OPTICAL CALIBRATION FACILITY AT THE IZAÑA
ATMOSPHERIC RESEARCH CENTER

C. Guirado [1] [2], R. Ramos [2], Á. de Frutos [1], A. Berjón [3] [1], A. Redondas [2], C. López [4], V. Cachorro [1], E. Cuevas [2], R. González [1], S. González [1], M. Hernández [4]

[1] Atmospheric Optics Group, Valladolid University (GOA-UVa), Spain, carmen@goa.uva.es
[2] Izaña Atmospheric Research Center, Meteorological State Agency of Spain (AEEMT), Spain
[3] Laboratoire d’Optique Atmosphérique, Université Lille, France
[4] Sieltac Canarias SL, Spain

ACKNOWLEDGMENTS
This work was developed within the Specific Agreement of Collaboration between the University of Valladolid and the CIAI-AEMT “Estable methods and quality assurance systems for programs of photometry, radiometry, atmospheric ozone and aerosols within the atmospheric monitoring program of the World Meteorological Organization. Financial supports from the Spanish MICINN (ref. CGL2008-05939-C03-00, CGL 2009-09740) and from the Gir-220 Project of the Junta de Castilla y Leon are gratefully acknowledged.

REFERENCES
Calibration Services of European Ultraviolet Calibration Center (EUVCC) at Physikalisch-Meteorologisches Observatorium Davos / World Radiation Center (PMOD/WRC), http://www.pmoweb.ch/research.php?topic=calibration_services

OPTICAL CALIBRATION FACILITY

During the last years a new optical calibration facility has been developed and deployed at the Izaña Observatory for the calibration and characterization of radiation instrumentation within research activities. The new systems are the result of a joint effort between the Izaña Atmospheric Research Center (AEEMT) and the Atmospheric Optics Group of Valladolid University (GOA-UVa).

This new facility allows the absolute, spectral and cosine response characterization of the atmospheric measurement instrumentation of the Izaña Atmospheric Observatory (IAO) in an isolated dark room where, at the same time, six set-ups are available for the above mentioned response characterization.

The systems have been built in a modular way, and the control and acquisition software have been developed such way the calibration facility could be easily adapted and meet the specific requirements of each sensor to be calibrated depending on its physical features as shape, size and weight.

Absolute Irradiance Calibration

The basis of the absolute irradiance scale consists on a set of DWW-type 1000 W lamps (vertical set-up) and 1000 W FEL (for horizontal set-up) lamps traceable to the primary irradiance standard of the National Institute of Standards and Technology (NIST). The accuracy in the intensity of the lamp during the calibration and the distance between the optical entrance of the instrument and the lamp are tightly controlled.

Angular Response Calibration

The irradiance measurements require the detector to weight incoming radiation with the cosine of the incoming angle relative to normal incidence (http://es.osmarisdh.cl).

Spectral Response Calibration

Radiation measurements with broadbandfilter radiometers fundamentally depend on the relationship between the measured radiation spectrum and the spectral responsivity of the radiometer. The relative spectral response set-up consists of an Optronics double monochromator OL 750 (figure 4). The wavelength can be selected within the range 200 to 1100 nm through three gratings. An OL 740-20 light source (figure 3) positioned in front of the entrance slit acts as radiation source and two lamps, UV (200-400nm) and Tunstall (250-2690nm) are used to calibrate the instrumental response.

Slit Function Determination

The components of the set-up are a VMTIM He-Cd laser and power supply. The laser features are the following: Nominal wavelength: 325 nm. Power: 6mW. Beam diameter: 1.8 mm.

The high altitude Izaña Atmospheric Observatory (IAO) is involved in several national and international atmospheric and environmental research networks and programs (i.e. GAW, BSRN, AERONET, NDACC, RBCC-E) in which is crucial a robust and traceable Quality Assurance & Quality Control system for the different broadband radiometers, photometers and spectrometers, which measure, among other ones, spectral solar radiation, aerosol optical depth and total ozone amount.

IZAÑA ATMOSPHERIC RESEARCH CENTER

The Izaña Atmospheric Observatory (IAO) is located at the highest point of the island of Tenerife (37º28’N 16º21’W 2000 m a.s.l.) in the Canary Islands. It is the only observatory in the world where the sun’s zenith angle is above 80º at the equinoxes. The Climate of the observatory is essentially a hot semi-arid one and the mean annual temperature is 18.1ºC. The most striking features are the high thermal amplitude (50ºC) and the strong light of the sun. The relative humidity is low and the monthly average is 45% (June) and 25% (January) (figure 5). The wind is relatively weak and blowing from the N and NE, except in the winter when the NE wind is the strongest (figure 6).

The site is ideal for observations of the sun and the sky, with no light pollution from nearby populated centers.

RADIANCE AND IRRADIANCE CALIBRATIONS DEVELOPED AT THE OPTICAL CALIBRATION FACILITY OF IZAÑA

Absolute Radiance Calibration of the Cimel Sunphotometer #380

On September 11th, 2009 the Cimel #380 was calibrated. Two measurements in the morning and two ones in the afternoon were done, getting at the same time the aureole and the sky calibration (figures 1 & 2). Figures 6 & 7 show all the calibrations done at Izaña to the Cimel #380. The files containing the calibration factors are sending to AERONET (Aerosol Robotic Network, http://aeronet.gsfc.nasa.gov/) and are used until the next calibration.

Absolute Radiance Calibration of the Brewer Spectrophotometer #201

On March 10th, 2010 the Brewer #201 was calibrated. The intensity and the voltage applied to the lamp (figure 8) and the Hg step parameter (figure 9) were checked during the calibration. The Hg step is a parameter of the Brewer which indicates the right alignment of the grating, i.e., the accuracy in the measuring wavelength. Finally the ultraviolet response of the Brewer was calculated (figure 10). This response is applied to the UV radiation measurements of the Brewer spectrophotometer.