

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)

2000

Introduction:

The official function of the Meteorological Observatory Hohenpeissenberg (MOHp)/Solar and Ozone Observatory Hradec Králové (SOO-HK) as common RDCC for RA VI Europe was started in June 1999 with a first small Dobson campaign at the facility at Hohenpeissenberg. It confirmed firstly the ability of practical operation and secondly a comparable quality of the results at the different locations Hohenpeissenberg and Arosa (the former European calibration site). The regular operation of RDCC was started in 2000 with the organisation of the first two official calibration campaigns with altogether 7 European Dobson instruments at MOHp. The function of SOO-HK as a training centre for Dobson operators was continued successfully.

It has been proved by the successful organization of these campaigns, that MOHp and SOO-HK are able to meet the demands on maintaining the high level of calibration quality in the expanded Dobson network in Europe. The installation of the restored D044 in Armenia additionally confirmed the ability of both partners in the RDCC-cooperation to provide experienced and skilled instrumental work and qualified service. Thus the Quality Assessment/Quality Control (QA/QC-programme of WMO) developed for the global total ozone monitoring network of Dobson spectrometer will be guaranteed by both institutions from Germany and Czech Republic in the RA-VI Region.

The experiences obtained during the organization of the MOHp2000- and the already started preparations of the MOHp2001-campaigns brought the following two points to light:

- The provision with spare parts is very important, because a majority of the instruments are older than 30 years and their electronical, optical and mechanical parts are no longer in the state-of-the-art. An aggravating fact is, that the manufacturer Coherent-Ealing (UK) is unfortunately no longer willing to support the Dobson business: Therefore new suppliers have to be investigated.
- Not only sufficient personal resources with good Dobson experience but also the provision of financial support for less prosperous countries are crucial for a successful work of RDCC. It should be mentioned in this context, that the financial support granted by Switzerland during the past campaigns, was a great help for WMO and the Dobson community.

The following sections give a description of the offered services, the work done in 2000 and the activities planned for 2001. An outlook will outline further intentions in the near future.

Offered Services:

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

- Maintenance/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 MOHp, 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 traveling 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 WDCC Boulder, WMO and Dobson Ad-Hoc Committee (MOHp, SOO-HK). Publication of a new special Dobson Manual for experts 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 Ozone meter as traveling 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 for users (SOO-HK)

Some other stations in Europe also have various tools (spectral lamps e.g. in U.K. and Switzerland), which can be used on demand.

Activities in 2000:

The European RDCC MOHp/SOO-HK performed the following activities at various locations in 2000:

- 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 (MOHp).
- Final adjustment and calibration of Dobson 044 (MOHp with strong support by Martin Stanek from SOO-HK) and its installation at the new station Nor-Amberd in Armenia by M. Lugauer and M. Stanek from October 19 to 27, 2000 (MOHp, SOO-HK).
- Technical and scientific organization, performance and evaluation of two Dobson intercomparisons at MOHp with the D013 (Portugal), D032 (UK), D035 (UK), D040 (Belgium), D044 (Germany/Armenia), D059 (Egypt) and D071 (Germany) from May 21 to June 10 (MOHp2000-1) and July 23 to August 5 (MOHp2000-2). During the first campaign an intense electronical work was done (installation of the new US-type electronics in three Dobsons and optical alignment of D035) with the assistance by Michael O'Neill (NOAA, Boulder, USA) and Martin Stanek (SOO-HK, CHMI). Detailed results are published in a report and can be downloaded as pdf-file from the Dobson Web Pages maintained by SOO-HK: (<http://www.chmi.cz/meteo/ozon/dobsonweb/welcome.htm>).
The graphs in attachment No.1 give a good impression of the success of the calibrations (MOHp, SOO-HK).
- Updating and release of the Dobson software package prepared at SOO-HK - implementation of total ozone CREX and extCSV encoders for operational data exchange to WOUDC Toronto and through WMO/GTS links (SOO-HK).
- Creation and installation of a draft version of Dobson Web Pages - an Internet site of the Dobson part of the GAW ozone monitoring network, located at the server of CHMI (SOO-HK).
- Training of 4 Dobson observers from Armenia, Iran and Seychelles at SOO-HK (11.-28.05.2000) in operation and maintenance of the instrument and processing of measurements at their home GAW stations, afterwards practical exercise in operation of the "new" Armenian Dobson No. 44 for David Melkonyan and Armen Ordyan at Hohenpeissenberg during MOHp2000-1 (SOO-HK, MOHp).
- Assistance of an invited expert from SOO-HK (K. Vanicek) at realization of the WMO/NOAA Regional Dobson Intercomparison in Pretoria, South Africa (24.03.-07.04.2000).
- Refurbishment and readjustment of a damaged Korean instrument D124 in Melbourne, January 2000 - a joint operation of M. Stanek from SOO-HK with an Australian specialist J. Easson on the request of WMO (SOO-HK).
- Presentation of some results of RDCC activities at the Quadrennial Ozone Symposium, Sapporo, 07/2000 - one individual (SOO-HK) and one joint presentation (MOHP, SOO-HK).
- Participation in the meeting of the Dobson Ad-Hoc Committee during the Ozone Symposium to discuss past, present and future tasks and activities (MOHp, SOO-HK). The corresponding report on the results can be found on the Dobson web pages of SOO-HK.
- Separate meeting of the RDCC-partners Dr. Vanicek and U. Koehler during the Ozone Symposium to discuss future joint tasks (MOHp, SOO-HK).

- Further development and improvement of the software for controlling the new semi-automated wedge calibration unit (MOHp).
- Further development, production and purchase of necessary RDCC-tools and equipment (e.g. digital camera for documentation and web presentation)(MOHp).
- Beginning of the preparations for the next MOHp Dobson-campaigns in 2001 (MOHp).

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)

Ing. Michael O'Neill, electronic engineer (NOAA, Boulder, USA)

Bert Dömling, technician (MOHp)

Alois Stögbauer, workshop (MOHp)

Plans for 2001:

The following list gives an overview about the intended activities in 2001:

- Presentation of results of SOO-HK and MOHP cooperation performed in the frame of RDCC activities in recent years at the CHMI/SOO Workshop in Hradec Kralove, May 2001 (SOO-HK, MOHp).
- Organization of a meeting of Dobson Ad Hoc Committee members present at the Workshop mentioned above and ozone specialists from DWD and CHMI in Hradec Kralove, May 2001 - discussion of present and future joint cooperation (SOO-HK, MOHp).
- Technical and scientific preparation, organization, performance and evaluation of two Dobson intercomparisons at MOHp (one campaign with support from SOO-HK, participation of Martin Stanek):
 - MOHp2001-1, tentatively from June 10 to June 23 and
 - MOHp2001-2, tentatively from July 8 to July 21
 It is planned to have the 7 instruments D030 (Sweden), D084 (Poland), D096 (Egypt), D104 (Germany) D108 (Russia), D110 (Hungary) and D121 (Romania) to be calibrated in the campaigns provided that the funding for the less prosperous countries can be made available. The at first intended D047 (Italy, no possibility to participate in 2000), D050 from Iceland (timing problem) and D092 (Denmark, no response) have to be shifted into 2002 (s. table in attachment No.2) (MOHp, SOO-HK).
- Complete overhaul of the regional standard D064 before performing an absolute calibration, support by M. Stanek tentatively intended(MOHP, SOO-HK).
- Plannings and preparations for the 2002 campaigns including the expected absolute calibration of the regional reference instruments after Langley in 2002 (MOHp, SOO-HK).
- Completing and official introduction of a semi-automated data recorder for Dobson instruments developed at SOO-HK - technical design, software, operational instructions (SOO-HK).
- Further updating of the Dobson Web Pages with the aim to get suggestions from visitors and to announce actual events related to the GAW Dobson network; designing and creating an own RDCC-Web Page at the MOHp-server as supplement to the Czech presentation (SOO-HK, MOHp).
- Training of 3 Dobson operators from developing countries at SOO-HK, September 2001. Preparing a summary report about training activities of SOO-HK of the period 1996-2001 addressed to WMO/GAW project managers (SOO-HK).

- Further improvement of the technical equipment and software (wedge calibrator, Dobson software package) (MOHp, SOO-HK).
- Supervision of the new Dobson station in Armenia and monitoring of the produced data, to ensure the demanded data quality within the global Dobson network (MOHp).

Further Outlook:

The calibration state of several Dobsons is presently not well defined or they are no longer operational. Additionally most of these instruments are „old-fashioned“, which means that their electronics and mechanical components are not state-of-the-art. Even the Dobsons, which participated in the intercomparisons of the last three decades and have therefore been undergone refurbishments and partly restorations show a great variety in their equipment. These fact impede a standardized procedure for service, examination, alignment and finally regular operation.

Whereas the past thirty years were marked by the indeed successful attempt to improve the data quality in the European and global Dobson network, the next ten years should stand for standardization of Dobson design and advancement of the so-called SOP's (Standard Operation Procedures) for regular operation of the Dobsons, testing of their calibration state and data processing. The possibly new Dobson manual („Archie's memoirs“, presently in preparation under the responsibility of the MOHp), training activities and the new Dobson software (both provided by the SOO-HK) could provide considerable contributions to reach these goals. The investigation of new suppliers for spare parts and the development of better components (e.g. the new US-type electronics) are also very important challenges. Finally the use of the internet (e.g. Dobson Web Pages in Boulder, Hradec Králové and Hohenpeißenberg) will enable the rapid spread of these new developments, knowledge and progress in the Dobson community.

All these activities together will then ensure, that the global Dobson network will remain the reliable and high-quality backbone of the global ozone monitoring system. This goal can hardly be reached without a systematic assistance by the GAW Dobson Ad Hoc Committee, where specialists of MOHp and SOO-HK act as regular members.

Hohenpeißenberg, February 2001

Hradec Králové, February 2001

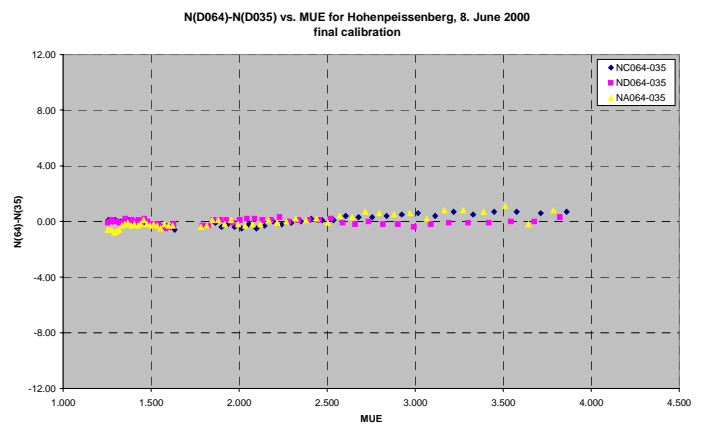
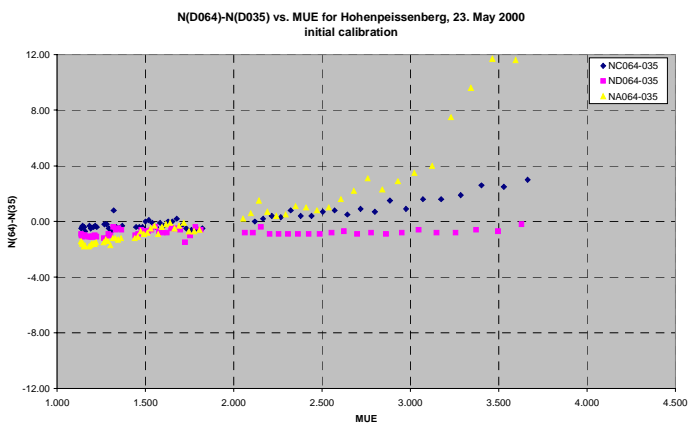
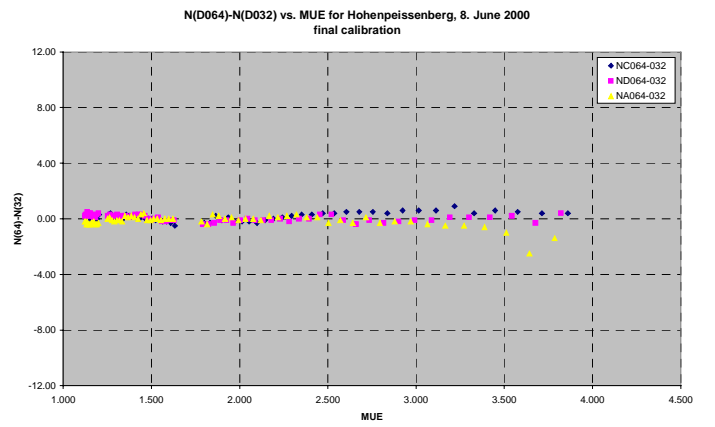
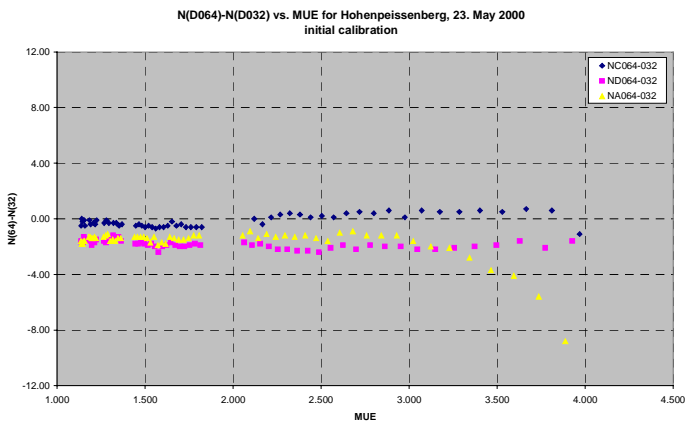
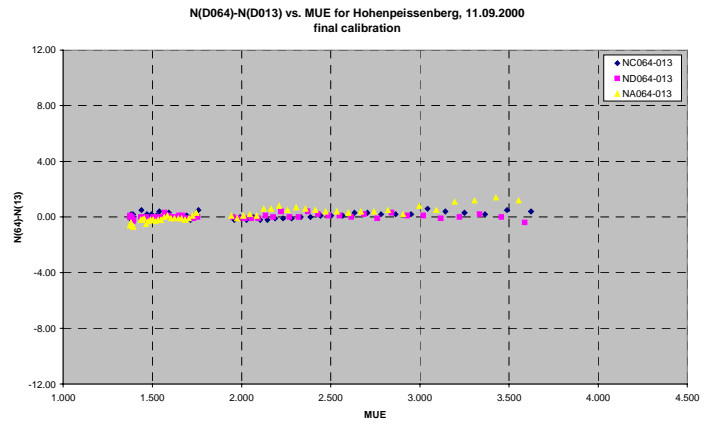
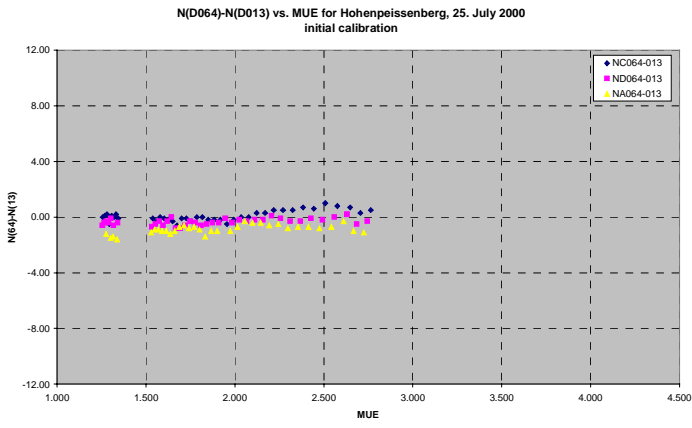
(Ulf Köhler)

(Dr. Karel Vaniček)

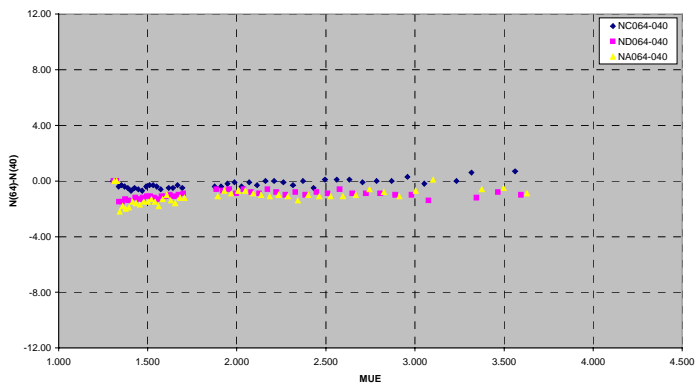
Attachments:

1. Summary graph of the Dobson calibrations (2 pages): Initial calibrations of the various instruments on the left hand, final calibrations on the right hand; shown are the differences of the raw data between standard Dobson and instruments under calibration in the three used wavelength pairs.
2. Actual table of all operational European Dobson stations incl. calibration state and schedule (1 page)

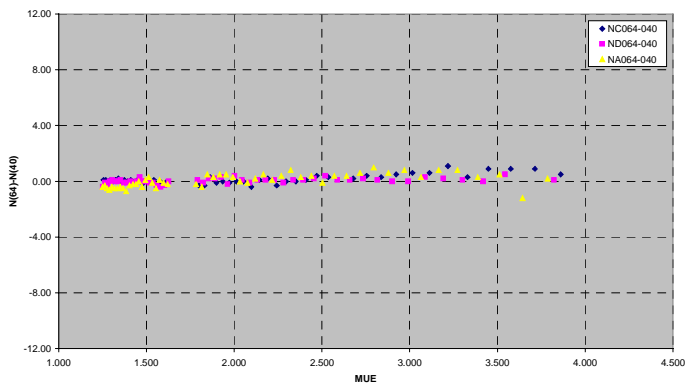
Attachment 1: Graphs of the Calibration Results



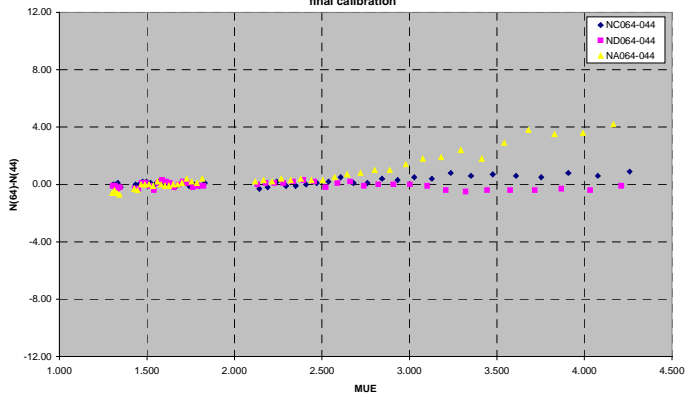
N(D064)-N(D040) vs. MUE for Hohenpeissenberg, 2. June 2000
initial calibration



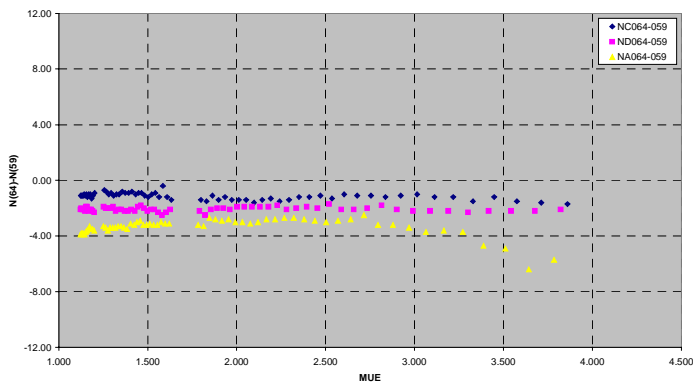
N(D064)-N(D040) vs. MUE for Hohenpeissenberg, 8. June 2000
final calibration



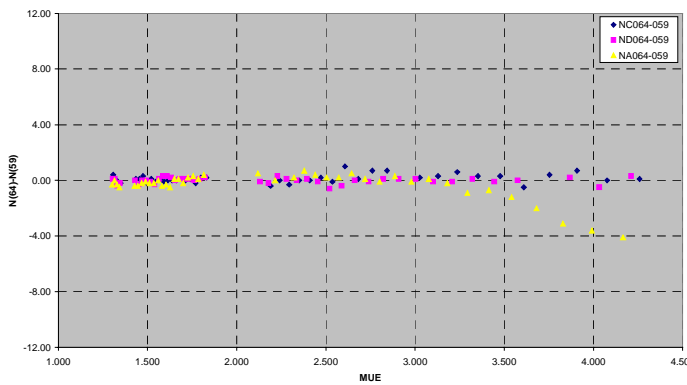
N(D064)-N(D044) vs. MUE for Hohenpeissenberg, 01.08.2000
final calibration



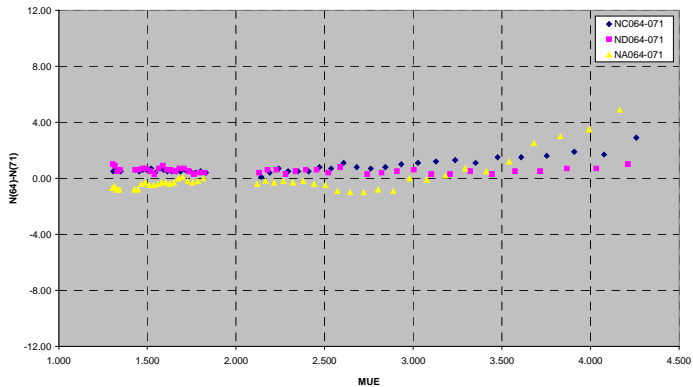
N(D064)-N(D059) vs. MUE for Hohenpeissenberg, 8. June 2000
initial calibration



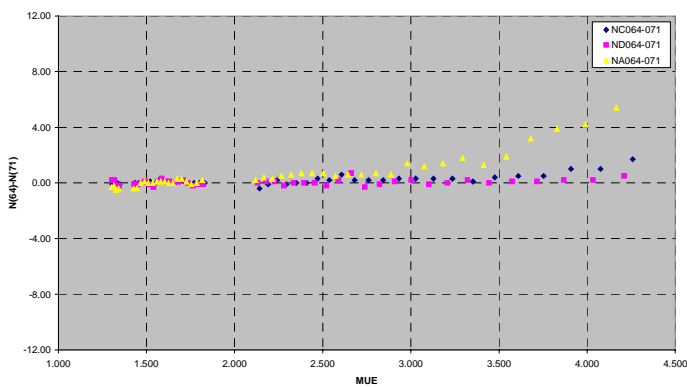
N(D064)-N(D059) vs. MUE for Hohenpeissenberg, 01.08.2000
final calibration



N(D064)-N(D071) vs. MUE for Hohenpeissenberg, 01.08.2000
initial calibration



N(D064)-N(D071) vs. MUE for Hohenpeissenberg, 01.08.2000
final calibration



Attachement 2: Table of State and Schedule for the European Dobsons

Summary of European Dobson Stations							
No.	Dobson- No.	Country	Location	Last Cal.	L. Cal. Location	Next Cal.	N.Cal. Location
1	D013	Portugal	Lisbon	7-9/2000	MOHp	2004	MOHp
2	D014	Norway	Tromsø	5/1998	Oslo	2002	MOHp
3	D015	Switzerland	Arosa	8/78	Arosa		
4	D030	Sweden	Vindeln	7/95	Arosa	2001	MOHp
5	D031	UK (Ukraine)	Vernadsky	?	?		
6	D032	UK	Lerwick	5-6/00	MOHp	2004	MOHp
7	D035	UK	Camborne	5-6/00	MOHp	2004	MOHp
8	D040	Belgium	Uccle	5-6/00	MOHp	2004	MOHp
9	D041	UK	Camborne	7/99	Arosa	2003	MOHp
10	D044	Armenia	Nor Amberd	8/2000	MOHp	2004	MOHp
11	D046	Italy	Brindisi	?	?	?	?
12	D047	Italy	Vigna di Valle	?	?	2002	MOHp
13	D048	Italy	Sestola	7/99	Arosa	2003	MOHp
14	D049	France	Observatoire De Bordeaux, Floirac	7/99	Arosa	2003	MOHp
15	D050	Iceland	Reykjavik			2002	MOHp
16	D051	Switzerland	Arosa	?	?	?	?
17	D056	Norway	Oslo	7/99	Arosa	2003	MOHp
18	D059	Egypt	Harghada	6-8/2000	MOHp	2004	MOHp
19	D062	Switzerland	Arosa	7/99	Arosa	2003	Arosa?
20	D064	Germany	Hohenpeissenberg	ref.instr.	-	2002	Izana
21	D066	Italy	S. Pietro Capofiume	?	?		
22	D069	Egypt	Aswan	7/99	Arosa	2003	MOHp
23	D071	Germany	Potsdam	8/2000	MOHp	2004	MOHp
24	D073	UK	?	?	?		
25	D074	Czech Republic	Hradec Kralove	7/99	Arosa	2001	Izana
26	D084	Poland	Belsk	7-8/95	Arosa	2001	MOHp
27	D085	France	Haute Provence	7/99	Arosa	2003	MOHp
28	D092	Denmark/Greenland	Thule			2002?	MOHp
29	D096	Egypt	Cairo	7-8/97	Kalavryta	2001?	MOHp
30	D101	Switzerland	Arosa	7/99	Arosa	2003	Arosa?
31	D103	UK	Halley	?	?		
32	D104	Germany	Hohenpeissenberg	7-8/95	Arosa	2001	MOHp
33	D107	Russia	Moscow	7/1999	Arosa	2003	MOHp
34	D108	Russia	Voeikovo	7-8/97	Kalavryta	2001?	MOHp
35	D110	Hungary	Budapest-Lorinc			2001	MOHp
36	D118	Greece	Athens	7-8/97	Kalavryta	2002	MOHp
37	D120	Spain	El Arenosillo	7/99	Arosa	2003	MOHp
38	D121	Romania	Bucharest	7/97	Kalavryta	2001	MOHp
39	D123	UK	?	?	?		
40	Dnn1	Bulgaria	?	?	?		

Description:

Next Calibration

Calibration in 2 years

Calibration next year

Calibration recently

Status not known