

DLHODOBÉ ZMENY A KLIMATOLÓGIA UV ŽIARENIA V EURÓPE – AKCIA COST 726 - INFORMÁCIA

INFORMATION ON COST ACTION 726 – LONG TERM CHANGES AND CLIMATOLOGY OF UV RADIATION OVER EUROPE

Anna Pribullová¹, Miroslav Chmelík², Juraj Štefánik¹

1 Meteorological observatory of the Geophysical Institute of the Slovak Academy of Sciences, Stará Lesná, 059 60 Tatranská Lomnica, Slovakia.

2 Slovak Hydrometeorological Institute, Department of distance measurements, 058 01 Poprad-Gánovce 178, Slovakia.

Abstract.

The COST¹ 726 action has been under operation since January 2004. The main objective of the Action is to advance the understanding of UV radiation distribution under various meteorological conditions in Europe in order to determine UV radiation climatology and assess UV changes over Europe. Cooperation between meteorologists studying transfer of UV radiation in real atmospheric condition and people studying its biological action can be helpful in adjustment of final form of recalculated UV radiation time series. Recalculated time series of UV radiation weighted by required biological action spectrum with sufficient length and precision can clarify connection between UV radiation level and increasing occurrence of some anatomical and physiological disadvantages observed by plants, animals and also humans in last decades. Four questionnaires were prepared by COST 726 action management committee to detect status of UV radiation measurement, physical and biological research on the national basis in all participated countries. The goal of this information is to contact all scientists interested in UV radiation research and in COST 726 action outputs.

Key words

COST 726 action, UV radiation, biological phenomena

Introduction

The ultraviolet (UV) radiation reaching the ground is only a small portion of the radiation, we receive from the sun. Nevertheless, enhanced UV has a wide variety of adverse effects on humans and the environment (i.e., terrestrial and marine ecosystems). The most well-known effects of excessive UV on people include sunburn and snow blindness. UV radiation has also been linked to skin cancer, cataracts, suppression of immune system, as well as a number of dermatological and ocular problems. From the perspective of public health risk assessment, reliable and continuous measurements of UV radiation and studies on factors responsible for the UV variations over different time scales (ranging from minutes up to decades) are necessary. Since the early 1990s, available resources have been applied to improve our knowledge of the UV changes and understanding of processes that affect surface UV radiation. Many activities have been carried out within the European countries in the frame of EC funded projects (e.g. UVRAPPF, MAUVE, QASUME, SUVDAMA, EDUCE, and COST Action 713 - *UV forecasting*).

¹ COST - cooperation in Science and technology
<http://cost.cordis.lu/>

Difficulties involved in the routine operation and maintenance of UV instruments have limited the length of reliable data records to about the past 10-15 years. It is recognised that 10-15 years are not adequate to carry out trend analyses. Studies on impact of UV radiation on the environment require knowledge of UV climatology and changes that have occurred in the past. It would be of special importance having the estimates of average and extreme characteristics of the UV impact on various biological systems (including human beings) as well as doses over different time periods, over much longer periods (≥ 3 decades).

The COST framework appears as the most suitable to achieve these goals in view of its wide European coverage, flexibility in adapting the methodology to existing know-how and its capability to mobilise the various relevant national stakeholders across discipline and institutional remits. This COST Action will exploit achievements of previous European Projects and add new knowledge. This Action will play an important role in better understanding the past UV changes and the role of UV influence on ecosystem. The presentation and dissemination of final results should take into account the needs of the main beneficiaries of the Action: the public, policy makers, health authorities and researchers.

The main aims of action

The COST 726 action has been under operation since January 2004. The main objective of the Action is:

- to advance the understanding of UV radiation distribution under various meteorological conditions in Europe in order to determine UV

radiation climatology and assess UV changes over Europe.

Since UV solar radiation plays an important role in many processes in the biosphere, including the influence on human organisms and may be very harmful if UV exposure exceeds "safe" limits, the knowledge of biologically effective UV radiation doses and their geographical distribution and climatology in Europe is crucial for the European population, which will be addressed as the main end user of the Action. To achieve its general objective, the Action has the following practical objectives:

- to inventory available solar radiation data sets, including UV data, spectral and broadband, ancillary data (ozone, clouds, sunshine etc.) and available satellite data,
- to advance the understanding of UV reconstruction models for the calculations of UV climatology and assessment of UV changes,
- to advance the understanding of biological UV radiation climatology and changes in Europe,
- to advance the understanding of UV influence on ecosystem, both on the basis of climatology and changes of selected effective UV radiation doses in Europe,
- to use the advanced knowledge under the points above, in order to elaborate a comprehensive analysis and information basis, addressed to beneficiaries,
- to create an European reference group of broadband radiometers.

The major benefits of the Action will be a geographically broader and scientifically deeper knowledge of the climatology of UV radiation and of selected biologically effective UV radiation doses across Europe.

The main beneficiaries will be the public, researchers in atmospheric and medical sciences as well as authorities and policy makers. Obtaining UV radiation data for long time period and various places without UV measurements requires modelling tools. This can be done by radiation transfer models, which use available proxy atmospheric data as input parameters, or it can be done by statistical models, using ancillary data.

Detailed recommendations for building up European UV climatologies under different conditions will be produced. In particular, this report will assess to which extent the climatology can fulfil the requirements for UV environmental impact studies, health protection and long-term changes detection.

Action spectra for a variety of photobiological effects were derived during the past, ranging from bacteria and plankton up to skin cancer in mammals (including the humans). A collection of action spectra will be undertaken. The most relevant for the climatology and trend analysis will be determined.

The long-term series of reconstructed UV radiation will be used for the trend calculations and analyses.

The results of climatology and trend analyses will be prepared, depending on the properties of the biological effects, to be appropriate for dissemination. Visualisation should give a clear overview of variability depending on location and time.

The results will give the basis for research of skin cancer development, since this has such a long incubation period that measured instantaneous UV data are not meaningful.

A separation for the reasons of the determined trend change of the UV radiation, as change of total

ozone, cloudiness or aerosol amount, will be examined to reveal sources of temporal variations of the UV trend patterns over Europe. The regional differences of long-term clouds/aerosols forcing on the UV radiation will be examined.

Proposals

Slovak Hydrometeorological Institute and Geophysical Institute of the Slovak Academy of Sciences are institutions guarantying organisation of COST 726 action in Slovakia, but project is also open for all other research institutions interested in UV radiation problematic in Slovakia. There is effort to make review of UV measurements in Europe, to concentrate UV data into one consistent database together with auxiliary information on phenomena affecting UV radiation reaching the Earth's surface. It is also necessary to ascertain possible interest of researchers studying effect of UV radiation on particular biological phenomena. It is necessary to summarize UV measurements and research groups dealing with UV radiation with respect to different biological phenomena. Cooperation between meteorologists studying transfer of UV radiation in real atmosphere and people studying its biological action can be helpful in adjustment of final shape of recalculated UV radiation time series. Recalculated time series of UV radiation weighted by required biological action spectrum with sufficient length and precision can clarify connection between UV radiation and increasing occurrence of some physiological disadvantages observed by plants, animals and also humans in last decades. There are several action spectra determined for different biological phenomena. The most important action spectra will be selected for final recalculation of UV

radiation on the basis of interest people dealing with medicine, agriculture or other related areas of research. Four questionnaires were prepared by COST 726 action organising committee to detect status of UV radiation measurement, physical and biological research on the national basis in all participated countries. The goal of this information is to contact all scientists interested in UV radiation research and in COST 726 action outputs. Questionnaires for detection of UV radiation research status are attached to this informative paper.

Súhrn

Akcia COST 726 'Dlhodobé zmeny UV žiarenia a UV klimatológia v Európe' začala po zážitou Európskej Komisie svoju činnosť vo februári 2004 . Hlavnými cieľmi akcie je prispieť k rozvoju poznania UV žiarenia, ktoré dopadá na povrch Zeme pri rôznych meteorologických podmienkach v oblasti Európy, získať obraz o slnečnom UV žiarení z dlhodobého klimatologického hľadiska a určiť jeho dlhodobé variácie. Spolupráca medzi meteorológmi a vedcami, ktorí študujú vplyv UV žiarenia na rôzne biologické procesy môže byť prospešná pri vytvorení finálnych produktov akcie, ktorými sú rekalkulované časové rady UV žiarenia s vybraným biologickým účinkom. Rekalkulované rady UV žiarenia, vážne požadovaným biologickým akčným spektrom, s dostatočnou dĺžkou a presnosťou môžu byť prínosom pri zisťovaní vzťahov medzi slnečným UV žiarením a zvýšeným výskytom niektorých anatomických a fyziologických zmien rastlín, živočíchov a taktiež v ľudskej populácii. Organizačný výbor akcie pripravil 4 formuláre pre zistenie stavu meraní slnečného UV žiarenia, fyzikálneho a biologického výskumu v tejto oblasti vo všetkých účastníckych krajinách projektu.

Cieľom tohto informatívneho príspevku je skontaktovať vedecké inštitúcie zaoberajúce sa problematikou UV žiarenia a jeho účinkami na rôzne biologické a iné procesy, ktoré by mohli mať záujem o výstupy z akcie COST 726, prípadne by mali záujem aktívne sa podieľať na riešení projektu. Dotazníky, slúžiace na zistenie stavu výskumu UV žiarenia na Slovensku, sú súčasťou tohto príspevku.

Contact: Anna Pribullová,

Meteorological observatory of the GPI SAS

Stará Lesná

059 60 Tatranská Lomnica

apribull@ta3.sk

tel. 0421 52 4467847

Miroslav Chmelík

Department of distance measurements

Slovak Hydrometeorological Institute

058 01 Poprad-Gánovce 178

miroslav.chmelik@shmu.sk

tel. 0421 52 773 1097

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