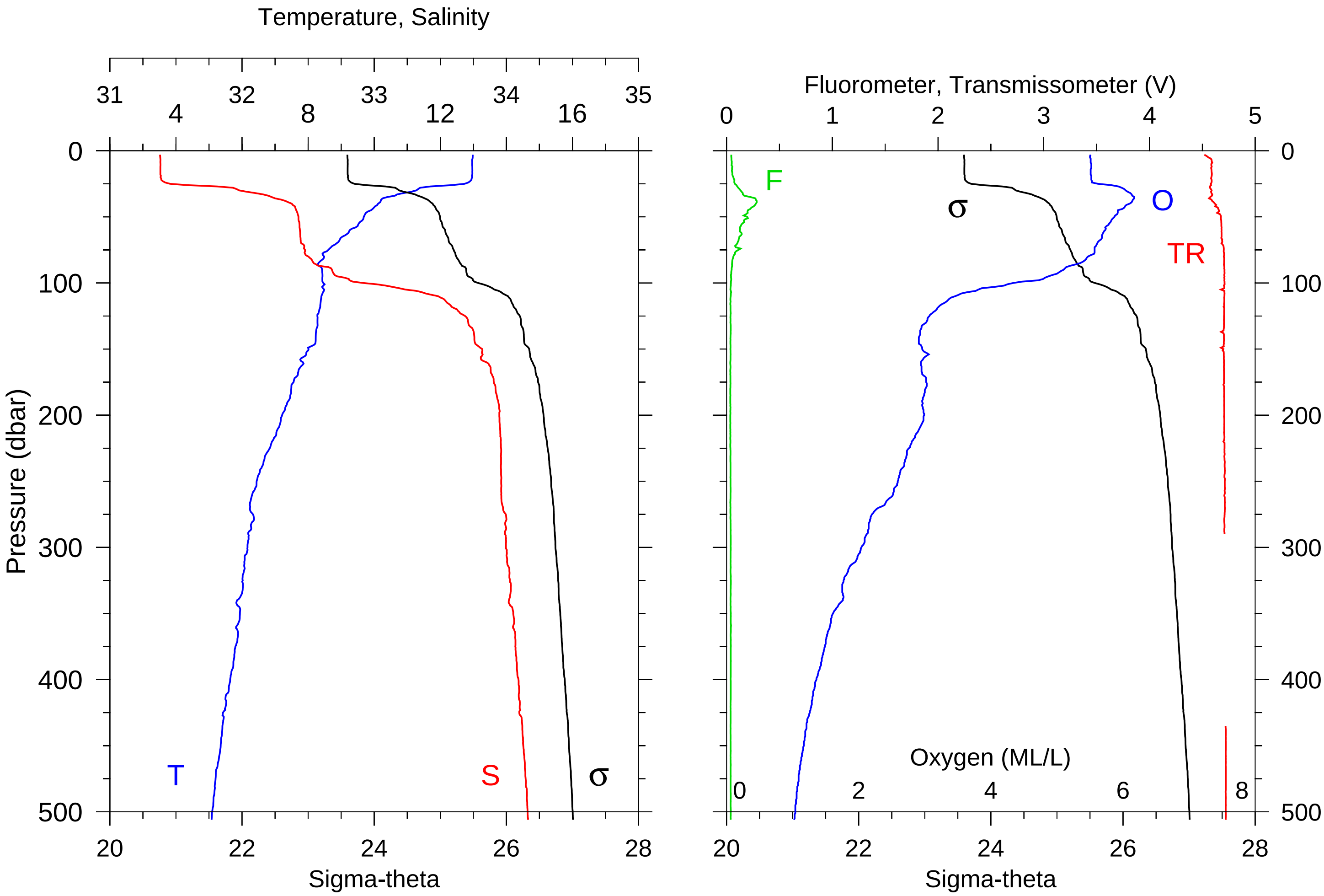




STA NO LAT: 42 30.1 N LONG: 125 36.1 W
06 Jun 2002 1453 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
4	12.968	31.206	12.967	23.463	0.177	0.15	4.59
10	12.969	31.205	12.968	23.462	0.441	0.17	4.59
20	12.703	31.347	12.700	23.623	0.882	0.17	4.60
30	9.263	32.170	9.260	24.863	1.238	0.57	4.49
40	8.844	32.352	8.839	25.070	1.536	0.61	4.65
50	8.425	32.493	8.421	25.244	1.815	0.09	4.69
60	8.318	32.614	8.312	25.355	2.082	0.07	4.69
70	8.302	32.815	8.295	25.515	2.338	0.06	4.69
80	8.321	33.193	8.313	25.809	2.566	0.05	4.70
90	8.237	33.529	8.228	26.085	2.771	0.04	4.69
100	8.216	33.603	8.206	26.147	2.961	0.04	4.70
110	8.167	33.752	8.156	26.271	3.142	0.04	4.70
120	8.083	33.816	8.072	26.334	3.316	0.04	4.70
130	8.001	33.855	7.988	26.377	3.485	0.04	4.69
140	7.857	33.903	7.843	26.436	3.649	0.05	4.69
150	7.807	33.916	7.793	26.454	3.809	0.05	4.69
175	7.569	33.961	7.552	26.524	4.199	0.04	4.68
200	7.263	33.994	7.244	26.593	4.573	0.04	4.68
225	6.955	34.013	6.934	26.651	4.932	0.05	4.68
250	6.780	34.023	6.757	26.682	5.282	0.05	4.66
275	6.434	34.015	6.409	26.722	5.624	0.05	4.69
300	6.162	34.043	6.136	26.780	5.955	0.05	-----
350	5.828	34.074	5.798	26.846	6.588	0.05	-----
400	5.511	34.104	5.479	26.909	7.193	0.05	-----
450	5.192	34.142	5.155	26.977	7.773	0.04	4.69
500	5.003	34.172	4.963	27.023	8.324	0.04	4.71

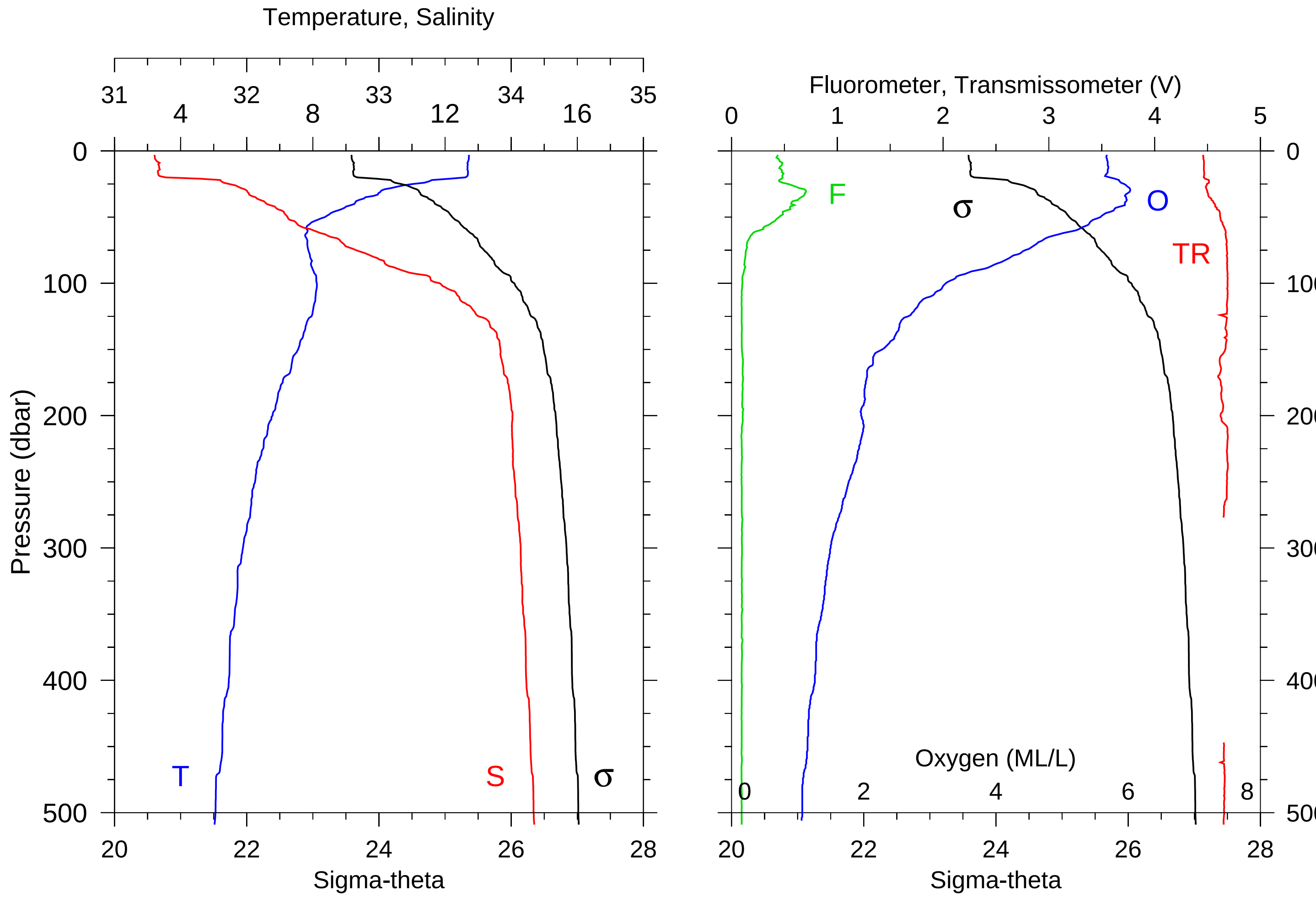
Station 7



STA NO LAT: 42 12.2 N LONG: 125 36.2 W
06 Jun 2002 1831 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	12.983	31.379	12.983	23.593	0.129	0.05	4.52
10	12.966	31.383	12.964	23.600	0.429	0.05	4.59
20	12.967	31.383	12.965	23.600	0.857	0.06	4.59
30	11.274	31.979	11.271	24.377	1.259	0.13	4.59
40	10.119	32.376	10.115	24.885	1.584	0.28	4.62
50	9.684	32.427	9.678	24.996	1.884	0.19	4.68
60	9.263	32.438	9.256	25.073	2.178	0.13	4.68
70	8.862	32.448	8.855	25.143	2.463	0.10	4.68
80	8.485	32.502	8.477	25.242	2.740	0.06	4.70
90	8.422	32.680	8.413	25.392	3.007	0.05	4.71
100	8.459	32.916	8.449	25.572	3.261	0.04	4.71
110	8.402	33.484	8.390	26.025	3.479	0.04	4.71
120	8.340	33.627	8.328	26.147	3.673	0.04	4.71
130	8.283	33.712	8.270	26.222	3.856	0.04	4.70
140	8.232	33.757	8.218	26.265	4.035	0.04	4.70
150	8.013	33.818	7.998	26.346	4.210	0.04	4.70
175	7.560	33.905	7.544	26.480	4.619	0.04	4.70
200	7.213	33.947	7.194	26.563	5.001	0.04	4.71
225	6.839	33.960	6.818	26.625	5.369	0.04	4.71
250	6.442	33.961	6.420	26.678	5.722	0.04	4.71
275	6.331	33.996	6.307	26.720	6.064	0.04	4.71
300	6.166	33.997	6.140	26.743	6.400	0.04	-----
350	5.936	34.052	5.906	26.816	7.050	0.04	-----
400	5.640	34.092	5.606	26.884	7.672	0.04	-----
450	5.353	34.128	5.317	26.947	8.261	0.04	4.72
500	5.094	34.161	5.054	27.004	8.824	0.04	4.72
506	5.078	34.164	5.038	27.008	8.890	0.04	4.72

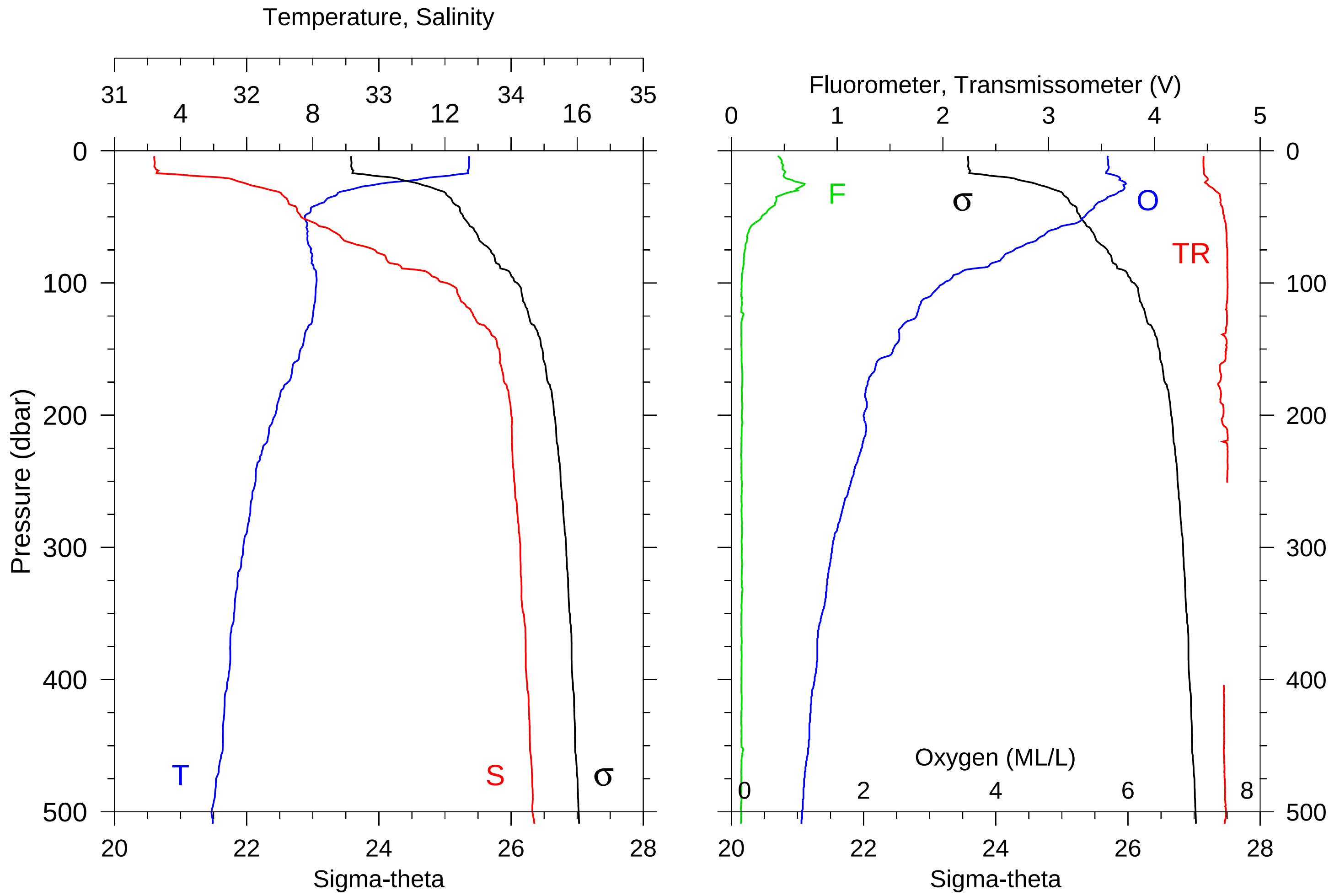
Station 8



STA NO LAT: 44 0.4 N LONG: 124 58.3 W
11 Jun 2002 1710 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	12.724	31.302	12.724	23.584	0.129	0.44	4.46
10	12.688	31.331	12.686	23.613	0.429	0.48	4.47
20	12.615	31.386	12.612	23.670	0.856	0.48	4.46
30	10.069	32.001	10.066	24.601	1.218	0.70	4.50
40	9.259	32.150	9.255	24.848	1.540	0.56	4.57
50	8.364	32.309	8.359	25.109	1.835	0.45	4.62
60	7.841	32.503	7.835	25.337	2.109	0.27	4.67
70	7.831	32.730	7.824	25.517	2.363	0.15	4.68
80	7.915	32.958	7.907	25.684	2.602	0.13	4.68
90	8.006	33.168	7.997	25.836	2.827	0.12	4.69
100	8.120	33.460	8.110	26.048	3.032	0.10	4.69
110	8.080	33.604	8.069	26.168	3.223	0.09	4.69
120	8.009	33.710	7.997	26.261	3.405	0.10	4.68
130	7.811	33.835	7.799	26.389	3.576	0.10	4.68
140	7.704	33.893	7.691	26.450	3.738	0.10	4.68
150	7.556	33.918	7.542	26.491	3.895	0.10	4.67
175	7.089	33.973	7.072	26.600	4.273	0.11	4.62
200	6.779	34.010	6.761	26.672	4.628	0.11	4.62
225	6.497	34.012	6.477	26.711	4.971	0.10	4.68
250	6.253	34.028	6.231	26.756	5.304	0.09	4.68
275	6.104	34.048	6.081	26.791	5.629	0.10	4.65
300	5.886	34.072	5.861	26.837	5.944	0.10	-----
350	5.636	34.091	5.607	26.883	6.555	0.10	-----
400	5.459	34.114	5.426	26.923	7.145	0.09	-----
450	5.260	34.146	5.224	26.972	7.716	0.10	4.66
500	5.054	34.170	5.014	27.015	8.269	0.09	4.66
509	5.024	34.175	4.983	27.023	8.367	0.09	4.65

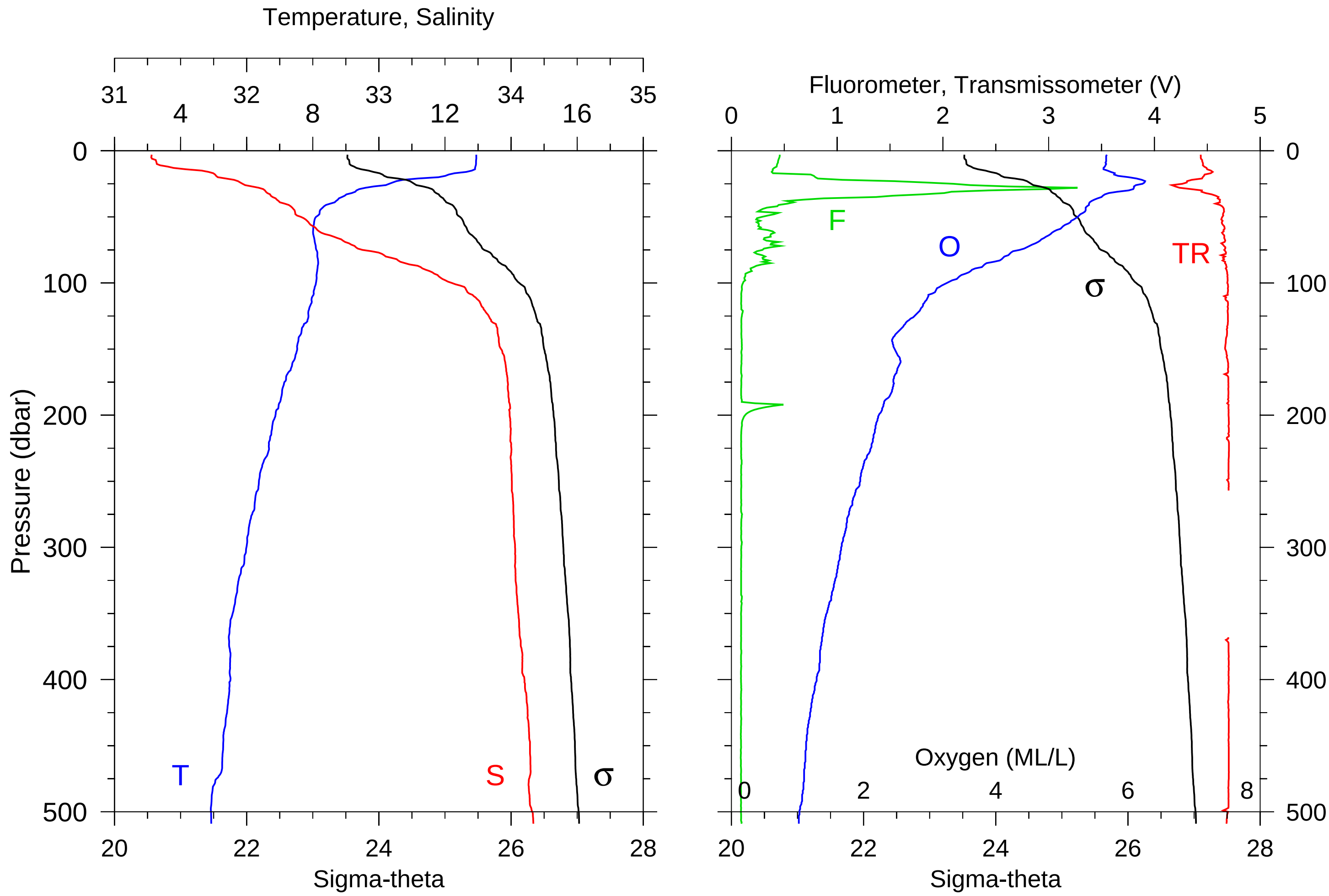
Station 9



STA NO LAT: 44 0.1 N LONG: 124 58.3 W
11 Jun 2002 1748 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
4	12.729	31.302	12.729	23.582	0.172	0.44	4.46
10	12.726	31.304	12.725	23.585	0.430	0.48	4.46
20	11.604	31.781	11.601	24.163	0.851	0.50	4.49
30	9.033	32.194	9.030	24.918	1.186	0.63	4.57
40	8.207	32.316	8.203	25.137	1.476	0.41	4.63
50	7.759	32.412	7.754	25.277	1.750	0.28	4.66
60	7.835	32.637	7.829	25.443	2.012	0.17	4.68
70	7.860	32.803	7.853	25.570	2.260	0.14	4.68
80	7.975	33.050	7.968	25.747	2.492	0.12	4.69
90	8.069	33.288	8.061	25.920	2.713	0.11	4.69
100	8.109	33.512	8.099	26.091	2.913	0.10	4.69
110	8.078	33.606	8.068	26.170	3.101	0.09	4.69
120	8.023	33.693	8.011	26.246	3.284	0.09	4.68
130	7.970	33.746	7.957	26.295	3.460	0.09	4.69
140	7.757	33.859	7.743	26.416	3.627	0.09	4.66
150	7.632	33.910	7.618	26.474	3.786	0.10	4.68
175	7.251	33.948	7.235	26.558	4.171	0.10	4.62
200	6.862	34.002	6.844	26.654	4.530	0.10	4.65
225	6.489	34.008	6.470	26.709	4.875	0.09	4.69
250	6.269	34.023	6.248	26.750	5.209	0.10	4.69
275	6.099	34.048	6.075	26.791	5.534	0.10	-----
300	5.899	34.070	5.873	26.834	5.850	0.10	-----
350	5.615	34.094	5.586	26.888	6.463	0.09	-----
400	5.435	34.118	5.403	26.929	7.052	0.09	-----
450	5.277	34.143	5.241	26.968	7.623	0.09	4.66
500	4.936	34.162	4.897	27.023	8.176	0.09	4.68
509	4.978	34.176	4.938	27.030	8.273	0.09	4.66

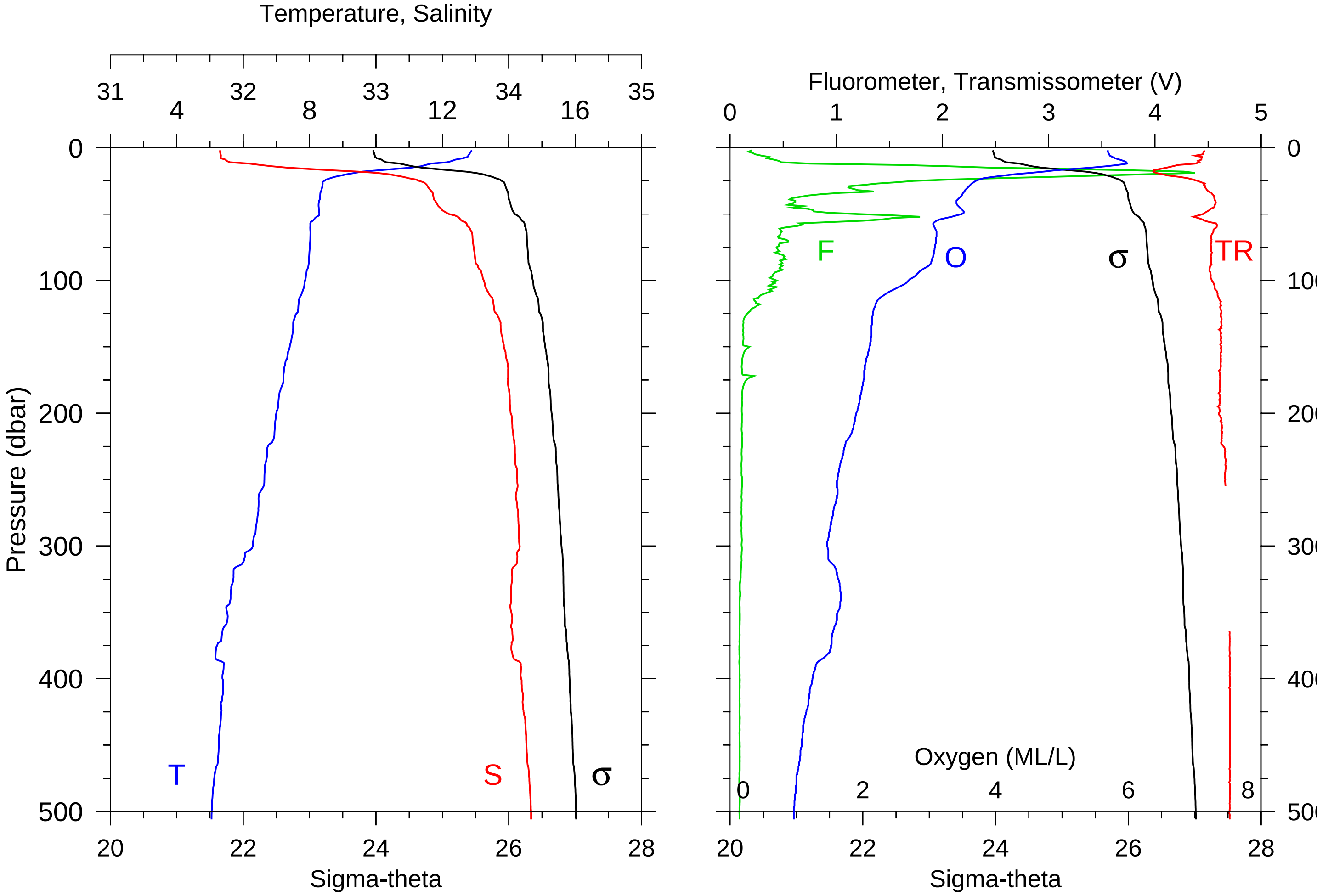
Station 10



STA NO　　LAT: 43 55.9 N　　LONG: 125 0.3 W
12 Jun 2002　　0105 GMT　　DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	12.947	31.281	12.947	23.524	0.131	0.46	4.44
10	12.939	31.320	12.938	23.556	0.435	0.43	4.46
20	11.805	31.781	11.803	24.127	0.841	0.79	4.46
30	9.320	32.138	9.317	24.829	1.179	2.43	4.45
40	8.528	32.287	8.524	25.067	1.480	0.53	4.58
50	8.098	32.410	8.093	25.227	1.761	0.29	4.64
60	8.012	32.535	8.007	25.338	2.029	0.34	4.65
70	8.069	32.774	8.062	25.517	2.284	0.38	4.63
80	8.138	33.052	8.130	25.726	2.522	0.32	4.67
90	8.136	33.354	8.127	25.963	2.737	0.18	4.68
100	8.095	33.552	8.085	26.124	2.934	0.11	4.69
110	7.994	33.718	7.983	26.270	3.116	0.09	4.66
120	7.887	33.793	7.875	26.345	3.288	0.09	4.70
130	7.802	33.863	7.790	26.412	3.454	0.09	4.69
140	7.605	33.902	7.592	26.471	3.613	0.09	4.68
150	7.529	33.924	7.515	26.499	3.769	0.10	4.67
175	7.141	33.975	7.125	26.594	4.145	0.09	4.70
200	6.871	33.989	6.853	26.643	4.505	0.13	4.70
225	6.675	34.002	6.655	26.680	4.854	0.09	4.70
250	6.370	34.006	6.348	26.723	5.196	0.09	4.70
275	6.166	34.018	6.142	26.759	5.529	0.10	-----
300	5.991	34.030	5.966	26.791	5.854	0.09	-----
350	5.575	34.055	5.547	26.862	6.483	0.09	-----
400	5.508	34.101	5.475	26.907	7.083	0.09	4.70
450	5.288	34.143	5.252	26.966	7.663	0.09	4.70
500	4.920	34.160	4.881	27.023	8.221	0.09	4.70
509	4.928	34.169	4.888	27.029	8.318	0.09	4.68

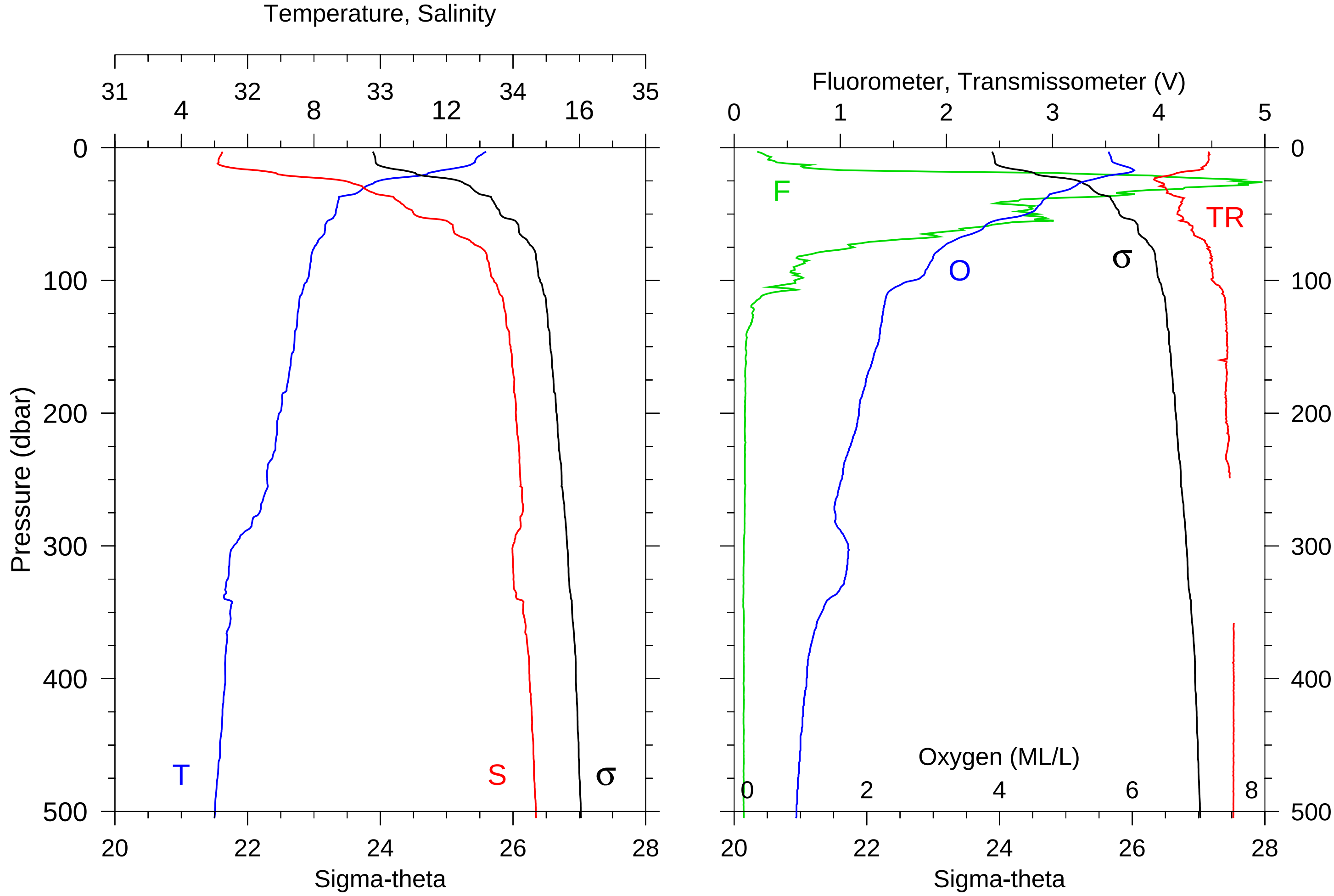
Station 11



STA NO LAT: 42 14.7 N LONG: 125 3.4 W
15 Jun 2002 1815 GMT DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
2	12.889	31.825	12.889	23.957	0.079	0.21	4.47
10	12.291	31.876	12.290	24.111	0.391	0.46	4.41
20	9.125	33.096	9.123	25.609	0.706	3.92	4.07
30	8.377	33.394	8.374	25.957	0.920	1.11	4.47
40	8.285	33.446	8.281	26.012	1.121	0.61	4.57
50	8.293	33.550	8.288	26.093	1.317	1.21	4.45
60	8.019	33.702	8.013	26.253	1.500	0.52	4.58
70	8.019	33.729	8.012	26.274	1.675	0.55	4.53
80	7.991	33.743	7.983	26.290	1.849	0.46	4.53
90	7.957	33.769	7.948	26.315	2.022	0.47	4.52
100	7.863	33.812	7.853	26.363	2.191	0.44	4.53
110	7.762	33.850	7.752	26.407	2.356	0.32	4.59
120	7.659	33.888	7.648	26.452	2.516	0.24	4.61
130	7.527	33.931	7.514	26.505	2.673	0.13	4.63
140	7.488	33.944	7.474	26.521	2.826	0.12	4.62
150	7.402	33.963	7.387	26.549	2.977	0.18	4.62
175	7.210	33.995	7.194	26.600	3.345	0.15	4.61
200	6.997	34.014	6.979	26.645	3.703	0.11	4.60
225	6.743	34.045	6.723	26.704	4.053	0.11	4.64
250	6.638	34.064	6.615	26.733	4.390	0.11	4.66
275	6.449	34.071	6.425	26.764	4.722	0.11	-----
300	6.295	34.083	6.269	26.794	5.047	0.11	-----
350	5.513	34.019	5.485	26.841	5.677	0.09	-----
400	5.374	34.093	5.342	26.916	6.281	0.09	4.70
450	5.266	34.133	5.230	26.961	6.861	0.09	4.71
500	5.051	34.167	5.011	27.014	7.417	0.09	4.70
506	5.046	34.168	5.006	27.015	7.483	0.09	4.70

Station 12

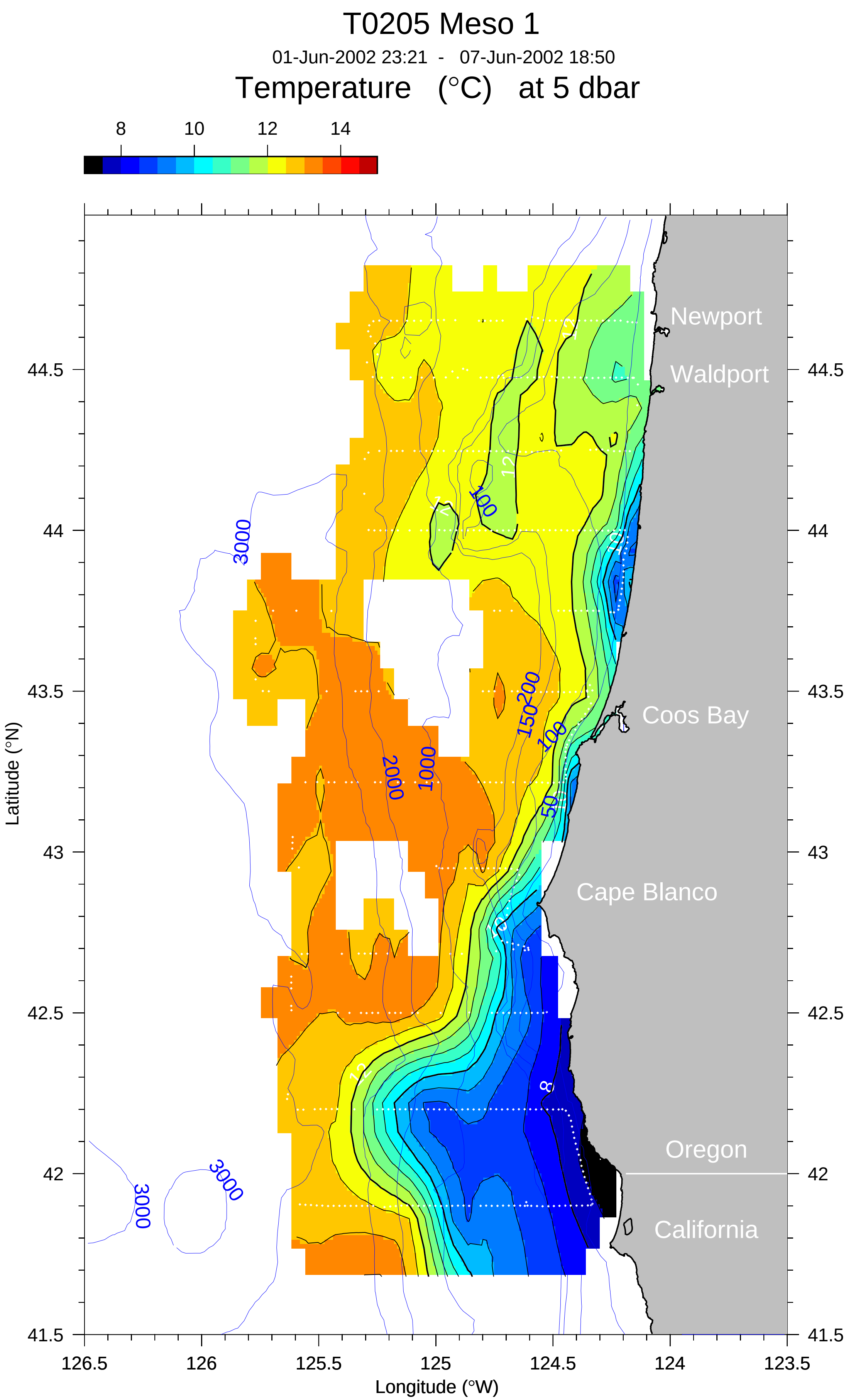


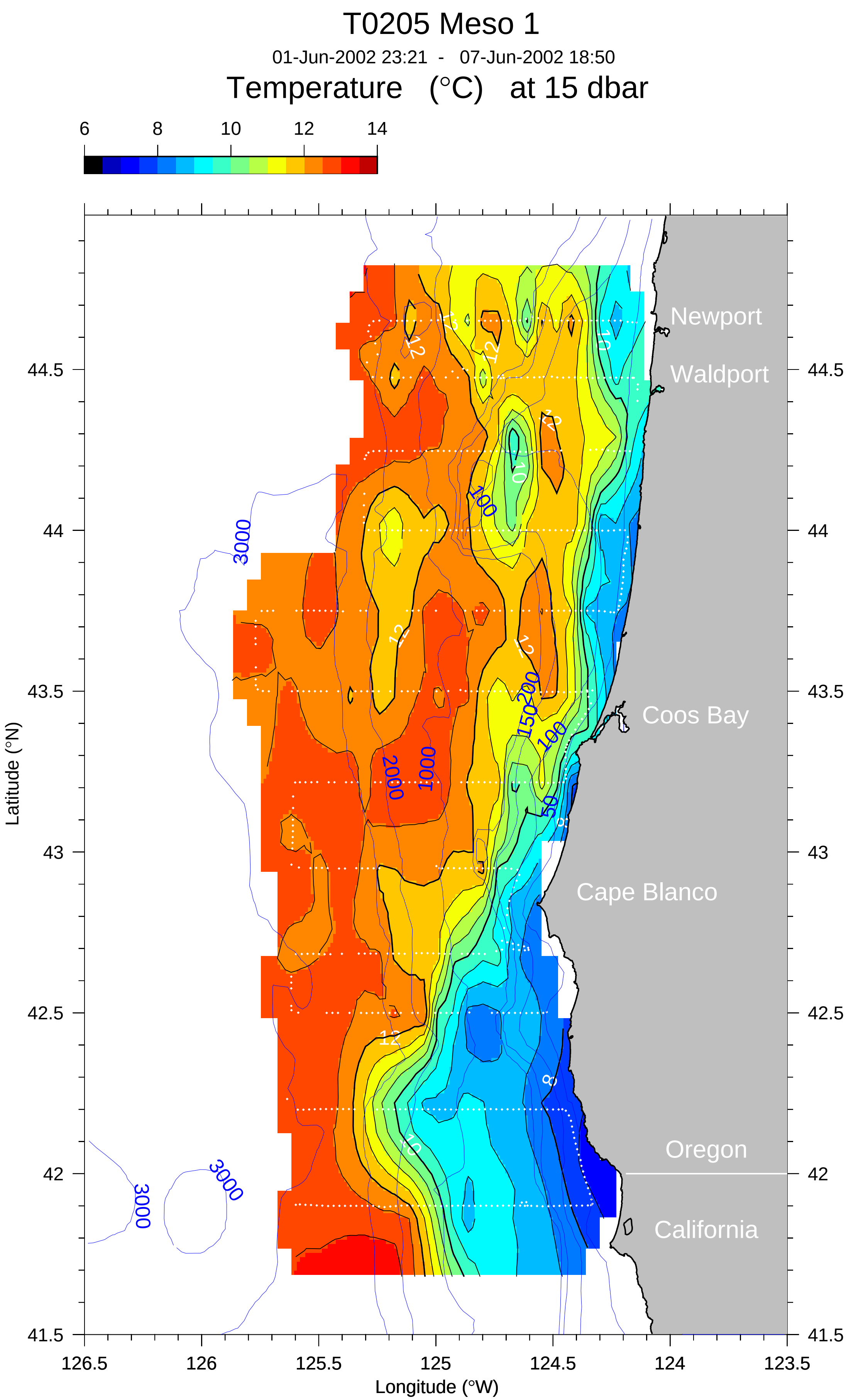
STA NO　　LAT: 42 10.3 N　　LONG: 125 5.1 W
15 Jun 2002　　2202 GMT　　DEPTH

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	13.189	31.811	13.189	23.888	0.120	0.22	4.47
10	12.858	31.780	12.856	23.928	0.399	0.38	4.47
20	11.413	32.227	11.410	24.544	0.774	3.39	4.14
30	9.518	32.870	9.515	25.369	1.061	4.25	4.06
40	8.732	33.132	8.728	25.698	1.306	2.68	4.22
50	8.650	33.254	8.645	25.807	1.529	2.86	4.18
60	8.337	33.547	8.331	26.084	1.732	2.27	4.32
70	8.125	33.678	8.118	26.219	1.921	1.43	4.43
80	7.930	33.800	7.922	26.343	2.095	0.74	4.49
90	7.881	33.822	7.872	26.368	2.262	0.56	4.49
100	7.789	33.856	7.779	26.408	2.427	0.57	4.50
110	7.637	33.899	7.627	26.463	2.587	0.31	4.60
120	7.542	33.932	7.531	26.504	2.741	0.16	4.63
130	7.494	33.948	7.482	26.523	2.894	0.17	4.63
140	7.419	33.972	7.406	26.553	3.046	0.12	4.65
150	7.394	33.983	7.380	26.565	3.195	0.11	4.65
175	7.227	34.010	7.210	26.610	3.561	0.11	4.64
200	6.954	34.021	6.935	26.657	3.918	0.10	4.64
225	6.840	34.044	6.820	26.690	4.265	0.10	4.65
250	6.589	34.055	6.567	26.733	4.604	0.10	-----
275	6.357	34.072	6.332	26.777	4.933	0.10	-----
300	5.578	33.998	5.553	26.816	5.253	0.09	-----
350	5.475	34.076	5.446	26.891	5.868	0.09	-----
400	5.326	34.124	5.294	26.947	6.449	0.09	4.71
450	5.168	34.154	5.131	26.989	7.014	0.09	4.70
500	5.016	34.172	4.976	27.022	7.564	0.09	4.70
505	5.000	34.175	4.960	27.026	7.618	0.09	4.70

Meso 1 Maps

Maps of Temperature, Salinity, σ_t, Chlorophyll, and CDOM at Specified Depths

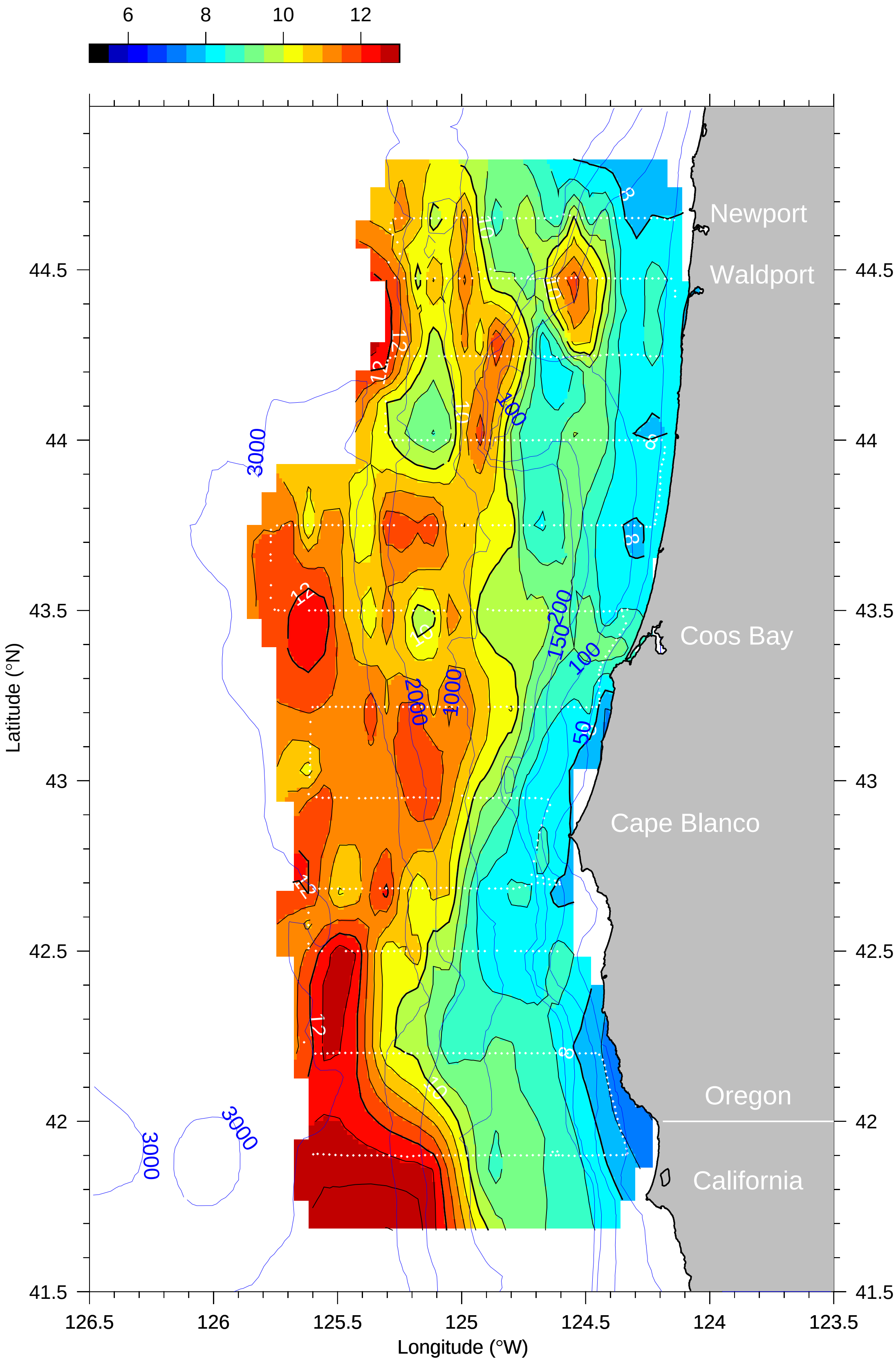

T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Temperature (°C) at 5 dbar
8
10
12
14
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Temperature (°C) at 15 dbar
6
8
10
12
14
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

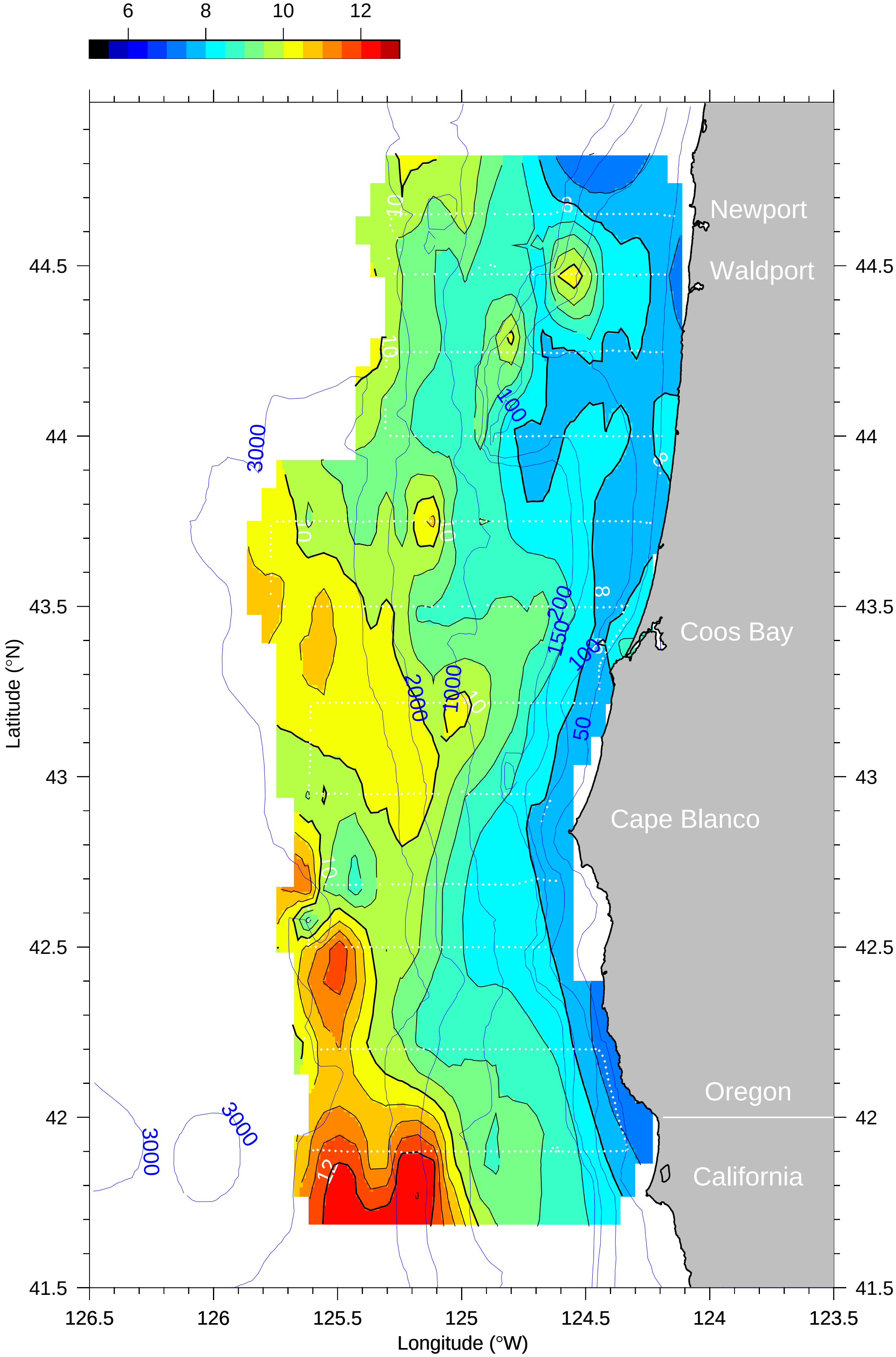
Temperature (°C) at 25 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

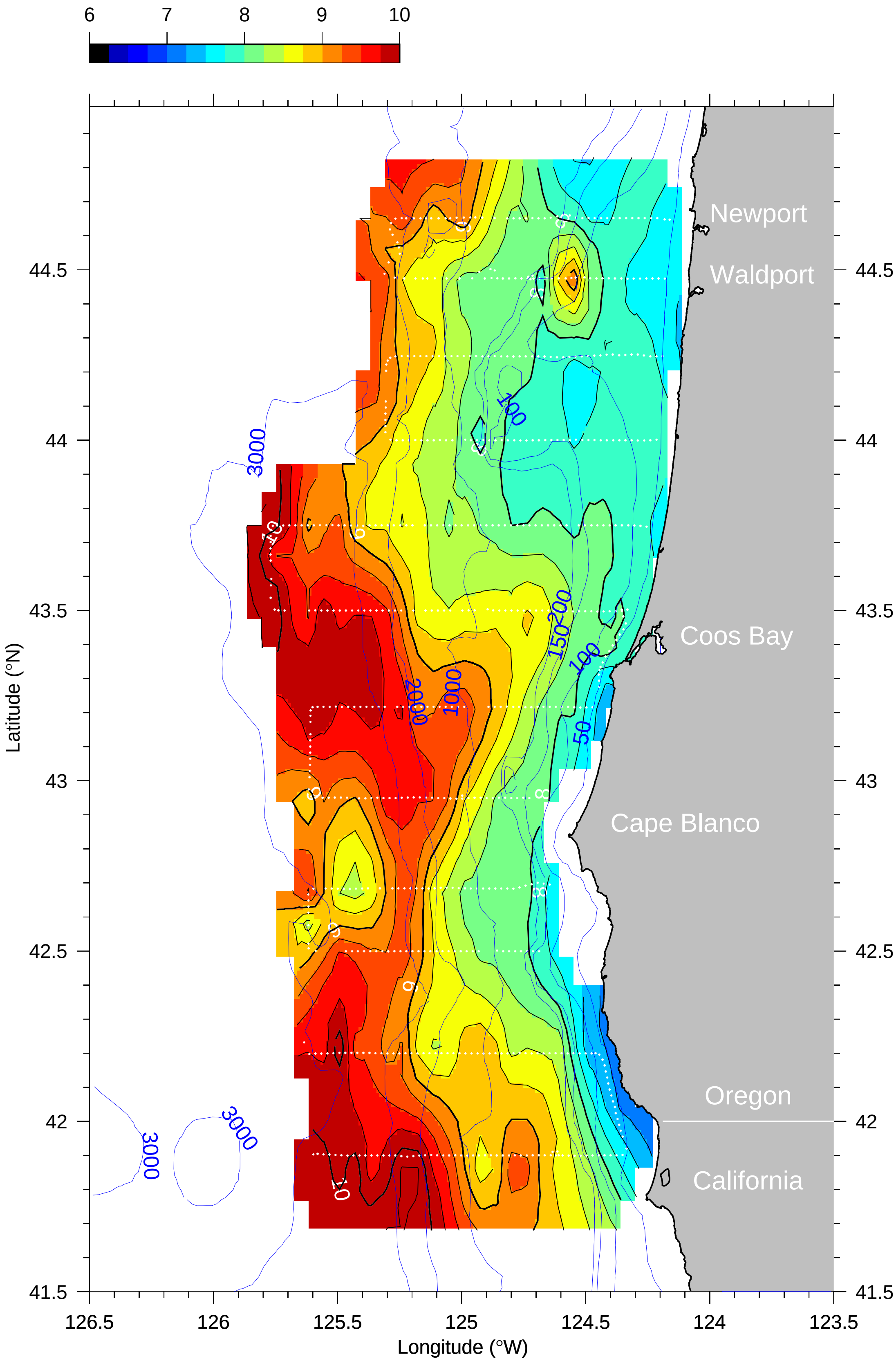
Temperature (°C) at 35 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

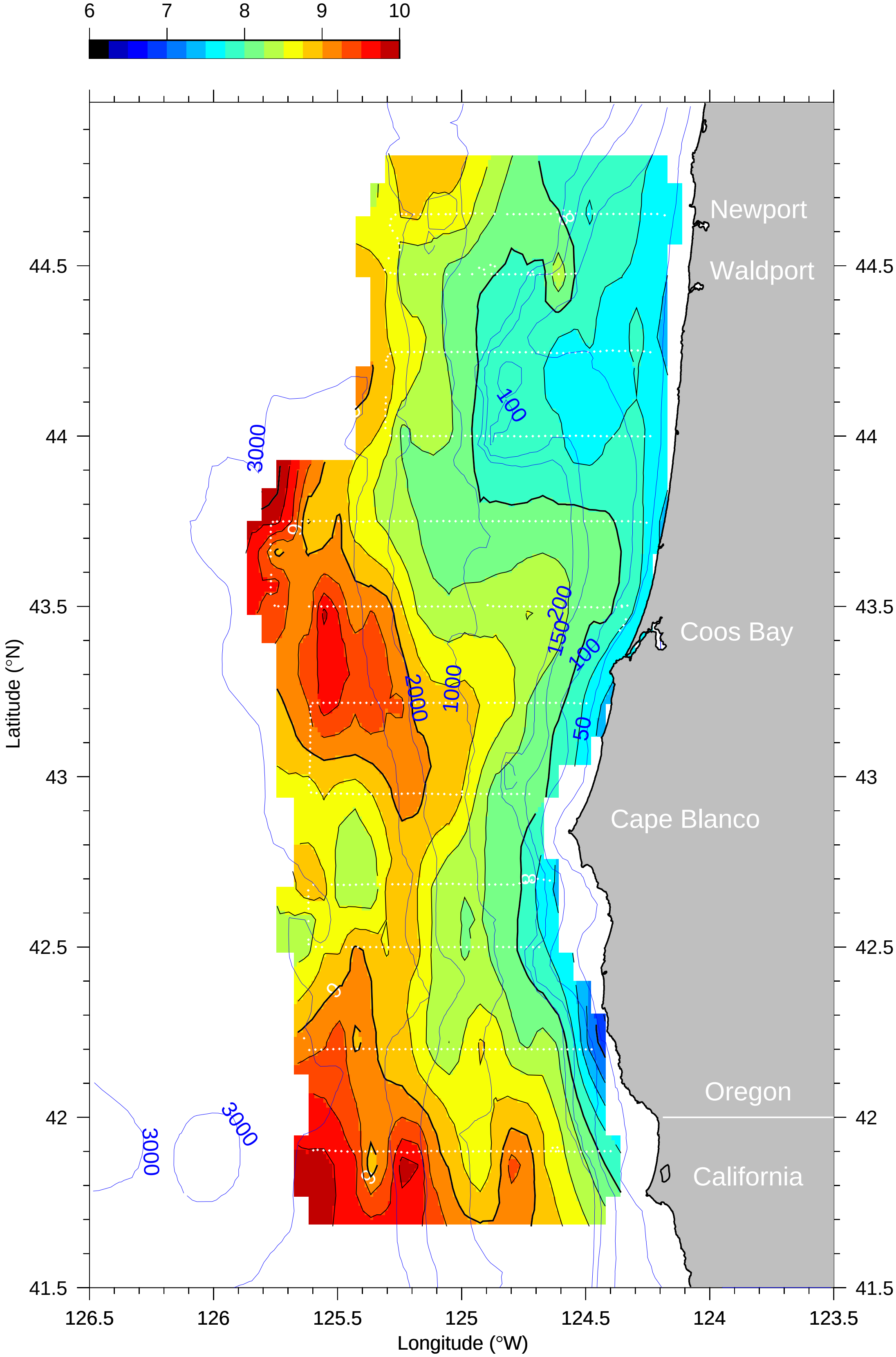
Temperature (°C) at 45 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

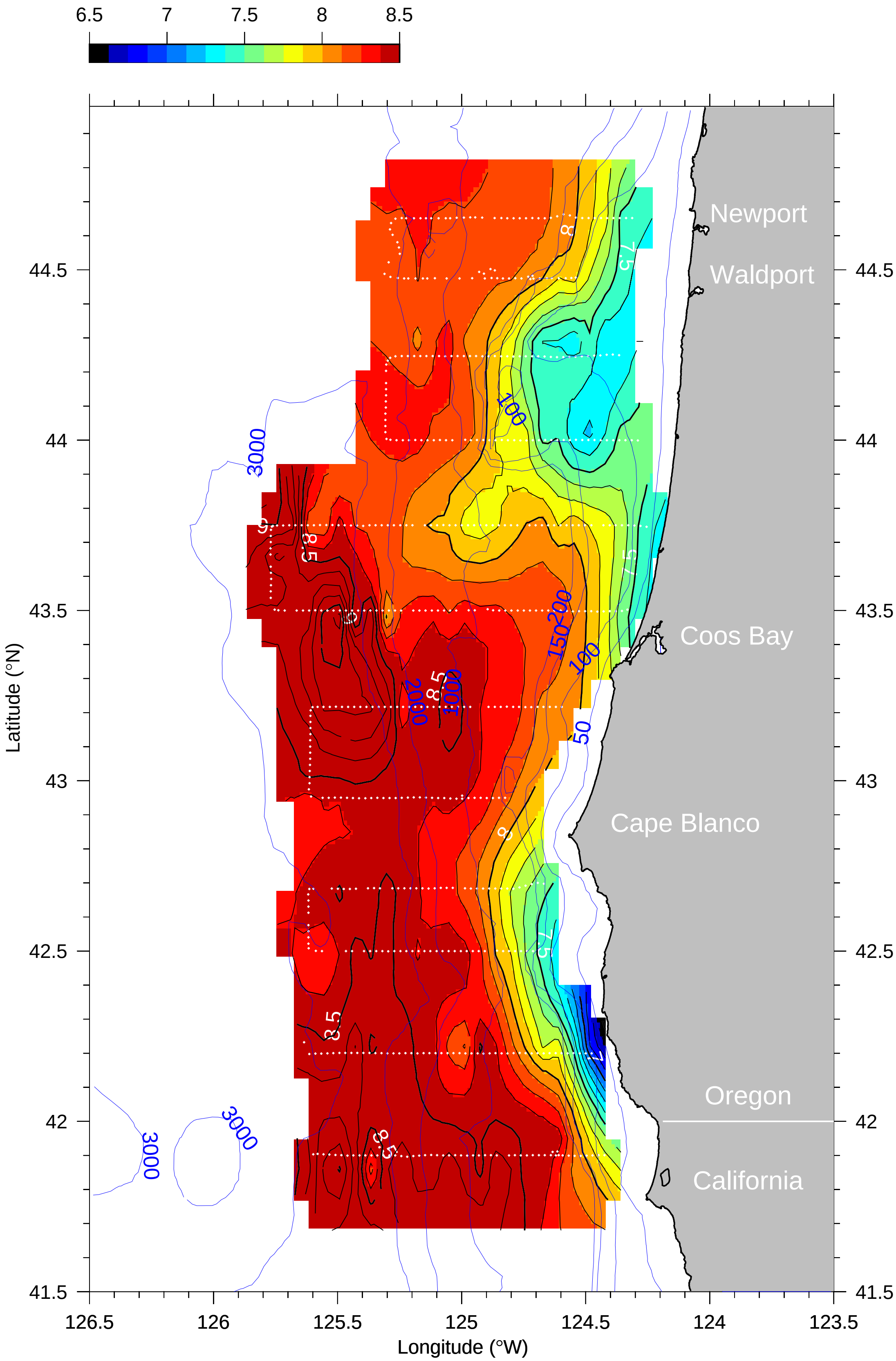
Temperature (°C) at 55 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

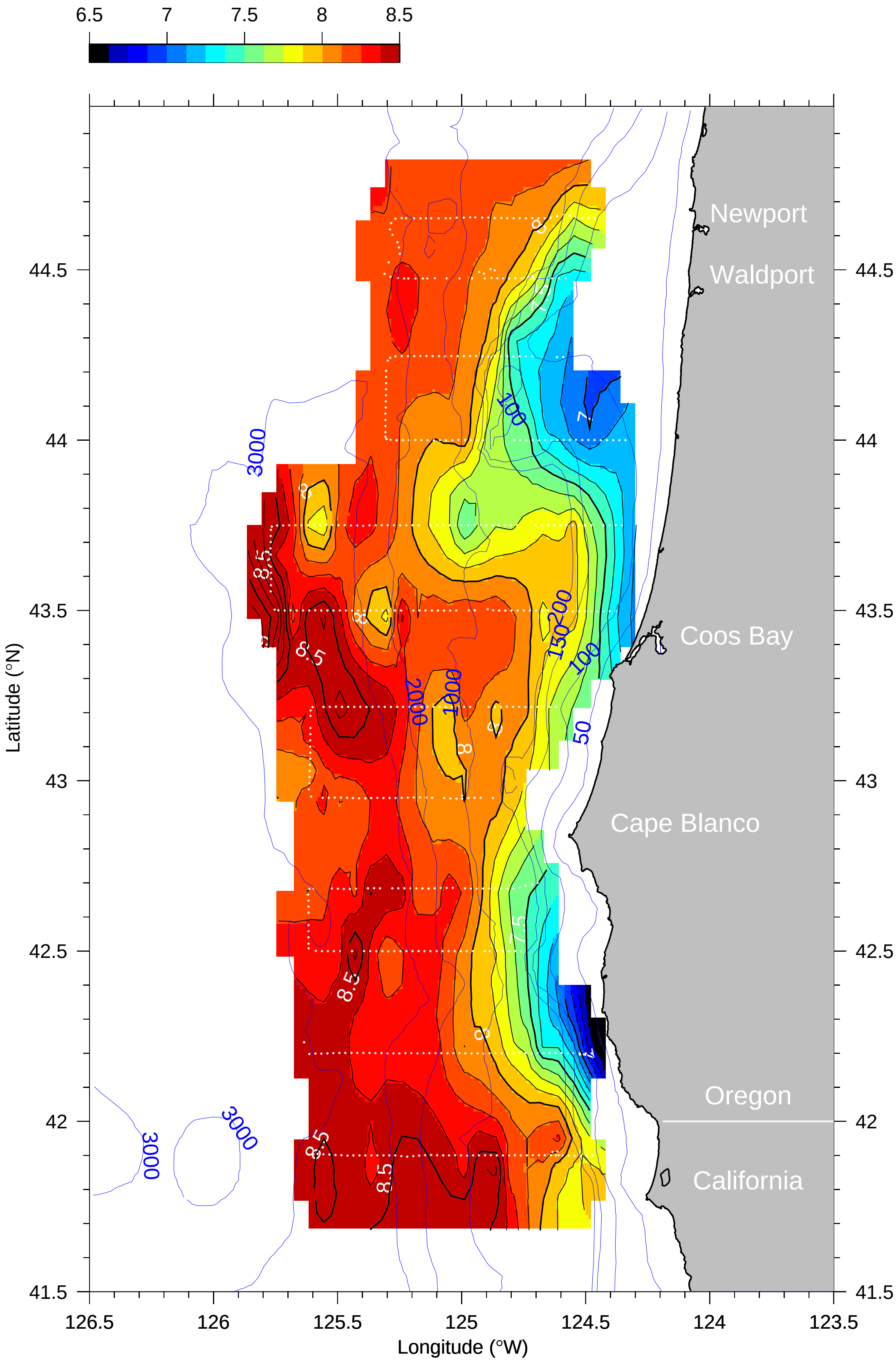
Temperature (°C) at 75 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

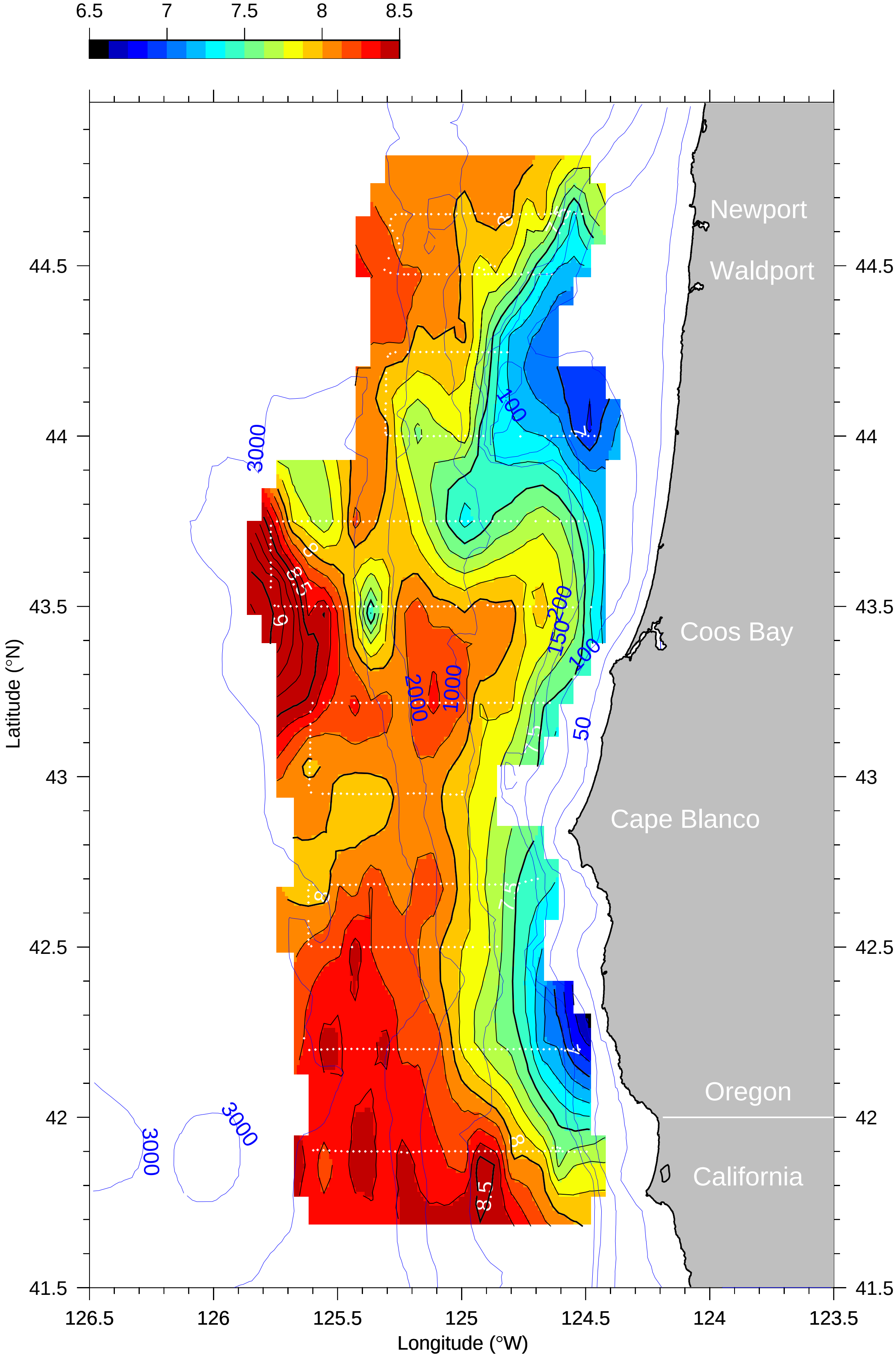
Temperature (°C) at 95 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

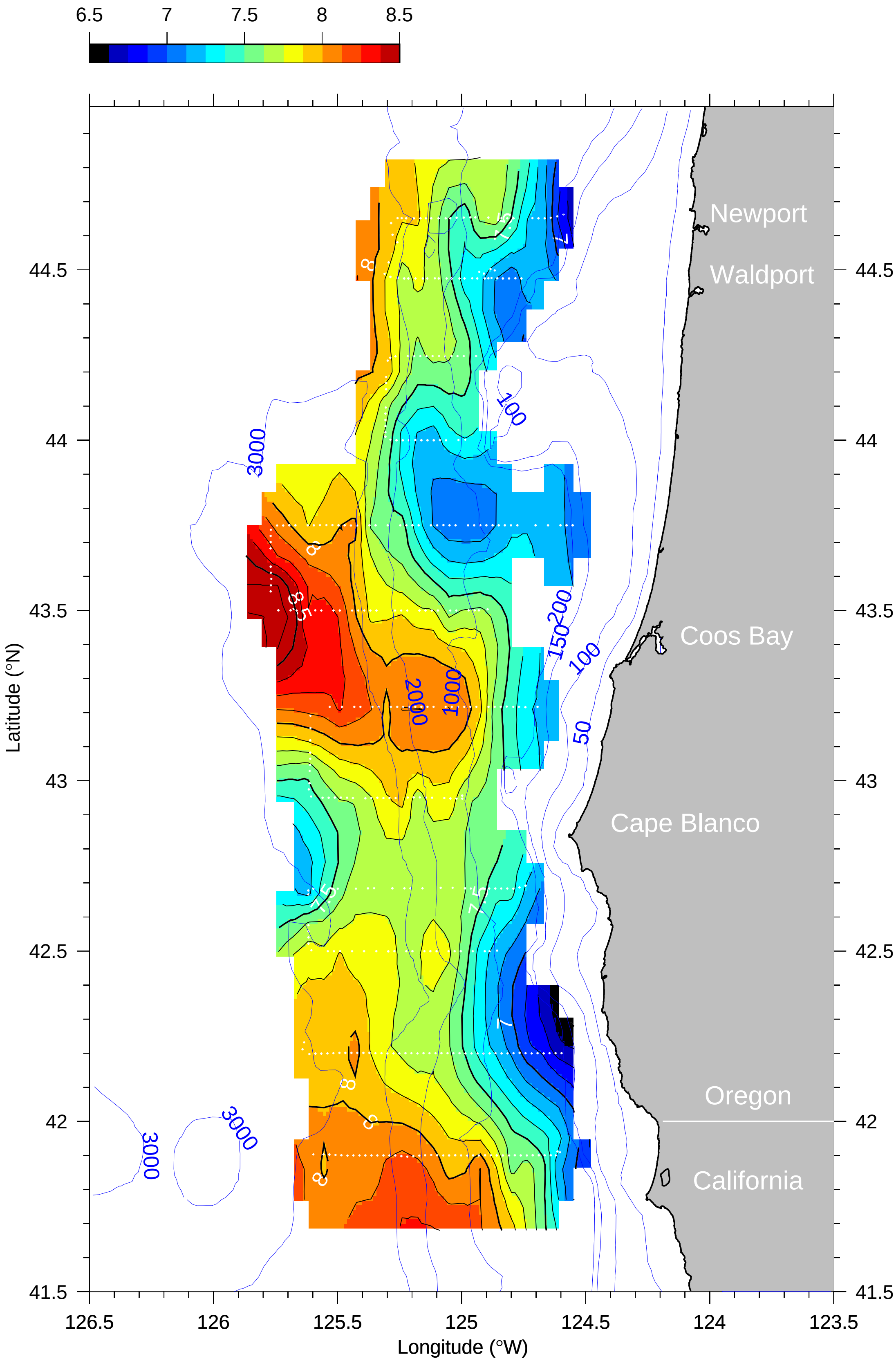
Temperature (°C) at 115 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

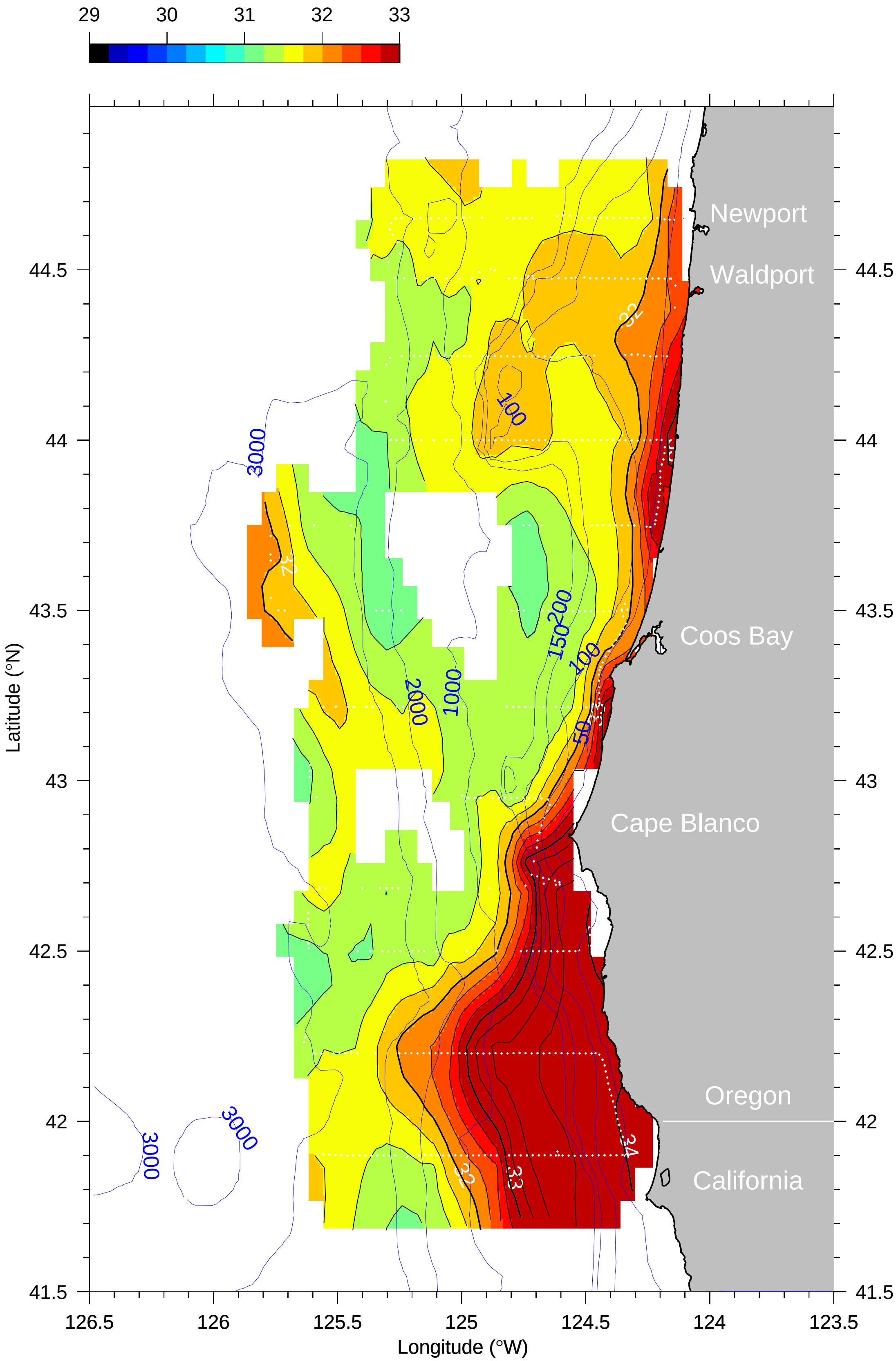
Temperature (°C) at 155 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

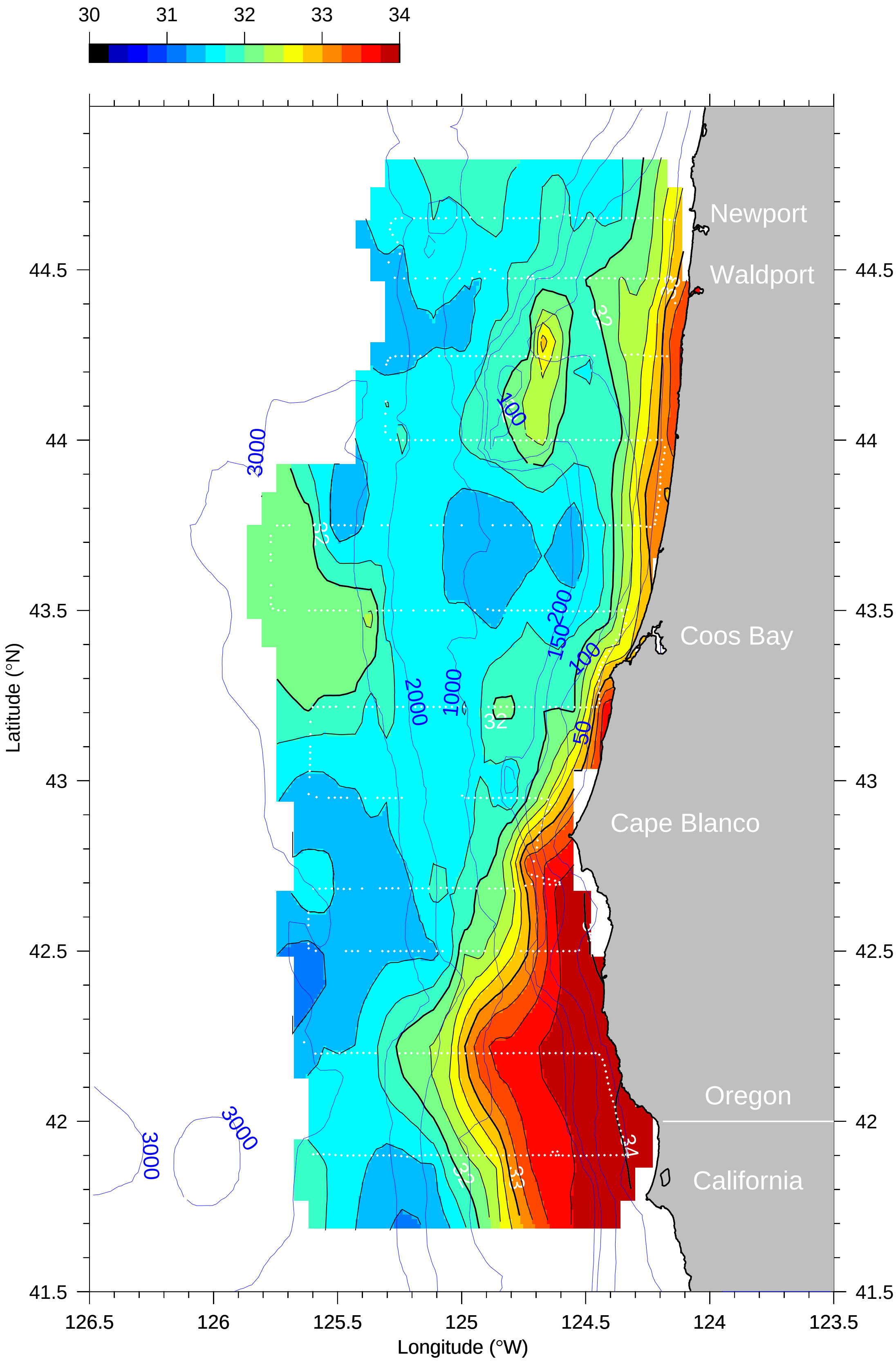
Salinity (PSS) at 5 dbar

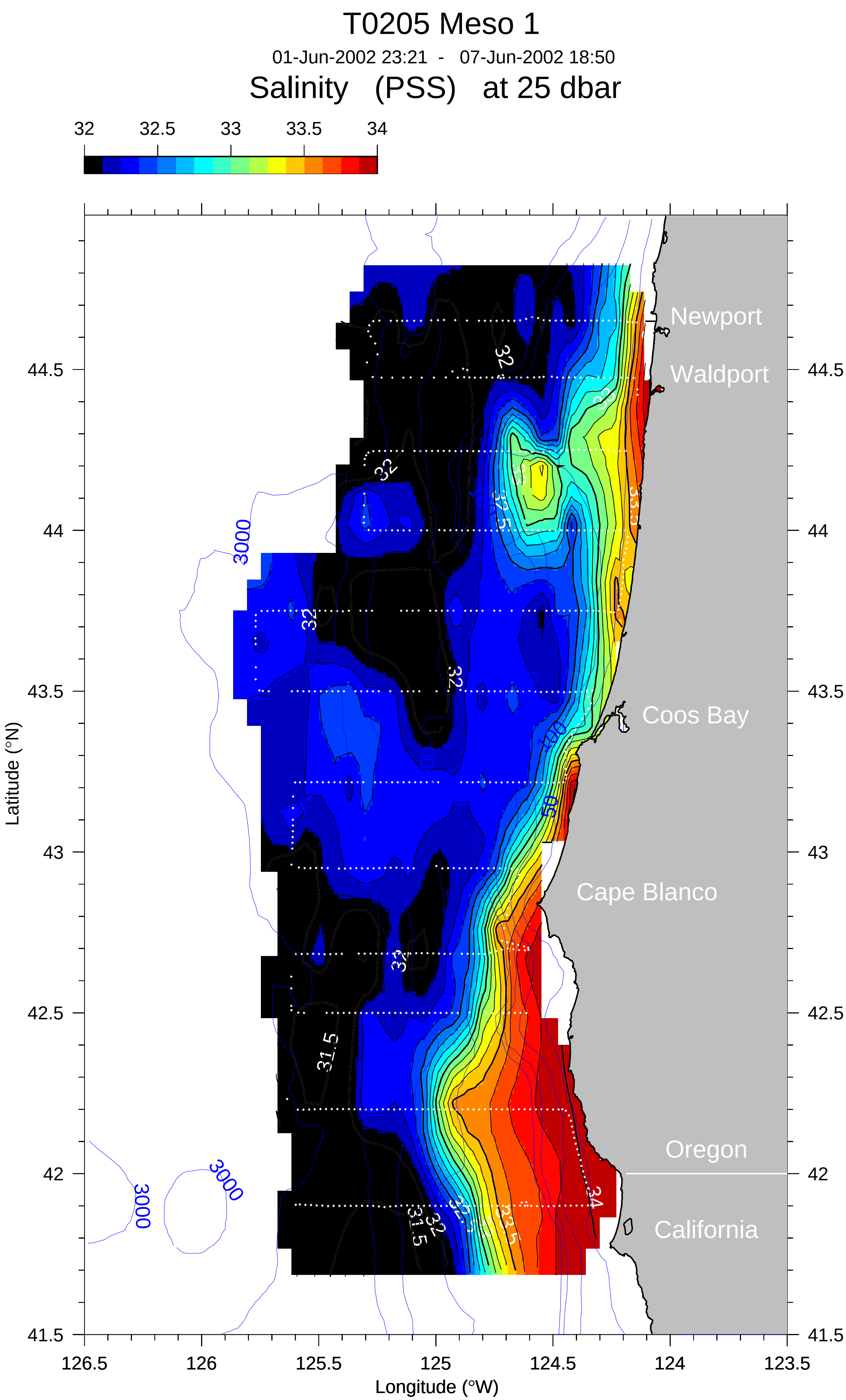


T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

Salinity (PSS) at 15 dbar



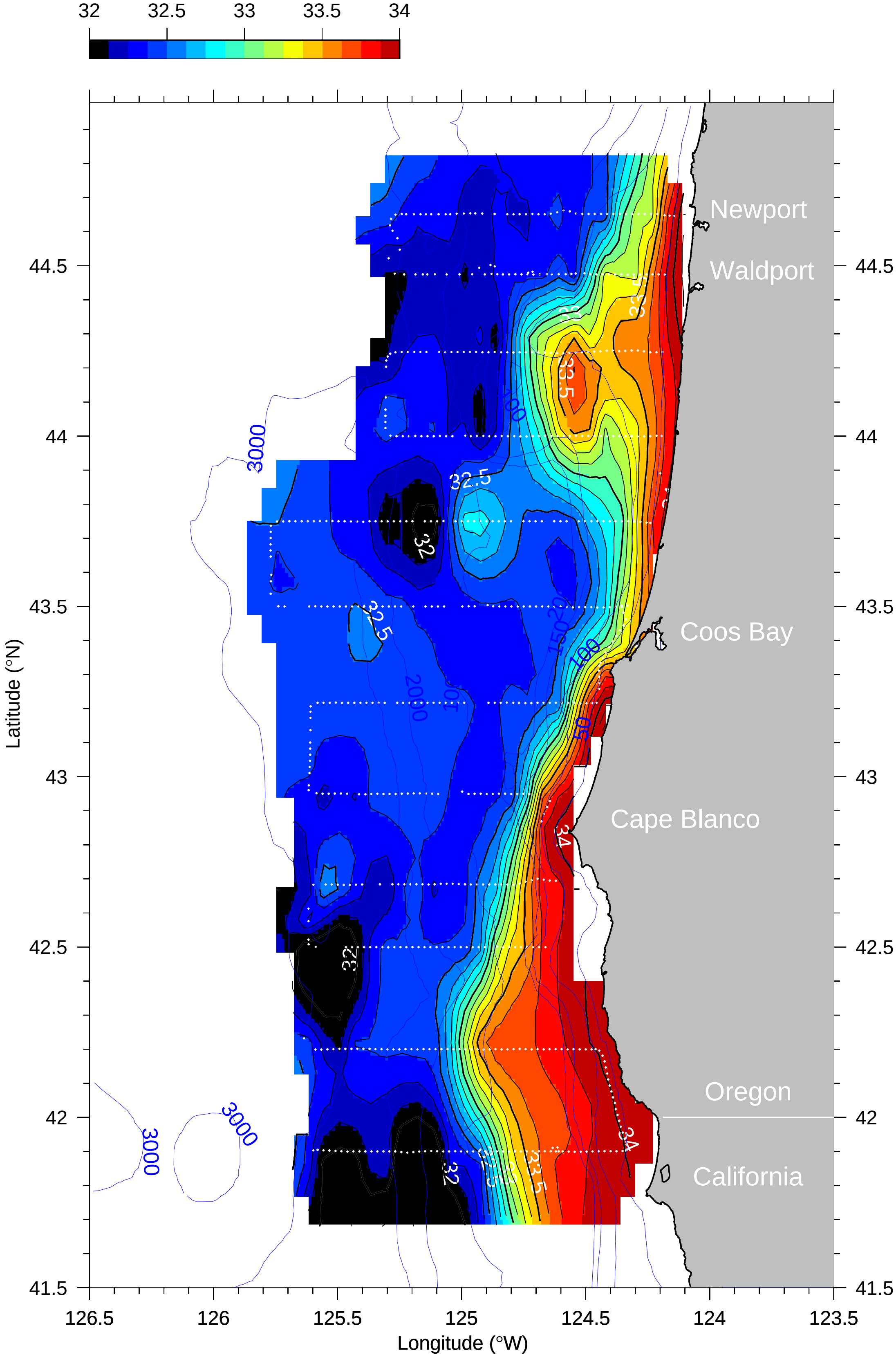


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Salinity (PSS) at 25 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
3000
100
50
31.5
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

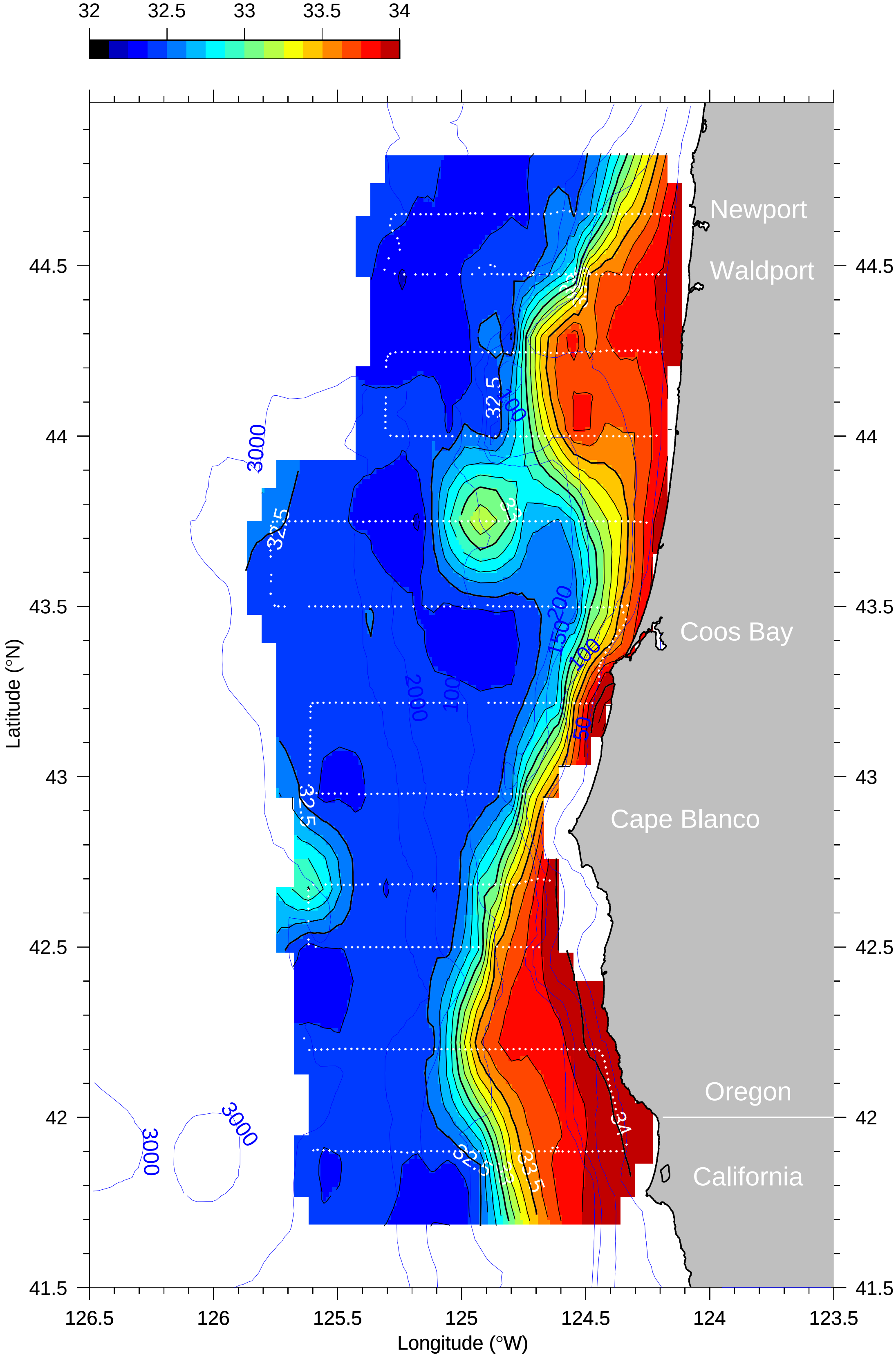
Salinity (PSS) at 35 dbar

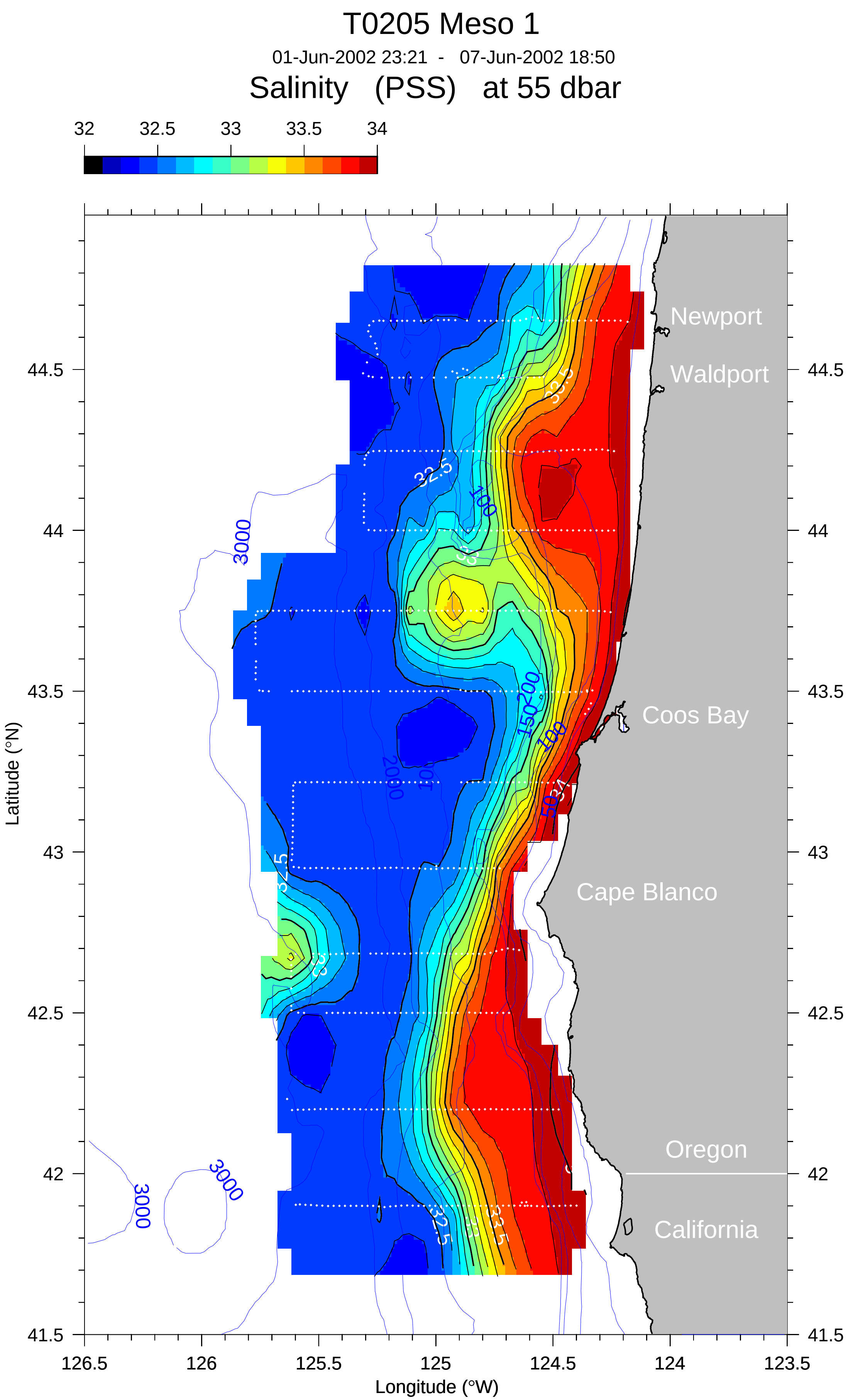


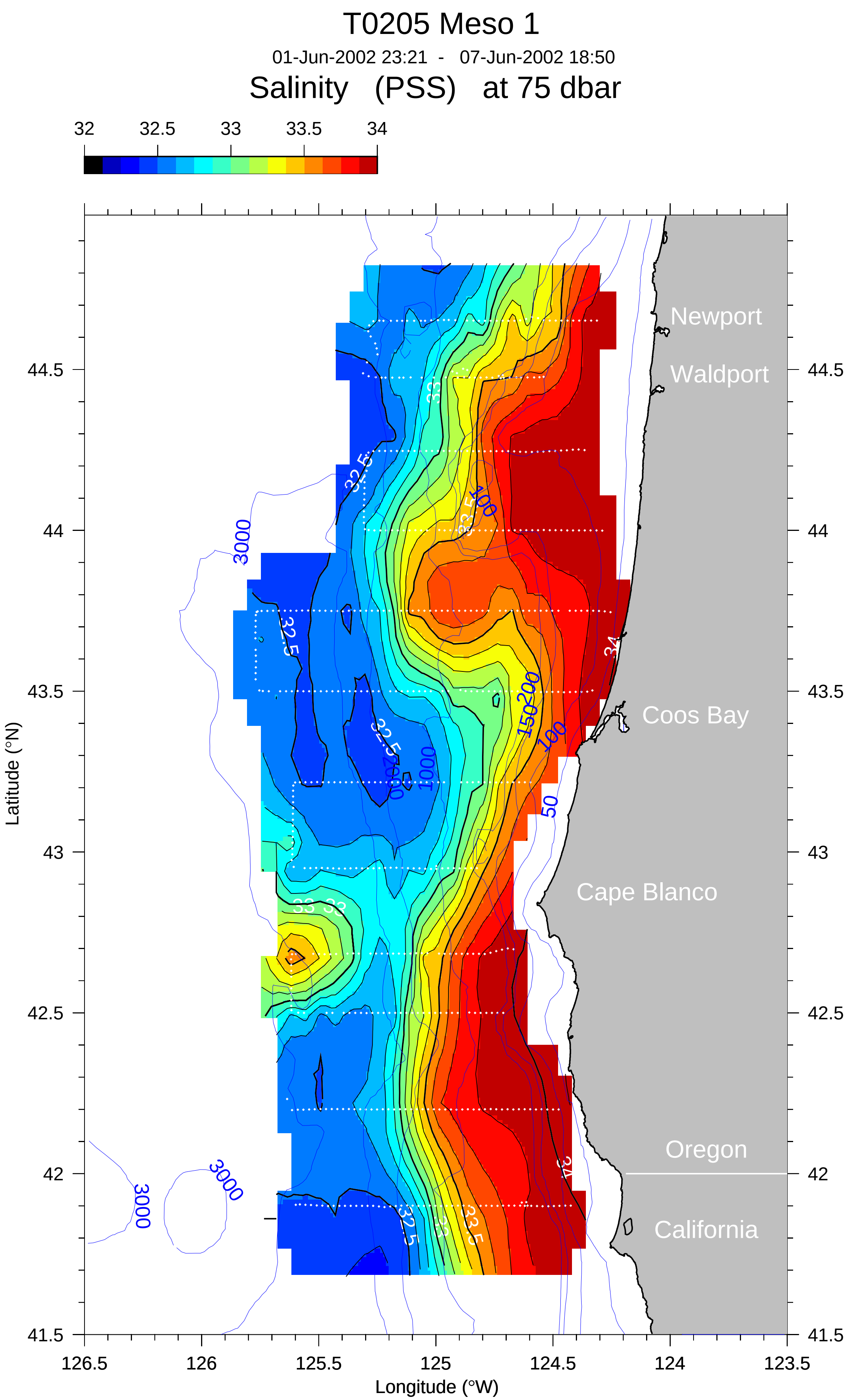
T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

Salinity (PSS) at 45 dbar



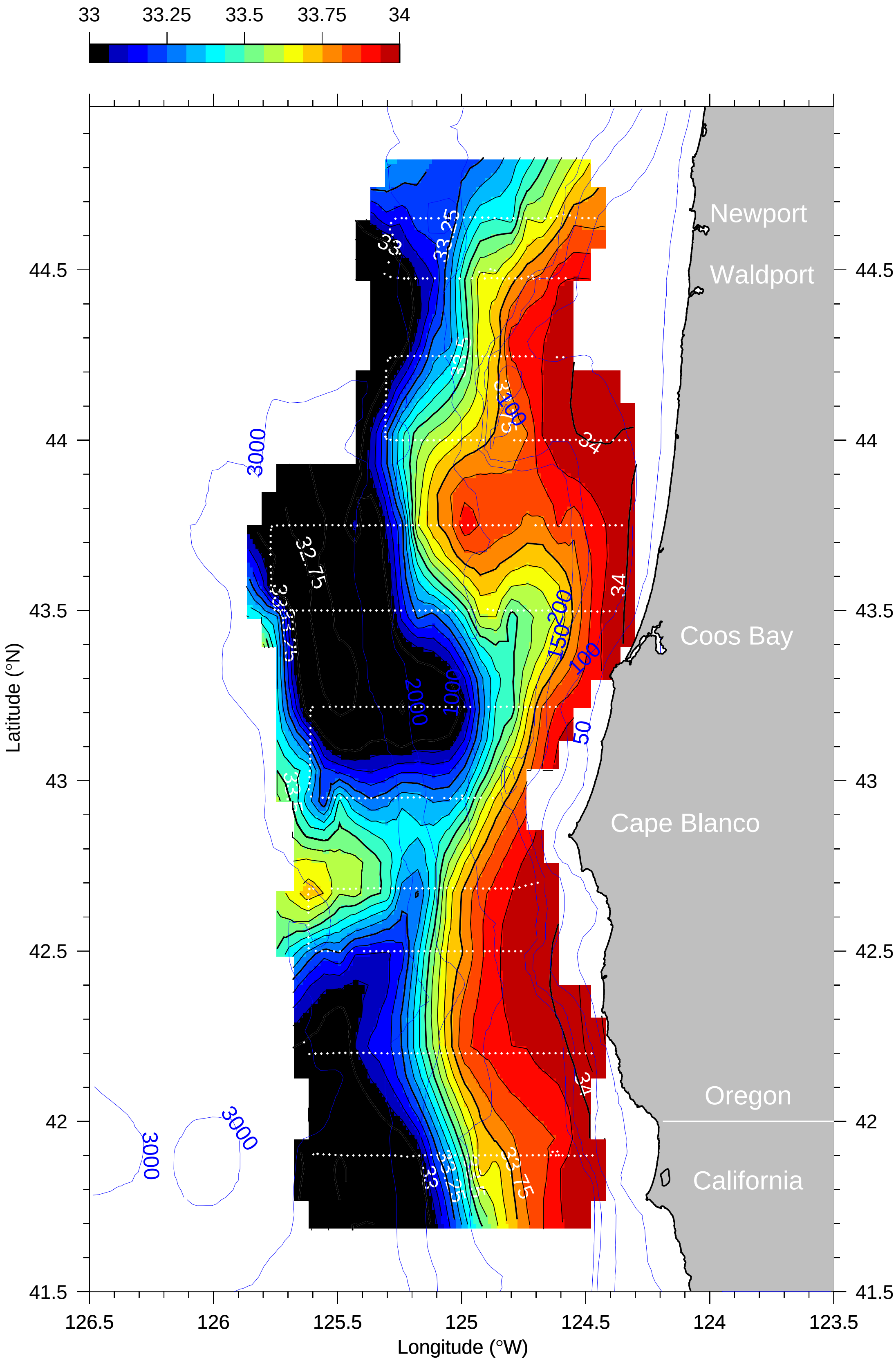

T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Salinity (PSS) at 55 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
3000
2000
100
150
200
50
32.5
33
33.5
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Salinity (PSS) at 75 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
1000
200
150
100
50

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

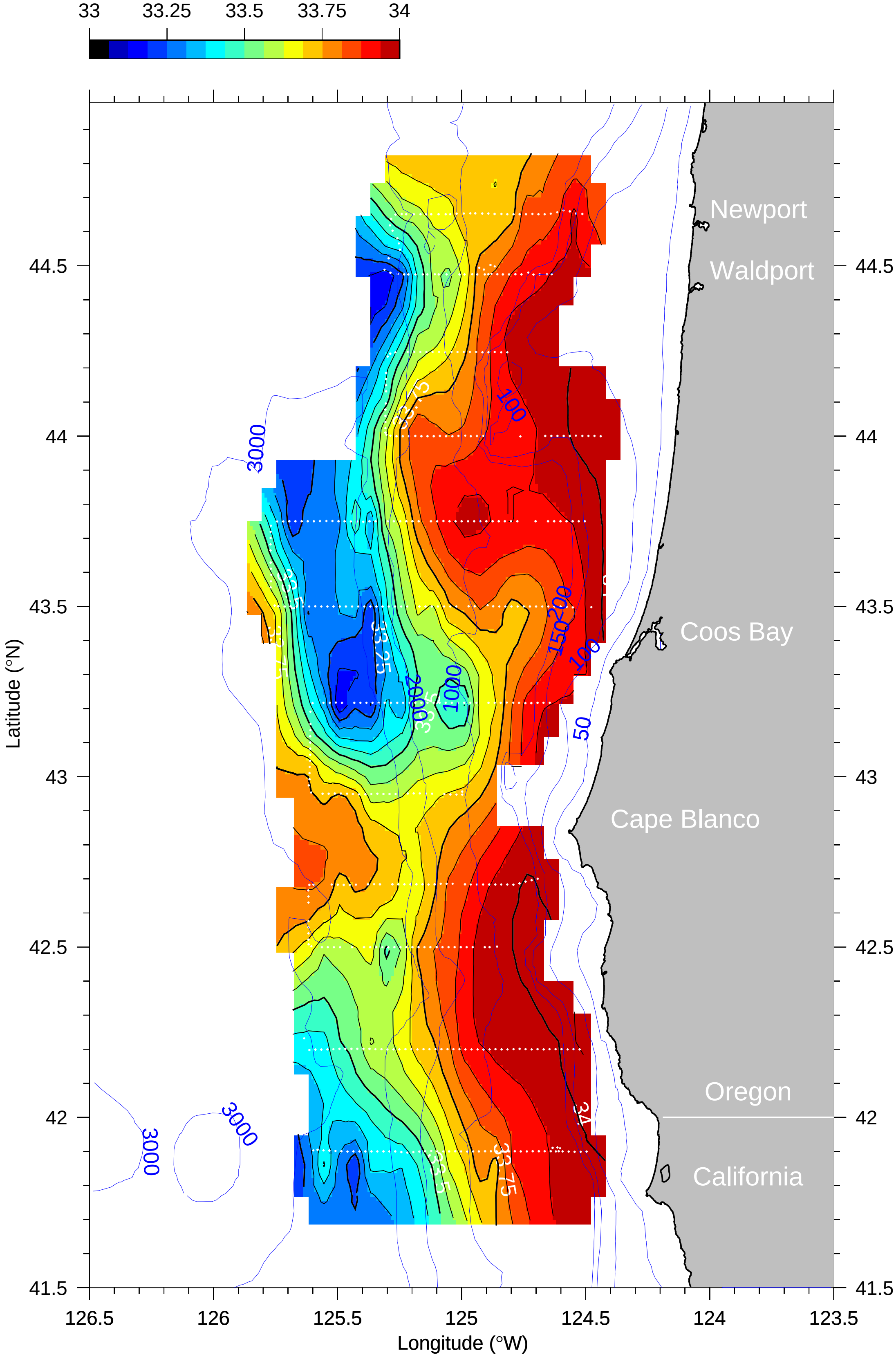
Salinity (PSS) at 95 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

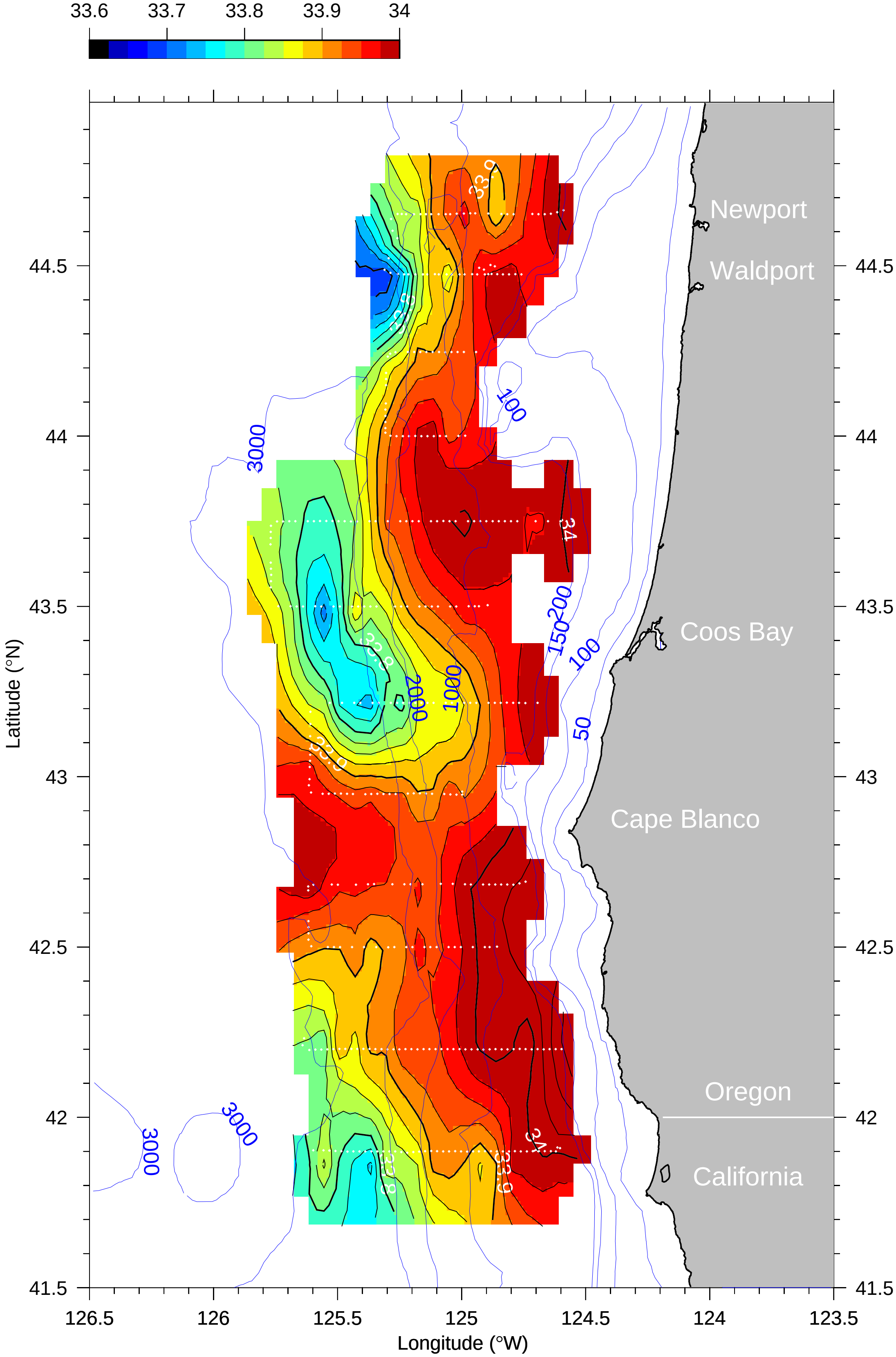
Salinity (PSS) at 115 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

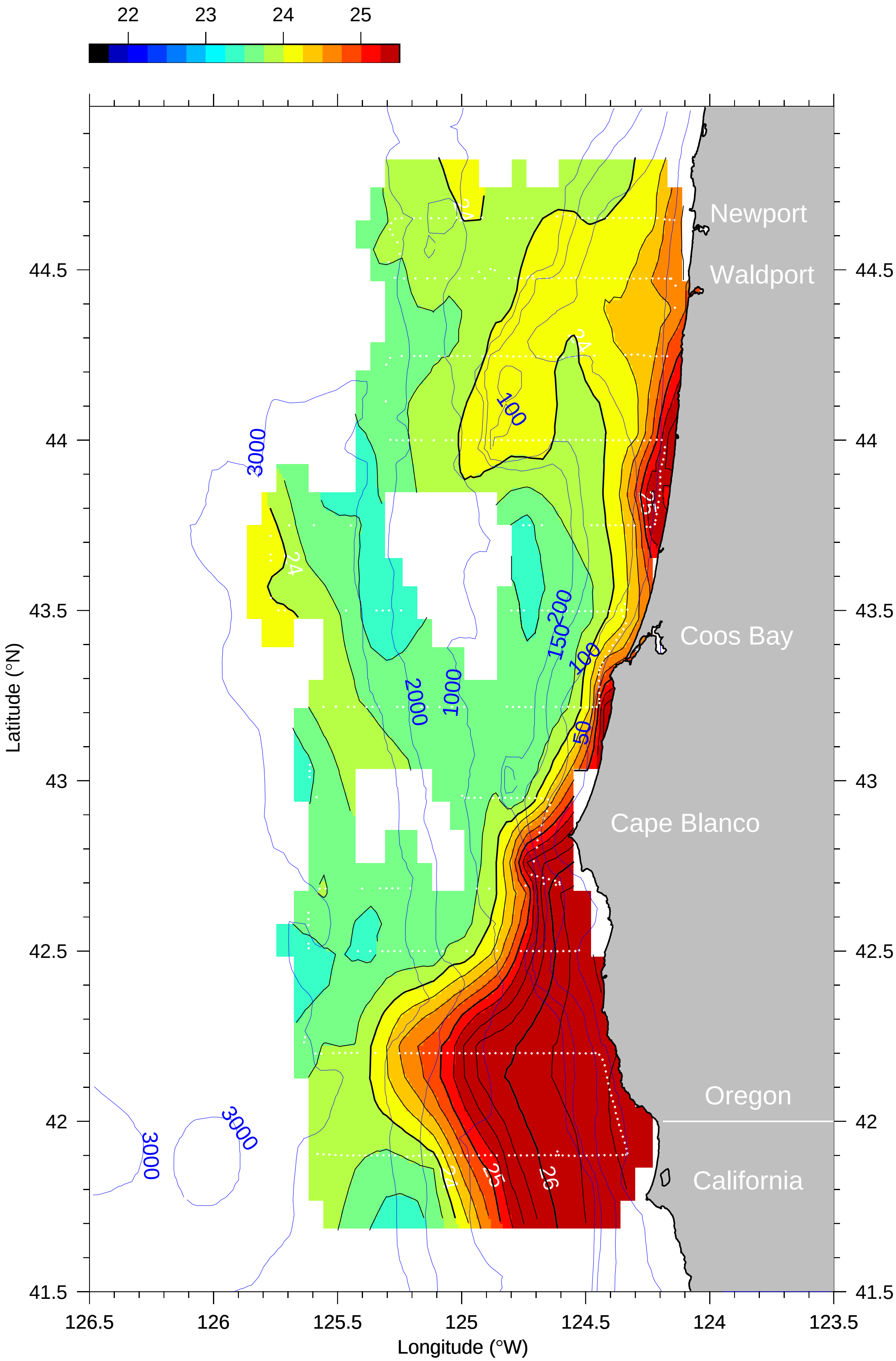
Salinity (PSS) at 155 dbar

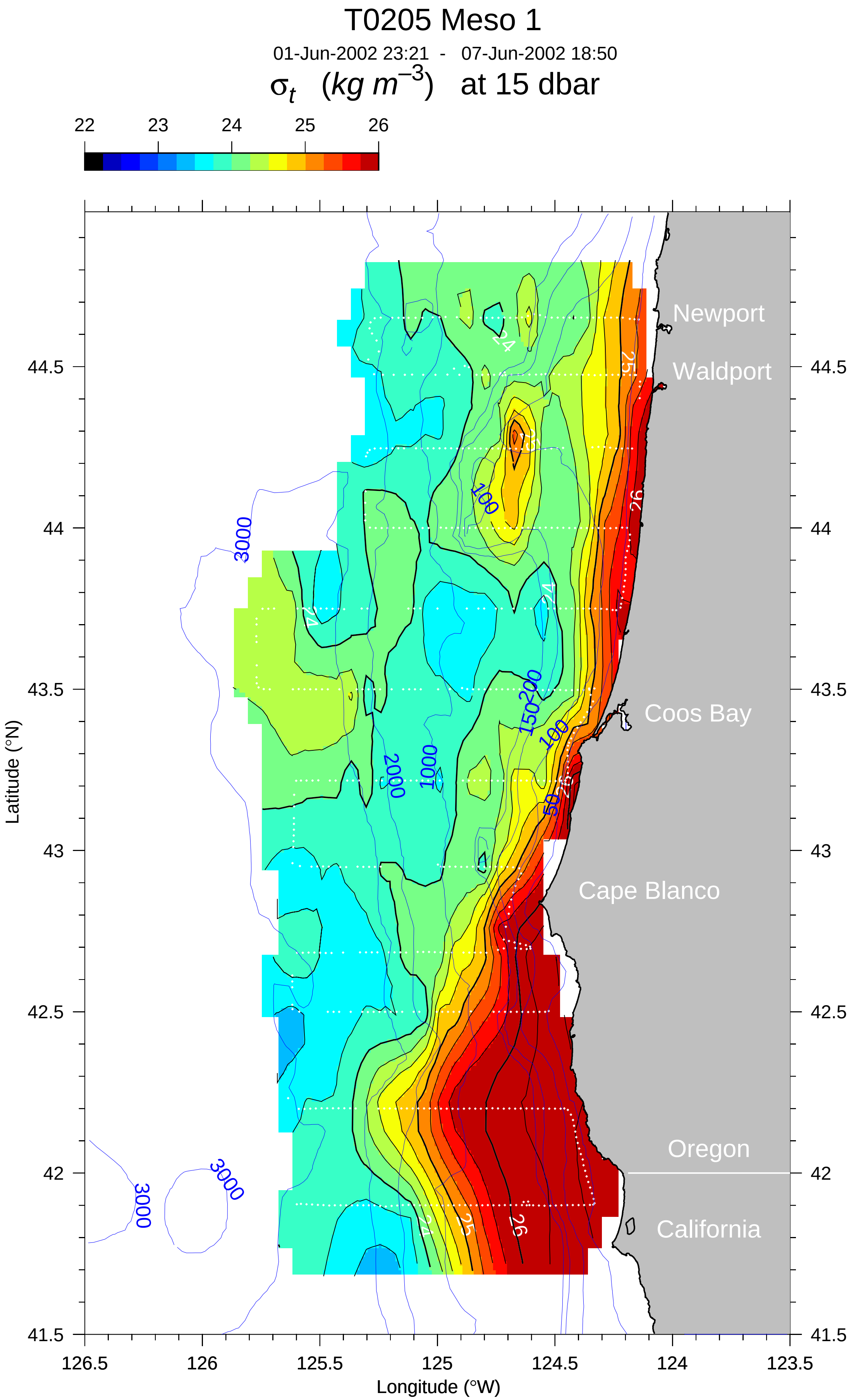


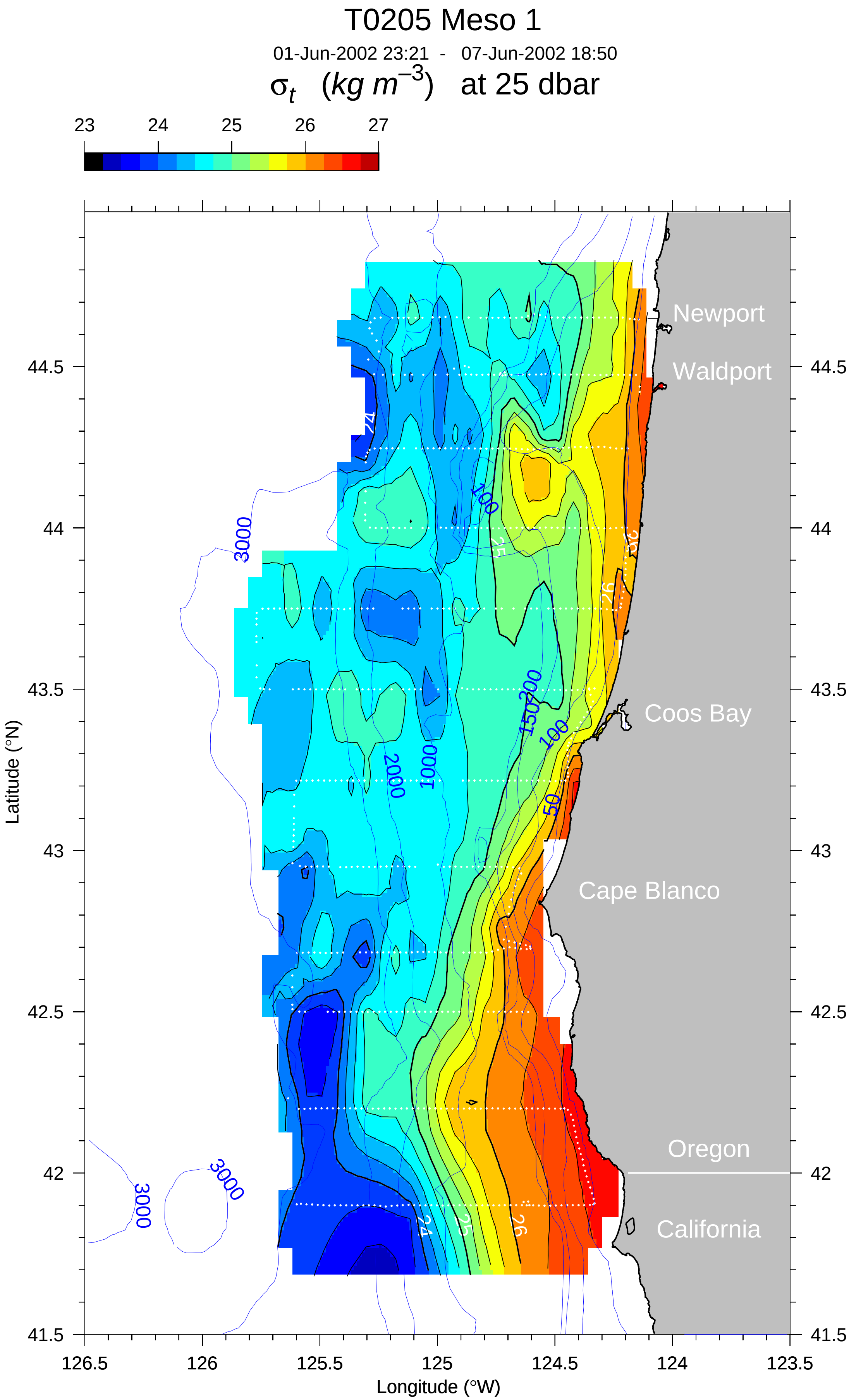
T0205 Meso 1

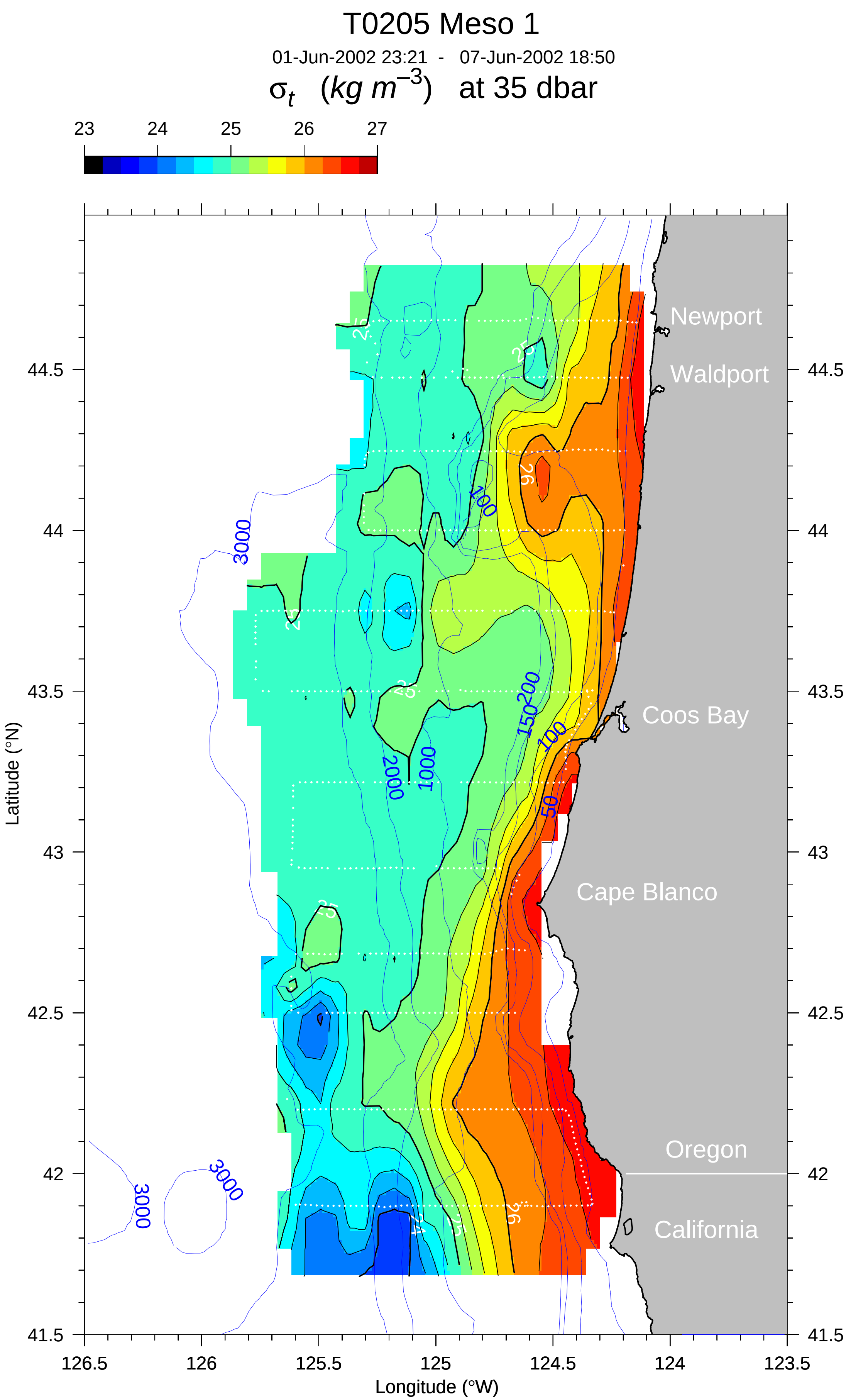
01-Jun-2002 23:21 - 07-Jun-2002 18:50

σ_t $(kg\ m^{-3})$ at 5 dbar




T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σt (kg m−3) at 15 dbar
22
23
24
25
26
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σt (kg m−3) at 25 dbar
23
24
25
26
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

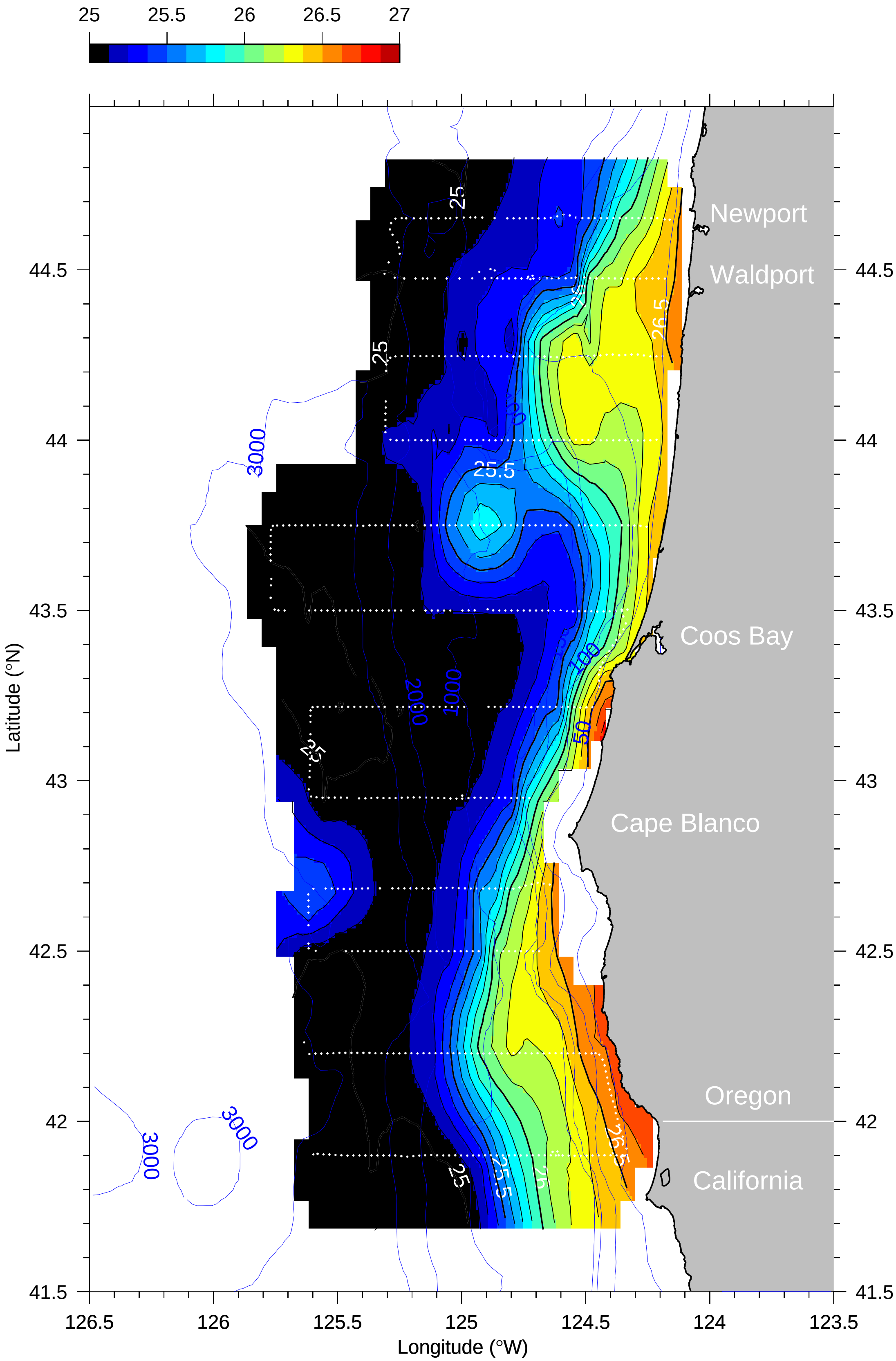


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σ_t $(kg\ m^{-3})$ at 35 dbar
23
24
25
26
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

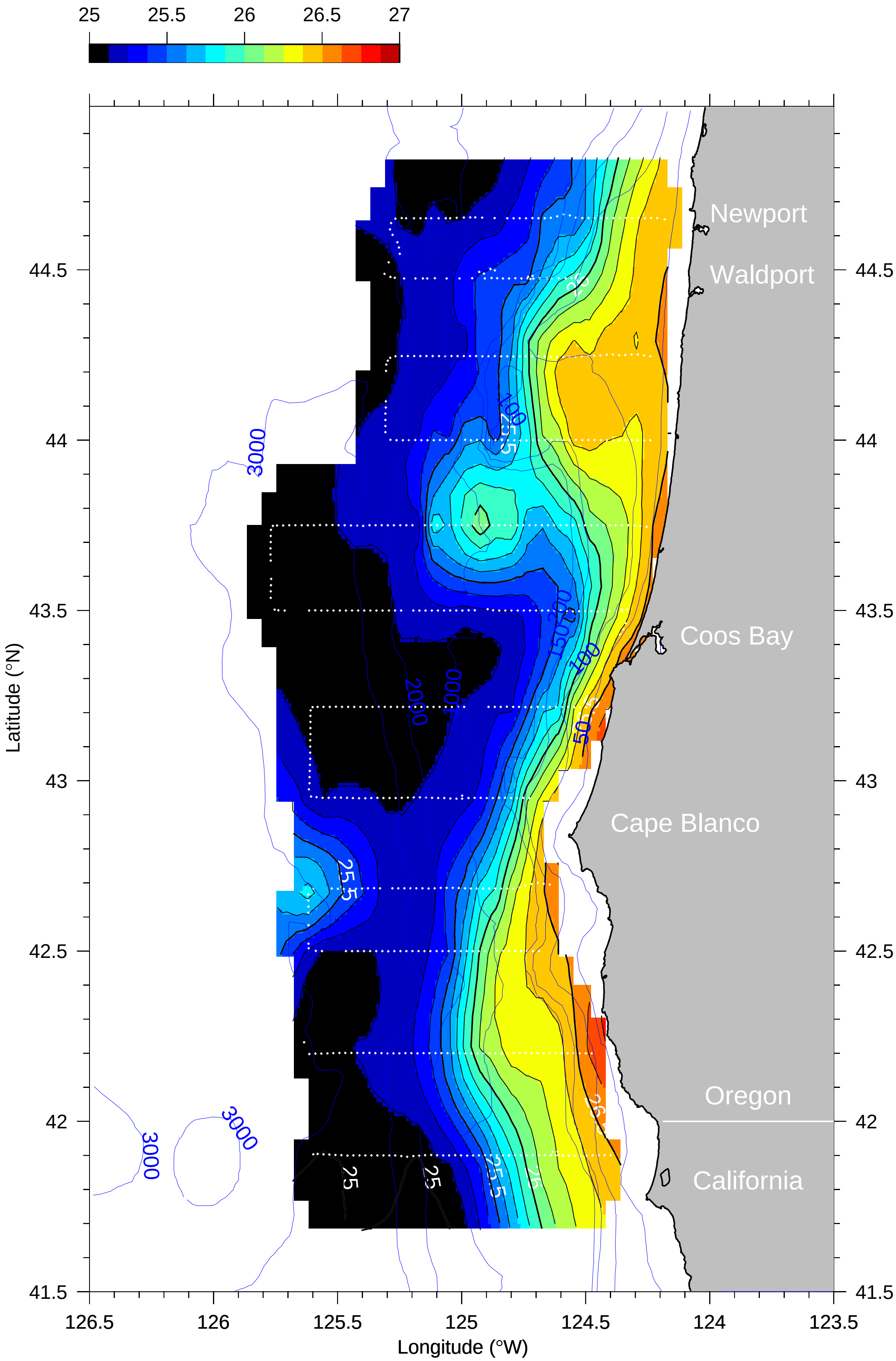
σ_t $(kg\ m^{-3})$ at 45 dbar

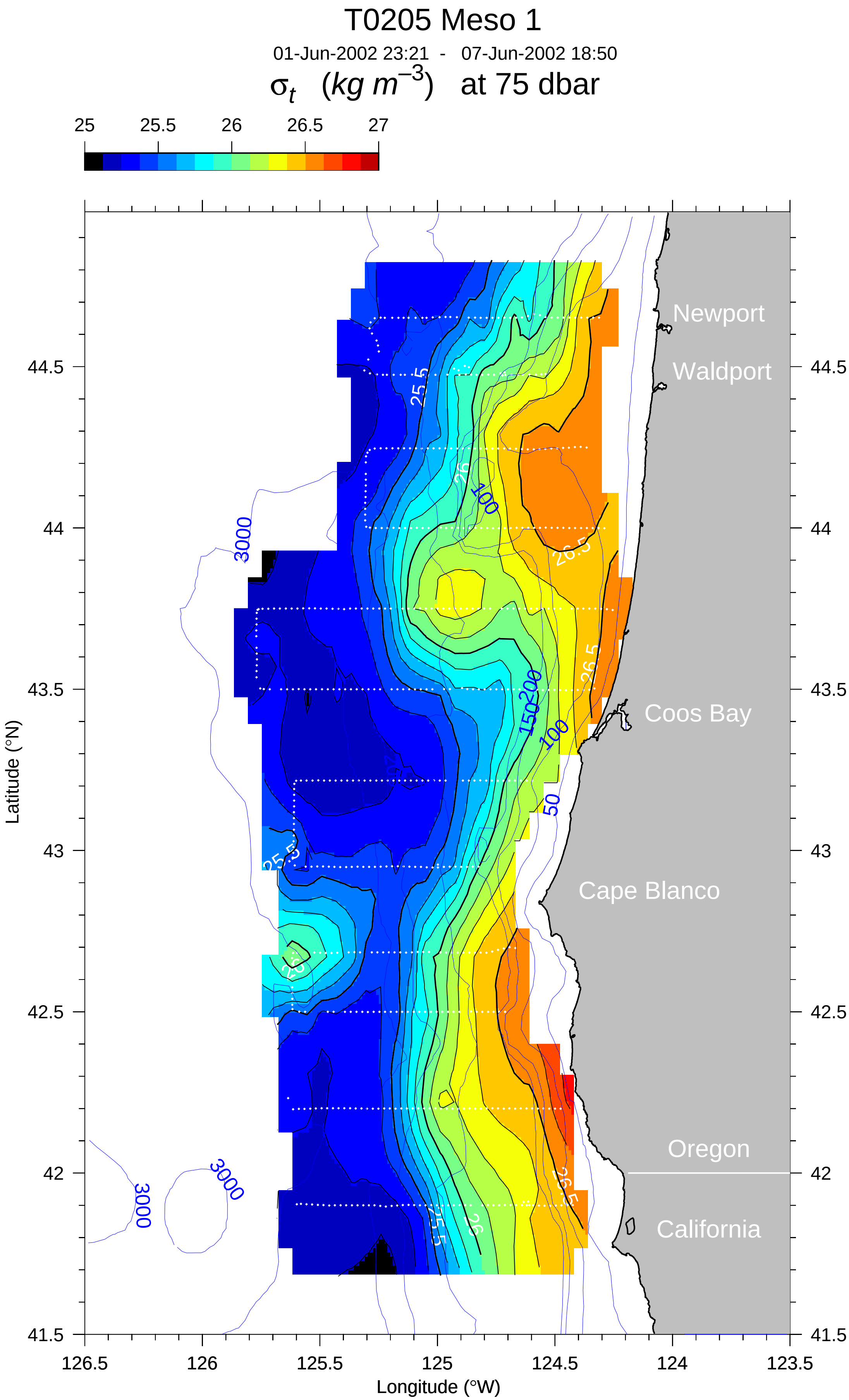


T0205 Meso 1

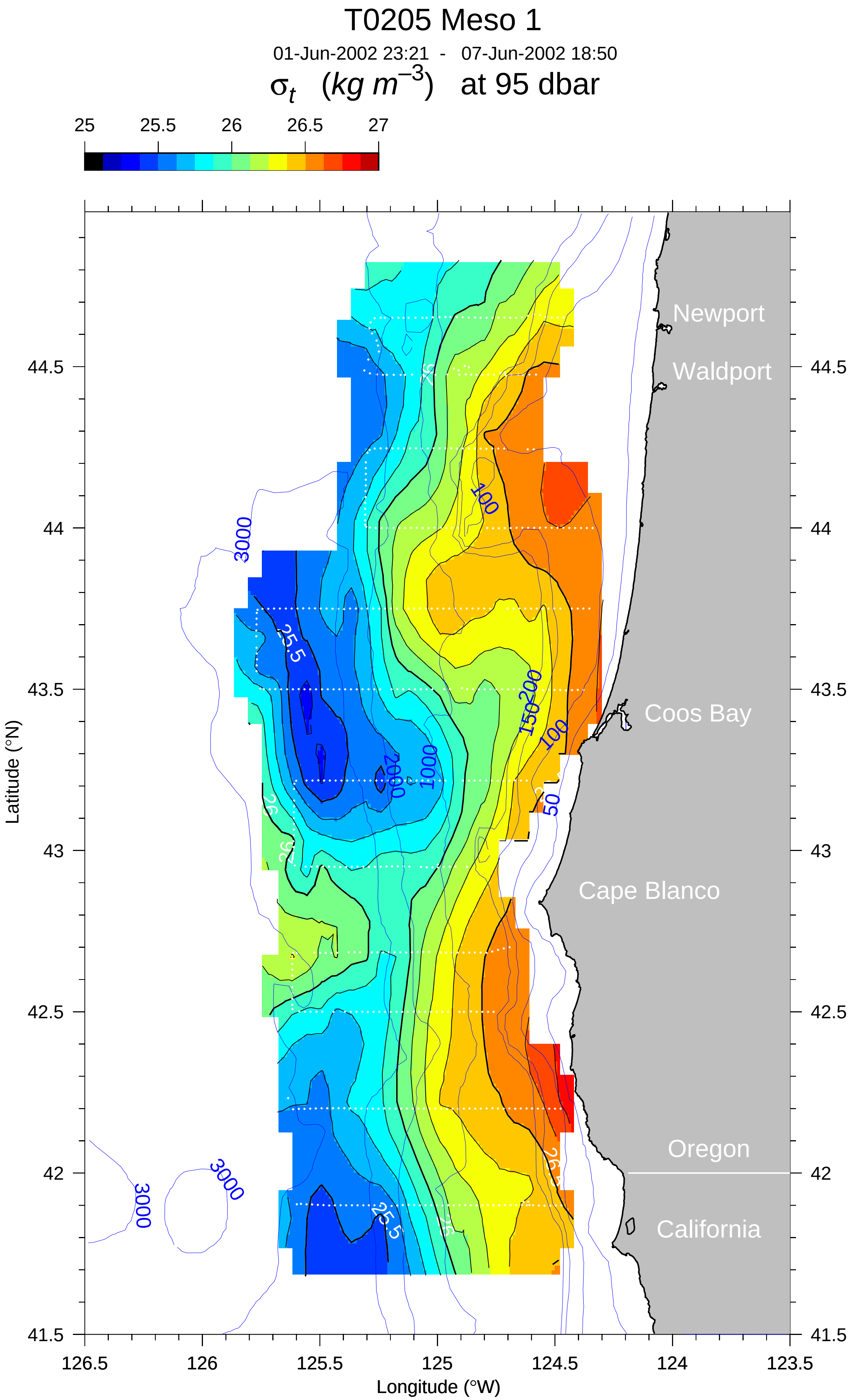
01-Jun-2002 23:21 - 07-Jun-2002 18:50

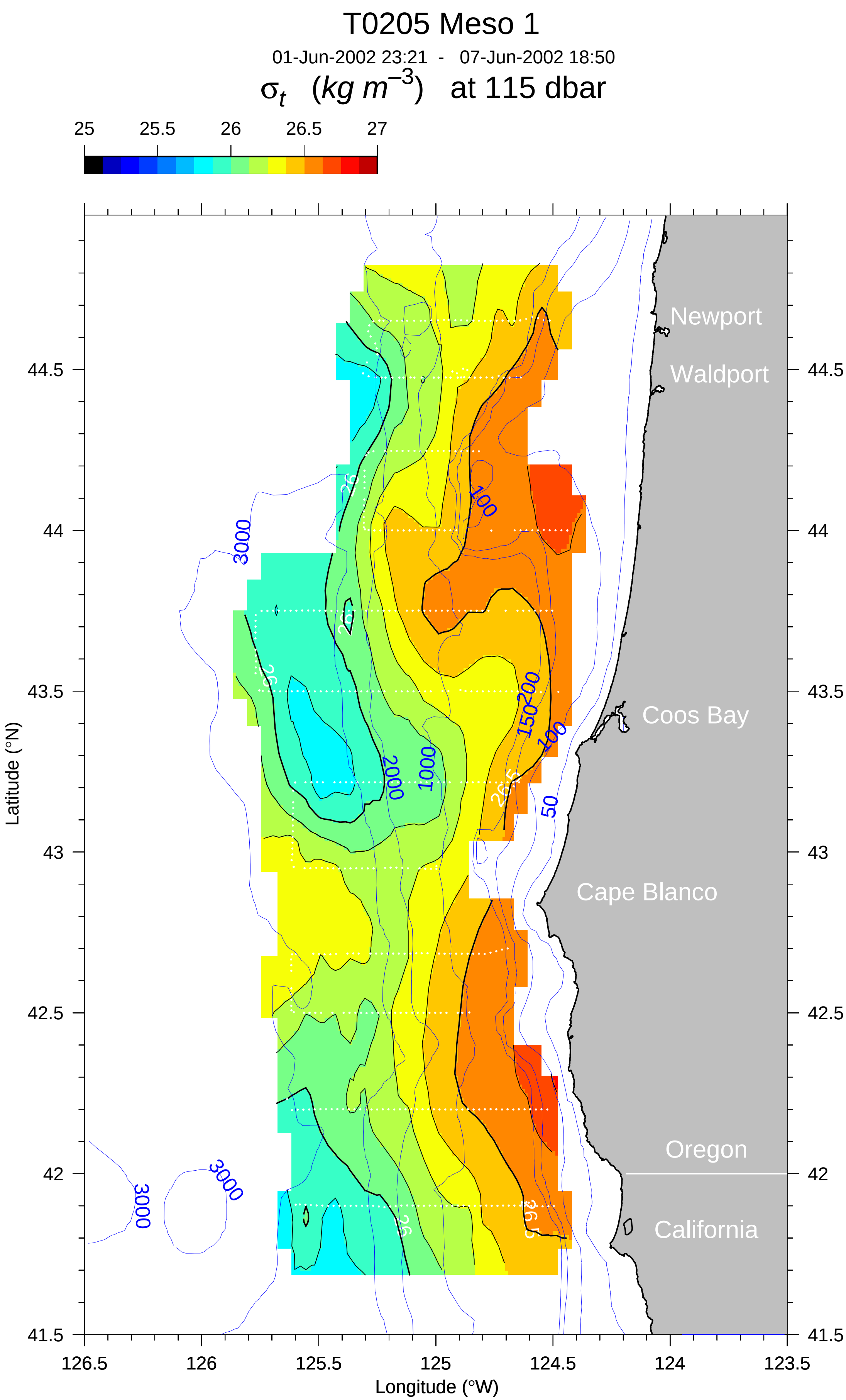
σ_t $(kg\ m^{-3})$ at 55 dbar





T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σ_t ($kg\ m^{-3}$) at 75 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
100
150
200
50
25.5
26
26.5

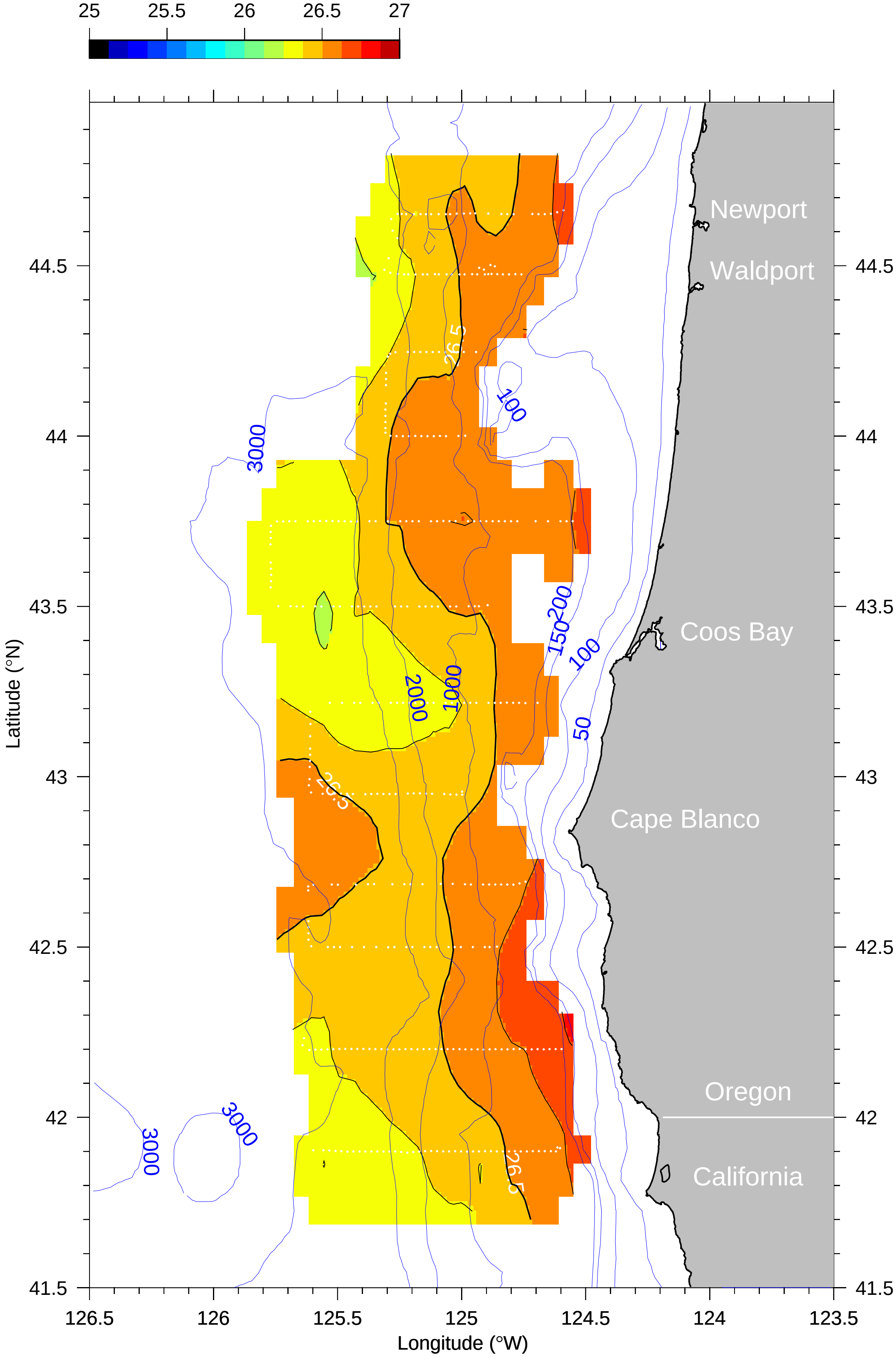

T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σ_t ($kg\ m^{-3}$) at 95 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
σ_t $(kg\ m^{-3})$ at 115 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
3000
2000
1000
200
150
100
50
26
26.5
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

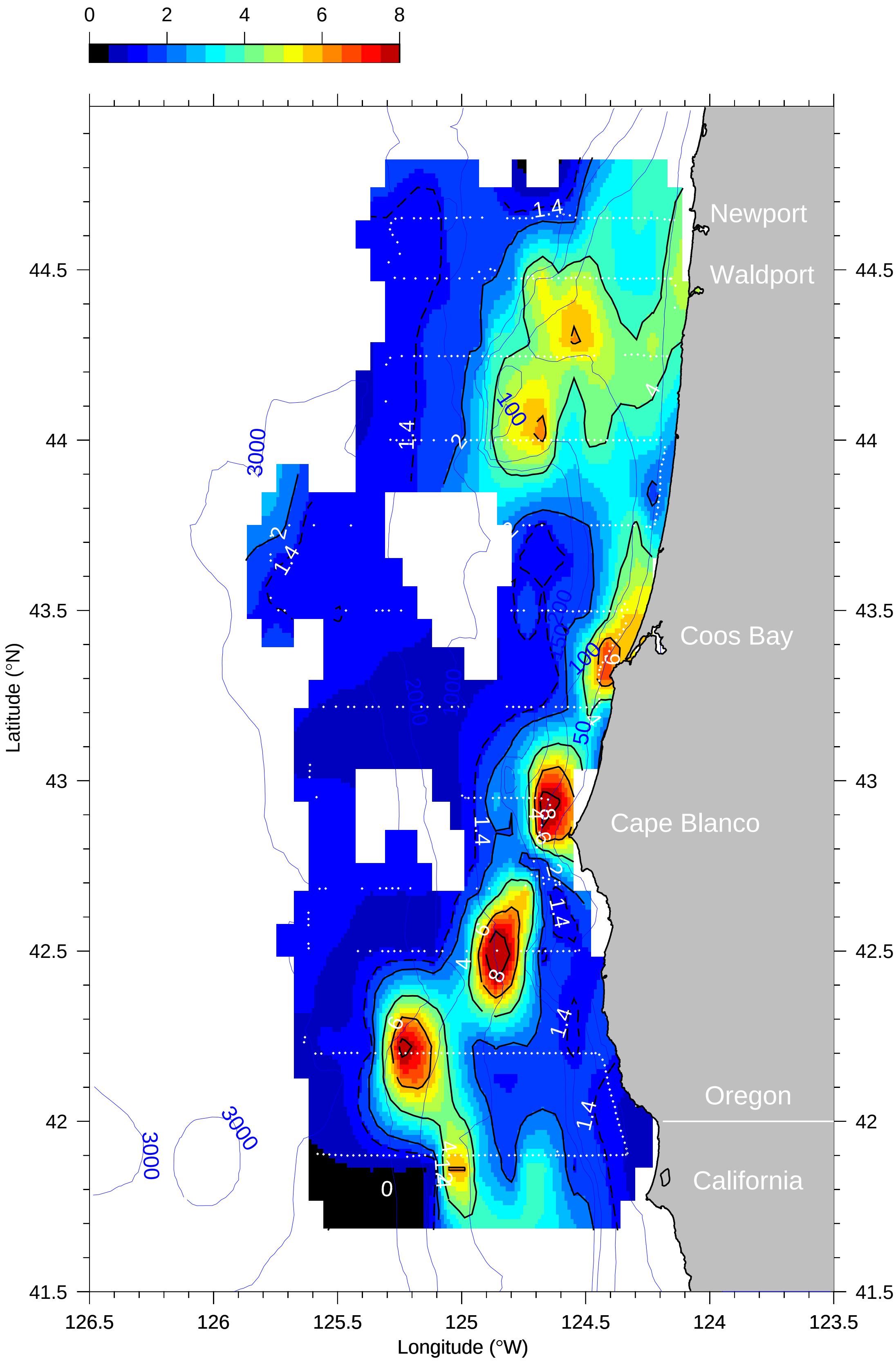
σ_t ($kg\ m^{-3}$) at 155 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

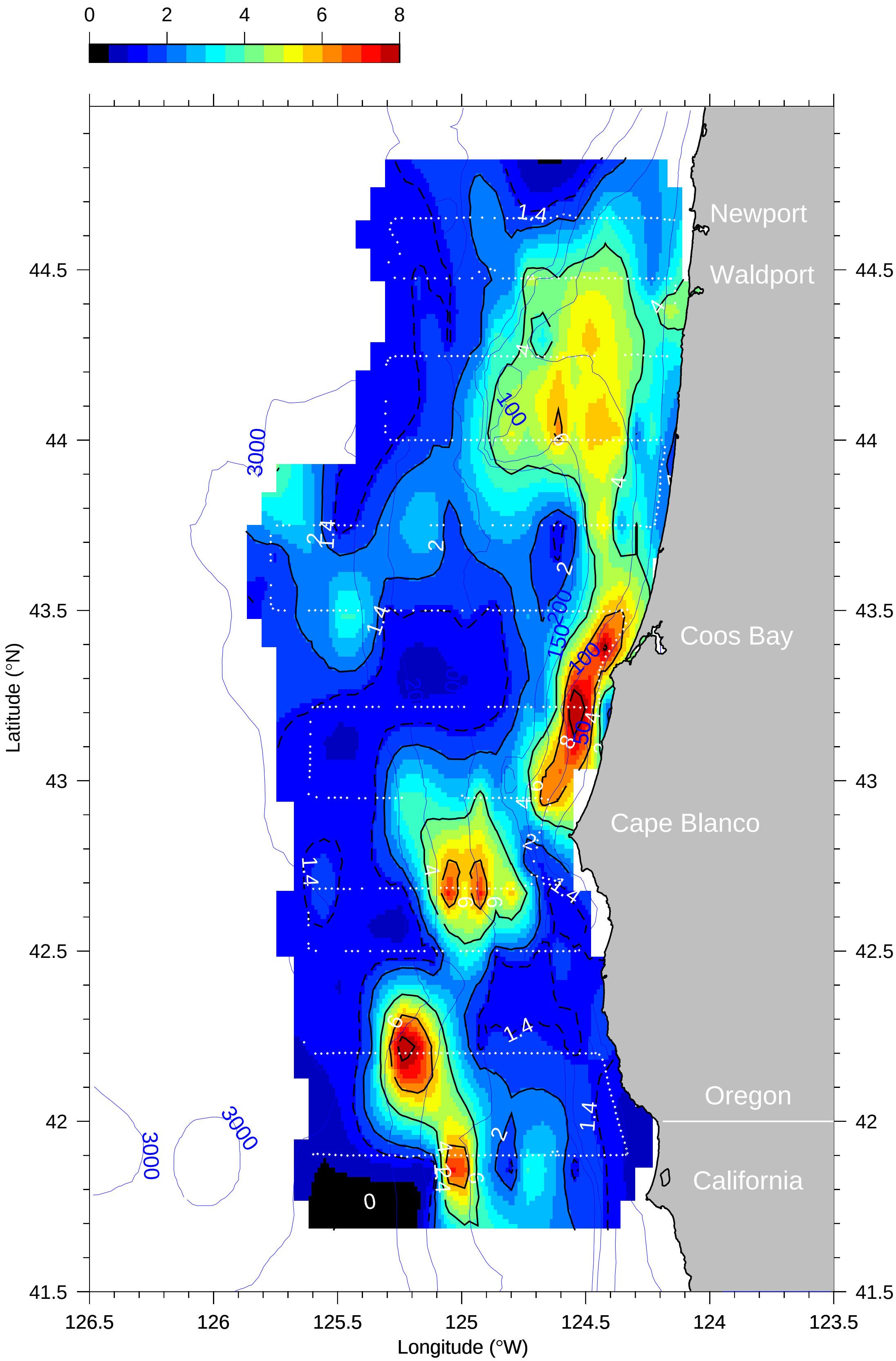
Chlorophyll (μg L^{-1}) at 5 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

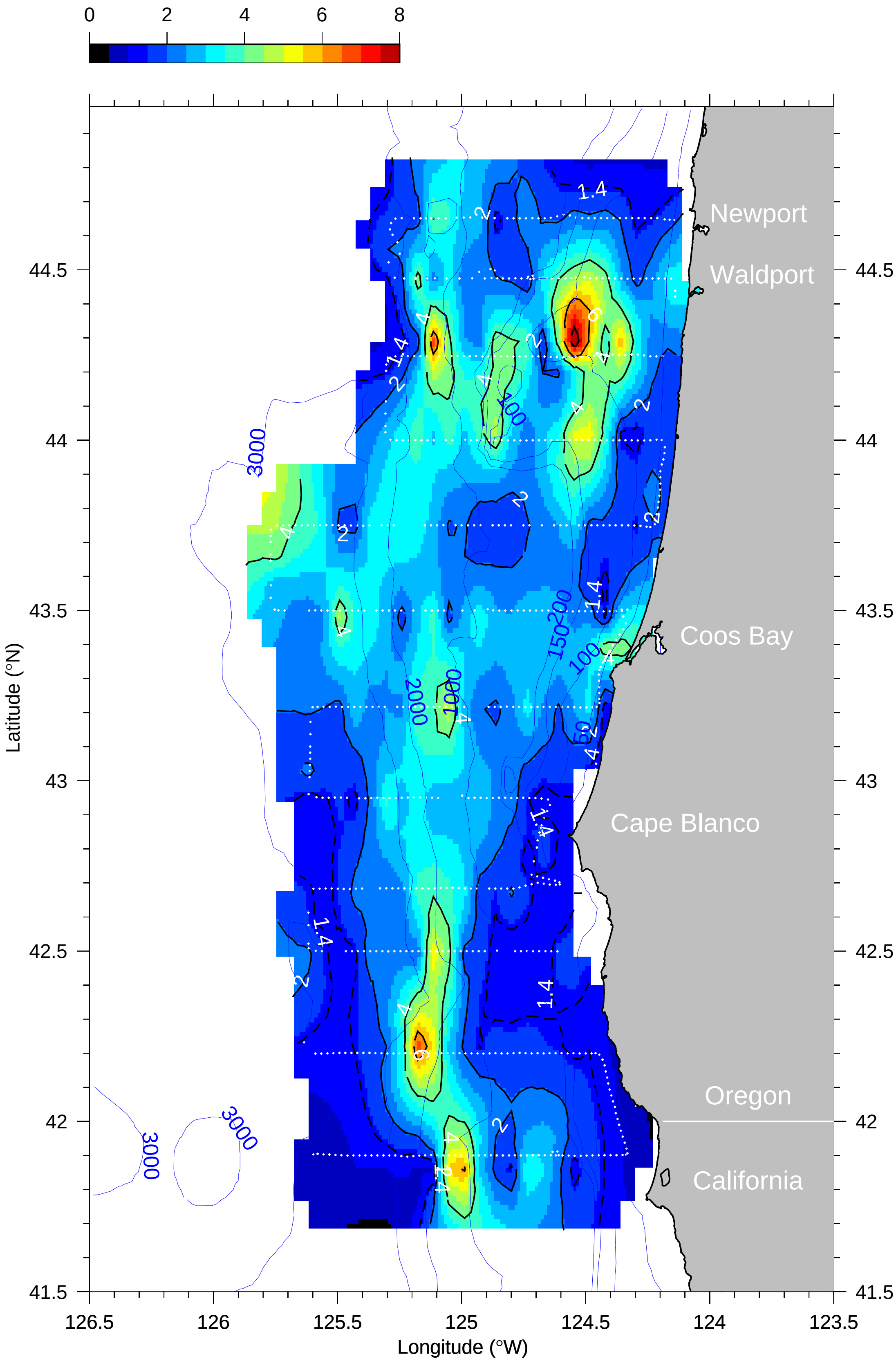
Chlorophyll (μg L^{-1}) at 15 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

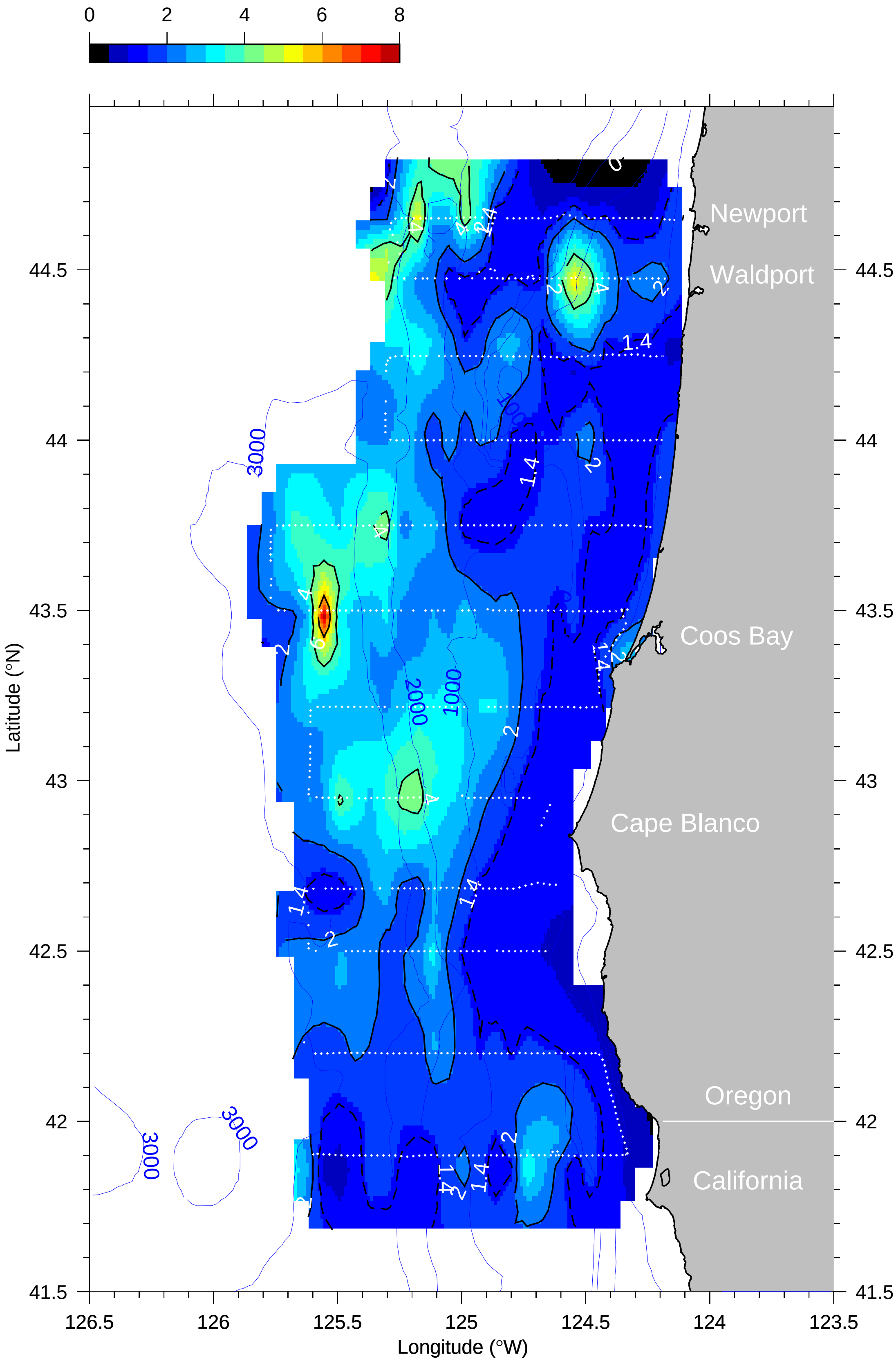
Chlorophyll (μg L^{-1}) at 25 dbar



T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

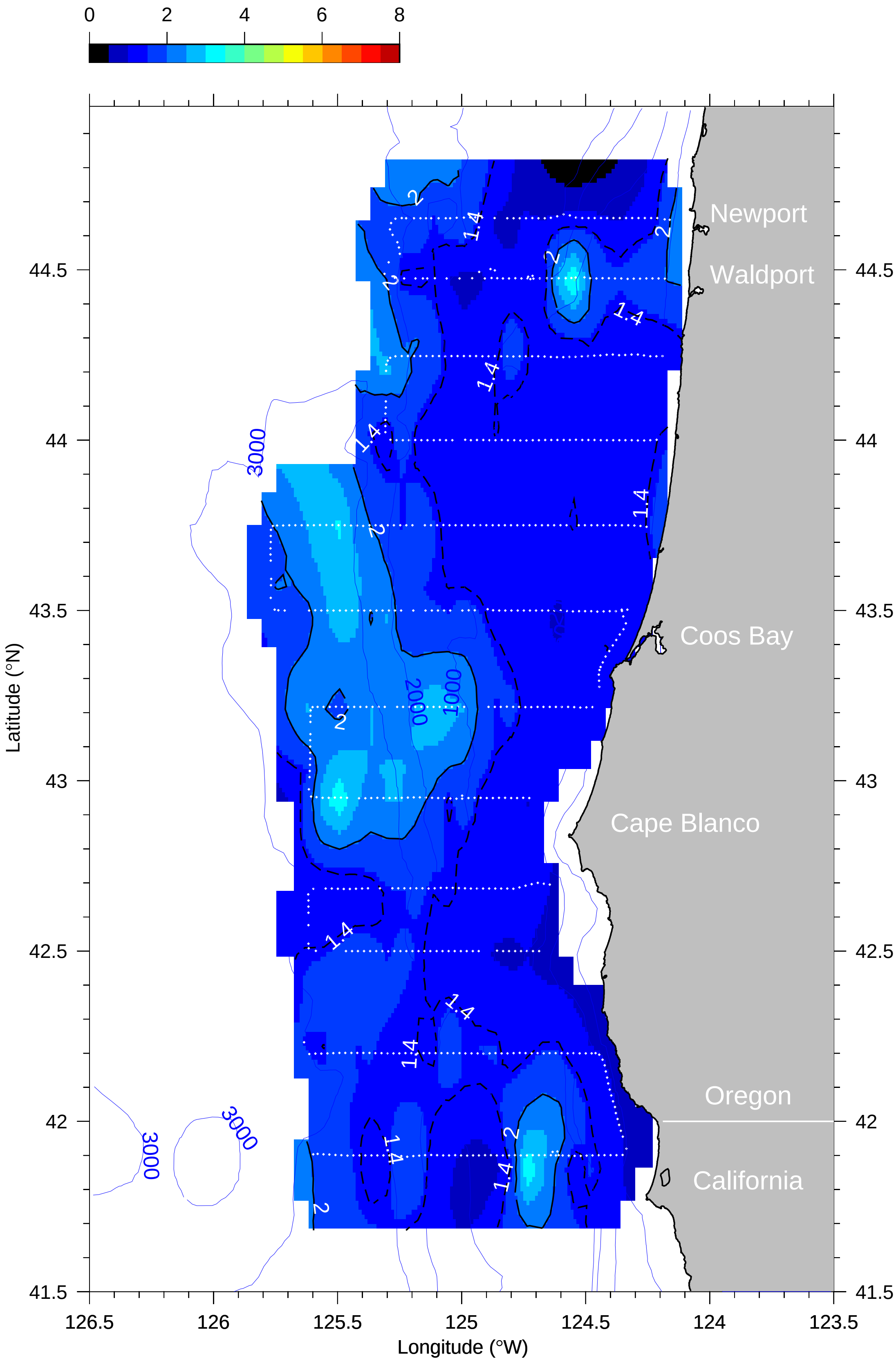
Chlorophyll (µg L^{-1}) at 35 dbar

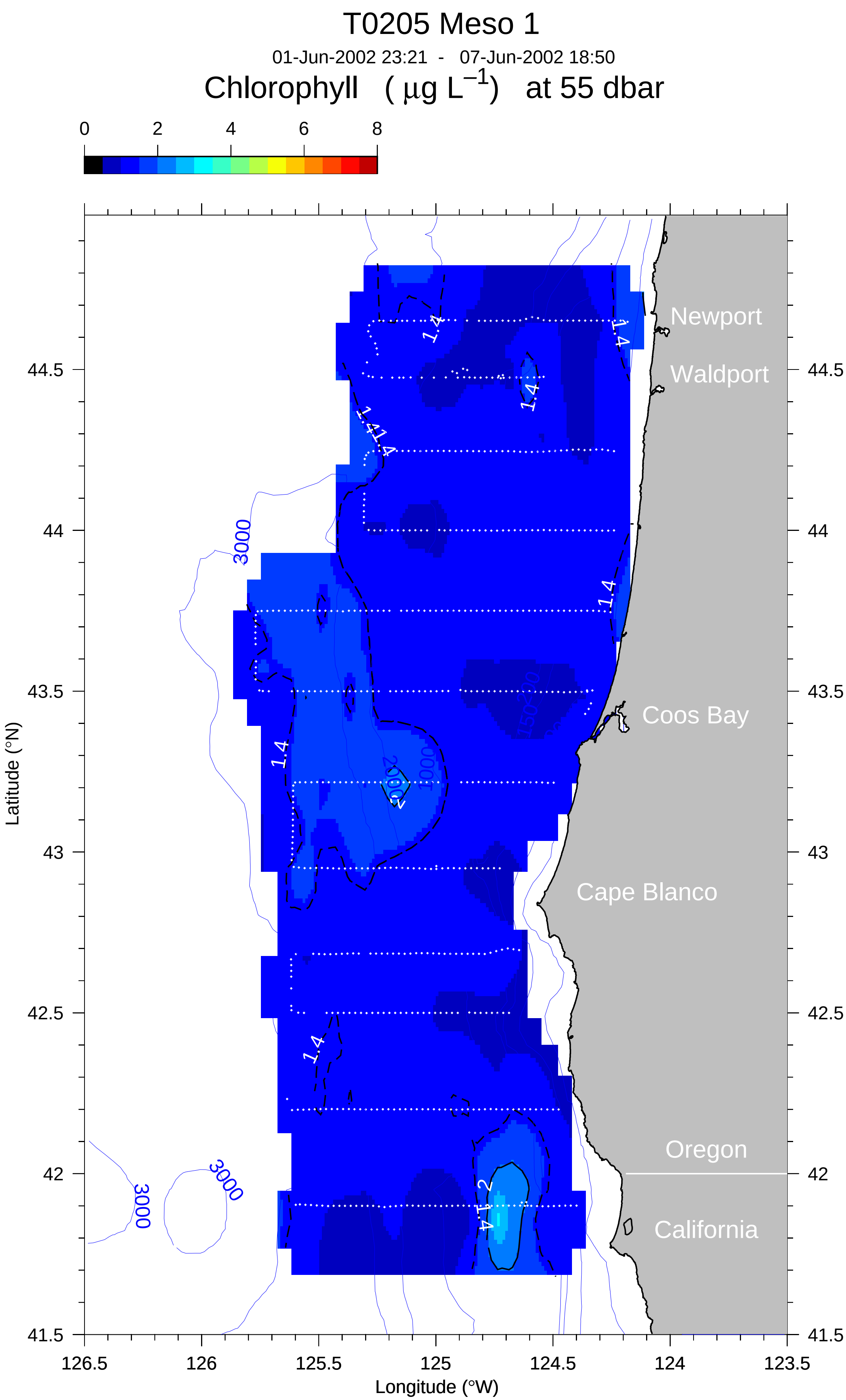


T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

Chlorophyll (μg L^{-1}) at 45 dbar

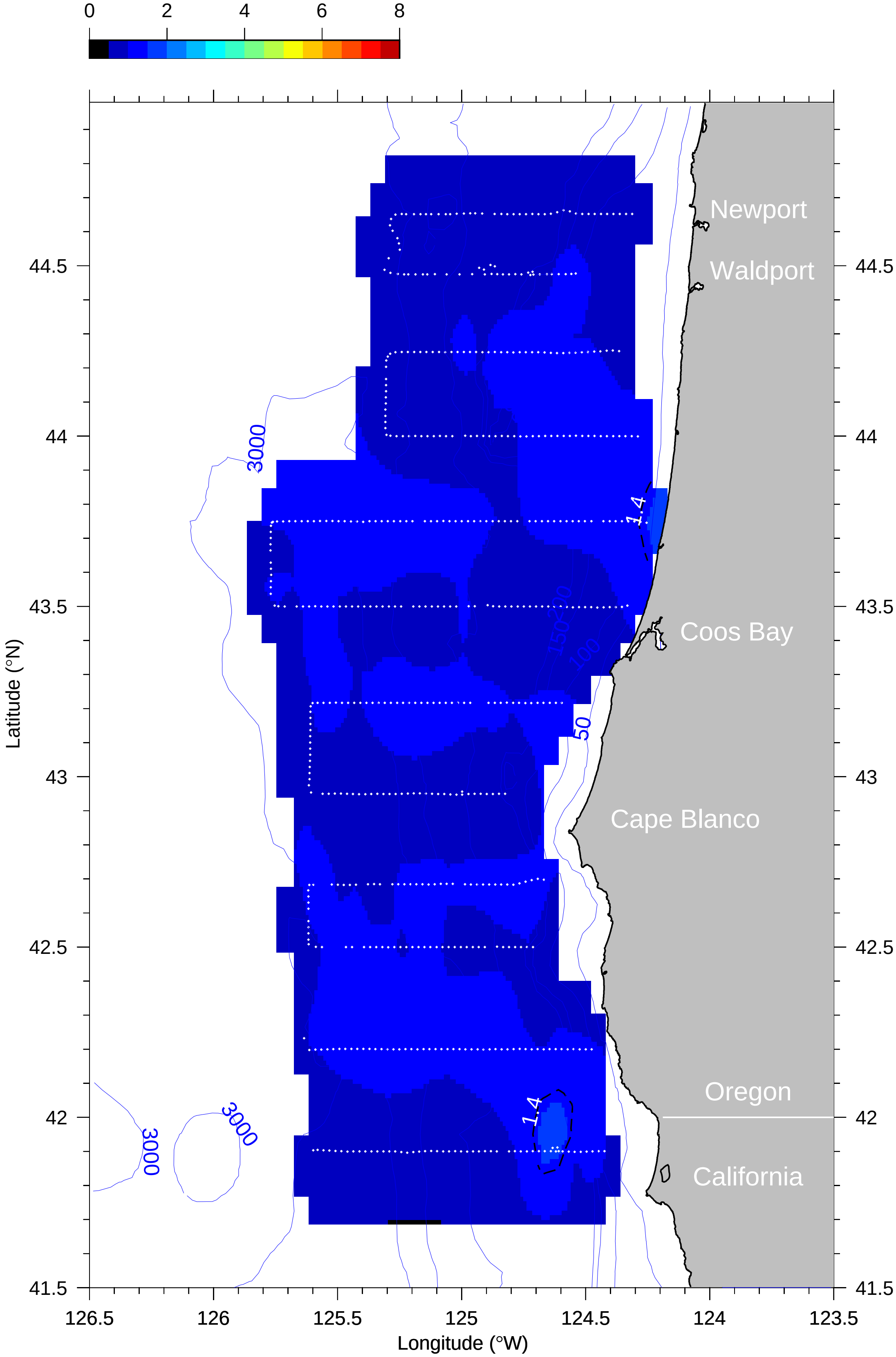


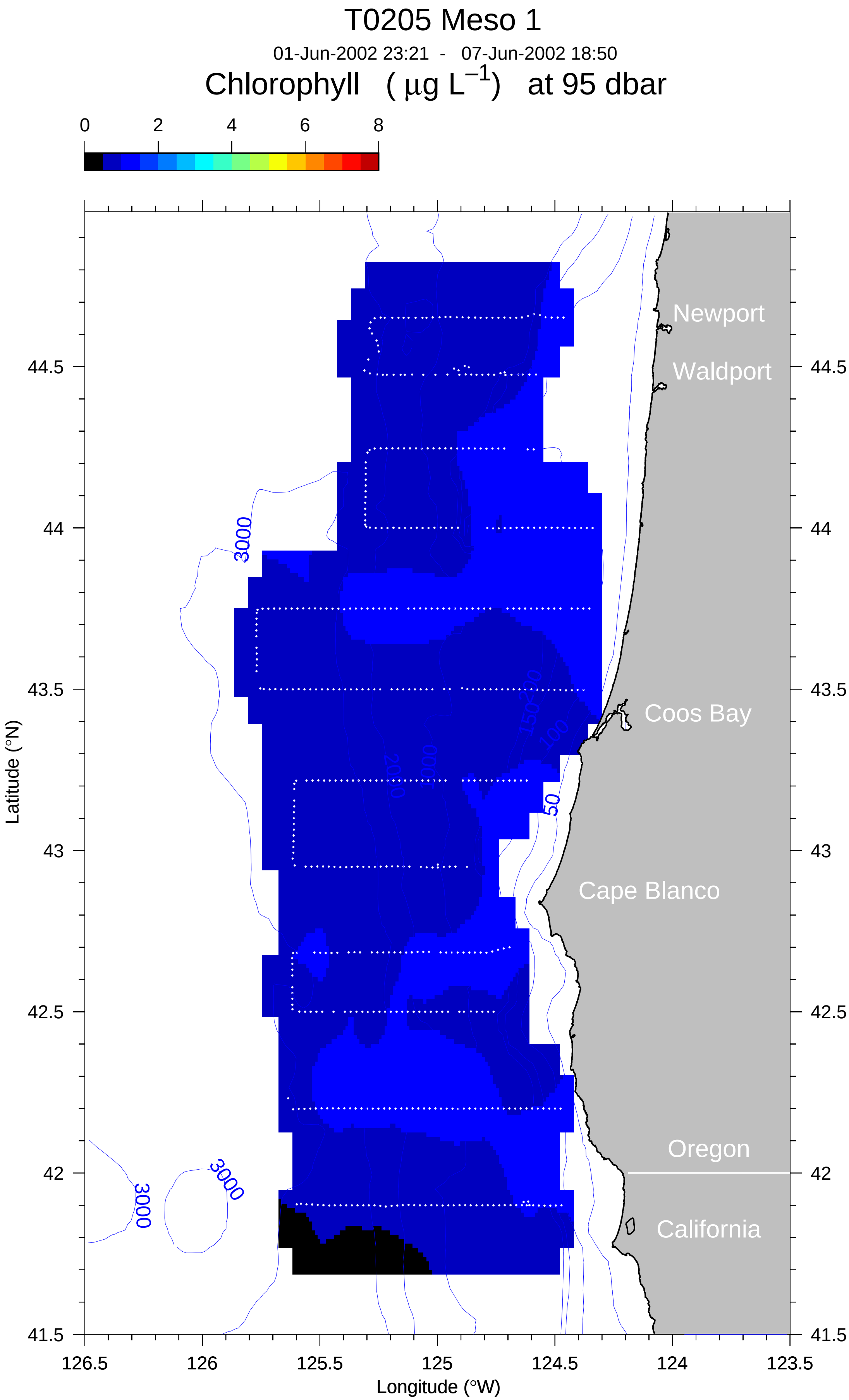

T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Chlorophyll (µg L⁻¹) at 55 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
1.4
1.2

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

Chlorophyll (μg L^{-1}) at 75 dbar

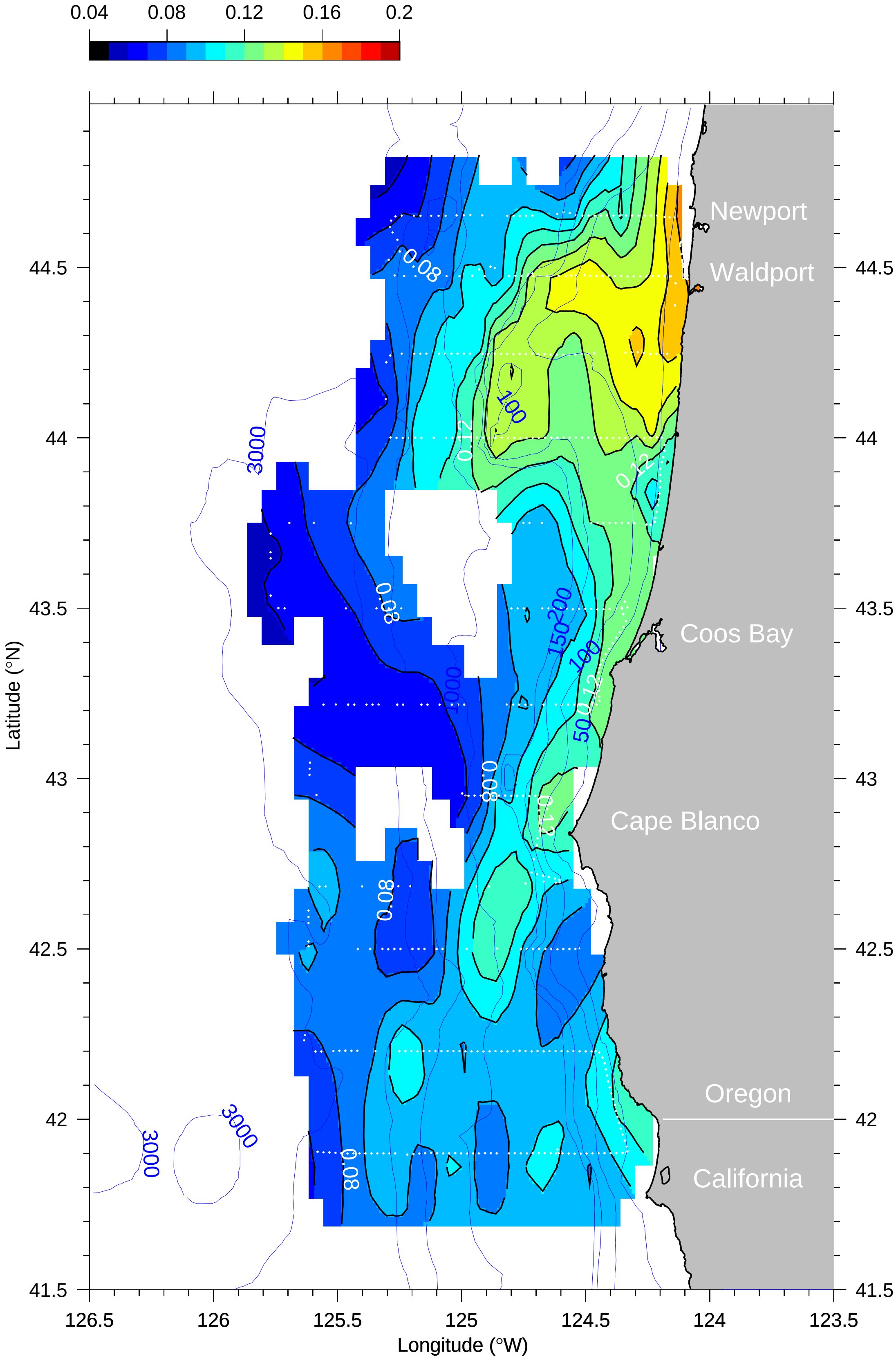


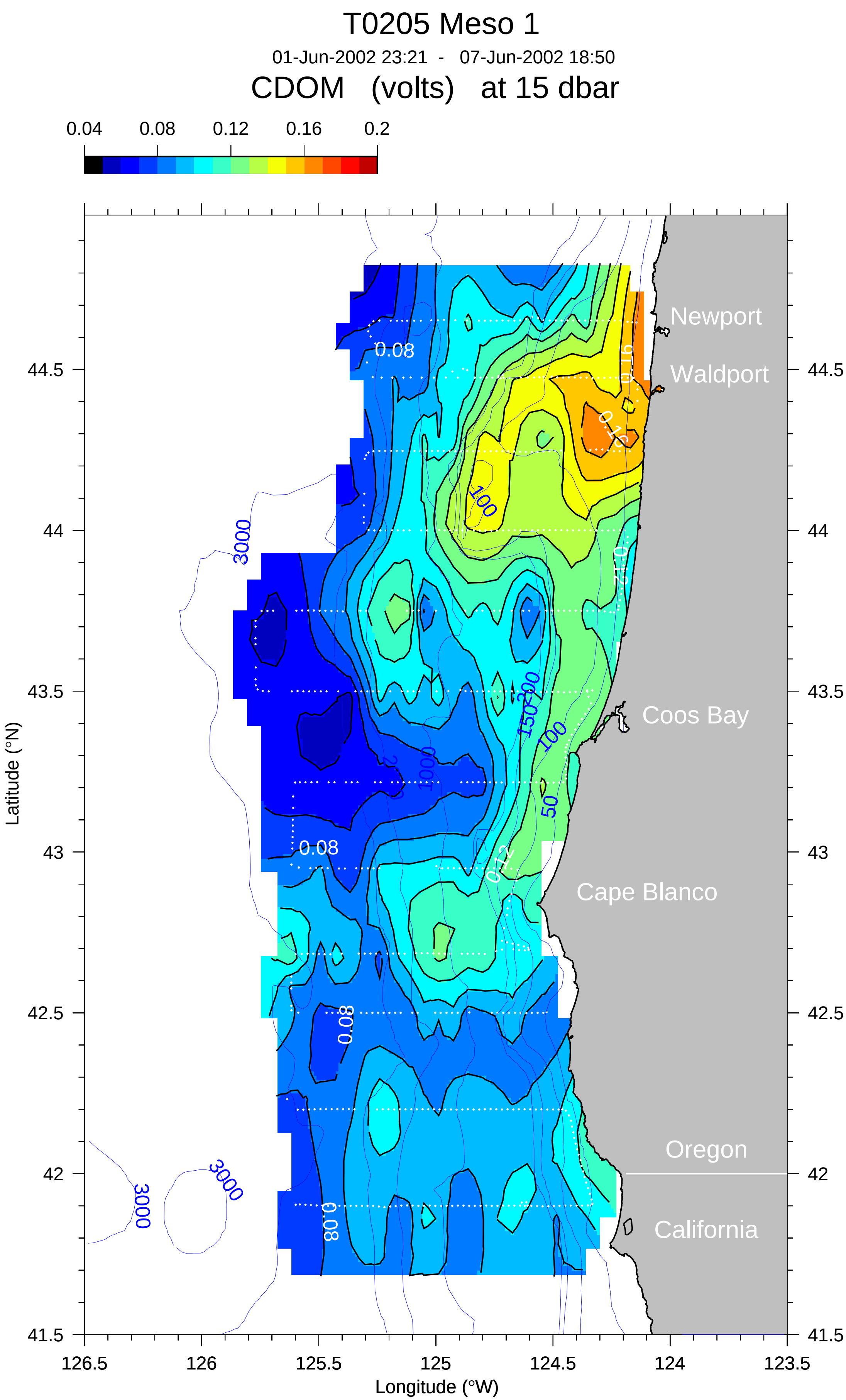

T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
Chlorophyll (µg L^{-1}) at 95 dbar
0
2
4
6
8
3000
3000
3000
2000
1000
150
200
100
50
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
Latitude (°N)
Longitude (°W)

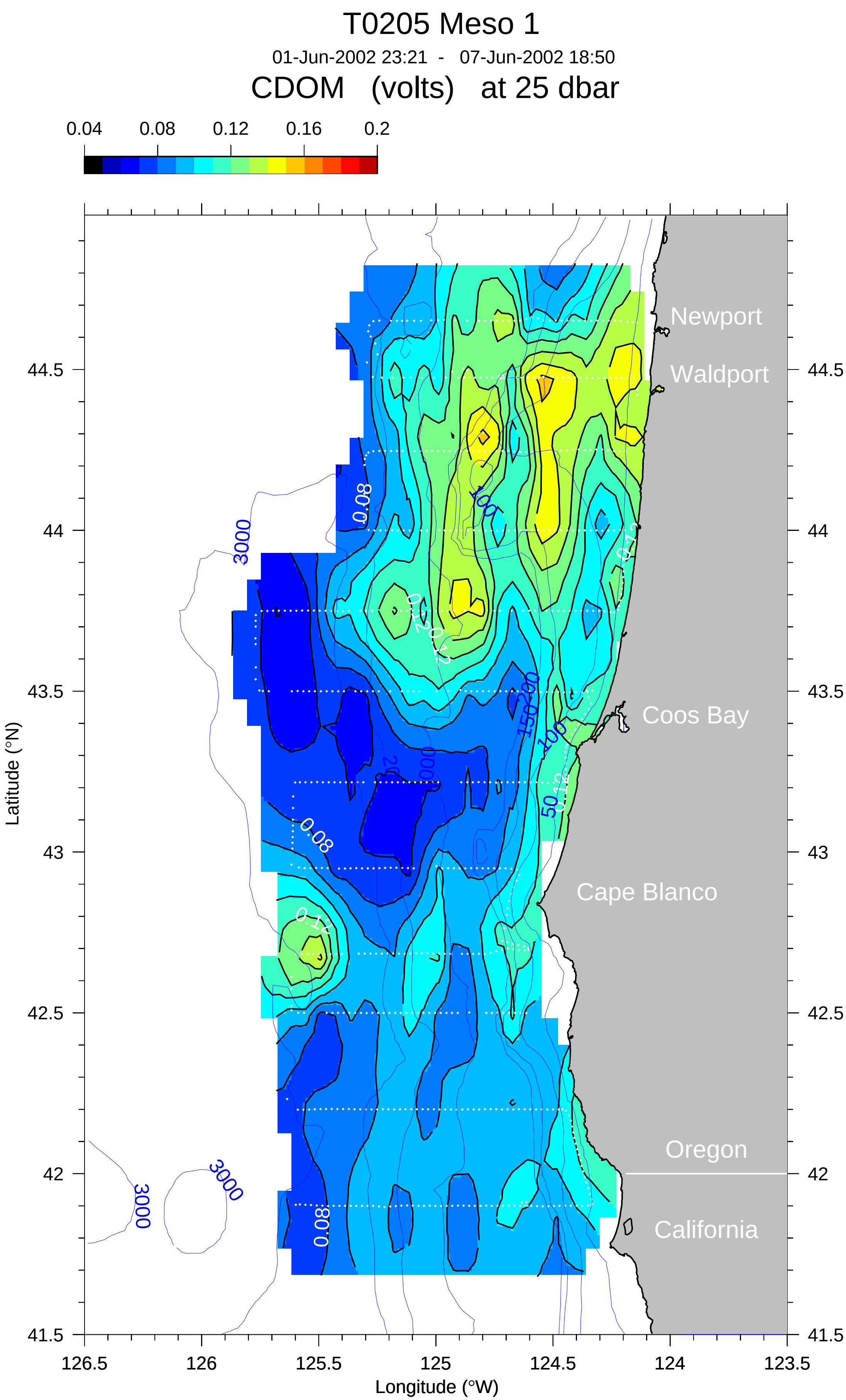
T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

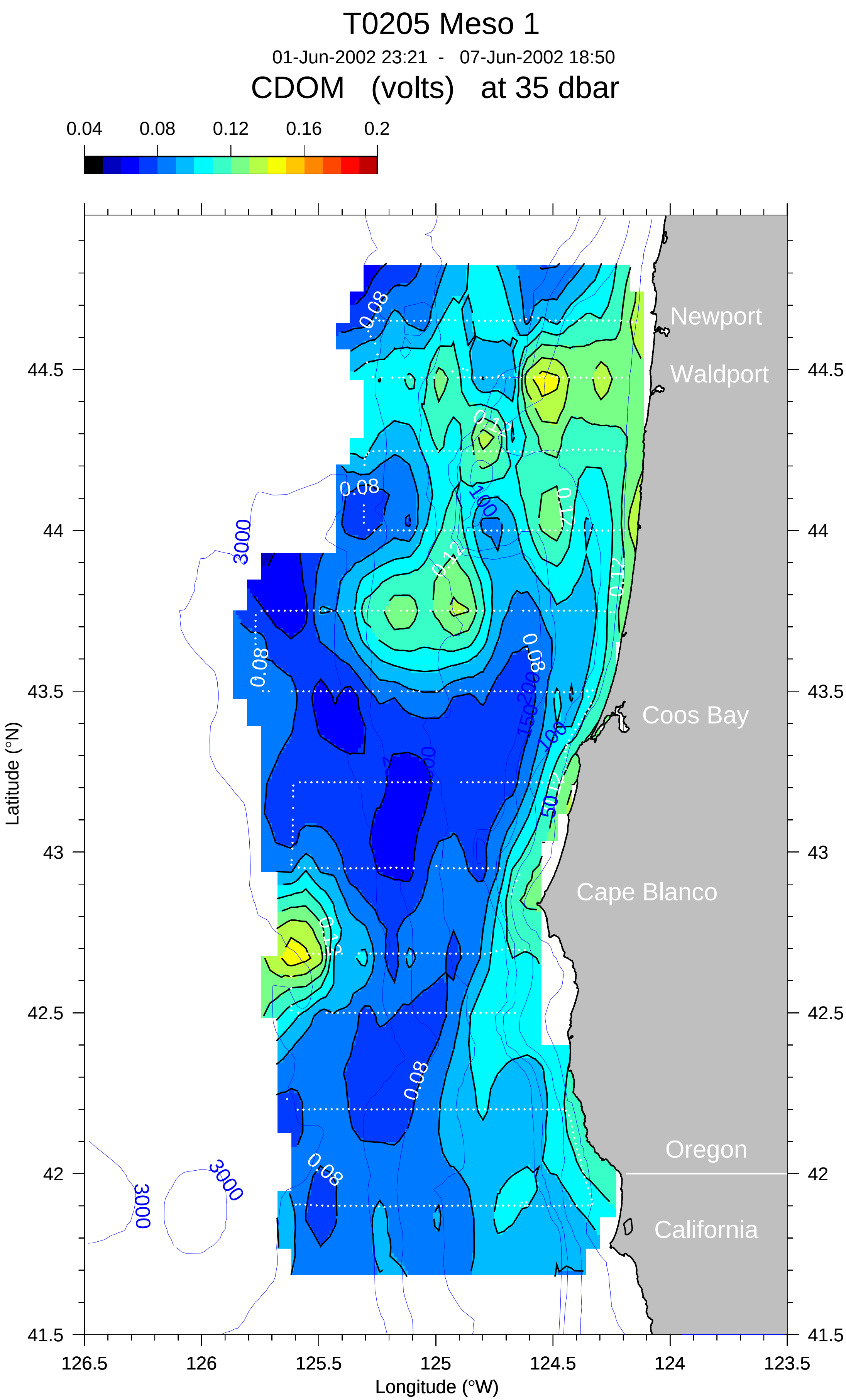
CDOM (volts) at 5 dbar




T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
CDOM (volts) at 15 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5



T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
CDOM (volts) at 25 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
0.08
0.12
0.14
100
200
150
50

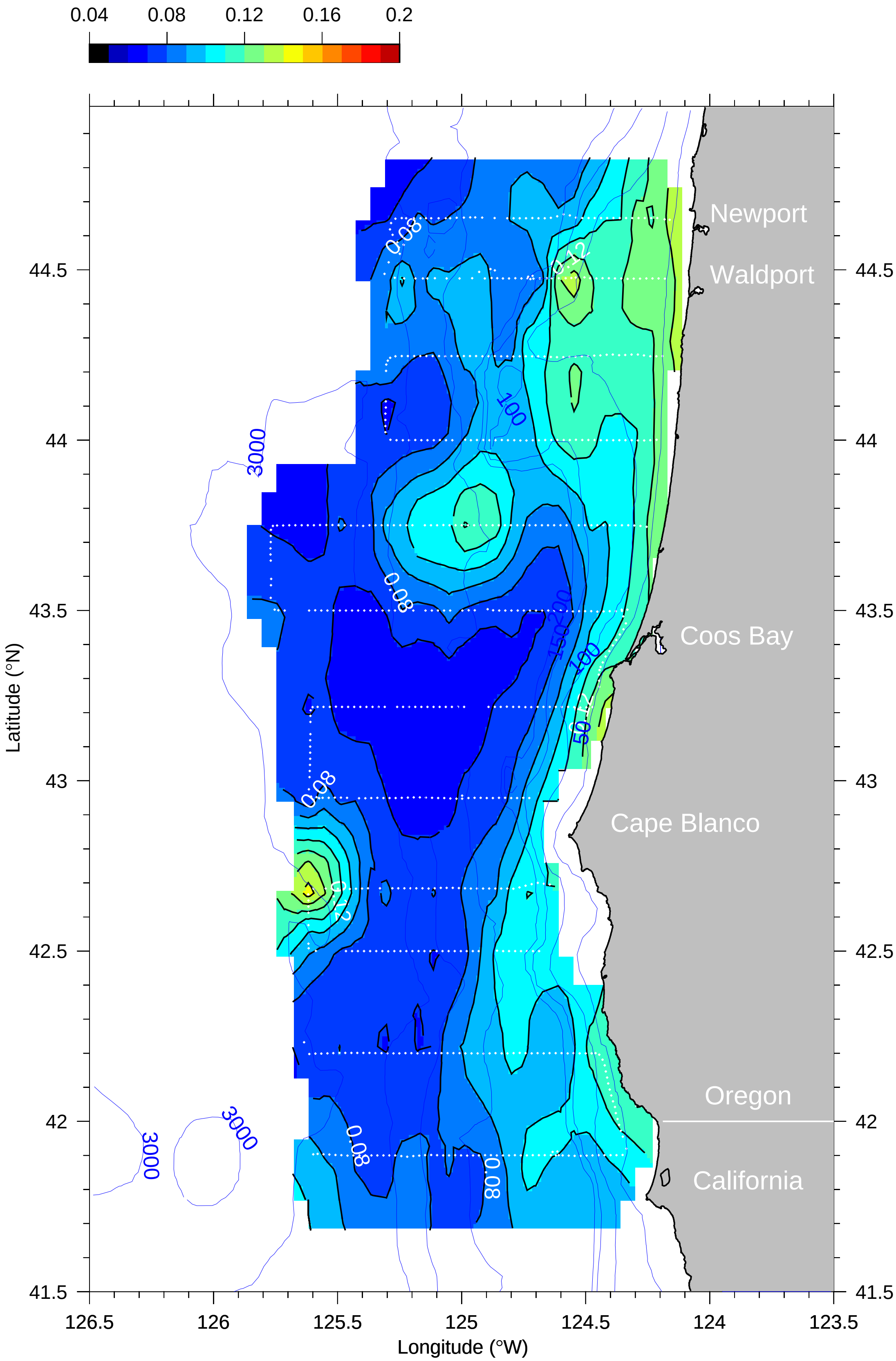


T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
CDOM (volts) at 35 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
126.5
126
125.5
125
124.5
124
123.5
44.5
44
43.5
43
42.5
42
41.5
3000
0.08
0.12
100

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

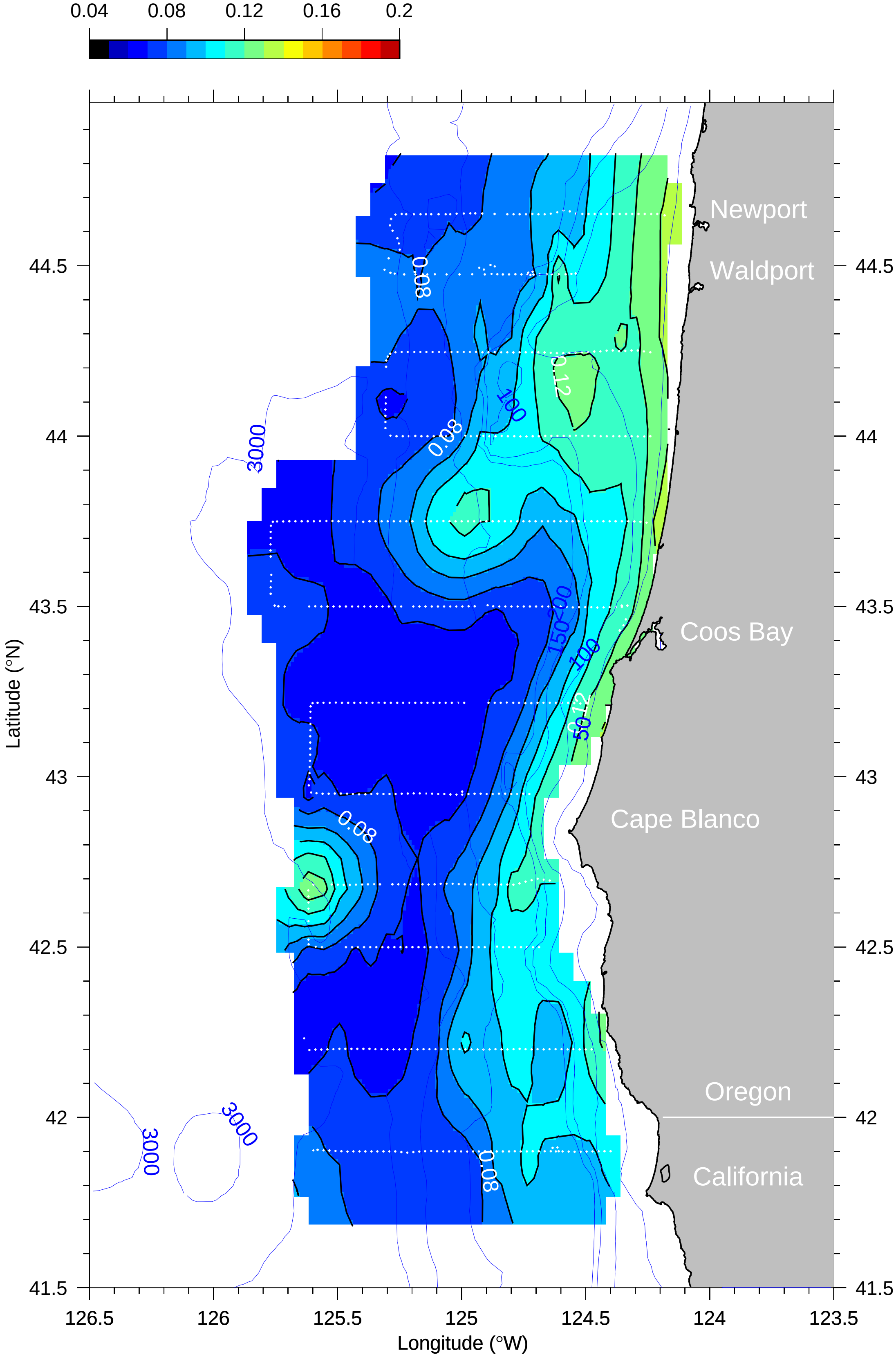
CDOM (volts) at 45 dbar

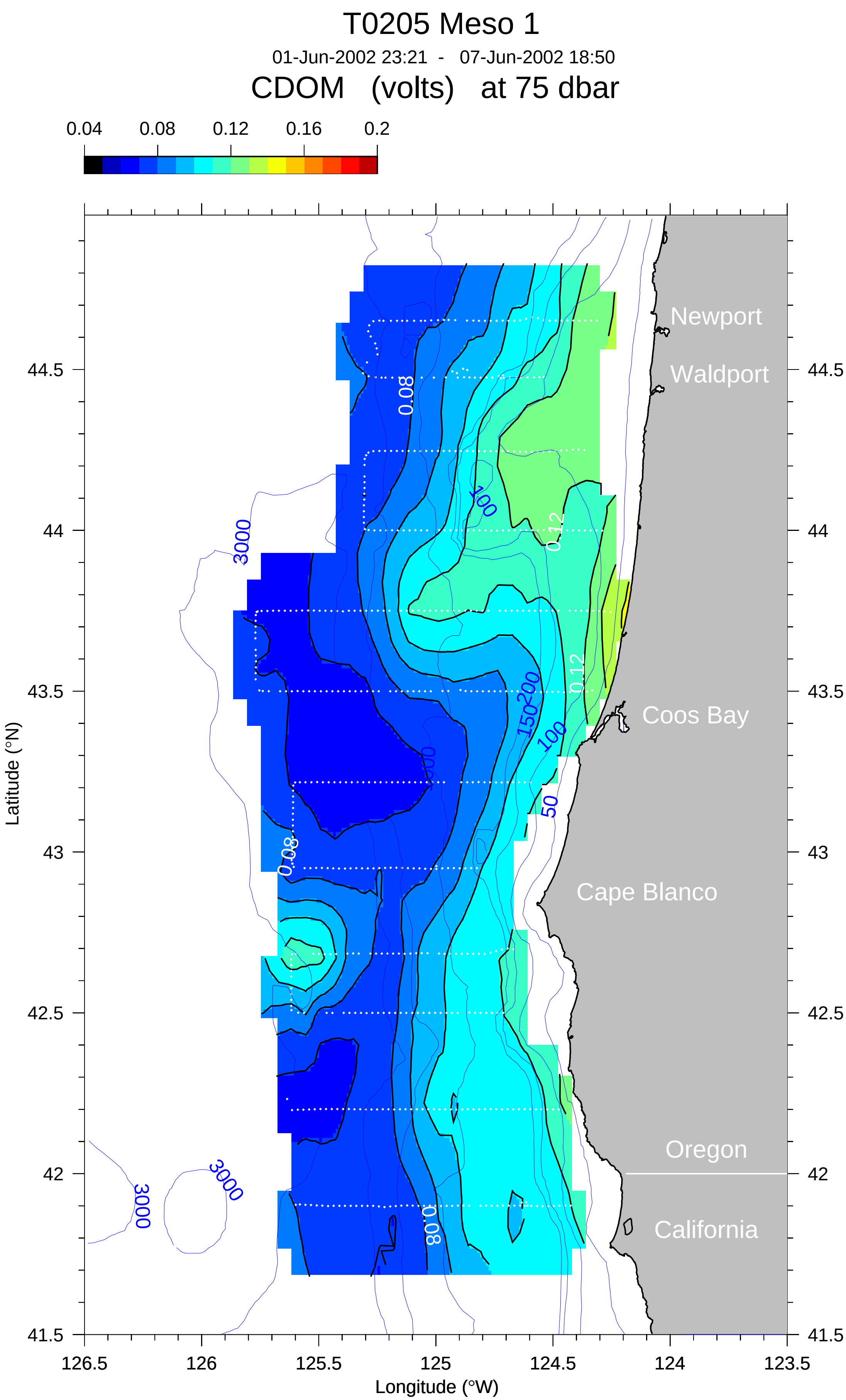


T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

CDOM (volts) at 55 dbar



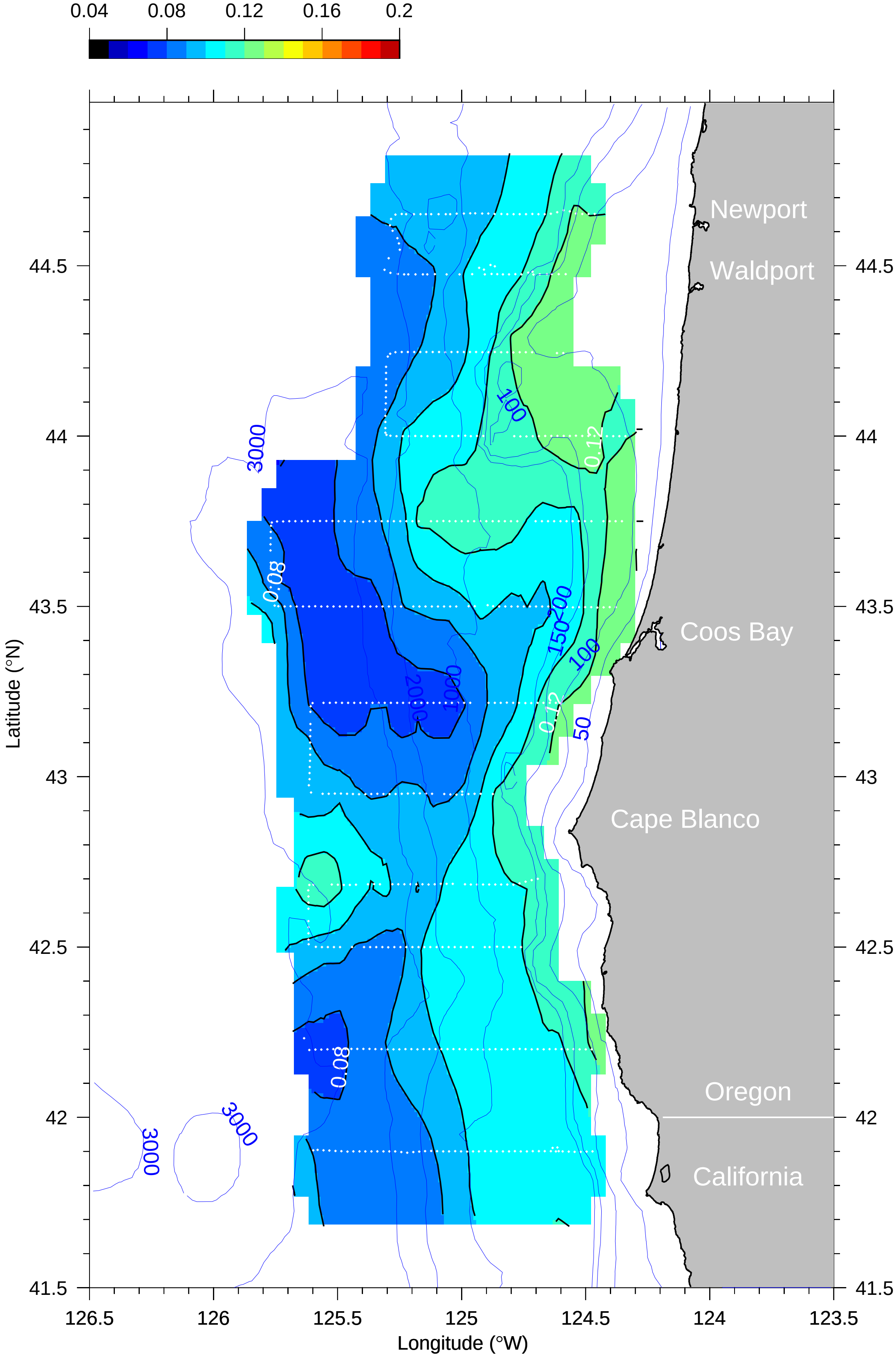


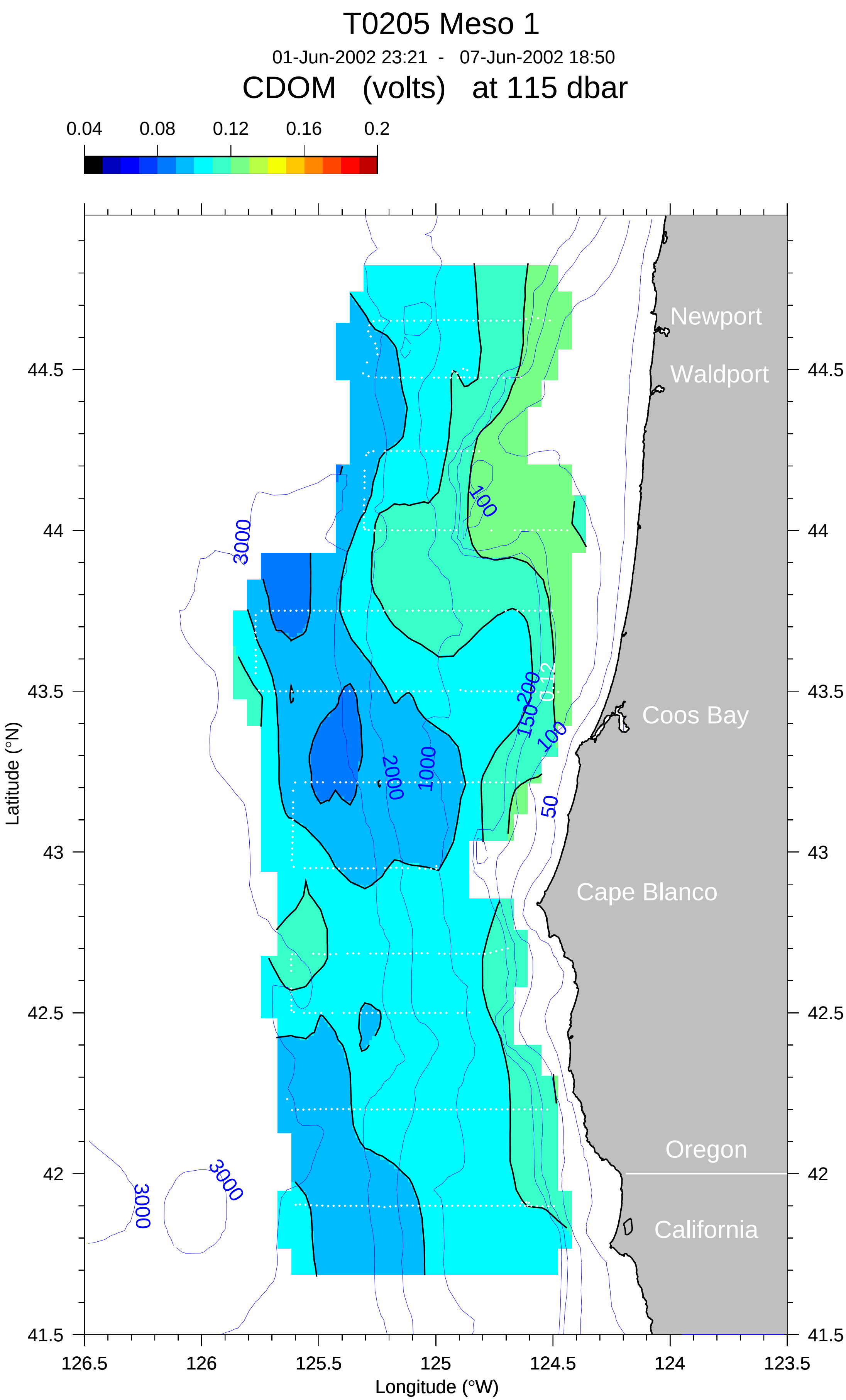
T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
CDOM (volts) at 75 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
100
200
150
50
0.08
0.12

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

CDOM (volts) at 95 dbar

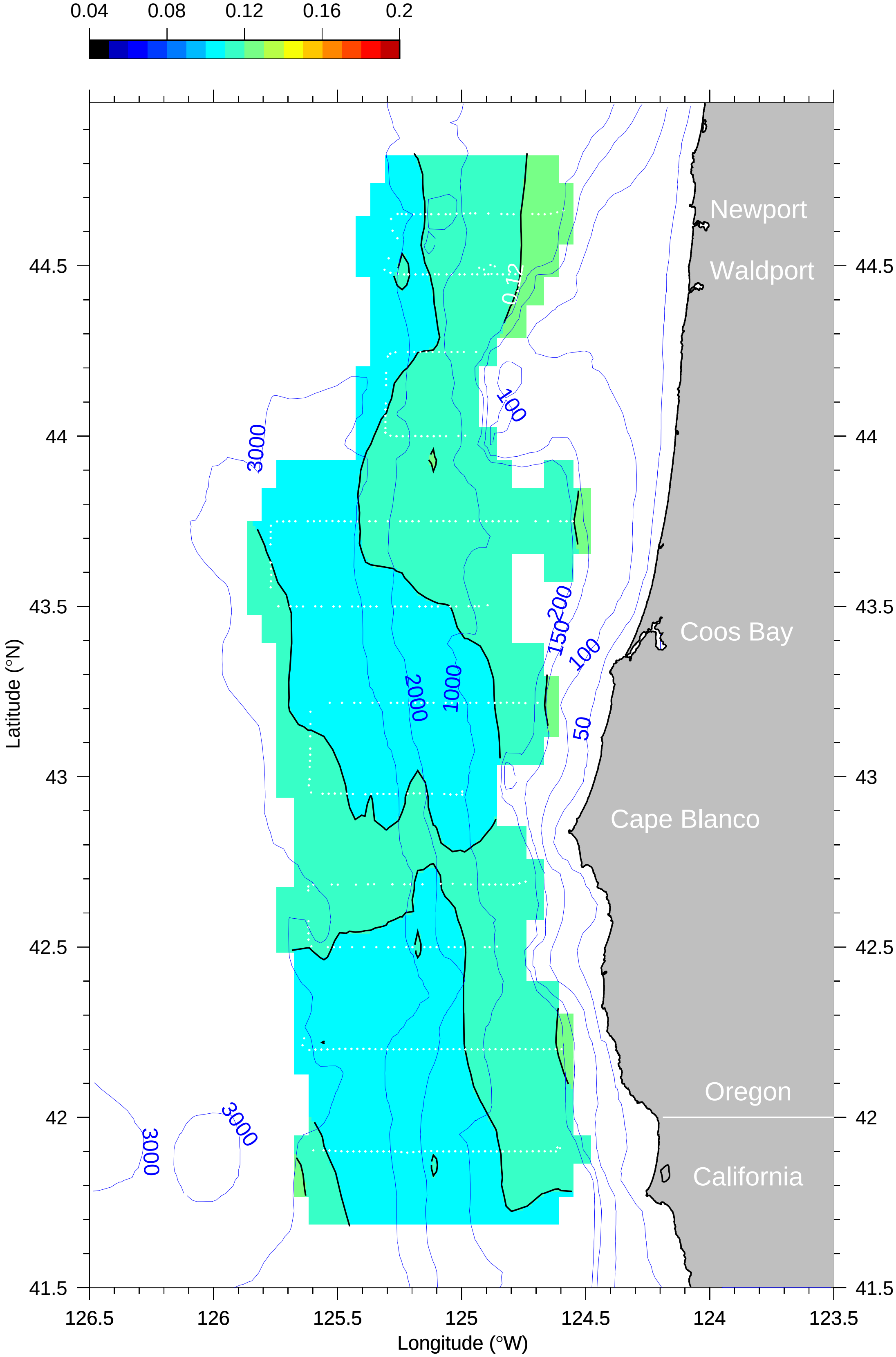



T0205 Meso 1
01-Jun-2002 23:21 - 07-Jun-2002 18:50
CDOM (volts) at 115 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
100
3000
200
150
0.12
100
2000
1000
50
3000
3000
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
Latitude (°N)
Longitude (°W)

T0205 Meso 1

01-Jun-2002 23:21 - 07-Jun-2002 18:50

CDOM (volts) at 155 dbar



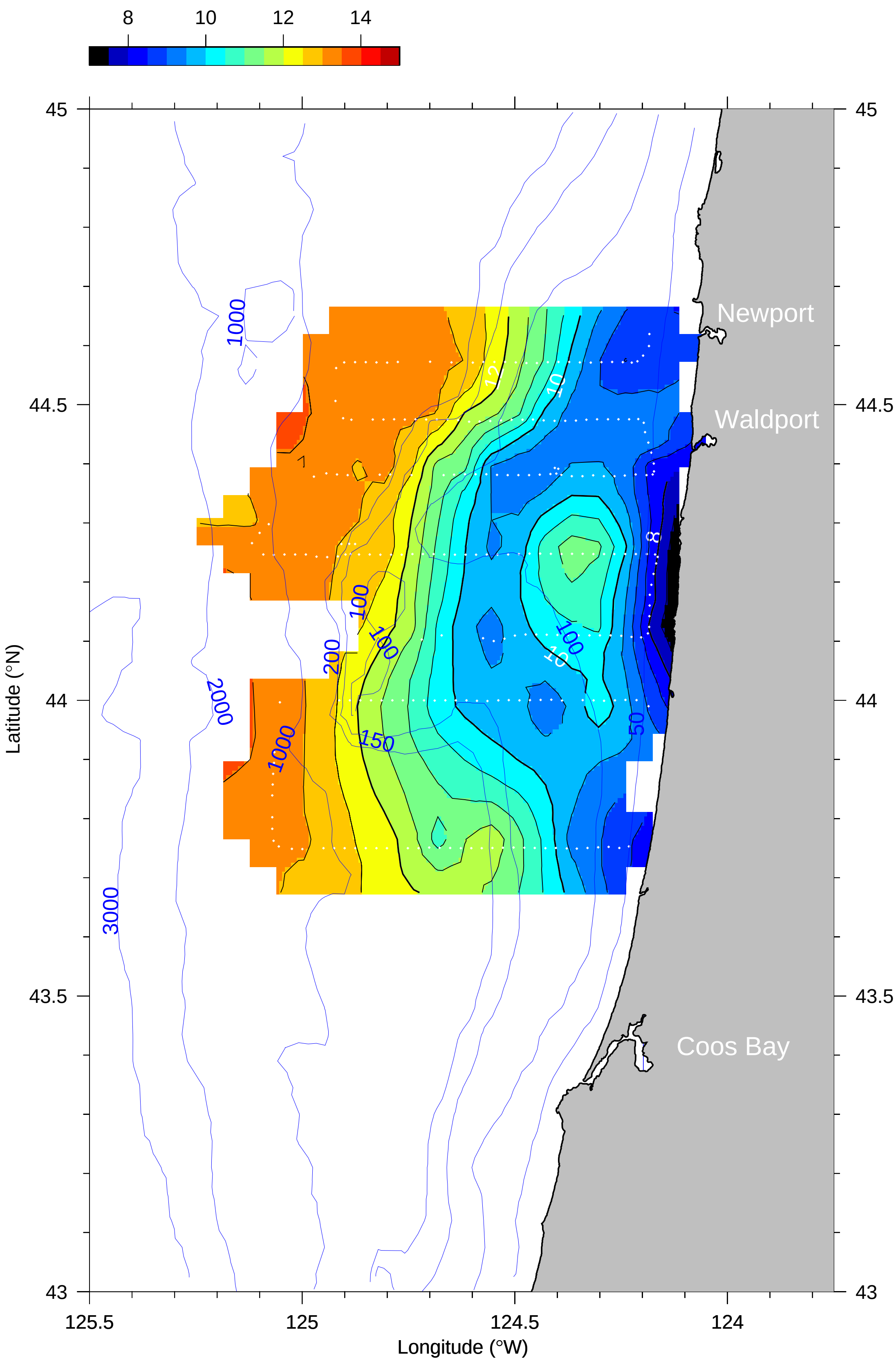
North Maps

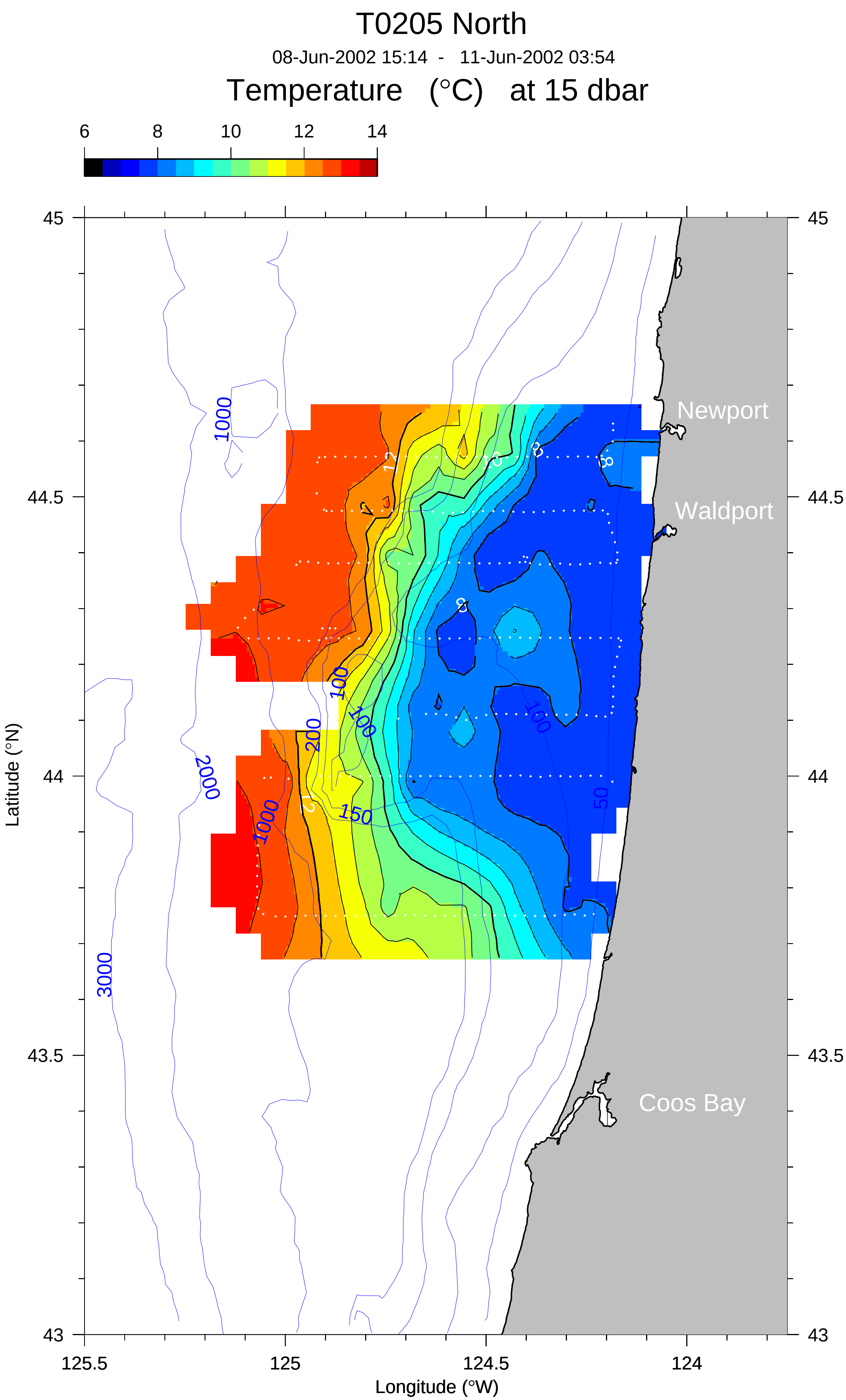
Maps of Temperature, Salinity, σ_t, Chlorophyll, and CDOM at Specified Depths

T0205 North

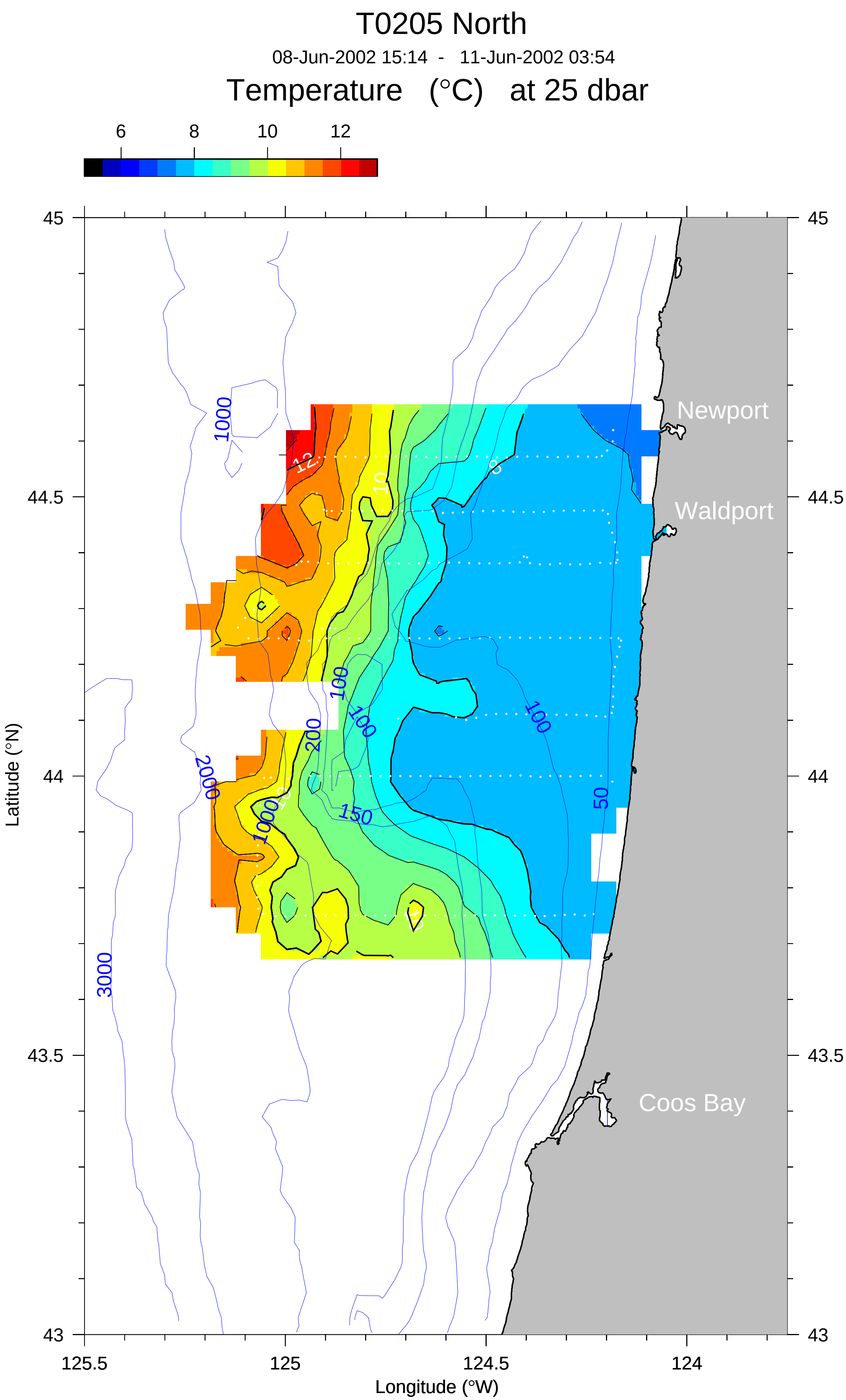
08-Jun-2002 15:14 - 11-Jun-2002 03:54

Temperature (°C) at 5 dbar





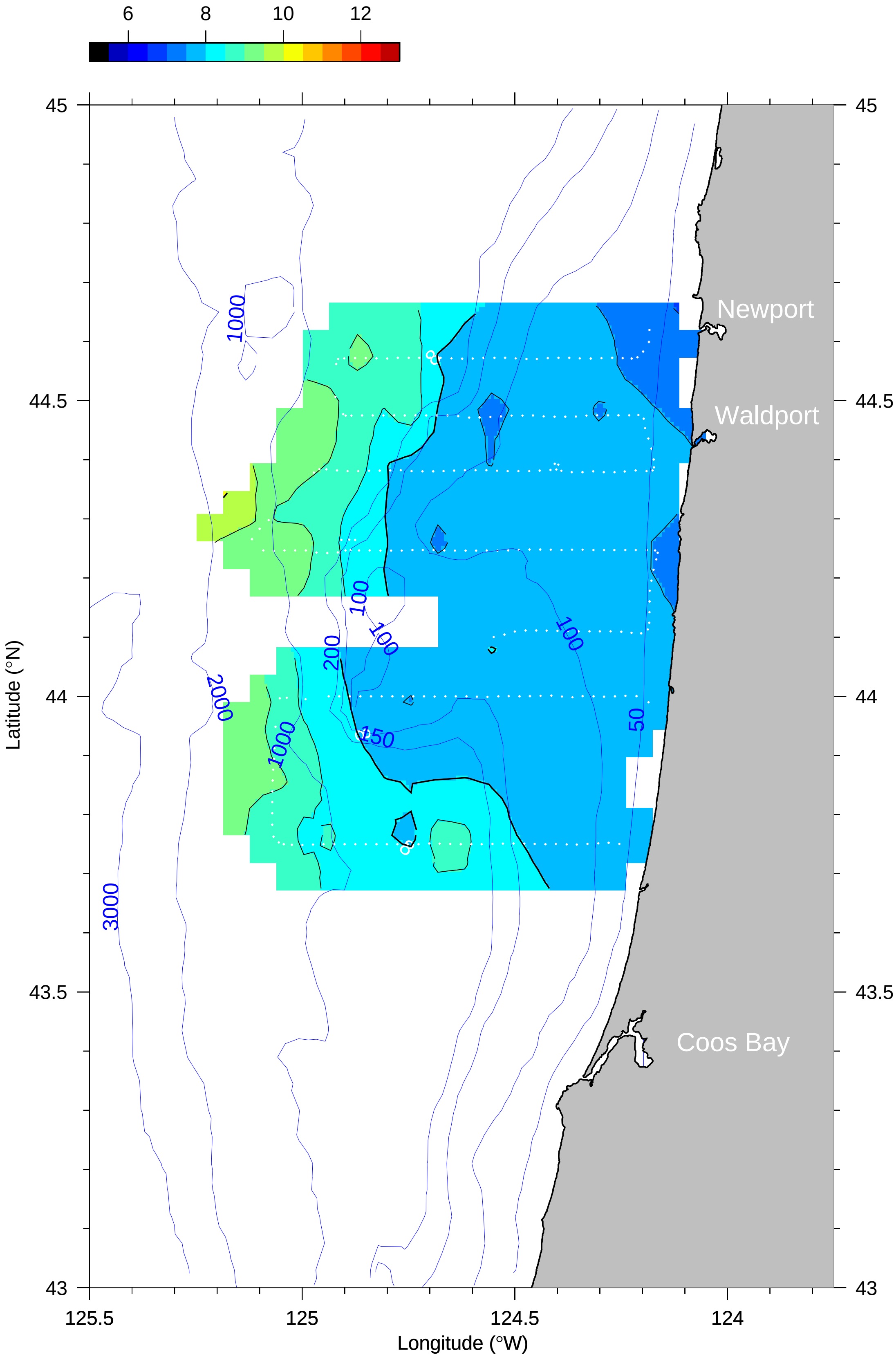
T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Temperature (°C) at 15 dbar
6
8
10
12
14
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
12
8


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Temperature (°C) at 25 dbar
6
8
10
12
45
44.5
44
43.5
43
125.5
125
124.5
124
Longitude (°W)
Latitude (°N)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

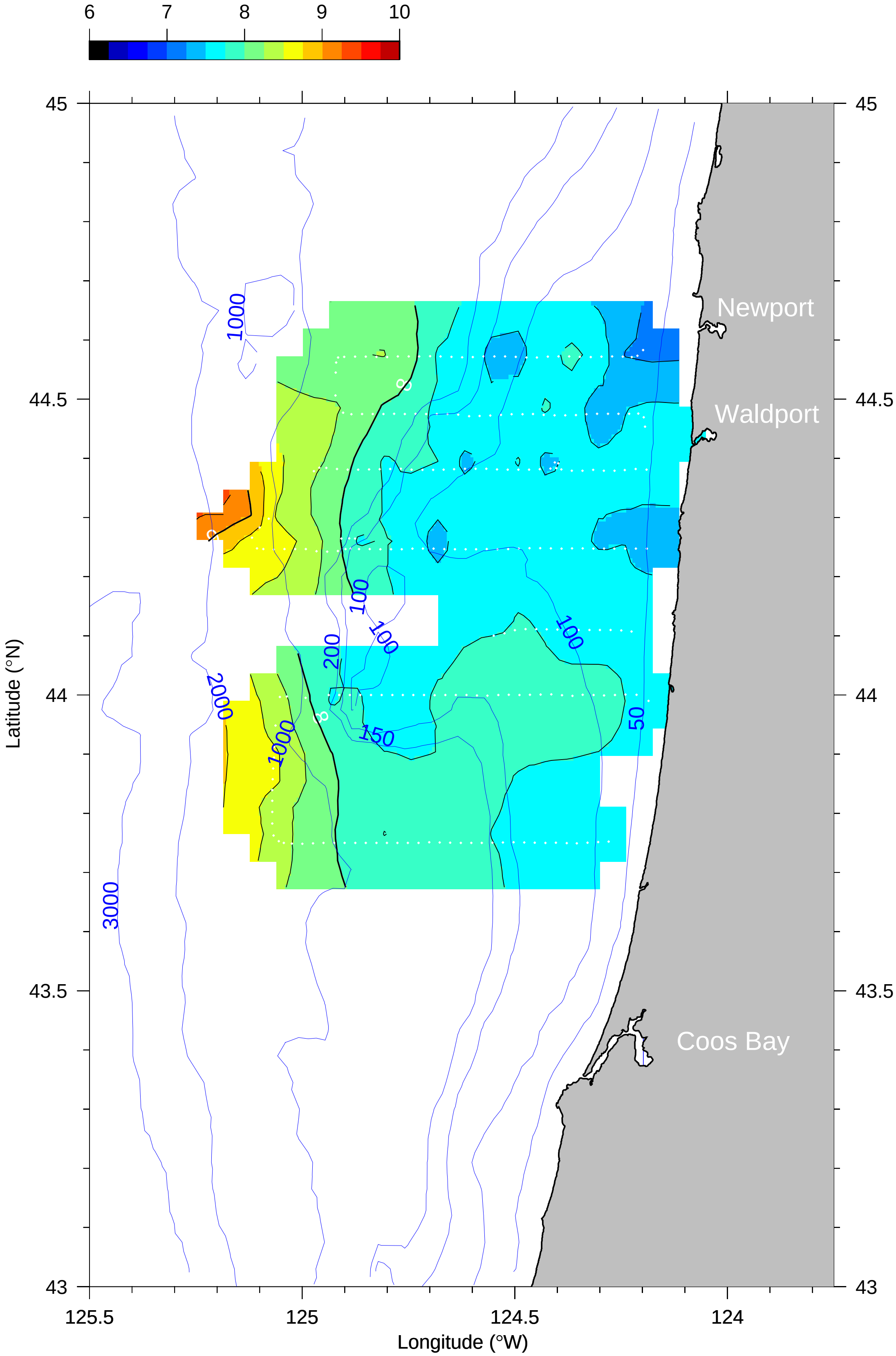
Temperature (°C) at 35 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

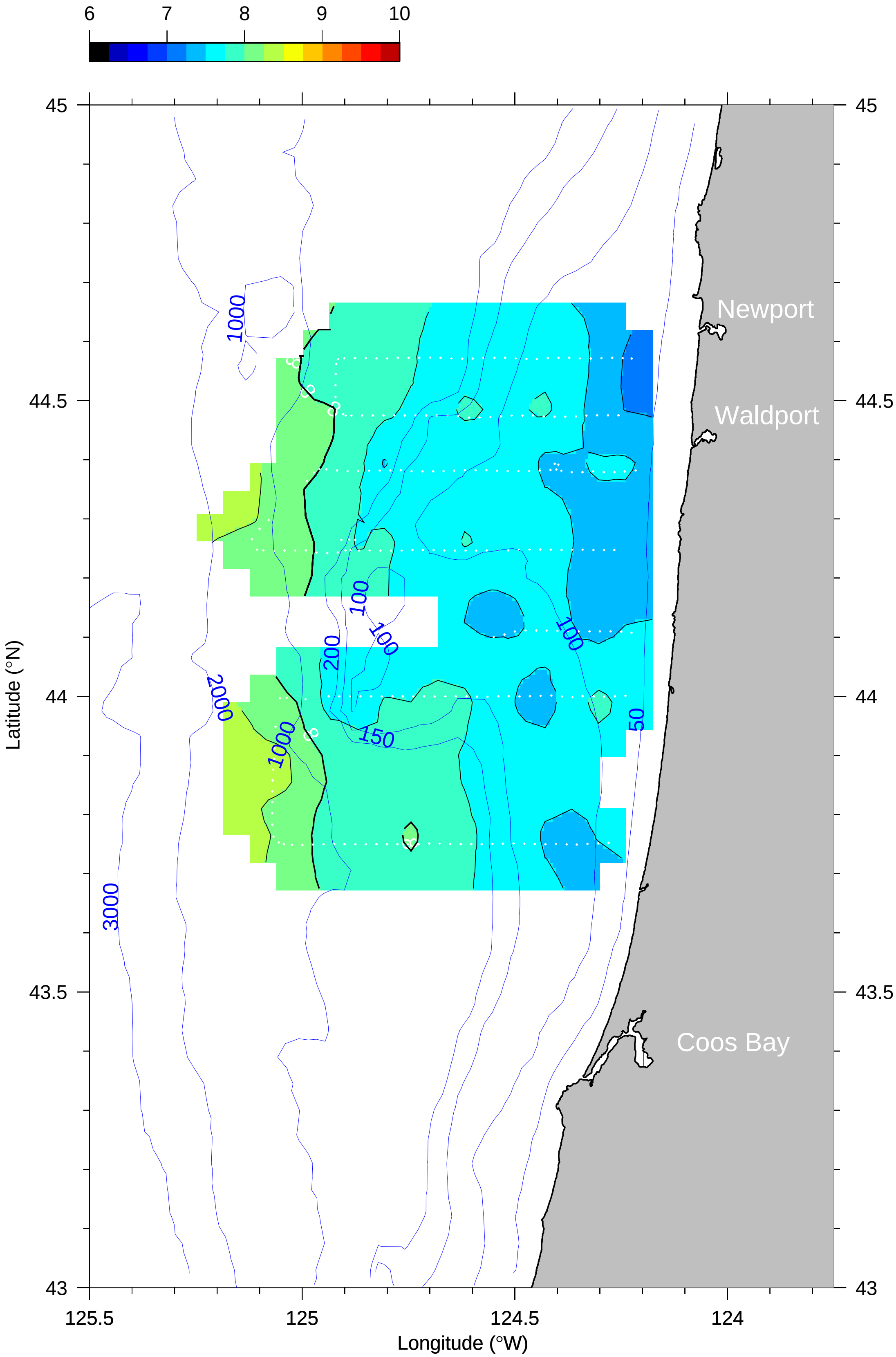
Temperature (°C) at 45 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

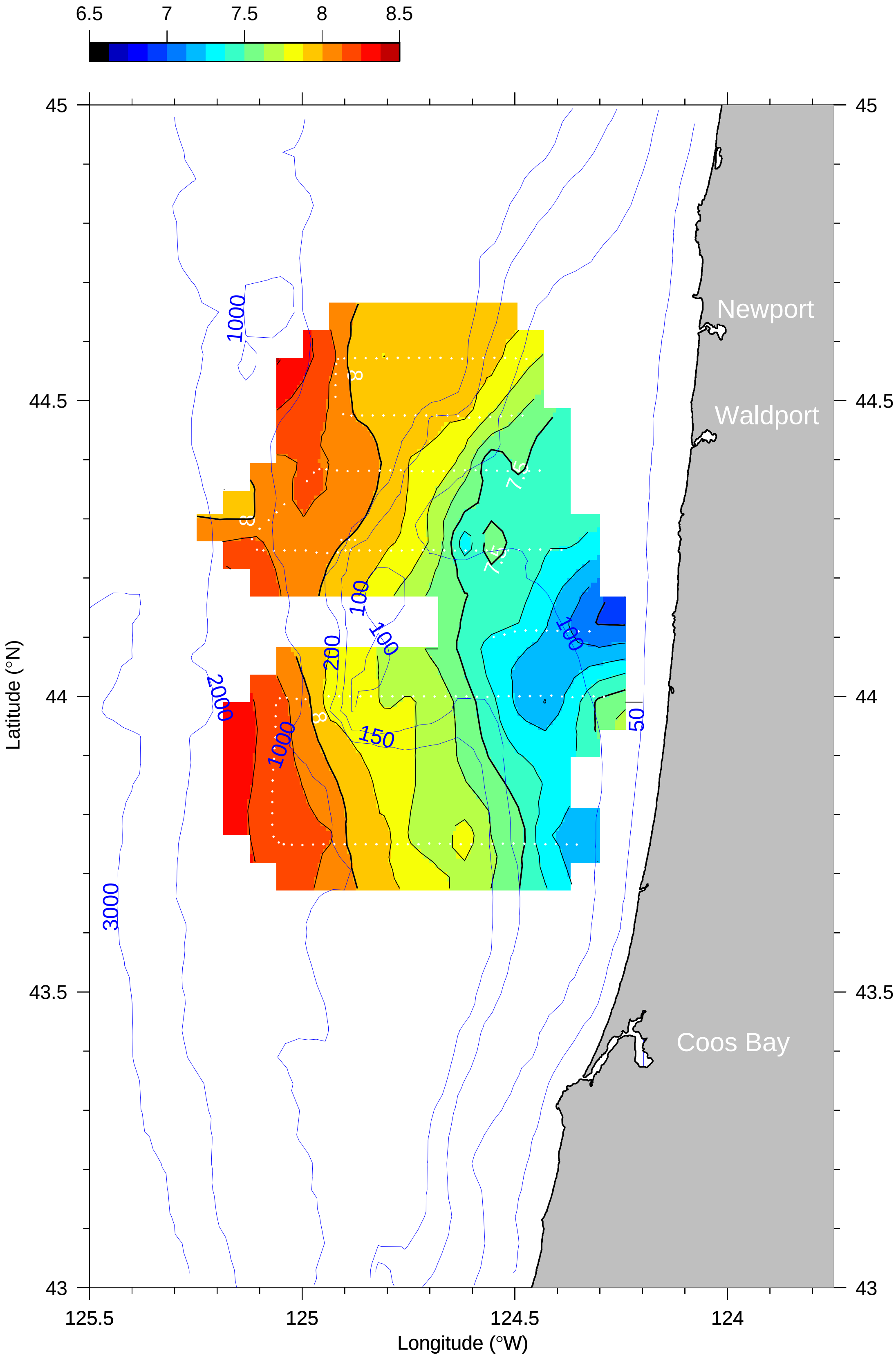
Temperature (°C) at 55 dbar

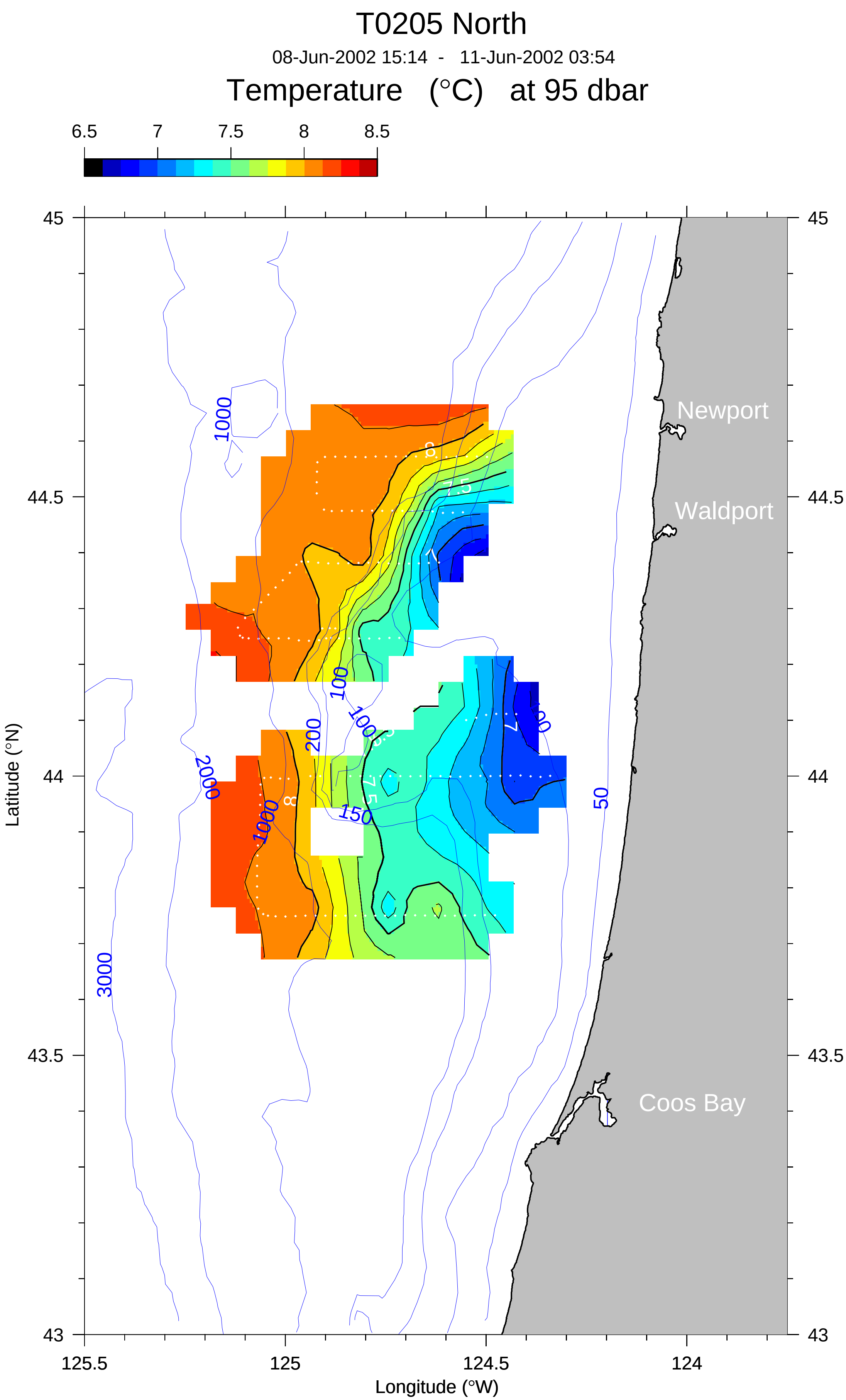


T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

Temperature (°C) at 75 dbar

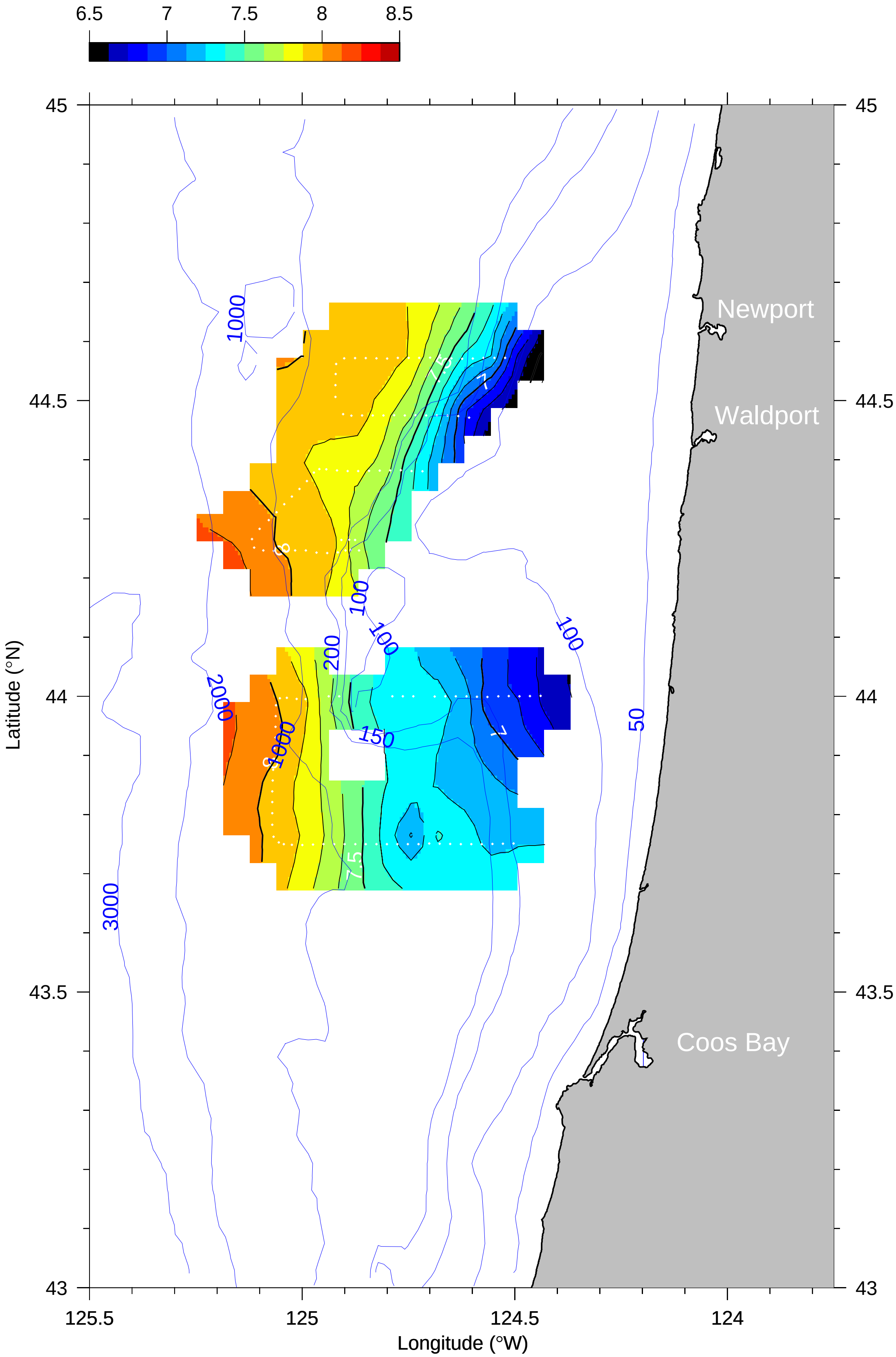


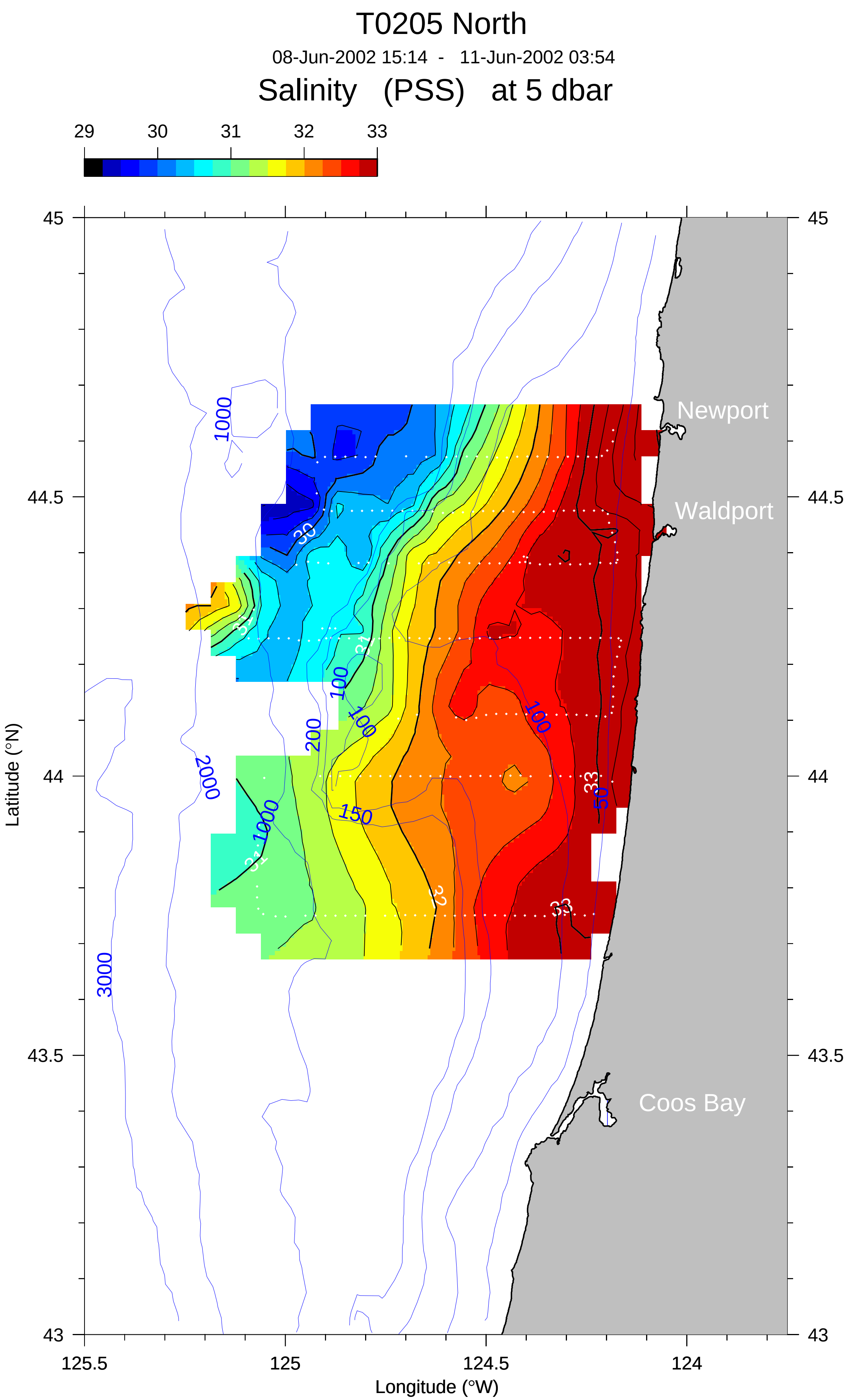

T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Temperature (°C) at 95 dbar
6.5
7
7.5
8
8.5
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50

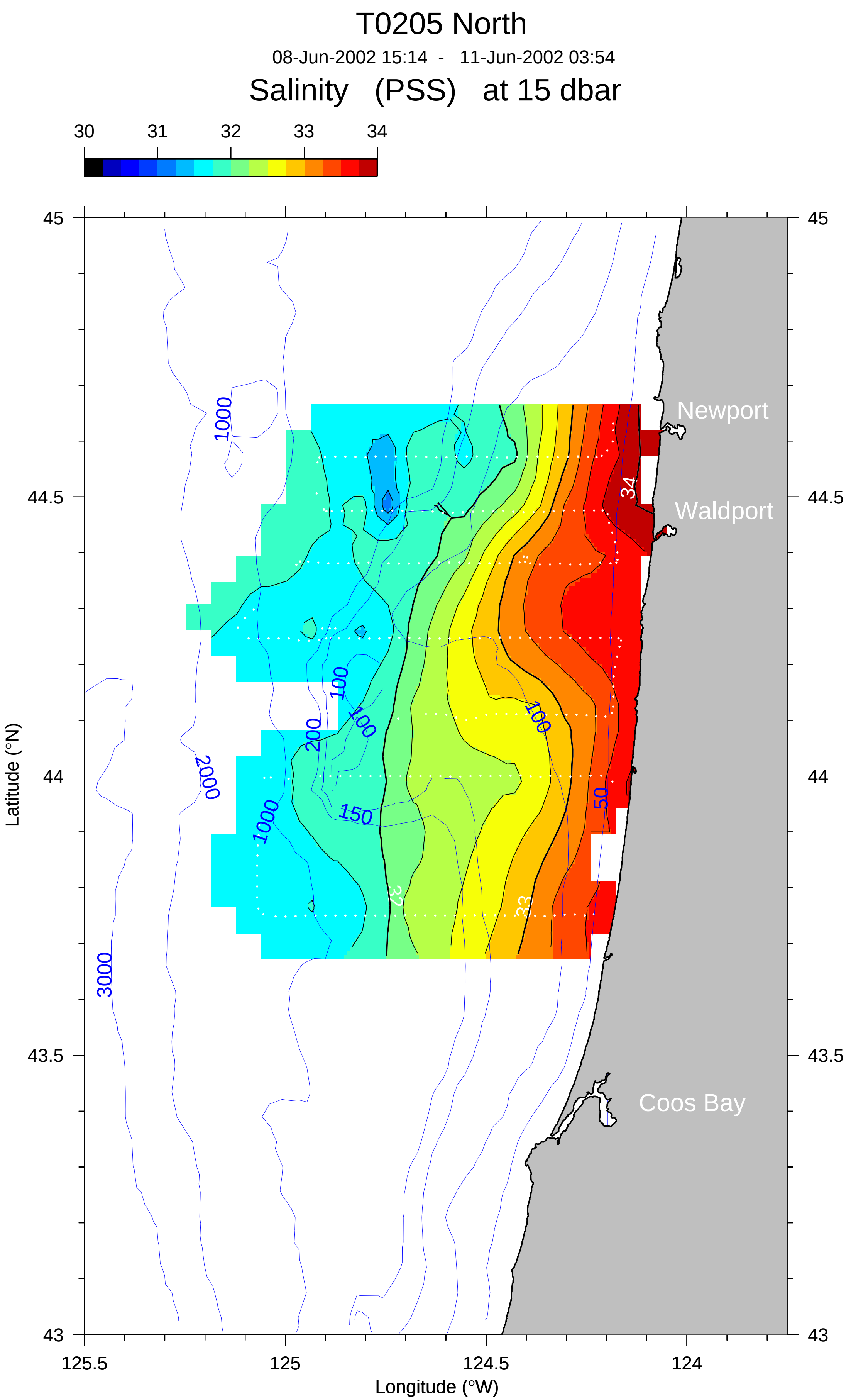
T0205 North

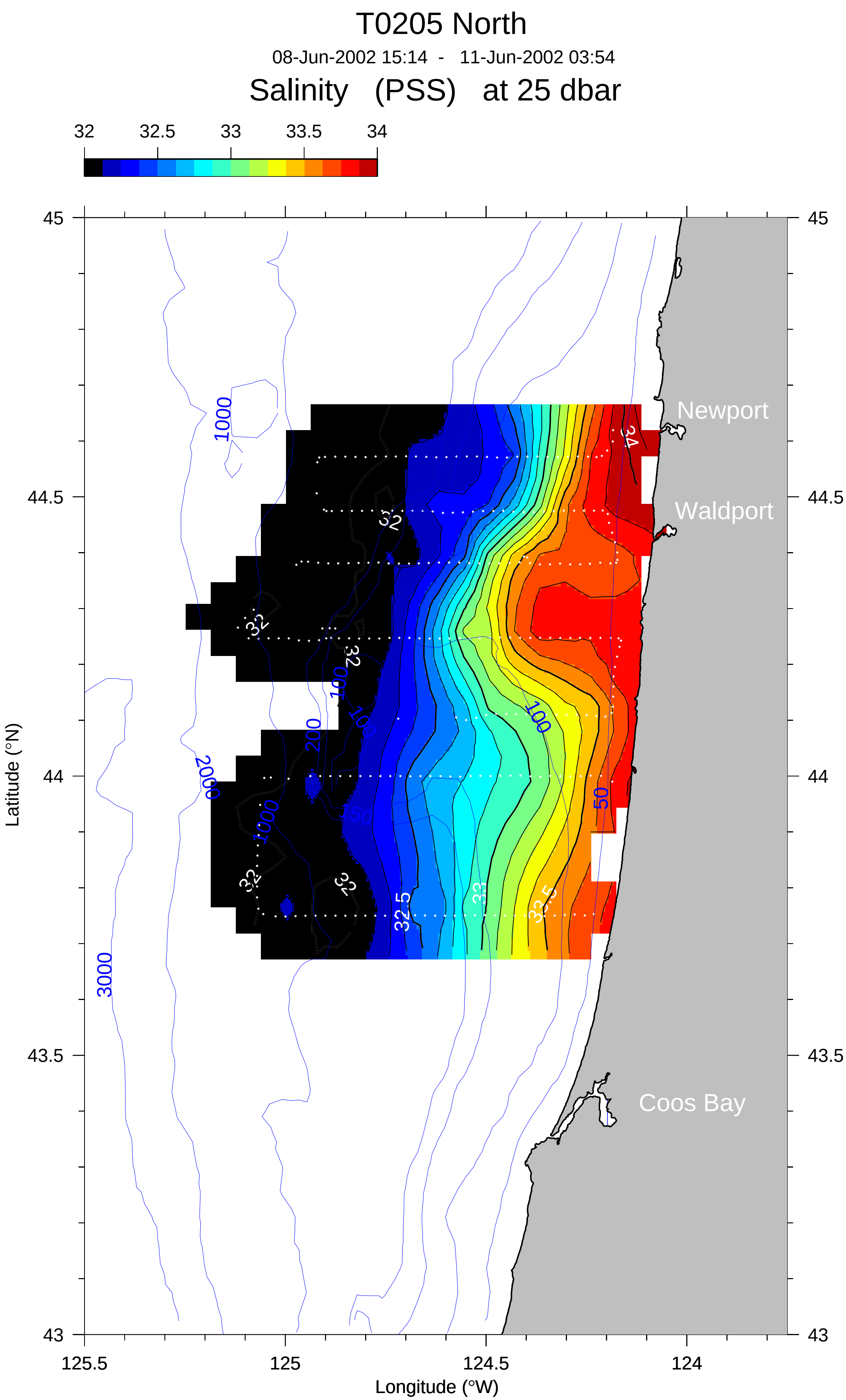
08-Jun-2002 15:14 - 11-Jun-2002 03:54

Temperature (°C) at 115 dbar




T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Salinity (PSS) at 5 dbar
29
30
31
32
33
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
30
31
32
33


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Salinity (PSS) at 15 dbar
30
31
32
33
34
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
32
33
34
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

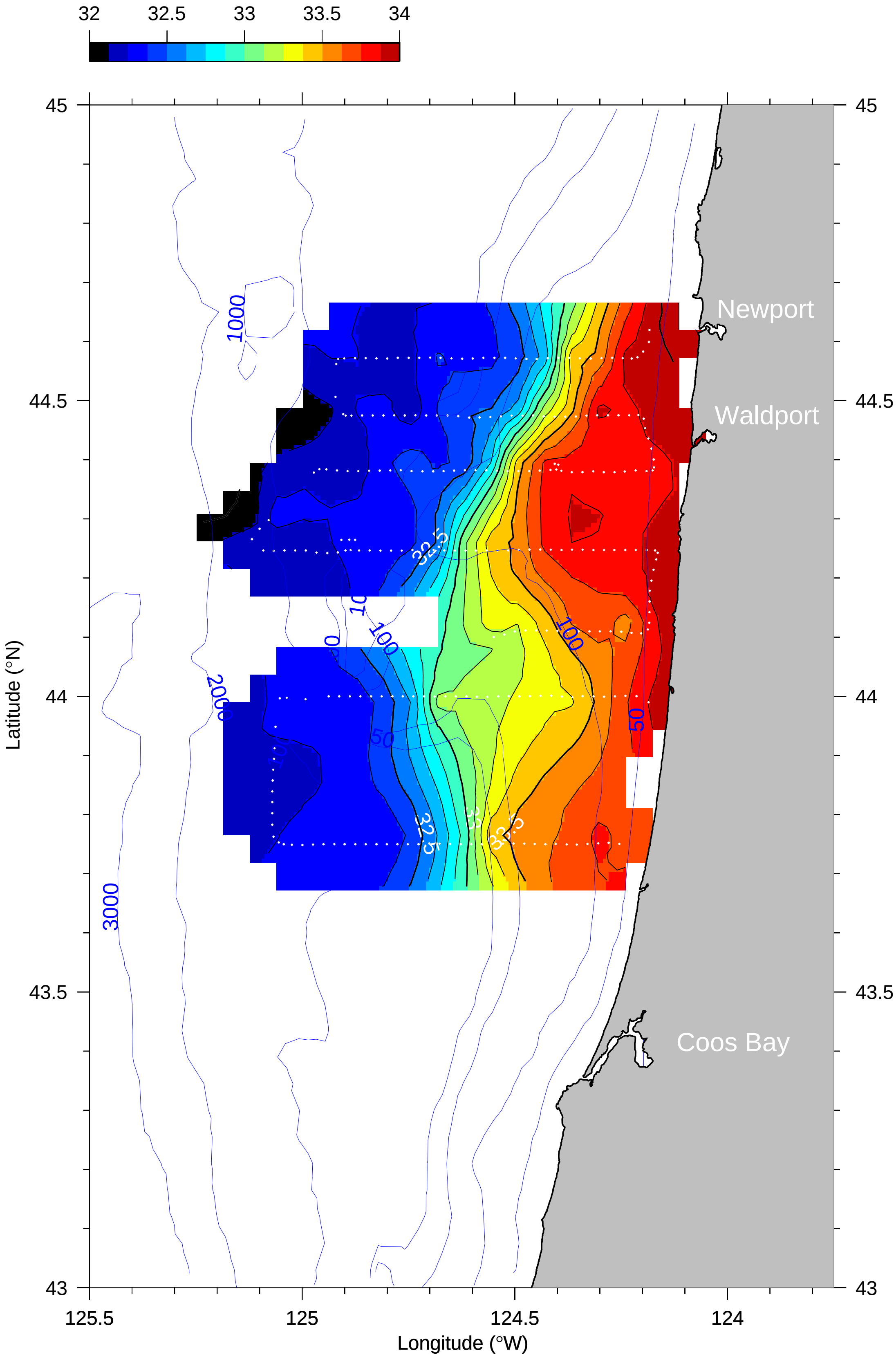


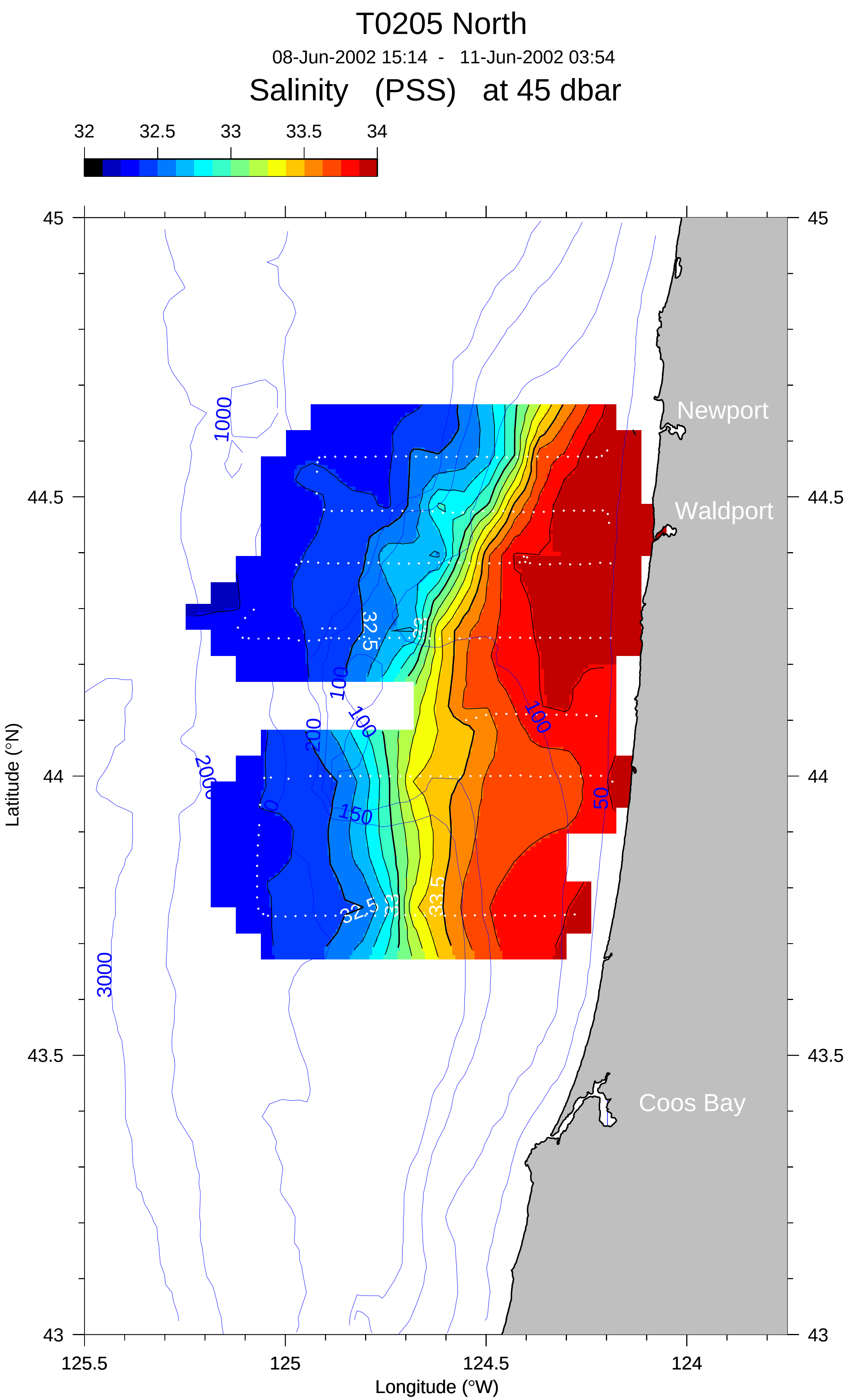
T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Salinity (PSS) at 25 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
50
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.5
125
124.5
124

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

Salinity (PSS) at 35 dbar



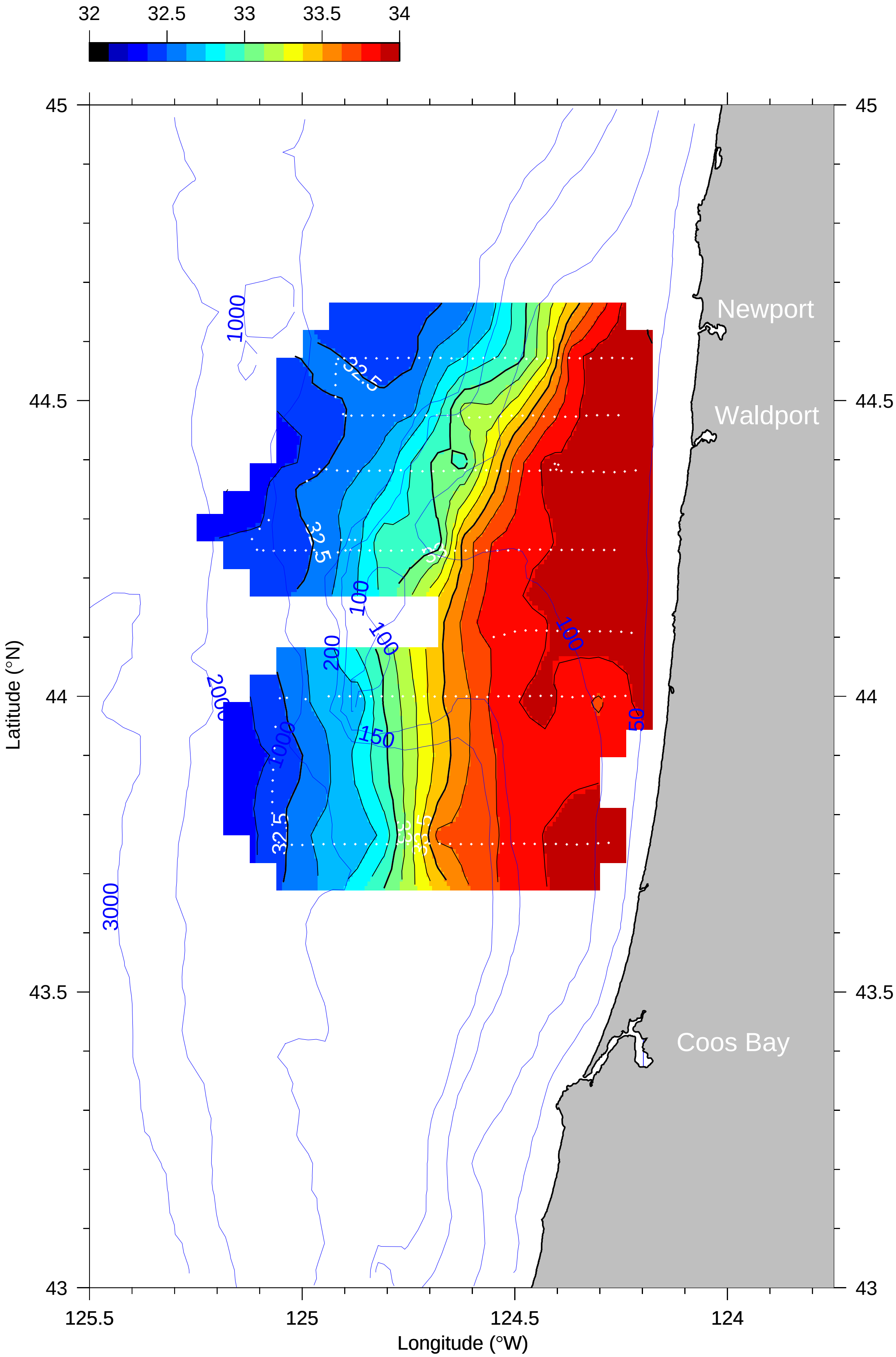


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Salinity (PSS) at 45 dbar
32
32.5
33
33.5
34
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
32.5
33
33.5

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

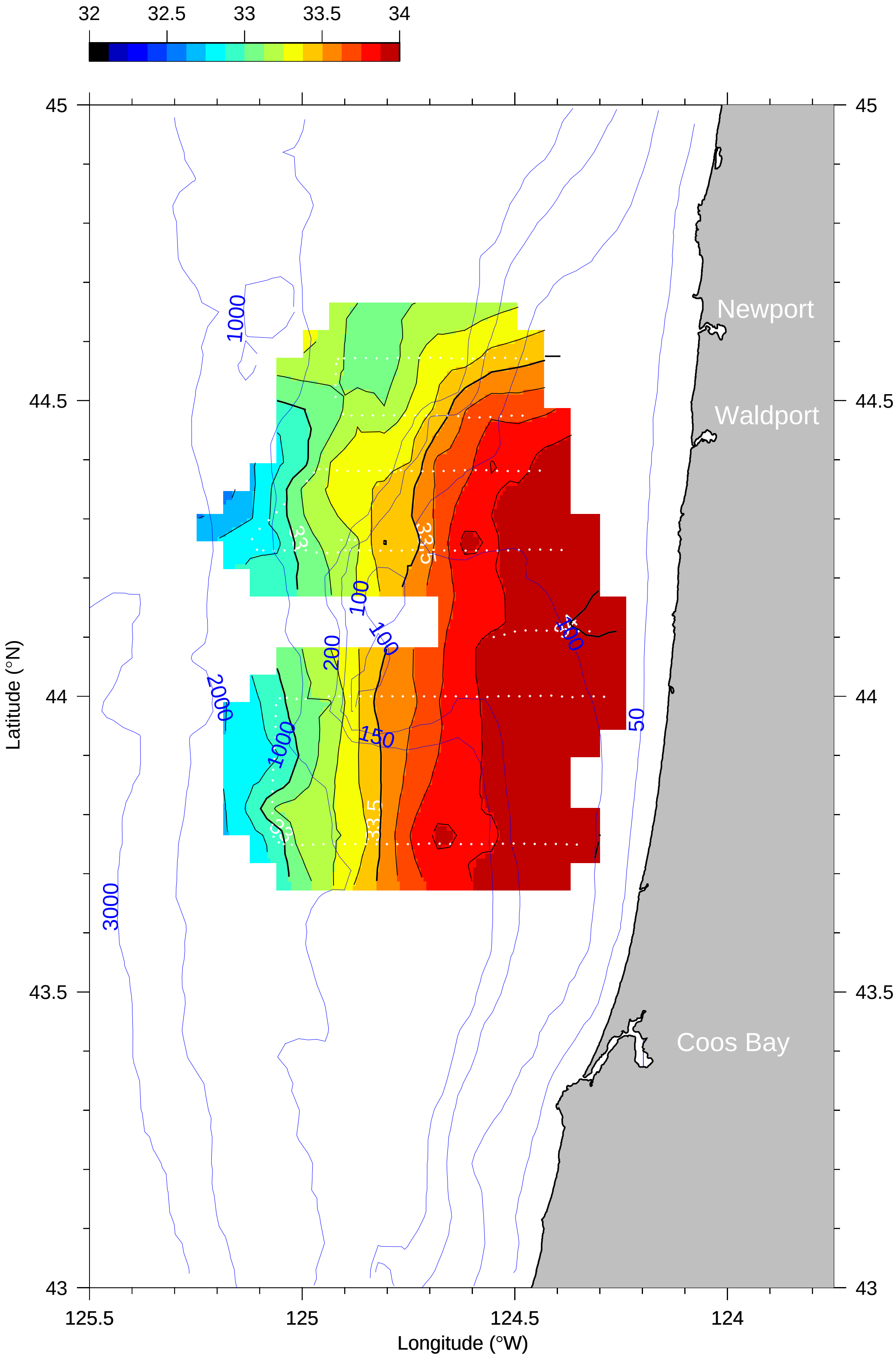
Salinity (PSS) at 55 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

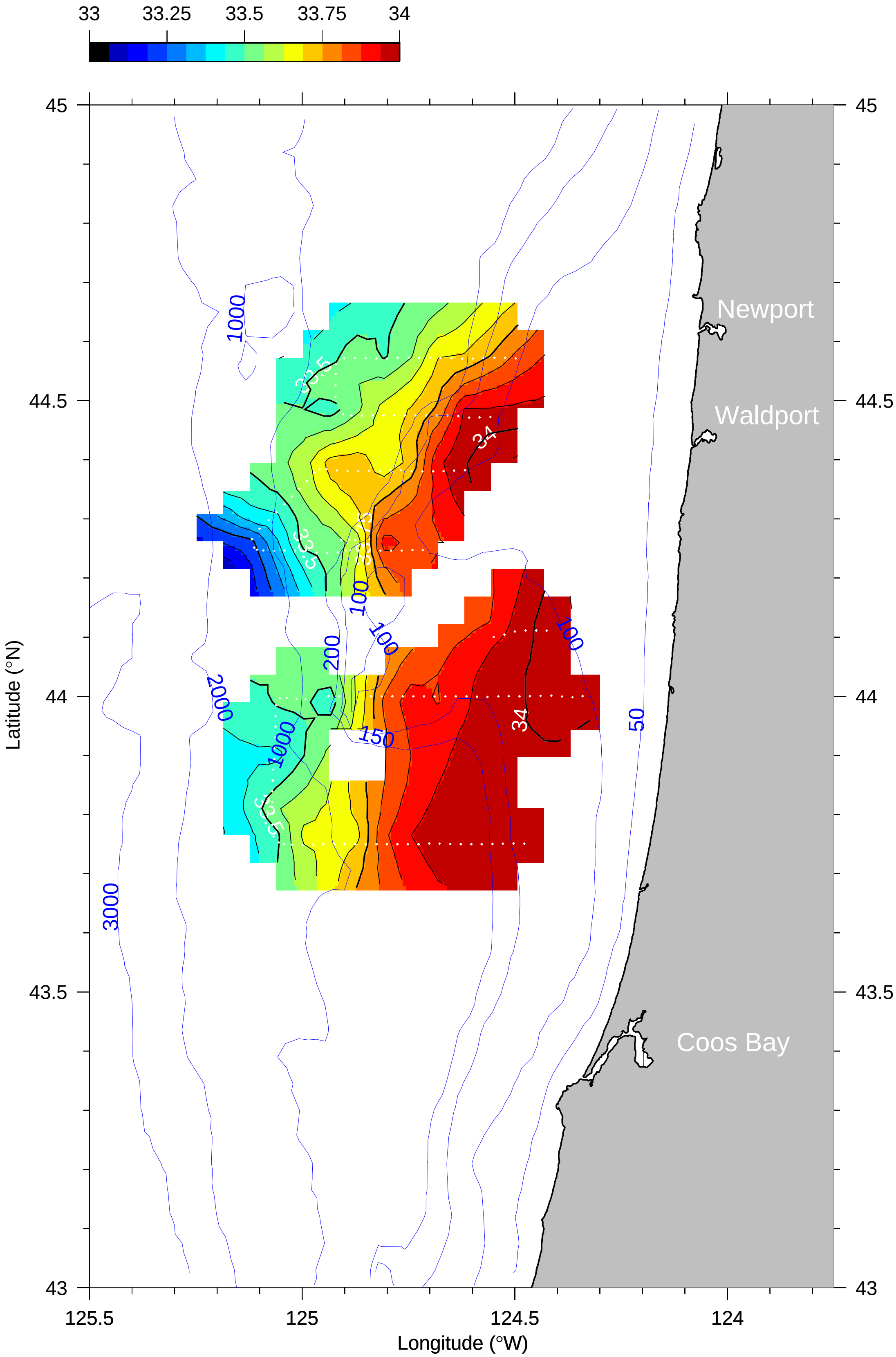
Salinity (PSS) at 75 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

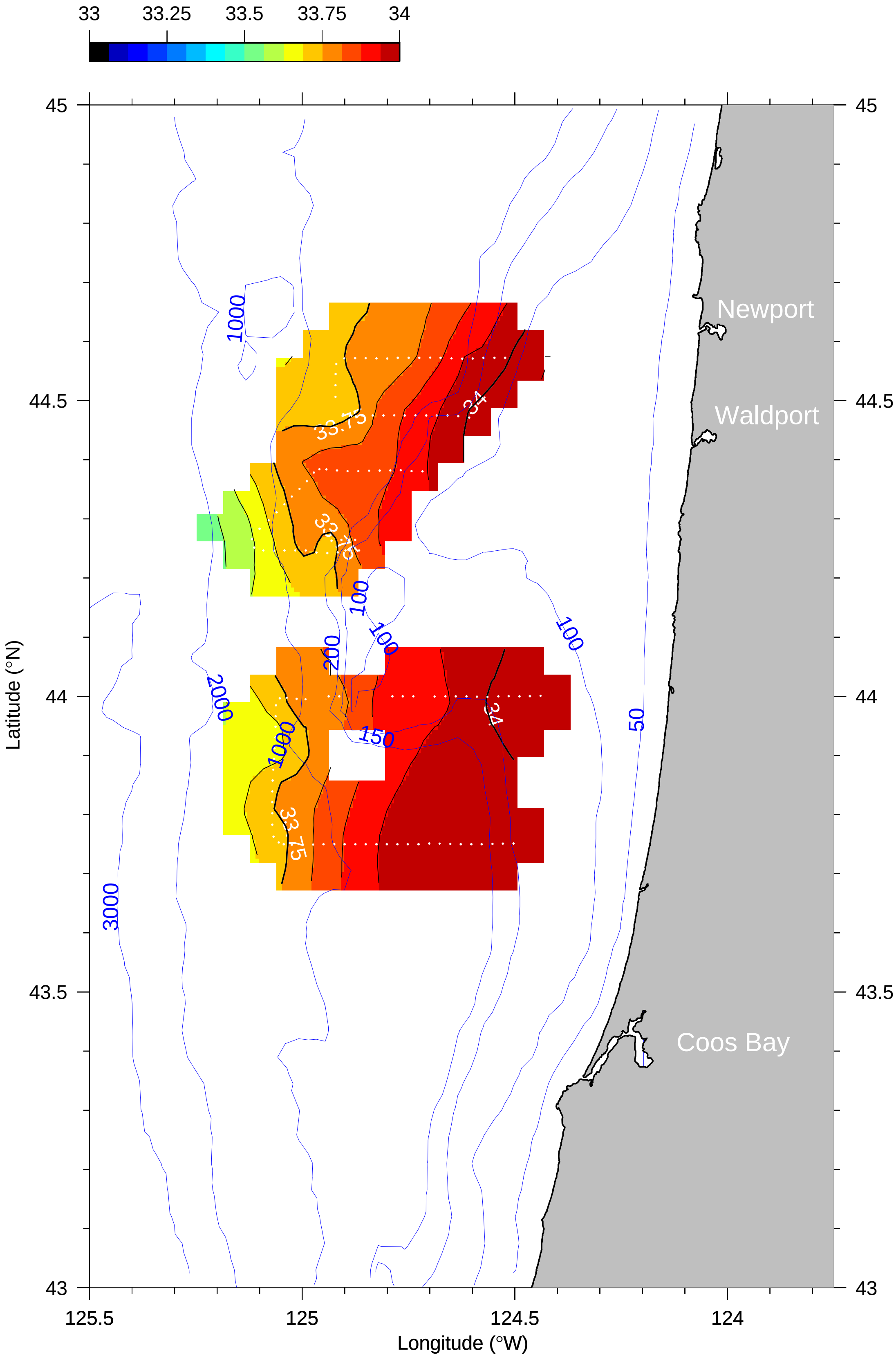
Salinity (PSS) at 95 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

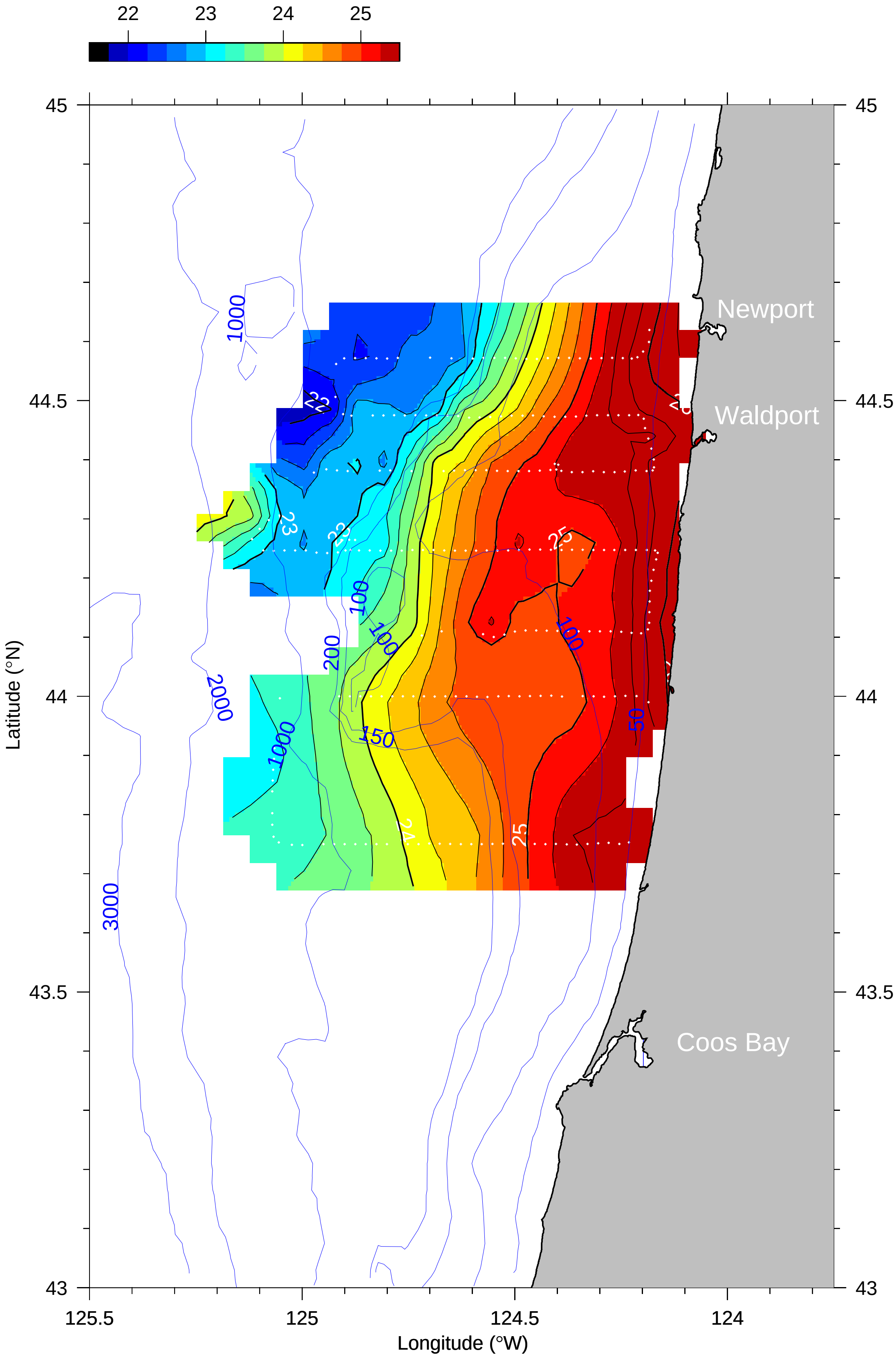
Salinity (PSS) at 115 dbar

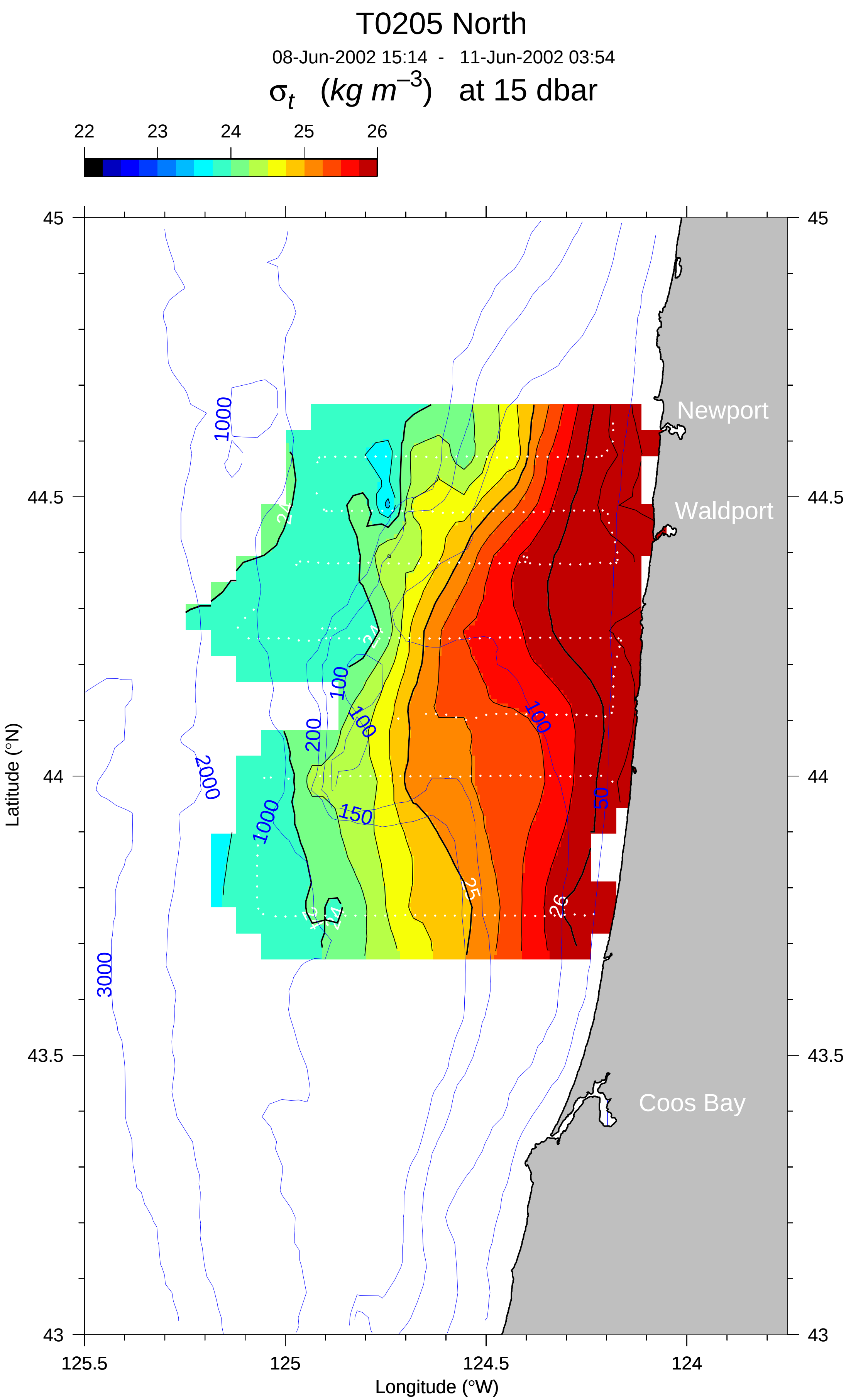


T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

σ_t ($kg\ m^{-3}$) at 5 dbar



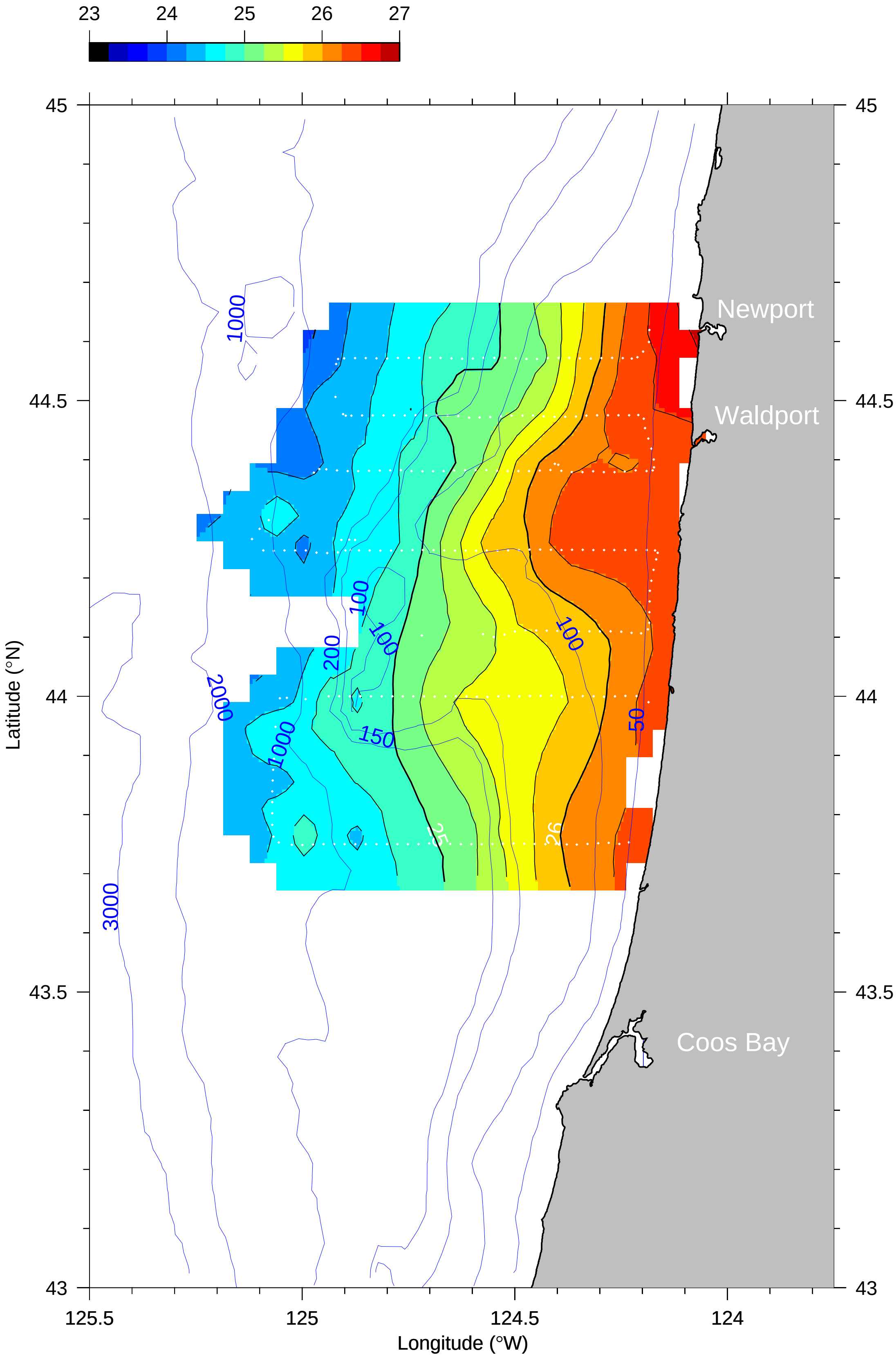


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
σt (kg m−3) at 15 dbar
22
23
24
25
26
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.5
125
124.5
124

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

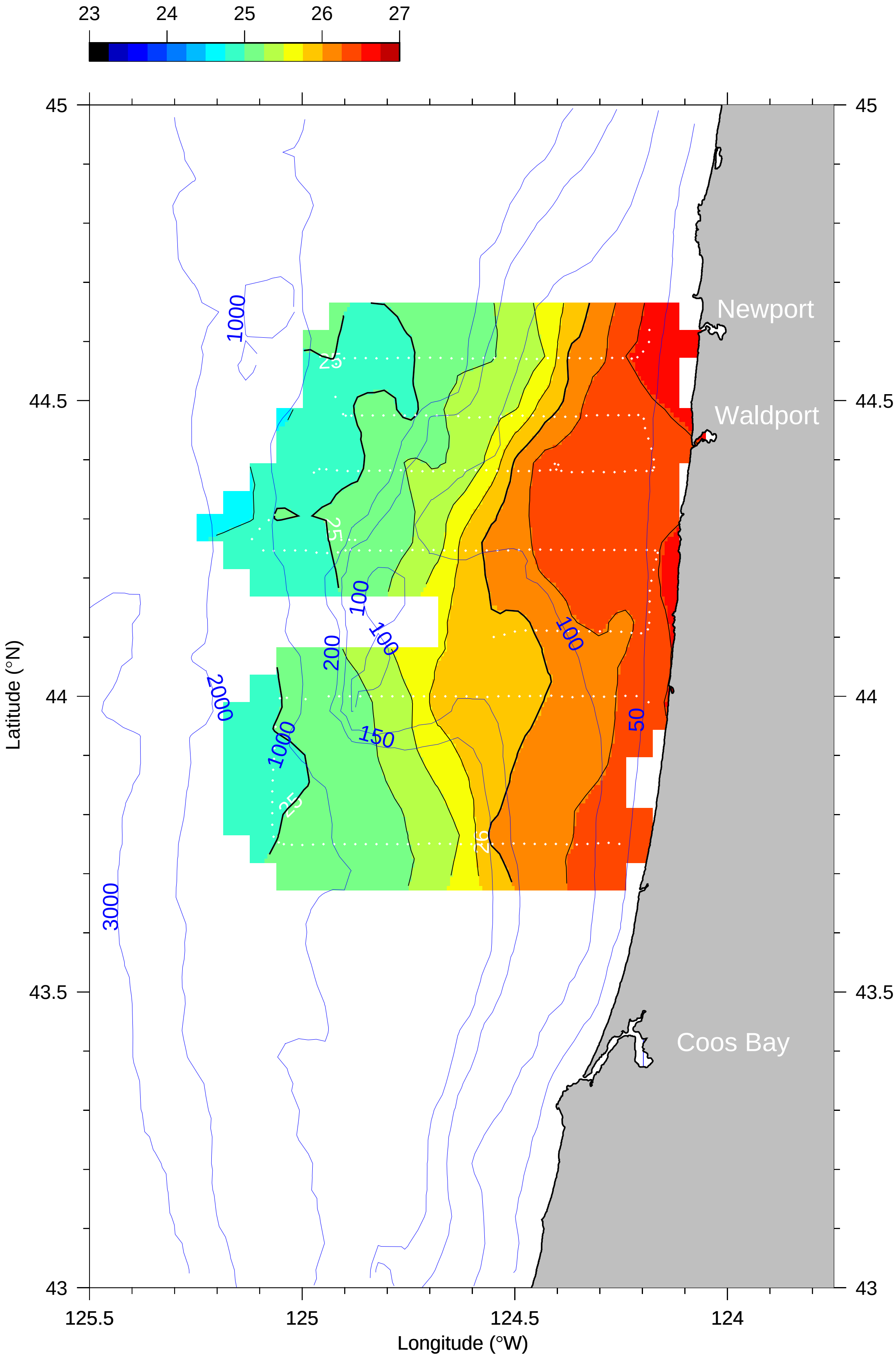
σ_t $(kg\ m^{-3})$ at 25 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

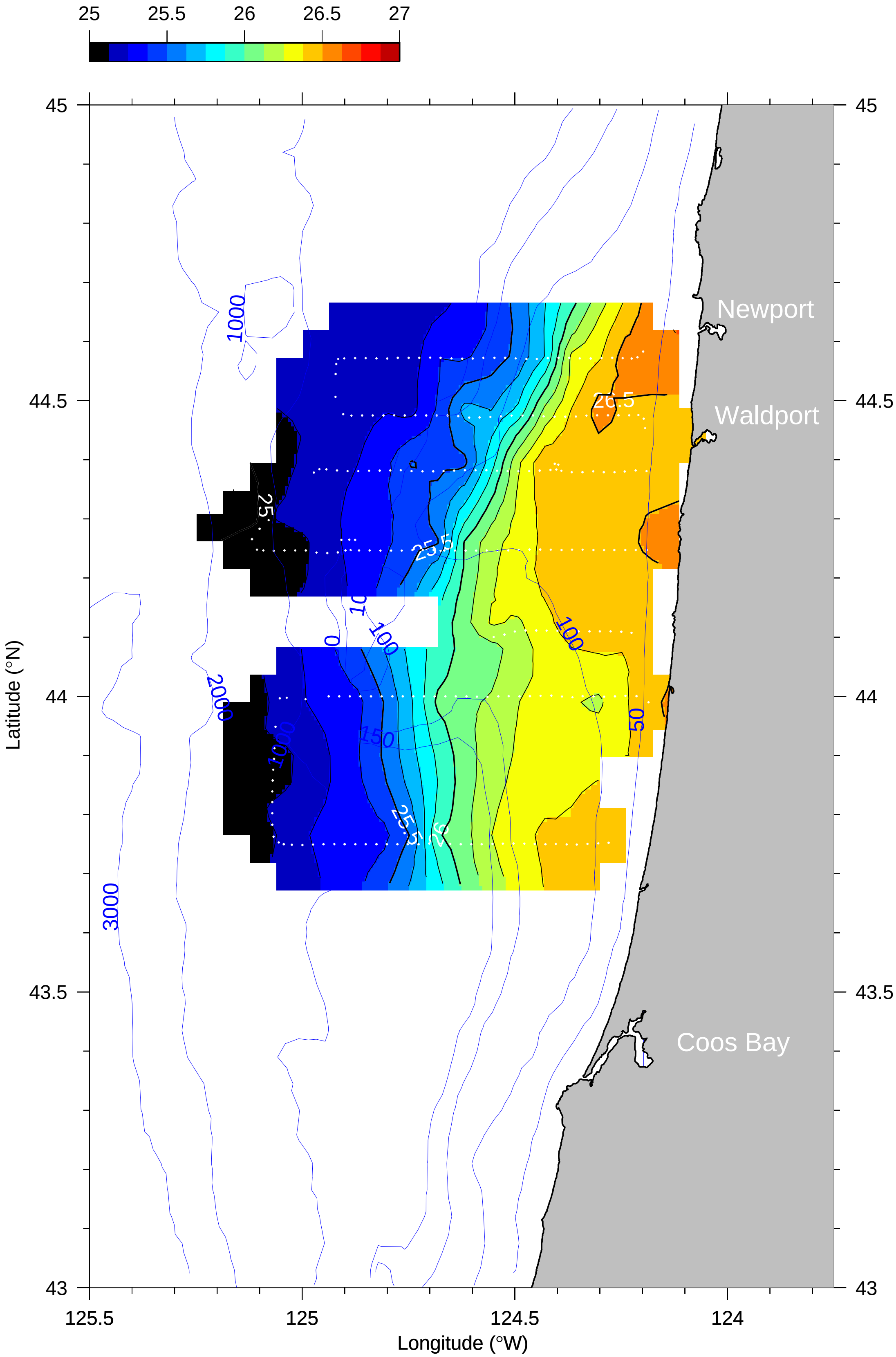
σ_t $(kg\ m^{-3})$ at 35 dbar

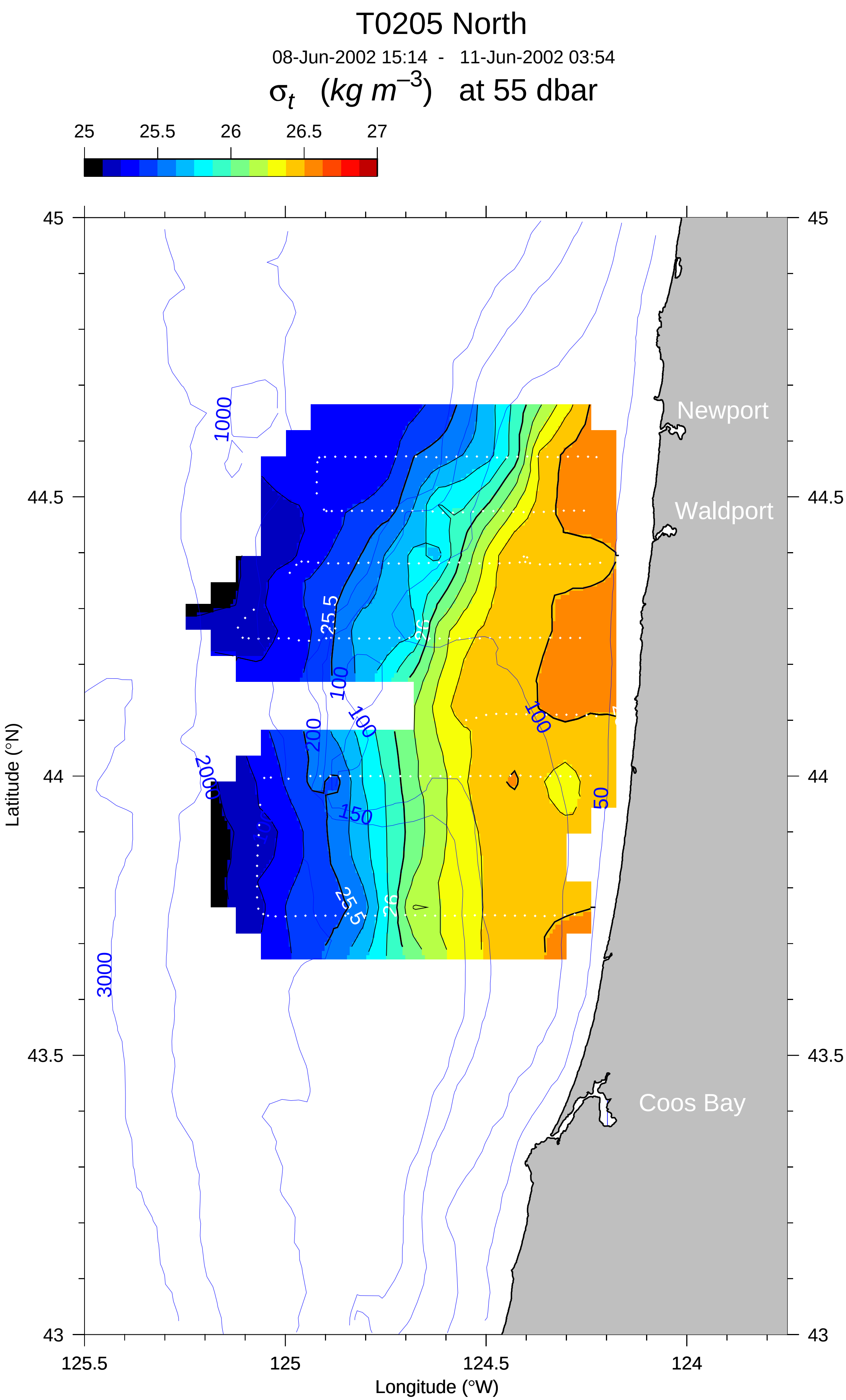


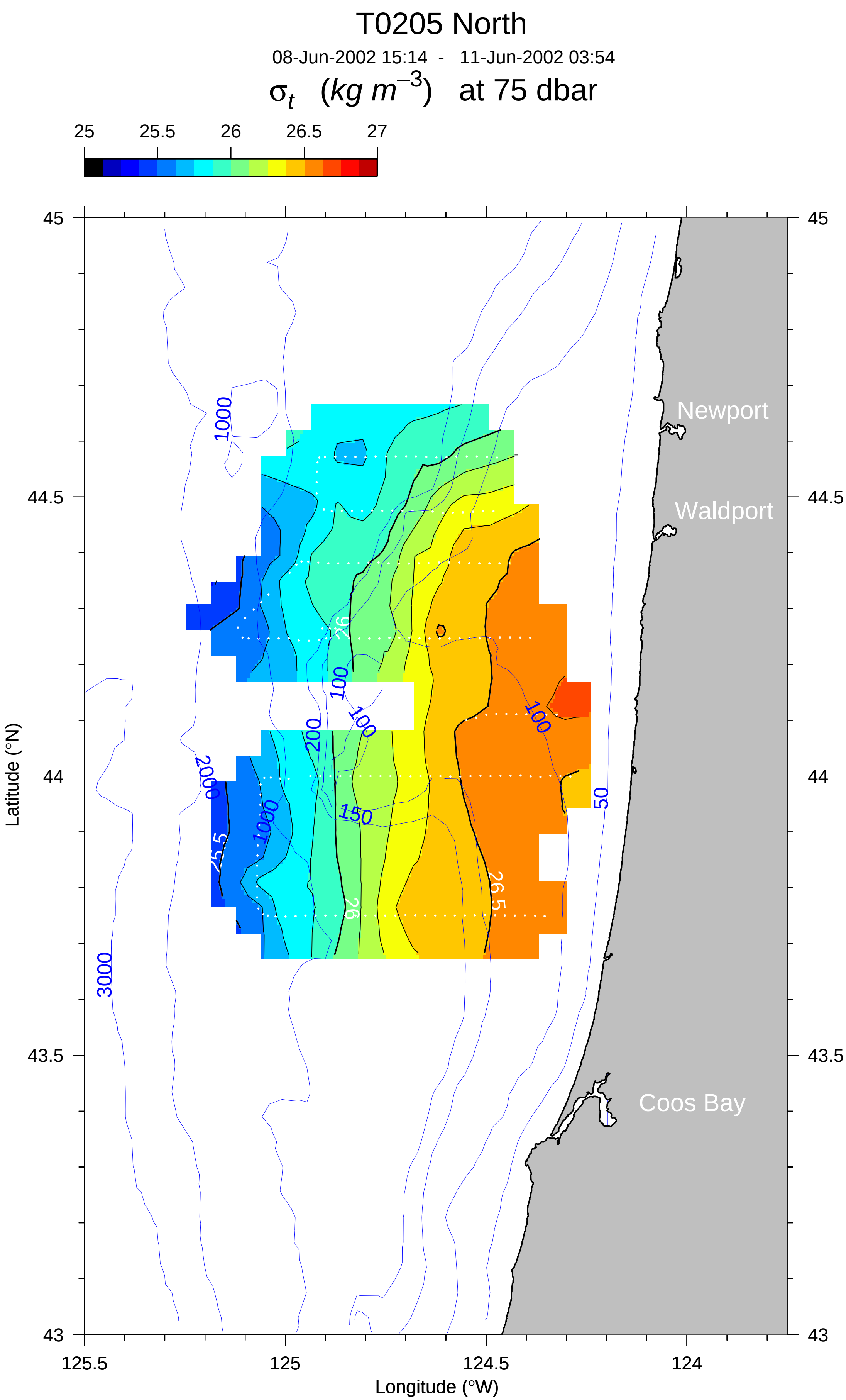
T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

σ_t ($kg\ m^{-3}$) at 45 dbar




T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
σ_t ($kg\ m^{-3}$) at 55 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
25.5
26
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.5
125
124.5
124

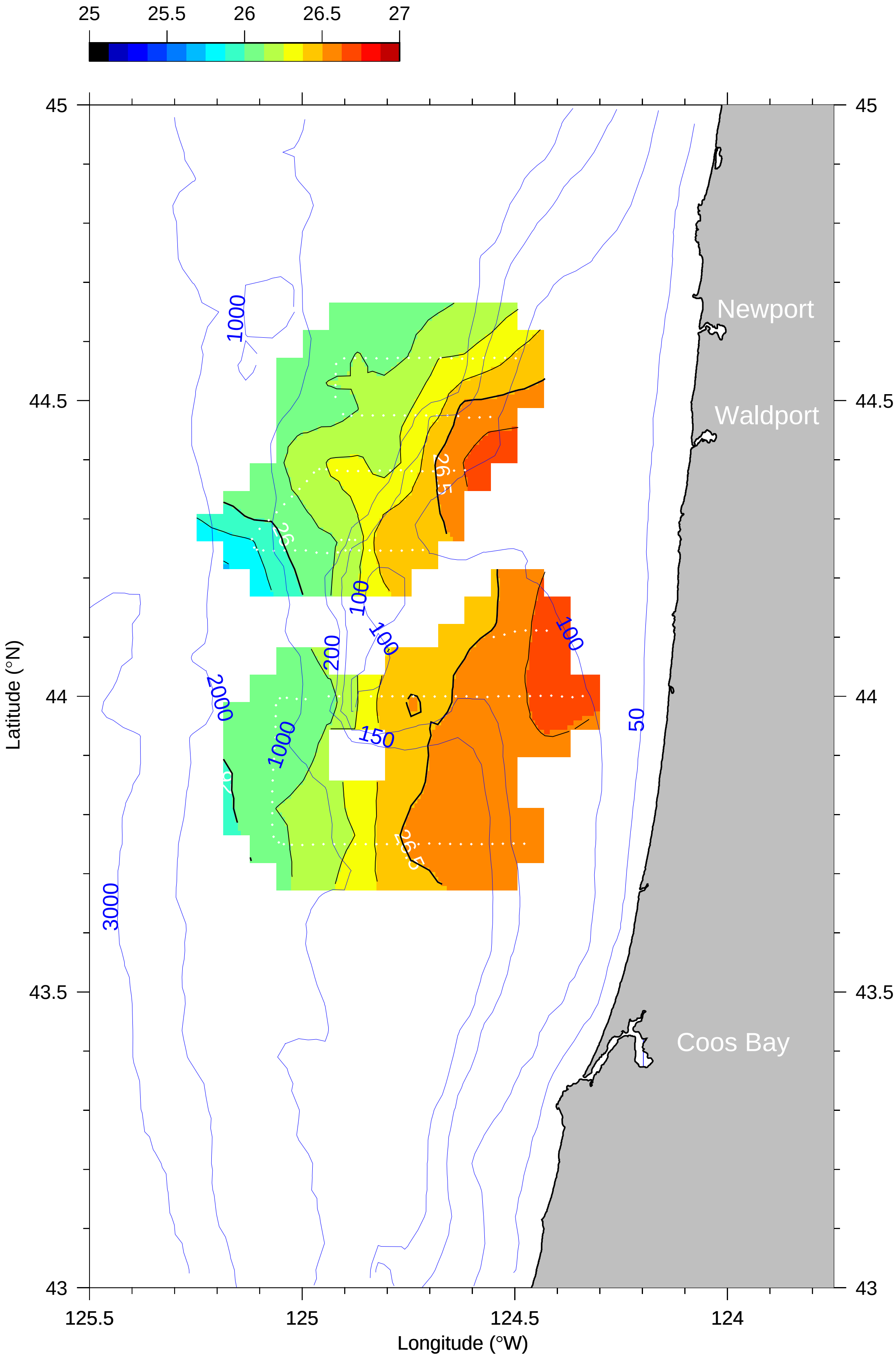


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
σ_t ($kg\ m^{-3}$) at 75 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.5
125
124.5
124
1000
2000
3000
200
100
150
50
25.5
26
26.5

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

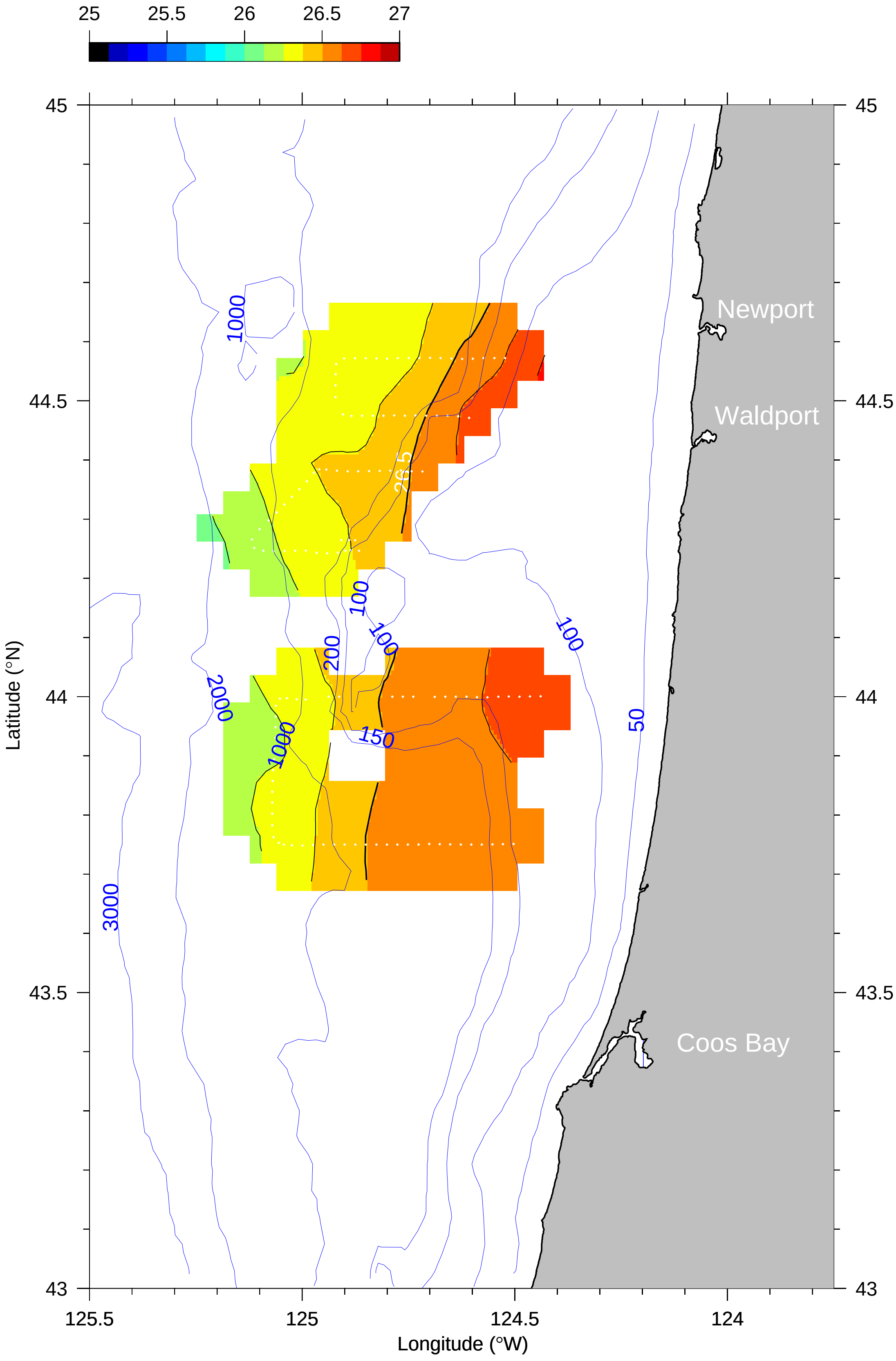
σ_t $(kg\ m^{-3})$ at 95 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

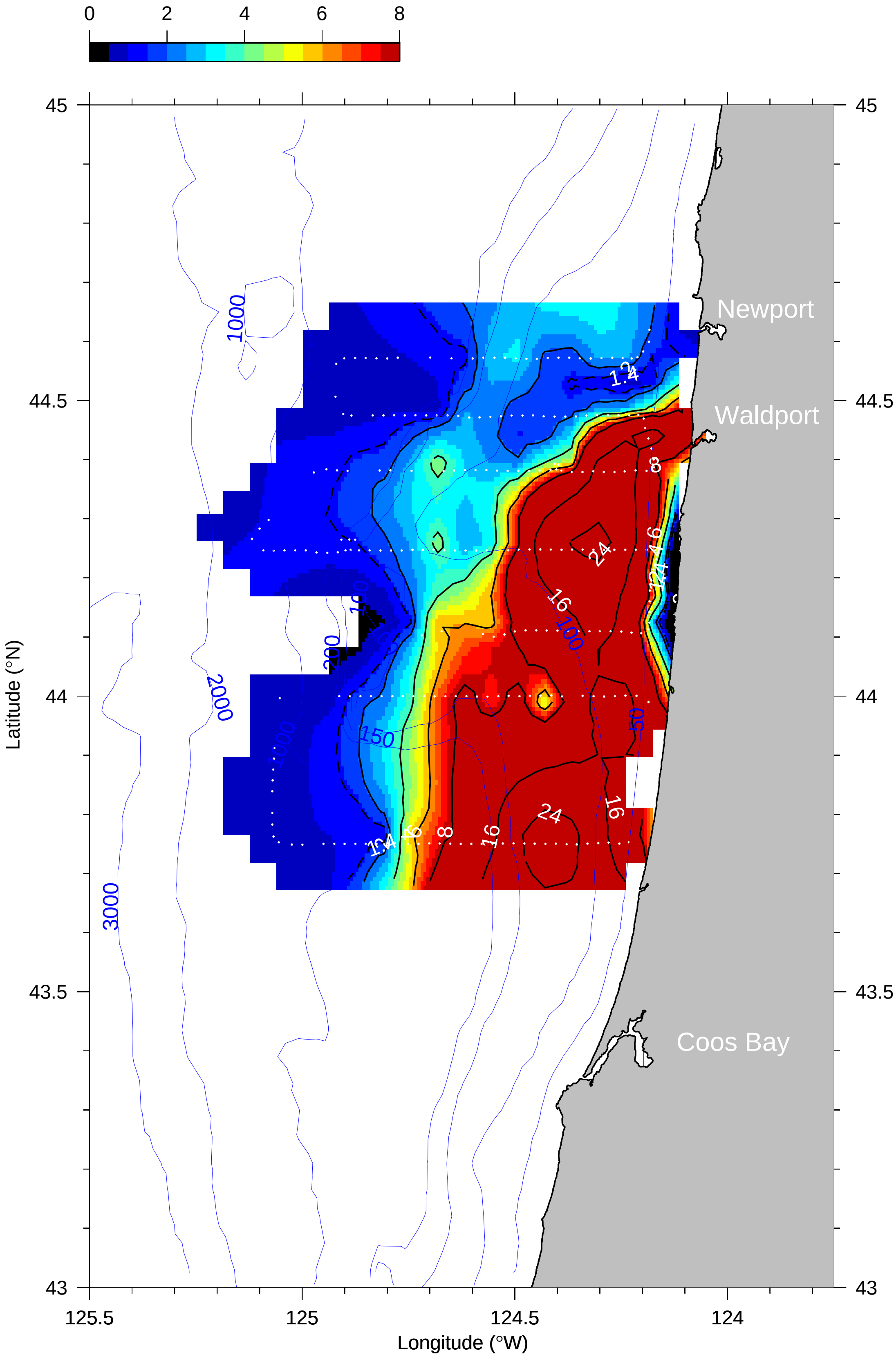
σ_t $(kg\ m^{-3})$ at 115 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

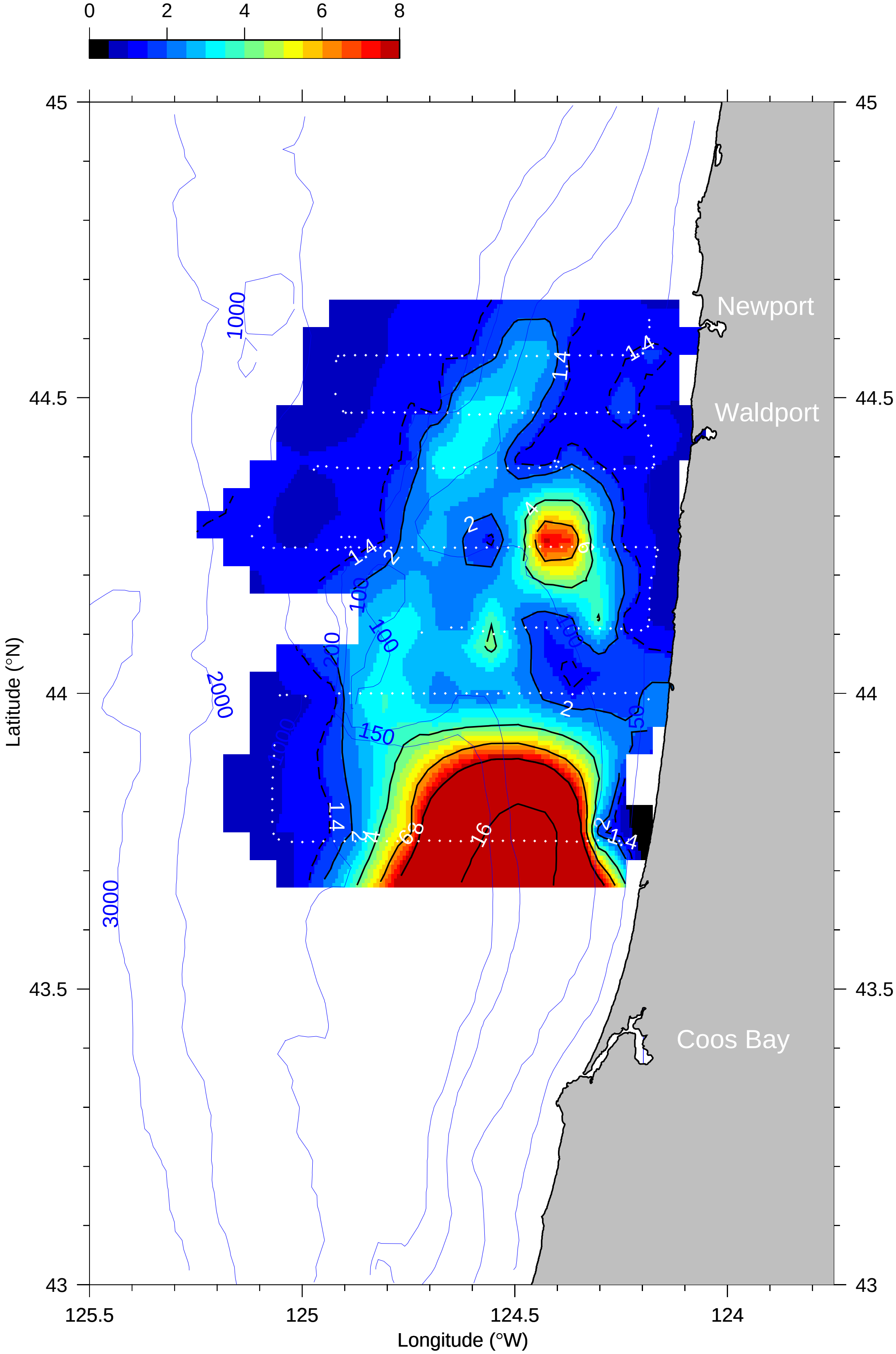
Chlorophyll ($\mu g\ L^{-1}$) at 5 dbar

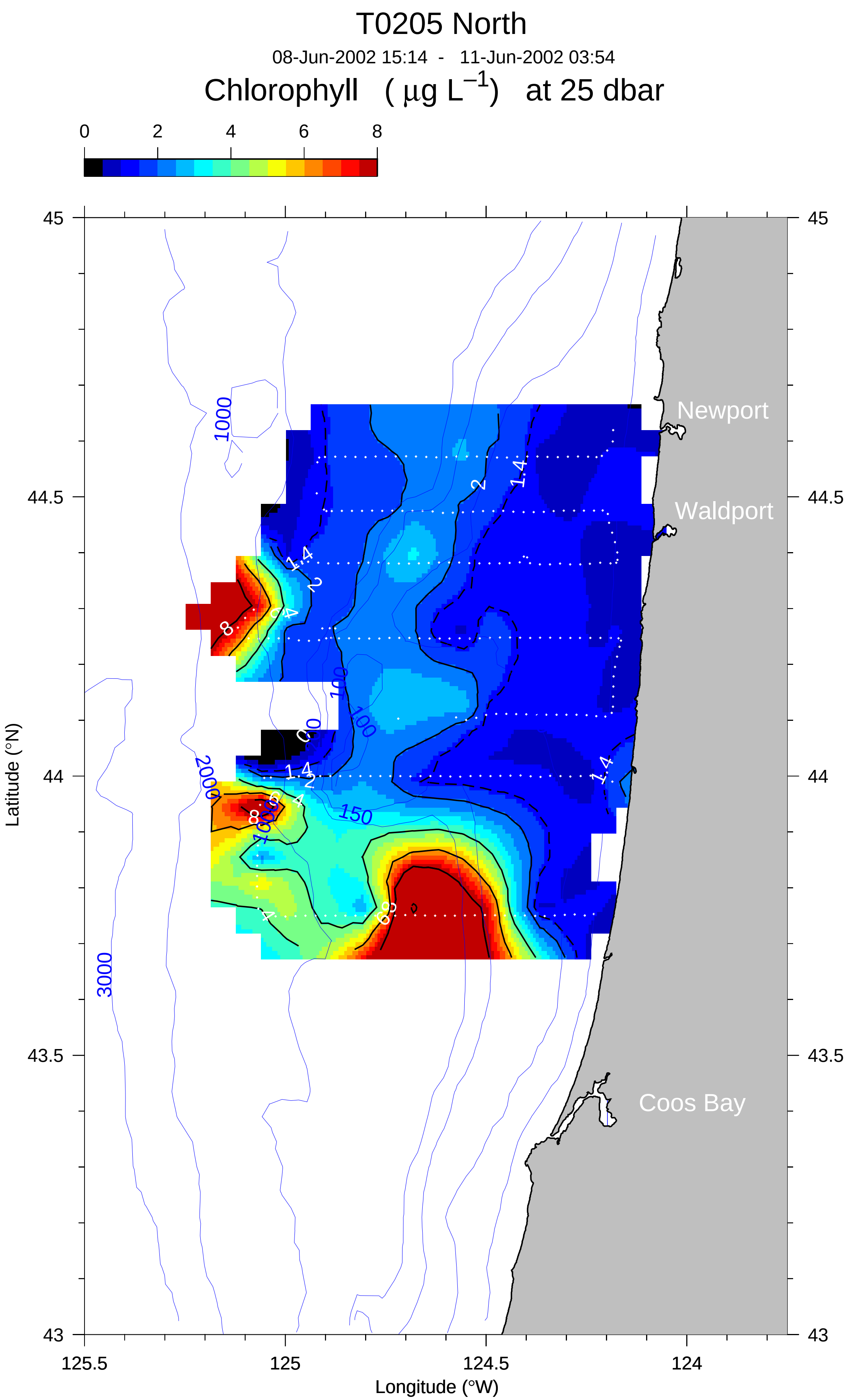


T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

Chlorophyll ($\mu g\ L^{-1}$) at 15 dbar

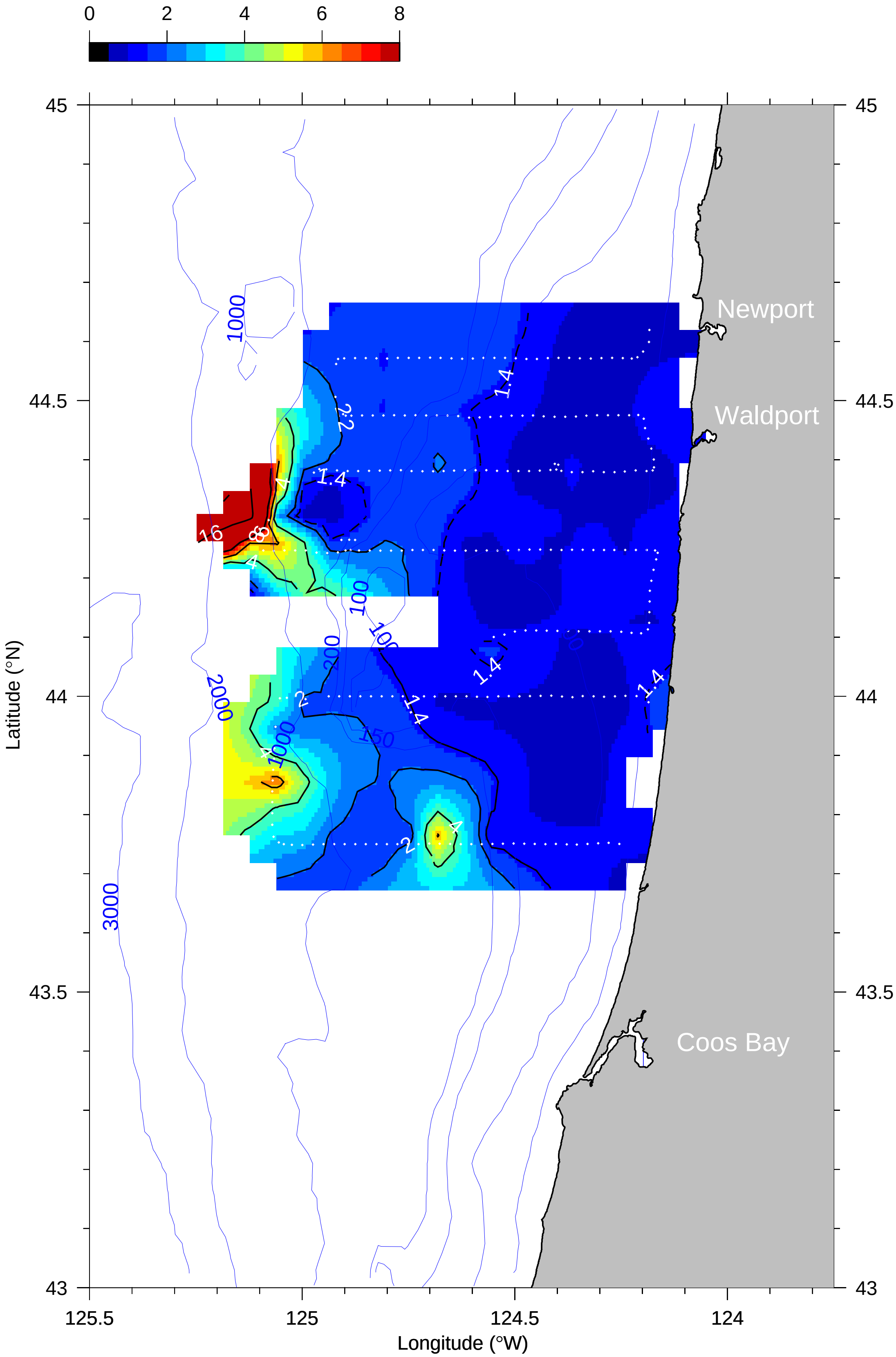


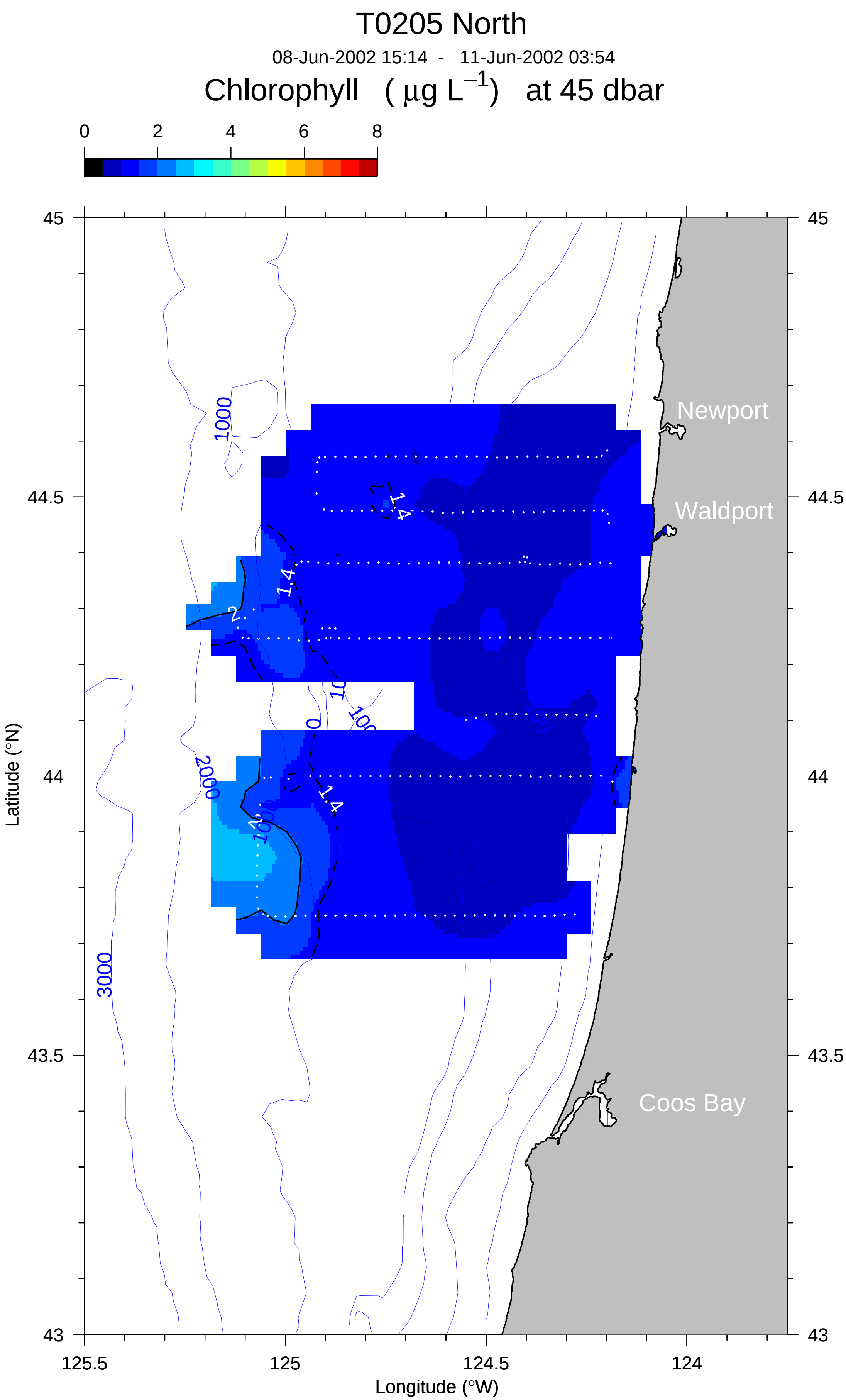

T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Chlorophyll (μg L⁻¹) at 25 dbar
0
2
4
6
8
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
150
100

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

Chlorophyll (μg L^{-1}) at 35 dbar



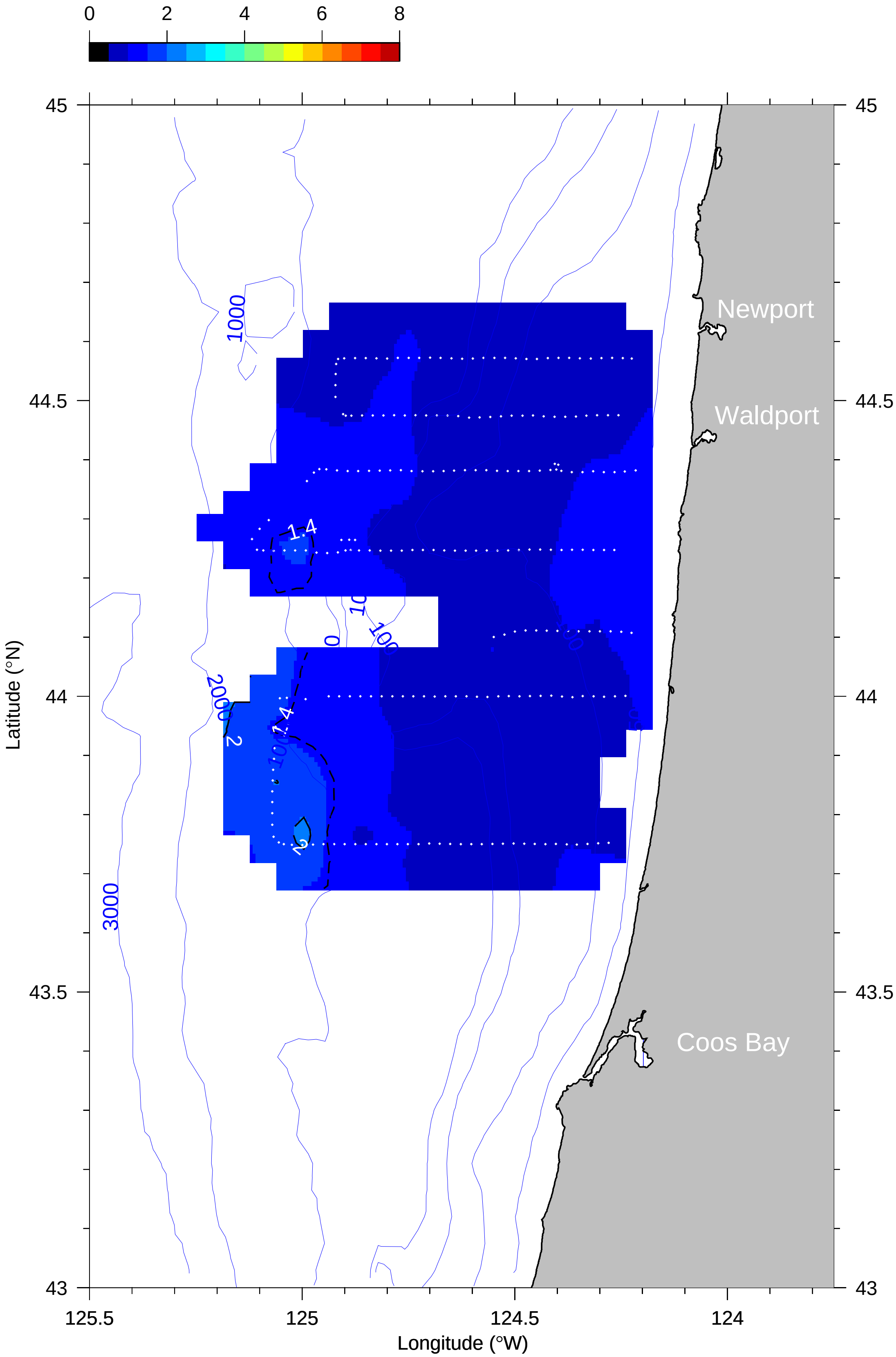


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
Chlorophyll (μg L−1) at 45 dbar
0
2
4
6
8
45
44.5
44
43.5
43
125.5
125
124.5
124
Longitude (°W)
Latitude (°N)
Newport
Waldport
Coos Bay
1000
2000
3000
1.4
2

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

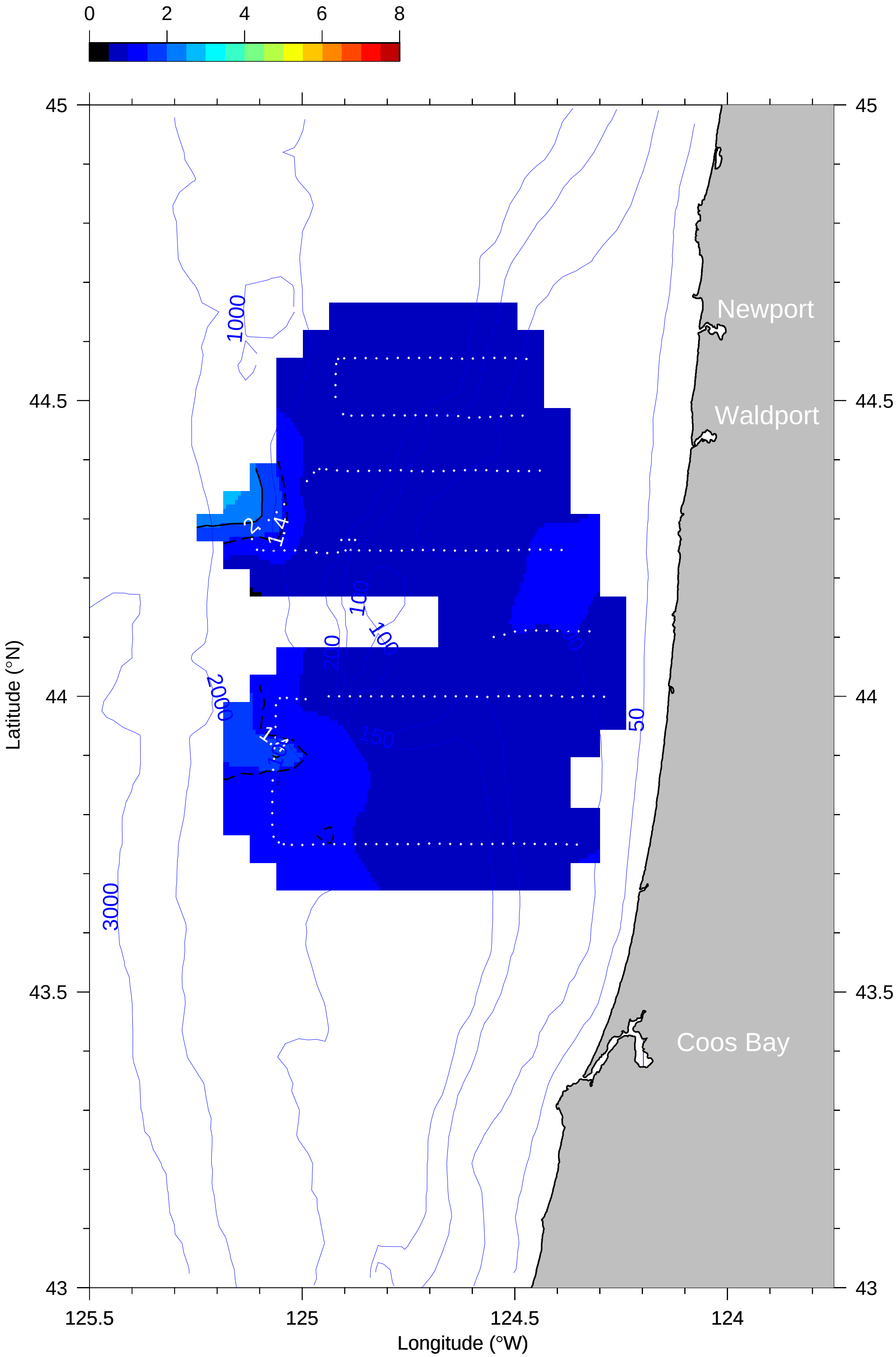
Chlorophyll (μg L^{-1}) at 55 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

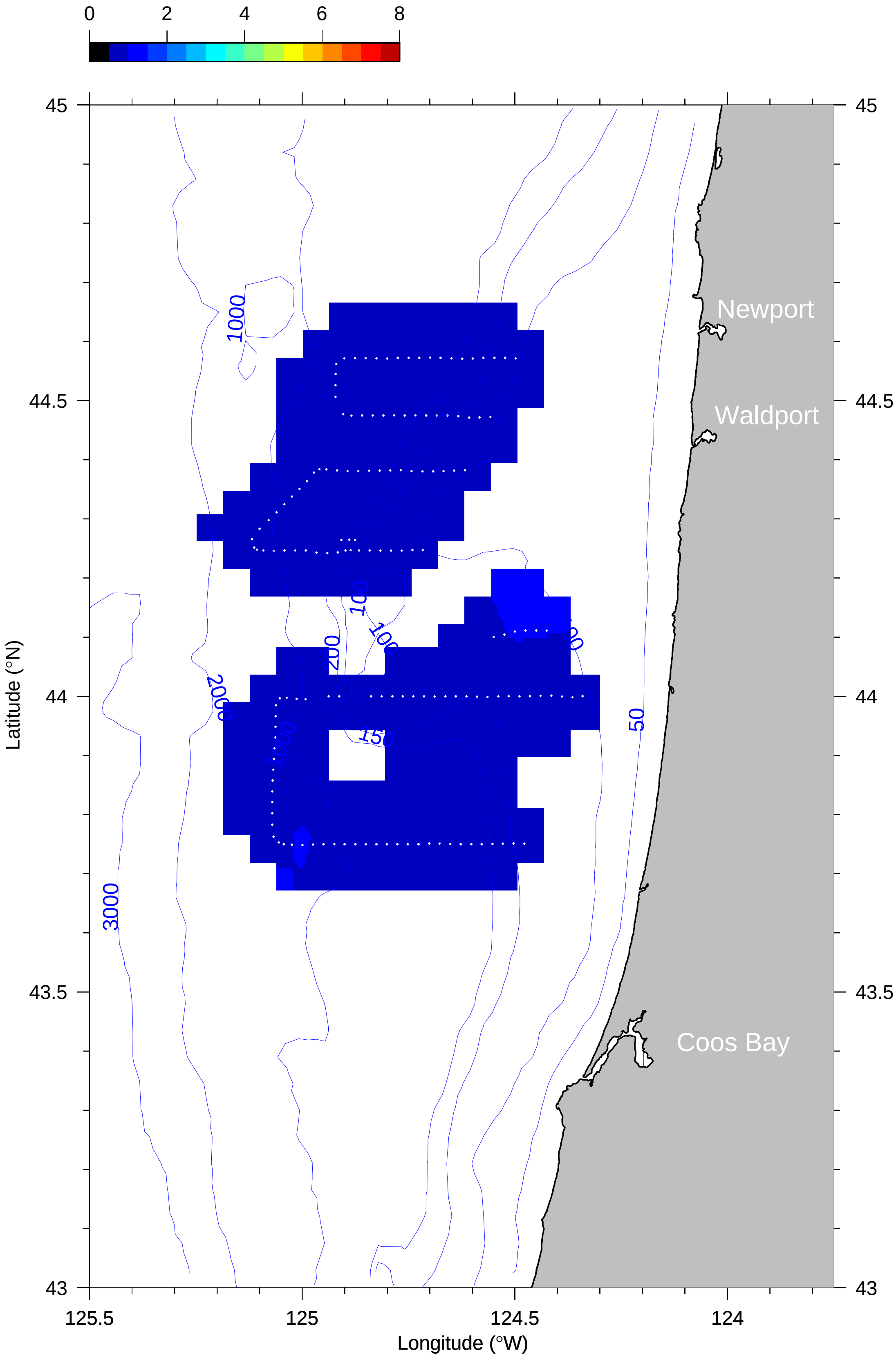
Chlorophyll (μg L^{-1}) at 75 dbar



T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

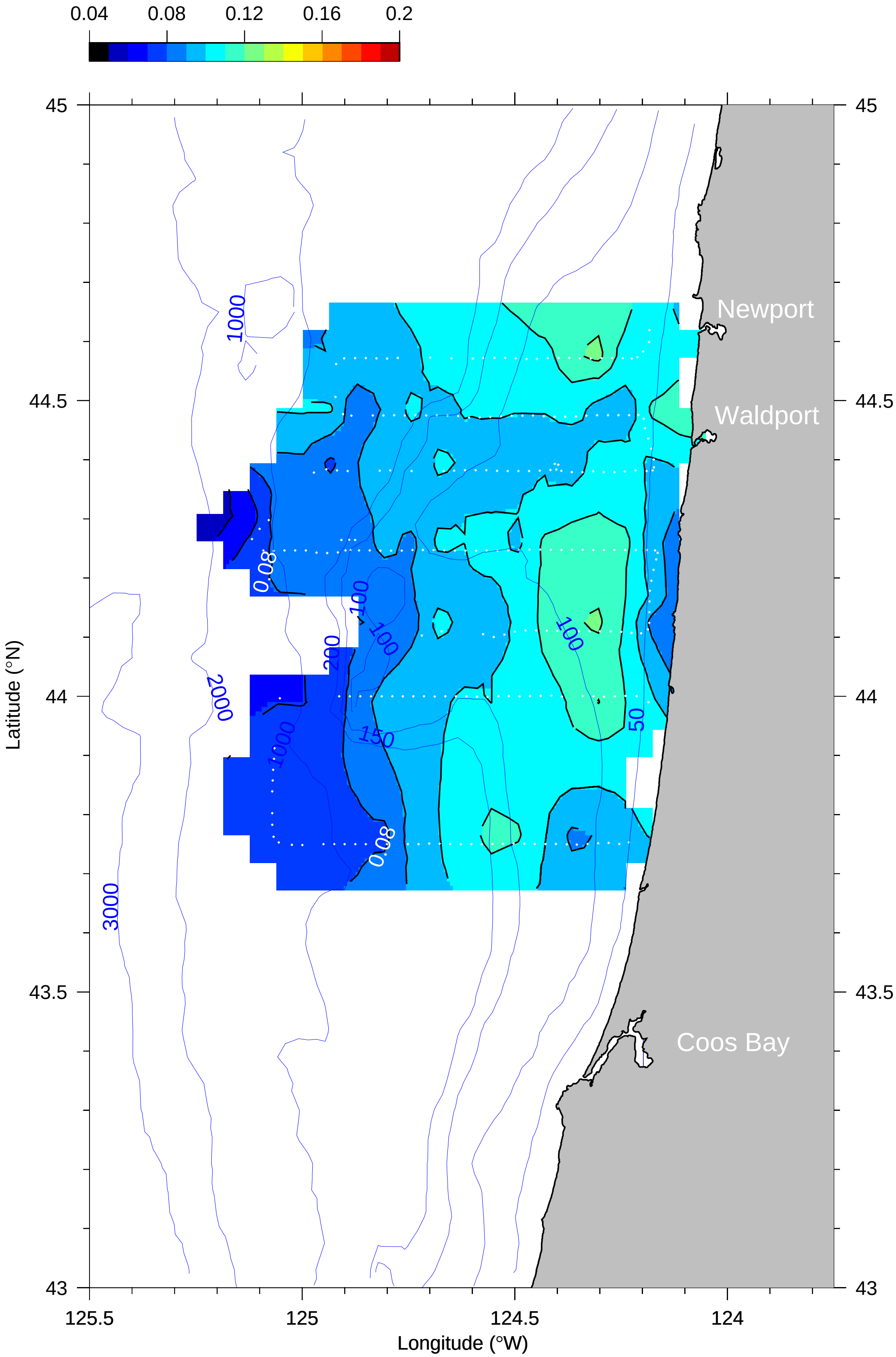
Chlorophyll ($\mu g\ L^{-1}$) at 95 dbar

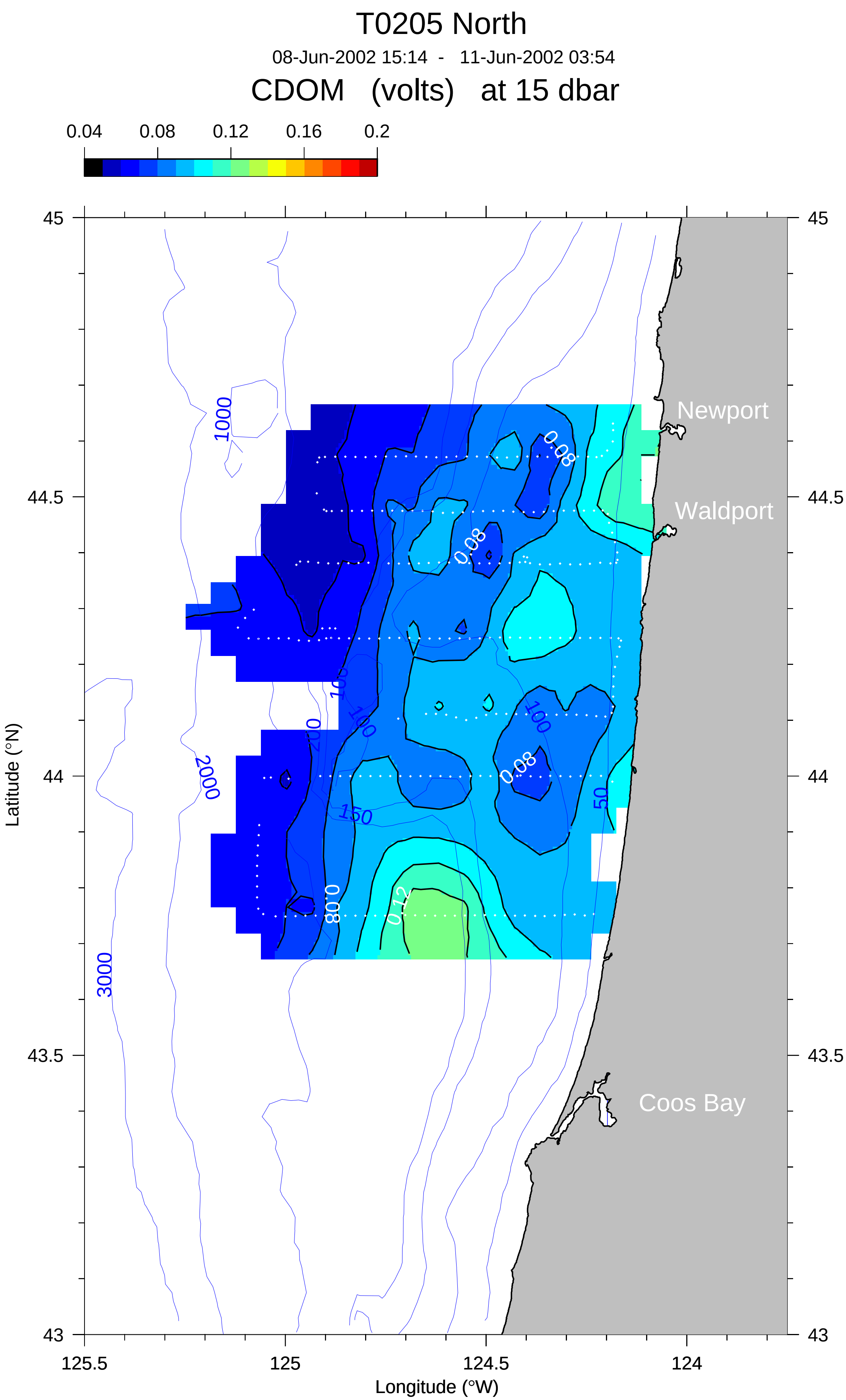


T0205 North

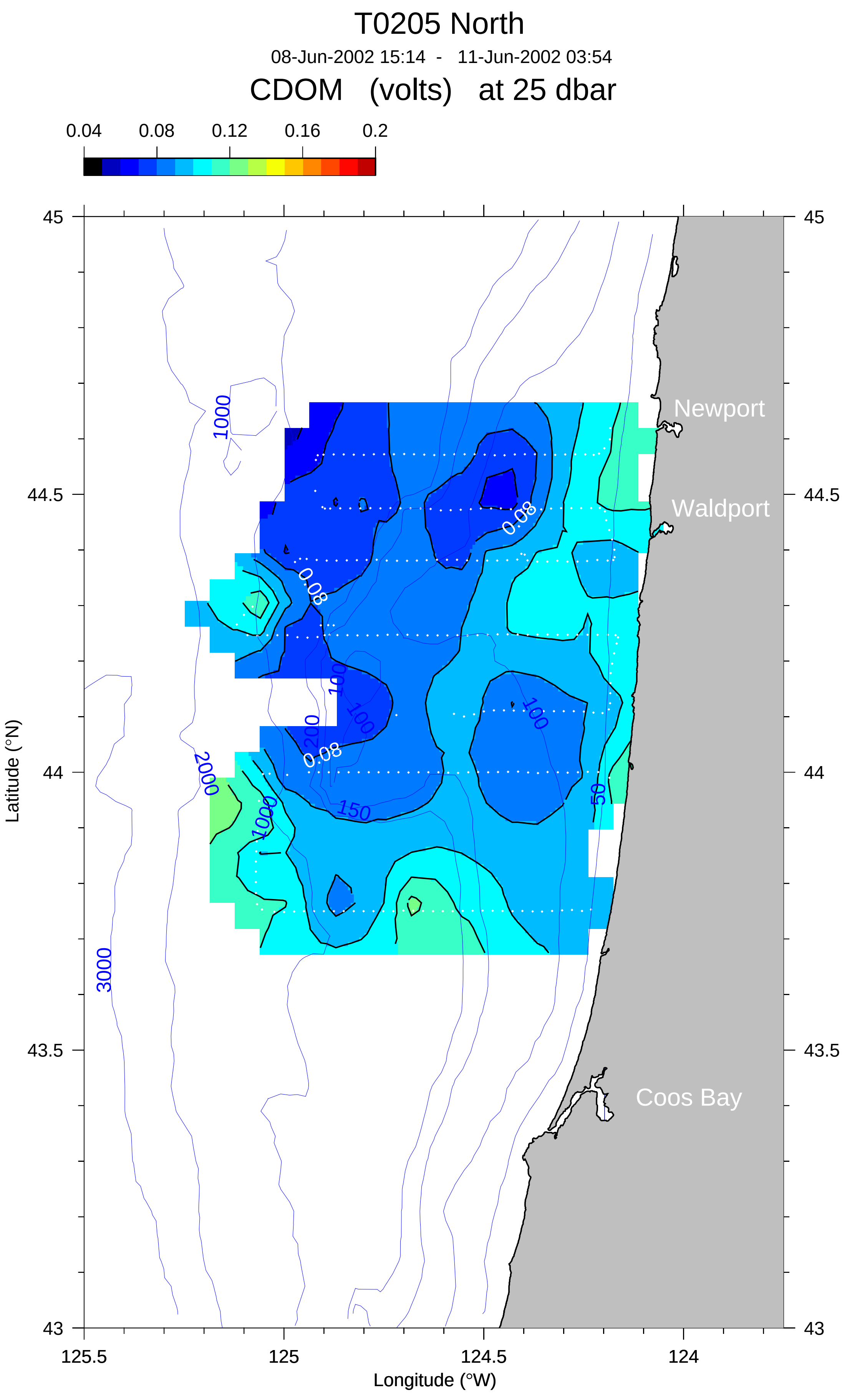
08-Jun-2002 15:14 - 11-Jun-2002 03:54

CDOM (volts) at 5 dbar





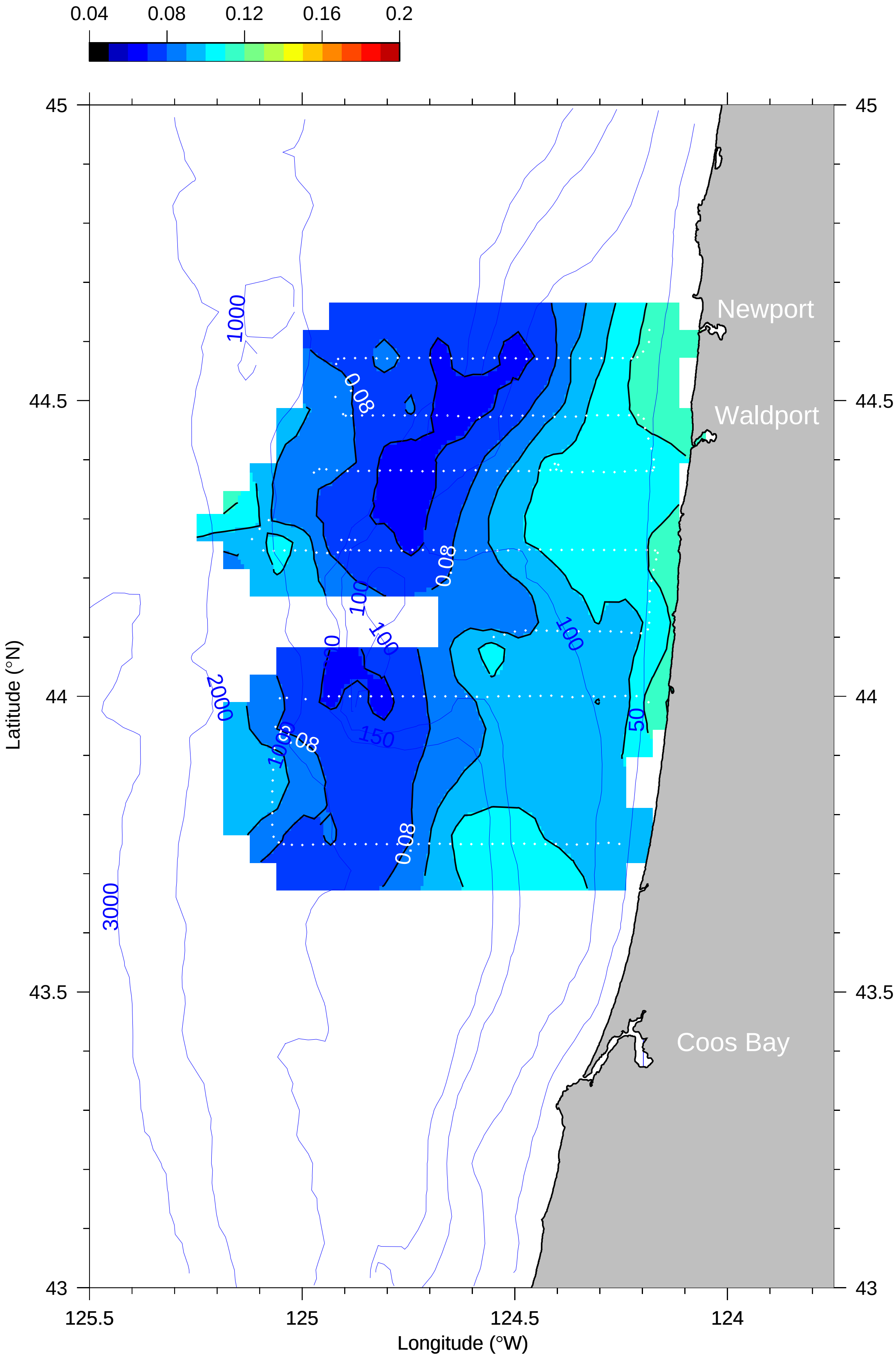
T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
CDOM (volts) at 15 dbar
0.04
0.08
0.12
0.16
0.2
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
0.08
0.12

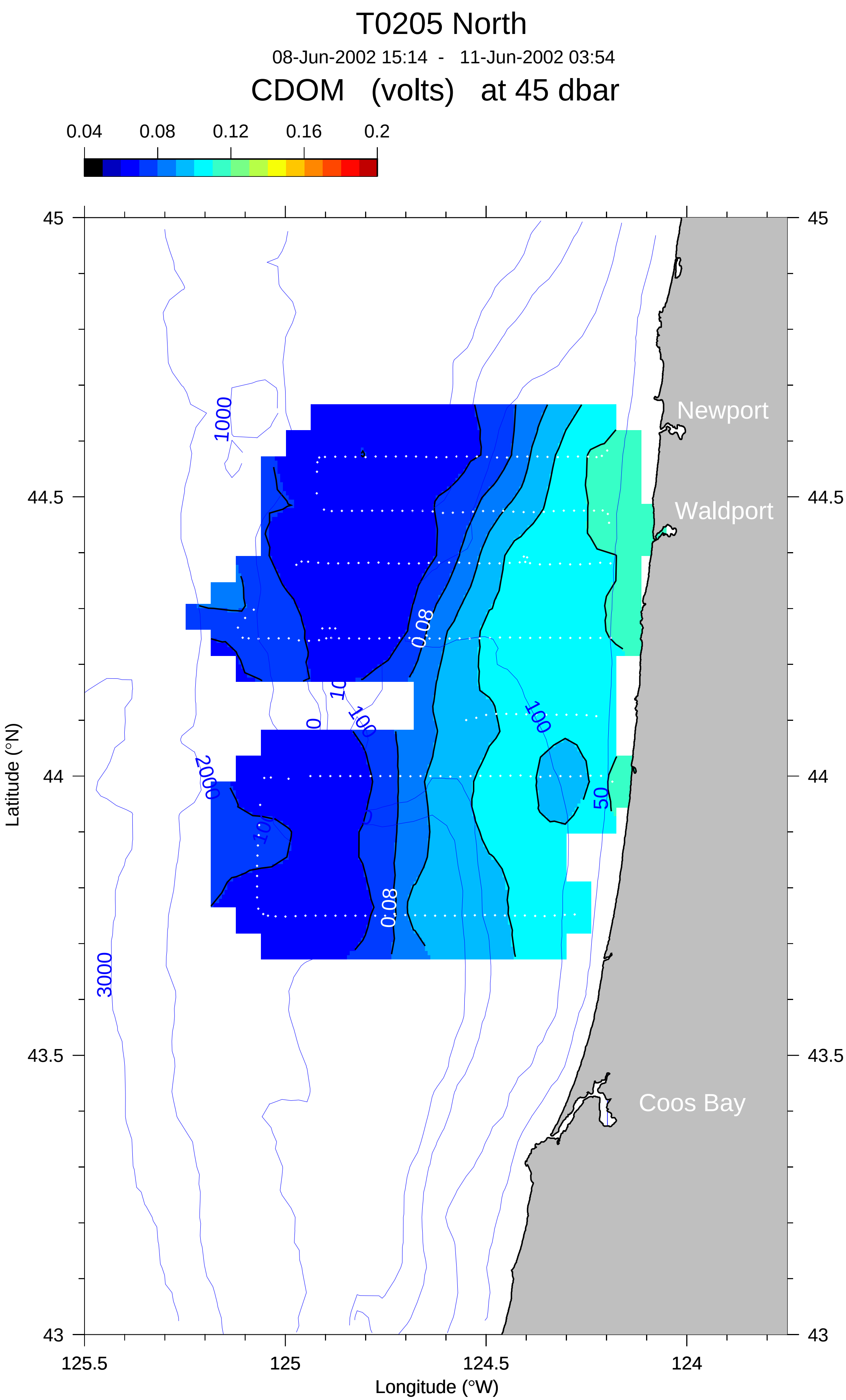

T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
CDOM (volts) at 25 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.5
125
124.5
124
0.08
1000
2000
3000
100
150
200
50

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

CDOM (volts) at 35 dbar

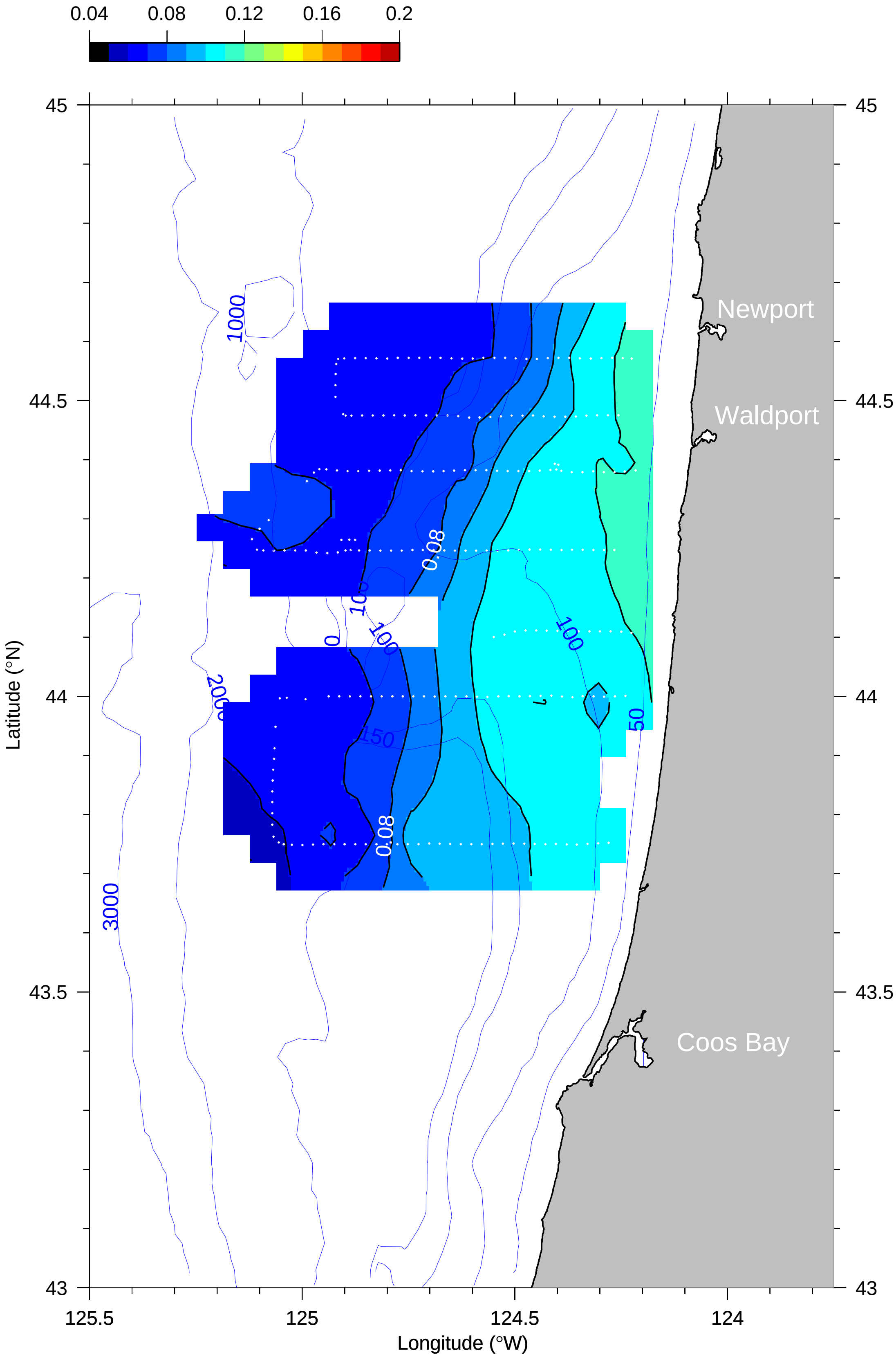


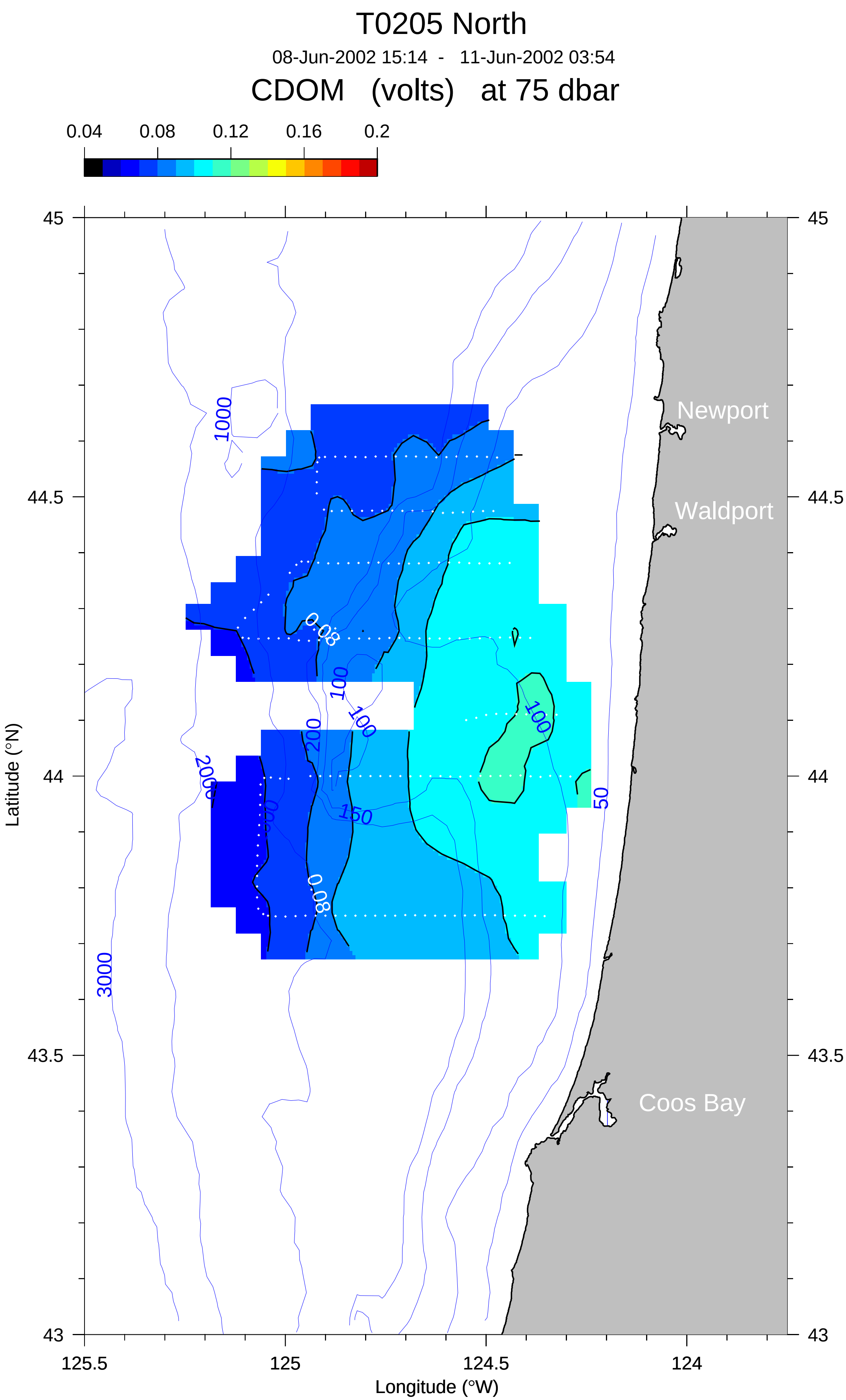

T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
CDOM (volts) at 45 dbar
0.04
0.08
0.12
0.16
0.2
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
100
50
0.08

T0205 North

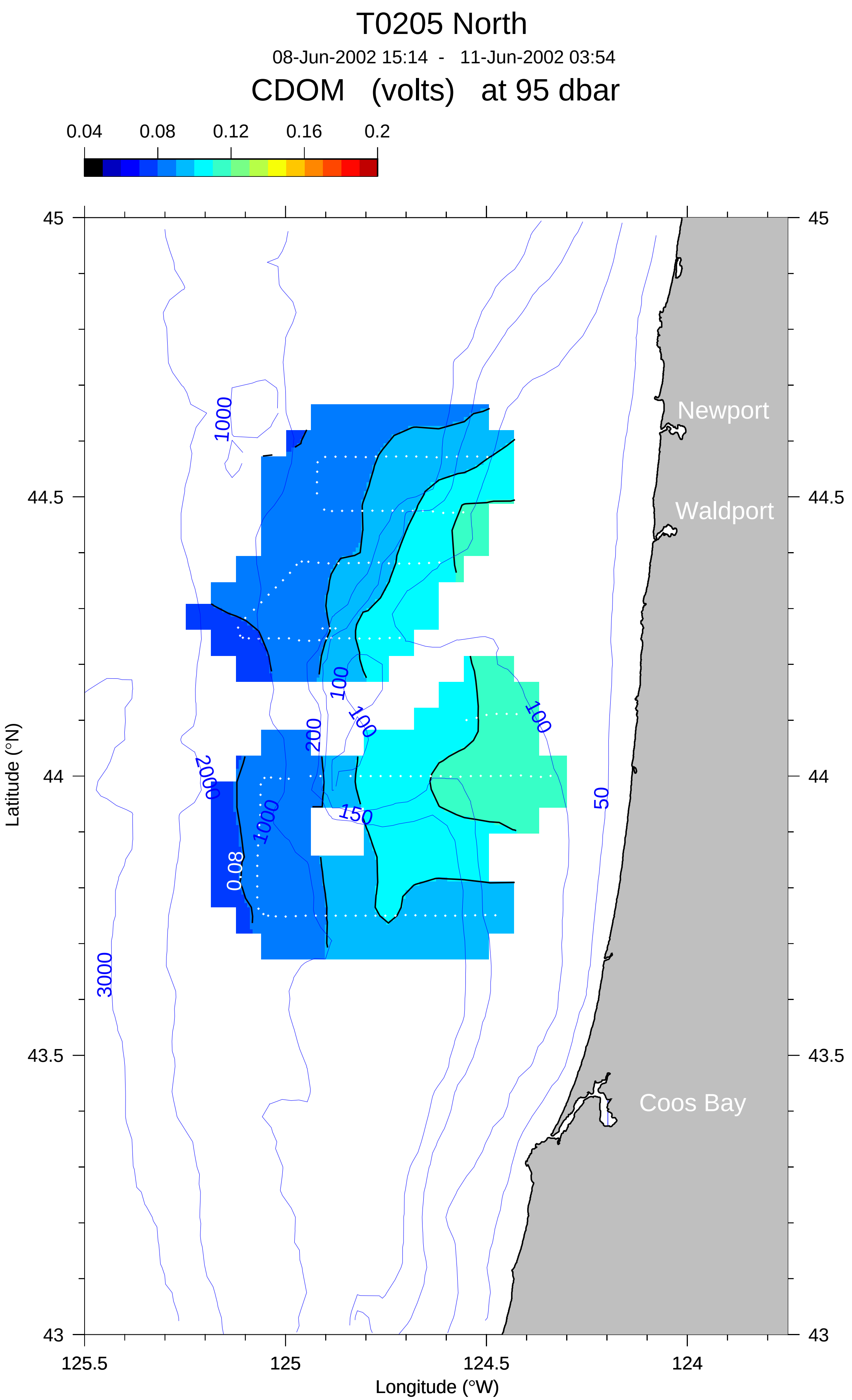
08-Jun-2002 15:14 - 11-Jun-2002 03:54

CDOM (volts) at 55 dbar





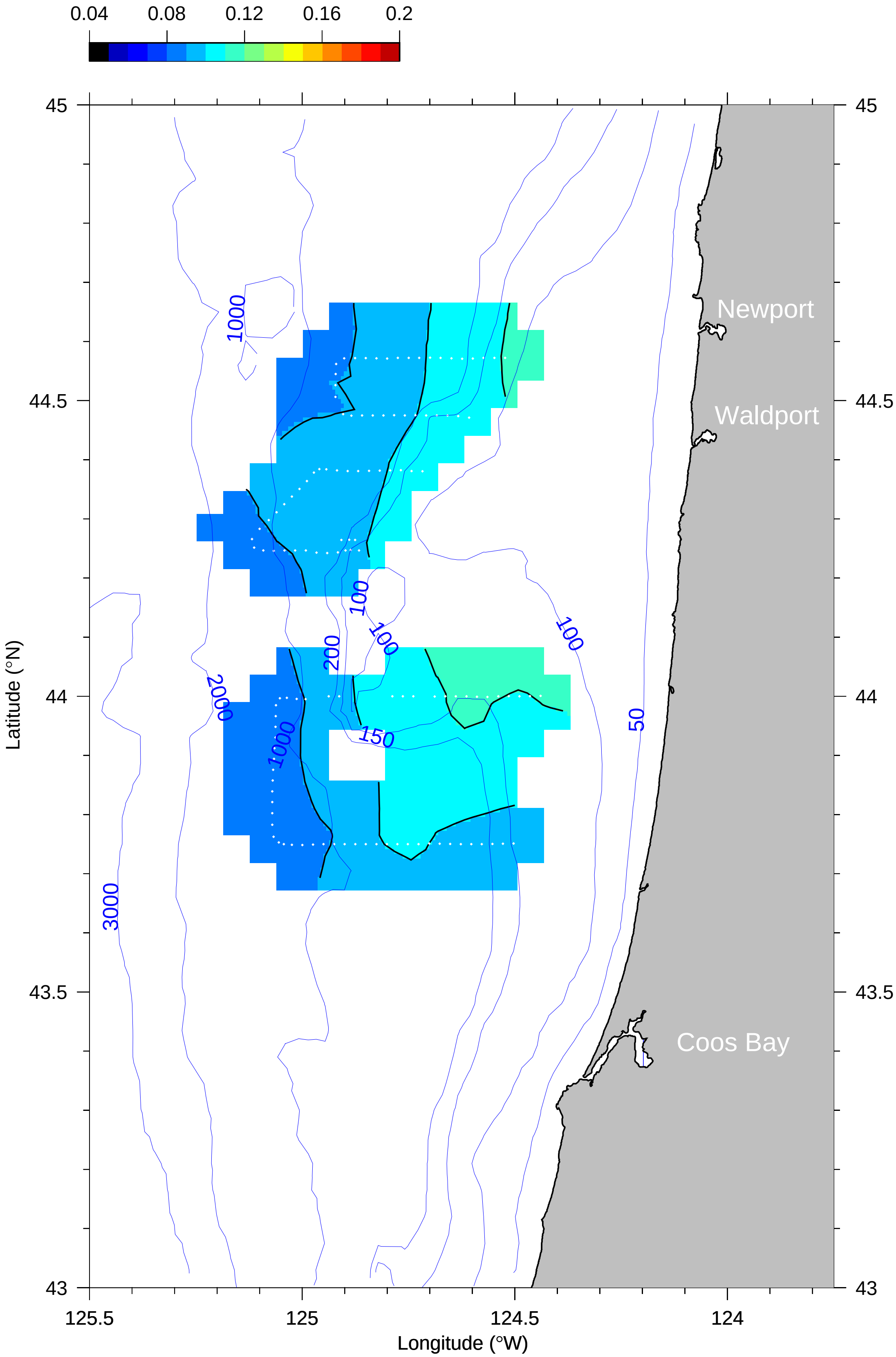
T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
CDOM (volts) at 75 dbar
0.04
0.08
0.12
0.16
0.2
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
0.08


T0205 North
08-Jun-2002 15:14 - 11-Jun-2002 03:54
CDOM (volts) at 95 dbar
0.04
0.08
0.12
0.16
0.2
45
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
0.08

T0205 North

08-Jun-2002 15:14 - 11-Jun-2002 03:54

CDOM (volts) at 115 dbar



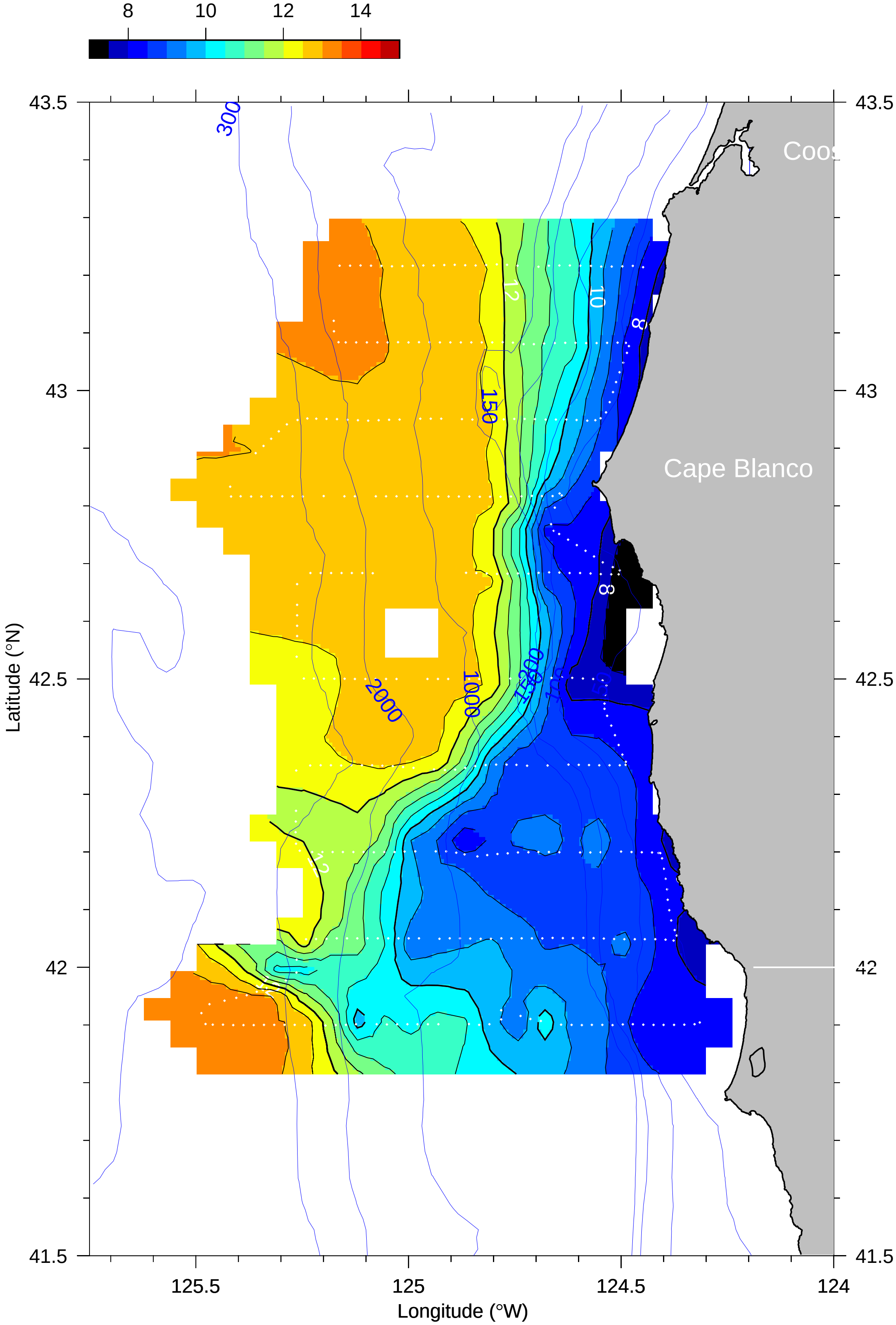
South Maps

Maps of Temperature, Salinity, σ_t, Chlorophyll, and CDOM at Specified Depths

T0205 South

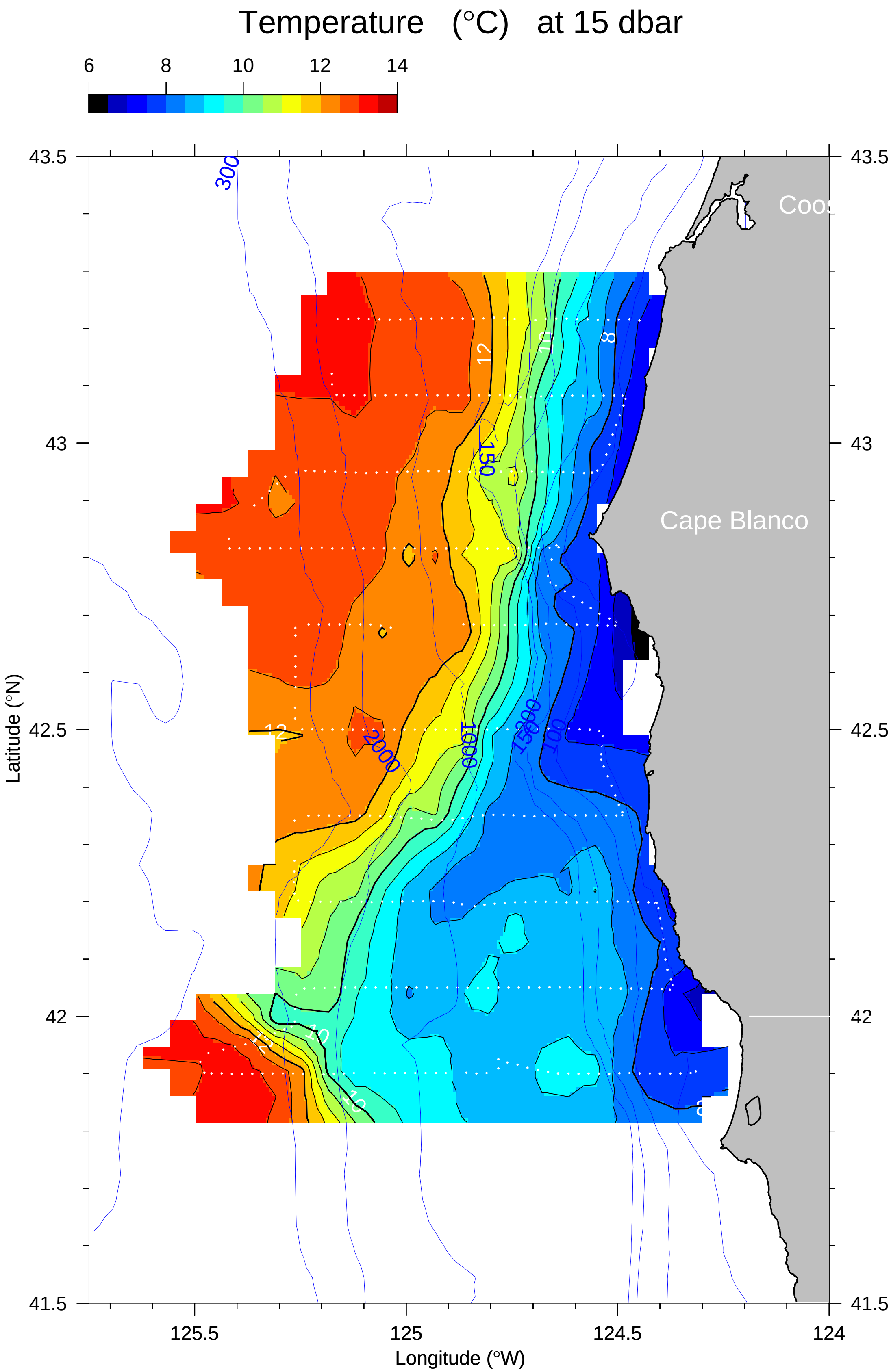
12-Jun-2002 14:51 - 15-Jun-2002 08:41

Temperature (°C) at 5 dbar



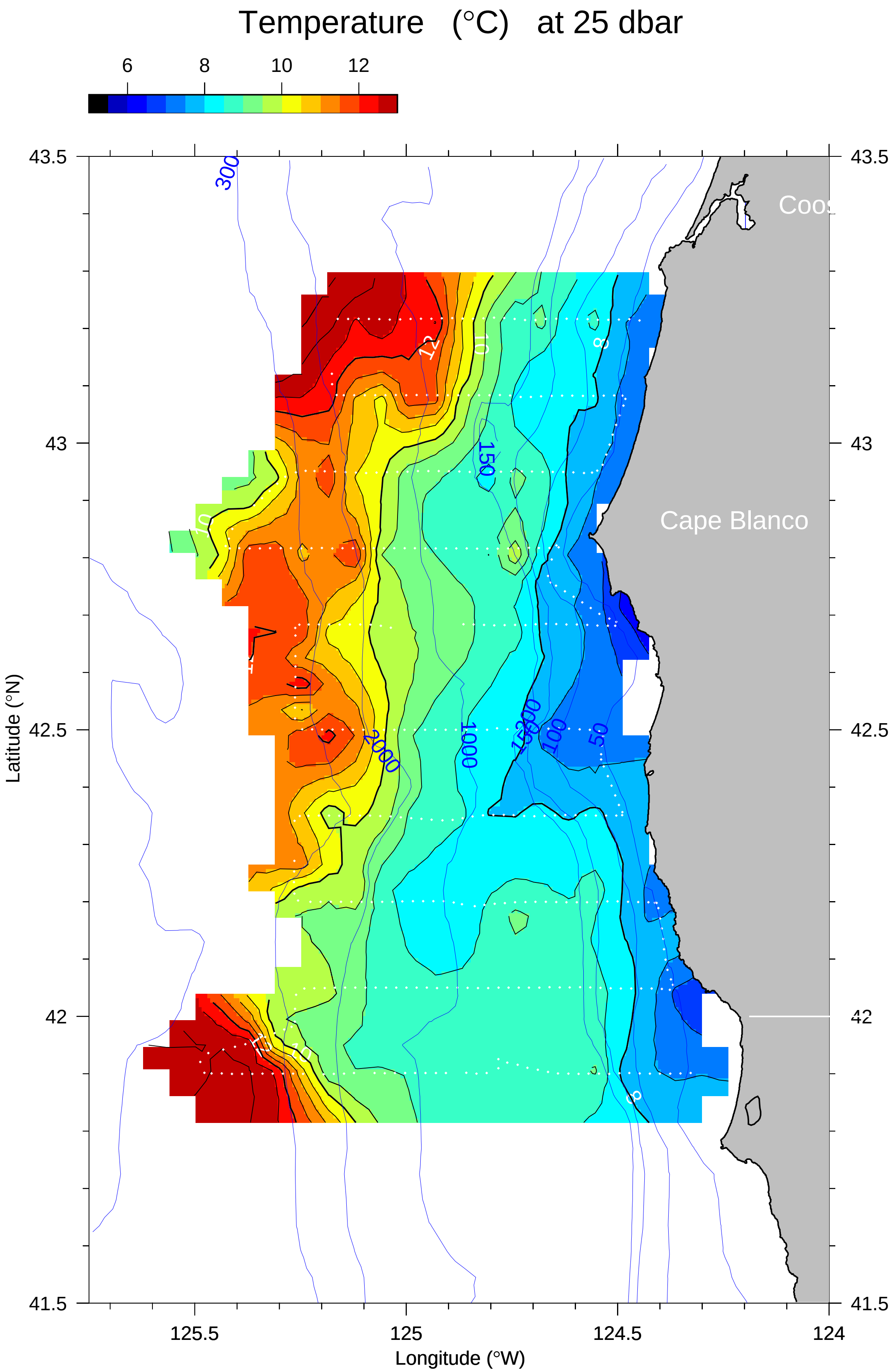
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



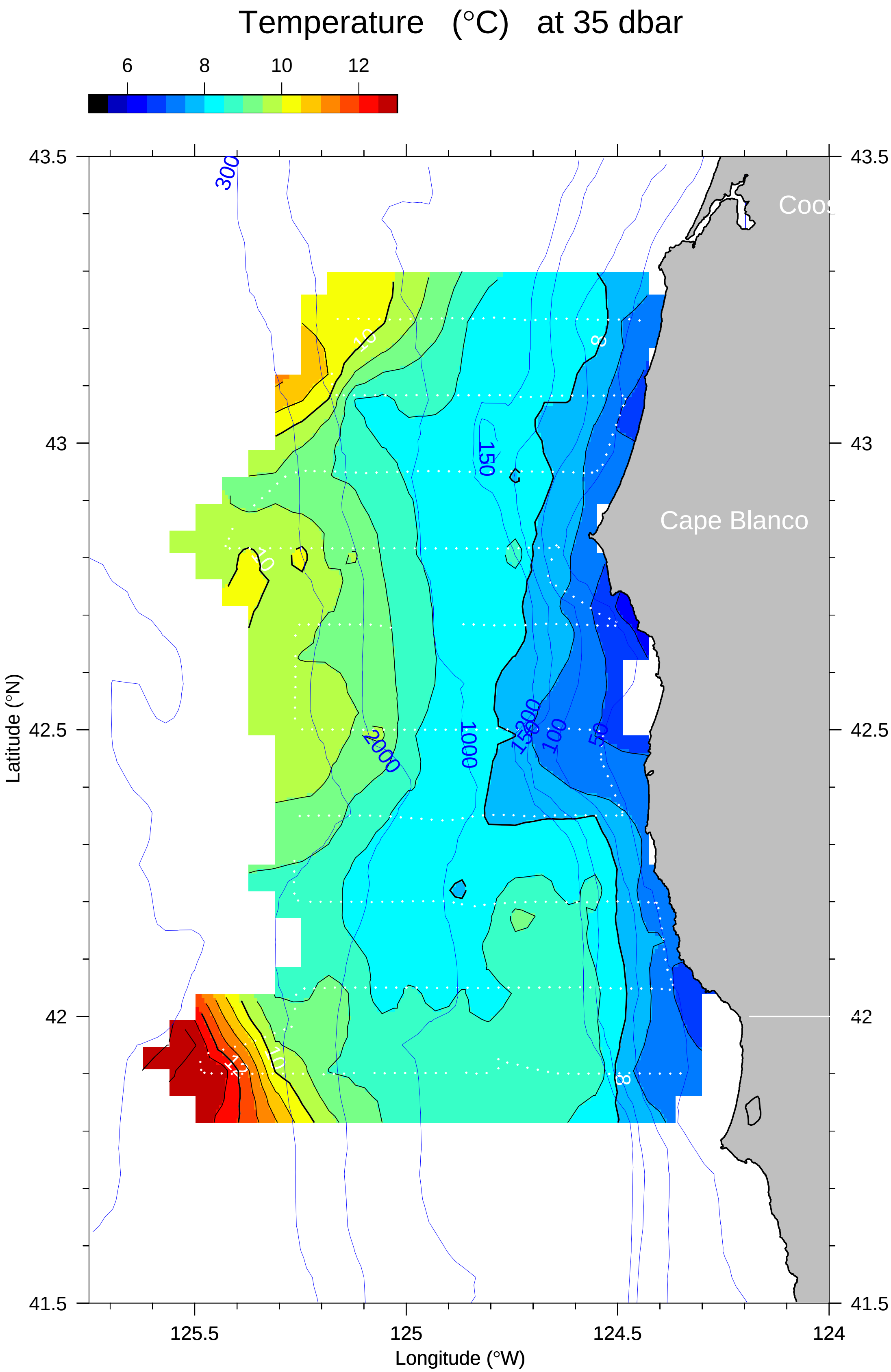
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

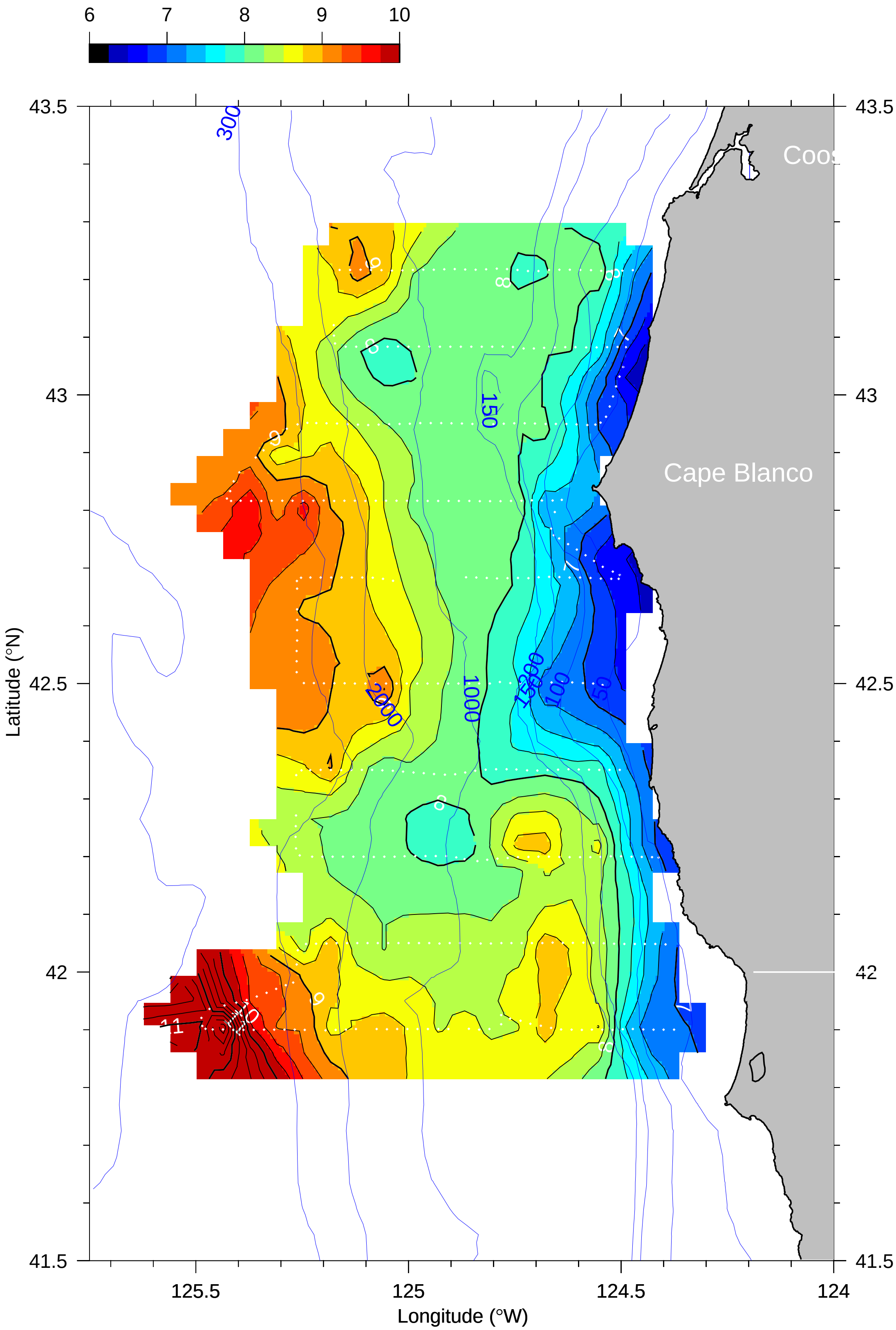
12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

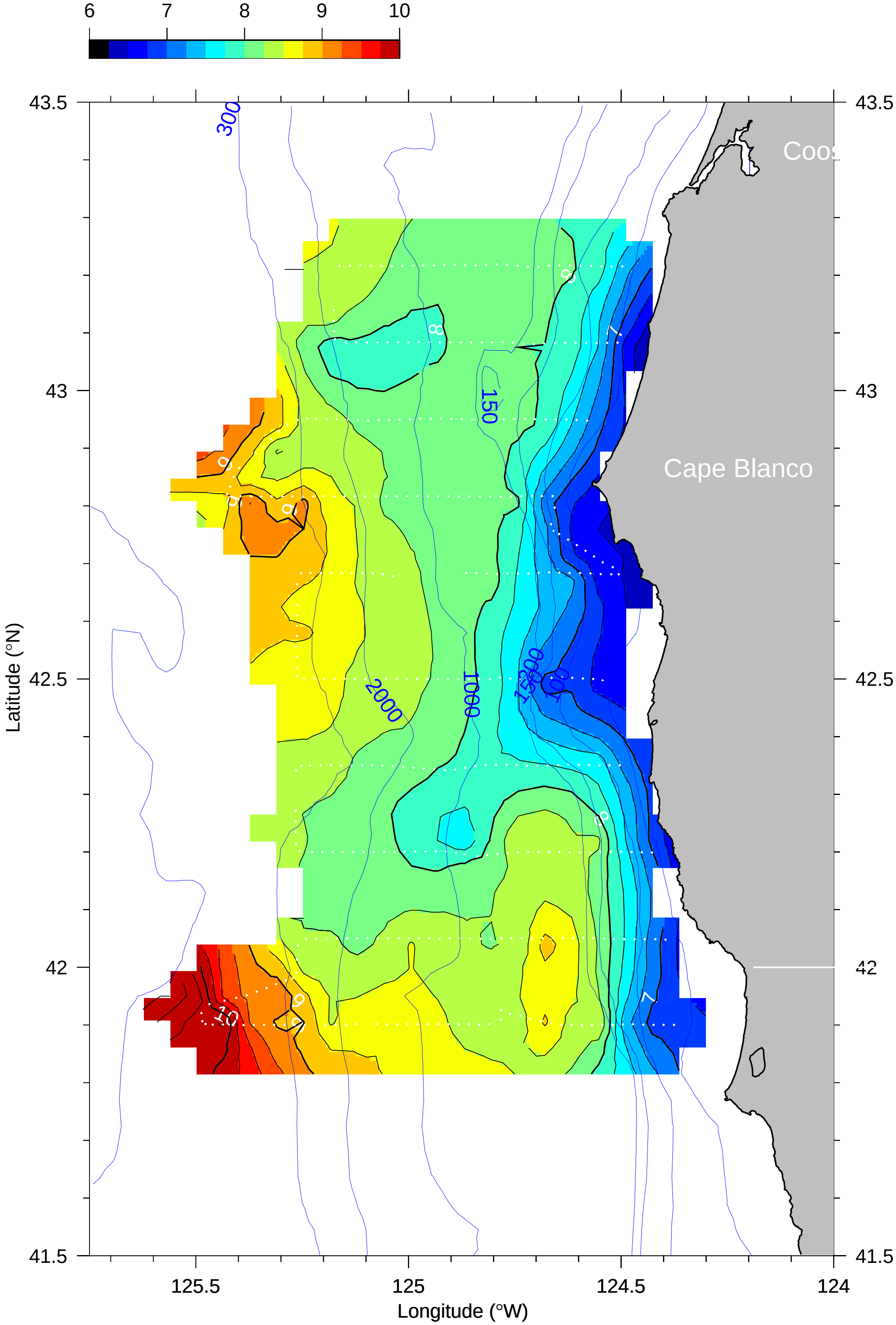
Temperature (°C) at 45 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

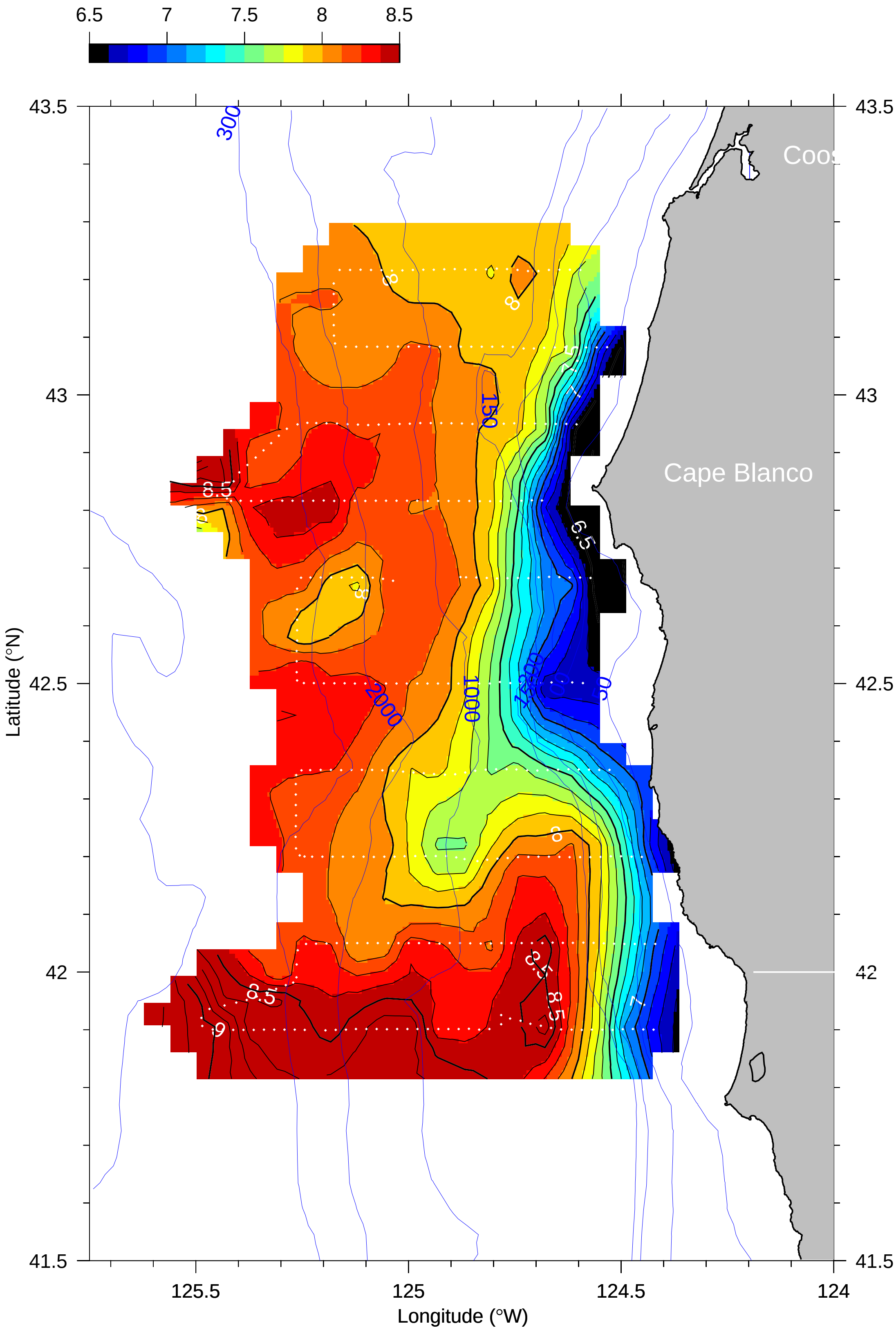
Temperature (°C) at 55 dbar



T0205 South

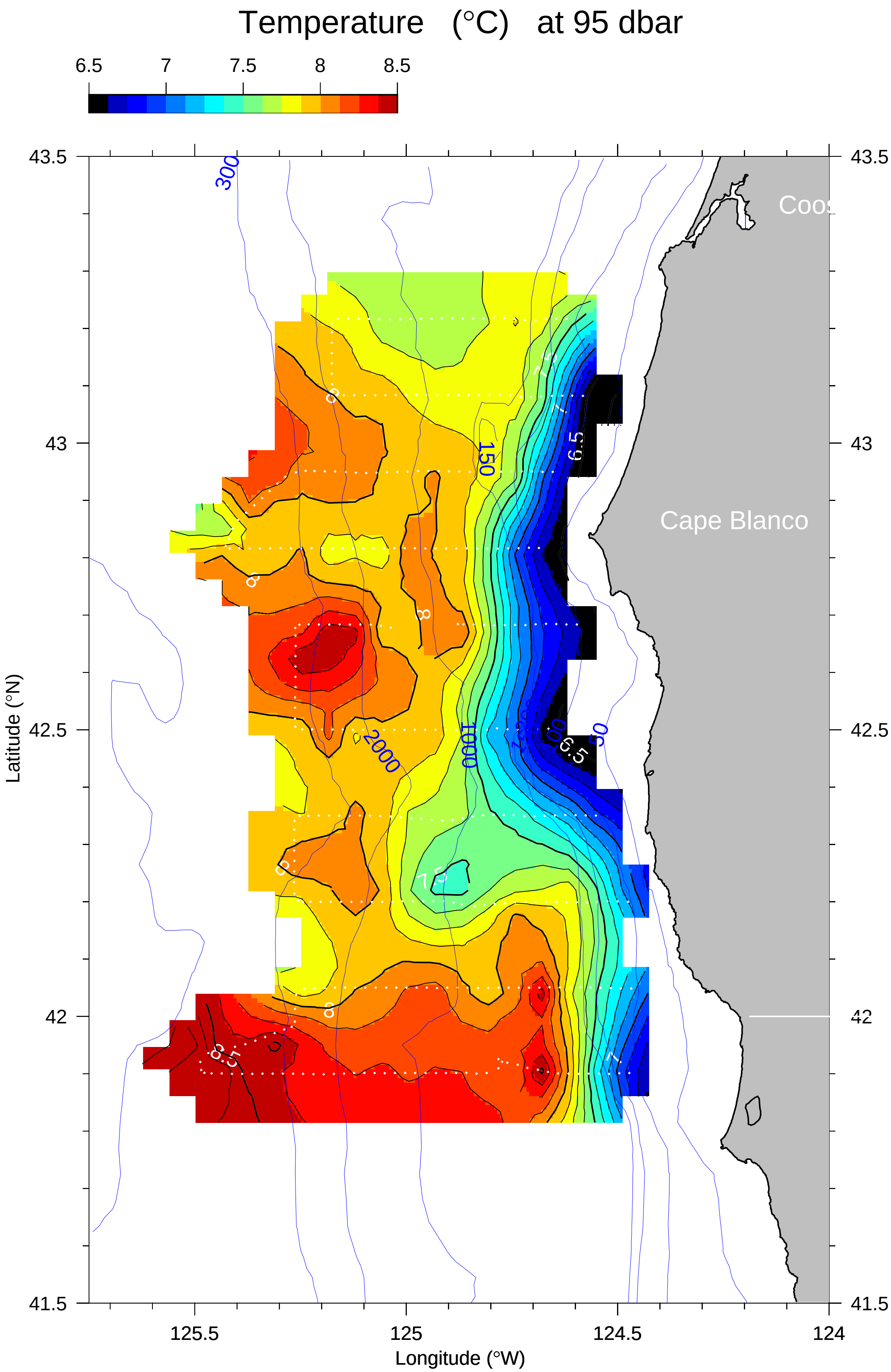
12-Jun-2002 14:51 - 15-Jun-2002 08:41

Temperature (°C) at 75 dbar



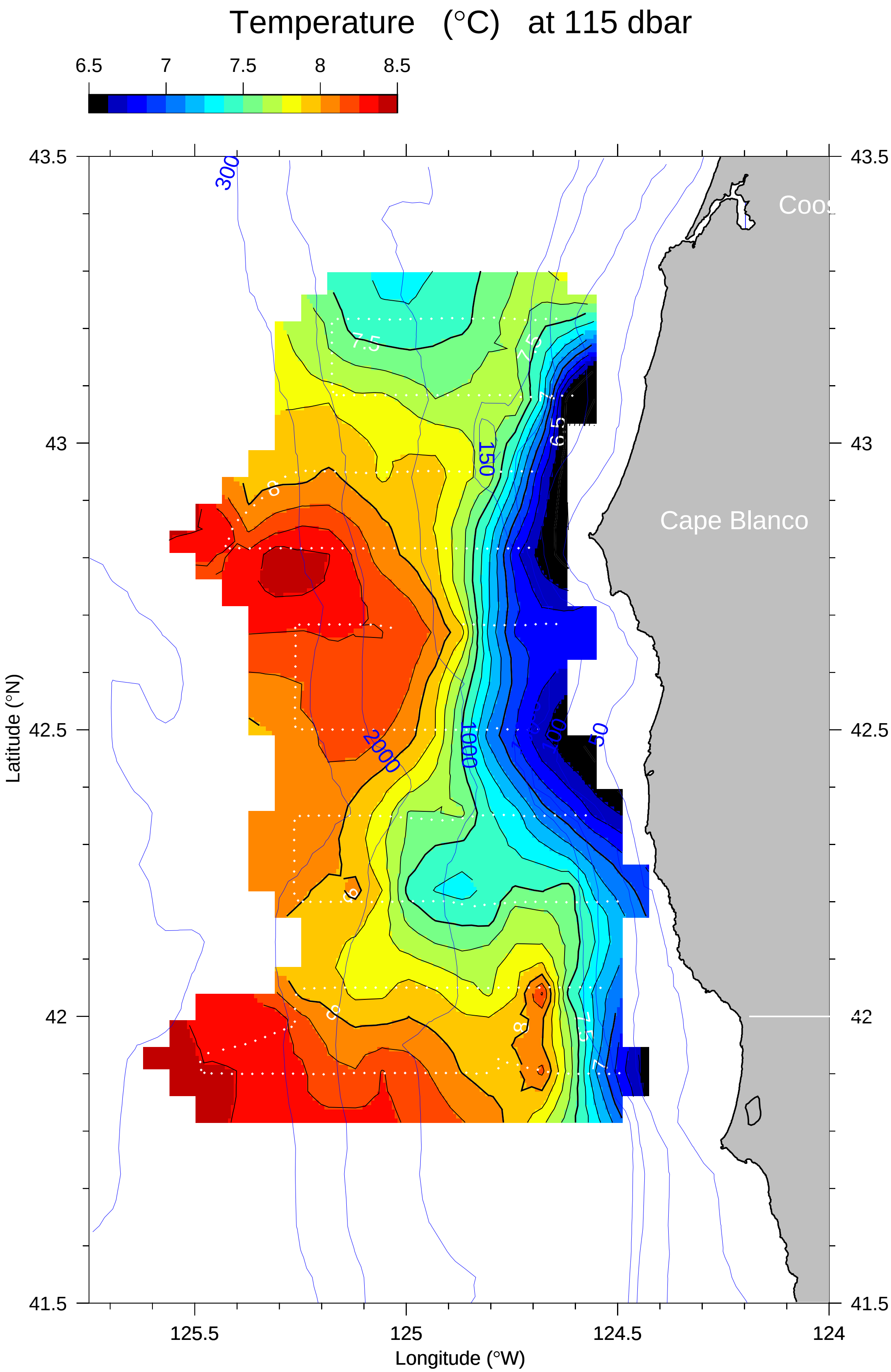
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



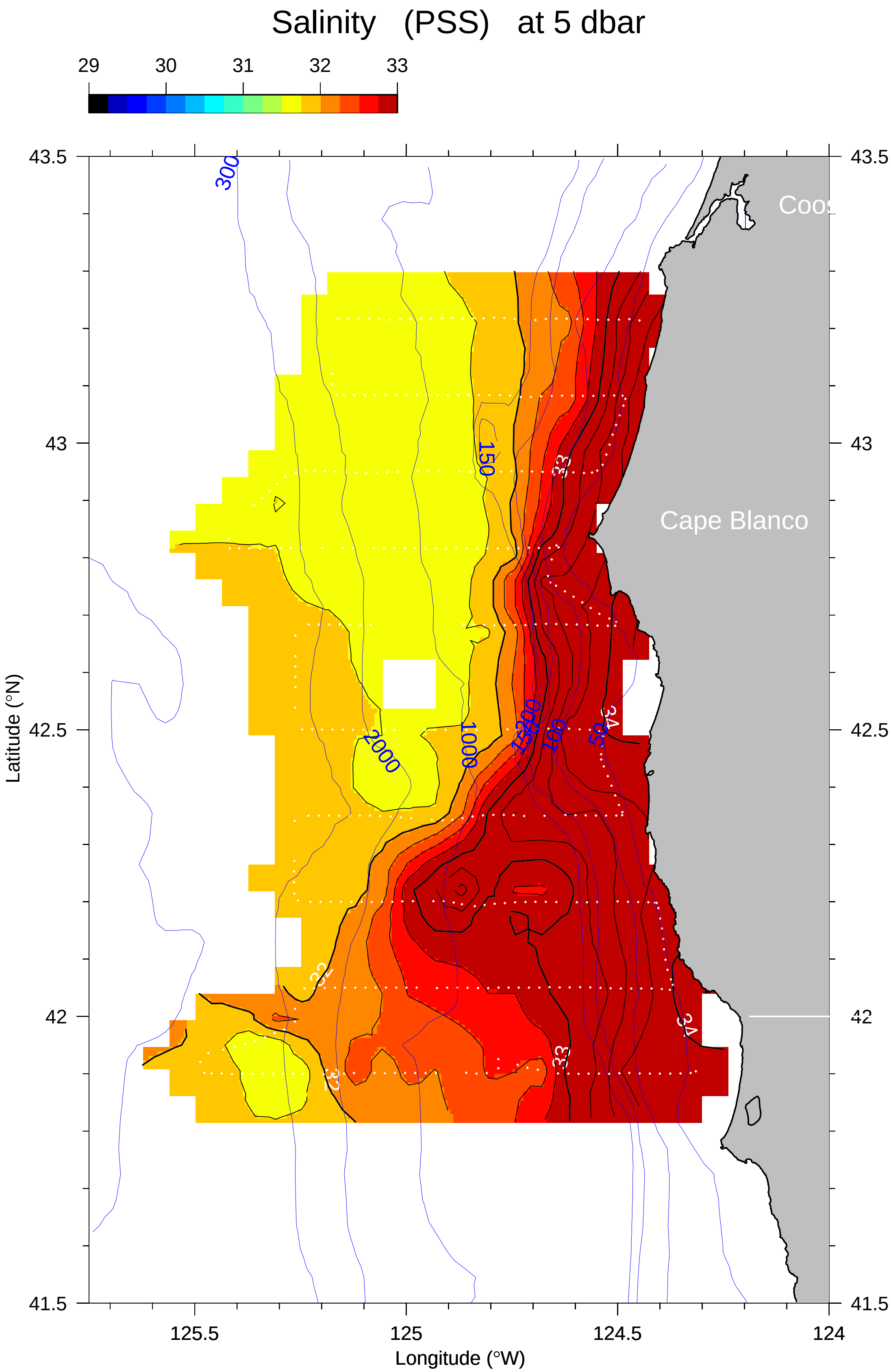
T0205 South

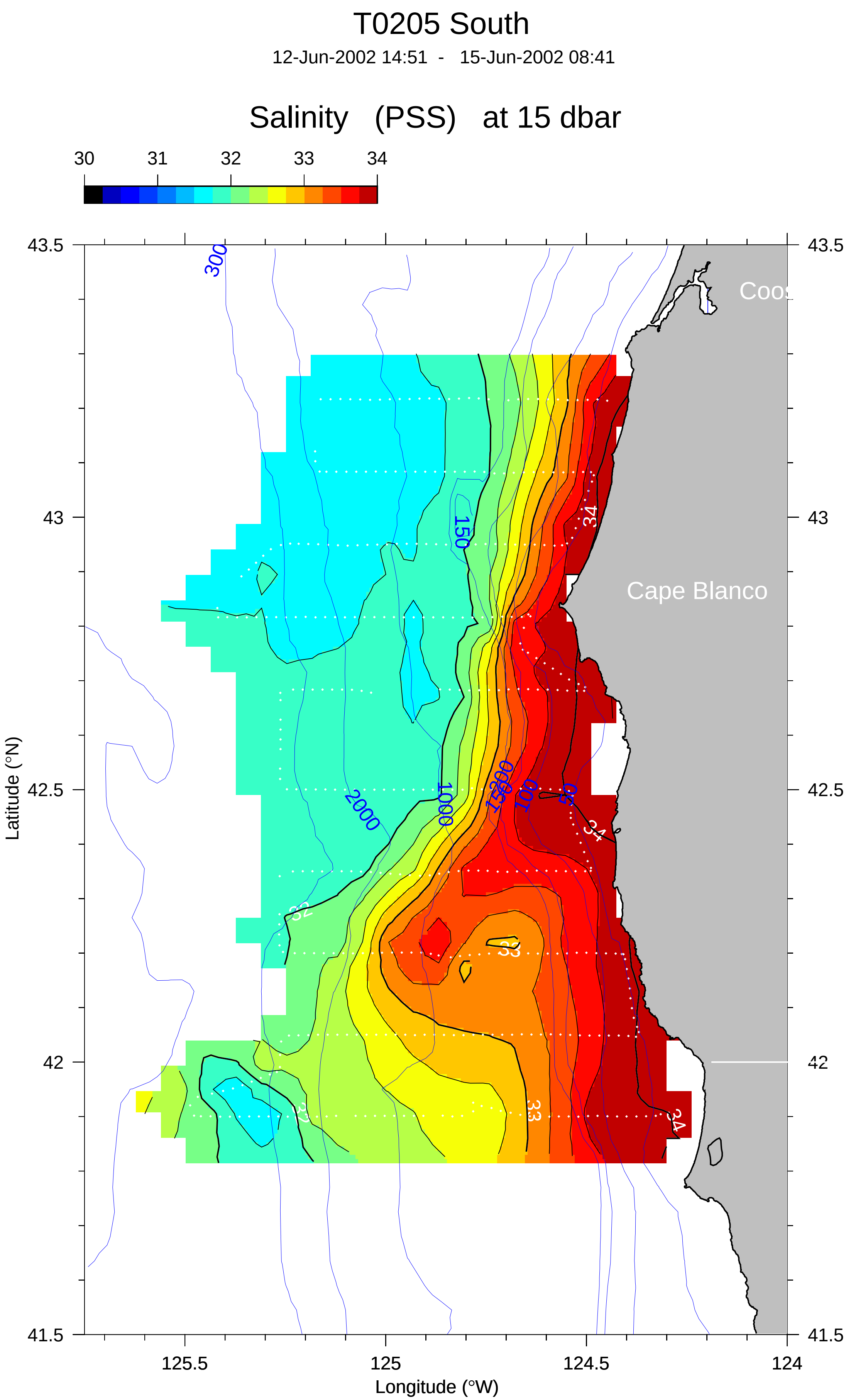
12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



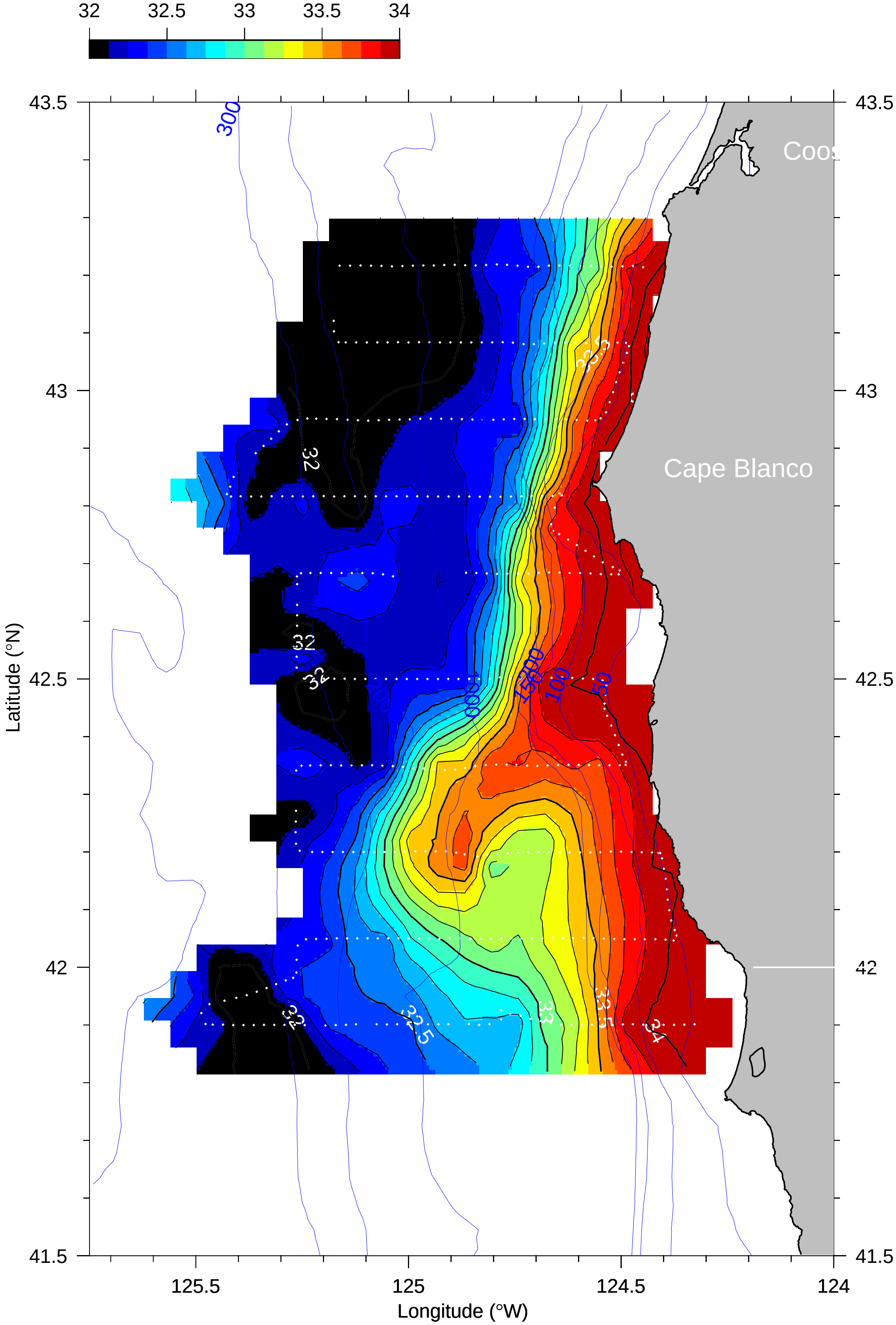


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
Salinity (PSS) at 15 dbar
30
31
32
33
34
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Cape Blanco
300
150
2000
1000
1500
200
100
50
34
33
32

T0205 South

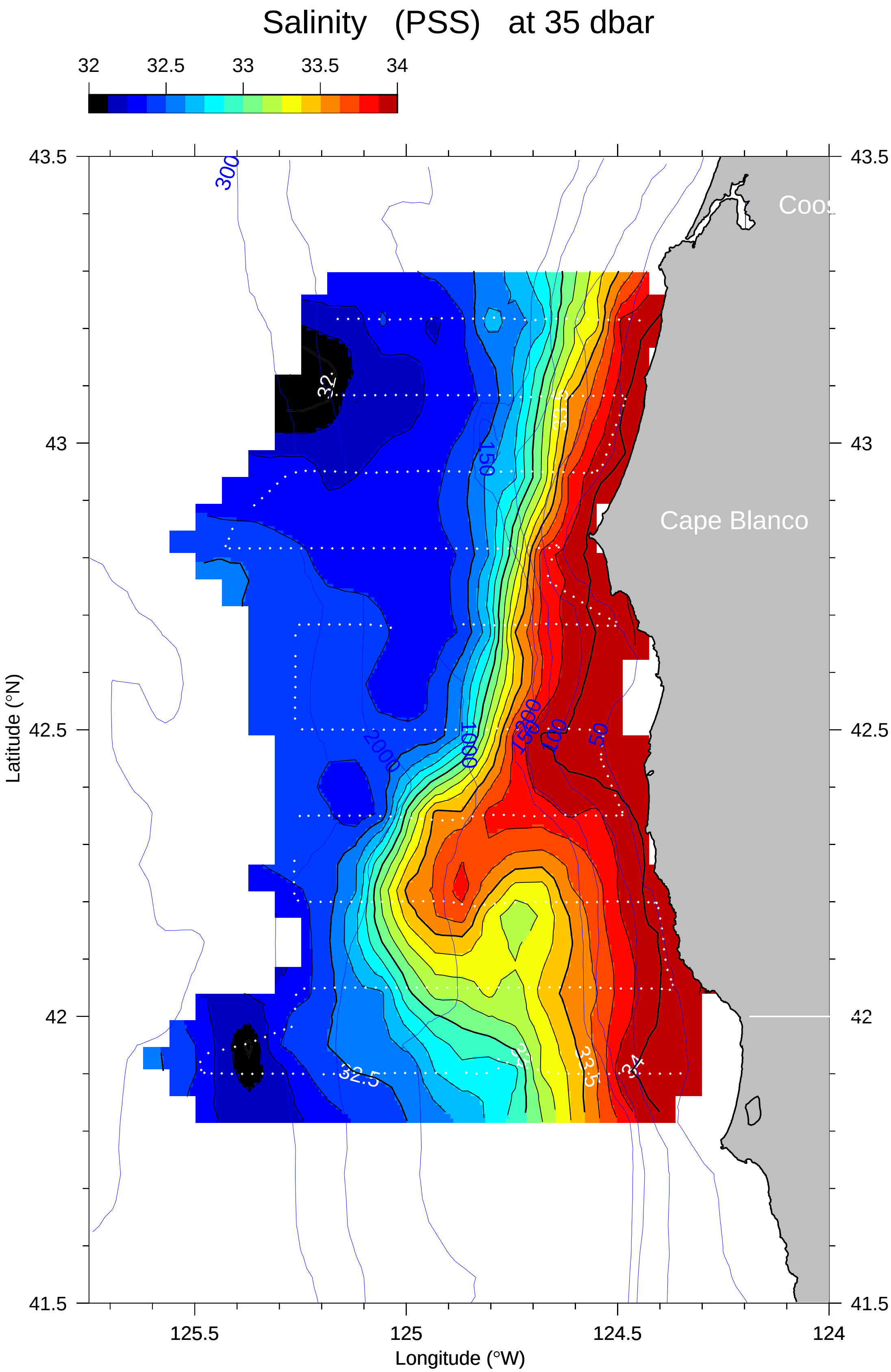
12-Jun-2002 14:51 - 15-Jun-2002 08:41

Salinity (PSS) at 25 dbar



T0205 South

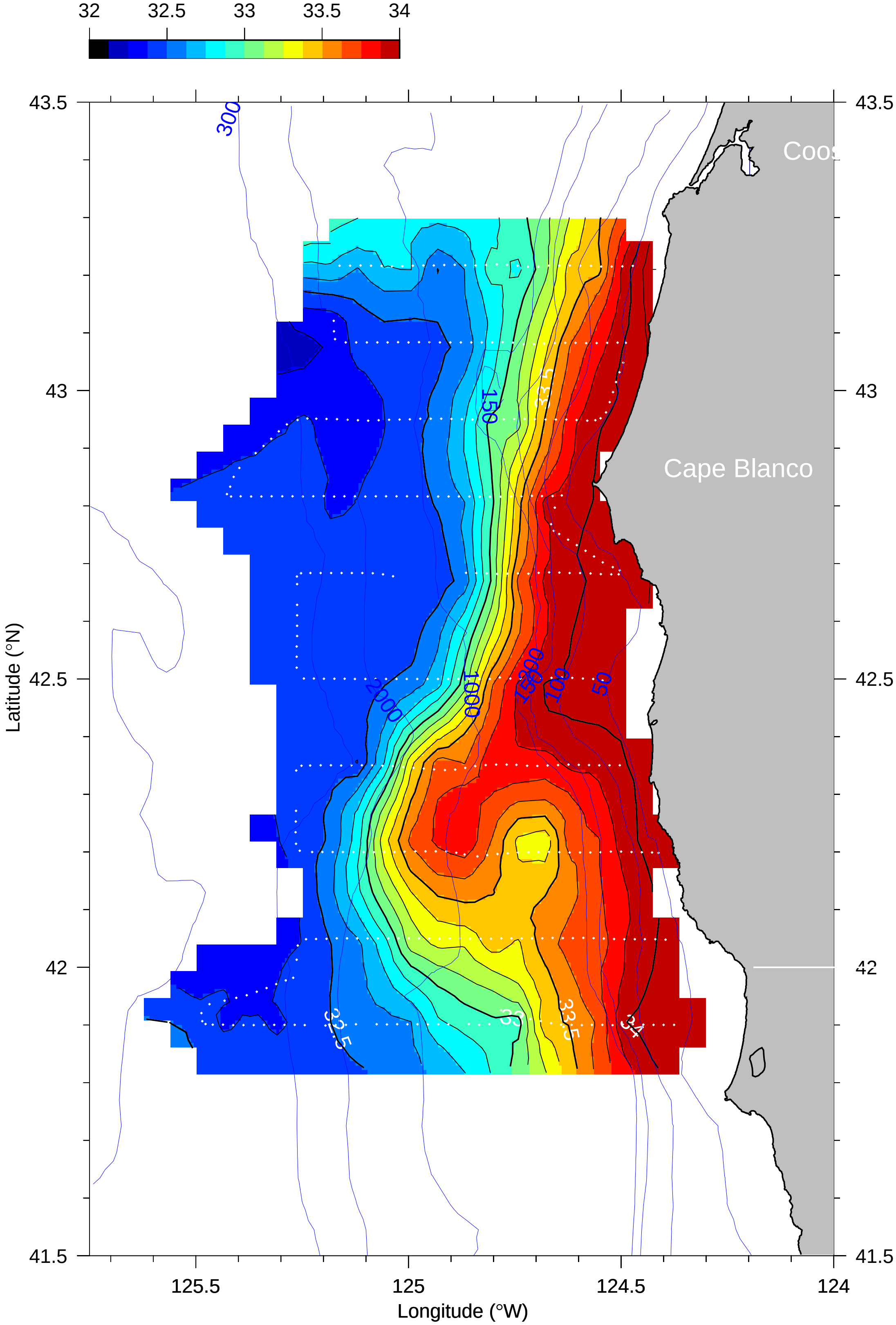
12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

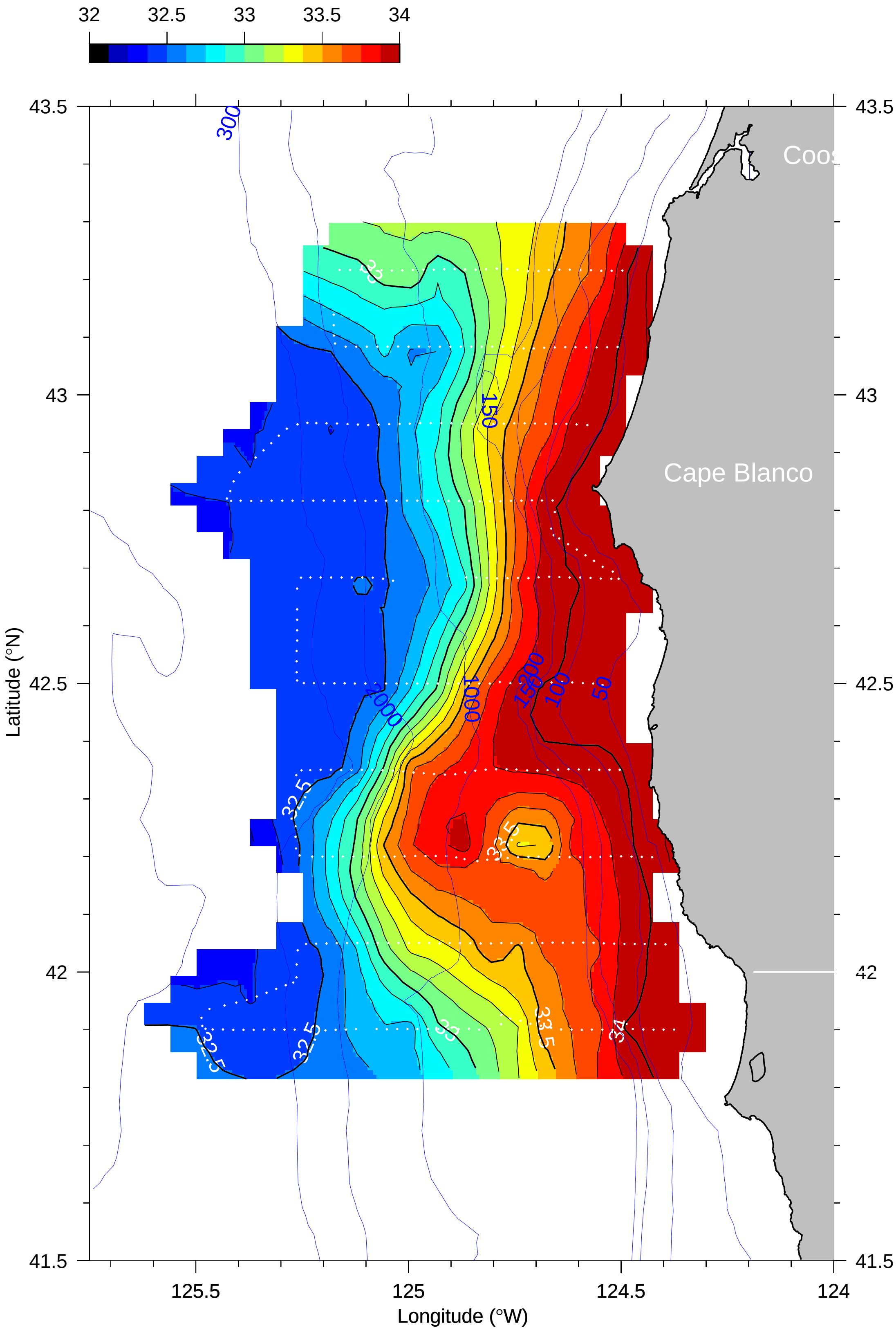
Salinity (PSS) at 45 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

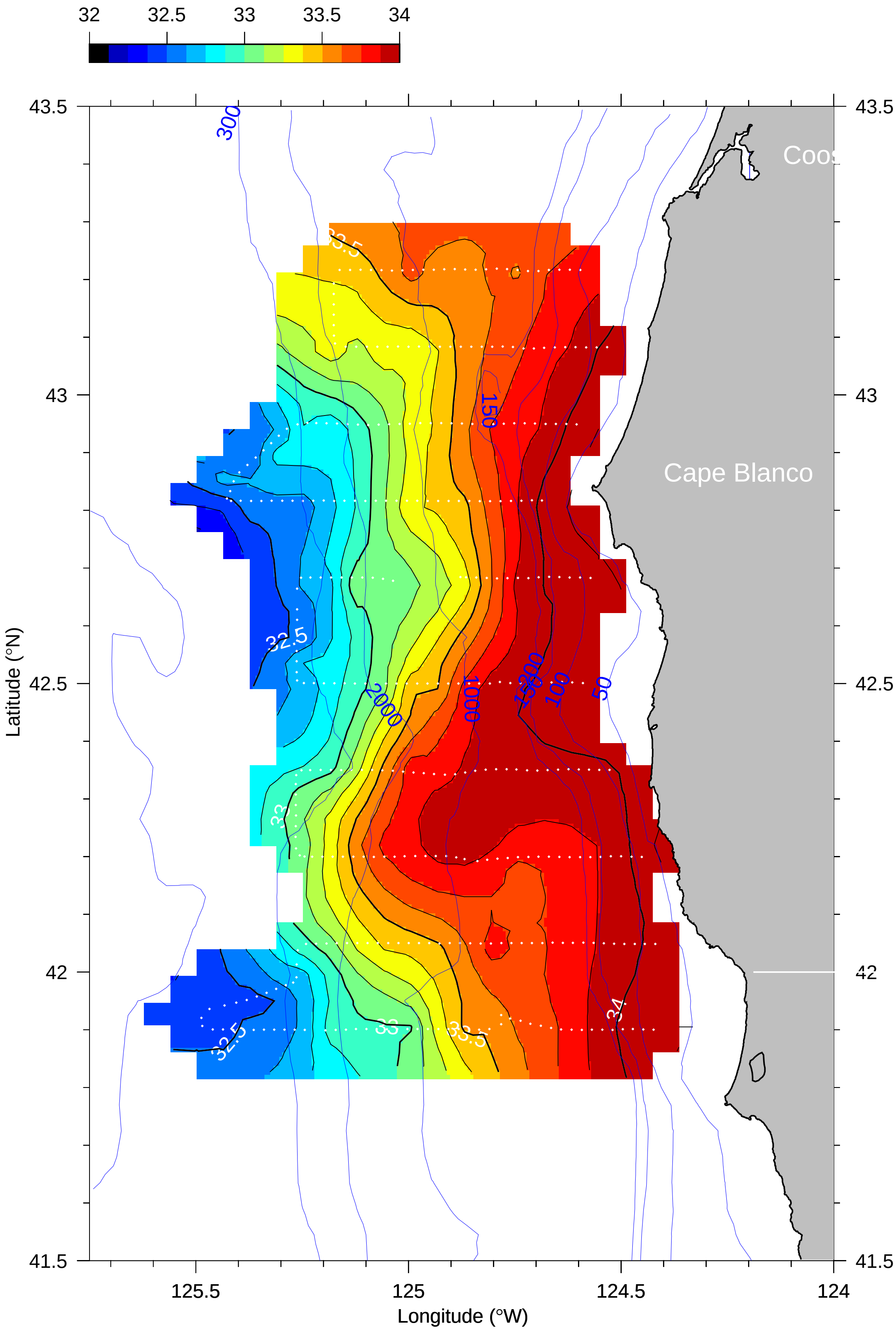
Salinity (PSS) at 55 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

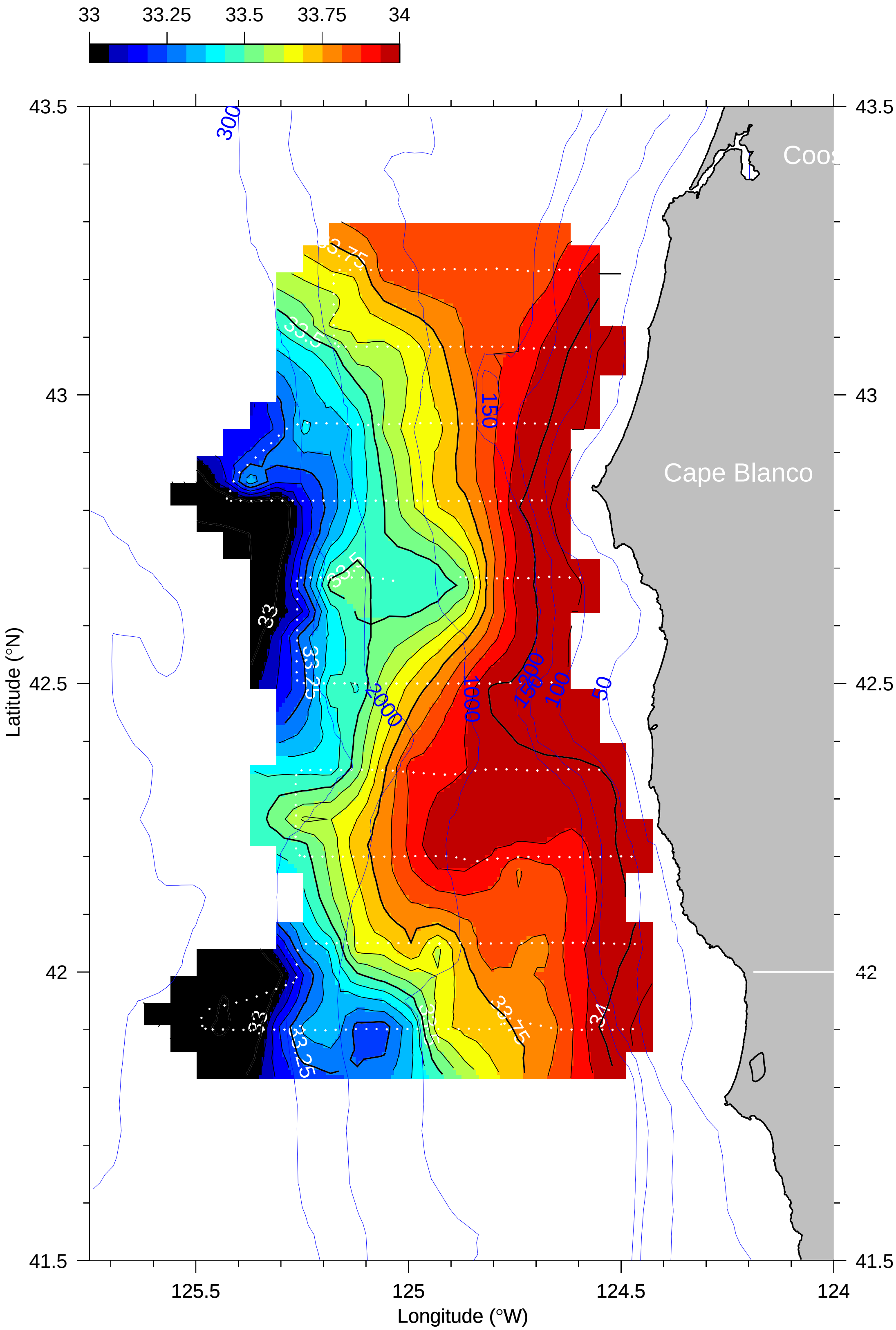
Salinity (PSS) at 75 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

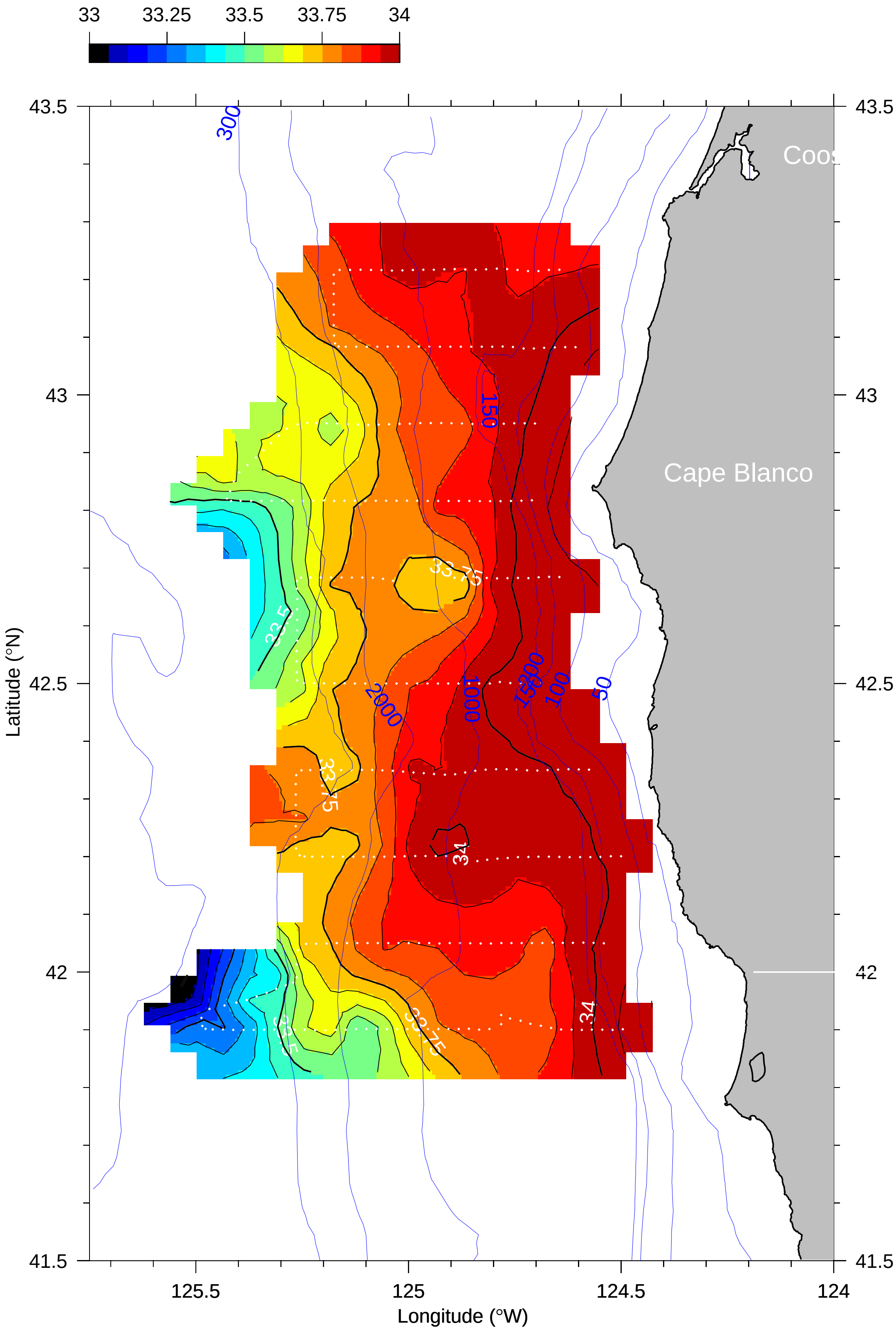
Salinity (PSS) at 95 dbar



T0205 South

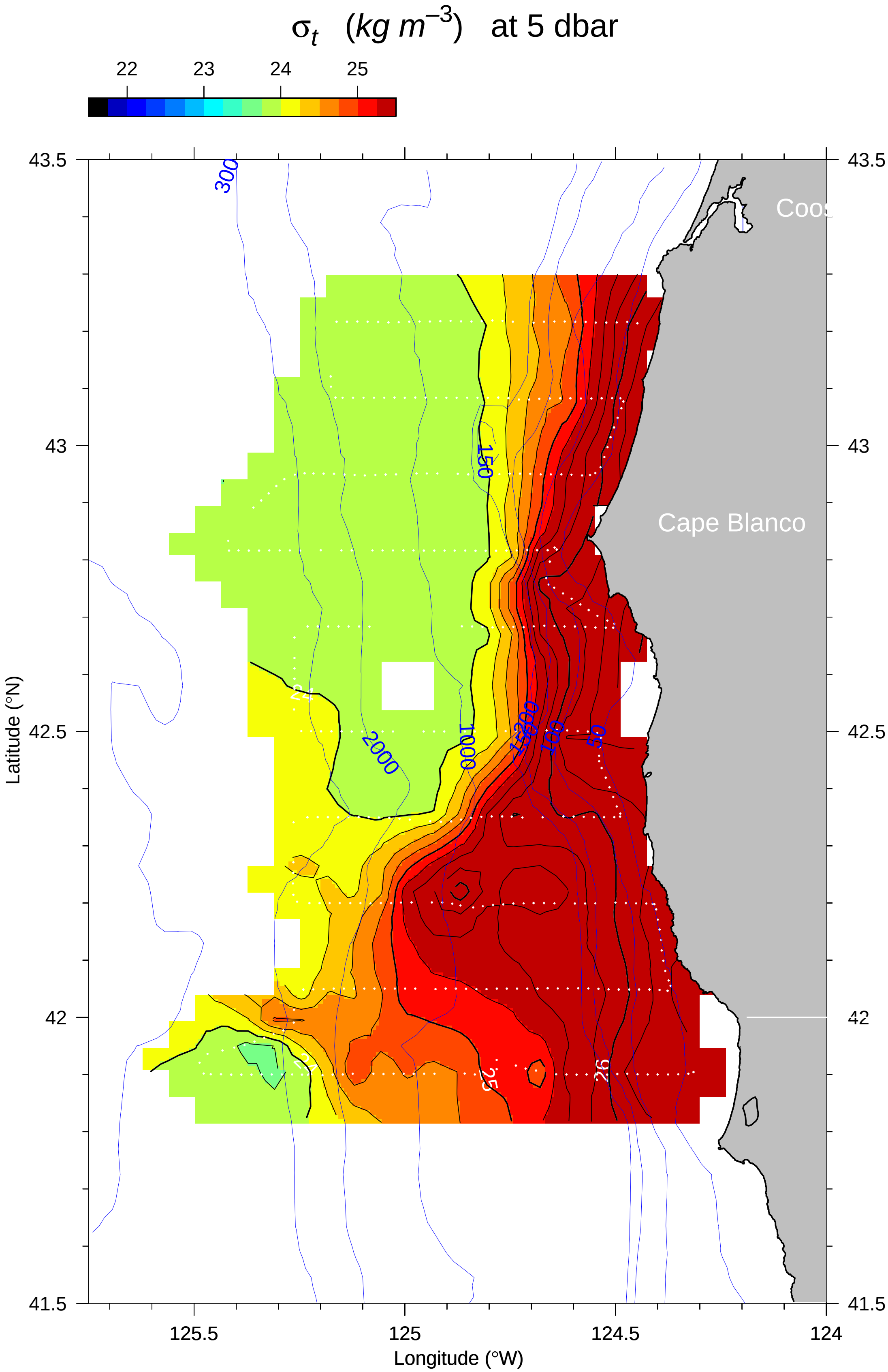
12-Jun-2002 14:51 - 15-Jun-2002 08:41

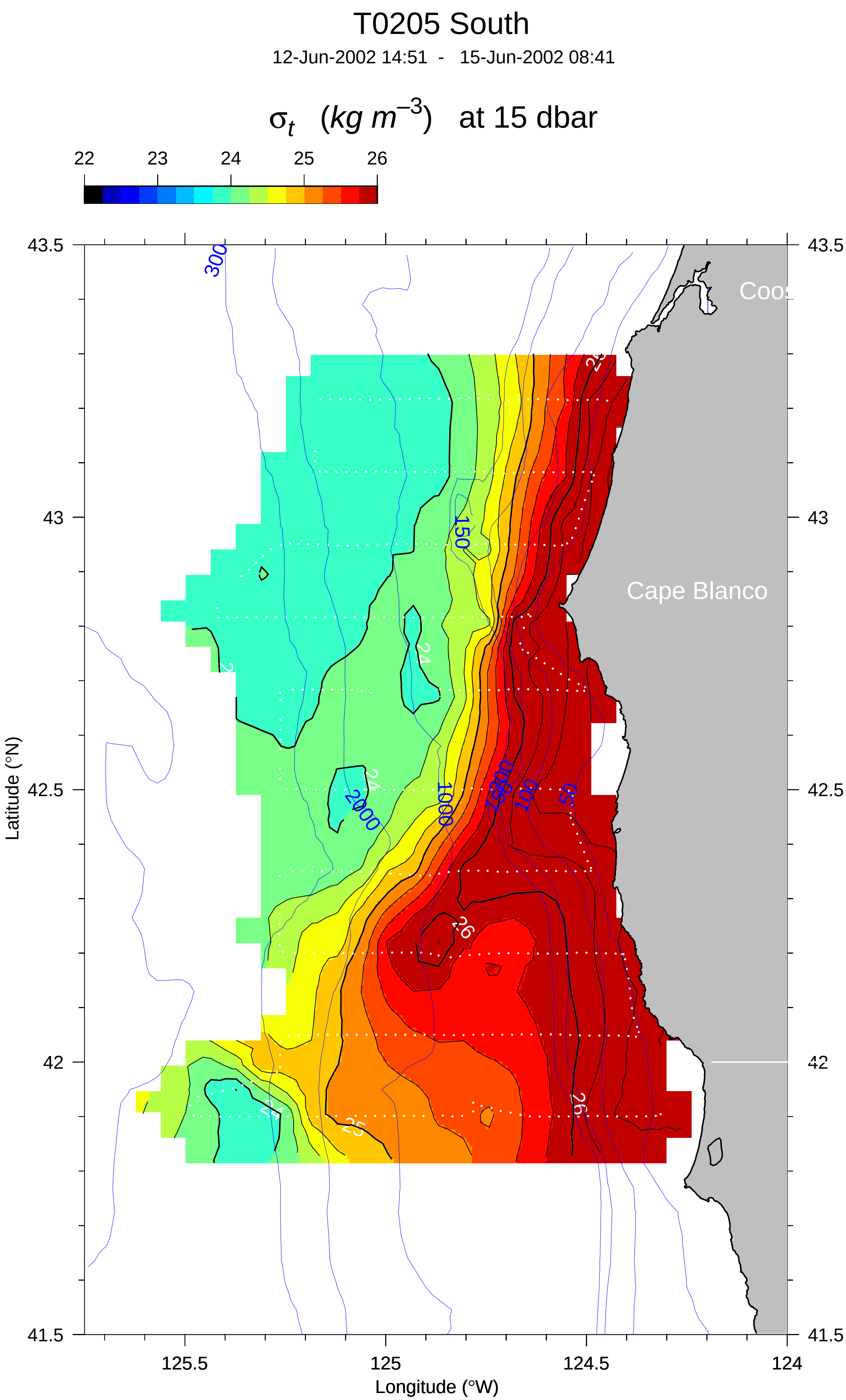
Salinity (PSS) at 115 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

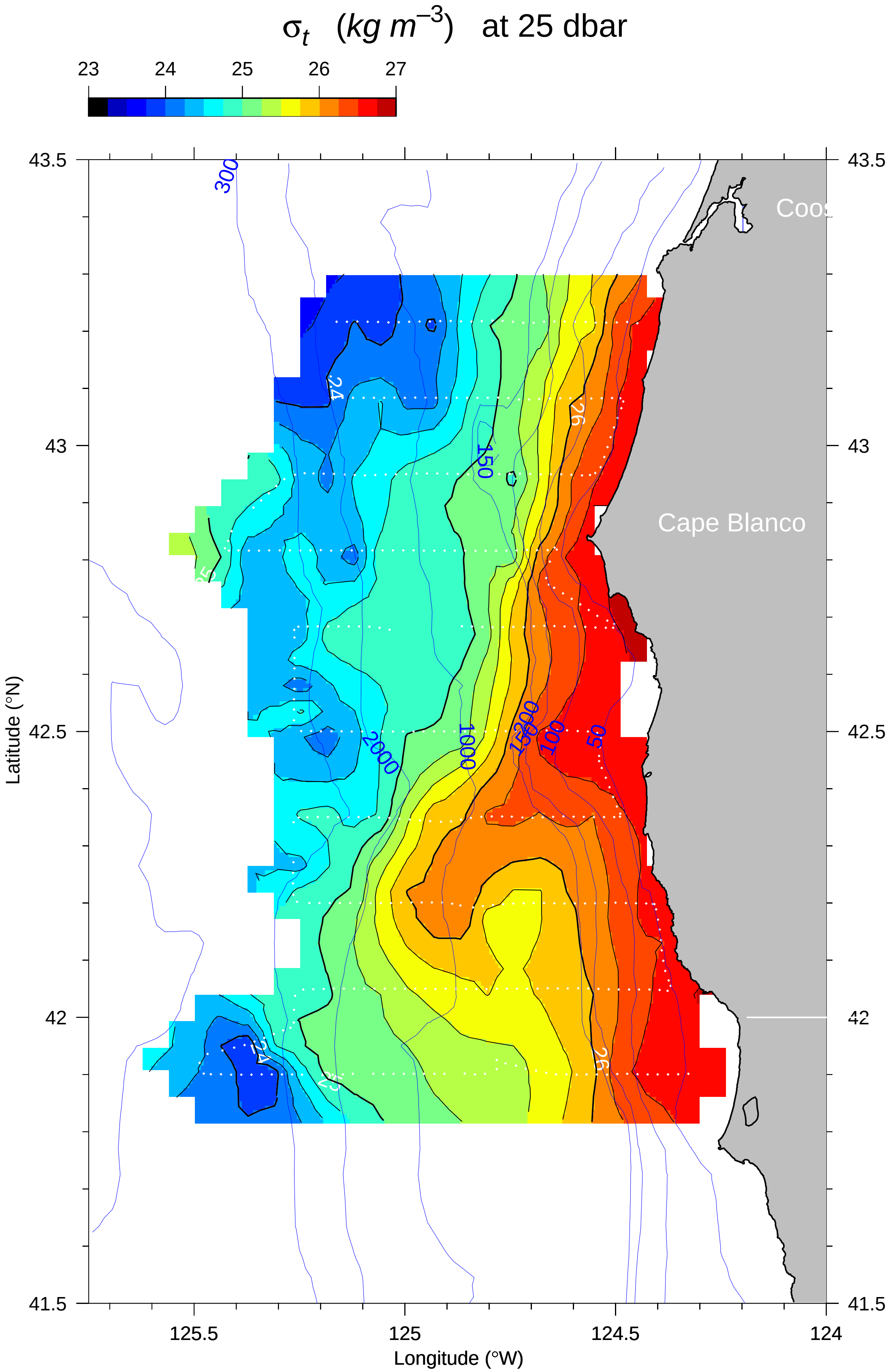


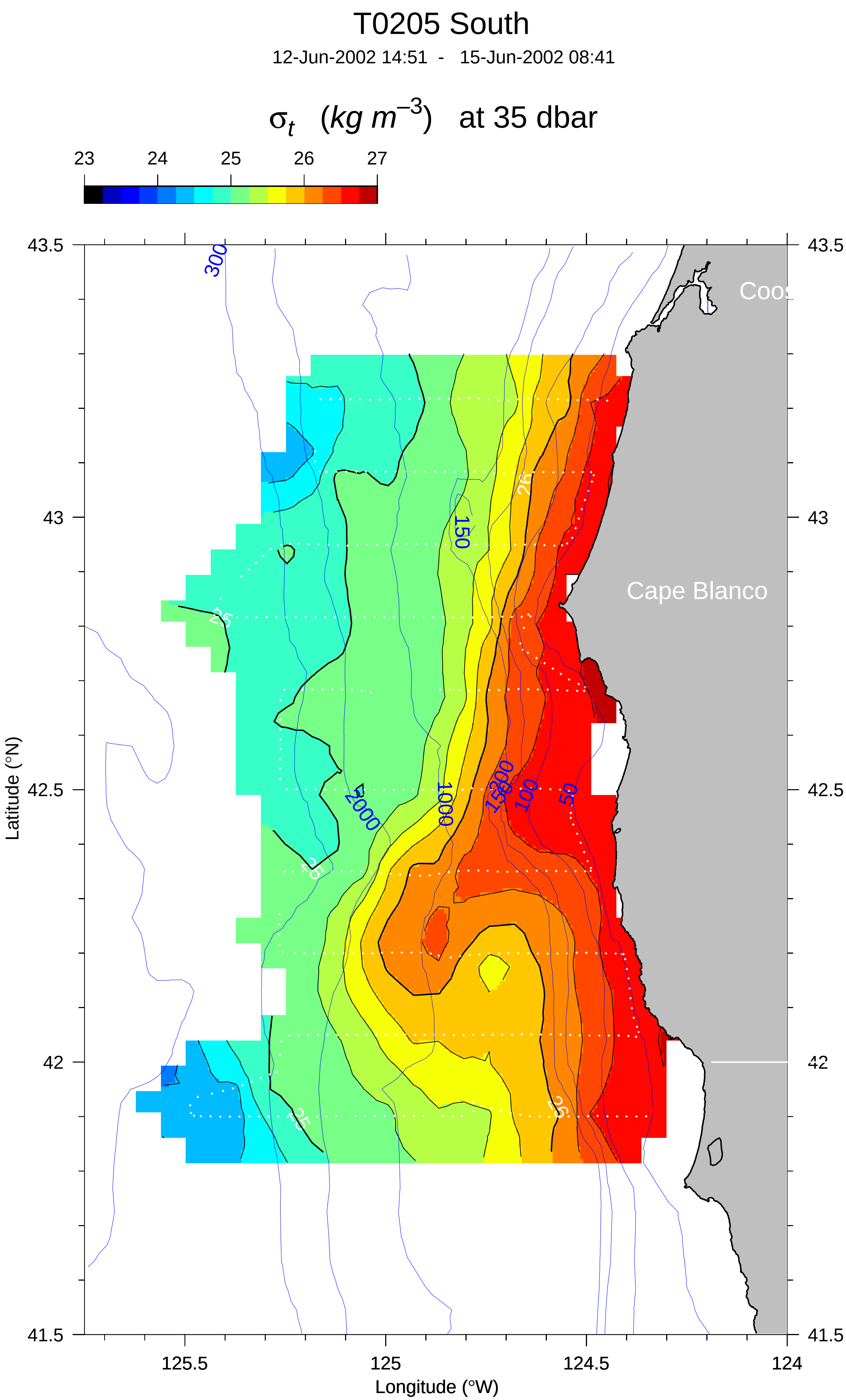


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
σt (kg m−3) at 15 dbar
22
23
24
25
26
43.5
43
42.5
42
41.5
Latitude (°N)
125.5
125
124.5
124
Longitude (°W)
Coos
Cape Blanco
300
150
1000
2000
1500
100
50
24
25
26

T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

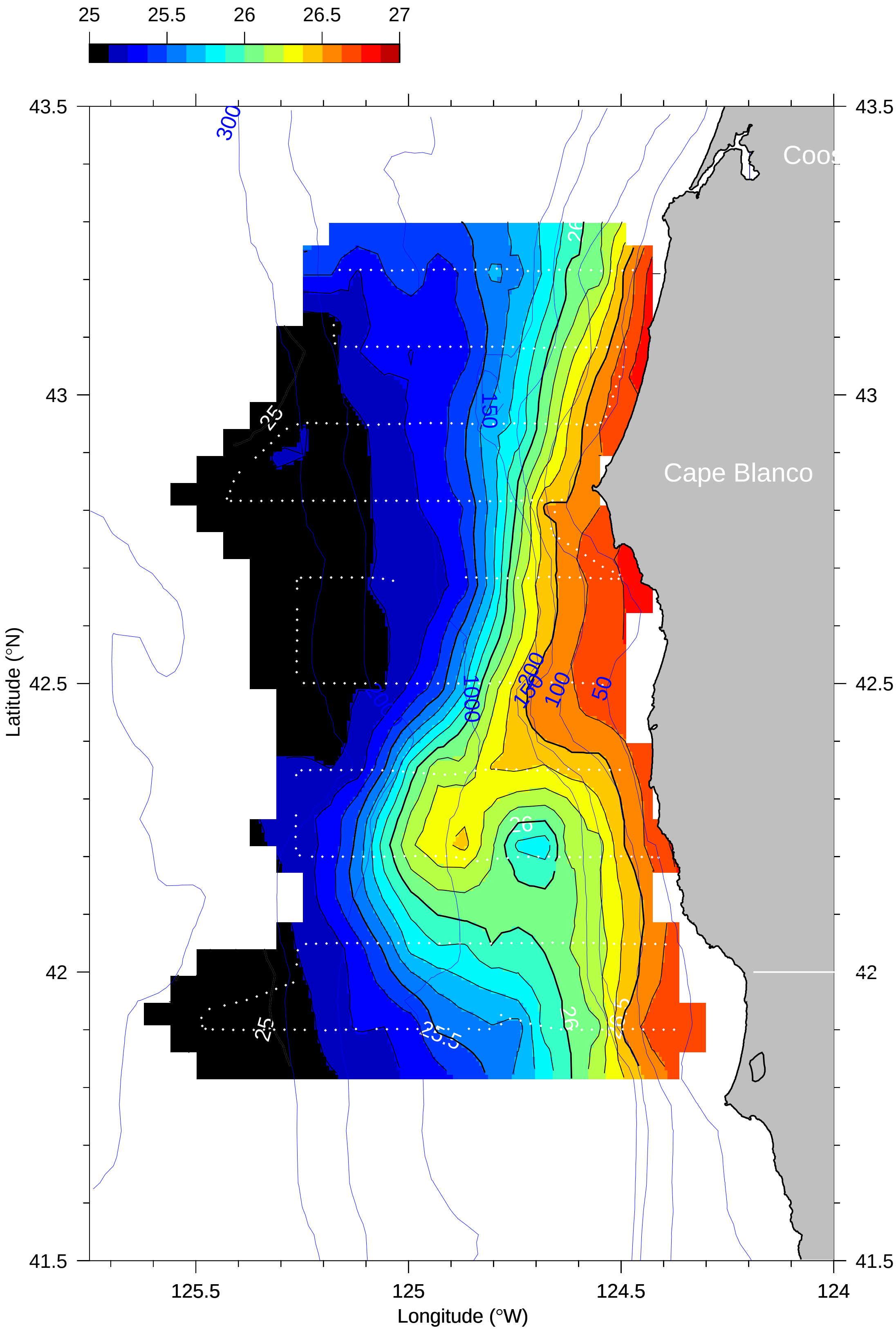



T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
σt (kg m–3) at 35 dbar
23
24
25
26
27
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Cape Blanco
300
150
1000
2000
100
50
200
25
26

T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

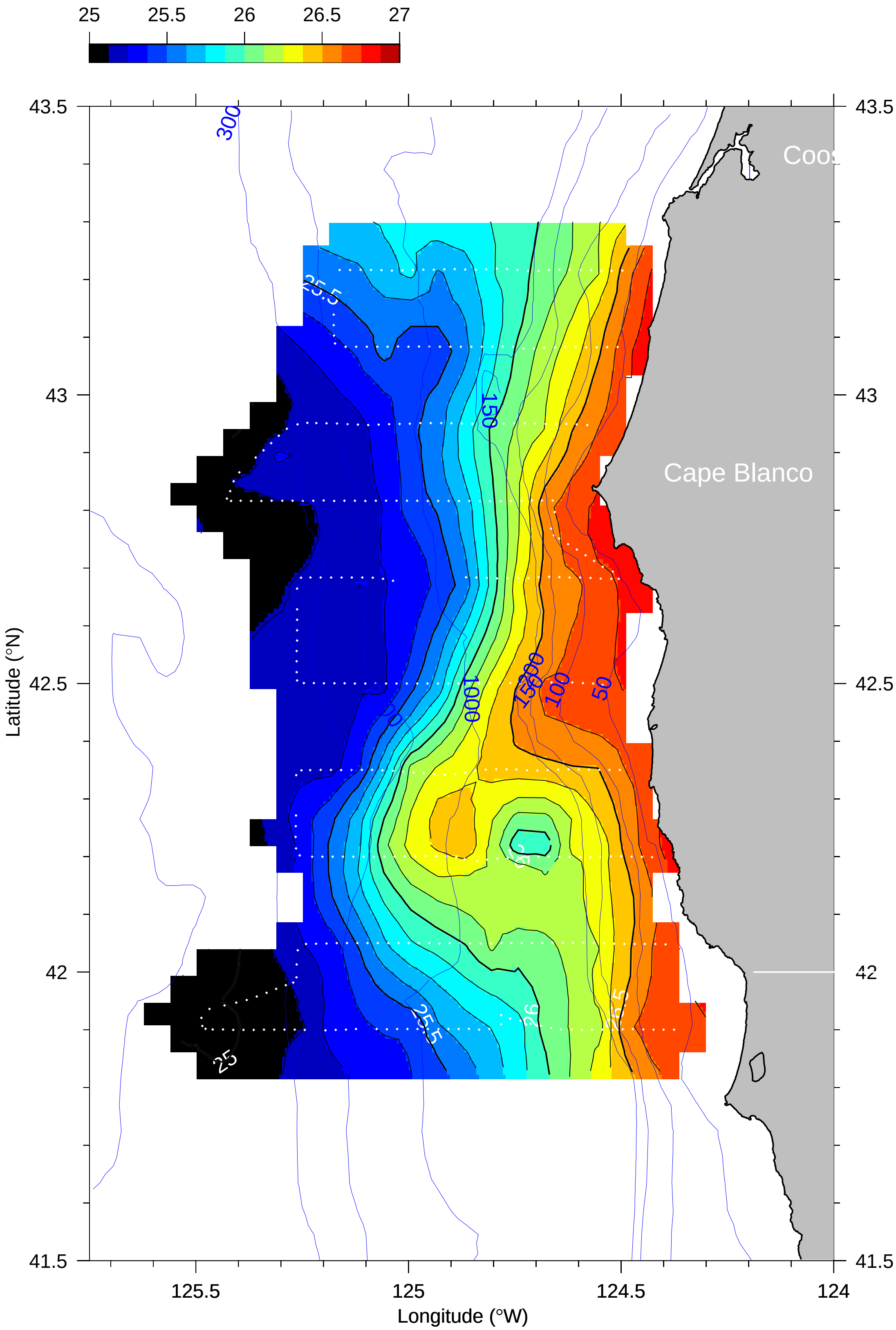
σ_t $(kg\ m^{-3})$ at 45 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

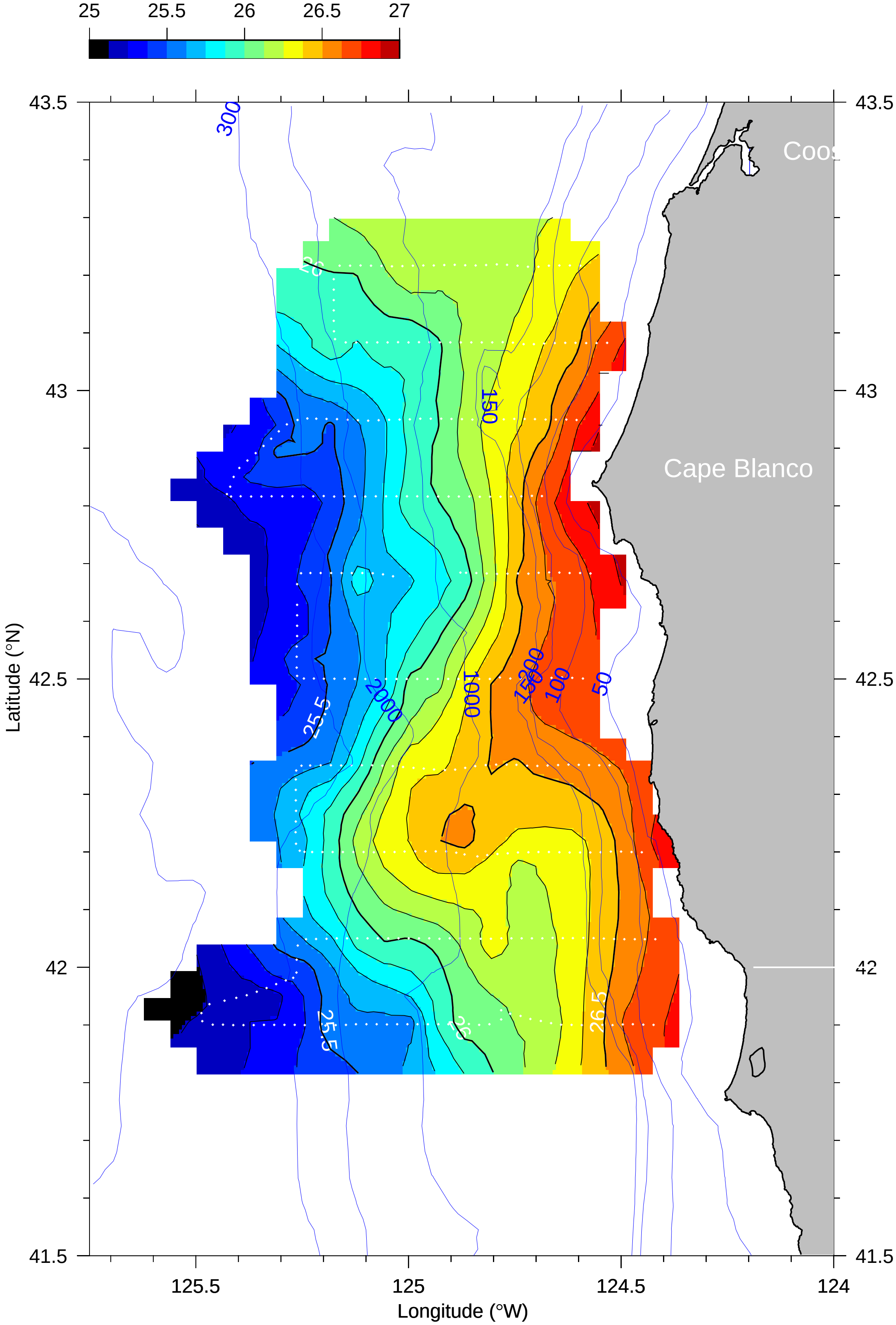
σ_t $(kg\ m^{-3})$ at 55 dbar



T0205 South

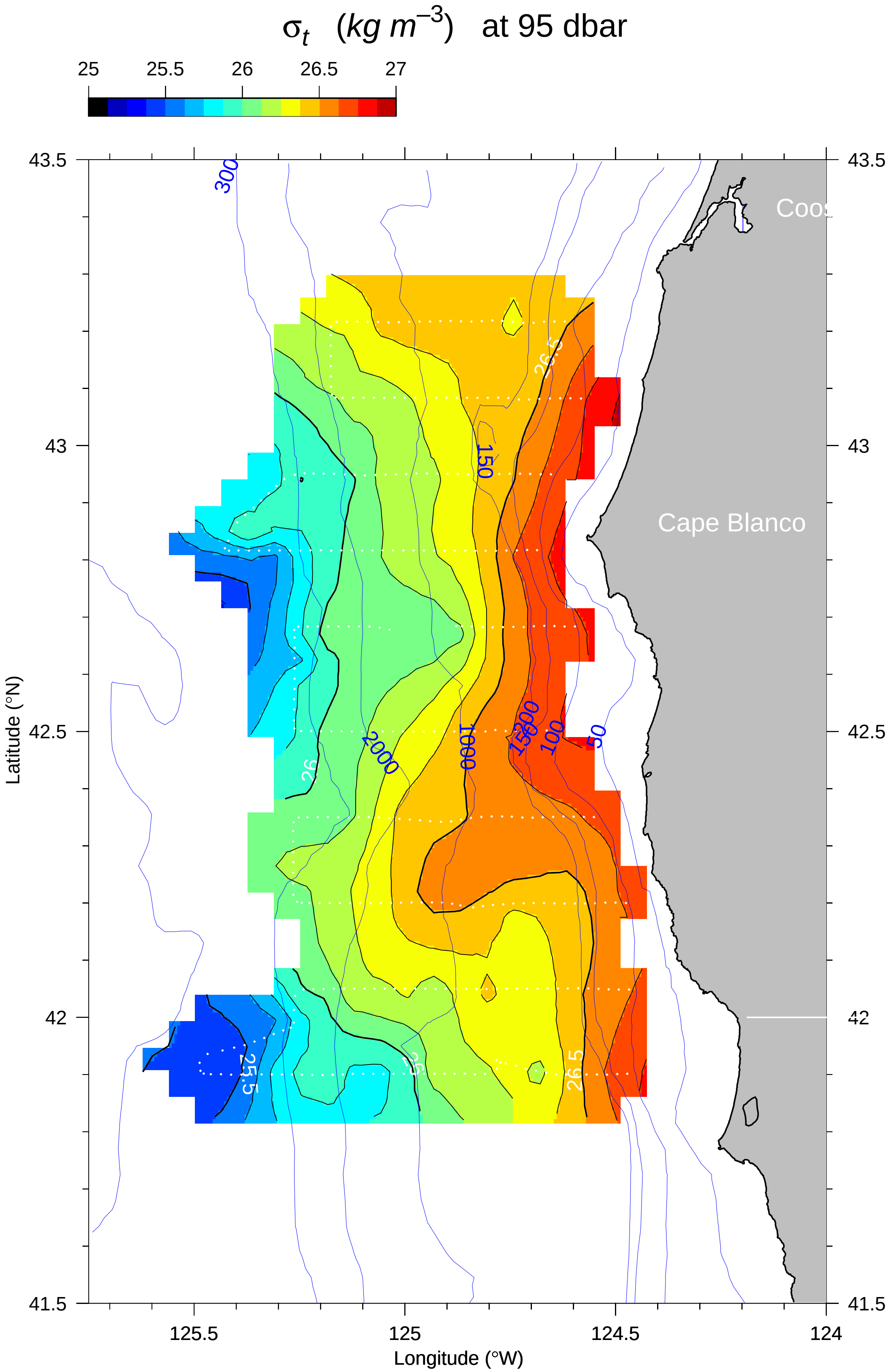
12-Jun-2002 14:51 - 15-Jun-2002 08:41

σ_t ($kg\ m^{-3}$) at 75 dbar



T0205 South

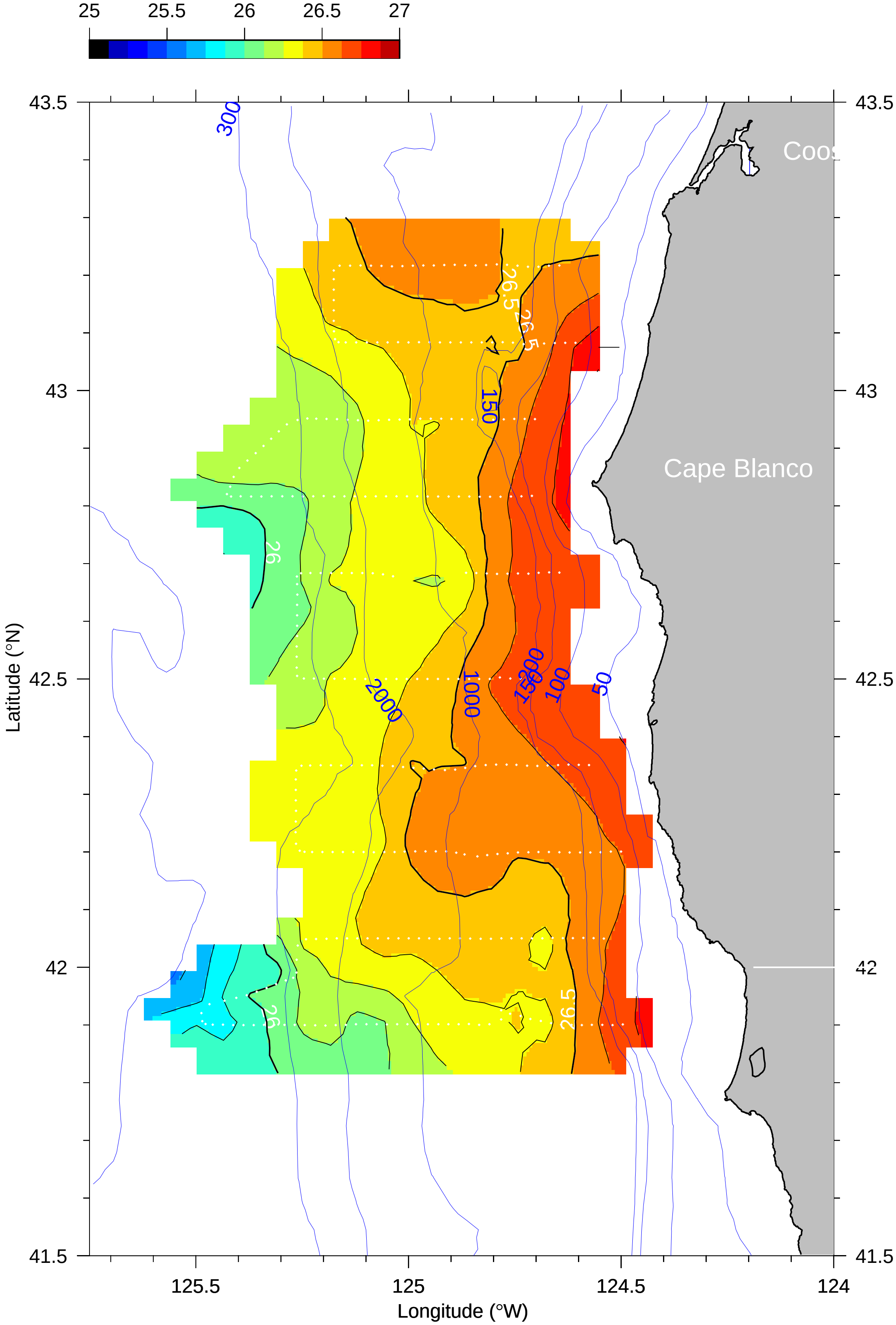
12-Jun-2002 14:51 - 15-Jun-2002 08:41

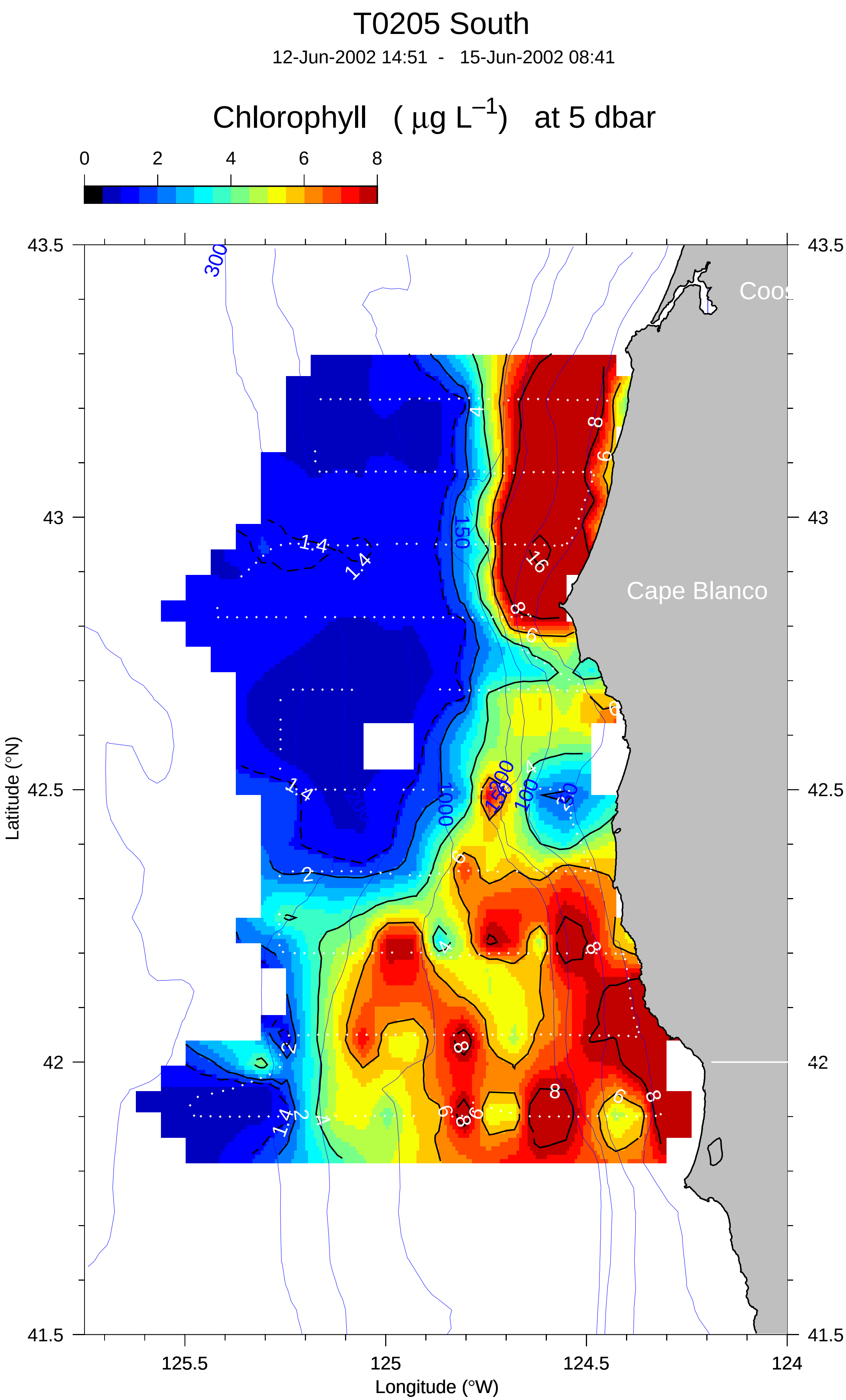


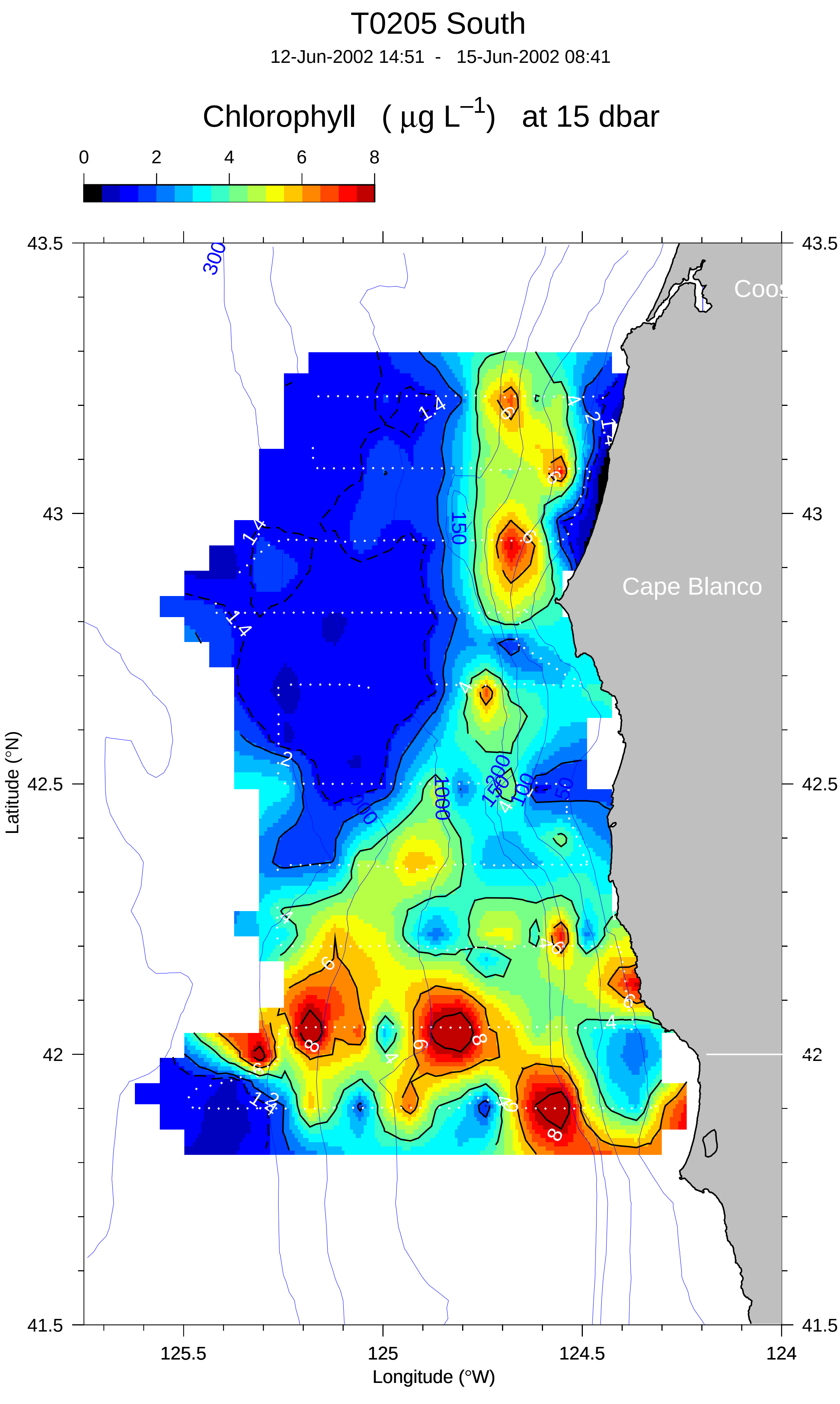
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

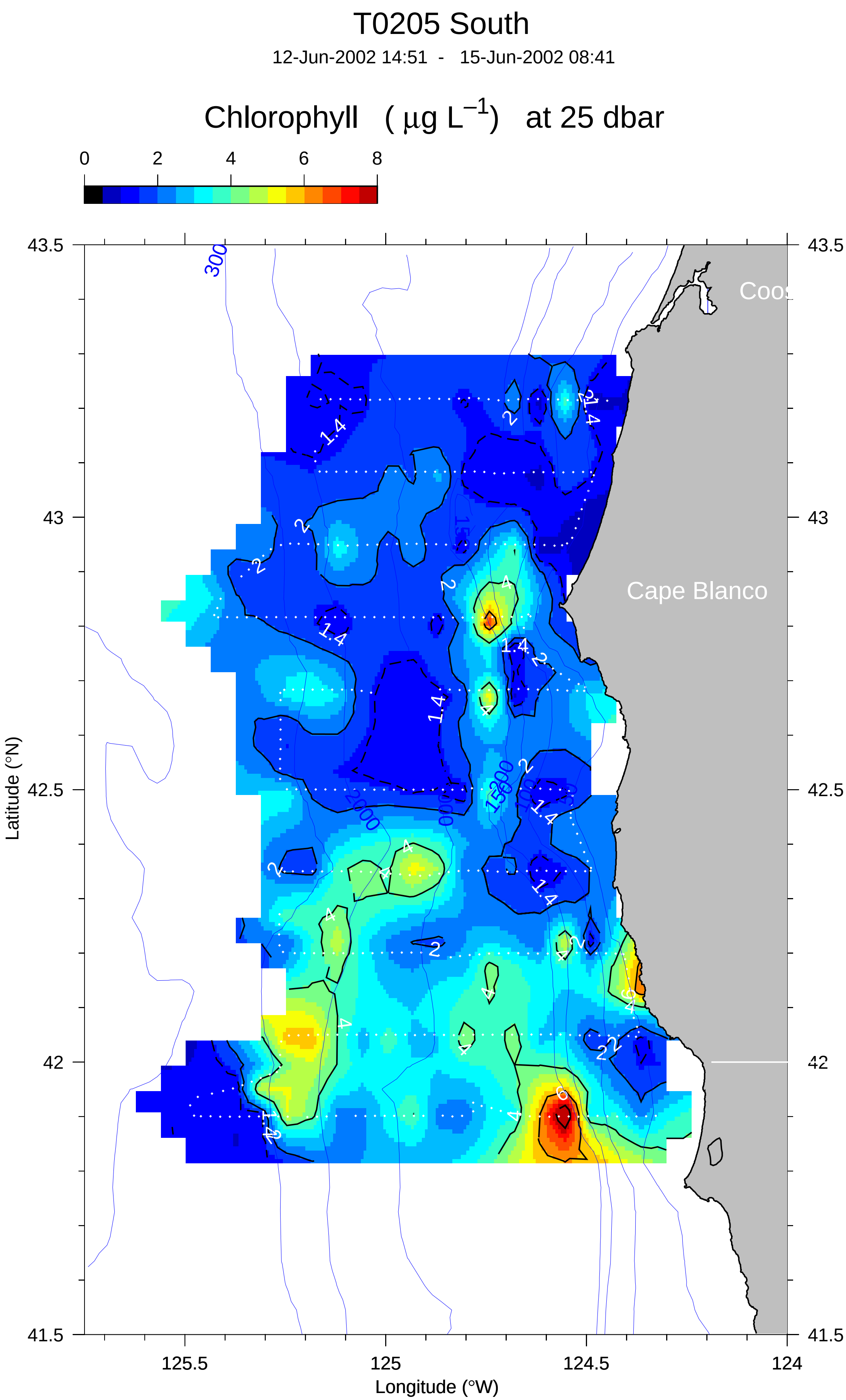
σ_t ($kg\ m^{-3}$) at 115 dbar




T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
Chlorophyll (µg L⁻¹) at 5 dbar
0 2 4 6 8
Latitude (°N)
Longitude (°W)
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Cape Blanco
Coos

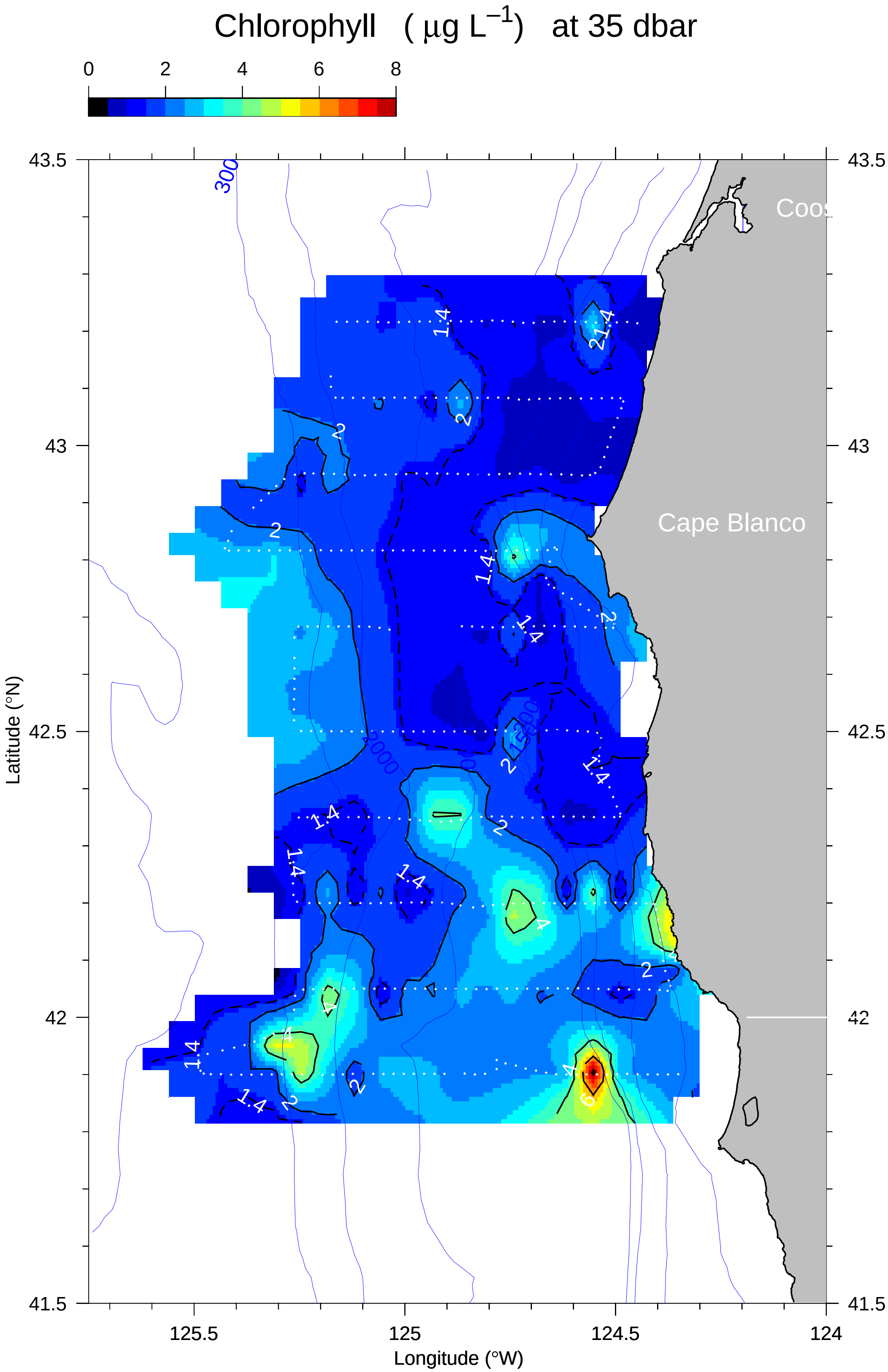


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
Chlorophyll (µg L^{-1}) at 15 dbar
0
2
4
6
8
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Cape Blanco


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
Chlorophyll (µg L−1) at 25 dbar
0
2
4
6
8
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Cape Blanco
300
2000
1500

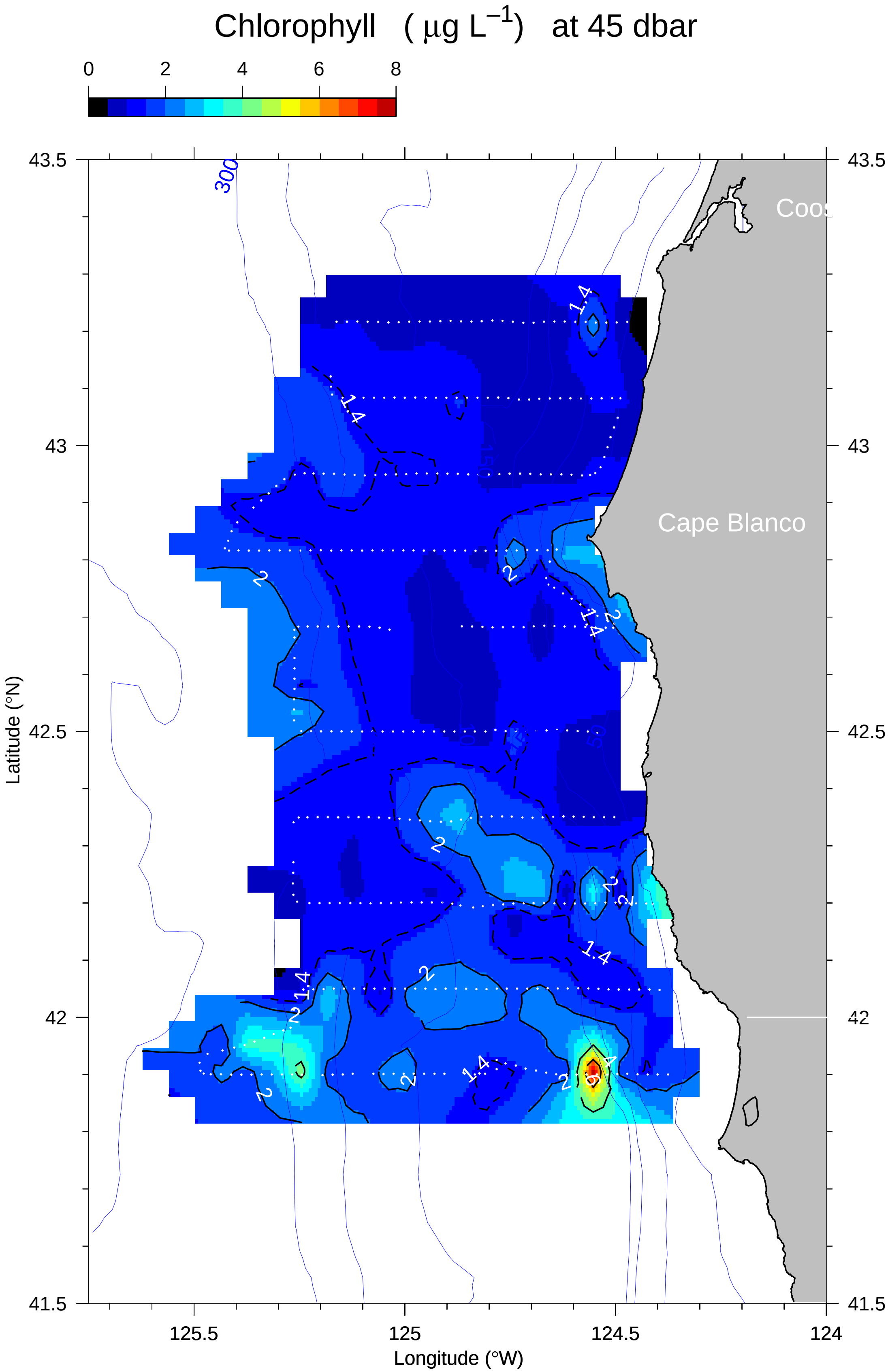
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



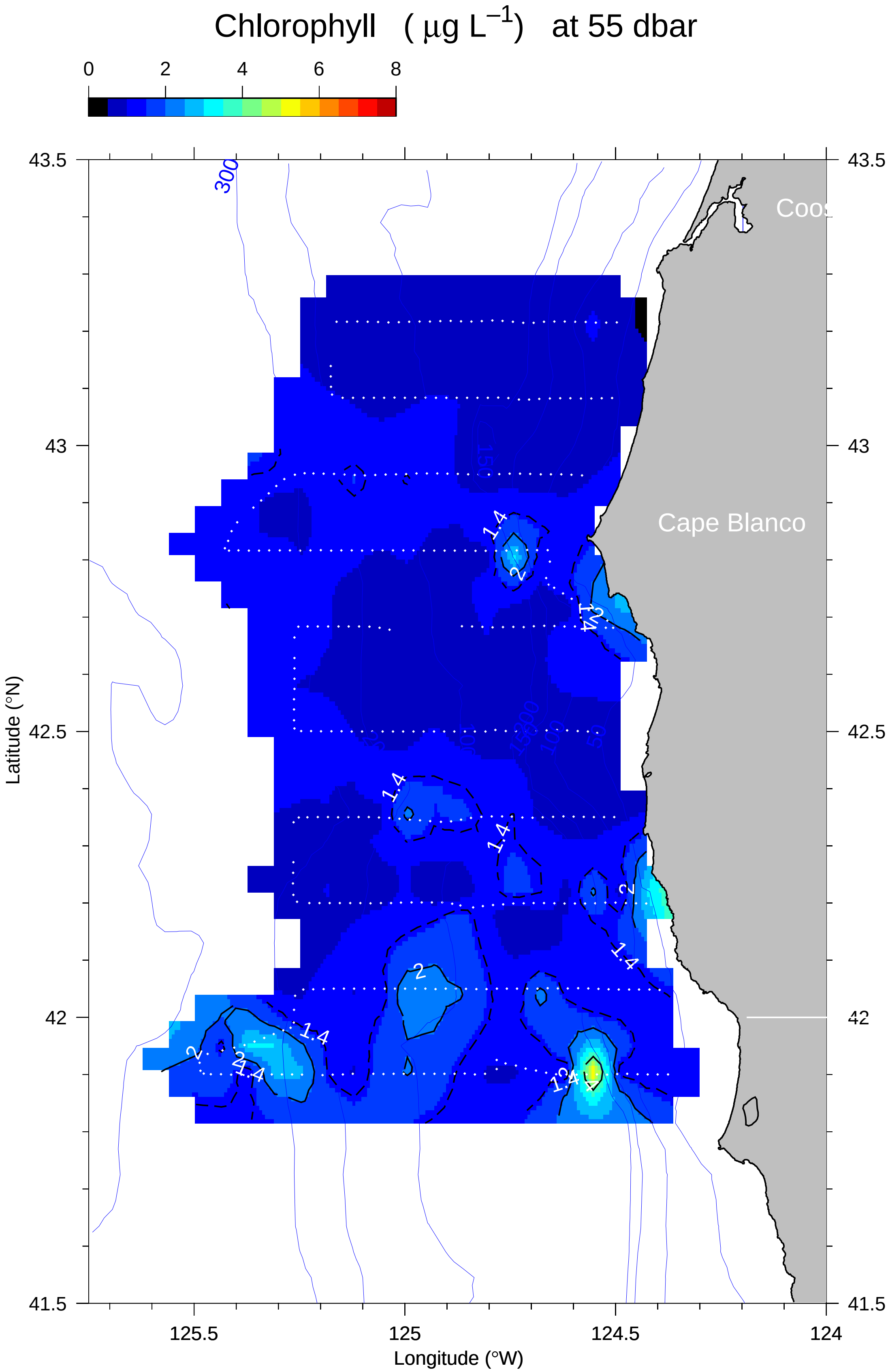
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

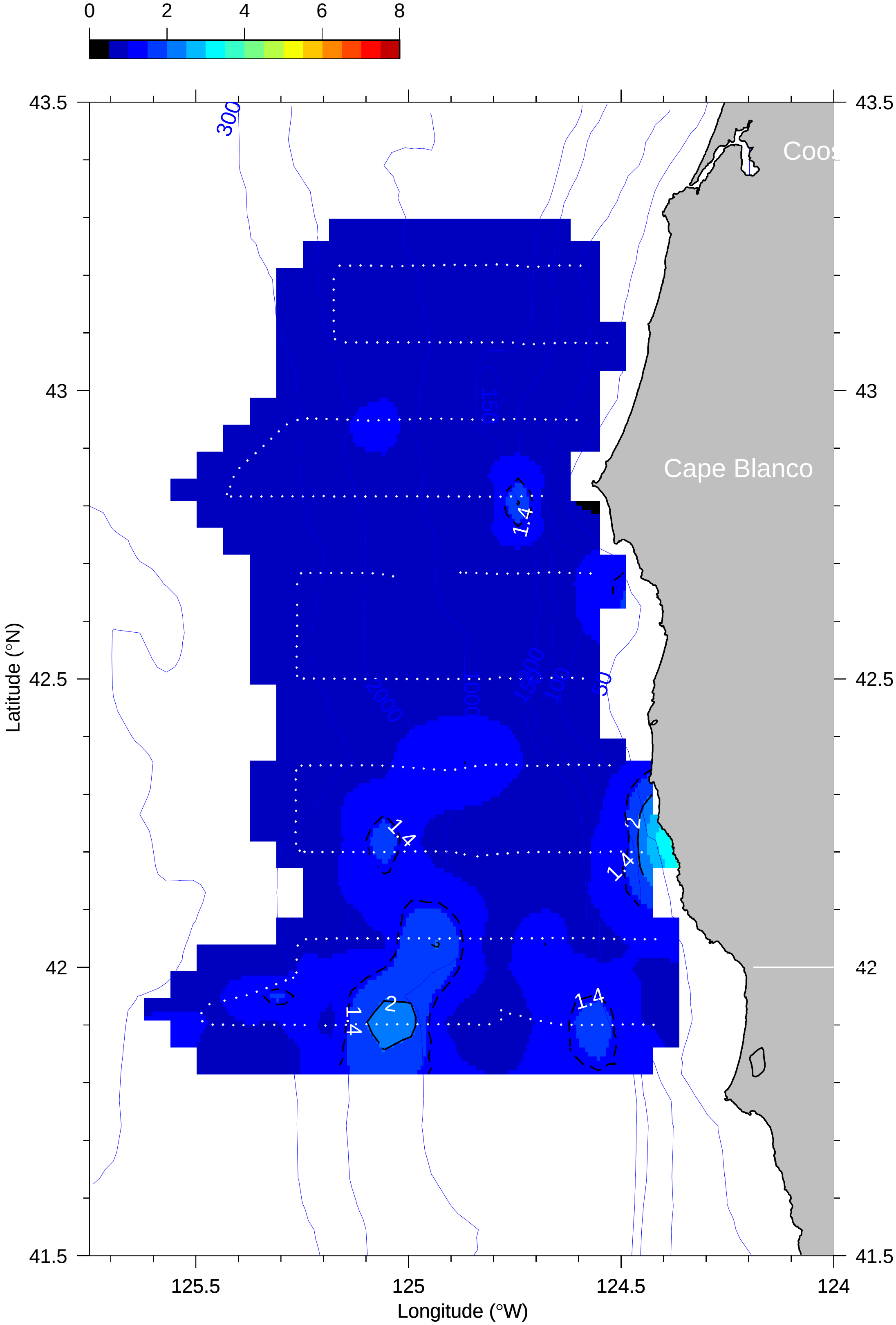
12-Jun-2002 14:51 - 15-Jun-2002 08:41



T0205 South

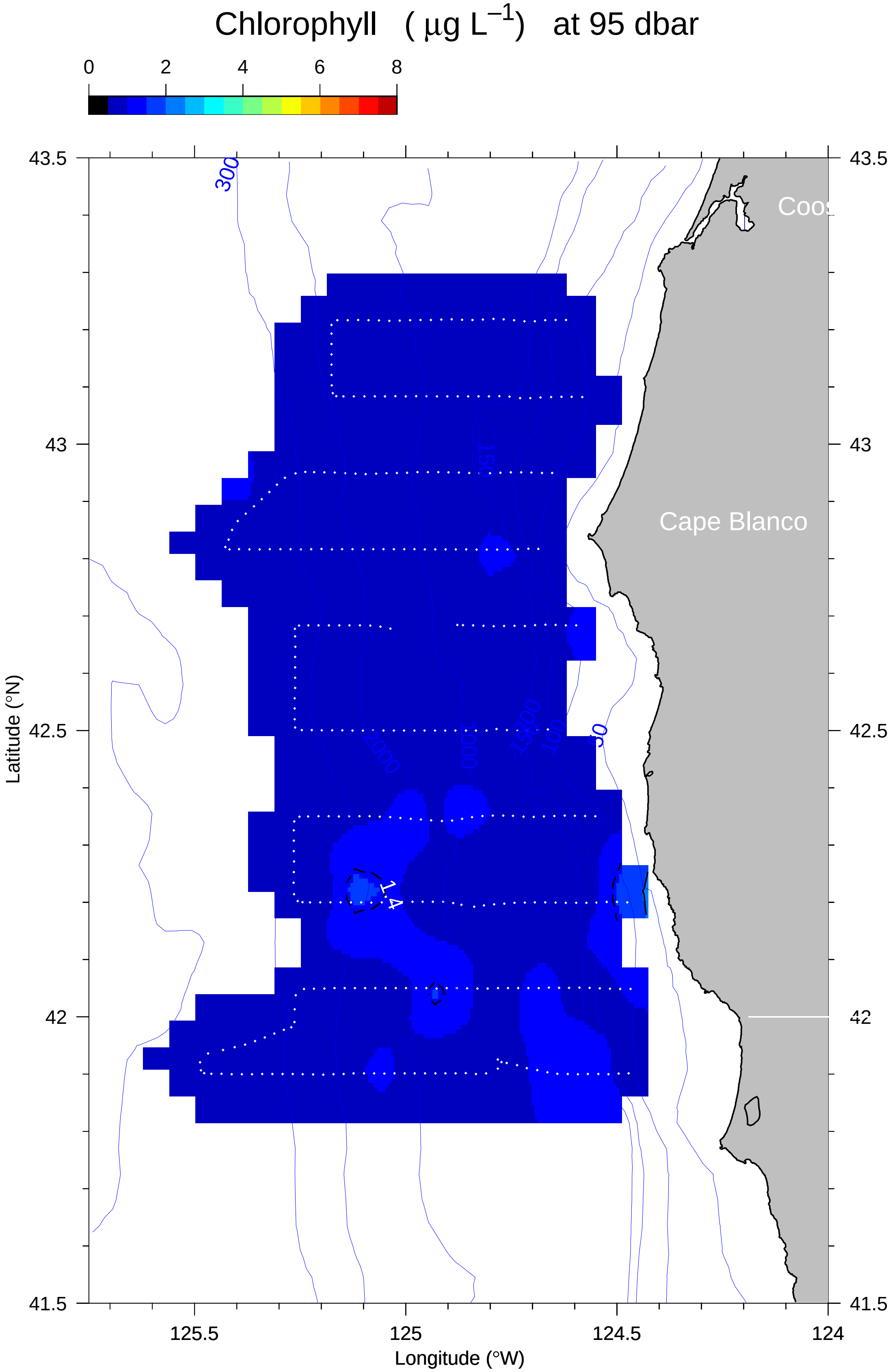
12-Jun-2002 14:51 - 15-Jun-2002 08:41

Chlorophyll (μg L^{-1}) at 75 dbar



T0205 South

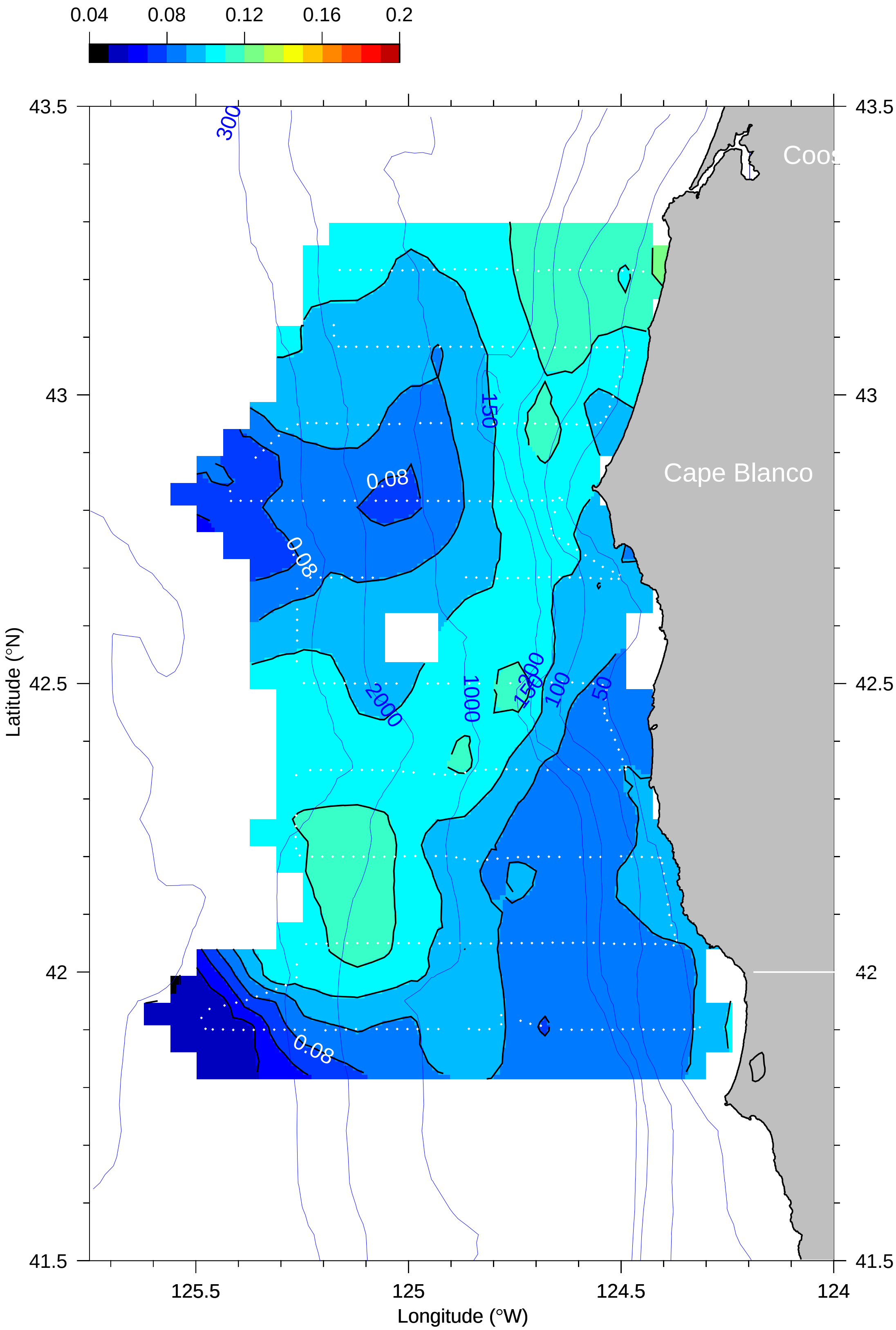
12-Jun-2002 14:51 - 15-Jun-2002 08:41

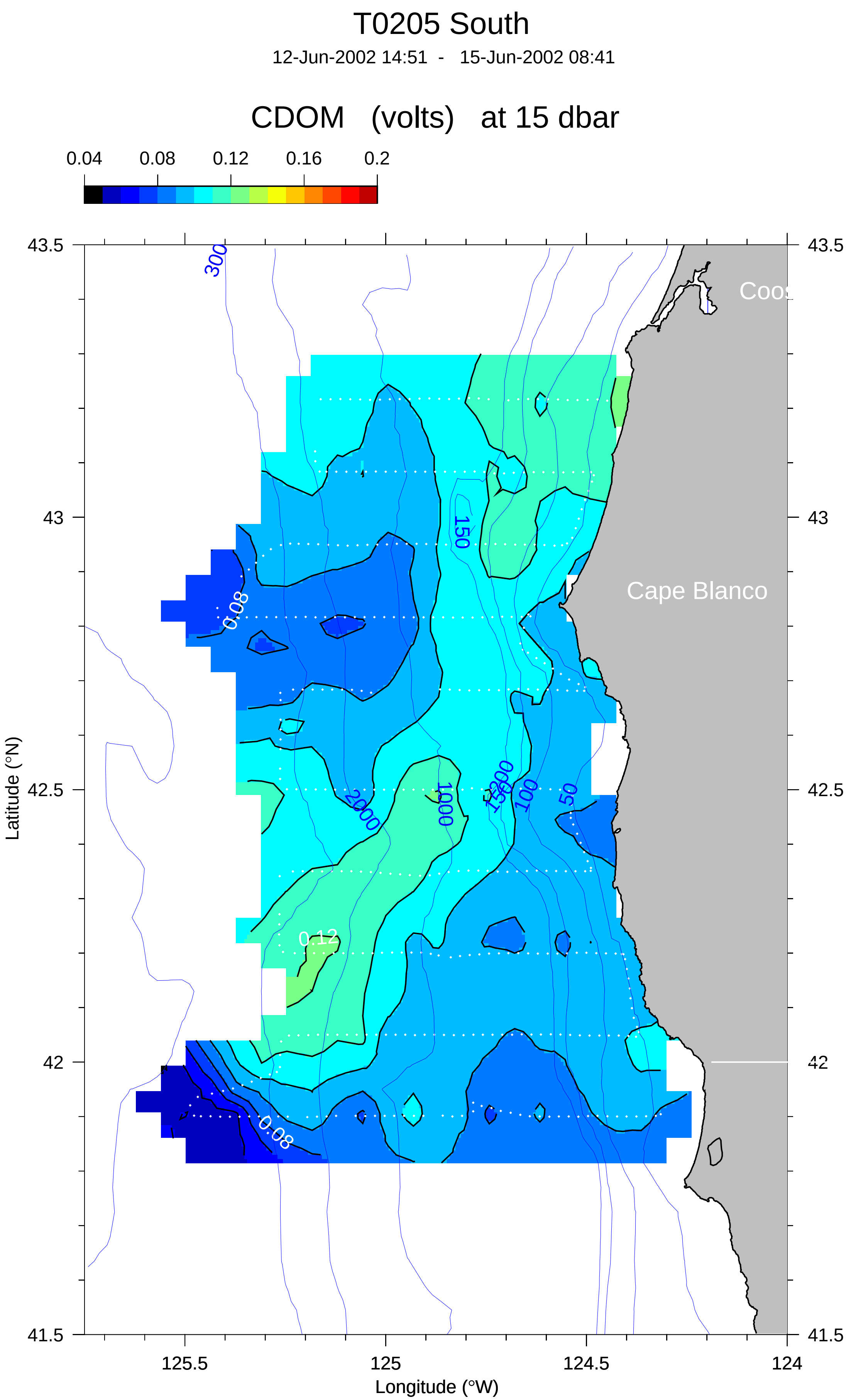


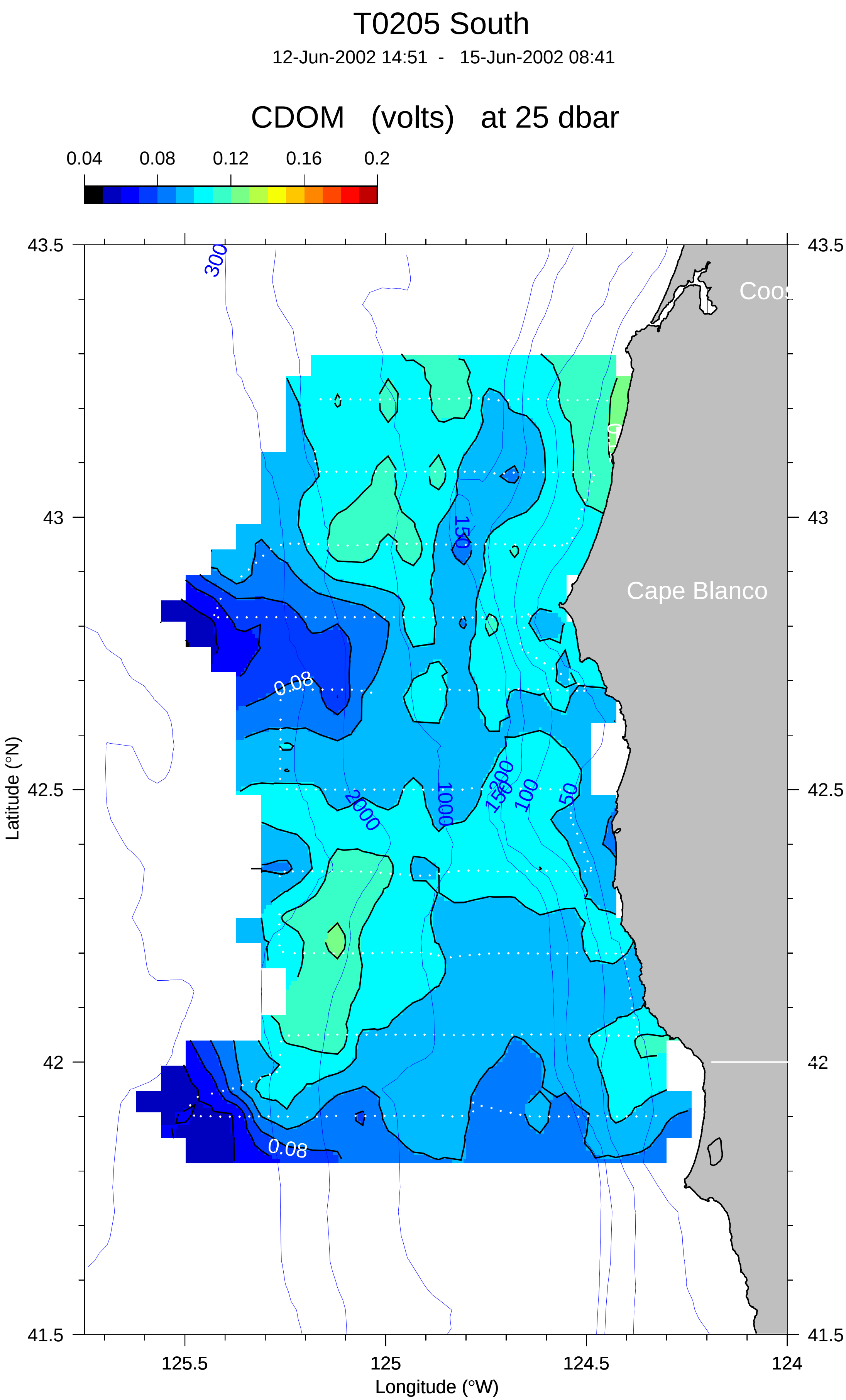
T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

CDOM (volts) at 5 dbar




T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
CDOM (volts) at 15 dbar
0.04
0.08
0.12
0.16
0.2
Cape Blanco
Latitude (°N)
Longitude (°W)
43.5
43
42.5
42
41.5
125.5
125
124.5
124
0.08
0.12
300
150
1000
2000
1500
200
100
50

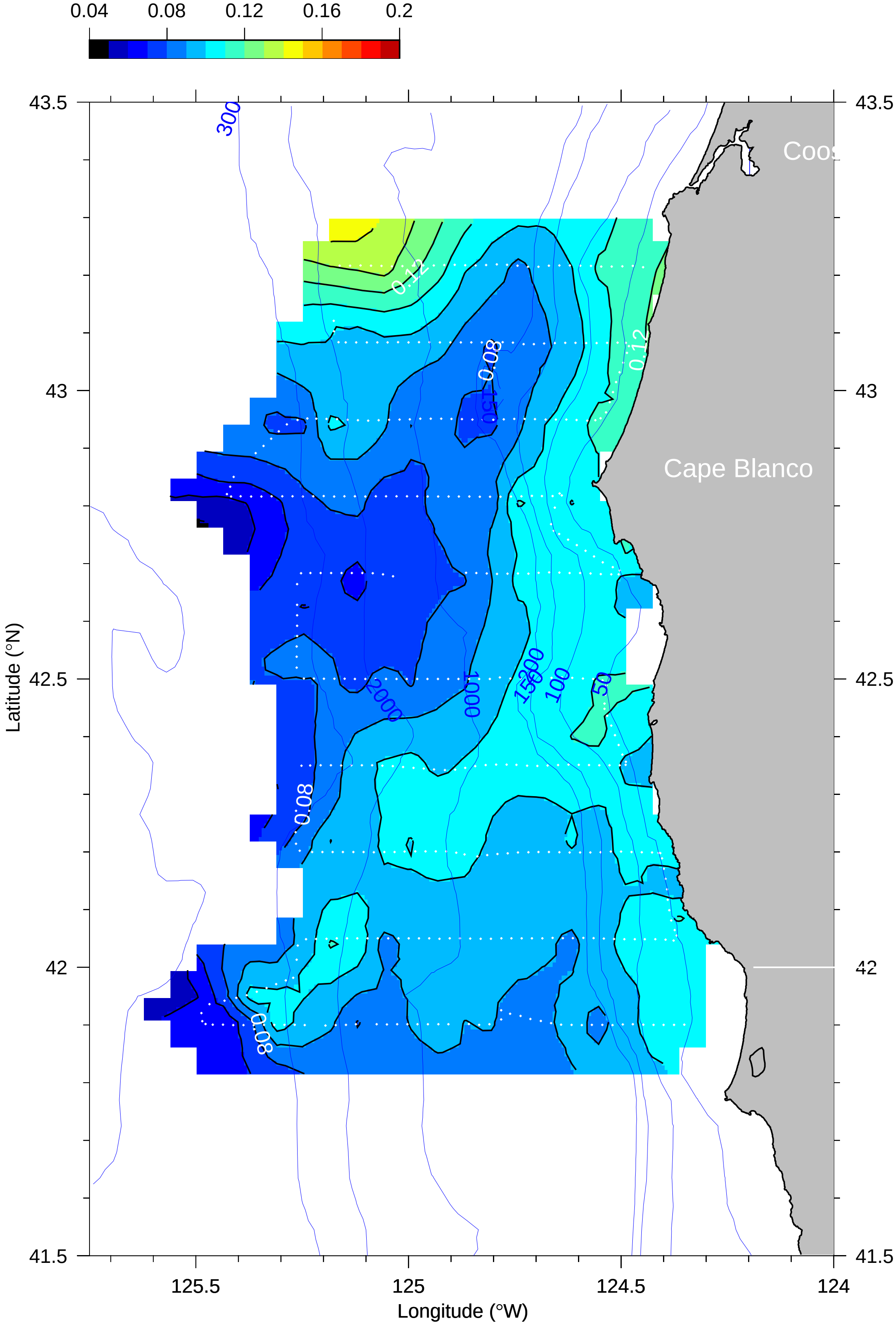


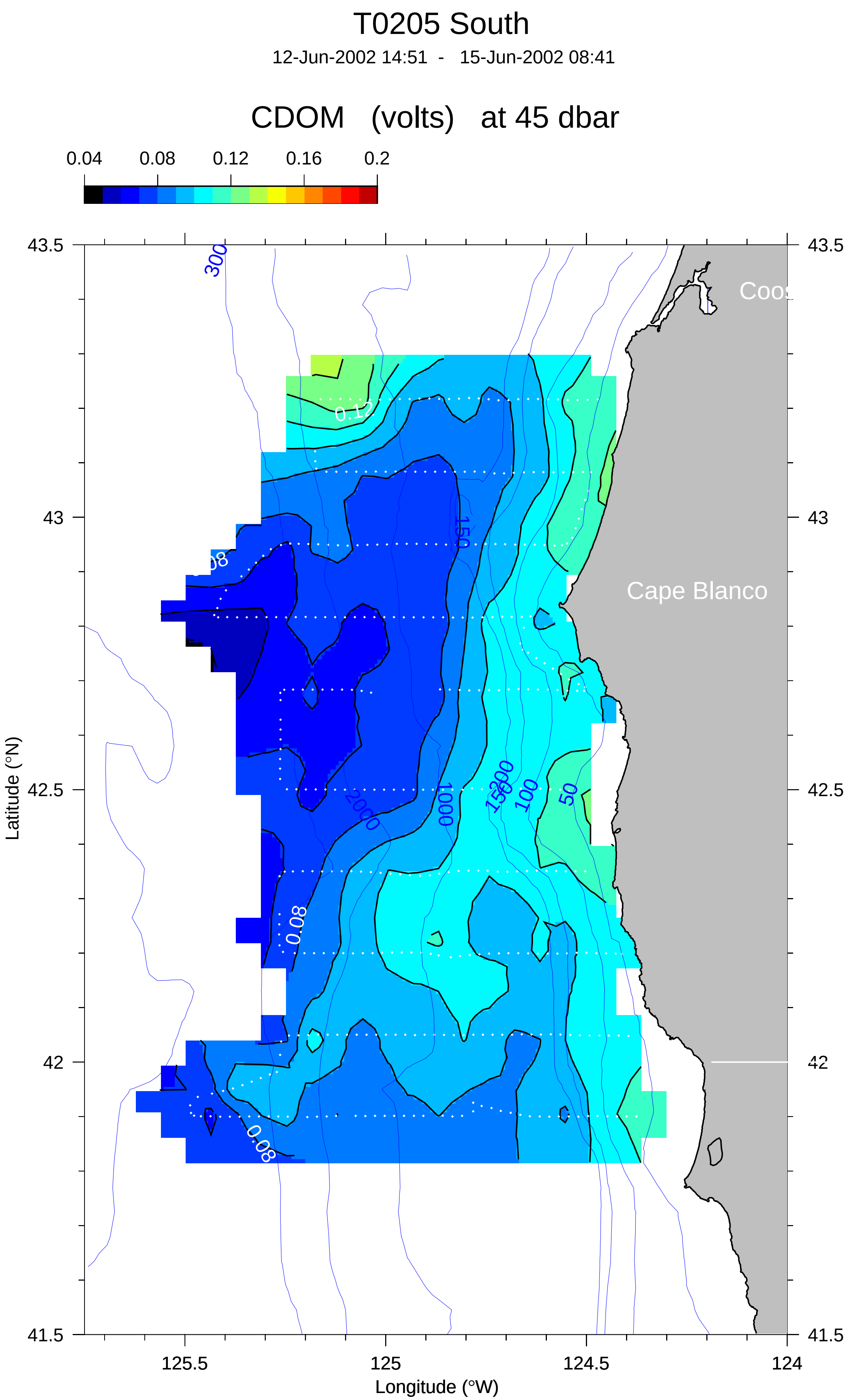
T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
CDOM (volts) at 25 dbar
0.04
0.08
0.12
0.16
0.2
43.5
43
42.5
42
41.5
Latitude (°N)
125.5
125
124.5
124
Longitude (°W)
Cape Blanco
0.08
300
150
2000
1000
1500
200
100
50

T0205 South

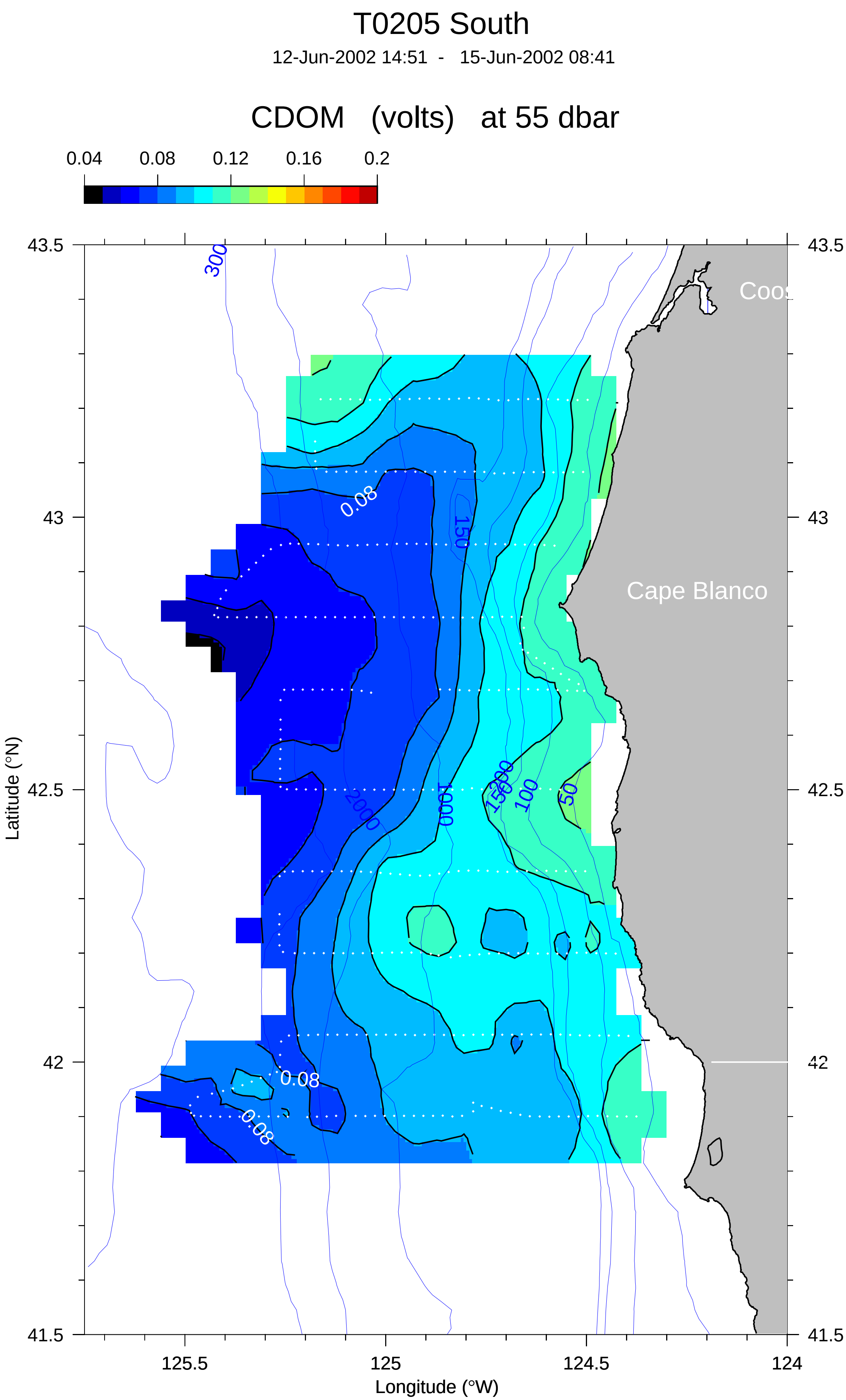
12-Jun-2002 14:51 - 15-Jun-2002 08:41

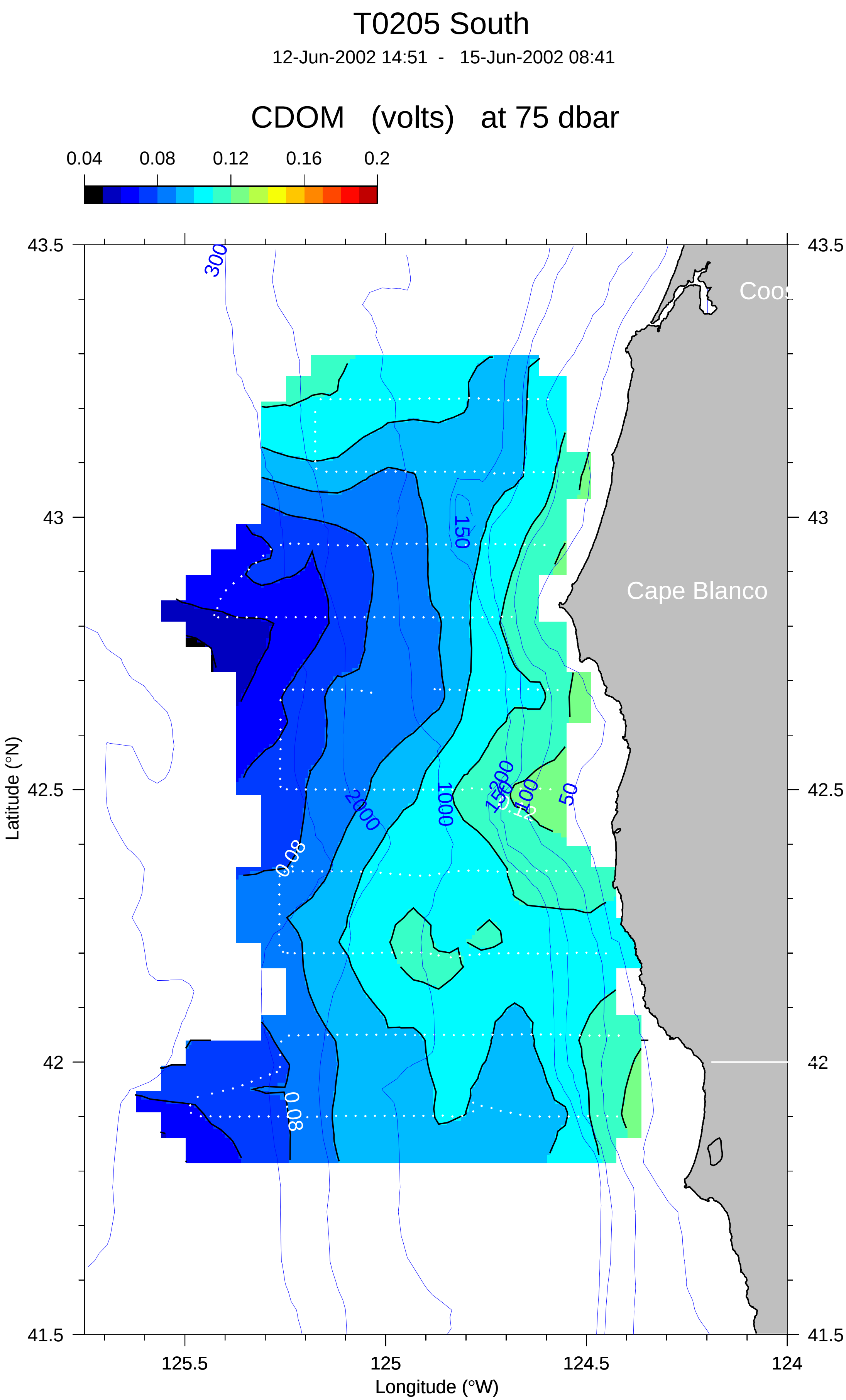
CDOM (volts) at 35 dbar





T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
CDOM (volts) at 45 dbar
0.04
0.08
0.12
0.16
0.2
43.5
43
42.5
42
41.5
125.5
125
124.5
124
Longitude (°W)
Latitude (°N)
Coos
Cape Blanco
300
150
1000
2000
1500
200
100
50
0.12
0.08


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
CDOM (volts) at 55 dbar
0.04
0.08
0.12
0.16
0.2
43.5
43
42.5
42
41.5
Latitude (°N)
125.5
125
124.5
124
Longitude (°W)
Coos
Cape Blanco
0.08
300
150
2000
1000
1500
100
50

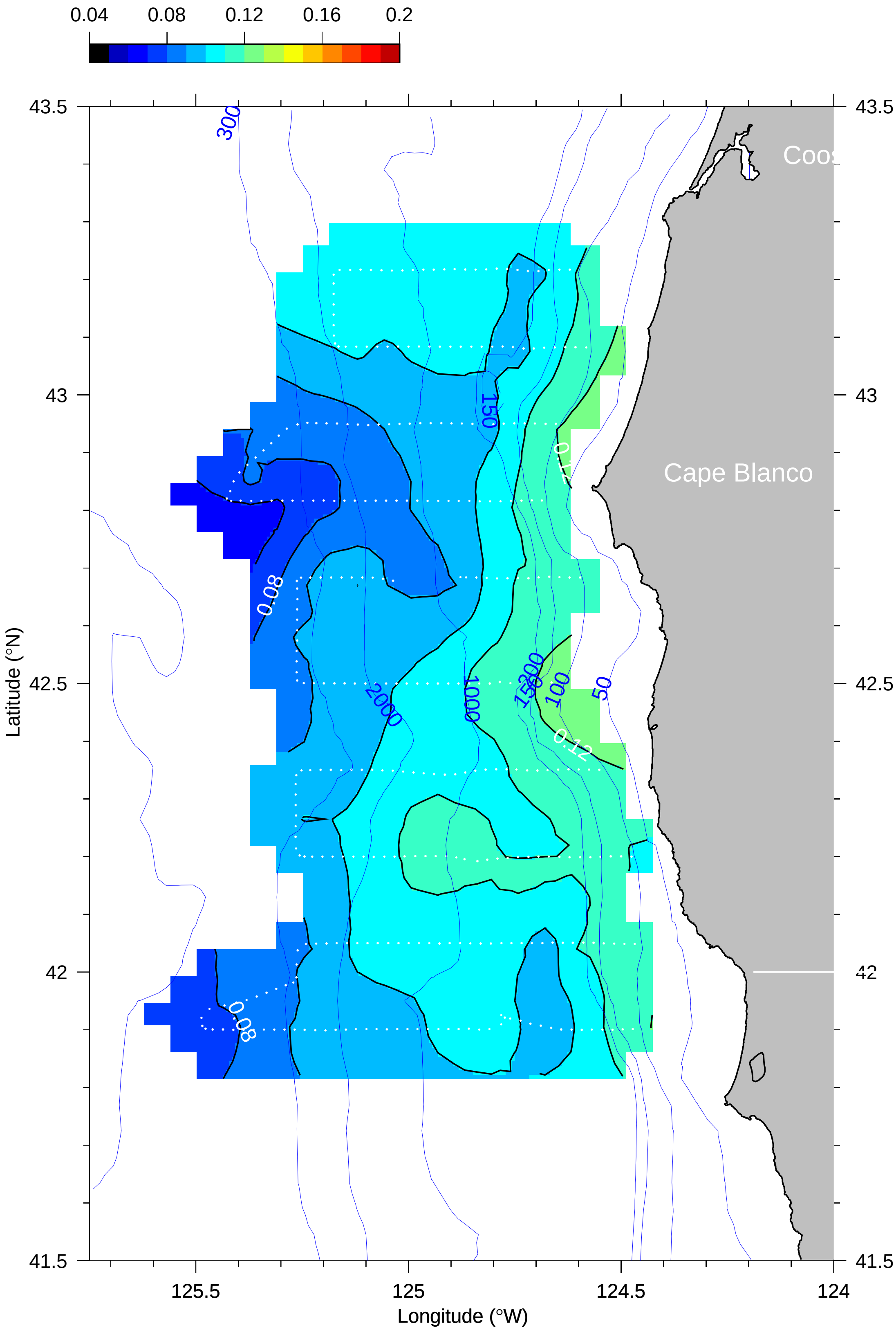


T0205 South
12-Jun-2002 14:51 - 15-Jun-2002 08:41
CDOM (volts) at 75 dbar
0.04
0.08
0.12
0.16
0.2
43.5
43
42.5
42
41.5
Latitude (°N)
125.5
125
124.5
124
Longitude (°W)
Cape Blanco
300
150
2000
1000
50
0.08
0.08

T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

CDOM (volts) at 95 dbar



T0205 South

12-Jun-2002 14:51 - 15-Jun-2002 08:41

CDOM (volts) at 115 dbar