



**10th ORM
Geneve**

Central America, México and the Caribbean

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In our Region measurements of total ozone are only systematically conducted in Mexico and Cuba

Mexico with the spectrophotometer Dobson No.98 Mexico City (UNAM, Geophysical Institute) and in Havana at the headquarters of the Meteorology Institute of Cuba with the spectrophotometer Dobson No. 67

MEXICO

OBSERVATIONAL ACTIVITIES

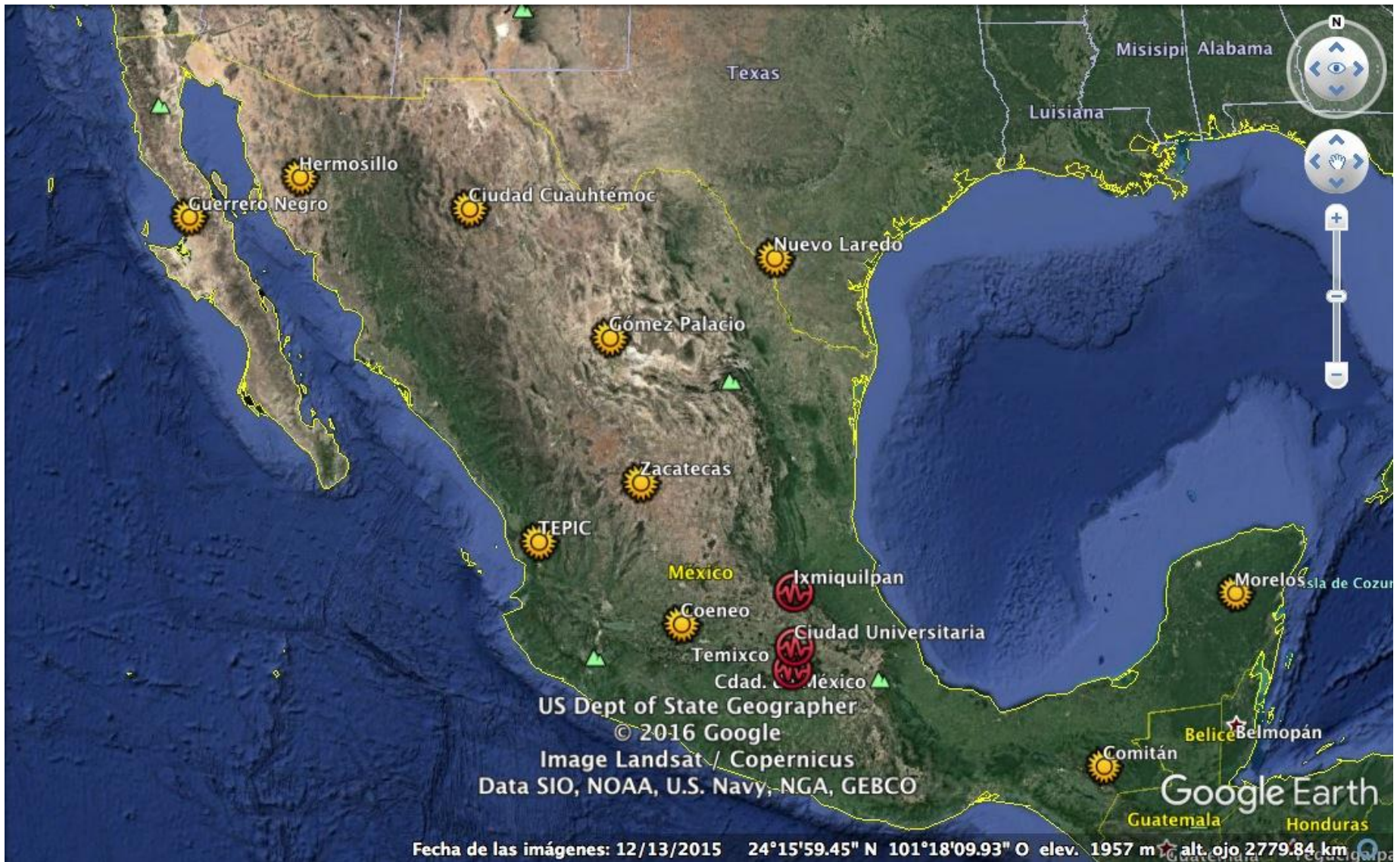
Total Ozone Measurements

- **Total ozone measurements at the Mexico City station were continued in 2014 to date, following a 10-year interruption due to changes in operating personnel of the Dobson spectrophotometer. Currently the management has been made to contribute to the measurements made to the World Ozone and Ultraviolet Radiation Data Center as well as the update of contact data.**
- **The Dobson 98 was calibrated last time in the IV Regional Dobson intercomparison in Buenos Aires Argentina between Nov and Dec 2010 obtaining the new measurement tables, The interval of 4 years without reporting data after the intercomparison in the year 2010 was due to which the facilities of the building where the Dobson 098 was located were updated, besides that the rupture of the bell of the optical wedge was broken in two times.**

UV measurements

For more than 15 years, the government of Mexico City has a variable number of UVB Biometer Model 501 Solar Light Radiometers (3 or 4 stations), which are used to inform the population of UV index levels. At the same time, an instrument of the same characteristics can be found at the facilities of the Solar Radiation Observatory of the National Autonomous University of Mexico for the purpose of climate research (Ultraviolet Solar Radiation Atlas for the National Center for Disaster Prevention of the Federal Government).

Recently (2016), 12 new photometers (Biometer Model 501) were installed in different locations in our country to try to achieve a latitudinal coverage of the country, these equipments are part of a solarimetric station equipped to measure more than 10 components of the radiation Solar, in addition to basic meteorology. The information is not public but transparent for research purposes.



UNAM Solarimetric Network Station that includes the UVB Broadband Measurement

RESULTS FROM OBSERVATIONS AND ANALYSIS

As a result of the work carried out at the Solar Radiation Observatory, monthly maps of UVB radiation have been published in the National Atlas of Risks of the National Center for Disaster Prevention of the Federal Government of our country.

<http://www.atlasnacionalderiesgos.gob.mx/app/RadiacionUV/>

DISSEMINATION OF RESULTS

Data reporting

Currently, the access is being processed by ftp server to contribute information on total Ozone measurements to the WOUDC and is managing the entry of at least three stations to report measurements of UVB radiation.

Aerosol optical thickness is reported to the AERONET project for Mexico City and Ciudad Juarez Chihuahua in the north of the country.

FUTURE PLANS

Currently under evaluation by the Federal Government of a project for the placement of UVB sensors in the main 30 cities of the country, in order to provide information to the general population of the UVB Index.

DOMINICAN REPUBLIC

The Dominican Republic has not carried out measurements of stratospheric ozone and ultraviolet radiation, there are no tropospheric ozone measurement programs at the surface level, it does not have the equipment or the technical preparation in this specific area in the ultraviolet UV, the National Office of Meteorology (ONAMET), only measures the sun hour.

The country is in the process of approving the criteria applied in other countries of the Caribbean region to participate in the network of countries that are carrying out these measurements of stratospheric ozone and ultraviolet radiation at a global level due to the large coastal extension of beaches That we already have the tourists that are, exposed to the sun.

The UVB radiation, of medium wavelength, possesses greater energy but penetrates little in the skin. Its effects are cumulative and are responsible for burns, increased thickness of skin and skin cancer.

In this respect, Dr. Guzman a specialist in skin surgery, revealed that in a study conducted in the Dominican Republic, where 365 patients were evaluated, and that 90% of these individuals had tumors in the face, 95% in Nose, cheek and mouth from high exposure to the sun. This said that the cell cancer is caused by excessive exposure to the sun and said that this type of cancer does not tend to metastasize nor does it require chemotherapy in most cases, but surgery with removal of the area affected.

The National Ozone Program of the Ministry of Environment and Natural Resources of the Dominican Republic requests the support of the United Nations Environment Program (UNEP) for its work to promote the cooperation of the member countries of which we are signatories. The Dominican Republic addressed the National Ozone Officers, where they undertook to establish coordination mechanisms with the countries of the region and their regional representatives before the Executive Committees and Implementation of the Montreal Protocol on issues relevant to the financing guidelines and fulfillment

Tables of visits of foreigners to the Dominican Republic

2012	2013	2014	2015
5,047,021	5, 163,682	5, 648,743	6,151003

Dominican Republic as seen in the table receives a large number of tourists annually which increases year after year.

For this reason, in addition to protecting the national population itself, it is necessary to carry out a program of measurements of ultraviolet solar radiation with installation of instruments in several localities of the country so that the information generated will be of interest to the health authorities and to the tourism industry

Cuba

OBSERVATIONAL ACTIVITIES

Program of measurements of the total amount of atmospheric ozone and ultraviolet solar radiation (UV-B)

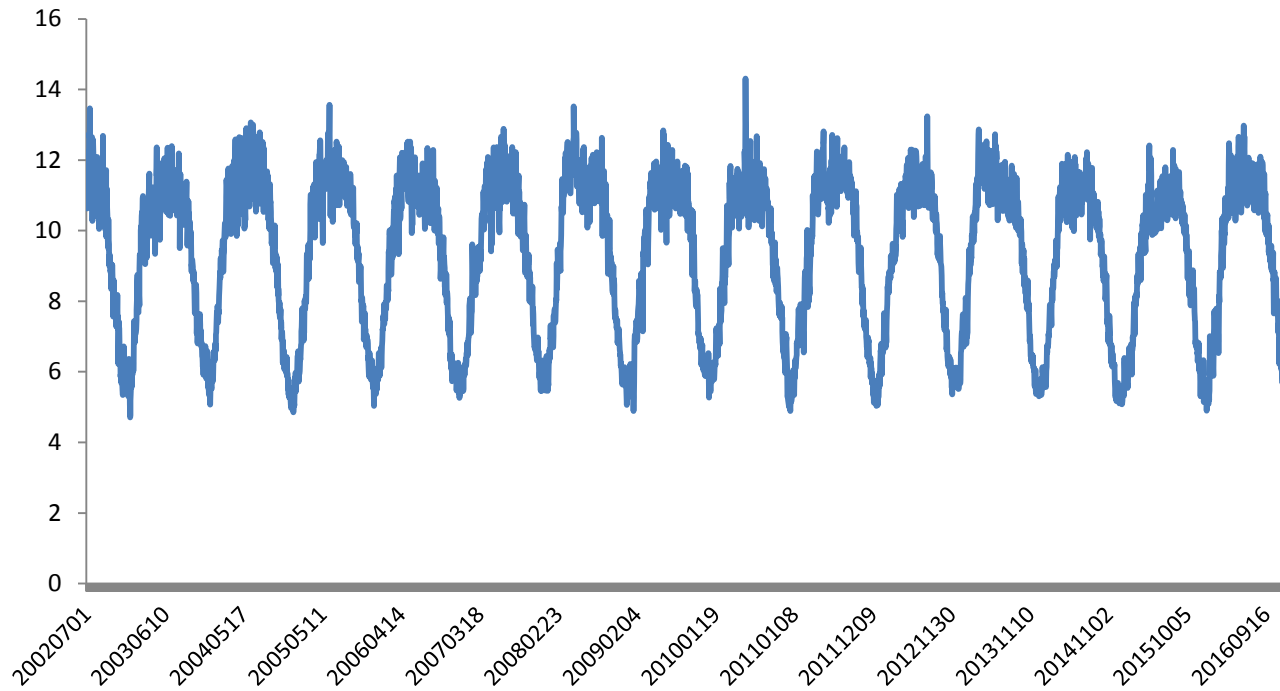
Total Ozone

- The measurements of total amount of ozone at Havana Ozone Station continue from February 2011 until August 2015 when Havana Ozone measurements are interrupted due to difficulties with the transportation of the instrument.
- . The Dobson No.67 was calibrated last time in the IV Regional Dobson Intercomparison in Buenos Aires, Argentina between Nov and Dec 2010 where the instrument was subjected to a deep revision.
- We have assisted and supported the colleagues at the Solar Radiation Observatory of the National Autonomous University of Mexico to restart total ozone measurements with Dobson spectrophotometer #98 after being repaired at NOAA/ESRL/GMD in charge of Robert Evans. Currently the instrument is operational and the station of Mexico City is reporting daily to http://exp-studies.tor.ec.gc.ca/e/ozone/Curr_allmap_g.htm

UV Measurements

In any case, partly compensating the lack of ground measurements, an analysis was made of the behavior of the UV index for Havana based on information from [http://www.temis.nl/uvradiation/archives/overpass/uv Havana Cuba ENS.dat](http://www.temis.nl/uvradiation/archives/overpass/uv_Havana_Cuba_ENS.dat). From the statistical analysis of these data no significant trend was found for UV solar radiation for the period 2002-2016 at Havana station.

Havana UV Index from Temis 2002-2016



Stratospheric Aerosol

Grupo de Optica Atmosferica de Camagüey (GOAC) from INSMET, Cuba
From 1989 to 1994: Stratospheric aerosols lidar measurements for the Mt. Pinatubo eruption. (Antuña et al., 2002). Measurements interrupted because of the lack of spare parts and instrument aging. This year the Max Plank Institute for Meteorology offered the equipment and parts to refurbish the lidar, pending approval of Cuban authorities.

2008 to the present: Aerosol spectral optical properties with sun photometer in Camagüey in cooperation with the University of Valladolid, Spain. Measurements have been contributed also to AERONET (Antuña et al., 2016).

RESULTS FROM OBSERVATIONS AND ANALYSIS

The study of ground measurements at Havana station and those from the OMI instrument over the same location, and at Camaguey station, located Eastward on the National Territory show, in agreement with former reports, the following results.

The total ozone distribution over the National Territory is well defined by an annual cycle with maxima in the summer months and minima in the winter months. The amplitude of this cycle is of about 40 Dobson Units and its mean value is 275 Dobson Units

Regarding the spatial distribution over the National Territory, the total ozone content shows a small latitudinal gradient of about 2 DU between the Eastern and the Western regions in the winter season. In the summer this gradient turns bigger reaching 10 DU in May. The small values in latitude are explained by the disposition of our territory, which practically spans over a single latitude (rigorously just a range no larger than 3.5 degrees). As previously pointed out, the most relevant feature is the wide annual cycle of the TOC.

Cuban scientist on lidar measurements from GOAC participated in the WMO panel in charge designing GAW Aerosols Lidar Observation Network (GALION):

J. Bösenberg, R. Hoff, A. Ansmann, D. Müller, J. C. Antuña, D. Whiteman, . Sugimoto, A. Apituley, M. Hardesty, J. Welton, E. Eloranta, Y. Arshinov, S. Kinne, V. Freudenthaler, (2008), Plan for the implementation of the GAW Aerosol Lidar Observation Network GALION. GAW Report No. 178, WMO TD No. 1443, 45 pag.

DISSEMINATION OF RESULTS

Data reporting All data obtained so far has been sent to WODC, an can be consulted on http://esee.tor.ec.gc.ca/cgi-bin/total_ozone/ until august 2015 when Havana Ozone measurements are interrupted due to difficulties with the transportation of the instrument

Relevant scientific papers

GOAC members promoted and facilitated the series of Workshops on Lidar Measurements in Latin America from 2001 to the present and the foundation of the Latin American Lidar Network (LALINET). LALINET is one of the regional lidar networks associated to GALION:

J. C. Antuña-Marrero, E. Landulfo, R. Estevan, B.Barja, A. Robock, E. Wolfram, P. Ristori, B. Clemesha, F. Zaratti, R. Forno, E. Armandillo, A. E. Bastidas, A. M. de FrutosBaraja, D. N. Whiteman, E. Quel, H. M. J. Barbosa, F. Lopes, E. Montilla-Rosero, J. L. Guerrero Rascado, 2016, LALINET: The first Latin American-born regional atmospheric observational network. Bull. Amer. Meteor. Soc., <http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-15-00228.1>

Antuña, J. C., A. Robock, G. L. Stenchikov, L. W. Thomason, and J. E. Barnes, (2002): Lidar validation of SAGE II aerosol measurements after the 1991 Mount Pinatubo eruption. J. Geophys. Res., 107(D14), 4194, doi:10.1029/2001JD001441

PROJECTS, COLLABORATION, TWINNING AND CAPACITY BUILDING

- **Currently we do not have collaboration any project with foreign institution.**

Recommendations 10- ORM

- **It would be helpful for technicians who perform measurements and processing of measurements with the Dobson spectrophotometer to be able to attend courses similar to those held at the Hradec Kralove Observatory (Czech Republic) in the same way as holding Dobson Data Quality Workshop which took place in Hradec Kralove in 2011.**
- **The Dobson Intercomparisons have been greatly extended and now are hardly ever performed every six years, at least for the III and IV WMO's Regions. We consider that the Intercomparisons of the Dobson instruments should be realized at least every four – five years.**

General recommendations

We are of the opinion that the region of Central America, Mexico and the Caribbean should form a regional network for the monitoring of ultraviolet solar radiation with the support of our governments, international organizations and countries whose nationals carry out tourism in this region, for example

Thank you for your Attention

Gracias por su Atención

Summary

In the presentation presents the current status of monitoring of the ozone layer and solar ultraviolet radiation in the region of Central America, Mexico and Caribbean where judging from the reports received to the X ORM only Mexico and Cuba have been and are systematic measurements of the total ozone using spectrophotometers Dobson. On the other hand only Mexico has a network of stations for the monitoring of solar ultraviolet radiation. The Dominican Republic is also present in the X ORM proposes through international collaboration to provide measurements of the solar ultraviolet radiation in its territory.