11ª. Reunión de los Administradores de Investigaciones sobre el Ozono del Convenio de Viena para la Protección de la Capa de Ozono
1 al 3 de abril, 2020 / Ginebra, Suiza

Informe de actividades realizadas por México

Universidad Nacional Autónoma de México

Instituto de Geofísica

Observatorio de Radiación Solar
Centro Regional de la IV Región

México 2020

Introduction.

This report is made to comply with the recommendations of the 10 Meeting of Representatives in Ozone Research in its subsection related to the research and systematic observations of Ozone and Solar Ultraviolet Radiation, which were carried out by the Radiation Observatory Site of the Institute of Geophysics of the National Autonomous University of Mexico.

1. OSERVATIONAL ACTIVITIES

1.1 Column measurements of ozone

One of the priorities of the Mexican Solarimetric Service (SSM) is the continuity of the measurements of the Total Ozone in the column, this activity is sustained in the special attention that has been put in the measurement process, through a program for the realization of observations between 11 and 14 hours daily, since it is during this period of time that the environmental and instrumental conditions are presented to achieve greater accuracy in the estimation of the Ozone.

On the other hand and not less important is the preventive and corrective maintenance that the equipment receives; the monthly performance of the "Hg" and "standard lamp" lamp tests, as well as its calibration with world reference equipment. Being the Dobson the only spectrophotometer for the measurement of Ozone in our country, the information generated is sent monthly to the World Center for Ozone and Ultraviolet Radiation Data in Canada, https://www.woudc.org/data/explore.php.

1.2 UV measurements

Since 2014, the SSM network has consolidated through the operation of its twelve stations distributed over the national terrarium, within its 22 observation parameters, the "B" Ultraviolet Band Solar Radiation (UVB) stands out, which It is measured with a frequency from minute to minute. Calibrations of the sensors of all the stations are carried out every year, including the Biometers that measure UVB, in addition to an annual meeting, with the personnel responsible for the stations, where experiences are exchanged on the process of measurement of solar radiation in Its different components.

1.3 Calibration activities

Calibration is one of the most important activities within the instrumentation, aware of this, for the SSM the maintenance of the instruments is important, and calibration as part of this maintenance becomes fundamental, for this purpose, the different Calibration campaigns organized by observatories recognized by the Munidal Meteorological Organization (WMO) for this purpose, the different events are then mentioned.

Dobson-Beck 098 spectrophotometer participated in the V intercompilation of Dobson instruments at the Villa Ortuzar Observatory facilities in the province of Buenos Aires, Argentina in March 2019, compared to the Dobson 065 by Glen Mconville, where in addition to The calibration was replaced by the microamperometer for the correct measurement of torque A, since the equipment replaced had certain inconsistencies in its results.

He participated in the UVB Biometrics calibration campaign in Davos, Switzerland for the calibration of the UVB instruments of the SSM network. Being the only calibrated and referenced instrument in our country, the latter is important to highlight, since this instrument will be used to calibrate the entire network of ultraviolet sensors and therefore have reliable information.

In February, 2020 the process of calibration of the sensors of the Solarimetric Network begins, in addition to providing the service to governmental institutions and individuals.

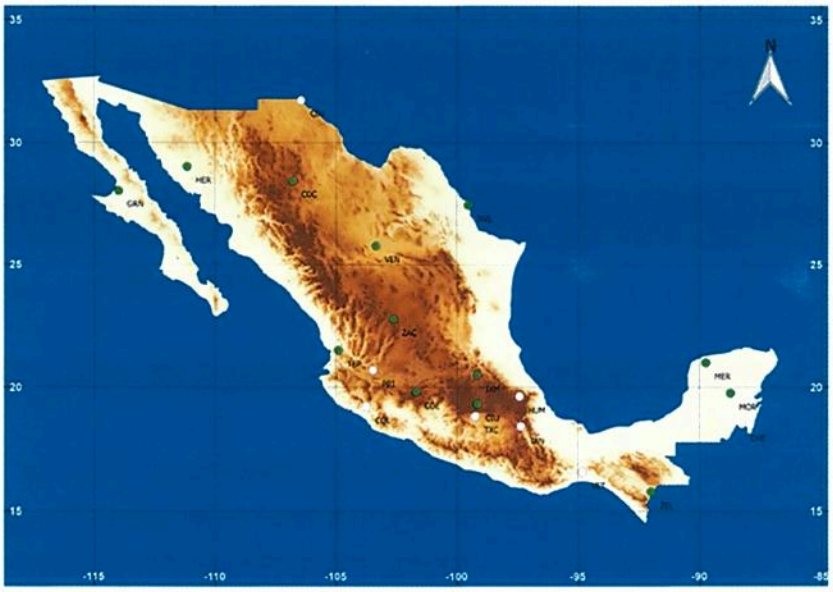

Figure 1 Network distribution

2. RESULTS FROM OBSERVATIONS AND ANALYSIS

2.1 As a result of the observation work, maps of spatial and temporal distribution of the UVBhave been published, as well as information on the different parameters and characteristics of the instrumentof of each station: http://areas.geofisica.unam.mx/solarimetrico/.

2.2 The SSM Network has made available to the public the information generated from the measurements of the UVB parameter through the database query, showing tables with hourly averages in Med / hour units.

Consulta Tablas Climatologicas Promedios Horarios UVB MED/Hra

DATE	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00
2019-07-01	0.00	0.01	0.10	0.31	0.57	0.63	0.66	0.47	0.58	0.22	0.43	0.29	0.16	0.04	0.00	0.00
2019-07-02	0.00	0.02	0.13	0.34	0.57	0.86	0.38	0.38	0.76	0.33	0.52	0.35	0.12	0.02	0.00	0.00
2019-07-03	0.00	0.02	0.12	0.33	0.55	0.79	0.76	0.74	1.01	0.21	0.06	0.04	0.08	0.03	0.00	0.00
2019-07-04	0.00	0.01	0.11	0.29	0.56	0.73	0.80	0.83	0.60	0.60	0.42	0.19	0.00	0.00	0.00	0.00
2019-07-05	0.00	0.02	0.12	0.29	0.51	0.75	0.92	0.80	0.85	0.78	0.55	0.37	0.15	0.01	0.00	0.00
2019-07-06	0.00	0.02	0.11	0.31	0.57	0.81	0.88	1.00	0.96	0.86	0.31	0.19	0.05	0.02	0.00	0.00
2019-07-07	0.00	0.01	0.08	0.29	0.51	0.79	0.95	1.04	0.99	0.79	0.45	0.25	0.14	0.03	0.00	0.00
2019-07-08	0.00	0.01	0.10	0.28	0.50	0.73	0.89	0.96	0.63	0.29	0.14	0.02	0.00	0.00	0.00	0.00
2019-07-09	0.00	0.01	0.11	0.29	0.52	0.77	0.93	0.86	0.92	0.71	0.52	0.29	0.06	0.01	0.00	0.00
2019-07-10	0.00	0.01	0.10	0.21	0.55	0.76	0.70	0.42	0.12	0.15	0.15	0.24	0.04	0.00	0.00	0.00
2019-07-11	0.00	0.00	0.06	0.21	0.36	0.77	0.81	0.58	0.03	0.03	0.34	0.25	0.16	0.03	0.00	0.00
2019-07-12	0.00	0.01	0.09	0.25	0.53	0.82	0.99	0.60	0.71	0.03	0.05	0.16	0.09	0.01	0.00	0.00
2019-07-13	0.00	0.00	0.02	0.24	0.56	0.80	0.96	0.94	0.57	0.56	0.27	0.04	0.01	0.01	0.00	0.00
2019-07-14	0.00	0.01	0.10	0.28	0.46	0.79	0.91	0.94	0.77	0.52	0.32	0.13	0.02	0.00	0.00	0.00
2019-07-15	0.00	0.01	0.10	0.29	0.53	0.71	0.85	0.91	0.92	0.68	0.36	0.07	0.07	0.03	0.00	0.00
2019-07-16	0.00	0.01	0.07	0.11	0.36	0.66	0.81	0.74	0.86	0.70	0.45	0.19	0.04	0.00	0.00	0.00
2019-07-17	0.00	0.01	0.08	0.27	0.49	0.53	0.73	0.64	0.35	0.49	0.25	0.25	0.10	0.01	0.00	0.00
2019-07-18	0.00	0.01	0.10	0.27	0.53	0.75	0.80	0.85	0.79	0.25	0.37	0.34	0.07	0.00	0.00	0.00
2019-07-19	0.00	0.01	0.10	0.30	0.55	0.77	0.69	0.82	0.72	0.35	0.06	0.13	0.03	0.00	0.00	0.00
2019-07-20	0.00	0.01	0.08	0.26	0.49	0.72	0.85	0.83	0.80	0.56	0.11	0.06	0.03	0.00	0.00	0.00
2019-07-21	0.00	0.01	0.09	0.24	0.50	0.80	1.00	1.00	0.81	0.08	0.04	0.06	0.07	0.02	0.00	0.00
2019-07-22	0.00	0.01	0.10	0.29	0.52	0.77	0.85	0.82	0.64	0.68	0.29	0.32	0.09	0.01	0.00	0.00
2019-07-23	0.00	0.01	0.09	0.22	0.51	0.77	0.90	0.76	0.23	0.17	0.37	0.31	0.04	0.00	0.00	0.00
2019-07-24	0.00	0.01	0.10	0.26	0.37	0.63	0.96	0.88	0.72	0.10	0.03	0.08	0.10	0.04	0.00	0.00
2019-07-25	0.00	0.00	0.07	0.21	0.34	0.42	0.45	0.84	0.30	0.12	0.11	0.08	0.02	0.01	0.00	0.00
2019-07-26	0.00	0.00	0.02	0.10	0.24	0.55	0.56	0.34	0.40	0.39	0.23	0.21	0.07	0.02	0.00	0.00
2019-07-27	0.00	0.01	0.09	0.27	0.55	0.80	0.93	0.97	0.98	0.61	0.48	0.22	0.04	0.02	0.00	0.00
2019-07-28	0.00	0.01	0.10	0.29	0.54	0.78	0.93	0.97	0.64	0.70	0.57	0.36	0.04	0.00	0.00	0.00
2019-07-29	0.00	0.01	0.10	0.28	0.53	0.77	0.86	0.90	0.28	0.51	0.30	0.24	0.14	0.02	0.00	0.00
2019-07-30	0.00	0.01	0.10	0.28	0.52	0.74	0.93	0.98	0.61	0.61	0.27	0.15	0.10	0.01	0.00	0.00
2019-07-31	0.00	0.00	0.09	0.19	0.34	0.74	0.88	0.91	0.75	0.62	0.39	0.22	0.05	0.00	0.00	0.00

Figure 2 Schedule averages table

3. THEORY, MODELLING AND OTHER OZONE RELATED RESEARCH

In the SSM, seasonal variations of the climatological behavior of the Ozone Layer corresponding to the National Territory have been observed, so this year a thorough analysis of the temporal and spatial distribution of the aforementioned variations began, in order to know the possible existence of periodicities and intensity of the variations.

For the realization of any type of analysis on the behavior of the Ozone Layer, it is convenient to have a long and consistent series of information, in the case of Mexico City, there are basically two large gaps of information. As a first approximation to solve this situation, the Ozone Measurement Instrument (IMO) data was used to complement the missing surface information (measured by Dobson 098), the validity of this method is under evaluation.

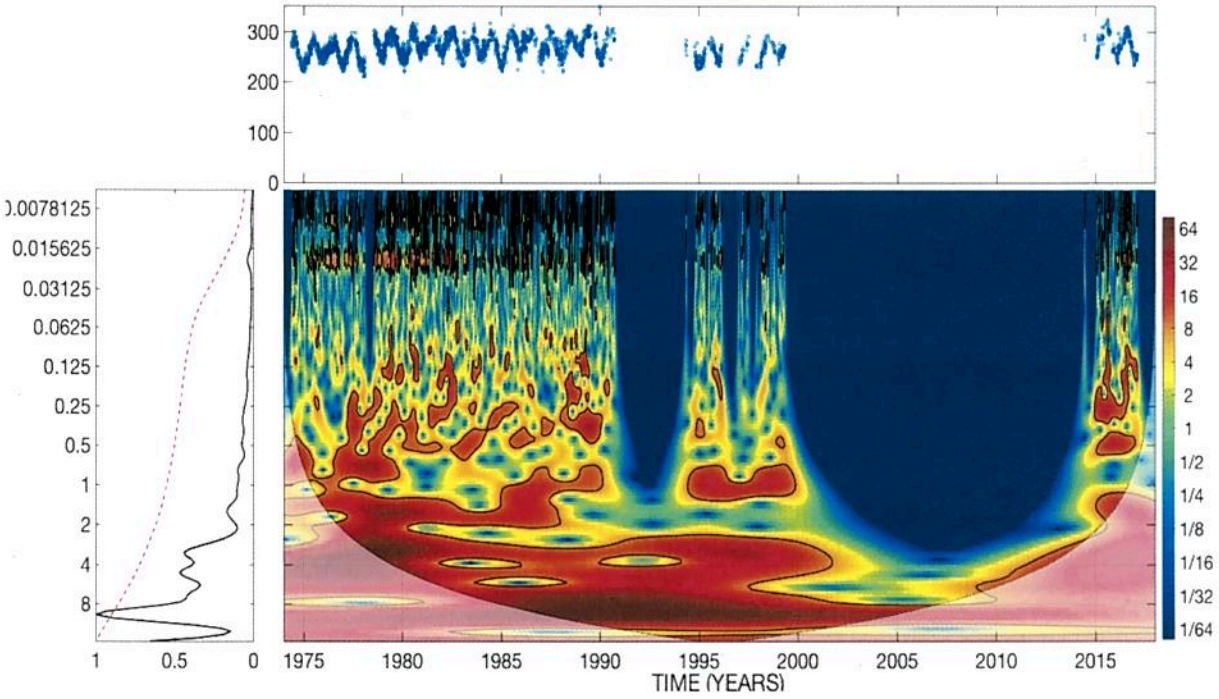

Figure 3 Ground measurement series

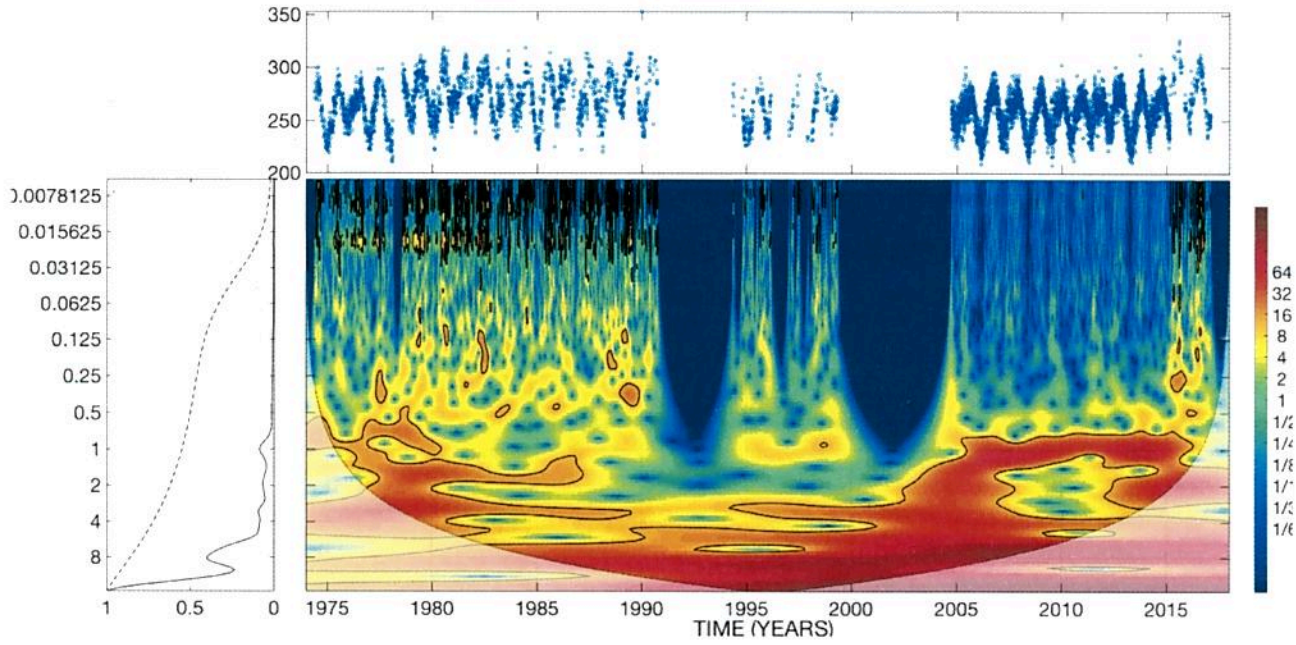

Figure 4 Ground measurement series completed with OMI measurements

4. DISSEMINATION OF RESULTS

Total Ozone measurements updated until December 2019 can be found on the World Center for Ozone and Ultraviolet Radiation Data in Canada web side: https://www.woudc.org/data/explore.php.

5. PROJECTS, COLABORATION, TWINNING AND CAPACITY BUILDING

In the National Risk Atlas of the National Center for Disaster Prevention there are 12 monthly maps of the spatial distribution of UVB solar radiation on the surface, these maps were prepared with the information of the TOMS satellite and a single surface station in 2013; It is intended to update this information, creating a new National UVB Atlas on the surface, having as reference the 12 stations of the SSM.

Promote with the National Meteorological Service an agreement to increase the number of UVB stations in the country and achieve coverage that allows detailed monitoring of surface UVB behavior.

6. IMPLEMENTATION OF THE RECOMMENDATIONS OF THE 10TH OZONE RESEARCH MANAGERS MEETING

Mexico as a country adhered to the Montreal protocol has established the Ozone Depleting Substances Reduction Program, https://www.gob.mx/semarnat/prensa/mexico-ha-eliminado-el-99-de-las-sustancias-agotadoras-de-la-capa-de-ozono-sao-217270

In Mexico, SEMARNAT is working on the application of the Montreal Protocol for the care of the ozone layer, and is currently promoting the Kigali Amendment, which was ratified on September 25, 2018, effective as of January 2019.

As part of these activities in question of environmental monitoring, an Ozone Layer measurement program was established through the only station in our country and aided by a network in Mexico of ultraviolet band B solar radiation sensors.

7. FUTURE PLANS

7.1 Expand the ground network for the measurement of the Ozone Layer by acquiring current technology equipment (Brewers).
7.2 Expand the surface UVB network.
7.3 Keep operating the SSM network.
7.4 Conduct research on seasonal variations

8. NEEDS AND RECOMENDATIONS

8.1 Training and training for operators responsible for the instigation for the measurement of the Ozone Layer, processing, data quality criteria and UVB radiation analysis.
8.2 Perform DOBSON intecomparisons more regularly since the last 9 years to complete.
8.3 Establish collaboration and academic exchange ties in the Central America and the Caribbean region for the analysis and measurement of UVB and Ozone parameters.