



## **Report on the Activities of the Regional Dobson Calibration Center (RDCC) for WMO RA VI: Meteorological Observatory Hohenpeissenberg (Germany) and Solar and Ozone Observatory Hradec Králové (Czech Republic)**

**1999**

### ***Introduction:***

The quality assessment/quality control (QA/QC-programme of WMO) within the global total ozone monitoring network with Dobson spectrometer has been guaranteed by the **World Dobson Calibration Centre (WDCC)** in Boulder (NOAA) during the last two decades. Several major international Dobson Intercomparisons were organized by the WDCC under the auspices of WMO, in Europe mostly at Arosa (Switzerland). Some minor campaigns were performed e.g. in Potsdam, Belsk and Siofok, organized by the European Regional Centre at the Meteorological Observatory Potsdam (former GDR). Increased demands on data quality, an expanded Dobson network in Europe and reduced resources in the WDCC required modifications of the worldwide Dobson calibration system. The regional centres should be solely responsible for the QA/QC-programme in their regions, but with the support of and in co-operation with the WDCC.

In 1995 the duties of a Regional Dobson Calibration Centre were taken over by the **Meteorological Observatory Hohenpeissenberg (MOHp)**. During the following years the infrastructure for a RDCC was set up at MOHp, the necessary knowledge and experience was transferred to the Hohenpeissenberg staff, most of the special equipment and tools for Dobson work (tests, alignment, repair) like spectral lamps, wedge calibrator etc. were purchased or constructed in the own workshop. Additionally, an agreement was made between German Meteorological Service DWD and the Czech Hydrometeorological Service CHMI about the mutual co-operation of MOHp and the **Solar and Ozone Observatory Hradec Králové (SOO-HK)**. Both observatories agreed upon the division of the RDCC-tasks according to the properties and qualifications of the location, facility and staff. A detailed working plan is described in the section „Offered Services“.

The official function as RDCC for RA VI Europe was started in June 1999 with a first, small Dobson campaign, which confirmed firstly the ability of practical operation and secondly the comparable quality of the results at the different locations Hohenpeissenberg and Arosa (the former European calibration site). Regular calibration campaigns with the European Dobson instruments will be performed from 2000 onward.

### ***Offered Services:***

In the following the tasks and offered services of the RA VI-DCC MOHp/SOO-HK are listed with a short description, the responsibility is given in brackets:

- Maintenance and provision of absolutely calibrated regional reference instruments (D064 at MOHp, D074 at SOO-HK), being regularly compared with the WDCC-standard instruments. These comparisons and/or Langley measurements for absolute calibrations should be performed at least every two or three years.
- Technical and scientific organization, performance and evaluation of regular Dobson calibrations at Hohenpeissenberg, 2 – 3 campaigns per year, each with 2 – 3 instruments (MOHp with support of SOO-HK).
- Refurbishment of Dobsons out of operation and /or with old equipment (e.g. electronics etc.) (mainly MOHp with support of SOO-HK).
- Service for the European Dobson stations, technical/scientific support additional to the regular intercomparisons (MOHp, SOO-HK) incl. provision of a travelling instrument ( e.g. Microtops) for in-situ calibration checks (MOHp).
- Development of new techniques, tools, software and other methods to improve instruments' maintenance, tests, operation and data processing/analyses in cooperation with the WDCC in Boulder, WMO and the Dobson Ad-Hoc Committee (MOHp, SOO-HK).
- Thorough and continuous analyses/control of data quality, support with data re-evaluations, comparison with other instruments (other Dobsons, other types: e.g. satellite validation), detection/explanation/quantifying of principal differences (e.g. to the Brewer) (MOHp, SOO-HK).
- Preparation and maintenance of Standard Operating Procedures in co-operation with Boulder, WMO and Dobson Ad-Hoc Committee (MOHp, SOO-HK). Publication of a new Dobson Manual written by Archie Asbridge (MOHp mainly responsible, SOO-HK with advisory function) under WMO-auspices.
- Education and training of Dobson operators for the regular operation, common tests and maintenance work both for RA VI and stations located in developing countries selected after consultation with WMO (SOO-HK).
- Education and training of the own staff (MOHp, SOO-HK).
- The following equipment (hardware and software) is already available for the above mentioned tasks:
  - Newly developed and constructed, semi-automated two-lamp unit for wedge calibrations (MOHp).
  - Set of spectral lamps for calibration of wavelength setting with Q-levers → Q-tables (MOHp, SOO-HK).
  - Microtops Filter Ozonometer as travelling instrument for in-situ calibration checks (MOHp).
  - Traverse Microscope incl. video system for measurement and adjustment of slit width (MOHp).
  - Special tools like traverse lamp device, 1/3-2/3-device etc. for special tests and alignment procedures (MOHp, SOO-HK).
  - Special Dobson software package for data processing, archiving and transfer, free release and available from SOO-HK

Some other stations in Europe dispose of various tools (spectral lamps e.g. in U.K. and Switzerland) too, which could be used on demand.

### ***Activities in 1999:***

The European RDCC MOHp/SOO-HK started its regular function with the official opening and dedication of the Dobson Calibration Facility at MOHp in the presence of representatives of WMO, DWD and politics at the end of June. RDCC-activities were nevertheless already performed in the months before as can be seen in the following list:

- Maintenance and provision of the two regional reference Dobson instruments No. 064 (MOHp) and 074 (SOO-HK).
- Provision of a Microtops filter ozonometer for in-situ calibration checks of Dobsons at their stations.
- Continuation of the Dobson 044 refurbishment, which started in 1998 (MOHp with strong support by Martin Stanek from SOO-HK).
- Final construction and test of the new „wedge-calibrator“ (MOHp).
- Official opening and dedication of the Dobson Calibration facility at MOHp on June 28.
- Technical and scientific organization, performance and evaluation of the first Dobson intercomparison at MOHp with the D044 (GER), D064 (GER, secondary reference.), D065 (USA, primary reference.), D071 (GER), D074 (CZ, secondary reference) from July 5 to 11 (MOHp with support from SOO-HK). Main goals were to compare the three reference instruments and to assess the calibration quality at the two different locations Hohenpeissenberg and Arosa. Detailed results are published in a separate report.
- Joint meeting of the experts from MOHp (U. Köhler) and SOO-HK (Dr. K. Vaniček) during this intercomparison on the division of work between Hohenpeissenberg and Hradec Králové within the RDCC-task.
- Participation in the technical and scientific organization, performance and evaluation of the last „big“ European Dobson Intercomparison at Arosa from July 12 to August 4 (MOHp, SOO-HK). Detailed results are published in a separate report.
- Preparation of a new Dobson Manual for experts and operators, written by Archie Asbridge, discussion of the first draft (during the Arosa campaign) with B. Evans and A. Asbridge; the manual should be published after some further corrections, amendments and improvements under WMO auspices by the end of 2000 (MOHp).
- Preparations for installation of the D044 in Armenia, interview of the members of the Dobson Ad-Hoc Committee B. Evans, U. Köhler and K. Vaniček as well as M. Proffitt (WMO) with an Armenian representative (David Melkonyan) in Arosa about the chance of a reliable and successful operation of D044 in Armenia (MOHp).
- Updating of the Dobson software package Version 3.0 and free release to the users (SOO-HK).
- Preparation of Dobson web pages as a source of operational information for the Dobson community (SOO-HK)
- Two-week training of Dobson operators from the stations Xianghe (China) and Lagos (Nigeria) at SOO-HK.

- Assistance in improvement of function of the INPE's Dobson stations in Brazil by Martin Stanek (SOO-HK).
- Experts mission of Karel Vaniček (SOO-HK) to Turkey - attending an advisory meeting with experts from Istanbul Technical University and Turkish Meteorological Institute on preparing a Turkish national ozone monitoring programme.
- Participation in development and operational validation of rules for creation and submission of total ozone reports in new extCSV and CREX codes in cooperation with WO<sub>3</sub>UDC (Toronto) and WMO/CBS experts (SOO-HK).
- Administrative work: Dispatch of a Dobson questionnaire to all European Dobson stations to collect all necessary information about state of the instruments, the stations and the staff, creation of a corresponding data base, first preparations of the year-2000-Dobson campaigns, contacts with the people in charge (MOHp).
- Routine simultaneous operation of Dobson and Brewer ozone spectrophotometers for assessment of their relation as instruments recommended for long-term total ozone monitoring (MOHp and SOO-HK).

The following staff was responsible for the fulfilment of the RDCC-tasks and participated in the different activities:

Dipl. Met. Ulf Köhler, scientific head of the Dobson Calibration Centre (MOHp)  
 Dr. Karel Vaniček, head director of the SOO-HK  
 Dr. Matthias Lugauer, scientist (MOHp)  
 Ing. Martin Stanek, engineer (SOO-HK)  
 Ing. Fritz Schönenborn, electronic engineer (MOHp)  
 Bert Dömling, technician (MOHp)  
 Alois Stögbauer, workshop (MOHp)  
 Jiří Pokorný, technician (SOO-HK)

### ***Plans for 2000:***

The following list gives an overview about the intended activities in 2000:

- Assistance of the Australian colleagues in repair of the Korean Dobson No. 124 in January (Martin Stanek, SOO-HK)
- Participation of Karel Vaniček in the South African Dobson Intercomparison and the adjacent workshop – Pretoria, March/April (SOO-HK).
- Technical and scientific preparation, organization, performance and evaluation of two Dobson intercomparisons at MOHp (first campaign with support from SOO-HK, participation of Martin Stanek):
  - MOHp2000-1 from May 21 to June 9 with D032 and D035 (both UK), D040 (Belgium) and D044 (Germany/Armenia). Additional to a regular intercomparison the brand-new US-electronics will be installed into the UK-Dobsons and D044.
  - MOHp2000-2 from July 23 to August 5 with D013 (Portugal), D059 (Egypt) and D071 (Potsdam, Germany). In the run-up to this campaign it is planned to examine and possibly refurbish (new electronics) the D059, that was transferred from Canada to Egypt in 1999.

- Preparation of the D044-transfer to Armenia: Visit and evaluation of designated locations by the expert Arkady Shalamyansky from St. Petersburg (in February/March), final refurbishment and calibration of this instrument (MOHp).
- Training of 4 Dobson operators from Iran, Seychelles and Armenia in Hradec Králové from May 15 – 26 (SOO-HK), afterwards participation of the Armenian operator(s) in the MOHp2000-1 campaign.
- Participation in the Quadrennial Ozone Symposium in Japan and presentation of the European RDCC (facility, services, work, results) (MOHp, SOO-HK).
- Visit of the Hohenpeissenberg experts (H. Claude, U. Köhler, M. Lugauer) in Hradec Králové in October at the invitation of SOO-HK for discussion and specification of further co-operation and division of work between both RDCC partners (MOHp, SOO-HK).
- First preparations for the 2001 campaigns including the possible absolute calibration of the regional reference instruments (MOHp, SOO-HK).

### ***Further Outlook:***

The performance of regular Dobson intercomparisons according the proposed schedule (2 –3 campaigns with 2-3 instruments each) will guarantee the good calibration state of all operational European Dobsons in the next years. The global concept of the Dobson training of unexperienced or new operators will continue to improve operation of the global network. It is planned to bring some Dobson instruments, which are presently out of operation, back into the European or even global network (e.g. 2 Dobsons from Italy) after their examination and renovation. A first contact with the British Antarctic Survey (Jonathan Shanklin) was made. Their four Dobsons (No.'s 031, 073, 103 and 123) are presently not included in the global scheme of Dobson calibrations and their instrumental state is not yet satisfying (e.g. old electronics). Their examination, renovation and calibration at MOHp should be considered. A first absolute calibration of the European regional reference instruments D064 and D074 and their comparison with the world primary standard instrument from USA (NOAA, Boulder) should be organized within the next two years, possible locations for this activity are Izaña (Tenerife) or Mauna Loa (Hawaii). It should be mentioned, that all these declarations of intent are strongly dependent on the available financial and personal resources in the future.

Hohenpeißenberg, February 2000

Hradec Králové, February 2000

(Ulf Köhler)

(Dr. Karel Vaniček)

Attachment: Table of all operational European Dobson stations incl. calibration state and schedule

### Summary of European Dobson Stations

No.	Dobson-No.	Country	Location	Last Cal.	L. Cal. Location	Next Cal.	N.Cal. Location
1	D011	Algeria	Tamanrasset	7/93	CMDL-Boulder	2000	SA
2	D013	Portugal	Lisbon	6/94	Izana	2000	MOHp
3	D014	Norway	Tromsö	5/1998	Oslo	2002	MOHp
4	D015	Switzerland	Arosa	8/78	Arosa		
5	D030	Sweden	Vindeln	7/95	Arosa	2001	MOHp
6	D031	UK (Ukraine)	Vernadsky	?	?		
7	D032	UK	Lerwick	7/95	Arosa	2000	MOHp
8	D035	UK	Camborne	5-6/98	Boulder	2000	MOHp
9	D040	Belgium	Uccle	1995	Arosa	2000	MOHp
10	D041	UK	Camborne	7/99	Arosa	2003	MOHp
11	D044	Germany	Hohenpeissenberg	7/99	MOHp	2000	MOHp
12	D046	Italy	Brindisi	?	?		
13	D047	Italy	Vigna di Valle	?	?		
14	D048	Italy	Sestola	7/99	Arosa	2003	MOHp
15	D049	France	Observatoire De Bordeaux, Floirac	7/99	Arosa	2003	MOHp
16	D050	Iceland	Reykjavik			2001	MOHp
17	D051	Switzerland	Arosa	?	?		
18	D056	Norway	Oslo	7/99	Arosa	2003	MOHp
19	D059	Egypt	Harghada	?	?	2000	MOHp
20	D062	Switzerland	Arosa	7/99	Arosa	2003	Arosa?
21	D064	Germany	Hohenpeissenberg			2001	Izana
22	D066	Italy	S. Pietro Capofume	?	?		
23	D069	Egypt	Aswan	7/99	Arosa	2003	MOHp
24	D071	Germany	Potsdam	7-8/99	MOHp	2003	MOHp
25	D073	UK	?	?	?		
26	D074	Czech Republic	Hradec Kralove	7/99	Arosa	2001	Izana
27	D084	Poland	Belsk	7-8/95	Arosa	2001	MOHp

