

# **BIO - OPTICAL CHARACTERIZATION OF THE BLACK SEA FOR REMOTE SENSING APPLICATIONS**

(SfP Project Number 982678)

## **APRIL Progress Report - 2011**

Progress Report prepared by:  
**Temel Oguz, Erdemli, Turkey, NPD**  
**Atanas Palazov, Varna, Bulgaria, PPD**

PROJECT CO-DIRECTORS:  
Michael Lee, Sevastopol, Ukraine  
Oleg Kopelevich, Moscow, Russia  
Viorel Malciu, Contsanta, Romania

## TABLE OF CONTENTS

1. LIST OF ABBREVIATION.....	3
2. PARTICIPANTS.....	4
3. BACKGROUND AND OBJECTIVES.....	5
4. PROJECT STRUCTURE AND ACTIVITIES.....	6
5. TECHNICAL PROGRESS.....	7
6. FINANCIAL STATUS.....	10
7. EQUIPMENT INVENTORY RECORDS.....	11
8. CRITERIA FOR SUCCESS TABLE.....	18
9. SUMMARY REPORT.....	19

## 1. LIST OF ABBREVIATIONS

<b>Acronym</b>	<b>Extended name</b>
<b>EC</b>	European Commission
<b>HPLC</b>	High Performance Liquid Chromatography
<b>IMS</b>	Institute of Marine Sciences of the Middle East Technical University
<b>IO</b>	Institute of Oceanology of Bulgarian Academy of Sciences
<b>JRC</b>	Joint Research Centre
<b>MHI</b>	Marine Hydrophysical Institute
<b>MODIS</b>	Moderate Resolution Imaging Spectrometer
<b>NIMRD</b>	National Institute for Marine Research and Development
<b>NPD</b>	NATO country Partner Director
<b>SeaWiFS</b>	Sea-viewing Wide Field-of-view Sensor
<b>SfP</b>	Science for Peace
<b>SIO</b>	Shirshov Institute of Oceanology
<b>NASA</b>	National Aeronautics and Space Administration
<b>ROSA</b>	Romanian Space Agency
<b>PPD</b>	Partner country Project Director

## 2. PARTICIPANTS

### (a) Project Director (NPD)

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Oguz /Temel/Prof.	Emeritus Prof. Institute of Marine Sciences, Middle East Technical University, 33731 Erdemli, Turkey	oguz@ims.metu.edu.tr

### (b) Project Director (PPD)

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Palazov/Atanas/Dr.	Director of Institute of Oceanology P.O. Box 152, Varna 9000, Bulgaria	+359 52 370484 +359 52 370483 palazov@io-bas.bg

### (c) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Lee/Michael/Dr.	Chief of Marine Optics Department at Marine Hydrophysical Institute Bldg. 2, Kapitanskaya Str., Sevastopol 99011, Ukraine.	+38 0692 540452 +38 0692 554253 lee@alpha.mhi.iuf.net

### (d) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Kopelevich/Oleg/Dr.	Head of Ocean Optics Laboratory, P.P. Shirshov Institute of Oceanology, 36 Nakhimovsky prospect, Moscow 117997, Russia.	(499) 124 7583 (499) 124 5983 oleg@ocean.ru

### (e) Project Co-Director

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Malciu/Viorel	Head Department Oceanography, Marine and Coastal Engineering, National Institute for Marine Research-Development "Grigore Antipa", Bvd Mamaia, 300 Constanta, Romania	Tel: 000241543288 Fax: 000241831274 Email: incdmct@datanet.ro

### (f) Participant / End-user

SURNAME/First name/Title	Job Title, Institute and Address	Phone, Fax and E-mail
Zibordi/Giuseppe/Dr.	Scientific Officer/ Joint Research Centre of the European Commission, I-21020 Ispra, Varese	+39 0332 785902 +39 0332 789177 giuseppe.zibordi@jrc.it

### 3. BACKGROUND AND OBJECTIVES

The Black Sea receives drainage from almost one-third of the continental Europe (five times its own surface) which includes significant portions of 17 countries, 13 capital cities and some 160 million people. The Black Sea is virtually isolated and hence a vulnerable water basin with 87% of its volume affected by anoxia. Of all the basins of the world ocean, the environmental degradation in the Black Sea is the most severe.

The monitoring of trophic and geochemical status of marine waters can rely on satellite ocean colour data. In fact such a technology allows for the determination at synoptic scale of water quality indicators like: chlorophyll a concentration (and potentially of accessory pigments) used as a proxy for phytoplankton biomass; concentration of total suspended matter and colored dissolved organic matter through its absorption properties.

Current limitation in the operational use of satellite ocean colour data in the Black Sea and in other marginal seas is the lack of regional bio-optical algorithms linking the satellite signal to the specific water quality indicators. In fact operational satellite products generally rely on algorithms developed for global applications which generally are the source of large uncertainties in coastal areas. This urges the development of specific regional bio-optical algorithms on the basis of comprehensive data sets of statistically representative in situ measurements.

The project, within the framework of the environmental security research topic, aims at the implementation of a tool to support remote sensing applications for operational environmental monitoring and climate studies in the Black Sea. Novel aspect of the project will be the comprehensive bio-optical characterization of the western-central ecological regions of the Black Sea (those exhibiting the highest environmental stress and range of variability in bio-optical features ) using state of the art measurement methods and instrumentation during seasons exhibiting different trophic regimes. The in situ data collected within the framework of two oceanographic cruises will be the basis for the development of new bio-optical algorithms and models for Black Sea environmental monitoring through Earth observing systems (mostly the MODIS onboard the NASA AQUA polar platform). The sequential objectives defining the project flow are highlighted in Fig. 1

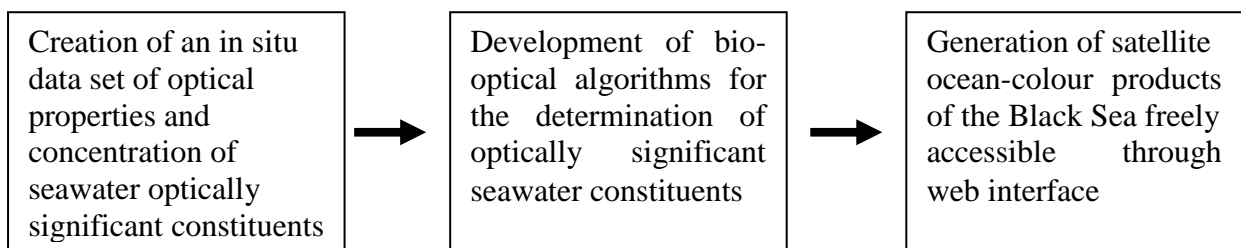


Figure 1: Major sequential objectives characterizing the project flow.

## 4. PROJECT STRUCTURE AND ACTIVITIES

MILESTONES, DELIVERABLES AND SCHEDULE: SfP-982678 REPORT DATE: 31.03.2011

Milestone/Year		1 <sup>st</sup> Year				2 <sup>nd</sup> Year				3 <sup>rd</sup> Year			
Month №:		Planned				New plan				Done			
		1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12
Month		XI-I	II-IV	V-VII	VII-X	XI-I	II-IV	V-VII	VII-X	XI-I	II-IV	V-VII	VII-X
<b>1</b>	<b>Instrument procurement &amp; assessment of methods</b>												
1.1	Procurement of field instruments (profiler)	█	█	█	█								
1.2	Assessment of measurement method	█	█	█	█	█	█	█					
<b>2</b>	<b>Field measurements</b>												
2.1	First bio-optical cruise (within the selected period)						█	█					
2.2	Second Bio-optical Cruise								█	█	█	█	
<b>3</b>	<b>Data analysis and quality assurance</b>												
3.1	Analysis and assurance of data from first cruise						█	█					
3.2	Analysis and assurance of data from second cruise								█	█			
<b>4</b>	<b>Algorithms development</b>												
4.1	Development of bio-optical algorithms												
4.2	Cross-comparison of regional and global algorithms												
<b>5</b>	<b>Results implementation</b>												
5.1	Implementation of regional bio-optical algorithms												
5.2	Assessment of new products												
5.3	Distribution of new products through web interface												

<b>Deliverables</b>				Availability of equipment	Assessment of measurement		Data from the first				Data from the second	Bio-optical algorithms	Ocean color products
<b>Reporting</b>		1 <sup>st</sup> Progress			2 <sup>nd</sup> Progress report		3 <sup>rd</sup> Progress report		4 <sup>th</sup> Progress		5 <sup>th</sup> Progress report		Final Report

## 5. TECHNICAL PROGRESS

### 5.1. Major Accomplishments

Major accomplishments achieved in the previous six months of the project can be summarized as follows:

*Task 1 The procurement of field equipment for bio-optical measurements (bio-optical profiler):*

The bio-optical profiler was successfully received to the final recipients (Institute of Oceanology – Bulgarian Academy of Sciences) in January 2011. The delays in the procurement of the equipment, mostly due to specifications imposed to the manufacturer of the profiling radiometer system, produced an approximate delay of eight months in the system delivery. The additional system specifications were addressed to ensure radiometric and data format compatibility with those of other profilers already utilized in different European Seas. This aspect is quite important in view of producing measurements fully consistent with those collected within the framework of different relevant international program, and relying on consolidated technology and measurement methods. This delay in acquiring equipment was also accompanied by natural delays in procuring funding for ship-time.

*Task 2 Assessment of measurement methods:*

Despite of natural delay in acquiring bio-optical equipment, investigation on measurement methods proceeded during 2010 through the cross-site comparison of early bio-optical data collected by the JRC in the Black Sea in 2006 and 2009. These analyses were so far restricted to the assessment of methods for backscattering and water leaving radiance data (among the most relevant quantities for satellite ocean color applications). Results, presented at the Ocean Optics Conference held in Anchorage in September 2010 and in a peer-review paper under revision, fully confirm the goodness of the measurement methods that will be applied during the SfPP bio-optical cruises.

*Task 3 Field measurements. First bio-optical cruise.*

The delay in the execution of the first planned bio-optical cruise is mainly due to fact that the ship-time was not funded by NATO. This major limitation was superseded through:

- The EUROFLEETS EU Program that will grant 8,6 ship-time days in Romanian and Bulgarian waters. The acquisition of this ship-time required the submission of research proposal and a successive negotiation phase. Definitive confirmation of the availability of ship-time came in late Fall 2010. The EUROFLEETS Cruises will take place from 01 till 05 July on the Romanian R/V Mare Nigrum and from 09 till 12 July on the Bulgarian R/V Akademik. These cruises will be performed in fulfillment of the EUROFLEETS BIO-OPT Project through EUROFLEETS funding, and will satisfy the requirements for the NATO SfP BIO-OPTICAL Project.
- A specific JRC-IO program (i.e., BioMaP) will support additional 10 ship-time days in July 2011. A BioMap cruise on the Bulgarian R/V Akademik will follow the EUROFLEETS cruise from 13 till 22 July. This cruise is aimed at exploring the bio-optical properties of the central Black Sea basin in Turkish waters and will satisfy requirements for the NATO SfP project.
- A negotiation process is already on progress within the collaboration of European Space Agency and Romanian Space Agency, with the direct contribution to bio-

optical activities by the Joint Research Centre for support an extra ship-time in Western Black Sea in 2012.

*Task 4 Test of the new MHI spectral transparency meter.*

Tests of the spectral transparency meter develop by MHI was done during field experiments on oceanographic platform near South Coast of Crimea. Measurements included seawater reflectance spectra, attenuation coefficient, Secchi disk depth and volume scattering functions at several wavelengths, and also atmospheric optical properties (aerosol optical thickness, Angstrom parameter).

*Task 5 Training on Optical Profile Measurements and Data handling.*

The planned training activities, linked to the use of the bio-optical instrumentation, could not be held in 2010 because of the non availability of the equipment. An effective solution to this delayed activity is to hold the training during the execution of the first SfPP cruise.

## **5.2. Milestones for the next six months**

- Execution of the first bio-optical cruise;
- Analysis and assurance of data from first cruise;
- Training on Optical Profile Measurements and Data handling.

## **5.3. Involvement of young scientists**

Currently the number of scientists less than 40 years old involved in the project activities is as follows:

- 3 from METU-IMS, Turkey:

In addition to one post doc (Dr. Heather Cannaby), and Msc Student (Mr. Akif Korkmaz), and Anil Akpınar (Phd Student) is involving the project. All are working on Black Sea ecosystem modelling, by using remote sensing, Argo float data and field optical measurements. They will partly involve to campaigns and data processing issues. Also they will be potential end users of the resulting products of the project

- 1 from IO – BAS, Bulgaria:

Mrs. Violeta Slabakova, Associate Researcher, has prepared the Web presentation for the Project, and maintains it as the permanent task. Also, she started with her PhD Thesis: “APPLICATIONS OF SATELLITE REMOTE SENSING FOR MONITORING THE MARINE ENVIRONMENT IN THE BULGARIAN BLACK SEA ZONE”. Also she will involve in the oceanographic campaign and data processing.

- 3 from MHI NASU, Ukraine:

Mrs. Elena Korchomkina, Junior Scientist is developing and testing two algorithms: for remote chlorophyll-retrieval in Case 2 waters and for improvement of standard atmospheric correction of remote sensed reflectance. Also, she is ready to present her PhD Thesis: “DETERMINATION OF PHYTOPLANKTON PIGMENTS CONCENTRATIONS IN SEAWATER USING REMOTE SENSING AND CONTACT OPTICAL MEASUREMENTS”.

Mrs. Daria Kalinskaya, Junior Scientist is concerned with aerosol optical properties spatial distribution and its analyses.

Mr. Alexander Latushkin, engineer, is studying spectral features of phytoplankton spectral attenuation coefficient and also taking part in design of spectral transparency meter.

- 1 from SIO RAS, Russia



Mr. Vladimir Levchenko, MSc Student (Moscow Institute of Physics and Technology). He is preparing a new flow-through fluorometer for studying spatial changeability of CDOM and phytoplankton fluorescence during the oceanographic campaigns.

- 3 from NIMRD, Romania

Dr. Razvan Mateescu, hydrotechnical engineer, was involved in the oceanographic campaign for ocean colour determination

Dan Vasiliu, chemist, involved in chlorophyll- a determination.

Alina Spanu, geographer, involved in spatial distribution of the physical parameters and data processing.

#### **5.4. Major travel**

None

#### **5.5. Visit by experts/advisors and NATO consultant**

No advisor and consultants are foreseen in the project.

#### **5.6. Visibility of SfP project**

The project is in its early phase. Presentation of the results of preliminary analysis of data obtained in the Black Sea was made at the "Oceans from Space" Symposium, Venice 2010 (Burenkov V., Kopelevich O., Sheberstov S., Vazyulya S. Bio-optical characteristics of the Black Sea from satellite data).

For the purpose of visibility of the project, the Web site: [www.natosps.io-bas.bg](http://www.natosps.io-bas.bg) was dedicated to the Project following the NATO existing recommendations. Besides ongoing and planned activities related to the Project, important document on outcomes, all necessary links to participating institutions, as well as to NATO SfP Programme are available.

#### **5.7. Technical and administrative difficulties**

No problems encountered with NATO administration, which provided help and assistance whenever requested.

#### **5.8. Changes in personnel**

As far it was no changes in personnel, but we are creating additional possibilities for involvement of new personnel and young researchers in the Project.

## 6. FINANCIAL STATUS

### 6.1 Annexes 4a: SfP NATO BUDGET TABLES

#### A) INSTITUTE OF MARINE SCIENCES, ERDEMLY, TURKEY

#### SfP NATO BUDGET TABLE

Project number: SfP - 982678	Project short title: SfP - Black Sea Characterization
Report date: 31.03.2011	Duration of the Project <sup>1</sup> : November 2009 – October 2012
Project Co-Director: (Temel Oguz, Erdemly, Turkey)	

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start until 31.03.2011	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>				
<b>(c) Training</b>				
<b>Subtotal "Training "</b>				
<b>(f) Travel</b>		5 000	8 820	
<i>(F1). Kick-off meeting Istanbul, Turkey 09-10 November 2009 - 2 person</i>	680			
<b>Subtotal "Travel"</b>	<b>680</b>	<b>5 000</b>	<b>8 820</b>	
<b>(g) Consumables - Spare parts:</b>	0	2 000	4 000	
<b>Subtotal "Consumables - Spare parts"</b>	<b>0</b>	<b>2 000</b>	<b>4 000</b>	
<b>(h) Other costs and (i) stipends (specify)</b>	0	1 500	3 000	
<b>Subtotal "Other costs"</b>	<b>0</b>	<b>1 500</b>	<b>3 000</b>	
<b>TOTAL (1), (2), (3) :</b>	<b>680</b>	<b>8 500</b>	<b>15 820</b>	
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>			<b>25 000</b>	

**B) INSTITUTE OF OCEANOLOGY-BAS, VARNA, BULGARIA****SfP NATO BUDGET TABLE**

Project number: SfP - 982678	Project short title: SfP - Black Sea Characterization
Report date: 31.03.2011	Duration of the Project <sup>1</sup> : November 2009 – October 2012
Project Co-Director: <i>(Atanas Palazov, Varna, Bulgaria)</i>	

Detailed Budget Breakdown <i>(to be completed in EUR<sup>3</sup>)</i>	ACTUAL EXPENDITURES		FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start until 31.03.2011	(2) for the following six months	(3) for the following period until project's end		
<b>(a) Equipment</b>		0	0		
<i>(A1) MicroPRO-II profiler system</i>	70 493				
<b>Subtotal "Equipment"</b>	<b>70 493</b>	<b>0</b>	<b>0</b>		
<b>(c) Training</b>	0	2 500	2 000		
<b>Subtotal "Training "</b>	<b>0</b>	<b>2 500</b>	<b>2 000</b>		
<b>(f) Travel</b>		4 500	6 627		
<i>(F1). Kick-off meeting Istanbul, Turkey 09-10 November 2009 - 2 person</i>	980				
<b>Subtotal "Travel"</b>	<b>980</b>	<b>4 500</b>	<b>6 627</b>		
<b>(g) Consumables - Spare parts:</b>	0	2 600	3 000		
<b>Subtotal "Consumables - Spare parts"</b>	<b>0</b>	<b>2 600</b>	<b>3 000</b>		
<b>(h) Other costs and (i) stipends</b> <i>(specify)</i>		1 000	2 376		
<i>(H1)Project specific mailing</i>	163.6				
<i>(H2) Other expenses</i>	260.4				
<i>(I1)Stipendies for Mrs.Violeta Salabakova</i>	1800				
<b>Subtotal "Other costs"</b>	<b>2 224</b>	<b>1 000</b>	<b>2 376</b>		
<b>TOTAL (1), (2), (3) :</b>	<b>73 697</b>	<b>10 600</b>	<b>14 003</b>		
<b>CURRENT COST OUTLOOK</b> <i>=(1)+(2)+(3)</i>			<b>98 300</b>		

**C) MARINE HYDROPHYSICAL INSTITUTE, SEVASTOPOL, UKRAINE**

**SfP NATO BUDGET TABLE**

Project number: SfP - 982678	Project short title: SfP - Black Sea Characterization
Report date: 31.03.2011	Duration of the Project <sup>1</sup> : November 2009 – October 2012
Project Co-Director: (Michael Lee, Sevastopol, Ukraine)	

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES		FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start until 31.03.2011	(2) for the following six months	(3) for the following period until project's end		
<b>(a) Equipment</b>					
<b>Subtotal "Equipment"</b>					
<b>(c) Training</b>	0	2 250	2 000		
<b>Subtotal "Training "</b>	<b>0</b>	<b>2 250</b>	<b>2 000</b>		
<b>(f) Travel</b>		4 500			
<i>Kick-off Project meeting, Istanbul, 09.11.2009</i>	714				
<i>CASRE meeting, Kiev, 12.10.2010</i>	133				
<b>Subtotal "Travel"</b>	<b>847</b>	<b>4 500</b>	<b>2 203</b>		
<b>(g) Consumables - Spare parts:</b>					
<i>Component parts</i>	878	1 000	822		
<b>Subtotal "Consumables - Spare parts"</b>	<b>878</b>	<b>1 000</b>	<b>822</b>		
<b>(h) Other costs and (i) stipends (specify)</b>			3 579		
<i>(H1) Other costs</i>	746	800			
<i>(I1) Stipends for Mrs. Elena Korchomkina</i>	1700	600			
<i>(I2) Stipends for Mrs. Daria Kalinskaya</i>	525				
<i>(I3) Stipends for Mr. Alexander Latushkin</i>	850	300			
<b>Subtotal "Other costs"</b>	<b>3 821</b>	<b>1 700</b>	<b>3 579</b>		
<b>TOTAL (1), (2), (3) :</b>	<b>5 546</b>	<b>9 450</b>	<b>8 604</b>		
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>			<b>23 600</b>		

## D) P.P SHIRSHOV INSTITUTE OF OCEANOLOGY, MOSCOW, RUSSIA

## SfP NATO BUDGET TABLE

Project number: SfP - 982678	Project short title: SfP - Black Sea Characterization
Report date: 31.03.2011	Duration of the Project 1: November 2009 – October 2012
Project Co-Director: ( <i>Oleg Kopelevich, Moscow, Russia</i> )	

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start until 31.03.2011	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>				
<b>(c) Training</b>				
<b>Subtotal "Training "</b>				
<b>(f) Travel</b>		3 800	4 000	
(F1) Kick-off meeting Istanbul, Turkey 09-10 November 2009 – 1 person	600			
(F2) "Ocean from Space" symposium, Venice, Italy, 25-30 Apr, 2010, 1 person	2 070			
<b>Subtotal "Travel"</b>	<b>2 670</b>	<b>3 800</b>	<b>4 000</b>	
<b>(g) Consumables - Spare parts:</b>	0	200	2 930	
<b>Subtotal "Consumables - Spare parts"</b>	<b>0</b>	<b>200</b>	<b>2 930</b>	
<b>(h) Other costs and (i) stipends (specify)</b>				
(H1) Other cost		200	200	
(I1) Stipendies for Mr. Vladimir Levchenko (or the other student)	1 300	800	1 600	
<b>Subtotal "Other costs"</b>	<b>1 300</b>	<b>1 000</b>	<b>1 800</b>	
<b>TOTAL (1), (2), (3) :</b>	<b>3 970</b>	<b>5 000</b>	<b>8 730</b>	
<b>CURRENT COST OUTLOOK =(1)+(2)+(3)</b>			<b>17 700</b>	

**E) NATIONAL INSTITUTE FOR MARINE RESEARCH AND DEVELOPMENT,  
CONSTANTA, ROMANIA**

**SfP NATO BUDGET TABLE**

Project number: SfP - 982678	Project short title: SfP- Black Sea Characterization
Report date: 31.03.2011	Duration of the Project <sup>1</sup> : November 2009 – October 2012
Project Co-Director: (Viorel Malciu, Contanta, Romania)	

Detailed Budget Breakdown (to be completed in EUR <sup>3</sup> )	ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in the financial planning compared to the approved Project Plan
	(1) from start until 31.03.2011	(2) for the following six months	(3) for the following period until project's end	
<b>(a) Equipment</b>				
<b>Subtotal "Equipment"</b>				
<b>(c) Training</b>	0	2 250	2 000	
<b>Subtotal "Training "</b>	<b>0</b>	<b>2 250</b>	<b>2 000</b>	
<b>(f) Travel</b>		3 527	3526	
(F1) Kick-off meeting Istanbul, Turkey 09-10 November 2009 – 1 person	497			
<b>Subtotal "Travel"</b>	<b>497</b>	<b>3 527</b>	<b>3 526</b>	
<b>(g) Consumables - Spare parts:</b>	1000	700	1 000	
<b>Subtotal "Consumables - Spare parts"</b>	<b>1000</b>	<b>700</b>	<b>1 000</b>	
<b>(h) Other costs and (i) stipends (specify)</b>		1 300	1 400	
(H1) Other costs	700			
(I1) Stipends	1 000			
<b>Subtotal "Other costs"</b>	<b>1 700</b>	<b>1 300</b>	<b>1 400</b>	
<b>TOTAL (1), (2), (3) :</b>	<b>3 197</b>	<b>7 777</b>	<b>7 926</b>	
<b>CURRENT COST OUTLOOK = (1)+(2)+(3)</b>			<b>18 900</b>	

## 6.2 Annexes 4b: SfP NATO SUMMARY BUDGET TABLES

### SFP NATO BUDGET SUMMARY TABLE

Project number: SfP - 982678	Project short title: SfP - Black Sea Characterization
Report date: 31.03.2011	Duration of the Project <sup>1</sup> : November 2009 – October 2012
The Project is in the year (please indicate): 1 – 2- 3	

Breakdown per Project Co-Director (to be completed in EUR <sup>3</sup> )			ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in financial planning compared to the approved Project Plan
Project Co-Director's name, city, country	APPROVED BUDGET: Total year1- 3	CURRENT COST OUTLOOK: Total year1- 3	since start until 31.03.2010	for the following 6 months	for the following period until project's end	
Prof. Temel Oguz,, Erdemli, Turkey	25 000	25 000	680	8 500	15 820	
Dr. Atanas Palazov, Varna, Bulgaria	98 300	98 300	73 697	10 600	14 003	
Dr. Michael Lee, Sevastopol, Ukraine	23 600	23 600	5 546	9 450	8 604	
Dr. Oleg Kopelevich, Moscow, Russia	17 700	17 700	3 970	5 000	8 730	
Dr. Viorel Malciu, Constanta, Romania	18 900	18 900	3 197	7 777	7 926	
<b>TOTAL (must be identical with TOTALs given in 'Breakdown per item'):</b>	<b>183 500</b>	<b>183 500</b>	<b>87 090</b>	<b>41 327</b>	<b>55 083</b>	

Breakdown per item (to be completed in EUR <sup>3</sup> )			ACTUAL EXPENDITURES	FORECAST EXPENDITURES		Comments on changes, if any, in financial planning compared to the approved Project Plan
Item	APPROVED BUDGET: Total year 3	CURRENT COST OUTLOOK: Total year 3	since start until 31.03.2010	for the following 6 months	for the following period until project's end	
(a) Equipment	68 000	70 493	70 493	0	0	
(b) Computers - Software						
(c) Training	13 000	13 000	0	7 000	6 000	
(d) Books - Publications						
(e) Experts - Advisors						
(f) Travel	52 000	52 177	5 674	21 327	25 176	
(g) Consumables - Spare parts	23 000	20 130	1 878	6 500	11 752	
(h) Other costs and (i) stipends	27 500	27 700	9 045	6 500	12 155	
<b>TOTAL :</b>	<b>183 500</b>	<b>183 500</b>	<b>87 090</b>	<b>41 327</b>	<b>55 083</b>	

## 6.3 Annexes 4c: SfP NATO NATIONAL CONTRIBUTION TABLES

## B) INSTITUTE OF OCEANOLOGY-BAS, BULGARIA

## SFP NATIONAL CONTRIBUTION TABLE

Project number: SfP -982678 Project Co-Director: ( <i>Atanas Palazov, Varna, Bulgaria</i> ) Report date: 31.03.2011	Project short title: SfP - Black Sea Characterization
---	---

## A. TYPE of EXPENDITURE

Budget breakdown	Year of expenditure		
	1st year	2nd year	3rd year
<b>(a) Salaries</b> ( <i>Name and qualification of research and support personnel</i> )			
(A1) Dr Atanas Palazov, director	2 500	2 500	2 500
(A2) Violeta Slabakova, associated researcher	2 000	2 000	2 000
(A3) Mr. Hirsto Stanchev, associated researcher	500	500	500
<b>Subtotal "Salaries"</b>	<b>5 000</b>	<b>5 000</b>	<b>5 000</b>
<b>(b) Overhead Costs</b> ( <i>specify: consumables, energy, local transportation</i> )			
(B1) Energy	500	500	500
(B2) Consumables	500	500	500
<b>Subtotal "Overhead"</b>	<b>1 000</b>	<b>1 000</b>	<b>1 000</b>
<b>(c) Equipment - Computers</b>			
<b>Subtotal "Equipment"</b>			
<b>(d) Other costs</b>			
(D1) Ship crew	10 000		
<b>Subtotal "Other costs"</b>	<b>10 000</b>		
<b>TOTAL :</b>	<b>16 000</b>	<b>6 000</b>	<b>6 000</b>
<b>GRAND TOTAL = (1) + (2) + (3) + (4) + (5)</b>	<b>28 000</b>		

## B. SPONSORING INSTITUTIONS

Name of sponsoring institution	Year of expenditure		
	1st year	2nd year	3rd year
<b>TOTAL :</b>	(1)	(2)	(3)
<b>GRAND TOTAL = (1) + (2) + (3) + (4) + (5)</b>			



**E) NATIONAL INSTITUTE FOR MARINE RESEARCH AND DEVELOPMENT,  
CONSTANTA, ROMANIA**

**SFP NATIONAL CONTRIBUTION TABLE**

Project number: SfP -982678	Project short title: SfP- Black Sea Characterization
Project Co-Director: ( <i>Viorel Malciu, Constanta, Romania</i> )	
Report date: 31.03.2011	

**A. TYPE of EXPENDITURE**

Budget breakdown	Year of expenditure		
	1st year	2nd year	3rd year
<b>(a) Salaries</b> ( <i>Name and qualification of research and support personnel</i> )			
Dr. Viorel Malciu	400	400	300
Dr. Razvan Mateescu	300	300	300
Dan Vasiliu	300	300	300
<b>Subtotal "Salaries"</b>	<b>1 000</b>	<b>1 000</b>	<b>900</b>
<b>(b) Overhead Costs</b> ( <i>specify: consumables, energy, local transportation</i> )	500	500	500
<b>Subtotal "Overhead"</b>	<b>500</b>	<b>500</b>	<b>500</b>
<b>(c) Equipment - Computers</b>	1 000	700	1 000
<b>Subtotal "Equipment"</b>	<b>1 000</b>	<b>700</b>	<b>1 000</b>
<b>(d) Other costs</b>			
<b>Subtotal "Other costs"</b>			
<b>TOTAL :</b>	<b>2 500</b>	<b>2 200</b>	<b>2 400</b>
<b>GRAND TOTAL = (1) + (2) + (3) + (4) + (5)</b>	<b>7 100</b>		

**B. SPONSORING INSTITUTIONS**

Name of sponsoring institution	Year of expenditure		
	1st year	2nd year	3rd year
<b>TOTAL :</b>	(1)	(2)	(3)
<b>GRAND TOTAL = (1) + (2) + (3) + (4) + (5)</b>			

## 7. EQUIPMENT INVENTORY RECORDS

Inventory Label №	Property Item	Manufacturer	Model Number	Serial Number	Date of Purchase	Cost (EUR <sup>1</sup> )	Location
1776	7 channel free fall optical profiler	Satlantic	MPRO II	141	07.12.2010	27 725.4	Institute of oceanology, Bulgaria
1777	In water profiling package reference sensor multispectral Irradiance cosine Air ( $E_s$ ) sensor	Satlantic	Micro II Ref 7 Channel	214,215	07.12.2010	6 226.9	Institute of oceanology, Bulgaria
1778	7 channel Irradiance cosine water ( $E_d$ , $E_u$ ) sensor	Satlantic	OCR-507I	216	07.12.2010	5 913.00	Institute of oceanology, Bulgaria
1779	Combination chlorophyll fluorometer and 2 channel backscattering	Wet labs	Triplet puck		07.12.2010	7 219.7	Institute of oceanology, Bulgaria
1780	Advanced pitch/roll compensated compass/ magnetometer system	Satlantic	SAT-THS	025	07.12.2010	2 847.00	Institute of oceanology, Bulgaria
1781	Sunphotometer	Solar Light Company Inc.	Model 540 Microtops II		07.12.2010	7 628.5	Institute of oceanology, Bulgaria
1782	GPS	Trimble	Geo XT	50025088 93	07.12.2010	9 022.8	Institute of oceanology, Bulgaria

## Project SfP 982678 April Progress Report - 2011

### 8. CRITERIA FOR SUCCESS TABLE

Project number:	SfP -982678	Project short title: SfP - Black Sea Characterization
Report date:	31.03.2011	Duration of the Project <sup>1</sup> : 10.11.2009 - 10.11. 2012
The Project is in the year <sup>2</sup> : 1 – <u>2</u> - 3		

<b>Criteria for Success as approved with the first Grant Letter on: 12.12.2008</b>		<b>Criteria for Success: Achievements as at 10.11.2009. / 31.03 2011</b>	
	%		%
1) Procurement and test of new in situ instrumentation (bio-optical profiler)	20	Bio-optical equipment was purchased and assessment of the measurement method was performed.	20
2) Execution of the first bio-optical cruise	20		0
3) Analysis and quality assurance of the bio-optical data from the first cruise	10		0
4) Execution of the second bio-optical cruise	10		0
5) Analysis and quality assurance of the bio-optical data from the second cruise	10		0
6) Development of regional bio-optical algorithms	10		0
7) Implementation of the new bio-optical algorithms in the JRC processing chain for ocean color satellite data	10		0
8) All countries involved in the project continue the bio-optical sampling program in the Black Sea to future improve bio-optical algorithms of available ocean color products	10		0
<b>TOTAL :</b>	<b>100%</b>	<b>TOTAL <sup>4</sup> :</b>	<b>20 %</b>

<b>SUMMARY REPORT</b>
-----------------------

### **SfP – Black Sea Characterization**

SfP – 982678

Bio - Optical Characterization of the Black Sea for Remote Sensing Applications

Project Co-Directors:

*Prof. Temel Oguz, IMS, Erdemli, Turkey (NPD)*

*Dr. Atanas Palazov, IO, Varna, Bulgaria (PPD)*

*Dr. Michael Lee, MHI, Sevastopol, Ukraine*

*Dr. Oleg Kopelevich, SIO, Moscow, Russia*

*Dr. Viorel Malciu, NIMRD, Constanta, Romania*

Approval Date: 12<sup>th</sup> December 2008      Effective Date: 10<sup>th</sup> November 2009

Duration: 3 years till 10<sup>th</sup> November 2009

NATO Budget: 183 500 EUR

---

Information about the SfP Project through Internet: [www.natosps.io-bas.bg](http://www.natosps.io-bas.bg)

---

#### Abstract of Research

The project, within the framework of the environmental security research topic, aims at the implementation of a tool to support remote sensing applications for operational environmental monitoring and climate studies in the Black Sea. This final objective is expected to be achieved through the implementation of new models and algorithms in a processing chain for ocean colour imagery. The new models and algorithms for the quantification of the concentration of seawater optically significant constituents (mostly chlorophyll a, total suspended matter and yellow substance), will result from the analysis and application of comprehensive in situ bio-optical measurements of optical properties (inherent and apparent) and concentration of seawater optically significant constituents performed during two major oceanographic campaigns.

#### Major Objectives:

- to create an in situ data set of optical properties (inherent and apparent) and concentration of seawater optically significant constituents for the Black sea.
- to develop a new bio-optical algorithms for the determination of optically significant seawater constituents for Black Sea environmental monitoring through Earth observing systems (mostly the Medium Resolution Imaging Spectrometer (MODIS) onboard the NASA AQUA polar platform).
- to validate a new regional bio-optical algorithm.
- to cross - compare of regional and global bio- optical algorithms
- to generate satellite ocean-colour products of the Black Sea freely accessible through web interface

#### Overview of Achievements since the Start of the Project until 31 March of current year

- Organisation of the first kick-off meeting in November 2009, in Istanbul, Turkey.
- Purchase request/ delivery of the free- fall profiler.
- Assessment of measurement method was carried out through the cross-site comparison of early bio-optical data collected by the JRC scientific team in the Black Sea in 2006 and 2009.
- Joint research proposal was submitted to obtain funding for ship-time through the EUROFLEETS program. The project was granted in the late Fall 2010. EUROFLEETS will fully fund 8 ship-time days for a bio-optical cruise in Romanian and Bulgarian waters expressively linked to the NATO project. The EUROFLEETS Cruises will take place from 01 till 05 July on the Romanian R/V Mare Nigrum and from 09 till 12 July on the Bulgarian R/V Akademik.
- A specific JRC program (i.e., BioMaP) will support additional 9 ship-time days in July 2011. A BioMap cruise on the Bulgarian R/V Akademik will follow the EUROFLEETS cruise from 13 till 22 July. This cruise is aimed at exploring the bio-optical properties of the central Black Sea basin in Turkish waters and will satisfy requirements for the NATO SfP project.
- A new spectral transparency meter was made, for future use in calibration of Volume Scattering Function meter during the both planning bio-optical expeditions.
- Presentation of the results of preliminary analysis of data obtained in the Black Sea was made at the “Oceans from Space” Symposium, Venice 2010 Burenkov V., Kopelevich O., Sheberstov S., Vazyulya S. Bio-optical characteristics of the Black Sea from satellite data.
- Project Internet web site was prepared and is now available under Institute of Oceanology, BAS web server: [www.natosps.io-bas.bg](http://www.natosps.io-bas.bg)

Payments through NATO Funds: 87 090 EUR

#### Milestones for the Next Six Months

- Execution of the first bio-optical cruise;
- Analysis and assurance of data from first cruise;
- Training on Optical Profile Measurements and Data handling

#### Implementation of Results

The Institute for Environment and Sustainability of the Joint Research Centre is a major civil entity that will make use the outcomes of the scientific activities of this project in its processing chain for satellite ocean colour data in view of generating more accurate remote sensing products for the Black Sea.

#### Other Collaborating Institutions

- Maritime Hydrographic Directorate, Romania
- Research Center of the Navy, Romania

---

Abbreviations: *(give full expression for all abbreviations which occur in this summary)*

IMS – Institute of Marine Science  
IO- Institute of Oceanology  
MHI – Marine Hydrophysical Institute  
SIO – Shirshov Institute of Oceanology  
NMRD – National Institute for Marine Research and Development  
JRC- Joint Research Centre  
NASA – National Aeronautics and Space Administration  
ROSA – Romanian Space Agency  
ESA – European Space Agency