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Bio-Optical Profile Data Report

Coastal Transition Zone Program

R/V Point Sur

June 15-28, 1987

Curtiss O. Davis
W. Joseph Rhea

December 1, 1990

Prepared for

Office of Naval Research

Through an agreement with

National Aeronautics and
Space Administration

by

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

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ABSTRACT

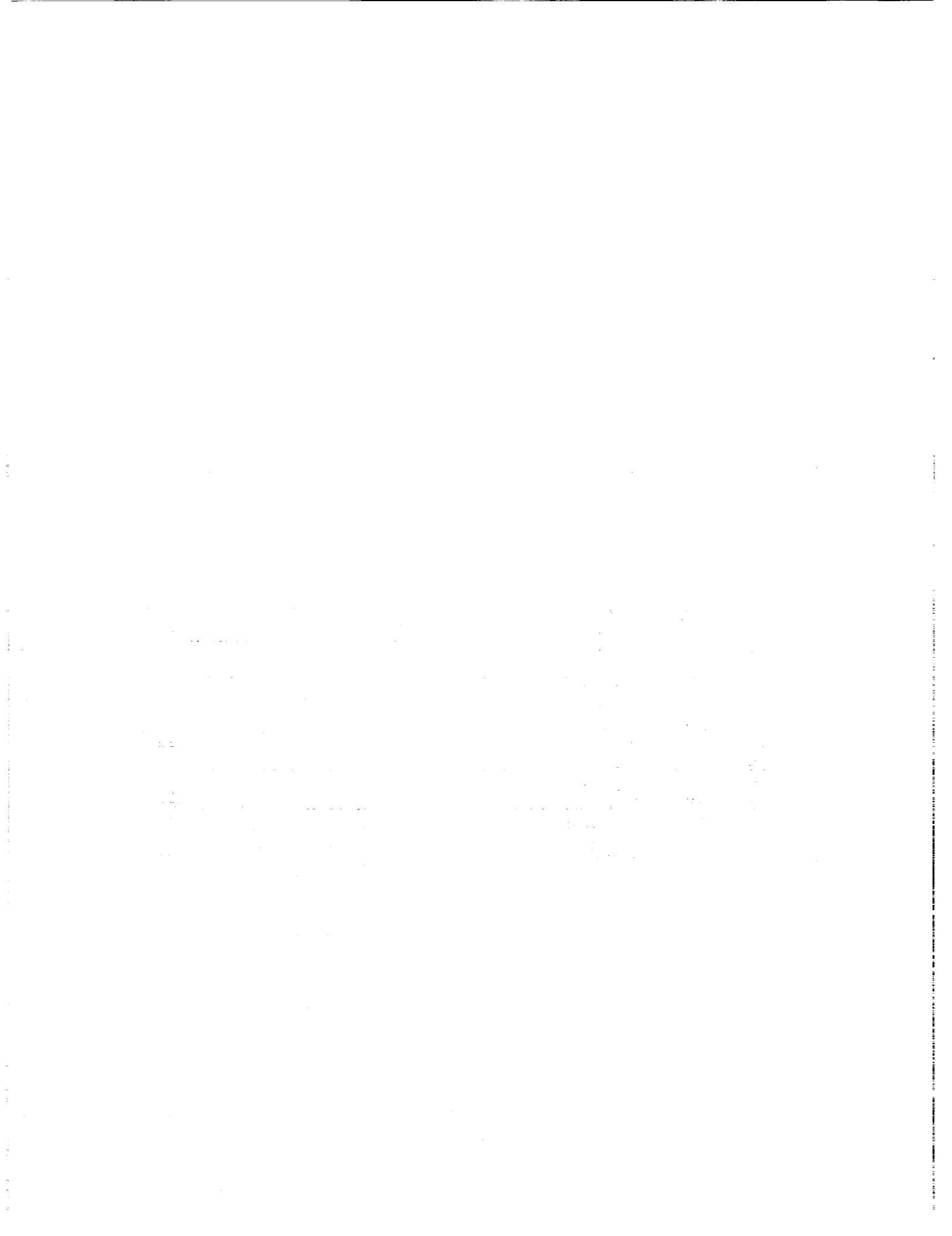
Twenty vertical profiles of the bio-optical properties of the ocean were made during a research cruise on the R/V Point Sur, June 15–28, 1987, as part of the Coastal Transition Zone Program off Point Arena, California. Extracted chlorophyll values were also measured at some stations to provide calibration data for the in situ fluorometer. This report is a summary to provide investigators with an overview of the data collected. The entire data set is available in digital form for interested researchers, and requests for the data should be addressed to W. Joe Rhea, (818) 393-6095.

ACKNOWLEDGMENTS

The assistance of the Captain and crew of the R/V Point Sur and Chief Scientist Steve Ramp is gratefully acknowledged.

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INTRODUCTION

The Coastal Transition Zone (CTZ) Program, sponsored by the Office of Naval Research, is an interdisciplinary study of the physical causes and the physical, biological, and optical characteristics of the filaments of cold, salty water that extend over 300 km off the West Coast of North America. The cruise of the R/V Point Sur, June 15–28, 1987, was designed to study a representative filament off Point Arena, California. Guided by satellite sea-surface temperature maps, two surveys of the filament and adjacent waters were conducted. Additionally, a cluster of drifters was placed in the root of the filament and tracked by satellite for several months. One of the drifters was instrumented with a fluorometer, transmissometer, spectroradiometer, water sampler, and a thermistor chain. At the end of eight days, the instrumented drifter was recovered approximately 300 km to the southwest of the launch site. This report describes bio-optical profile data that were collected at 20 stations representative of the filament, freshly upwelled water near the coast, and the offshore water surrounding the filament.

DATA DESCRIPTION

Optical data were collected with a Bio-Optical Profiling System (BOPS), an updated version of the BOPS originally developed by Smith et al. (1984). The heart of the BOPS was a Biospherical Instruments MER-1048 spectroradiometer, which measures up- and downwelling spectral irradiance and upwelling spectral radiance. The MER-1048 also has sensors for Photosynthetically Available Radiation (PAR), depth, tilt, and roll. In addition, temperature and conductivity were measured with a Sea-Bird CTD, chlorophyll fluorescence was measured with a Sea Tech fluorometer, and beam transmission was measured with a Sea Tech 25-cm transmissometer. The MER-1048 acquired all the data 16 times a second, averaged it to four records a second, and sent it up the cable to a deck box and a Compaq-286 computer, which stored the data on the hard disk. The BOPS data (Table I) were filtered to remove obvious data spikes and a depth aberration, which occurred at 95 m, and then binned into one-meter averages and stored as ASCII comma-separated files.

At selected stations, extracted chlorophyll and phaeopigments were measured on water samples taken with the CTD rosette sampler immediately before or after the optical profile. Water samples (100 ml) were filtered on Whatman GF/F filters. Samples were extracted in 10 ml of acetone in the dark in a freezer for 24 h and then measured in a Turner Designs Model 10-005 Fluorometer calibrated with pure chlorophyll (Sigma Chemical Co.). Samples were remeasured after acidification with one drop of 5% HCl, and chlorophyll and phaeopigments were calculated according to Strickland and Parsons (1972).

INDIVIDUAL STATION DATA PROFILES

For each station (Table II), eight profiles are presented to give a graphical overview of the data (Figures 1–20). Data files are identified by a filename of the format:

Nyymmddc.MER

where N = j for JETZ cruise of the R/V Point Sur, June 15–28, 1987

yy = Year

mm = Month

dd = Day

c = Cast order for each day.
i.e. 'a' = first cast of day
'b' = second cast of day, etc.

Temperature and salinity data were from the Sea-Bird CTD. Salinity was calculated from the temperature and conductivity measurements using the standard equations for practical salinity units (Millero et al., 1980). Occasional spikes in salinity were observed at the surface and at the thermocline. This is an artifact caused by the fact that the response time of the conductivity sensor does not exactly match that of the temperature sensor.

Data from the Sea Tech fluorometer are presented in fluorescence units. The fluorometer data were calibrated using extracted chlorophyll and phaeopigment values from water samples taken immediately before or after a number of optical profiles (Table III). Average chlorophyll plus phaeopigment values for the entire cruise give the following equation for calibrating the Sea Tech fluorometer data: chl + phaeo = 0.236 + 0.127 fluor, where $r^2 = 0.77$ and $n = 27$.

Beam transmissometer (25-cm path length, 660-nm wavelength) data were recorded in percent transmission (%T; value in pure water = 91.3%). The attenuation of a beam of light is defined by Jerlov (1976):

$$c = a + b$$

and

$$T = e^{-cr}$$

where

c is the beam attenuation coefficient in m^{-1}
a is the absorption coefficient
b is the total scattering coefficient
T is the fraction of light transmitted over path length r.

Then, for this data set, c can be calculated from the following equation ($r = 0.25$ m):

$$c = -4 \ln(\%T/100)$$

The radiance, irradiance, and PAR data are presented in calibrated units based on a laboratory calibration conducted by Biospherical Instruments on June 11, 1987. A second calibration after the cruise showed no significant deviation from these values. The spectral light data are presented as a plot of spectra near the surface (dashed line) and then at every five meters (5 m, 10 m, 15 m, etc.). Typically, the surface reading is for 2 m; however, during rough weather, the first usable readings are from greater depth, as indicated on the figures. This is calibrated radiance data, but no corrections for ship shadow or other artifacts have been made to the data. We have developed routines for correcting such artifacts, calculating K, etc., following the guidelines of Smith and Baker (1984, 1986) and Gordon (1985), and the reader is referred to those references for a discussion of these problems.

The data are available in digital format for researchers who wish to work with the actual data. Individuals who are interested in working with the data should request it in digital form from Joe Rhea ((818) 393-6095). The data can be provided in a number of formats compatible with most standard computing environments.

REFERENCES

- Gordon, H. R., "Ship Perturbation of Irradiance Measurements at Sea. 1: Monte Carlo Simulations," *Applied Optics*, 24, 4172-4182, 1985.
- Jerlov, N. G., *Marine Optics*, Elsevier, New York, 1976.
- Millero, F., C.-T. Chien, A. Bradshaw, and K. Schleicher, "A New High Pressure Equation of State for Seawater," *Deep-Sea Research*, 27a, 255-264, 1980.
- Smith, R. C., and K. S. Baker, "The Analysis of Ocean Optical Data," *Proceedings of the SPIE, Ocean Optics VII*, 489, 119-126, 1984.
- Smith, R. C., and K. S. Baker, "Analysis of Ocean Optical Data II," *Proceedings of the SPIE, Ocean Optics VIII*, 637, 95-107, 1986.
- Smith, R. C., C. R. Booth, and J. L. Star, "Oceanographic Bio-optical Profiling System," *Applied Optics*, 23, 2791-2797, 1984.
- Strickland, J. D. H., and T. R. Parsons, *A Practical Handbook of Seawater Analysis*, Fish. Res. Board Canada, Bulletin 167, 1972.

TABLE I.

Data Channels

0. Number of data points averaged into bin
1. 410-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
2. 441-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
3. 488-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
4. 520-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
5. 550-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
6. 560-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
7. 589-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
8. 633-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
9. 656-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
10. 671-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
11. 683-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
12. 694-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
13. 710-nm Downwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
14. Depth of averaged bin (m)
15. Tilt (angles in degrees (-45 to +45))
16. Roll (angles in degrees (-45 to +45))
17. 410-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
18. 441-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
19. 488-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
20. 520-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
21. 550-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
22. 633-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
23. 656-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
24. 683-nm Radiance ($\mu\text{W}/\text{cm}^2/\text{nm}/\text{sr}$)
25. 410-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
26. 441-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
27. 488-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
28. 520-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
29. 550-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
30. 589-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
31. 671-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
32. 694-nm Upwelling Irradiance ($\mu\text{W}/\text{cm}^2/\text{nm}$)
33. Transmissometer - 25 cm (% transmission)
34. Fluorometer (fluorescence units)
35. PAR (10^{17} quanta/cm²/s)
36. Temperature (deg C)
37. Conductivity (mmho/cm)
38. Salinity (PSU)
39. Density (g/cm³)
41. 520-nm Surface Irradiance (ship mounted)
40. 410-nm Surface Irradiance (ship mounted)
42. 589-nm Surface Irradiance (ship mounted)
43. 683-nm Surface Irradiance (ship mounted)

TABLE II.

1987 R/V Point Sur CTZ Cruise--Station Summary

FILENAME yymmdd	Sta (Cast)	Time (Ship)	Latitude Deg Min	Longitude Deg Min	Comments
j870616a	004	0736	N38 53.4	W123 50.69	
j870616b	006	1010	N39 06.7	W123 51.82	
j870616c	011	1550	N39 13.2	W124 19.03	
j870616d	012	1702	N39 07.3	W124 12.42	
j870617a	CD	1150	N38 33.9	W124 02.91	Drifter launch
j870617b	D5	1516	N38 34.8	W123 56.45	AOCI overflight
j870618a	031	1158	N39 08.3	W125 07.59	
j870619a	046	1030	N37 46.9	W125 22.04	Blue water station
j870619b	051	1750	N38 35.1	W125 35.08	Evening/overcast
j870620b	055	1120	N38 31.3	W123 20.67	Upwelling center/clear
j870620c	056	1340	N38 31.3	W123 35.68	Clear/calm
j870620d	059	1830	N39 06.8	W123 51.83	Overcast/calm
j870621a	070	1135	N38 11.4	W123 46.38	
j870621b	073	1600	N38 32.2	W124 00.00	
j870625a	079	1122	N37 43.3	W124 37.01	Drifter pickup
j870626a	090	0915	N38 26.8	W124 17.16	Fog/calm
j870626b	905	1050	N38 23.9	W124 15.13	Fog/calm
j870626c	091	1228	N38 20.2	W124 12.64	Bad wire angle
j870626d	091	1240	N38 20.2	W124 12.64	Recast/overcast
j870626e	092	1430	N38 12.4	W124 09.35	

TABLE III.

Extracted Chlorophyll and Phaeopigment Values
(Note: 3-m Depth = sample from underway system)

Date	Sta	Depth (m)	mg/l			Comments	
			Chl.	Phaeo- pigments	Total		
6/16/87	6	10	8.23	1.06	9.29		
		20	8.23	1.35	9.58		
		40	2.95	0.59	3.54		
		60	0.22	0.32	0.54		
		80	0.17	0.36	0.53		
		100	0.12	0.35	0.47		
6/17	CD	3	0.92	0.35	1.27	Drifter launch AOCI overflight	
	D5	3	4.29	1.03	5.32		
6/18	31	3	0.15	0.038	0.188		
	38	20	0.86	0.22	1.08		
6/19	46	20	0.071	0.035	0.106		
		51	20	0.209	0.115	0.324	
			40	0.356	0.218	0.574	
			60	0.160	0.120	0.28	
			80	0.086	0.061	0.147	
			100	0.037	0.081	0.118	
6/20	55	20	1.04	0.39	1.43		
		56	20	2.70	0.39	3.09	
		58	3	0.71	0.098	0.808	
6/21	70	3	0.29	0.093	0.383		
		73	20	2.15	1.09	3.24	
			40	1.89	1.17	3.06	
			60	0.43	0.47	0.90	
			80	0.38	0.39	0.77	
			100	0.26	0.45	0.71	
6/25	79 pre 83 83	10	0.288	0.14	0.428	Drifter pickup	
		20	1.50	0.56	2.06		
		20	1.10	0.34	1.44		
		40	1.63	0.50	2.13		
		60	2.22	0.72	2.94		
		80	1.83	0.97	2.80		
6/26	90 905 91 92	100	0.23	0.31	0.54		
		3	0.36	0.20	0.56		
		20	0.60	0.33	0.93		
		3	0.27	0.14	0.41		
		3	0.26	0.12	0.38		

STATION PROFILES

JETZ 06-16-87 Loc: STA 4 Lat: 38° 53.4' N Long: 123° 50.69' W File: j870616a

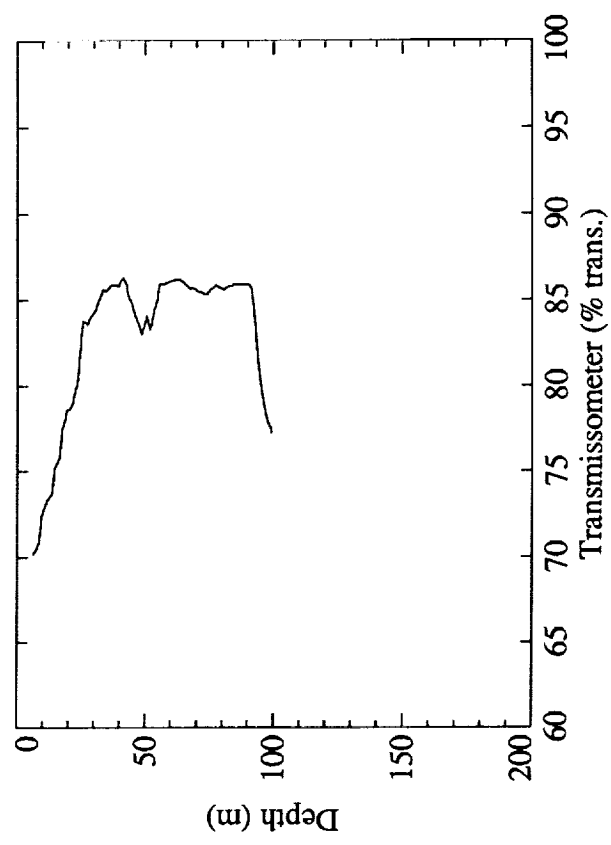
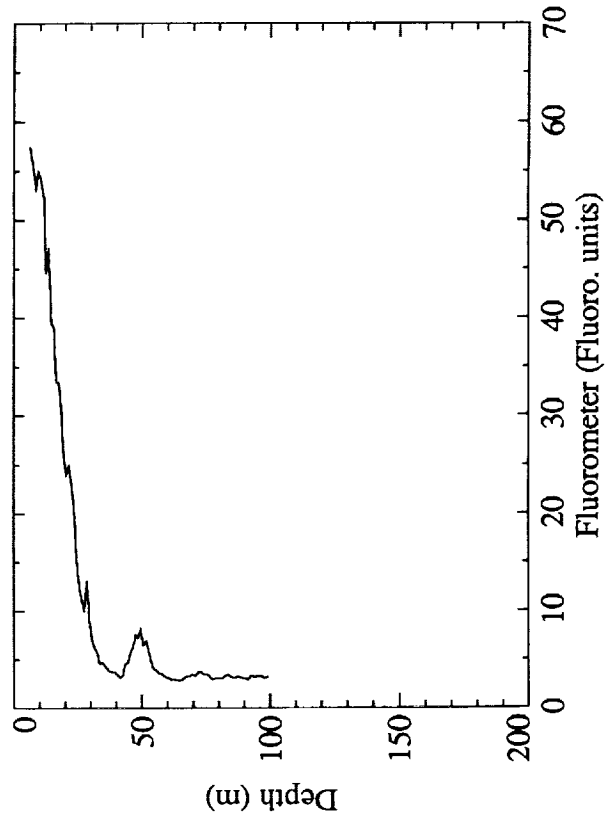
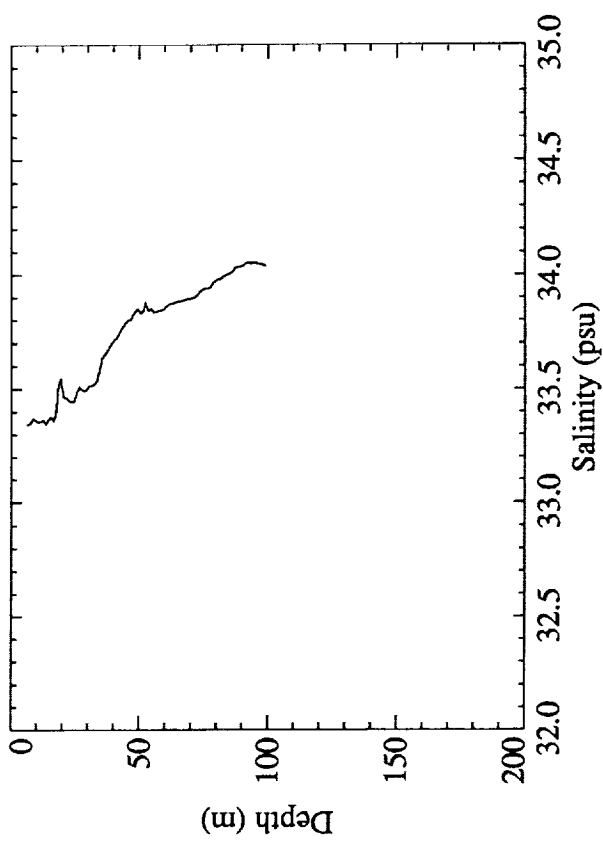
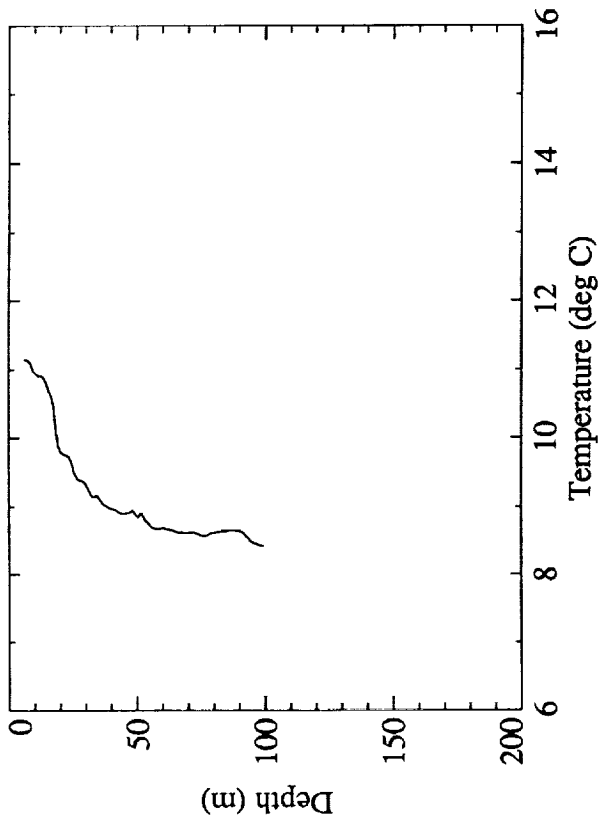


Figure 1. File: j870616a

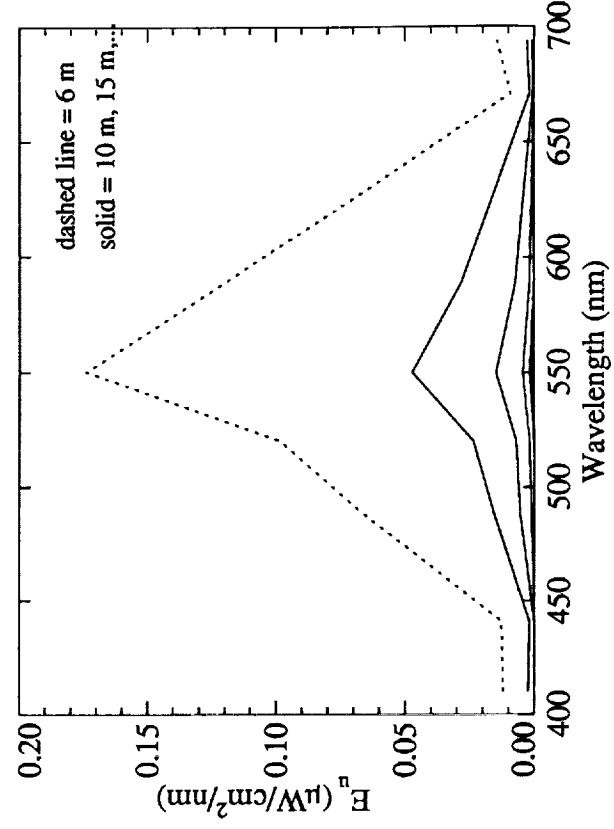
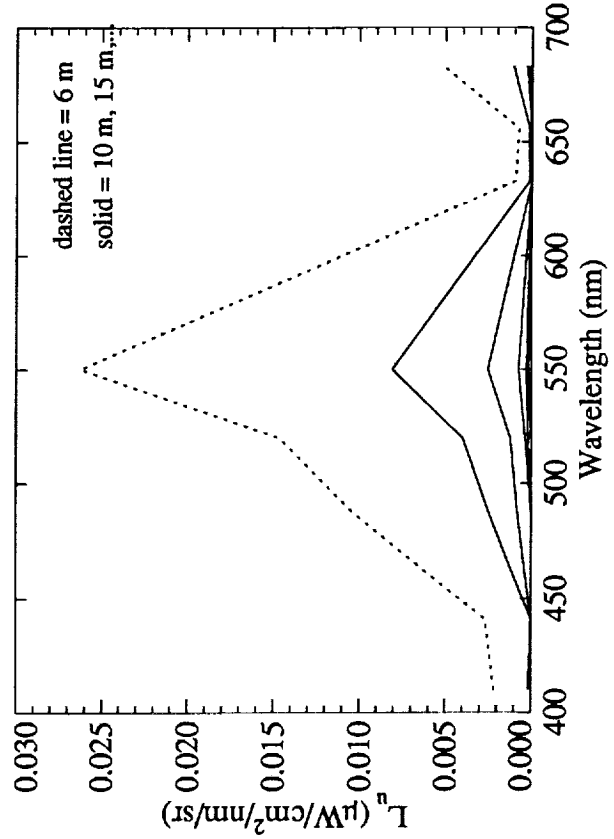
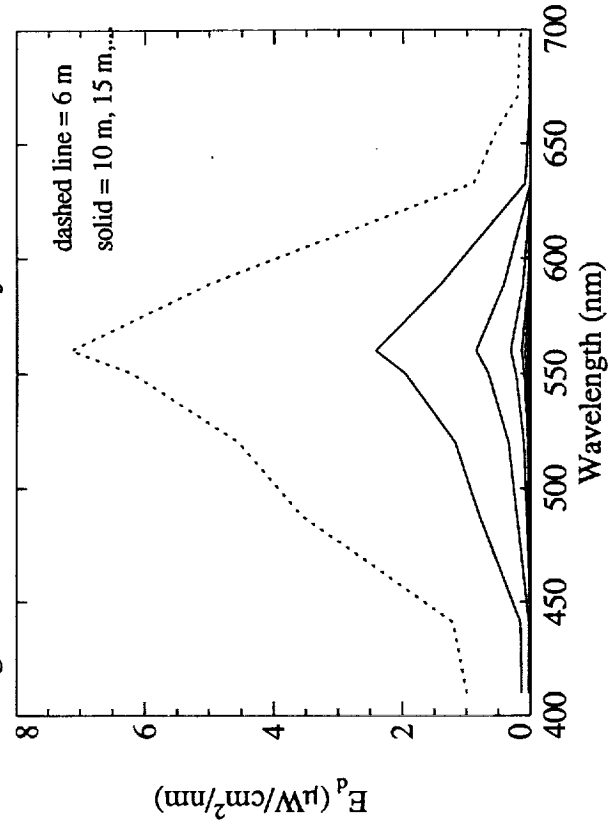
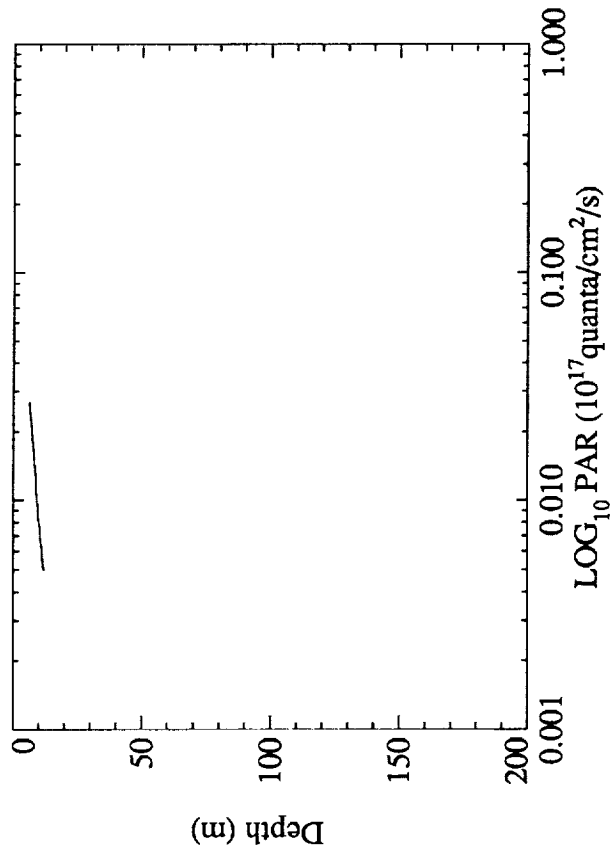


Figure 1. Continued

JETZ 06-16-87 Loc: STA 6 Lat: 39° 06.7' N Long: 123° 51.82' W File: j870616b

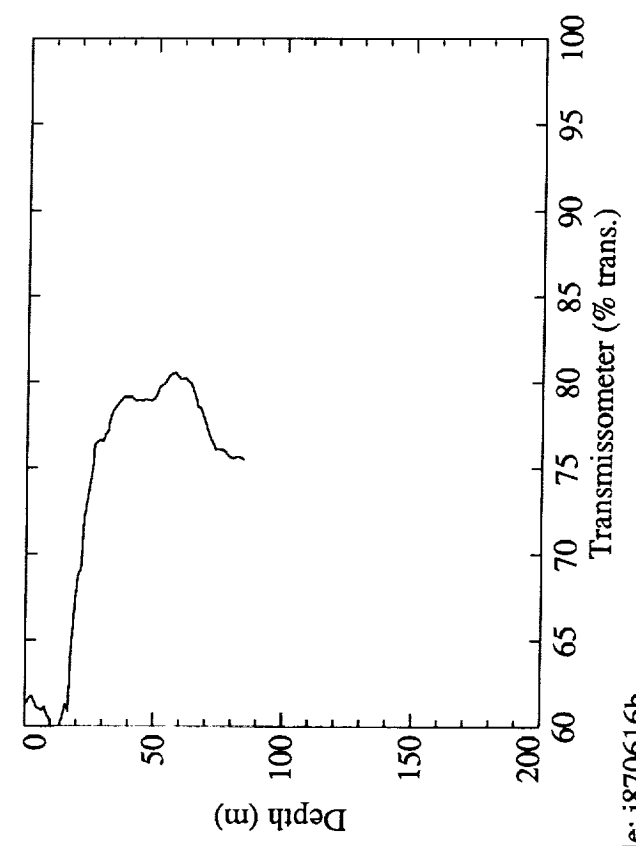
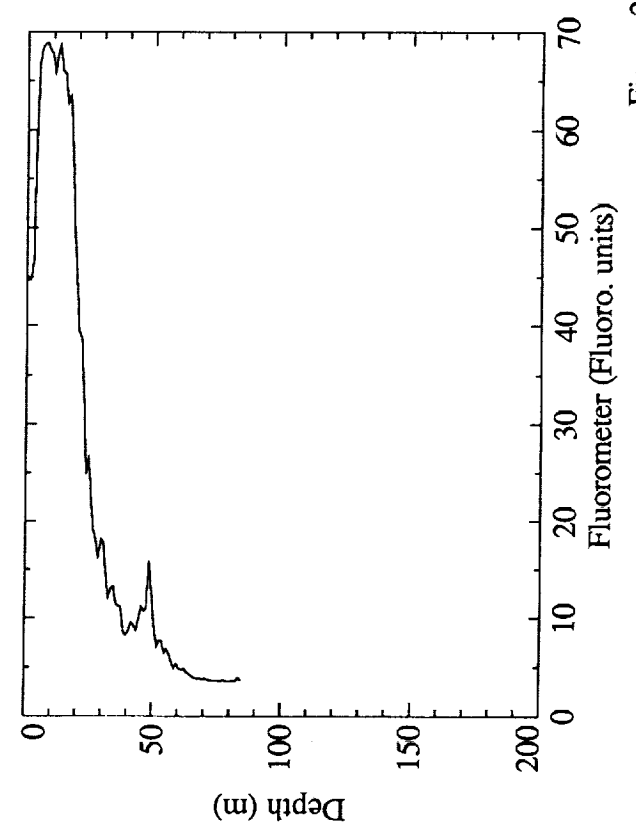
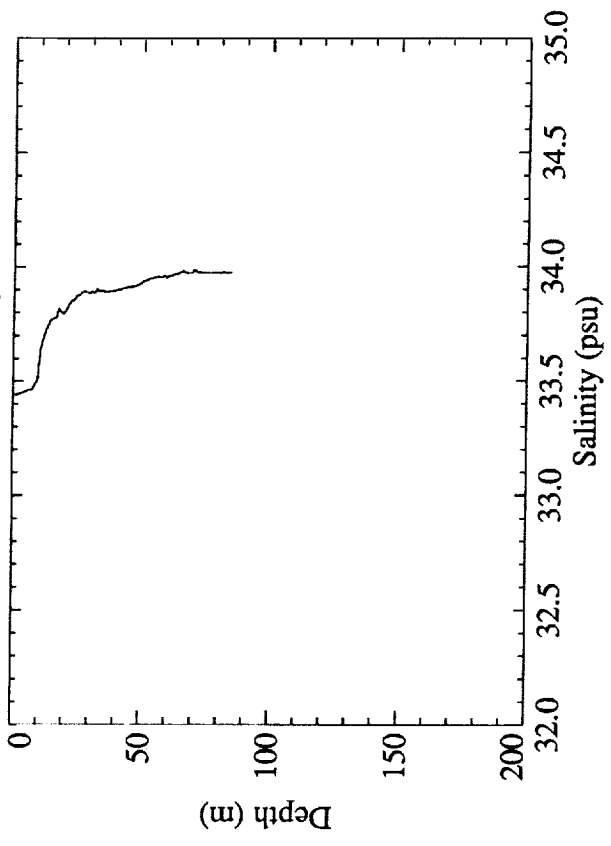
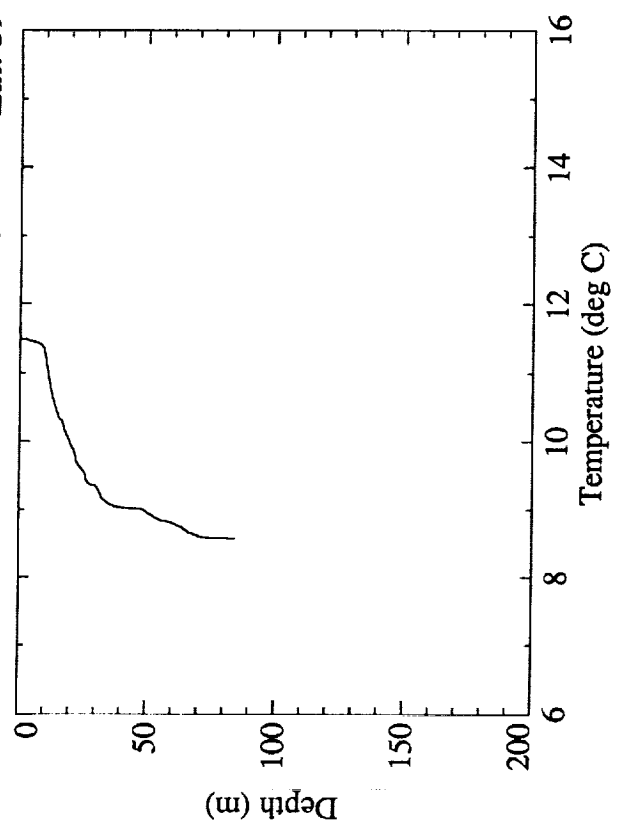


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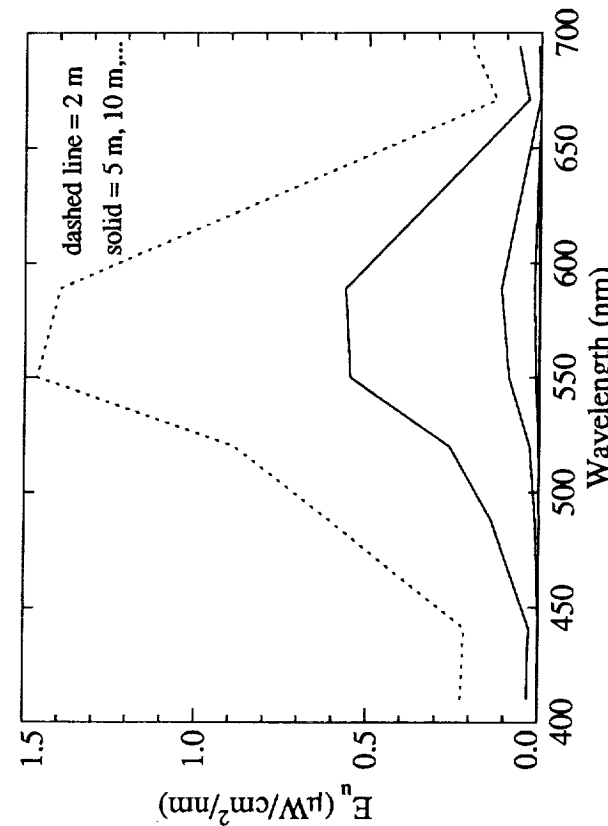
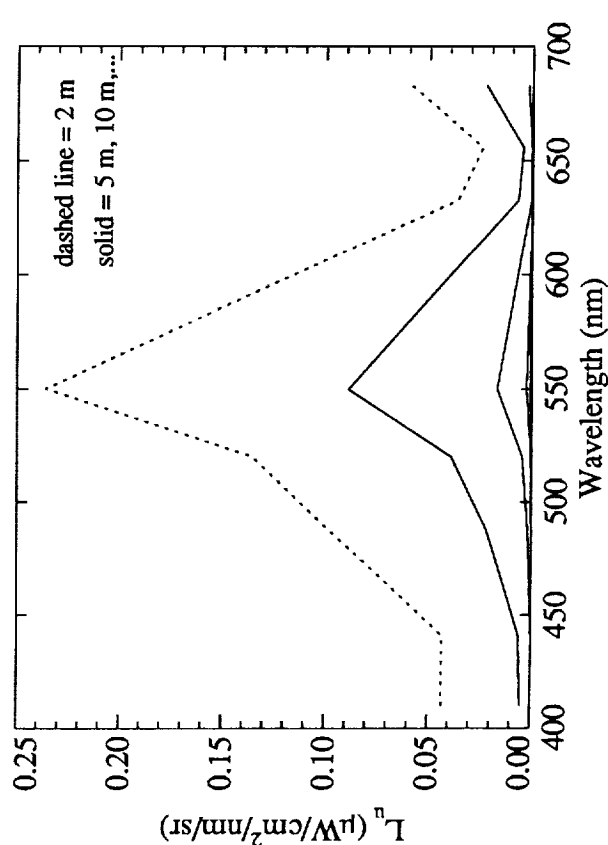
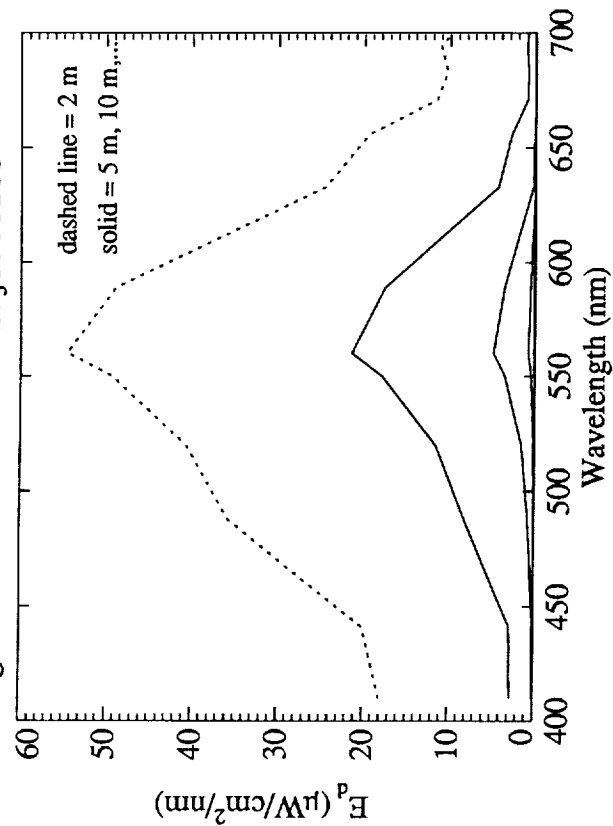
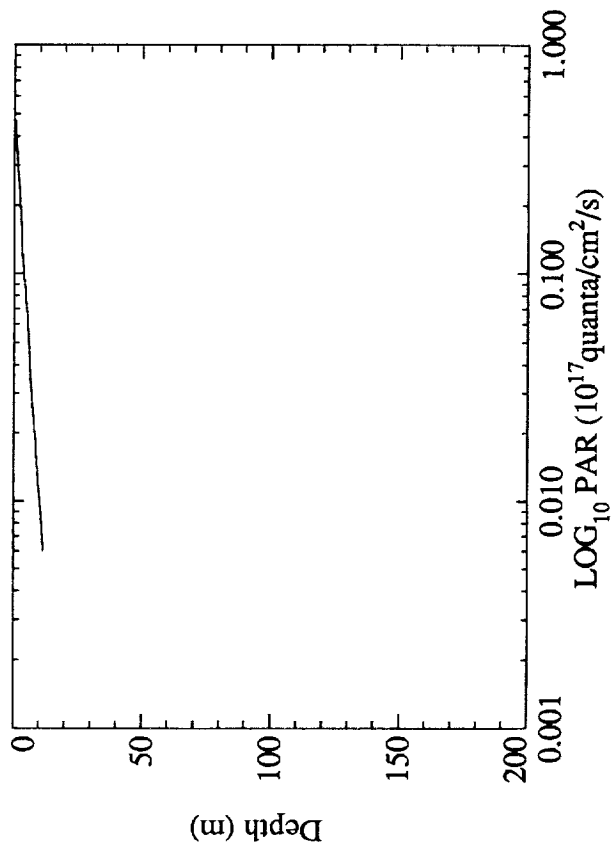


Figure 2. Continued

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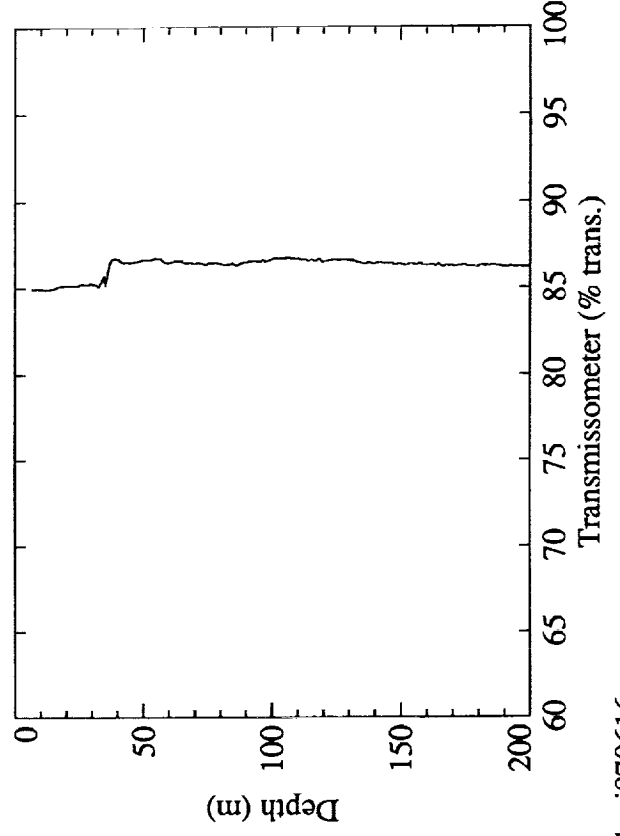
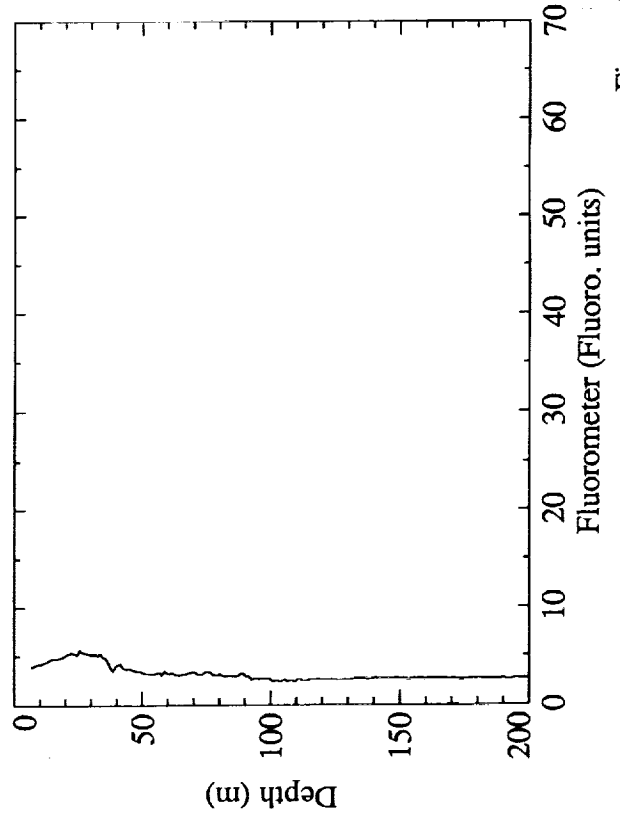
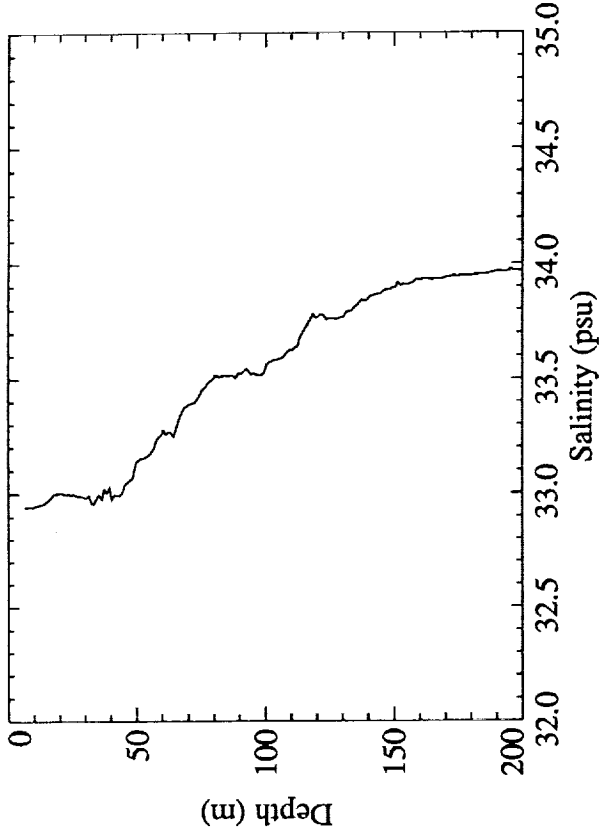
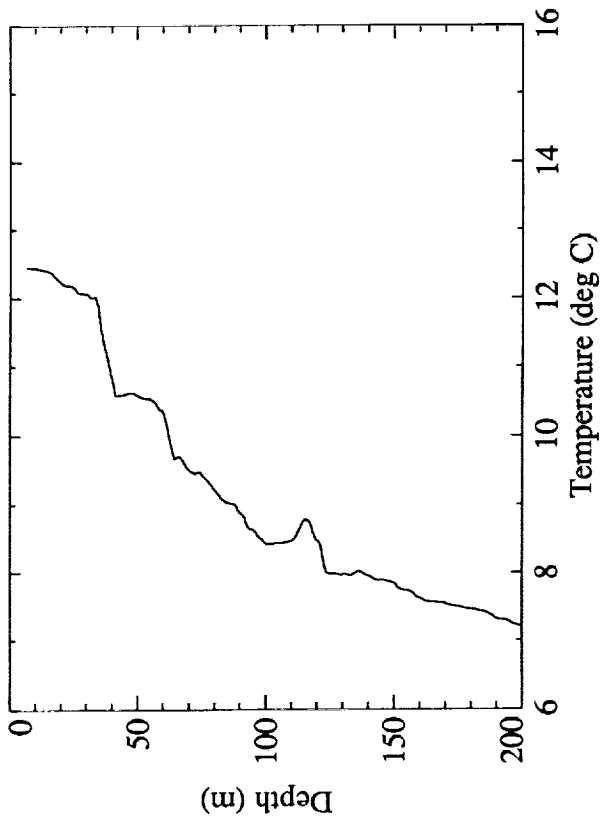


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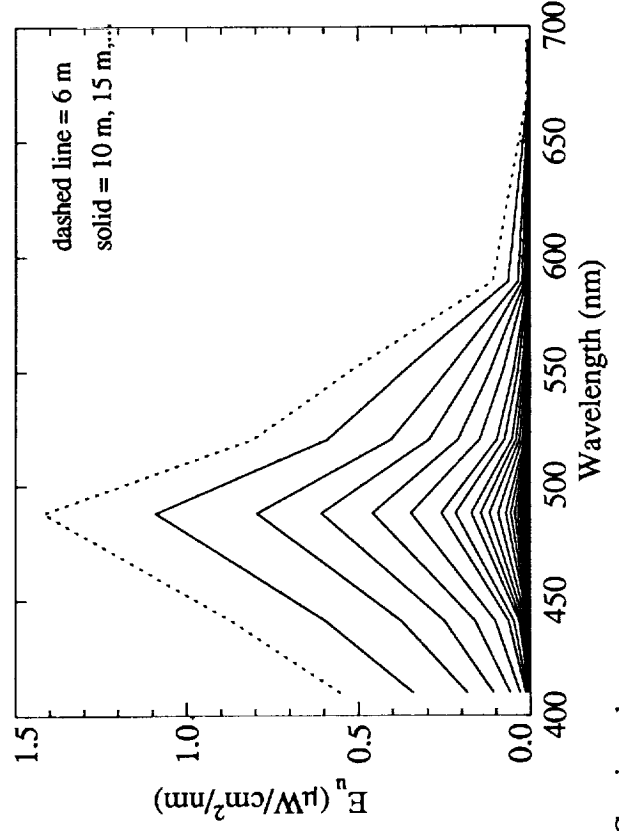
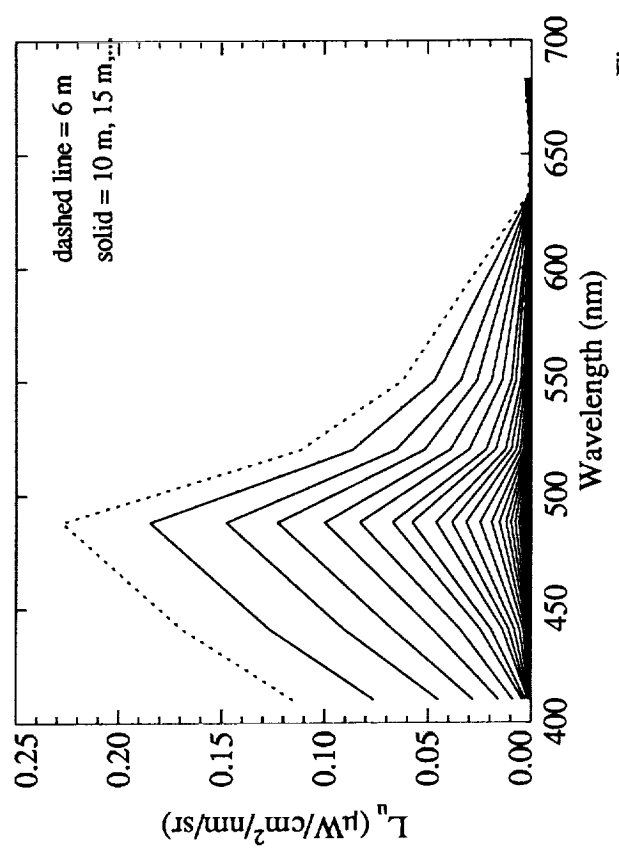
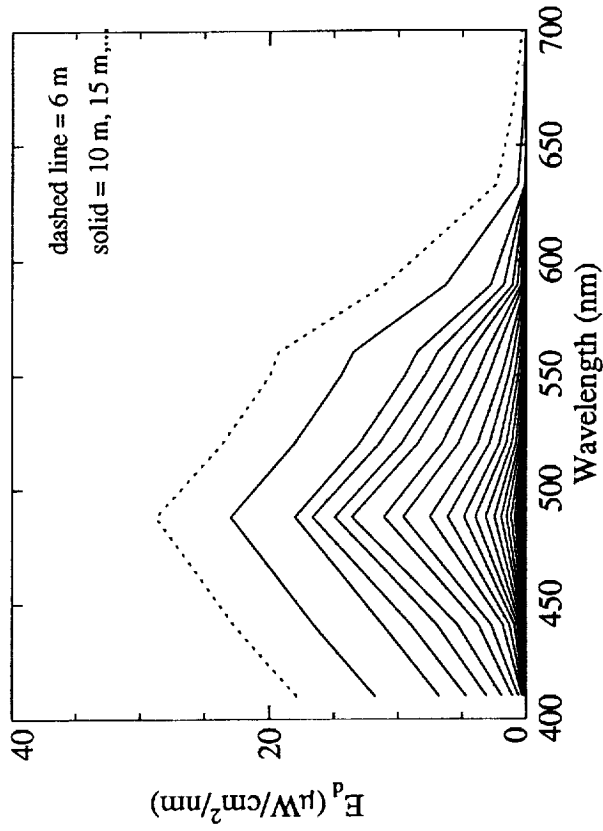
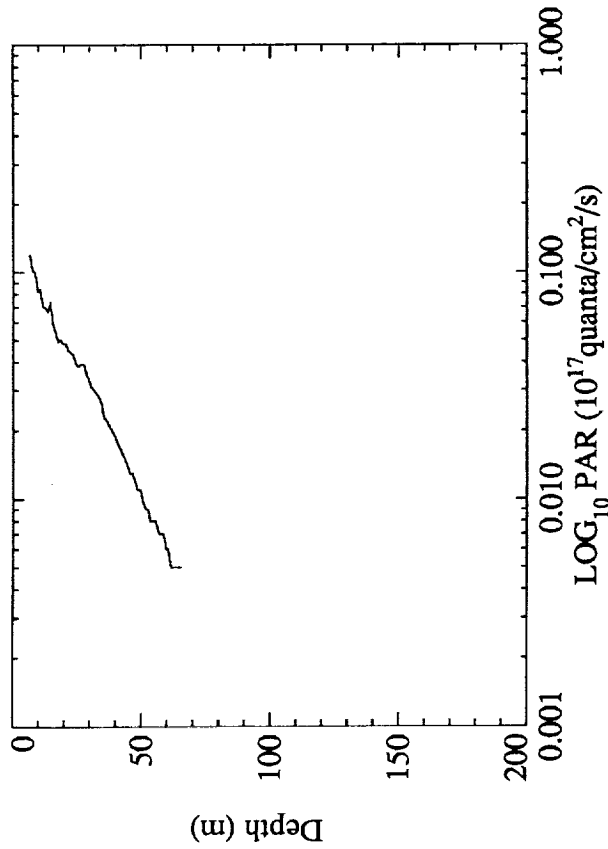


Figure 3. Continued

JETZ 06-16-87 Loc: STA 12 Lat: 39° 7.30' N Long: 124° 12.42' W File: j870616d

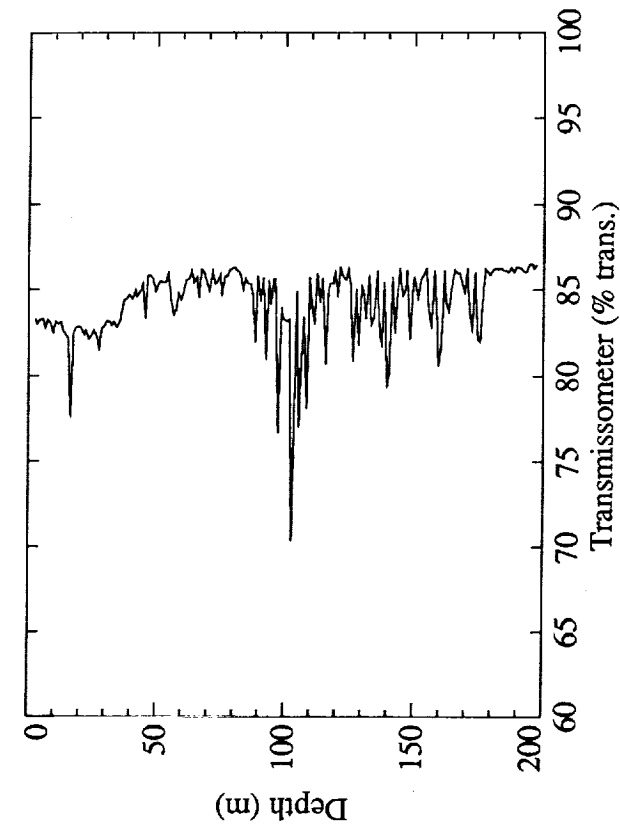
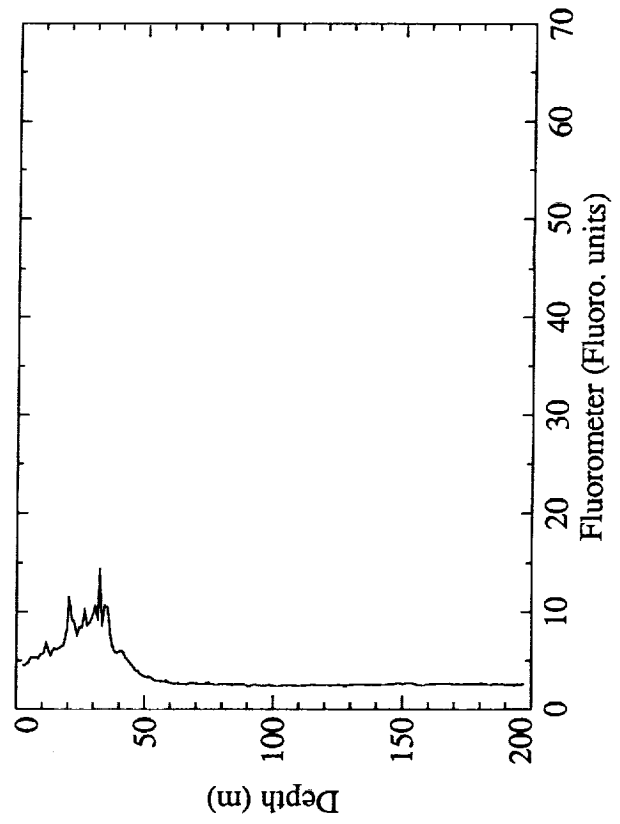
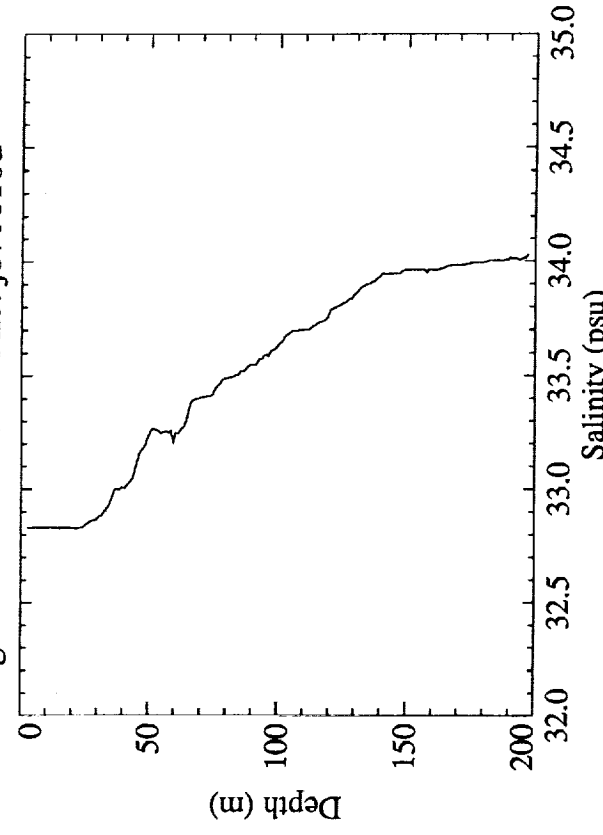
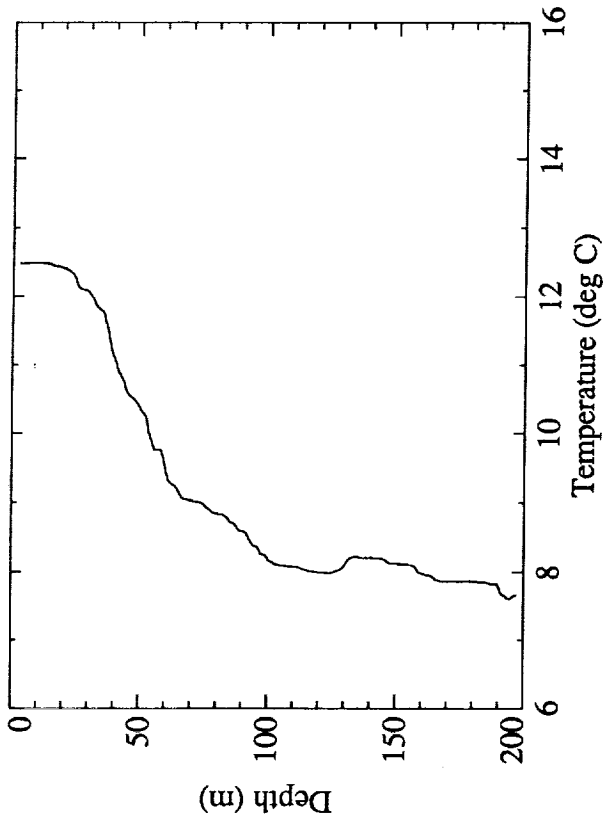


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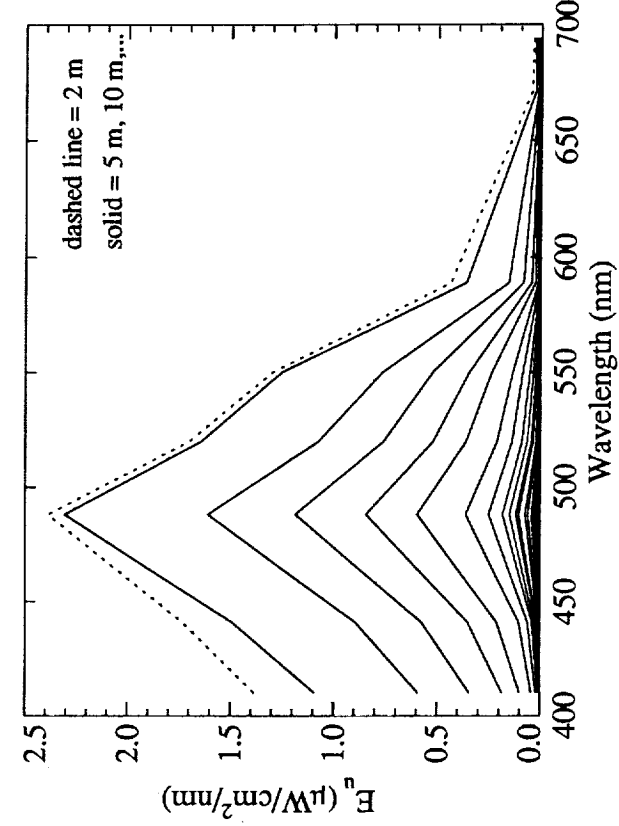
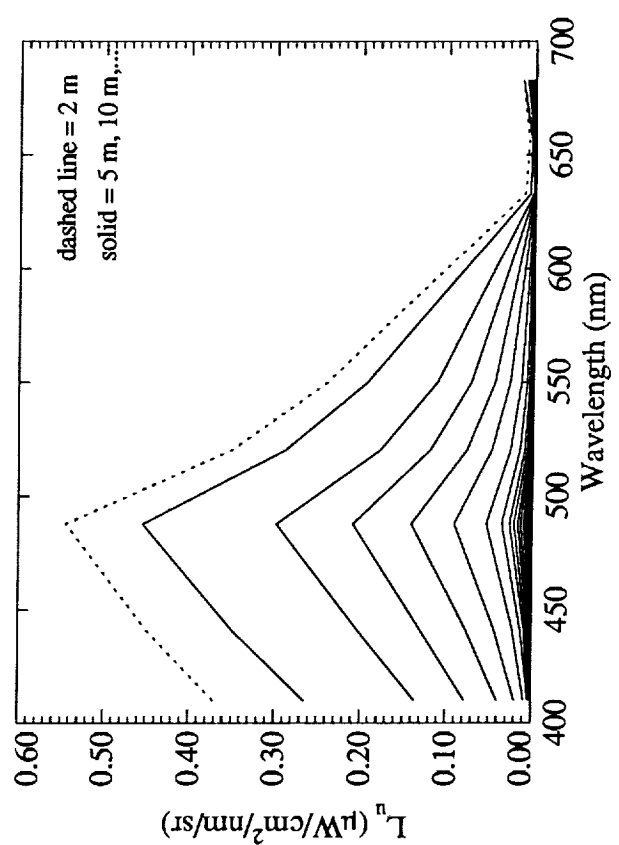
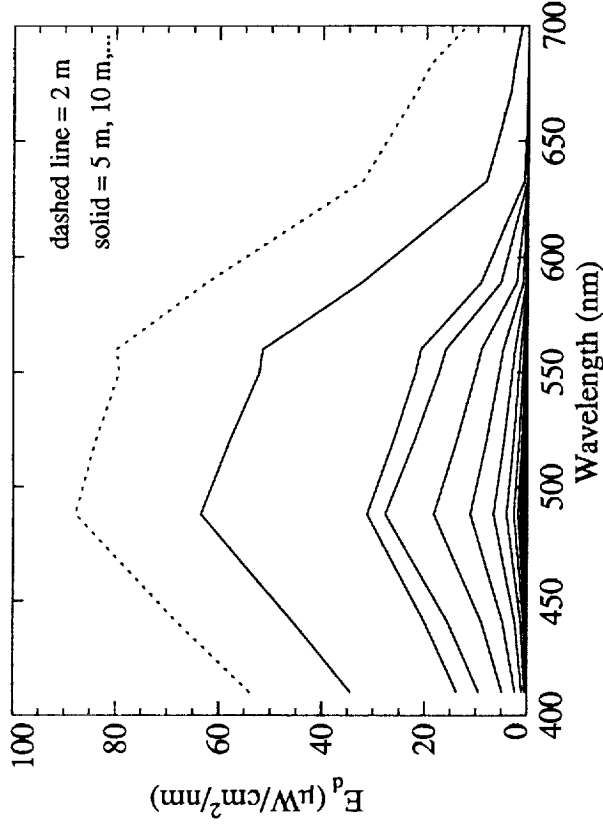
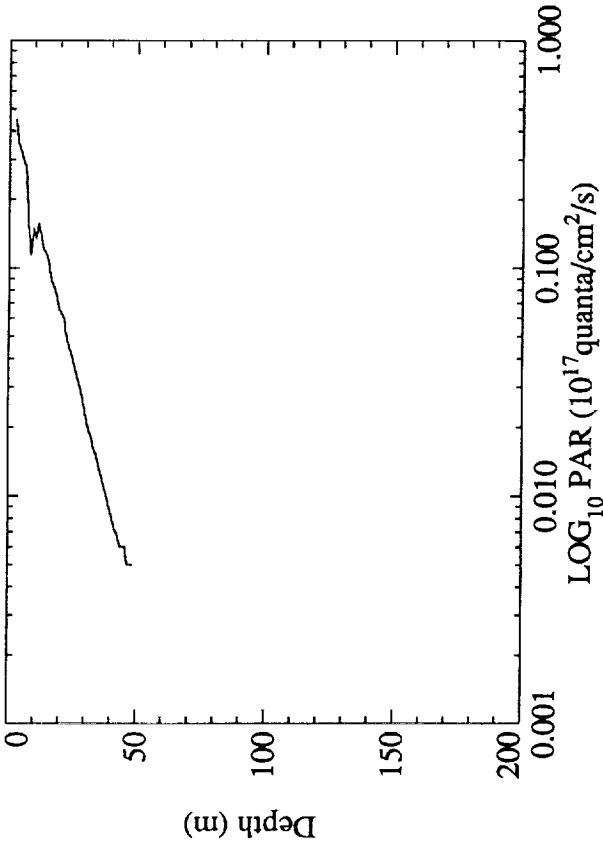


Figure 4. Continued

JETZ 06-17-87 Loc: drift launch Lat: 38° 33.88' N Long: 124° 02.91' W File: j870617a

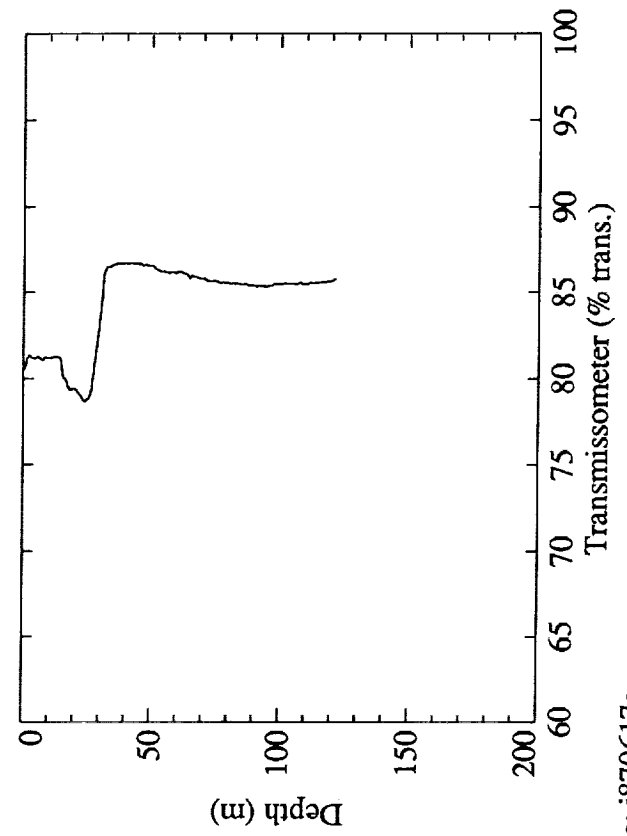
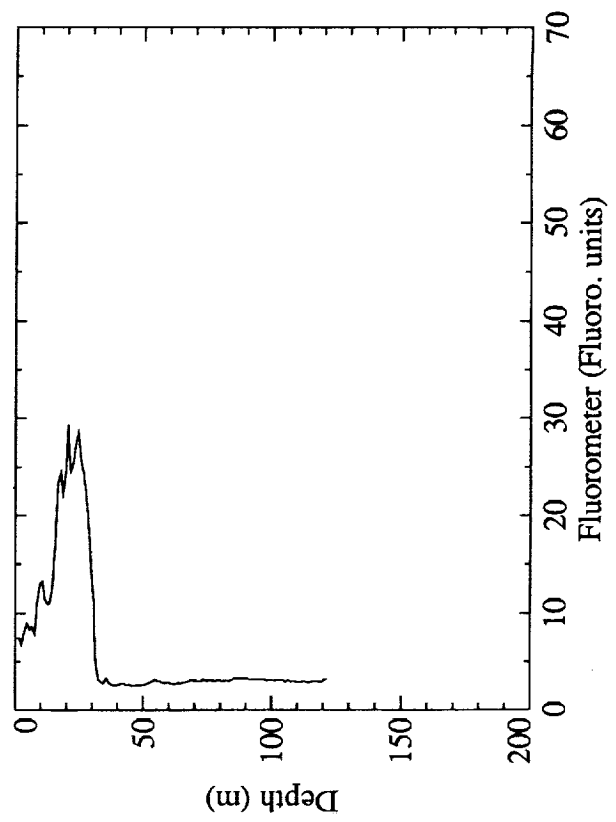
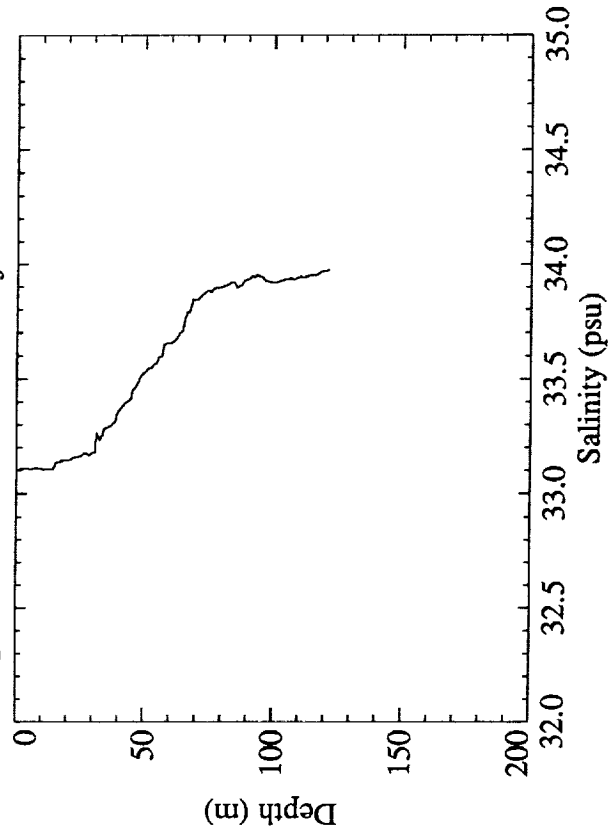
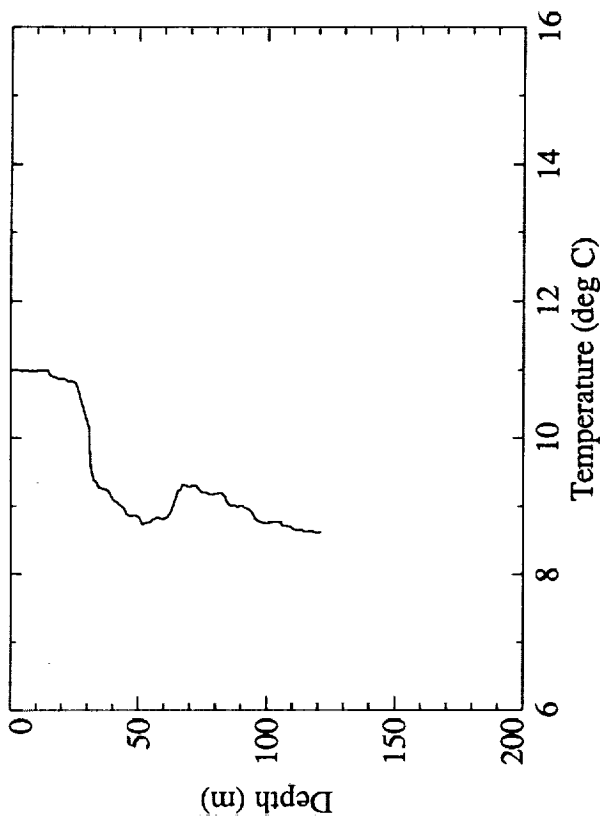


Figure 5. File: j870617a

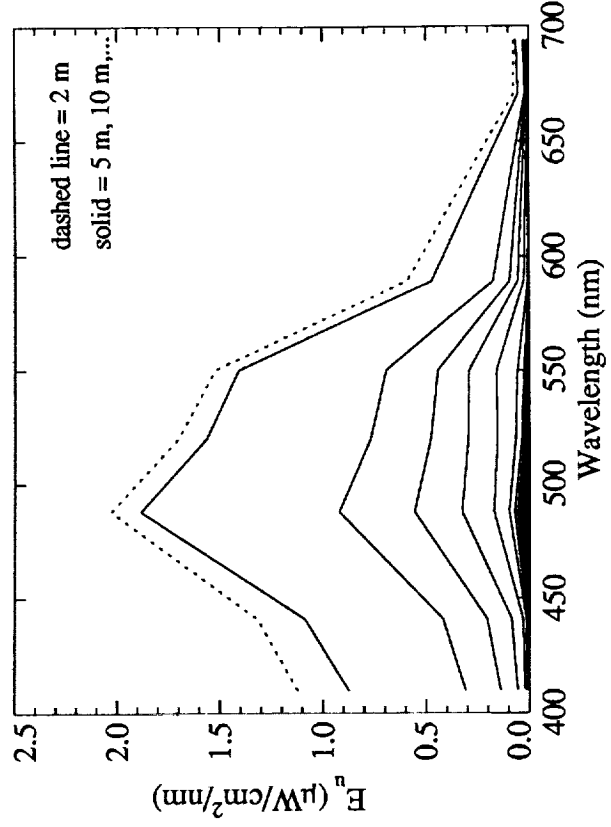
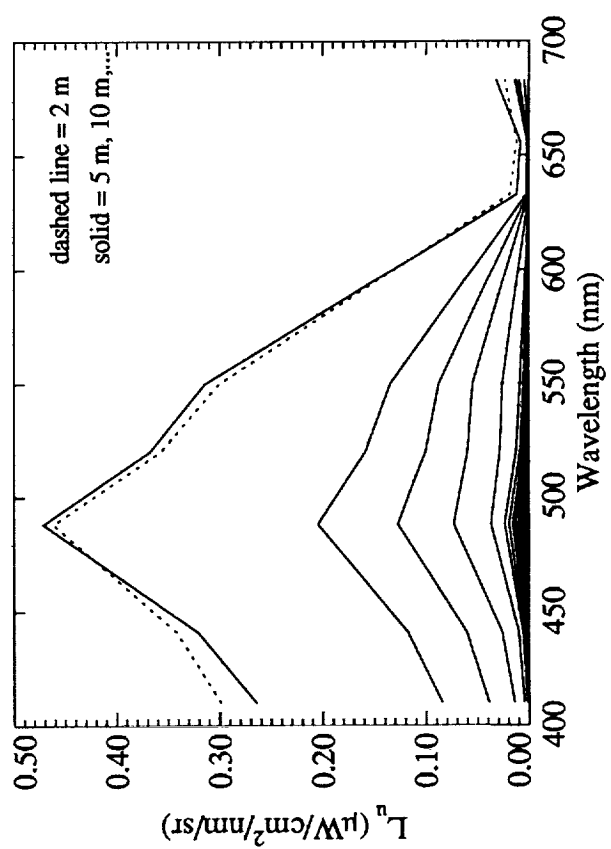
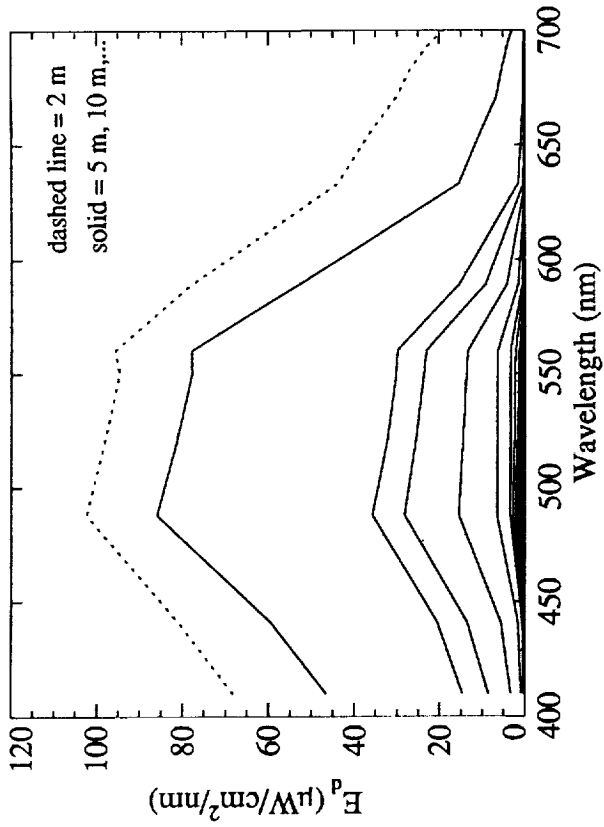
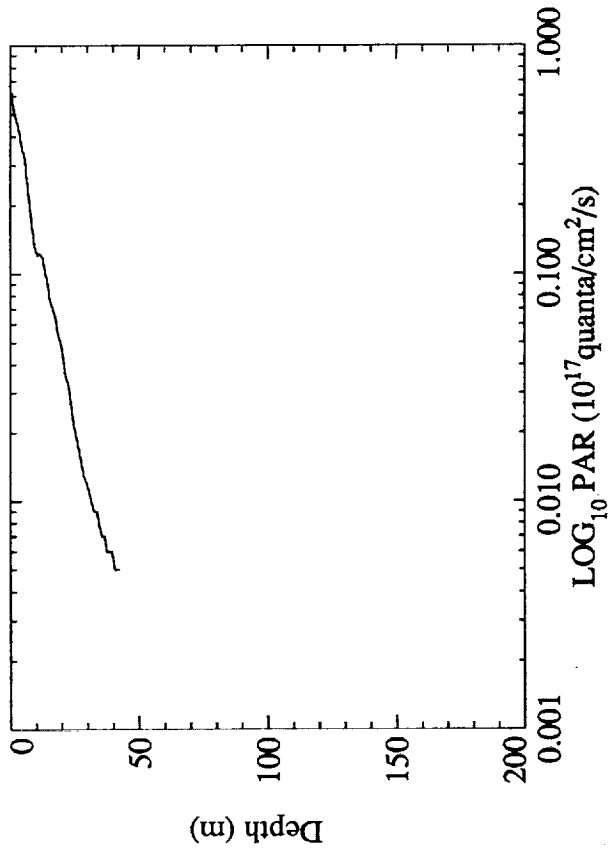


Figure 5. Continued

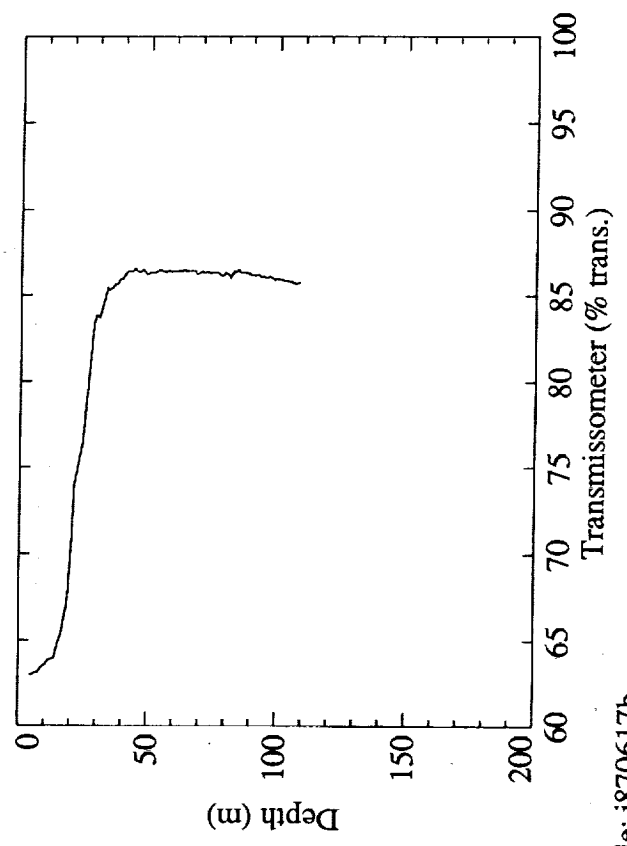
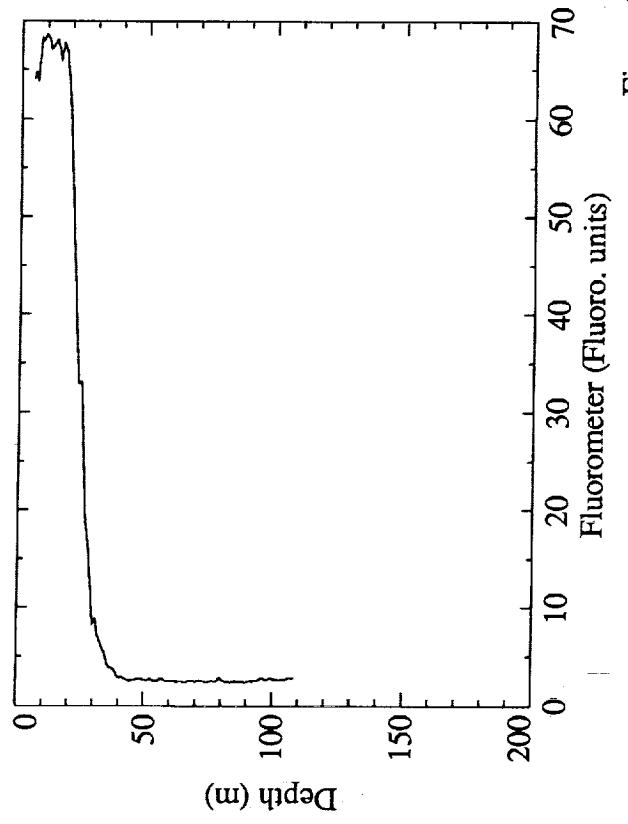
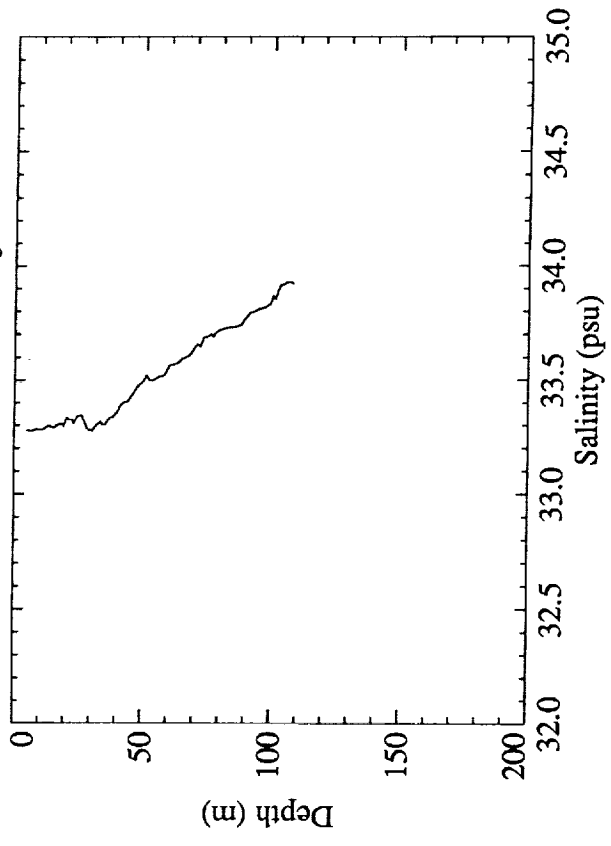
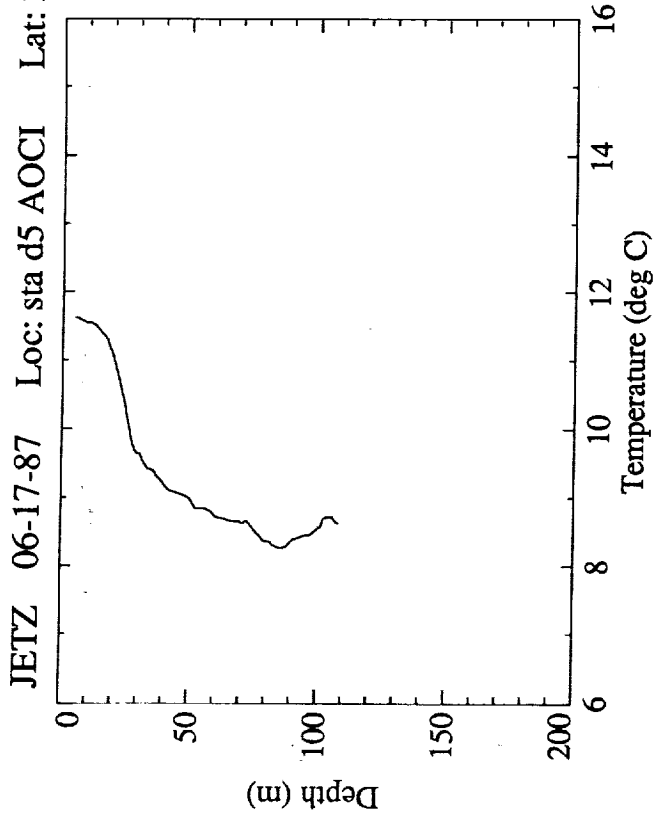


Figure 6. File: j870617b

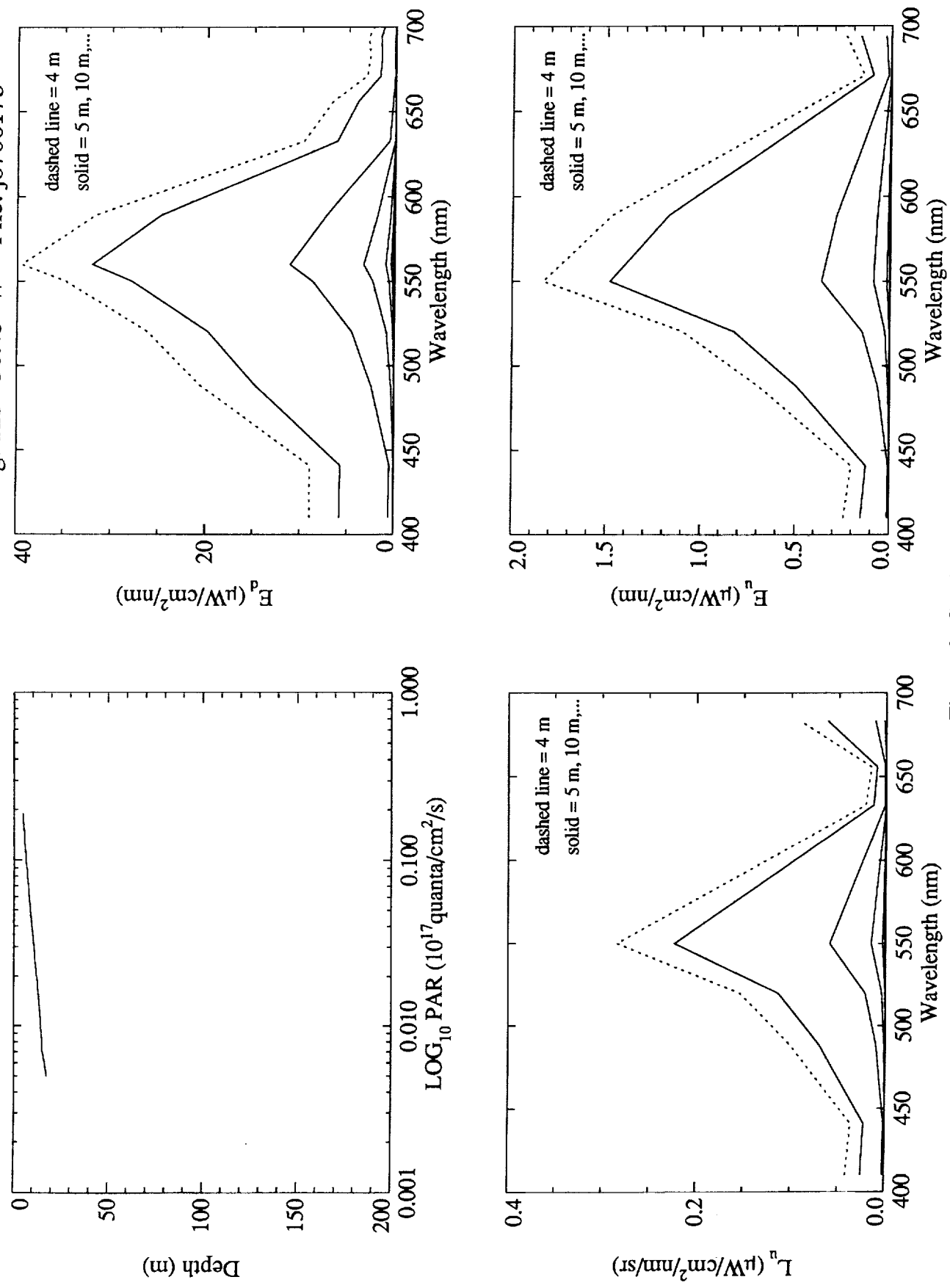


Figure 6. Continued

JETZ 06-18-87 Loc: STA 31 Lat: 39° 8.28 ' N Long: 125° 7.59 ' W File: j870618a

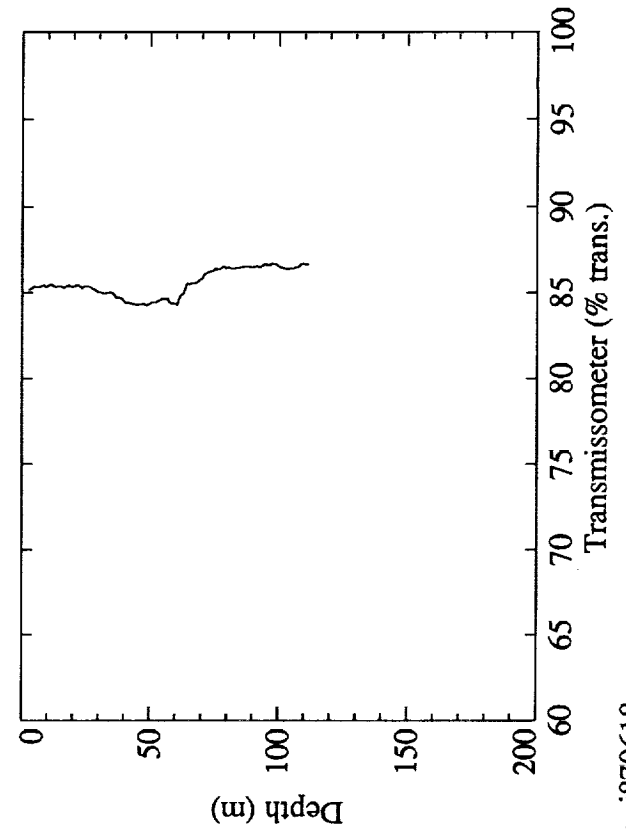
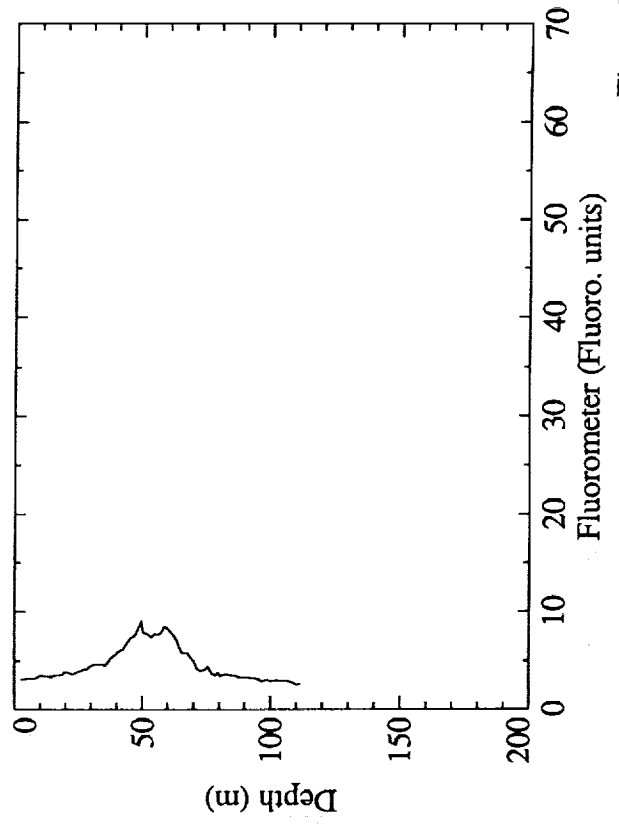
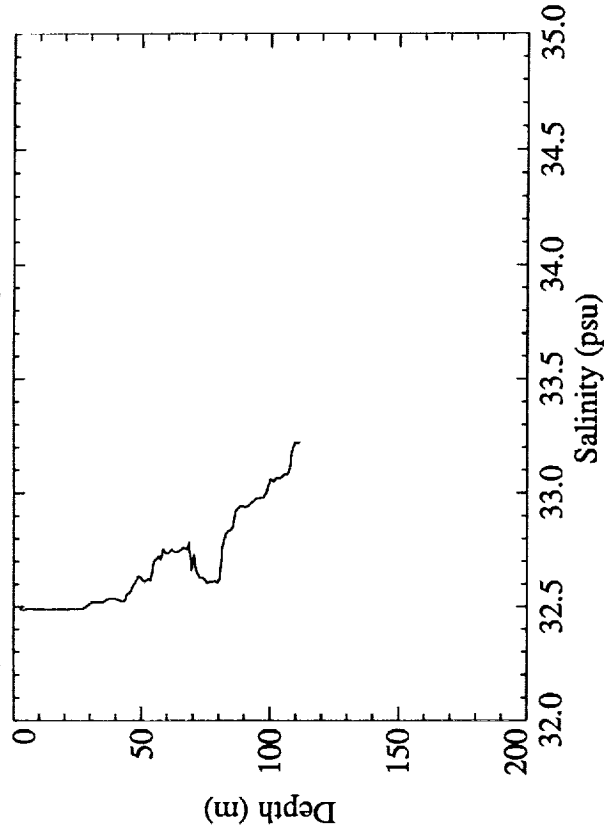
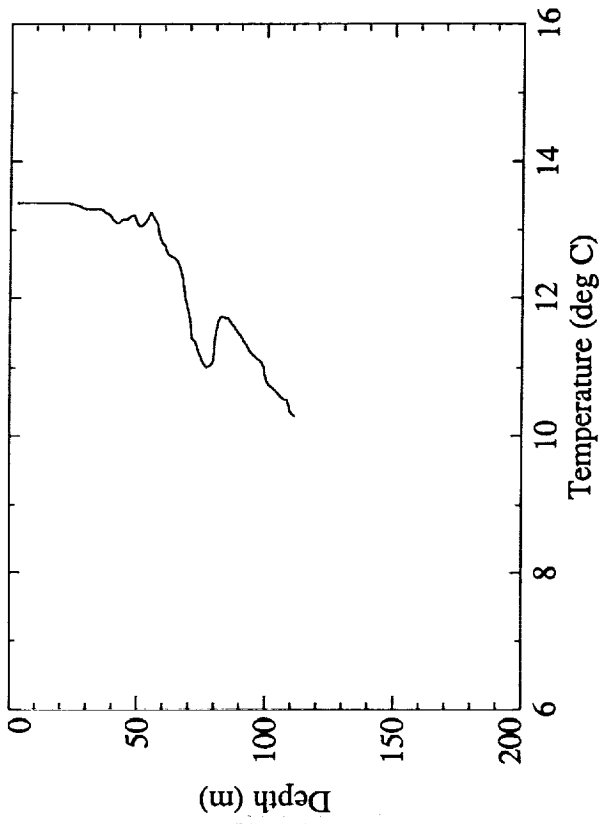


Figure 7. File: j870618a

JETZ 06-18-87 Loc: STA 31 Lat: 39° 8.28' N Long: 125° 7.59' W File: j870618a

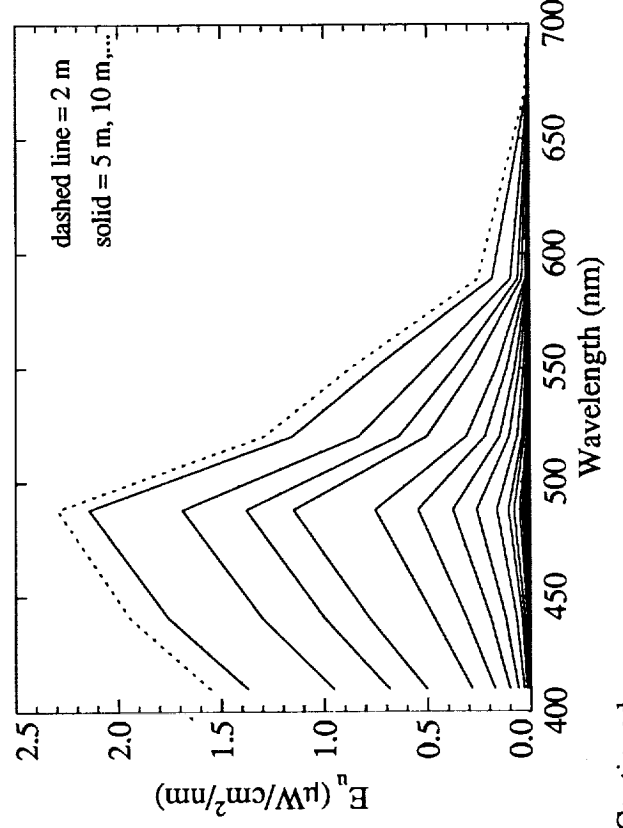
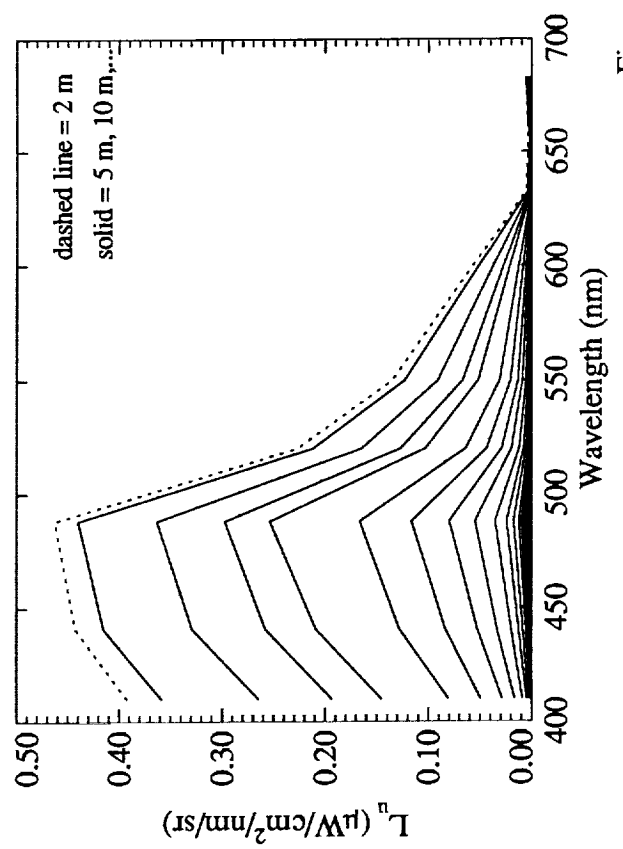
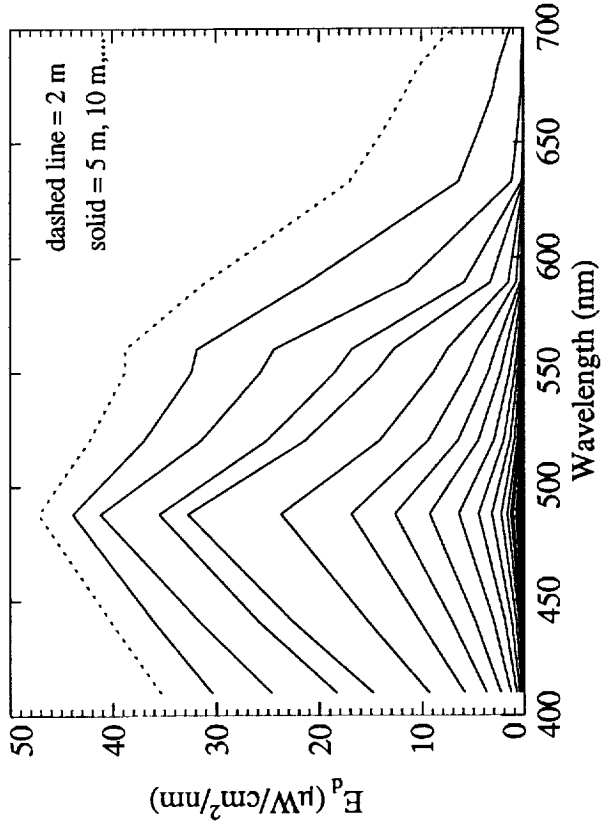
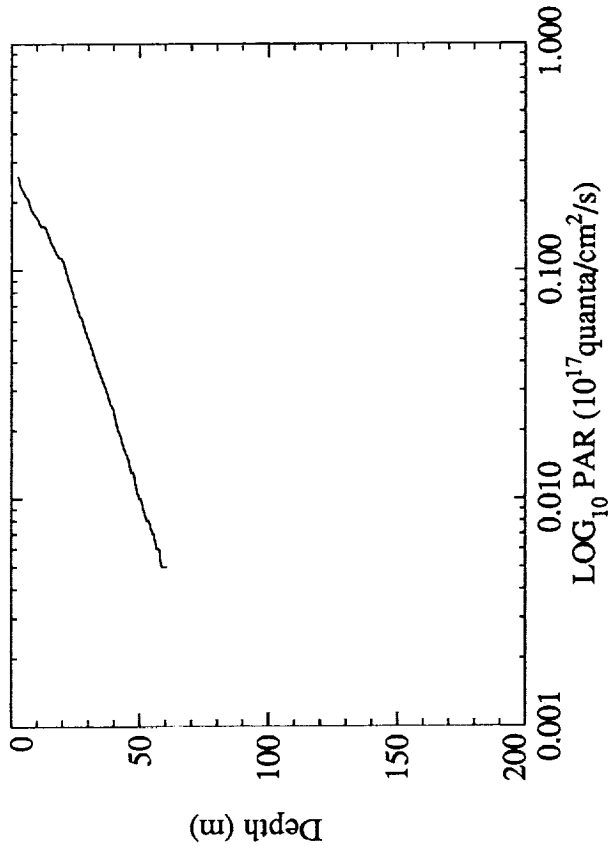


Figure 7. Continued

JETZ 06-19-87 Loc: sta 46 Lat: 37° 46.95' N Long: 125° 22.04' W File: j870619a

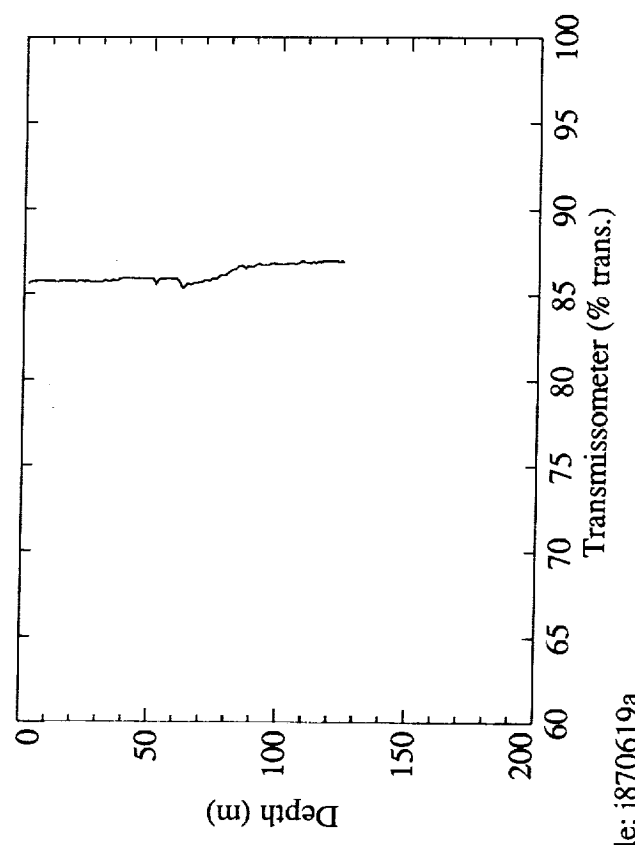
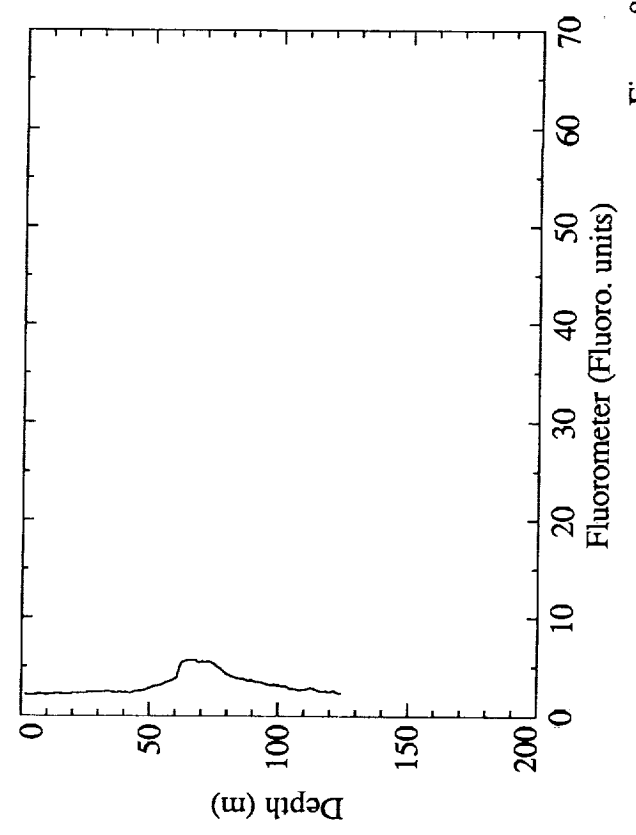
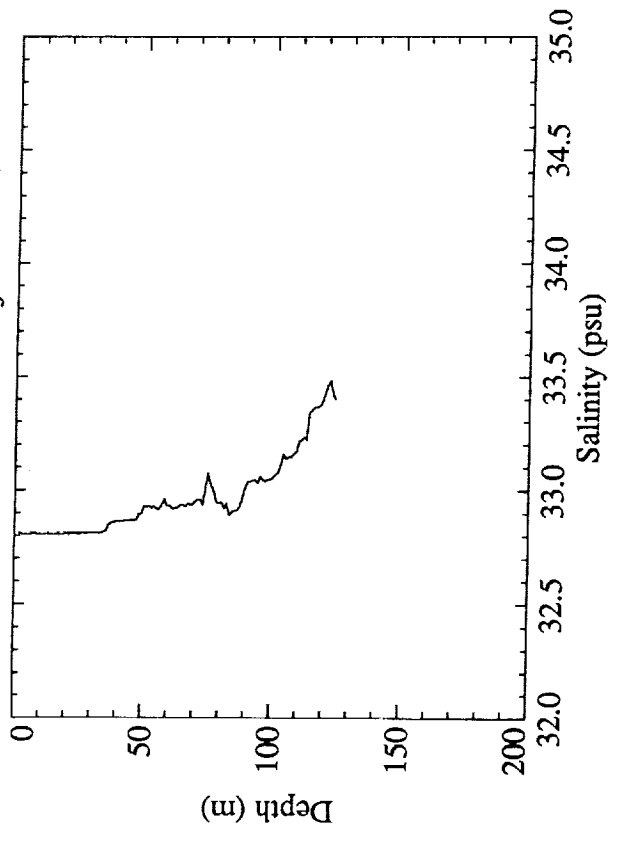
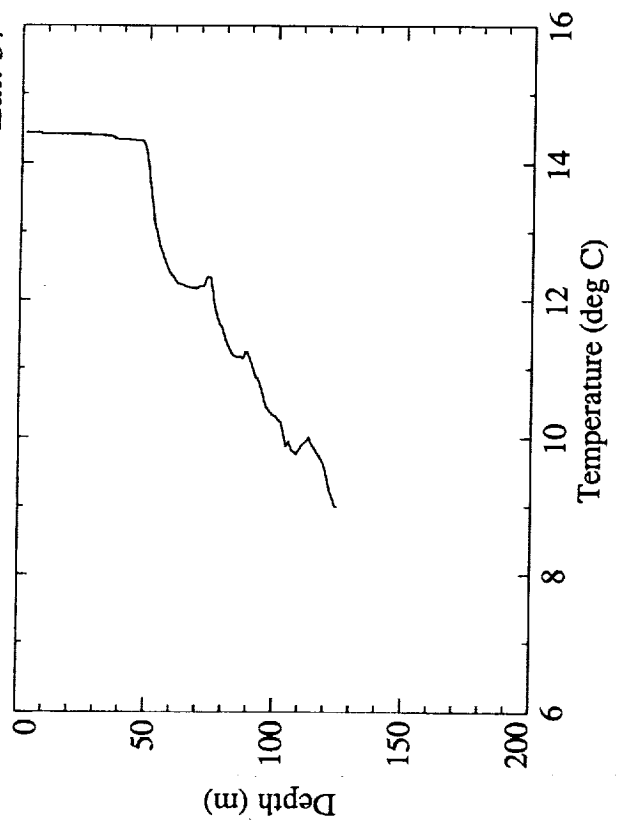


Figure 8. File: j870619a

JETZ 06-19-87 Loc: sta 46 Lat: 37° 46.95' N Long: 125° 22.04' W File: j870619a

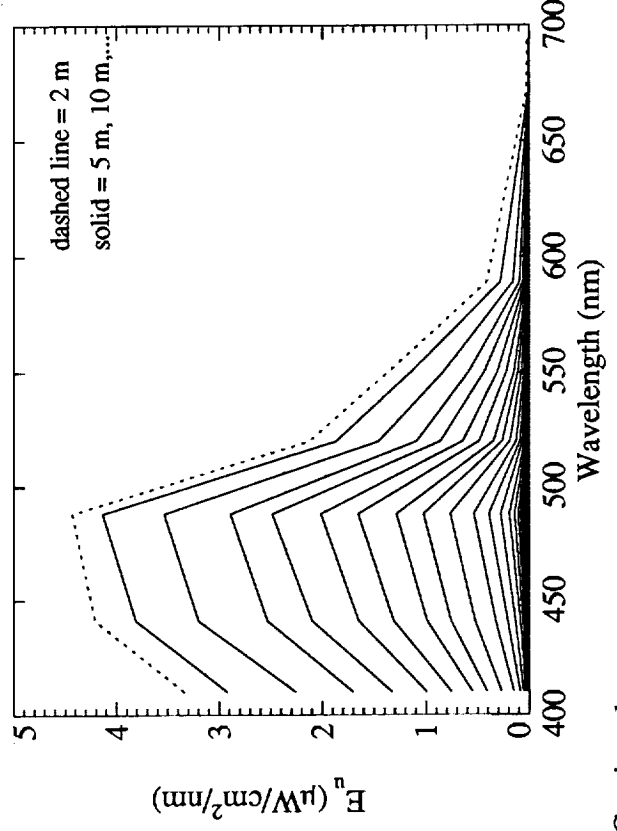
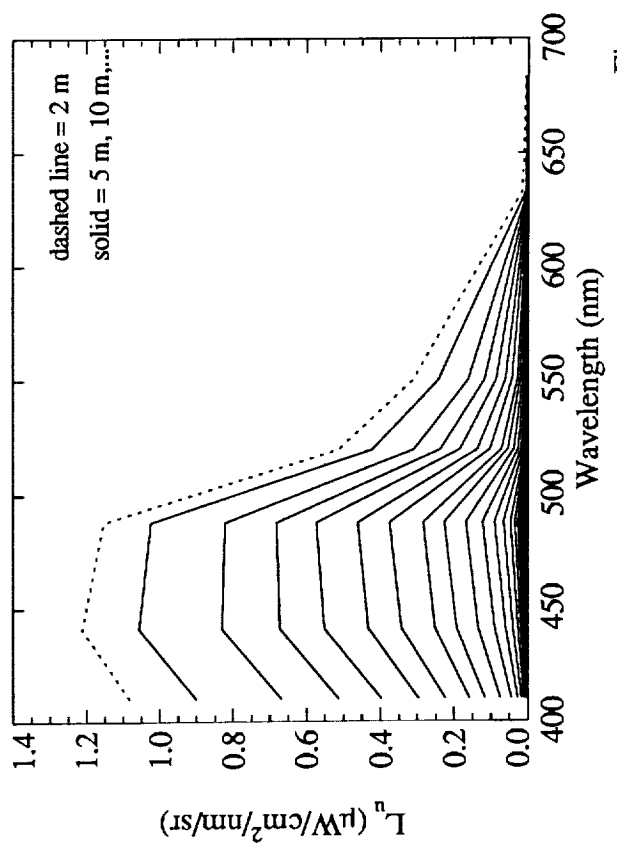
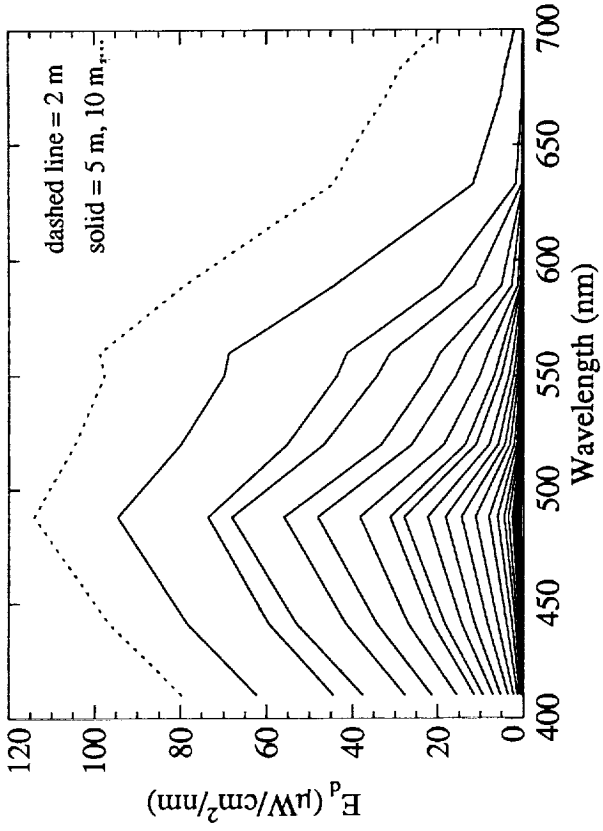
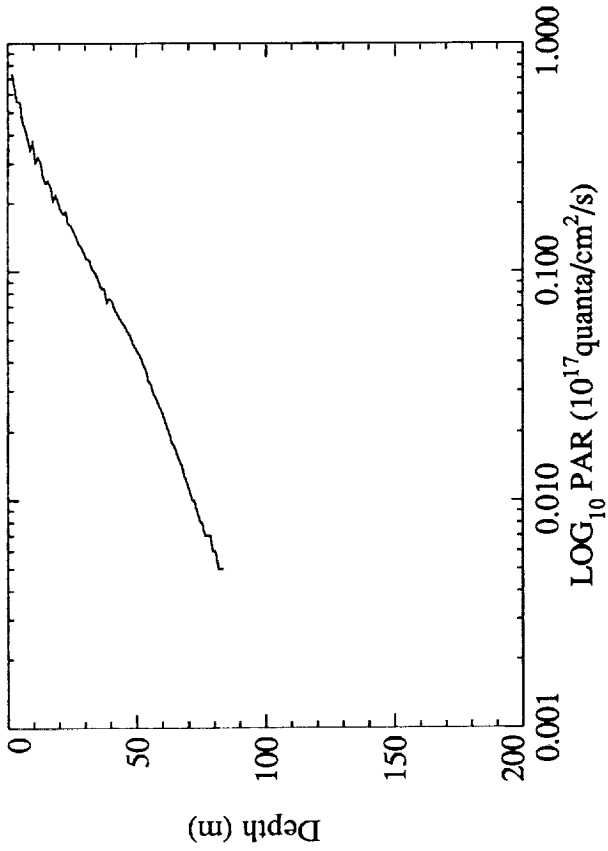


Figure 8. Continued

JETZ 06-19-87 Loc: sta 51

Lat: 38° 35.08' N Long: 125° 35.08' W File: j870619b

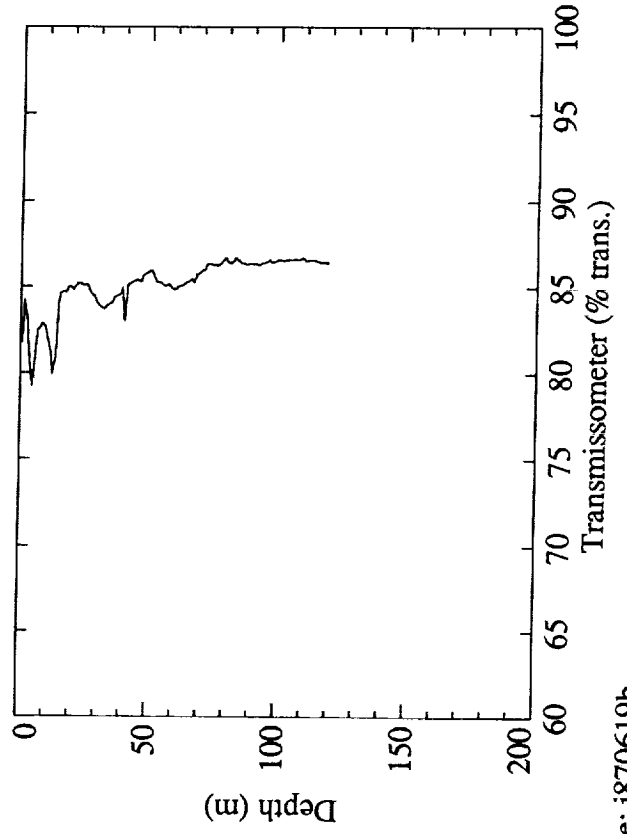
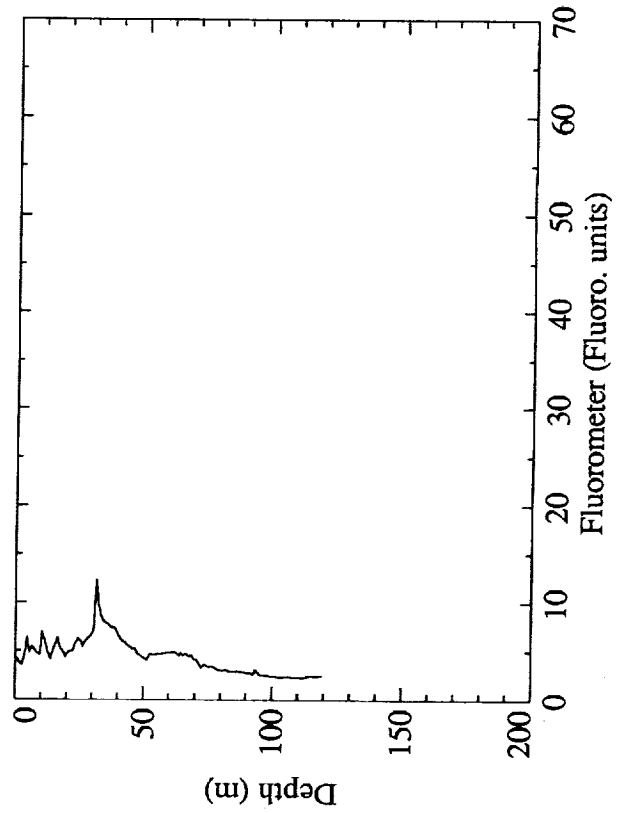
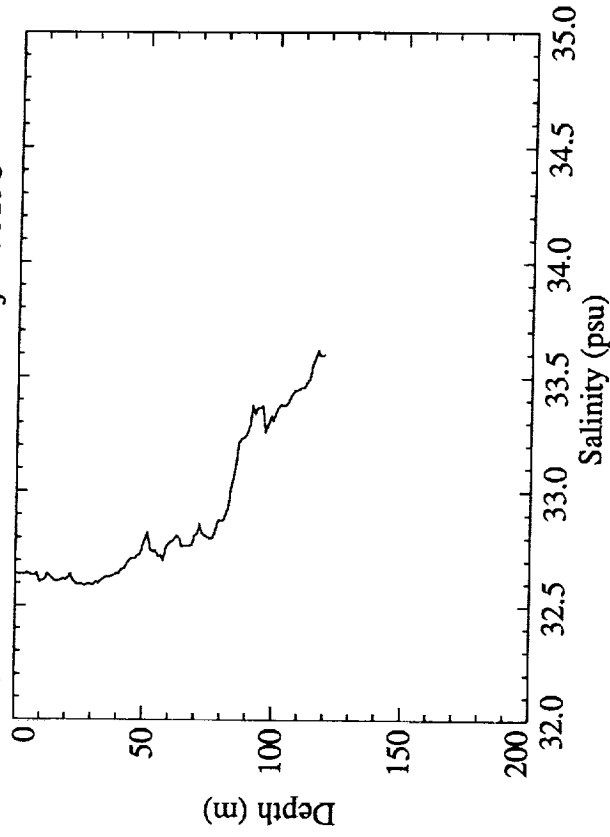
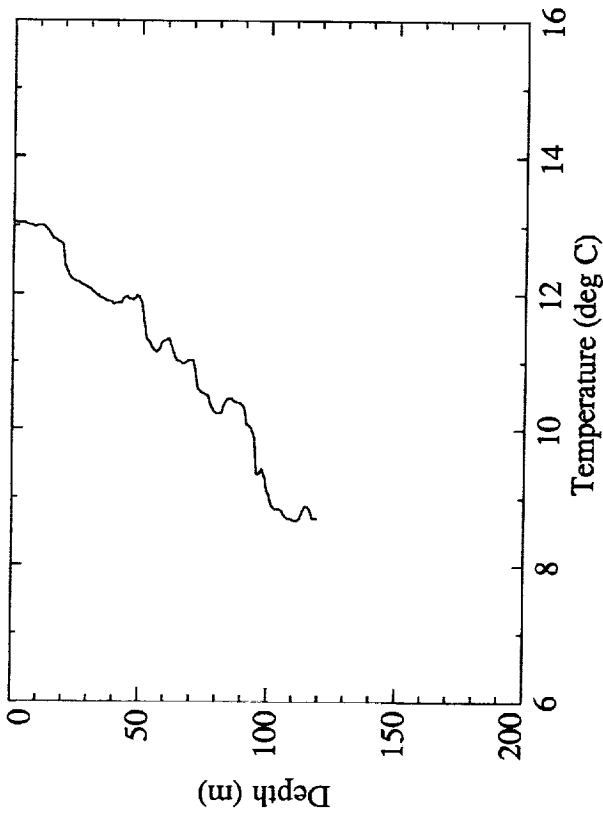


Figure 9. File: j870619b

JETZ 06-19-87 Loc: sta 51 Lat: 38° 35.08' N Long: 125° 35.08' W File: j870619b

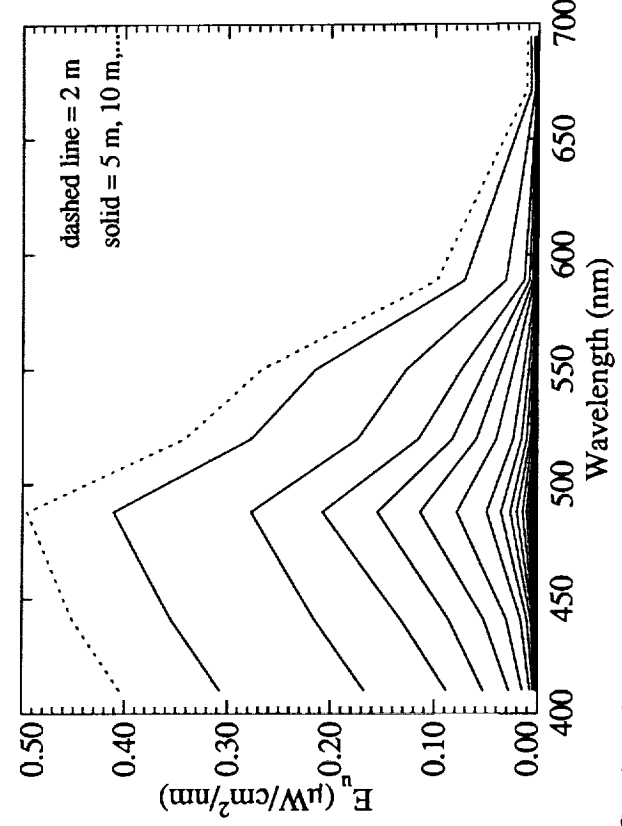
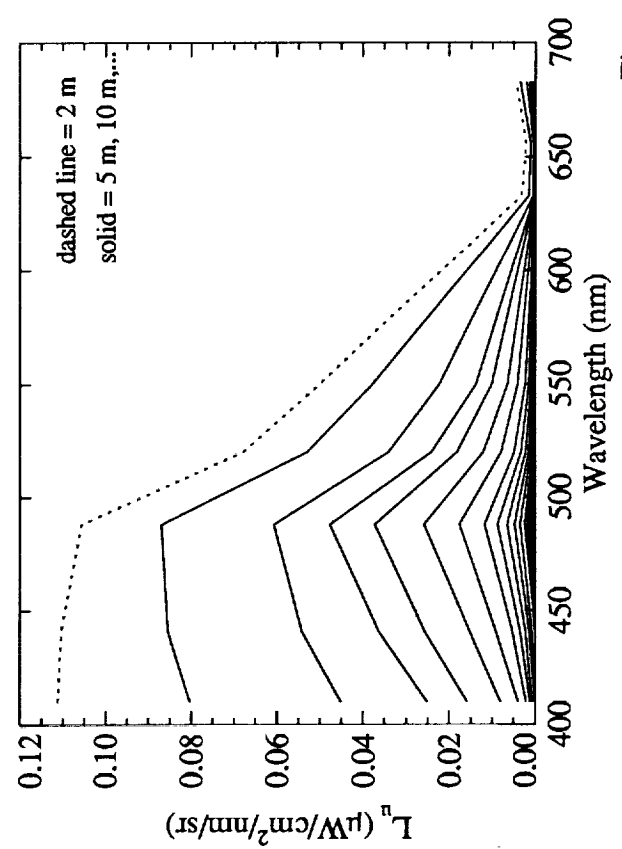
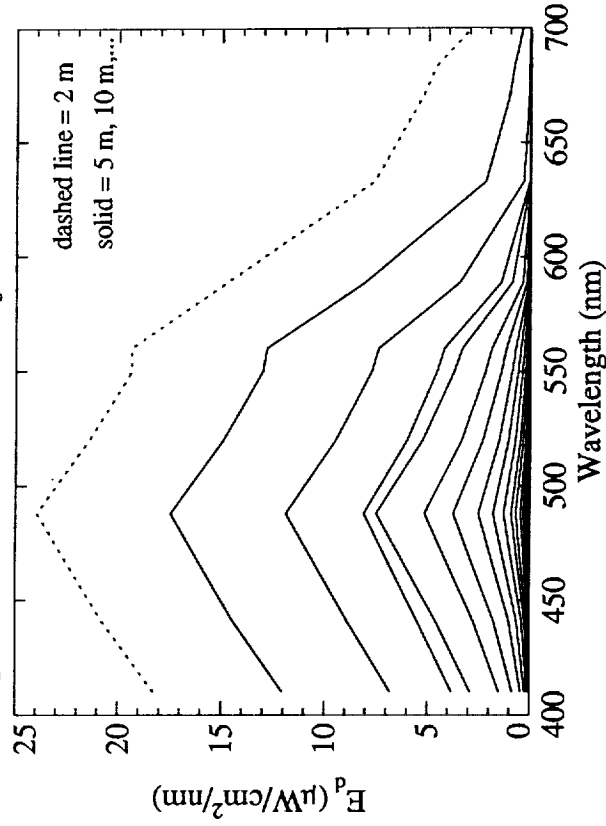
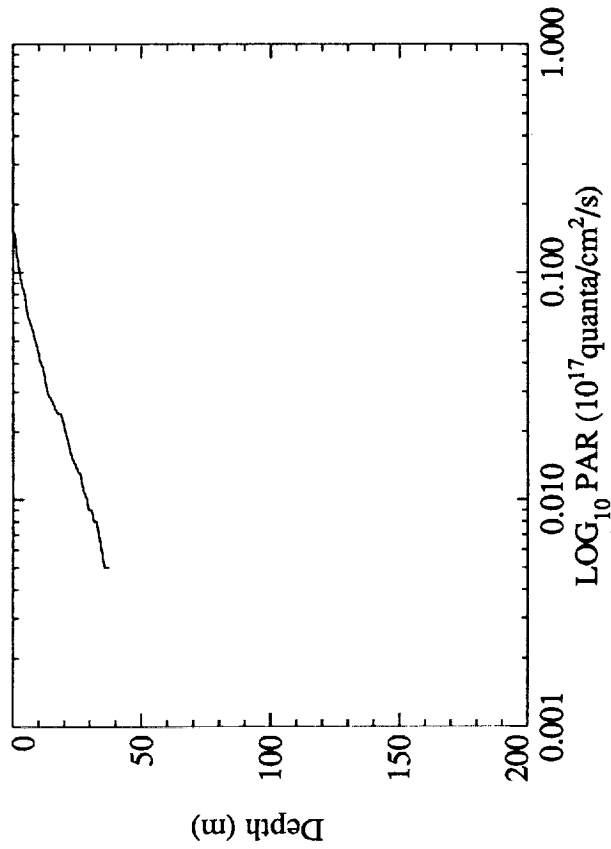


Figure 9. Continued

JETZ 06-20-87 Loc: sta 55

Lat: 38° 31.33' N Long: 123° 20.67' W File: j870620b

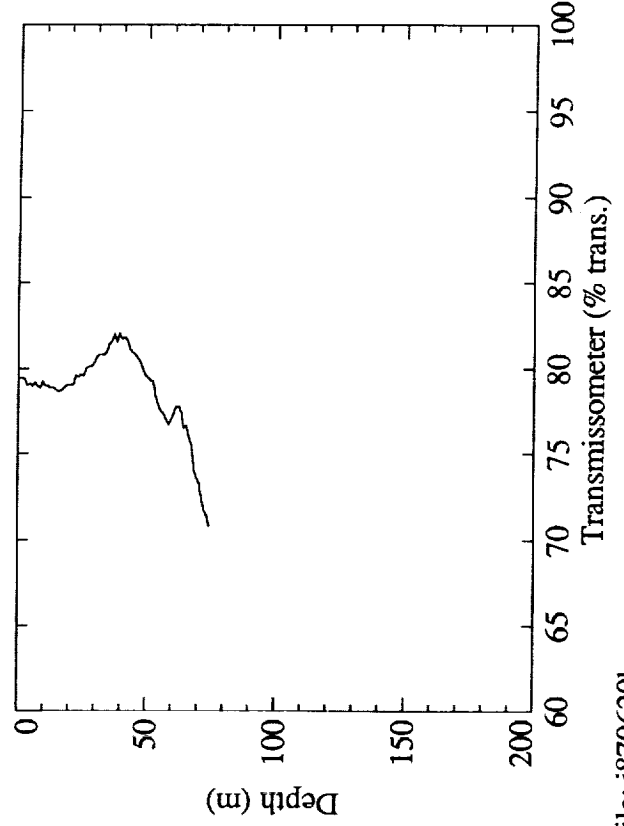
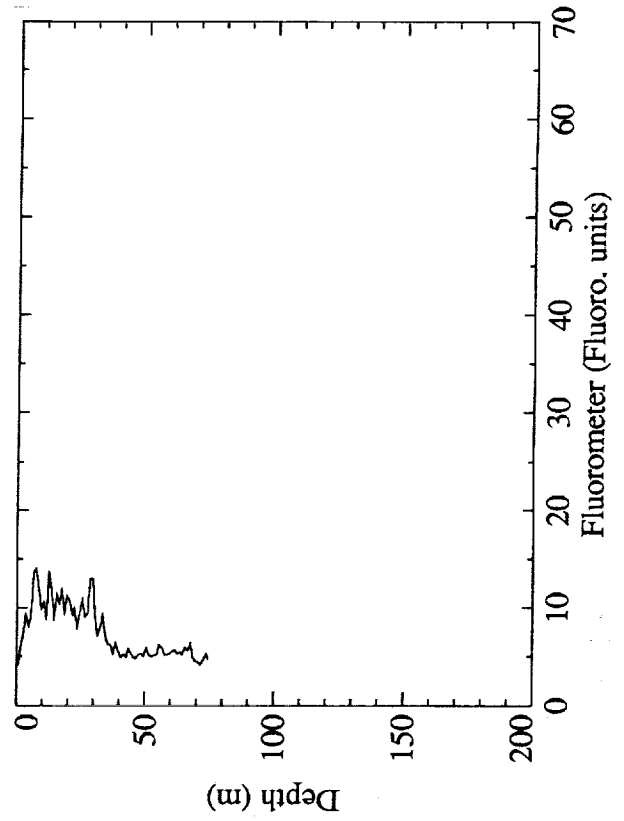
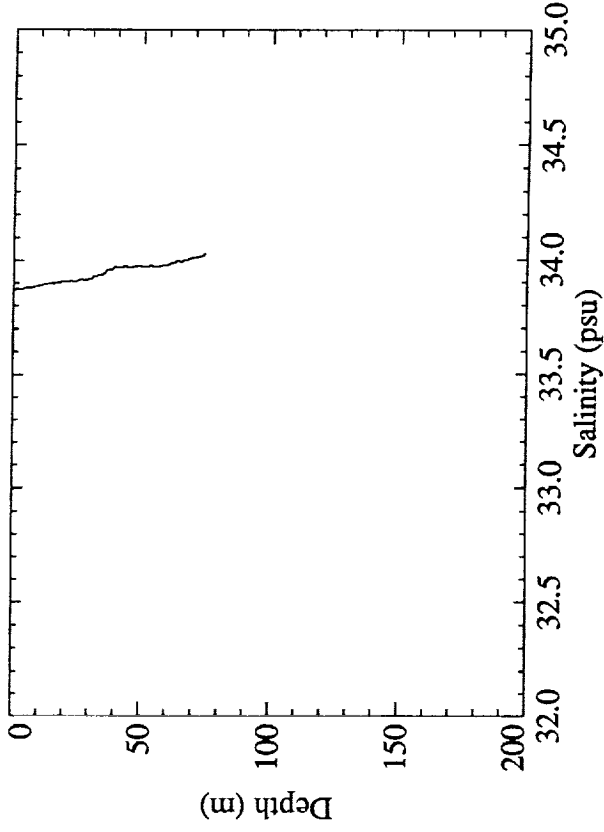
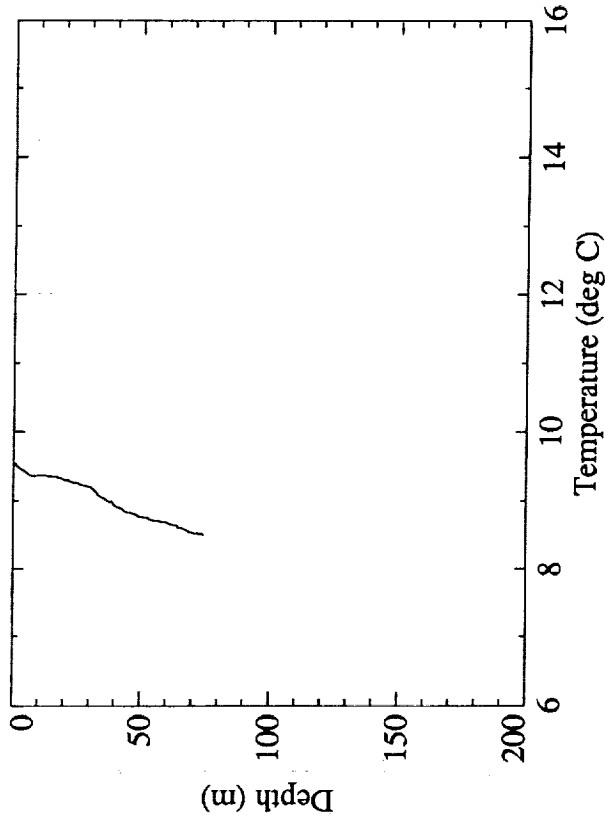


Figure 10. File: j870620b

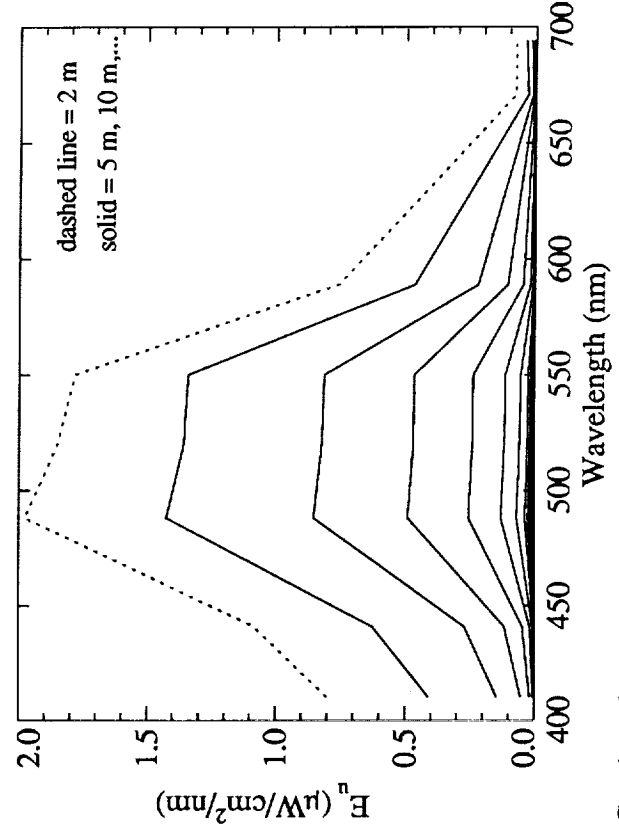
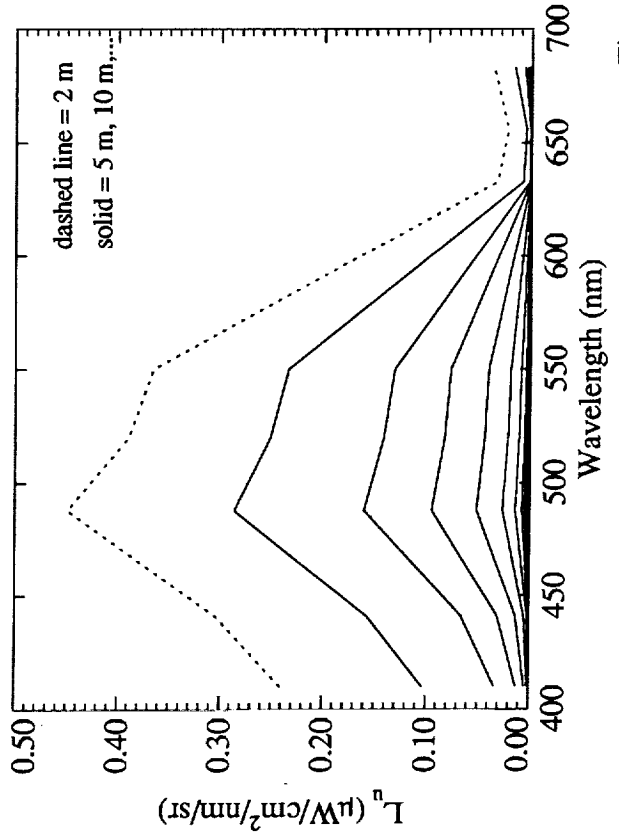
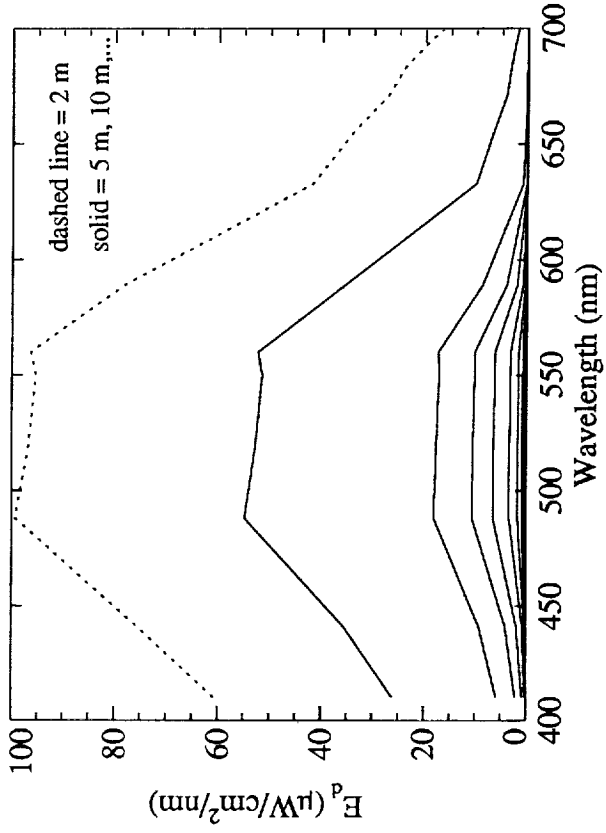
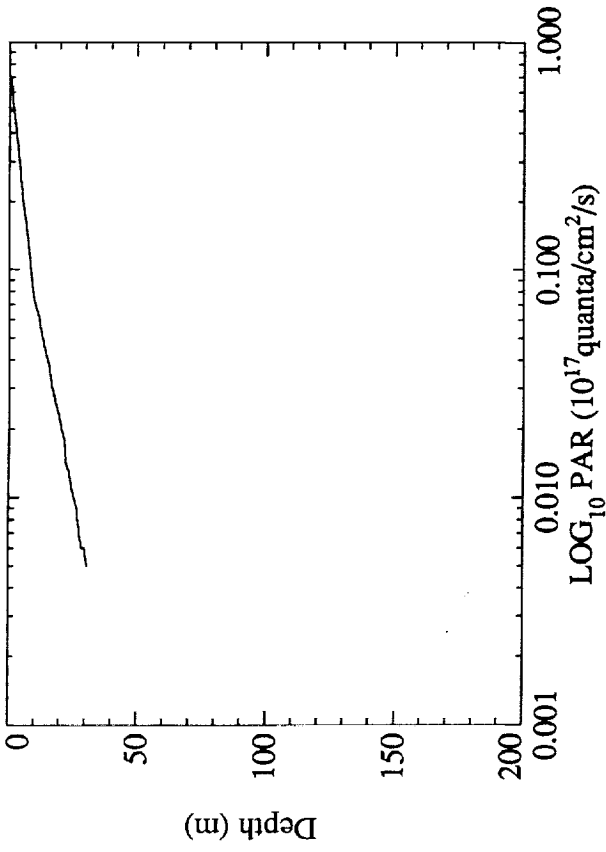


Figure 10. Continued

JETZ 06-20-87 Loc: sta 56 Lat: 38° 31.33' N Long: 123° 35.68' W File: j870620c

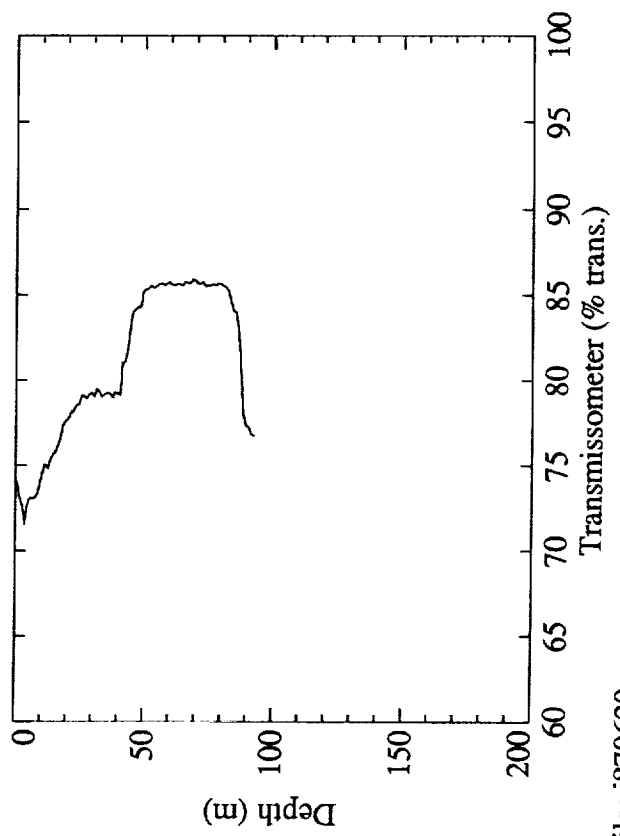
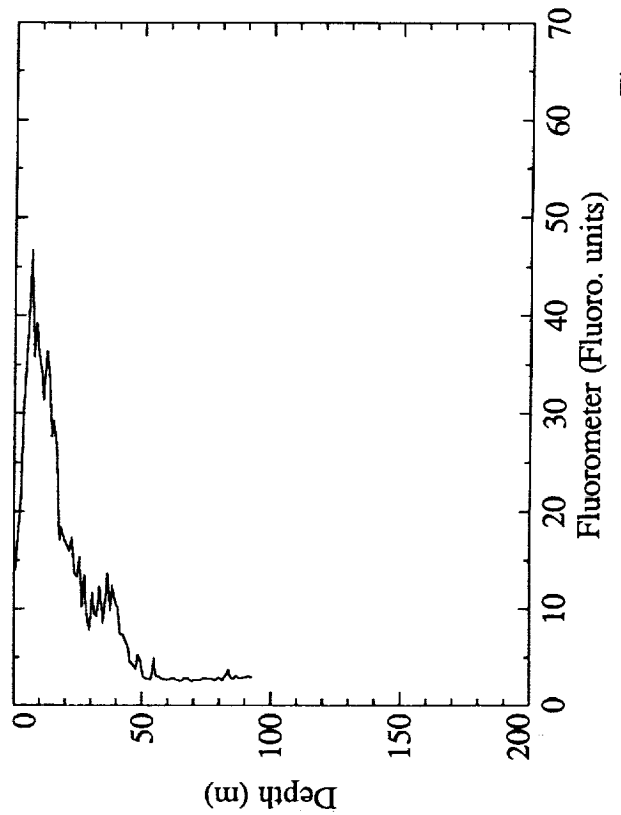
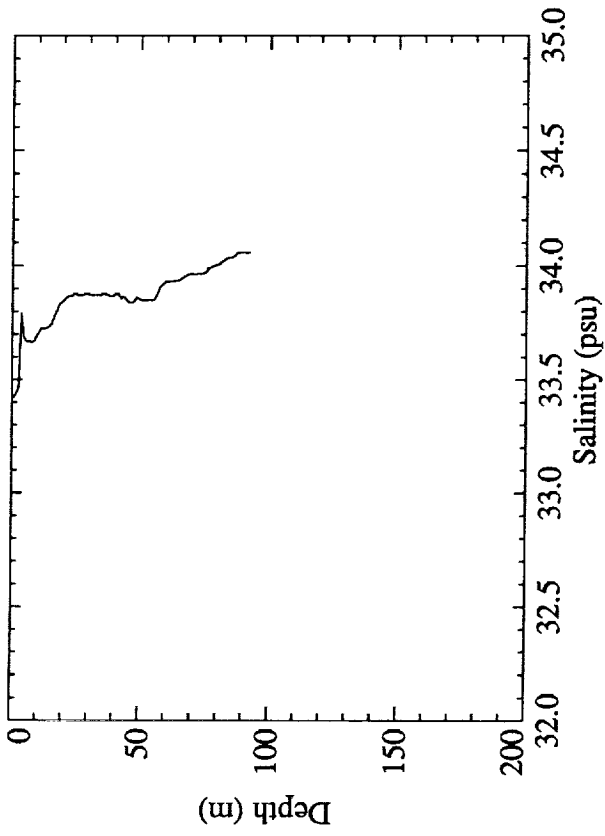
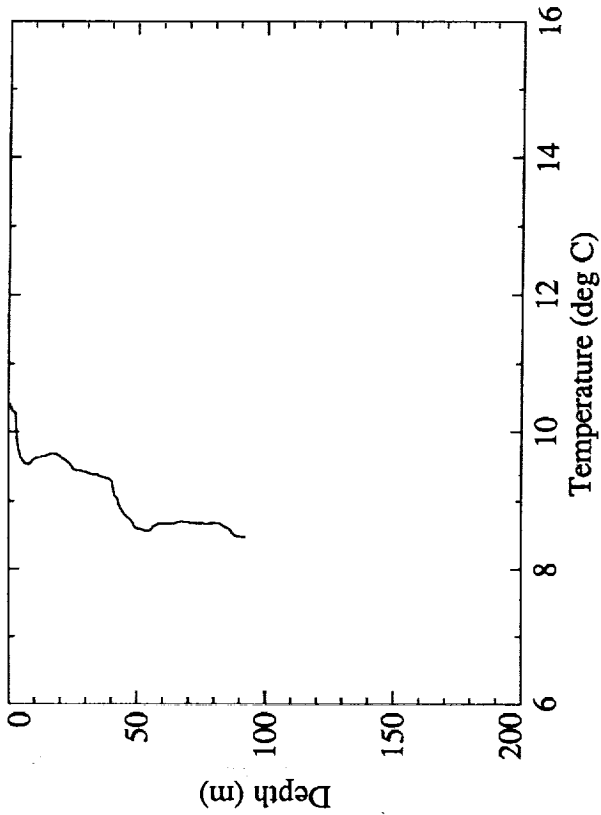


Figure 11. File: j870620c

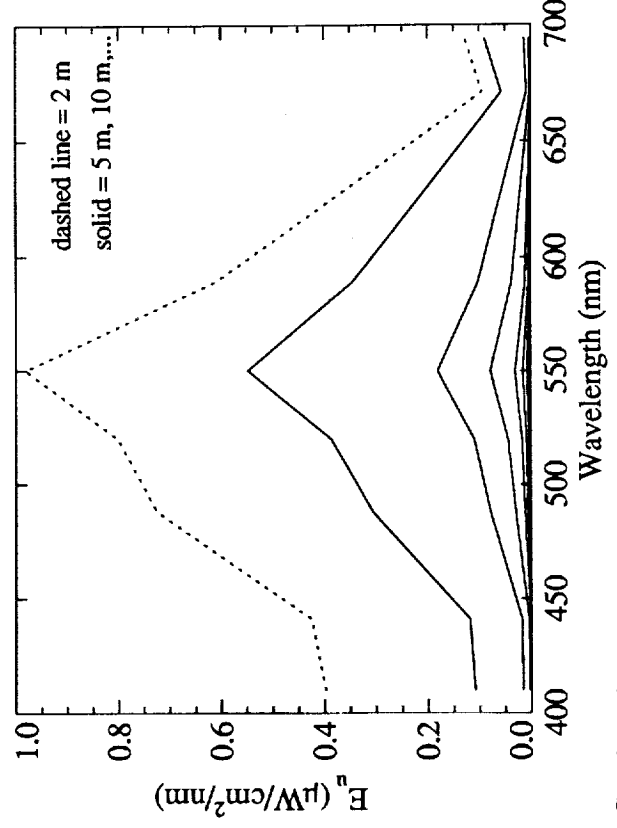
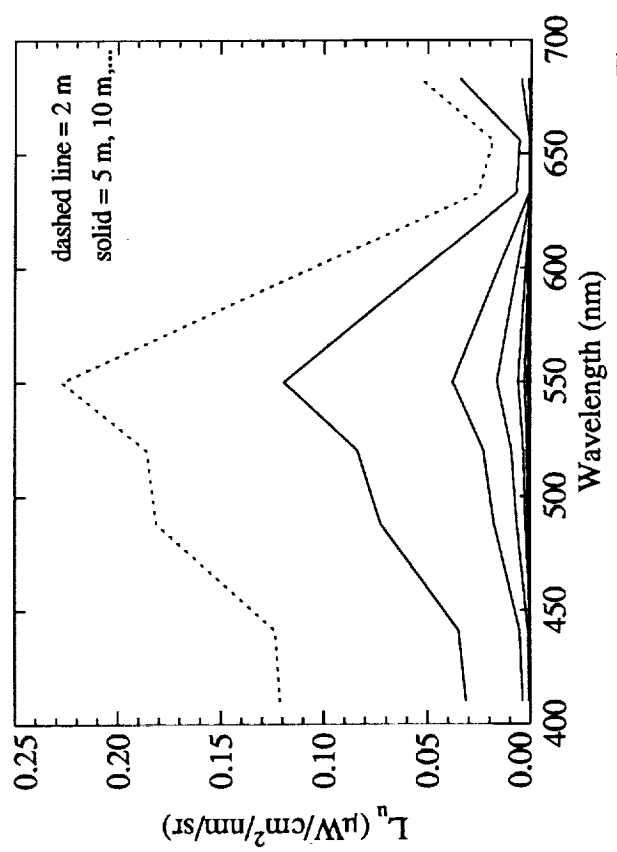
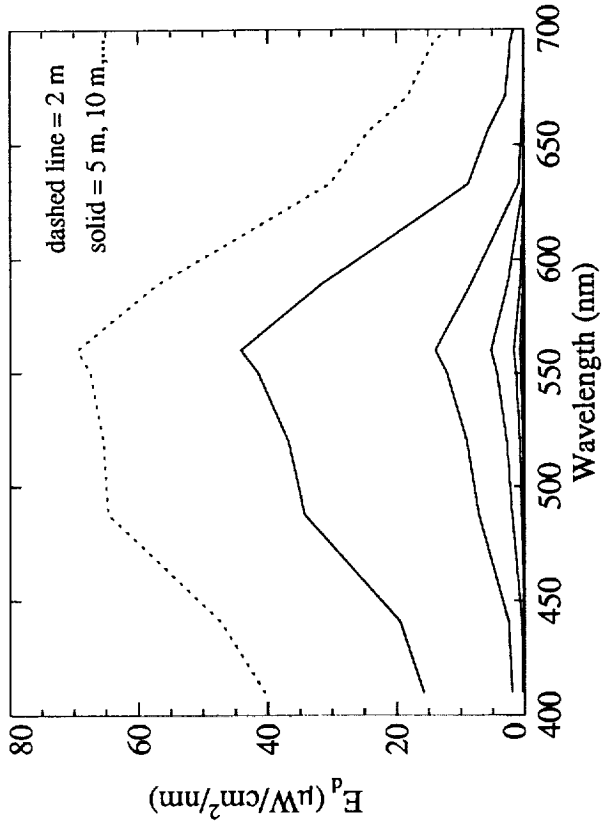
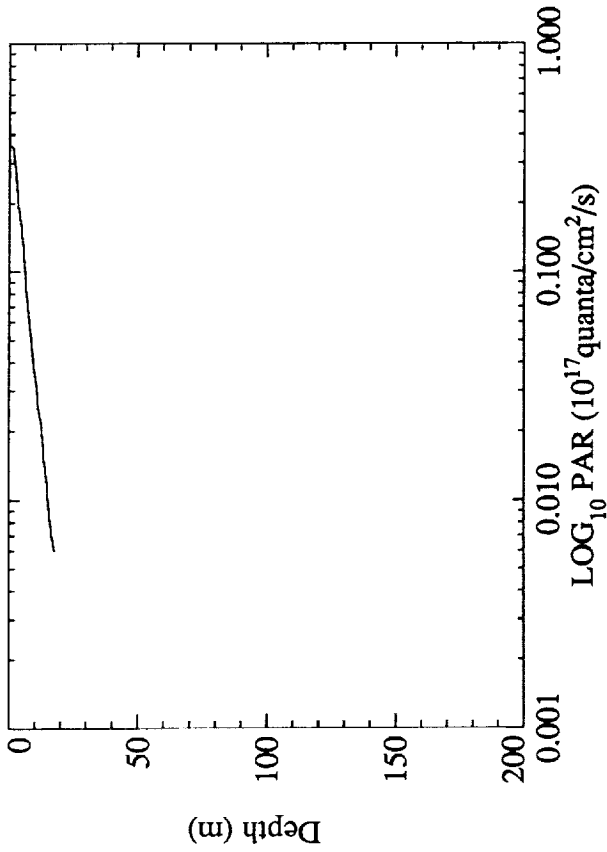


Figure 11. Continued

JETZ 06-20-87

Loc: sta 59

Lat: 39° 06.79' N

Long: 123° 51.83' W

File: j870620d

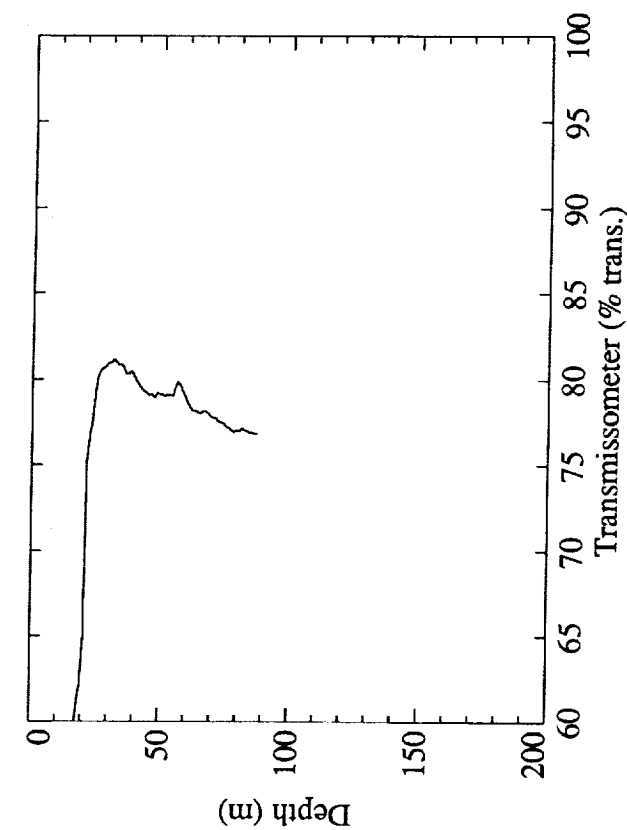
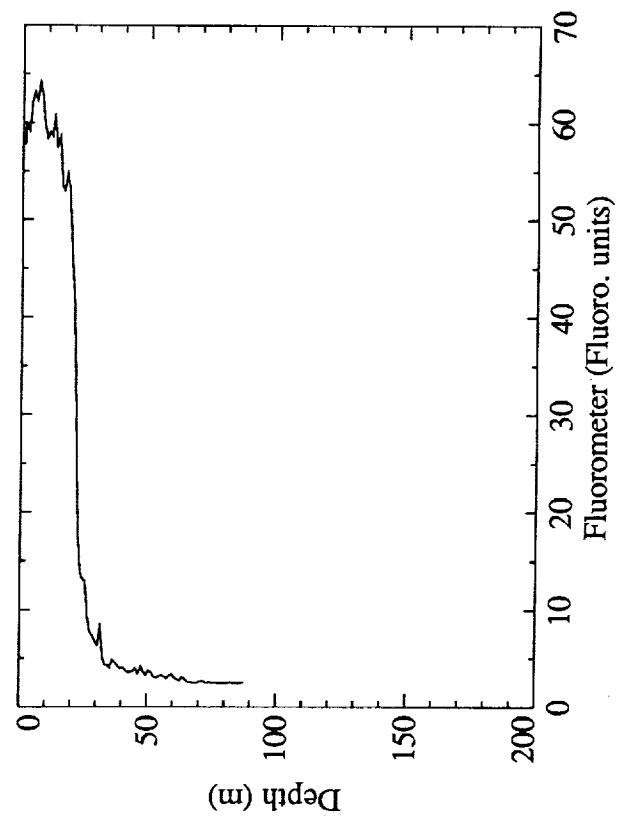
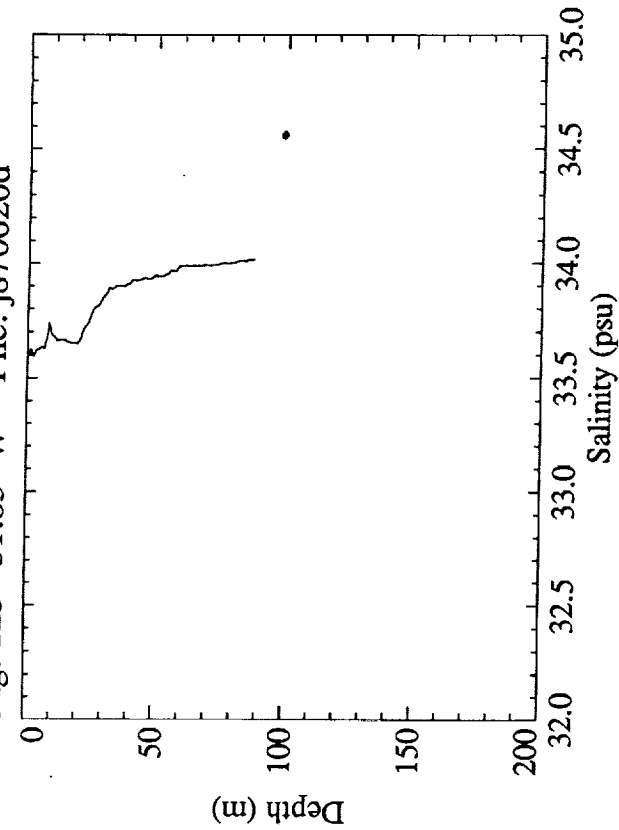
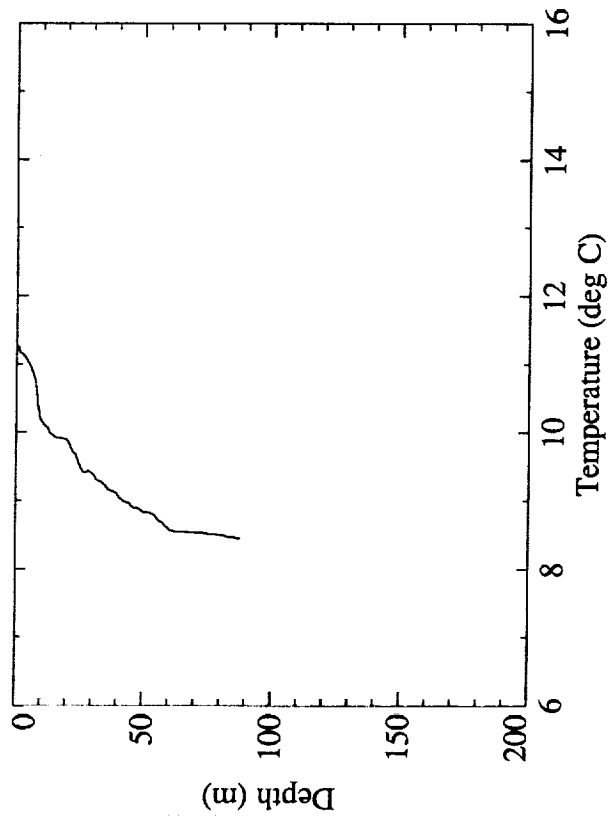


Figure 12. File: j870620d

JETZ 06-20-87 Loc: sta 59 Lat: 39° 06.79' N Long: 123° 51.83' W File: j870620d

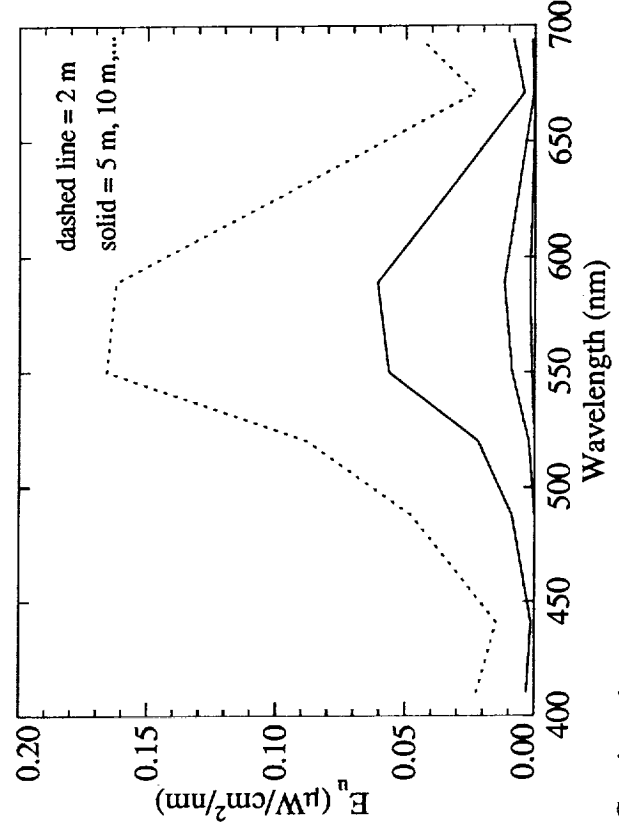
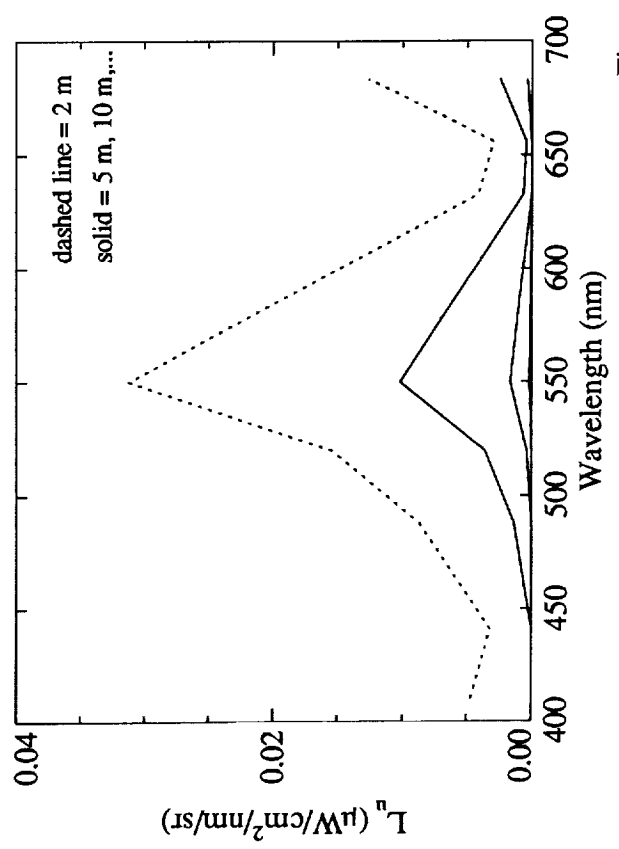
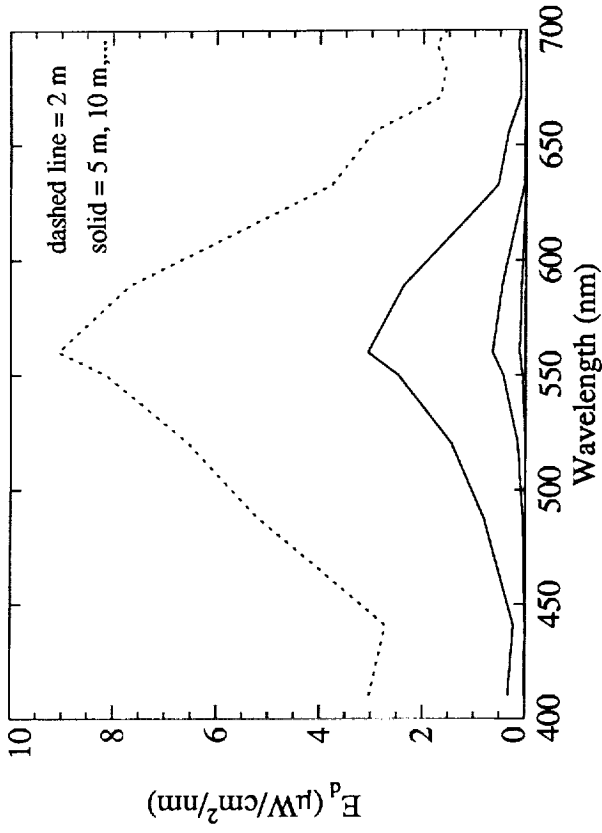
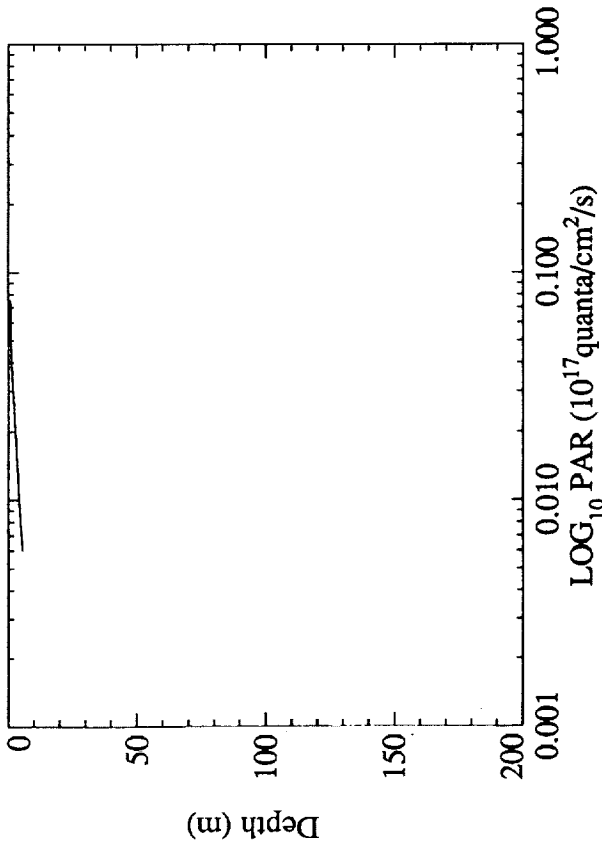


Figure 12. Continued

JETZ 06-21-87

Loc: sta 70

Lat: 38° 11.36' N

Long: 123° 46.38' W

File: j870621a

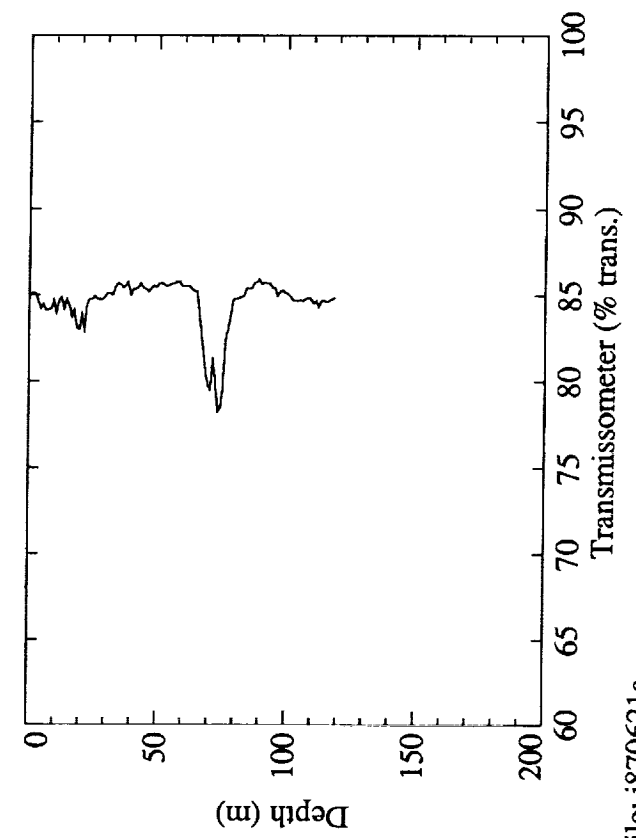
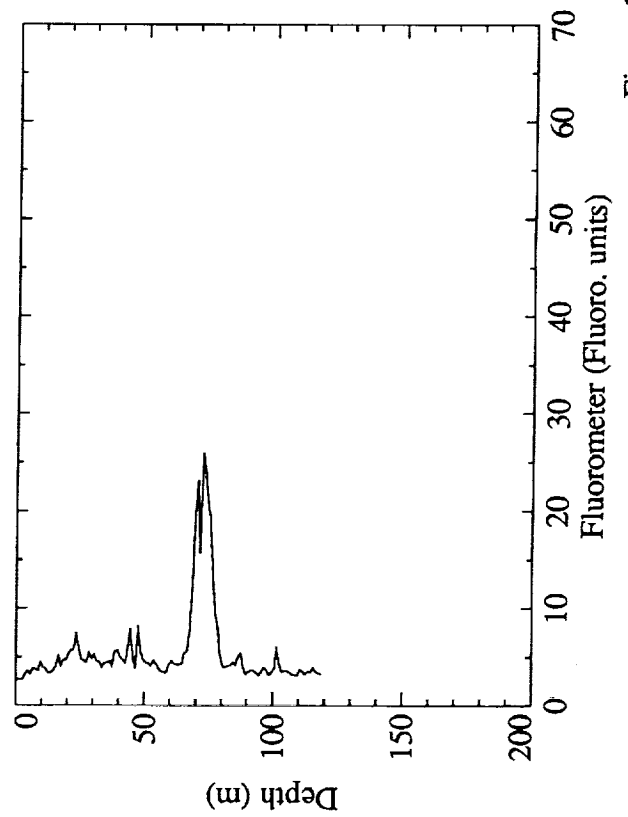
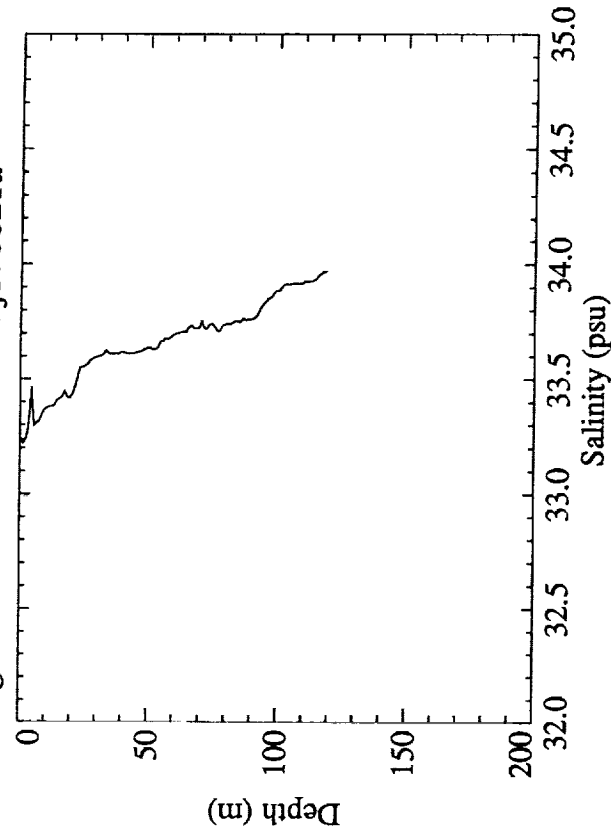
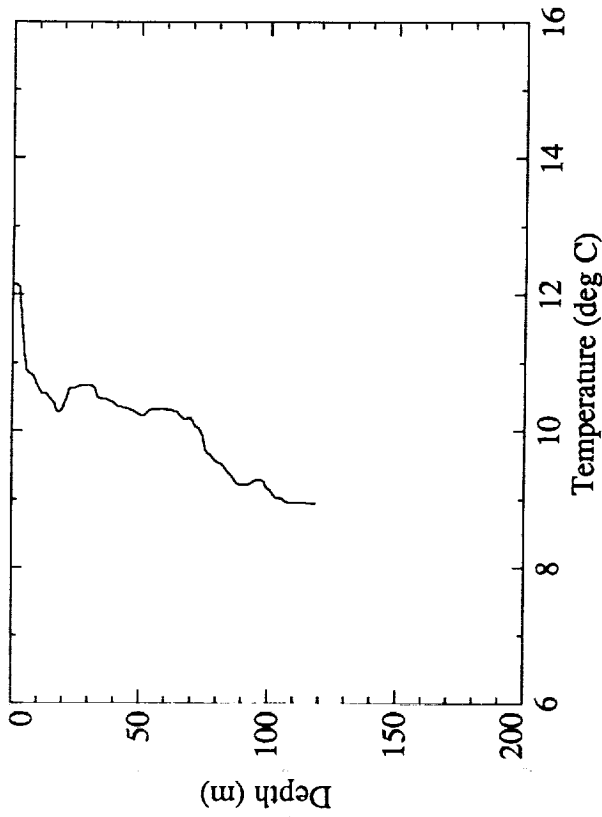


Figure 13. File: j870621a

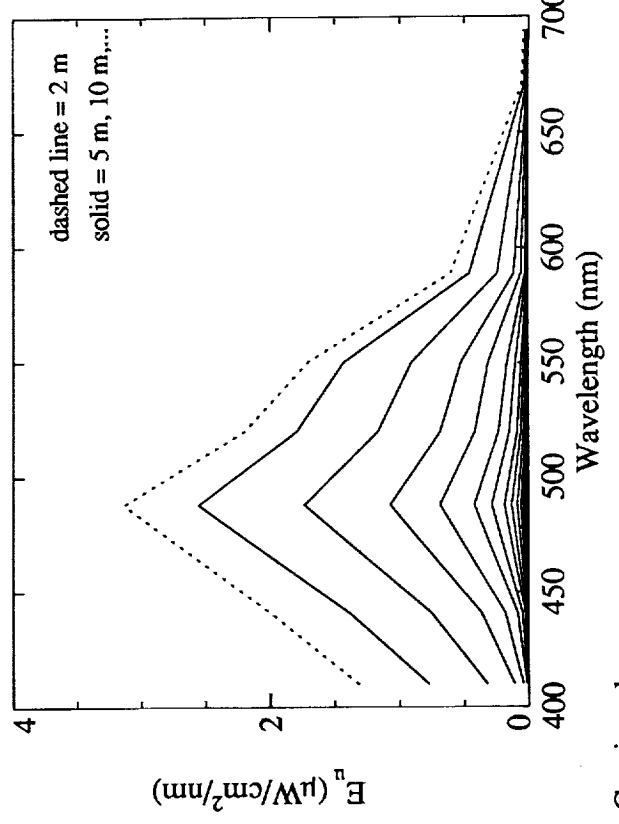
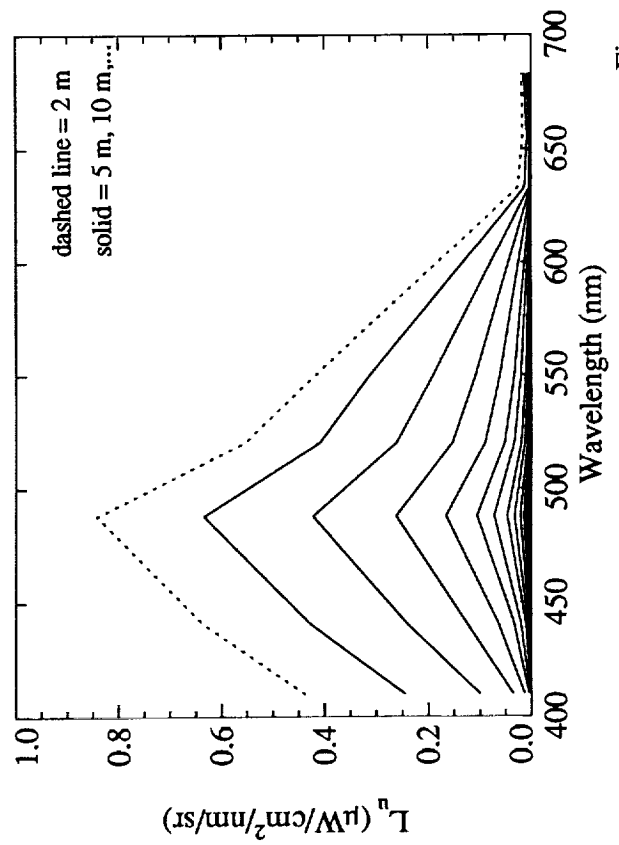
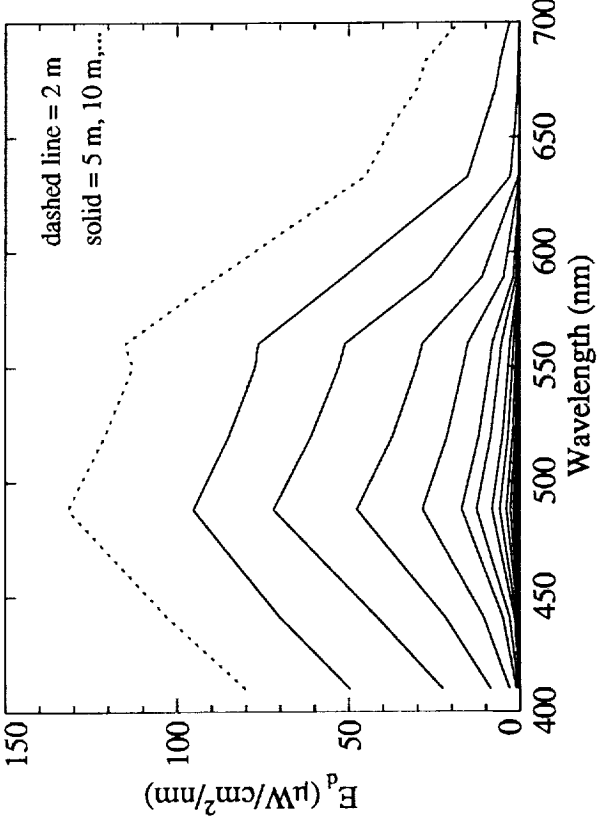
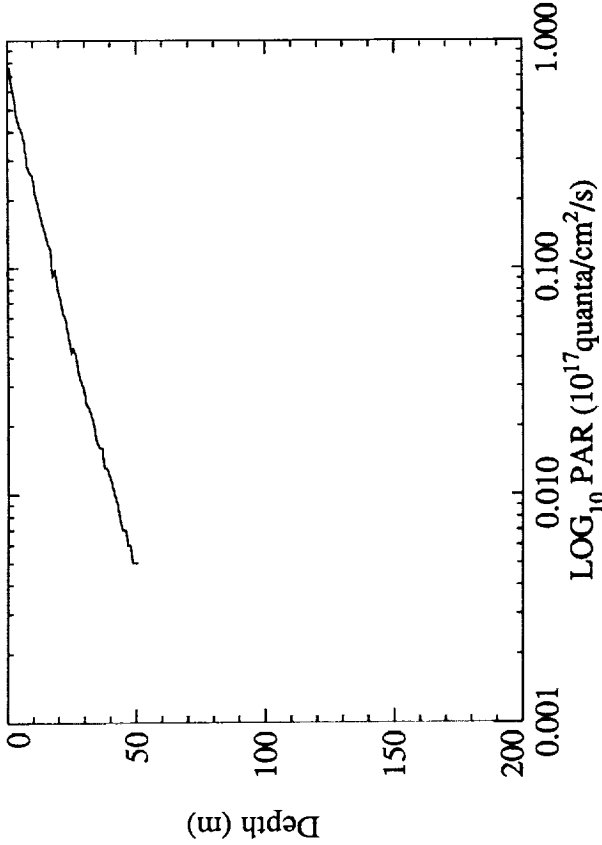


Figure 13. Continued

JETZ 06-21-87 Loc: sta 73

Lat: 38° 32.16' N Long: 124° 00.0' W File: j870621b

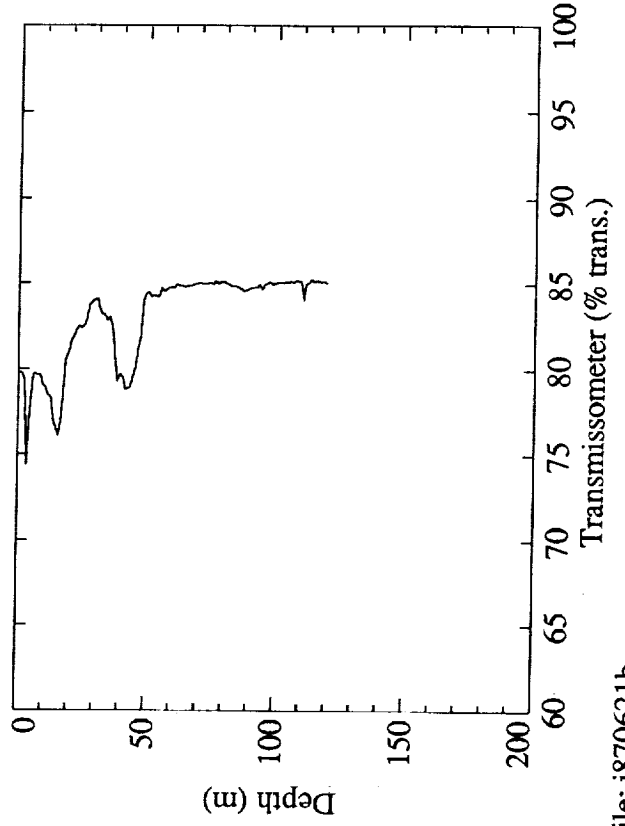
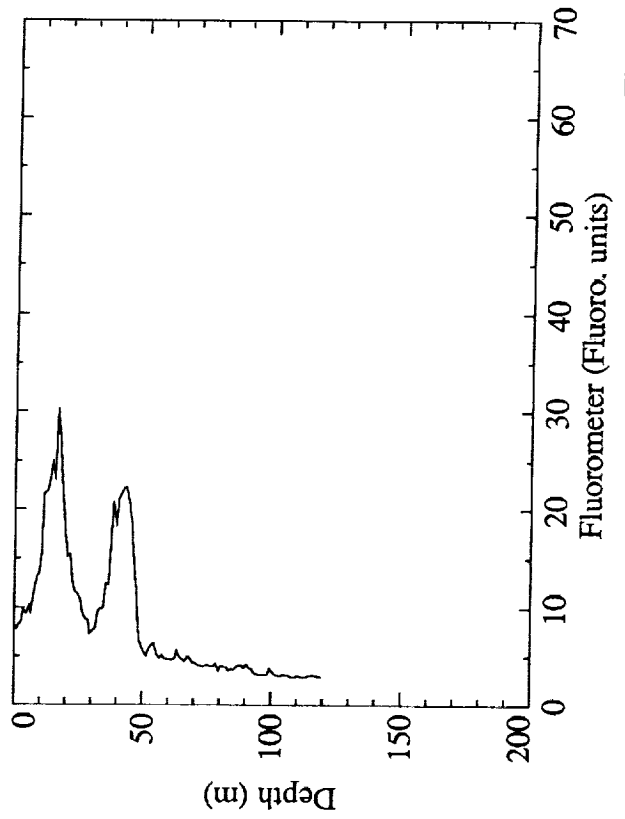
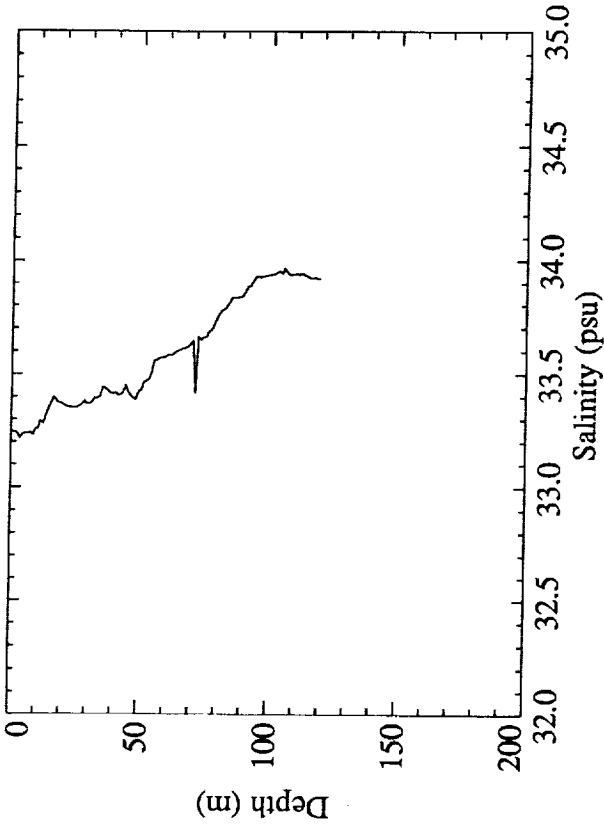
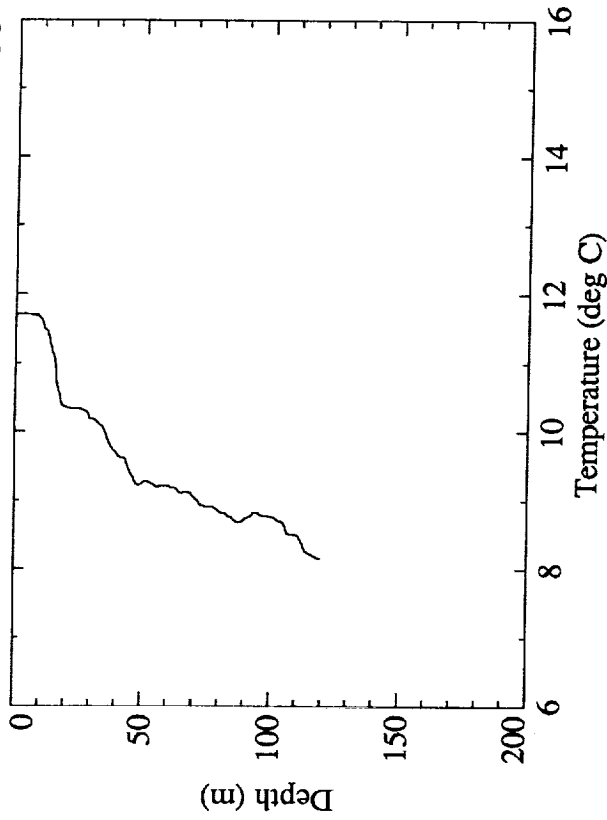


Figure 14. File: j870621b

JETZ 06-21-87 Loc: sta 73 Lat: 38° 32.16' N Long: 124° 00.0' W File: j870621b

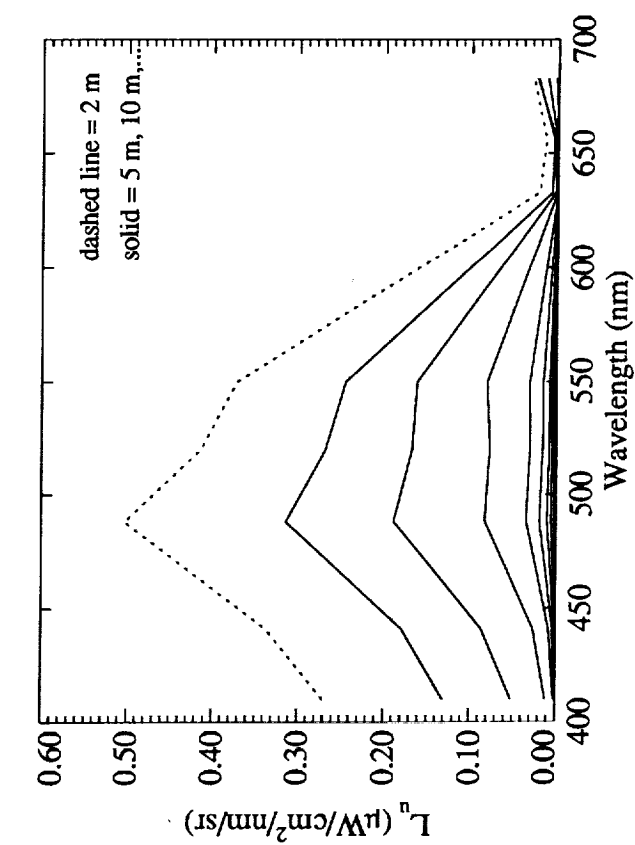
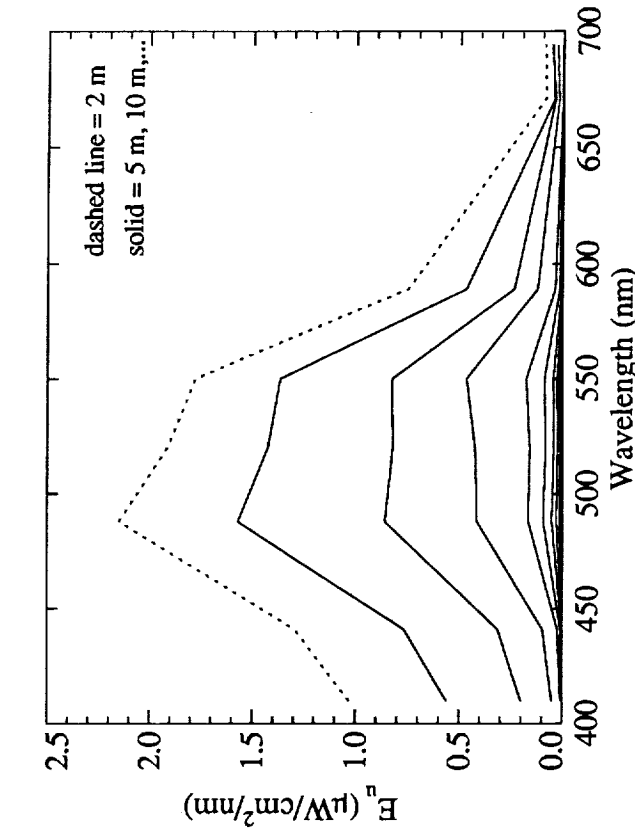
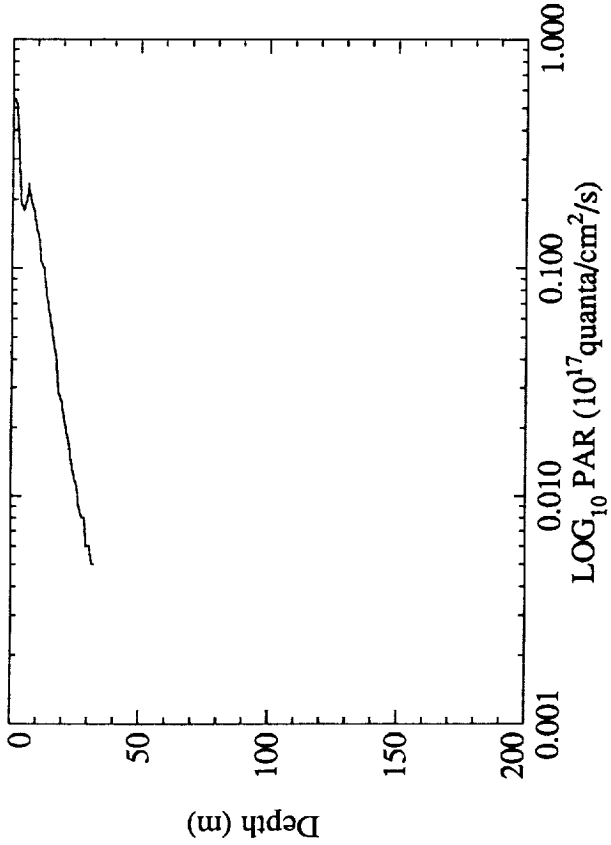
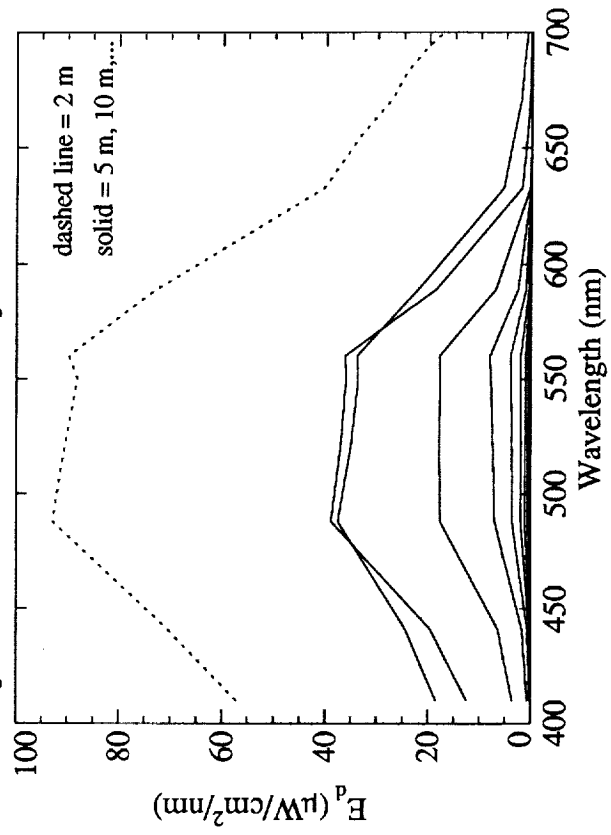


Figure 14. Continued

JETZ 06-25-87 Loc: sta 79

Lat: 38° 31.33' N Long: 123° 20.67' W File: j870625a

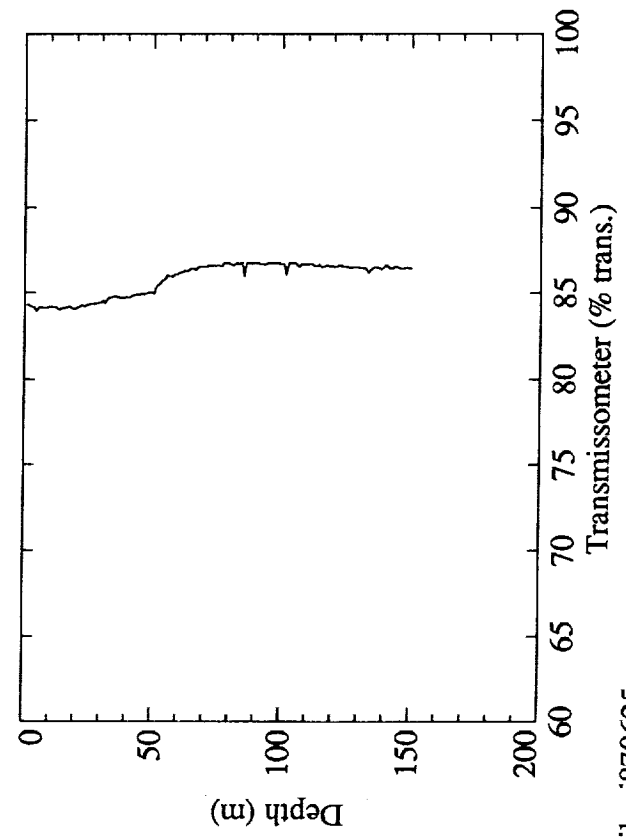
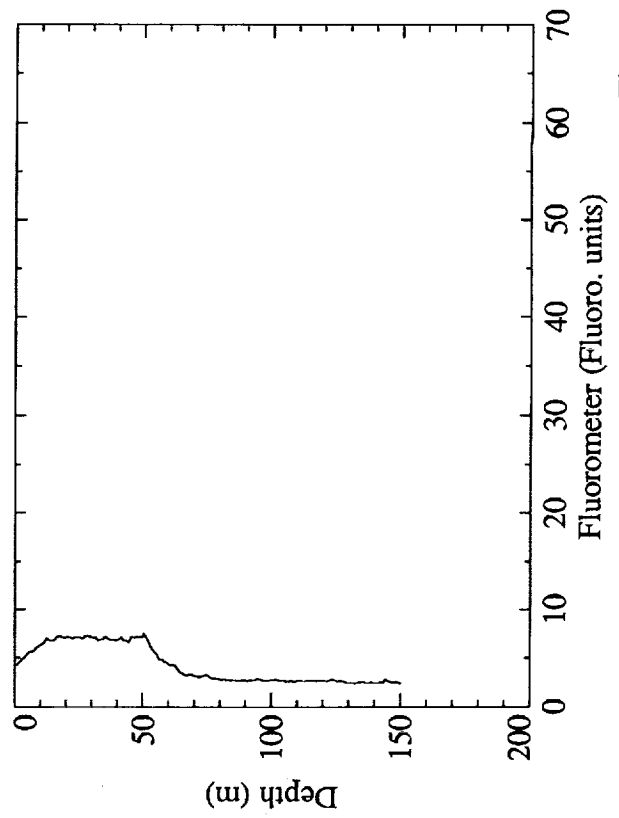
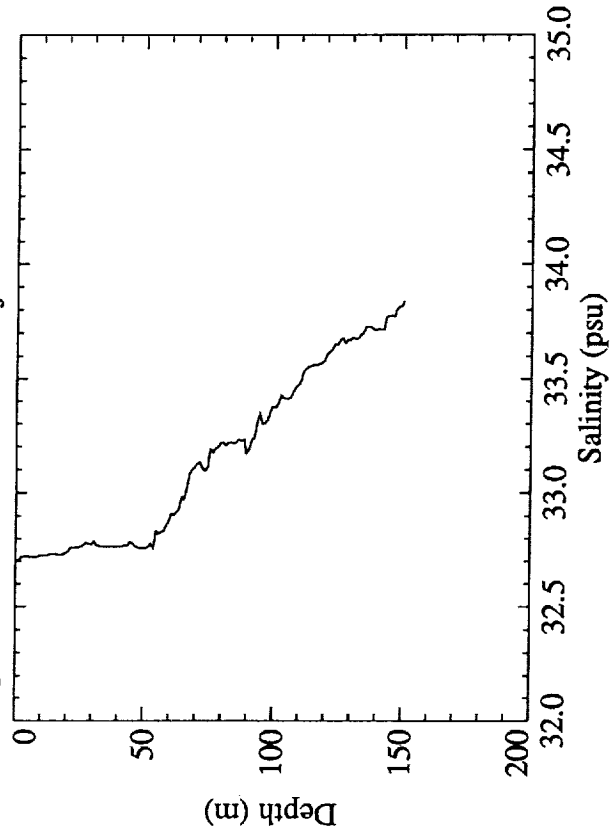
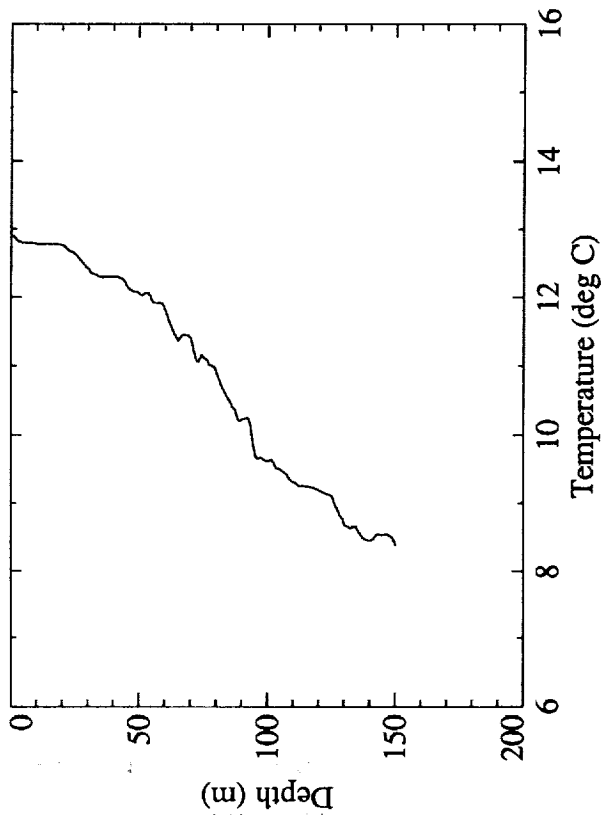


Figure 15. File: j870625a

JETZ 06-25-87 Loc: sta 79 Lat: 38° 31.33' N Long: 123° 20.67' W File: j870625a

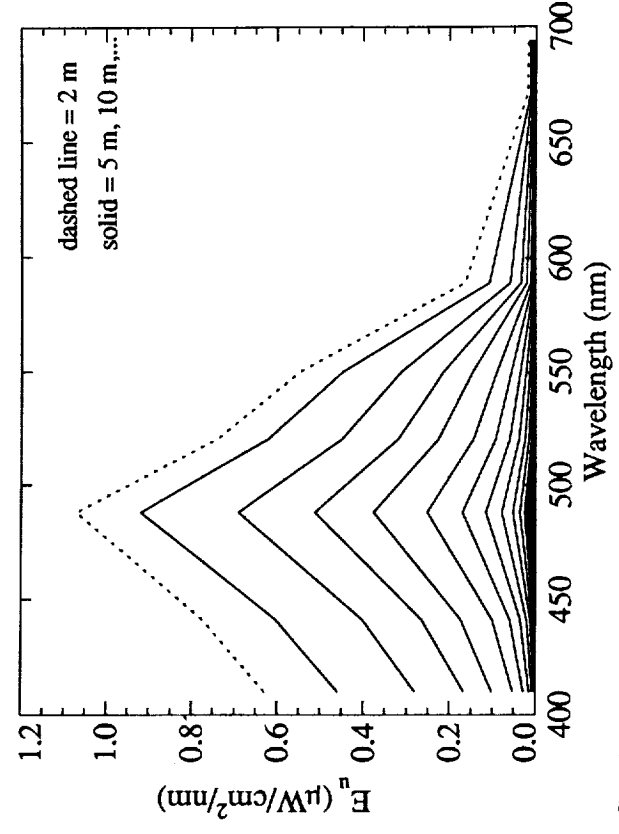
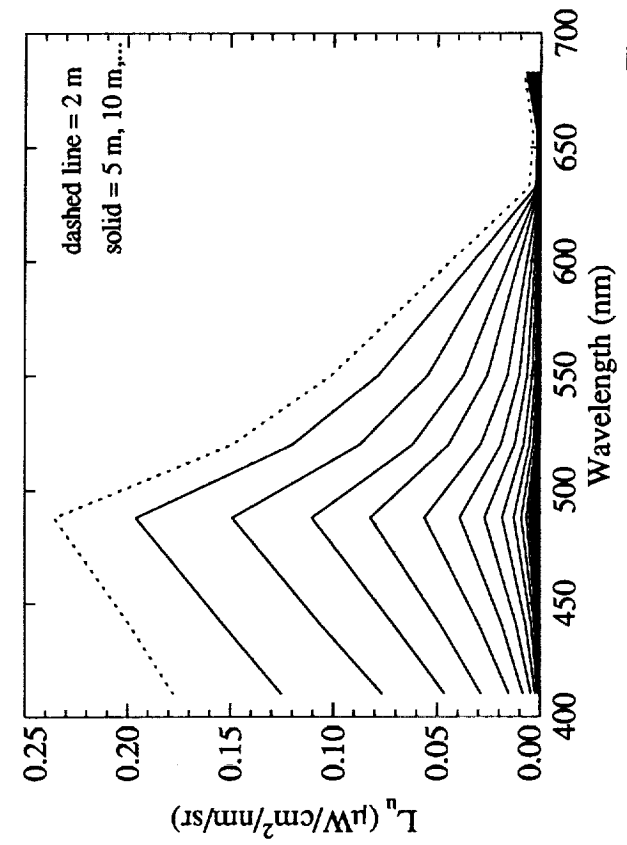
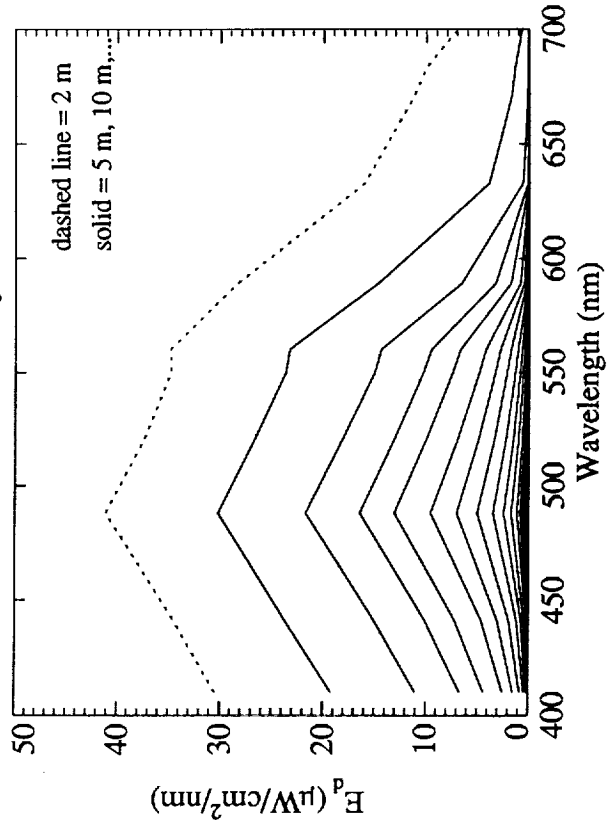
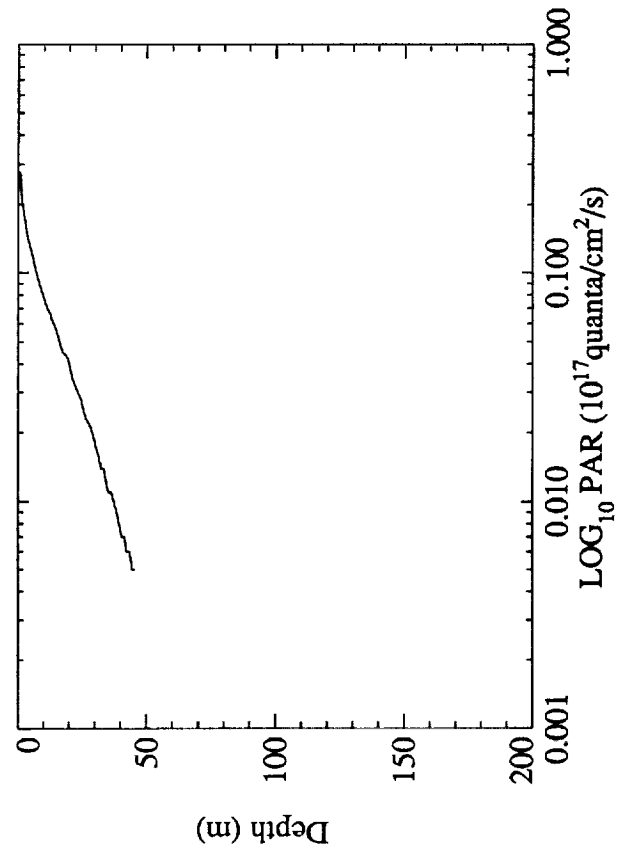


Figure 15. Continued

JETZ 06-26-87 Loc: sta 90 Lat: 38° 26.80' N Long: 124° 17.16' W File: j870626a

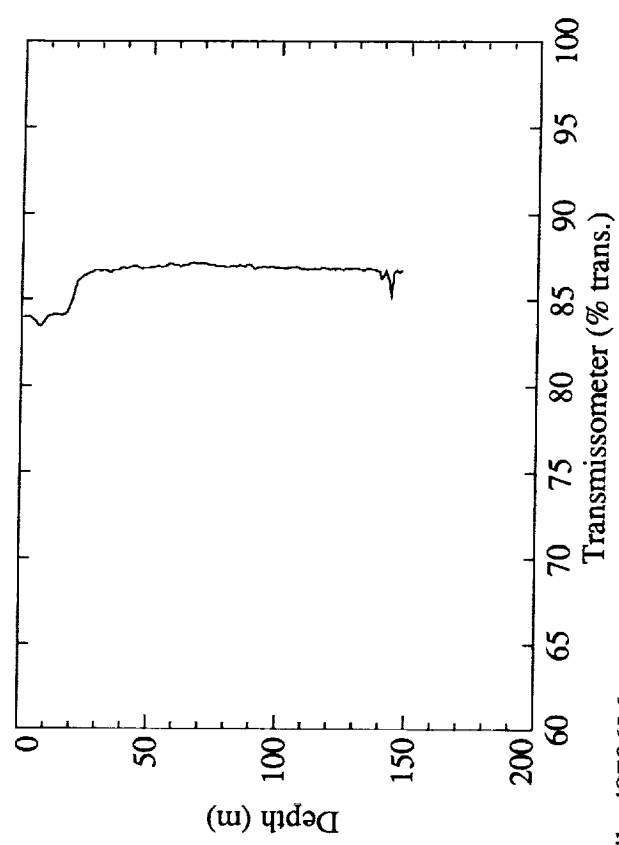
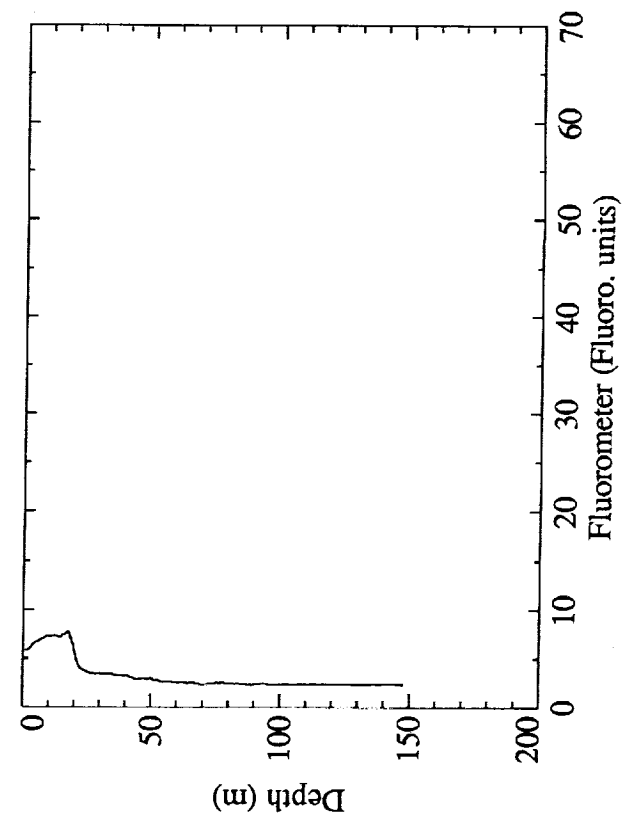
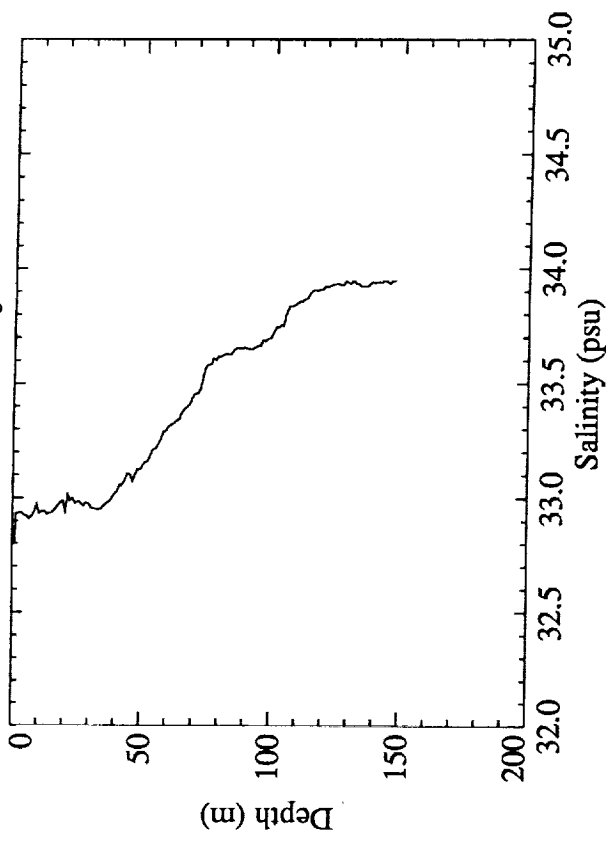
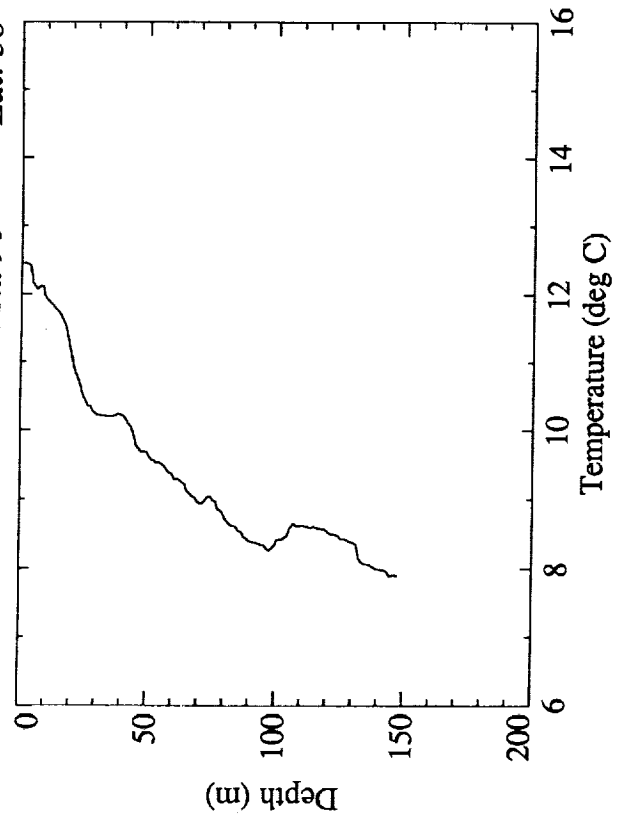


Figure 16. File: j870626a

JETZ 06-26-87 Loc: sta 90 Lat: 38° 26.80' N Long: 124° 17.16' W File: j870626a

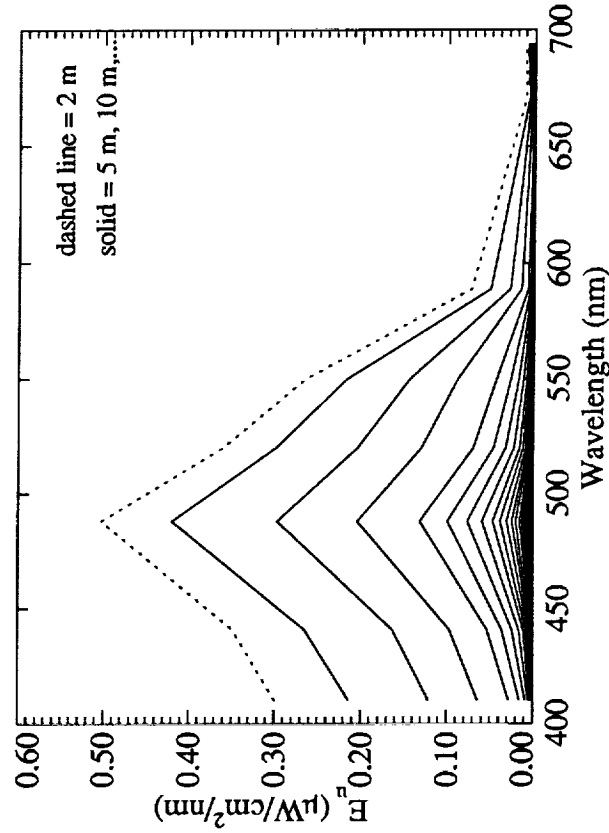
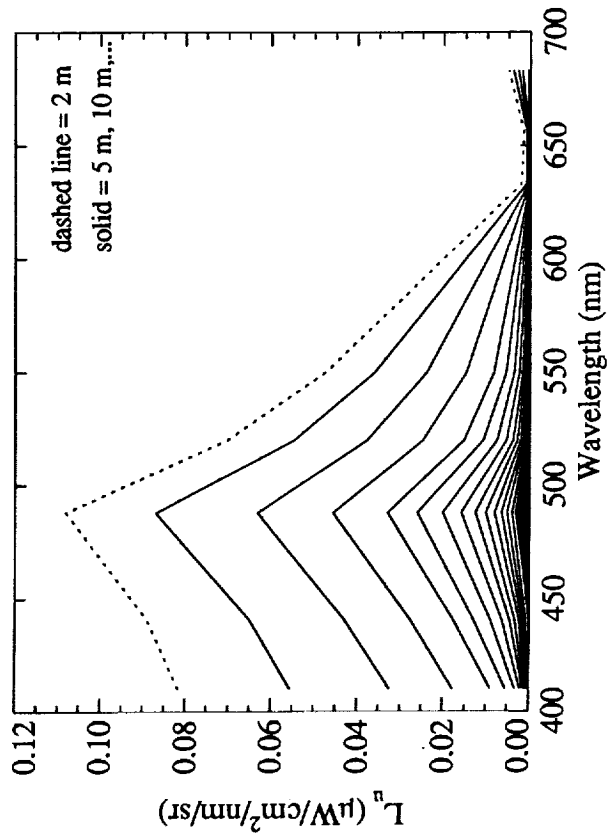
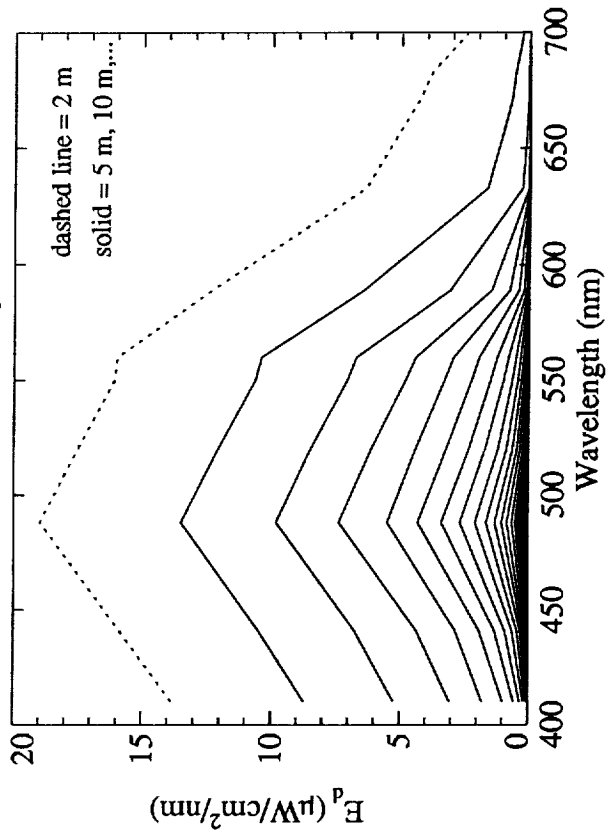
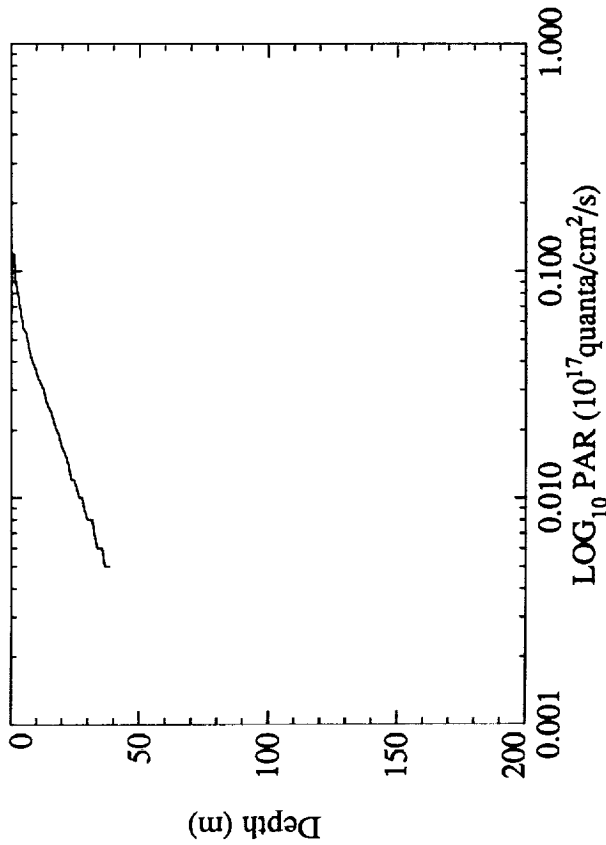


Figure 16. Continued

JETZ 06-26-87 Loc: sta 91 Lat: 38° 23.91' N Long: 124° 15.13' W File: j870626b

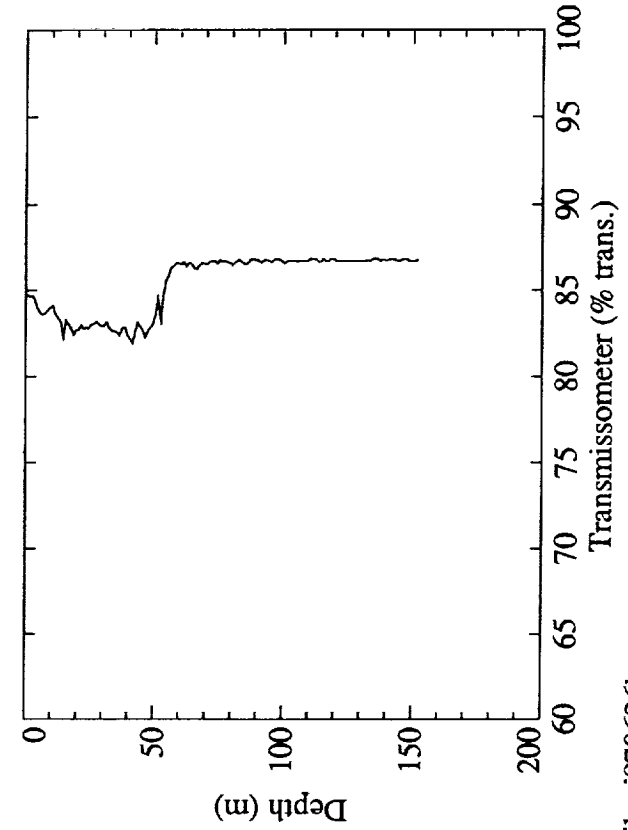
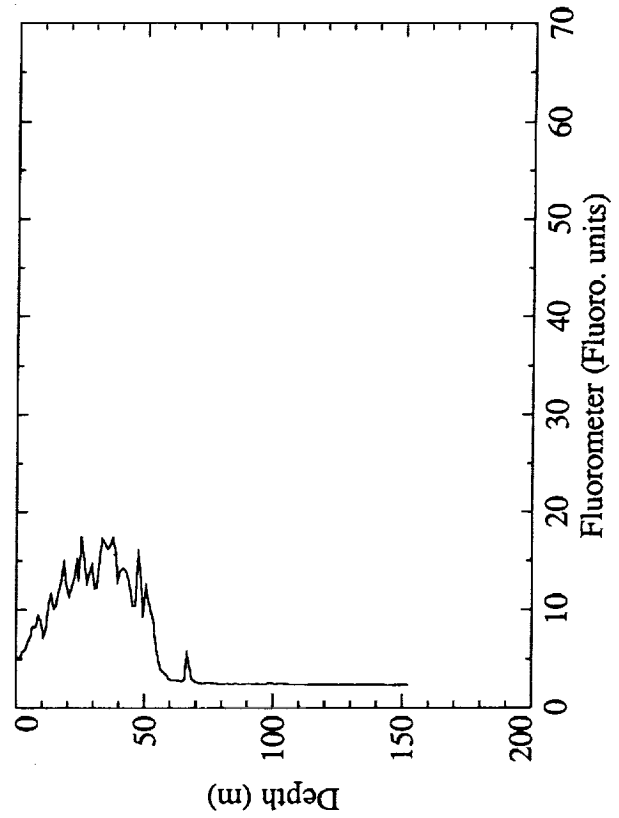
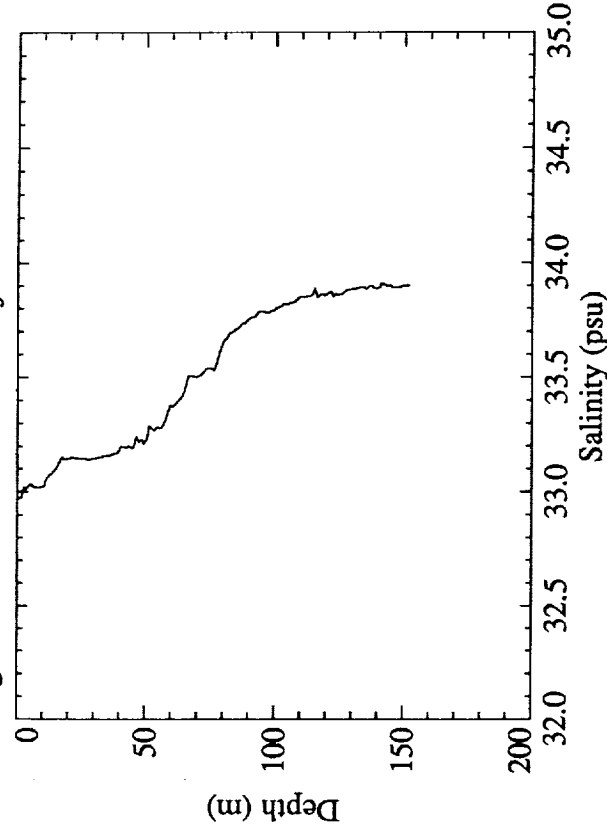
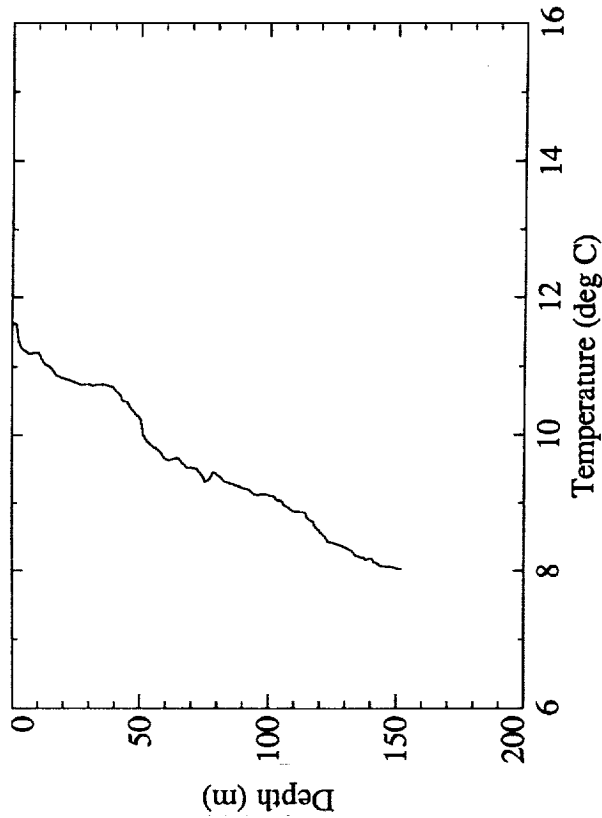


Figure 17. File: j870626b

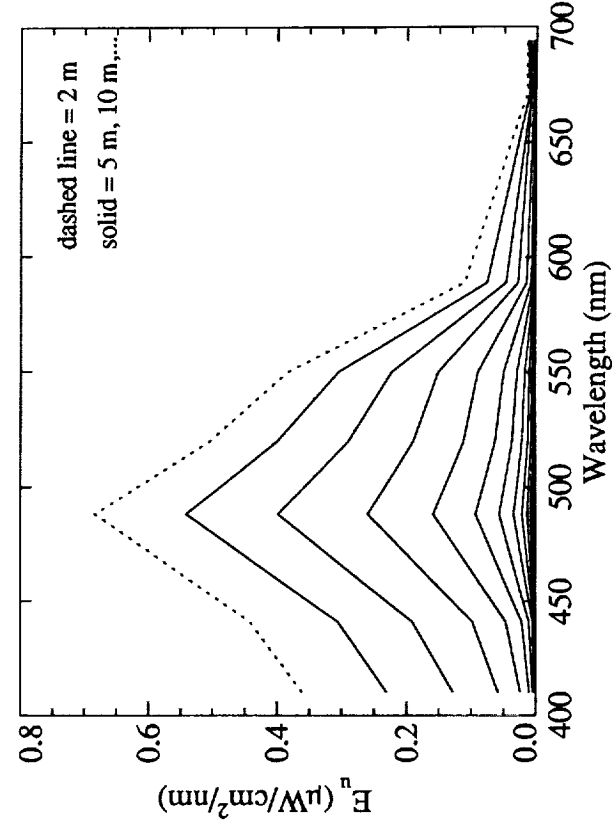
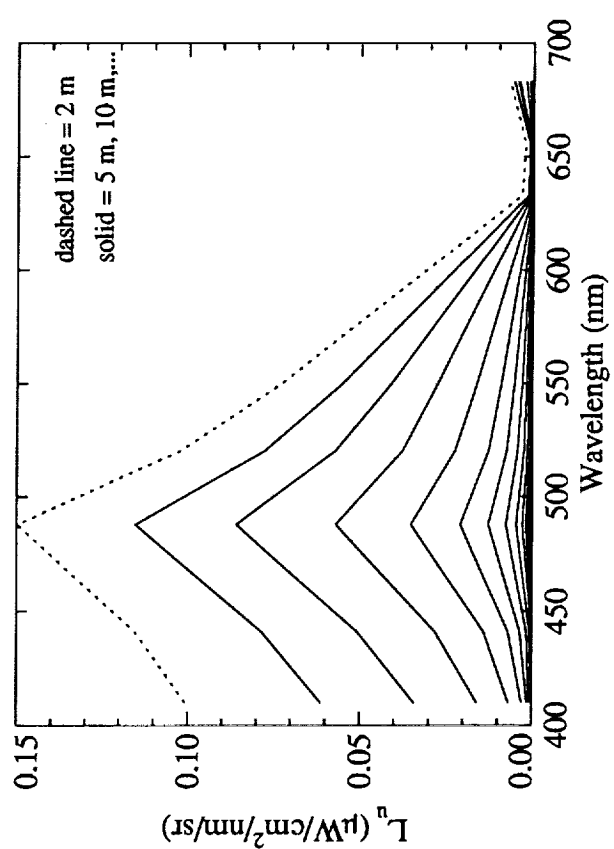
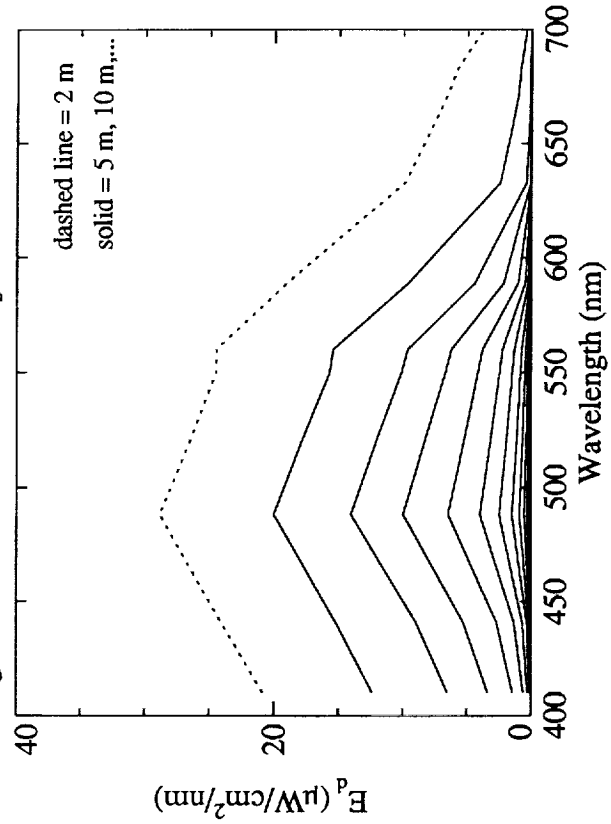
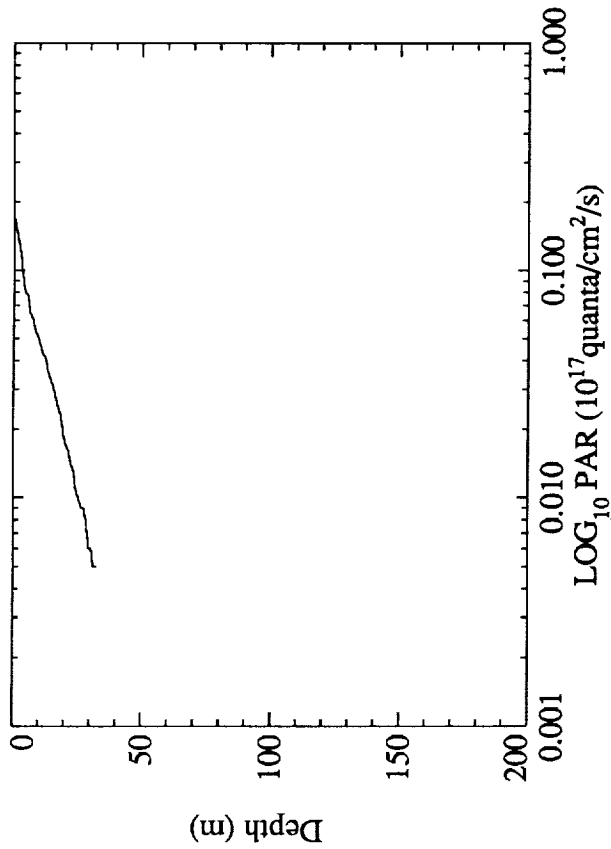


Figure 17. Continued

JETZ 06-26-87 Loc: sta 91 Lat: 38° 20.22' N Long: 124° 12.64' W File: j870626c

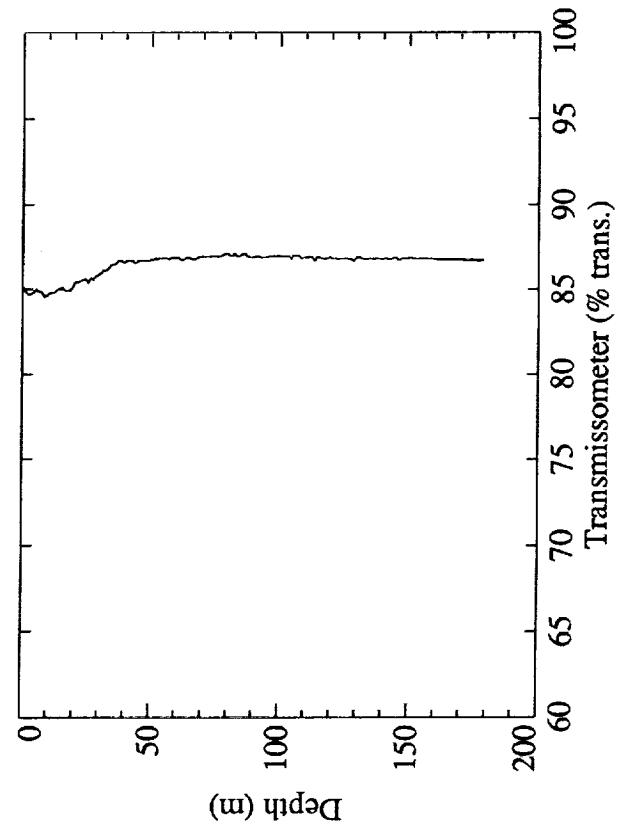
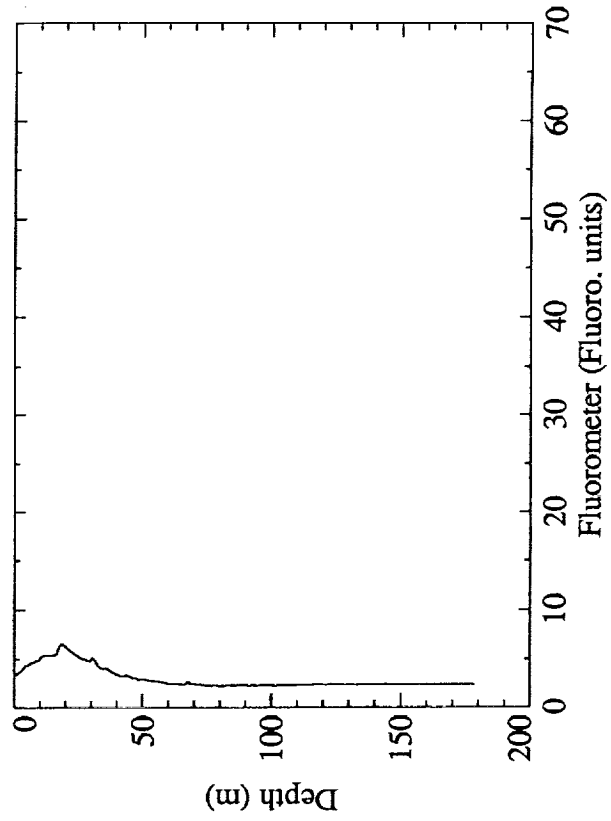
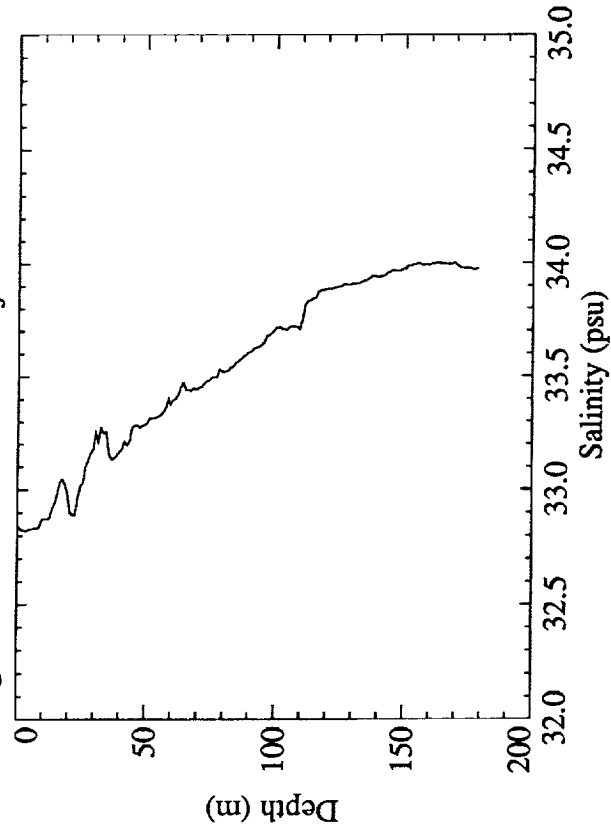
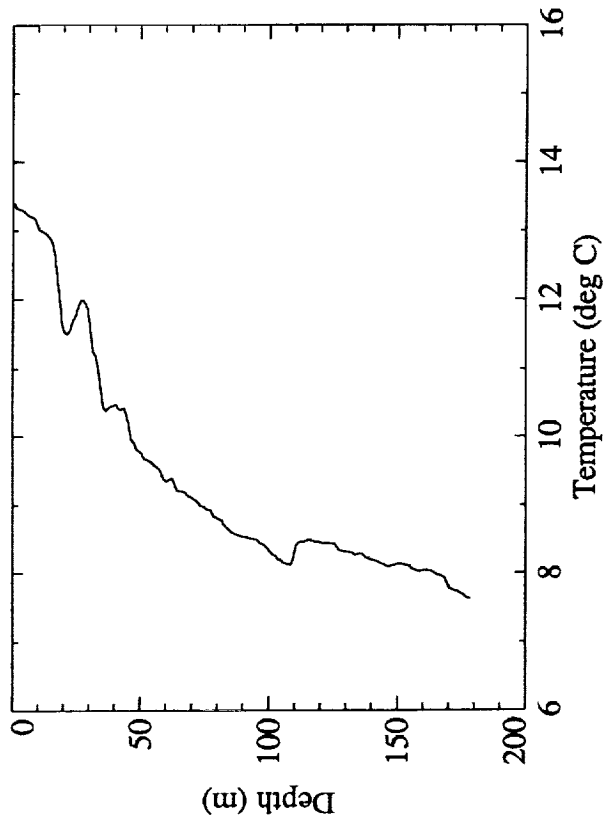


Figure 18. File: j870626c

JETZ 06-26-87 Loc: sta 91 Lat: 38° 20.22' N Long: 124° 12.64' W File: j870626c

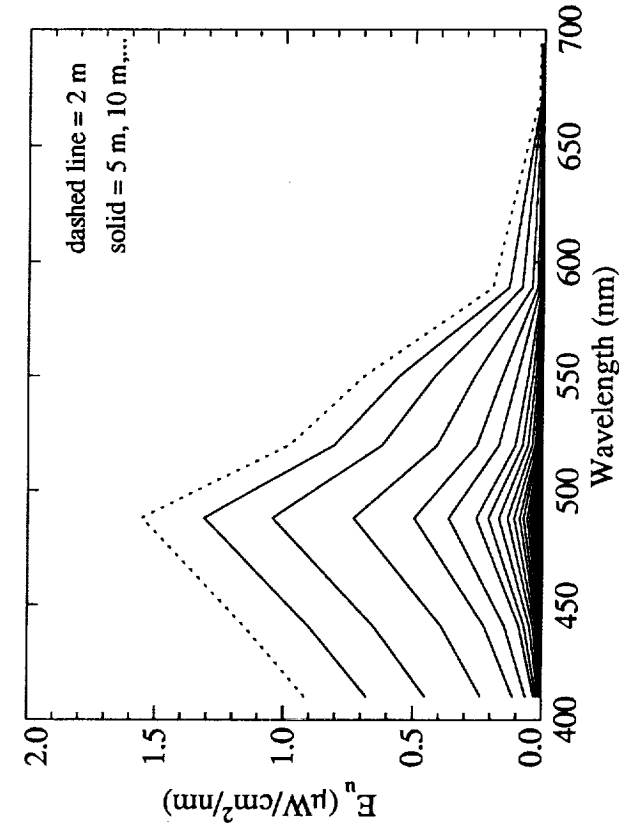
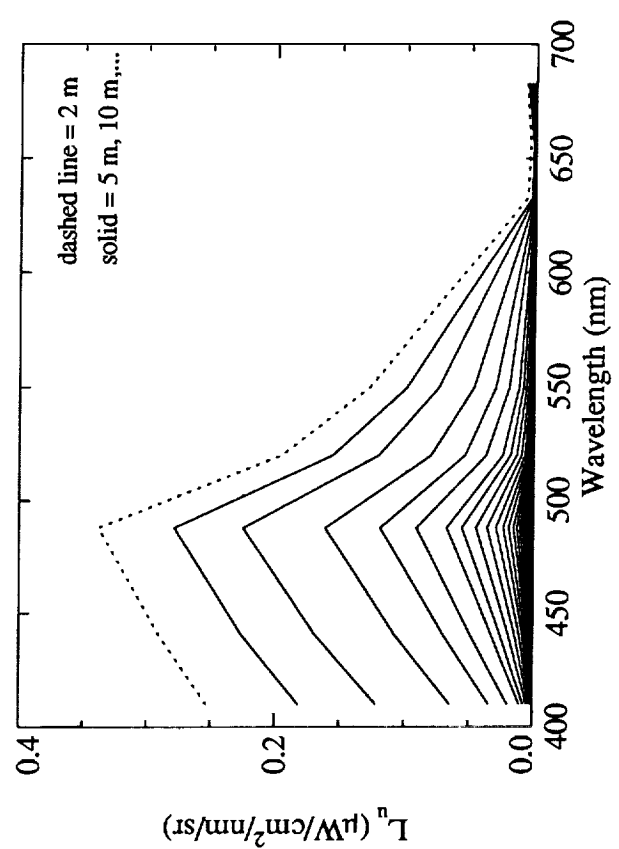
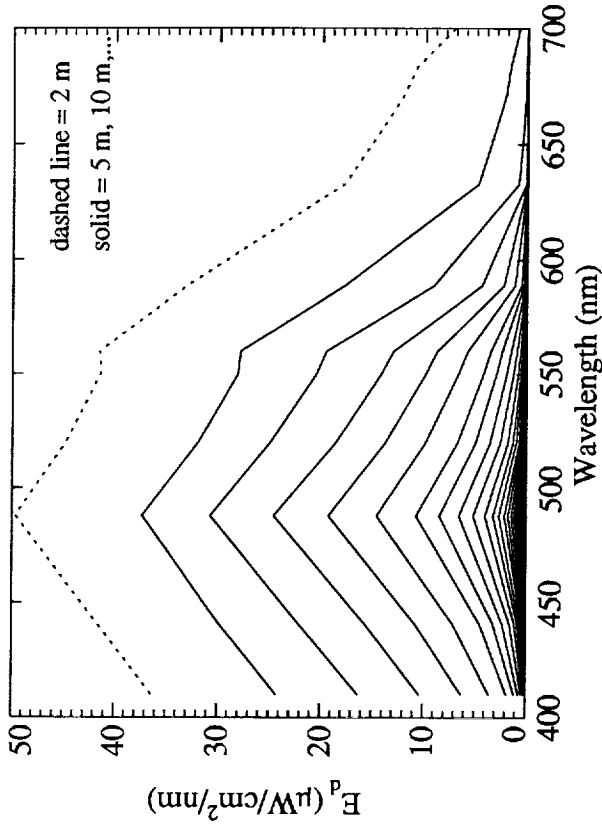
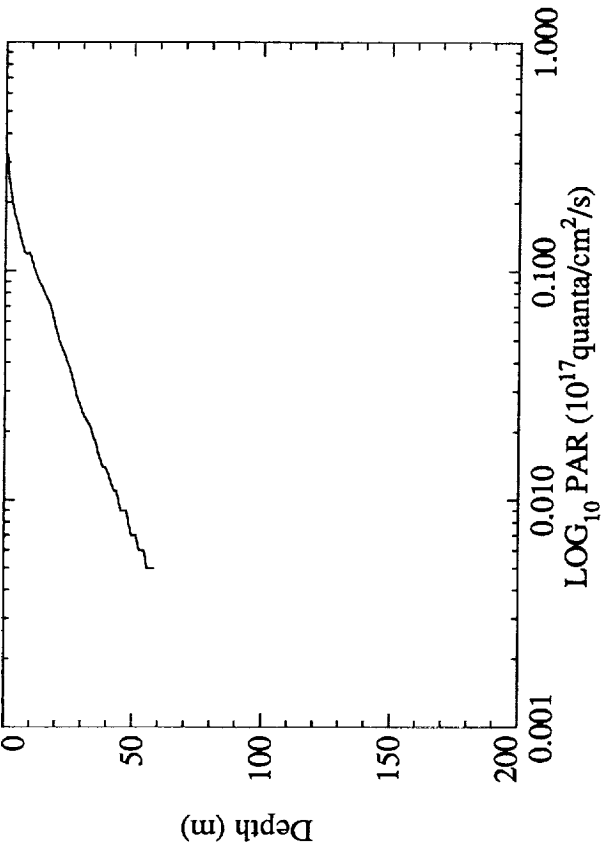


Figure 18. Continued

JETZ 06-26-87 Loc: sta 91 #2 Lat: 38° 20.22' N Long: 124° 12.64' W File: j870626d

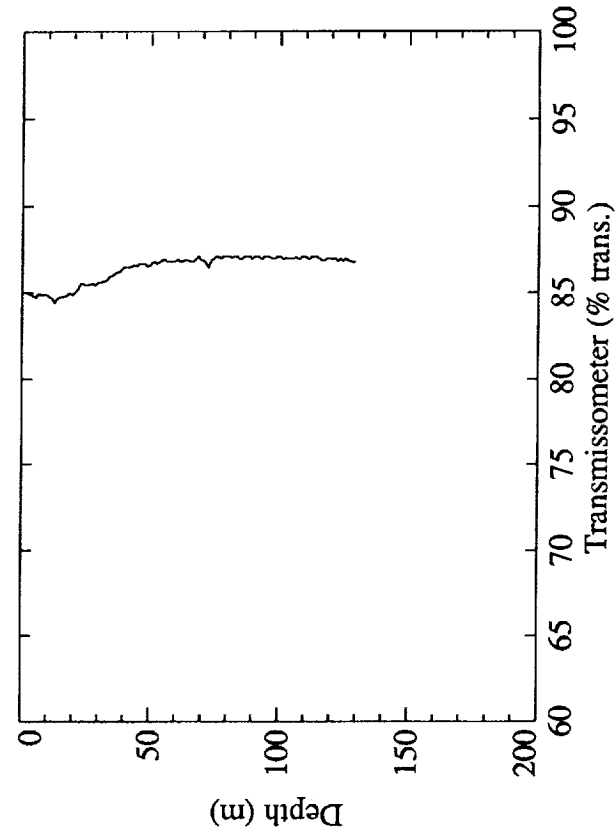
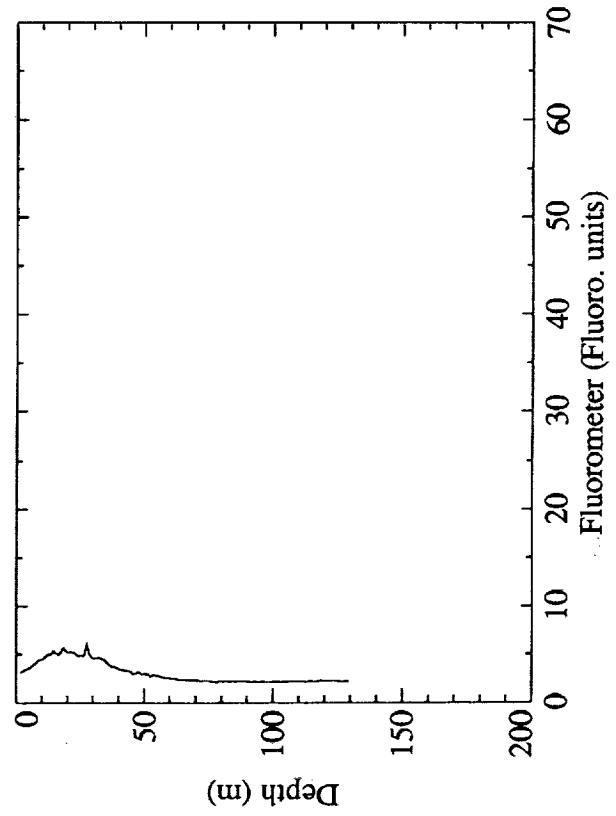
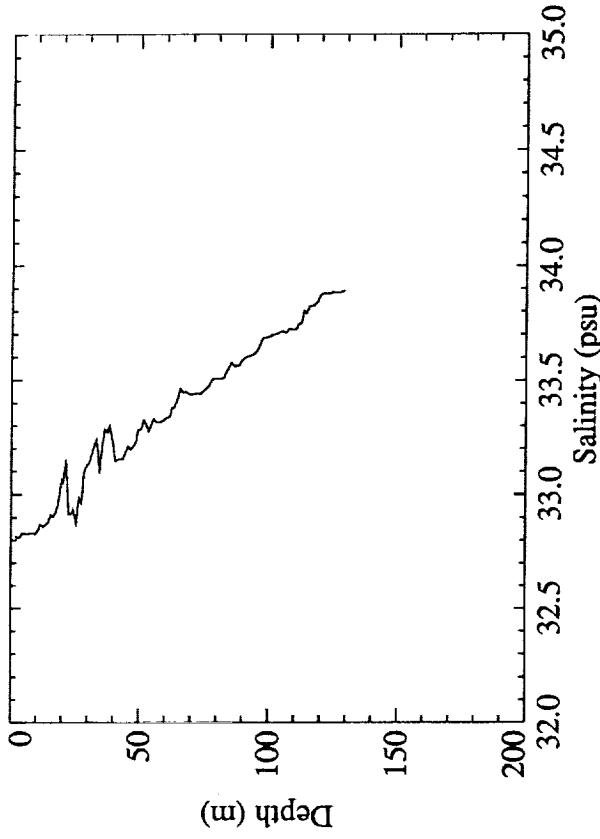
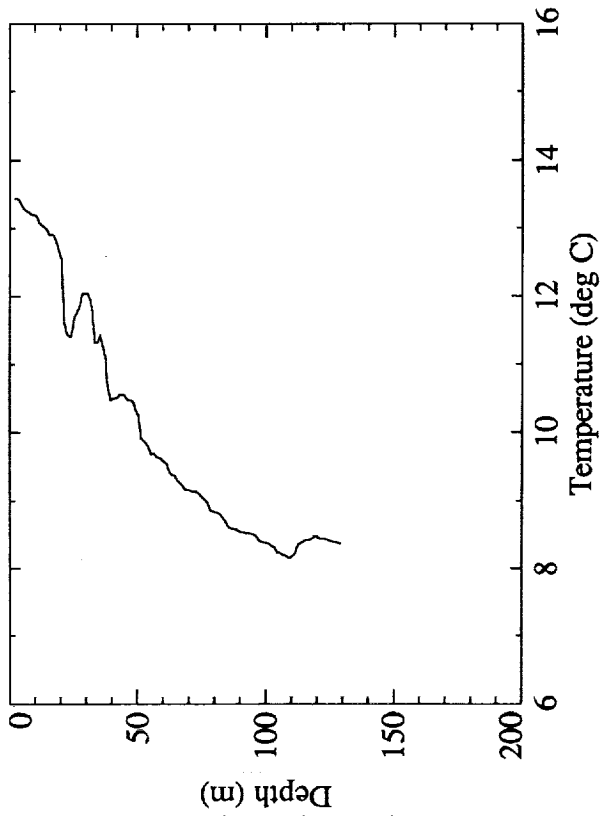


Figure 19. File: j870626d

JETZ 06-26-87 Loc: sta 91 #2 Lat: 38° 20.22' N Long: 124° 12.64' W File: j870626d

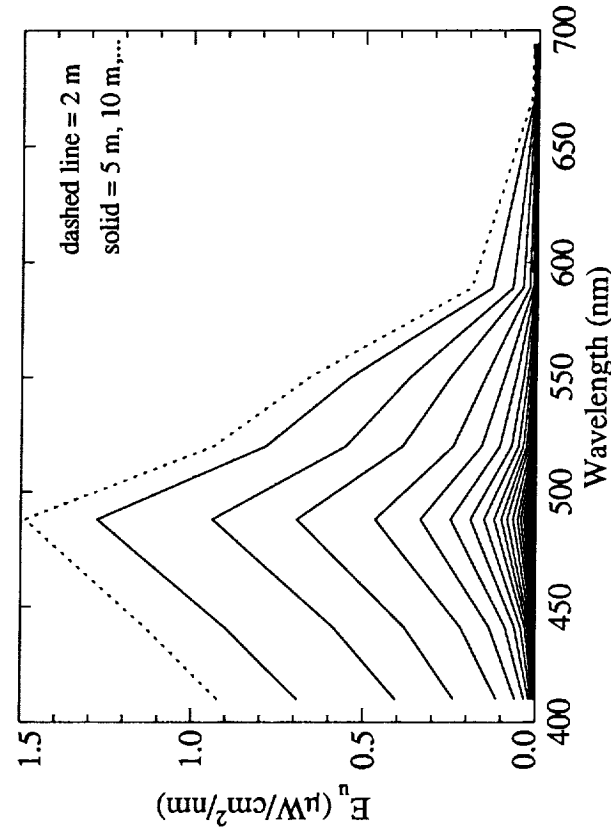
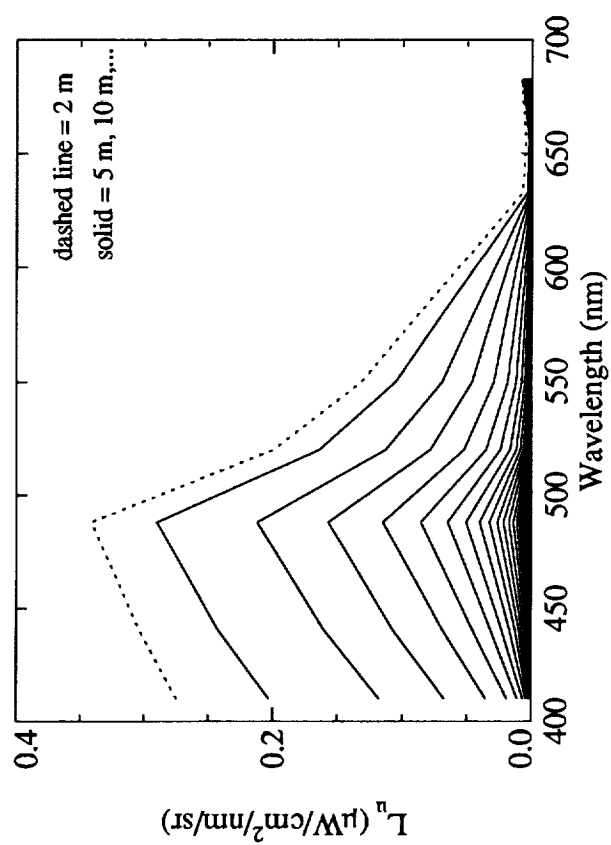
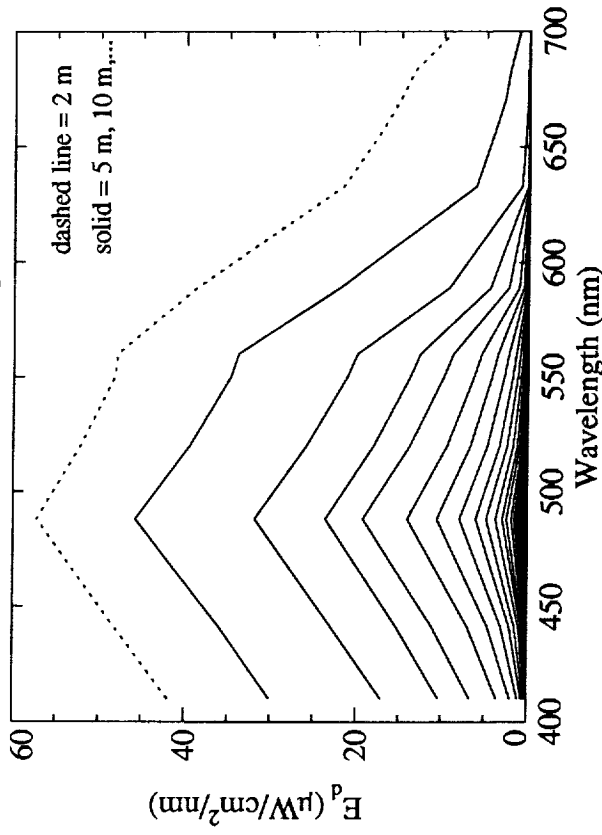
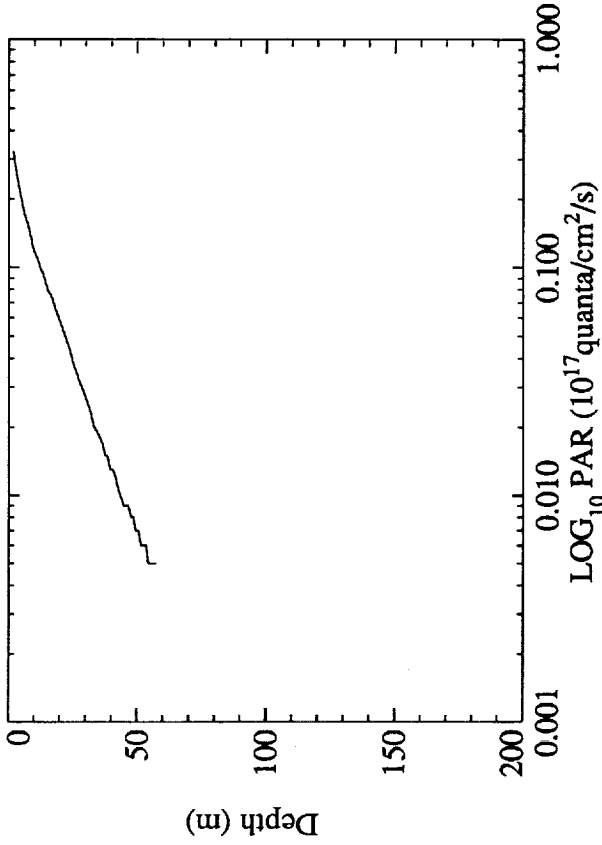


Figure 19. Continued

JETZ 06-26-87 Loc: sta 92 Lat: 38° 12.35' N Long: 124° 09.35' W File: j870626e

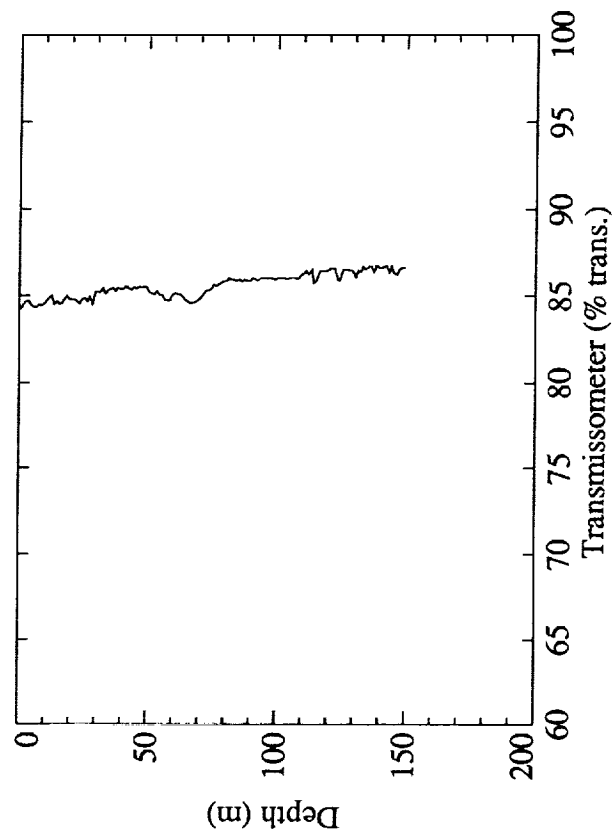
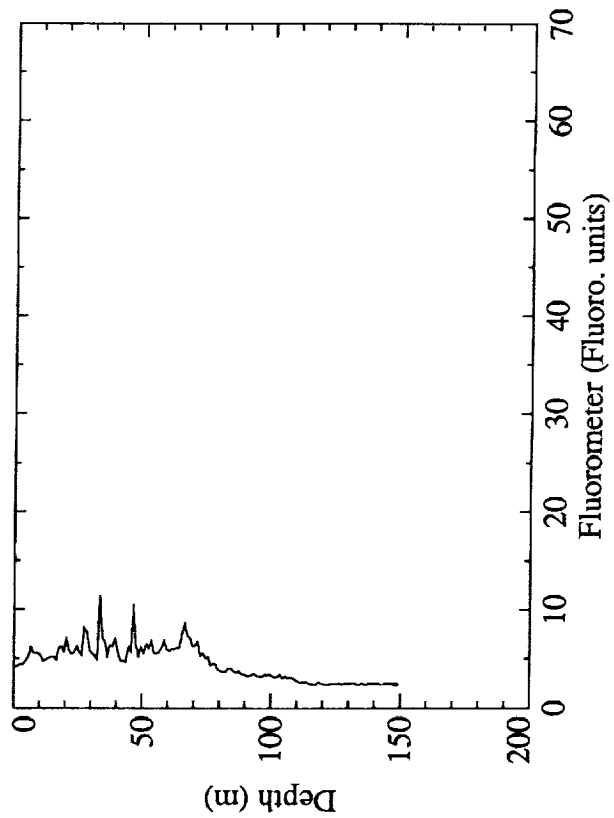
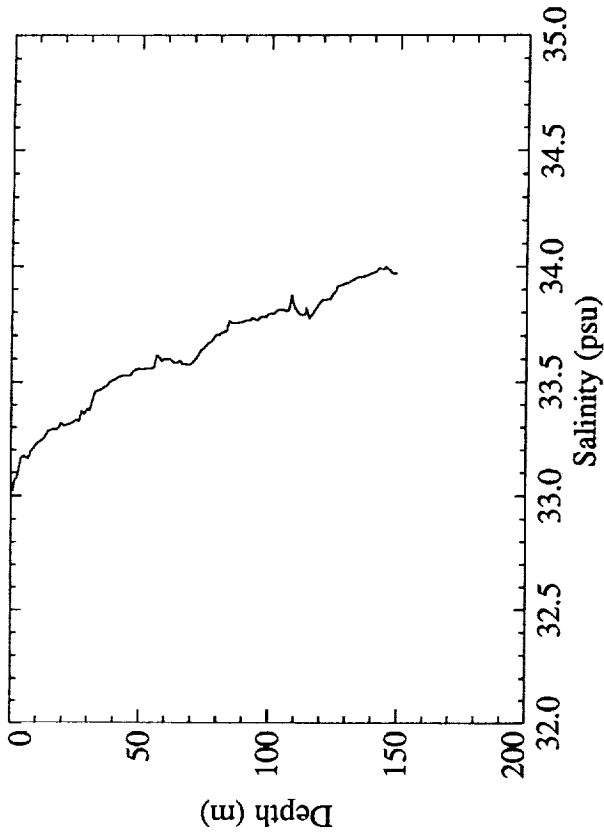
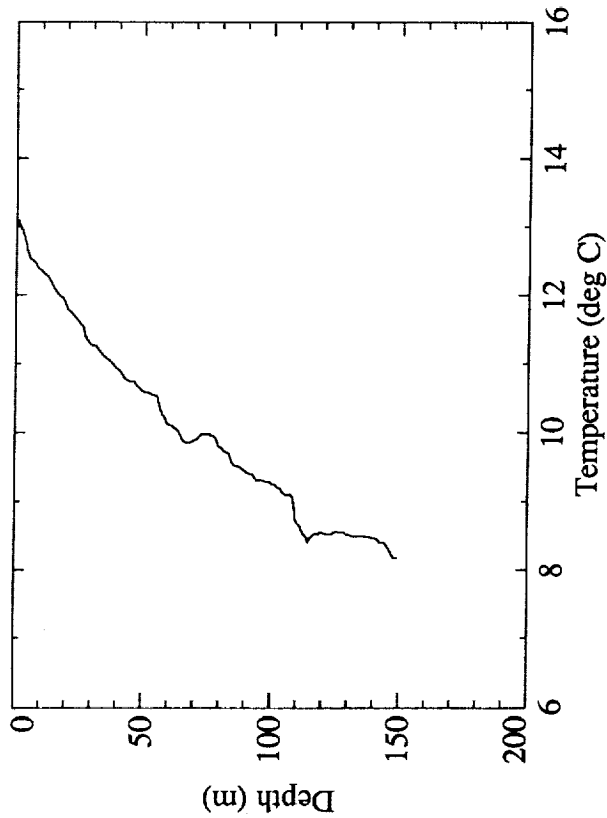


Figure 20. File: j870626e

JETZ 06-26-87 Loc: sta 92 Lat: 38° 12.35' N Long: 124° 09.35' W File: j870626e

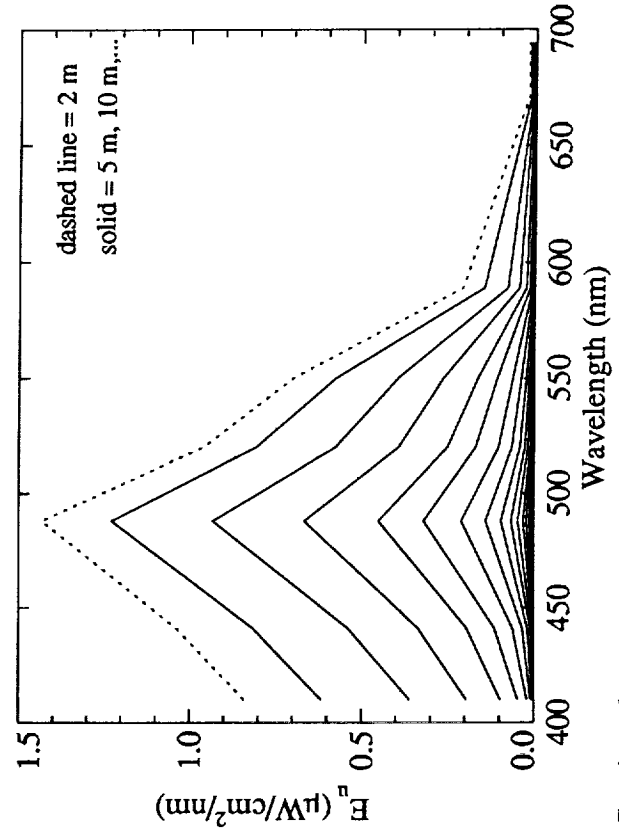
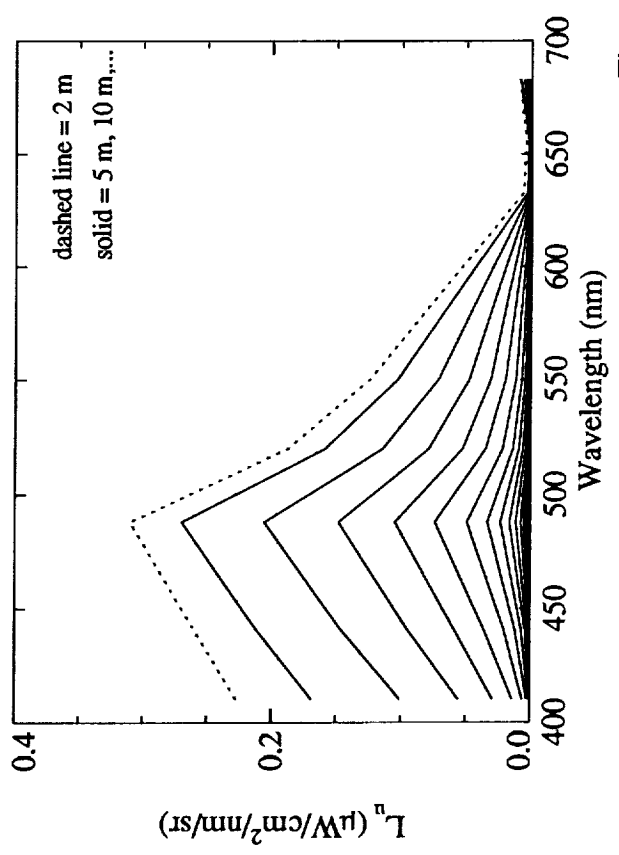
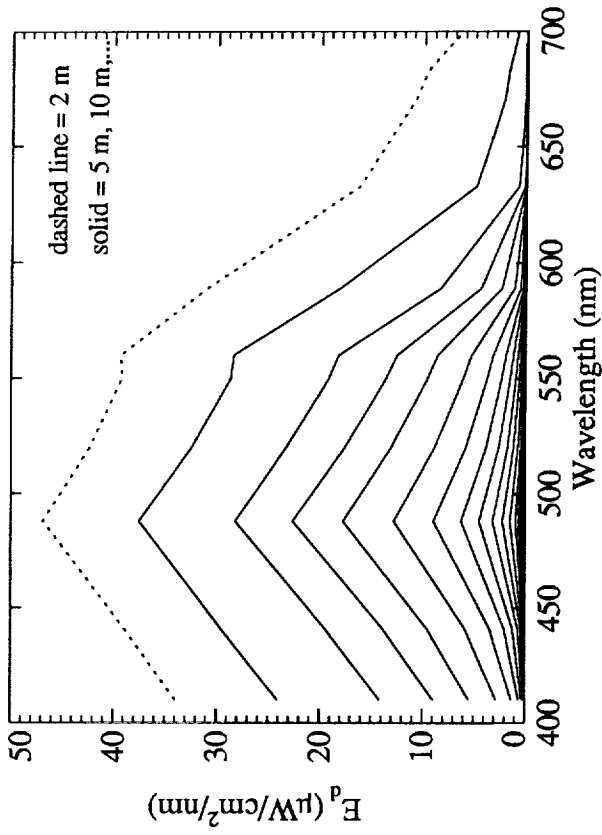
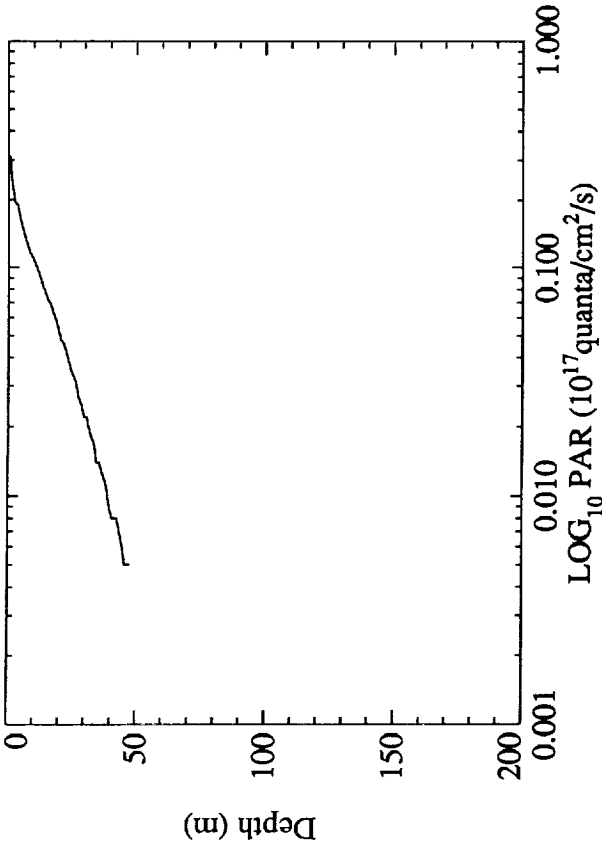
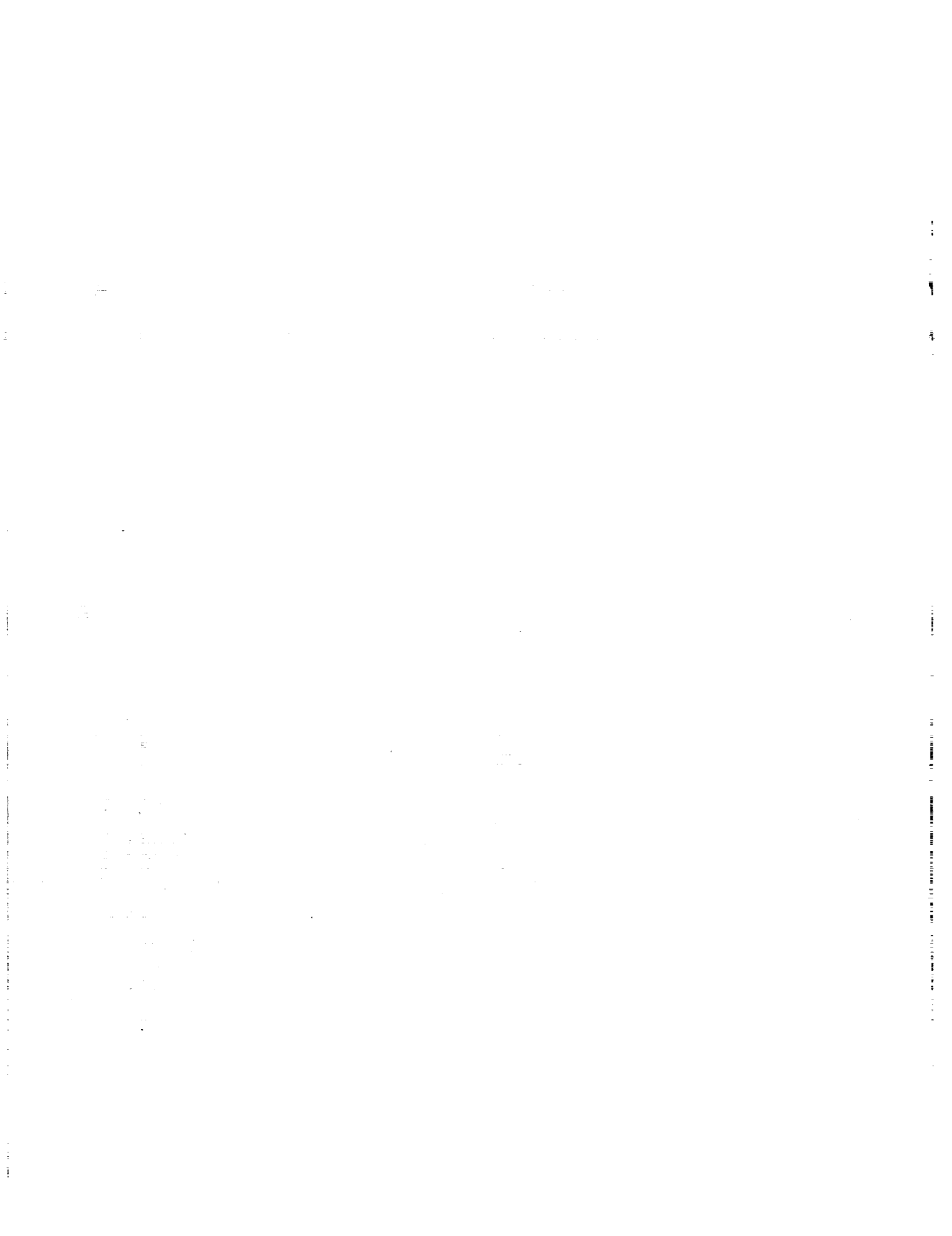
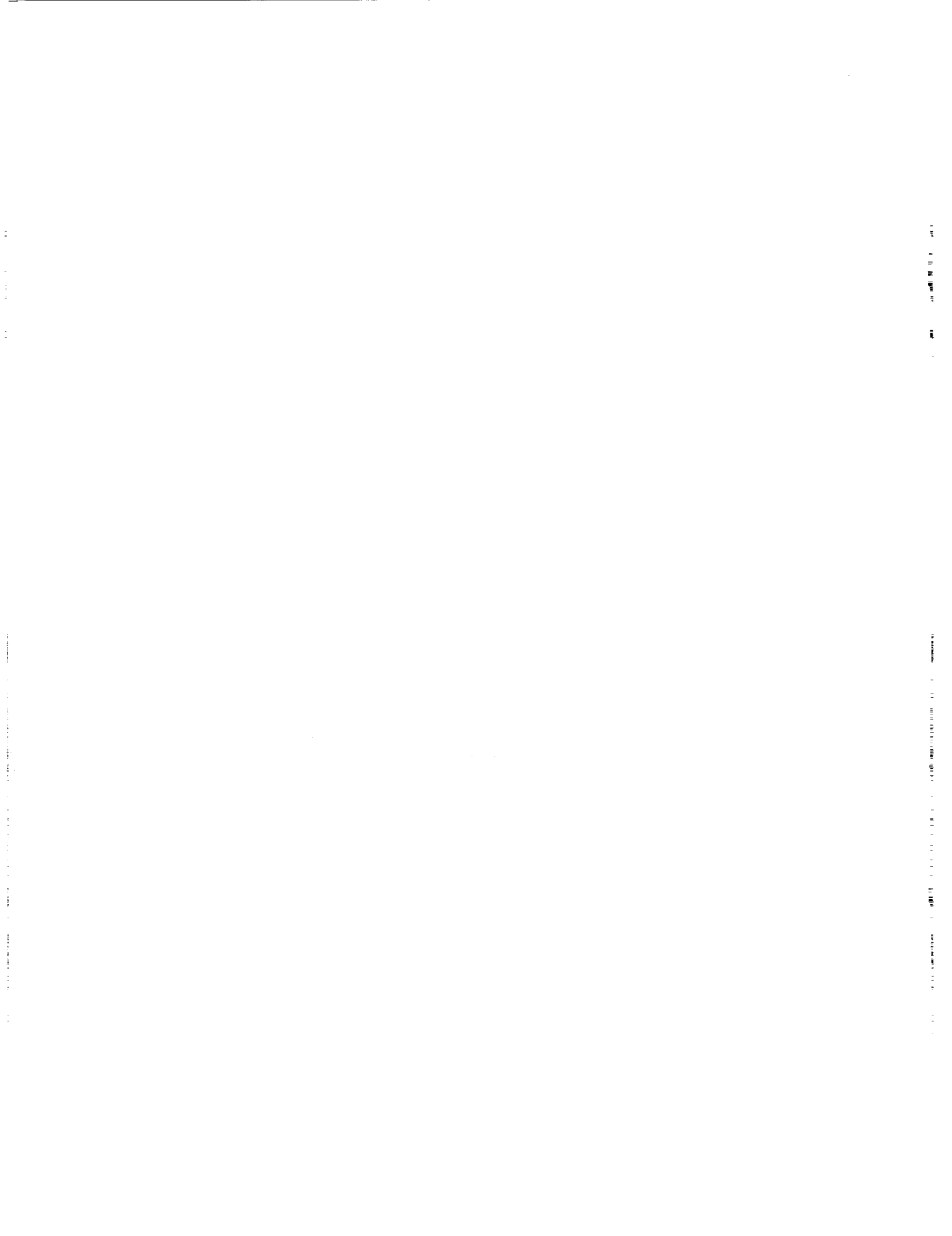


Figure 20. Continued





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16. Abstract Twenty vertical profiles of the bio-optical properties of the ocean were made during a research cruise on the R/V Point Sur, June 15-28, 1987, as part of the Coastal Transition Zone Program off Point Arena, California. Extracted chlorophyll values were also measured at some stations to provide calibration data for the in situ fluorometer. This report is a summary to provide investigators with an overview of the data collected. The entire data set is available in digital form for interested researchers, and requests for the data should be addressed to W. Joe Rhea, (818) 393-6095					
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