

PVM 4

MARECO 2004

June-July 2004

R/V GO SARS

Preliminary DATA

Marc Picheral-Lars StemmannGaby Gorsky
CNRS/UPMC, LOV, Station Zoologique, Chemin du Lazaret, 06230 Villefranche sur mer
picheral@obs-vlfr.fr stemmann@obs-vlfr.fr gorsky@obs-vlfr.fr



CENTRE NATIONAL
DE LA RECHERCHE
SCIENTIFIQUE



INSTRUMENT/METHODOptical & CTD sensors..	IDENTIFIER :
NAME : Underwater Video Profiler 4 (U.V.P.4)	
PROJECT: MTP II-MATER	

Description of the main instruments/methods used at sea and in the laboratory during the project MTP II-MATER.

Examples : CTD, Current meter, salinometer, sediment trap, spectrometer ...

LABORATORY (Owner of the instrument or who performs the method) :

Laboratoire d'Océanographie de Villefranche sur mer (LOV, UMR7093)

Address :

Station Zoologique

BP 28

06234 Villefranche sur mer

Tel : 0493763816 Fax : 0493763834

Email : Gorsky@ccrv.obs-vlfr.fr.

CONTACT SCIENTIST :

Gabriel GORSKY, Marc PICHERAL, Lars STEMMANN

INSTRUMENT NAME (60) : Underwater Video Profiler 4 (U.V.P.4)

MANUFACTURER (60) :

METAL PROCESS

Dept VISION : 9 Lotissement de la gare Avenue Robert Brun 83500 La Seyne sur Mer
Tel : 33 (0) 4 94 87 37 42 Fax : 33 (0) 4 94 87 39 86 Courriel : vision@metalprocess.com

SIEGE SOCIAL : 20,rue du Château de Chessy 77144 MONTEVRAIN Tel : 33(0) 1 60 07 52 58 www.metalprocess.com

MANUFACTURING DATE (10) : 2001

SERIAL NUMBER (20) : CTD S/N 1539

DESCRIPTION (240) :

Version 4 of the UVP. Built for the study of MARINE SNOW and ZOOPLANKTON.
Coupled with SBE19 pumped CTD and Chelsea Fluorometer and Nephelometer.

TECHNICAL CHARACTERISTICS (240) :

1000 m operational depth / 2 CCD B&W cameras (25 & 8 mm lenses) / In situ recordings at 12/25 Hz..
Marine snow mode with structured strobes lights : 1.25 & 10.53 litres analysed volume per image for ...
60 µm ESD detection limits. (>120 µm available data set.)

Time synchronisation with CTD.

See SBE for SBE19 probe characteristics (<http://www.seabird.com/>)

See Chelsea for Aquatracka Nephelometer & Fluorometer characteristics (<http://www.chelsea.co.uk/>)

COMMENTS (120)

INSTRUMENT TYPE (circle the main type) :

In situ Sensor (default) Transmitter/Receiver On board recorder
 Drifter Towed platform Expendable sensor

OTHER ATTACHED EQUIPEMENT (in case of complex multi sensor:Platform equipment) (10) :

DATE (of updating this form) : 09-16-05

MEASURED PARAMETER 1	CALIBRATION DATE	CRUISES	COMMENTS
Temperature S/N 1539	11-2-94		SBE Lab.
	10-11-97		SBE Lab.
	5-5-99		SBE Lab.
	3-5-2000		SBE Lab.
	6-13-2002		SBE Lab.
	5-2004		SBE Lab.

MEASURED PARAMETER 2	CALIBRATION DATE	CRUISES	COMMENTS
Conductivity S/N 1539	11-2-94		SBE Lab.
	10-11-97		SBE Lab.
	5-5-99		SBE Lab.
	3-5-2000		SBE Lab.
	6-13-2002		SBE Lab.
	5-2004		SBE Lab.

MEASURED PARAMETER 3	CALIBRATION DATE	CRUISES	COMMENTS
Pressure S/N 1539	11-2-94		SBE Lab.
	10-11-97		SBE Lab.
	5-5-99		SBE Lab.
	3-5-2000		SBE Lab.
	6-13-2002		SBE Lab.
	5-2004		SBE Lab.

MEASURED PARAMETER 4	CALIBRATION DATE	CRUISES	COMMENTS
Nephelometer S/N 88/167	9-24-96		Chelsea Lab.
	1-2003		Chelsea Lab.

MEASURED PARAMETER 5	CALIBRATION DATE	CRUISES	COMMENTS
Fluorometer S/N 88/2615/123	1-5-95		Chelsea Lab.
	1-2003		Chelsea Lab.

MEASURED PARAMETER 6	CALIBRATION DATE	CRUISES	COMMENTS
25 mm camera for particles > 60 µm	03/2002		LOBEPM

MEASURED PARAMETER 7	CALIBRATION DATE	CRUISES	COMMENTS
8 mm camera for particles > 140 µm	03/2002		LOBEPM

A. DATA COLLECTION

The UVP4 has been developed for the acquisition of large-particle (> 60 μm) and zooplankton abundance and size distribution data from 0 to 1000 m. It was designed to minimise the disturbance of the illuminated volume in order to reduce a possible disruption of imaged particles. It is autonomous has been be lowered to 1000m at each station on the hydrological steel cable of the GO SARS. The fourth digital model of the UVP used during MAR-ECO 2004 cruise is described here.

The UVP model 4 is a vertically lowered instrument mounted on a galvanized steel frame (1.1 x 0.9 x 1.25 m). The lighting is based on two 54W Chadwick Helmuth stroboscopes. Two mirrors spread the beams into a structured 10 cm thick slab. The strobes are synchronized with two full frame video cameras with 25 and 8 mm C-mount lenses and IR filters. The illuminated particles in a volume of respectively **1.25** and **10.5** liters are recorded simultaneously by the computer. The cameras are positioned perpendicular to the light slab and only illuminated particles in dark background are recorded. The short flash duration (pulse duration = 30 μs) allowed a 1m/s lowering speed without the deterioration of image quality.

Depth, temperature and conductivity data are acquired using a Seabird Seacat 19 CTD probe (S/N 1539) with fluorometer and nephelometer (both from Chelsea Instruments Ltd.). The system is powered by four 24V batteries and is piloted by a powerful computer. The data acquisition is time related and programmed prior to the immersion.. The UVP is well adapted to count and measure fragile aggregates such as marine snow as well as delicate zooplankton.

The depth of the images is obtained with the SBE19 probe fixed in the main frame and geographical position by the ships instruments (mainly GPS).

Samples consist of computer video files and CTD data.

During Leg 1, we have performed 20 stations along the mid Atlantic ridge. Most of them were recorded during the night in order to avoid sun light perturbation on UVP images. All the profiles went down to 1000m (maximum UVP rating) except SuperStation 12 due to the 930 depth of the place.

During leg 2, we have performed 19 stations along the mid Atlantic ridge. Nine of them were recorded during the night in order to avoid sun light perturbation on UVP images. All the profiles went down to 1000m (maximum UVP rating) except SuperStation 60 due to the 750 depth of the place.

The exact position and time (UTC) of the UVPs are listed below. All the UVP data were treated immediately according to our standard procedures to give quasi real-time evaluation of the vertical distributions of particulate matter, CTD data and zooplankton above 5mm (ESD) and copepods above 1mm (ESD).

SuperStation	Lat	Long	Date UTC	Time UTC	SBE19 Number
2	59.58	25.53	20040610	54100	3
4	60.13	28.14	20040611	41400	5
5	59.42	29.51	20040611	180000	6
6	56.35	31.14	20040613	600	8
8	56.19	34.26	20040613	224700	9
10	55.31	36.36	20040614	201000	10
12	52.47	34.40	20040616	165000	11
14	53.00	36.40	20040618	10100	12
16	51.34	33.17	20040620	2800	13
18	52.36	32.04	20040620	222400	14
20	52.47	30.31	20040621	212800	15
22	50.42	27.31	20040623	14100	16
24	49.40	28.25	20040623	221500	17
26	48.06	29.33	20040625	23600	18
28	42.59	27.48	20040627	14000	19
30	42.47	29.15	20040628	20700	20
32	42.48	30.14	20040629	41200	21
34	41.40	30.00	20040630	34200	22
36	41.29	28.19	20040701	13700	23
36	41.29	28.19	20040701	20900	24

SuperStation	Lat	Long	Date UTC	Time UTC	SBE19 Number
42.00	42.50	29.44	20040707	230800	21
44.00	45.56	29.30	20040709	15100	22
46.00	42.45	29.16	20040710	55600	23
48.00	42.52	29.05	20040711	71800	24
50.00	45.55	28.29	20040712	95800	25
50.00	42.55	28.29	20040712	102900	26
52.00	42.56	28.09	20040713	85900	27
54.00	51.20	28.54	20040716	173400	28
56.00	51.44	29.31	20040717	141900	29
58.00	51.18	29.59	20040718	93100	30
60.00	51.30	30.79	20040719	72800	31
64.00	51.33	31.01	20040721	101800	32
62.00	51.54	30.23	20040721	225300	33
62.00	51.53	30.24	20040722	200800	34
66.00	53.02	33.36	20040724	123300	35
68.00	53.07	34.47	20040725	100400	36
70.00	53.01	34.52	20040726	32600	37
74.00	53.17	36.46	20040728	25500	38
74.00	53.17	36.46	20040728	32700	39

B. PARTICLES PROCESSING

The UVP has two important features:

- a) it does not disturb the recorded particles or organisms
- b) b) it allows quick data retrieval and processing.

Processing of images obtained by the UVP in the structured light beam is automated and made by the system during the recovery. The images are analysed and treated automatically by custom-made software. The objects in each image are detected and enumerated. The area and the other parameters of every individual object interesting (measuring above a pre-set size) are measured. Data are stored in an ASCII file and are combined with the associated CTD, fluorometer and nephelometer data (Seasoft Software) using a spreadsheet software. Vertical profiles are printed out onboard immediately after the recovery of the UVP.

The results of the calibrations indicate that the tested configuration can detect 60 µm-sized particles and can reliably measure particles larger than 120 µm in diameter. The metric surface as a function of the pixel surface for the 25 mm and 8 mm lens cameras can be expressed by the following equations:

$$\text{Equations for cam0 (X=0) : } S_{\text{réelle}} = 0,0024 \times (S_{\text{pixels}})^{1,4959}$$

$$\text{Equations for cam1 (X=1) : } S_{\text{réelle}} = 0,0149 \times (S_{\text{pixels}})^{1,6128}$$

These equations have to be checked for cross-calibration of both cameras.

The calibrations were carried out in a dark test tank filled with 3 m³ filtered (20 µm) sea water. The brightness measured in the test tank was similar to that in the aphotic layers. A calibration grid, placed at different depths of the light slab, was used to estimate the recorded water volume. The dimensions and volume of the parallel light beam recorded by the cameras are :

Caméra 25 mm : 14.1 x 10.6 cm

Caméra 8 mm : 43.5 x 32.7 cm

The pixel/mm relationship was calibrated in a test tank by injection of biological particles (range 40 µm - 20 mm) measured prior to their use with a stereomicroscope (Gorsky et al., Estuarine, Coastal and Shelf Science).

C. ZOOPLANKTON PROCESSING

We used both Camera 0 and Camera 1 for Zooplankton identification.

Camera 0 targets measuring more than 1mm ESD have been visually identified above 200m (and deep to 1000m at some stations) to count large copepodlike bodies. The results are given as total numbers of copepods per 10m of profiles (equivalent to 150L of seawater).

Camera 1 targets measuring more than 5 mm ESD and filtered for surface noise due to the sun or on interesting large aggregates have also been manually identified and sorted in major groups : appendic euphaus largedecapod maedusa radiolarians chaetognathe largeaggregates fish thaliacae siphon ctenophore sphere mollusk shapeless otherzoo particle copepodlike diatommatlike. The results are given in total numbers of organisms per 10m of profile (equivalent to 1263 Liters).

A bilanzoo.txt file is computed and includes sums the organisms of each group at each station.

D. PROBLEMS

Lot of targets remains non-identified and will be checked by qualified taxonomist after the cruise. Euphaus, LargeDecapods and amphipods have been grouped together in the figures for Leg 2 (but not for leg1) but are grouped together in all files.

ZOOPLANKTON PROCESSING

Camera 0 : The STROBO_0 treatment has been used to count and size particulate matter. Every target measuring more than 50 pixels (1mm ESD) has been analysed in the ETQ file. The upper layer has been checked for copepods to 200m depth. All non checked targets are set to NOIDENT or TOIDENT in the ETQ file.

Values of copepods in the *_zoo.txt file represents the numbers of copepods per 10m of profile. It's equivalent to #/150Liter.

Copepods graphs are displayed on a 300m scale.