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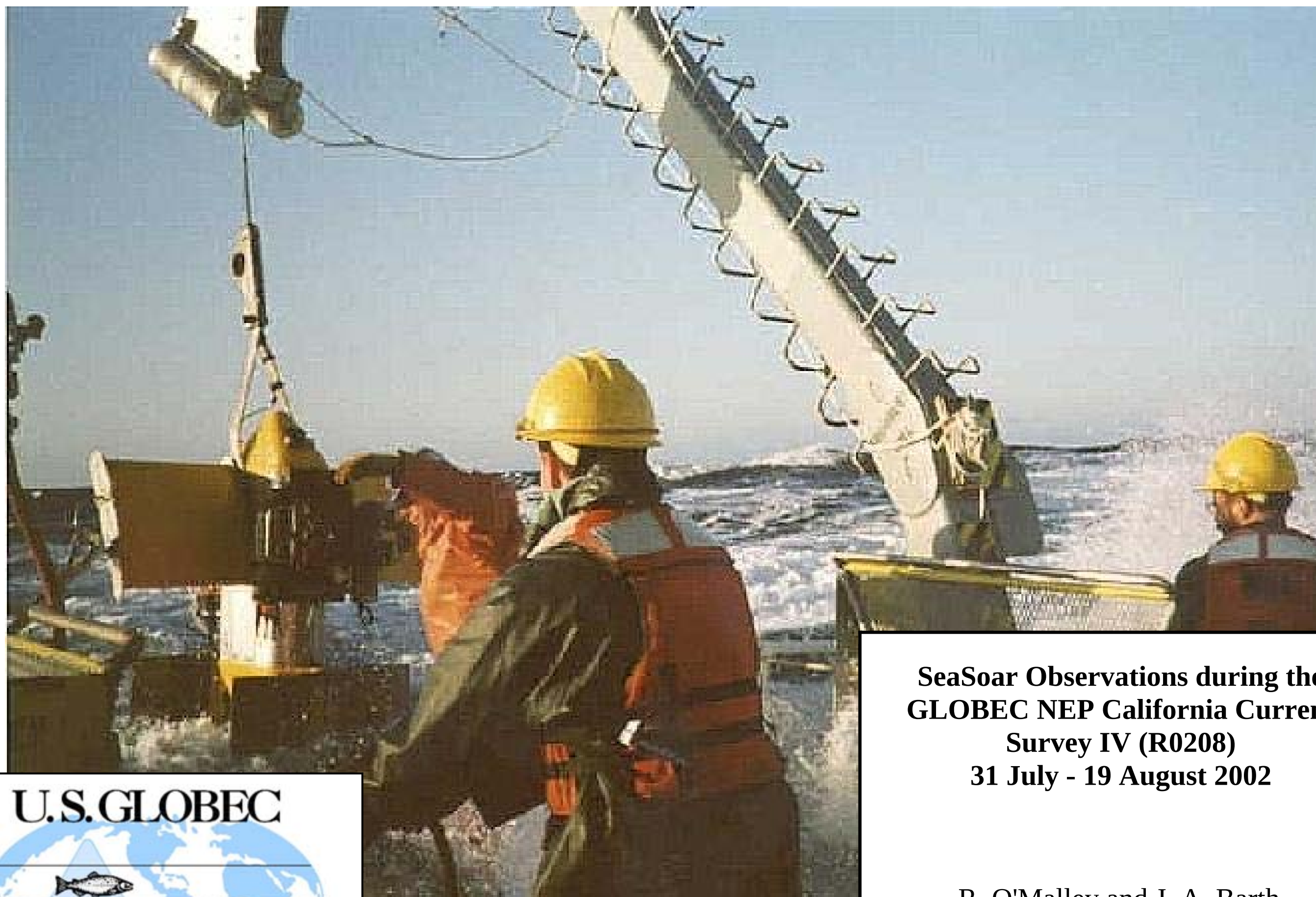

SeaSoar Observations during the GLOBEC NEP California Current Survey IV (R0208)
31 July - 19 August 2002

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Data Report 195
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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 second of two cruises in 2002 to study the physical and biological oceanographic distributions and processes that influence juvenile salmonid habitat 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. The goal is 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 made mesoscale surveys at the beginning and end of our study, along with finescale surveys south of Newport centered on Heceta Bank, and north of the Oregon-California border up to Cape Blanco (Figure 1).

We used a variety of instruments: a towed, undulating vehicle (SeaSoar) to measure temperature, salinity, phytoplankton fluorescence, colored dissolved organic matter (CDOM) fluorescence, and zooplankton; a shipboard Acoustic Doppler Current Profiler (ADCP) to measure water velocity; and a towed, four-frequency acoustics unit (HTI) to detect large zooplankton and larval fish. Surveys of the bird and mammal populations were also made during daylight hours. A set of three WOCE-standard surface drifters was released on the Newport Hydrographic line at the beginning of the cruise. Two sets of 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 SeaSoar. All drifters were tracked via ARGOS. Bio-optical measurements using a Tethered Spectral Radiometer Buoy (TSRB) and the vertically profiling bioacoustics package were made near the surface drifters. We also worked in close coordination with the R/V *New Horizon* and the F/V *Frosti*, both conducting net sampling in our study region.

We towed 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 except for one reversal at the start of the South SeaSoar

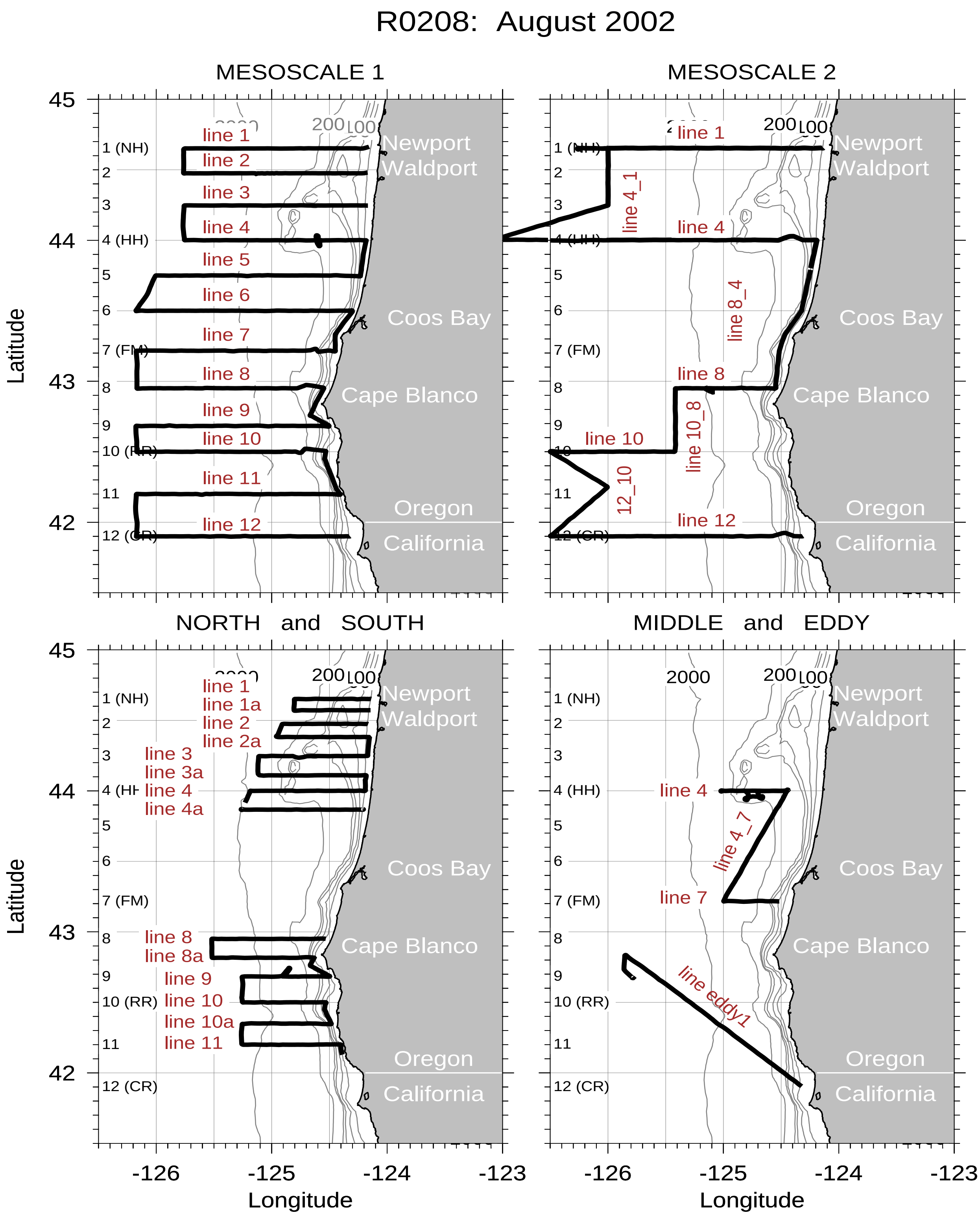

Figure 1: Map of the central Oregon continental shelf and slope showing the summary locations of the SeaSoar sampling lines and mapping surveys. Bottom topography is in meters.

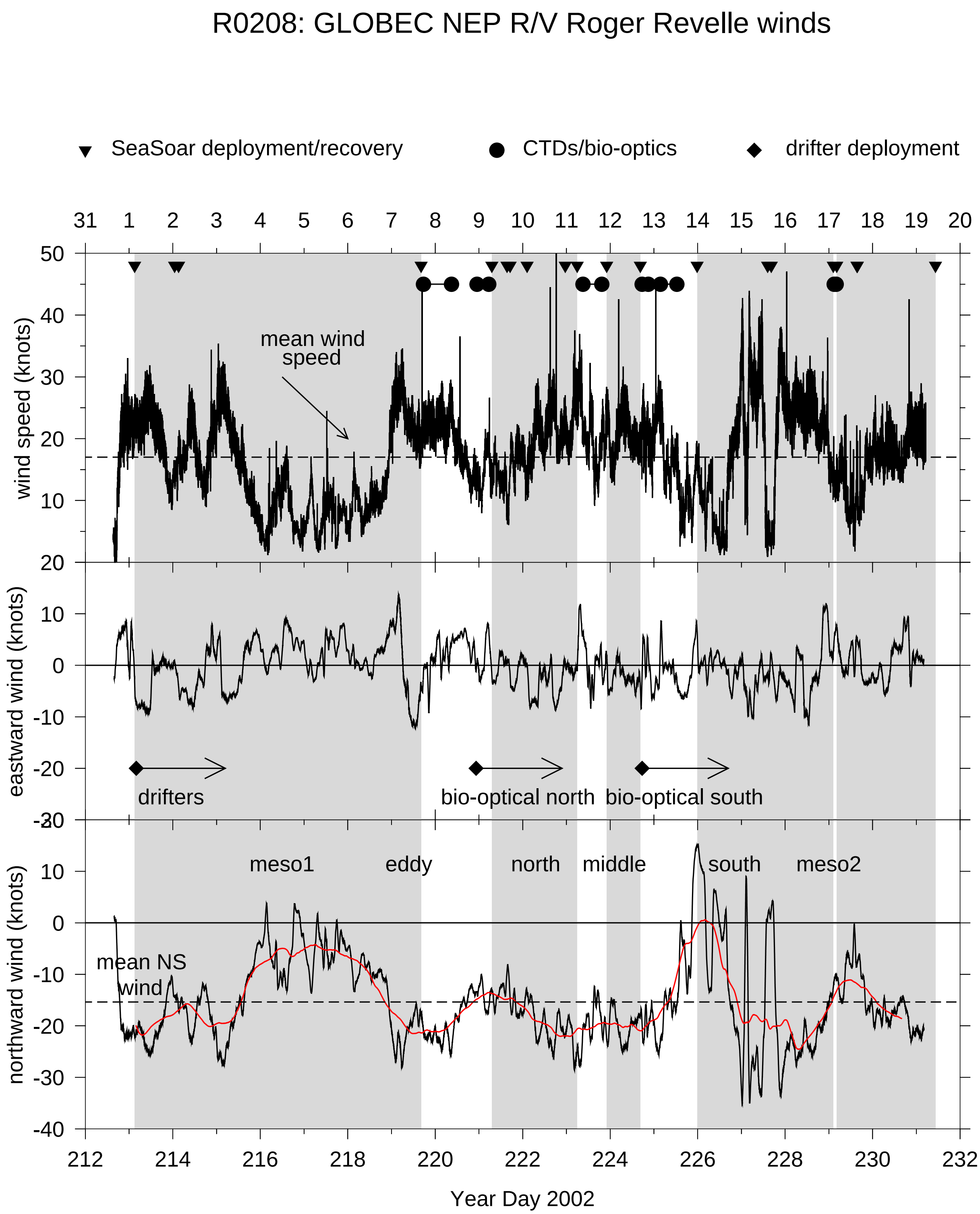

Figure 2: Wind as measured from the R/V Wecoma and cruise activities.

survey. Each of the SeaSoar/ADCP/HTI sampling grids is indicated by gray shading in Figure 2, and the timing of CTD/bio-optics stations and drifter deployments is shown along the top.

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 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 bare (i.e., no streamlined fairing) cable from a trawl winch for the majority of the cruise. The vehicle profiled from the surface to around 110 m and back in approximately 4 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

Note: All times referred to in cruise narrative are local (PDT: UTC -7).

The R/V *Roger Revelle* was loaded for GLOBEC NEP mesoscale survey activities at the OSU Ship

Operation's dock on 28-31 July 2002. The *Revelle* was tied up forward of the R/V *Wecoma* which was being loaded for departure on 1 August for Hawaii. The R/V *New Horizon* arrived on 30 July and tied up outside of the *Revelle*. It was loaded with MOCNESS gear in preparation for zooplankton sampling in coordination with the survey work conducted from the *Revelle*.

Mesoscale Survey 1 (31 July - 7 August)

31 July. The R/V *Roger Revelle* sailed at 1600 on Wednesday with a scientific party of 27 on board (Table 1), after the R/V *New Horizon* pulled away from being rafted on the outside of *Revelle*. We proceeded to the east end of line 1 where there were many crab pots, then continued westward to about the 60m isobath scouting for pots. The HTI was deployed in a crane-in-crutch towing configuration, then was recovered to shorten the tow cable by about 10-12 feet so that it would tow well at 7-8 knots. This towing configuration worked well although the HTI was closer to the ship then we've been used to on *Wecoma* or *Thompson*. We then found a hole in the crab pots around 1E and deployed the HTI and SeaSoar. *New Horizon* was near us during deployment. SeaSoaring went well as we headed out line 1. The westward ends of lines 1-4 were moved out to 125 45'W (from 125 15'W as occupied during the May-June 2002 mesoscale survey) in order to capture a cold water feature observed in recent satellite SST imagery. Three satellite-tracked surface drifters were deployed at NH-10, NH-15 and NH-25, the historic LTOP drifter release locations. There was still a great deal of cold water on the shelf and a subsurface temperature minimum extended all the way across line 1. The ADCP section showed a nice shelf upwelling jet, a more depth-independent northward flow over the shelf, and then another "shelf-like" equatorward flow centered near 125.6. This was the strong flow coming off the shelf that we thought might be there given the SST imagery. Chlorophyll fluorescence was high in the upper 20m to out well beyond the shelf break.

While heading out past the shelf break on line 1 we observed that the new plastic, zip-on fairing made the SeaSoar performance worse than towing with bare cable. We only got down to about 80 m (see Mesoscale Survey 1, line 1) with about 400 m of zip-faired cable out. It was decided to remove all the fairing and this was accomplished by the OSU MarTechs during the late morning of 1 August. We then towed SeaSoar on bare cable with about a 110 m depth capability. The data set

Table 1: R0208 cruise participants and their primary responsibilities (all from Oregon Statue University unless indicated otherwise).

Jack Barth	Chief Scientist	SeaSoar
Robert O'Malley	Technician	SeaSoar
Anatoli Erofeev	Scientist	SeaSoar
Renato Castelao	Graduate Student	SeaSoar
Meng Zhou (U Mass)	Scientist	OPC
Di Wu (U Mass)	Graduate Student	OPC
Ricardo Letelier*	Scientist	underway nutrients/FRR/drifters
Amanda Ashe	Technician	underway nutrients/FRR/drifters
Rachael Sanders	Graduate Student	underway nutrients/FRR/drifters
Guido Corno	Graduate Student	underway nutrients/FRR/drifters
Mauricio Andrades	Undergrad Student	underway nutrients/FRR/drifters
Marc Willis	Marine Tech Sup	SeaSoar
Linda Fayler	Marine Tech	SeaSoar
Toby Martin	Marine Tech	SeaSoar
Chad Waluk (Cal State)	Technician	SeaSoar
Steve Pierce	Scientist	ADCP/HTI
Kasey Legaard	Graduate Student	HTI/misc
Christopher Wingard	Technician	bio-optics
Amanda Briggs	Graduate Student	bio-optics
Cidney Howard	Graduate Student	bio-optics
David Ainly (HTH)**	Scientist	bird observations
Charles Alexander (HTH)	Technician	bird observations
Cyndy Tynan (UW)	Scientist	mammal observations
Tom Ryan (HTH)	Technician	mammal observations
John Hercher (South Salem HS)	High School Teacher	outreach
Tammy Baiz (Scripps)	Resident Technician	operations
Bill French (Scripps)	Computer Technician	operations

* disembarked 9 August

** HTH = H.T. Harvey and Associates

from this cruise will be comparable to what we collected during COAST 2001 and GLOBEC 2000.

After removing the zip fairing, we towed east on line 2 and transited the shallow end and back out before nightfall. We saw the drilling ship *Joides Resolution* and the *Ewing* working over the methane hydrates on the slope between our lines 1 and 2. All bio-optical instruments were online and working well from the beginning of the first mesoscale grid. The 4-person bird and mammal team established their sampling protocol and began surveys during daylight.

2 August. We completed lines 3 and 4 by 1730 . SeaSoar and its instruments continued to work well, sampling to about 110 m on bare cable. Just about 24 hours earlier (8/1) we snagged a crabpot at the shallow end of line 2. In the process of pushing it off SeaSoar, the vehicle rebounded into the transom and the upper rear tail fin was broken. There was no damage to the bio-optics instruments located there; the stainless steel PAR cage did its job. The OSU Martechs replaced the tail fin and we were back in the water 2 hours later. Around 1300 at HH-3 we towed the SeaSoar and HTI behind *New Horizon* as they MOCNESSed.

Initial maps of surface properties from lines 1-4 showed that the low temperature, high chlorophyll water was restricted to Heceta Bank, north of 44N and east of 124.8W. This is the zone of low O2 that ODFW, OSU and PISCO investigators have reported. After the Mesoscale 1 survey we planned to return to the Heceta Bank region and to do some CTD/rosette casts in this region with an O2 sensor on the package.

3 August. Winds and seas were calm as we proceeded down the coast near Coos Bay (see Figure 2). Lots of whale sightings this morning near the middle of line 6 (43.5N). We did a near flyby of *New Horizon* along line 6 at 125 10'W (1/2 hour between occupations of that spot). There were several groups (4-12 individuals) of sea lions off the Coos Bay entrance, along with numerous fishing boats that the *Revelle* wound its way through.

In the 5-m SST maps from SeaSoar data, there was cold water near the coast and a streamer of cold water extending offshore near 44N out to at least 126W. 5-m chlorophyll was highest over the

Bank, but elevated values were also found in that cold water feature far offshore. There are lots of downward excursions of high chl water (down to ~50 m), likely associated with the "egg beater" motion of the meanders, filaments and eddies in this well-developed upwelling system.

About 2000 the ship's Knudsen echosounder failed just as we were about to turn offshore near 7E. We flew the SeaSoar conservatively based on the ADCP and HTI depth outputs. We didn't get great depth coverage over the shelf, but we chose to err on the side of caution. The SIO computer tech and OSU Marine Technician Linda Fayler swapped in the ship's ODEC Bathy2000 12.5 kHz echosounder and had it done in about an hour and a half. Meanwhile we did a very close and coordinated flyby of *New Horizon* on the FM line at 124 36'W. The winds were weak and seas calm.

4 August. We conducted a safety meeting to go over the procedures for deploying the CTD/rosette, the bio-optics profiling package and the TSRB in anticipation of switching to those activities after the first Mesoscale survey.

During the early evening, the bird and mammal observers saw many (~25) humpback whales around Coquille Bank just north of Cape Blanco. This was an area of strong upwelling and high chlorophyll. We expect to cover this region again during our south fine-scale survey later in the cruise. We could also see the smoke from the Illinois Valley forest fires to the south.

5 August. By approximately 0800 we completed lines 7-9 on the mesoscale survey and turned eastbound onto line 10 (Rogue River line, 42 30'N) with an ETA at the east end of about 1800. The winds and seas continued to be calm, making for easy operations. We planned to complete the mesoscale survey and get back north to the Newport area before winds picked up as forecast for the end of the week. We plan to do another *New Horizon* flyby this afternoon, closer inshore on line 10, comparing HTI bioacoustics measurements of zooplankton from *Revelle* with zooplankton net tows from the *New Horizon*.

The bio-optics group (Wingard, Howard, Briggs) flow-through systems continue to work well. The phytoplankton physiology group (Letelier, Ashe, Sanders, Corno, Andrades) have operated the Fast

Repetition Rate Fluorometer (FRRF) and MicroSAS continuously since we sailed. They take discrete samples every 1-2 hours for chlorophyll, nutrients (frozen for analysis back at OSU), HPLC pigments, absorption, flow cytometry and particle size distributions. They have conducted two C14 productivity experiments using surface offshore waters and will complete a third today using inshore, upwelled water. All these measurements are intended to assess the phytoplankton assemblages and their physiological state.

The physical and biological measurements have shown some amazing structure associated with an offshore cyclone (counterclockwise eddy) located at 42 45'N, 125 45' W. This is a piece of coastal water spinning off from the alongshore coastal upwelling jet. The strong counterclockwise circulation appears to be forcing cold water, phytoplankton and zooplankton down from near the surface to over 100 m depth. Given this striking feature, we hope to return to the eddy region for a day of intense sampling (SeaSoar/HTI and deep CTD/rosette casts) after we complete the mesoscale survey tomorrow night (8/6). The *New Horizon* will join us to tow the zooplankton nets through the feature. The goal is to map the physical structure of this eddy and to determine the contents and physiological state of the phyto- and zooplankton communities which it contains.

6 August. We successfully completed lines 10 (Rogue River) and 11 of the Mesoscale grid and are eastbound on line 12 (Crescent City). We expect to complete the survey inshore at 12E at around 2000 this evening.

The SeaSoar and HTI bioacoustics sampling on line 11 delineated the southern end of the cyclonic circulation feature that is centered at 125 35'W, 42 40'N. This eddy has lots of surface chlorophyll with values as high as observed over Heceta Bank. The presence of warm water, phytoplankton and zooplankton at depth (in excess of 100 m) on the westward edge of the cyclonic-turning jet occurs most strongly on lines 8-10, with just a hint of it on line 11. This feature is very intriguing and we will investigate it further on Wednesday.

We completed a flyby of *New Horizon* on the inshore end of line 10 and may do another somewhere on line 12 when we go by the *New Horizon* working its way westbound. The inshore end of line 10 had enormous numbers of jellyfish. Over the outer shelf, they were a white or pale blue color without tentacles and the *New Horizon* scientists told us they were "*Aurelia labiata*." Farther inshore, these were joined by another species of jellyfish, brown or yellow in color with tentacles.

The topside upper trophics group (Cyndy Tynan, David Ainley, Tom Ryan and Chuck Alexander) continue to do line-transect surveys of mammals and strip-transect surveys of birds for 12-14 hours each day. They're doing continuous monitoring during daylight hours, except for short breaks for meals. On line 10 yesterday, they observed the following mammals (# in parentheses): Dall's Porpoise (18), Humpback whales (6), Harbor porpoise (11), Elephant seals (10), Fur seals (2), Stellar Sea Lions (2), California Sea Lion (10) and Harbor seals (5). As far as birds, in waters of the slope and deeper (warm water), they observed Leach's storm petrels and a major southward migration of Red Phalaropes, Arctic Terns, and Long-tailed and Parasitic Jeagers. In waters within 10 miles of the coast associated with the cold alongshore upwelling front they observed Common Murres, Pink-footed and Sooty Shearwaters, Cassin's Auklets, and Red-necked and Red Phalaropes.

One challenge that the Scripps computer tech Bill French is working on is intermittent failure of the Knudsen echosounder. We cannot fly SeaSoar safely in shallow water without good bottom depth information. The failure seems to be temperature dependent and Bill is in contact with engineers back at Scripps about how to solve the problem. As a backup, we ran the Simrad multi-beam echosounder system this morning and it did not appear to interfere with the HTI bioacoustics package. So we can use depth information from the Simrad to fly the SeaSoar. Bill is working on coding up a piece of software that will make the Simrad output available to our SeaSoar flight controller. The detailed bottom characteristics from the Simrad can later be shared with geologists at OSU and HMSC to improve their characterization of the bottom habitat off Oregon.

Eddy Study (7-8 August)

7 August. After completing the Mesoscale 1 survey, the R/V *Roger Revelle* turned northwest, still towing the SeaSoar and HTI bioacoustics instrument, to resurvey the cyclone offshore flow feature that we'd measured offshore of Cape Blanco. This morning we found the counterclockwise eddy and the deep subsurface chlorophyll feature on its offshore side. We used the SeaSoar to refine our choice of sampling stations and radioed those locations to the *New Horizon*. We spent the remainder of the day completing five deep stations across the eddy from west to east (see Table 2 and Figure 3). Our first station on the western edge of the eddy sampled through the 90 m deep subsurface chlorophyll feature. We did a traditional CTD/rosette cast to 1000 m to investigate the deep physical structure of this feature. Water was obtained from various depths for chlorophyll and nutrient analysis. Ricardo Letelier and Amanda Ashe collected water from the subsurface chlorophyll maximum in order to run a C14 growth rate experiment. This will tell us about the viability of this deep phytoplankton population, especially since at those depths there is very little to no light. Getting this biological information about the subsurface feature will add to what we learned about deep chlorophyll features during the 1993 EBC experiment. The bio-optics package was deployed at this same station, and the *New Horizon* was alongside doing vertical net and MOCNESS tows. The bio-optics package was also deployed after the 1000 meter CTD casts at the

Table 3: CTD stations during R0208

Cast	**Name**	**Date (2002)**	**Time (UTC)**	**Latitude (N)**	**Longitude (W)**	**Depth (m)**
1	Eddy 2	07 Aug	1735	42 43.50	125 51.00	3000
2	Eddy 1	07 Aug	2119	42 43.49	126 04.49	2357
3	Eddy 3	08 Aug	0044	42 43.50	125 37.50	3075
4	Eddy 4	08 Aug	0422	42 44.14	125 24.02	3077
5	Eddy 5	08 Aug	0804	42 43.50	125 10.50	2944
6	North 1	09 Aug	0320	44 38.18	124 15.31	74
7	Oxy 1	11 Aug	0916	44 15.00	124 09.00	45
8	Oxy 2	11 Aug	1101	44 14.99	124 10.21	54
9	Oxy 3	11 Aug	1228	44 14.99	124 12.51	64
10	Oxy 4	11 Aug	1354	44 14.98	124 19.08	79
11	Oxy 5	11 Aug	1539	44 14.96	124 26.96	97
12	FM 5	12 Aug	2023	43 12.77	124 39.55	145
13	FM 10	13 Aug	0331	43 12.99	125 20.00	3022
14	FM 9	13 Aug	0535	43 12.98	125 09.98	1670
15	FM 8	13 Aug	0754	43 13.00	125 00.00	1083
16	FM 7	13 Aug	1010	43 12.99	124 50.00	343
17	FM 6	13 Aug	1145	43 12.98	124 45.00	313
18	Drifter 1	17 Aug	0341	42 55.25	125 05.74	1646

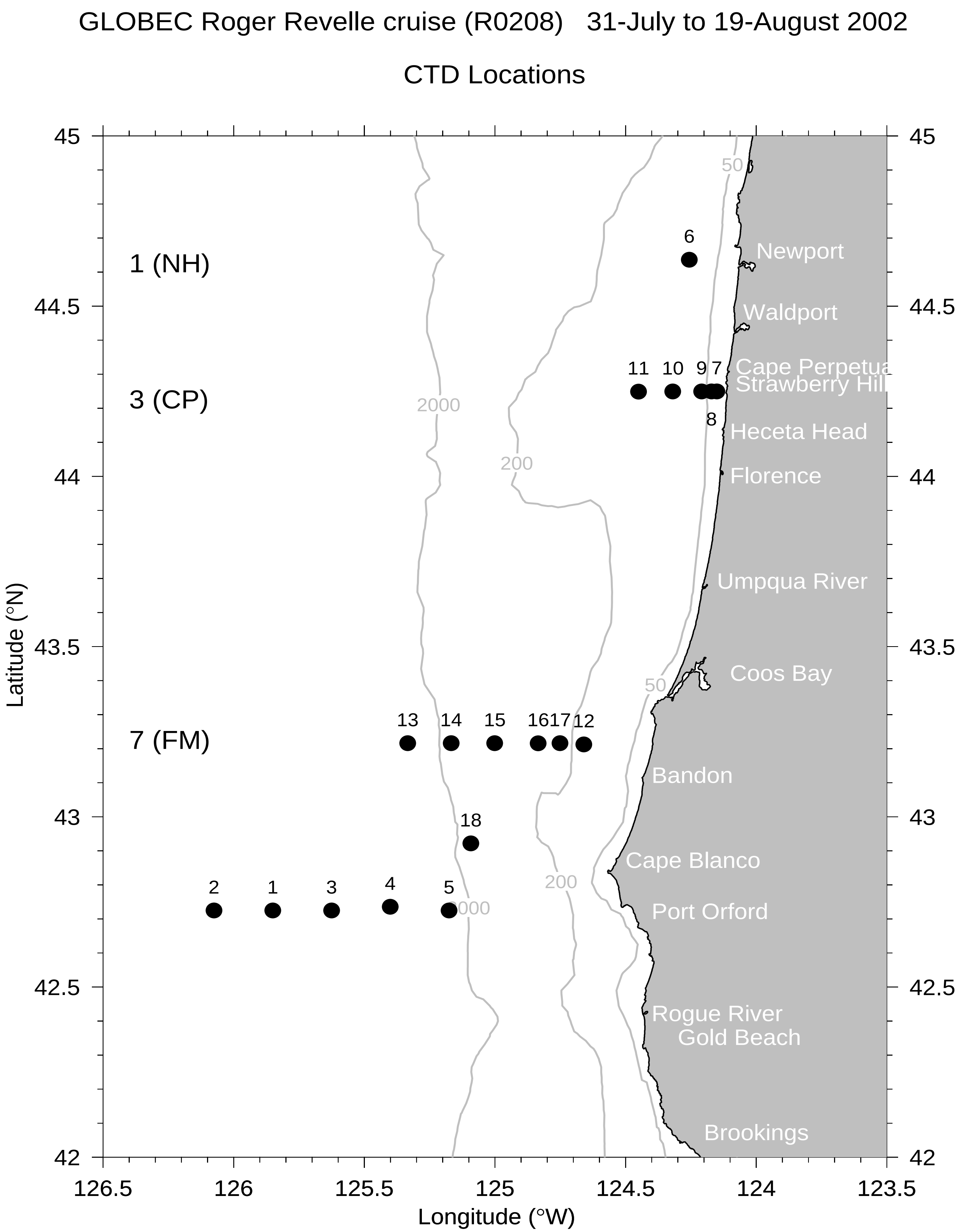

Figure 3. CTD station locations during R0208. Bottom topography in meters

center and eastern edge of the "eddy". We are in the process of analyzing the deep CTD data in an effort to see how deep these coastal features penetrate once they leave the continental shelf. We also released a bio-optical drifter near the center of the cyclonic feature.

8 August. We finished our eddy study just after 0200, steamed north at 12 knots, and arrived on the Newport hydrographic line at about 1200 on 8 August. We headed inshore, measuring the subsurface currents using the shipboard ADCP and mapping the crab pots. An upwelling jet core was found near NH-5, about 5 miles offshore of Newport. Three bio-optics drifters were deployed in this feature and we are presently conducting station operations near the drifters. This includes deployment of the TSRB and multiple vertical profiles with the bio-optics package. Also planned is an inter-calibration test between the HTI bioacoustics instrument and the TAPS bioacoustics instrument deployed from the bio-optics package.

It's absolutely amazing the number of research vessels that are in this region. In addition to our GLOBEC project using the R/V *Roger Revelle*, the R/V *New Horizon* and the F/V *Frosti* , the drill ship *Joides Resolution* is working off Newport. Further, the German research vessel, R/V *Sonne*, may have been seen working near it today. When calling the R/V *Elakha* today to arrange for a possible meeting, the R/V *Thomas G. Thompson* called in. It is believed that earlier the R/V *Atlantis* and the R/V *Ewing* were in the area too.

At midnight tonight we'll deploy the SeaSoar and HTI off Newport and tow to the south on the Fine-Scale North grid over Heceta Bank. We have a quick meeting with the R/V *Elakha* planned later in the morning, at 9 am off Newport. If the weather holds and the seas aren't too rough, we'll receive some science and ship supplies from shore and transfer one of the scientists to shore. After this we'll continue south on the Fine-Scale North grid. We'll be SeaSoaring for two days, and will be down on the Heceta Head (44N) line when the *New Horizon* (and hopefully F/V *Frosti*) joins us down there on 8/10. When we complete the North survey we plan to find the bio-optics drifters and work by them for a few hours. Then we'll proceed to the Fine-Scale South survey around Cape Blanco. The top trophic observers are excited to resample that area where they saw large numbers of birds and whales.

North Survey (9-11 August)

9 August. We deployed the HTI bioacoustics instrument and the SeaSoar inshore on the Newport Hydrographic Line (line 1) at 0000 on 9 August. Lots of boat traffic near Newport, but it was a crystal clear night. We surveyed on lines 1 and 1A of the Fine-Resolution North survey region before recovering the HTI and SeaSoar at 0800 today. The *Revelle*'s zodiac was used to transfer Ricardo Letelier to the R/V *Elakha* and to pick up some filters for the flow-through bio-optics group and refrigerant for the Chief Engineer. The seas were calm and the transfer went smoothly. We were back SeaSoaring on line 2 at 1000. There was a hotspot of activity on the offshore side of line 2A, at 44 22.8N, 124 42'W. This was the western edge of a very high chlorophyll feature. HTI echoes were solid to the bottom inshore of this point. Many humpbacks and large numbers of birds were observed in this area. This could be the continuation of a chlorophyll front running along the isobaths, but it is not very strong on the NH line.

We had heavy fog most of the day, most likely the result of warmer, moisture laden air meeting the cold upwelled water on the Heceta Bank. This shutdown the daytime bird and mammal observations and necessitated the regular sounding of the *Revelle'*s fog horn. High values of chlorophyll remain over the Bank and the flow-through system filters need to be changed frequently.

11 August. After completing the North Fine-Scale survey at 2300 last night, we transited north to 44 15.0'N. This is just offshore of the PISCO Strawberry Hill measurement site. We conducted 5 CTD stations from 45 to 100 m depth during the night from 0200-0600. We were especially interested in measuring dissolved oxygen through the water column given the previously reported findings of low oxygen waters in this area. We found freshly upwelled, quite salty water (33.914 psu) near the bottom. Each CTD station included samples for nutrients and various phytoplankton properties (chlorophyll content, pigment composition).

As we pulled onto our final station in 100 m of water, one of the bright orange bio-optical drifters was only 50 m off the bow of the *Revelle*! We had tried to finish near where we expected the drifters to be, but it was pure luck that they were that close to our CTD station. The other two drifters were close by, within about several hundred meters of each other. After the CTD we proceeded with our station work near the drifters, including a TSRB session, and 1.5 hours of bio-optical profiling.

Meanwhile, Chris Wingard, Marc Willis and Chad Waluk worked hard to repair the SeaSoar from the two minor problems we had encountered toward the end of the North Fine-Scale sampling. Chris made a new cable for the PAR sensor and, with assistance from Chad, also made a new cable for the ac-9 we're flying on top of SeaSoar. The light absorption channel had gone out on ac-9 #152 (Barth's ac-9), so we swapped in ac-9 #141 from the Cowles group once we had the cable we needed. Marc and Chad reattached all the instruments to SeaSoar and buttoned it up in record time as we transited to the offshore end of line 4.

Middle Survey (11-12 August)

We needed to reassemble the SeaSoar quickly because of the opportunity to work with both the R/V *New Horizon* and the F/V *Frosti* along the 44 0'N (Heceta Head) line this afternoon. We decided to take a closer look at the region near 124 42'W on the inshore side of Heceta Bank , where the top trophic group reported sightings of about 50 humpbacks along this line the previous day.

The SeaSoar was deployed at 1500 today (8/11) and we began towing inshore on line 4 (HH). We did another inter-calibration flyby of the *New Horizon* starting at 2115 as we were heading eastbound; the *Frosti* was also working nearby.

On the inshore part of line 4 the water was the color of root beer, a deep brown from high phytoplankton concentrations. It appears that the whales and birds are on the outside, western edge of this high chlorophyll feature. We should have the data in hand, from physics (temperature, salinity, circulation, and water clarity), chemistry (nutrients) and biology (phytoplankton, zooplankton, birds and mammals) to sort out the spatial structure of this community.

Next up is towing the SeaSoar and HTI to line 7 off Bandon, deploying another set of bio-optical drifters, and then conducting a 2-2.5 day survey of the southern region around Cape Blanco.

12 August. Unfortunately, at about 0900 the SeaSoar vehicle hit the bottom on the shallow end of line 7 off Bandon. Upon recovery, the Optical Plankton Counter (OPC) had been sheared off the bottom and the nose of SeaSoar was dented. There were rocks, mud and a piece of benthic sponge in the nose opening of SeaSoar. The temperature and conductivity sensors mounted in the nose of SeaSoar were jarred, but may be okay as further tests will tell. The vehicle and the other instruments are okay. We have a second OPC and backup temperature and conductivity sensors on board. We also have a spare SeaSoar nose. We are now working to replace all the damaged parts and hope to have SeaSoar back in operation tomorrow afternoon (8/13). The bottom collision was caused by an incorrect setting on the ship's echosounder: the minimum depth was set too deep as we came into shallow water.

While the SeaSoar is under repair, we deployed 3 bio-optical drifters in the upwelling jet along line 7 off Bandon. We completed TSRB, bio-optics and CTD/rosette profiling near the drifters.

South Survey (13-15 August)

13 August. As of 1700 today we were back SeaSoaring on the Fine-Resolution South grid. Thanks to the OSU Marine Technicians (Marc Willis, Linda Fayler, Chad Waluk and Toby Martin) for their hard work rebuilding the SeaSoar nose and bringing the vehicle back to 100% functionality. During the time it took to do the repair, we surveyed lines 7, 7A and 8 with the HTI in the water, along with the complete flow-thru instrumentation and the bird and mammal observers on the O3 deck. Last night between surveying lines 7 and 7A, we completed CTD profiles along the FM line (FM-6,7,8,9 and 10). Combining these with *New Horizon*'s CTD stations along the FM line earlier in the day gives us a complete LTOP-quality FM line.

We found freshly upwelled, low chlorophyll water along these first three lines of the South grid, consistent with the strong upwelling favorable (southward) winds over the last couple of days. The HTI bioacoustics instrument showed strong returns in the low frequencies (euphausiids?) over and inshore of Coquille Bank. The bird and mammal observers reported very few whales in this region, in contrast with their count of about 25 individuals along line 8 about nine days ago. Scientists aboard the F/V *Frosti* report catching many adult salmon on three stations they occupied over the Bank. Although there weren't large numbers of mammals along these lines, the top trophic observers logged their 300th cetacean sighting.

The SeaSoar rebuilding effort involved stripping all the instruments out of the vehicle and pulling off the smashed nose. Then a spare SeaSoar nose was reinstalled, with a little cosmetic surgery, and a new OPC frame was attached to the bottom of the vehicle. The OPC instrument was reattached and newly constructed ballast weights (thanks Chief Engineer John Downey and crew!) were hung beneath SeaSoar. The spare OPC does not have serial communications as did the lost OPC, so we ran the OPC via copper conductors rather than over the fiber optic link. All communications up and down the cable are working fine. The OSU MarTechs also took the opportunity to replace the hydraulic unit which drives the wings up and down, while the other repairs were going on.

14 August. We completed lines 8 through 10 on the Fine-Resolution South grid. Heavy fog inshore near Port Orford put the bird and mammal observers out of work for a few hours. There is a great deal of freshly upwelled, cold, salty water inshore on each of these lines. We went far enough offshore on lines 8 and 8A to find the temperature and salinity front near 125 25'W. Lines 9 and 10 contained mostly freshly upwelled water, but there was a pool of chlorophyll in the upper 20 m centered on the middle of each line. There was very little phytoplankton in either the freshly upwelled water right near the coast or the water offshore of the front.

Amanda Ashe took a sample for C14 analysis this morning inshore near Cape Blanco. The flow-through system continues to work well. Winds picked up to 30 knots as we came in toward the coast on line 9. We could clearly see the huge plumes of smoke coming off the mountain ridges in this area from the forest fires.

Mesoscale Survey 2 (15-19 August)

15 August . We completed the Fine-Resolution south grid through line 11, then skipped line 11a and instead dropped down to do line 12 (Crescent City Line) and the start of the next survey. The South survey had showed freshly upwelled water inshore of about 125 10'W. The only significant surface layer chlorophyll was restricted to 42.5-43 N and 124 36' to 125 10'W.

We ran into gale force winds around Blanco. As we headed inshore on line 10, winds were out of the north at 25 knots increasing to 35 knots as we passed the longitude of the Cape. Inshore of that, the winds weakened and even reversed as we moved into the protective lee south of the Cape.

We designed a "Mesoscale 2" survey from south to north to hit some of the important features we discovered on our previous Mesoscale 1 grid, as well as to occupy some of the main GLOBEC cross-shelf lines. We extended line 12 out to warm water at 126 30' and then will angle back through the center of the cyclonic eddy we had sampled earlier.

16 August . As we sampled through the eddy early this morning we found that it still had some chlorophyll in a subsurface maximum around 30 m, but it had reduced greatly since the previous week. Further analysis will allow us to estimate the fate of shelf material (cold water, nutrients, phyto- and zooplankton) sent offshore in this feature.

We then angled offshore to the western end of line 10, and then turned shoreward. We turned north at 125 30' in the early afternoon, intending to intersect the drifters on line 8 before dusk. After only diverting about a mile from our track line, we found the bio-optical drifters in the middle of line 8 off Cape Blanco. The drifters finally got caught up in a strong southward jet (45 cm/s or about 1 knot of current) and shot down to our track line. Once again, there was a bit of luck getting the place and time about right. Line 8 is the Coquille Bank line. We did 1.5-2 hours of station work near the drifters before redeploying SeaSoar and finishing a tow on line 8 to the east. The one sacrifice was loss of bird and mammal observations from 125 5'W to the beach, since darkness set in as we resumed our tow. We passed by *New Horizon* at 124 50' as they concluded a MOCNESS tow.

Each of our SeaSoar/ADCP/HTI sections across the equator-ward jet continues to show lots of vertical structure, including alternating layers of cold and warm water. High chlorophyll is found in the warm lenses extending down the isopycnals (lines of constant density) just offshore of the front and jet. This is all consistent with a vigorous mesoscale circulation consisting of jets, meanders and eddies.

17 August. We are about to turn west for a long (~15 hours) tow along line 4 (Heceta Head) during which we'll lose satellite communications. The satellite dish is on the starboard side of the ship's mast, and will be blocked from the satellite which is located on the dateline (180W) above the equator.

We came out of the coastal fog and headed west on line 4 along 44 0.0'N. There was high chlorophyll over Heceta Bank out to 125 18' W. As we passed over "Humpback Hollow", the top trophic observers reported seeing some humpback whales. We did a HTI bio-acoustics flyby of the *New Horizon* as they MOCNESSed at HH-5 (125 0'W). We then continued west, looking for the equatorward jet that had transported one of our drifters in a large counter-clockwise loop around Heceta Bank. We found evidence of a strong (> 60 cm/s) southwestward jet at 126 30'W, offshore of which we finally reached warm (17+ degrees C) oceanic water, albeit influenced by Columbia River outflow (salinity < 32.5). Elevated chlorophyll was found at 30-50 m on the western side of the sloping isopycnals which support the jet.

18 August. At 0240 this morning we turned back east along and into the jet waters. We towed up to line 1 (NH line) and started sampling up the shelf on that line starting at 1300. The top trophic observers reported seeing many (~50) fin whales near ~126, 44 15'N.

19 August. We performed the *New Horizon* flyby between midnight and 1 AM this morning; the SeaSoar and HTI bioacoustics instrument were later recovered at about 0330. We then headed for the whistle buoy outside the Newport jetty to meet the pilot at 0645. *R/V Roger Revelle* was alongside the OSU ShipOps dock at 0730.

Estimates made at the end of cruise of the data collected include the following:

18	CTDs
410	discrete chlorophyll samples
209	discrete HPLC (pigment) samples
214	discrete samples for absorbance spectra
409	nutrient samples
217	discrete sample for flow cytometry
83	Coulter counter samples
9	C14 stations for P vs I curves
3	surface drifters deployed
7	bio-optics drifters deployed
38	bio-optics casts
3	Tethered Spectral Radiometer Buoy deployments
> 370	cetacean sightings
> 3000	bird sightings
7	HTI bioacoustics flybys with *New Horizon*
7	Gigabytes of HTI bioacoustics data
0.7	Gigabytes ADCP velocity data
10550	SeaSoar profiles CTD/bio-optics/OPC

CTD Data Acquisition, Calibration and Data Processing

All 18 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). A transmissometer and a SeaPoint fluorometer were mounted adjacent to the CTD. A Sea-Bird SBE 43 dissolved oxygen sensor was mounted on the rosette adjacent to the CTD sensor. The calibration dates for the sensors are shown in Table 3.

Table 3: Instruments and sensors used during R0208 for CTD/Rosette sampling, and date of most recent manufacturer's pre-cruise calibration.

System (Instrument)	Sensor	SN	Pre-Cruise Calibration
R0208 CTD/Rosette SBE 9/11 plus	P	67248	18 July 2002
	T0	4213	11 June 2002
	T1	2495	14 May 2002
	C0	2766	18 June 2002
	C1	2115	18 May 2002
	Seapoint Fluorometer		
	Transmissometer	CST-492DR	
	Oxygen	0197	14 March 2002
	altimeter		
	Irradiance (PAR)	4508	02 November 2001
	Surface irradiance		

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. At most CTD stations duplicate samples were collected from Niskin bottles fired at one or two depths for *in situ* calibration of the conductivity sensors. The pressure, temperature and conductivity data for each bottle firing depth were extracted from the recorded up cast data using the Sea-Bird Seasoft DATCNV and ROSSUM utilities.

One set of the duplicate salinity samples were later analyzed on a Guildline Autosal. IAPSO Standard Water was used to standardize and check the salinometer at the beginning and end of each batch of 24 samples. The Guildline Autosal determines water sample salinity with a precision of better than ±0.002 and an accuracy of better than ±0.003. Sample conductivity was calculated using the sample salinity value with the CTD temperature and pressure values; a value of 4.2914 S m-1 was used for the conductivity of standard sea water at 15°C (Culkin and Smith, 1980) to convert the measured sample conductivity ratios to conductivity. Occasionally the CTD-sample differences were large (> 3 standard deviations from the mean); these values were iteratively removed from the final calibration data sets. Such large values can occur from sampling in regions of sharp vertical gradients, or from sample contamination, etc. The results of the CTD - bottle comparison are shown in Table 4. Analysis showed corrections were needed for the primary sensor, but not the secondary sensor. The primary conductivity sensor was later found to have a cracked cell, and was subsequently repaired and recalibrated (K. Sanborn, 2002, personal communication). Because of this, the secondary sensor pair was the preferred sensor pair for final processing of all casts. The secondary conductivity could have been corrected using the formula:

Corrected Conductivity = *correction* (slope) * *computed conductivity* + 0.0 (offset),

where

correction = 0.99997246.

However, the correction was so small it was within the reported precision of the data, and was not applied.

Table 4. Results of *in situ* conductivity calibration for both sensor pairs. Columns show the station numbers, number of samples (N), correction applied to CTD conductivity, and the average and standard deviation of the bottle - CTD conductivity differences.

		Correction		***Average***		***Standard Deviation***	
Sta	**N**	**C0**	**C1**	**C0**	**C1**	**C0**	**C1**
18	21	1.00018835	0.99997246	0.007	-0.001	0.006	0.002

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 dissolved oxygen concentration), 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 oxygen current and oxygen temperature, 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 3.0 seconds relative to pressure. 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).

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 5). 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

Table 5: Instruments and sensors used during R0208 for SeaSoar sampling, and date of most recent manufacturer's pre-cruise calibration.

System (Instrument)	Sensor	SN	Pre-Cruise Calibration
R0208 SeaSoar CTD SBE 9/11 plus SN 428	P	64256	28 March 2001
	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		

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.

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 5), (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, and 5; the secondary sensor was used for tows 1, 4, 8 and10; and both sensors were used in tows 6, 7 and 9. The final lags for the preferred sensor pair of each tow are shown in Appendix I of this report. Tow 2 was a bit unique, as it was analyzed in two distinct portions (before and after the secondary sensor pair became unusable due to sliming the temperature probe). This resulted in two different sets of variables for pair 1.

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

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

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

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 6.

Using the variable lags (shown in Appendix I) and the optimal thermal mass slopes and offsets (Table 6), 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

Table 6: Optimized thermal mass corrections.

Survey	tow	preferred sensor	α slope	α offset	τ slope	τ offset
R0208	1	T2, C2	7.89759E-03	5.87760E-03	1.32290	7.19397
	2	T1, C1	1.04497E-02	5.59406E-04	1.33984	7.12857
		T1, C1	2.63236E-04	-3.45307E-04	1.34263	7.15376
	3	T1, C1	0.00	1.46055E-02	1.33579	7.14968
	4	T2, C2	1.51469E-02	0.00	1.34241	7.14993
	5	T1,C1	1.14676E-02	0.00	1.37589	7.18018
	6	T1, C1	5.29598E-03	9.37673E-03	1.33982	7.15209
		T2, C2	1.80877E-02	1.24876E-03	1.33553	7.14162
	7	T2, C2	1.26759E-02	0.00	1.34058	7.14967
		T1, C1	1.21911E-02	0.00	1.34286	7.15442
	8	T2, C2	3.07027E-03	1.58426E-02	1.32659	7.14102
	9	T1,C1	6.49495E-03	1.88456E-02	1.33927	7.14955
		T2, C2	0.00	2.15255E-02	1.32267	7.14620
	10	T2,C2	1.19123E-02	-3.45307E-0	1.34504	7.15154

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 $\sigma_{t,}$ plots 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 7 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 95 meters depth. Data used in the maps were obtained by first binning the data into 2-db bins in the vertical, and 1.25 km bins in the

Table 7: Section Times

	Section name	Start time	Stop time
Meso 1	meso1.line1	02/08/01 03:04:40	02/08/02 12:09:44
	meso1.line1_2	02/08/01 12:09:45	02/08/02 13:28:15
tow 1	meso1.line2	02/08/01 13:28:16	02/08/02 00:44:49
	…	…	…
tow 2	meso1.line3	02/08/02 03:13:39	02/08/02 12:12:23
	meso1.line3_4	02/08/02 12:12:24	02/08/02 14:02:55
	meso1.line4	02/08/02 14:02:56	02/08/03 00:26:12
	meso1.line4_5	02/08/03 00:26:13	02/08/03 02:30:35
	meso1.line5	02/08/03 02:30:36	02/08/03 12:13:54
	meso1.line5_6	02/08/03 12:13:55	02/08/03 14:20:23
	meso1.line6	02/08/03 14:20:24	02/08/04 00:32:26
	meso1.line6_7	02/08/04 00:32:27	02/08/04 03:03:11
	meso1.line7	02/08/04 03:03:12	02/08/04 13:30:04
	meso1.line7_8	02/08/04 13:30:05	02/08/04 15:28:05
	meso1.line8	02/08/04 15:28:06	02/08/05 00:39:12
	meso1.line8_9	02/08/05 00:39:13	02/08/05 03:51:17
	meso1.line9	02/08/05 03:51:18	02/08/05 13:54:36
	meso1.line9_10	02/08/05 13:54:37	02/08/05 15:12:49
	meso1.line10	02/08/05 15:12:50	02/08/06 00:31:49
	meso1.line10_11	02/08/06 00:31:50	02/08/06 03:24:17
	meso1.line11	02/08/06 03:24:18	02/08/06 13:40:17
	meso1.line11_12	02/08/06 13:40:18	02/08/06 16:05:39
	meso1.line12	02/08/06 16:05:40	02/08/07 03:16:50
	meso1.eddy1	02/08/07 03:18:23	02/08/07 14:33:43
	meso1.eddy2.a	02/08/07 14:33:44	02/08/07 15:16:14
	meso1.eddy2.b	02/08/07 15:16:15	02/08/07 16:16:25
North	north.line1	02/08/09 07:04:21	02/08/09 10:49:50
	north.line1_1a	02/08/09 10:49:51	02/08/09 11:29:24
tow 3	north.line1a	02/08/09 11:29:25	02/08/09 15:21:50
	…	…	…
	north.line2	02/08/09 17:07:50	02/08/09 21:19:25
tow 4	north.line2_2a	02/08/09 21:19:26	02/08/09 22:02:00
	north.line2a	02/08/09 22:02:01	02/08/10 02:33:11
	north.line2a_3	02/08/10 02:36:48	02/08/10 03:35:23
	north.line3	02/08/10 03:35:24	02/08/10 08:52:02
	north.line3_3a	02/08/10 08:52:03	02/08/10 09:55:50
	north.line3a	02/08/10 09:55:51	02/08/10 15:13:35
	north.line3a_4	02/08/10 15:13:36	02/08/10 16:06:17
	north.line4	02/08/10 16:06:18	02/08/10 21:40:20
	north.line4_4a	02/08/10 21:40:21	02/08/10 22:26:05
	…	…	…
tow 5	north. line4a	02/08/10 23:22:54	02/08/11 05:54:04

Table 7: Section Times (continued)

Middle	middle.line4.1	02/08/11 22:06:35	02/08/12 01:39:43
	middle.line4.2	02/08/12 01:39:44	02/08/12 06:27:35
tow 6	middle.line4_7	02/08/12 06:27:36	02/08/12 13:11:37
	middle.line7	02/08/12 13:11:38	02/08/12 15:59:59
South	south.line8	02/08/13 23:48:06	02/08/14 05:45:10
	south.line8_8a	02/08/14 05:45:11	02/08/14 06:47:00
tow 7	south.line8a	02/08/14 06:47:01	02/08/14 12:22:42
	south.line8a_9	02/08/14 12:22:43	02/08/14 13:55:57
	south.line9	02/08/14 13:55:58	02/08/14 19:26:38
	south.line9_10	02/08/14 19:26:39	02/08/14 21:08:06
	south.line10	02/08/14 21:08:07	02/08/15 01:20:20
	south.line10_10a	02/08/15 01:20:21	02/08/15 02:45:14
	south.line10a	02/08/15 02:45:15	02/08/15 07:09:53
	south.line10a_11	02/08/15 07:09:54	02/08/15 08:21:41
	south.line11	02/08/15 08:21:42	02/08/15 13:36:46
	south.line11_11a	02/08/15 13:36:47	02/08/15 14:25:08
Meso 2	meso2.line12	02/08/15 16:27:49	02/08/16 05:43:40
	meso2.line12_10.a	02/08/16 05:43:41	02/08/16 10:05:26
tow 8	meso2.line12_10.b	02/08/16 10:05:27	02/08/16 13:38:31
	meso2.line10	02/08/16 13:38:32	02/08/16 20:24:25
	meso2.line10_8	02/08/16 20:24:26	02/08/16 23:54:07
	meso2.line8.a	02/08/16 23:54:08	02/08/17 02:20:45
	…	…	…
tow 9	meso2.line8.b	02/08/17 04:24:36	02/08/17 08:35:56
	meso2.line8_4.a	02/08/17 08:35:57	02/08/17 15:26:12
	…	…	…
tow 10	meso2.line8_4.b	02/08/17 15:43:45	02/08/17 17:22:37
	meso2.line4	02/08/17 17:22:38	02/08/18 09:43:30
	meso2.line4_1.1	02/08/18 09:58:42	02/08/18 16:39:33
	meso2.line4_1.b	02/08/18 16:39:34	02/08/18 20:11:40
	meso2.line1.1	02/08/18 20:11:41	02/08/18 21:43:12
	meso2.line1.2	02/08/18 21:43:13	02/08/18 10:36:26

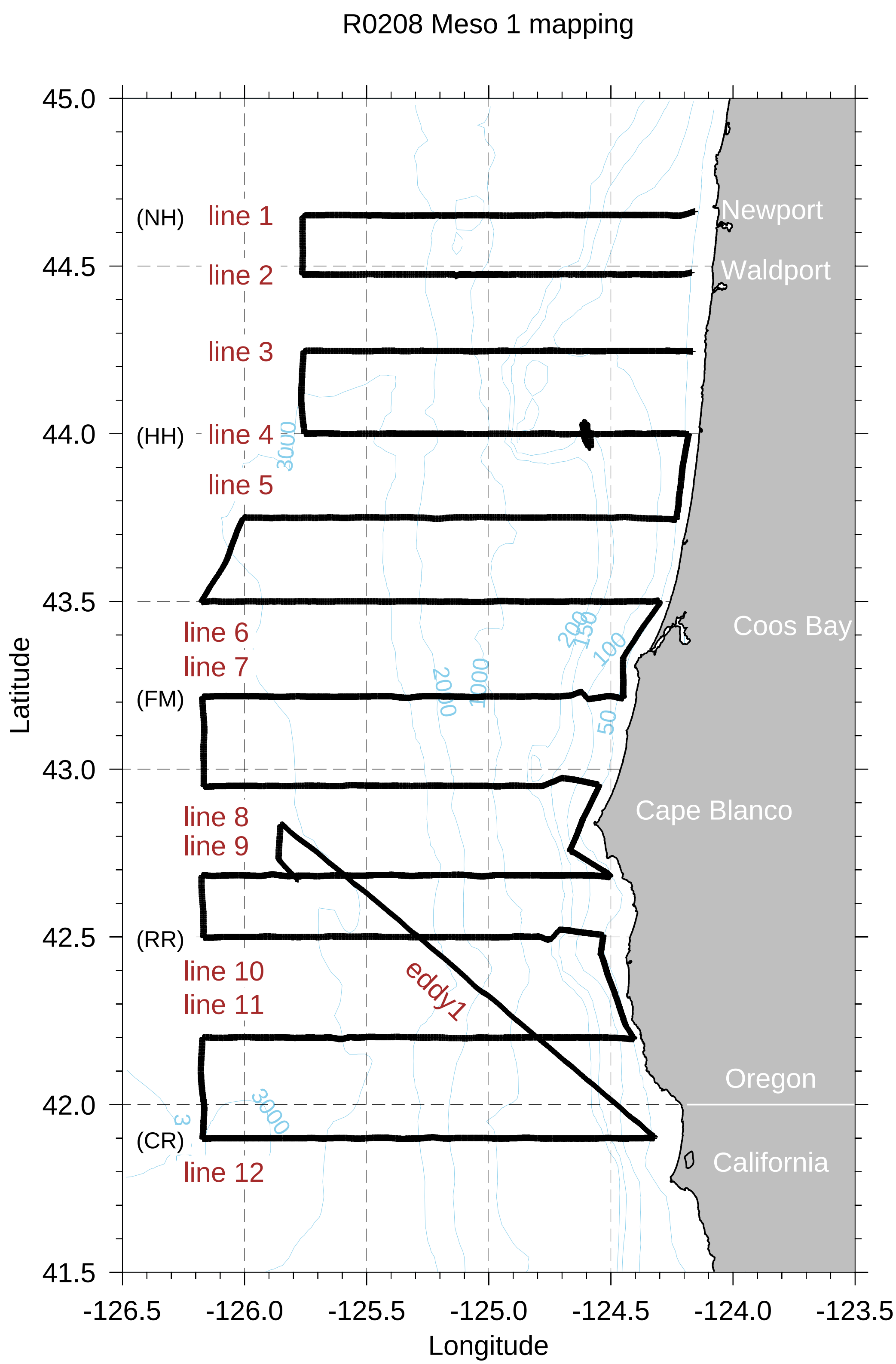

Figure 4a: Cruise tracks during the R0208 SeaSoar surveys. See table 7 for individual line start and stop times.

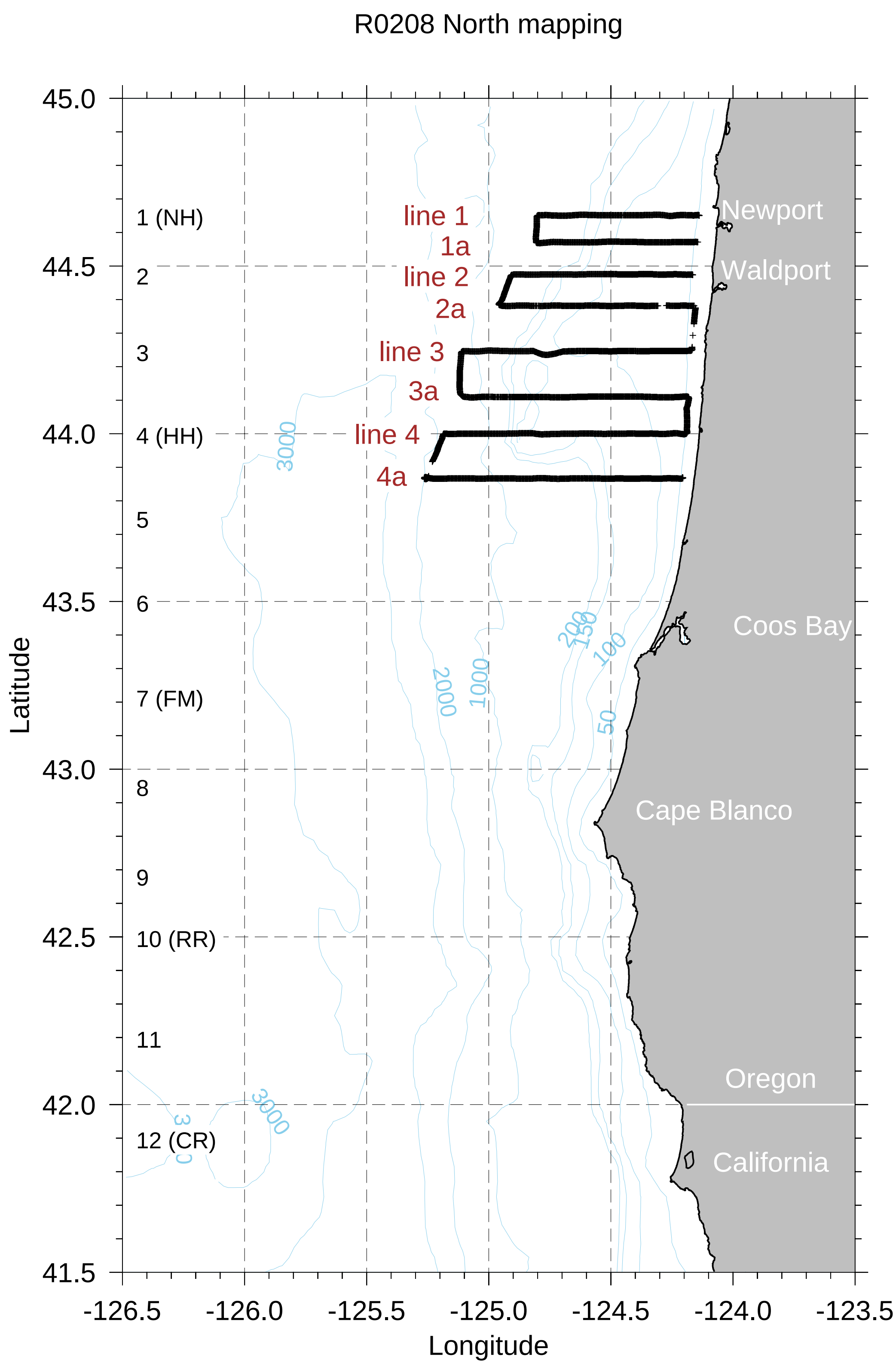

Figure 4b: Cruise tracks during the R0208 SeaSoar surveys. See table 7 for individual line start and stop times.

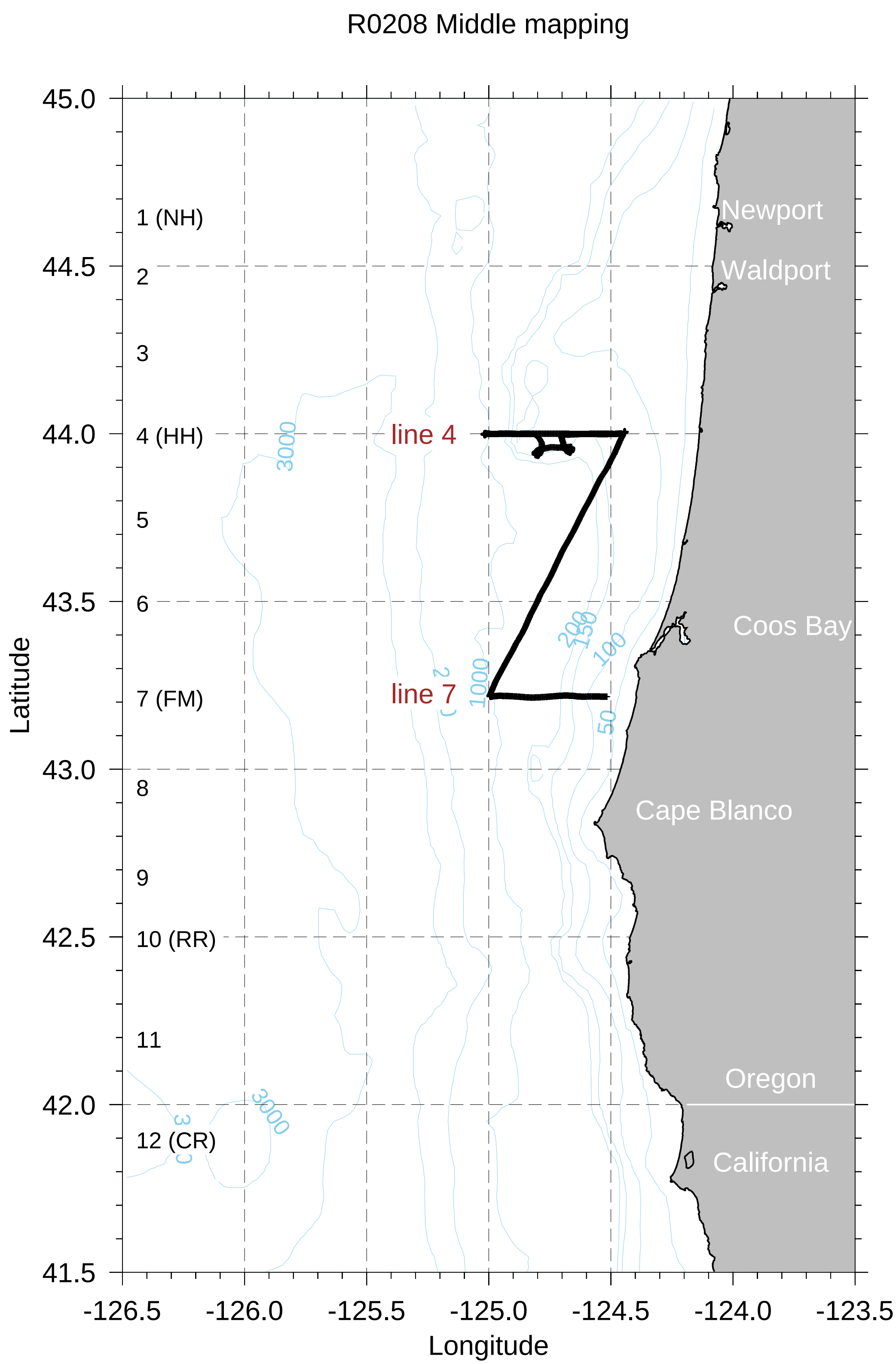

Figure 4c: Cruise tracks during the R0208 SeaSoar surveys. See table 7 for individual line start and stop times.

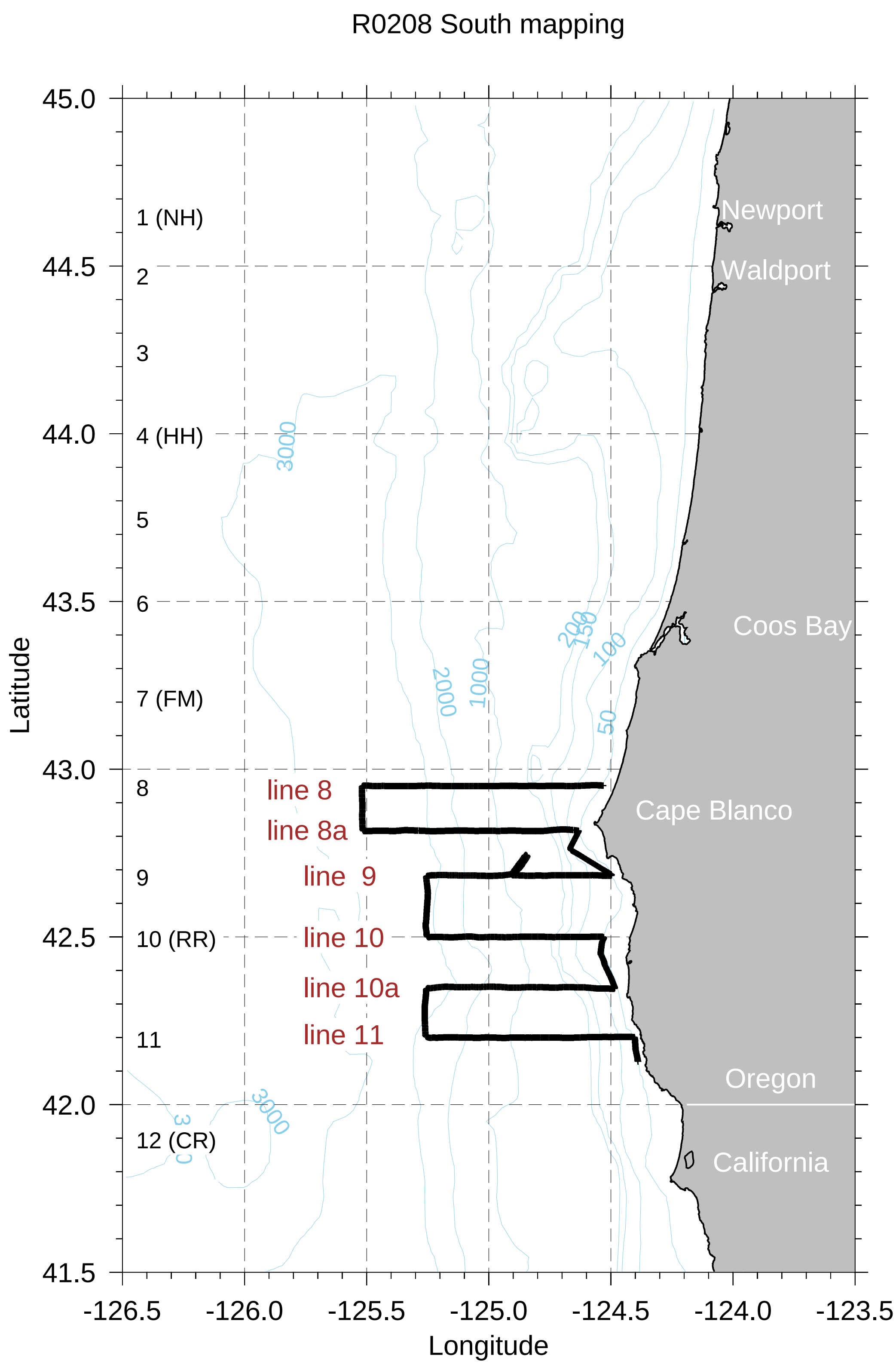

Figure 4d: Cruise tracks during the R0208 SeaSoar surveys. See table 7 for individual line start and stop times.

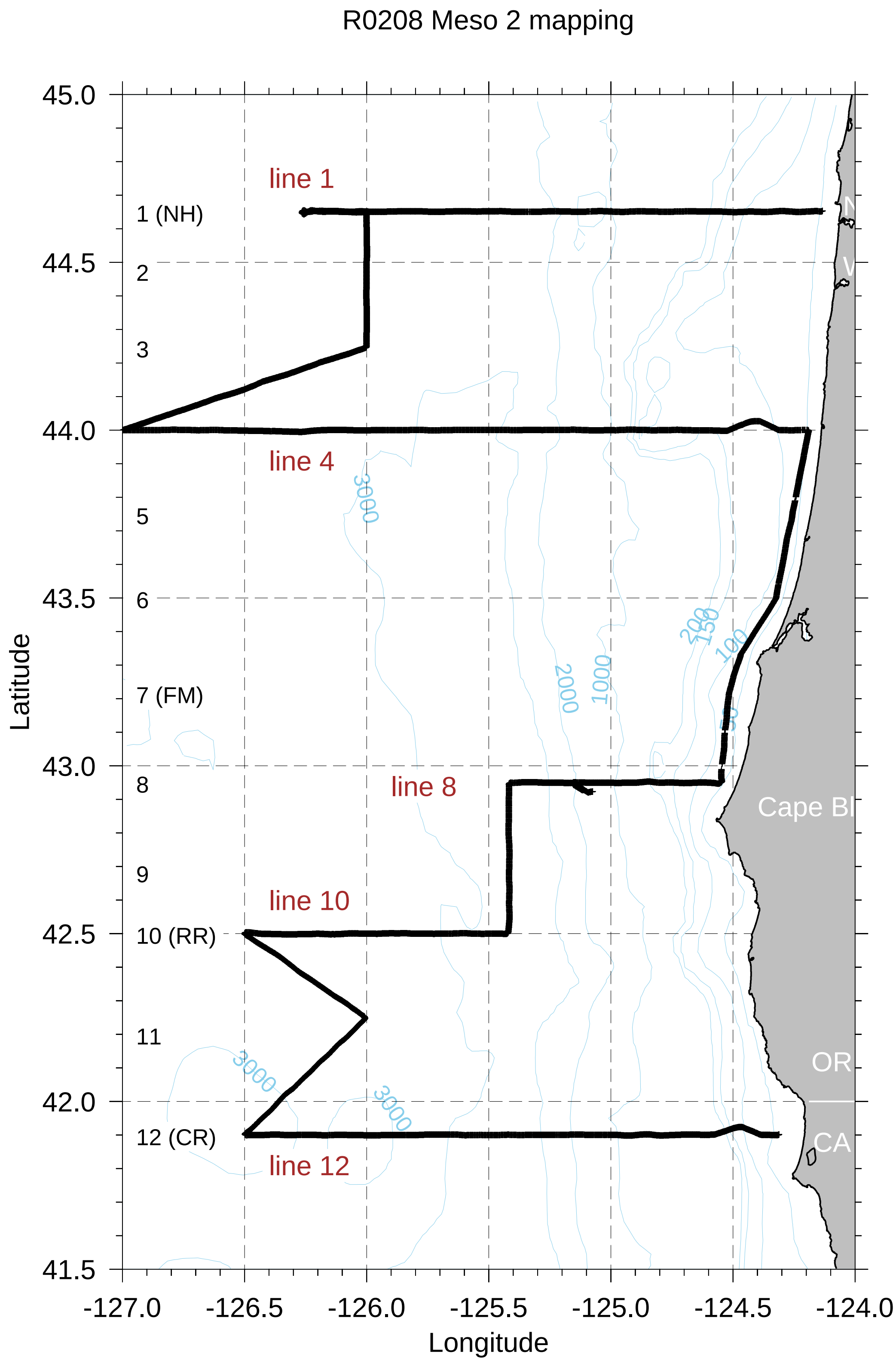

Figure 4e: Cruise tracks during the R0208 SeaSoar surveys. See table 7 for individual line start and stop times.

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 1.25-km, 2-db averaged data.

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 Roger Revelle* 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.

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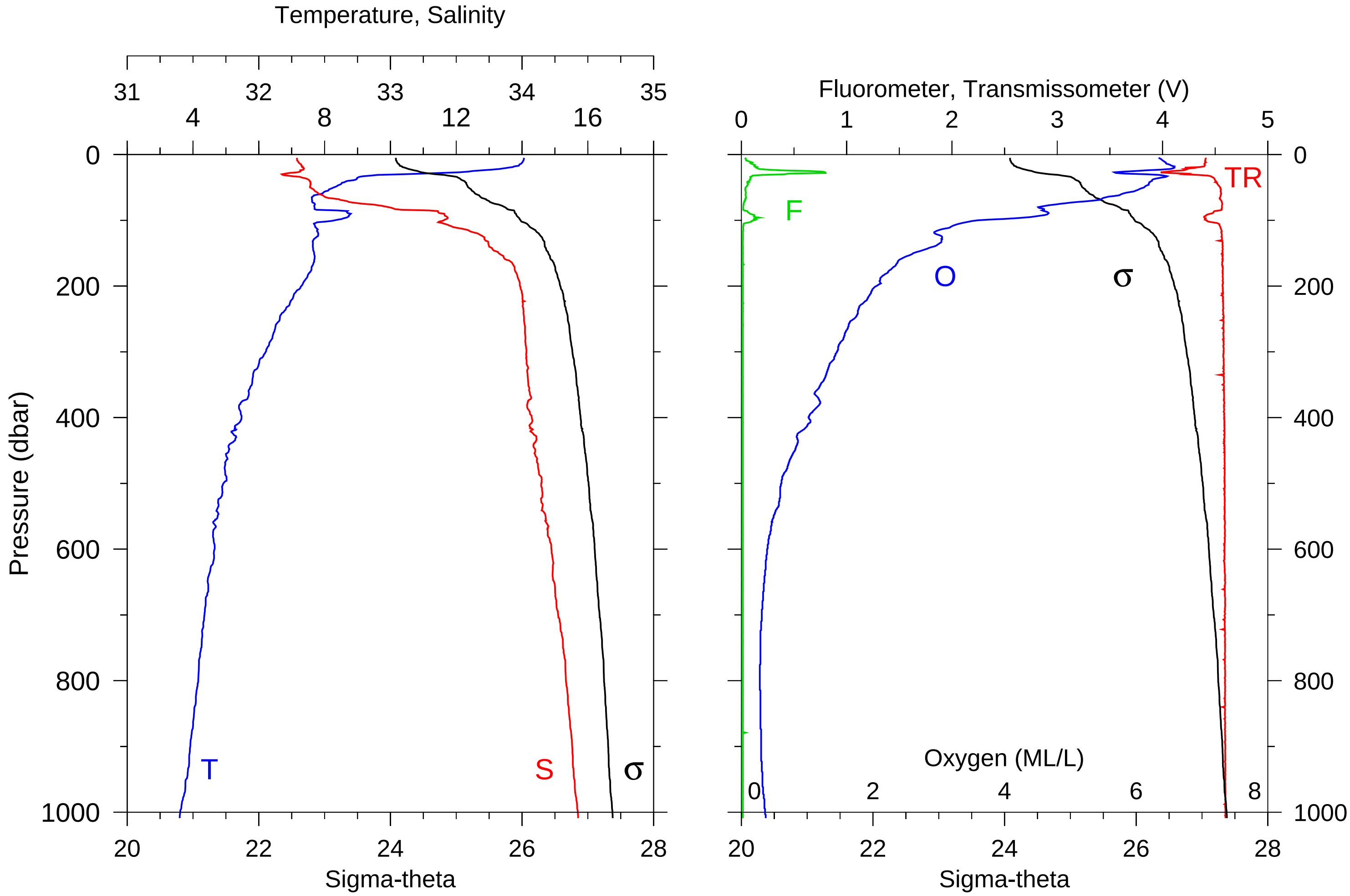
CTD Data

Profiles of Temperature, Salinity, and Density Anomaly

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

Tabulated Values at Standard Depths

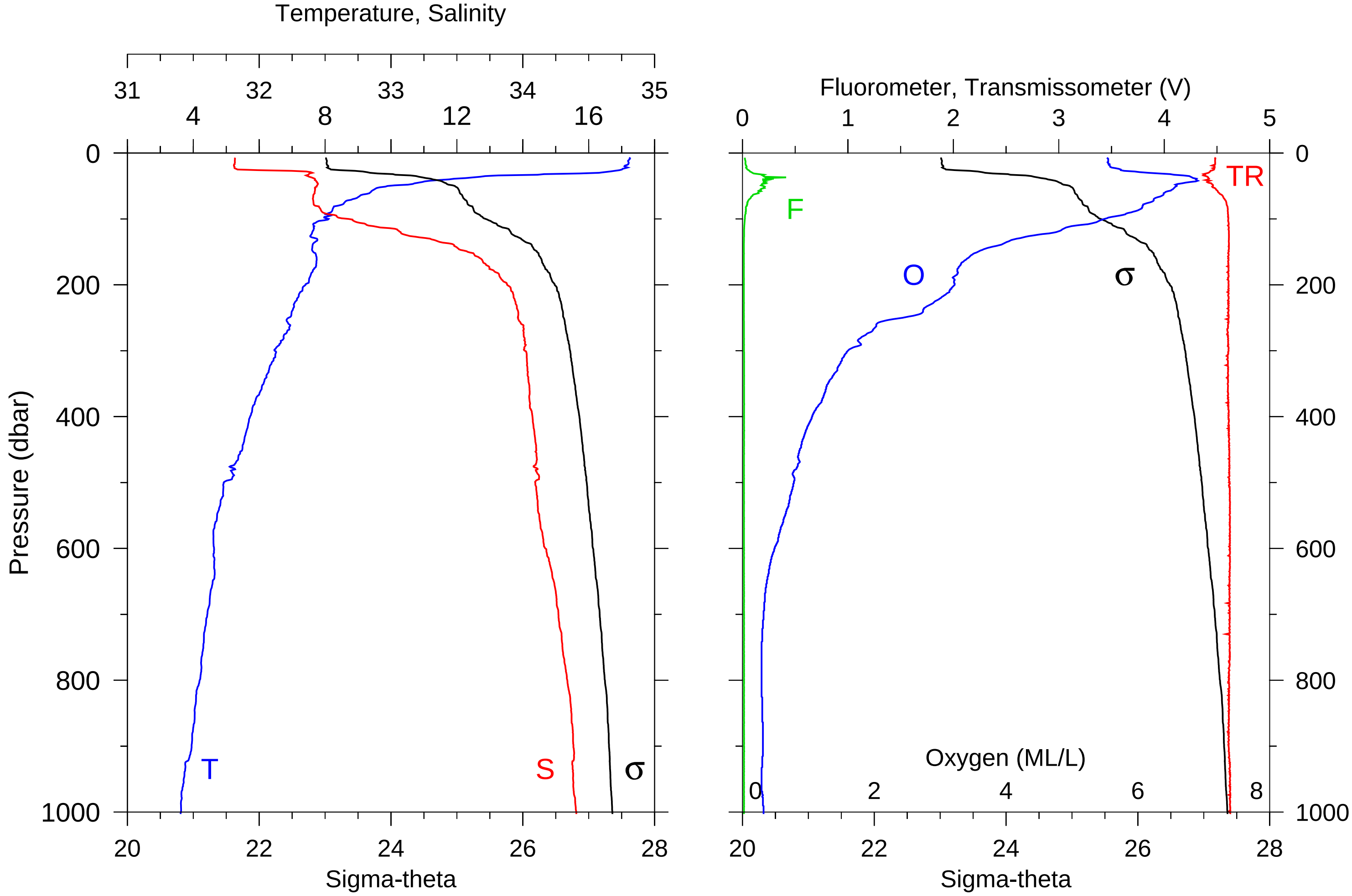
Station 1



STA NO 1 LAT: 42 43.5 N LONG: 125 51.0 W
07 AUG 2002 1735 GMT DEPTH 3000

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
5	14.058	32.290	14.057	24.083	0.191	0.05	4.41
10	14.032	32.296	14.031	24.092	0.382	0.06	4.41
20	13.584	32.336	13.582	24.215	0.760	0.15	4.31
30	10.280	32.192	10.276	24.713	1.110	0.32	4.28
40	8.760	32.387	8.756	25.111	1.408	0.07	4.50
50	8.285	32.393	8.281	25.187	1.689	0.04	4.55
60	7.859	32.462	7.853	25.303	1.961	0.04	4.55
70	7.617	32.646	7.611	25.481	2.220	0.03	4.56
80	7.691	32.984	7.683	25.736	2.458	0.02	4.56
90	8.736	33.392	8.727	25.902	2.675	0.09	4.45
100	8.301	33.402	8.291	25.976	2.883	0.12	4.41
110	7.725	33.480	7.714	26.122	3.079	0.02	4.55
120	7.802	33.658	7.790	26.250	3.262	0.01	4.56
130	7.658	33.719	7.646	26.320	3.437	0.01	4.55
140	7.642	33.754	7.629	26.349	3.606	0.01	4.57
150	7.681	33.825	7.666	26.400	3.773	0.01	4.57
175	7.601	33.945	7.584	26.506	4.170	0.01	4.57
200	7.293	33.986	7.273	26.582	4.547	0.01	4.57
225	6.948	34.006	6.927	26.646	4.908	0.01	4.57
250	6.636	34.015	6.614	26.695	5.257	0.01	4.58
275	6.425	34.025	6.401	26.731	5.596	0.01	4.58
300	6.210	34.034	6.184	26.765	5.928	0.01	4.58
350	5.785	34.048	5.756	26.831	6.568	0.01	4.58
400	5.474	34.074	5.441	26.890	7.180	0.01	4.59
450	5.089	34.100	5.053	26.955	7.766	0.01	4.59
500	4.925	34.146	4.887	27.011	8.324	0.01	4.59
600	4.655	34.223	4.609	27.104	9.377	0.01	4.59
700	4.347	34.274	4.294	27.179	10.361	0.01	4.59
800	4.159	34.333	4.099	27.246	11.275	0.01	4.59
900	3.916	34.381	3.849	27.309	12.139	0.01	4.60
1007	3.596	34.426	3.523	27.377	13.009	0.01	4.60

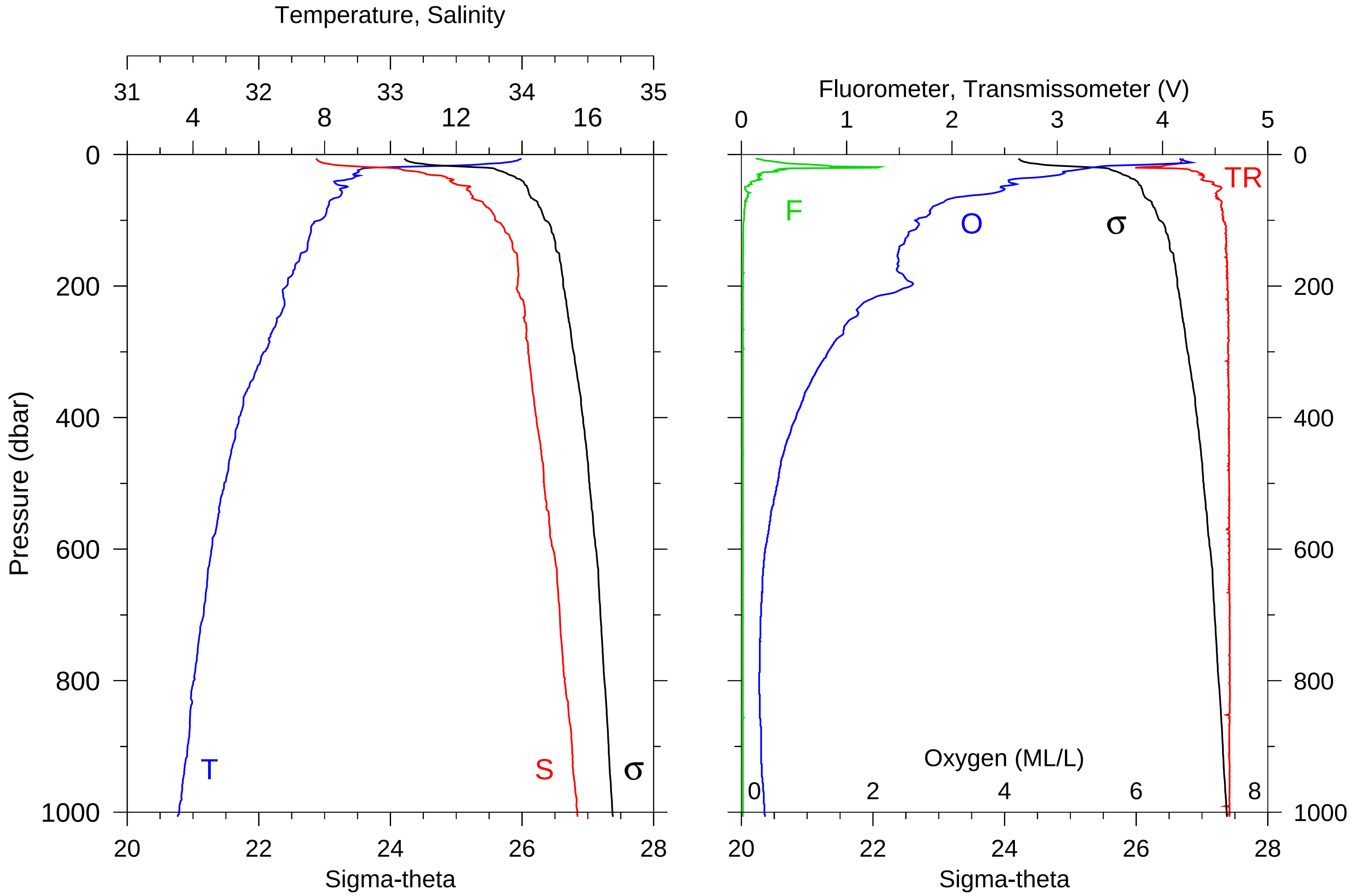
Station 2



STA NO 2 LAT: 42 43.5 N LONG: 126 4.5 W
07 AUG 2002 2119 GMT DEPTH 2357

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
7	17.224	31.817	17.222	23.022	0.339	0.02	4.48
10	17.228	31.816	17.226	23.021	0.484	0.02	4.48
20	17.107	31.811	17.104	23.044	0.967	0.04	4.46
30	16.103	32.385	16.098	23.715	1.429	0.09	4.41
40	11.675	32.422	11.670	24.648	1.794	0.26	4.41
50	9.972	32.438	9.967	24.958	2.108	0.19	4.46
60	9.368	32.421	9.362	25.042	2.402	0.15	4.52
70	8.854	32.408	8.847	25.112	2.691	0.07	4.57
80	8.366	32.435	8.358	25.208	2.971	0.04	4.60
90	8.156	32.484	8.148	25.277	3.244	0.03	4.60
100	8.054	32.667	8.044	25.435	3.507	0.02	4.61
110	7.656	32.840	7.646	25.629	3.752	0.02	4.61
120	7.614	33.069	7.602	25.815	3.977	0.01	4.61
130	7.726	33.285	7.713	25.969	4.191	0.01	4.61
140	7.621	33.478	7.608	26.135	4.387	0.01	4.61
150	7.642	33.587	7.628	26.219	4.573	0.01	4.61
175	7.669	33.748	7.652	26.341	5.013	0.01	4.61
200	7.398	33.884	7.378	26.487	5.420	0.01	4.61
225	7.106	33.943	7.085	26.575	5.801	0.01	4.61
250	6.898	33.965	6.875	26.620	6.168	0.01	4.61
275	6.769	34.006	6.744	26.671	6.523	0.01	4.59
300	6.482	34.017	6.455	26.718	6.868	0.01	4.61
350	6.129	34.047	6.099	26.787	7.534	0.01	4.60
400	5.724	34.074	5.691	26.859	8.168	0.01	4.61
450	5.486	34.103	5.449	26.911	8.773	0.01	4.62
500	4.931	34.094	4.891	26.970	9.354	0.01	4.62
600	4.630	34.173	4.585	27.066	10.446	0.01	4.62
700	4.426	34.271	4.372	27.167	11.451	0.01	4.62
800	4.196	34.337	4.135	27.245	12.379	0.01	4.61
900	3.949	34.384	3.882	27.308	13.240	0.01	4.61
1001	3.622	34.406	3.549	27.359	14.064	0.01	4.62

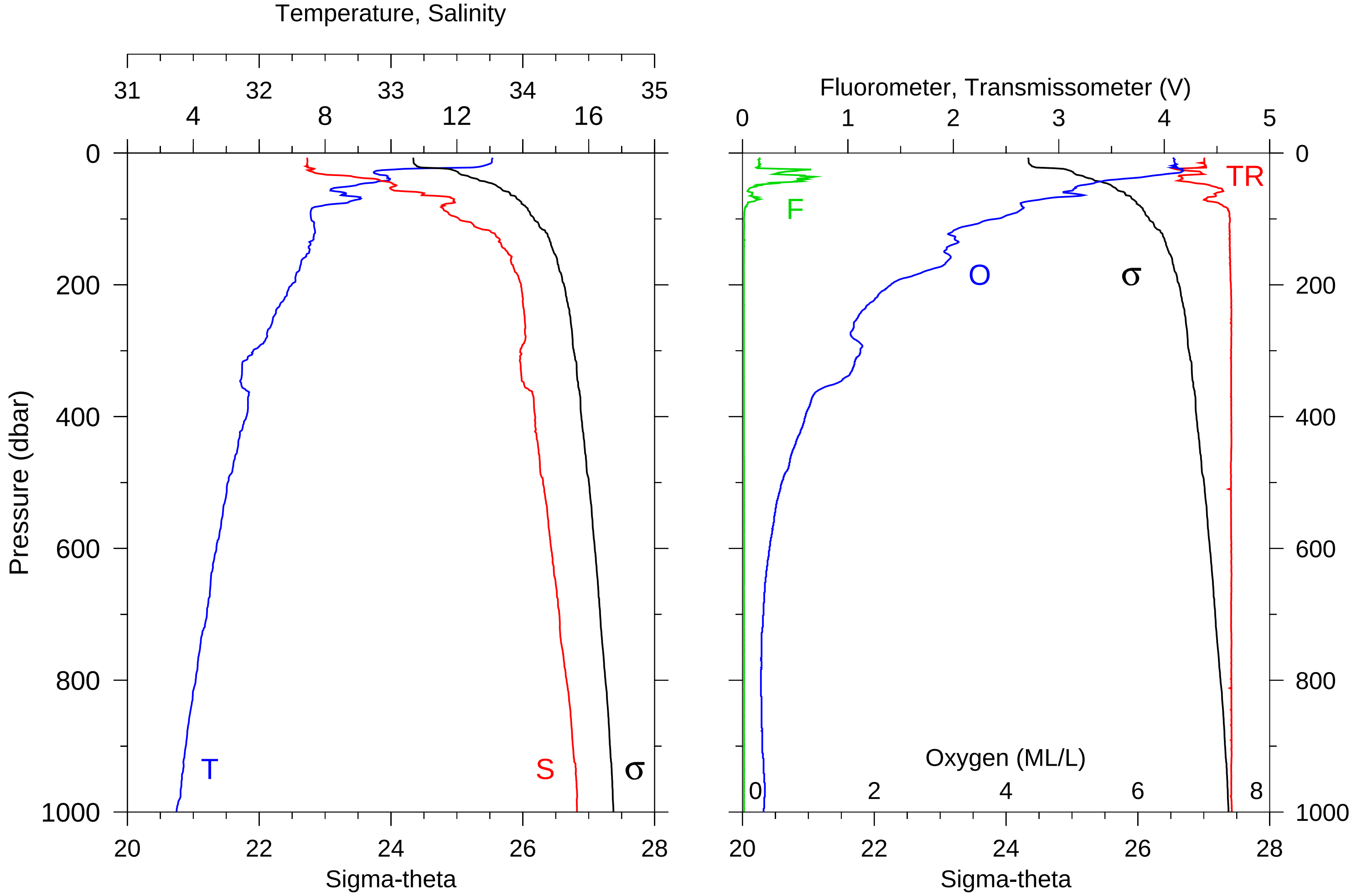
Station 3



STA NO 3 LAT: 42 43.5 N LONG: 125 37.5 W
08 AUG 2002 0044 GMT DEPTH 3075

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
6	13.978	32.435	13.977	24.211	0.222	0.14	4.20
10	13.768	32.457	13.767	24.271	0.369	0.28	4.18
20	9.419	32.975	9.417	25.467	0.696	1.29	3.74
30	8.871	33.270	8.867	25.784	0.928	0.16	4.38
40	8.384	33.452	8.380	26.002	1.137	0.13	4.41
50	8.652	33.599	8.647	26.077	1.334	0.04	4.56
60	8.510	33.611	8.504	26.108	1.525	0.06	4.51
70	8.160	33.672	8.154	26.209	1.713	0.04	4.55
80	8.098	33.731	8.090	26.264	1.891	0.03	4.56
90	8.045	33.780	8.036	26.311	2.064	0.03	4.57
100	7.845	33.795	7.835	26.352	2.234	0.02	4.58
110	7.591	33.858	7.581	26.438	2.397	0.02	4.60
120	7.574	33.887	7.562	26.464	2.556	0.02	4.59
130	7.513	33.917	7.500	26.496	2.712	0.02	4.61
140	7.482	33.928	7.469	26.509	2.866	0.02	4.60
150	7.283	33.960	7.269	26.562	3.018	0.01	4.61
175	7.074	33.971	7.057	26.600	3.386	0.02	4.61
200	6.845	33.964	6.827	26.626	3.746	0.01	4.62
225	6.783	34.013	6.762	26.673	4.099	0.01	4.62
250	6.553	34.017	6.531	26.708	4.444	0.01	4.62
275	6.357	34.033	6.332	26.747	4.780	0.01	4.63
300	6.167	34.045	6.141	26.780	5.108	0.01	4.62
350	5.723	34.076	5.693	26.861	5.739	0.01	4.63
400	5.394	34.109	5.361	26.927	6.337	0.01	4.63
450	5.162	34.147	5.126	26.984	6.909	0.01	4.63
500	4.949	34.168	4.910	27.026	7.459	0.01	4.64
600	4.568	34.236	4.522	27.124	8.499	0.01	4.64
700	4.322	34.287	4.269	27.191	9.460	0.01	4.64
800	4.024	34.324	3.965	27.252	10.371	0.01	4.64
900	3.835	34.380	3.769	27.316	11.226	0.01	4.64
1006	3.536	34.422	3.464	27.380	12.078	0.01	4.64

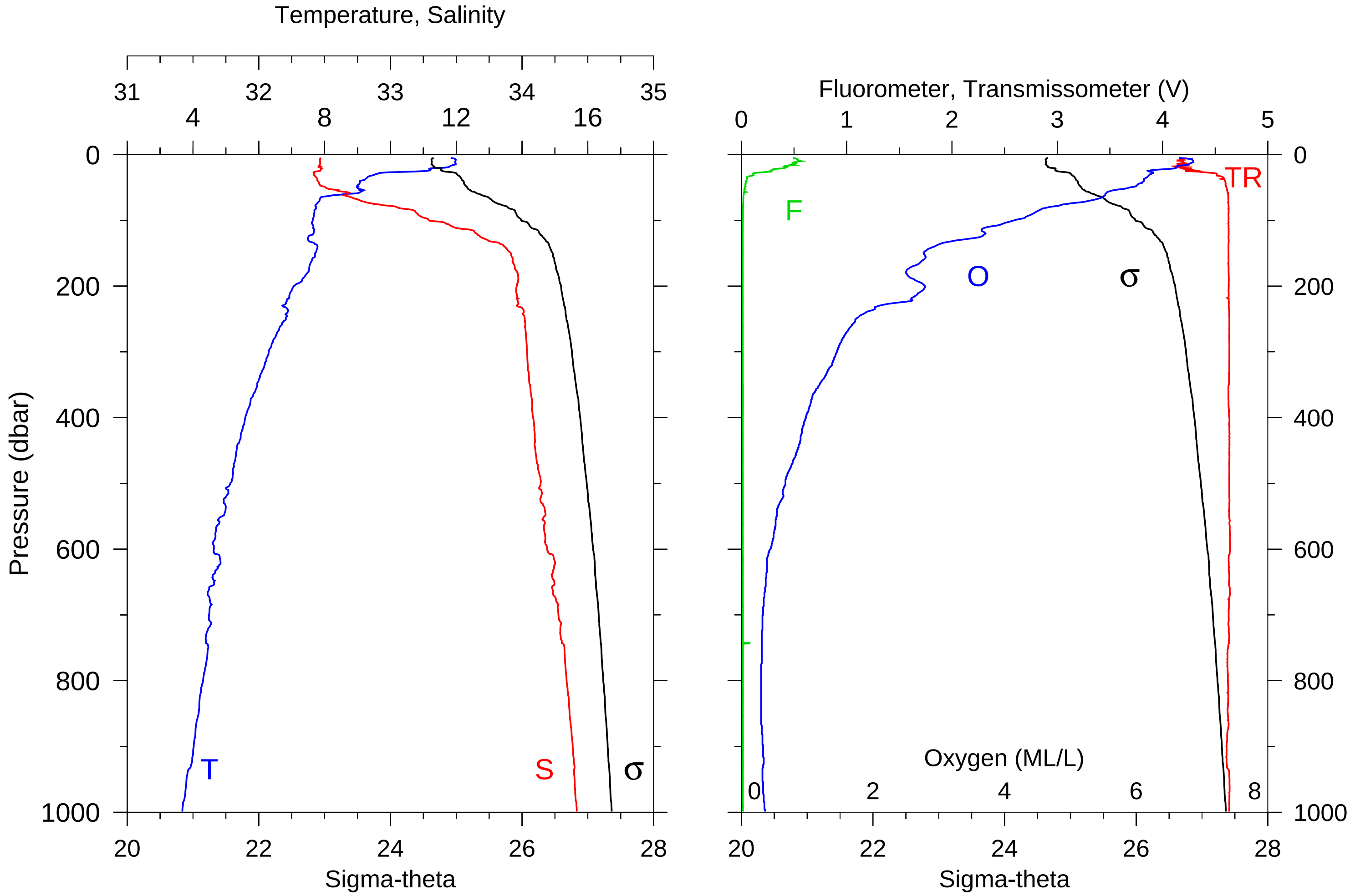
Station 4



STA NO 4 LAT: 42 44.1 N LONG: 125 24.0 W
08 AUG 2002 0422 GMT DEPTH 3077

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
7	13.081	32.365	13.080	24.337	0.251	0.16	4.38
10	13.066	32.366	13.065	24.340	0.358	0.16	4.38
20	12.748	32.368	12.745	24.404	0.715	0.15	4.38
30	9.493	32.427	9.490	25.027	1.028	0.35	4.35
40	9.962	32.894	9.958	25.315	1.309	0.53	4.16
50	8.806	33.029	8.802	25.606	1.560	0.15	4.45
60	8.554	33.222	8.548	25.796	1.790	0.08	4.51
70	9.010	33.472	9.003	25.922	2.004	0.13	4.39
80	7.891	33.389	7.882	26.026	2.208	0.04	4.56
90	7.562	33.430	7.554	26.105	2.402	0.02	4.62
100	7.578	33.516	7.569	26.171	2.590	0.01	4.62
110	7.663	33.629	7.653	26.248	2.772	0.02	4.62
120	7.696	33.762	7.684	26.347	2.945	0.01	4.62
130	7.650	33.821	7.638	26.401	3.112	0.01	4.62
140	7.538	33.838	7.525	26.431	3.274	0.02	4.62
150	7.519	33.882	7.505	26.468	3.433	0.01	4.62
175	7.233	33.932	7.217	26.548	3.817	0.01	4.63
200	6.985	33.987	6.966	26.625	4.184	0.01	4.63
225	6.717	33.999	6.697	26.671	4.537	0.01	4.64
250	6.422	34.014	6.400	26.723	4.880	0.01	4.64
275	6.234	34.017	6.210	26.750	5.213	0.01	4.64
300	5.821	33.981	5.796	26.773	5.542	0.01	4.63
350	5.455	34.009	5.427	26.840	6.177	0.01	4.63
400	5.612	34.093	5.579	26.889	6.787	0.01	4.64
450	5.337	34.119	5.300	26.942	7.378	0.01	4.64
500	5.046	34.154	5.007	27.004	7.945	0.01	4.63
600	4.701	34.215	4.656	27.092	9.009	0.01	4.64
700	4.413	34.277	4.359	27.173	9.997	0.01	4.63
800	4.072	34.333	4.012	27.253	10.918	0.01	4.64
900	3.773	34.381	3.707	27.323	11.767	0.02	4.64
999	3.492	34.411	3.420	27.375	12.555	0.01	4.64

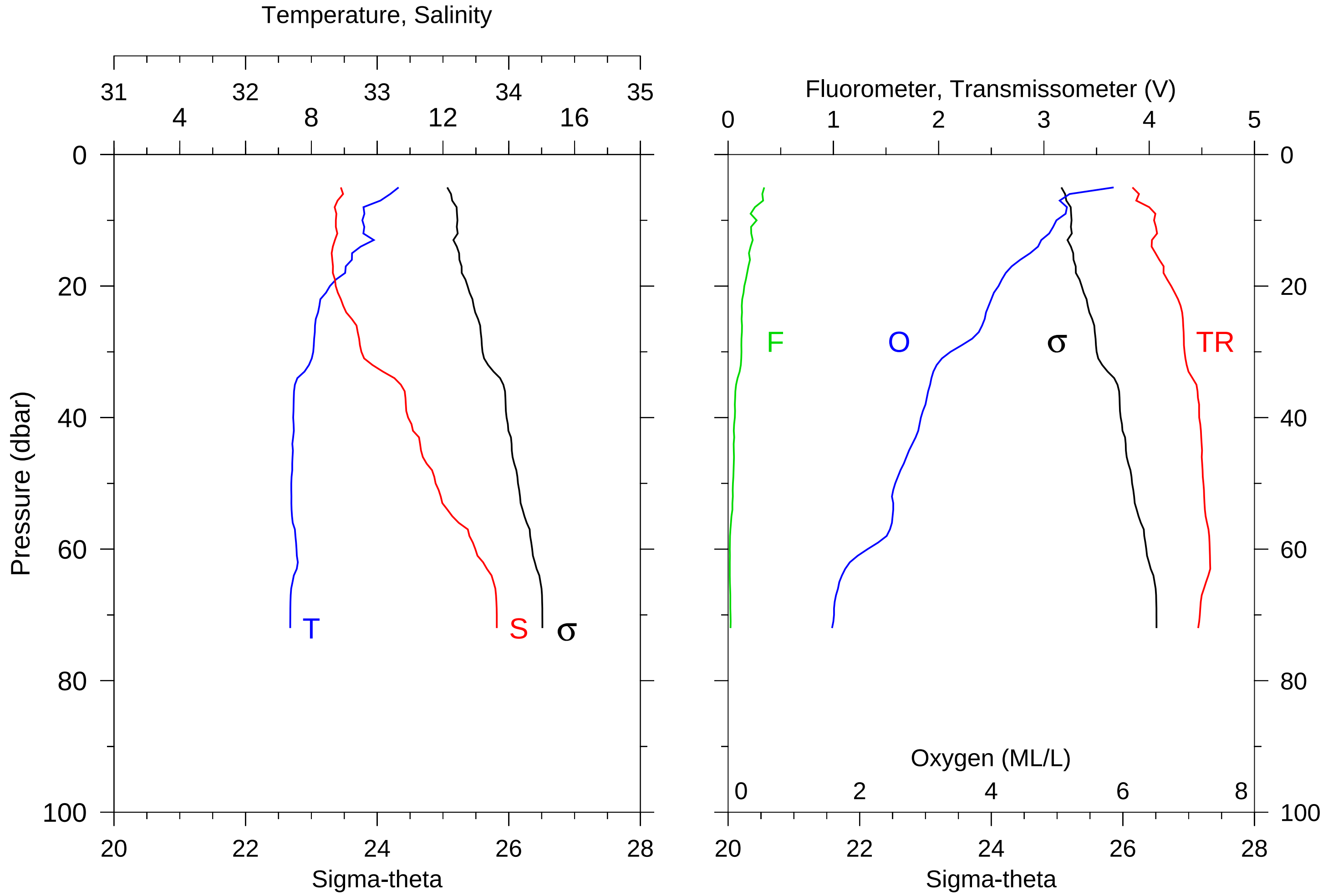
Station 5



STA NO 5 LAT: 42 43.5 N LONG: 125 10.5 W
08 AUG 2002 0804 GMT DEPTH 2944

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
5	11.833	32.471	11.832	24.657	0.164	0.49	4.23
10	11.972	32.465	11.971	24.627	0.329	0.53	4.17
20	11.498	32.468	11.496	24.716	0.658	0.41	4.21
30	9.564	32.421	9.561	25.010	0.967	0.11	4.51
40	9.124	32.449	9.120	25.103	1.257	0.04	4.59
50	9.012	32.507	9.007	25.165	1.541	0.03	4.61
60	8.736	32.676	8.730	25.340	1.814	0.02	4.62
70	7.844	32.772	7.837	25.548	2.065	0.02	4.63
80	7.736	33.049	7.728	25.782	2.299	0.02	4.63
90	7.681	33.205	7.673	25.912	2.513	0.01	4.63
100	7.639	33.296	7.628	25.990	2.720	0.01	4.63
110	7.656	33.479	7.646	26.131	2.913	0.01	4.63
120	7.660	33.652	7.648	26.267	3.095	0.01	4.63
130	7.500	33.736	7.487	26.355	3.266	0.01	4.63
140	7.780	33.867	7.767	26.418	3.431	0.01	4.63
150	7.716	33.913	7.701	26.465	3.591	0.01	4.63
175	7.530	33.949	7.513	26.520	3.980	0.01	4.63
200	7.074	33.961	7.055	26.592	4.354	0.01	4.63
225	6.825	33.972	6.805	26.635	4.717	0.01	4.63
250	6.821	34.021	6.799	26.675	5.070	0.01	4.64
275	6.521	34.030	6.497	26.723	5.412	0.01	4.63
300	6.302	34.038	6.275	26.757	5.746	0.01	4.63
350	5.952	34.060	5.922	26.819	6.394	0.01	4.63
400	5.589	34.084	5.556	26.884	7.012	0.01	4.63
450	5.324	34.102	5.288	26.930	7.607	0.01	4.64
500	5.137	34.141	5.097	26.983	8.181	0.01	4.63
600	4.633	34.192	4.587	27.080	9.259	0.01	4.64
700	4.487	34.277	4.434	27.165	10.258	0.01	4.63
800	4.305	34.339	4.245	27.235	11.194	0.01	4.62
900	4.021	34.385	3.955	27.302	12.069	0.01	4.61
997	3.677	34.416	3.604	27.362	12.864	0.01	4.63

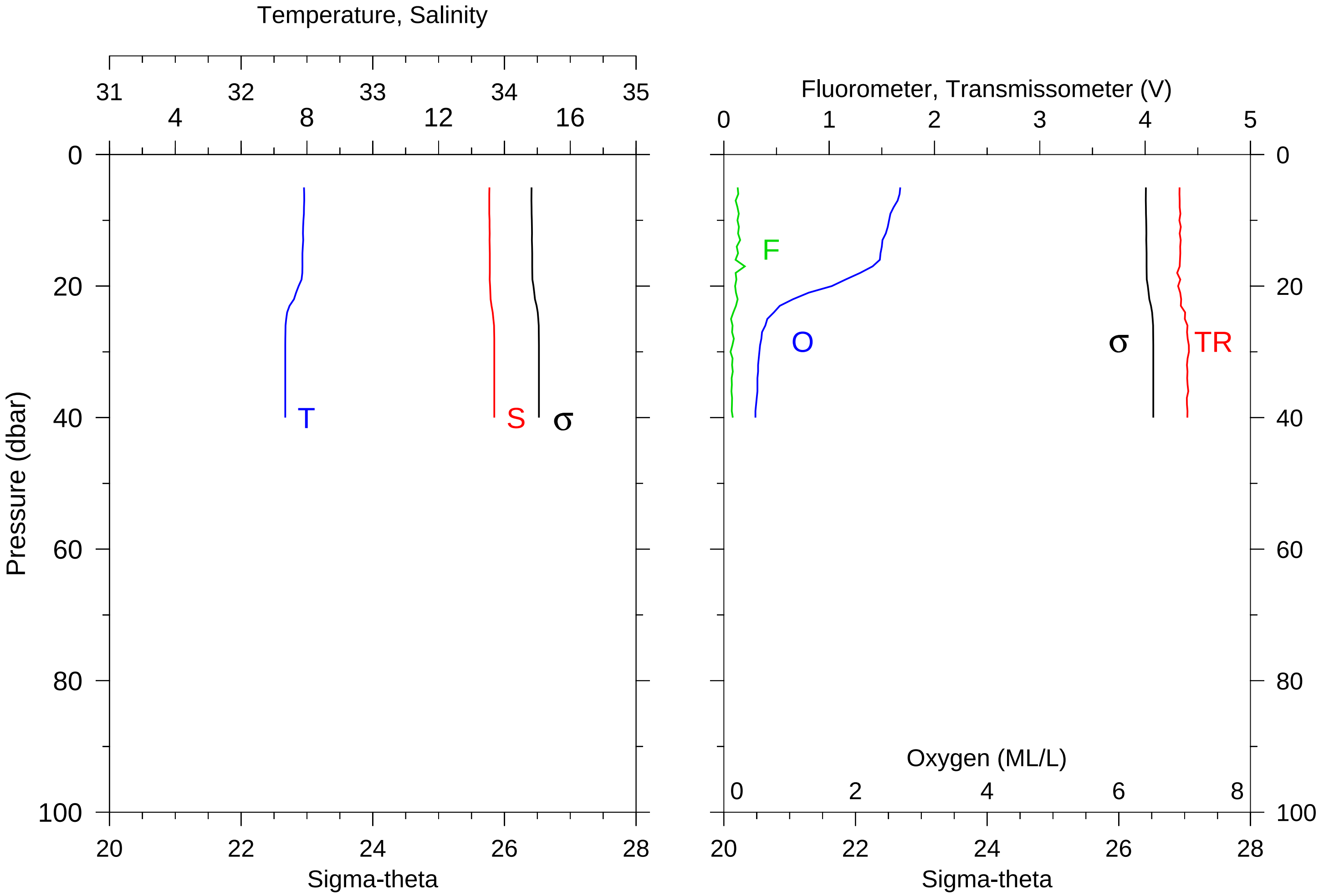
Station 6



STA NO 6 LAT: 44 38.2 N LONG: 124 15.3 W
09 AUG 2002 0302 GMT DEPTH 74

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
5	10.651	32.724	10.651	25.065	0.144	0.34	3.84
10	9.611	32.688	9.609	25.211	0.284	0.22	4.06
20	8.597	32.690	8.594	25.372	0.555	0.16	4.21
30	8.042	32.885	8.039	25.608	0.801	0.13	4.34
40	7.458	33.241	7.455	25.971	1.016	0.06	4.48
50	7.393	33.451	7.389	26.145	1.211	0.05	4.51
60	7.546	33.744	7.540	26.354	1.389	0.02	4.57
70	7.359	33.909	7.352	26.510	1.546	0.02	4.48
71	7.358	33.909	7.351	26.511	1.561	0.02	4.47

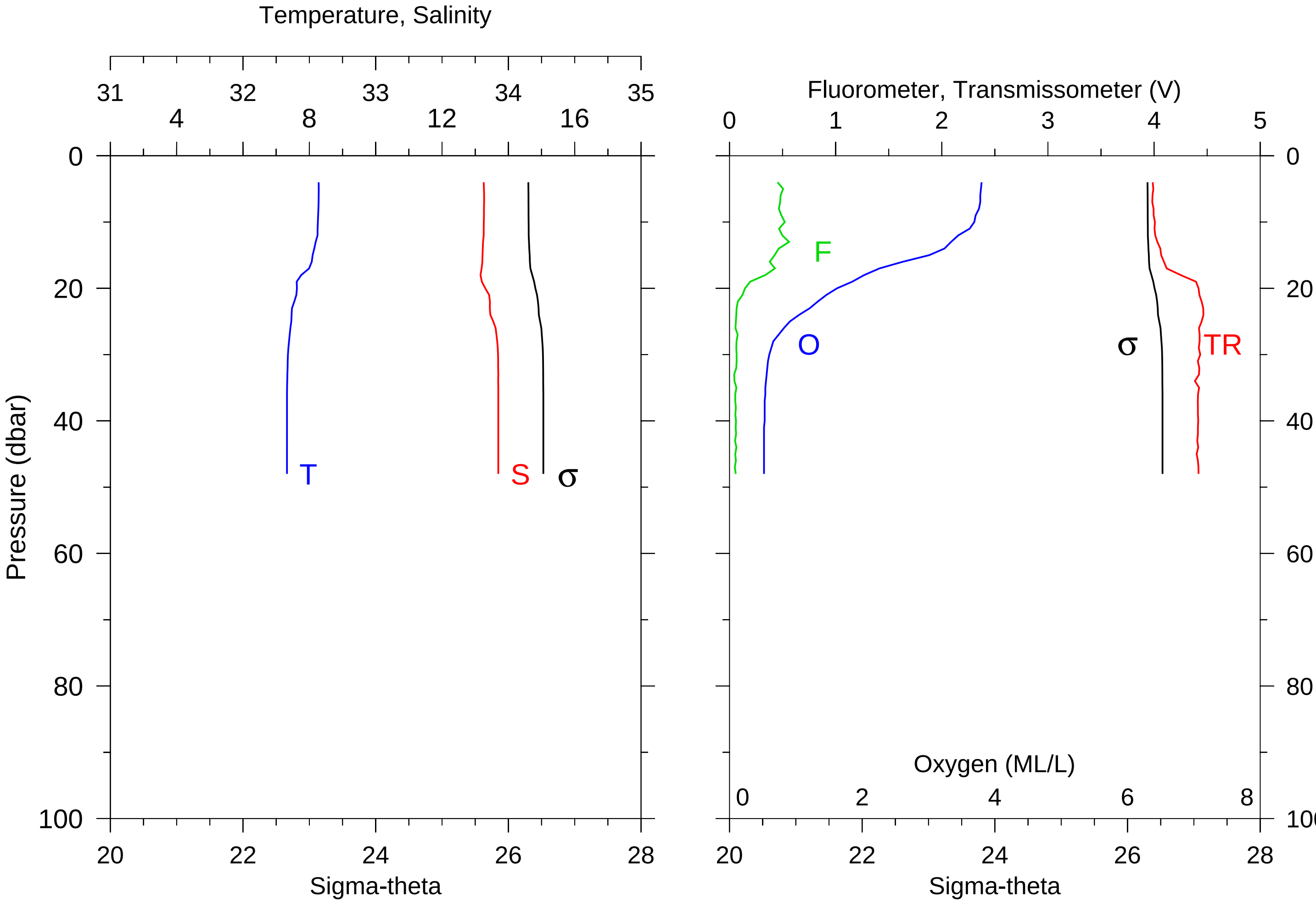
Station 7



STA NO 7 LAT: 44 15.0 N LONG: 124 9.0 W
11 AUG 2002 0916 GMT DEPTH 45

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
5	7.910	33.886	7.909	26.412	0.080	0.13	4.33
10	7.895	33.886	7.894	26.416	0.161	0.14	4.34
20	7.753	33.891	7.751	26.439	0.321	0.12	4.33
30	7.341	33.923	7.338	26.524	0.473	0.08	4.41
39	7.341	33.923	7.337	26.524	0.609	0.08	4.40

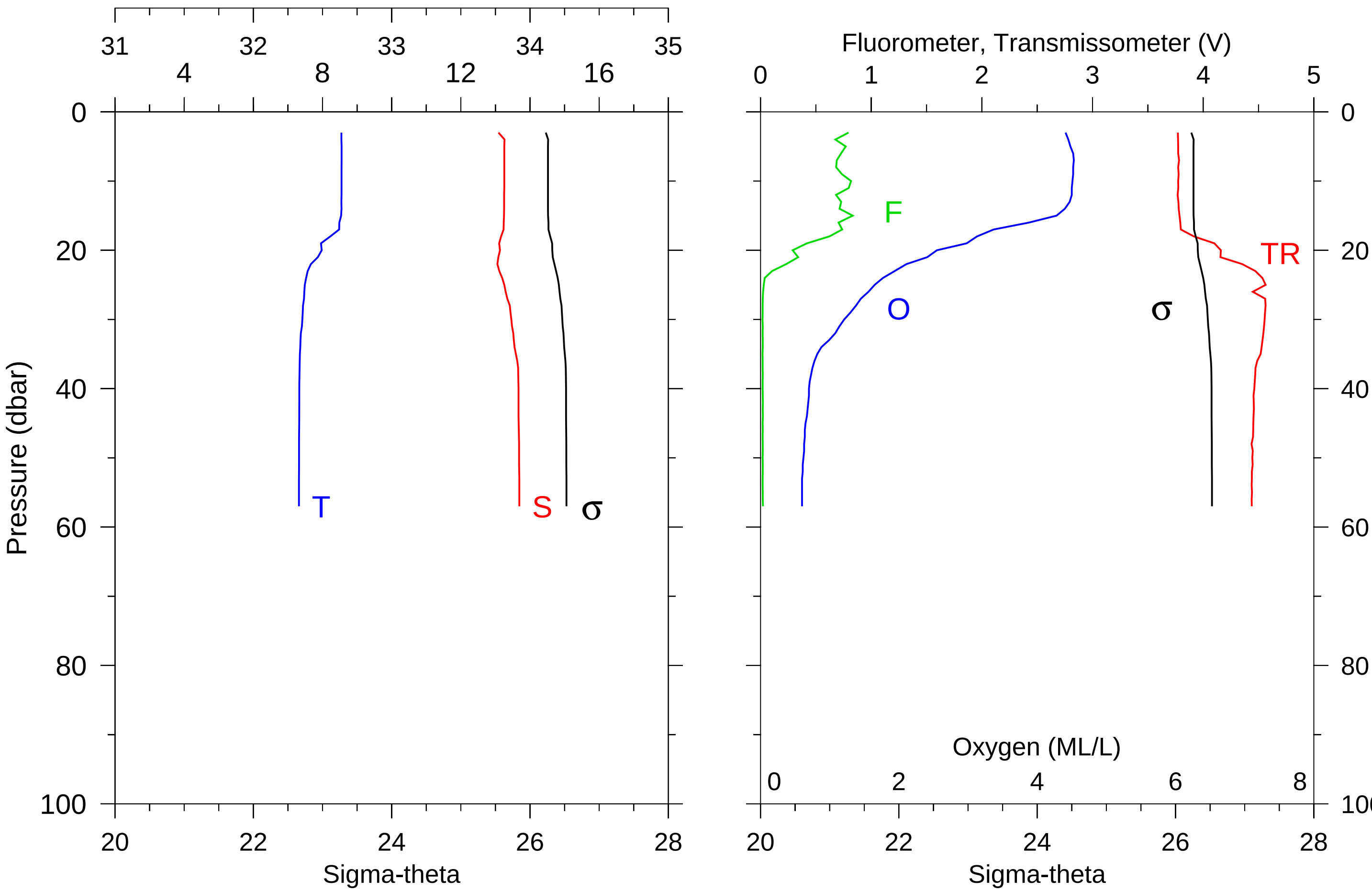
Station 8



STA NO 8 LAT: 44 15.0 N LONG: 124 10.2 W
11 AUG 2002 1101 GMT DEPTH 54

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
4	8.281	33.814	8.281	26.301	0.068	0.45	3.99
10	8.257	33.815	8.256	26.305	0.171	0.52	4.01
20	7.626	33.826	7.624	26.407	0.339	0.15	4.42
30	7.354	33.922	7.351	26.521	0.494	0.07	4.43
40	7.326	33.924	7.322	26.527	0.645	0.06	4.42
46	7.325	33.924	7.321	26.527	0.735	0.06	4.41

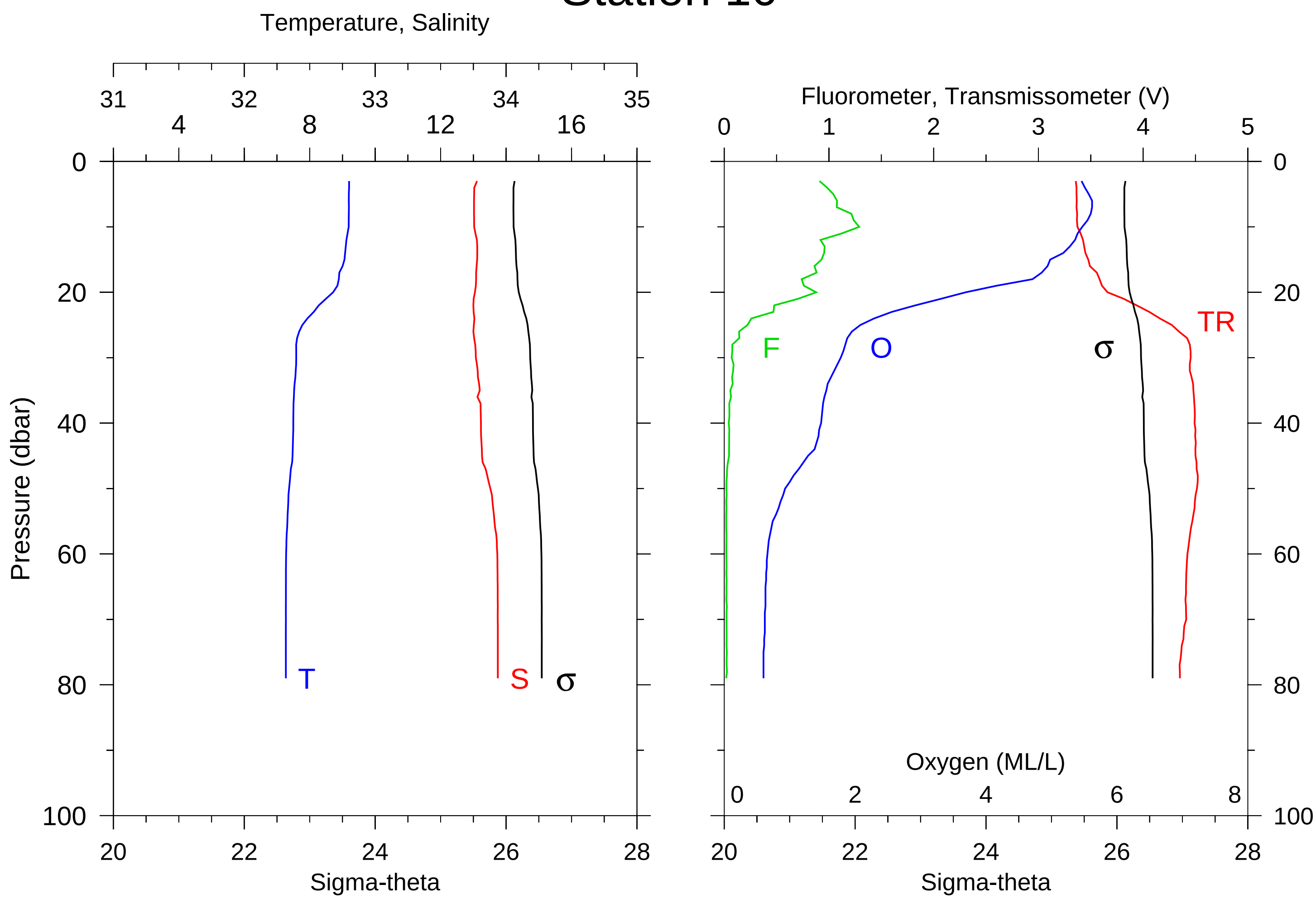
Station 9



STA NO 9 LAT: 44 15.0 N LONG: 124 12.5 W
11 AUG 2002 1228 GMT DEPTH 64

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	8.546	33.772	8.546	26.228	0.053	0.80	3.77
10	8.550	33.814	8.549	26.260	0.176	0.77	3.78
20	7.910	33.774	7.908	26.325	0.350	0.38	4.13
30	7.416	33.865	7.413	26.467	0.512	0.02	4.55
40	7.329	33.917	7.325	26.521	0.664	0.02	4.46
50	7.321	33.921	7.316	26.525	0.815	0.02	4.45
55	7.319	33.923	7.314	26.527	0.891	0.02	4.44

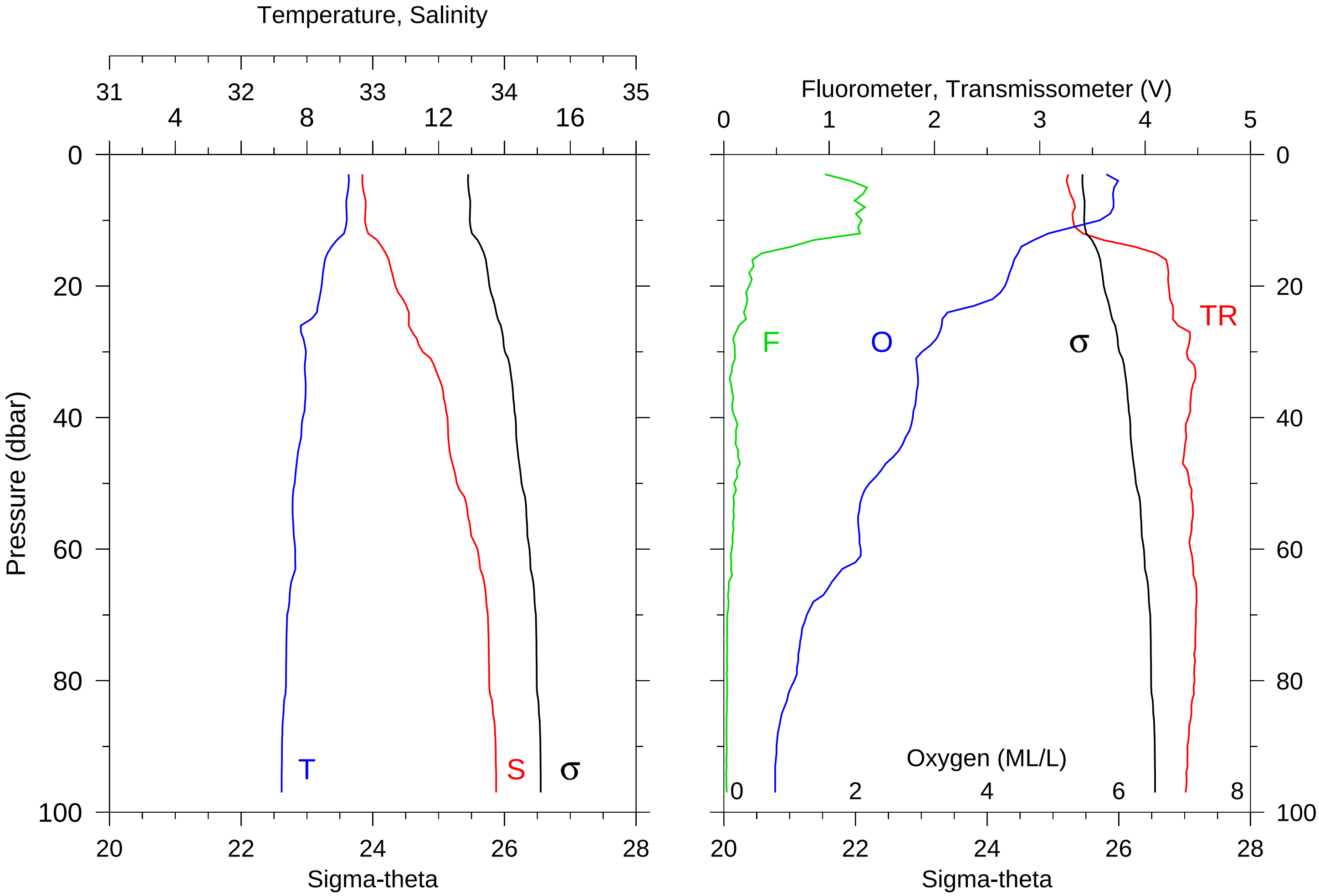
Station 10



STA NO 10 LAT: 44 15.0 N LONG: 124 19.1 W
11 AUG 2002 1354 GMT DEPTH 79

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	9.202	33.778	9.202	26.130	0.056	0.91	3.36
10	9.174	33.761	9.172	26.121	0.189	1.18	3.39
20	8.670	33.760	8.668	26.200	0.373	0.73	3.71
30	7.586	33.772	7.583	26.371	0.544	0.08	4.45
40	7.498	33.807	7.494	26.410	0.707	0.05	4.50
50	7.370	33.880	7.365	26.486	0.867	0.02	4.51
60	7.280	33.932	7.275	26.540	1.018	0.02	4.43
70	7.271	33.937	7.264	26.545	1.167	0.02	4.40
77	7.271	33.937	7.264	26.545	1.271	0.02	4.35

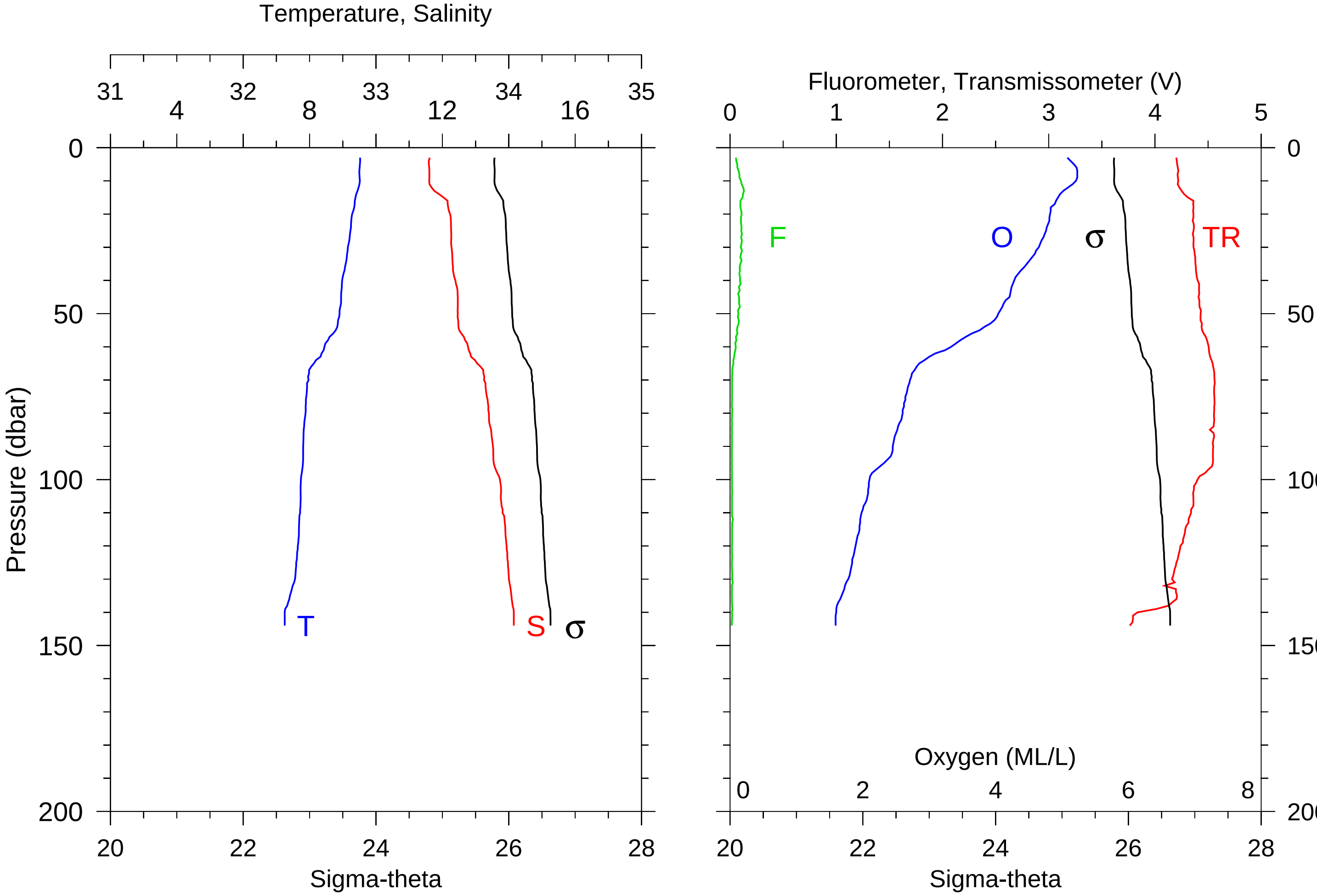
Station 11



STA NO 11 LAT: 44 15.0 N LONG: 124 27.0 W
11 AUG 2002 1539 GMT DEPTH 97

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	9.265	32.922	9.265	25.450	0.076	0.96	3.27
10	9.194	32.946	9.193	25.480	0.251	1.26	3.32
20	8.438	33.176	8.436	25.778	0.484	0.24	4.22
30	7.945	33.395	7.943	26.022	0.694	0.10	4.41
40	7.884	33.563	7.880	26.163	0.883	0.11	4.41
50	7.616	33.645	7.611	26.266	1.065	0.12	4.43
60	7.634	33.788	7.628	26.377	1.234	0.08	4.43
70	7.417	33.871	7.411	26.473	1.394	0.04	4.48
80	7.362	33.884	7.354	26.491	1.549	0.03	4.46
90	7.242	33.933	7.234	26.546	1.700	0.03	4.41
95	7.231	33.937	7.223	26.551	1.774	0.02	4.39

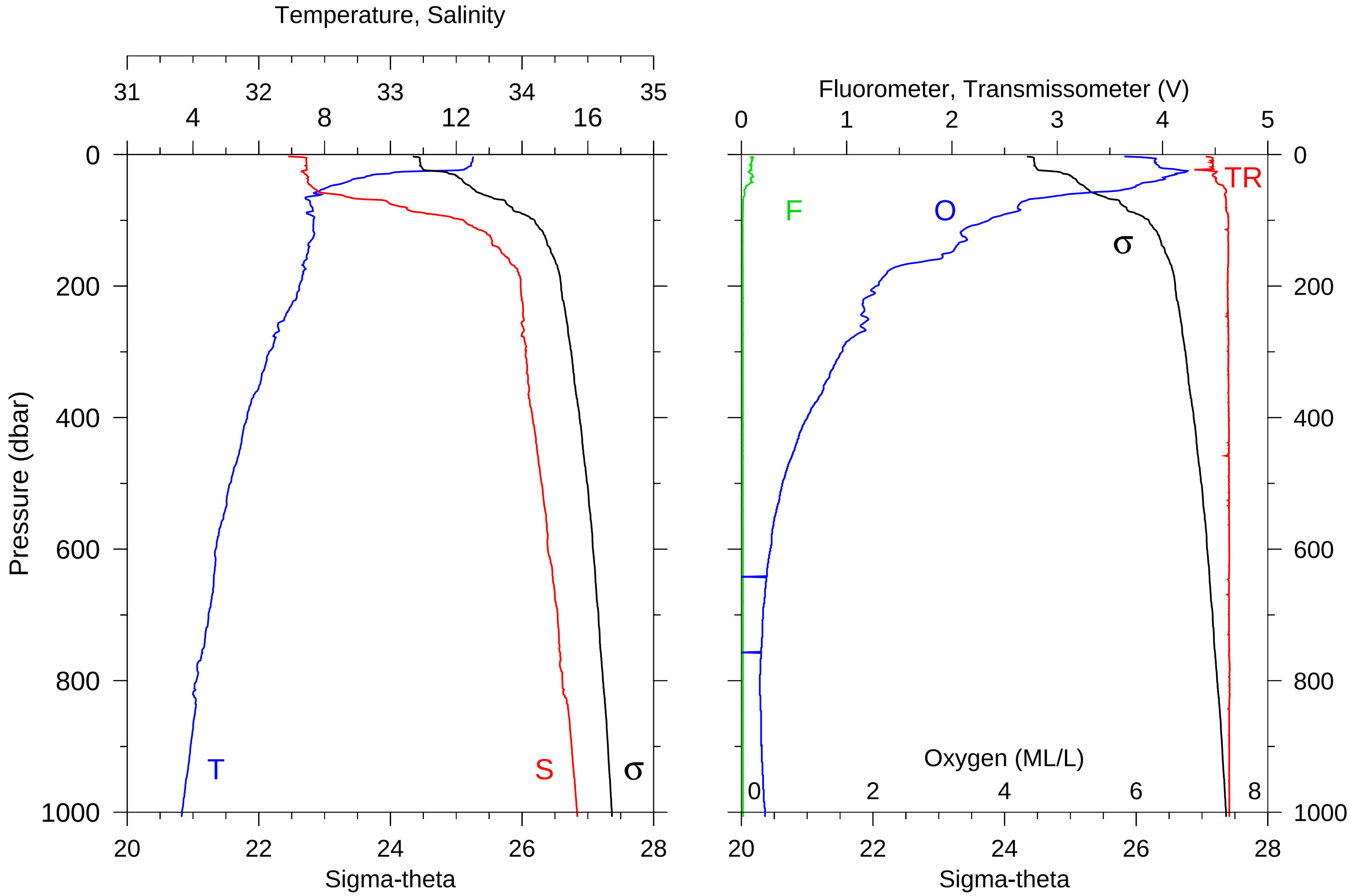
Station 12



STA NO 12 LAT: 43 12.8 N LONG: 124 39.5 W
12 AUG 2002 2023 GMT DEPTH 145

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
3	9.521	33.405	9.521	25.786	0.066	0.05	4.20
10	9.504	33.403	9.503	25.787	0.220	0.10	4.22
20	9.292	33.556	9.289	25.941	0.433	0.10	4.36
30	9.160	33.569	9.157	25.973	0.637	0.11	4.37
40	8.986	33.596	8.982	26.021	0.837	0.10	4.40
50	8.897	33.615	8.892	26.051	1.033	0.07	4.43
60	8.450	33.693	8.443	26.181	1.225	0.05	4.50
70	7.938	33.821	7.931	26.358	1.400	0.02	4.56
80	7.875	33.849	7.867	26.389	1.566	0.02	4.56
90	7.809	33.881	7.799	26.424	1.727	0.02	4.55
100	7.741	33.931	7.731	26.474	1.888	0.02	4.40
110	7.703	33.960	7.693	26.503	2.043	0.02	4.33
120	7.650	33.983	7.640	26.528	2.195	0.02	4.25
130	7.554	34.003	7.540	26.557	2.345	0.02	4.18
140	7.257	34.037	7.244	26.626	2.491	0.02	3.90
143	7.251	34.038	7.238	26.629	2.534	0.02	3.79

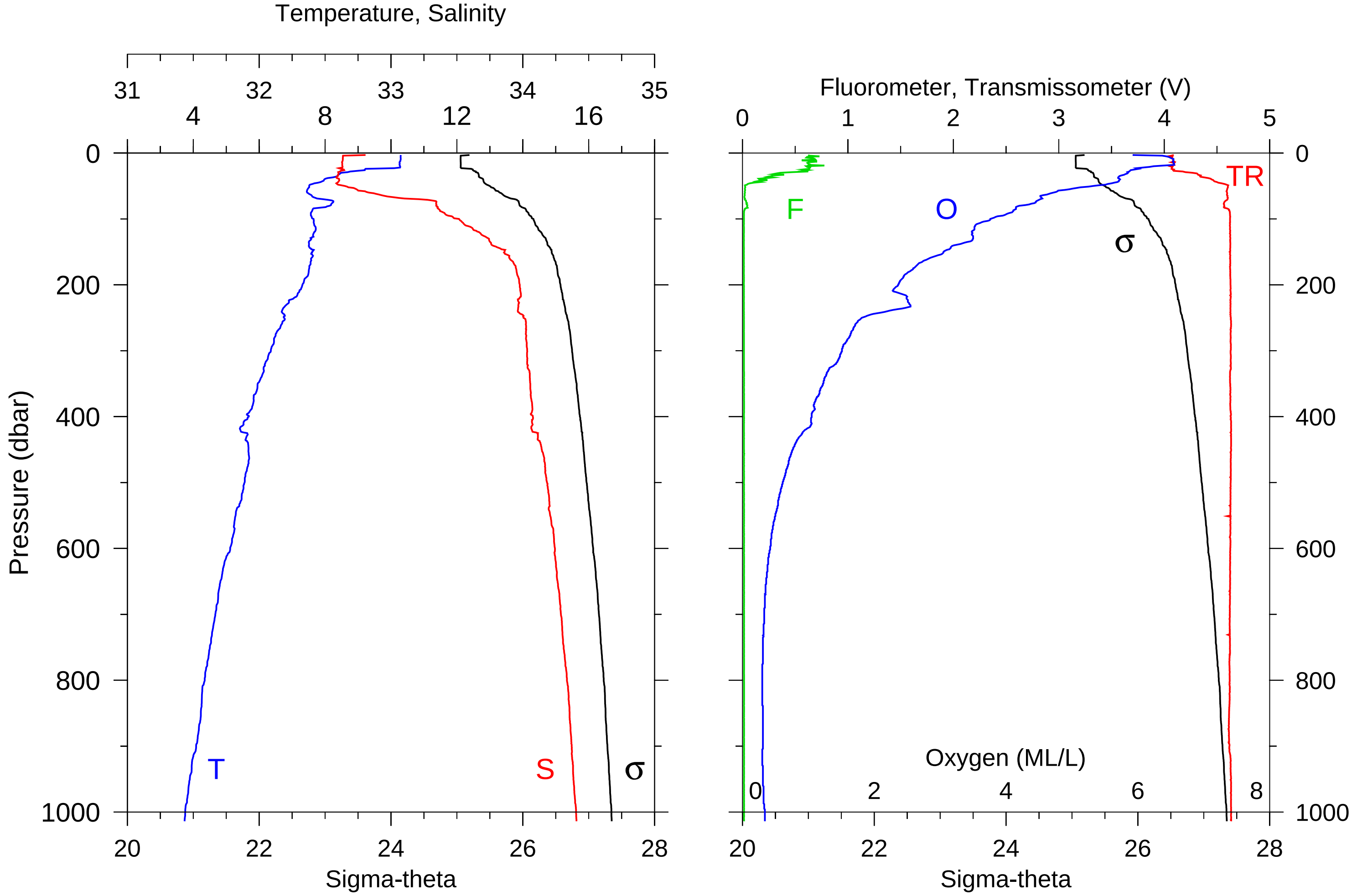
Station 13



STA NO 13 LAT: 43 13.0 N LONG: 125 20.0 W
13 AUG 2002 0331 GMT DEPTH 3022

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
1	13.001	0.000	13.001	-0.621	0.280	0.01	1.84
10	12.495	32.361	12.495	24.448	0.788	0.10	4.47
20	12.337	32.363	12.334	24.480	1.135	0.09	4.47
30	9.705	32.356	9.702	24.938	1.460	0.10	4.49
40	8.765	32.373	8.761	25.099	1.752	0.09	4.51
50	8.080	32.410	8.076	25.230	2.033	0.04	4.58
60	7.783	32.562	7.777	25.392	2.300	0.03	4.59
70	7.533	32.951	7.526	25.733	2.544	0.02	4.60
80	7.617	33.100	7.609	25.838	2.766	0.01	4.61
90	7.503	33.299	7.496	26.010	2.977	0.01	4.62
100	7.662	33.551	7.652	26.188	3.168	0.01	4.63
110	7.656	33.630	7.645	26.250	3.350	0.01	4.63
120	7.690	33.732	7.679	26.326	3.523	0.01	4.62
130	7.598	33.771	7.586	26.369	3.692	0.01	4.62
140	7.518	33.806	7.504	26.407	3.858	0.01	4.62
150	7.486	33.850	7.472	26.446	4.019	0.01	4.62
175	7.400	33.965	7.384	26.550	4.405	0.01	4.62
200	7.231	33.990	7.212	26.594	4.775	0.01	4.62
225	7.025	34.005	7.005	26.634	5.139	0.01	4.62
250	6.774	34.013	6.752	26.675	5.492	0.01	4.62
275	6.463	33.999	6.438	26.706	5.837	0.01	4.63
300	6.318	34.028	6.292	26.748	6.174	0.01	4.62
350	6.031	34.049	6.001	26.802	6.827	0.01	4.63
400	5.648	34.079	5.615	26.873	7.452	0.01	4.63
450	5.414	34.115	5.378	26.930	8.049	0.01	4.63
500	5.130	34.149	5.090	26.990	8.621	0.01	4.63
600	4.690	34.195	4.643	27.077	9.694	0.01	4.63
700	4.470	34.271	4.416	27.162	10.698	0.01	4.63
800	4.105	34.306	4.045	27.230	11.639	0.01	4.64
900	3.927	34.377	3.860	27.305	12.510	0.01	4.63
1005	3.658	34.420	3.585	27.366	13.366	0.01	4.64

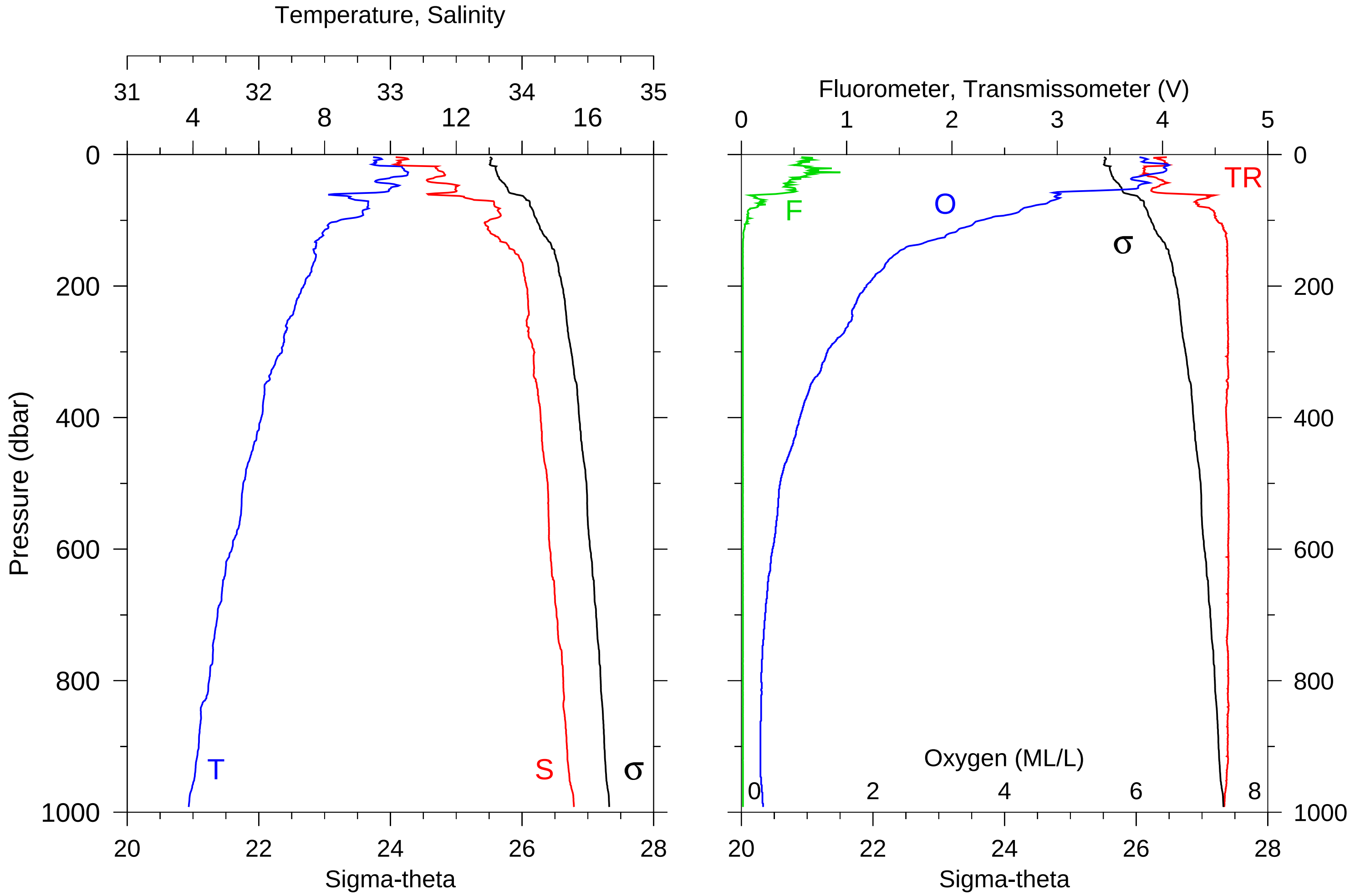
Station 14



STA NO 14 LAT: 43 13.0 N LONG: 125 10.0 W
13 AUG 2002 0535 GMT DEPTH 1670

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
1	10.805	3.708	10.805	2.522	0.248	0.27	0.79
10	10.292	32.634	10.291	25.056	0.645	0.62	4.08
20	10.272	32.632	10.270	25.058	0.934	0.69	4.08
30	8.573	32.601	8.570	25.306	1.211	0.40	4.26
40	7.987	32.606	7.983	25.397	1.474	0.19	4.45
50	7.519	32.646	7.514	25.494	1.729	0.02	4.61
60	7.467	32.840	7.462	25.655	1.970	0.02	4.60
70	7.920	33.189	7.913	25.865	2.195	0.02	4.60
80	8.117	33.347	8.109	25.960	2.403	0.05	4.57
90	7.580	33.396	7.571	26.076	2.602	0.01	4.62
100	7.629	33.500	7.619	26.151	2.792	0.01	4.62
110	7.682	33.574	7.672	26.201	2.977	0.01	4.62
120	7.679	33.663	7.668	26.272	3.155	0.01	4.62
130	7.567	33.739	7.554	26.348	3.328	0.01	4.63
140	7.508	33.771	7.495	26.382	3.496	0.01	4.63
150	7.605	33.859	7.591	26.438	3.658	0.01	4.63
175	7.519	33.948	7.503	26.520	4.050	0.01	4.62
200	7.313	33.977	7.295	26.571	4.427	0.01	4.63
225	6.903	33.966	6.883	26.620	4.794	0.01	4.63
250	6.756	34.009	6.733	26.674	5.149	0.01	4.63
275	6.499	34.023	6.474	26.720	5.492	0.01	4.63
300	6.354	34.034	6.327	26.747	5.828	0.01	4.63
350	5.957	34.056	5.927	26.816	6.479	0.01	4.62
400	5.671	34.076	5.638	26.868	7.104	0.01	4.63
450	5.674	34.144	5.637	26.922	7.705	0.01	4.63
500	5.554	34.184	5.513	26.968	8.285	0.01	4.63
600	5.119	34.243	5.071	27.068	9.384	0.01	4.63
700	4.669	34.290	4.615	27.155	10.396	0.01	4.62
800	4.345	34.335	4.283	27.228	11.341	0.01	4.62
900	4.086	34.371	4.019	27.284	12.230	0.01	4.62
1013	3.736	34.407	3.661	27.349	13.172	0.01	4.64

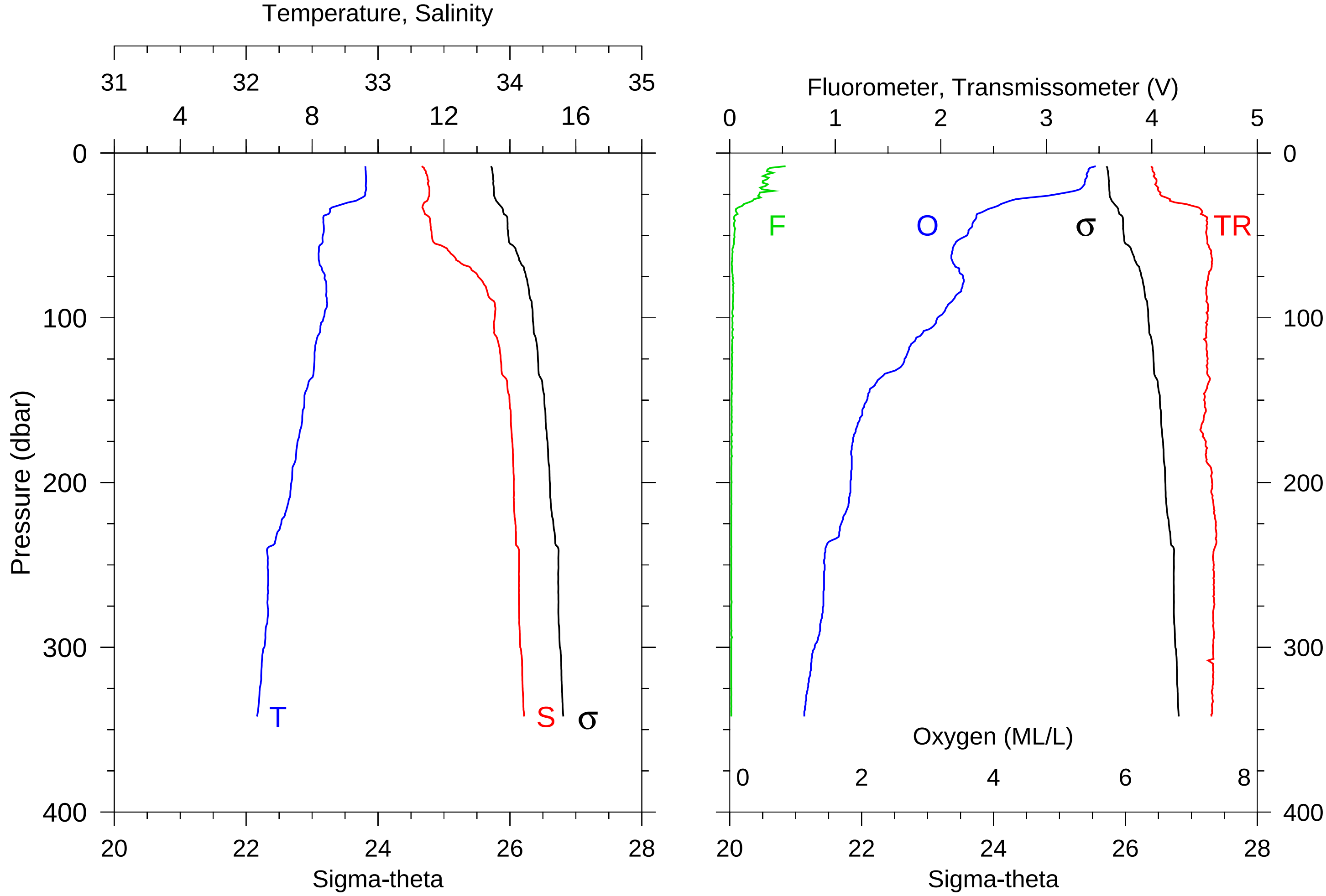
Station 15



STA NO 15 LAT: 43 13.0 N LONG: 125 0.0 W
13 AUG 2002 0754 GMT DEPTH 1083

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
4	9.473	33.040	9.473	25.509	0.099	0.57	4.04
10	9.549	33.073	9.548	25.523	0.245	0.56	4.02
20	10.360	33.343	10.358	25.598	0.489	0.61	3.83
30	10.521	33.410	10.517	25.623	0.726	0.68	3.84
40	9.547	33.281	9.542	25.686	0.960	0.46	4.00
50	10.021	33.496	10.015	25.775	1.186	0.47	3.94
60	8.287	33.283	8.281	25.884	1.406	0.32	4.20
70	9.148	33.729	9.141	26.101	1.606	0.19	4.32
80	9.294	33.804	9.286	26.137	1.795	0.15	4.40
90	9.168	33.835	9.158	26.181	1.981	0.07	4.49
100	8.451	33.750	8.441	26.226	2.164	0.06	4.51
110	8.121	33.743	8.110	26.270	2.342	0.03	4.57
120	7.929	33.763	7.917	26.315	2.516	0.02	4.61
130	7.781	33.834	7.768	26.393	2.684	0.02	4.61
140	7.728	33.899	7.715	26.451	2.846	0.01	4.61
150	7.693	33.948	7.678	26.495	3.003	0.01	4.62
175	7.600	34.010	7.583	26.557	3.383	0.01	4.61
200	7.358	34.034	7.339	26.611	3.751	0.01	4.61
225	7.135	34.046	7.114	26.652	4.109	0.01	4.62
250	6.916	34.038	6.893	26.676	4.460	0.01	4.61
275	6.770	34.049	6.745	26.705	4.806	0.01	4.62
300	6.705	34.093	6.677	26.748	5.143	0.01	4.62
350	6.178	34.112	6.147	26.832	5.794	0.01	4.62
400	6.074	34.142	6.040	26.869	6.415	0.01	4.61
450	5.811	34.157	5.772	26.915	7.019	0.01	4.62
500	5.526	34.195	5.485	26.980	7.598	0.01	4.63
600	5.182	34.212	5.133	27.035	8.714	0.01	4.62
700	4.746	34.262	4.691	27.126	9.756	0.01	4.62
800	4.489	34.314	4.427	27.195	10.731	0.01	4.62
900	4.174	34.341	4.105	27.251	11.651	0.01	4.62
990	3.874	34.394	3.800	27.324	12.432	0.01	4.59

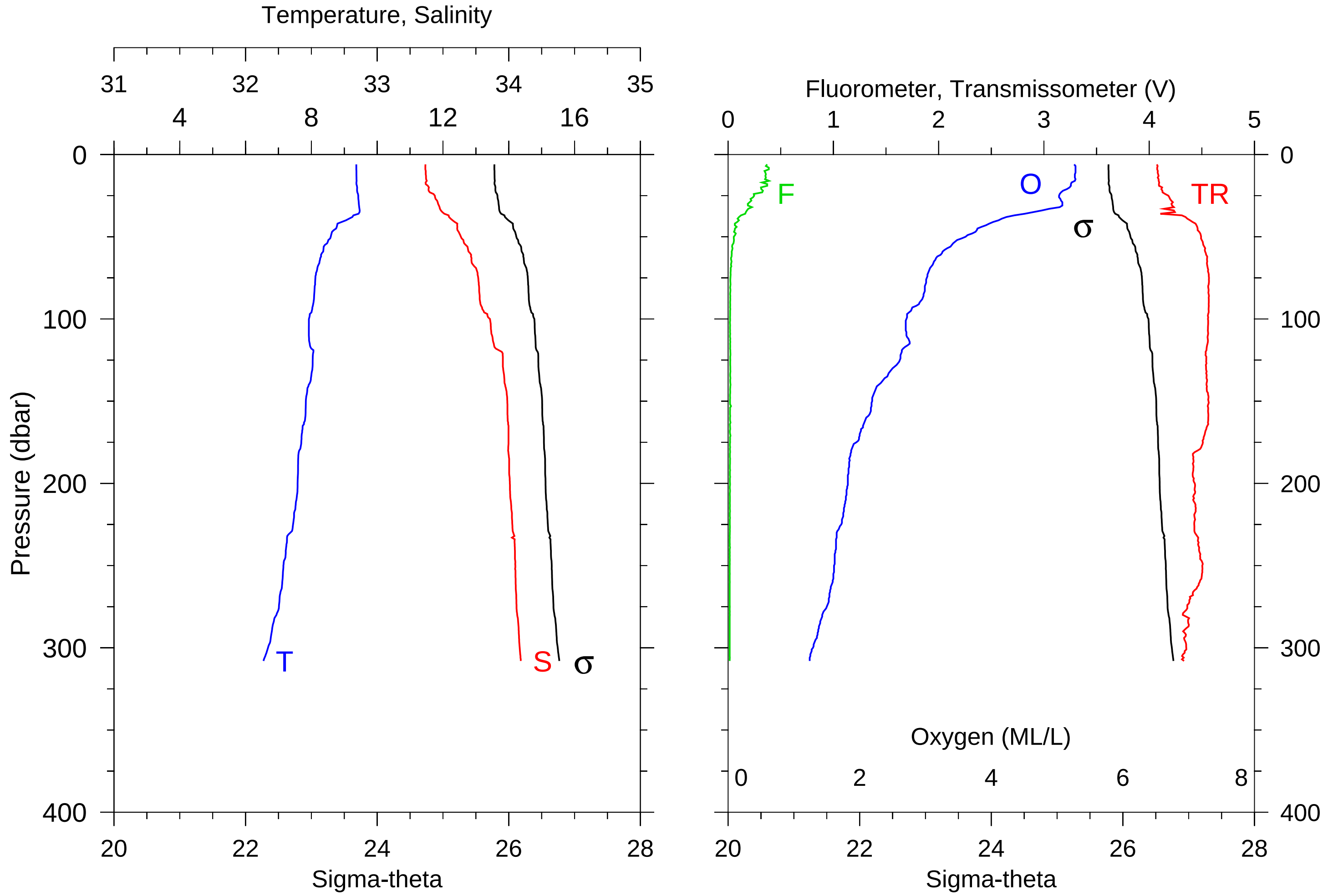
Station 16



STA NO 16 LAT: 43 13.0 N LONG: 124 50.0 W
13 AUG 2002 1010 GMT DEPTH 343

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
8	9.614	33.331	9.613	25.714	0.182	0.53	3.99
10	9.621	33.352	9.620	25.728	0.227	0.36	4.01
20	9.628	33.384	9.626	25.752	0.451	0.34	4.05
30	9.095	33.351	9.092	25.813	0.674	0.18	4.22
40	8.340	33.394	8.336	25.963	0.884	0.04	4.52
50	8.326	33.407	8.321	25.975	1.088	0.04	4.52
60	8.205	33.543	8.199	26.100	1.286	0.03	4.56
70	8.297	33.705	8.290	26.214	1.472	0.02	4.57
80	8.433	33.806	8.425	26.272	1.650	0.03	4.52
90	8.444	33.879	8.435	26.329	1.823	0.03	4.52
100	8.347	33.884	8.337	26.347	1.993	0.02	4.53
110	8.206	33.883	8.195	26.368	2.161	0.03	4.51
120	8.081	33.924	8.069	26.419	2.324	0.02	4.52
130	8.057	33.935	8.044	26.431	2.486	0.02	4.52
140	7.886	33.979	7.873	26.491	2.645	0.02	4.53
150	7.768	33.997	7.753	26.522	2.799	0.02	4.50
175	7.563	34.018	7.547	26.569	3.176	0.02	4.51
200	7.372	34.029	7.353	26.605	3.544	0.02	4.57
225	7.057	34.042	7.036	26.659	3.904	0.01	4.61
250	6.656	34.069	6.634	26.735	4.245	0.01	4.59
275	6.654	34.069	6.629	26.735	4.580	0.01	4.59
300	6.551	34.078	6.524	26.757	4.914	0.01	4.58
340	6.349	34.106	6.319	26.805	5.433	0.01	4.57

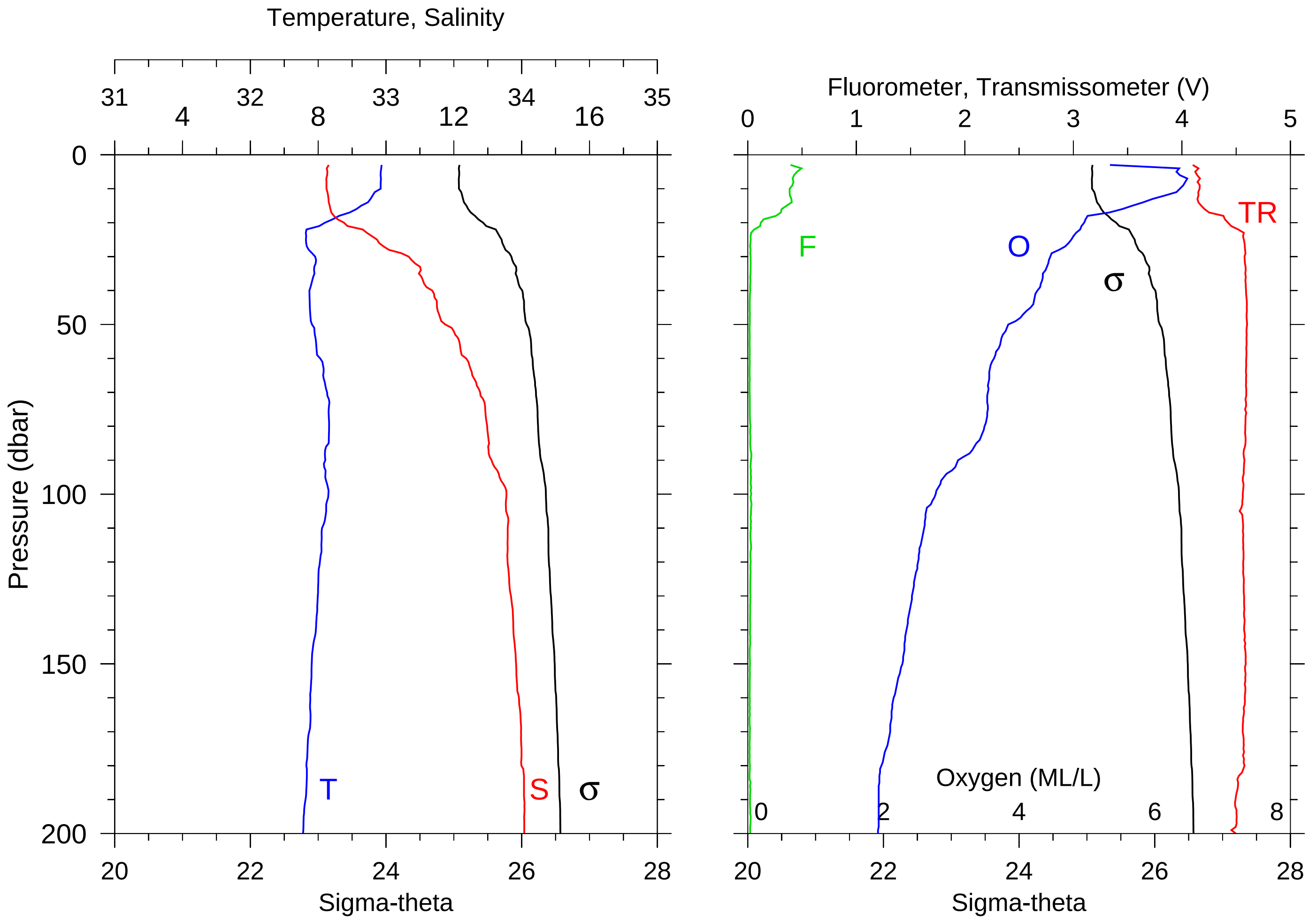
Station 17



STA NO 17 LAT: 43 13.0 N LONG: 124 45.0 W
13 AUG 2002 1145 GMT DEPTH 313

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
6	9.365	33.367	9.365	25.782	0.132	0.37	4.07
10	9.369	33.369	9.368	25.783	0.221	0.35	4.08
20	9.391	33.393	9.389	25.798	0.441	0.31	4.12
30	9.442	33.463	9.439	25.845	0.658	0.19	4.21
40	9.051	33.573	9.047	25.994	0.869	0.10	4.39
50	8.589	33.636	8.584	26.115	1.062	0.05	4.49
60	8.319	33.706	8.313	26.211	1.247	0.04	4.54
70	8.175	33.755	8.168	26.272	1.426	0.03	4.56
80	8.102	33.774	8.094	26.298	1.599	0.02	4.56
90	8.064	33.783	8.055	26.310	1.772	0.02	4.57
100	7.925	33.857	7.915	26.389	1.941	0.02	4.56
110	7.923	33.873	7.912	26.402	2.105	0.02	4.56
120	8.062	33.947	8.051	26.439	2.268	0.02	4.54
130	8.032	33.957	8.019	26.452	2.427	0.02	4.54
140	7.920	33.972	7.906	26.481	2.585	0.02	4.54
150	7.832	33.989	7.818	26.507	2.740	0.02	4.56
175	7.693	33.998	7.676	26.535	3.123	0.02	4.51
200	7.581	34.008	7.562	26.559	3.500	0.02	4.43
225	7.443	34.027	7.422	26.593	3.872	0.02	4.43
250	7.149	34.050	7.126	26.653	4.231	0.01	4.50
275	7.014	34.059	6.989	26.680	4.583	0.01	4.36
300	6.681	34.083	6.654	26.744	4.924	0.01	4.35
308	6.544	34.091	6.516	26.768	5.030	0.01	4.33

Station 18



STA NO 18 LAT: 42 55.2 N LONG: 125 5.7 W
17 AUG 2002 0341 GMT DEPTH 1646

P (DB)	T (C)	S	POT T (C)	SIGMA THETA	GEO AN (J/KG)	FL (V)	TRN (V)
1	10.702	0.000	10.702	-0.363	0.277	0.27	2.12
10	9.755	32.564	9.754	25.092	0.717	0.40	4.16
20	8.231	32.680	8.229	25.418	0.992	0.13	4.43
30	7.879	33.150	7.876	25.840	1.222	0.02	4.58
40	7.758	33.326	7.754	25.995	1.430	0.02	4.59
50	7.833	33.446	7.828	26.078	1.627	0.02	4.60
60	8.046	33.582	8.040	26.155	1.816	0.02	4.59
70	8.252	33.690	8.245	26.209	1.999	0.02	4.59
80	8.321	33.744	8.313	26.241	2.178	0.02	4.59
90	8.185	33.775	8.176	26.286	2.354	0.03	4.57
100	8.300	33.887	8.289	26.357	2.525	0.03	4.56
110	8.129	33.898	8.118	26.391	2.691	0.03	4.56
120	8.049	33.896	8.038	26.402	2.855	0.02	4.57
130	7.990	33.920	7.976	26.430	3.018	0.02	4.57
140	7.931	33.939	7.917	26.453	3.178	0.02	4.58
150	7.809	33.958	7.795	26.486	3.336	0.02	4.58
175	7.687	33.999	7.670	26.536	3.720	0.02	4.57
199	7.562	34.019	7.543	26.570	4.081	0.02	4.46

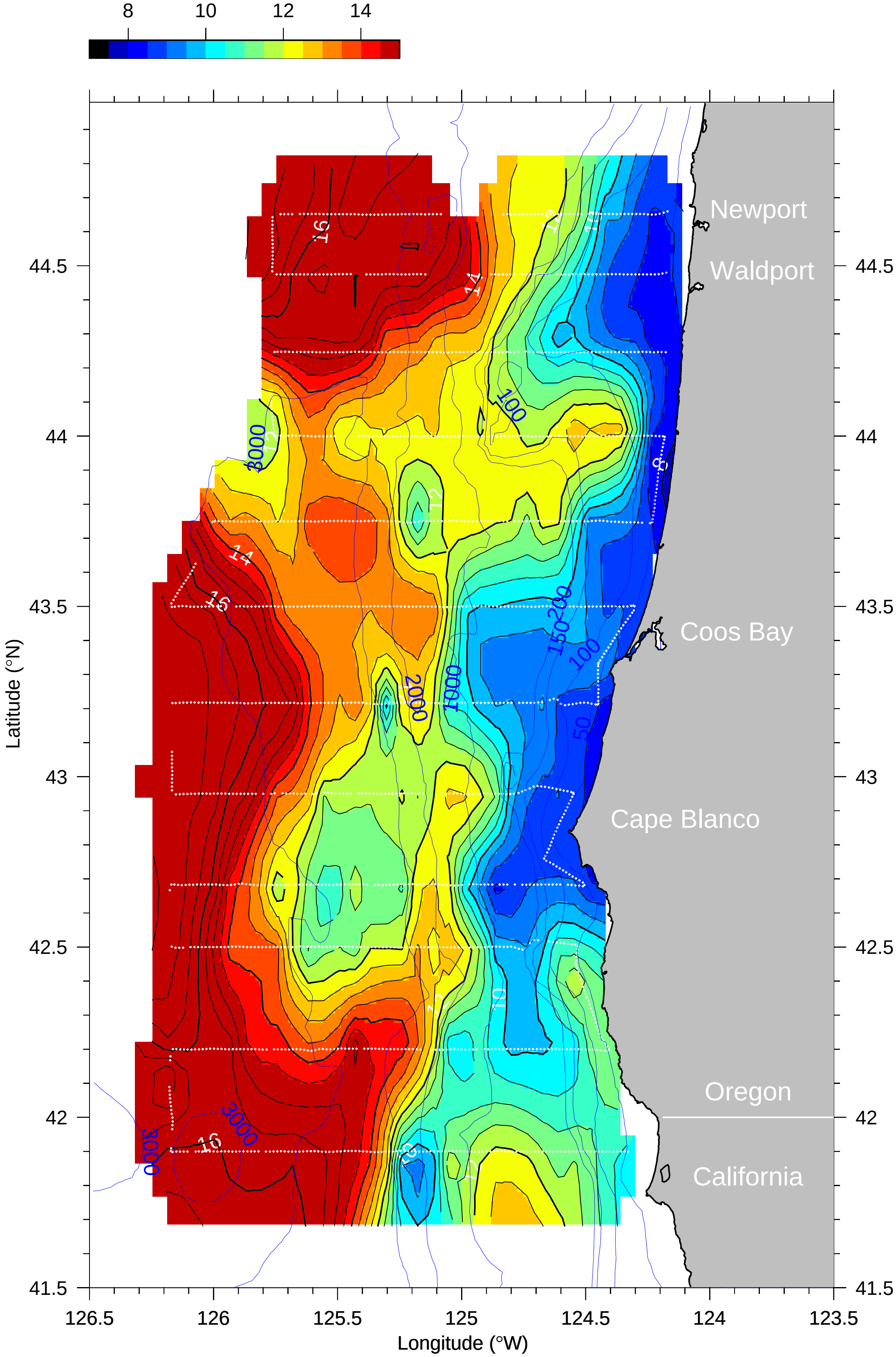
Meso 1 Maps

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

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

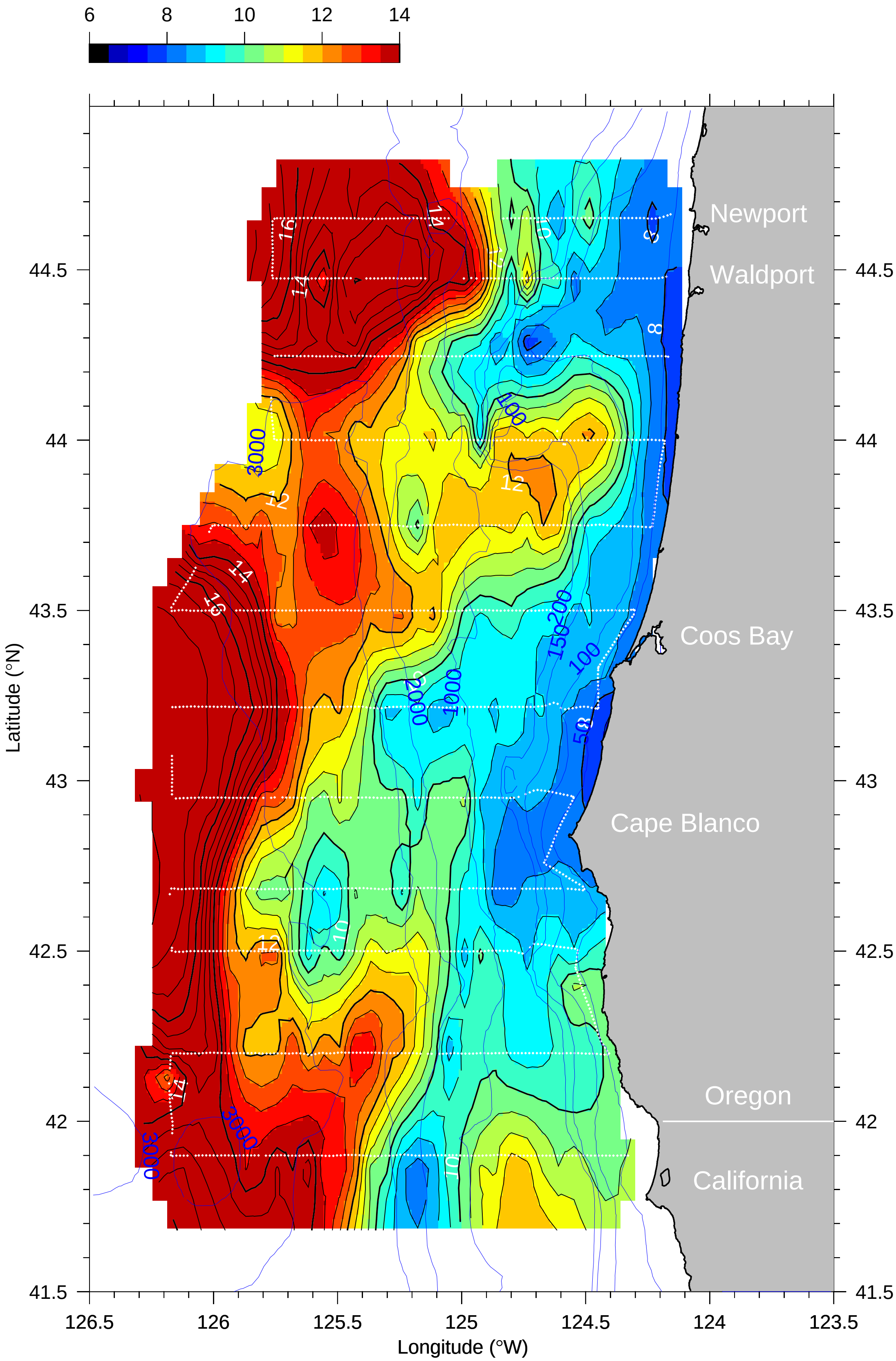
Temperature (°C) at 5 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

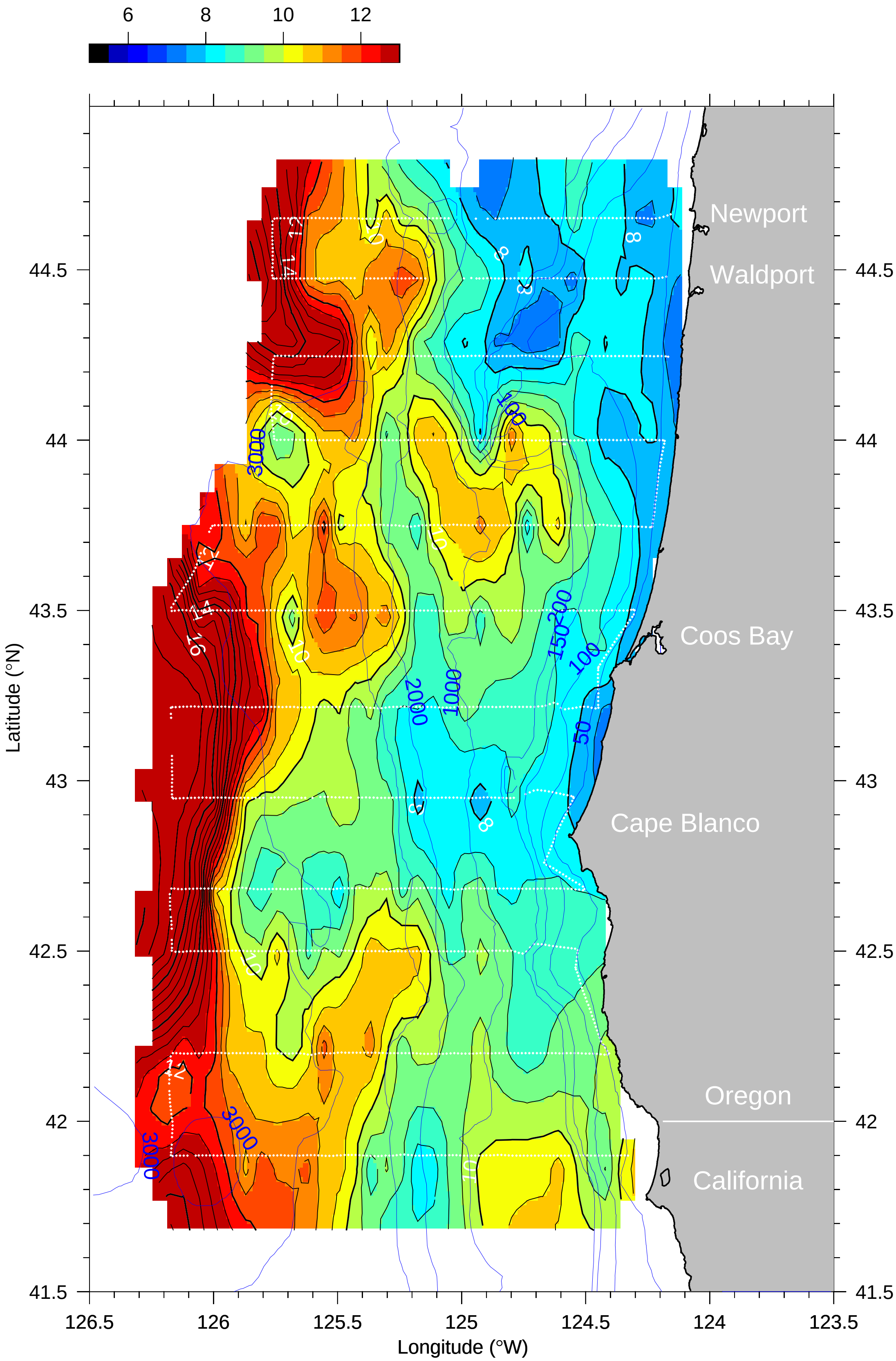
Temperature (°C) at 15 dbar

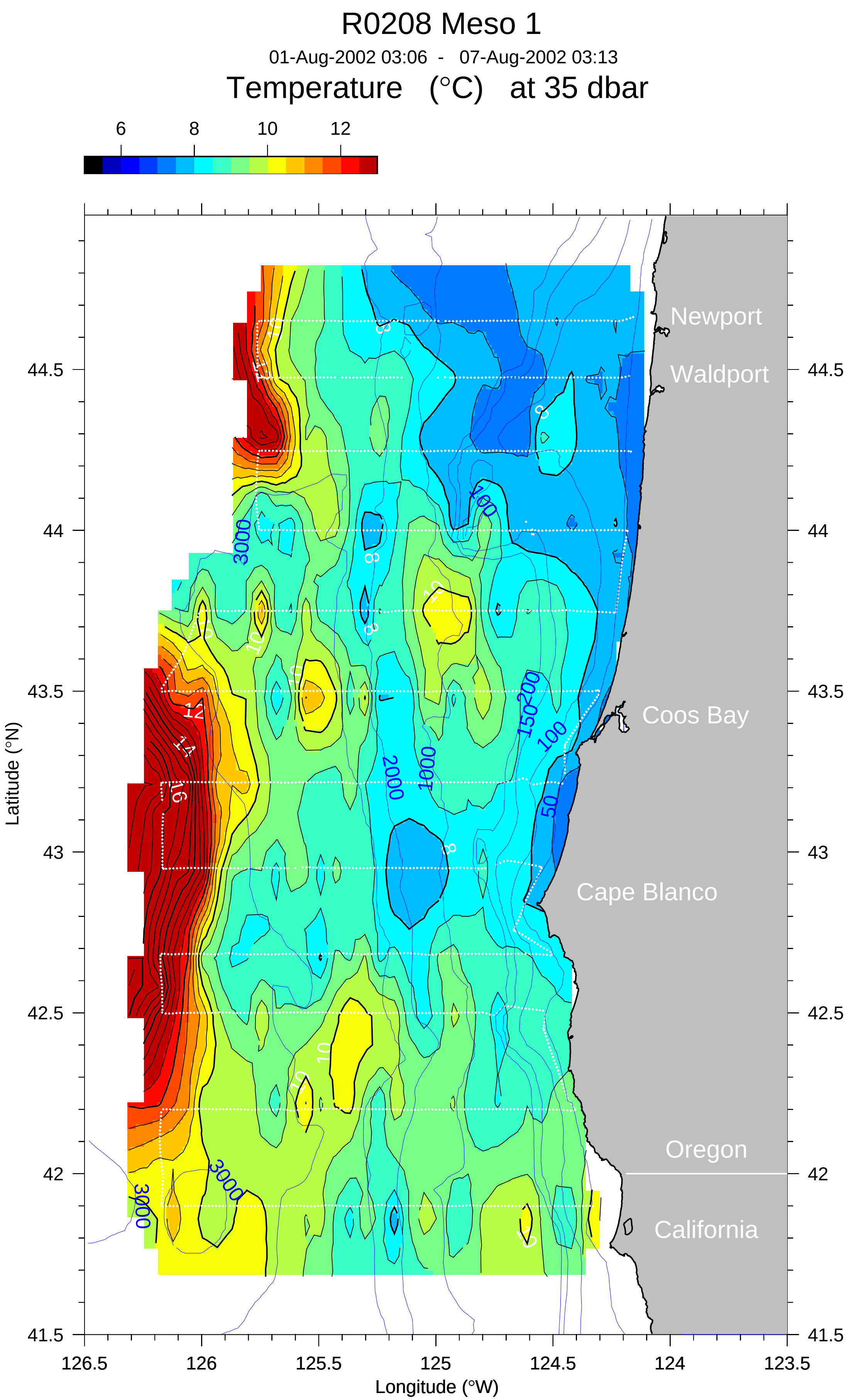


R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

Temperature (°C) at 25 dbar



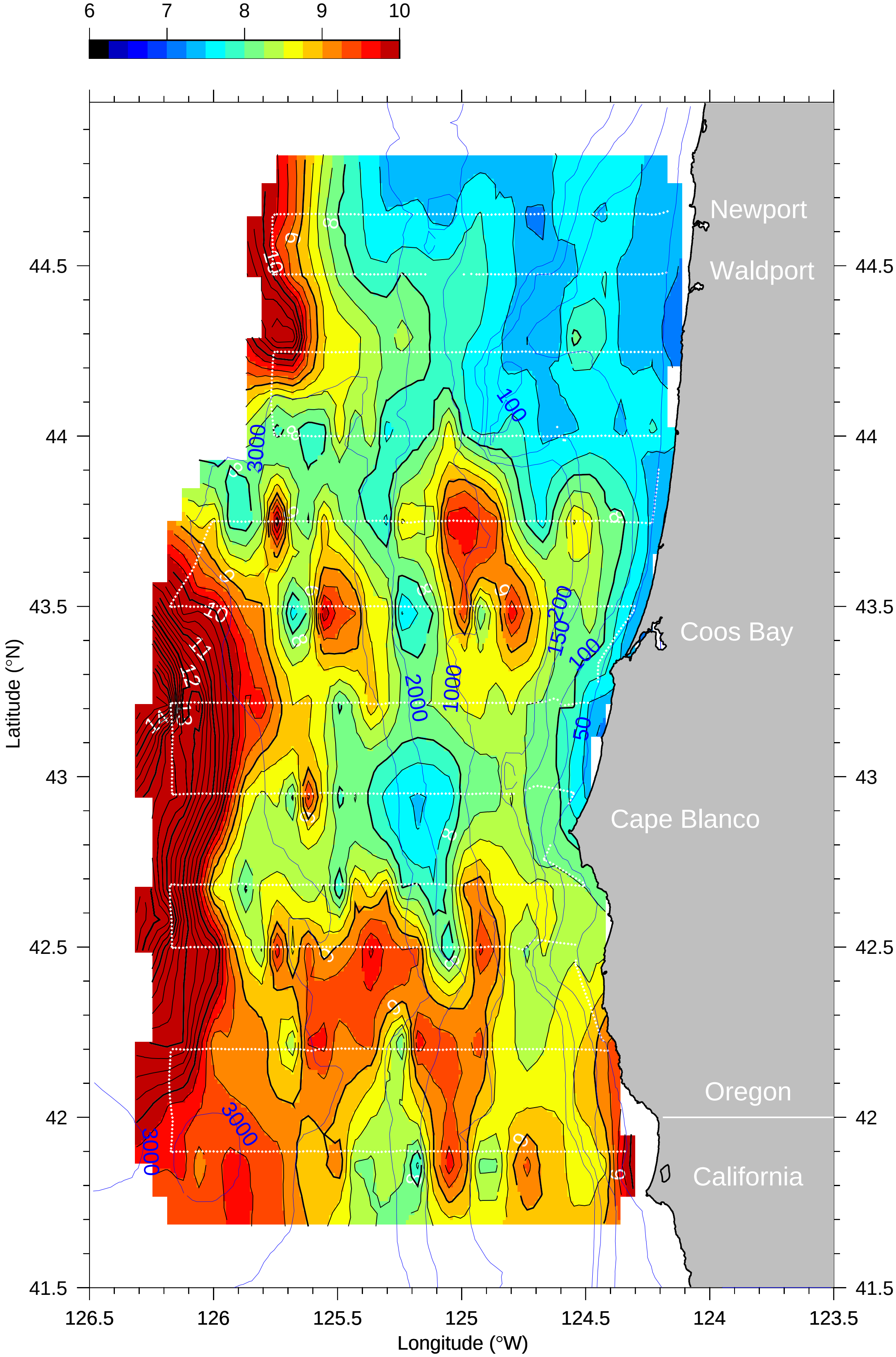


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Temperature (°C) at 35 dbar
6
8
10
12
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

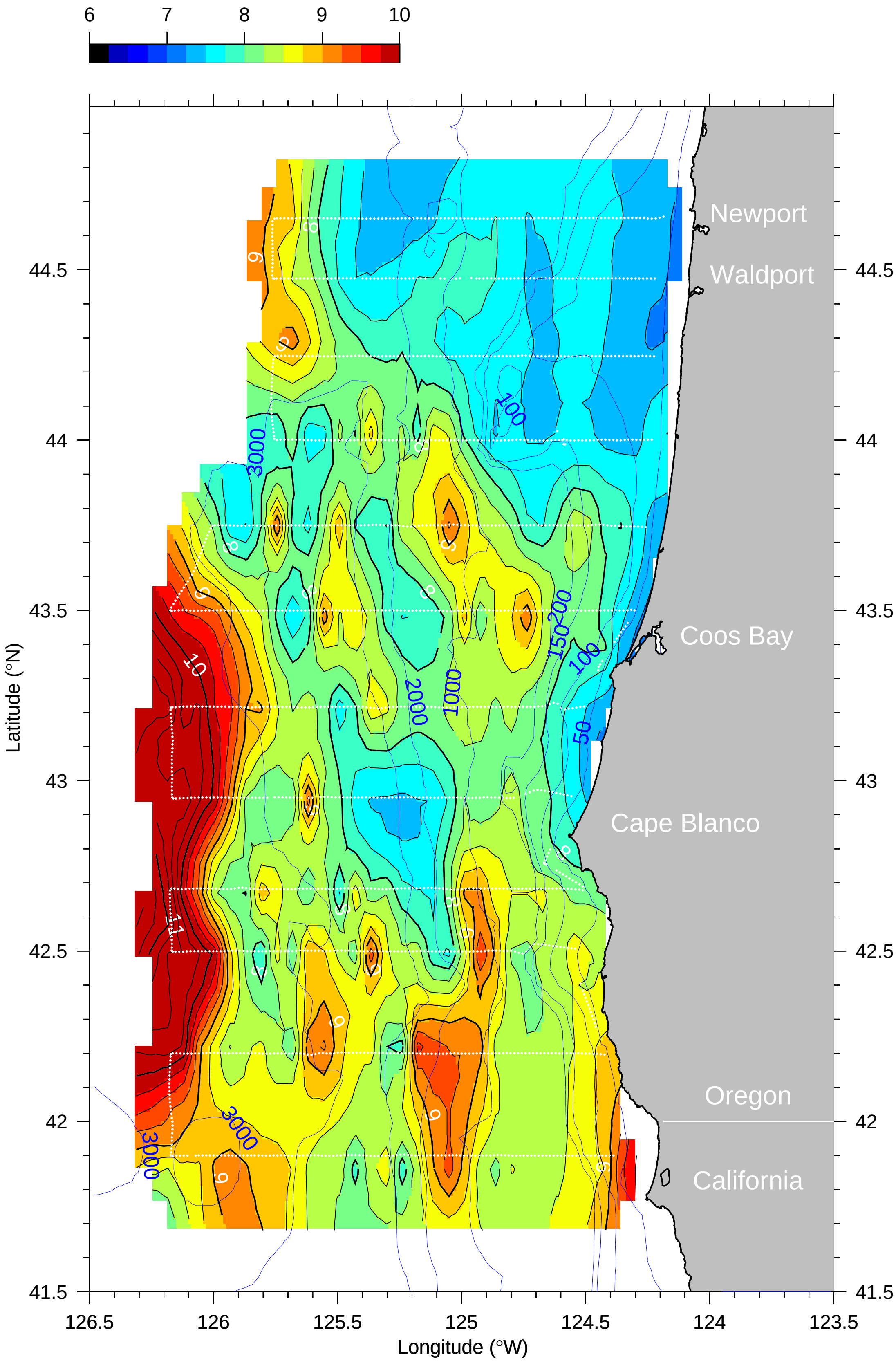
Temperature (°C) at 45 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

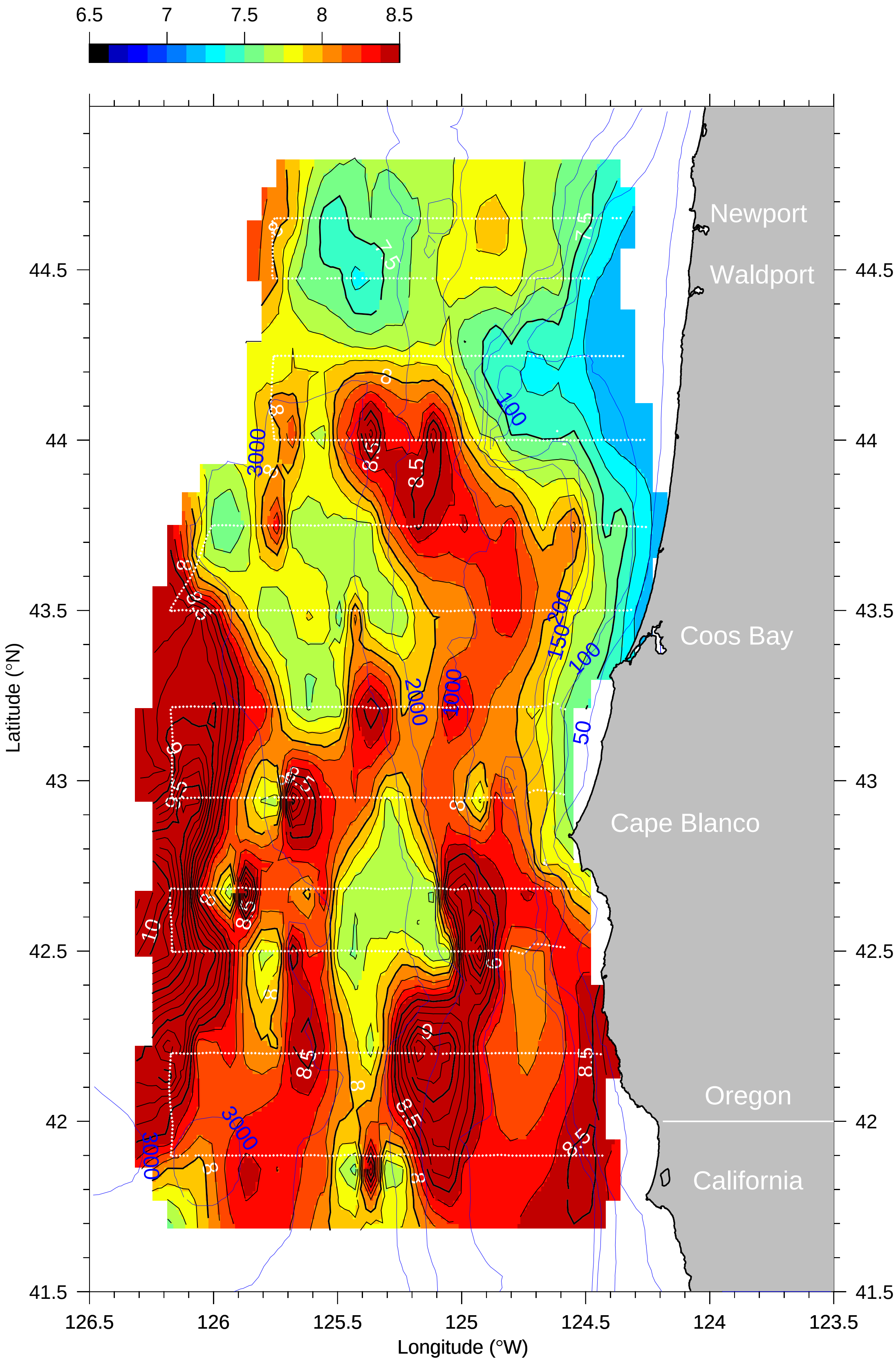
Temperature (°C) at 55 dbar

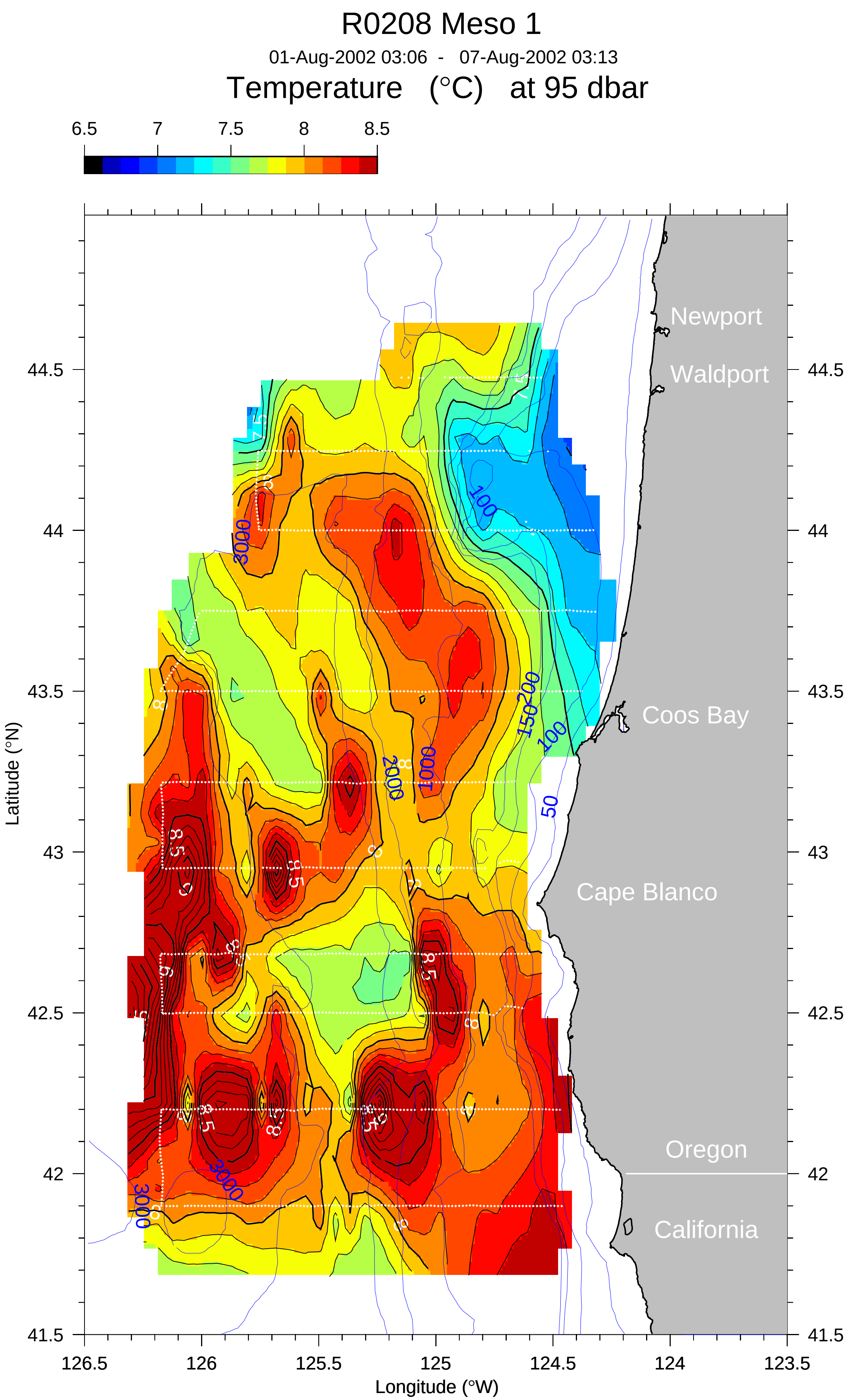


R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

Temperature (°C) at 75 dbar

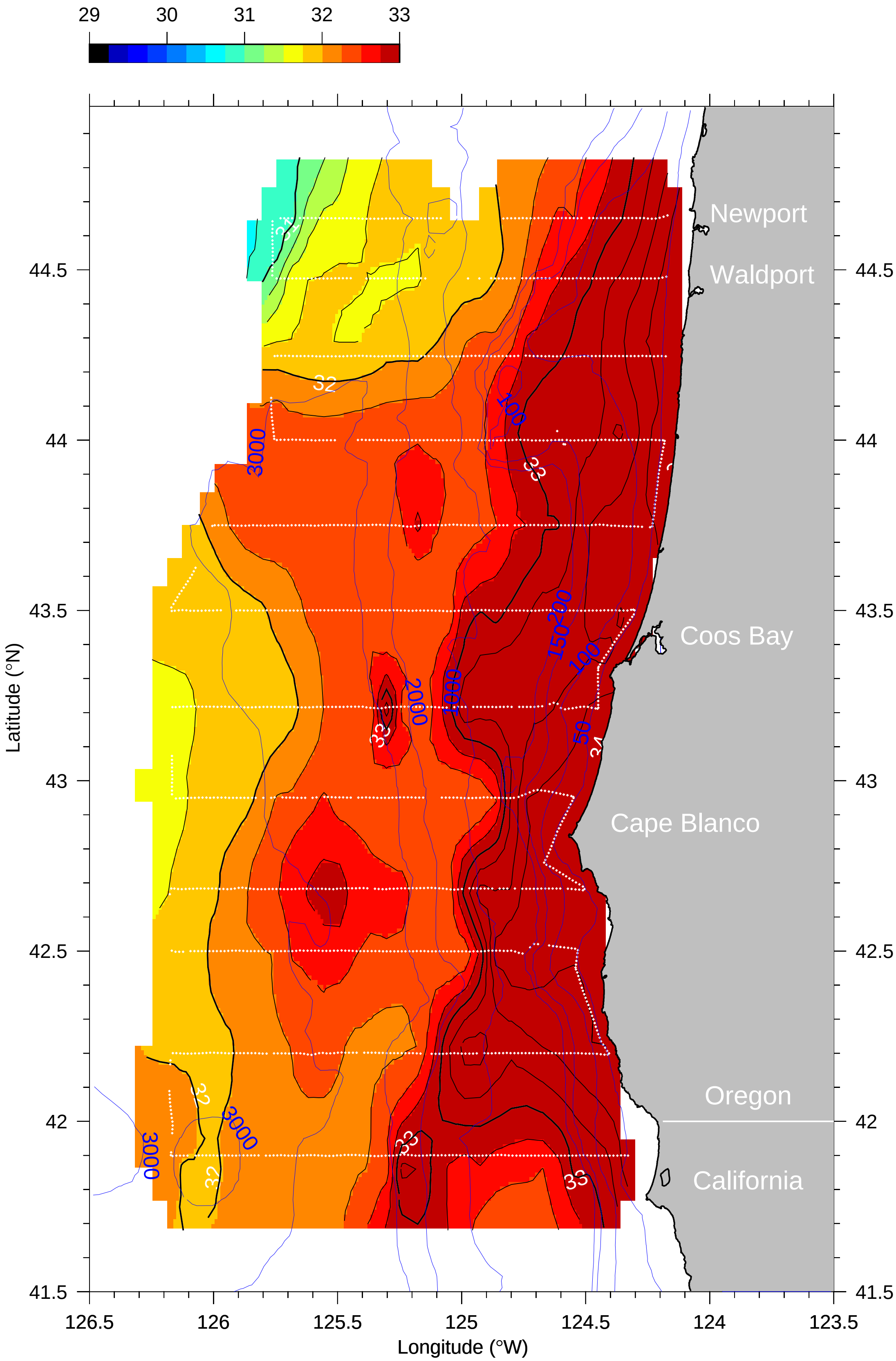



R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Temperature (°C) at 95 dbar
6.5
7
7.5
8
8.5
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

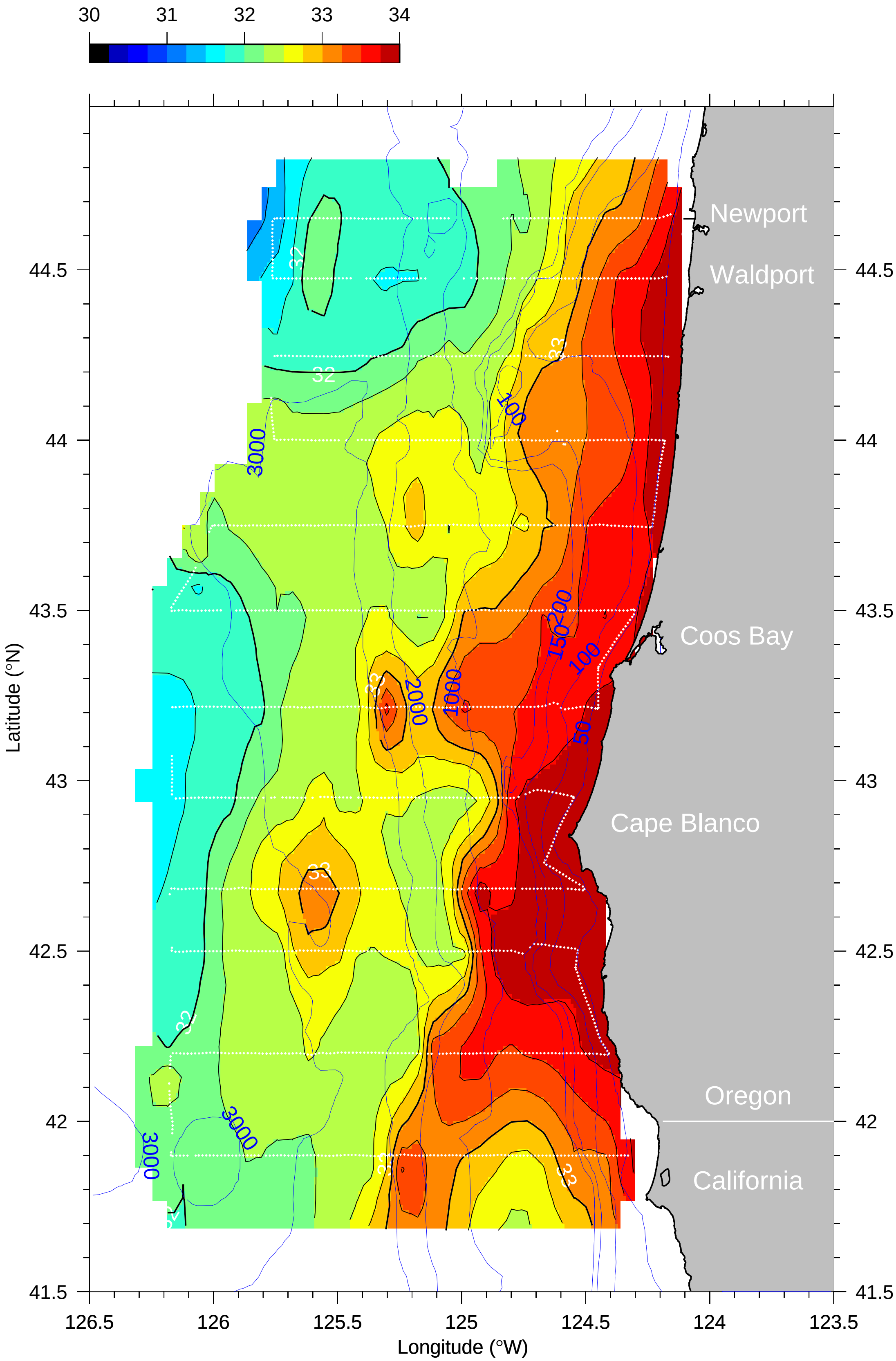
Salinity (PSS) at 5 dbar

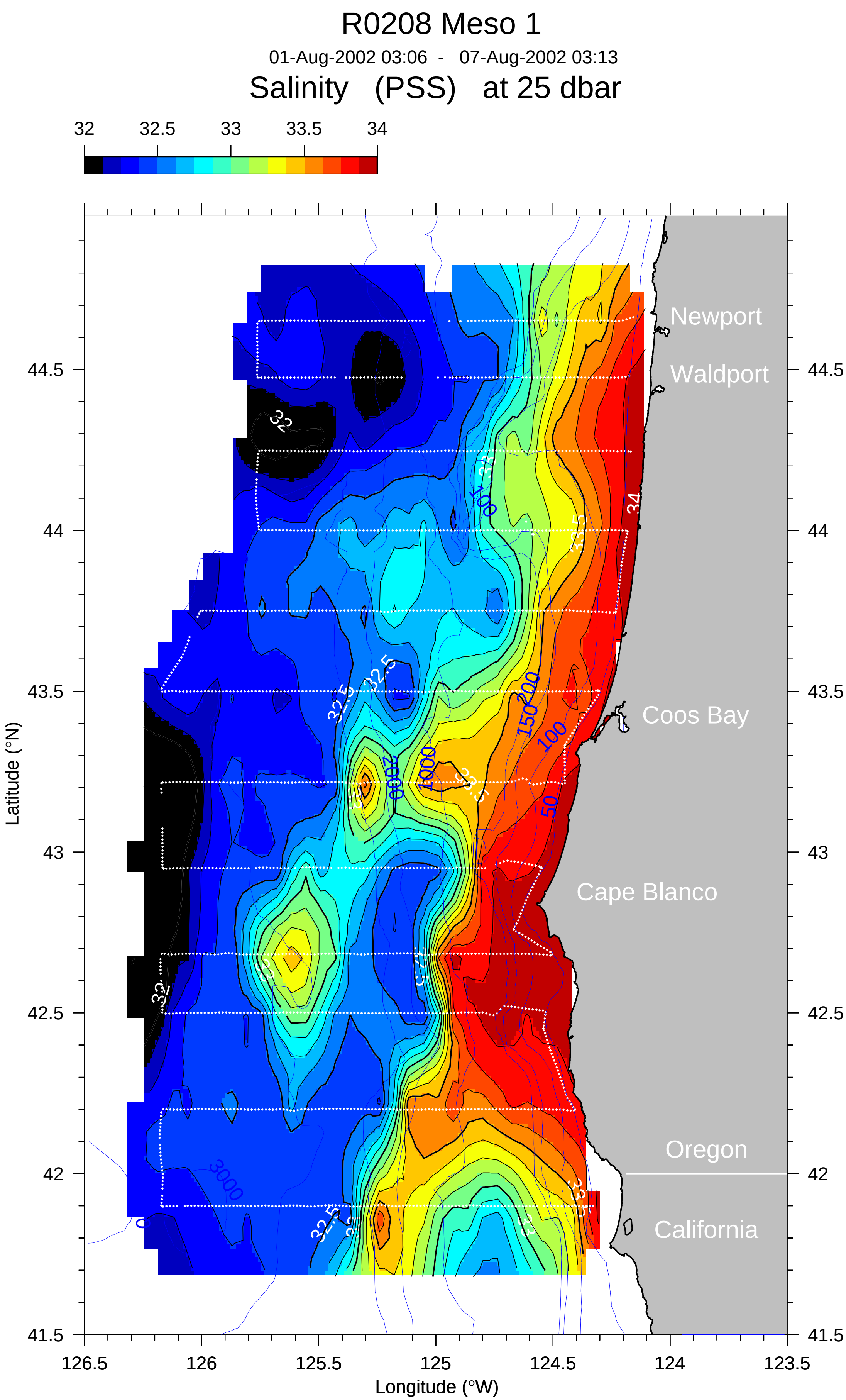


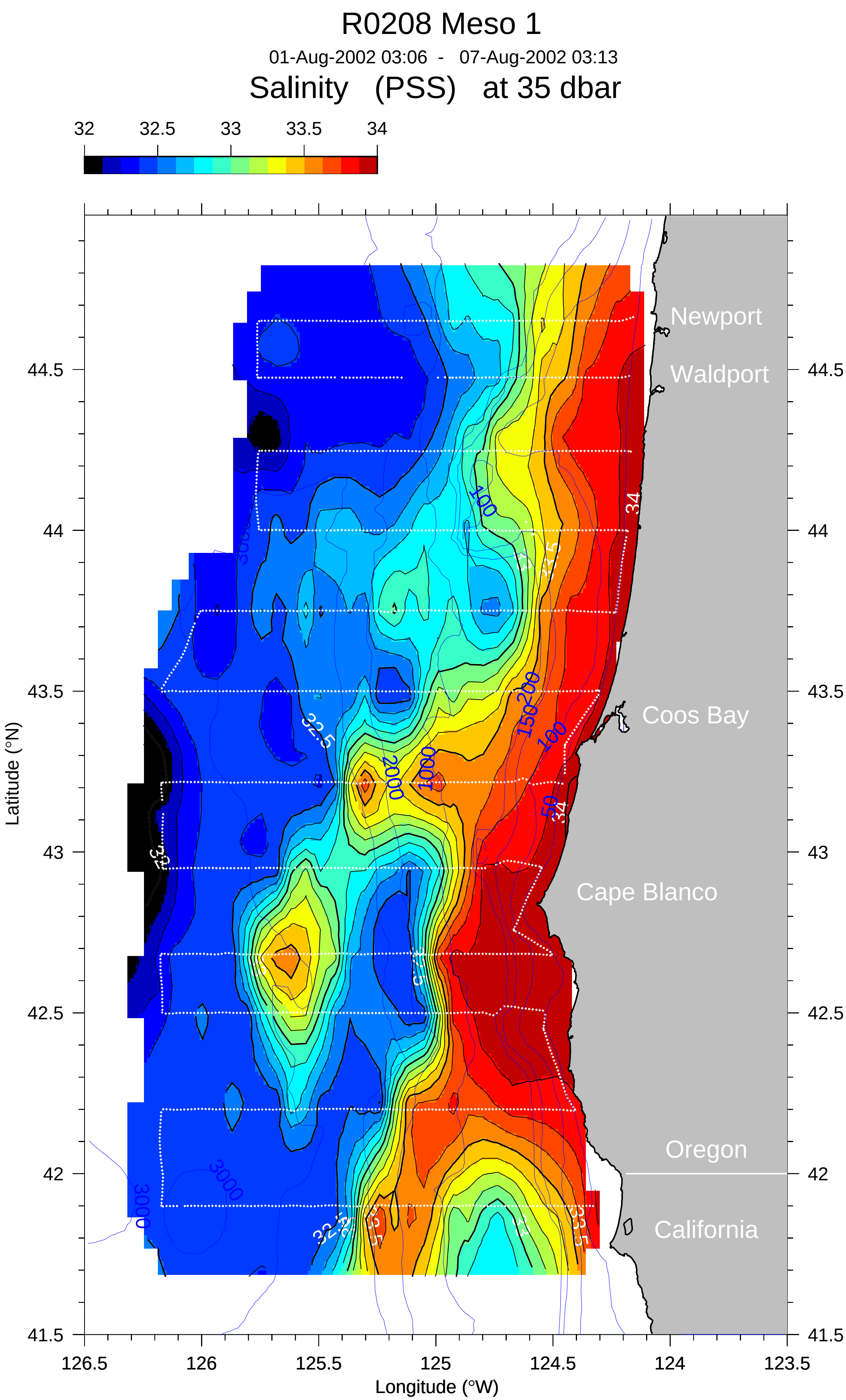
R0208 Meso 1

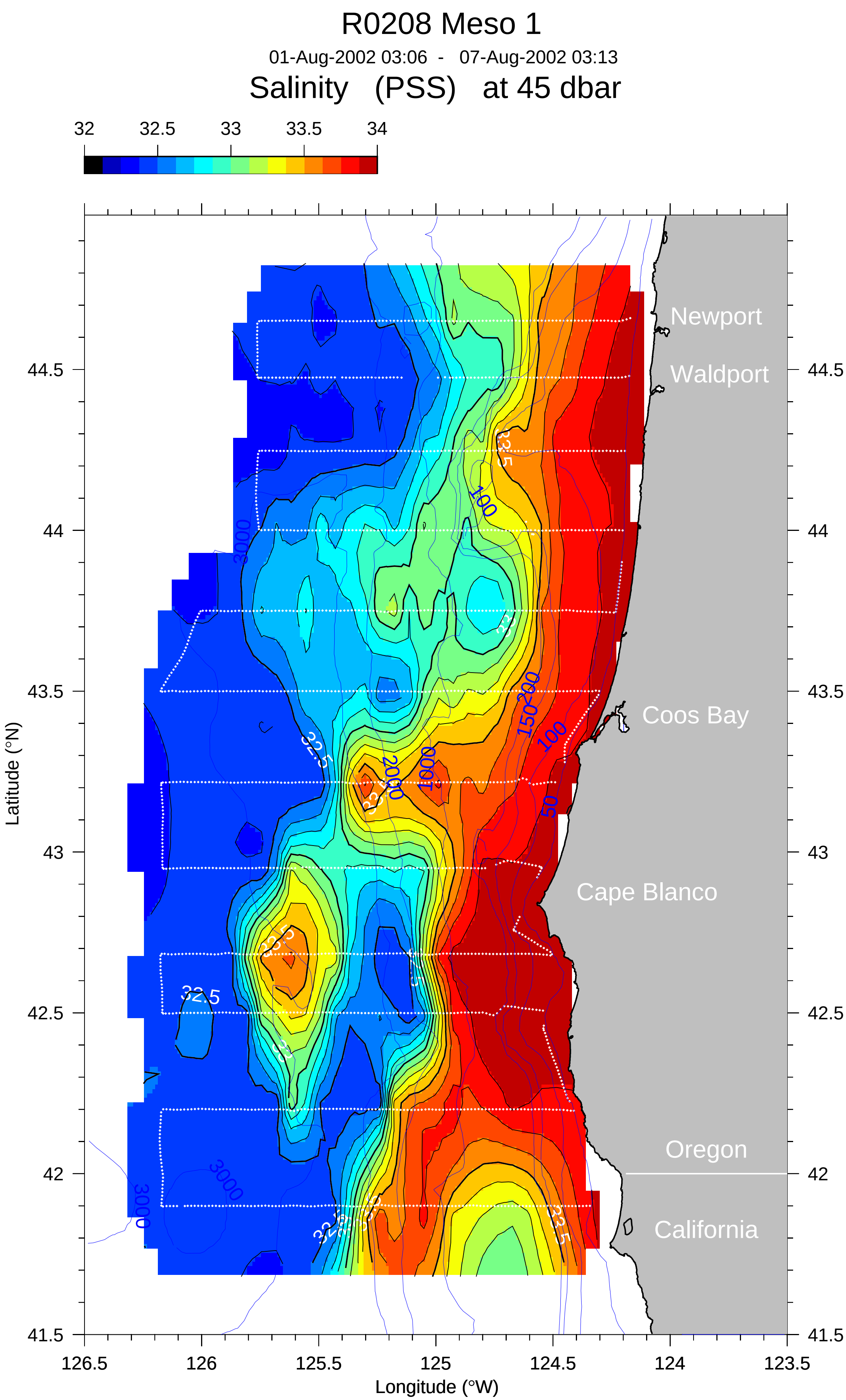
01-Aug-2002 03:06 - 07-Aug-2002 03:13

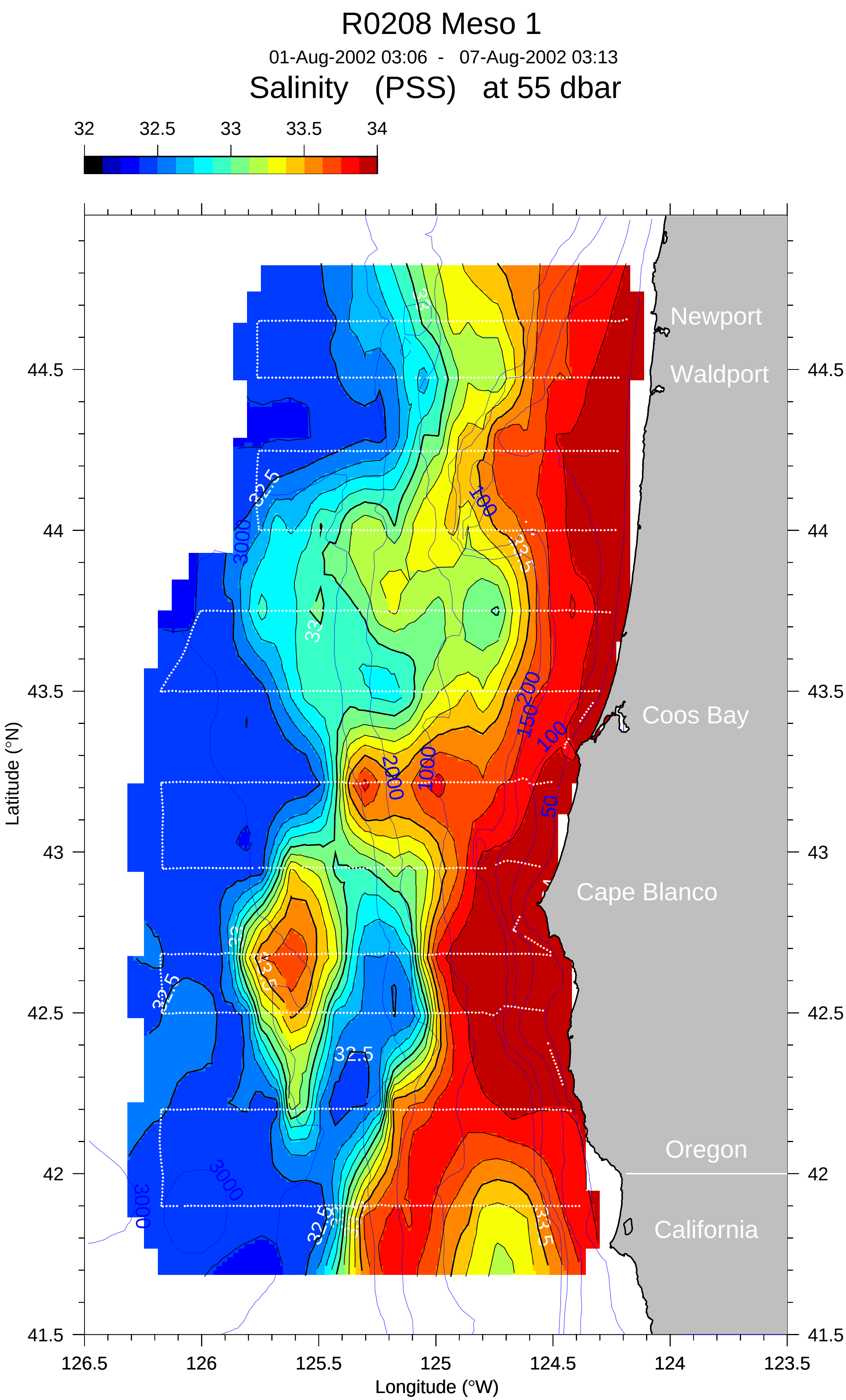
Salinity (PSS) at 15 dbar

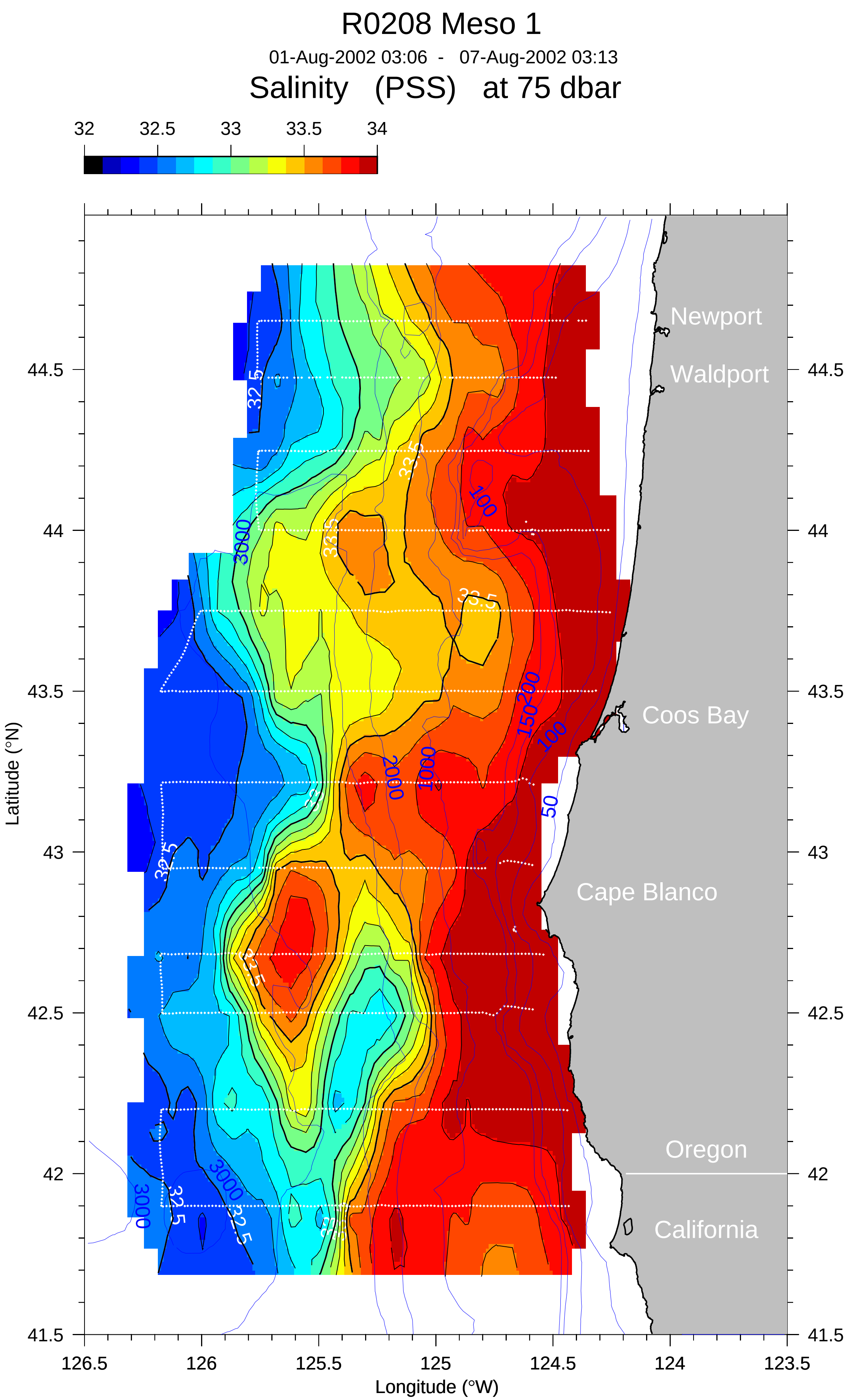



R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Salinity (PSS) at 25 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Salinity (PSS) at 35 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
100
200
150
1000
2000
3000
50
34
33.5
32.5


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Salinity (PSS) at 45 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
2000
1000
200
150
100
50

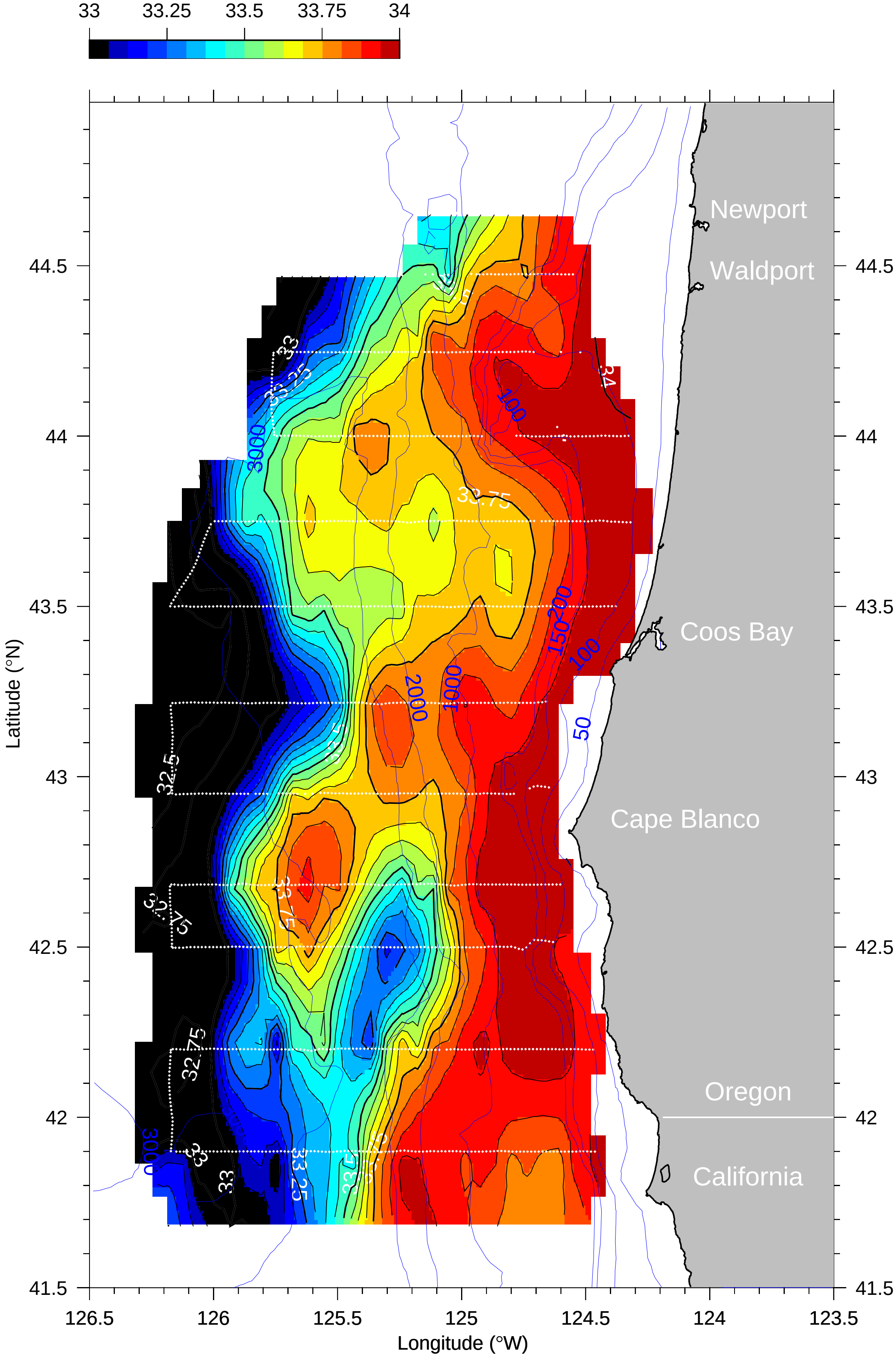

R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Salinity (PSS) at 55 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

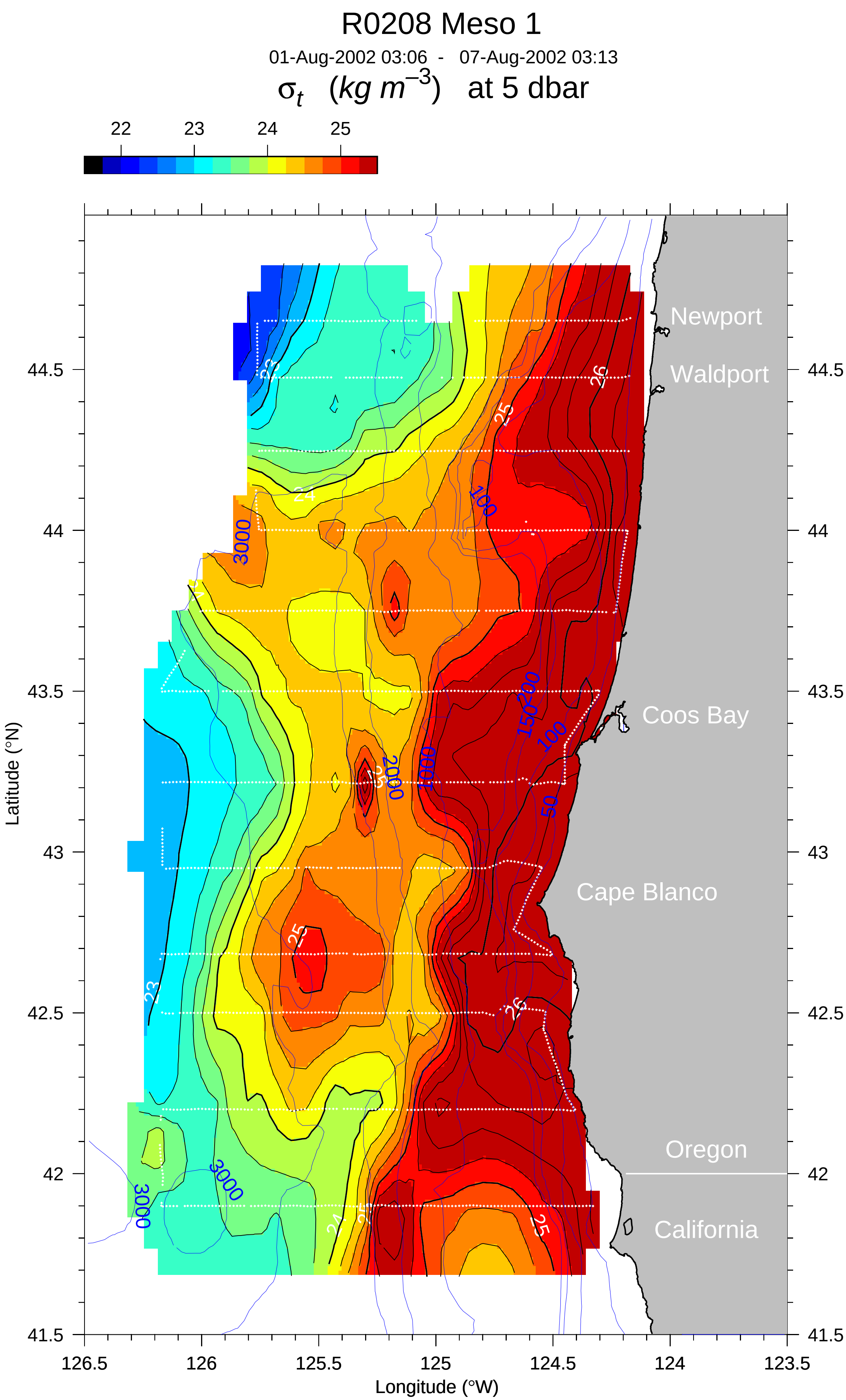

R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Salinity (PSS) at 75 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

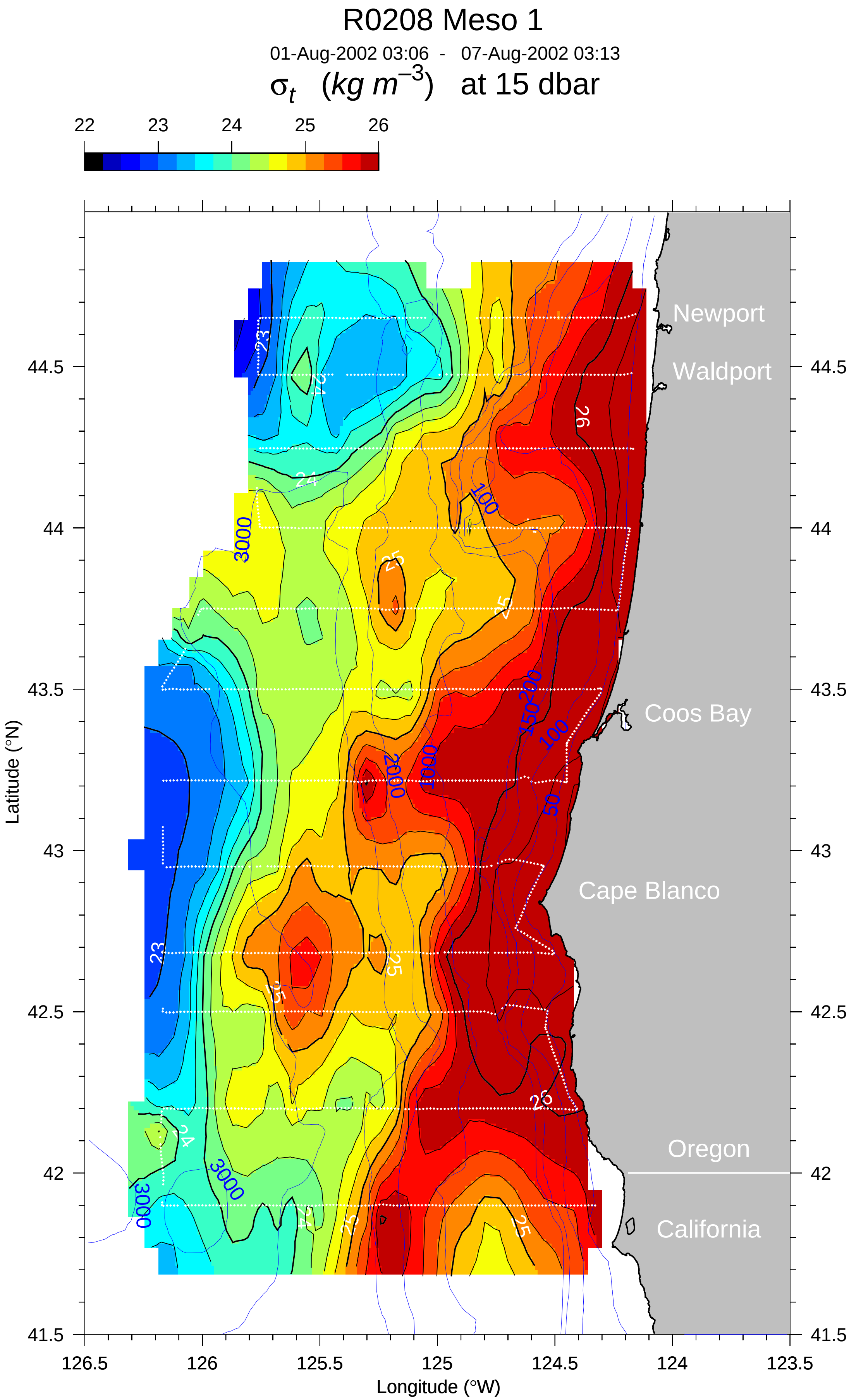
R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

Salinity (PSS) at 95 dbar



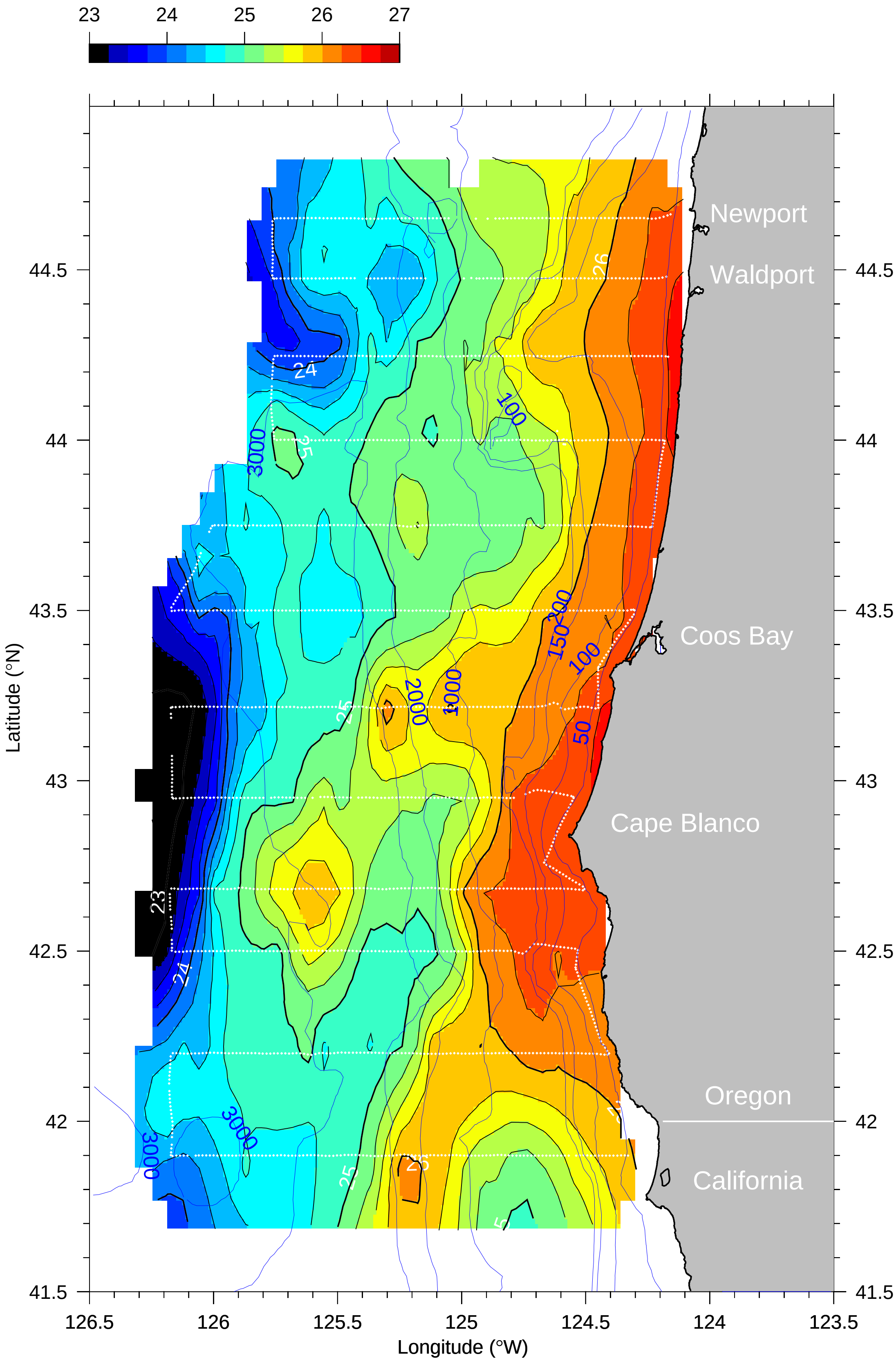

R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
σ$_t$ ($kg\ m^{-3}$) at 5 dbar
22
23
24
25
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

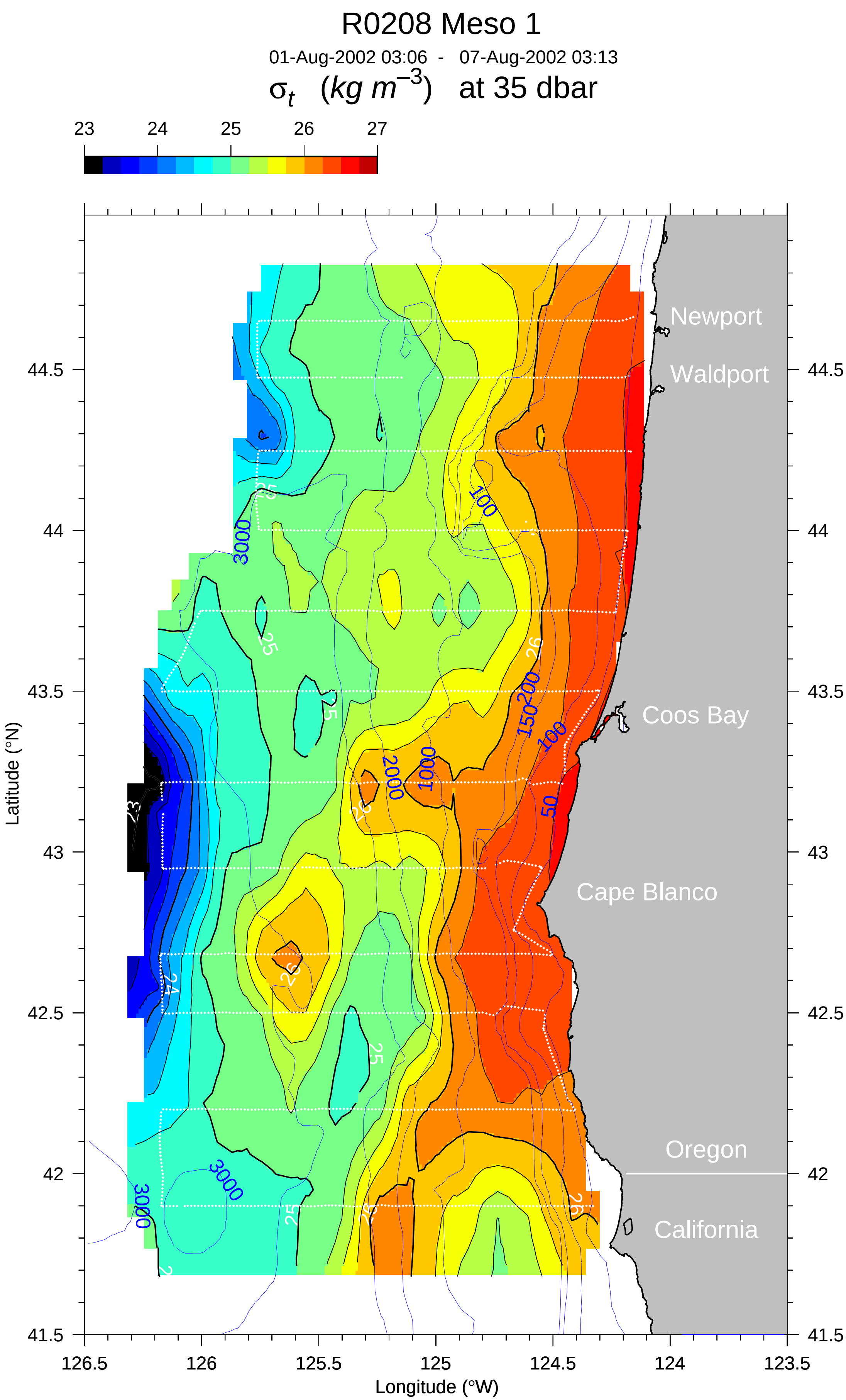

R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
σt (kg m−3) at 15 dbar
22
23
24
25
26
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5
3000
2000
1000
200
150
100
50

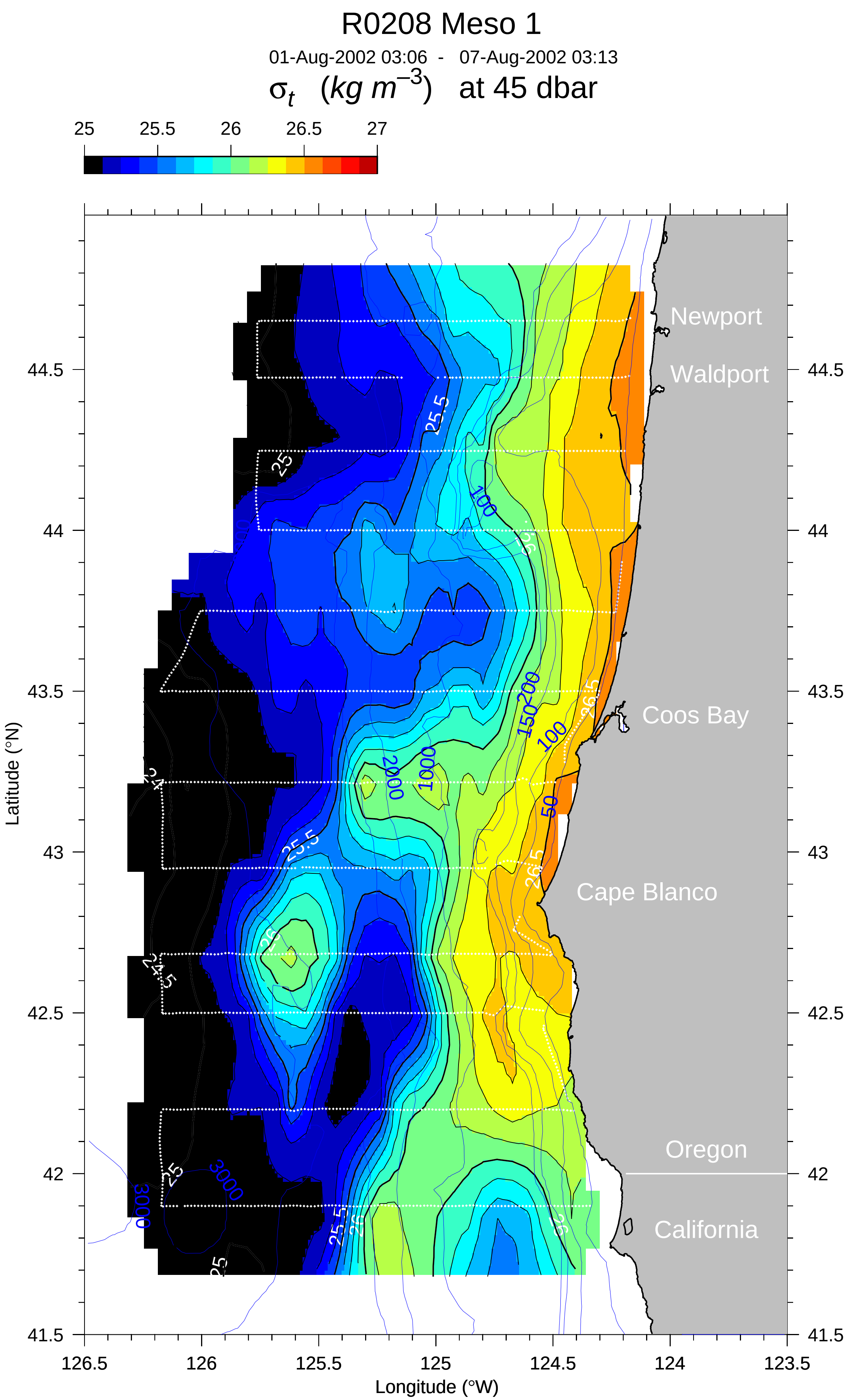
R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

σ_t ($kg\ m^{-3}$) at 25 dbar




R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
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

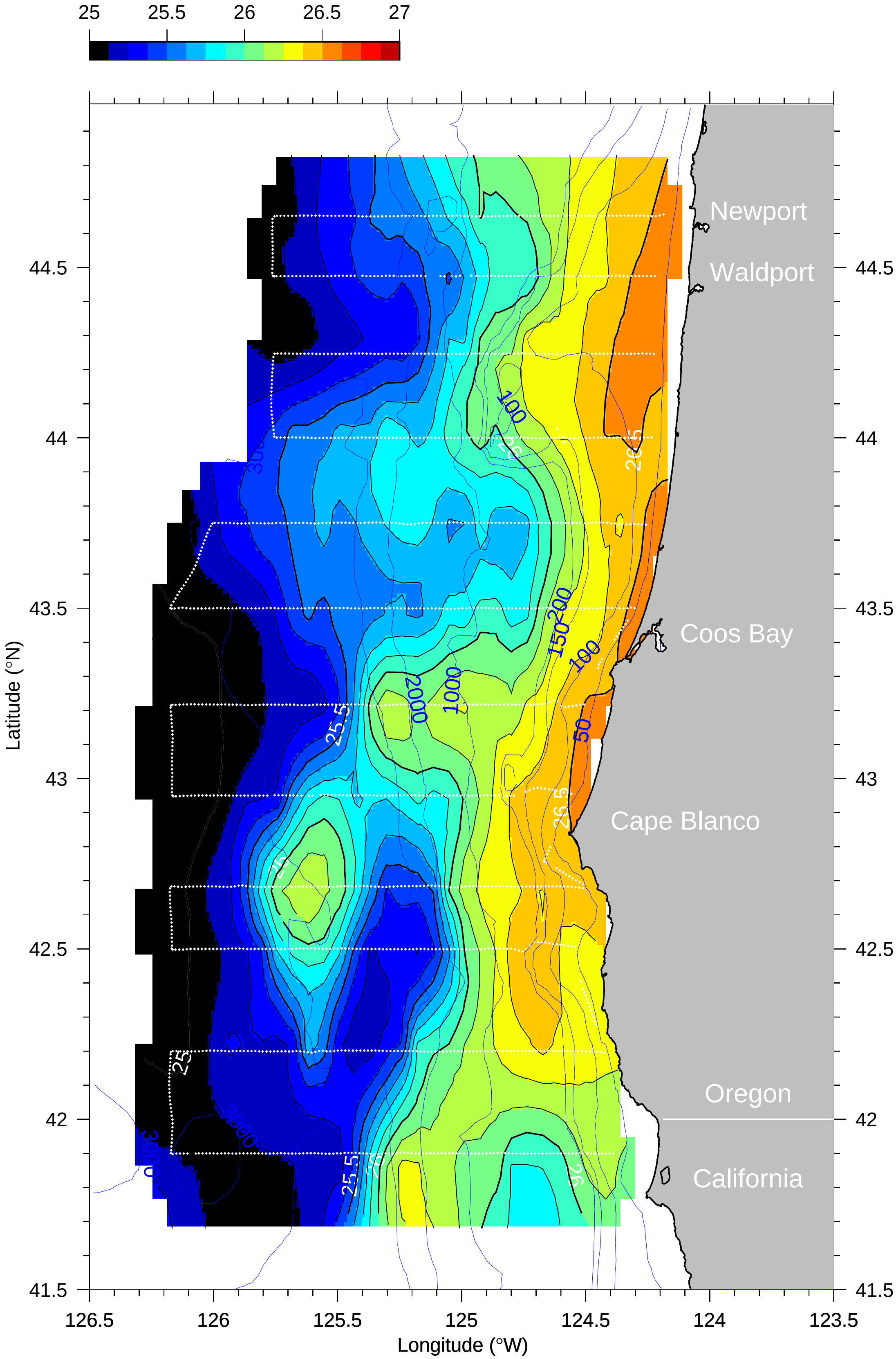


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
σ_t ($kg\ m^{-3}$) at 45 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

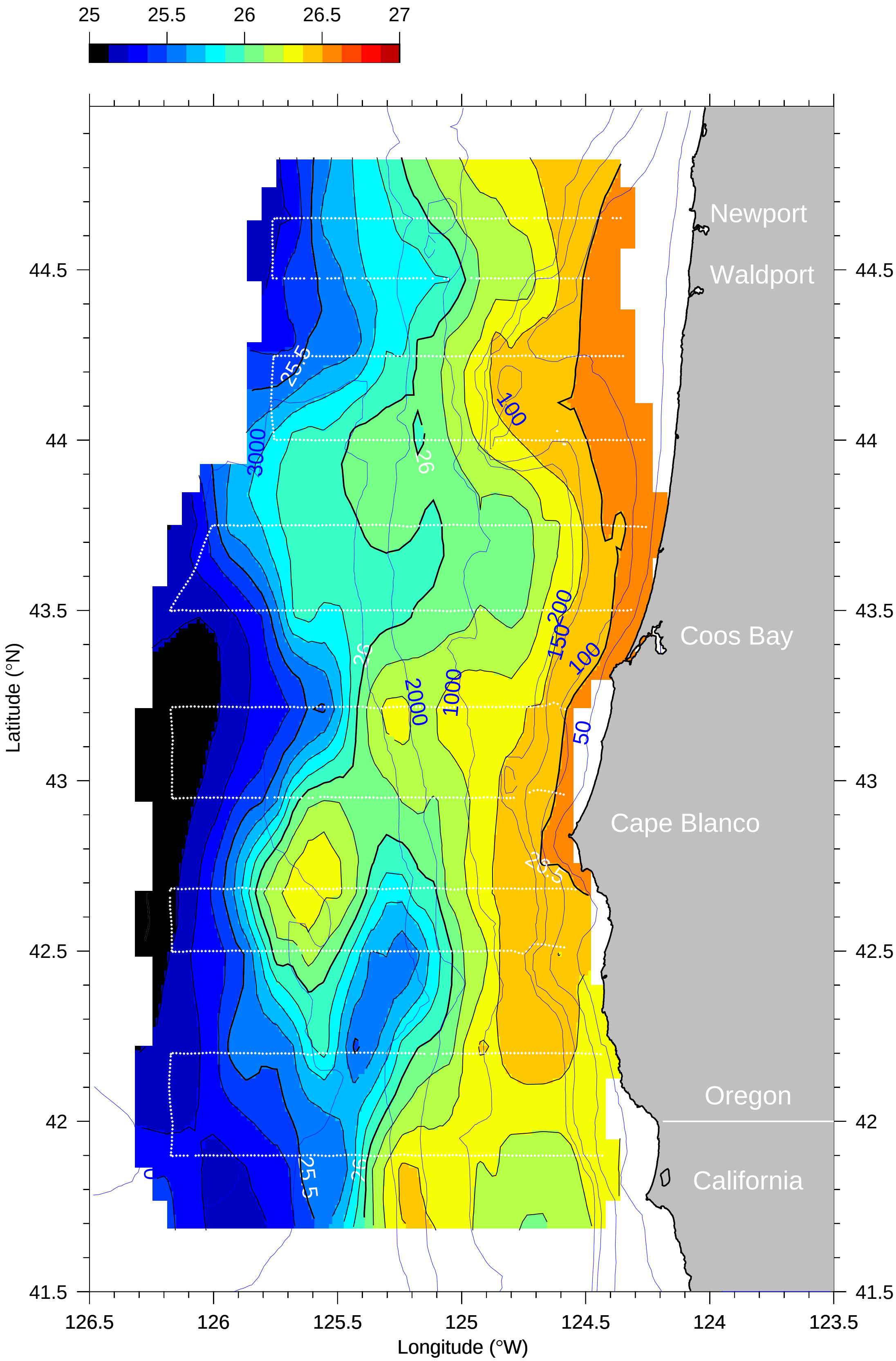
σ_t $(kg\ m^{-3})$ at 55 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

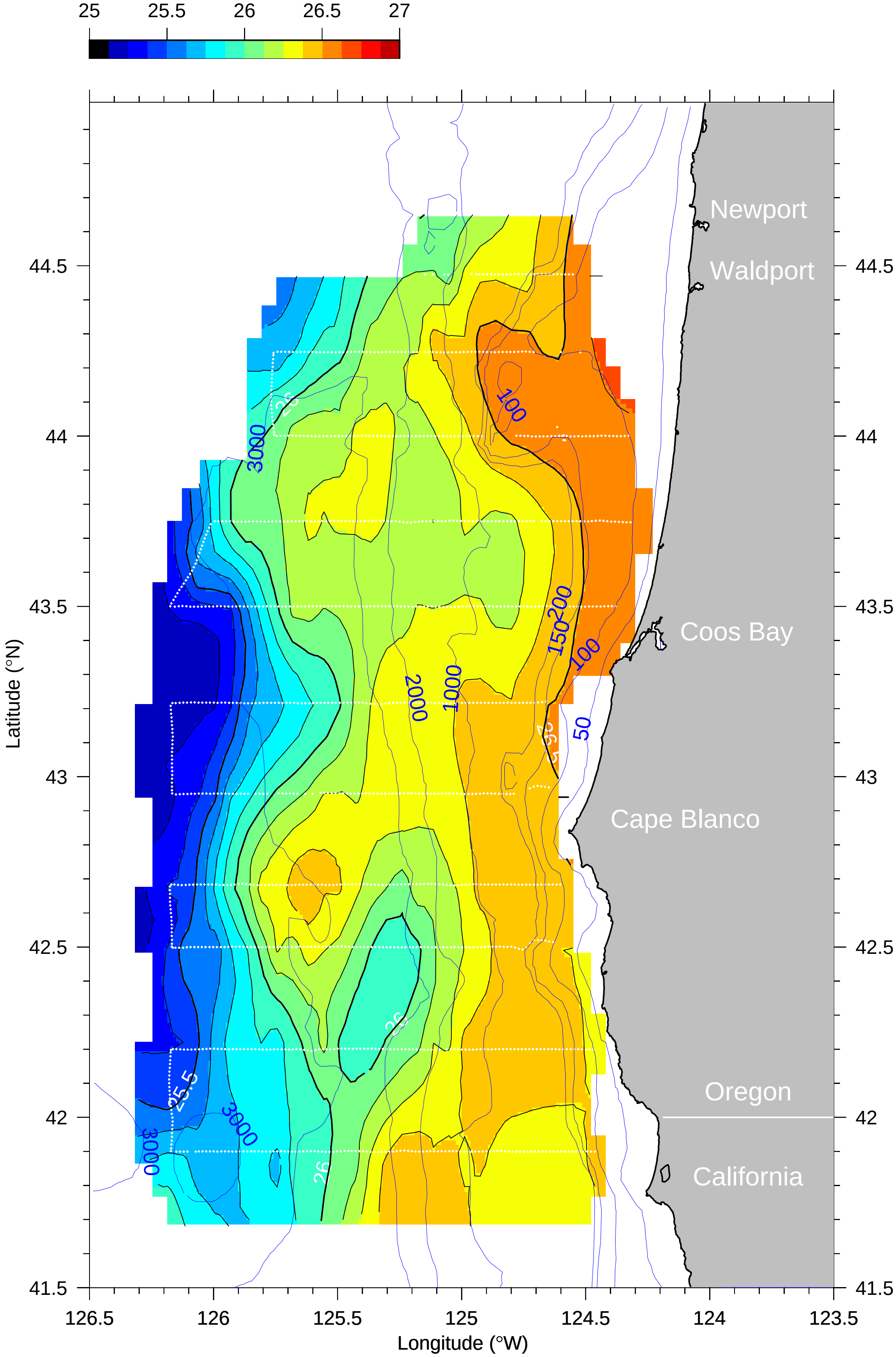
σ_t ($kg\ m^{-3}$) at 75 dbar

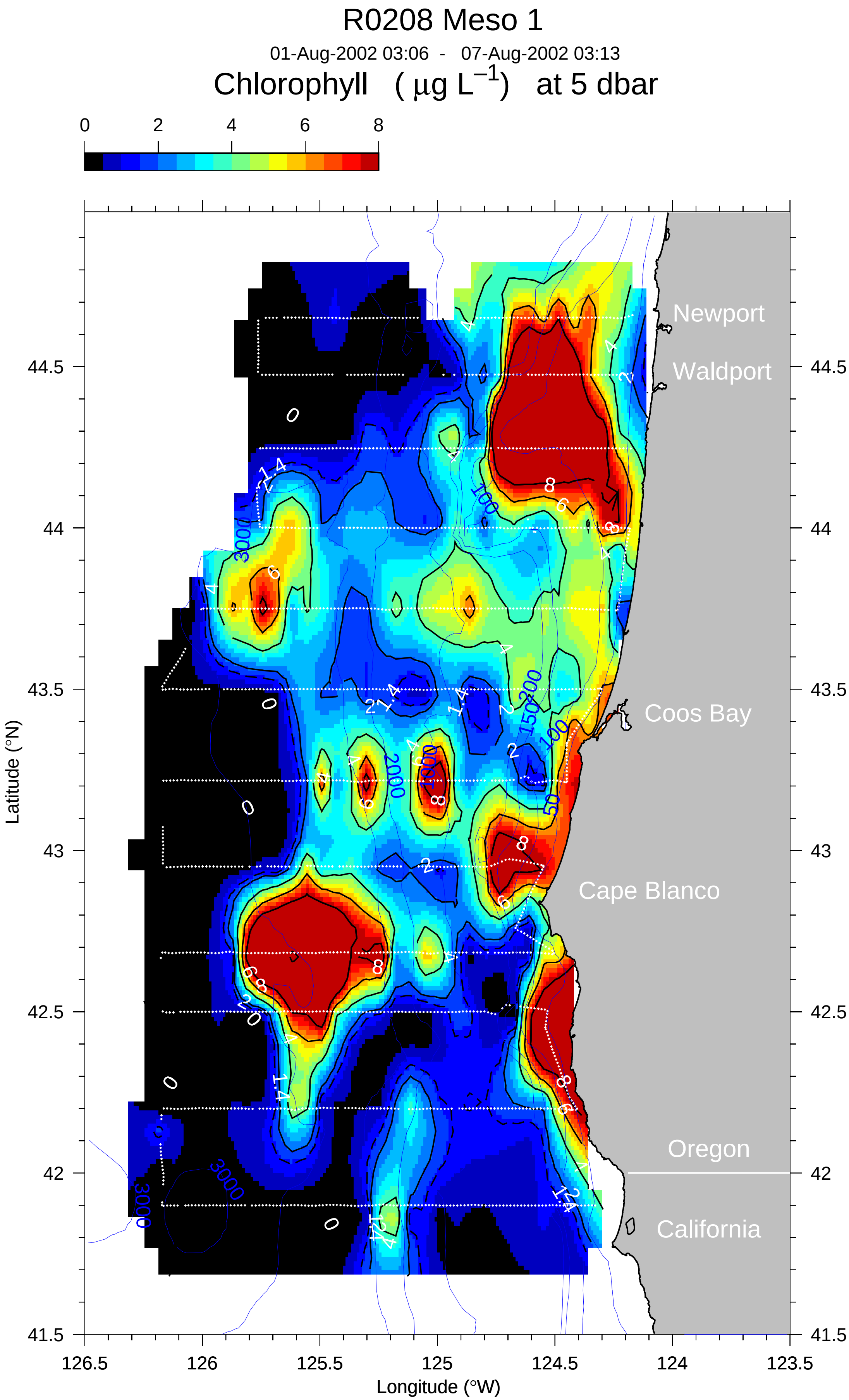


R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

σ_t $(kg\ m^{-3})$ at 95 dbar

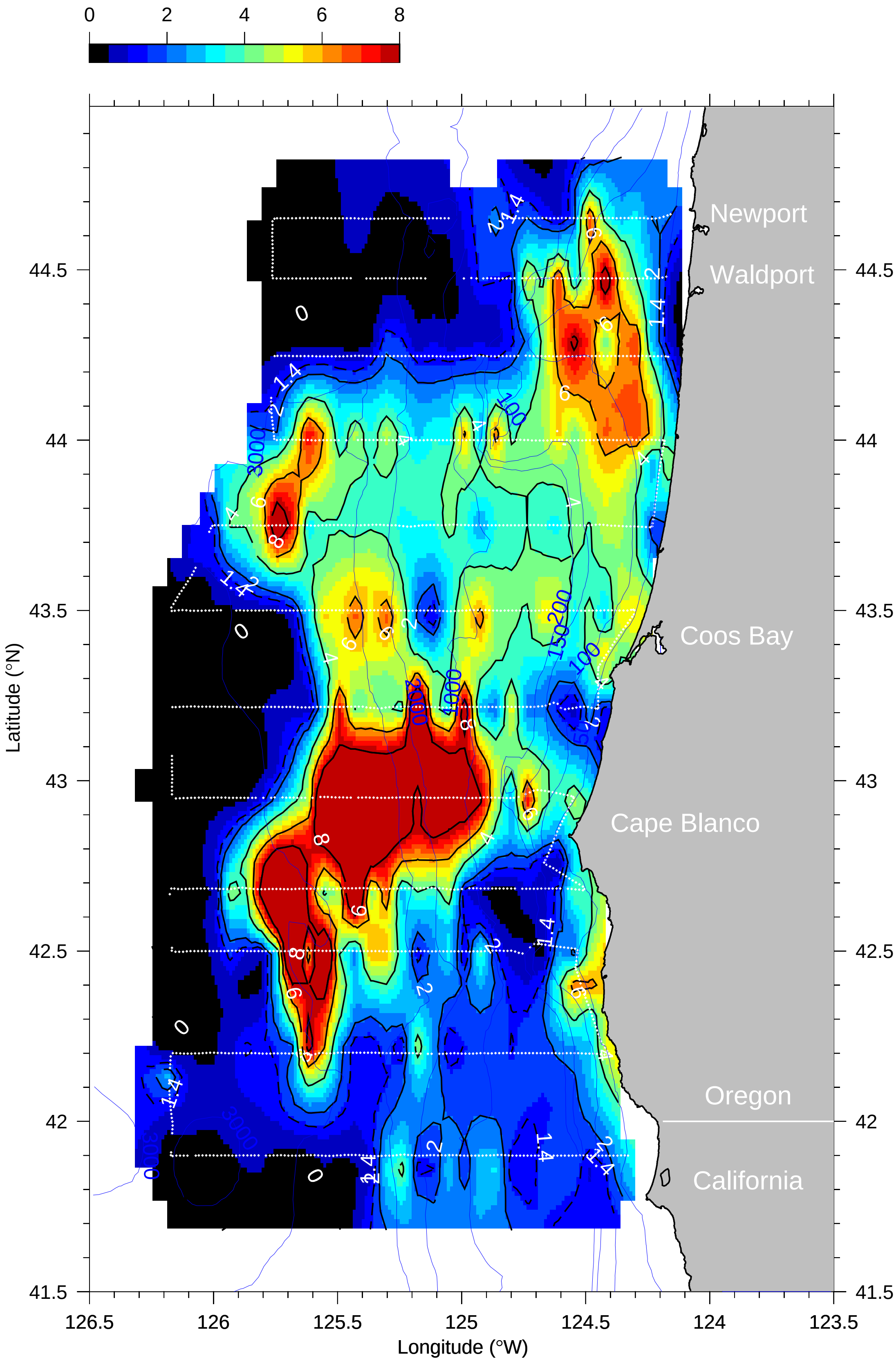



R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Chlorophyll (µg L⁻¹) at 5 dbar
0 2 4 6 8
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

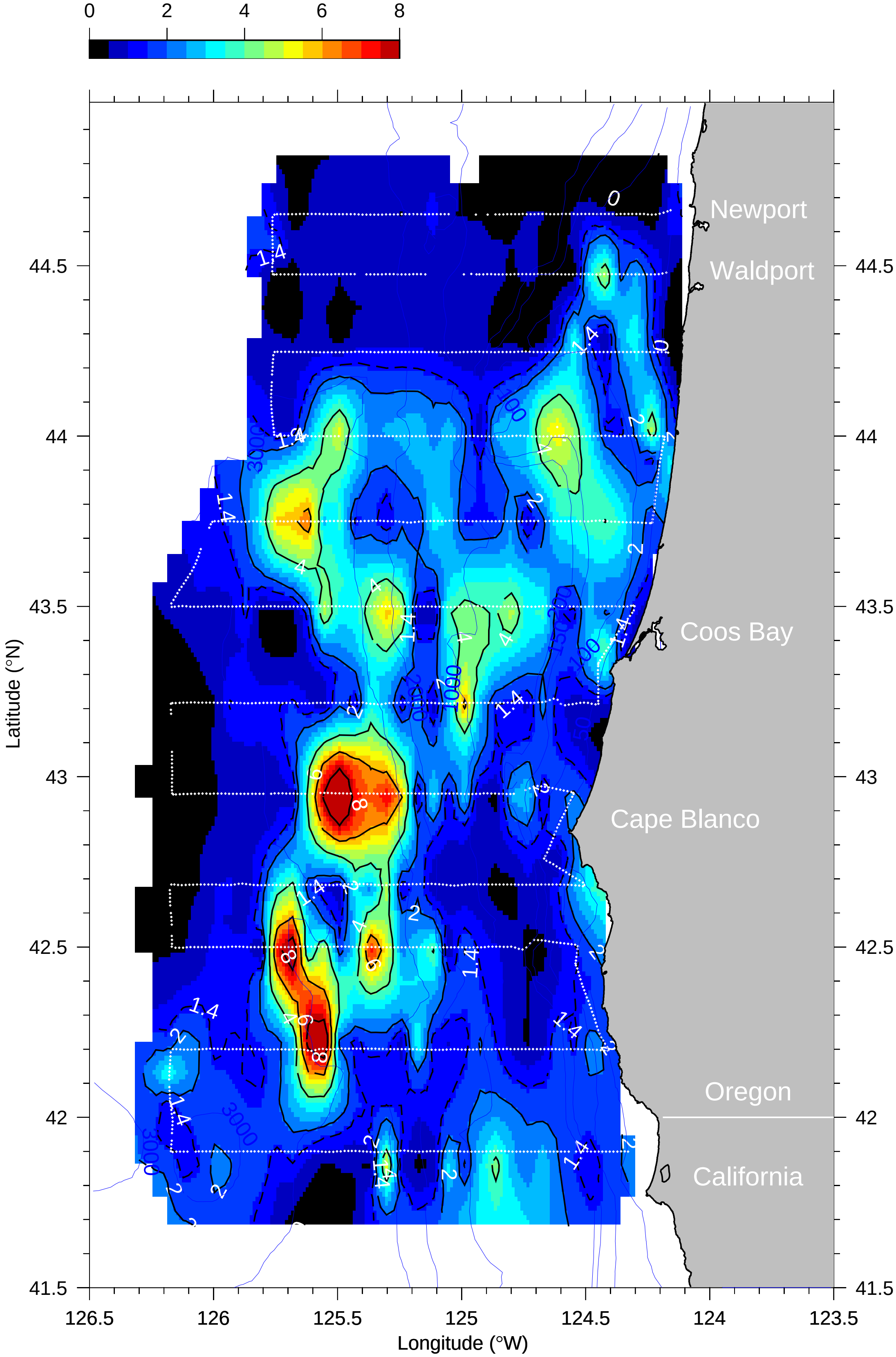
Chlorophyll (μg L^{-1}) at 15 dbar

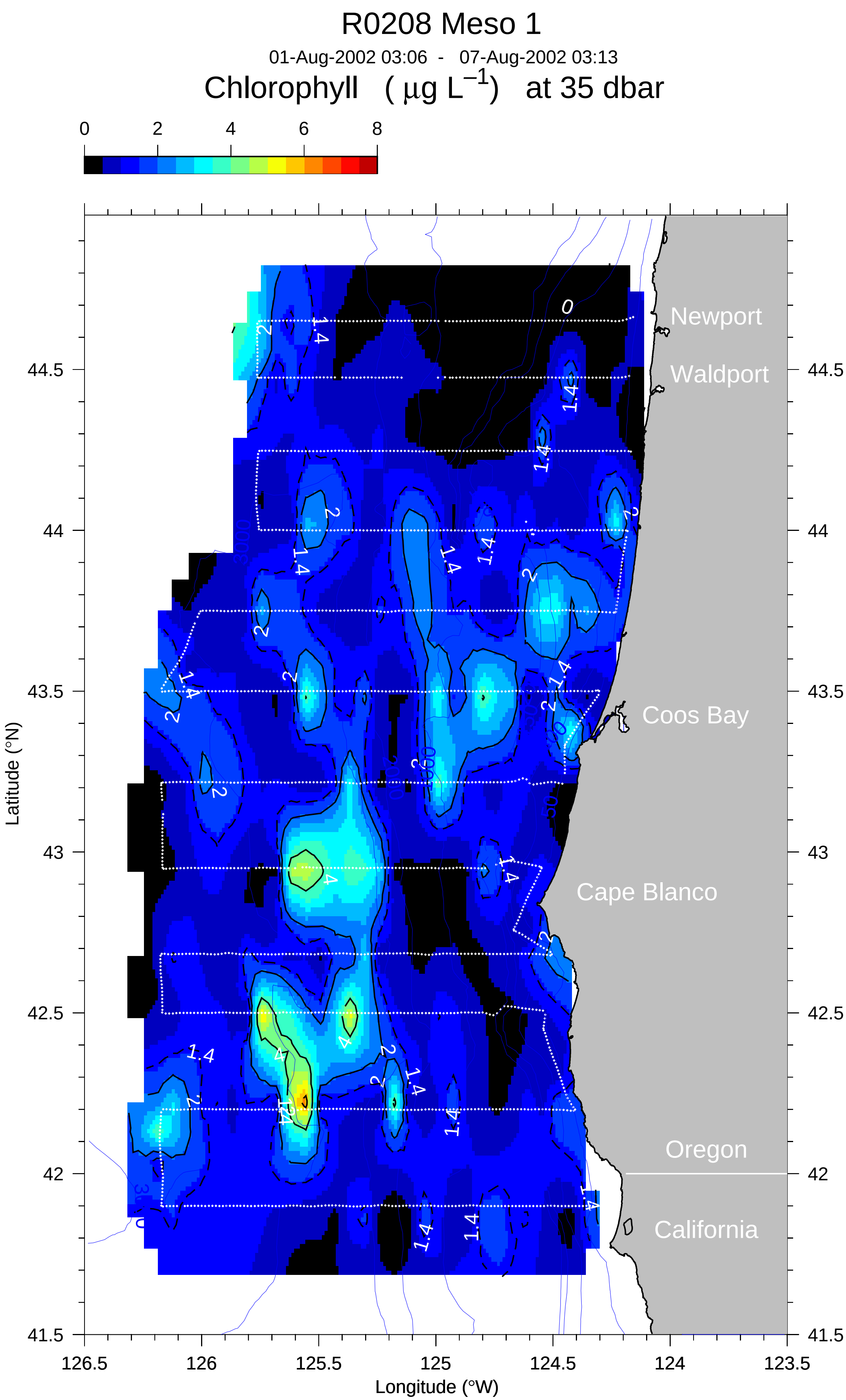


R0208 Meso 1

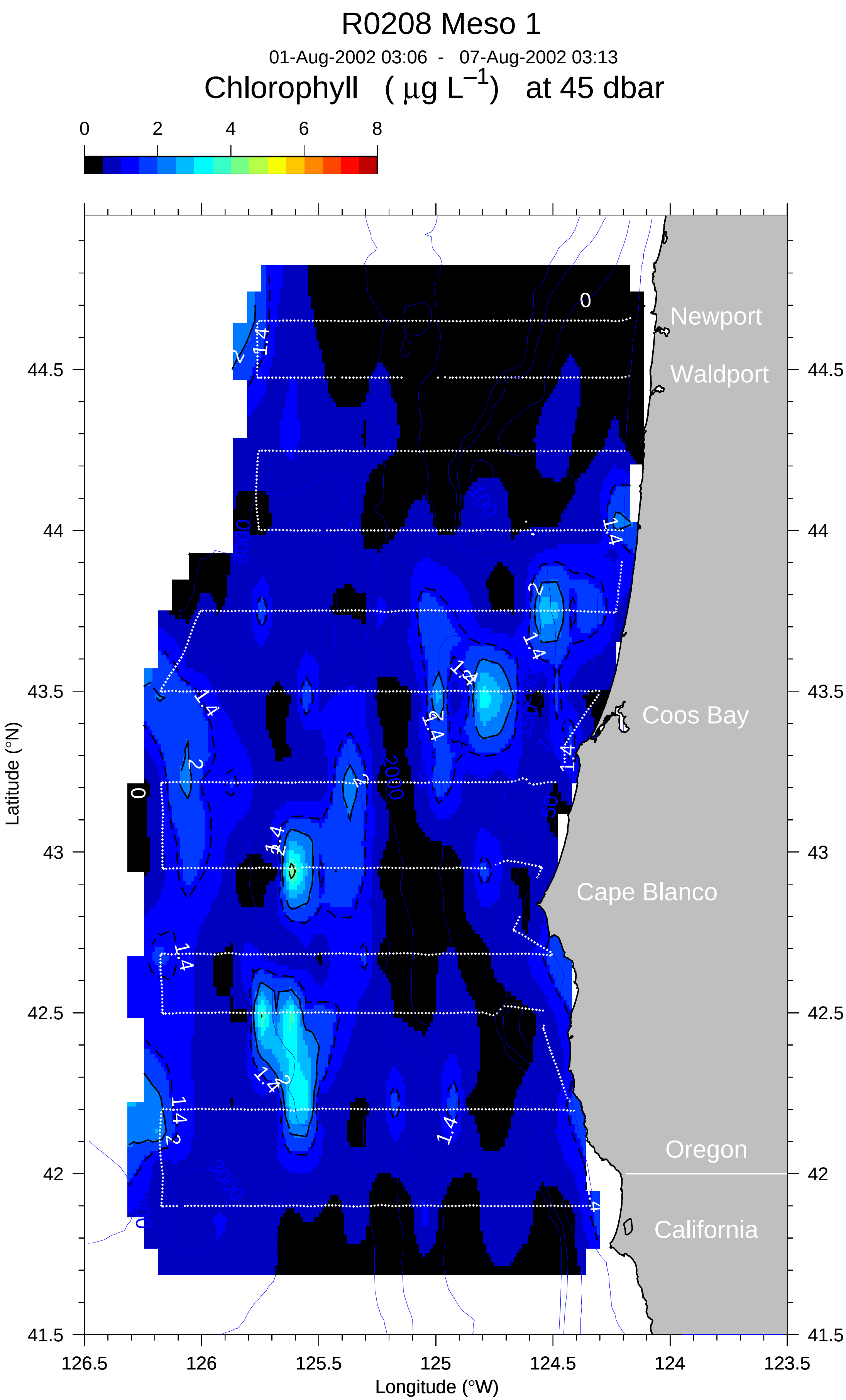
01-Aug-2002 03:06 - 07-Aug-2002 03:13

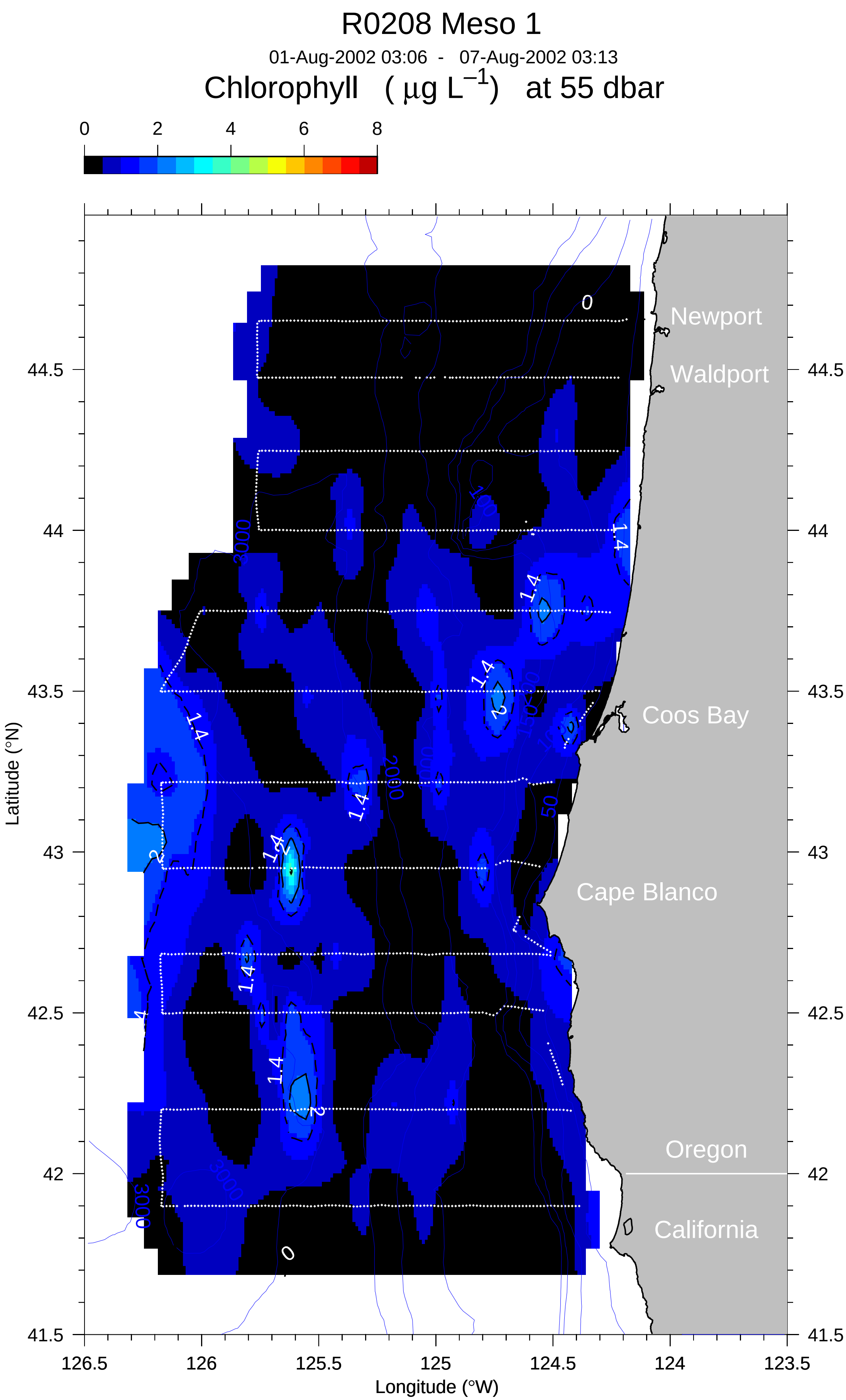
Chlorophyll (μg L^{-1}) at 25 dbar

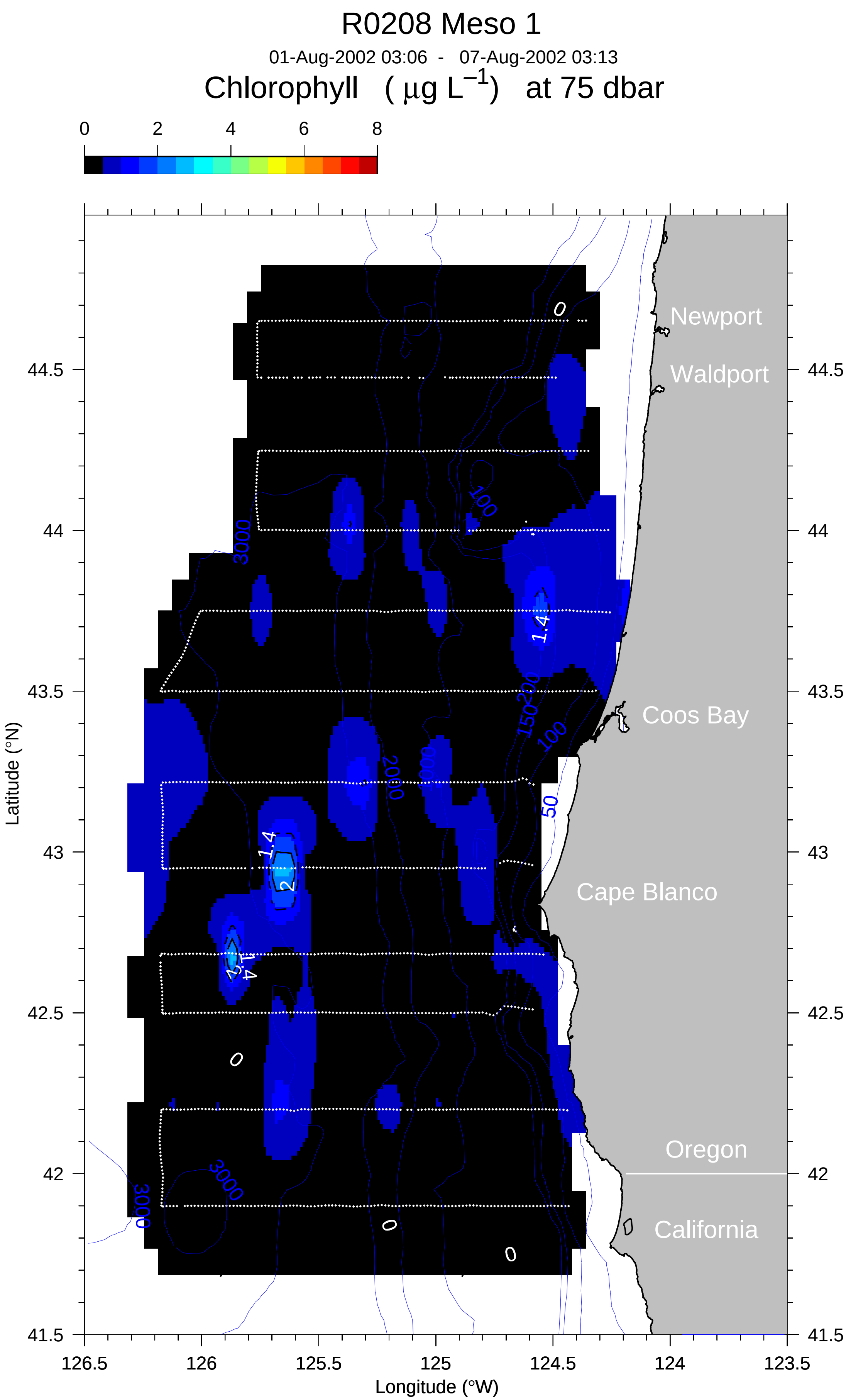




R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Chlorophyll (µg L^{-1}) at 35 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Chlorophyll (µg L^{-1}) at 45 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

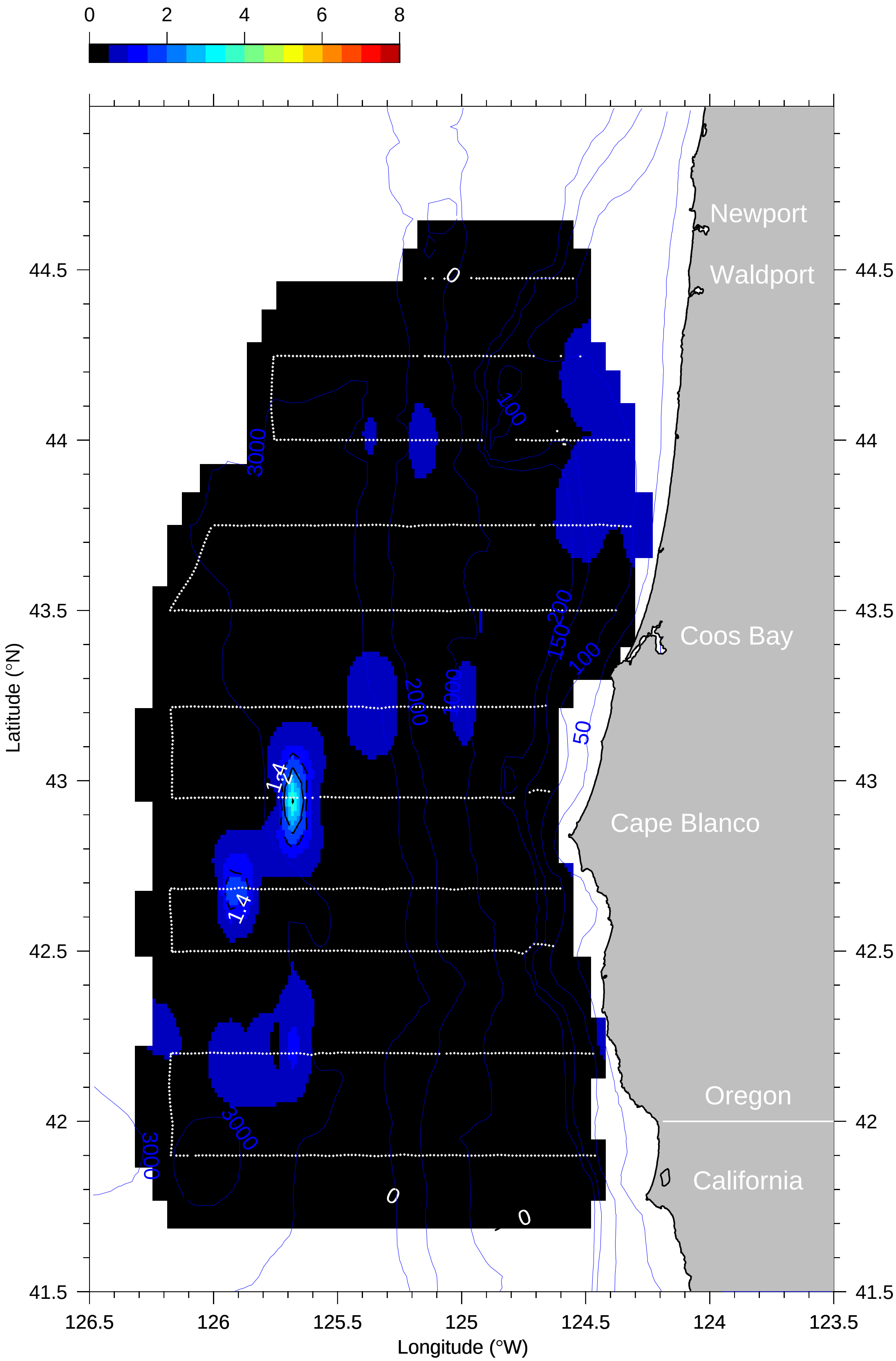

R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Chlorophyll (µg L^{-1}) at 55 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
44.5
44
43.5
43
42.5
42
41.5
126.5
126
125.5
125
124.5
124
123.5


R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
Chlorophyll (µg L⁻¹) at 75 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

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

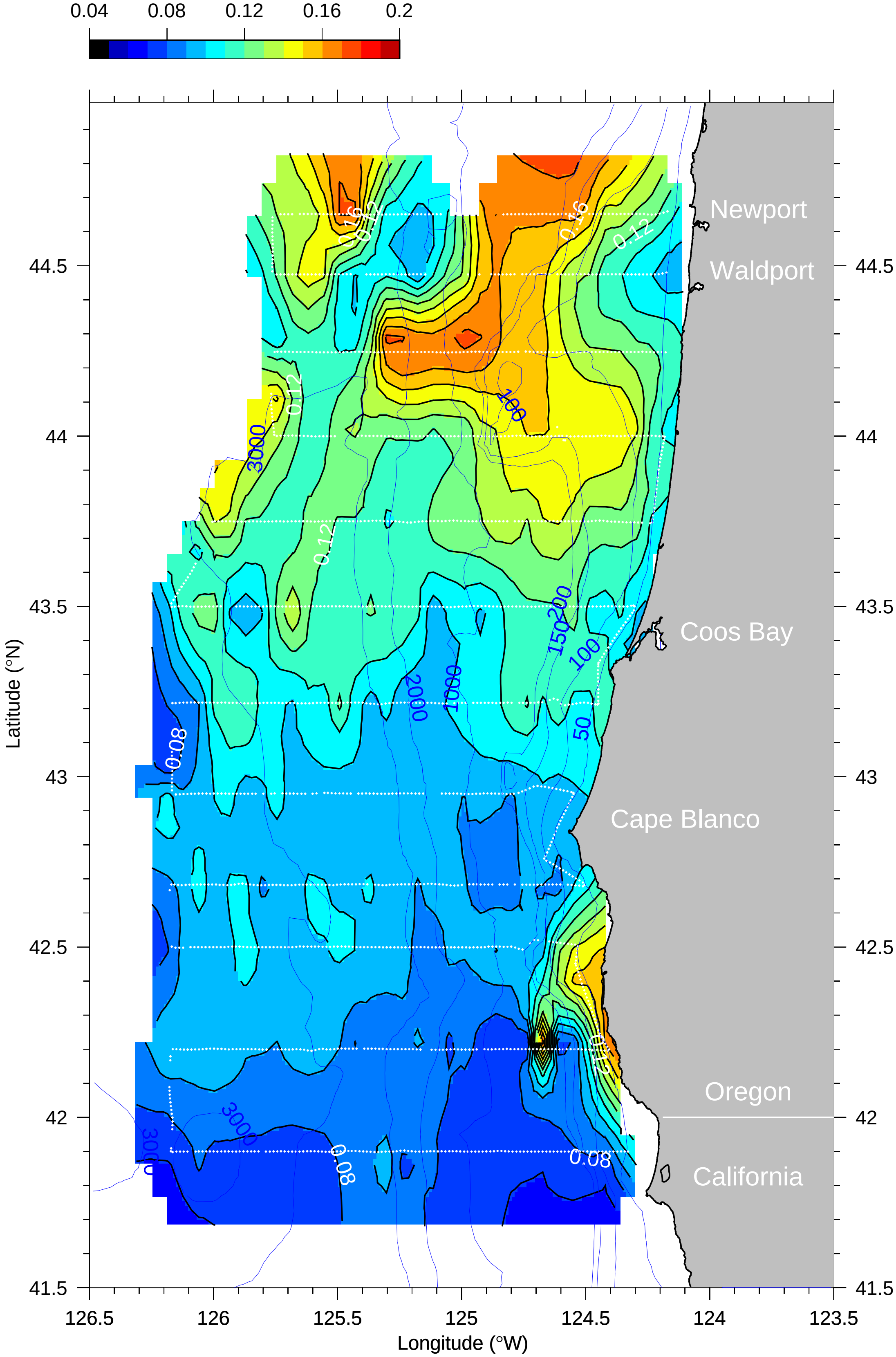
Chlorophyll (μg L^{-1}) at 95 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

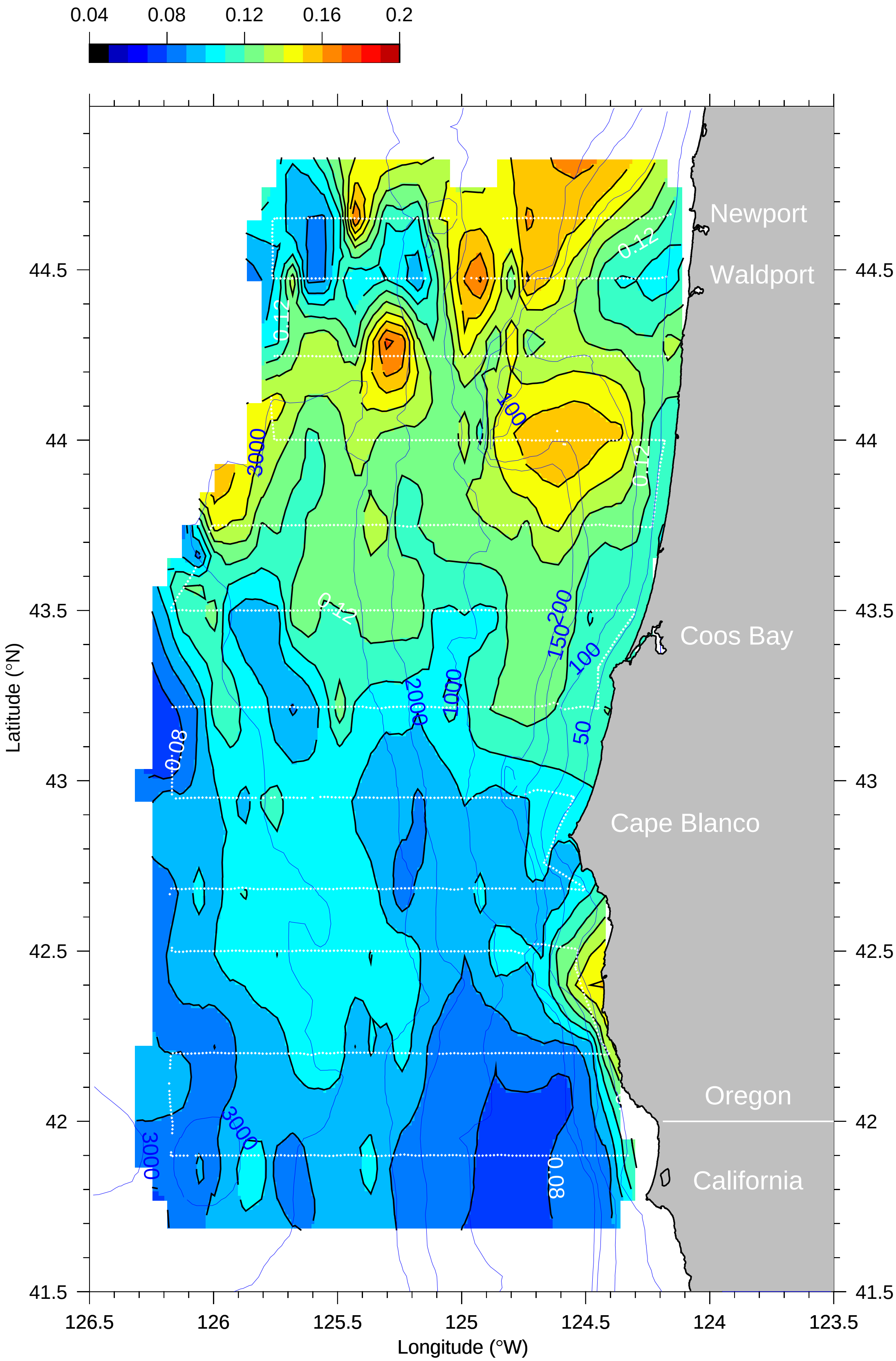
CDOM (volts) at 5 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

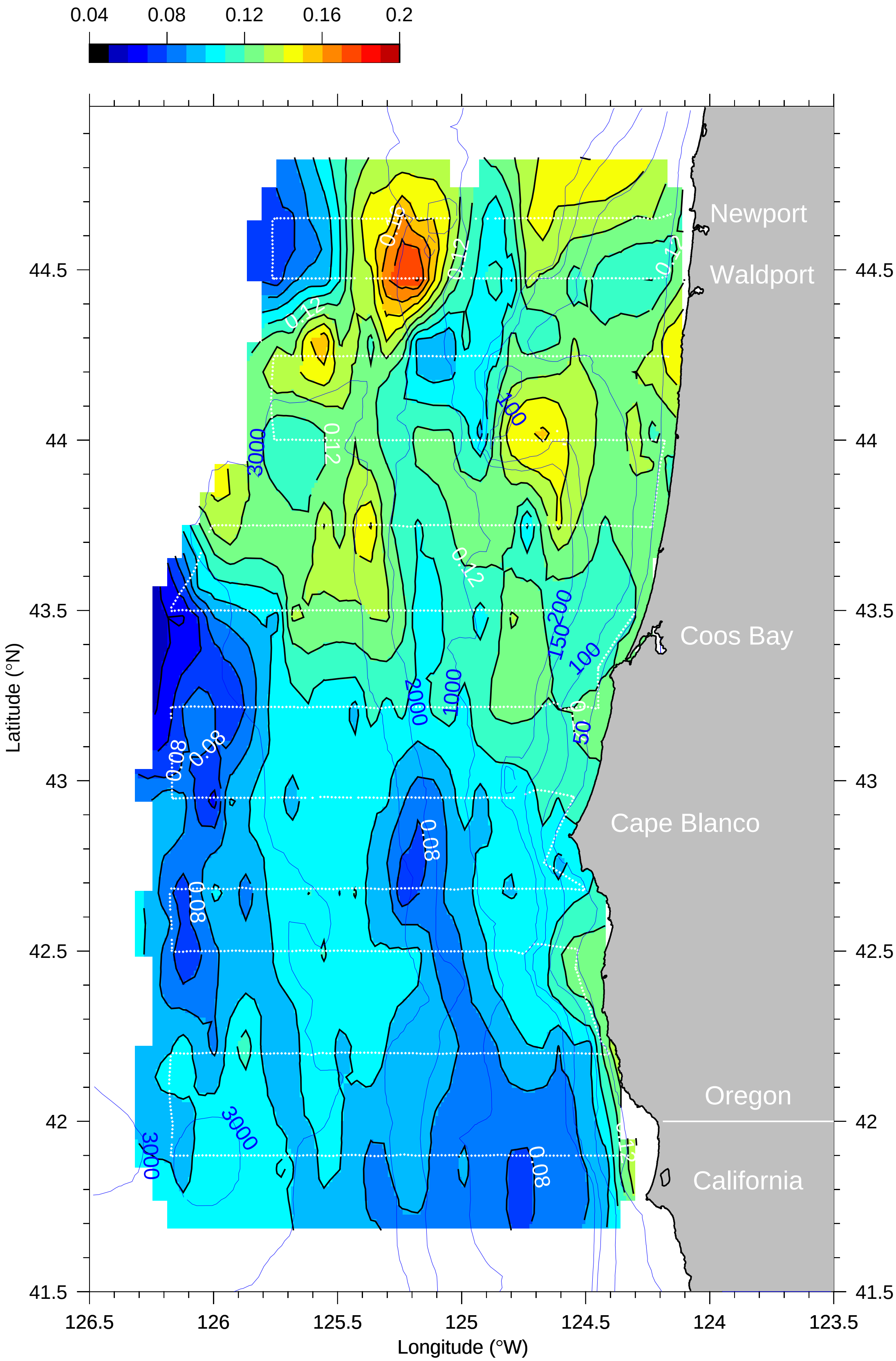
CDOM (volts) at 15 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

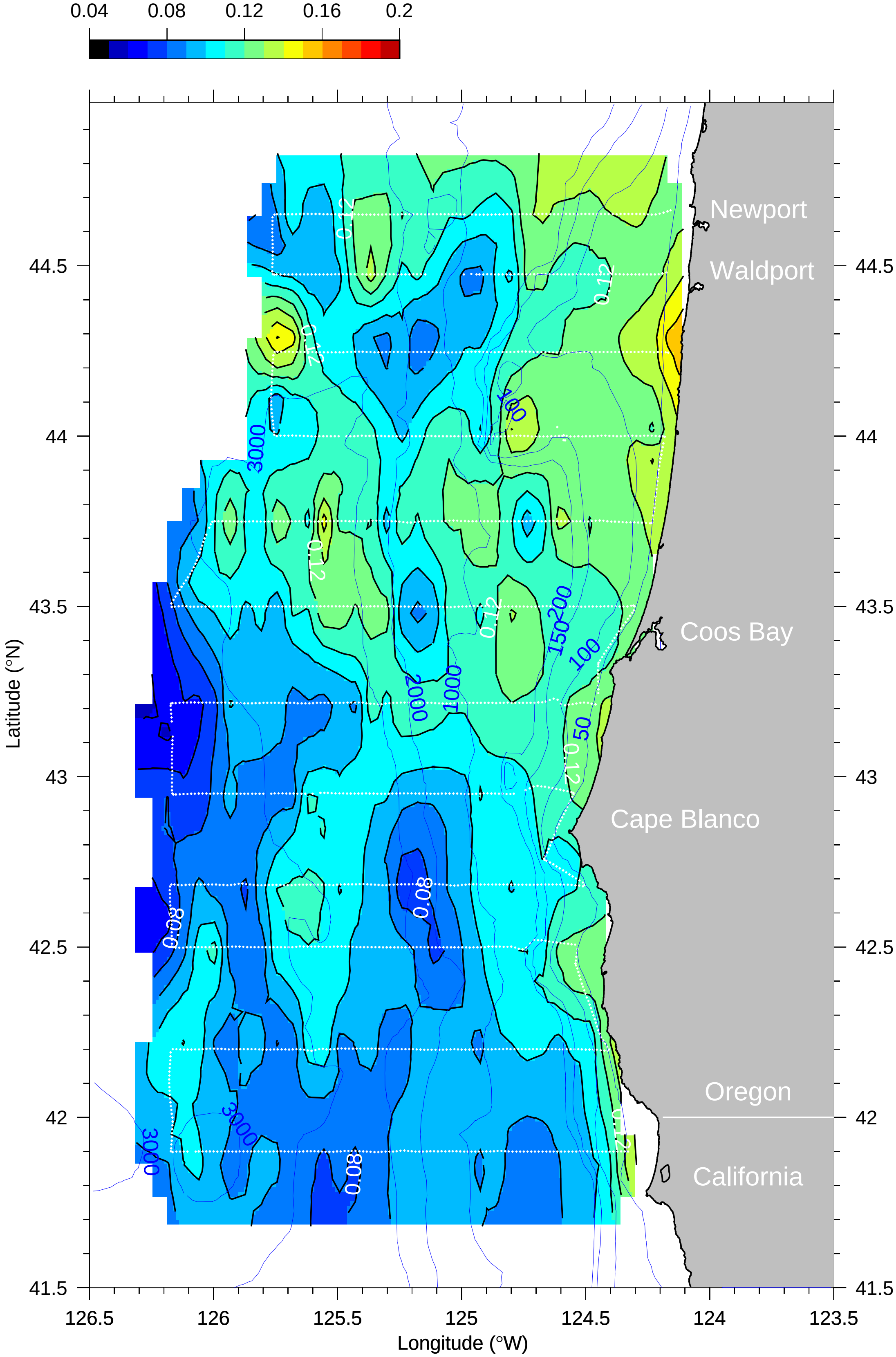
CDOM (volts) at 25 dbar



R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

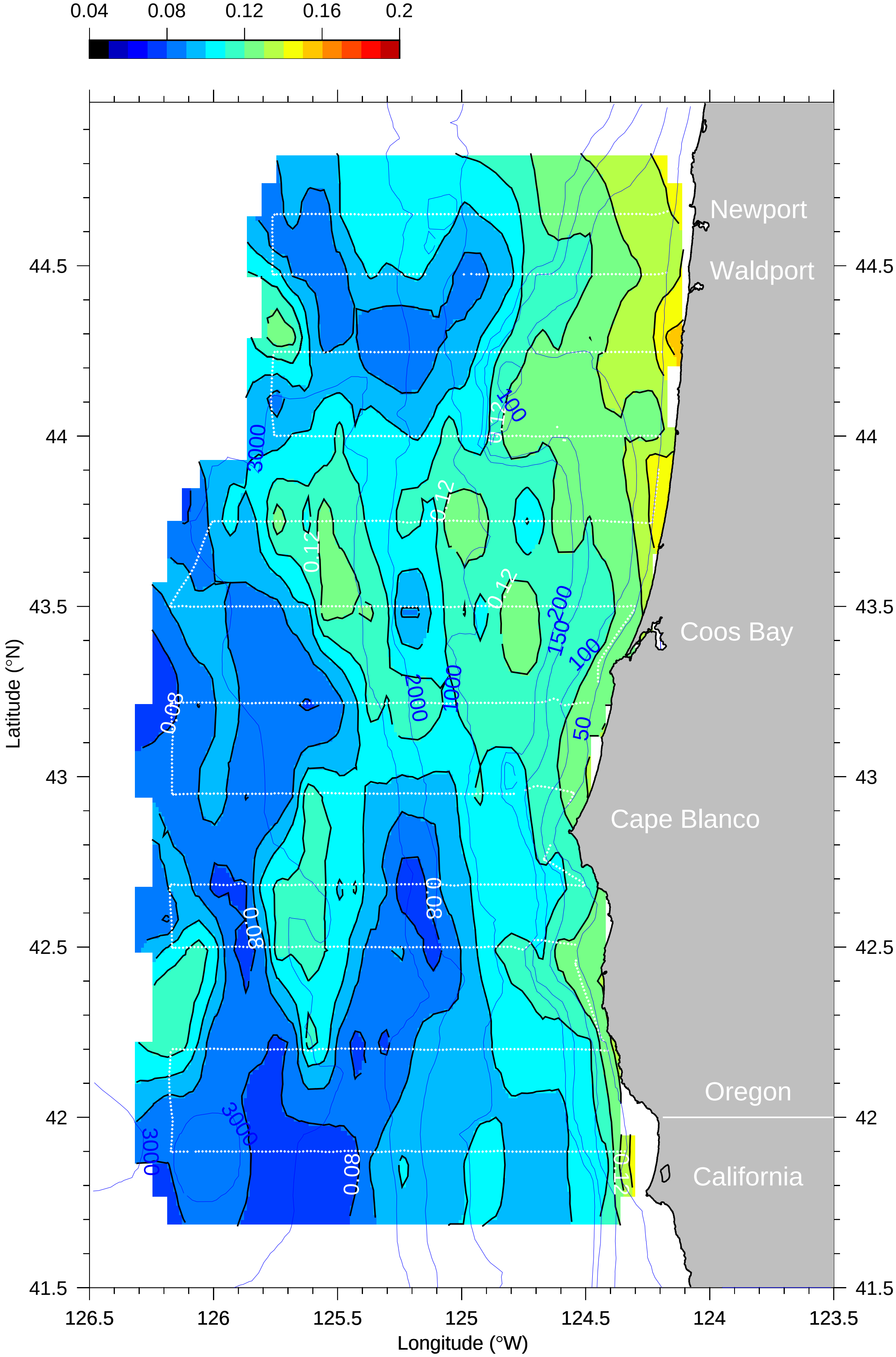
CDOM (volts) at 35 dbar

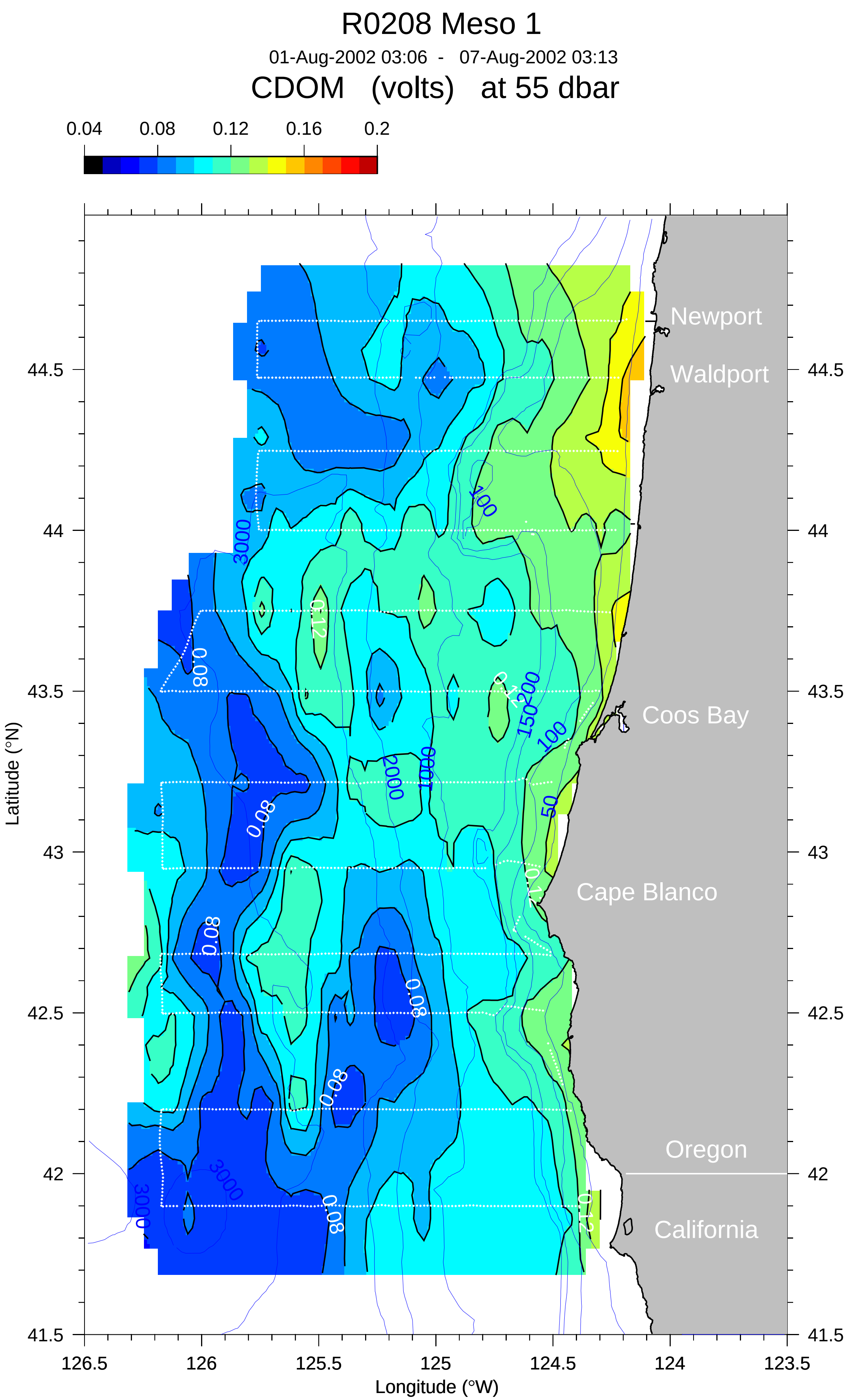


R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

CDOM (volts) at 45 dbar

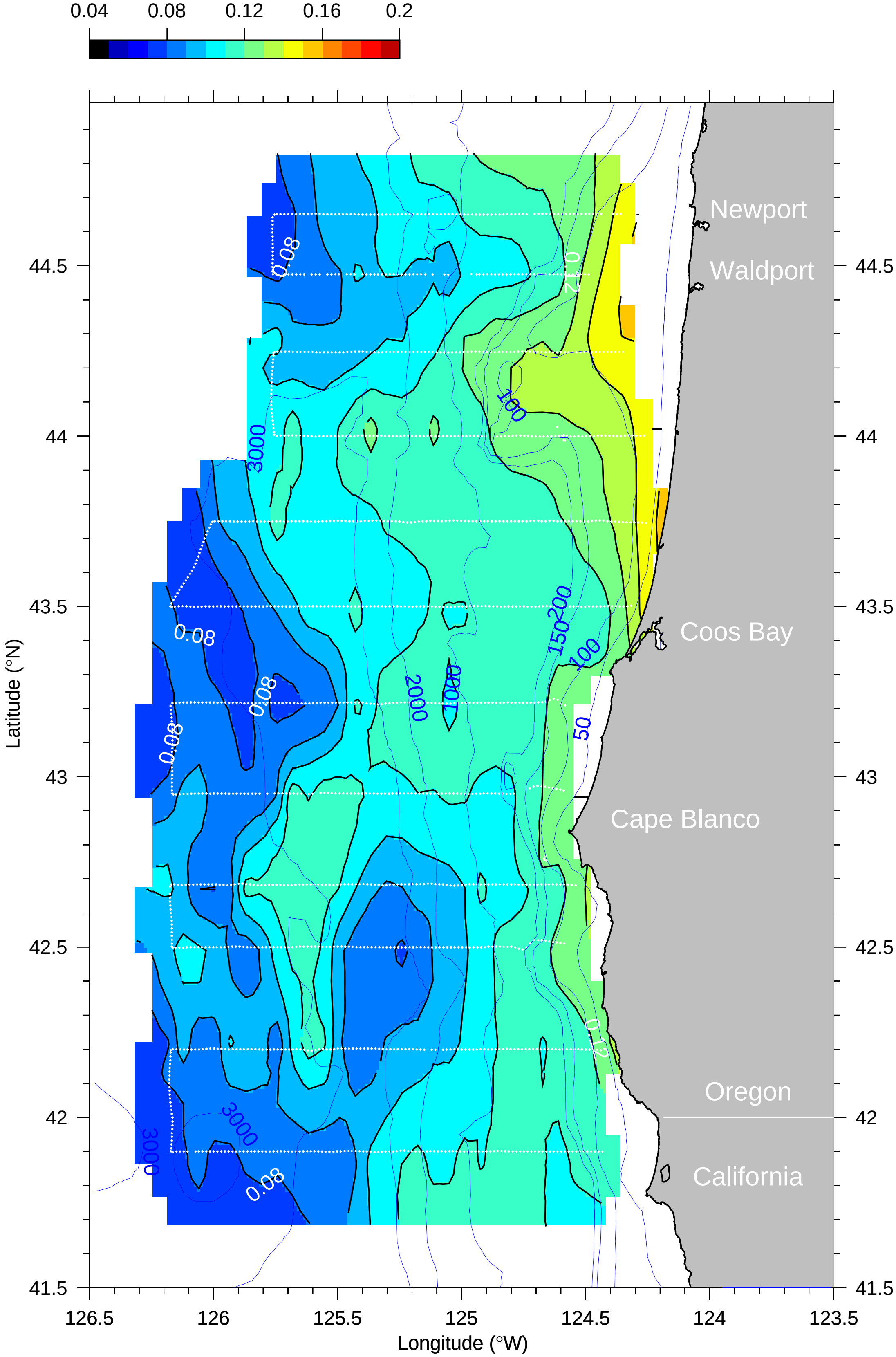



R0208 Meso 1
01-Aug-2002 03:06 - 07-Aug-2002 03:13
CDOM (volts) at 55 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
Oregon
California
Latitude (°N)
Longitude (°W)
126.5
126
125.5
125
124.5
124
123.5
41.5
42
42.5
43
43.5
44
44.5

R0208 Meso 1

01-Aug-2002 03:06 - 07-Aug-2002 03:13

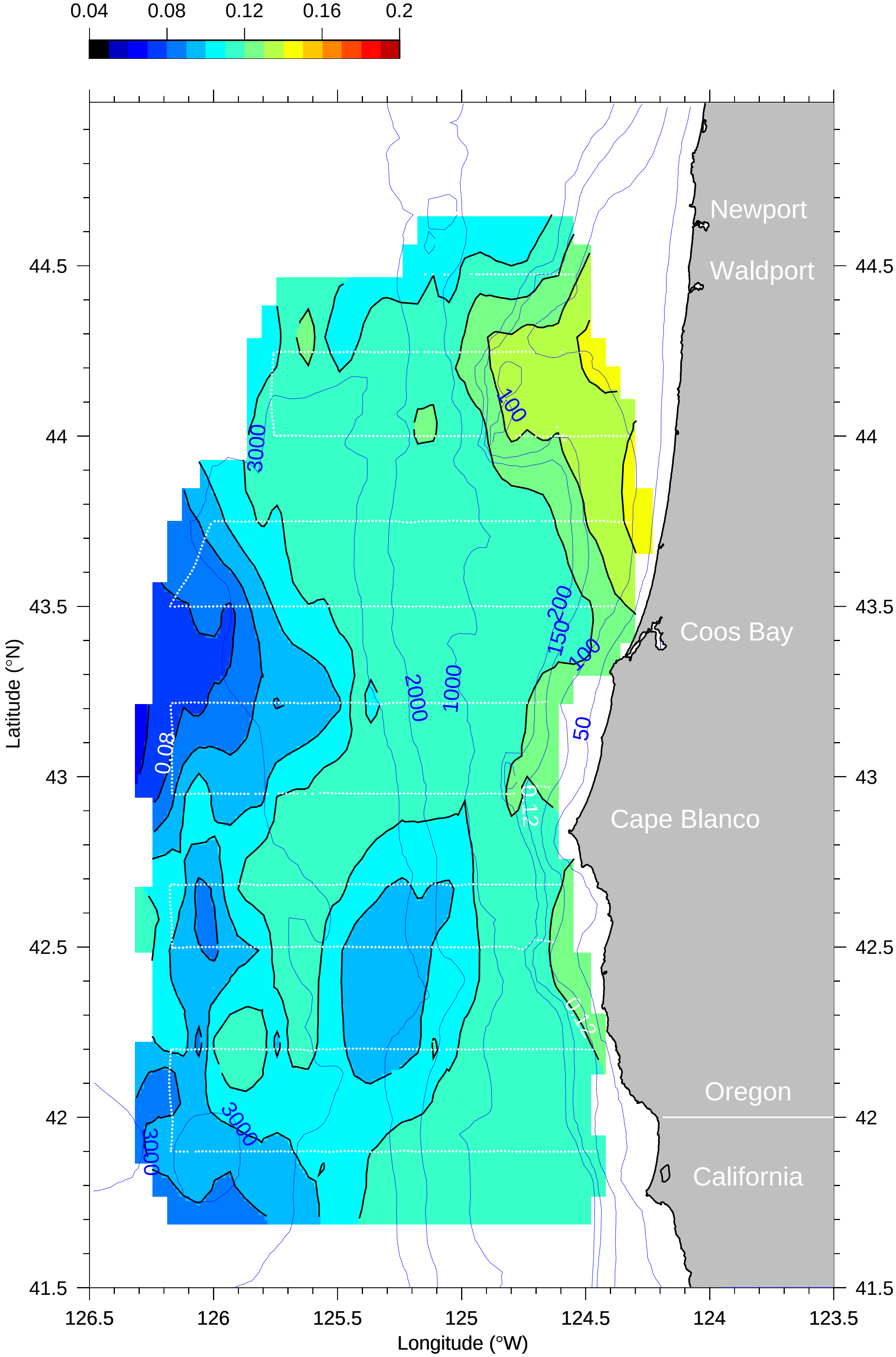
CDOM (volts) at 75 dbar



R0208 Meso 1

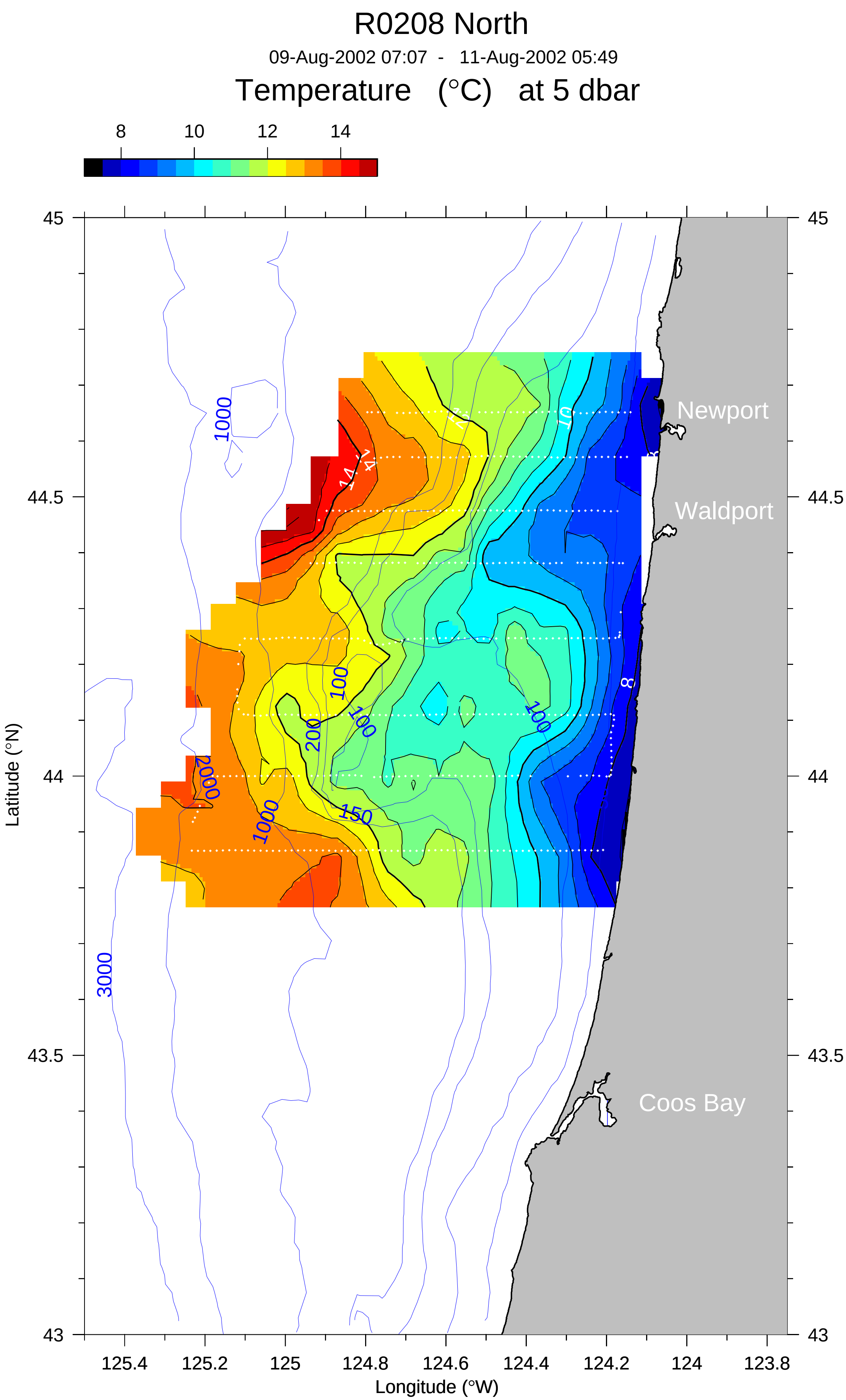
01-Aug-2002 03:06 - 07-Aug-2002 03:13

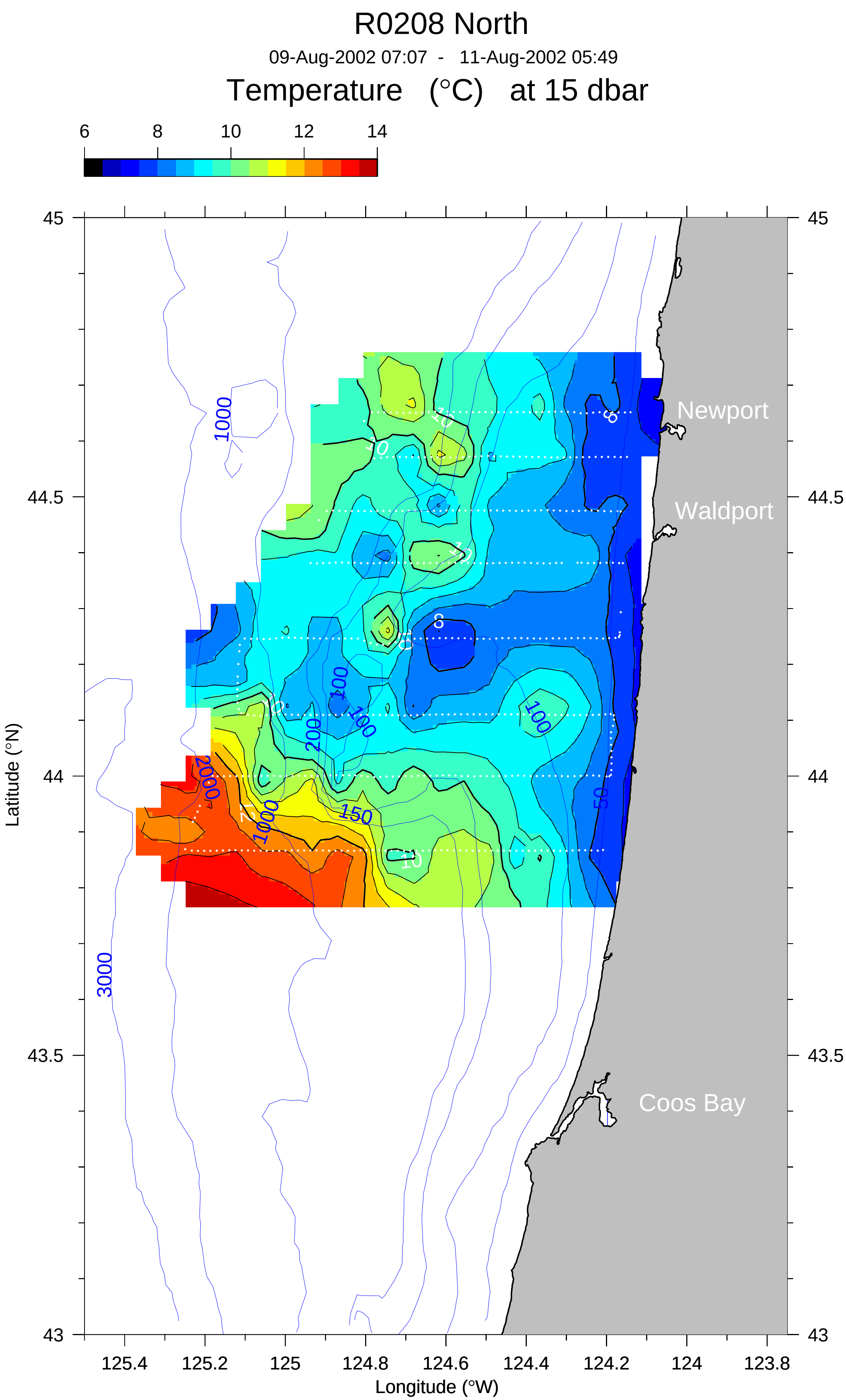
CDOM (volts) at 95 dbar

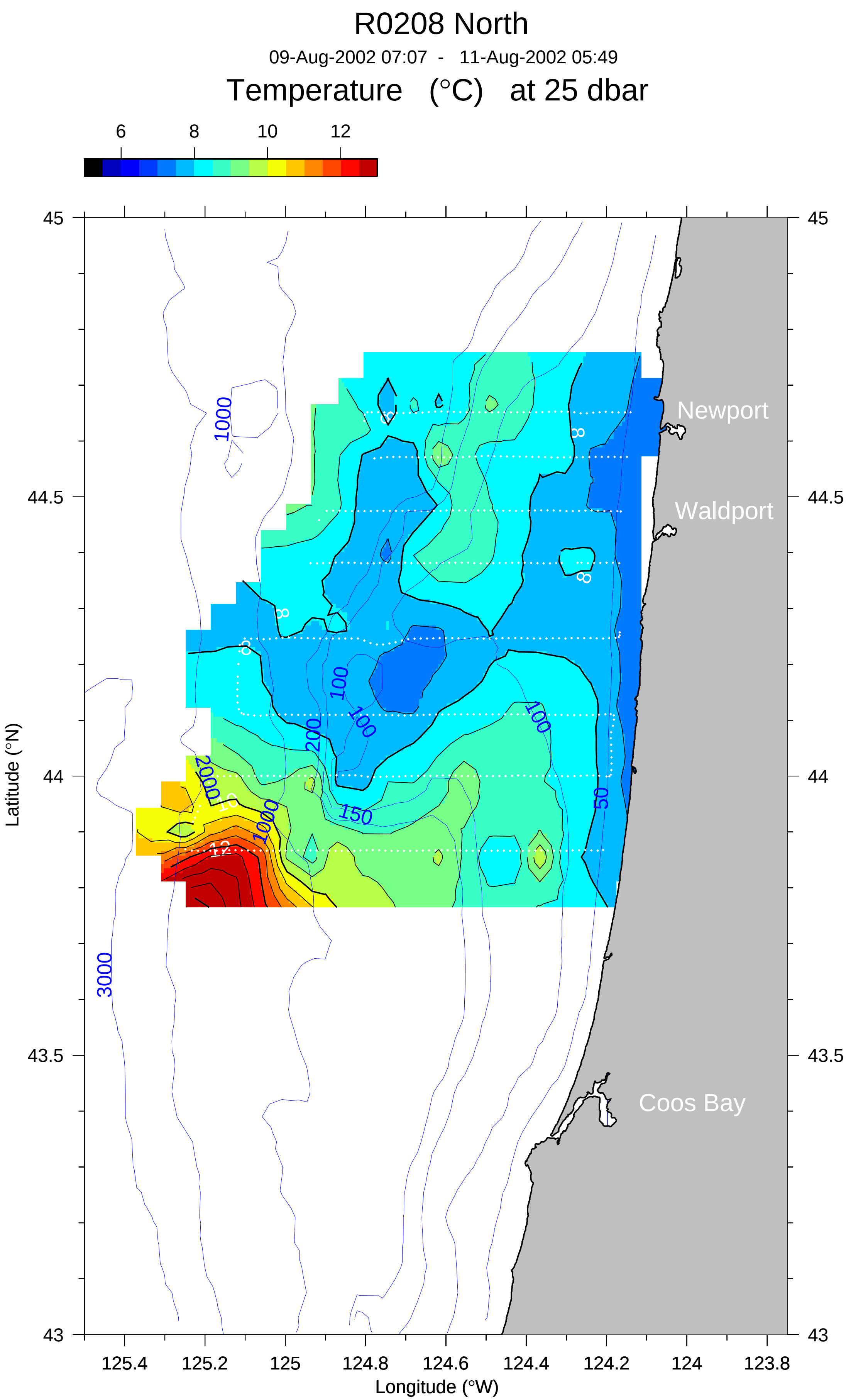


North Maps

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


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 5 dbar
8
10
12
14
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 15 dbar
6
8
10
12
14
Newport
Waldport
Coos Bay
1000
3000
2000
200
100
150
50
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8

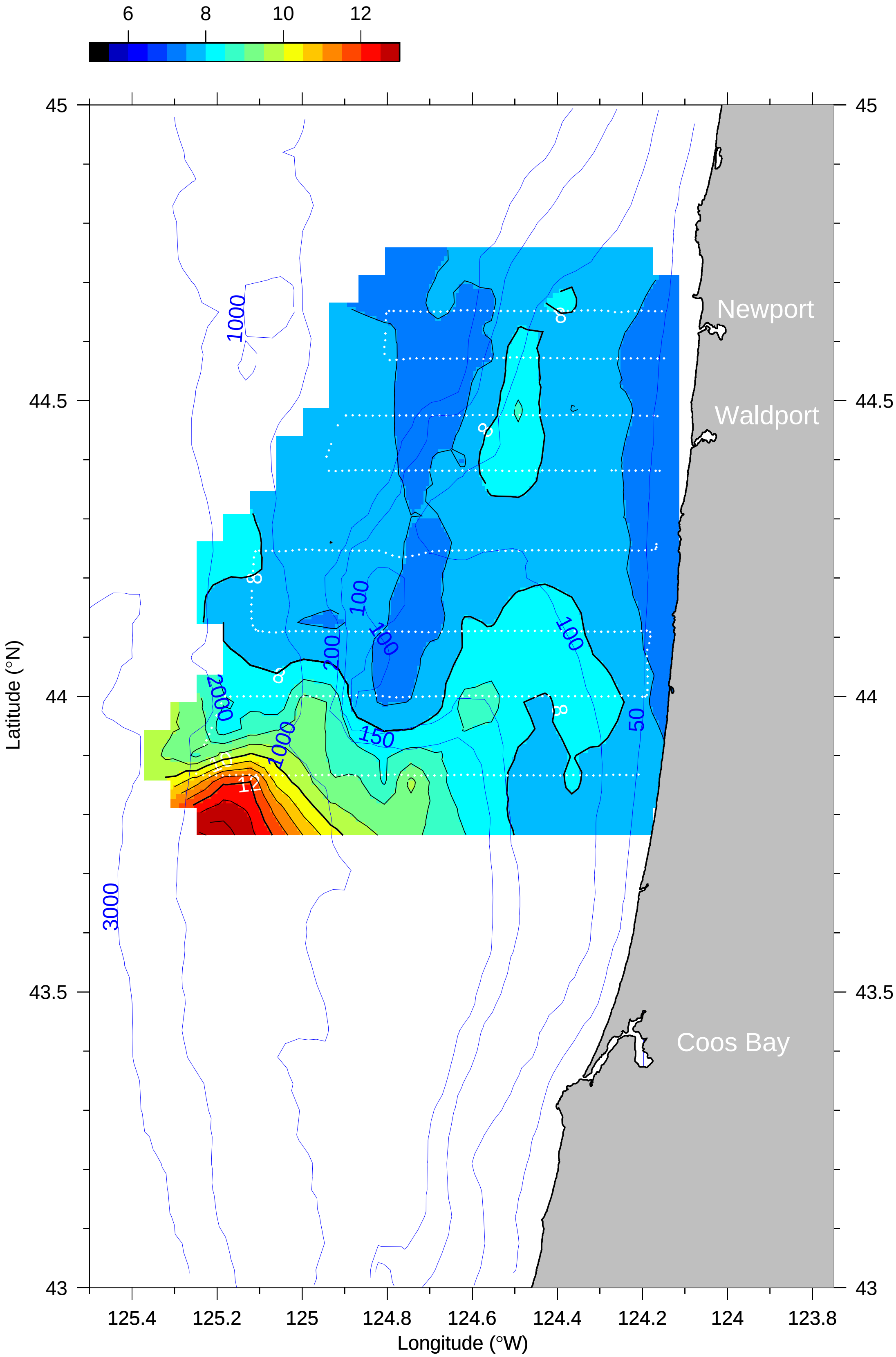


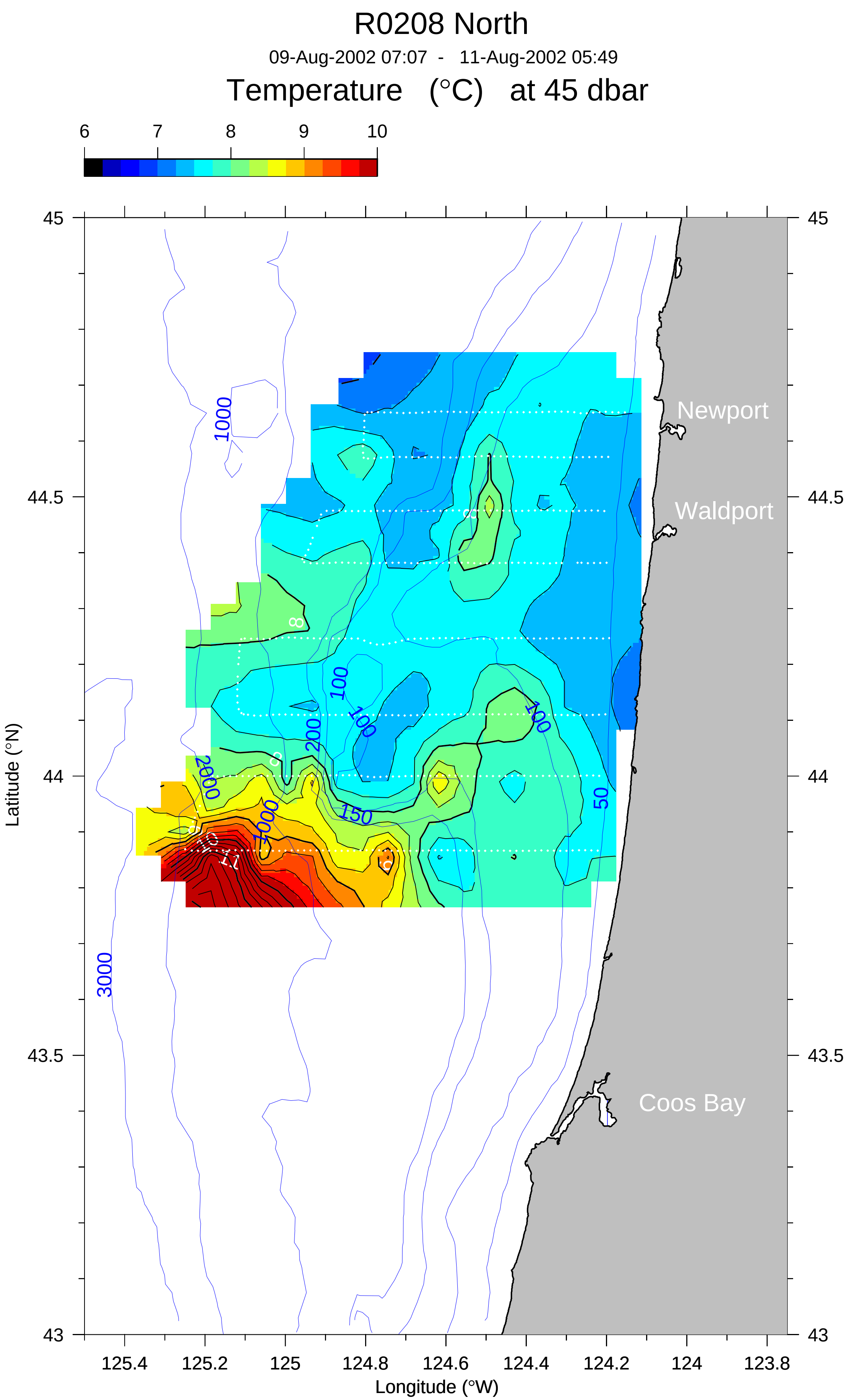
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 25 dbar
6
8
10
12
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50

R0208 North

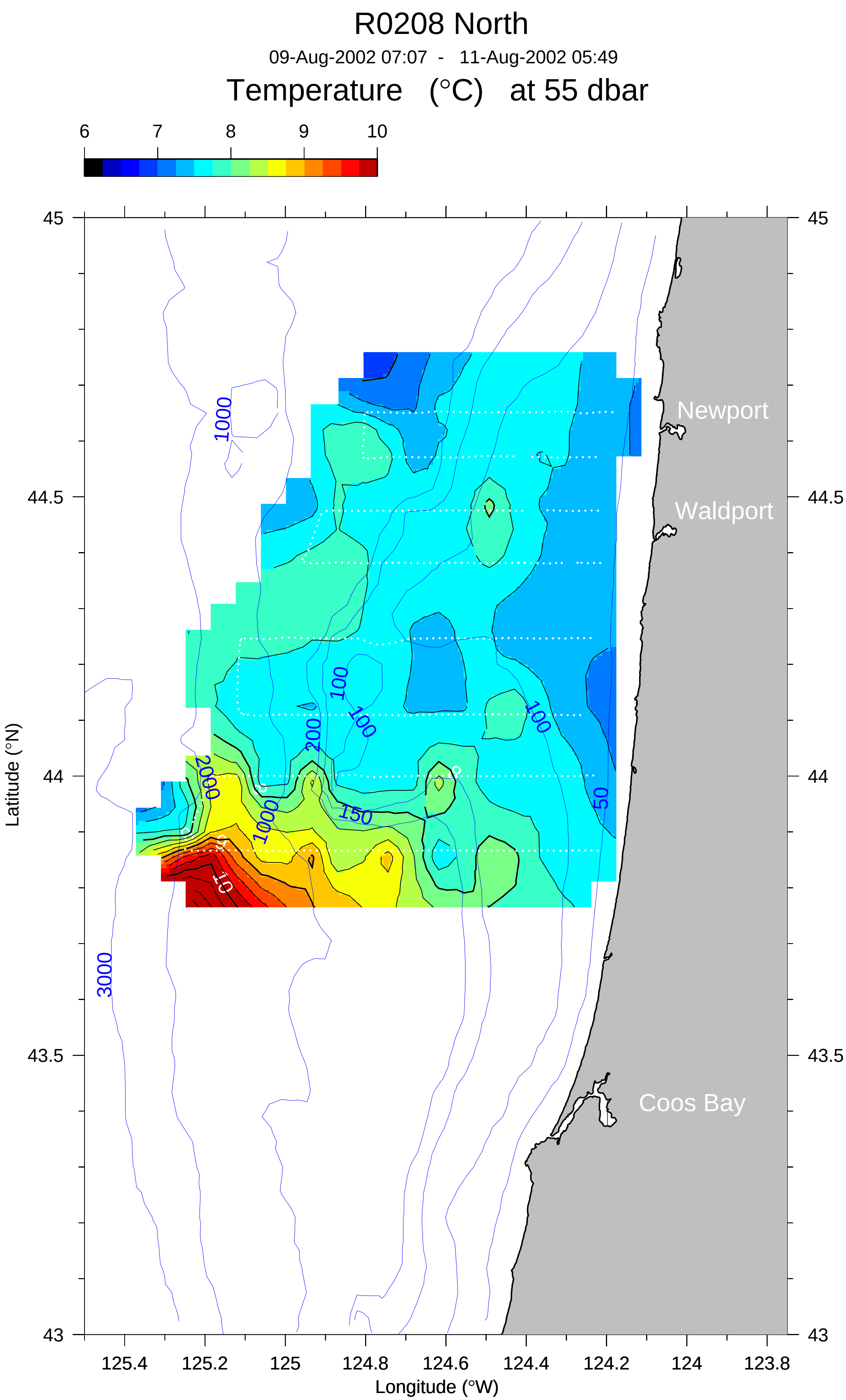
09-Aug-2002 07:07 - 11-Aug-2002 05:49

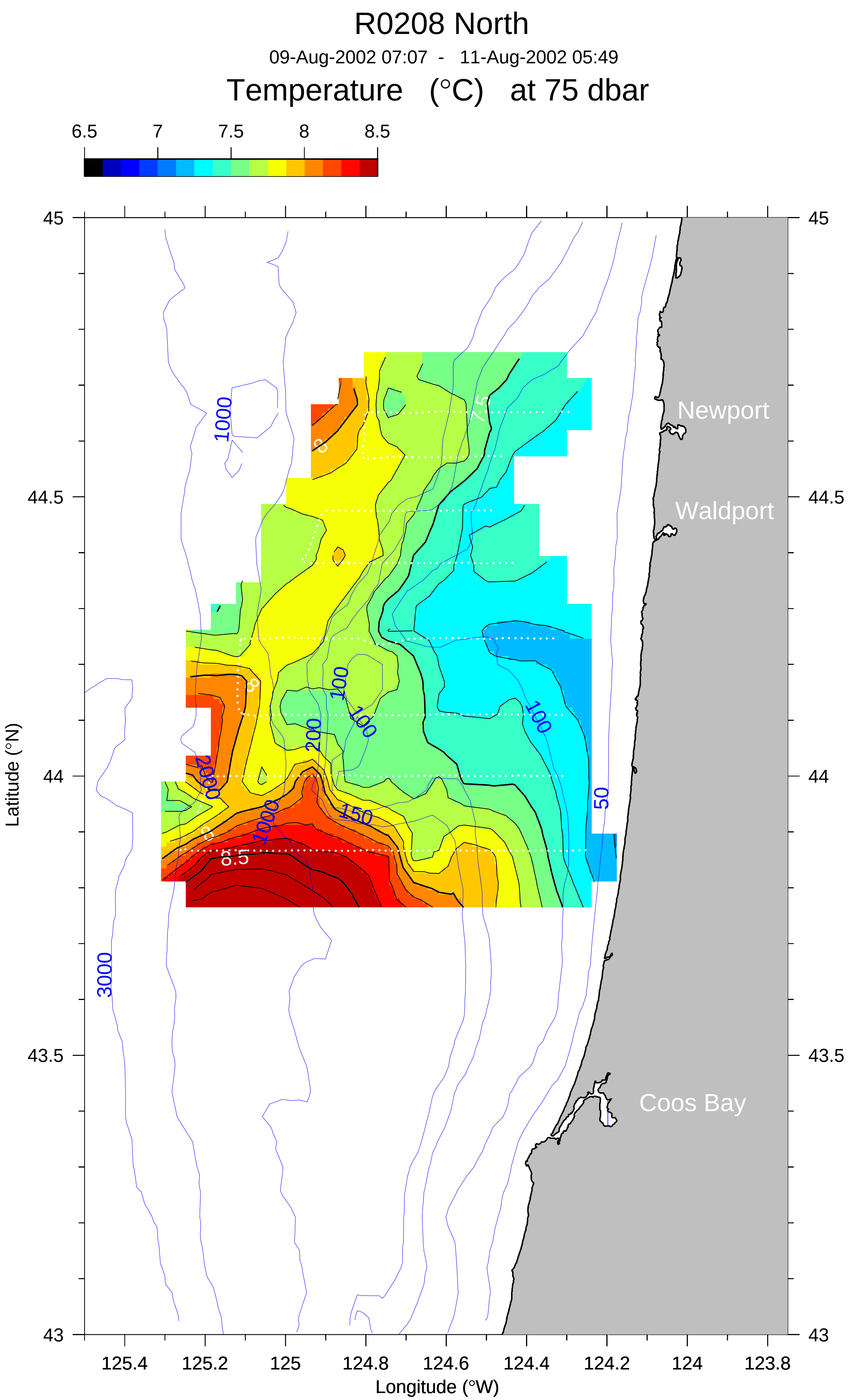
Temperature (°C) at 35 dbar

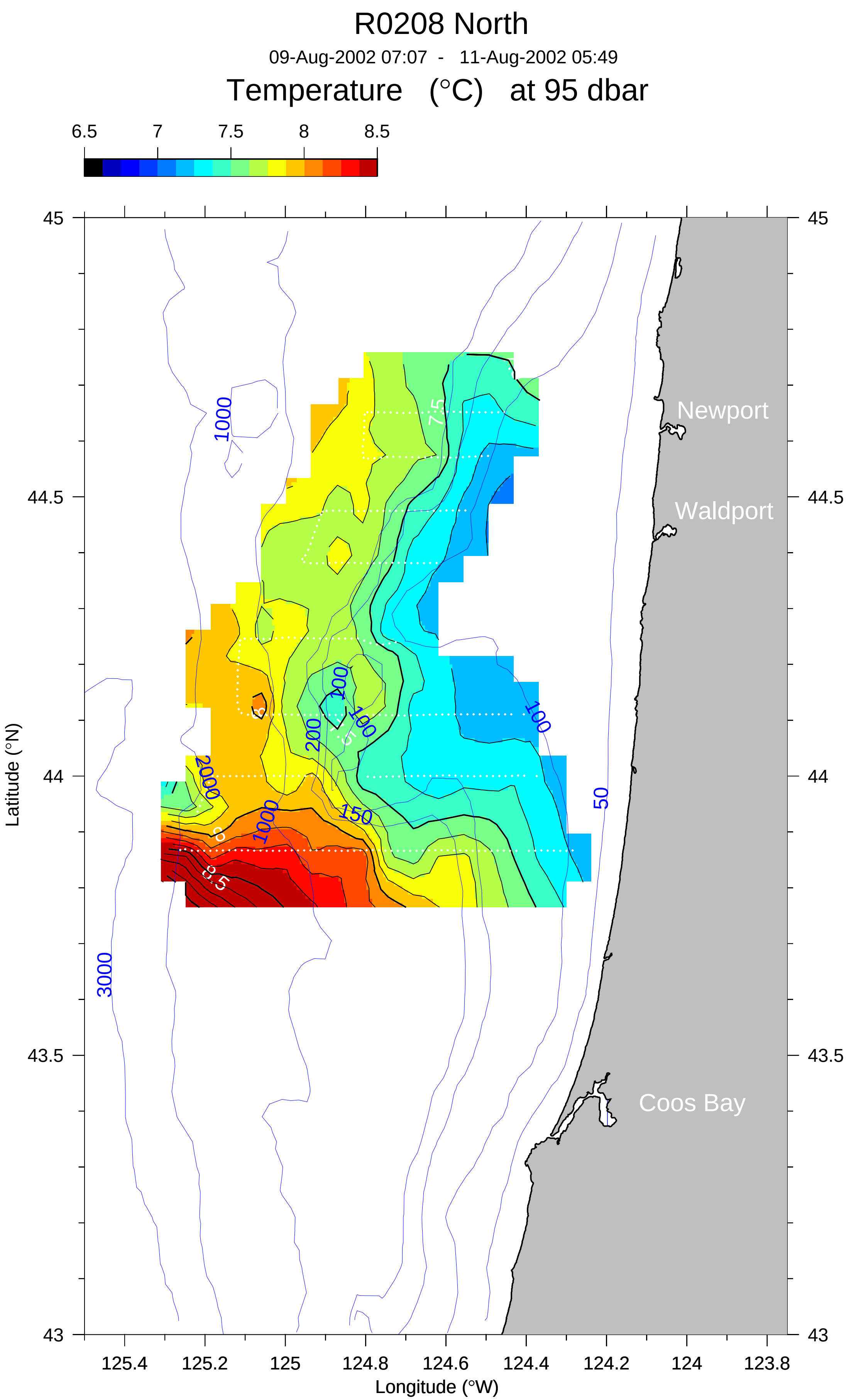




R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 45 dbar
6
7
8
9
10
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Latitude (°N)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 55 dbar
6
7
8
9
10
45
44.5
44
43.5
43
Latitude (°N)
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 75 dbar
6.5
7
7.5
8
8.5
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
150
100
50

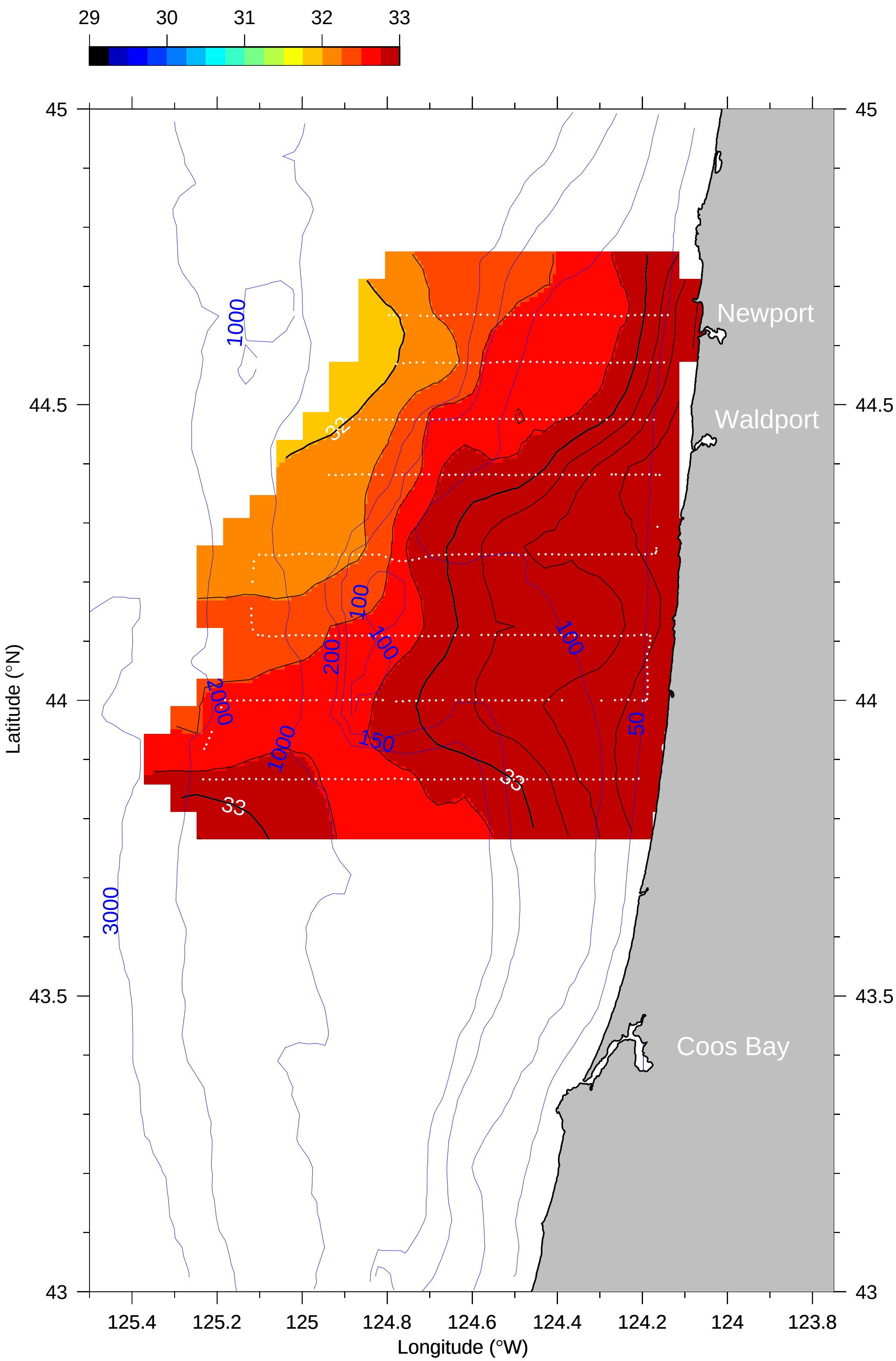


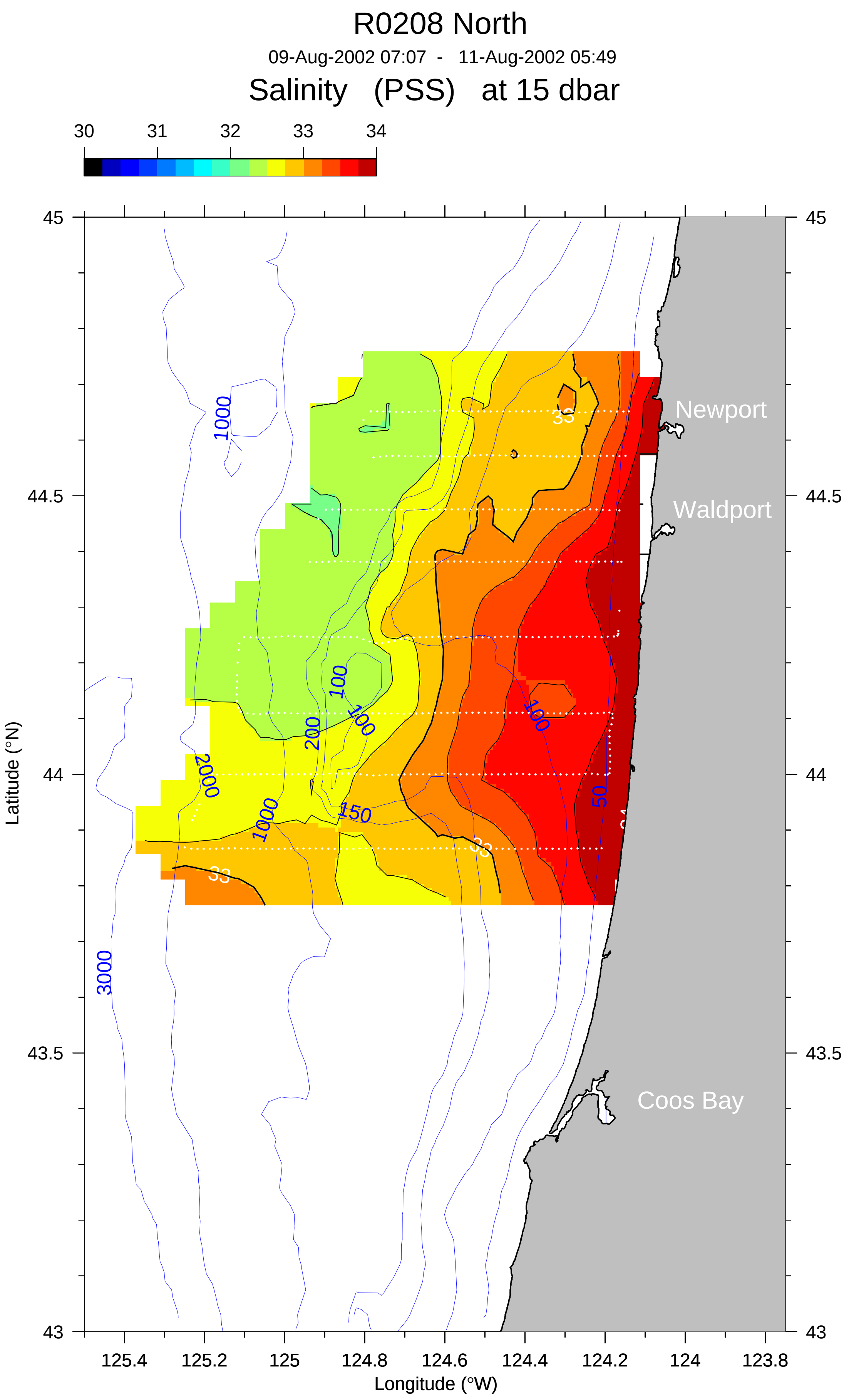
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Temperature (°C) at 95 dbar
6.5
7
7.5
8
8.5
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
150
100
50

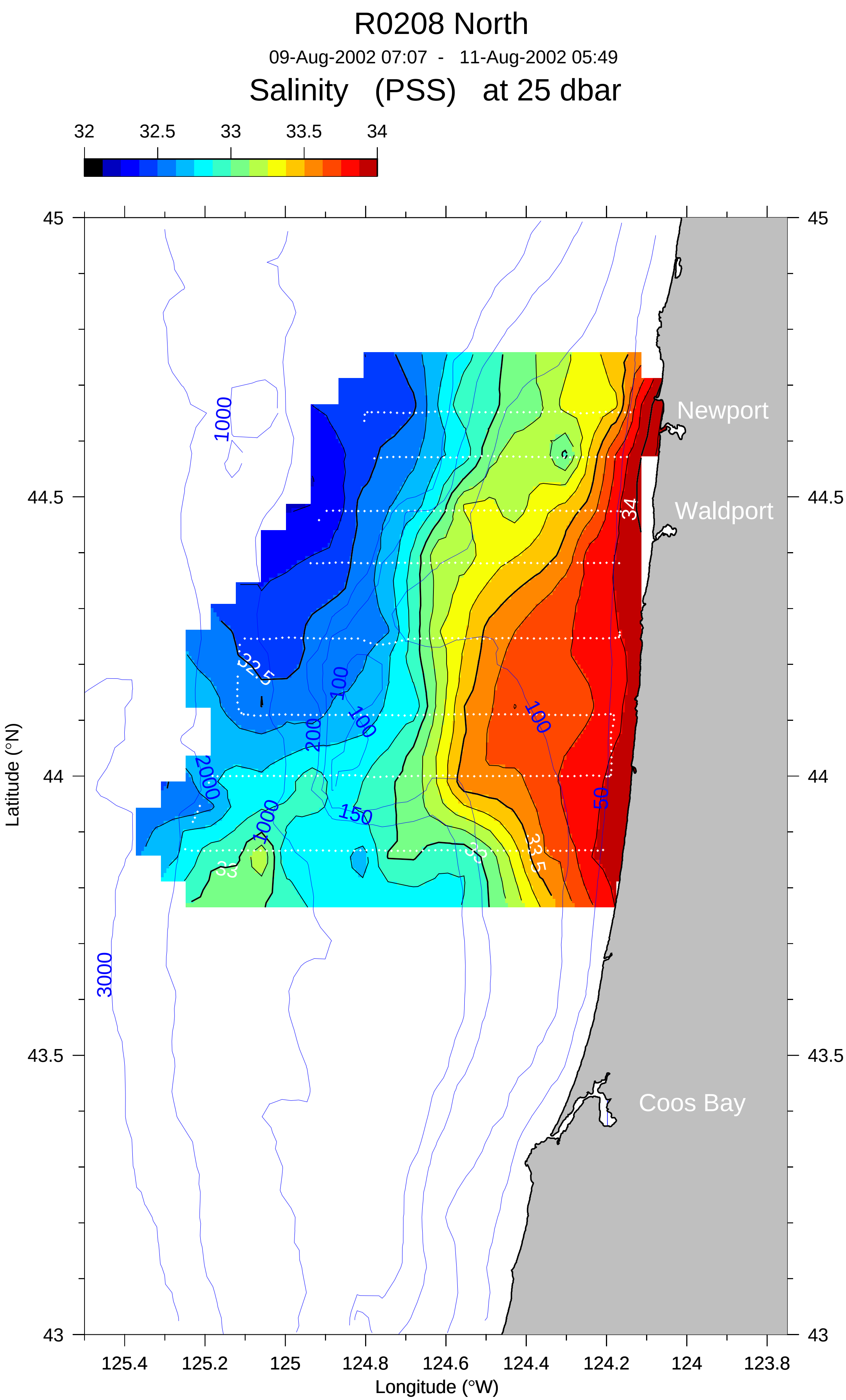
R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

Salinity (PSS) at 5 dbar



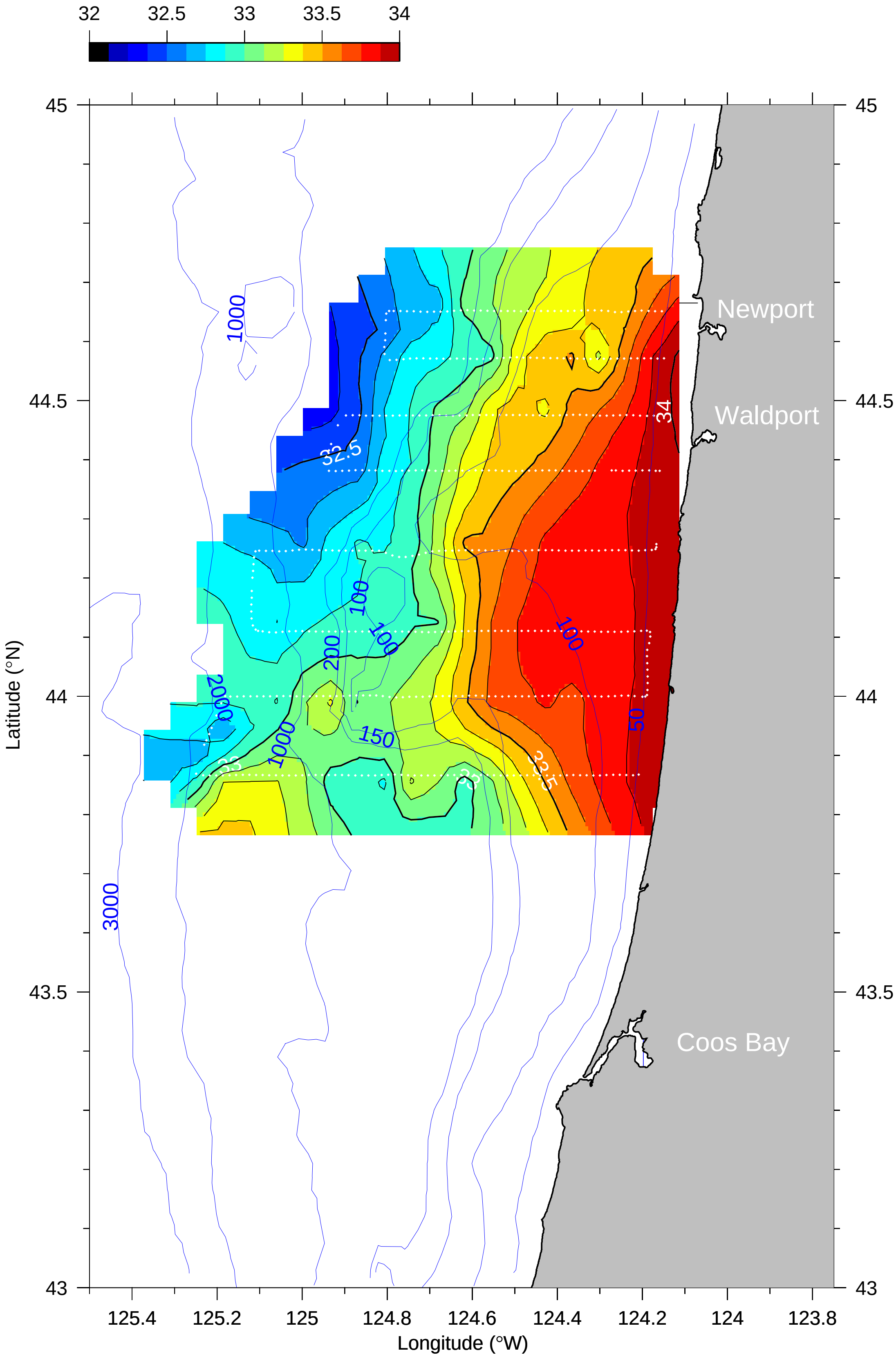

R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Salinity (PSS) at 15 dbar
30
31
32
33
34
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
33
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8

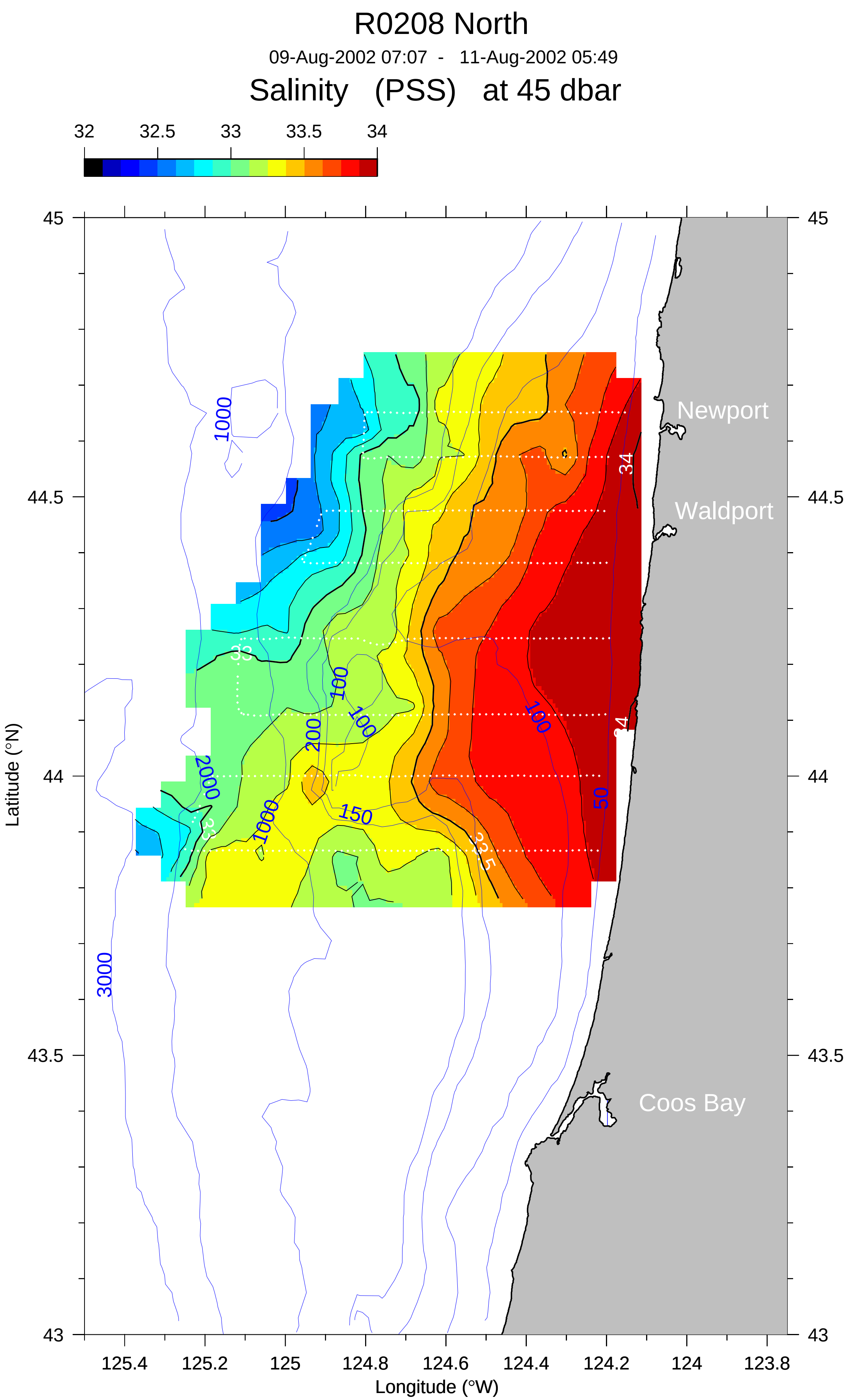

R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Salinity (PSS) at 25 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
100
150
50
32.5
33
33.5
34

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

Salinity (PSS) at 35 dbar

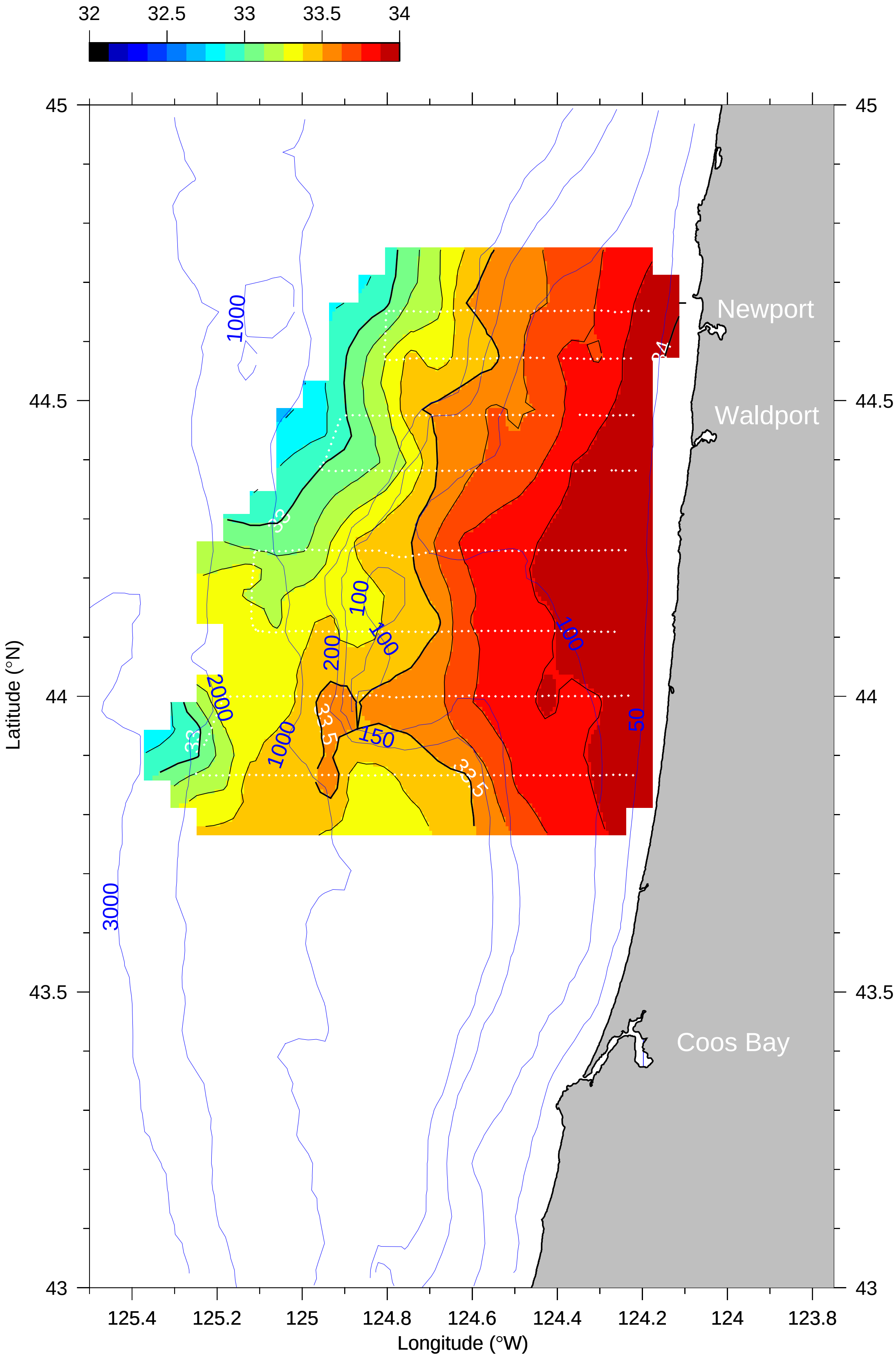



R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Salinity (PSS) at 45 dbar
32
32.5
33
33.5
34
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Latitude (°N)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
33
33.5
34

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

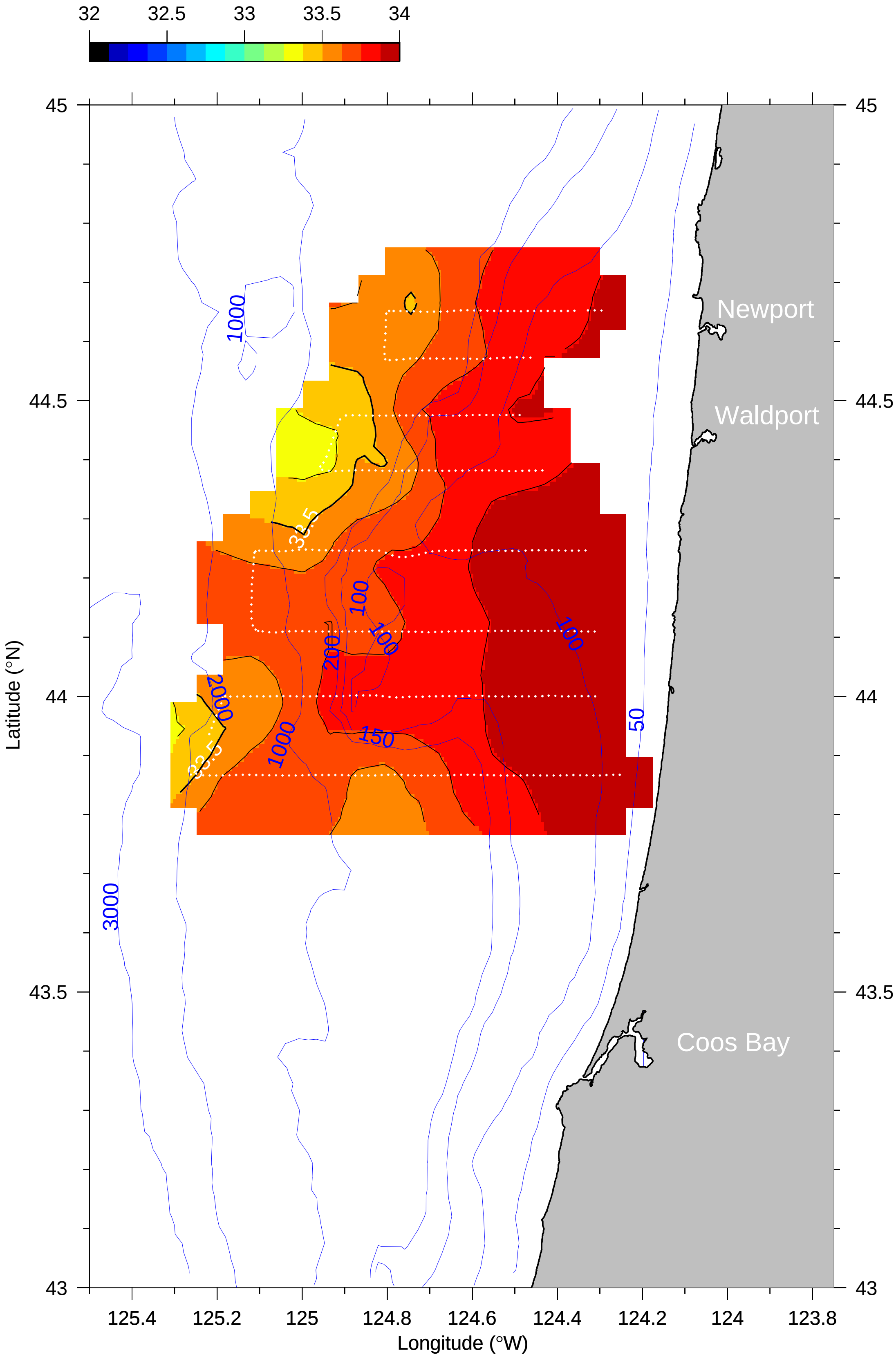
Salinity (PSS) at 55 dbar



R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

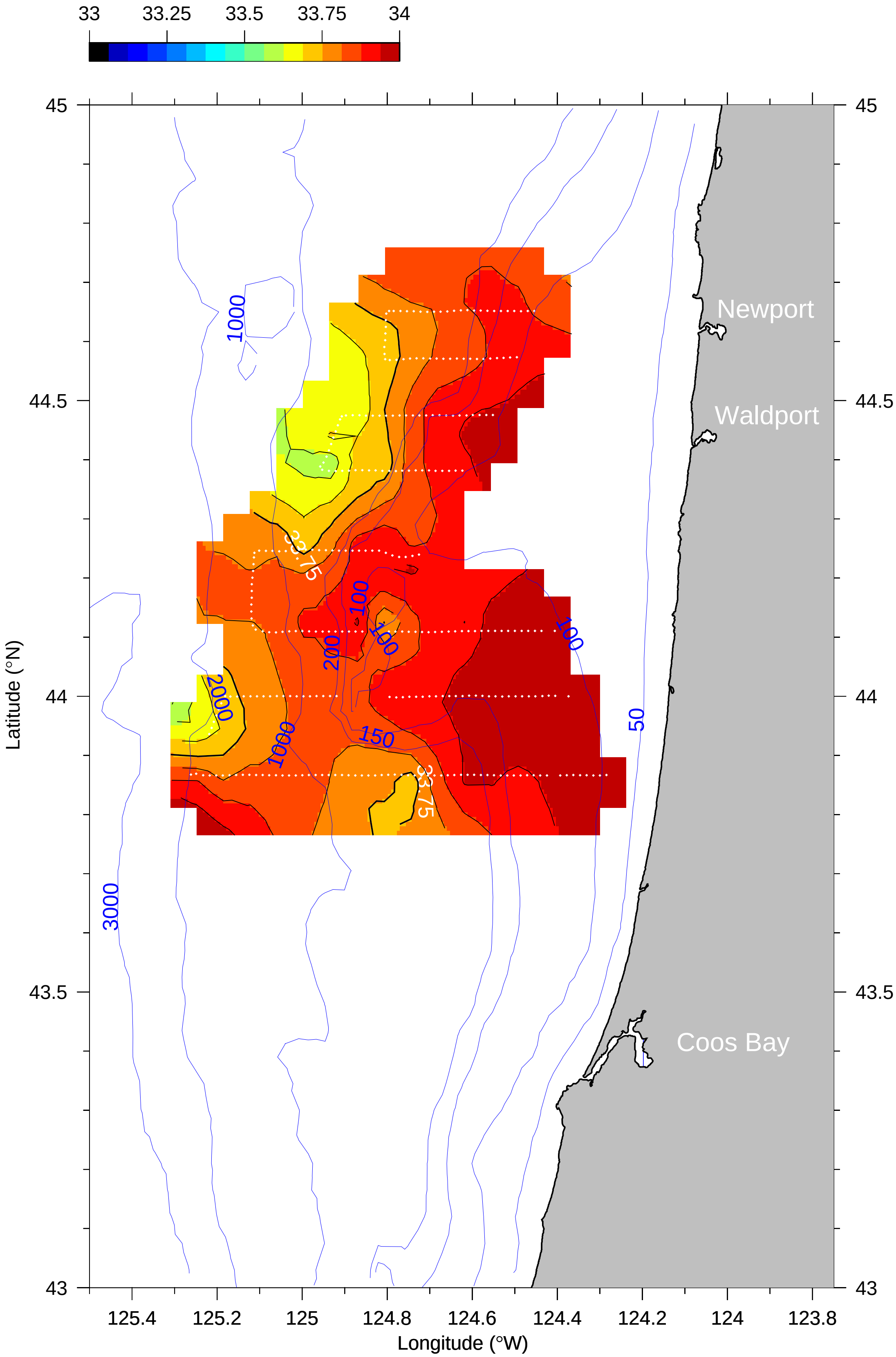
Salinity (PSS) at 75 dbar

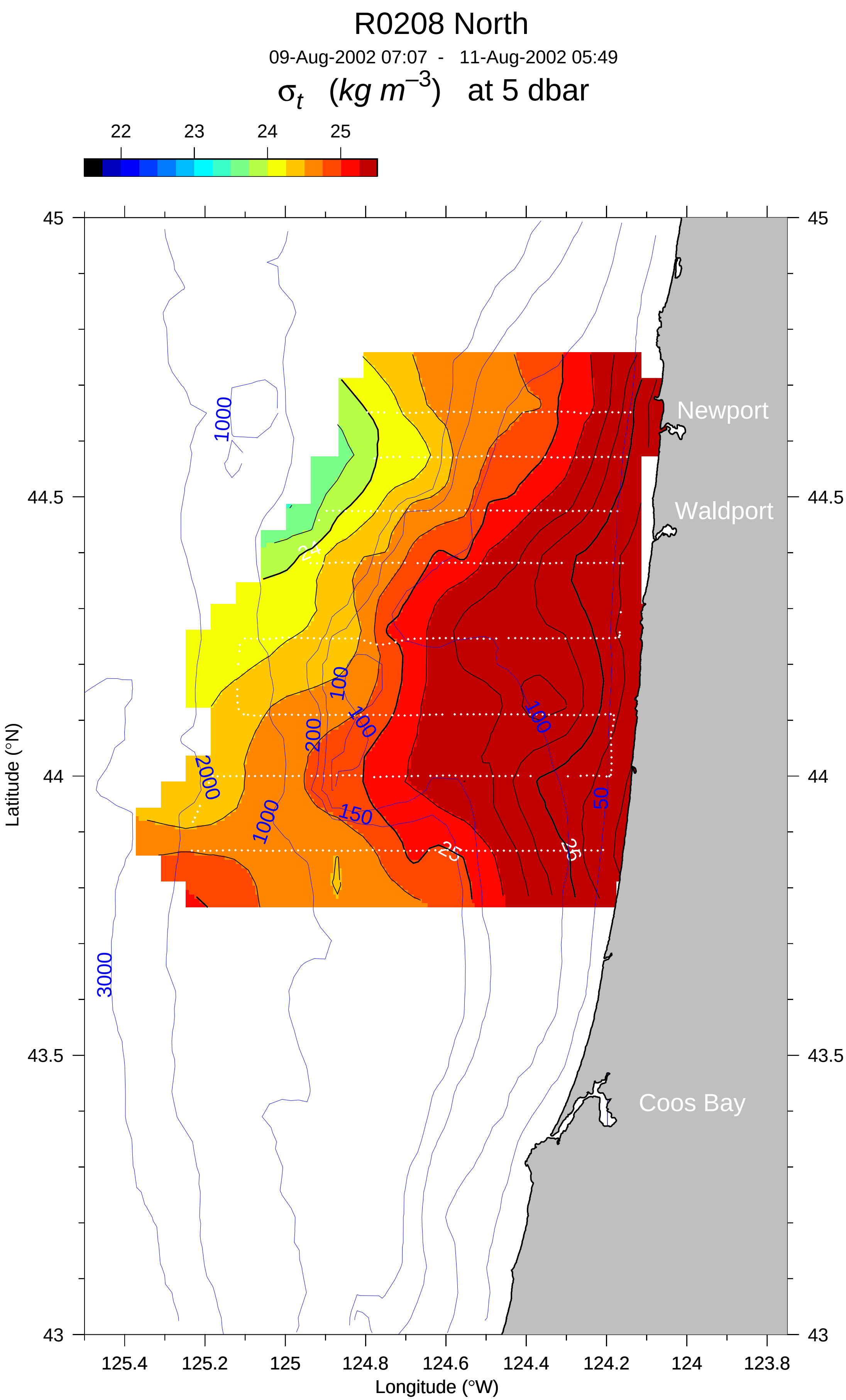


R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

Salinity (PSS) at 95 dbar



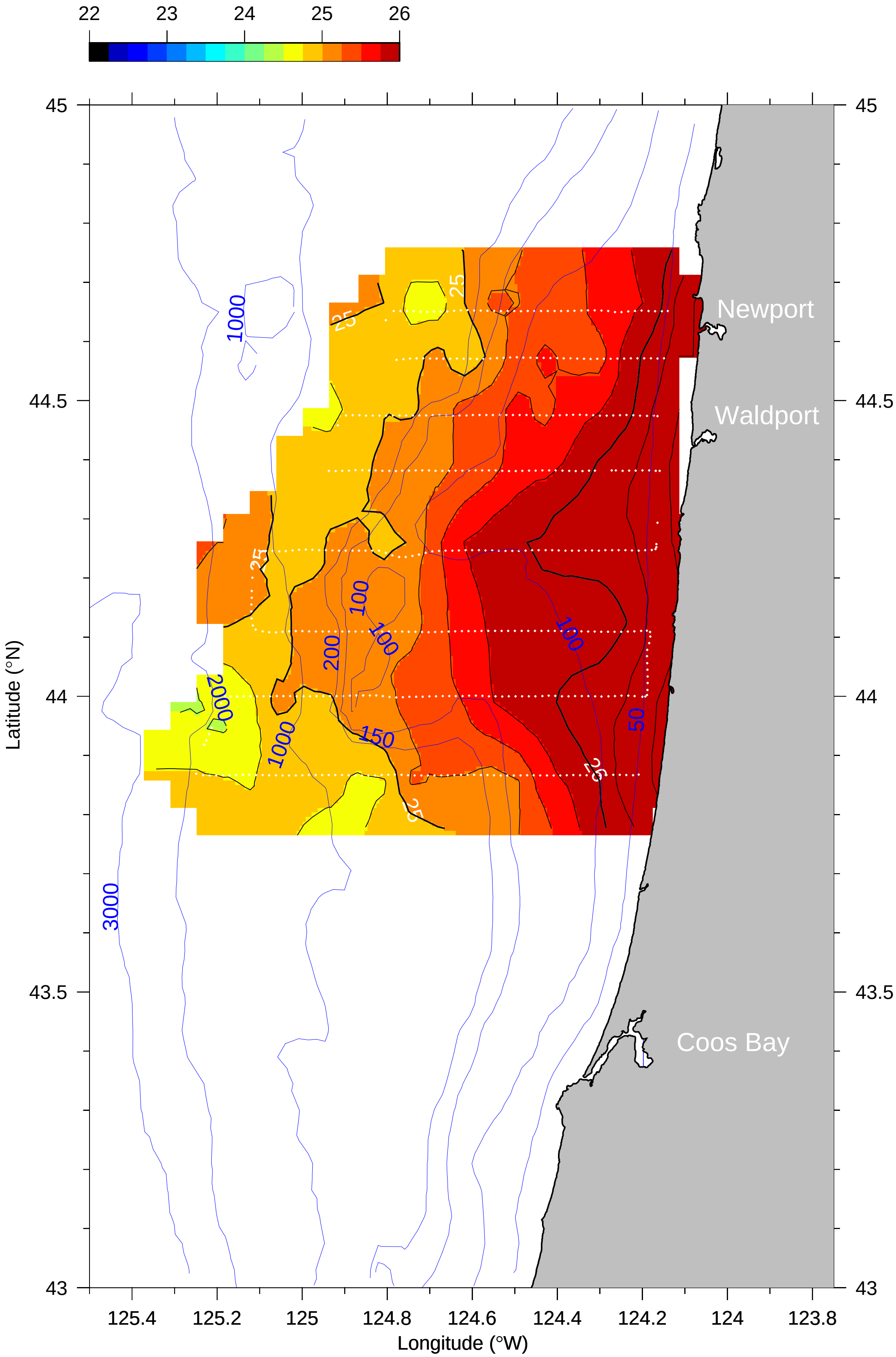


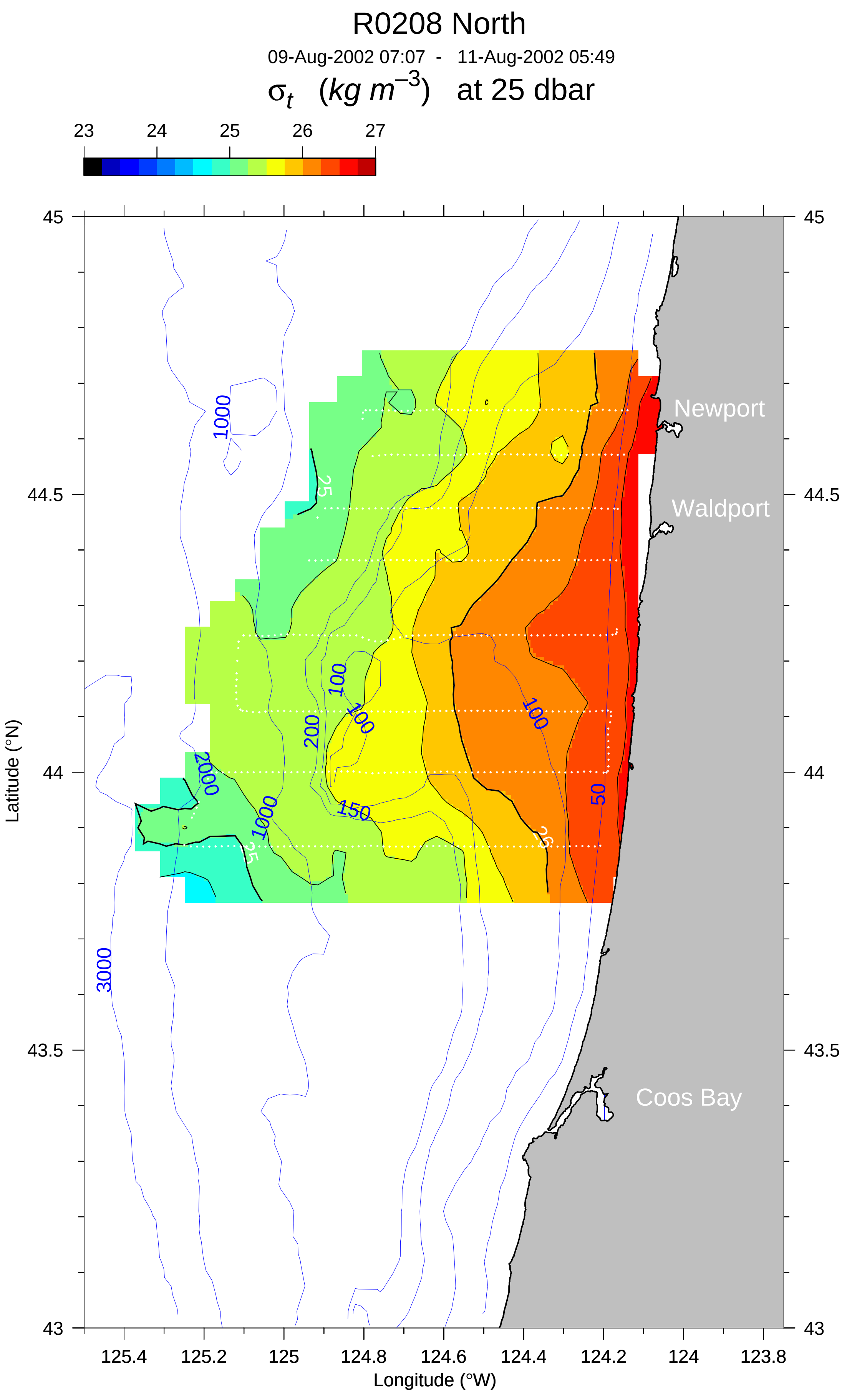
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
σt (kg m−3) at 5 dbar
22
23
24
25
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
24
25
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Latitude (°N)
Longitude (°W)

R0208 North

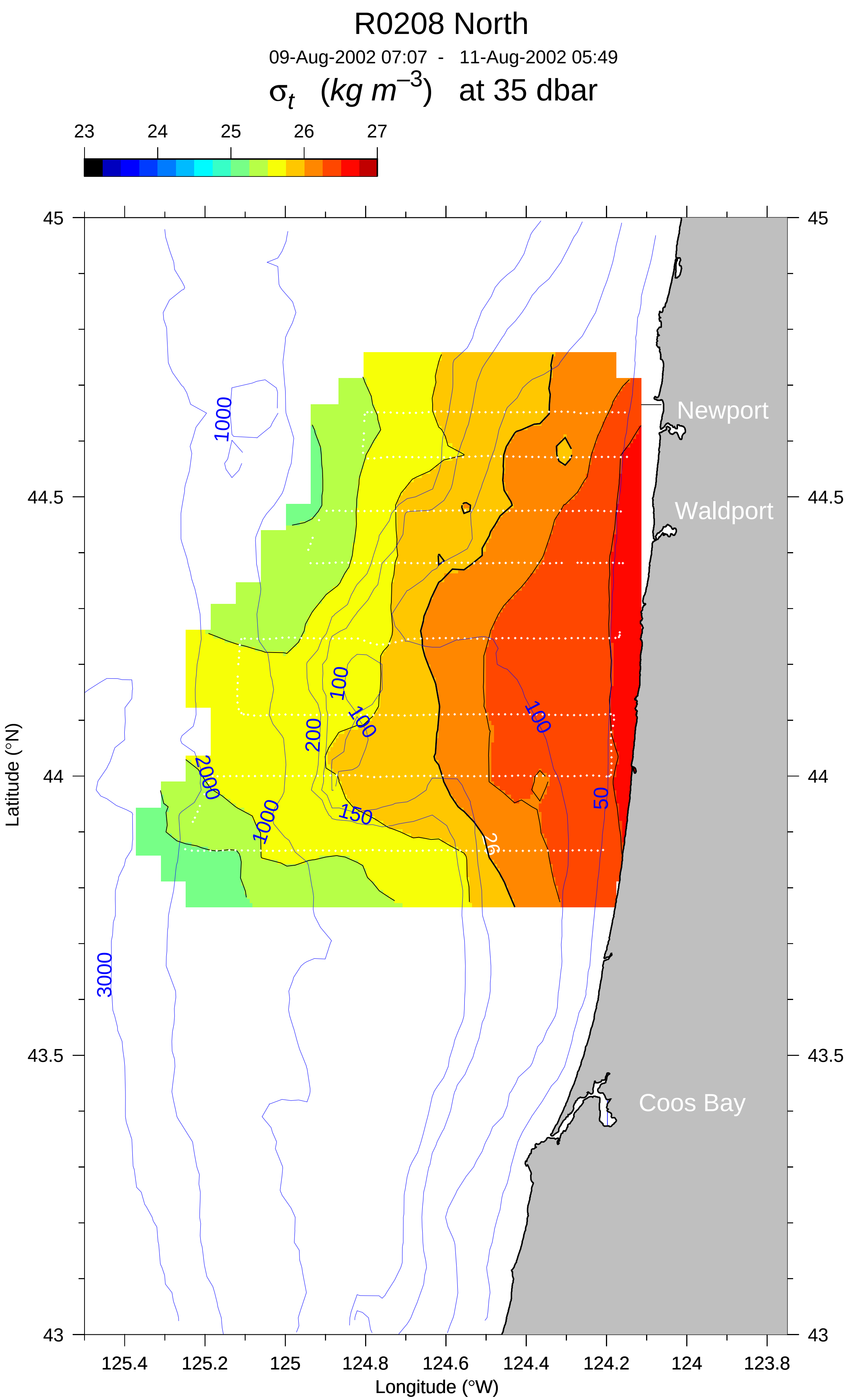
09-Aug-2002 07:07 - 11-Aug-2002 05:49

σ_t $(kg\ m^{-3})$ at 15 dbar





R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
σt (kg m−3) at 25 dbar
23
24
25
26
27
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
25

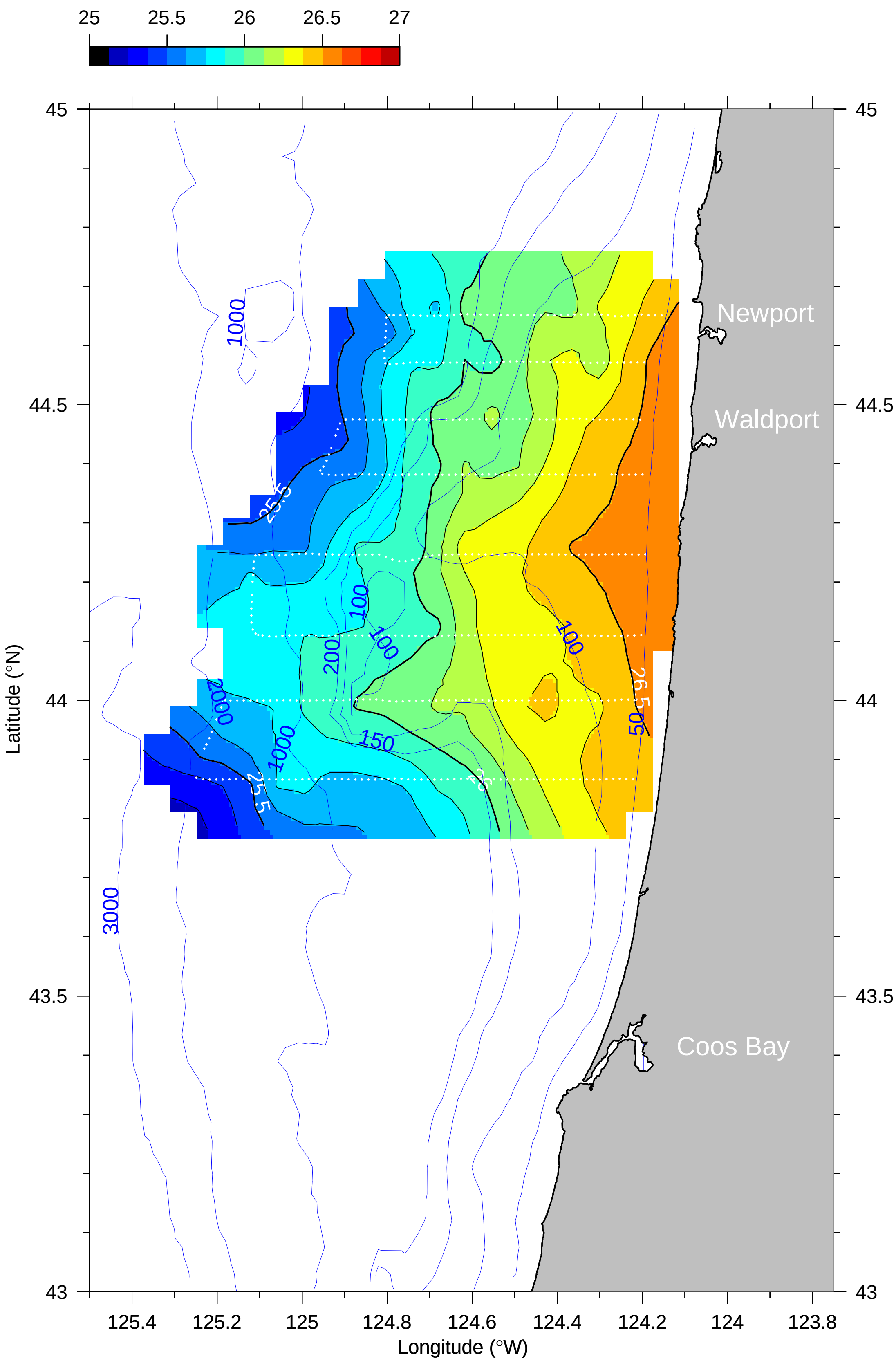


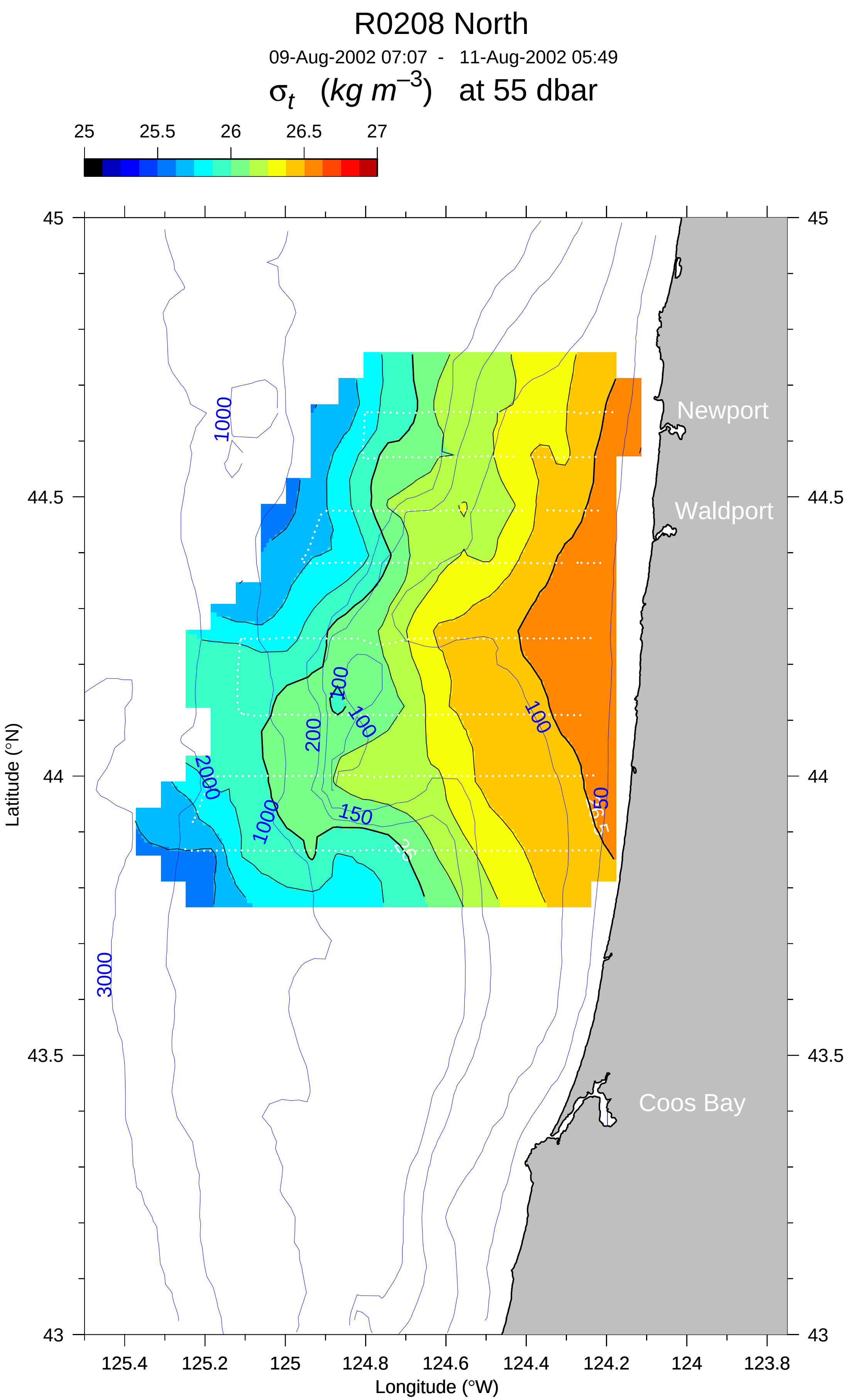
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
σt (kg m−3) at 35 dbar
23
24
25
26
27
45
44.5
44
43.5
43
Latitude (°N)
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Newport
Waldport
Coos Bay
1000
100
100
200
2000
1000
150
26
100
50
3000

R0208 North

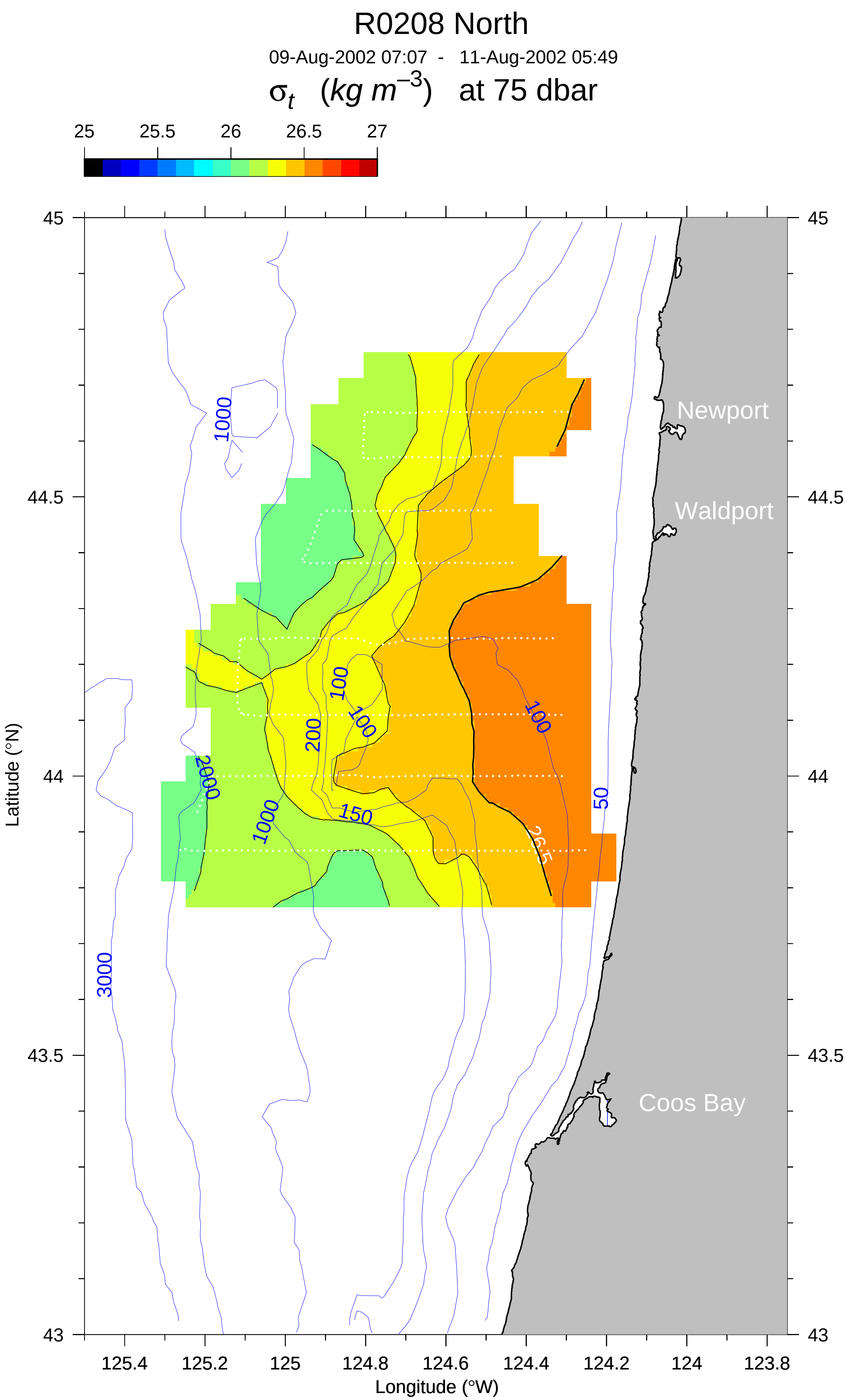
09-Aug-2002 07:07 - 11-Aug-2002 05:49

σ_t $(kg\ m^{-3})$ at 45 dbar





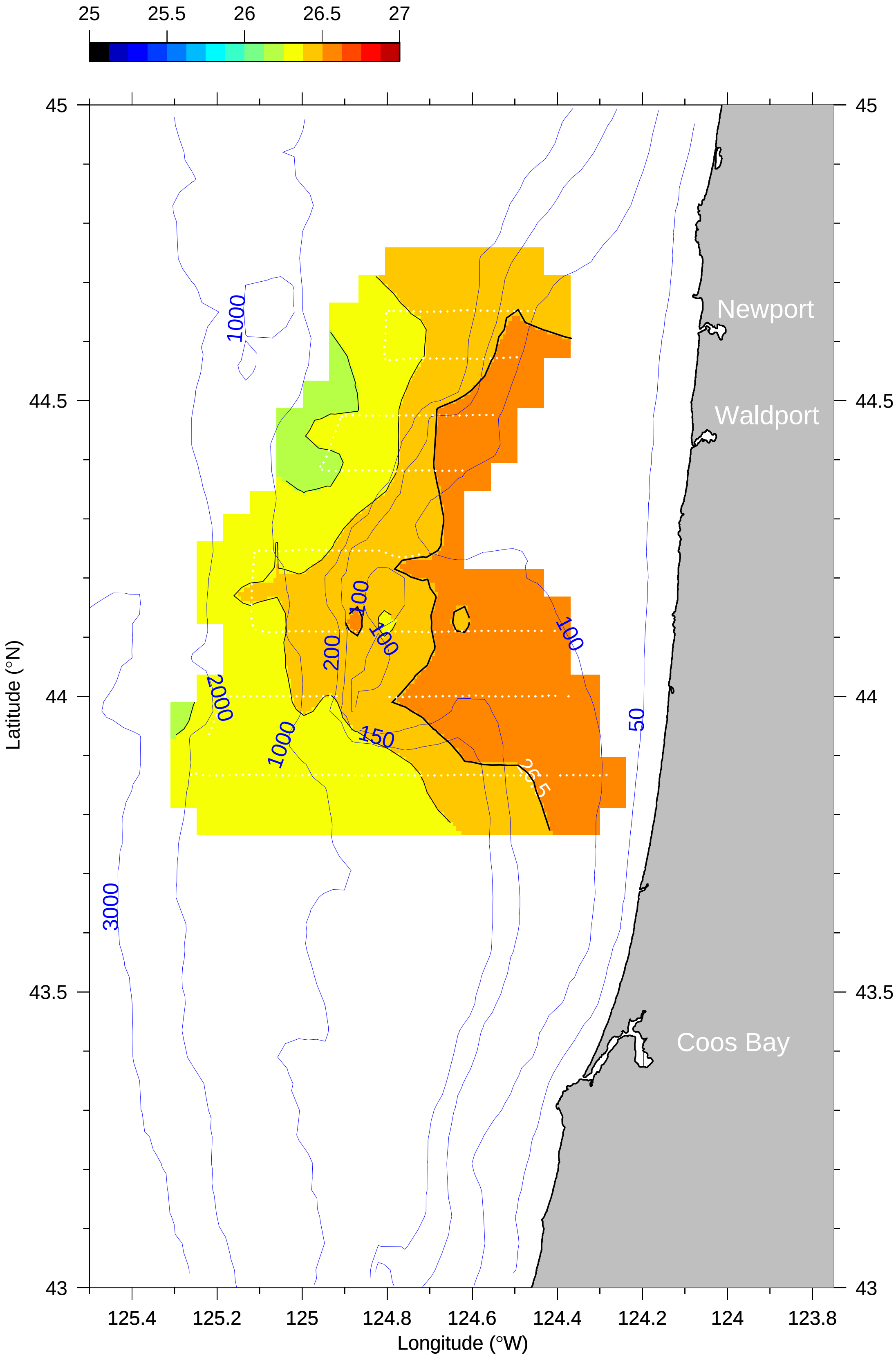
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
σt (kg m−3) at 55 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
Latitude (°N)
Longitude (°W)
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8

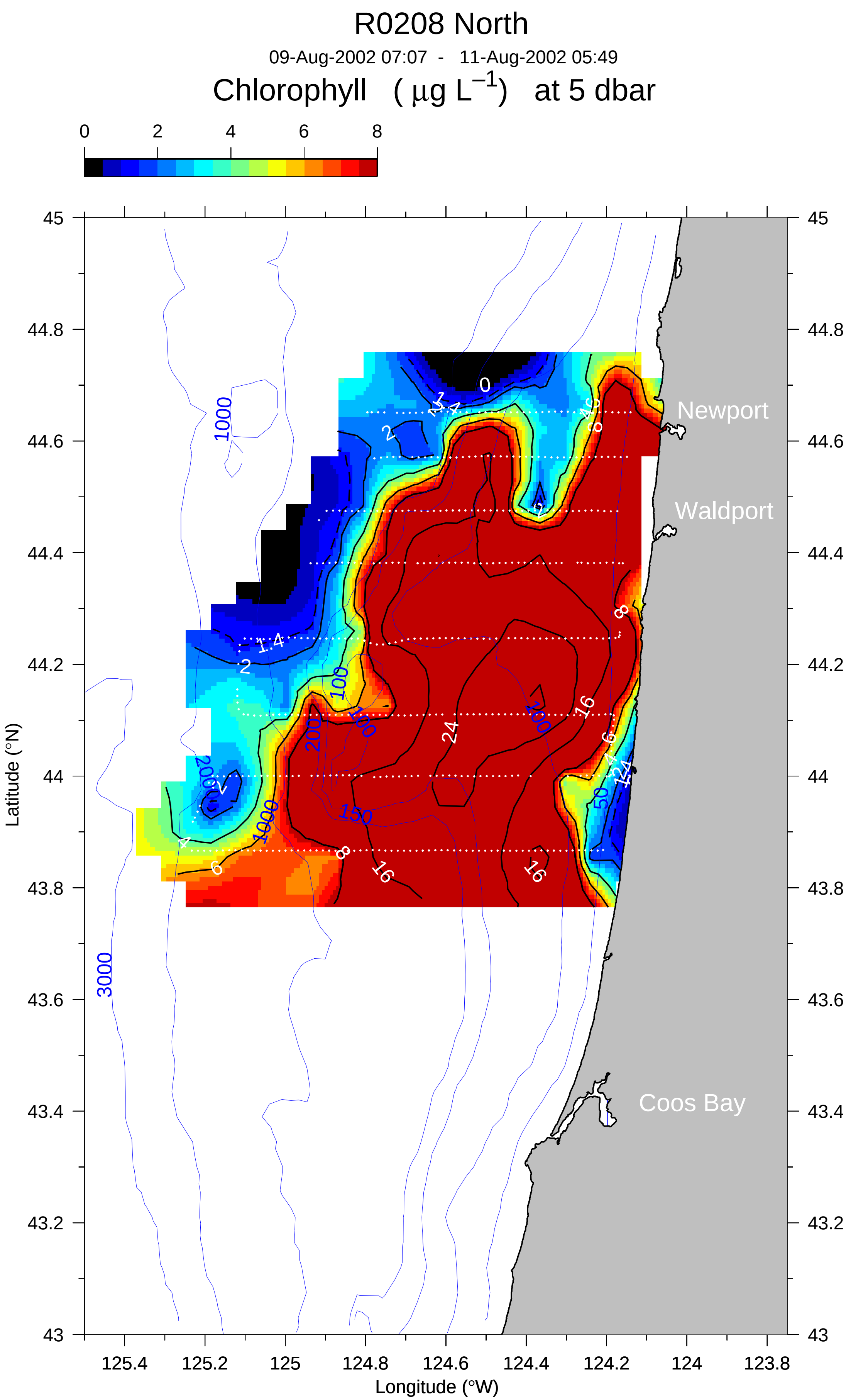

R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
σt (kg m−3) at 75 dbar
25
25.5
26
26.5
27
45
44.5
44
43.5
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Latitude (°N)
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
26.5

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

σ_t $(kg\ m^{-3})$ at 95 dbar



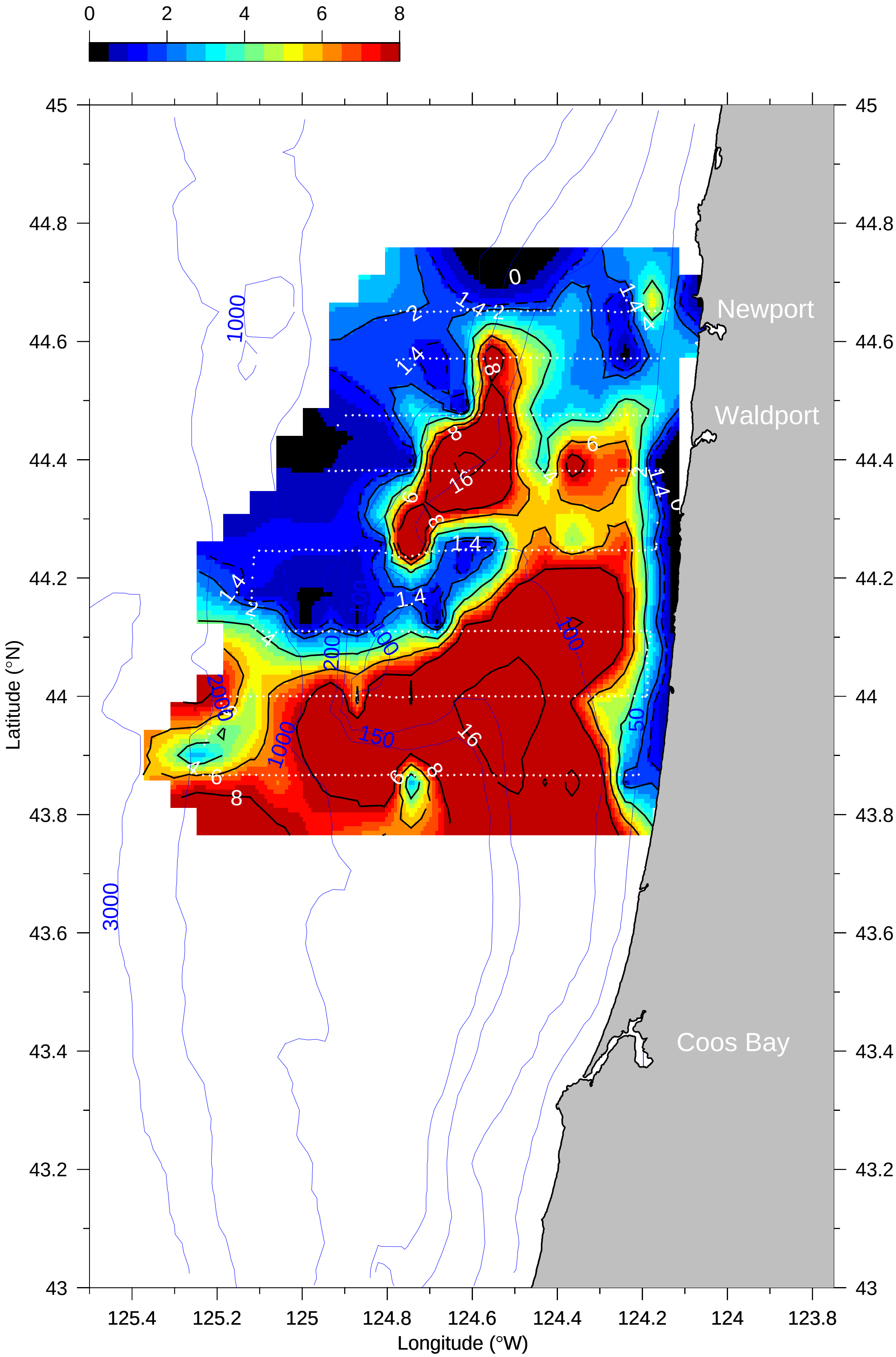


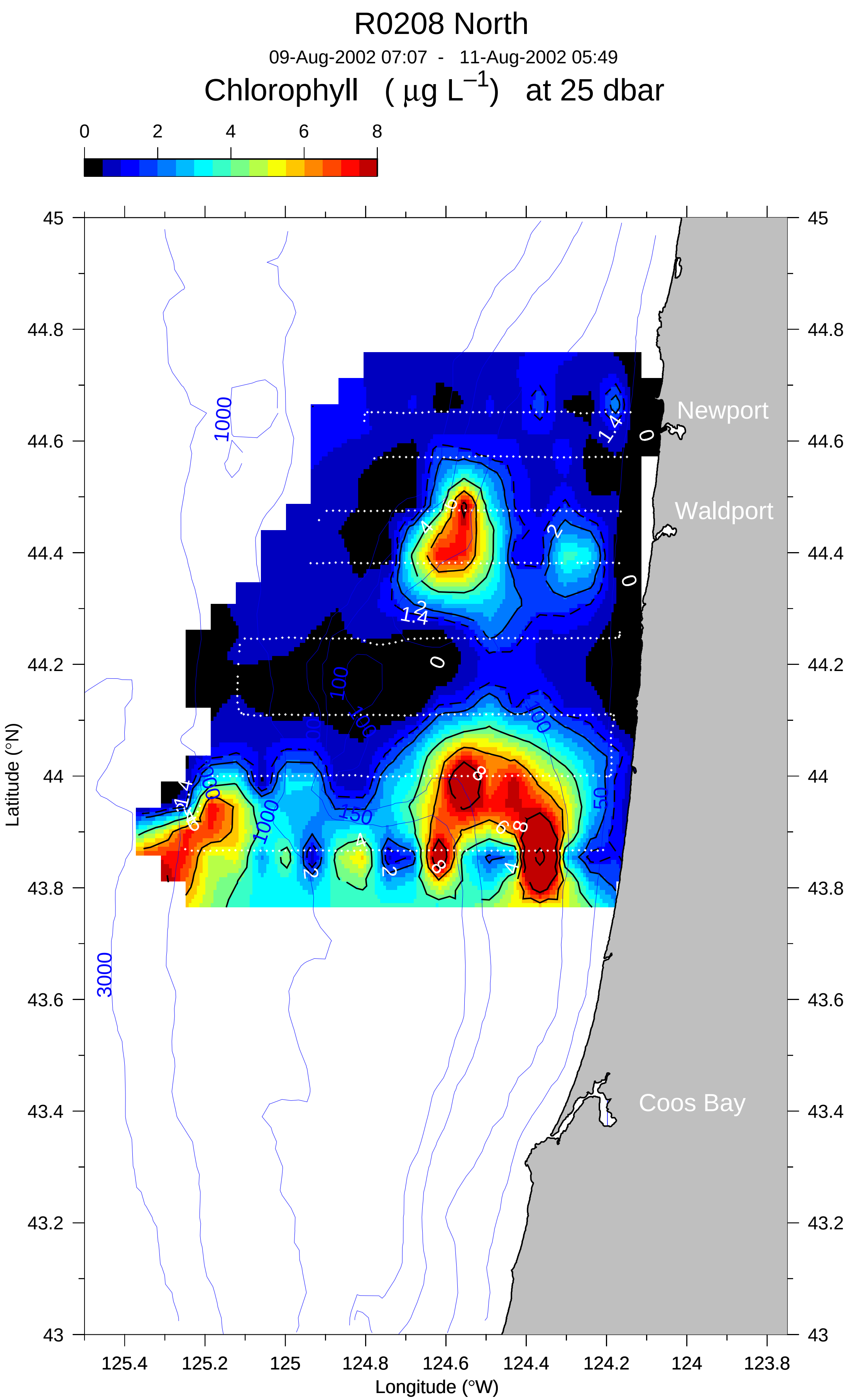
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Chlorophyll (µg L^{-1}) at 5 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
3000

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

Chlorophyll (μg L^{-1}) at 15 dbar

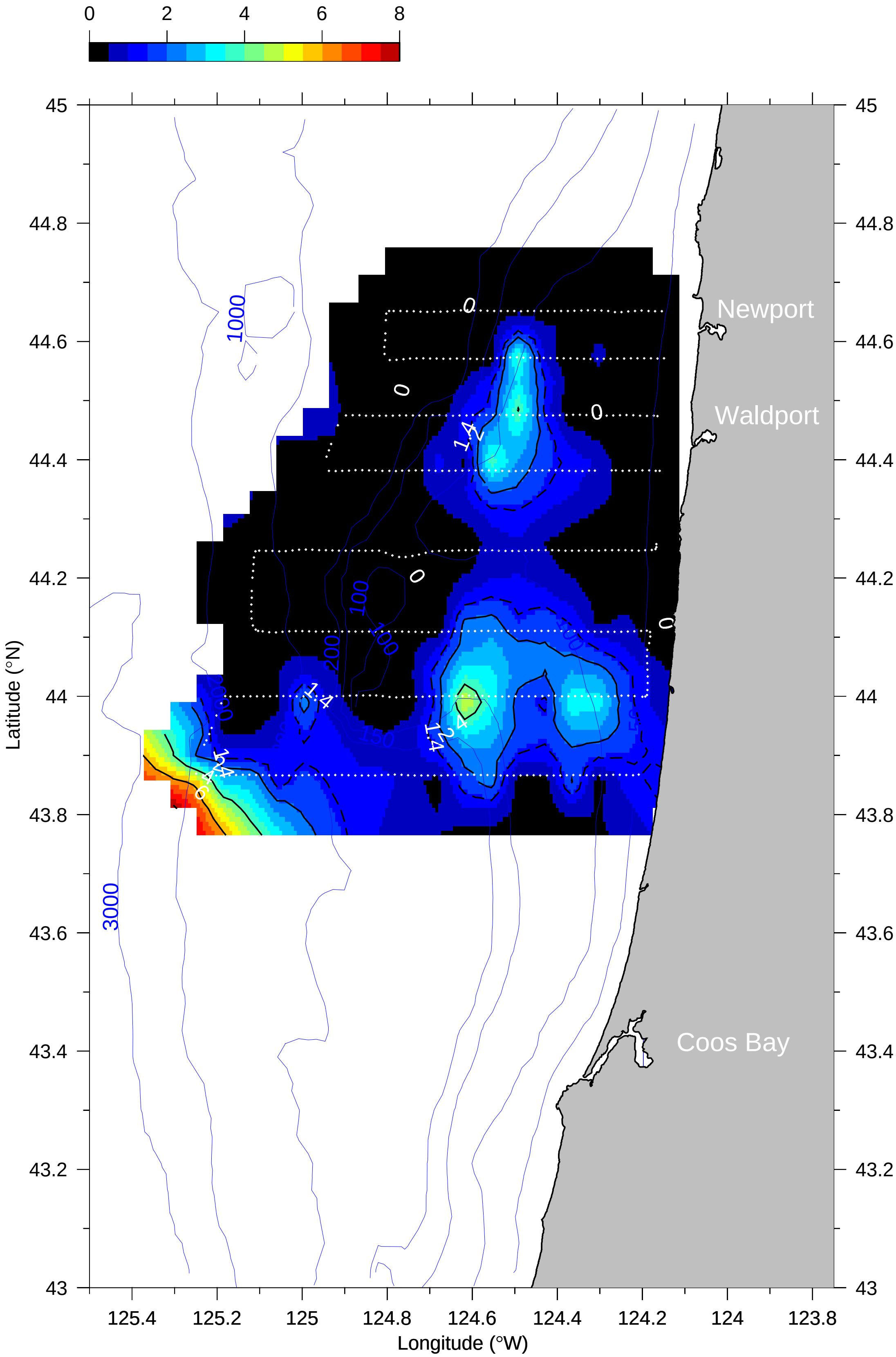



R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Chlorophyll (µg L−1) at 25 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
1000
3000
100
150
50
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

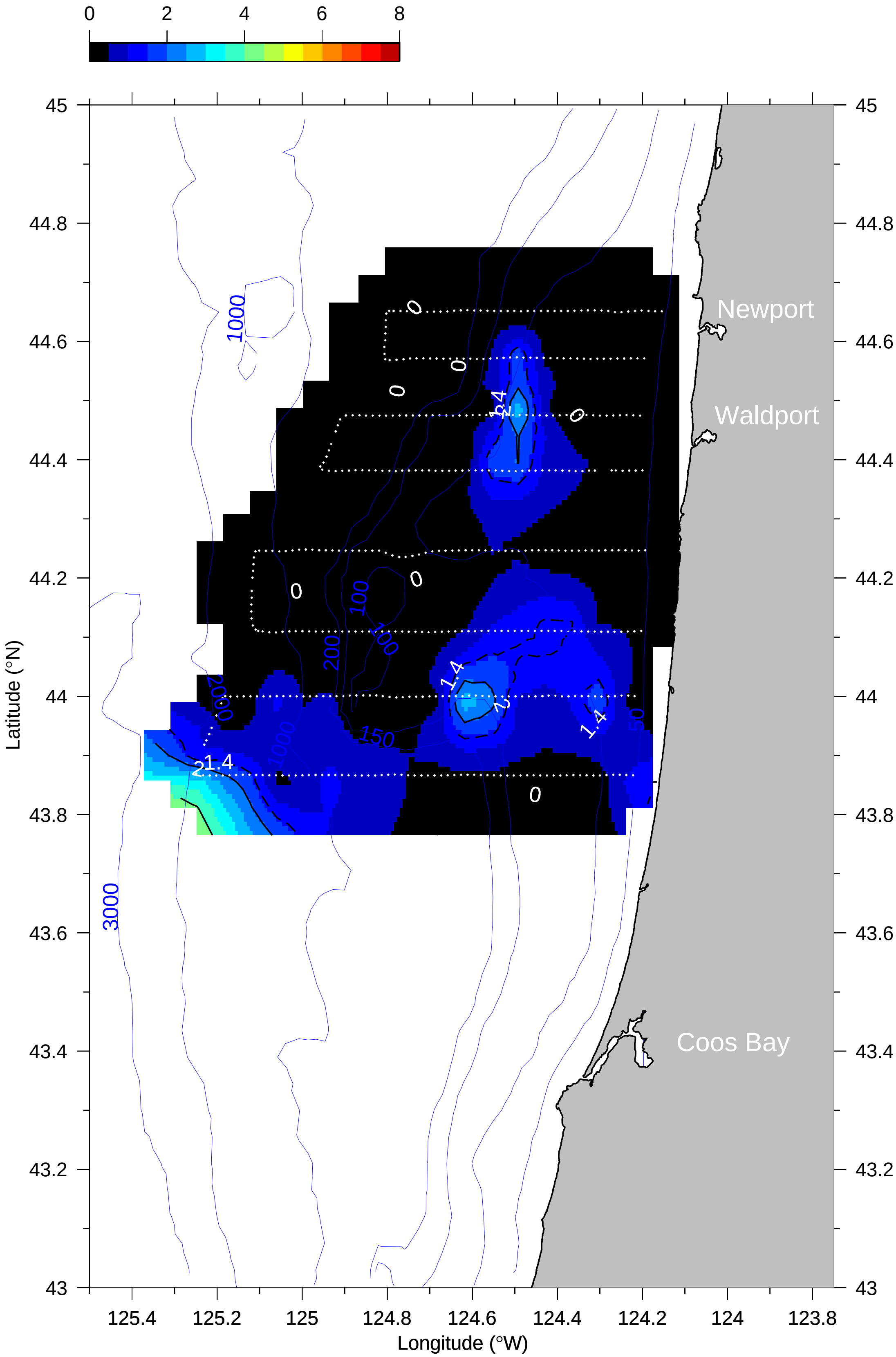
Chlorophyll (μg L^{-1}) at 35 dbar

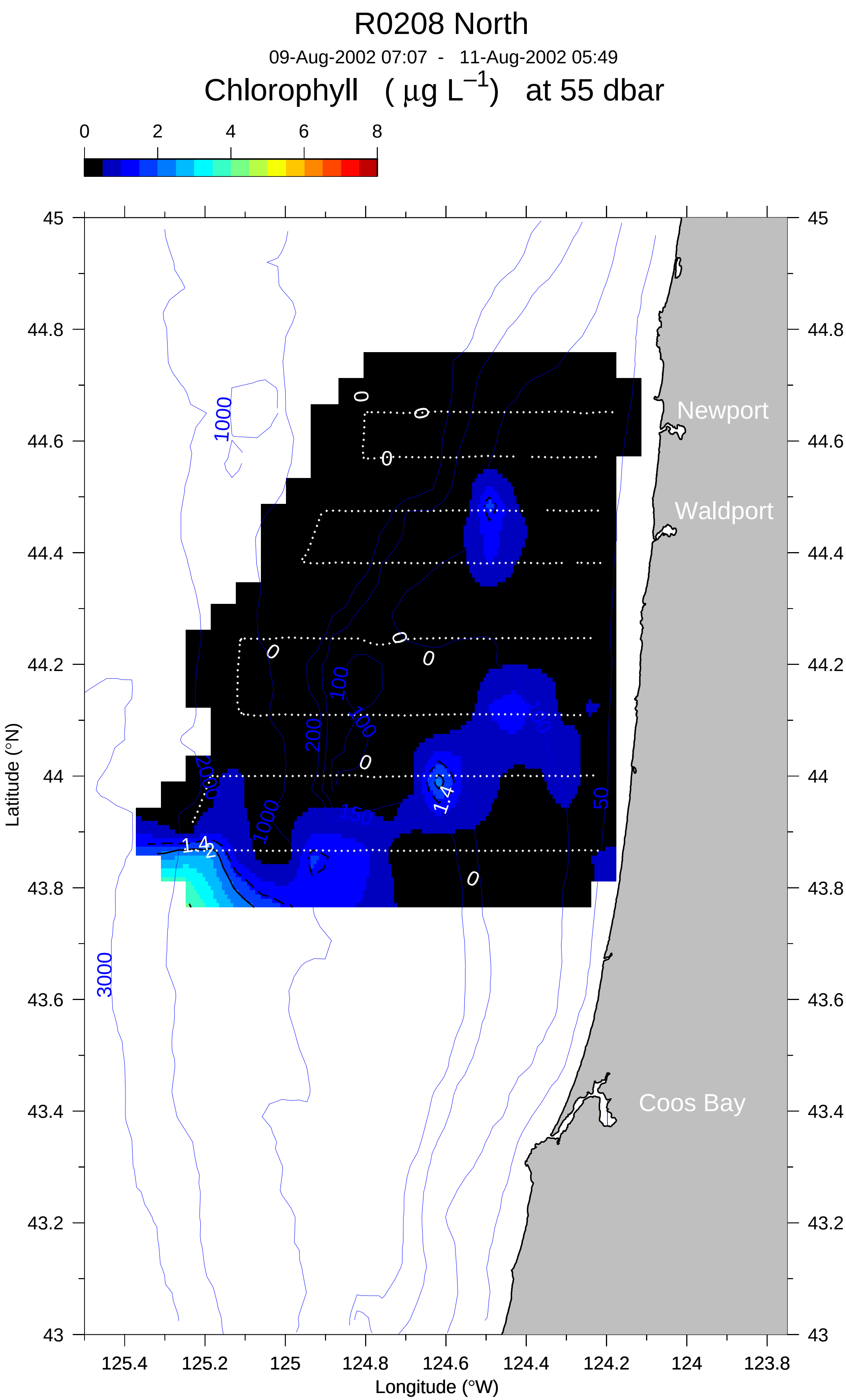


R0208 North

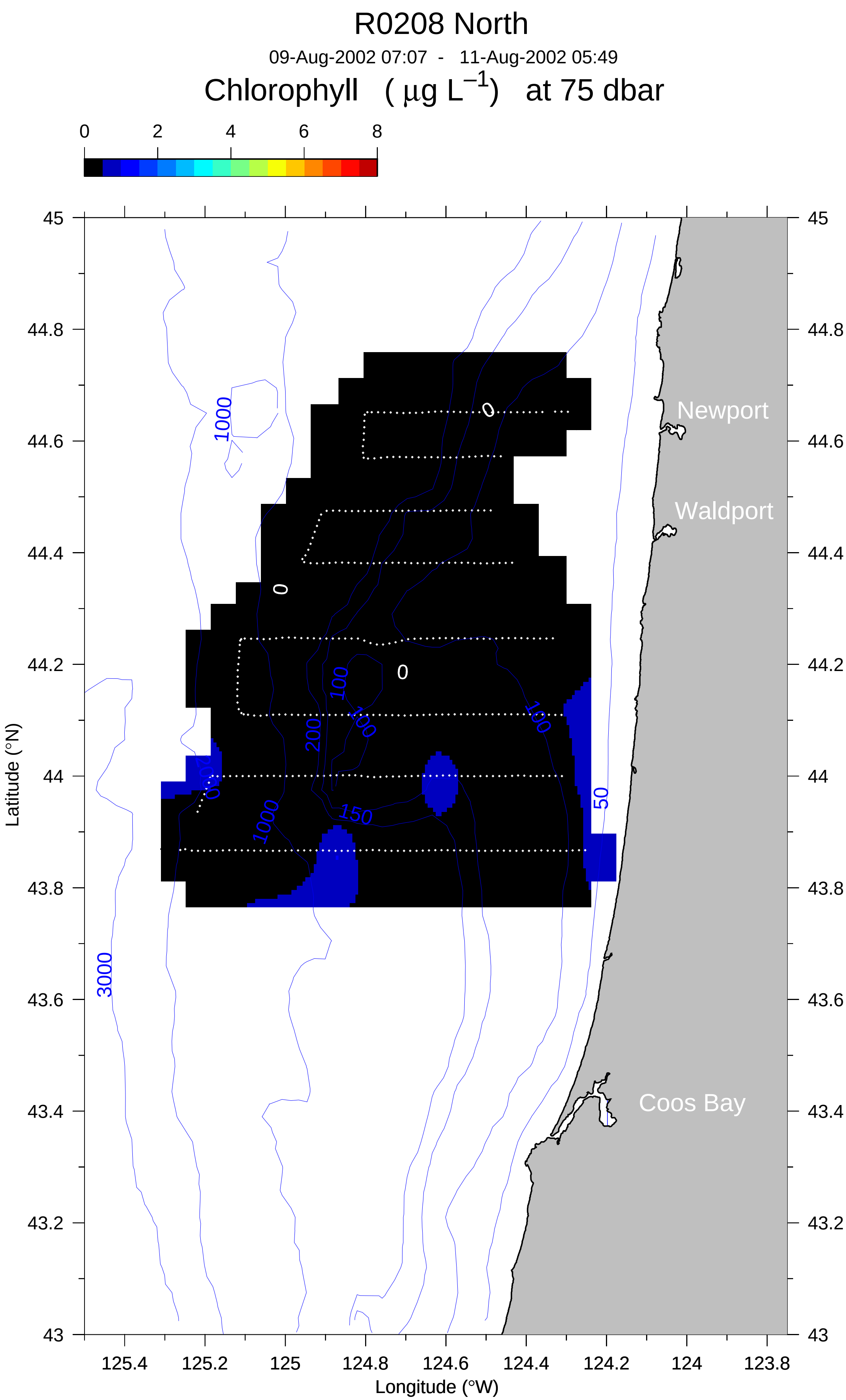
09-Aug-2002 07:07 - 11-Aug-2002 05:49

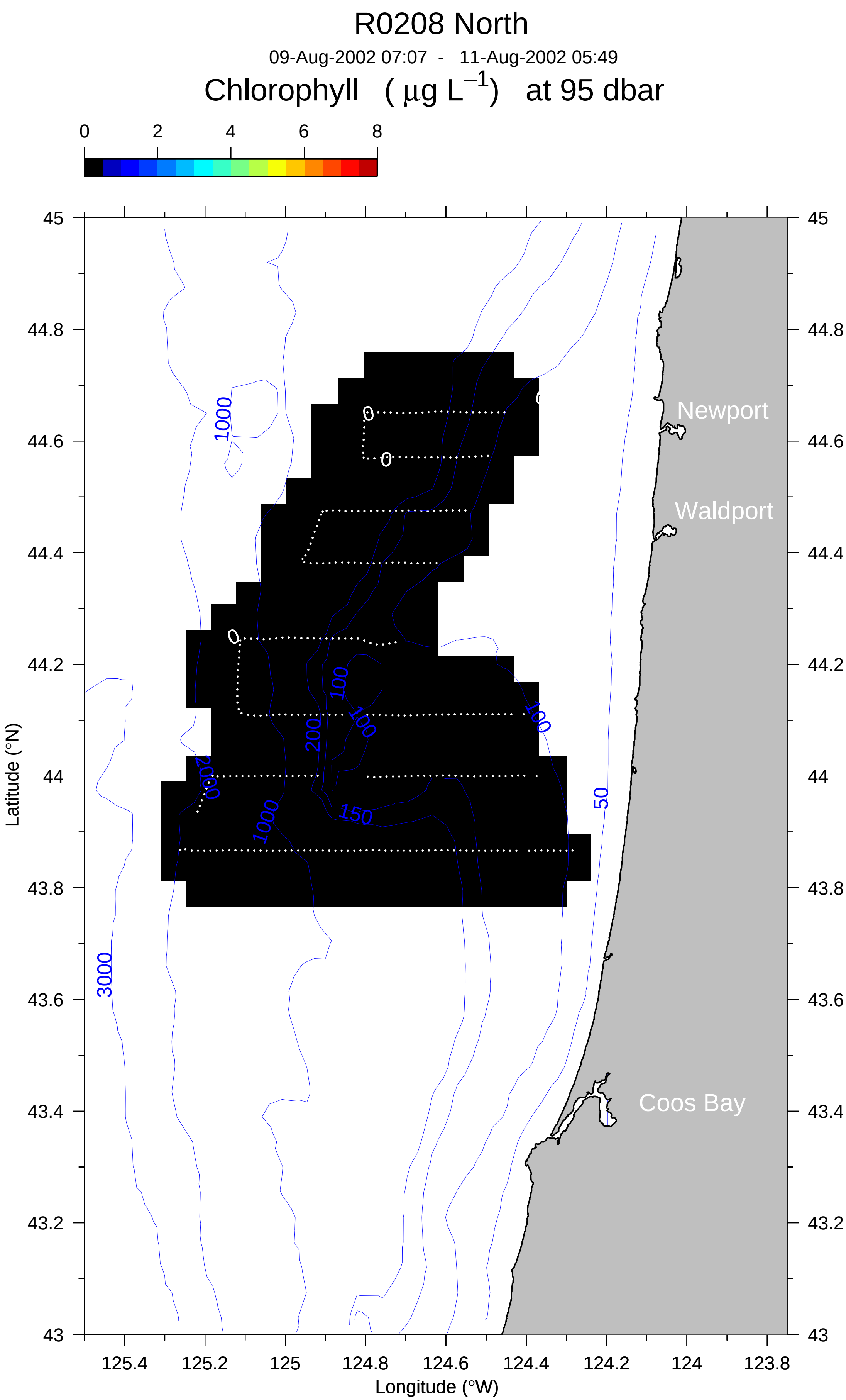
Chlorophyll (μg L^{-1}) at 45 dbar



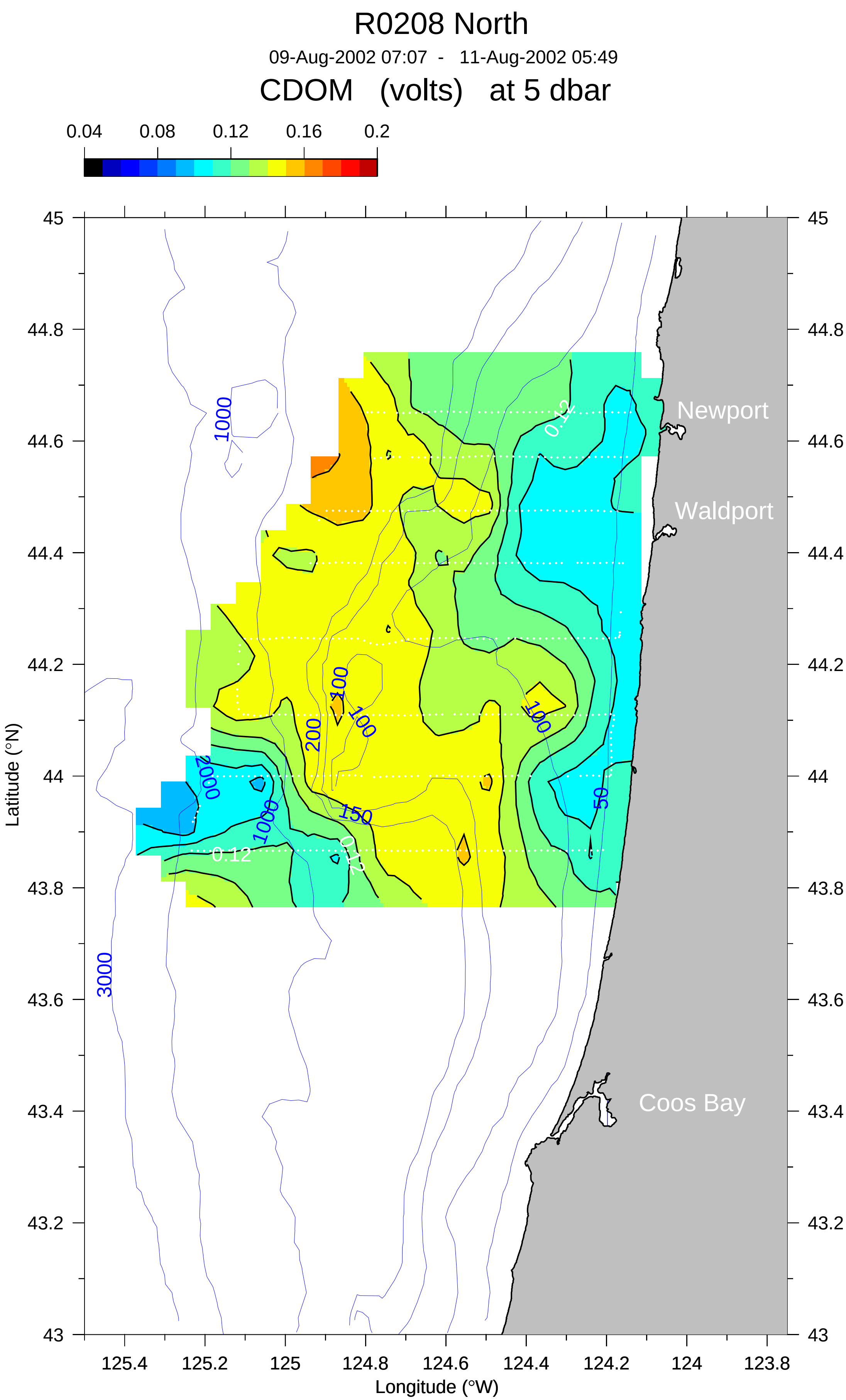


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Chlorophyll (µg L−1) at 55 dbar
0
2
4
6
8
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
3000
200
100
50
150
1.4
0
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Chlorophyll (µg L−1) at 75 dbar
0
2
4
6
8
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
1000
3000
200
100
150
50
0



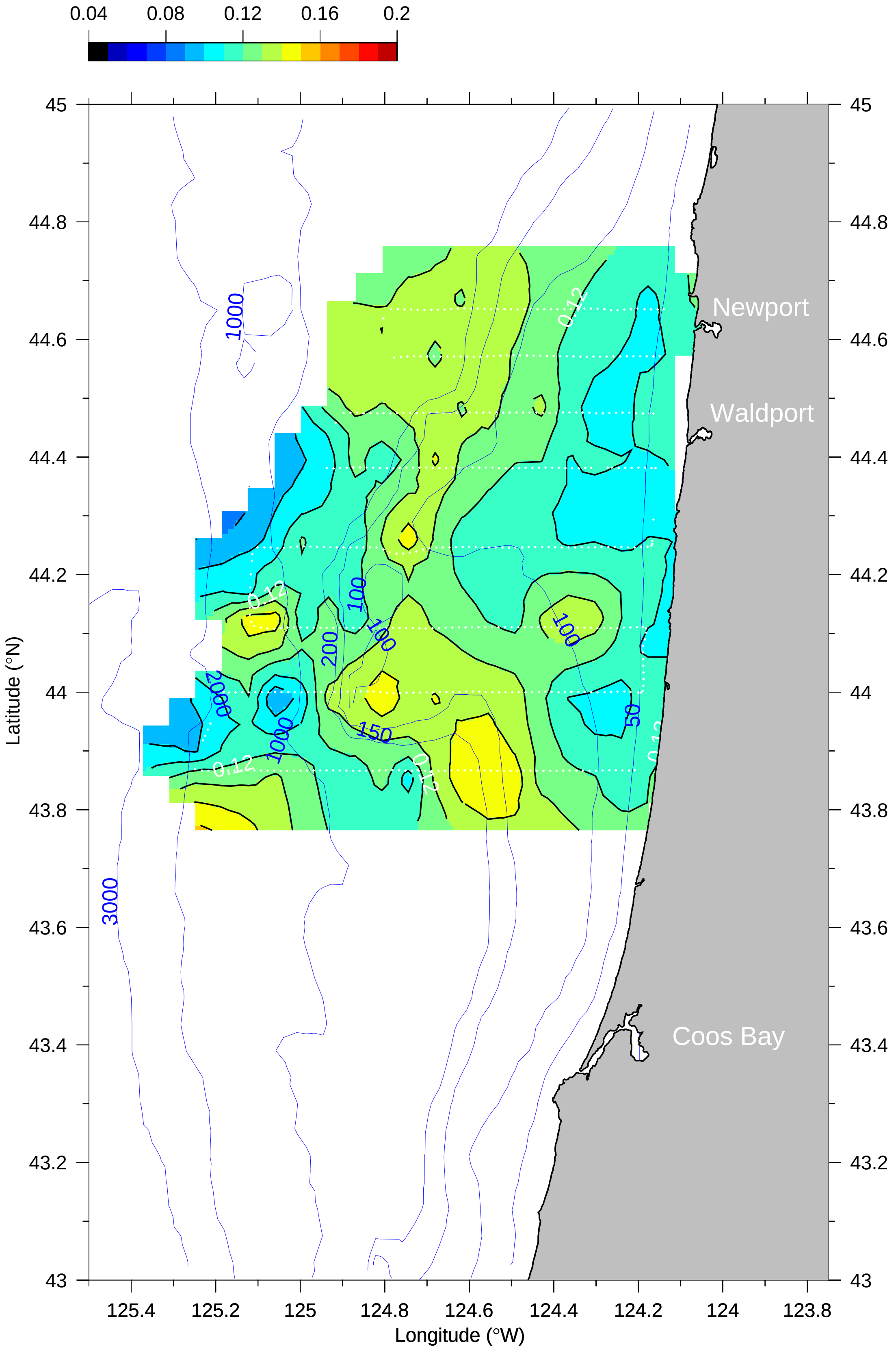
R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
Chlorophyll (µg L⁻¹) at 95 dbar
0
2
4
6
8
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
Latitude (°N)
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
Longitude (°W)
Newport
Waldport
Coos Bay
1000
3000
2000
200
100
150
50
0


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
CDOM (volts) at 5 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
150
100
50
0.12

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

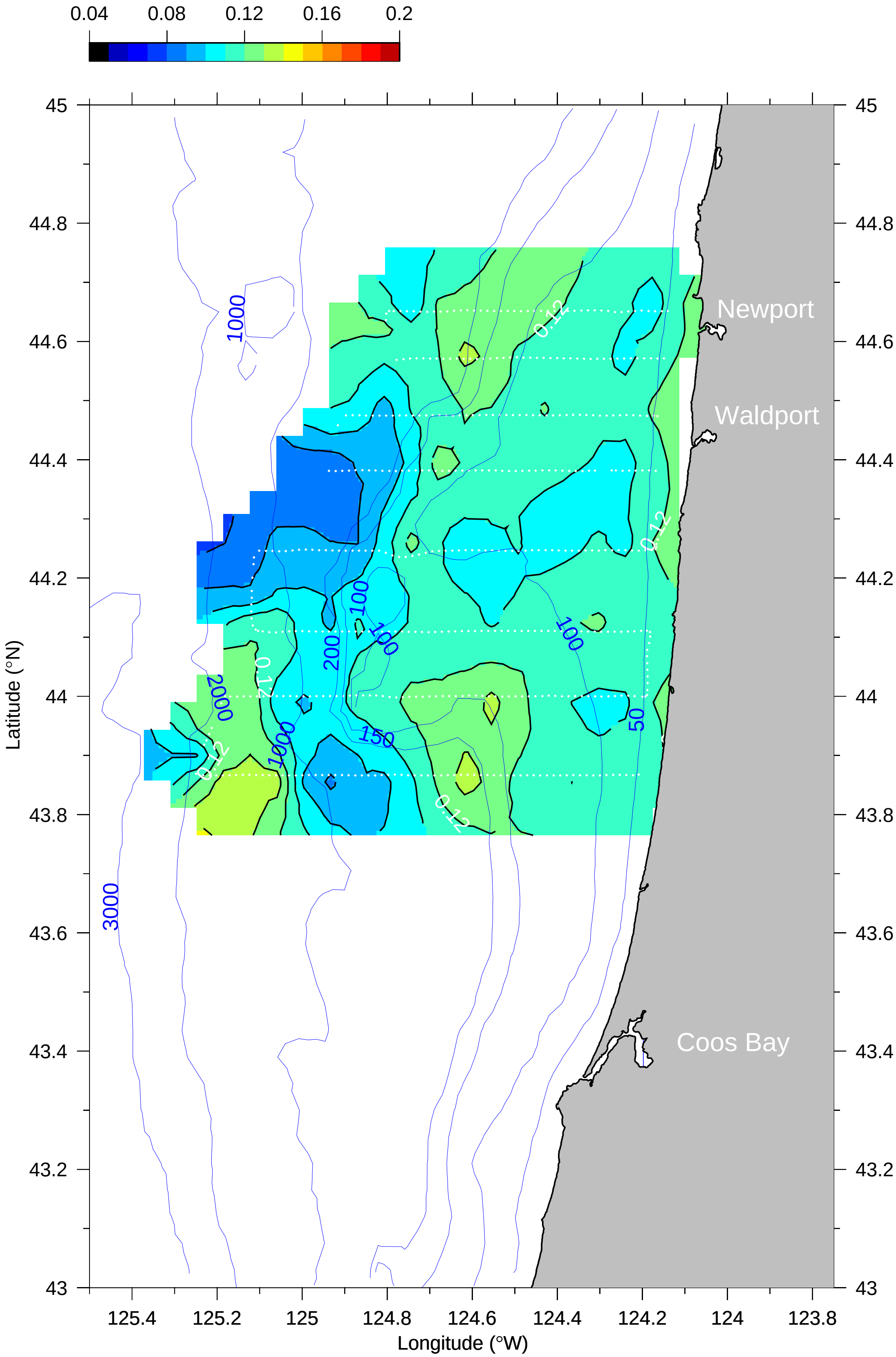
CDOM (volts) at 15 dbar

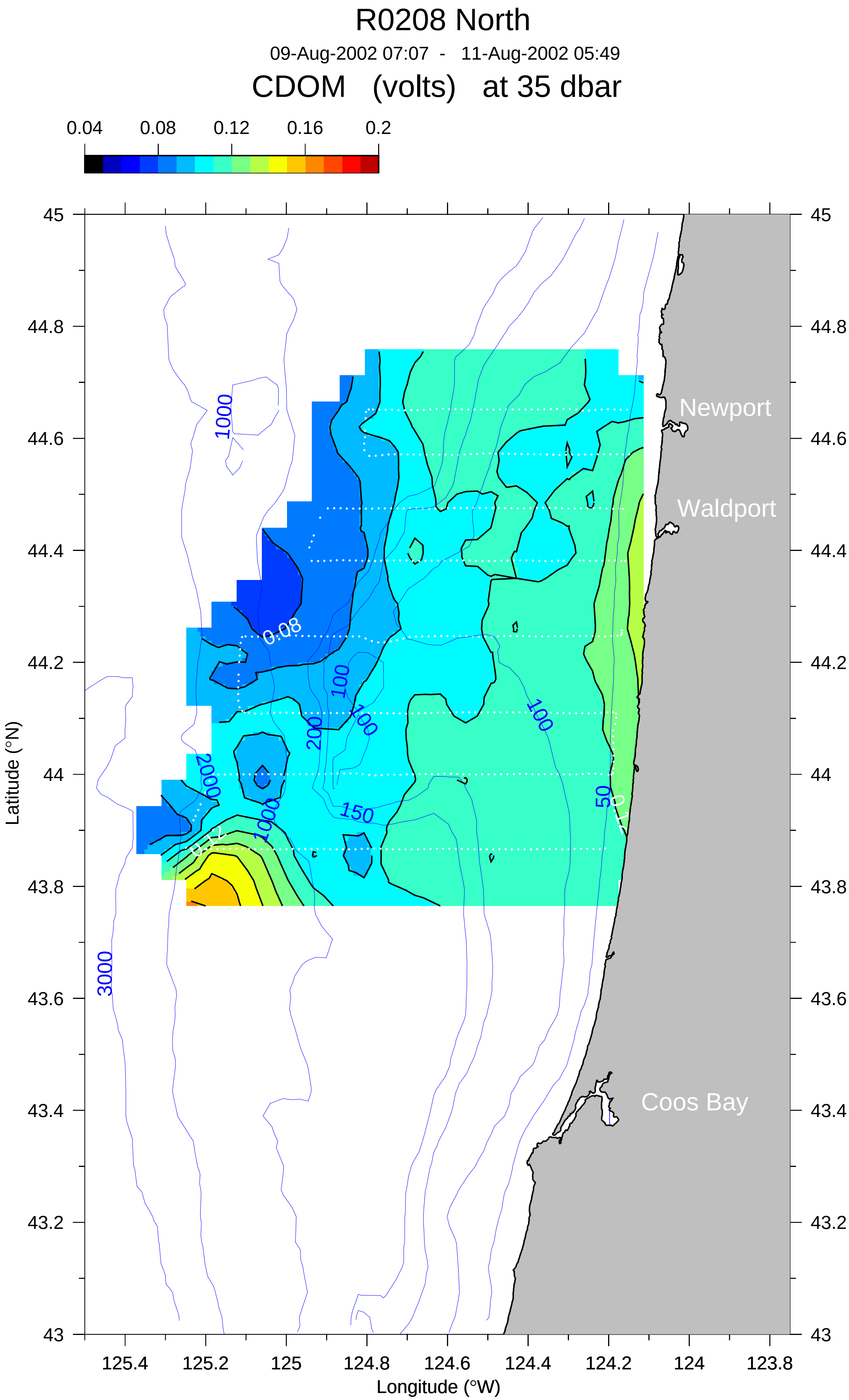


R0208 North

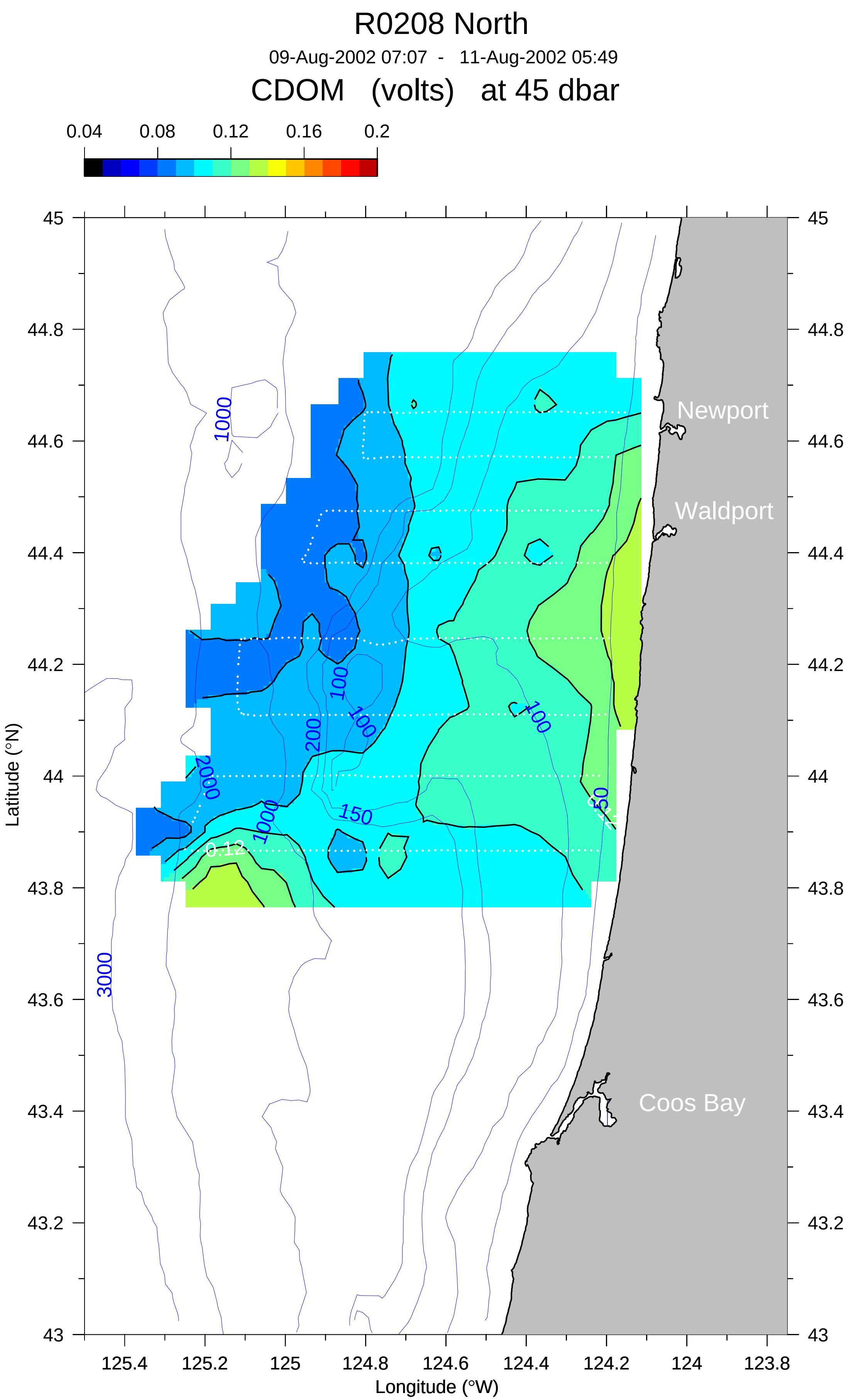
09-Aug-2002 07:07 - 11-Aug-2002 05:49

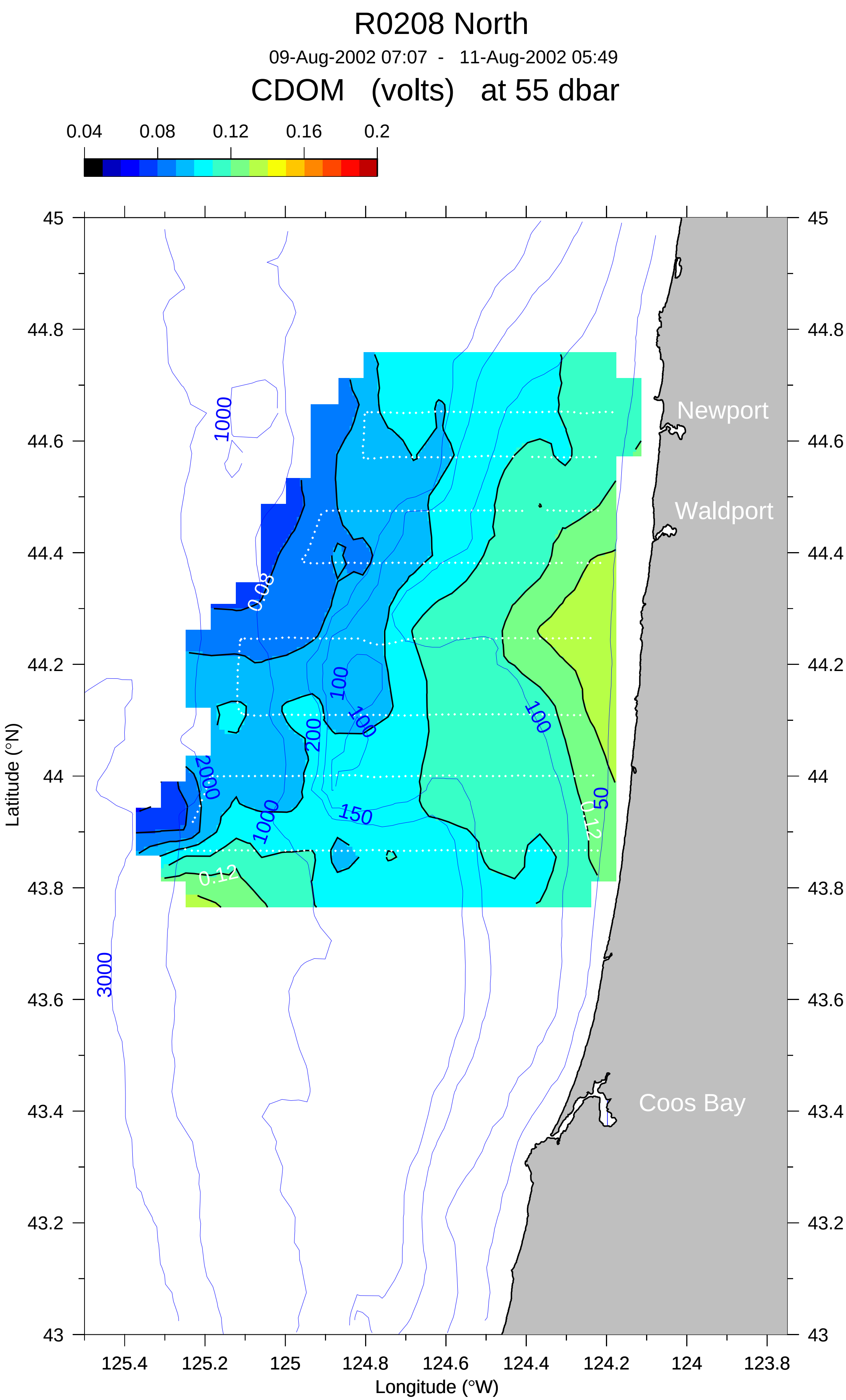
CDOM (volts) at 25 dbar



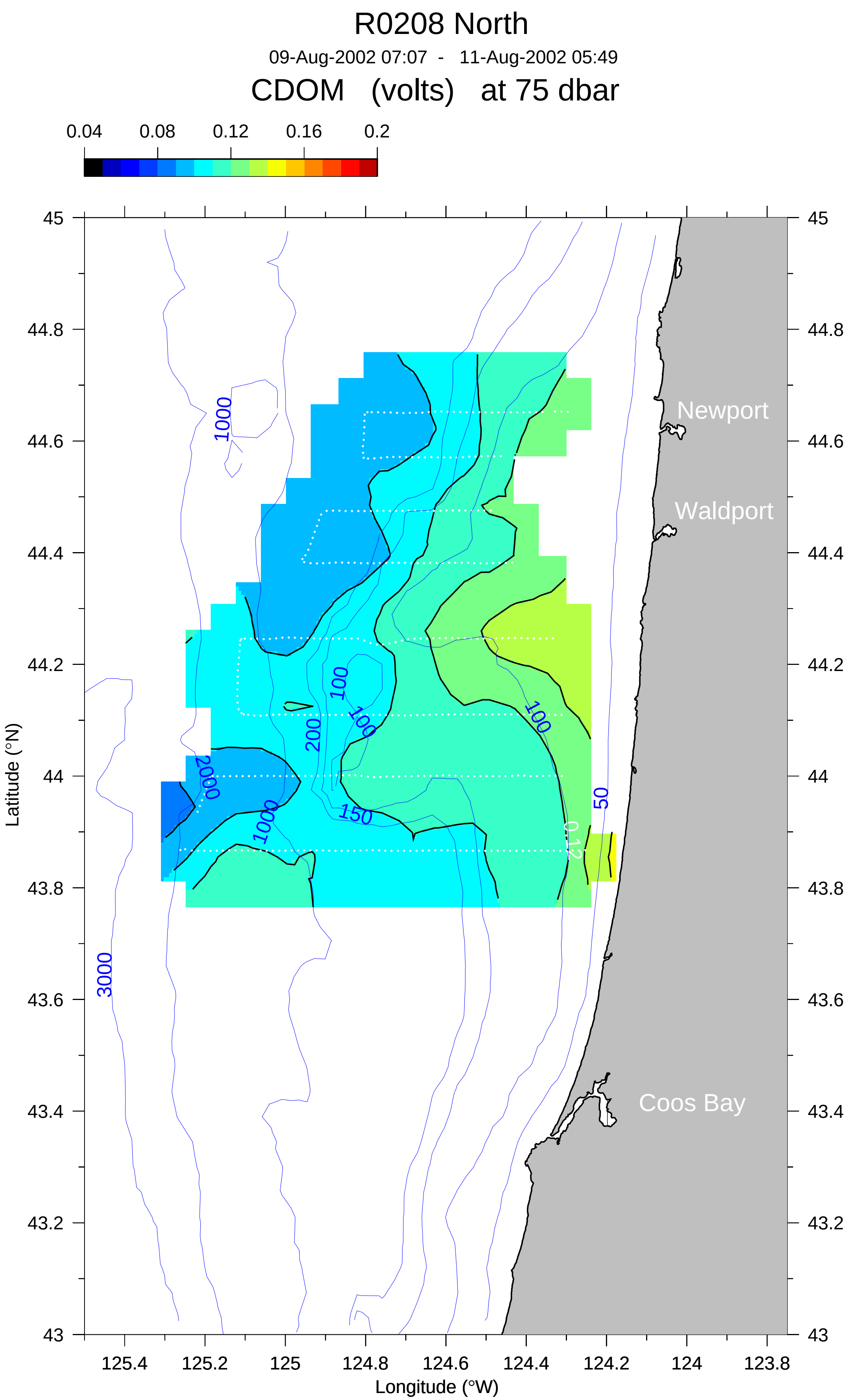


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
CDOM (volts) at 35 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
100
150
50
0.08


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
CDOM (volts) at 45 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
1000
2000
3000
200
150
100
50
0.12
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8



R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
CDOM (volts) at 55 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8
1000
2000
3000
200
100
150
50
0.08
0.12

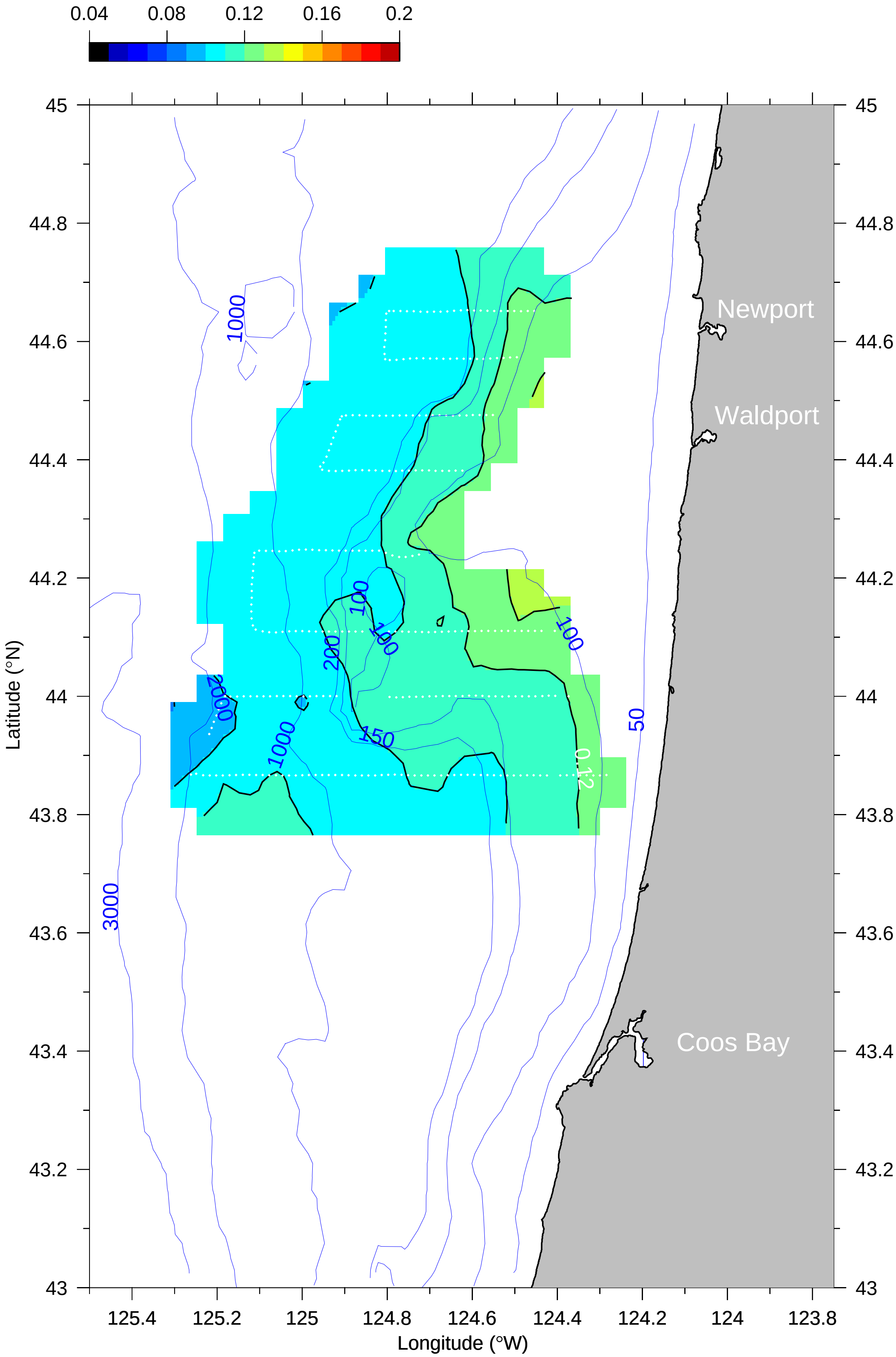


R0208 North
09-Aug-2002 07:07 - 11-Aug-2002 05:49
CDOM (volts) at 75 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
1000
2000
3000
200
100
150
50
0.12
Latitude (°N)
Longitude (°W)
45
44.8
44.6
44.4
44.2
44
43.8
43.6
43.4
43.2
43
125.4
125.2
125
124.8
124.6
124.4
124.2
124
123.8

R0208 North

09-Aug-2002 07:07 - 11-Aug-2002 05:49

CDOM (volts) at 95 dbar



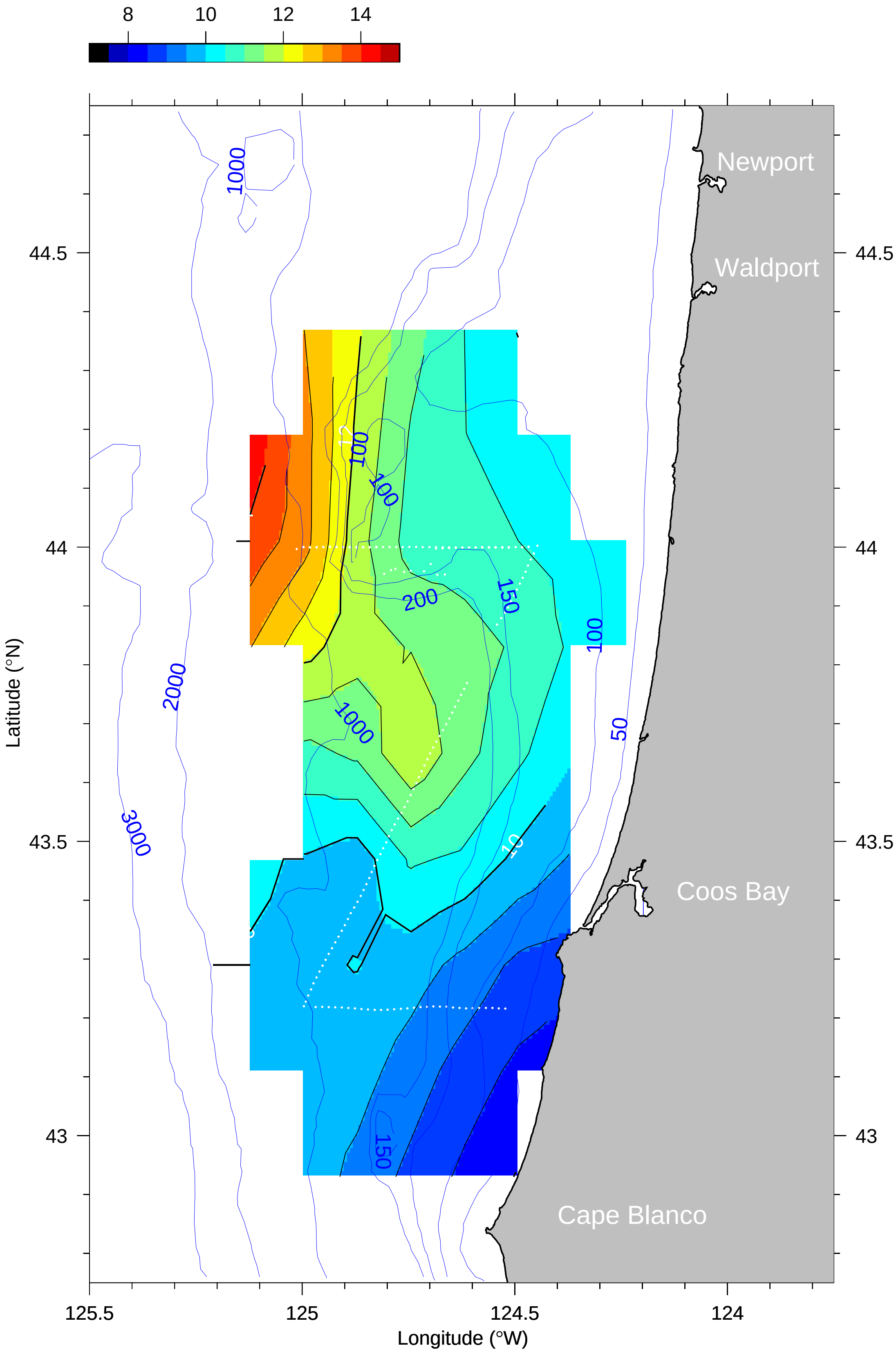
Middle Maps

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

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

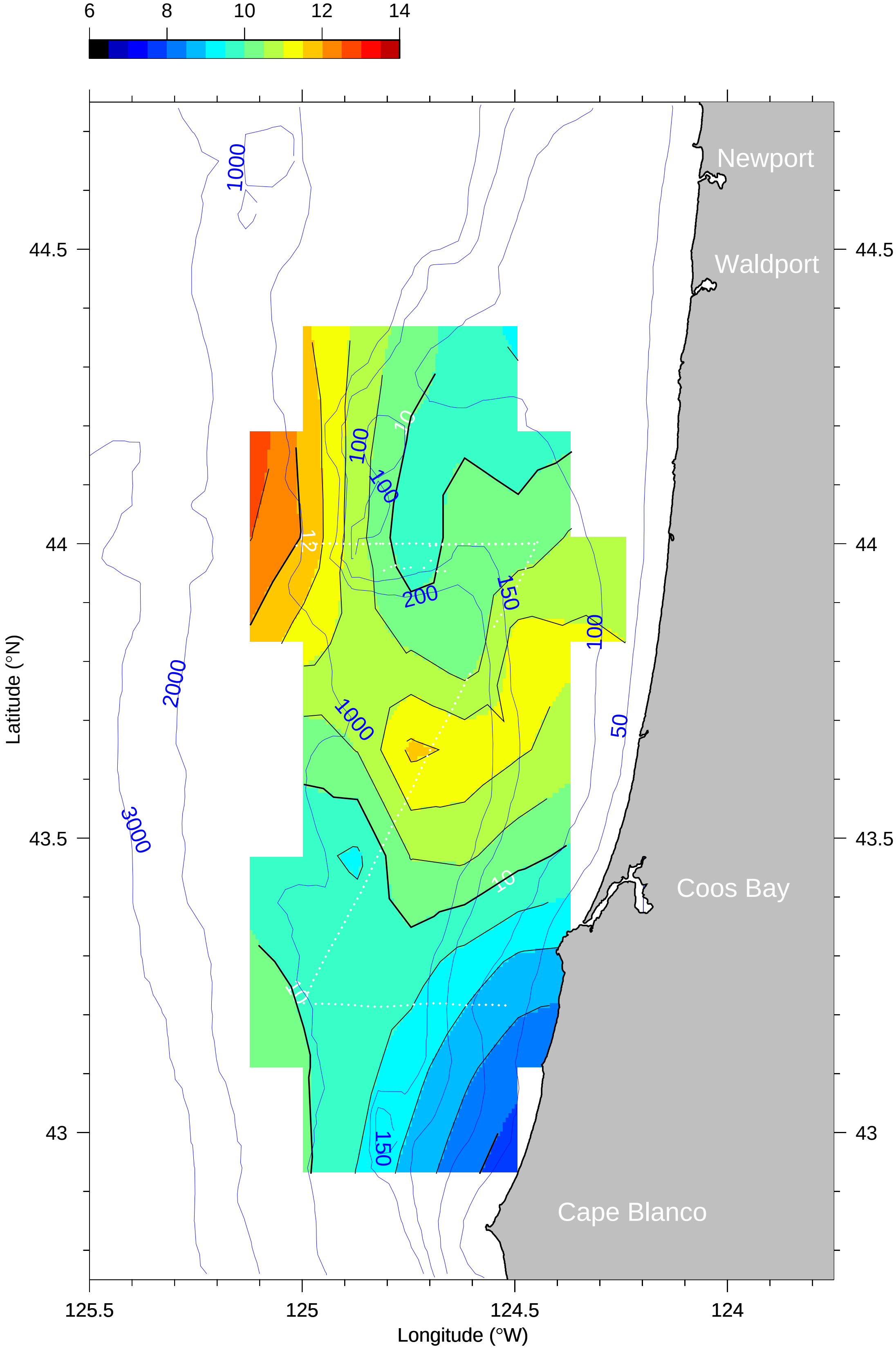
Temperature (°C) at 5 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

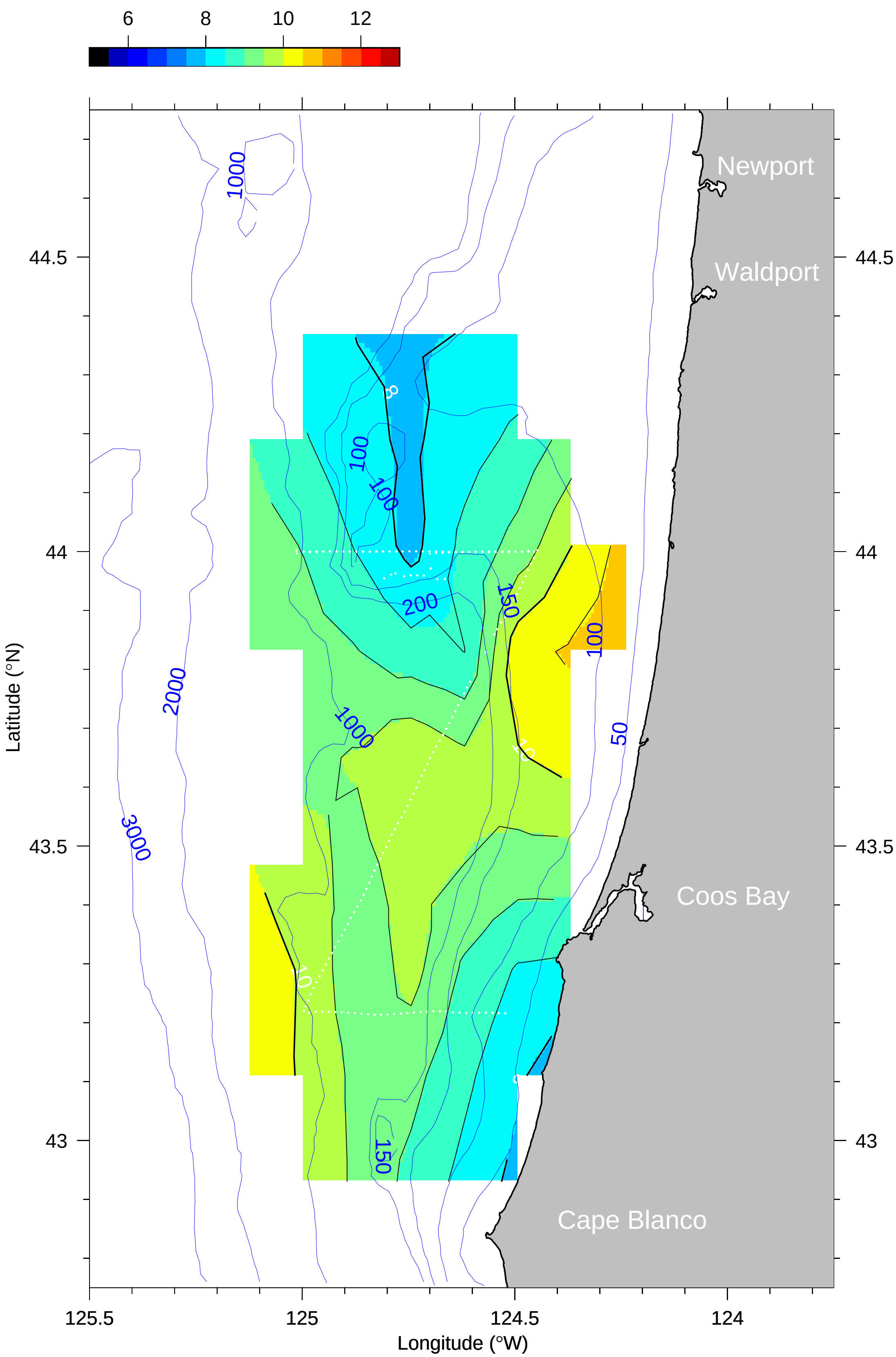
Temperature (°C) at 15 dbar

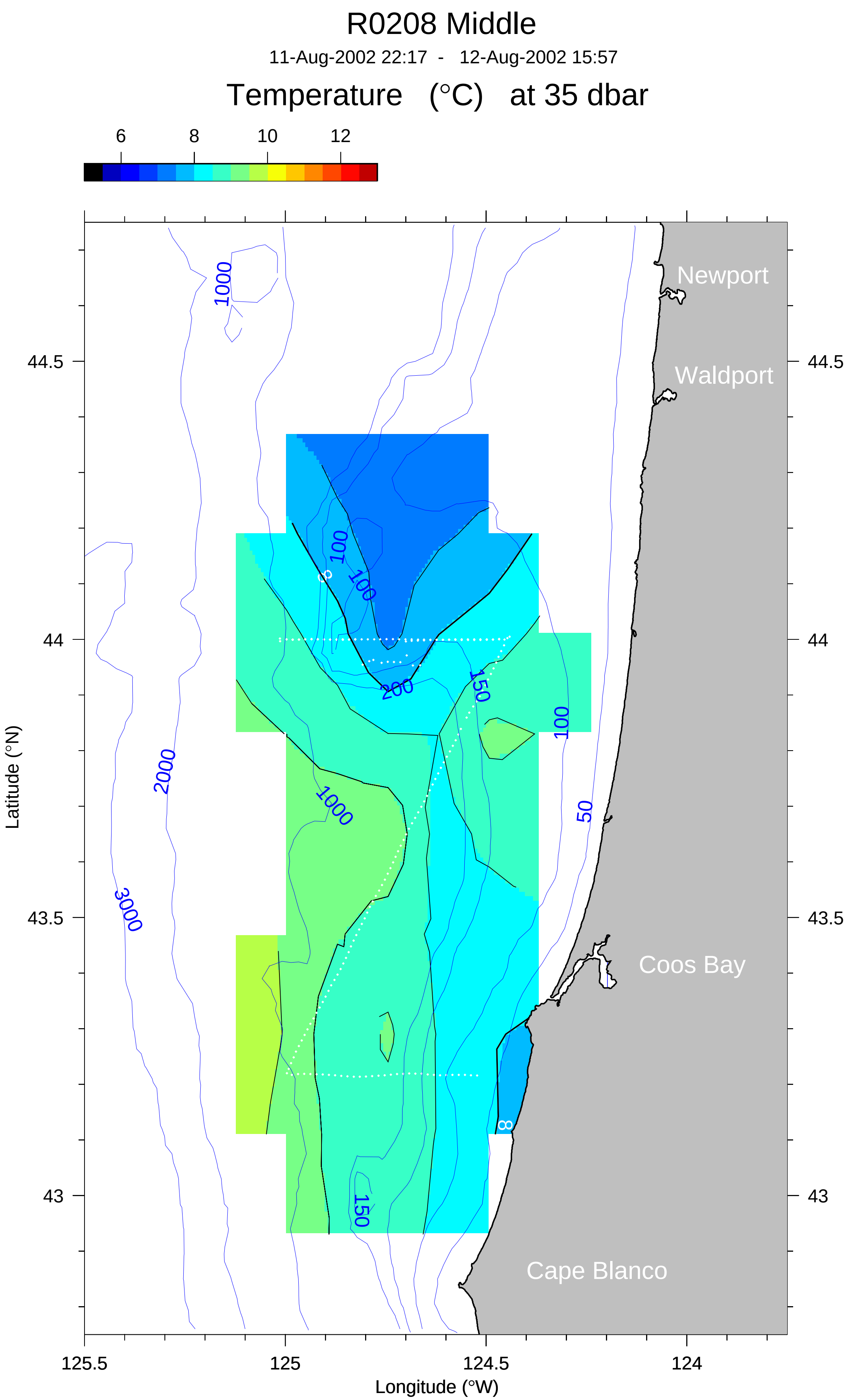


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Temperature (°C) at 25 dbar

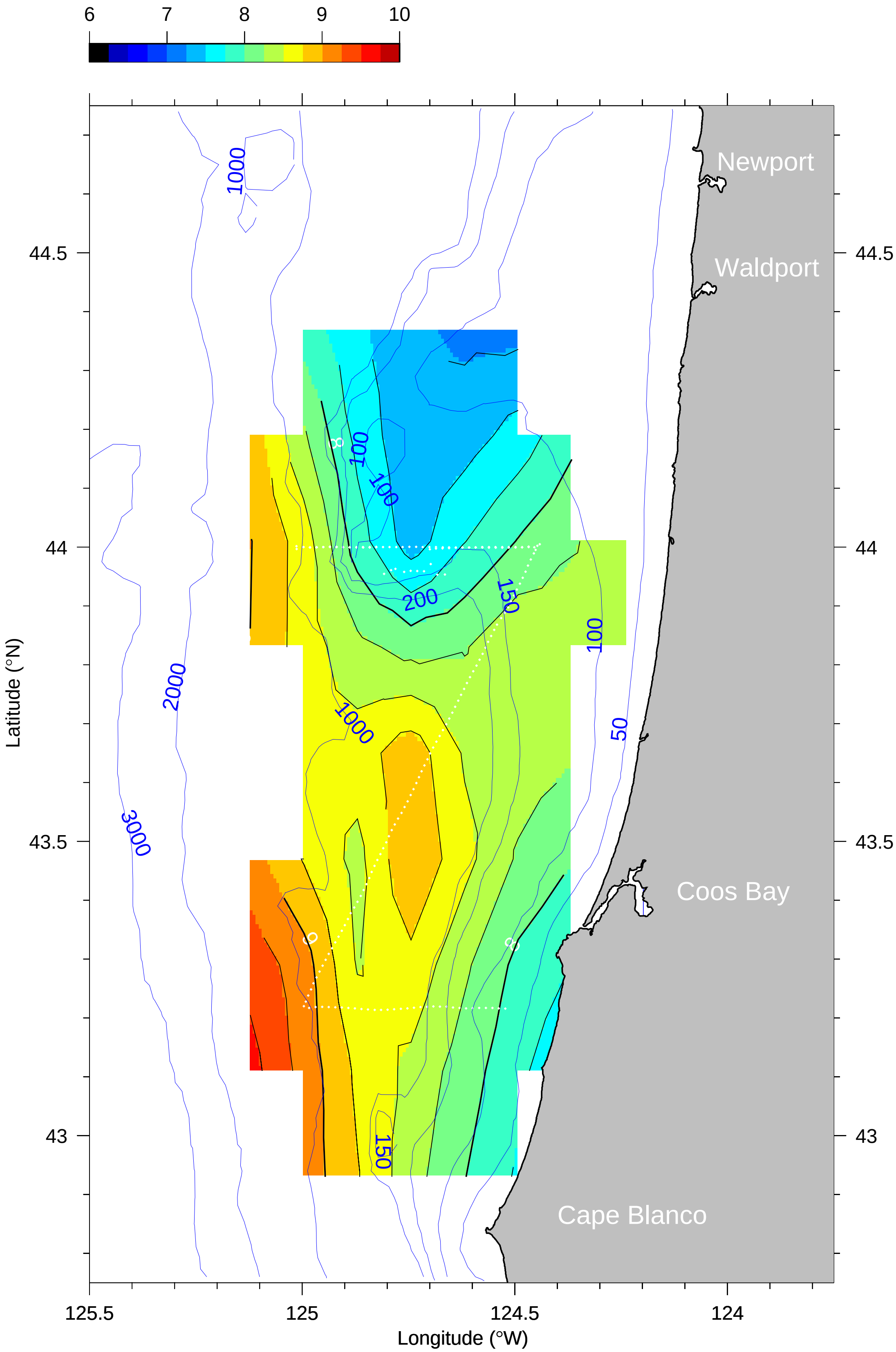



R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Temperature (°C) at 35 dbar
6
8
10
12
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
150
200
50
8
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

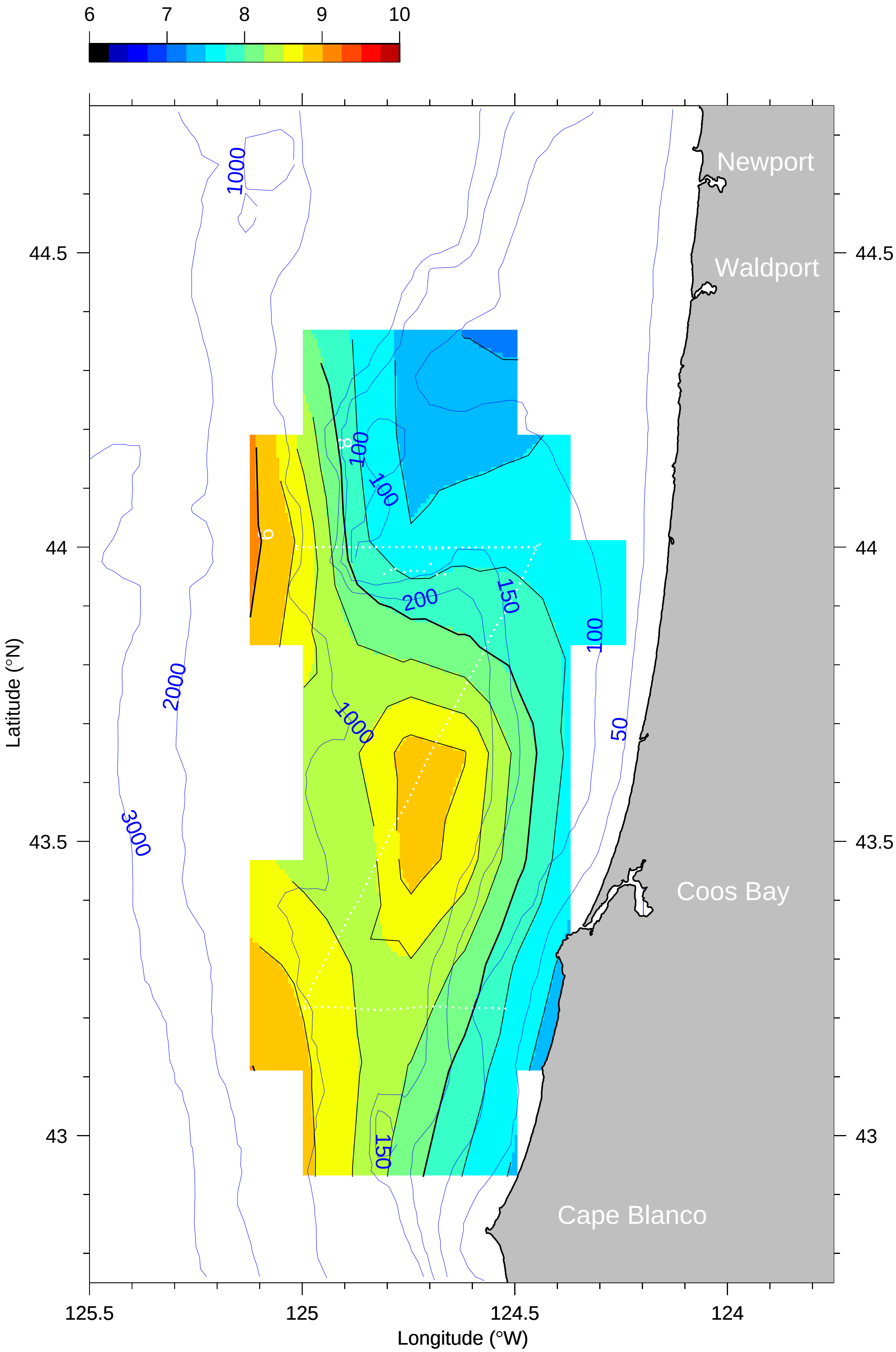
Temperature (°C) at 45 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

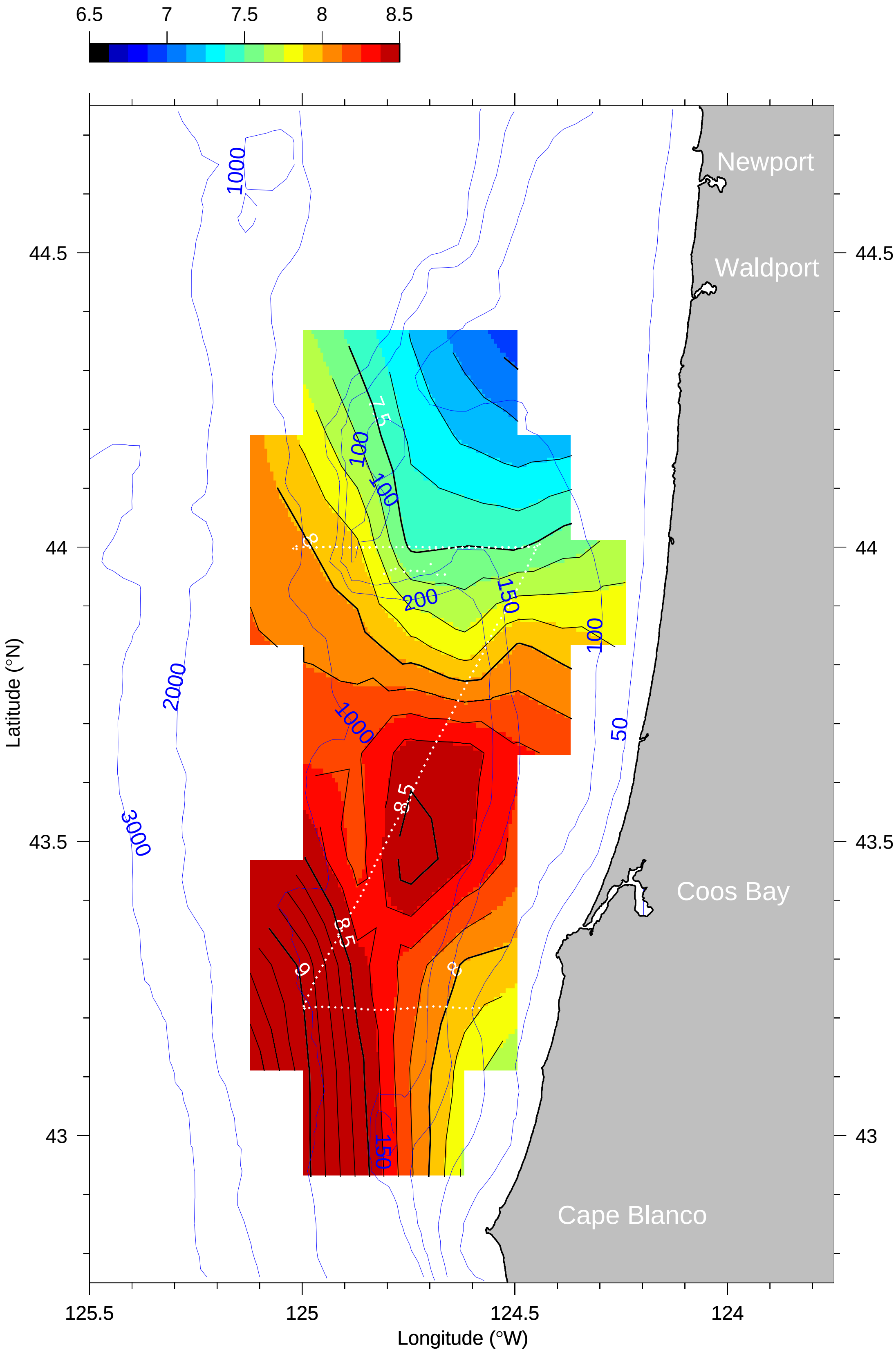
Temperature (°C) at 55 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

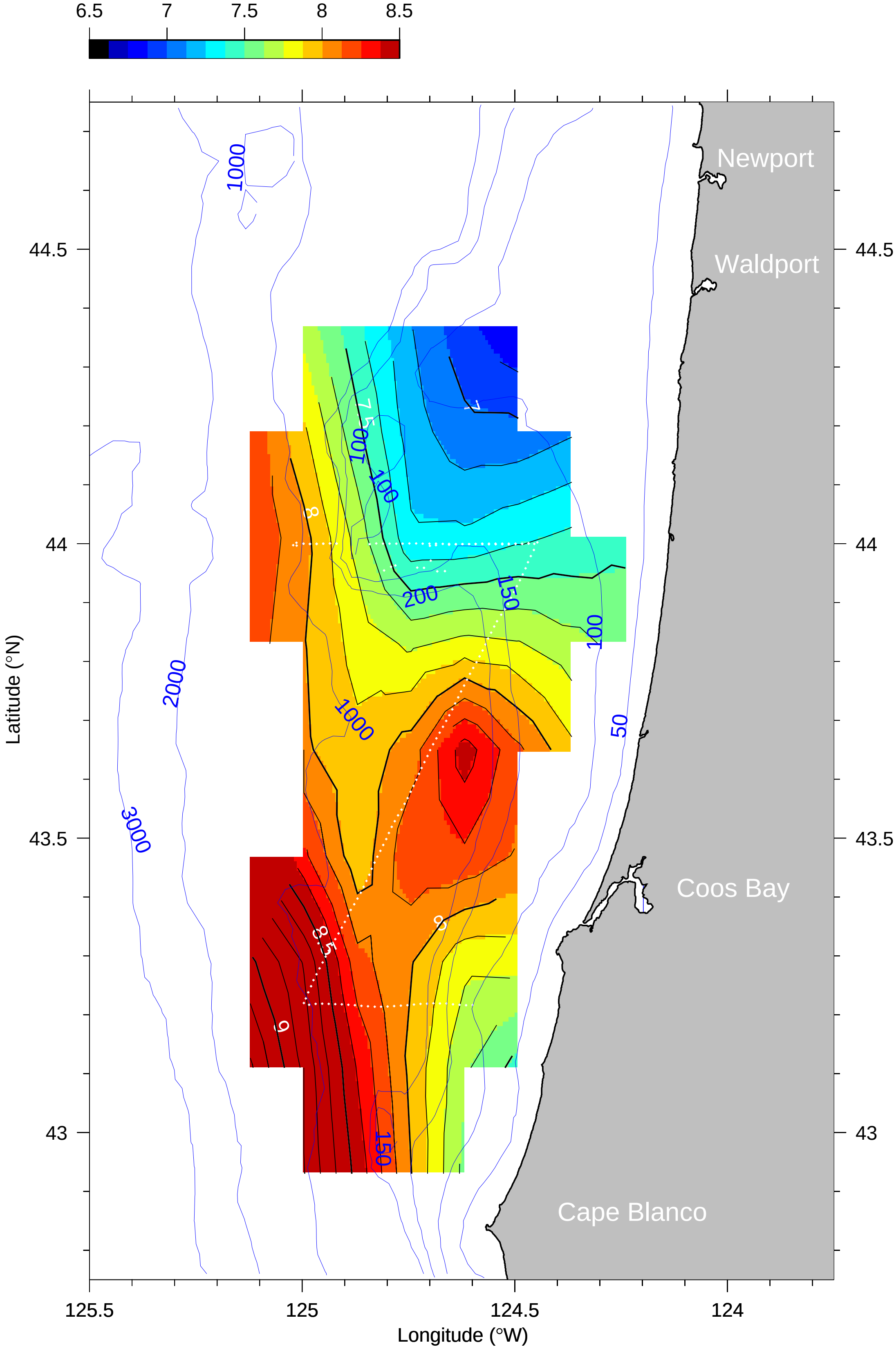
Temperature (°C) at 75 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

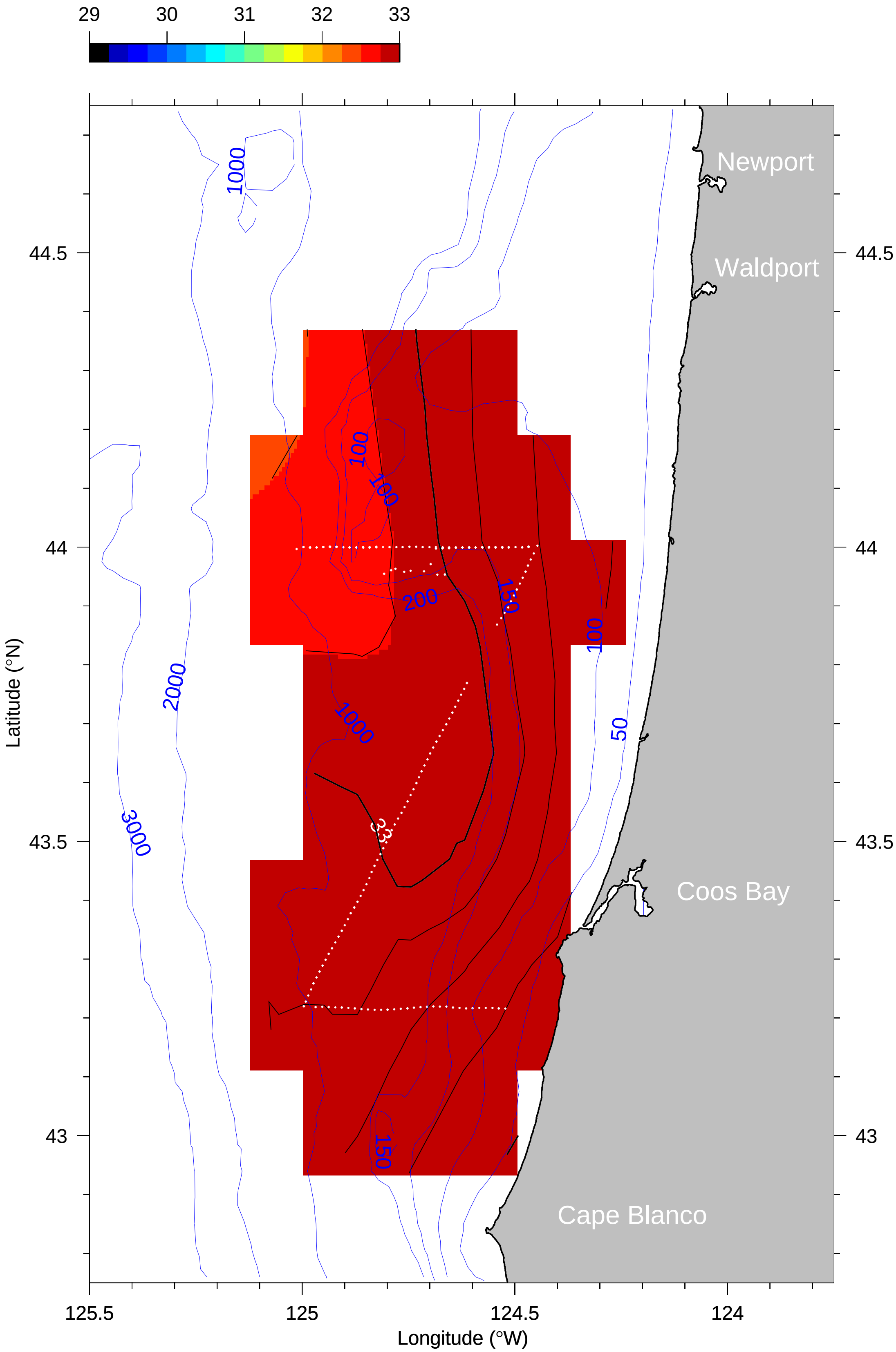
Temperature (°C) at 95 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

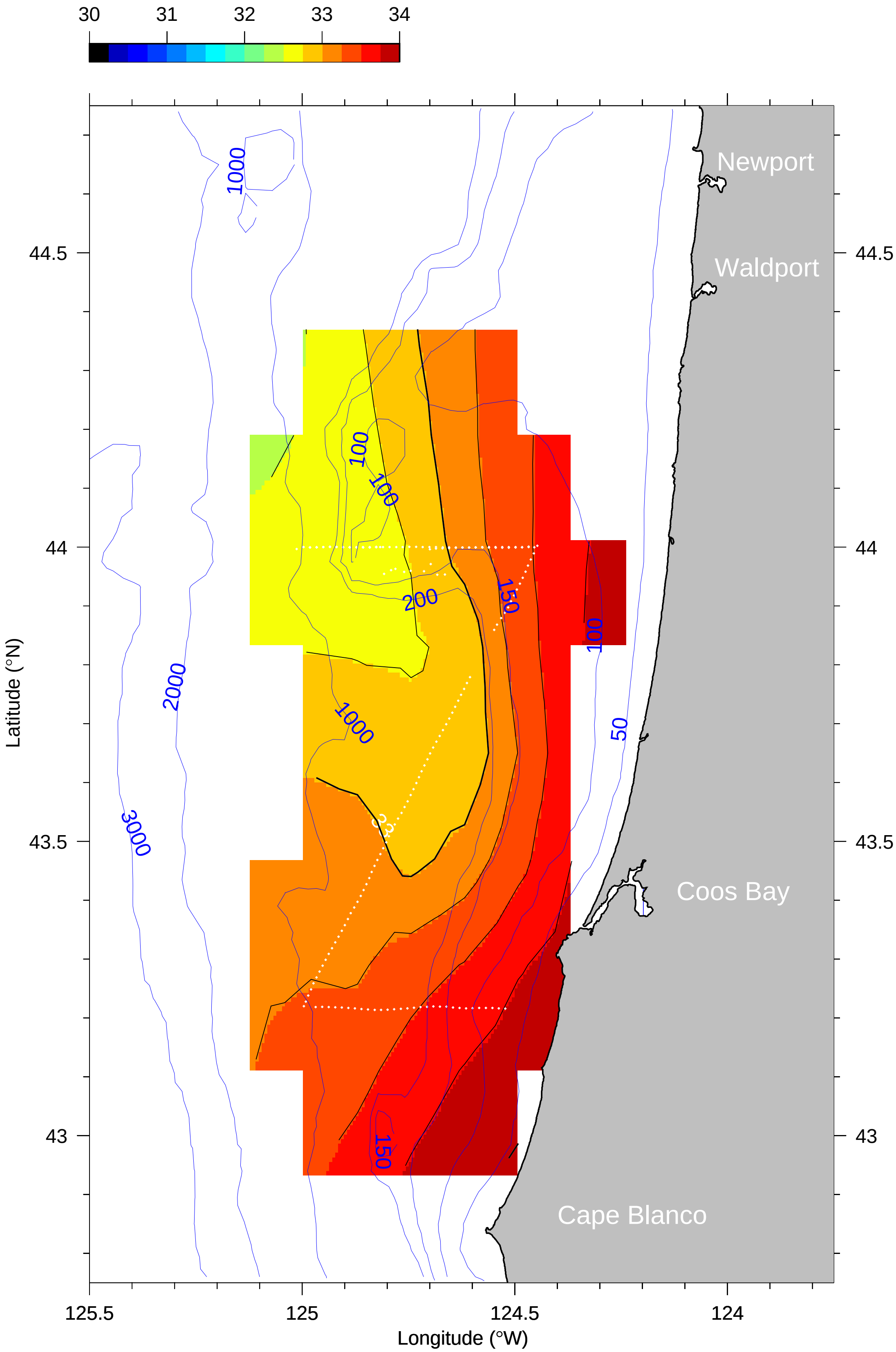
Salinity (PSS) at 5 dbar

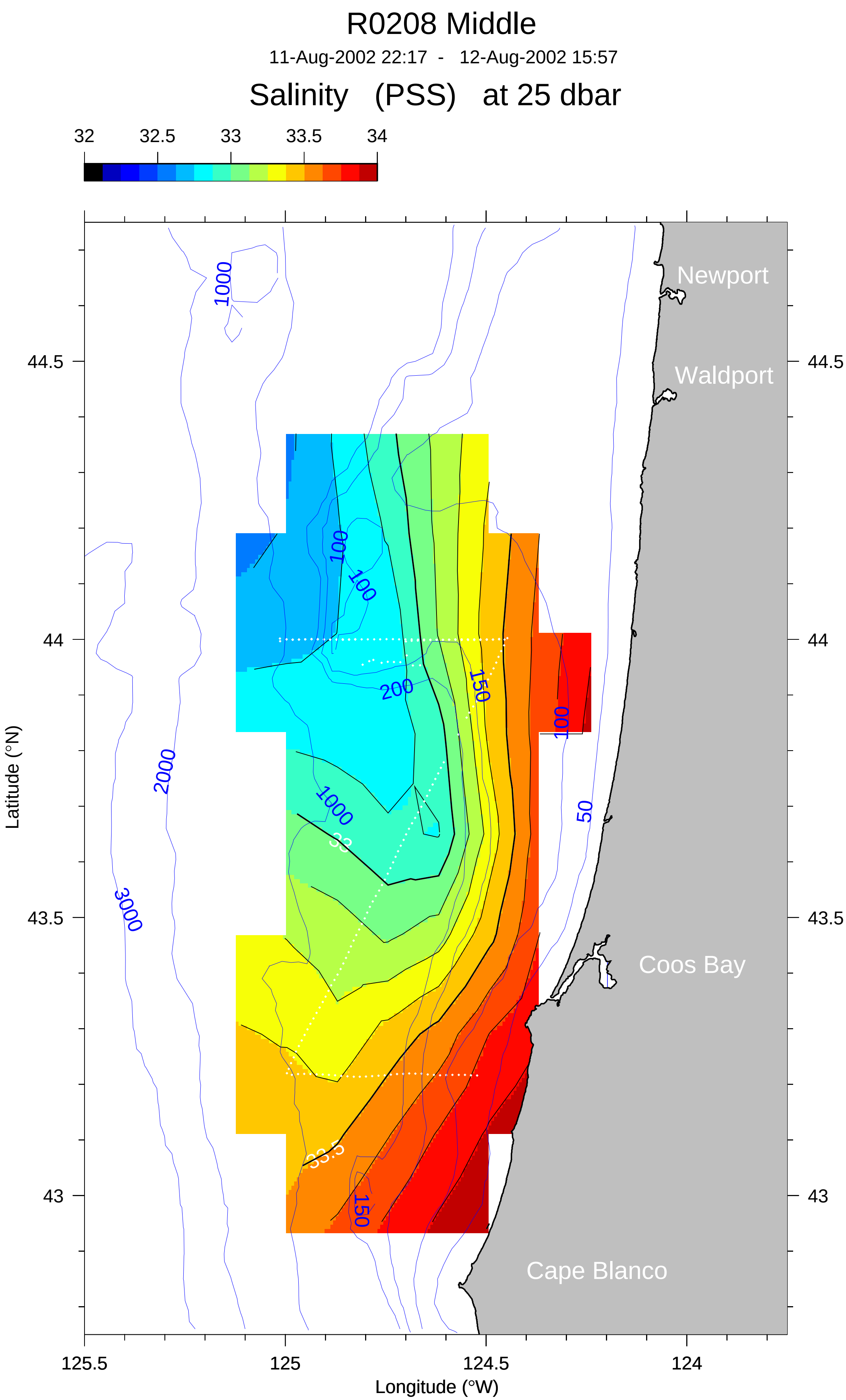


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Salinity (PSS) at 15 dbar

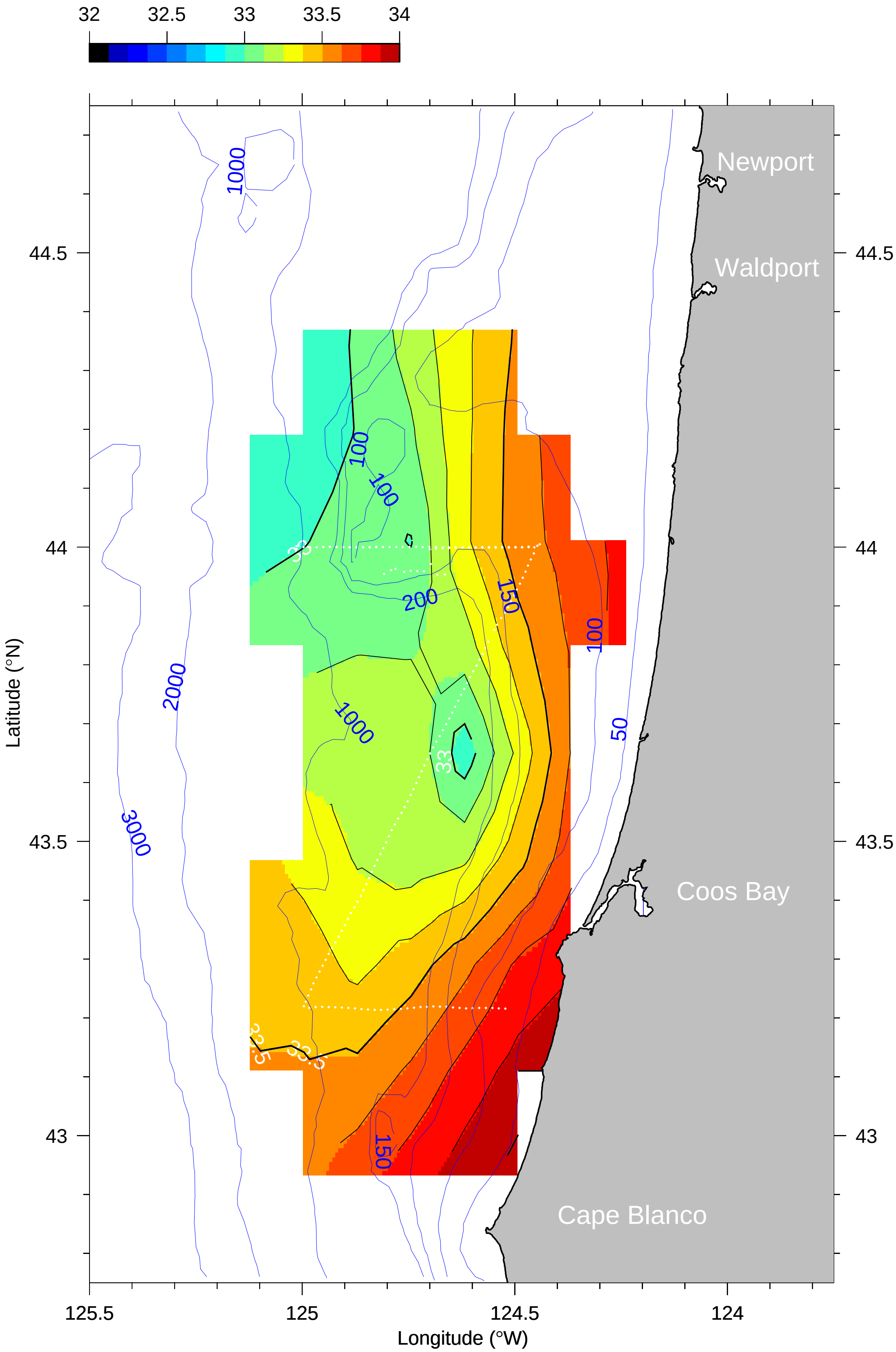



R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Salinity (PSS) at 25 dbar
32
32.5
33
33.5
34
Newport
Waldport
Coos Bay
Cape Blanco
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
1000
2000
3000
200
150
100
50
33
33.5

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

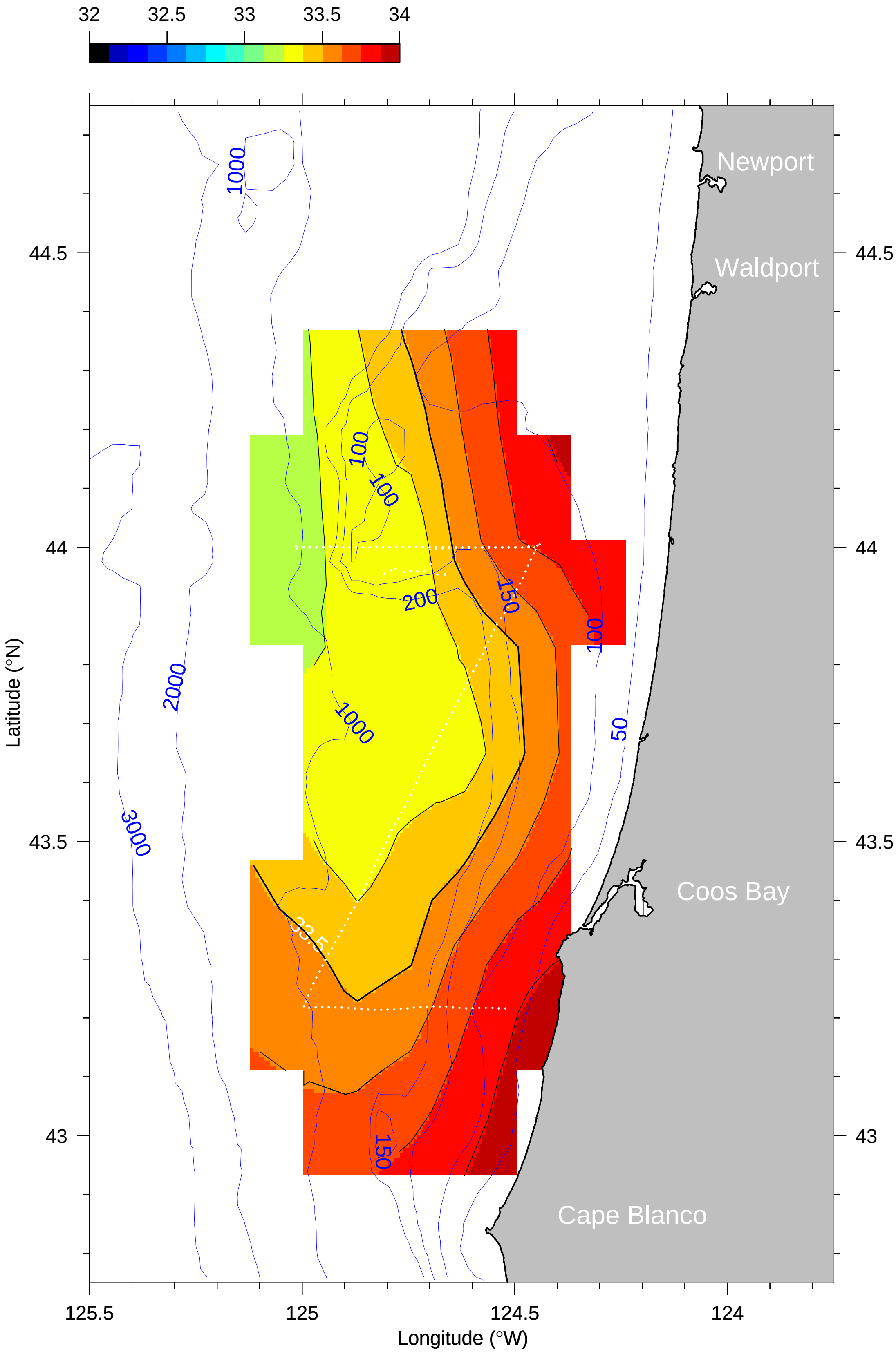
Salinity (PSS) at 35 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

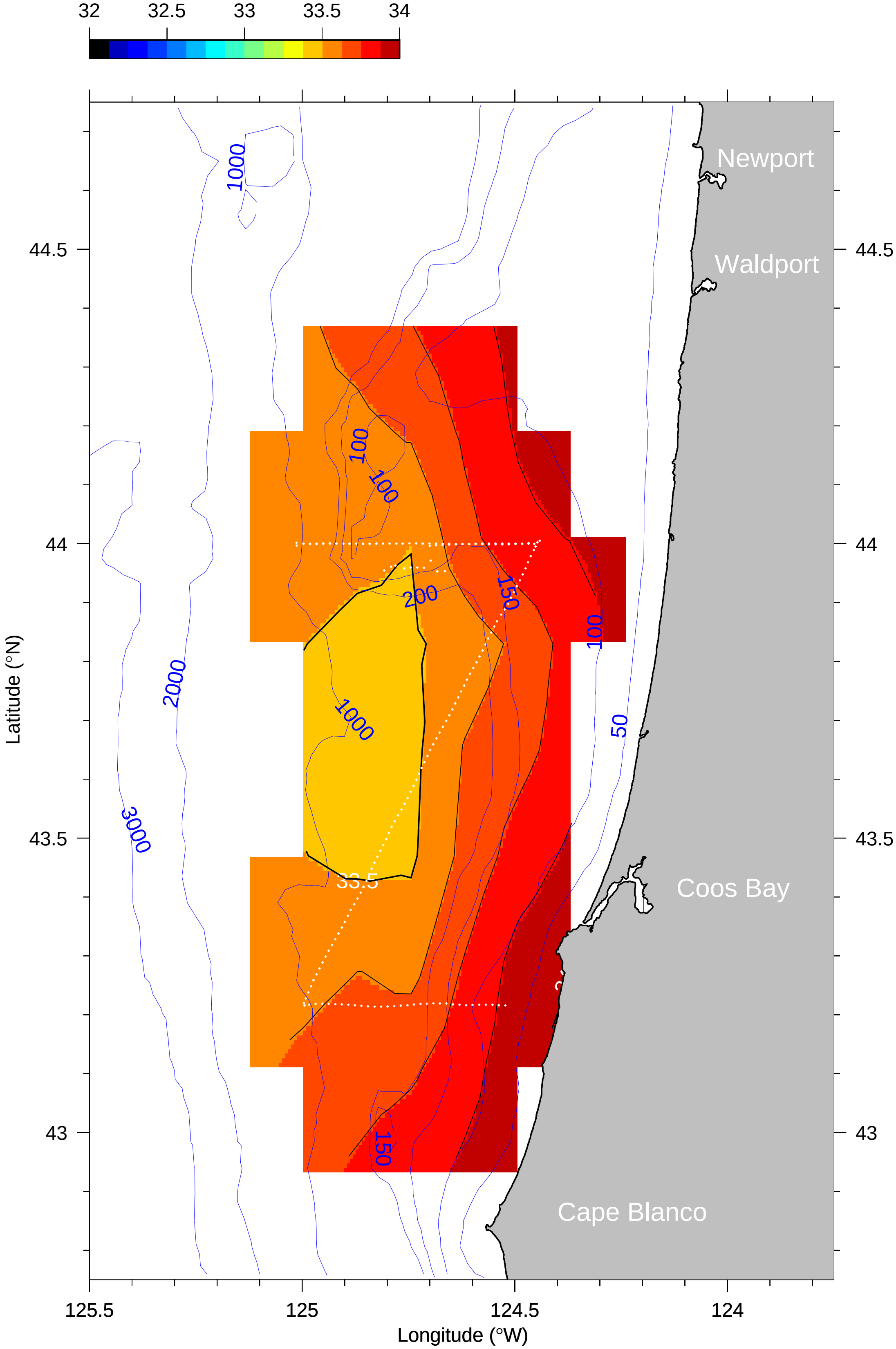
Salinity (PSS) at 45 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

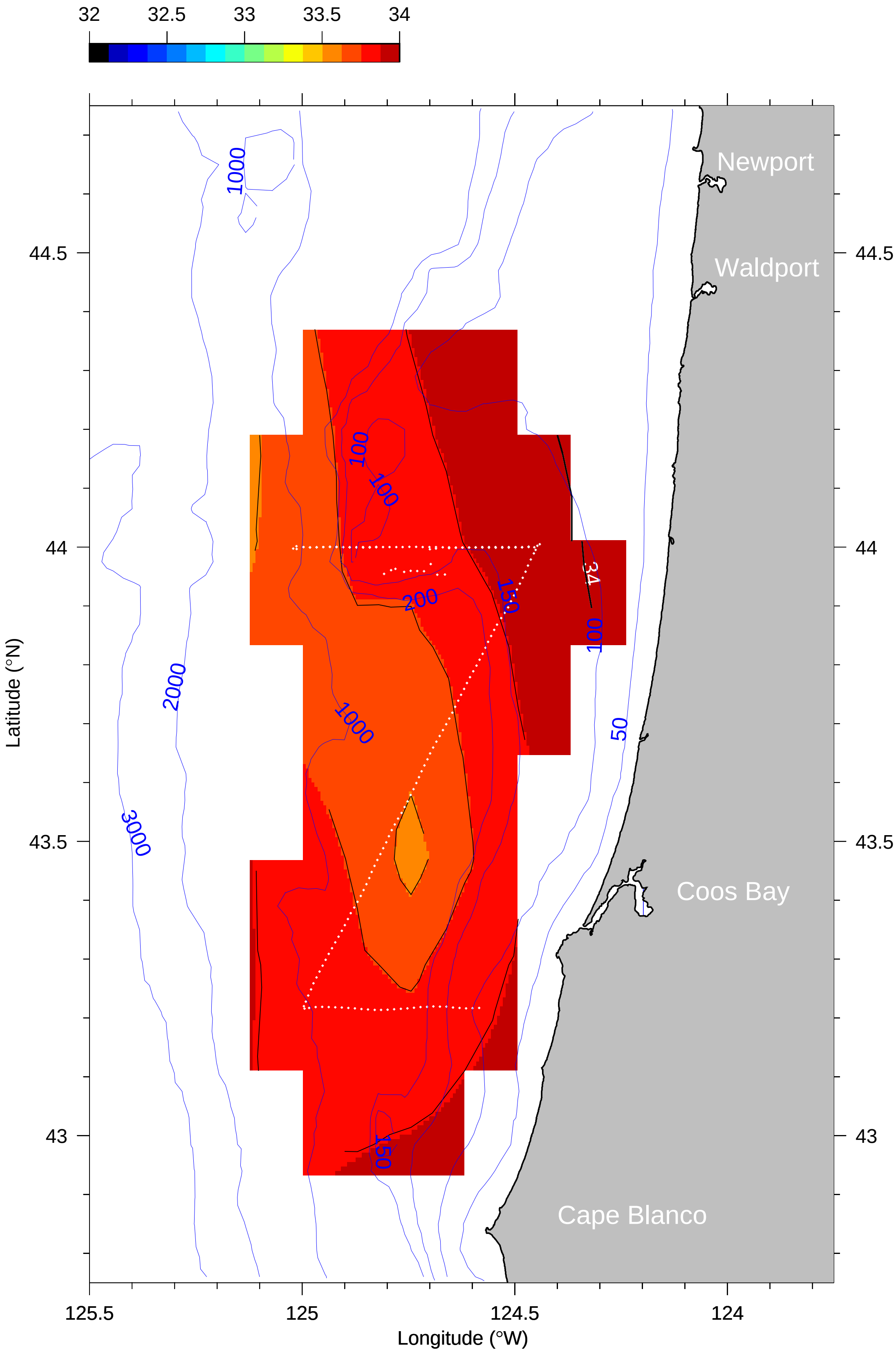
Salinity (PSS) at 55 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

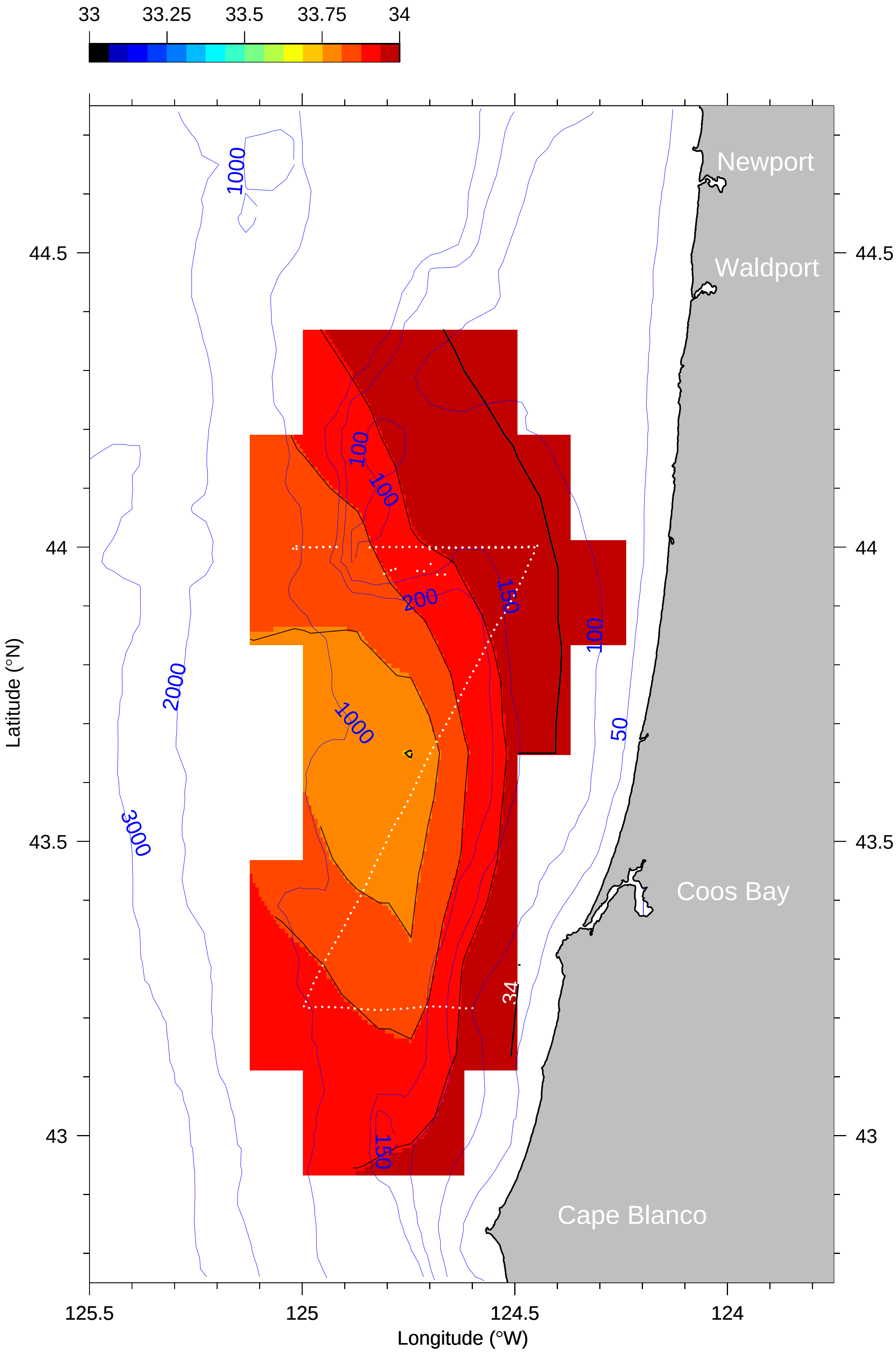
Salinity (PSS) at 75 dbar

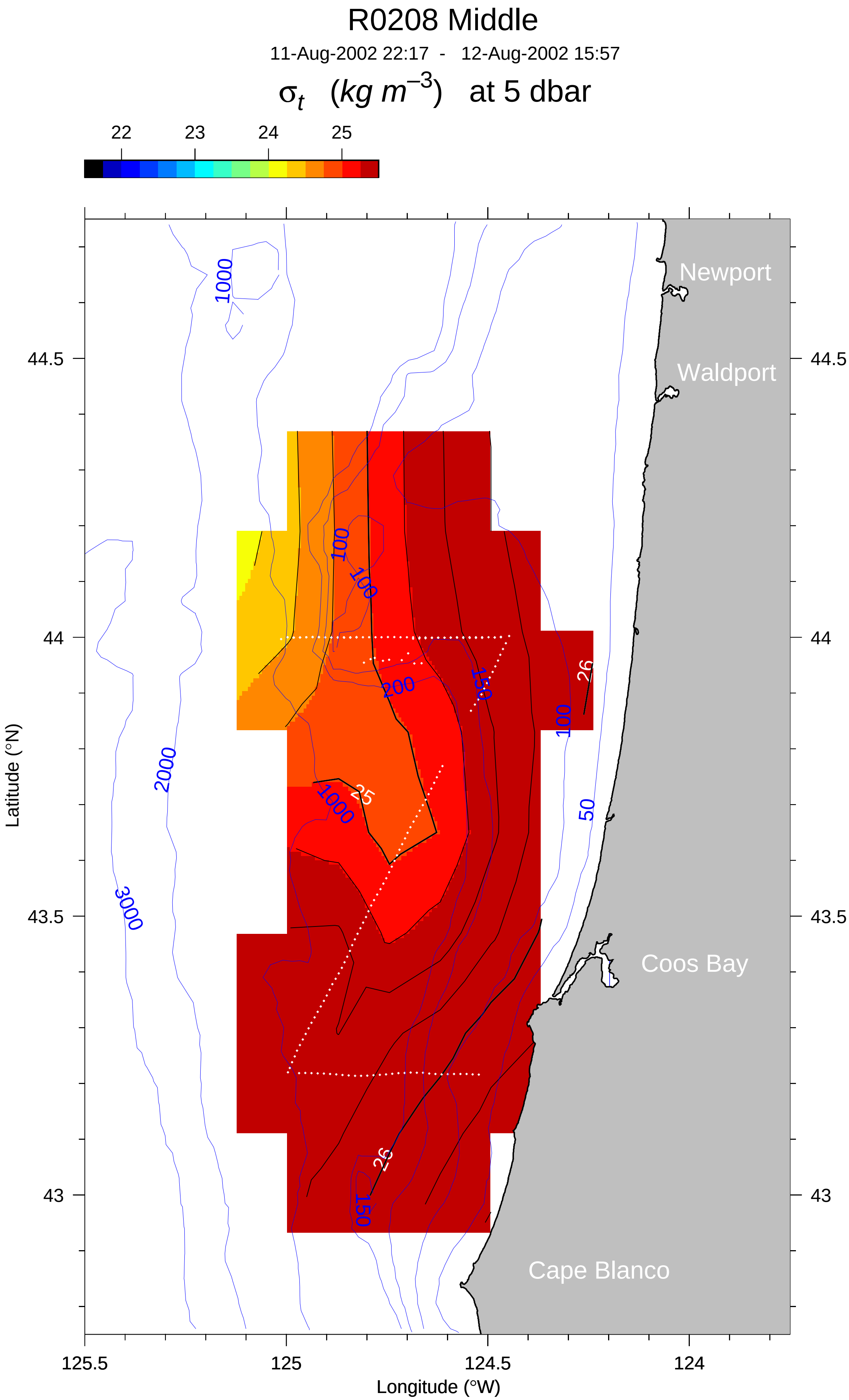


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Salinity (PSS) at 95 dbar

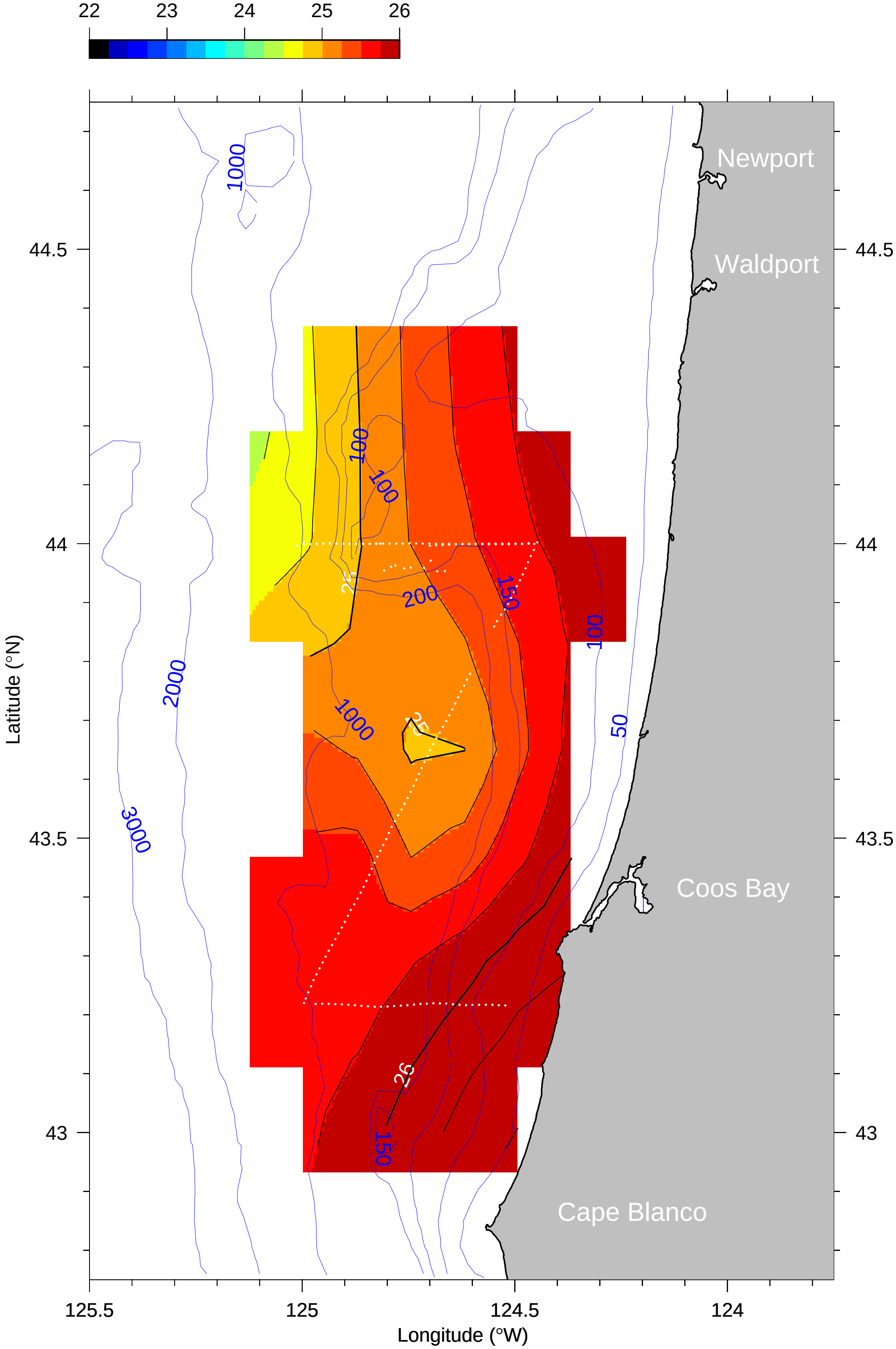


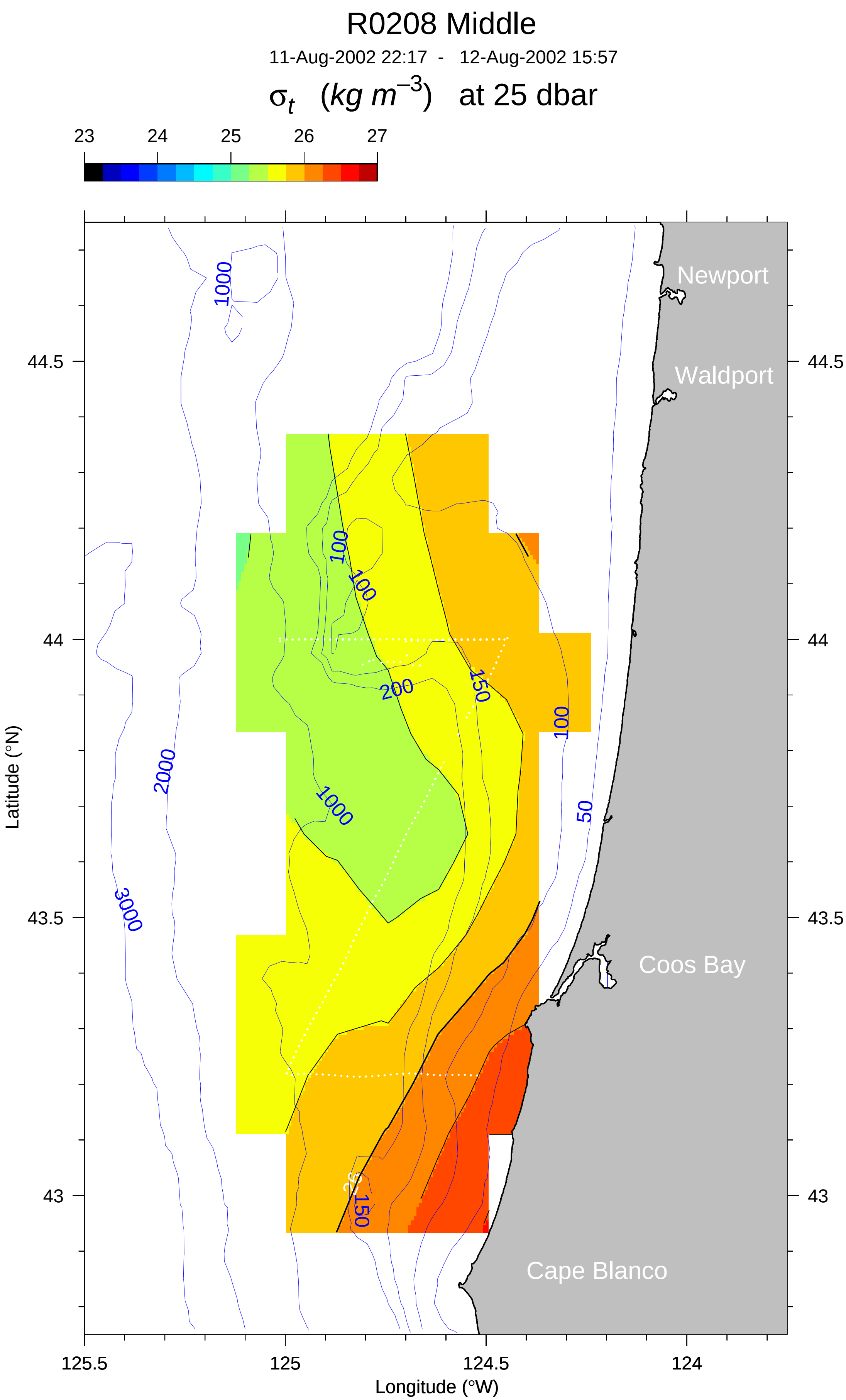

R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
σ_t ($kg\ m^{-3}$) at 5 dbar
22
23
24
25
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
150
200
50
25
26
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

R0208 Middle

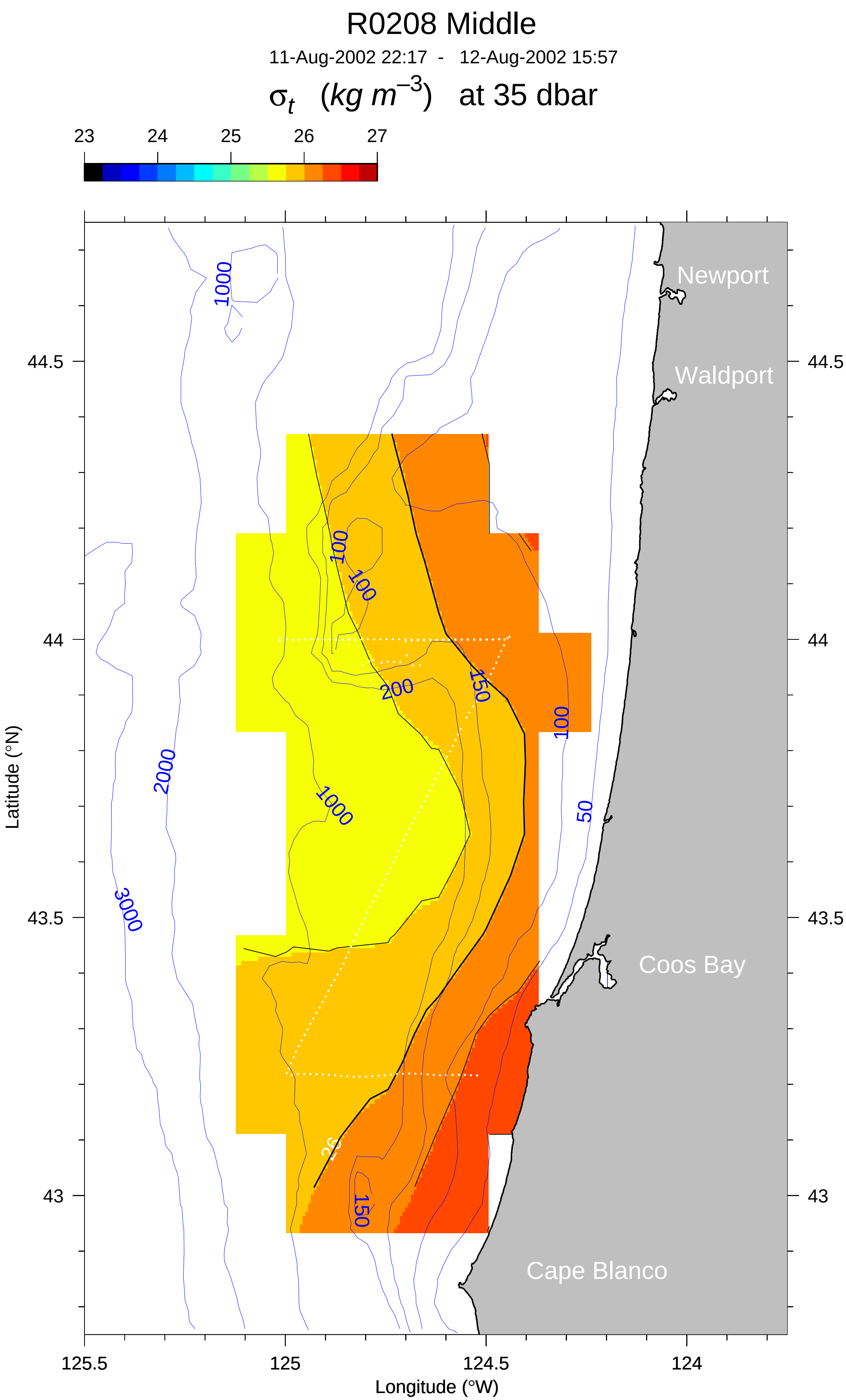
11-Aug-2002 22:17 - 12-Aug-2002 15:57

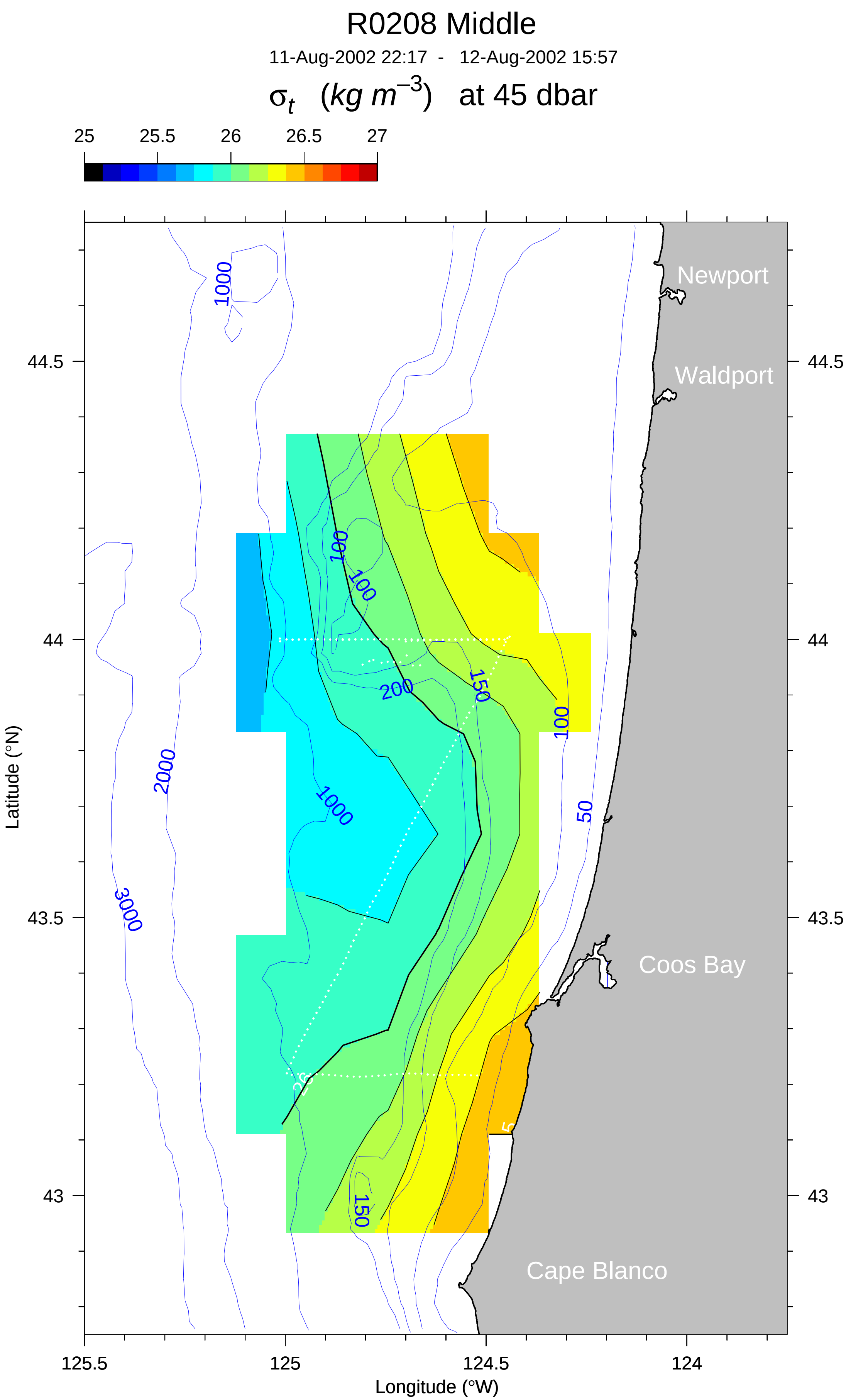
σ_t $(kg\ m^{-3})$ at 15 dbar





R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
σ_t ($kg\ m^{-3}$) at 25 dbar
23
24
25
26
27
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
200
150
50
26
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)


R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
σ_t ($kg\ m^{-3}$) at 35 dbar
23
24
25
26
27
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
200
150
50
26

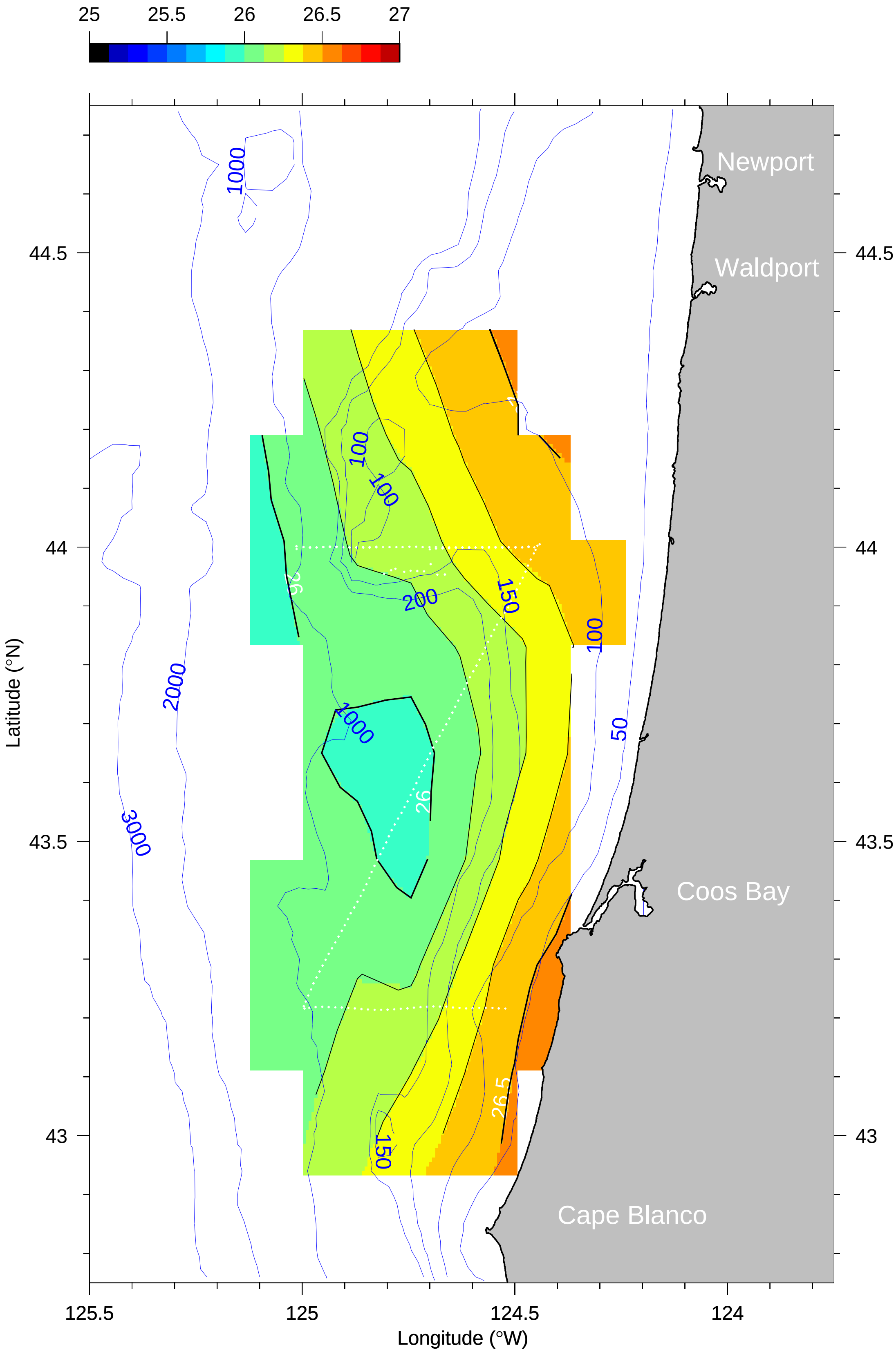


R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
σ_t $(kg\ m^{-3})$ at 45 dbar
25
25.5
26
26.5
27
Newport
Waldport
Coos Bay
Cape Blanco
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
1000
2000
3000
100
150
200
50

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

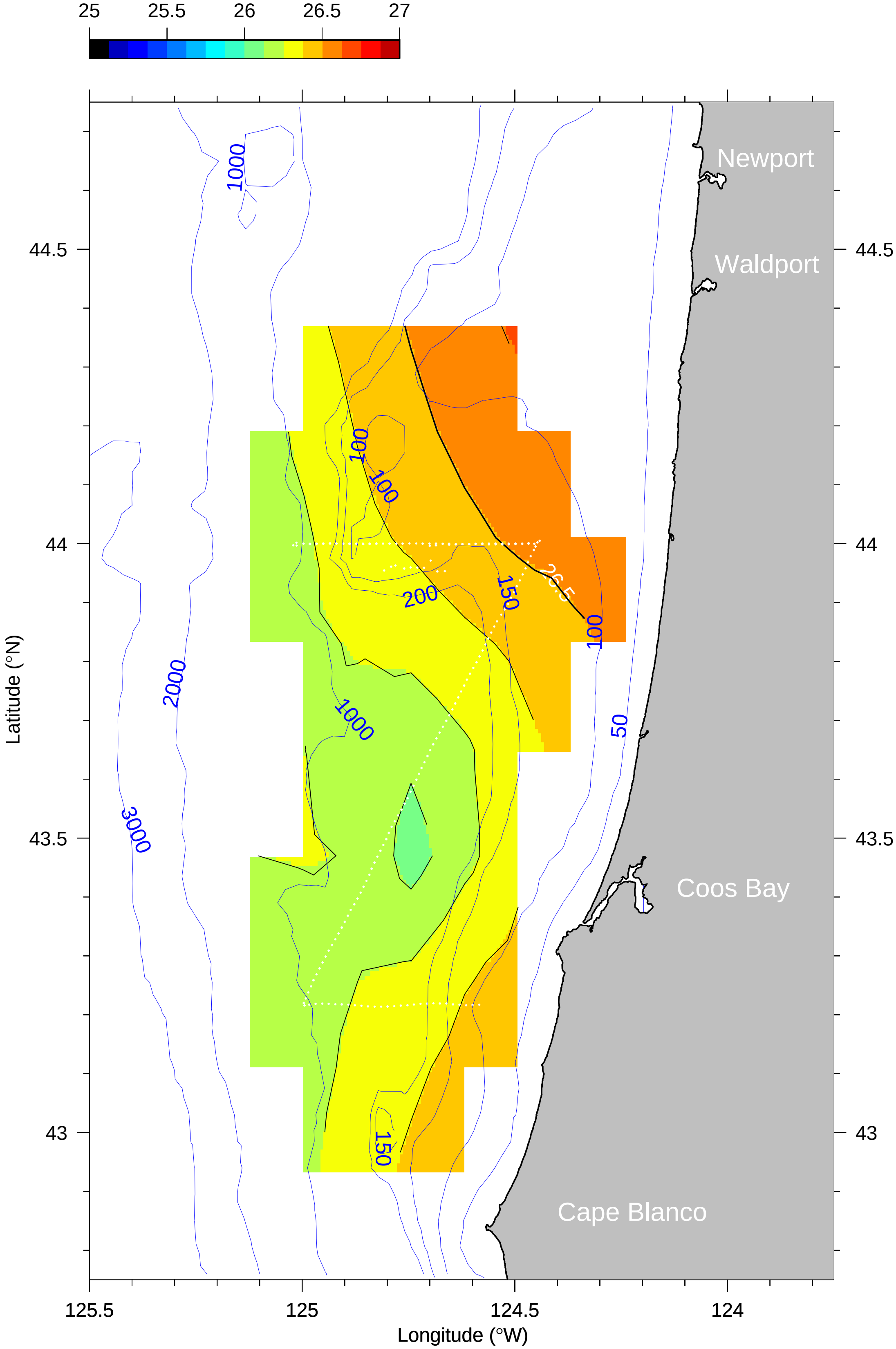
σ_t $(kg\ m^{-3})$ at 55 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

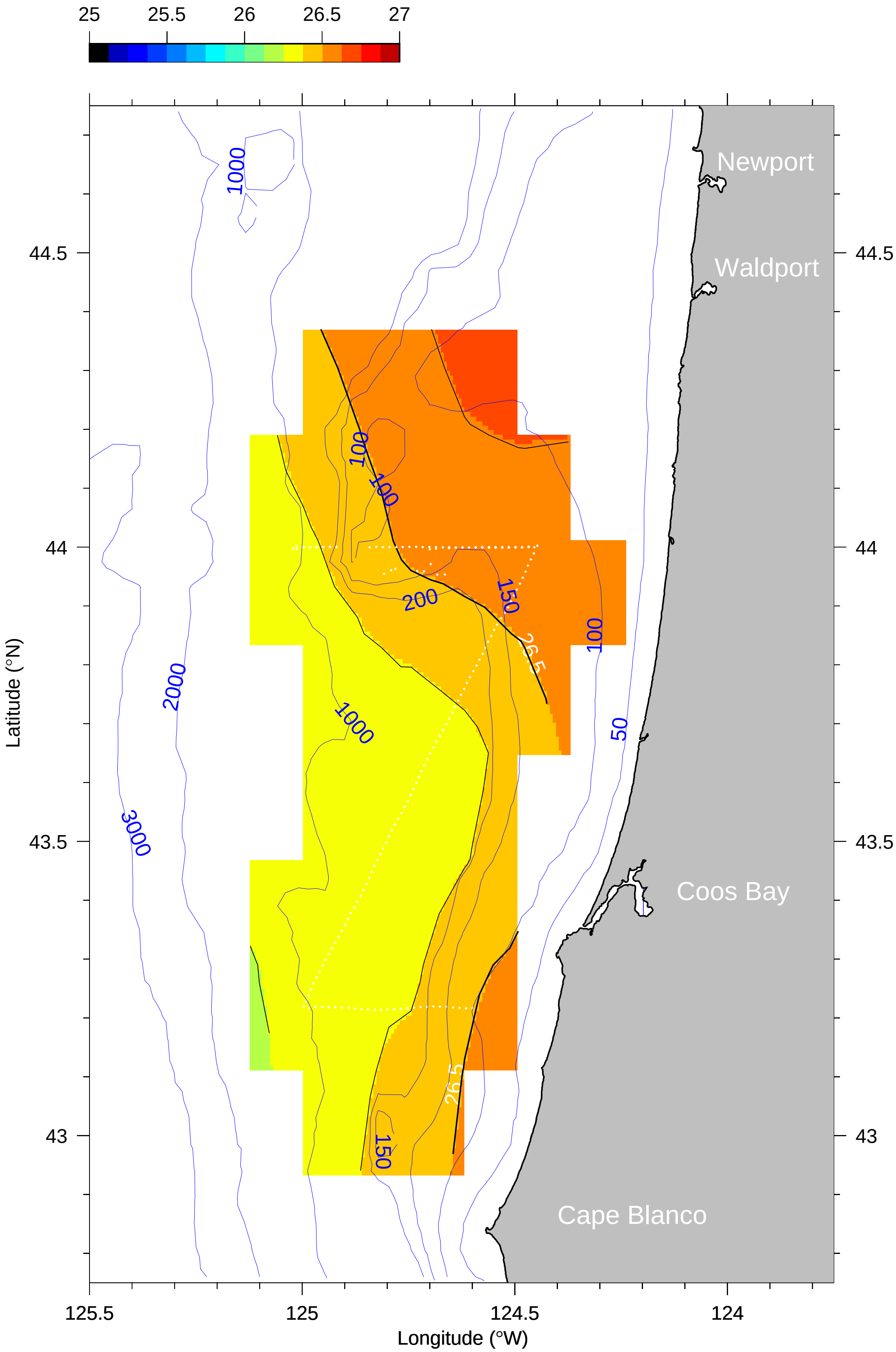
σ_t $(kg\ m^{-3})$ at 75 dbar

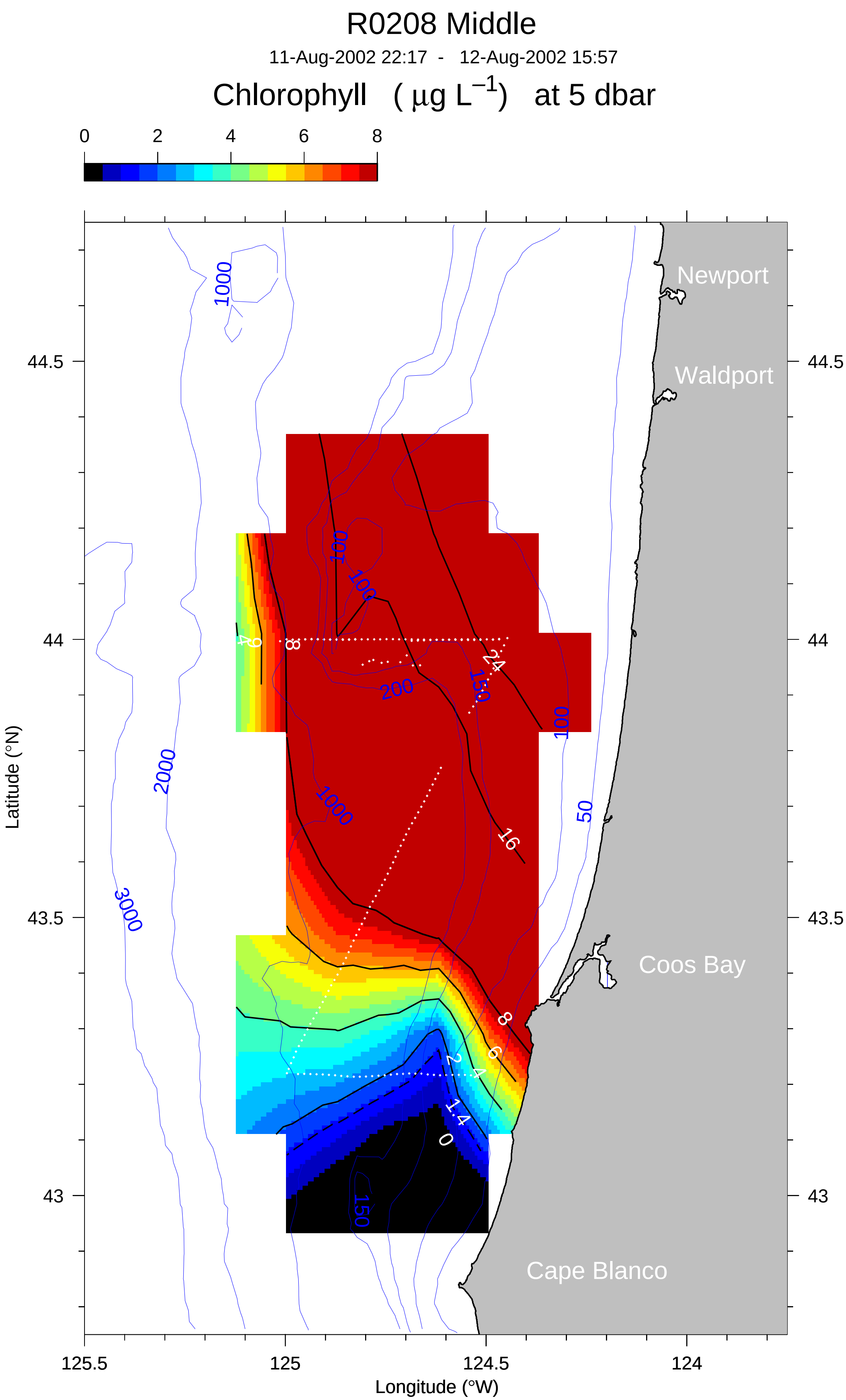


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

σ_t ($kg\ m^{-3}$) at 95 dbar

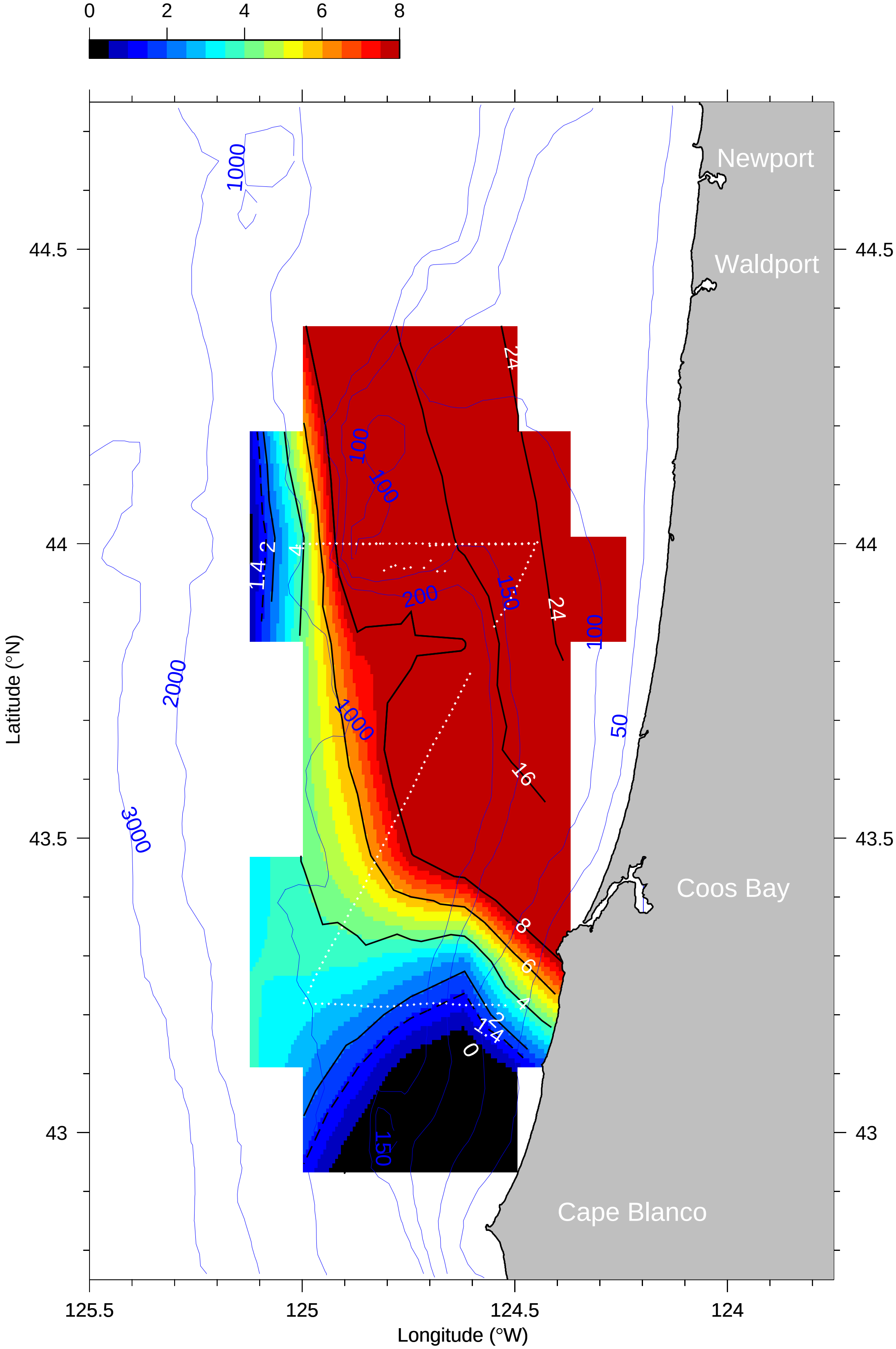


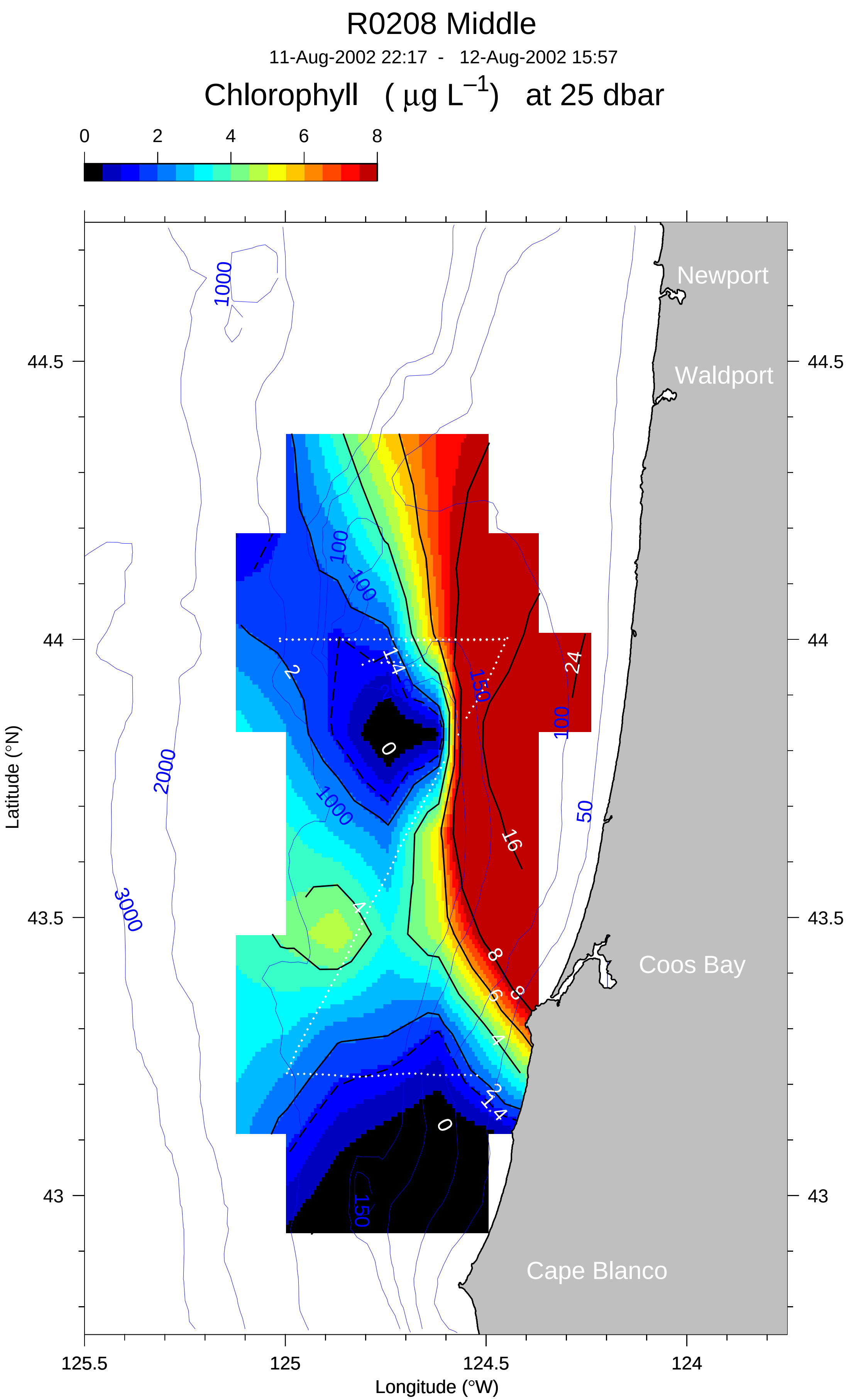

R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Chlorophyll (µg L^{-1}) at 5 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
1000
2000
3000
200
150
100
50
8
6
4
2
1.4
0
16
24

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Chlorophyll (μg L^{-1}) at 15 dbar



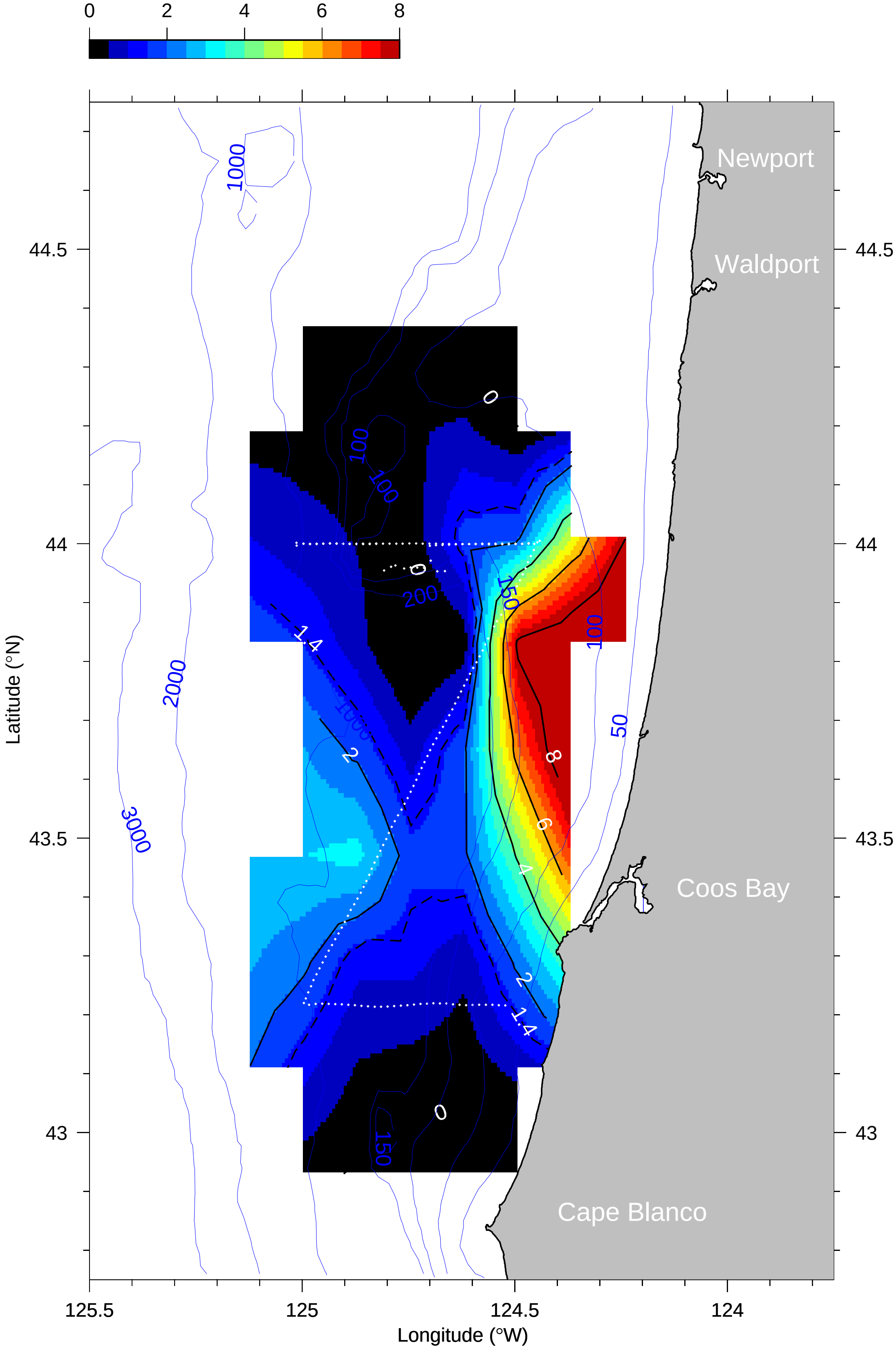


R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Chlorophyll (µg L−1) at 25 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
1000
2000
3000
100
150
50

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

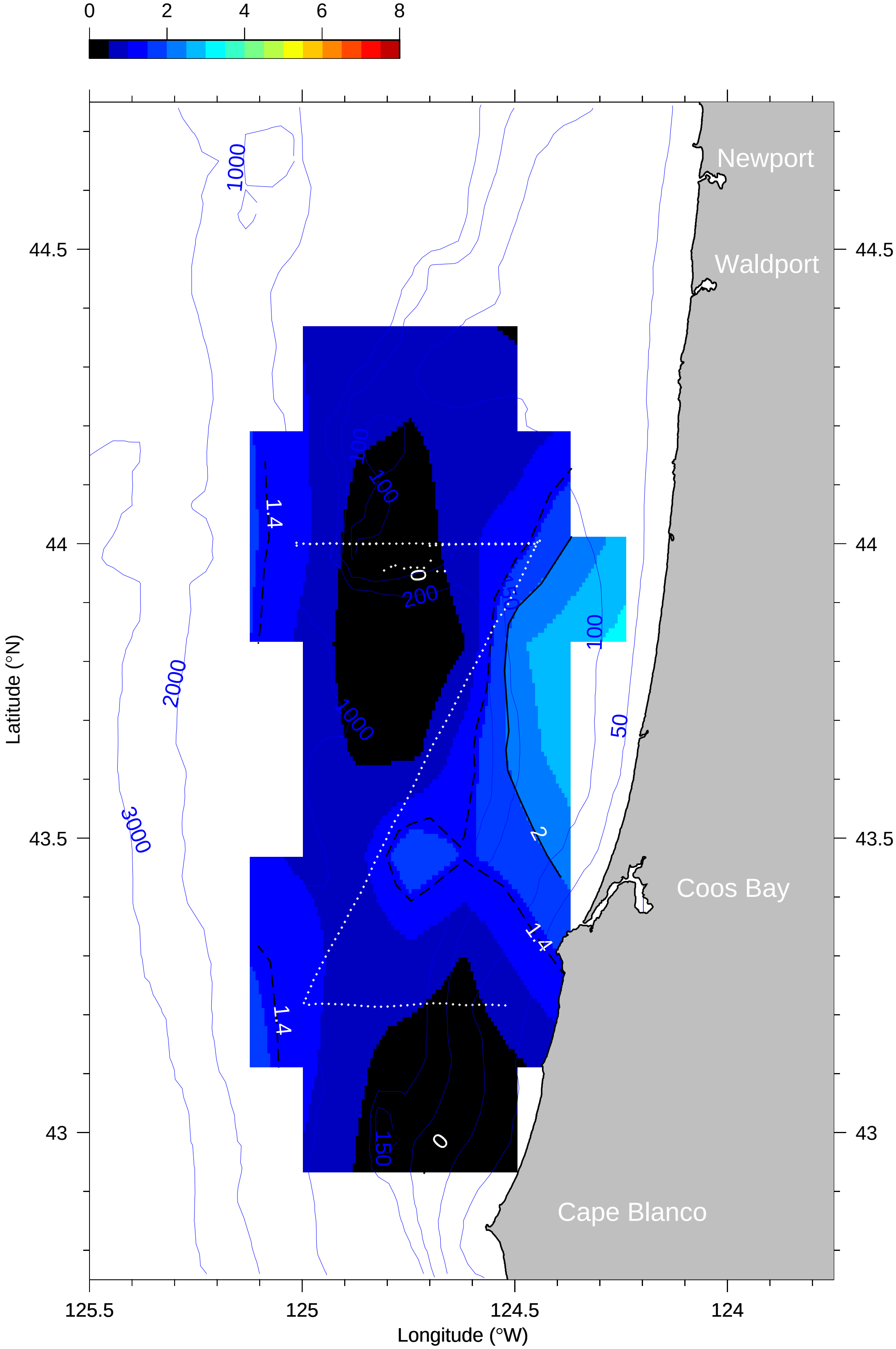
Chlorophyll (μg L^{-1}) at 35 dbar

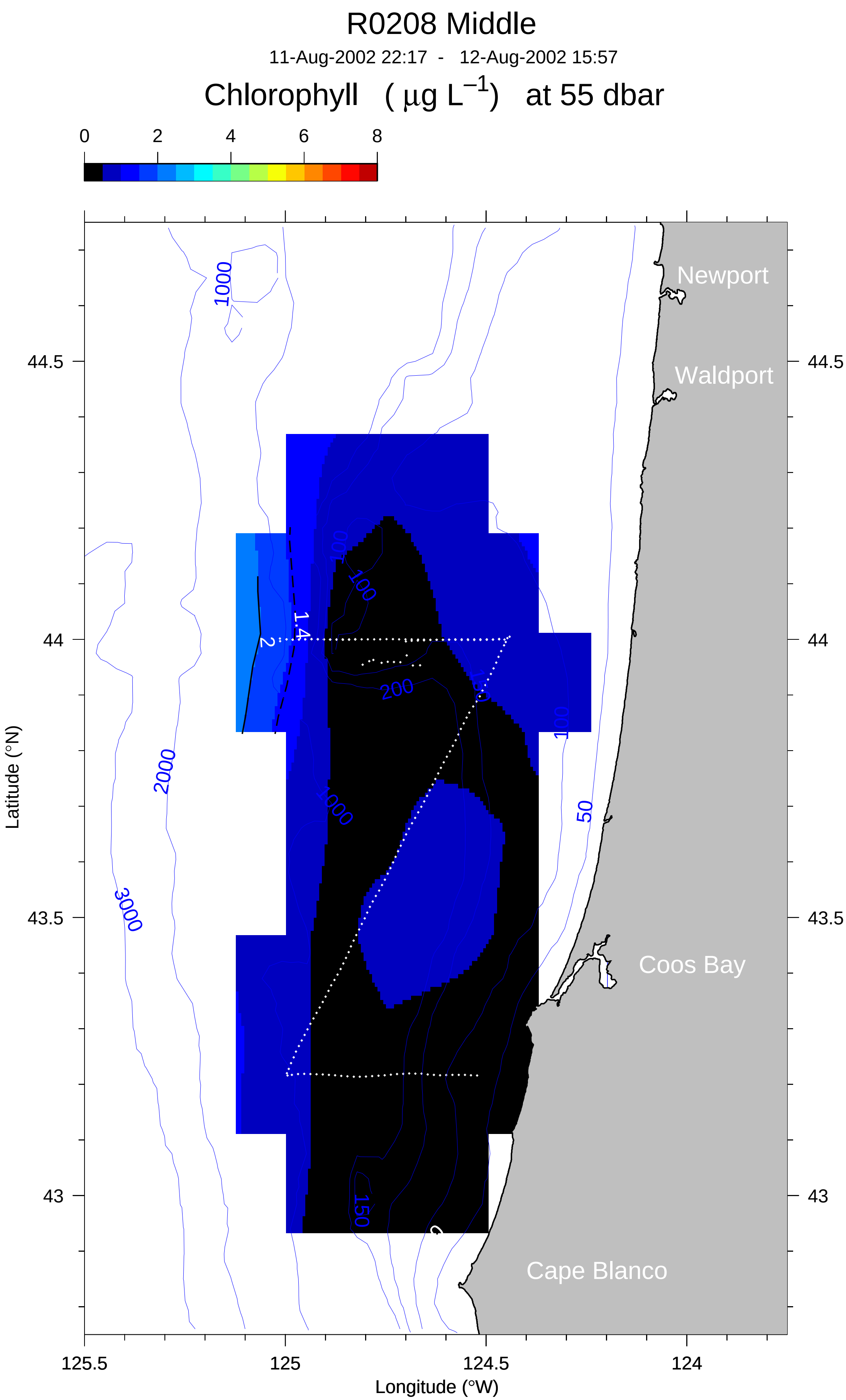


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Chlorophyll (μg L^{-1}) at 45 dbar



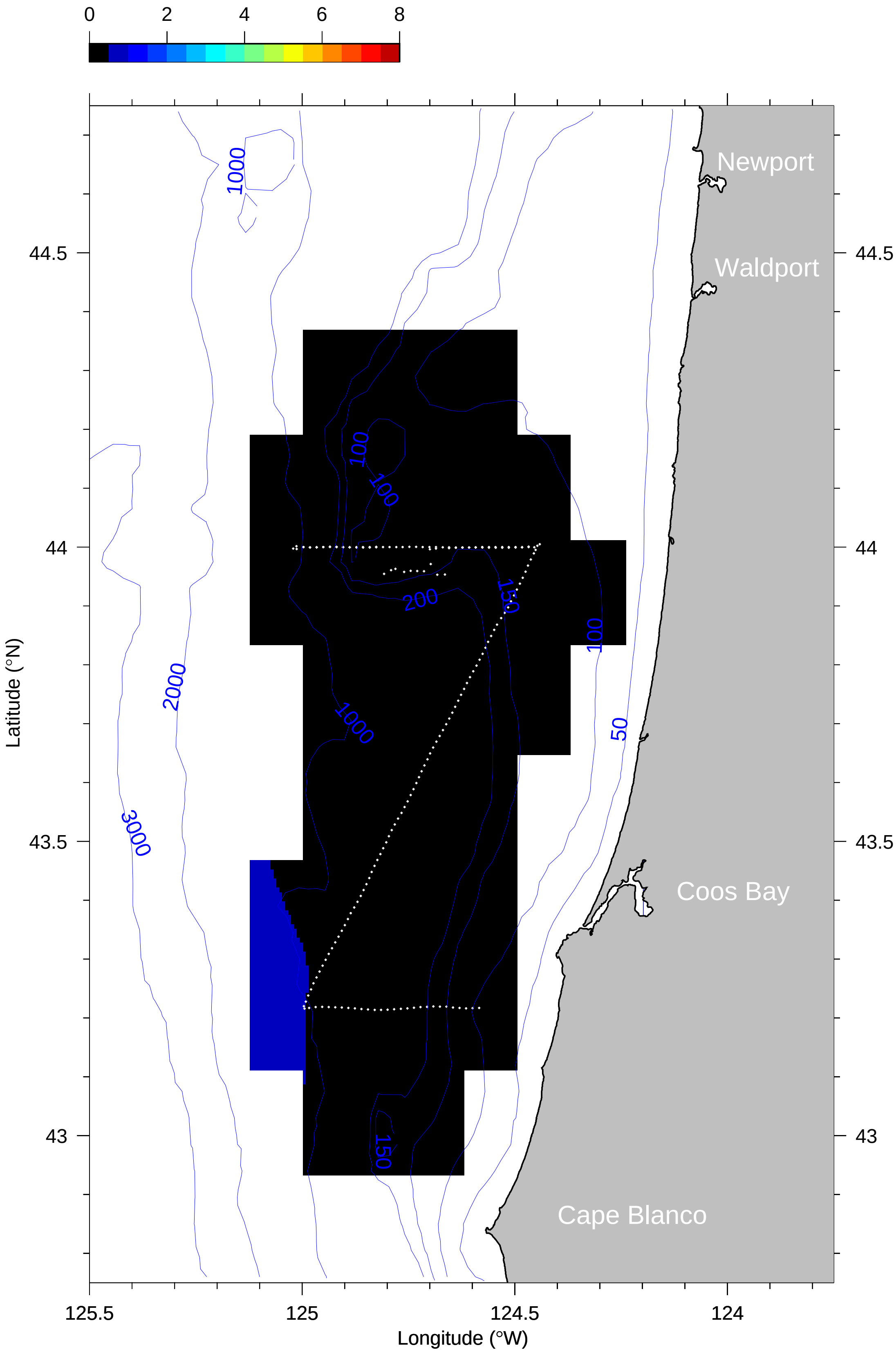


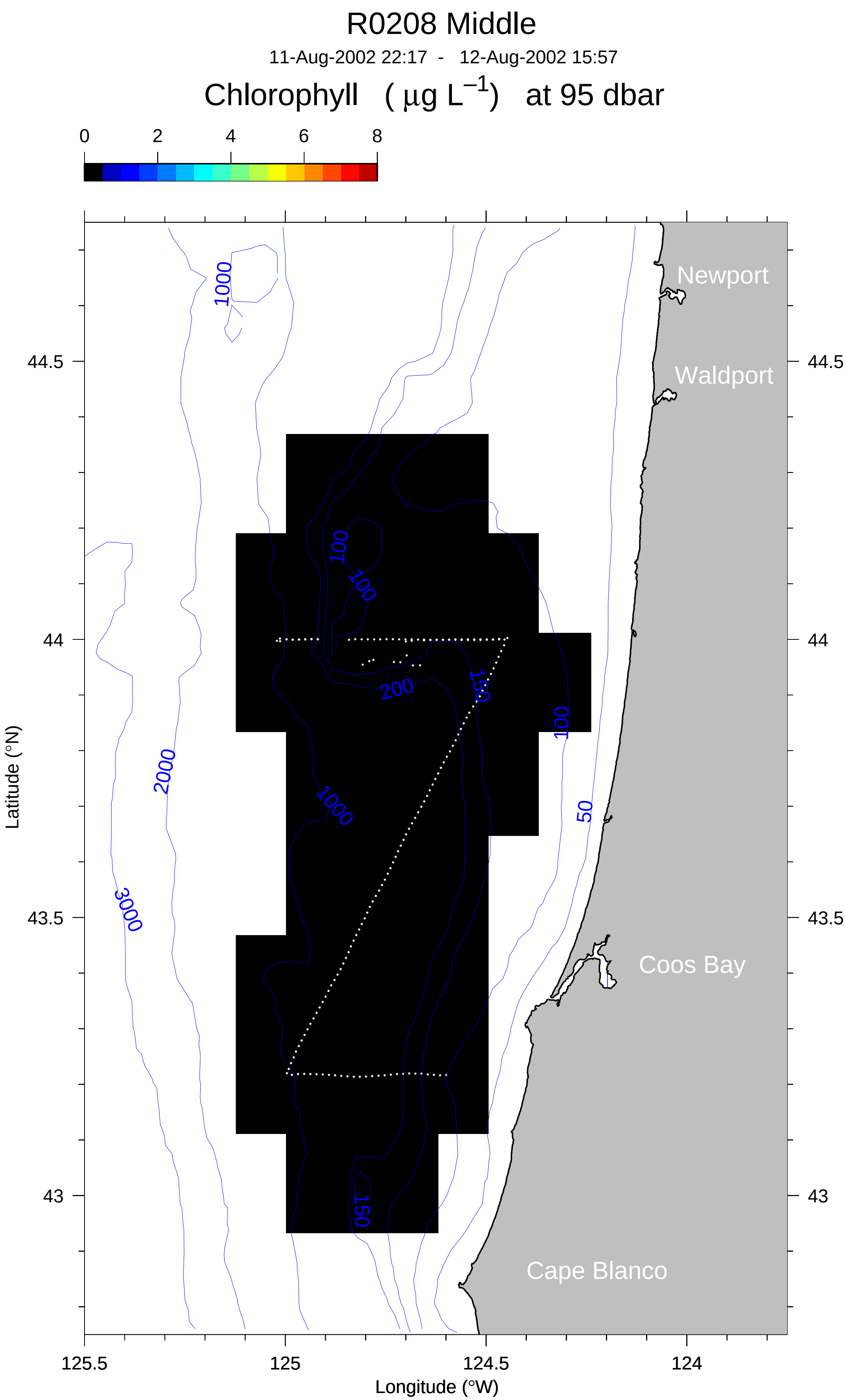
R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Chlorophyll (µg L−1) at 55 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)
1000
2000
3000
200
100
150
50
1.4
2

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

Chlorophyll (µg L^{-1}) at 75 dbar



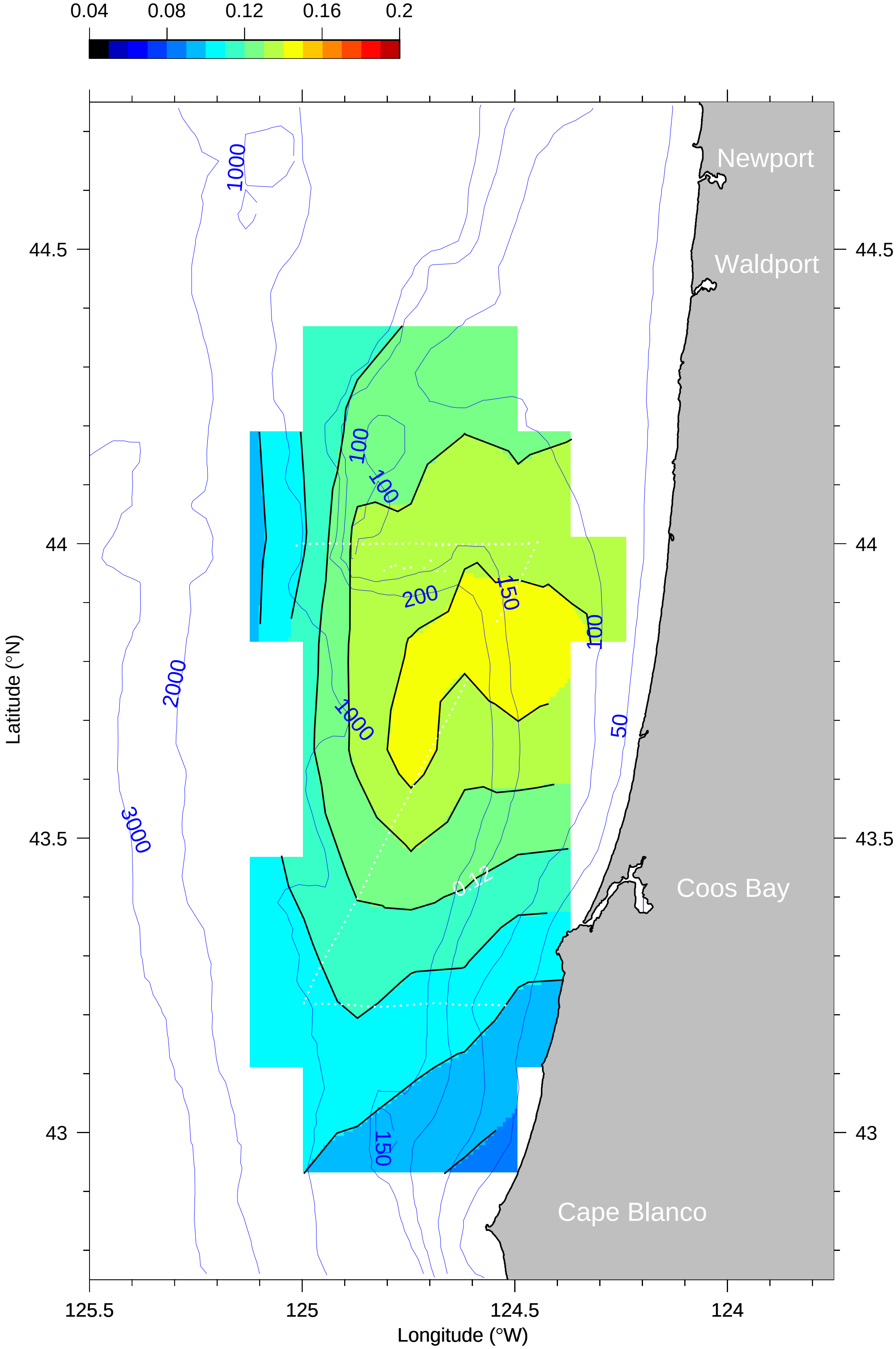


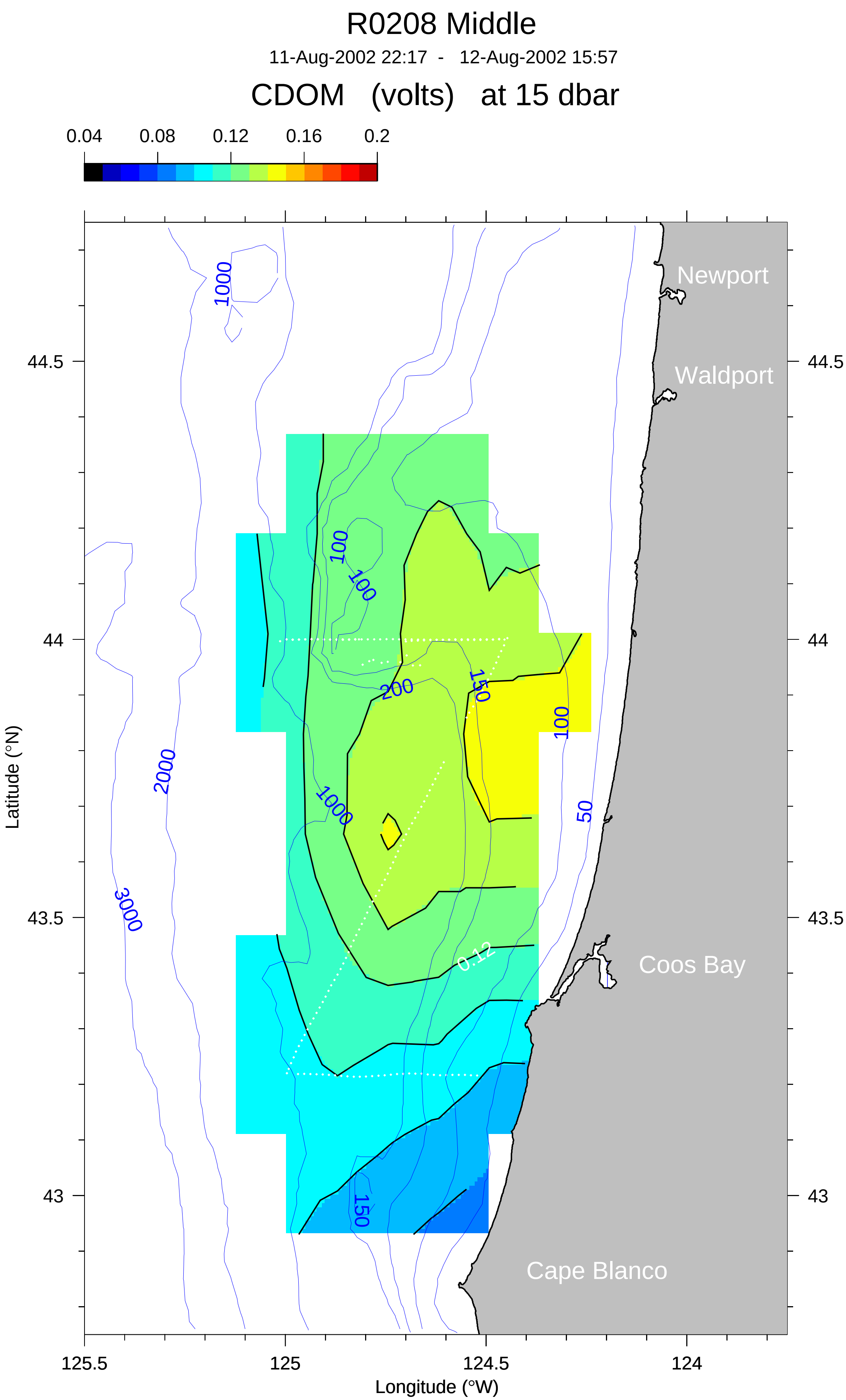
R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
Chlorophyll (µg L^{-1}) at 95 dbar
0
2
4
6
8
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
200
150
50
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

CDOM (volts) at 5 dbar

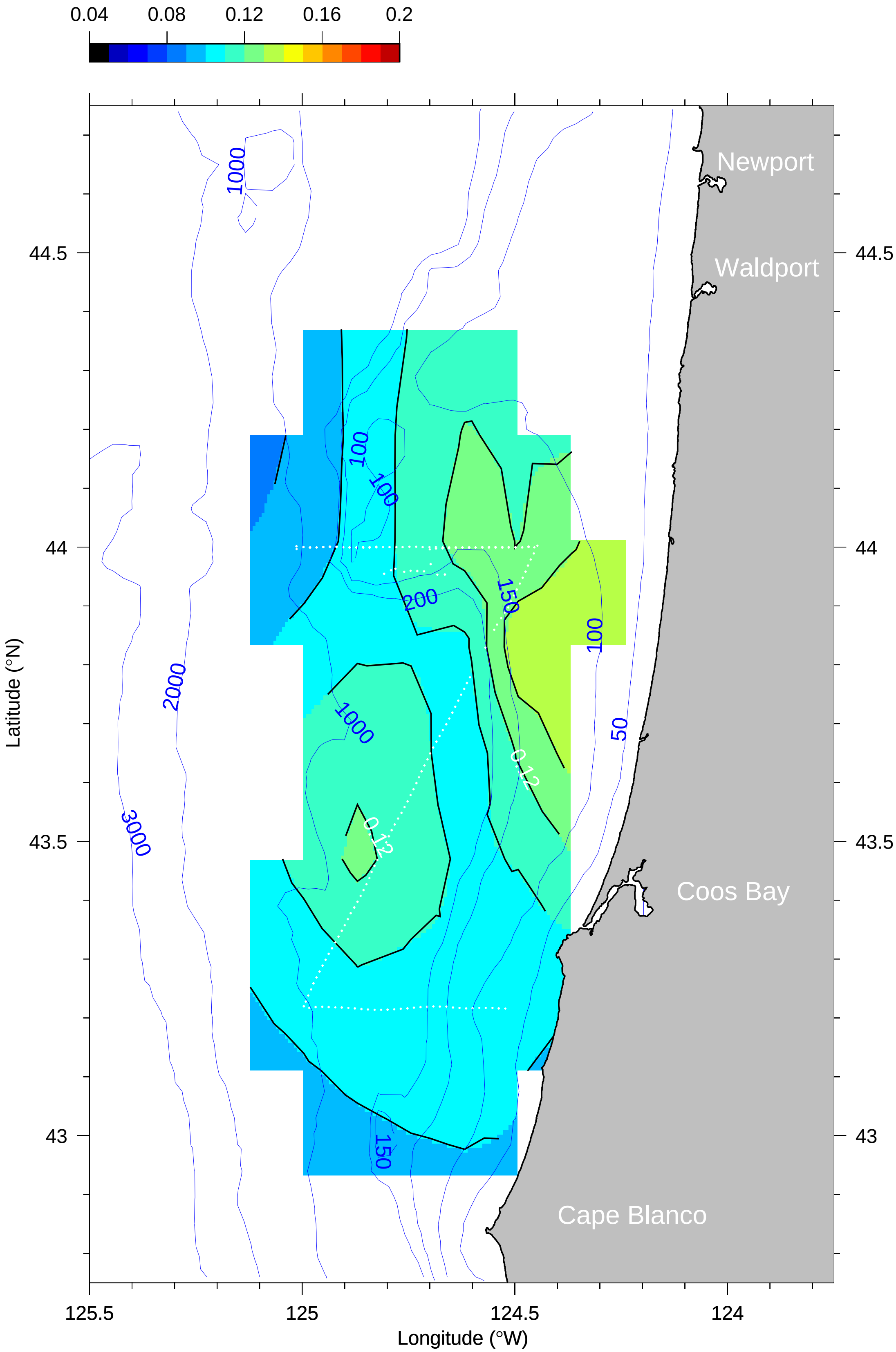



R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
CDOM (volts) at 15 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
150
200
50
0.12
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

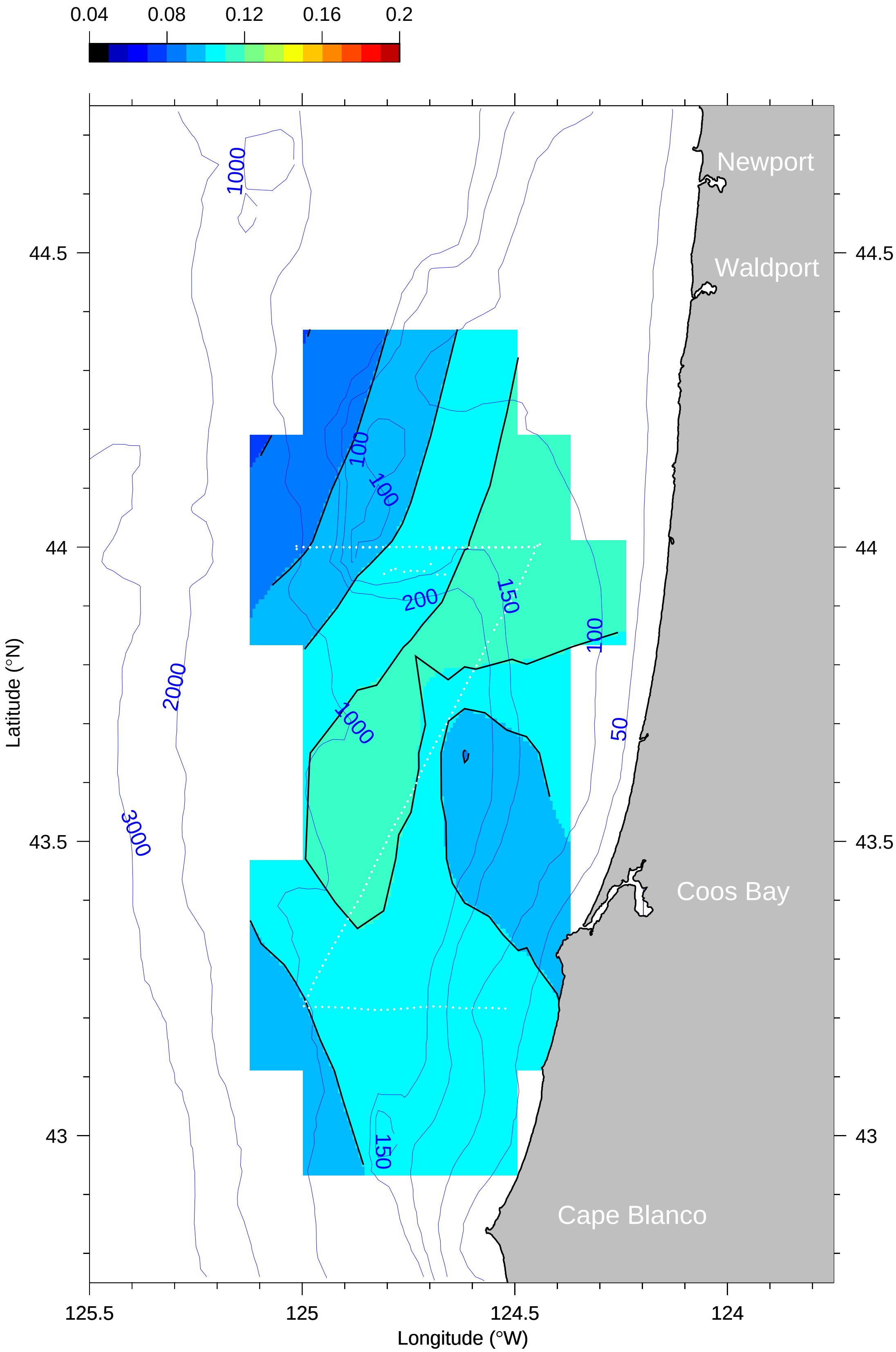
CDOM (volts) at 25 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

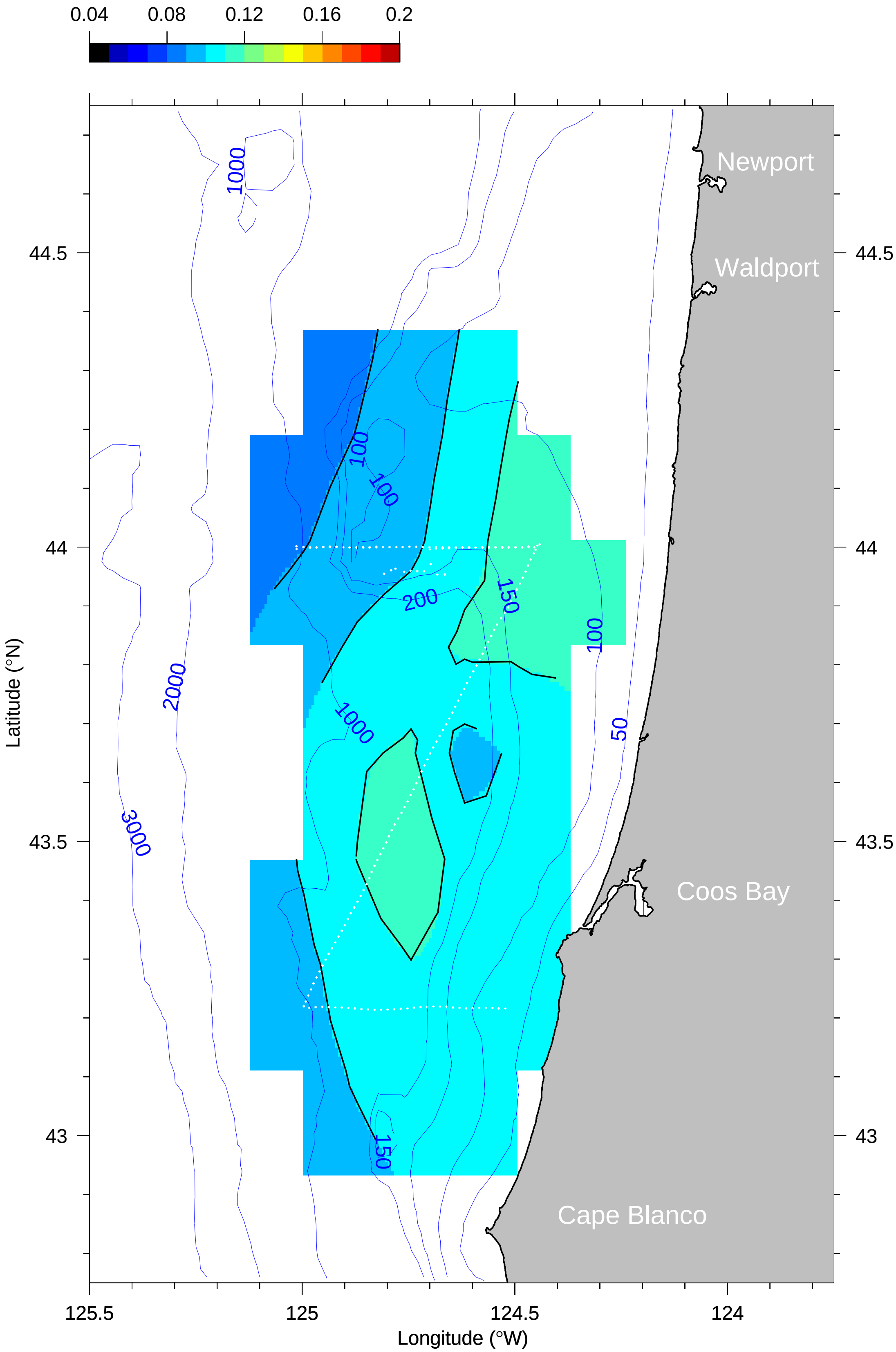
CDOM (volts) at 35 dbar

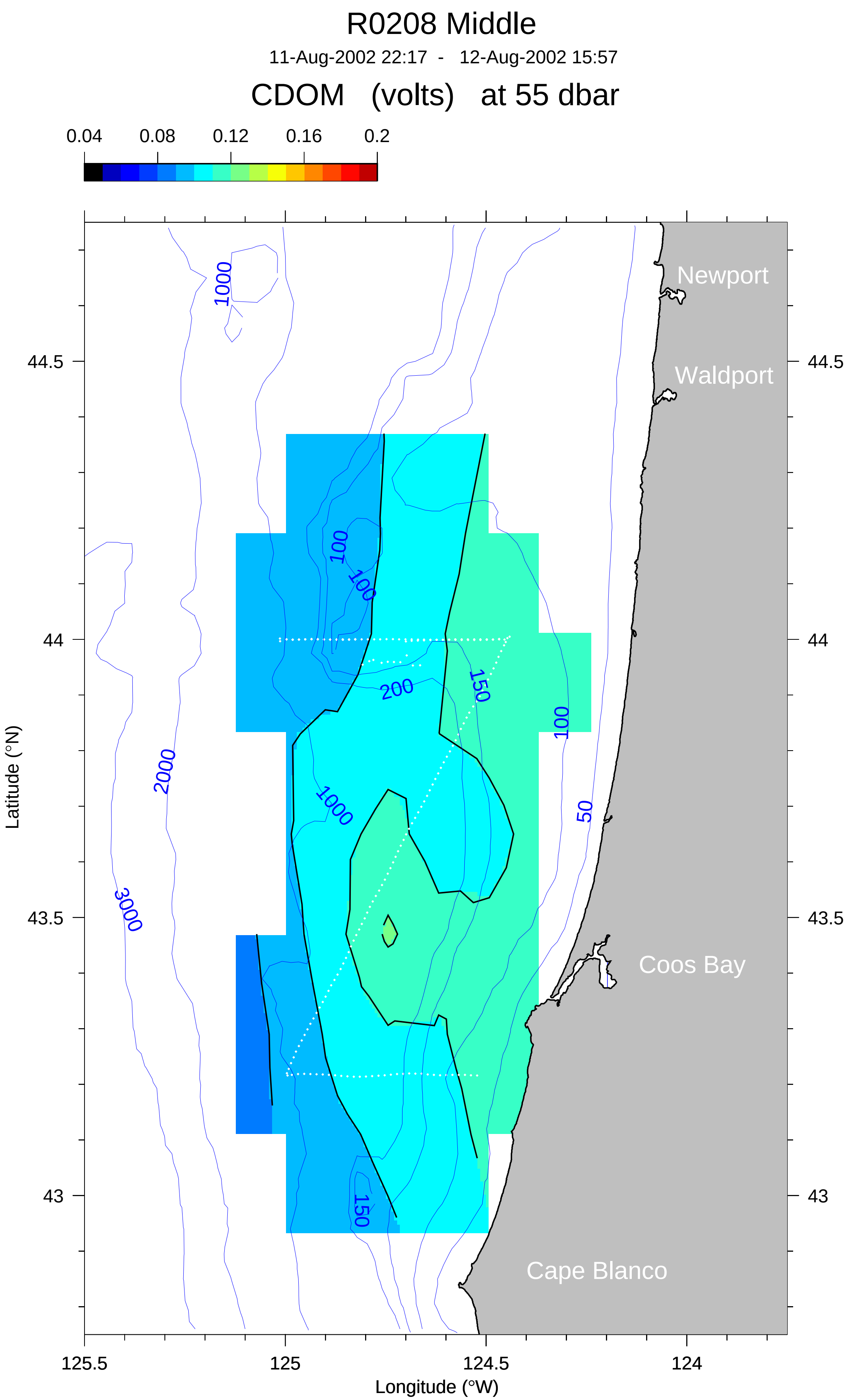


R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

CDOM (volts) at 45 dbar

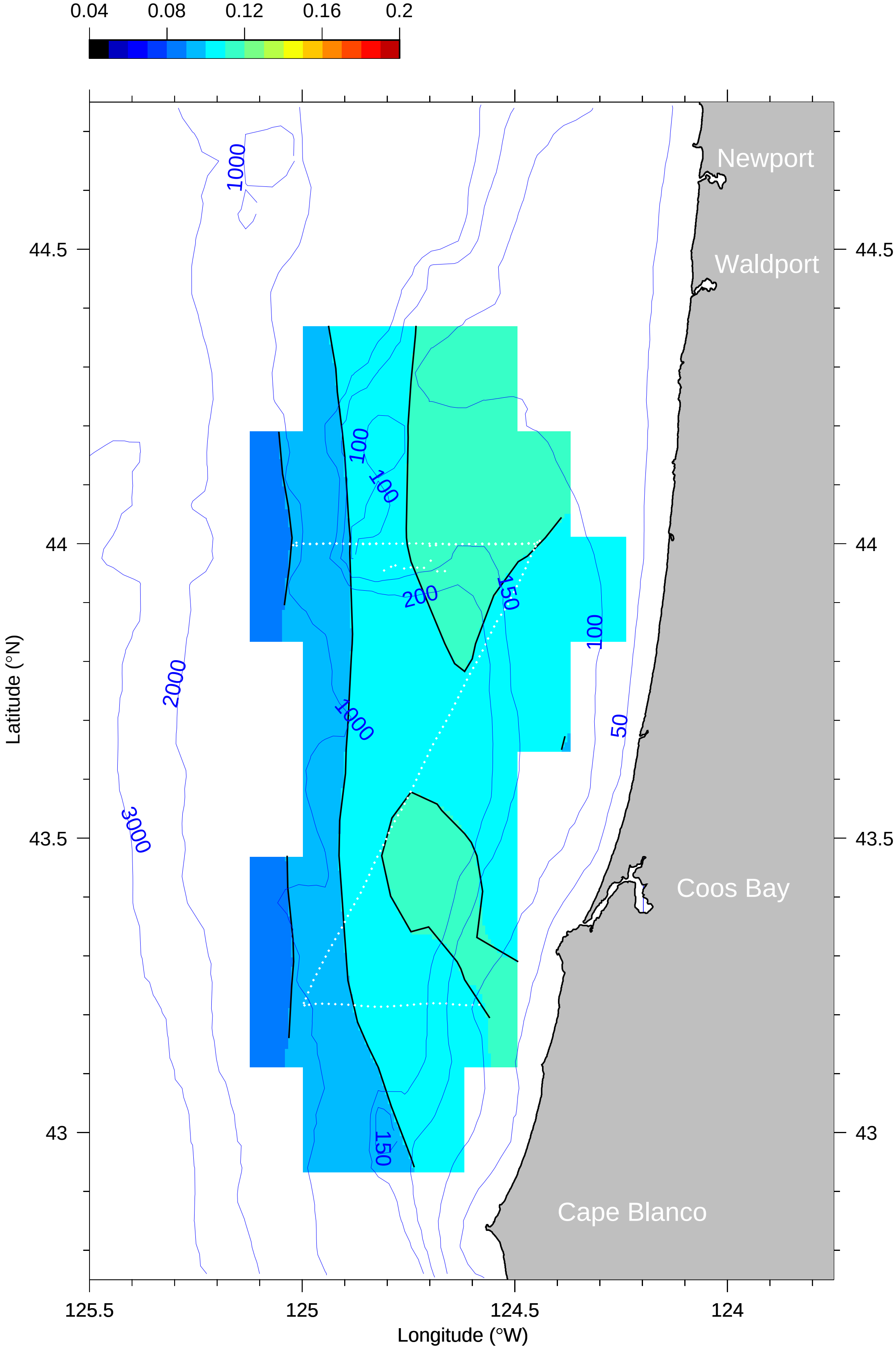



R0208 Middle
11-Aug-2002 22:17 - 12-Aug-2002 15:57
CDOM (volts) at 55 dbar
0.04
0.08
0.12
0.16
0.2
Newport
Waldport
Coos Bay
Cape Blanco
1000
2000
3000
100
200
150
50
44.5
44
43.5
43
125.5
125
124.5
124
Latitude (°N)
Longitude (°W)

R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

CDOM (volts) at 75 dbar



R0208 Middle

11-Aug-2002 22:17 - 12-Aug-2002 15:57

CDOM (volts) at 95 dbar