

Establishment of a network for UV monitoring in Greece

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Abstract. A network of narrowband multi-channel radiometers for measuring surface solar UV radiation, which covers geographically Greece and Cyprus, is being established. The network uses state of the art instrumentation and techniques for the measurement of solar ultraviolet radiation and the analysis, interpretation and dissemination of the results. It comprises seven satellite stations distributed at locations with different environments and a central station located at Thessaloniki, where a suite of radiation and other related measurements are performed. The aim of the network is to establish long term monitoring of UV radiation in the eastern Mediterranean, to be used for climatological purposes, for public information and awareness and for providing quality controlled measurements for scientific studies. In this respect the database of the network will be linked to international databases making the measurements available to the broad scientific community.

Introduction

The growing interest at international level, concerning the ozone layer depletion and the resultant enhancement of ultraviolet radiation reaching the ground, in combination with the consequences on the ecosystem induced by overexposure to ultraviolet radiation, stimulated the scientific community to establish monitoring programs of solar ultraviolet radiation. Substantial efforts have also been made by scientists to produce long- and short-term forecasts of UV radiation levels. At the same time, scientific and public organizations have launched specific programs to educate and inform the public about ways of protection from the biological effects caused by overexposure to ultraviolet radiation. For this purpose, international conventions have been signed and implemented by a number of countries, including Greece.

The need for conducting high quality and quality assured measurements of solar ultraviolet radiation was soon realized, and led to the establishment of several UV monitoring networks in different countries. Apart from their scientific nature, the ultimate goal of these networks is to provide continuous and reliable information to public authorities, national and international health organizations and to the public, on the actual levels and possible consequences from exposure to biologically effective ultraviolet radiation.

Description of the network

In the framework of an already completed project (1993-1997), the Aristotle University of Thessaloniki (AUTH) established in Greece a pilot network of five

stations measuring erythemal ultraviolet radiation. Lack of financial sources after the end of that project obscured the continual operation and maintenance of the peripheral stations. In contrast, the central station and its technical support facilities (calibration unit and instrument characterization unit) continued its long-term operation, providing useful information about the relationship between changes in solar UV radiation and associated changes in total ozone, clouds, aerosols and other minor constituents (e.g. Bais et al, 1993; Zerefos, 1997; Zerefos et al, 1998; Zerefos, 2002).

Currently, in the frame of a new national project, another attempt is scheduled to revive and restructure the original network, by improving the instrumentation, optimizing the locations of the stations to ensure their long-term viability, and by modernizing the data retrieval, analysis and dissemination scheme. The project will be carried out by a consortium of two Universities (AUTH and NTUA) and three private enterprises (ALTEC, DOTSOFT and GEOINFO).

The instruments that were chosen are the NILU-UV narrowband multi-channel radiometers, which provide UV irradiance measurements at five wavelength bands centered at 305, 312, 320, 340 and 380 nm, with full width at half maximum (FWHM) of approximately 10 nm. In addition, a sixth channel measures photosynthetic active radiation (PAR) between 400-700 nm. The optical part of the instrument consists of a Teflon diffuser, silicon detectors and high quality band pass filters. The instrument has a built-in- circular data logger with capacity of storing 3 weeks of one minute averages of the measured irradiances and of the detector temperature. A schematic diagram of the instrument is shown in Figure 1.

The network is designed to cover geographically Greece and Cyprus, comprising 7 satellite stations distributed at locations with different environments and a central station located at Thessaloniki, where a suite of spectral and broadband radiation and other related measurements are performed (see Figure 2). The network will provide online real-time data from all stations through a public web interface, as well as forecasting of UV levels by combining the measurements with state of the art models. Apart from the irradiances at single wavelengths, a series of other products such as CIE-weighted UV dose rates, integrated UV-A and UV-B irradiances, cloud cover assessment, total ozone abundances will be also available based on a method described by A. Dahlback (1996). Quality

controlled data will be available for submission to international databases (e.g. EUVDB).

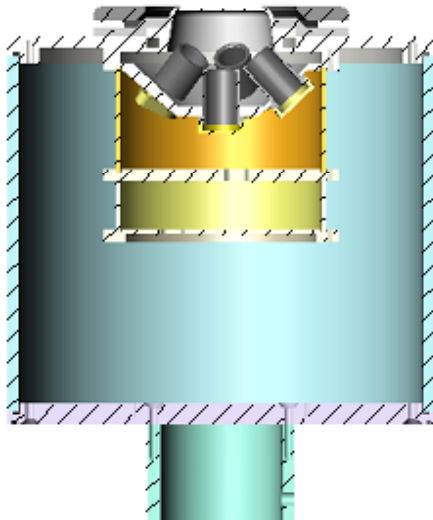


Figure 1. Technical drawing of the NILU-UV instrument



Figure 2. Tentative locations of the monitoring stations of the network.

The main goals of this three year project are:

- Installation of the new instruments at the stations in 2004 and 2005 and have a fully operational network by the fall 2005.
- Development of quality control and quality assurance protocols and data analysis tools
- Development of a database for data collection and administration
- Improvement of the methodologies for short term UV forecasts covering Greece and Cyprus, with the incorporation of cloud information

- Presentation of UV irradiance measurements and forecasts in real time on the web
- Submission of network products to other relevant international databases
- Design of a system to provide electronic information to the public and the appropriate authorities for the nature, influences and effects of overexposure to UV radiation and to propose measures and actions for human protection
- Development of a plan to ensure long-term support of the networks operation and maintenance.

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