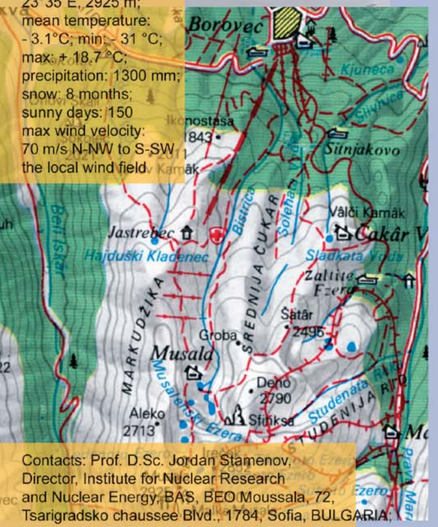
Coordinates: 42°11´N, 23°35´E, 2925 m;
mean temperature: - 3.1°C; min: - 31 °C; max: + 18.7 °C;
precipitation: 1300 mm;
snow: 8 months;
sunny days: 150
max wind velocity: 70 m/s N-NW to S-SW
the local wind field



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Global Change and Climate Research

Meteorology (standard parameters)

Atmospheric Chemistry

- Cloud and rain acidity
- NO, NO_x, SO_2 concentration
- O_3 concentration
- CO, CO_2 concentration
- $^{14}C/^{12}C$ ratio in CO_2 measurement
- HNO_2, CH_2O, CS, ClO measurements*

Atmospheric physics

- UV flux measurements
- Aerosols measurements
- Air transport of radioactive aerosols, toxic and heavy metals
- ^{210}Pb surface deposition control
- ^{220}Rn atmospheric concentration passive and active measurements
- Gamma background dose
- Total ozone column measurements
- Transparency of atmosphere

- Data acquisition, processing and analysis
- Information transmission and exchange in real time

Aerospace and Terrestrial Environment

Meteorology (standard parameters)

Atmospheric Chemistry

- Cloud and rain acidity
- NO, NO_x, SO_2 concentration
- CO, CO_2 concentration
- $^{14}C/^{12}C$ ratio in CO_2 measurement
- HNO_2, CH_2O, CS, ClO measurements*

Atmospheric physics

- UV flux measurements
- Aerosols measurements
- Air transport of radioactive aerosols, toxic and heavy metals
- ^{210}Pb surface deposition control
- ^{220}Rn atmospheric concentration passive and active measurements
- Gamma background dose
- Total ozone column measurements
- Transparency of atmosphere

Cosmic Ray Physics

- Cosmic muon flux intensity
- Absolute intensity of cosmic neutron flux
- Energy spectrum of cosmic rays 10^{14}-10^{17} eV

- Early forest fire detection and warning system*
- Complex monitoring of environment
- Ecotoxicological measurements

- Data acquisition, processing and analysis
- Information transmission and exchange in real time

Analysis of dynamics of physical, hydro-meteorological, chemical, geochemical and biological parameters of atmosphere, soils, waters, fauna and flora

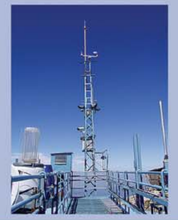
Monitoring of physical, hydro-meteorological, chemical, geochemical and biological parameters of atmosphere, soils, waters, fauna and flora

Natural Hazard and Technological Risks

Meteorology (standard parameters)

- Technological accidents and transborder pollution transport

- Nuclear accidents



- Nuclear accidents
- Neutron flux influence on biological objects
- Early forest fire detection and warning system*

- Data acquisition, processing and analysis
- Information transmission and exchange in real time

Monitoring and control of critical values of hazardous natural and technological processes and phenomena parameters

Apparatuses and Systems

Automatic meteorological station (Vaisala)

- Cloud and rain acidity measurements device
- Gas analyzer (Environnement)
- * $^{14}C/^{12}C$ ratio active measurement in atmospheric CO_2

- UV flux meter
- Integrated nephelometer (TSI)
- Cascade impactor
- BAM for PM2,5 and PM10 measurements
- Device for controlling of aerosols radioactivity
- ^{210}Pb air concentration estimation
- X-ray fluorescent spectrometer
- Thermoluminescent detectors (TLD)
- ^{220}Rn active device and alpha spectrometer
- Gamma background probe (Technidata)
- High temperature semiconductor spectrometer
- SBN-90 gamma background probe
- MICROTOPS II ozonometer
- Gamma and neutron detector (Harwell 3208-1)

- Passive neutron detector
- Active neutron flux meter based on SNM15
- Muon Cerenkov teleskope
- Cerenkov telescope
- LET spectrometer device Liulin

- * Automatic forest fire control system
- Complex monitoring sampling (radiological, chemical, hydrological, biological, geological)

* Future development

- Information system
- Telecommunication system

Basic Environmental Observatory BEO MOUSSALA

FOUNDED 1969
REBUILD 1999

BEOBAL FP6 Project

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

BEO Centre Structure

Director

Scientific council

Expert councils

Head

BEO Centre
Laboratories and Scientific Experimental Facilities

- Basic Environmental Observatory Moussala
- Radio Analytical Methods
- Radio Chemistry and Radio Ecology
- Control of Illicit Trafficking of Nuclear Materils
- X-ray - Fluorescent Analysis
- Neutron Generator
- Neutron Data
- Control Laboratory of Radiation Protection
- Information Technologies
- Department of European Projects

Radioecology and Environment

Nuclear Methods

Neutron and Reactor Physics

In accordance with New INRNE Structure, Decision of Scientific Council from 04.07.2002

BEO IEC

BEO Integrated Environmental Centre

Bulgarian Academy of Sciences

- Institute of Zoology
- Institute of Geology
- Institute of Forestry
- National Institute of Hydrology & Meteorology
- Institute of Geography
- Institute of Botany
- Central Lab. of General Ecology

INRNE
BEO Centre

- South-West University Blagoevgrad
- American University Blagoevgrad
- Sofia University — Faculties of Chemistry, Physics, Biology
- Plovdiv University
- Schoumen University
- Rila & Pirin National Parks
- SME
- Reference Points: BEO Moussala, Alinitza, Parangalitza, Hotovo, Kaliakra, Chernomoretz

1. Historical dates

1932 - Inauguration of Meteorological Station on peak Moussala.
1959 – Opening of Cosmic Ray Station on peak Moussala.
1983 - Destroy of Cosmic Ray Station (fired).
1993 - Start of Bulgarian-French project OM2 for monitoring and management of high mountain ecosystems.
1999 – Inauguration of Basic Environmental Observatory (BEO) – Moussala.
2002 - Creation of BEO Centre of Excellence

2. Main Fields of Research

- Atmospheric physics
- Atmospheric chemistry
- Cosmic Ray Physics
- Astrophysics
- Complex environmental monitoring and ecotoxicological studies
- Control of long range radionuclides and toxic elements transport
- Sensor and detector development
- Complex measuring device design

3. National Objectives

- Radiological monitoring of environment in order to control the large-scale and long-term changes and transborder transport of pollutants
- Chemical monitoring of environment in order to control the large-scale and long-term changes and transboder transport of pollutants
- Attracting young scientists from Bulgaria and improving their qualification (Ph.D., Post Doc).

4. Regional Objectives and European Policies

- Development of long-term collaborations with other European high mountain environmental observatories
- Establishmentment of the telecommunication and information system in attempt to transmit environmental observation data via the INRNE computer network in INTERNET in real time.
- Improvement of measuring devices and methods.
- Establishment of BEO Moussala as GAW station.
- Attracting young scientists from the region and improving their qualification (Ph.D., Post Doc).
- Further harmonization of quality assurance programmes with European standards.
- Realisation of active exchange of information and specialists with other Centres.

5. Collaboration and International Connections

The BEO Centre represented by INRNE has official collaboration contracts with the following institutions:

- JRC Karlsruhe (ITU) - Institute for Transuranium Elements, Kernforschungs Zentrum Karlsruhe, Forschugszentrum Julich, Germany
- JRC Ispra (IES) – Institute for Environment and Sutainability, Italy
- JRC Geel (IRMM) – Institte of referent materials and measurements
- IAEA - Vienna, Austria
- CERN, Geneve, Switzerland
- JINR, Dubna, Russia
- University of Torino, INFN, Italy
- Institute of Troposphere Physics, Leipzig, Germany
- IRE – Fleurus, Belgium
- Nuclear Physics Institute, Czech AS, Czech Republic
- Institute of Nuclear Science, Izmir, Turkey
- Vinca Institute of Nuclear Science, Belgrade, Serbia
- Centre for Ecotoxicological Research, Podgorica, Montenegro
- Institute of Nuclear Physics, Tirana, Albania
- Institute of Nuclear Research, UNAcademy of Sciences, Kiev, Ukraine
- National Ukrainian Antarctic Centre, Kiev, Ukraine

The main sponsors are:

- Ministry of Environment and Water, Republic of Bulgaria
- CERN (O_3, NO_x and Harvel neutron monitor-first generation devices);
- OM2 project, EDF (SBN-90 gamma background monitor);
- NPI, Czech AS (passive neutron detector);
- LPI Moscow (SNM15 proportional counters for the new detector for neutron flux density)
- HIMONTONET FP5 project *(EVRI-CT-2002-80003)*
- BEOBAL FP6 project *(INCO-CT-2005-016663)*