INCO-CT-2005- 016663

BEOBAL

BEO Centre of Excellence Research Capacity Improvement for Sustainable Environment and Advanced Integration into ERA

SSA

PRIORITY 6: Global Change and Ecosystems

Publishable Final Activity Report

Period covered: from 01.04.2007 to 30.09.2007 **Date of preparation:** 12.11.2007

Start date of project: 01.04.2005 **Duration:** 30 months

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Project coordinator organisation name
Institute for Nuclear Research and Nuclear Energy,
Bulgarian Academy of Sciences

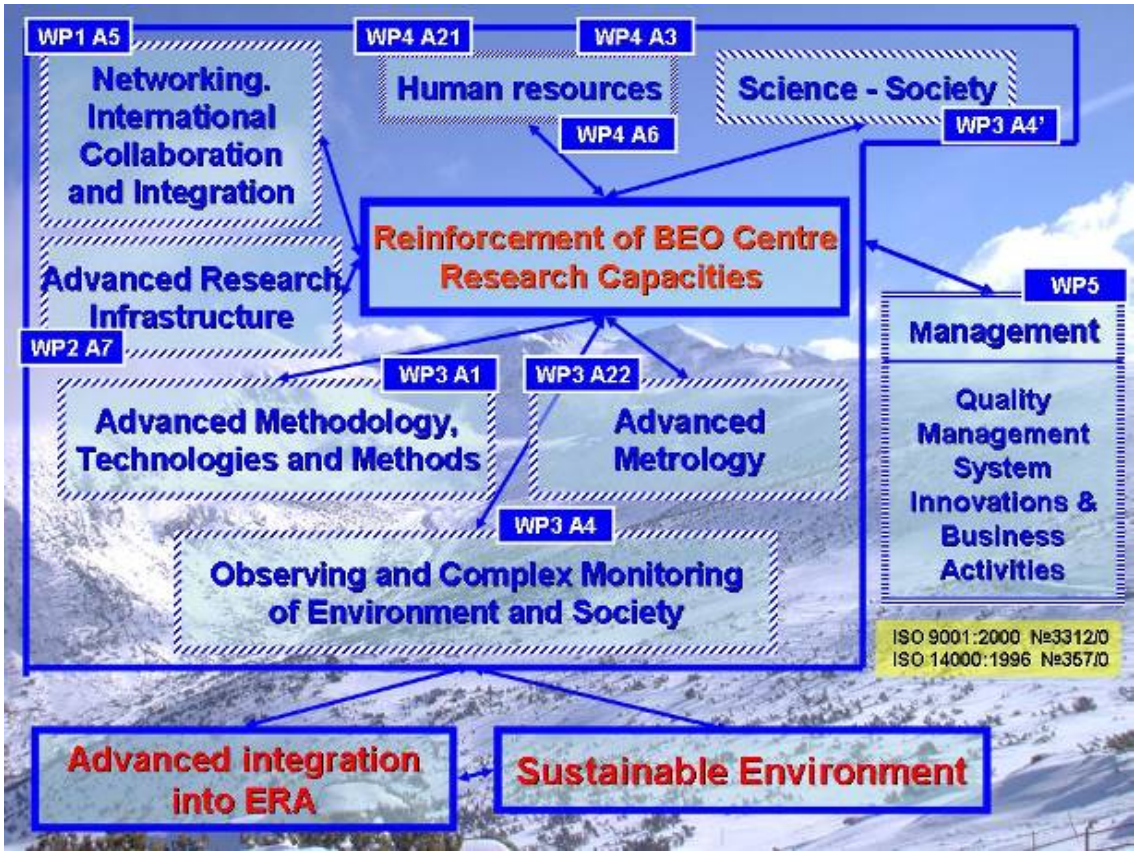
Revision 1

"BEO Centre of Excellence Research Capacity Improvement for Sustainable Environment and Advanced Integration into ERA"

INRNE 6th Framework Programme of EU project (*INCO-CT-2005-016663*)

BEOBAL

1. Project Execution



The main purpose of this and others previous and current projects is in next years BEO Moussala to be developed as/for:

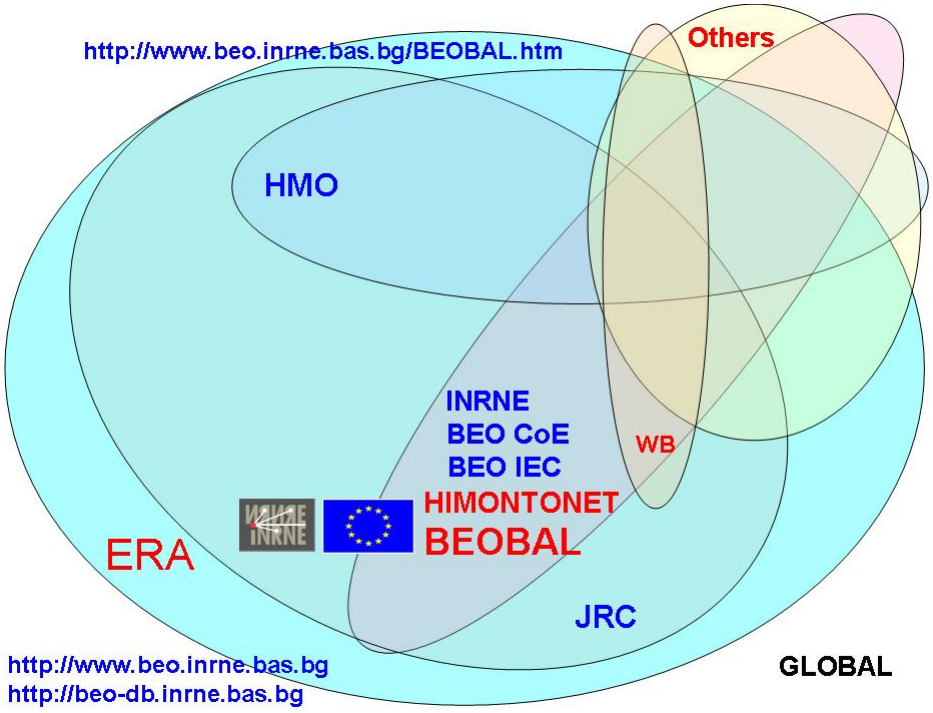
- an observatory attracting the scientists from abroad and to be included as "research infrastructure for transnational access" (at the first time, mainly for neighboring countries)
- the regional station of GAW (Global Atmosphere Watch) programme of World Meteorological Organization
- implementation and development of advanced methodology, technology, methods and advanced metrology
- enhancement of observing and complex monitoring of global change and ecosystems
- diversification, broadening and enhancement of international collaboration and cooperation
- advanced Human Resources long-term management and stimulate of youth in science
- active science communication by advanced Science – Society interaction policy
- application and development of advanced management system
- reinforcement of S&T equipment and systems of BEO CoE directed to enhancement of the research infrastructure of European importance

The basic fields of current and future work and studies at BEO Moussala and in BEO Centre of Excellence are:

- **Global change**
- **Aero - Space weather**
- **Sustainable development**
- **Measuring devices and systems development and enhancement.**

WP1: ***Networking.*** *Diversification, broadening and* ***enhancement of international collaboration*** *and cooperation.* **Operational goal A1** (Networking, International Collaboration & Integration and Reinforced Research Infrastructure)

Objectives ***Networking. Diversification, broadening and enhancement of international collaboration and cooperation*** towards to reach real European integration.
The special attention is paid and a substantial part of work is directed to the joint activities with Balkan institutions, deepening of international collaboration, networking and integration in the space of ERA with European centers of excellence - JRC institutes (**ITU**, Karlsruhe, Germany, **IES**, Ispra, Italy, **IRMM**, Geel, Belgium), European High Mountain observatories (**HMO**), large international institutions of European and global importance like **CERN** and other leading European institutes, traditional and new INRNE partners (**INP**, Prague, Czech Republic, **INFN**, Torino, Italy, **INS**, Izmir, Turkey), **ITP**, Leipzig, Germany, ect. and fom some neigbour countries like Ukraine- **INR, UNAS** and **UNARC**, Kiev of MES and ICPC, like Kazachstan - Institute of Nuclear Physics, Alma Ata, Yerevan Physics Institute, Yerevan, Armenia).



Study visits: 32
2 in Western Balkan counties institutes - INP, Tirana, Albania; VINS, Vinca, Serbia; CETR, Podgirica, Montenegro; IF, Skopje, FYRO Macedonia; **1** in INP, Prague, Czech Republic; **4** in INS, Izmir, Turkey; **4** in Bern university, PSI and HAFS Jungfraujoch &Gornegrad, Interlaken, Switzerland; **1** in UFS Schneefernerhause, Zugspitze and Hochenpeissenberg Observatory, Germany; **3** in UFS Schneefernerhause, Zugspitze, Germany; **2** in INP, Alma-Ata and Tyan-Shan HMO, Kazachstan; **2** in INR, NUAS and NUARC, Kiev, Ucraine; **1** in ITU, JRC, Karlsruhe, Germany; **2** in Monte Cimone ISAC observatory, Italy, **2** in Sonnblick and Hochenpeissenberg Observatory, Austria, Germany; **1** in Observaoire de Paris, France; **2** in NUARC (ONPU), Odessa, Ukraine; **1** in Perrudja, Itally; **1** in EPI, Erevan, Armenia, **2** in Lomnitsky Stit, Slovakia; **1** in SEE, Athens, Greece;

Special regional task was directed to the activities with **Balkan , neighbouring and ICPC countries**. Other important direction is the **Joint work programme with JRC institutes** (in the framework of **NUSES initiative** and **BEOBAL** and **HIMONTONET** FP6 and FP5 projects). The third main activity is **Bilateral cooperation and joint cooperative agreements with European HMO** (in the framework of **HIMONTONET, BEOBAL, ACCENT, EUSAAR and other EU FP5 and FP6 projects** and initiatives) and finally, **Deepening of international collaboration, networking and integration in the space of ERA** with **large international institutions of European and global importance and INRNE traditional and other new partners**.

I. Joint activities with Balkan, neighbouring and ICPC countries institutions
A. In frame of the project BEOBAL programme – 12 study visits were realized in partner institutes from Albania, Serbia, Montenegro, FYRO Macedonia, Kazakhstan and Ukraine. As results of this action are obtained the following:

1. BEOBAL project was presented in: JNP, Tirana, Albania; VINS, Vinca, Serbia; CETR, Podgoriza, Montenegro; IF, Scopje, FYRO Macedonia, INS, Izmir, Turkey, Tien-Shan Observatory, INP, Alma Ata, Kazakhstan, NUARC, Kiev, Ukraina. .
2. Signed protocols and developed joint proposals
3. Joint research project with JNS, Ege University, Bornova, Izmir, Turkey was proposed and memorandum has been signed
4. Partners from Balkan countries have been included in two FP7 INRNE projects proposals.
5. Signed protocol with JNS, Ege University, Bornova, Izmir
6. New **user partners** from Kiev, Ukraine – National Antarctic Research Centre and Kiev Institute for Nuclear Research - (see protocol and report). This new partnership is in sound with new EU neighbouring policy and BG role in it. It was proposed to Ukrainian partner to joint the EUSAAR project as associate. Signed agreements with INR of NUAS and UNARC of MES, Kiev, Ukraine

B. **6** visits for research activities (SSA_A22) were realized: Dr. Nicolla Civici from JNP Tirana and Assoc. Prof. Sema Akyil – INS, Izmir, Prof. Vladimir Pavlovych from INR, UNAS, Kiev, D.Sc. Vladimir Vashchenko from UNRAC, MES, Kiev, Prof. Vitalii Russov, UNRAC (ONTU), Odessa and Dr, Turgay Karali from INS, Izmir and the correspondent joint activities programmes were developed

C. Conference activities
14 scientists from Albania, Serbia, Montenegro, Ukraine and Turkey were participating in BEOBAL conference events. **5** scientists from Albania, Serbia, Montenegro and Turkey were participating in **BEOBAL workshop**, presenting their contributions. **6** scientists from Serbia, Turkey and Ukraine were participating in **BEOBAL project conference**, presenting theirs contributions. **3** scientists from Turkey, Ukraine and Serbia are participating in **BEOBAL conference – informational days.** Three BEOBAL scientists are participating in the ogranisation of INSINUME – 3 European symposium in Turkey (see D.1.5) and have 7 reports.

II. Joint activities with JRC institutes is realized in 2 basic directions:
- Joint research activities (projects) in frame of FP6
  EUSAAR I^3 – strengthening and improvement of the aerosol measurements at BEO Moussala and participation in joint research activities together with the leading European

institutions

ACCENT NoE - FP6 project for coordination of activities connected with aerosol measurements in Europe

- Direct scientific connection with JRC institutes:
  1. **IES, JRC, Ispra, Italy** – 2 x 3 month specialization for young scientists inside EURDEP programme with the intend to develop this connection to make more stabile the exchange towards to improve the level of radiological database of BEO Moussala.
  2. **ITU, JRC, Karlsruhe, Germany** - after more then 10 years close collaboration on the field of nuclear fuel modeling during the last BEOBAL seminar was developed the idea for new project proposal, connected with the problems of "dirty bomb" and illicit trafficking problems
  3. **IRMM, JRC, Gell, Belgium** – 1 Ph.D. student 12 months visit is in stage of realisation (travel and stay paid by BEOBAL project).

III. Joint activities with high mountain observatories (HMO)

UFS (Environmental research station) Schneefernerhause, Zugspitze, Germany:

- participation of BEO Moussala staff (4 participants) in GAW qualification courses
- GAW QA/QC qualification (4 people) towards to implementation of the same software system and methods for control of data flow, obtained in the real time at BEO Moussala.

DWD Hohenpeisenberg Meteorological Observatory: 5 visits

- qualification courses of calibration of GAW gas analyzers
- similar activity performed at BEO Moussala under leadership of DR. Stefan Gilge

The high altitude research station Jungfraujeuch and connected Swiss universities and research institutions were visited by Dr. Ilia Penev, Dr. Ch. Angelov and two Ph.D. students. Except of the detail discussion about common air pollution and aerosol measurements it is proposed that BEO Moussala has to become a member of the non-formal "Ring of FIVE", which is the European HMO network for monitoring air born radioactivity. The high altitude research station Jungfraujeuch and important 75 Anniversary conference were visited by Prof. J. Stamenov and Dr. B. Vachev. The ideas about HMO management and new future projects have been developed and discussed.

The interest of joint works continuation started already during FP5 HIMONTONET project is declared in the Minutes signed be representatives of BEO Moussala **and ISAC – CNR (HMO Monte Cimone), Italy.** A special stress has been made on science dessimination and public awareness. Another Minutes are signed especially for DOOAS measurements. The joining of efforts in the fields of aerosol and CO2 measurements plays essential role for the improvement of BEO Moussala measurements.

ALOMAR observatory, Norway. According to the executed signed contract are realized the measurements of the atmosphere transparency with help of Cherenkov light telescope on the basis of parallel operation with tropospheric LIDAR devices at ALOMAR observatory. Ideas for the new project have been discussed - it has been done in the framework of direct collaboration.

Sonnblick Observatorium, Austria

- exchange of high mountain observatories exploitation experience
- joint work on the problems of atmospheric ozone
- preparation of joint projects

Institute of Experimental Physics, Slovakian Academy of Sciences, Coshice, Lomnitski Stit Cosmic Rays Observatory:

- comparative measurements of the counting characteristics of CNM15 proportional gas counters
- improvement of connected electronic designs
- comparative measurements with Liulin LET spectrometer
- signed bilateral agreement in the field of cosmic rays and eco toxicological investigations

IV. ERA

The long years (more 40) collaboration with **NPI (Nuclear Physics Institute, Czech Academy of Sciences, Prague, Czech Republic)** is continuing in the framework of BEOBAL project:

- passive neutron dosimetry detector joint research at BEO Moussala
- measurement of 14C in CO2 using methodology developed by NPI
- implementation of semiautomatic device for analysis of track detectors
- comparative measurements and absolute calibration of TLDs (Thermo Luminescent Detectors) at different energy interval
- absolute calibration and comparative measurement with Liulin LET spectrometer
- continuation of bilateral agreement between INRNE and NPI for 3 years

The collaboration agreements with **Safety commission and IT division of CERN**, signed in sound with HIMONTONET FP5 and BEOBAL FP6 projects were prolonged for the next 2 years (till end of 2008). The exchange of environmental monitoring data, calibration of measuring devices, application of new measuring methods is successfully continued. With the help of CERN IT division the GRID computer cluster of INRNE, connected also with BEO telecommunication and information systems, is essentially improved during the last time.

Special attention has to be paid to the collaboration and **twinning partnership agreement,** signed inside BEOBAL project between **World calibration center for Aerosol Physics and the Institute for Troposphere Physics, Leipzig, Germany** and INRNE BEO Centre of Excellence. This collaboration is of crucial importance for new aerosol equipment putting into operation.

Institute of Nuclear Sciences, Ege University, Izmir, Turkey: Joint investigations of radiological status of different regions in Bulgaria and Turkey, comparative analysis in the frame of executing bilateral agreement; joint orgnisation of INSINUME-3 symposium.

Erevan Physical Institute, Armenia: Joint research in the frame of World Heliospheric Year. Signing of memorandum of understanding for setting up of specialized device of simultaneous measuring of the cosmic rays components.

INR of NUAS (Institute of Nuclear Research of National Ukrainian Academy of Sciences) and UNARC (Ukrainian National Antarctic Research Centre) of MES, Kiev, Ukraine: exchange of joint visits; working on joint publications in the field of cosmic rays investigation at BEO Moussala, aerosol studies and climate change modelling, in the frame of signed bilateral agreements.

Collaboration with **NILU** as BEOBAL partner **(Norwegian Institute for Air Research)** was realised by participation in a large European scale passive air sampling 3 month campaign during the summer of 2006, being

carried out under the Convention on long-range trans boundary air pollution, EMEP-CCC / NILU in order to support work on persistent organic pollutants (POPs).

INFN, Torino branch, Italy

- implementation of FLUCA code for the neutron flux estimations for BEO Moussala joint calculations of the efficiency of BEO neutron flux meter
- active exchange of working visit to both sites
- active exchange of overview information for cosmic neutron investigation
- science communication – exhibition for High Mountain Observatories, presented in Torino in the programme of XX Winter Olympic Games, Sofia, Chieri, Bergamo

Development of joint activities with **BEO Integrated Environmental Centre members** – Bulgarian Universities, research institutes and others: joint organisation of BEOBAL conference activities (BEOBAL workshop and BEOBAL conference – informational days); participation in joint research; development of joint projects.

As result from above mentioned activities several project FP7 proposals have been developed: **6** project proposal **for FP7 have been submitted** and **2** are **in stage of preparation** with BEOBAL and other BEO CoE, BEO Moussala and INRNE partners:
in **Research Potential (REGBEOBAL),** in **eContent*Plus* (EURTRAILS),** in **Science and Society (PHASEBASES),** in **Security (BIOGHOST, EU-SAFER)** and in **Ideas**

In details all these activities are reported in BEOBAL periodic reports and dliverables 1. D1.1, 2. D1.2, 3. D1.3, 4. D1.4, 5. D1.5 and at BEOBAL web page
http://www.beo.inrne.bas.bg/BEOBAL.htm

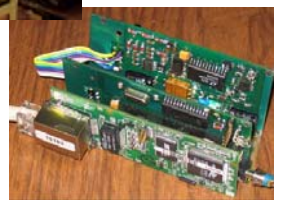
WP2: ***Reinforcement of S&T equipment and systems of BEO CoE***
Operational goal A2 (Networking, International Collaboration & Integration and Reinforced Research Infrastructure)
Objectives Reinforcement of S&T equipment and systems of BEO CoE directed to ***enhancement of the research infrastructure*** of European importance, connected with: global change observing, ecosystems monitoring, technological and natural risks (study, early detection and control) widely using new information technologies and platforms. The improving of systems for ***observing and complex monitoring*** in attempt to realize adequate management towards to reach sustainable environment. ***Improving BEO Moussala to a regional GAW station***, creating and improving by this way South - East European part of this network, joining ERA.

Upgrading and renewal of S&T equipment and systems: more 20. The following equipment and systems are in operation, delivered in the frame of BEOBAL project:

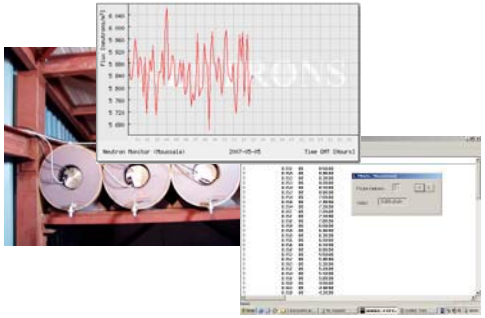
- **Air quality monitoring system** 1
  - NO_x analyzer
  - CO analyzer
  - CO_2 analyzer
  - SO_2 analyzer
  - O_3 analyze
  - Portable calibrator
  - Data acquisition system
- **Aerosols properties measuring devices**
  - Integrated nephelometer for determination of integral light-scattering coefficient of aerosols 2
  - Inlet
  - Condensation particle counter 3
  - Neutraliser
- **Systems for cosmic particles, radioactivity detection and complex environmental monitoring:**
  - Gamma background device 4
  - Neutron flux meter 5
  - Muon telescope 6
  - LET gamma spectrometer 11
  - Ozonometer 7
  - Rn analyser 8
  - Alpha spectometer 9
  - UV meter 10
  - Modernized set of portable small devices for complex environmental monitoring (*new electronic analytical balance, portable multiparameter meter, portable spectrophotometer*) 12 13 14
- **Modernized computer network**; 15
- **Improved automatic weather station (**new wind, temperature and pressure sensor and new logger); 16 17 18 19
- **Upgraded system for uninterruptible emergency power supply**; 20
- **Improved equipment for radioaerosols studies in quasi real time**; 21
- **Improved and modernised video control and cloud formation observing system**; 22
- **Modernisation of :**
- Electricity supply 23
- Thunder protection 24
- Transport
- Water supply and other **techn. infrastructure syst.**ect.(all modernisations funded by INRNE part of project)

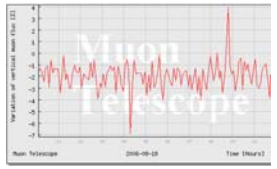
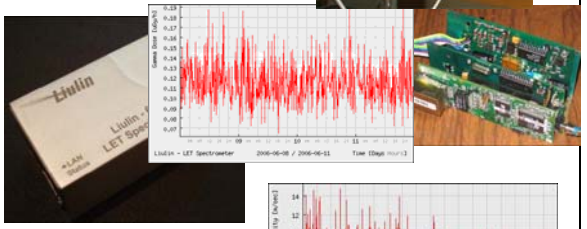
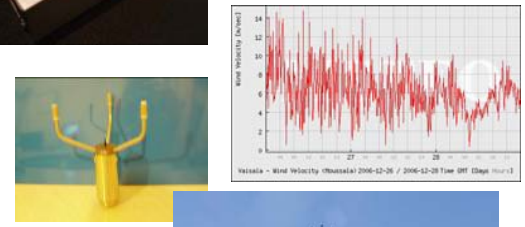
The systems and devices and their location are presented in tables and pictures below.

Type of equipment	Status, Date	Functional characteristics (specification)	Tender procedure	Data transfer	Illustrations
Environnement CE Mark Automatic System for Gas Concentration Measurements; ISO 9001:2000 & ISO14001	Test operation Start 07.12.2005	**NOx analyser:** Chemilumiscence technique ISO 7996/1985 & EN 14211; 0-0.05/0.1/0.2/0.5/1/2/5/10 ppm or auto ; Lower detectable limit (LDL) : 0.4 ppb; Response time (RT) (T90s) : 40 s min; NOx converter efficiency : 98.5% **SO2 analyser:** UV-fluorescence technique ISO 10498 & EN 14212; 0-0.05/0.1/0.2/0.5/1/2/5/10 ppm or auto; LDL: < 1 ppb; RT (T90) : 10 s min **CO analyser:** NDIR FC technique in accordance with ISO 4224 & EN 14626; 0-10/25/50/100/200 ppm or auto; LDL: < 0.05 ppm; RT (T90s) : 30 s min; **O3 analyser:** UV photometry technique in accordance with ISO 13964 & EN 14625; 0-0.05/0.1/0.2/0.5/1/2/5/10 ppm or auto; LDL: 0.4 ppb: RT (T90s) : 30 s min; **Portable calibration device**: fast and multipoint calibration of gas monitors by dynamic generation of standard gas at known volume content (method referenced by ISO standard n° 6349	Open tender 3 candidates	On screen and database output, Web integration is force coming	  
Intelligent Gamma probe IGS421	Test operation started 09.12.2005	**Detector 2x GM tubes 20031E** Range: 10nGy/h … 2mGy/h Sensitivity: 1976 counts/min ~ mGy/h Detector background: 38 counts/min ~ 38nGy/h Energy range: 40 keV …1.25 MeV **Detector GM tube 20018E** Range: 0.1mGy/h … 10 Gy/h Sensitivity: 1.24 counts/min ~ µGy/h Energy range: 50 keV …1.25 MeV Sensitivity range: 10 nGy/h …10 Gy/h Accuracy: ~ 15% resp. to Cs-137 Operating temperature: -40 deg. C …+ 60 deg. C Dimensions, wight: 80/115mm x 635 mm; ~ 2300 g	No tender, 3 offers	On screen and file output, software and database integration is force coming	
SNM15 **Neutron flux meter**	Detectors in test operation	2 modules of 3 SNM-15 detectors SNM -15 detector: Dimensions 2mx15 cm diameter Filled with BF_3 enriched to 90% with B^{10} (pressure 1.2 atm); High voltage regime 2000-2200 V Moderator tube – 240x40 cm cylinder, approximativly 200 litters of glycerin; Data acquisition system - 6 channels of individual counters; 1 channel integrated sum.; Maximal counting rate 30 000 counts/s for each channel	No tender, direct negotiation		 

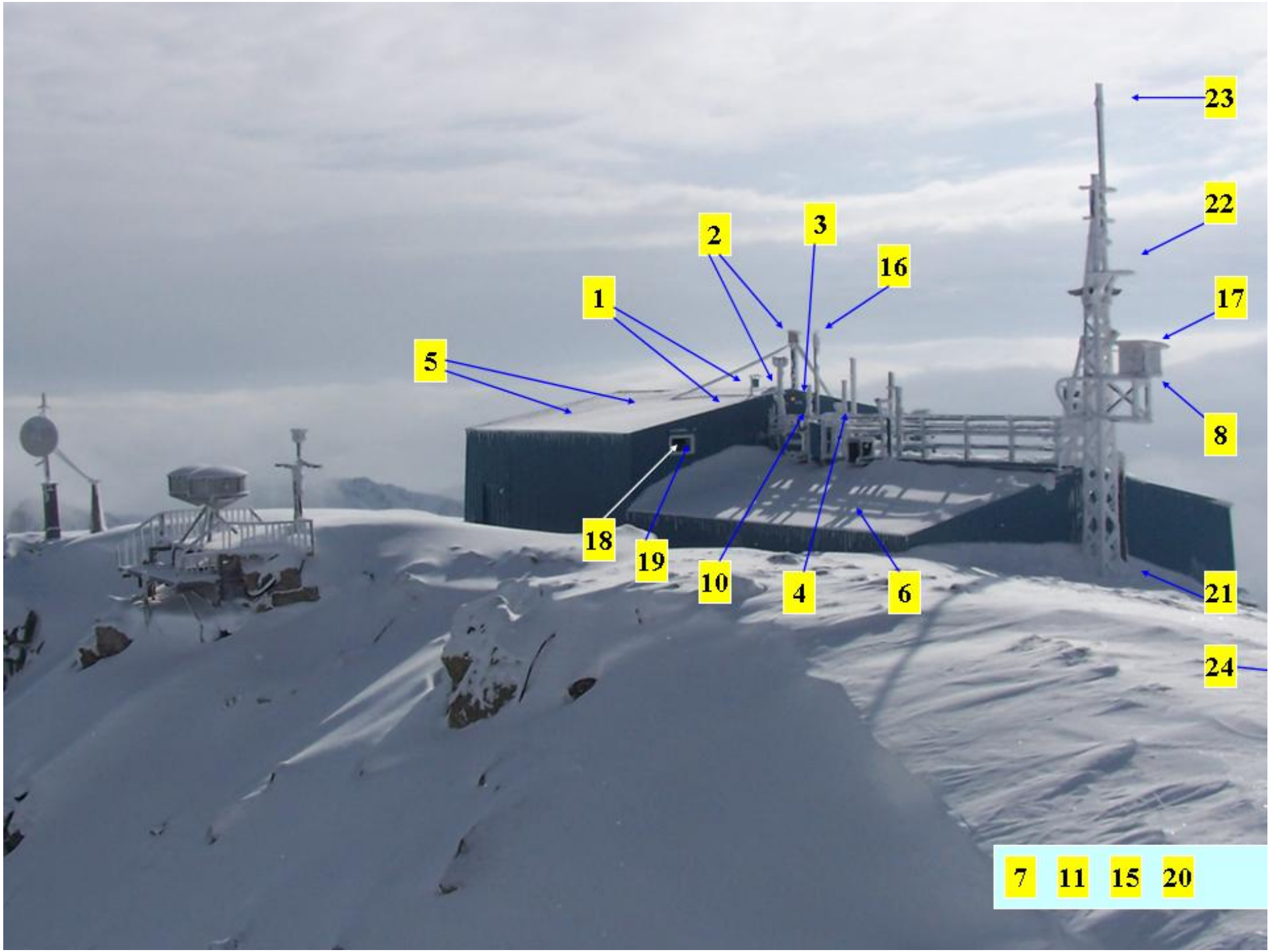
Type of equipment	Status, Date	Functional characteristics (specification)	Tender procedure	Data transfer	Illustrations
Moun telescope;	Test operation Start 28.04.2006	Threshold of energy 1 GeV Zenith angular interval ± 25° All others angular Intervals 0 … 45 ° Standard error/hour 0.5% Total effective detect area 1m2	No tender, direct negotiation	On screen and database output, Web integration is force coming	 
Liulin - 6MB Modernization of set of portable small devices for complex environmental monitoring	Test operation 28.02.2006	**Hi - Tech Gamma spectrometer with wide range, incl. space application** - Dose range: 0.093 nGy – 1.56 mGy; - Flux range: - 0.01 – 1250 part/cm2s; - Energy loss range: - 0.0407 – 20.83 MeV; - Pulse height analysis range: - 9.25 mV – 5.0 V; - LET range: 0.135 - 69.4 keV/μ; - Temperature range: -20oC - +40oC; - Power consumption at normal operation: not more than 150 mA from 12 V - Spectrometer dimensions: 84x40x40 mm; weight 0.12 kg;	No tender, direct negotiation; recommen-dations of leading experts; wide international cooperation	Web based interface	 
2 PC NEC Power Mate ML7 **2 Laptops NEC Versa M350** Modernisation of computer network;	Operation		open tender INRNE; several candidates		  
Vaisala WINDCAP® Ultrasonic Wind Sensor WS425 Improvement of automatic weather station	Software adjustment and integration	**Wind speed** Measurement range: serial output: 0...65 m/s (0...144 mph, 0...125 knots); analog output: 0...56 m/s (0...124 mph, 0...107 knots) Starting threshold: virtually zero Delay distance: virtually zero Resolution: 0.1 m/s (0.1 mph, 0.1 knots, 0.1 km/h) Accuracy (range 0...65 m/s): ± 0.135 m/s (±0.3 mph, ±0.26 knots) or 3% of the reading, whichever is greater **Wind direction** Measurement range: 0...360° Starting threshold: virtually zero Delay distance: virtually zero Resolution: 1° Accuracy (wind speed over 1 m/s): ±2°	No tender, direct negotiation (improving of existing Vaisala automatic weather station)	Software adjustment; software integration is force coming	

Type of equipment	Status, Date	Functional characteristics (specification)/ Common description	Tender procedure	Data output	Illustrations
Upgrading of the UPS system for emergency power supply;	Operation; 10.12.2005	**Input** Nominal Input Voltage 230V; Input Frequency 50/60 Hz +/- 3 Hz (auto sensing) ; Input Connections Bulgarian BDS Schuko type; Input voltage range for main operations 160 - 285V ; Input voltage adjustable range for mains operation 151 - 302V **Output** Output Power Capacity 1980 Watts / 2200 VA; Max Configurable Power 1980 Watts / 2200 VA; Nominal Output Voltage 230V; Efficiency at Full Load 95% ; Output Voltage Distortion Less than 5% at full load ; Output Frequency (sync to mains) 47 - 53 Hz for 50 Hz nominal,57 - 63 Hz for 60 Hz nominal Crest Factor up to 5 : 1; Waveform Type Sine wave Output Connections	Open tender, INRNE	Log files	  
Improvement of equipment for radioaerosols measurements	Test operation	El. motor - 3kw, 3 phases House for el. motor, 140x80x90cm, material - special isolation against noise and vibrations Air turbine - 3000t/minp capacity - 1200m^3/h, possibility for reduction till 300-400m^3/h Filter device, 50x50cm, filter material ФППП-15 Effectiveness for aerosols in the frame 0.2 - 5mkm more then 95% House for filter device, steel 80x80x80cm	No tender		  
Improvemet and modernisation of video control and observing system	Operation 15.03.06		No tender, direct negotiation	BEO-db web	http://beo-db.inrne.bas.bg/moussala/images/index.html?asddd 
Electro generator Modernisation of emergency electricity supply	Test operation	Electro generator based on YaAZ – 204 engine, 30 kW, 400V	No tender, direct negotiation		
Improving of thunder protection system of BEO	Operation 10.10.05 Real tests are expected in late spring 2006		No tender, Direct negotiation	N/A	 
Modernisation of transport and other technical infrastructure systems, ect.	Operation 15.11.05	Reconstruction of storage building at cargo lift station			
UAZ 39094	1.07.05	4x4 combined truck auto;			  

light-scattering coefficient of aerosol **Inlet** to the integrated nephelometer	Moussala since 21-th of February 2007.	forcing of the Earth's climate by aerosol particles.The light-scattering coefficient is a highly variable aerosol property. Integrating Nephelometer measures the angular integral of light scattering that yields the quantity called the *scattering coefficient*, which is used in the Beer-Lambert Law to calculate total light extinction. Model 3563 includes three-wavelength and back-scatter features – wavelengths 450 nm (blue); 550 nm (green) and 700 nm (red).	standards and 3 recommendations of leading experts Direct negotiation		 
Gas analyser CO12	Delivery Jun 2007	Gas analyser for measurement CO2 production of Environnement	No tender, 3 offers	On screen and database output, Web integration	
MICROTOPS II ozonometer	Delivery Jun 2007	**MICROTOPS II** is a 5 channel hand-held ozonometer for measuring total ozone column; Optical channels: 305.5 ±0.3 nm, 312.5 ±0.3 nm, 320.0 ±0.3 nm, 936 ±1.5 nm, 1020 ±1.5 nm, 10 nm; Resolution: 0.0001uW/cm² on 305nm channel; Dynamic range: >300,000; Viewing angle 2.5° Precision 1-2%; Nonlinearity max 0.002% FS; Operating environment 0 to 50°C, no precipitation; Computer interface RS-232C Power source 4xAA Alkaline batteries Weight 21 oz (600 grams) Size 4"W x 8"H x 1.7"D (10x20x4.3 cm)	No tender, 3 offers	On screen and database output, Web integration	
CPC + neutralizer radioactive source (Am241) **SNM15**	Delivery Jul 07	CPC- Condensation particle counter. Optical counter of aerosols	Direct negotiation	On screen and database output, Web integration	
Neutron detector	Neutron detector in test operation from march 2007	2 modules of 3 SNM-15 detectors SNM -15 detector: Dimensions 2mx15 cm diameter Filled with BF_3 enriched to 90% with B^{10} (pressure 1.2 atm); High voltage regime 2000-2200 V Moderator tube – 240x40 cm cylinder, approximately 200 litters of glycerine; Data acquisition system - 6 channels of individual counters; 1 channel integrated sum.; Maximal counting rate 30 000 counts/s for each channel	No tender, direct negotiation		
Improvement of equipment for radioaerosols measurements	regular operation	El. motor - 3kw, 3 phases; House for el. motor, 140x80x90cm, material - special isolation against noise and vibrations; Air turbine - 3000t/minp capacity - 1200m^3/h, possibility for reduction till 300-400m^3/h Filter device, 50x50cm, filter material ФПП-15 Effectiveness for aerosols in the frame 0.2 - 5mkm more then 95% House for filter device, steel 80x80x80cm Air flow meter Testo 435-2	No tender		
Small portable devices El.An. balan. JD400–2B multip.. meter "Sension 156"; DR 2800 spectrophotometer	regular operation	Sension 156" – pH meter for measurement of pH, conductivity, dissolved oxygen, salinity, total dissolved solids; DR 2800 spectrophotometer: wavelength range – 340-900 nm; accuracy - ± 1.5nm; resolution – 1 nm; calibration – automatic; spectral bandwidth - ≤ 8nm; date storage – 500 measured values	No tender		 

Type of equipment	Status, Date	Functional characteristics (specification)	Tender procedure	Data transfer	Illustrations
Moun telescope;	Regular operation Aug, .2006	Threshold of energy 1 GeV Zenith angular interval ± 25° All others angular Intervals 0 … 45 ° Standard error/hour 0.5% Total effective detect area 1m2	No tender, direct negotiation	On screen and database output, Web integration is realise	
Rn low level analyzer;	Test operation Feb 2007	Air aspiration flow-rate – adjustable from 0,5 to 2,5 L min^{-1}; Filter rotation velocity : fixed – 1 rph or 1 rp12h PC controlled – adjustable from 1 rph to 1 rp24h; Alpha-spectrometry detectors – surface barrier detectors, 30 mm^2; SSNT detectors – Kodak LR 115; Air aspiration time – unlimited; Temperature range (without heating) – from 0 to 50^0 C	No tender, Direct negotiation	Web based interface	
α-spectrometer;	In operation Mar 2007	ADC – type Wilkinson, 4 K channels; Nonlinearity < 0,25 %; Interface – USB; Max. counting rate – 5000 s^{-1}; Detector surface – 450 cm^2; Measured resolution (^{241}Am): 17 keV with PIPS detector; 22 keV with surface barrier detectors.	No tender, 3 offers	On screen and digital output	
Liulin - 6MB Modernization of set of portable small devices for complex environmental monitoring	Regular operation June.2006	**Hi - Tech Gamma spectrometer with wide range, incl. space application** - Dose range: 0.093 nGy – 1.56 mGy; - Flux range: - 0.01 – 1250 part/cm2s; - Energy loss range: - 0.0407 – 20.83 MeV; - Pulse height analysis range: - 9.25 mV – 5.0 V; - LET range: 0.135 - 69.4 keV/μ; - Temperature range: -20oC - +40oC; - Power consumption at normal operation: not more than 150 mA from 12 V - Spectrometer dimensions: 84x40x40 mm; weight 0.12 kg;	No tender, direct negotiation; recommen-dations of leading experts; wide international cooperation	Web based interface	
Vaisala WINDCAP® Ultrasonic Wind Sensor WS425 Improvement of automatic weather station	Regular operation from Nov 2006	**Wind speed** Measurement range: serial output: 0...65 m/s (0...144 mph, 0...125 knots); analog output: 0...56 m/s (0...124 mph, 0...107 knots) Starting threshold: virtually zero Delay distance: virtually zero Resolution: 0.1 m/s (0.1 mph, 0.1 knots, 0.1 km/h) Accuracy (range 0...65 m/s): ± 0.135 m/s (±0.3 mph, ±0.26 knots) or 3% of the reading, whichever is greater **Wind direction** Measurement range: 0...360° Starting threshold: virtually zero Delay distance: virtually zero Resolution: 1° Accuracy (wind speed over 1 m/s): ±2°	No tender, direct negotiation (improving of existing Vaisala automatic weather station)	Software adjustment; software integration is made	 
Vaisala data logger + new detectors of temperature and pressure	Regular operation Jul 2007	The QLI50 Data Logger acts as interface between sensors for meteorological and other parameters and the computer. It performs automatically measuring commands to 20 Voltage and 10 Current inputs with 16-bit A/D converter with digital filters for analog signals, and 8 bit I/O port for digital signals. QLI50 is designed to work in harsh ambient condition and has built EMI (electromagnetic interference) and ESD (electrostatic discharge) protection.	No tender, direct negotiation (improving of existing Vaisala automatic weather station	On screen and database output	

Type of equipment	Status, Date	Functional characteristics (specification)	Tender procedure	Data transfer	Illustrations
Gas analyser CO2	Delivered Jun 07 Test operation 18.07.07	Gas analyser for measurement CO2 production of Environnement	No tender, 3 offers	On screen and database output, Web integration	
MICROTOPS II ozonometer	Delivered Jun 2007 Test operation Aug 2007	**MICROTOPS II** is a 5 channel hand-held ozonometer for measuring total ozone column; Optical channels: 305.5 ±0.3 nm, 312.5 ±0.3 nm, 320.0 ±0.3 nm, 936 ±1.5 nm, 1020 ±1.5 nm, 10 nm; Resolution: 0.0001uW/cm² on 305nm channel; Dynamic range: >300,000; Viewing angle 2.5° Precision 1-2%; Nonlinearity max 0.002% FS; Operating environment 0 to 50°C, no precipitation; Computer interface RS-232C Power source 4xAA Alkaline batteries Weight 21 oz (600 grams) Size 4"W x 8"H x 1.7"D (10x20x4.3 cm)	No tender, 3 offers	On screen and database output, Web integration	 
CPC + neutralizer radioactive source (Am241)	Delivered Sep, Jul 07 Calibration	CPC- Condensation particle counter. Optical counter of aerosols	Direct negotiation	On screen and database output, Web integration	
Vaisala data logger + new detectors of temperature and pressure	Regular operation Aug2007	The QLI50 Data Logger acts as interface between sensors for meteorological and other parameters and the computer. It performs automatically measuring commands to 20 Voltage and 10 Current inputs with 16-bit A/D converter with digital filters for analog signals, and 8 bit I/O port for digital signals. QLI50 is designed to work in harsh ambient condition and has built EMI (electromagnetic interference) and ESD (electrostatic discharge) protection.	No tender, direct negotiation (improving of existing Vaisala automatic weather station	On screen and database output	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Institute for Nuclear Research and Nuclear Energy
Bulgarian Academy of Sciences
BEO Centre of Excellence
BEO Moussala
Radio Ecology
Radio Analytical Methods
Radio Chemistry & Pharmacy
Neutron Generator
Neutron Data
X-ray - Fluorescent Analysis
BEO INRNE
Department of European Projects
15
12
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Control Laboratory of Radiation Protection
Information Technologies
INRNE

WP3 ***Advanced methodology, technology, methods, metrology, observing and complex monitoring.***
Science – society interactions. **Operational goal A3, (Networking, International Collaboration & Integration and Reinforced Research Infrastructure), Operational goal C (Advanced Science – Society Interaction policy)**

Objectives: ***Implementation and development of advanced methodology, technology, methods and advanced metrology, observing and complex monitoring*** in the field of Global change and ecosystems and their regional and European projections and components including: impact and mechanisms of greenhouse gas emissions and atmospheric pollutants from all sources on climate, ozone depletion and carbon skins, towards to improve predictions and forecasts; operational forecasting and modelling, global change observing systems; especially environmental radioactivity, monitoring and assessment of technological and natural hazard and risks.
Advanced metrology development and implementation in the field of global change observing, environmental radioactivity and radioecology, radiochemistry and radionuclide analysis, based on the close collaboration with JRC institutes. ***Observing and complex monitoring*** of Global change processes and ecosystems in attempt to realize adequate management towards to reach sustainable environment. ***Advanced Science – Society Interaction policy*** towards to reach not only dissemination of the obtained research results but to succeed in the active communication and dialogue with the public organizations, government and NGOs. ***Improving responses to socio-economic needs of the country.***

Exchange of personnel visits: 11 to 7 institutes
Networking with other research centers (exchange of personnel and of results and joint experiments) for execution of joint experiments and exchange of results
2 with INP, Prague, Czech Republic; **2** with UFS, Schneefernerhaus, Zugspitze, Germany, **3** with CERN, Geneva, Switzerland, **1** with Monte Chimone ISAC-CNR station, Italy, **1** with DWD HP observatory, Germany, **1** with INFN, Torino section, Italy, **1** from ITF, Leipzig, Germany.

Visits for research activities: 17 from 10 institutions
(visits for joint research activities to BEO Centre of Excellence of scientists from leading European institutions, BEOBAL partners, EU and Balkan and neighbouring and ICPC countries):
1 from INP, Prague, Czech Republic; **1** from ITF, Leipzig, Germany; **3** from INFN, Torino and Torino University, Italy; **2** from INS, Izmir, Turkey; **1** from INP, Tirana, Albania (seminar connected with "Small portable devices…" seminar – X-ray measurement device), **2** from ALOMAR, Norway, **3** from INR, UNAS, Kiev, NUARC, Kiev, NOPU, NUARC, Odessa, Ukraine and **3** from CERN, Geneva, Switzerland, **1** from DWD HP observatory, Germany.

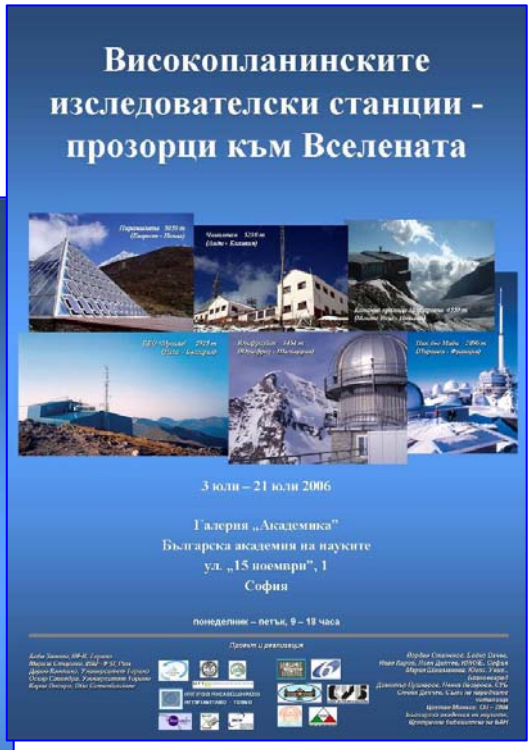
Conference activities: 3
- BEOBAL Coordination and Methodologuical Workshop, Bachinovo, Blagoevgrad, 22-26 Oct 2005
- BEOBAL Conference, BEOBAL Project Conference, "GLOBAL CHANGE, ENVIRONMENT, SUSTAINABLE DEVELOPMENT OF THE SOCIETY AND HIGH MOUNTAIN OBSERVATORIES NETWORK", Giuletchitza, 21-25 Mar. 2007
- BEOBAL Conference – Informational Days "Nature and Society" 15.06.07, Shoumen, 17-19.06.07, Varna and 28-29.06.07, Blagoevgrad

Science communication:

- Improvement of BEO web sites and development of BEOBAL web page

http://www.beo.inrne.bas.bg
http://beo-db.inrne.bas.bg
http://www.beo.inrne.bas.bg/BEOBAL.htm

- **4** CD, electronic, **2** web sites and **1** web page and other publications
- **18** Public lectures
- **18** Posters
- **More then 17** Exhibitions, including participation in **the world exhibition during the XX Olympic Games in Torino, Italy "High Mountain Research Stations – a Window to the Universe",** its **Sofia and subsequent Bergamo and Chieri realisations** and two exhibitions of Bulgaria and Bulgarian Science, devoted to Bulgaria joining of EU – "**Bulgarian Research – a New Brick in the European House of Knowledge"** organised by the Ministry of Education and Science with the support of European Commission and Permanent Representation of the Republic of Bulgaria to the European Union
- **Media activities** – TV activities: **10;** Radio activities: **6; 1** video film; publications in popular journals, newspapers, bulletins, news agencies, web releases, ect.: **19;** Media briefings: **4**
- **3** volumes of OM2 multi volume series – 2 (10 and 11)devoted for BEOBAL training seminars and 1 (12) with the proceedings of BEOBAL conference
- **1** BEOBAL BEO Moussala leaflet **–** second edition



The Nobel Prize in Chemistry 1995
Paul J. Crutzen visiting
the exhibition LA RICERCA
"D'ALTA QUOTA"
with Jimmy the Phantom
(12th October 2006, **4th BERGAMOSCIENZA EDITION**)

"High Mountain Research Stations – a Window to the Universe" Exhibition
Students from schools and universities, scientists, generic audience, members from University of the Third Age… Bergamo and Sofia realization

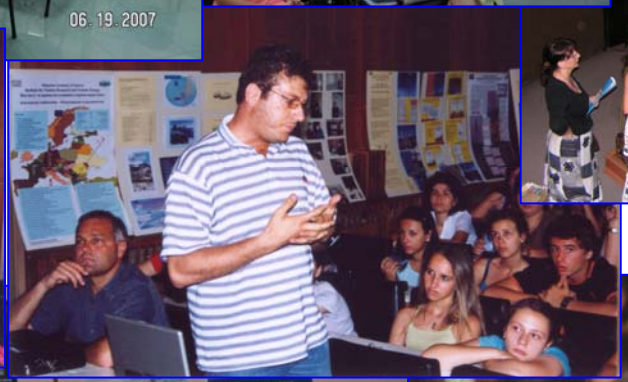
A mini version of HMO Exhibition has realized in the Chitalishte (centre o culture and knowledge) “Kiril and Mefodius”, Sofia in the beginning of September, 2006 during the traditional cultural festival

INRNE European project – Exhibition

in the Info Centre of Delegation of European Commission in Bulgaria, Sofia, Dec 2006
http://www.evropa.bg/en/ic/calendar/events.html?date=2006-12-00&eventid=2360 and

in Bulgarian Academy of Sciences from 16 Jul 2007 to the middle of Sep 2007

Exhibitions and public lectures during BEOBAL Conference – Informational Days "Environment and Society", 15 Jun 2007 in Shumen, 17-19 Jun 2007 in Varna and 28-29 Jun 2007 in Blagoevgrad



The main objectives of WP3 within the frame of BEOBAL Project plan are implementation and development of advanced methodology, technology, methods, metrology, observing and complex monitoring in the field of Global change and ecosystems, including gas emissions and atmosphere pollutants (ozone depletion and carbon skin etc.), global change observing systems (environmental radioactivity, monitoring and assessment of the natural and anthropogenic hazards and risks.

The work is realised based on national research competence on the field and close collaboration and networking with recognized scientific Centers in Europe.
This activity will pursue the long tradition of BEO Moussala to support the European science and intends to have the new and noteworthy impact of improving our knowledge on national and international level.
It bring to bear the realization of theoretical and modeling studies accompanied by experimental research and application.
The direct impact of specific technical solutions explored by the team is strongly influenced by the competencies existing in the institutes.

Advanced metrology development and implementation in the field of Global change observing, environmental radioactivity and radioecology, radiochemistry and radionuclide analysis.
In this part of the Project the most advanced methods for investigation of physical –chemical and radiological interactions, use of modern measuring instruments and new technologies have been applied.
The goal set out for:
- the most advanced methodology for global change observing
- use of most powerful (as possible) instruments for measuring of gas concentration in air, aerosols and cosmic particles and radioactivity detection
- implementation of new technologies in atmosphere physics and chemistry
- promoting progress on the most advanced techniques in complex monitoring of the environment.

The research is focused on the development of methods for appraising environmental quality and on the environmental monitoring tools as absolute calibration and intercalibration of instruments, statistical methods for data treatment.
The technical choice for particle tracking detector devices and other apparatus has easily been explained by the fact that they have already been implemented in other laboratories.

Observing and complex monitoring of Global change processes and ecosystems for sustainable environment
During the last project period the main accent was puted on continuation of improvement and upgrade of the measuring devices and systems in BEO CoE and transition from test to regular operation.
The new technologies and apparatuses for CO2 and aerosols (CPC) has been introduced.
New methods for statistical data treatment were studded and improvement of the work with the existing data banks and Internet realization was continued.
Different environmental components characteristics as radioactivity, chemical composition (major and trace elements) measurements have been estimated.
Bio-indicators as a criterion for the environmental status and anthropogenic impact have been used for assessment of the sustainability of the environment.

The e effectively improved complex of measuring devices and systems of BEO Moussala is now excellent basis for advanced experimental studies of the Sun – Earth interactions and the influence of the cosmic radiation on the meteorological pareters and aerospace weater characteristic.

Advanced science - society interaction policy

The Climate change problems are now from high actuality for the human society. The open explanation of local and worldwide problems (phenomenon) of the environment and climate changes is now the necessary contribution of the science to the development of the society.

The applied hightech solutions for atmosphere and environmental control, the careful and highest technological level of data treatment and its realisation and distribution via Internet is the basis for awareness and preparedness of the society for the urgent need of high quality scientific observing and management of the environment.

Inside the BEOBAL project organisation of several one-man shows and also participation in numerous INRNE, national and international exhibitions are realized.

The installed TV control system continues to be used via Internet prepared on-line by the Administration of Rila National Park. TV image information is given from BEO Moussala to the one of the channels of Bulgarian National Television for purposes of meteorological forecast.

All these activities will assure a quite close and very sensible science – society interaction.. Moreover the BEO websites were improved and BEOBAL web page was created and carefully developed.

Improving responses to socio- economic needs of the country.

The BEOBAL project could have only indirect contribution to the socio-economic needs of the country providing systematical complex observing of the environment in real time and giving by this way the basis for the effective management of the environment. Such a management gives the basis to overcome or to avoid negative influences of same environmental factors towards to reach sustainable development of the environment.

The realization of the measures and activities foreseen in WP3 of BEOBAL project leaded to implementation of advanced technology and methodology for observing of Global changes, concentrated mainly on atmosphere physics and chemistry, aerosol physics and complex monitoring of the environment.

In the same time active exchange of the personnel was realized which leaded to essential increase of the qualification of BEOBAL participants.

BEOBAL Project Conference – Informational Days , “Nature and Society” - 15.06.07, Shoumen, 17-19.06.07, Varna and 28-29.06.07, Blagoevgrad, Bulgaria with around 25 INRNE participants, 5 BEOBAL foreign partners and 105 local participants and partners, with more then 500 people public (mainly high school students), 13 public lectures, gives the basis for active and fruitful exchange of opinions and ideas and future pragmatic collaboration. BEOBAL Project Conference – Informational Days lessons and proposals now are developing and in use. The same was effect of 2 previous BEOBAL conference events, in addition targeted for scientific and expert public

The extended BEOBAL Internet, TV, radio, and other media, exhibition and other public activities are a good example for an effective science communication.

WP4: ***Improvement of Human Resources.*** **<u>Operational goal B</u> (Advanced Human Resources long-term Management)**
Objectives: ***Advanced Human Resources long-term management*** reaching and preserving European qualification level and creating the best home for young scientist, additionally attracting young scientist from other countries

Description of work Young students from Bulgaria will be attracted to work in the BEO Integrated environmental centre preparing PhD and Post doc studies devoted to the global change and environmental problems. Plan for a regular improvement of qualification level will be realized among the basic staff of the BEO CoE and BEO IEC.

The objective of this WP will be achieved primarily by the use of PhD (post doc) form of qualification, in the institutes – partners, INRNE and institutes and universities from BEO IEC, by use also of activity 2 (visiting fellows -hosting scientist from aboard for teaching and training activities) and activity 3 training for Ph.D. students and/or post-doctoral researchers

9 training seminars with lecturers from **10** institutes and **7** countries have been realised in the frame of BEOBAL project.

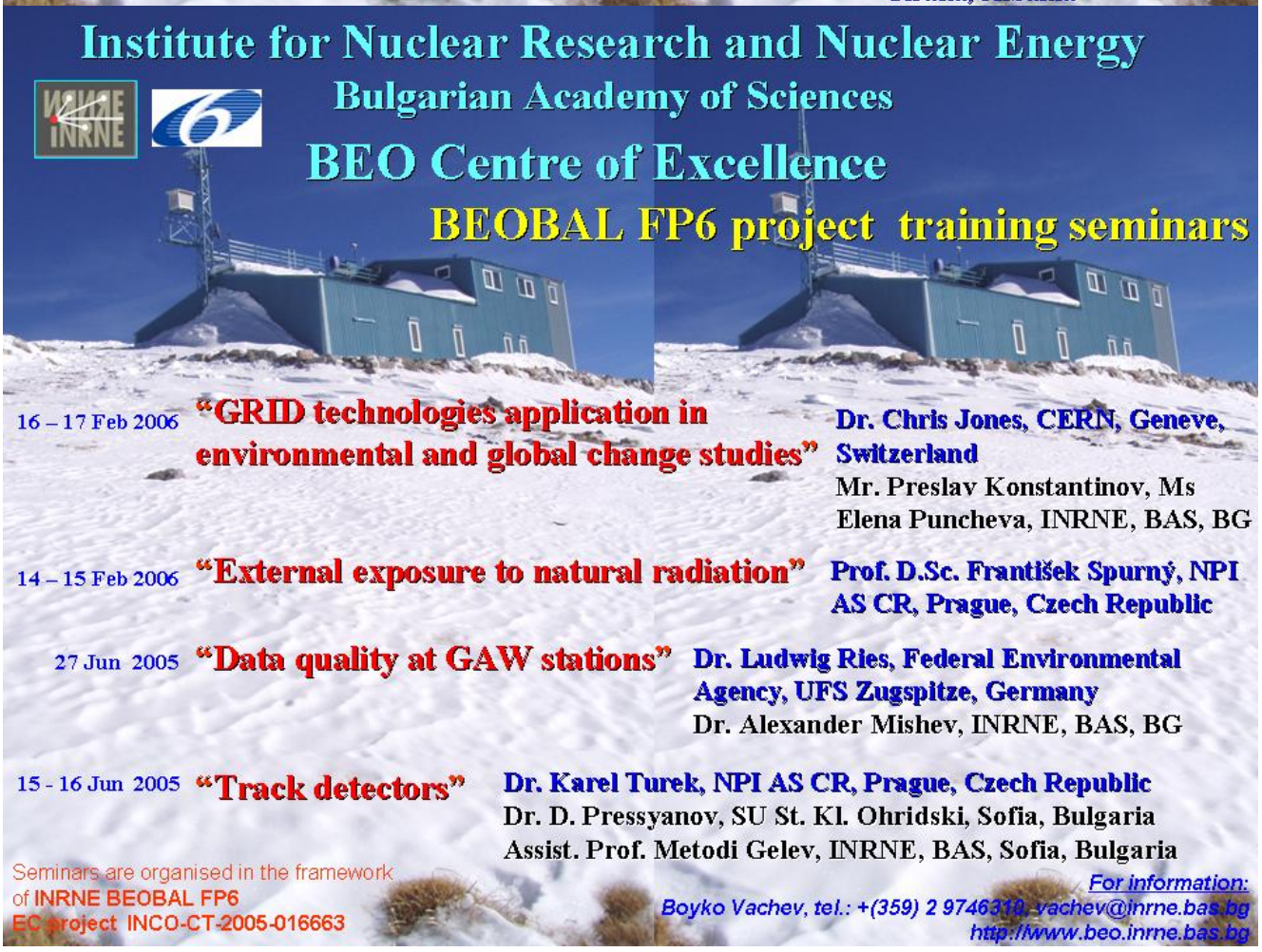
All training seminars materials are placed at BEOBAL web page:
http://www.beo.inrne.bas.bg/BEOBAL/BEOBAL_events.htm
The training seminars lectures are printed in two volumes of multi volume series OM2 – vol.10 and 11 and published also in DVD "INRNE European Project"..

Short stays for specialization: 15 in 8 institutions
2 visits in Lomnicky Stit observatory; **3** visits to INP, Prague, Czech Republic, **1** visit to Monte Cimone research station, **2** visit to INS., Izmir, Turkey, **2** visits in JFJ, HMO, Bern, Switzerland; **2** visits to CERN, Switzerland., **2** visits in DWD HP Observatory and **1** visit in UFS Schneefernerhause, Germany

Young researcher's specialization: 3
2 in **IES, JRC, Ispra, Italy** – 2 x 3 month specialization for young scientists inside EURDEP programme with the intend to develop this connection to make more stabile the exchange towards to improve the level of radiological database of BEO Moussala.
1 in **IRMM, JRC, Gell, Belgium** – 1 Ph.D. student 12 months visit

Young scientists are participating intensively in all BEOBAL activities:


Institute for Nuclear Research and Nuclear Energy
Bulgarian Academy of Sciences
BEO Centre of Excellence
BEOBAL FP6 project training seminars
19 – 20 Feb 2007
"Solar particle phenomena into magnetosphere"
Prof. D.Sc. Karel Kudela IEP SAS, Kosice, Slovak Republic
26 Jul 2006
"Global climate - cosmic rays – clear air standard. Aerosols"
Prof. D.Sc. Volodimir Paciovych, INR NANU, Kyiv, Ukraine
30 – 31 Mar 2006
"Environmental monitoring and complex safety"
Dr. Pavol Vojtyla, CERN, Geneva, Switzerland
Sevdalina Topalova, NCRRP, Sofia, Bulgaria
Kiril Slavov, NIMH, Sofia, Bulgaria
Dr. Alba Zanini, INFN, Torino, Italy
27 – 28 Feb 2006
"In situ measurements for complex environmental monitoring using portable equipment"
Dr. Andre von Zweidorf, ITU (DG JRC), Karlsruhe, Germany
Dr. Boyko Vachev, Assist. Prof. Metody Gelev, Dr. Alexander Strezov INRNE
Dr. Tsvetan Dachev, CLSTR, Sofia, BG
19 Dec 2005
"Portable X-ray spectroscopy equipment"
Dr. Nicolla Civici, INP AAS, Tirana, Albania


Institute for Nuclear Research and Nuclear Energy
Bulgarian Academy of Sciences
BEO Centre of Excellence
BEOBAL FP6 project training seminars
16 – 17 Feb 2006
"GRID technologies application in environmental and global change studies"
Dr. Chris Jones, CERN, Geneve, Switzerland
Mr. Preslav Konstantinov, Ms Elena Puncheva, INRNE, BAS, BG
14 – 15 Feb 2006
"External exposure to natural radiation"
Prof. D.Sc. František Spurný, NPI AS CR, Prague, Czech Republic
27 Jun 2005
"Data quality at GAW stations"
Dr. Ludwig Ries, Federal Environmental Agency, UFS Zugspitze, Germany
Dr. Alexander Mishev, INRNE, BAS, BG
15 - 16 Jun 2005
"Track detectors"
Dr. Karel Turek, NPI AS CR, Prague, Czech Republic
Dr. D. Pressyanov, SU St. Kl. Ohridski, Sofia, Bulgaria
Assist. Prof. Metodi Gelev, INRNE, BAS, Sofia, Bulgaria
Seminars are organised in the framework of INRNE BEOBAL FP6
EC project INCO-CT-2005-016663
For information:
Boyko Vachev, tel.: +(359) 2 9746310, vachev@inrne.bas.bg
http://www.beo.inrne.bas.bg

Summary of all BEOBAL activities

N	Organization	Country	A5	ja/p	A7	A1	A22	A4	A21	A3	A6	N	tot
1	Institute for Nuclear Research and Nuclear Energy, Sofia	Bulgaria	32	65	27	11	17	41	9	15	10	1	227
2	JRC EC, Joint Research Centre	Belgium		1								2	1
3	Institute for Transuranium Elements, ITU, JRC EC, Karlsruhe	Germany	1	1	1				1			3	4
4	Institute for Environment and Sustainability, IES, JRC EC, Ispra	Italy		2	2						2	4	6
5	Institute for Reference Materials and Measurements, IRMM, JRC EC, Geel	Belgium		1	1						1	5	3
6	Mt. Cimone Environmental Research Station, HMO MC	Italy	2	2	2	1		2		1		6	10
7	Testa Grigia Research Station, HMO TG	Italy		1	1							7	2
8	UFS Schneeferner hause, Zugspitze, HMO ZS	Germany	3	3	3	2		2	1	1		8	15
9	High Altitude Research Station Jungfraujoch and Gornergrat, HMO JFJ	Switzerland	4	3	1			1		2		9	11
10	Sonnblick Observatorium, HMO SB	Austria	2	3	1			1				10	7
11	Nuclear Physics Institute, Czech Academy of Sciences, Prague, NPI	Czech Republic	1	6	3	2	1	1	1	3		11	18
12	National Institute of Nuclear Physics, INFN, Torino sect.	Italy		6	2	1	3	2	1			12	15
13	Institute of Nuclear Sciences, Ege University, Izmir, INS	Turkey	4	3	1		2	4		2		13	16
14	ALOMAR Observatory, ALOMAR	Norway		2	2		2	2				14	8
15	Meteorological Observatory Hohenpeissenberg, Deutscher Wetterdienst, MOHP-DWD	Germany	1	2	3	1	1	1		2		15	11
16	Lomnitský Štit Observatory, LS	Slovakia	2	4	1			1	1	2		16	11
17	Institute of Tropospheric Physics, Leipzig, Germany	Germany		2	2	1	1					17	6
18	Institute of Nuclear Physiscs, Tian – Shyan Observatory, Alma - Ata, Kazachstan	Kazachstan	2	1	1							18	4
19	Norwegian Institute for Air Research, Polar Environmental Centre, Tromsø, NILU	Norway		2	1							19	3
20	Institutes and Universities from BEO IEC	Bulgaria	v	7	2			15	2			20	26
21	European organization for nuclear research, CERN	Switzerland		3	2	3	3		1	2		21	14
22	Kiev Institute of Nuclear Research, UNAN	Ukraine	2	2	1		1	1	1			22	8
23	Ucrainian National Centre of Antarctic Research	Ukraine	2	2	1		2	2				23	9
24	Yerevan Phisics Institute, Yerevan	Armenia	1	1	1							24	3
25	Observatoire de Paris, Paris	France	1	1								25	2
26	Vinca Institute for Nuclear Science, Belgrade	Serbia	2	1				3				26	6
27	Centre for Ecotoxicological Research, Podgorica	Montenegro	2	1				2				27	5
28	Institute of Nuclear Physics, Tirana	Albania	2	1	1			1	1			28	6
29	Institute of Physics, Scopie	FYR of Macedonia	2	1								29	3
1	Institute for Nuclear Research and Nuclear Energy, Sofia	Bulgaria	32	65	27	11	17	41	9	15	10	1	227
	Young scientist (visitors, activities particip., operating or responsib. for measure. equipm. & others included & concerned)		4	36	16	7	8	5	8	9	10		103
		%	13	55	59	64	47	12	89	60	100		45

Legend. *SSA applied in this call (Annex D of Work programme)* - **SSA_A1: Networking** with other research centres in Member States (MS) or ACCs: organising *exchange of personnel* and *of results* and *joint experiments;* **SSA_A2: Visiting fellows** (teachers and/or researchers): hosting scientists from abroad for *teaching, training* - **SSA_A21** *and/or research activities* - **SSA_A22***;* **SSA_A3: Training in MS or ACCs** for *Ph.D. students and/or post-doctoral researchers:* sending scientists from the centre for short stays, to laboratories abroad, either for specialised training or to carry out a specific research experiment; **SSA_A4: Workshops, conferences**: in order *to diffuse and to exploit research results;* **SSA_A5: Study visits** of the researchers from the Centre to other institutions in MS or ACCs in order *to prepare cooperative activities and/or joint RTD proposals;* **SSA_A6: Hiring of new young researchers** *to reinforce human potential;* **SSA_A7: Upgrading and/or renewal of S&T; ja/p:** Joint cooperative activities and RTD projects

2. Dissemination and use

It has been identified 2 exploitable result from the BEOBAL:

A. Gamma background measurement as result of the project BEOBAL should be offered and used by many institutions as follows:
Environmental Protection Agencies, Rescue Services, Information Agencies, TV, Radio, Newspapers, experts, universities, interested organizations.
The data-base for the gamma background is established and in a working stage.

Any scientist, teacher, student, expert from interested organization or popular user is welcome to use BEO-Moussala data on http://beo-db.inrne.bas.bg , for information, research or educational purposes, under the conditions:

1) to acknowledge
Basic Environmental Observatory, Institute for Nuclear Research and Nuclear Energy of Bulgarian Academy of Sciences and
BEOBAL EC 6th Framework Programme project (INCO-CT-2005-016663) in any published use of the data,
2) to send a copy of any paper using these data to:

Jordan Stamenov, jstamen@inrne.bas.bg
Peter Ivanov, petkoiv@inrne.bas.bg
Ivo Kalapov, kalapov@inrne.bas.bg

For providing more detailed data, please contact us by e-mail if you need.
jstamen@inrne.bas.bg , kalapov@inrne.bas.bg , petkoiv@inrne.bas.bg ;
tel./fax: + 359 2 9746310

B. Publications

List of publications

Stamenov J, Vachev B., editors, BEOBAL Training Seminars - I, 15 June 2005 – 17 February 2006, INRNE, Sofia, Bulgaria, BEOBAL FP6 Project “BEO Centre of Excellence Research Capacity Improvement for Sustainable Environment and Advanced Integration into ERA”, Observatoire de montagne de Moussala OM2, INRNE, Sofia, 2005; 10: p.452.

Stamenov J, Vachev B., editors, BEOBAL Training Seminars - II, 27 February 2006 – 20 February 2007, INRNE, Sofia, Bulgaria, BEOBAL FP6 Project “BEO Centre of Excellence Research Capacity Improvement for Sustainable Environment and Advanced Integration into ERA”, Observatoire de montagne de Moussala OM2, INRNE, Sofia, 2006; 11: p.582.

Stamenov J, Vachev B., editors, BEO Moussala, BEOBAL FP6 Project “BEO Centre of Excellence Research Capacity Improvement for Sustainable Environment and Advanced Integration into ERA”, Leaflet, INRNE, Sofia, 2007; in English and in Bulgarian.

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