

# Recommendations from the 3<sup>rd</sup> meeting of the WMO Brewer Sub-committee El Arenosillo, Spain, September 30, 2003

**Chairman and Rapporteur: E. Hare**

## **In Attendance**

H. De Backer  
V. Fioletov  
T. Grajnar  
E. Hare  
A. Los  
T. McElroy  
V. Savastiouk  
K. Vanicek

## **Affiliation**

Royal Meteorological Institute of Belgium  
Meteorological Service of Canada  
Meteorological Service of Canada  
Meteorological Service of Canada  
Kipp & Zonen),  
Meteorological Service of Canada  
International Ozone Services Inc  
Czech Hydro-Meteorological Institute

## **Absent**

A. Bais  
J. Kerr  
M. Proffitt

Aristotle University of Thessaloniki  
Meteorological Service of Canada  
World Meteorological Organization

## **Introduction**

The meeting was chaired by E. Hare on behalf of J. Kerr. Following a brief review of the September 2002 meeting minutes, it was decided that the outstanding action items would be revisited and included as items within this summary report. Refer to Annex A.

Four main topics were discussed: Standard Operating Procedures, Announcements and General Business, Capacity Building and Umkehr Analysis. This report does not detail the minutes of the meeting, but simply reports the recommendations resulting from the discussion of these four topics.

## **Standard Operating Procedures (SOPs)**

The following recommendations regarding Standard Operating Procedures (SOPs) have been put forth:

- 1 establish a unified definition of SOPs for Brewers - T. Grajnar
- 2 build a “dynamic” document and deliver a hardcopy to the WMO (if requested)
- 3 call to the Brewer community to voluntarily submit any test or operational programs and local SOPs to be considered for inclusion in this document
- 4 the sub-committee will be responsible for the technical review of this SOPs document

***Action Item: begin developing the document with the simple operations as a starting point for the document. A draft version of this document should be made ready by early 2004.***

### **Announcements and General Business**

1. Recommend that Jim Kerr be contacted about his possible future involvement with the Brewer sub-committee and workshops as the SAG-Ozone Brewer expert
2. Recommend that Tom McElroy maintain his membership with the NDSC as the Brewer expert and representative until a replacement arrangement is worked out with the other column ozone co-chair (S. Oltzman)
3. Put a call out to the Brewer community for nominations to serve on the sub-committee with special attention paid to geographical and institutional representation on the committee
4. It is noted that this Brewer meeting date was changed so as not to coincide with the QOS years.
5. Acknowledge that the GAW RBCC for RA-VI at Izaña has occurred as mentioned in the 2002 meeting.

### **Capacity Building**

That “retired” Brewers be made available to developing countries provided that the WMO and operating institution will be committed to calibrate, maintain and operate the instrument correctly.

### **Umkehr Analysis**

Re-iterate the importance of Umkehr data for high altitude trends, noting that there is a need for an operational Umkehr program. The MSC will investigate the possible cooperation with NASA-GSFC.

### **Unified formula for Mu calculation**

Consultation with Dobson sub-committee is needed to generate a definition of a joint formula for calculation of the relative ozone air mass for processing Dobson and Brewer total ozone observations. The formula then will be included into Dobson and Brewer SOPs.

The meeting concluded with an acknowledgement of the efforts of INTA and its staff for hosting the 8<sup>th</sup> Biennial Brewer meeting. The meeting was adjourned.

## **Annex A**

### **Action Items**

(from the 2<sup>nd</sup> Meeting of the Brewer Sub-committee,  
September 17, 2002, Toronto, Canada)

1. *The MSC will undertake the writing of the call letter for enhanced information on calibrations and pass it by the committee.*

**Action:** a draft letter with accompanying documentation should be ready by early 2004. It was agreed that more detail is required before the request can be sent.

2. *T. Grajnar will email a sample of the MSC Brewer SOPs to the community.*

**Action:** This request has been continued forward as an action item resulting from the 2003 meeting with a date of early to mid 2004

3. *It was suggested that Brewer #017B-files be examined to profile the various site visits.*

**Action:** Tables I and II lists these locations and the dates of the visits. Table I is based upon the day header records read from B and UV files residing in the Brewer Data Management System (BDMS) at the MSC. Table II is a list of site visits provided by IOS Inc. where Brewer B (or UV) files are not archived with IOS or at the BDMS. Refer to the notes accompanying each table for further details.

4. *E. Hare will provide a current Umkehr station table to the committee.*

**Action:** the list is provided below in Table III. Refer to the Table III caption for details.

**Table I Site Visits (using BR#017)**

<b>Site (Station) Name</b>	<b>Date of Visit</b>
Alma Ata	July 1989
Alomar	June 2000
Alomar	June 2001
Alomar	June 2002
Alomar	June 2003
Angra - Azores	July 1994
Angra - Azores	December 1996
Arosa	August 1990
Arosa	September 1991
Arosa	August 1996
Arosa	July 1998
Arosa	August 1999
Arosa	July – August 2000
Arosa	July 2001
Arosa	July 2002
Arosa	July 2003
Athens Ga.	May 1994
Athens Ga.	January 2000
Bandung	February 1995
Bandung	April 2000
Bandung	April 2001
Bangkok	April 2000
Bedford	October 1997
Beijing	May 1989
Beijing	April 1992
Black Mountain	January 2000
Boulder	June 1988
Boulder	September 1994
Brindisi	September 1993
Brindisi	April 1996
Brussels	March 1989
Brussels	May 2003
BSRM Regina	September 1997
Budapest	May – June 2001
C. Paulista	May 1998
Camborne	April 1997
Camborne	May 1999
Casablanca	July – August 1990
Chengkung	April 1992
Chengkung	April 1993
Chengkung	November 1995
Chengkung	February 1997

Cuiaba	October 1991
Cuiaba	May 1998
De Bilt	August 1997
De Bilt	July 1999
De Bilt	May 2001
De Bilt	May 2003
Edmonton	October 1984
Edmonton	April – May 1986
Edmonton	August 1988
Edmonton	May 1996
El Arenosillo	September 1999
El Arenosillo	September 2001
El Arenosillo	September 2003
Funchal	June – July 1994
Funchal	November 1996
Gaithersburg	July 1994
Gonghe	August 1991
Gonghe	April 1992
Goose Bay	May 1987
Goose Bay	September 1988
Haidian Region	April 2002
Halkidiki	September 1998
Hohenpeissenberg	July 1991
Hohenpeissenberg	August 1992
Hohenpeissenberg	August 1994
Hohenpeissenberg	August 1995
Hohenpeissenberg	August 1996
Hohenpeissenberg	June 1997
Hohenpeissenberg	June 1998
Hohenpeissenberg	June 1999
Hohenpeissenberg	May 2000
Hohenpeissenberg	May 2001
Hohenpeissenberg	May 2002
Hohenpeissenberg	May 2003
Hong Kong	November 1996
Hong Kong	April 1999
Hong Kong	April 2000
Hong Kong	April 2001
Hong Kong	April 2002
Hradec Kralove	September 1995
Hradec Kralove	June 1997
Ispra	September 1991
Ispra	August 1994
Ispra	June 1995
Ispra	April 1996
Ispra	May 1997

Ispra	July 1998
Ispra	September 1999
Ispra	August 2000
Ispra	July – August 2001
Ispra	May 2003
Izana	May 1991
Izana	June 1992
Izana	June 1994
Izana	October 1996
Izana	October 1998
Izana	October 2000
Izana	September 2001
Izana	September 2002
Izana	September 2003
Izana	October 1996
Jokioinen	March 1995
Jokioinen	June 1995
Jokioinen	July – August 1997
Jokioinen	June 1998
Jokioinen	June 1999
Jokioinen	June 2001
Jokioinen	June 2002
Jokioinen	June 2003
Kozani	March 1989
La Paz	August 1997
La Paz	August 2001
Lampedusa	July 1998
Lampedusa	February 2002
Lindenberg	August 1992
Lindenberg	August 1994
Lindenberg	August 1995
Lindenberg	August 1996
Lindenberg	June 1997
Lindenberg	June 1998
Lindenberg	June 1999
Lindenberg	May 2000
Lindenberg	May 2001
Lindenberg	May 2002
Lindenberg	May 2003
Lisbon	May 1989
Lisbon	December 2002
Longfenshan	April 1999
Madrid	May 1991
Madrid	June 1992
Madrid	October 1998
Madrid	September 2002

Manila	April 1999
Manila	April 2000
Mauna Loa Obs	March – April 1987
Mauna Loa Obs	November – December 1991
Mauna Loa Obs	April 1993
Mauna Loa Obs	March 1997
Mauna Loa Obs	March 1998
Mauna Loa Obs	November 2002
Messina	April 1996
Messina	October 2003
Moscow	September 1991
Natal	December 1996
Natal	October – November 2000
Norrkoping	June 1989
Norrkoping	July 1991
Norrkoping	May 1996
Norrkoping	June 2003
Obninsk	August 1996
Obninsk	July 2001
Obninsk	August – September 2003
Oslo	August 1991
Oslo	May 1994
Oslo	June 1995
Oslo	June 1996
Oslo	August 1997
Oslo	May 1998
Oslo	June 1999
Oslo	June 2000
Oslo	June 2001
Oslo	June 2002
Oslo	June – July 2003
Paramaribo	November 2002
PetalingJaya	February 1995
PetalingJaya	February – March 1997
PetalingJaya	April 1999
PetalingJaya	March 2001
PetalingJaya	April 2002
Pohang	February 1995
Poprad-Ganovce	May 1995
Poprad-Ganovce	May 1999
Potsdam	April 1988
Potsdam	July 1991
Potsdam	August 1992
Potsdam	August 1994
Potsdam	March 1995
Potsdam	August 1995

Potsdam	September 1996
Potsdam	June 1997
Potsdam	June 1998
Potsdam	June 1999
Potsdam	May 2000
Potsdam	May 2001
Potsdam	May 2002
Punta Arenas	December 1997
Res.Tri. Park	May 1994
Resolute Bay	May 1992
Rio Branco	October 1991
S.Jose d.Campos	March 1999
S.Jose d.Campos	March 2000
Seoul	April 1992
Sestola	June 1995
Sestola	April 1996
Sestola	September 2000
Sestola	September 2003
Sodankyla	April 1988
Sodankyla	June 1989
Sodankyla	August 1991
Sodankyla	June 1995
Sodankyla	July 1997
Sodankyla	June 2002
Sodankyla	June 2003
Sondrestrom	August 1994
Sondrestrom	July 1999
Sonnblick	August 1996
Sonnblick	August 1999
Sonnblick	July – August 2002
Table Mountain	September 1994
Taipei	May 1987
Taipei	May 1989
Taipei	April 1992
Taipei	April 1993
Taipei	February 1997
Taipei	April 1998
Taipei	March – April 1999
Taipei	March 2000
Taipei	March – April 2001
Taipei	March 2002
Tateno	April 1992
Thessaloniki	April – May 1988
Thessaloniki	March 1989
Thessaloniki	July 1991
Thessaloniki	February 1993



Thessaloniki	May 1995
Thessaloniki	July 2000
Thessaloniki	July 2002
Tromso	August 1994
Tromso	June 1995
Tromso	April 1997
Tromso	July 1997
Tromso	May 1998
Tromso	June 1999
Tylosand	June 2000
Univ. of Rome	May 1991
Univ. of Rome	May 1995
Univ. of Rome	April 1996
Univ. of Rome	May 1997
Univ. of Rome	July 1998
Univ. of Rome	September 1999
Univ. of Rome	August – September 2000
Univ. of Rome	March 2002
Univ. of Rome	September 2003
Valentia	May 1994
Valentia	June 1996
Valentia	June 1998
Valentia	May 2000
Valentia	May 2002
Vigna di Valle	July 1989
Vigna di Valle	January 1992
Vigna di Valle	April 1996
Vigna di Valle	September – October 2003
Vindeln	June 1999
Vindeln	June 2002
Warsaw	June 2003
Winnipeg	February 1996
Xining	November 1996
Yakutsk	August 1996
Yakutsk	July 2001

**Table I Notes:** This list of site visits is based on information extracted directly from B or UV files (from the travelling standard, Brewer #017) that are available from the Brewer Data Management System (BDMS) for the years 1984 to 2003. Although the data exist within the BDMS, this list does not reflect the time during which BR#017 was located at either MSC headquarters or IOS (Toronto, Canada).

**Table II Additional Information about Brewer #017 Site Visits**

Site (Station) Name	Date of Visit
Thessaloniki	September 1984
Sodankyla	April 1987
Potsdam	April 1987
Thessaloniki	April - May 1987
Madrid	June 1989
Potsdam	Jun 1989
Kislovodsk	August 1990
Garmish	July 1993
Ispra	July 1993
Arosa	July - August 1993
Lindenberg	August 1993
Oslo	August 1993
Sestola	September 1993
Messina	September 1993
Izana	October - November 1993
Brussels (Uccle)	September 1994
Natal	October 1994
Jokionen	April 1997
Sestola	May 1997
Gaithersburg	November 1998
Copenhagen	June 2000
Taipei	March - April 2003
Copenhagen	June - July 2003

**Table II Notes:** The above list was generated from IOS Inc. records and represents visits to sites where Brewer B (or UV) files from BR#017 are not presently archived within the Brewer Data Management System (BDMS). IOS Inc. is currently in the process of recovering the files to support these records.

**Table III Umkehr Data Available at the BDMS.**

<b>Brewer</b>	<b>Agency</b>	<b>Country</b>	<b>Min Date</b>	<b>Max Date</b>
BR#005	AUTH	GRC	1989-12-04	1992-12-31
BR#007	MSC	CAN	1995-12-04	1997-09-23
BR#008	MSC	CAN	1985-05-23	1992-02-21
BR#009	MSC	CAN	1995-10-25	1996-02-13
BR#011	MSC	CAN	1988-02-26	2003-07-21
BR#012	MSC	CAN	1987-10-27	to Present
BR#013	MSC	CAN	1987-10-27	2002-02-19
BR#014	MSC	CAN	1984-09-18	1991-12-04
BR#015	MSC	CAN	1984-11-08	to Present
BR#018	MSC	CAN	1985-03-26	to Present
BR#019	MSC	CAN	1989-07-19	1999-06-30
BR#020	MSC	CAN	1987-04-01	1991-12-23-
BR#021	MSC	CAN	1997-03-07	1997-10-27
BR#026	MSC	CAN	1986-04-15	to Present
BR#029	MSC	CAN	1998-04-16	to Present
BR#031	MSC	CAN	1988-03-09	to Present
BR#039	MSC	CAN	1989-06-09	to Present
BR#040	MeteoSwiss	CHE	1988-12-14	1992-01-09
BR#043	RAS-IAP	RUS	1993-01-29	1996-10-12
BR#044	IEM-SPA	RUS	1991-05-12	1998-12-31
BR#054	CAMS-IAC	CHN	1990-10-24	2001-12-30
BR#055	MSC	CAN	1990-09-18	to Present
BR#066	JRC EU	ITA	1992-06-13	1993-08-12
BR#067	U_Rome	ITA	1992-12-01	2000-12-28
BR#069	MSC	CAN	1997-04-22	1997-08-21
BR#071	MSC	CAN	1997-11-07	1997-11-12
BR#074	CAMS-IAC	CHN	1991-01-12	2001-02-28
BR#076	CAMS-IAC	CHN	1993-07-21	2001-09-08
BR#077	CAMS-IAC	CHN	1996-04-21	199712-27
BR#078	DWD MOL	DEU	2000-01-01	2001-03-31
BR#084	MSC	CAN	1992-07-17	1992-08-07
BR#085	MSC	CAN	1994-04-03	1994-10-20
BR#088	ME	IRE	1993-02-17	1995-02-03
BR#097	SHMI	SVK	1993-08-19	to Present
BR#101	US-EPA	USA	1996-06-24	1999-05-31
BR#103	US-EPA	USA	1996-01-01	1999-04-15
BR#105	US-EPA	USA	1996-01-01	1999-05-31
BR#106	US-EPA	USA	1996-03-13	1997-03-13
BR#108	US-EPA	USA	1996-05-23	1999-05-13
BR#109	US-EPA	USA	1994-09-23	1999-05-31
BR#112	US-EPA	USA	1995-10-05	1999-05-31
BR#115	HKO	HKG	1995-03-01	2002-08-15
BR#119	MSC	CAN	1997-05-09	1997-06-03

<b>BR#120</b>	<b>TMD</b>	<b>THD</b>	<b>1997-03-01</b>	<b>2001-12-30</b>
<b>BR#121</b>	<b>TMD</b>	<b>THD</b>	<b>1996-08-09</b>	<b>2000-12-03</b>
<b>BR#126</b>	<b>UMKO</b>	<b>GBR</b>	<b>1995-11-27</b>	<b>1995-11-29</b>
<b>BR#129</b>	<b>CWBT</b>	<b>TWN</b>	<b>1997-02-25</b>	<b>1997-02-25</b>
<b>BR#130</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-02-20</b>	<b>1999-05-31</b>
<b>BR#131</b>	<b>US-EPA</b>	<b>USA</b>	<b>1998-09-29</b>	<b>1999-05-31</b>
<b>BR#132</b>	<b>US-EPA</b>	<b>USA</b>	<b>1996-12-26</b>	<b>1999-05-31</b>
<b>BR#133</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-07-31</b>	<b>1999-05-31</b>
<b>BR#134</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-09-18</b>	<b>1999-05-31</b>
<b>BR#135</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-01-18</b>	<b>1999-02-18</b>
<b>BR#137</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-03-05</b>	<b>1999-05-31</b>
<b>BR#138</b>	<b>US-EPA</b>	<b>USA</b>	<b>1998-03-04</b>	<b>1998-07-30</b>
<b>BR#139</b>	<b>US-EPA</b>	<b>USA</b>	<b>1998-08-18</b>	<b>1999-05-31</b>
<b>BR#140</b>	<b>US-EPA</b>	<b>USA</b>	<b>1999-02-16</b>	<b>1999-05-28</b>
<b>BR#141</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-10-03</b>	<b>1999-05-31</b>
<b>BR#144</b>	<b>US-EPA</b>	<b>USA</b>	<b>1998-05-25</b>	<b>1999-05-31</b>
<b>BR#146</b>	<b>US-EPA</b>	<b>USA</b>	<b>1998-05-13</b>	<b>1999-05-31</b>
<b>BR#147</b>	<b>US-EPA</b>	<b>USA</b>	<b>1997-12-09</b>	<b>1999-05-31</b>
<b>BR#149</b>	<b>UAE-MOC</b>	<b>UAE</b>	<b>1998-07-08</b>	<b>to Present</b>
<b>BR#159</b>	<b>KNMI</b>	<b>NLD</b>	<b>2001-02-01</b>	<b>2001-09-19</b>
<b>BR#171</b>	<b>NASA-GSFC</b>	<b>USA</b>	<b>2000-11-15</b>	<b>2002-08-17</b>

**Table III Notes:** This table represents Level 0, Umkehr data available from Brewer instruments within the Brewer Data Management System (BDMS). The total number of Brewer instruments with B-files containing Umkehr measurements is 64 out of a total of 95 registered Brewers in the BDMS. NOTE: for a list of Agency names, use the WOUDC web site form at:

*[http://www.woudc.org/data/MetaQuery/metaquery\\_e.cfm](http://www.woudc.org/data/MetaQuery/metaquery_e.cfm)*