



International Development and Cooperation Project:

„Maintenance of the Network for Monitoring of the Ozone Layer in Developing Countries“

Realization and Achievements, 2004-2006

By:

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1. Aim of the Project

Assistance of CHMI to governmental institutions in developing countries in maintenance and further development of their national programs on monitoring of the ozone layer was the chief goal of the Project. The Project continued previous assistance conducted by CHMI in cooperation with the Global Atmosphere Watch Programme (GAW) of the World Meteorological Organization (WMO) that started in 1996. The works performed have been partially included into activities of the European Regional Dobson Calibration Center Hohenpeissenberg that is supported by the SOO-HK.

2. Chief Impacts in Assisted Countries

- Capacity building for realization of commitments to the Vienna Convention
- Involvement of national experts into international ozone monitoring and research projects
- Improvement of quality of monitoring of the ozone layer in the global GAW network, mainly in tropical and subtropical regions

3. Co-operating Partners:

- The Environment Division (ENV) of the AREP, WMO, Geneva
- The Scientific Advisory Group for Ozone of WMO
- The World Dobson Calibration Centre, NOAA, Boulder CO, USA
- The Regional Dobson Calibration Centre – Europe, Hohenpeissenberg, Germany
- The Regional Dobson Calibration Centre – Asia, Tsukuba, Japan

4. Activities Performed

Training of the personnel

Two-week trainings were organized for operators from ozone stations in:

- Proper maintenance and operation of ozone spectrophotometers
- Physical background of observation technologies
- Standard observation and data processing procedures
- Application of the unified software tools at stations
- Evaluation of quality of long-term data series

Implementation of software tools

Unified software packages for Dobson and Brewer ozone spectrophotometers have been developed and donated as freeware to GAW ozone stations. These tools help the operators and data evaluators to:

- Process total ozone measurements by standardized methods defined by GAW manuals
- Manage total ozone data bases at stations and do statistical operations
- Prepare and transfer ozone data reports to WOUDC via Internet and GTS
- Evaluate and re-process historical data sets

Hardware for semi-automation of instruments

A semi-automated facility with operation software for Dobson spectrophotometers has been developed at SOO-HK, donated and installed during missions at several stations. This facility makes digital reading and real-time processing of observations possible including automated data transfer via connected PC.

Calibration of instruments

Several local and big international calibration missions were assisted by experts of CHMI where instruments from developing countries were collocated, serviced, repaired and calibrated (DICE Dahab 2004, MOHP 2005, DIC-T Tsukuba 2006)

Evaluation/correction of data series

Consistency and quality of long-term data sets were analyzed and methods for re-processing or correction recommended to selected stations by experts of SOO-HK. Re-calculation of some sets of observations have been actually been performed under the project.

Missions at stations

Special missions were performed and supported by the project to remote stations to:

- Solve technical problems on instruments
- Install new technologies or spectrophotometers at newly established stations
- Inspect and improve local infrastructure related to ozone observing programmes

Management of the network

The Project and its activities were operationally coordinated with the GAW Programme through the ENV of WMO and presented at annual meetings of the SAG-Ozone - mainly in the area of the Capacity Building.

Maintenance of the Dobson Web Pages at the server of CHMI were also included into the Project as an efficient facility for information, communication and transfer of technologies among stations and the GAW centres - see:

<http://www.chmi.cz/meteo/ozon/dobsonweb/welcome.htm>

5. Institutions / Stations Assisted in 2004-2006

Country	Institution	Stations
Algeria	National Meteorological Office	Tamanrasset
Botswana	Department of Meteorological Services	Maun
Brazil	National Space Institute	Natal, Cachoeira Paulista
Egypt	Egyptian Meteorological Authority	Aswan, Cairo, Hurghada
India	India Meteorological Department	New Delhi
Iran	University of Tehran	Esfahan/Tehran
Kenya	Kenya Meteorological Department	Nairobi
Pakistan	Pakistan Meteorological Department	Quetta
Philippines	Atmos..Geophys.& Astronom. Services	Manila
South Africa	South African Weather Service	Irene, Springbok
Thailand	Thai Meteorological Department	Bangkok

6. Assistance Given to Particular Stations

Station	Training	Software	Hardware	Calibration	Evaluation	Missions
Aswan		X	X	X	X	
Bangkok		X		X	X	
Cairo		X	X	X	X	X
Cachoeira Paul		X	X		X	X
Hurghada		X	X	X	X	
Esfahan/Tehran		X		X		
Irene	X	X	X	X		X
Natal		X	X		X	X
Manila				X	X	
Maun	X	X		X	X	X
Nairobi	X	X		X	X	X
New Delhi		X		X	X	
Quetta		X		X	X	
Springbok	X	X	X	X		
Tamanrasset	X	X		X	X	

7. Budget

The Project was supported by a grant of the Ministry for Environment of the Czech Republic (MZP CR) and by allocation of costs from the budget of the CHMI. Particular costs of 2004-2006 are summarized in USD in the table below.

Costs (USD)	MZP CR	CHMI	Total
Personal costs		48.000	48.000
Travel	35.000		35.000
Services	4.500		4.500
Durable equipment	14.000	7.500	21.500
Overheads	9.000	10.000	19.000
Consumables	1.500		1.500
Total	64.000	65.500	129.000

8. Comments and recommendations

During the Project a lot of experiences and information have been gathered by the realization team about the actual state of the GAW ozone network in developing countries. Though the activities were focused mainly on the Dobson stations an assessment of operation of Brewer spectrophotometers at assisted stations was also included. Following are the chief conclusions and recommendations that can be useful for management and maintenance of the network.

- The 4-year periods of WMO Dobson ICs fix calibration state and maintenance of instruments fairly well and keep stations/operators in touch with GAW central facilities. If the period between ICs is longer then stability and quality of observations rapidly suffer both from obsolete calibration constants and change of operators

R: At least the 4-year periods to be continued by the WDCC and the RDCCs

- In the nineties almost all stations stopped manual calculation of total ozone and they have implemented processing of observations by PCs. The majority of Dobson and some Brewer stations currently use the software packages developed by CHMI. The software tools are used for routine processing of observations and data transfer to WOUDC very often in their original DOS installations prepared at SOO-HK. The Windows version and subroutines for re-calculation of historical data sets are utilized only sporadically.

R: The software installations should be upgraded at the stations

- Analyses of calibration and lamp tests histories of instruments performed at ICs and during missions show that the majority of stations need re-evaluation and correction of at least some parts of their data series. This is evident also from comparison of the ground and satellite total ozone observations. Such re-evaluation must be carried out under a supervision of GAW experts to guarantee application of proper methods.

R: Special workshop(s) should be organized by WMO for station data managers to assist them in evaluation and re-processing of their data sets.

- Some Dobson and majority of Brewer stations can only operate instruments but they are not able to process observations and to apply QA procedures without a permanent assistance of the GAW centres.

R: The above stations need to be identified and recommended to process their observations either at the RDCCs or in the BDMS.

- Despite the assistance given by GAW facilities or by other partners some stations do not perform reliable observations or stopped delivery of their data into WOUDC, though they are still registered as GAW stations.

R: Only stations that continue regular observations and that submit their data into WOUDC should be supported by the GAW facilities and included into the Capacity Building projects.

Illustrations pictures



International comparison of Dobson spectrophotometers from Asia, Tsukuba, 2006



Installation of the Dobson spectrophotometers at the Nairobi station, 2005



Training of Dobson operators from the Maun station, Botswana at Hradec Kralove, 2004



Installation of the semi-automated facility at the Dobson instrument in Natal, Brazil, 2004