

③

Problems with Dohern

1. PMT in incorrect position

Set PMT so that on 3129 line response is even

2. Response not correct for 3021.5 line

1. Test to see whether response is similar using std lamp on S2/S3

More Common Faults

1. CQP not Querty Remove CQP & reset

2. LI should obstructing beam

Test by using std lamp if response varies same on S2 as S3 for A22, should be ^{probably} pointing down. level up & retestotherwise beam is too ~~low~~ high

3. Reflecting prism loose

3. Beam not central:

- distorted optical bench - no solution unless can be corrected by shimming mirrors

- S1 not parallel

- loose mirror

- loose reflecting mirror S1

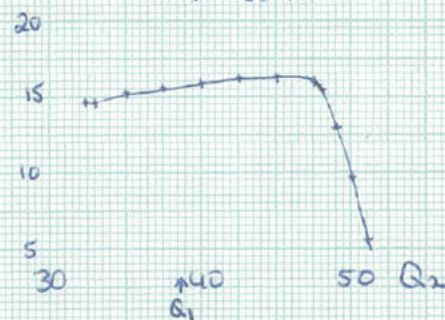
- loose reflecting prism S2

4. Zenith corrections vastly different

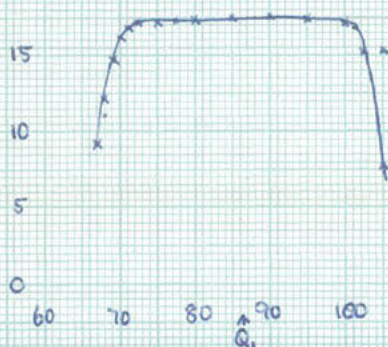
- achromating lens over S2/S3 incorrectly set

- beam not falling cutoff by bottom of P2

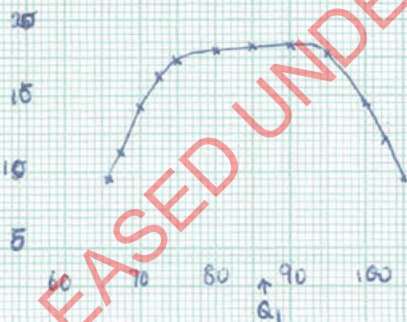
3021.5 Å (S2)
Temp = 24.7
Q₁ = 38.75



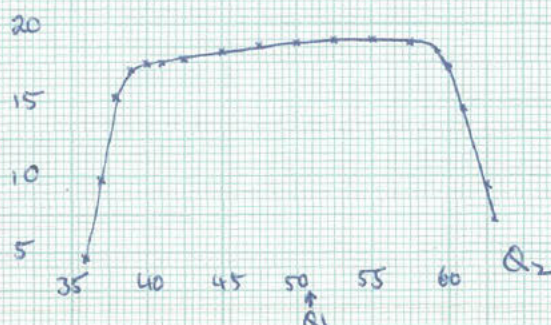
3129 Å (S2)
Temp = 24.7
Q₁ = 86.35



3342 Å (S3)
Temp = 24.7
Q₁ = 86.4



4358 Å (S4)
Temp = 24.7
Q₁ = 50.9



2C)

Hg Lamp Profile Test @ 24.7

① 3021.5 Q₂ = 38.4 Q₁ 77.3
Q₅ = 5
2 | 172.8
86.4

② 4358 Q₂ = 58 Q₁ 46.5
Q₅ = 3
2 | 101.8
50.9

③ 3021.5 Q₂ = 38 Q₁ = 36.9
Q₅ = 6
2 | 71.5
38.75

④ 3129 Q₂ = 84 Q₁ = 82.9
Q₅ = 8
2 | 172.7
86.35

Conclusion

Since all peaks show a tendency to increase slightly PMT is slightly too Low

Did not adjust though probably will do also when #81 is referenced to #83 or #105.

Also L5 UV filter shows slight contamination by fungal growth at extreme edges. This will be changed at next referencing

#115 Traverse Lamp Test: 16/6/93

A 22

Position of Traverse Lamp

Traverse Lamp



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2202 (Srinifo)
28/12
blue

132

Please incorporate
the corrections derived
as soon as practicable.
28/12

cloud correction?

25/005716

Review of zenith corrections for Dobson Number 6 at Macquarie Island

Dobson Number 6 was optically realigned and calibrated in mid 1997 and commenced operation at Macquarie Island on the 24th of November 1997. Due to the climatology of Macquarie Island the majority (typically 80%), of total ozone observations are zenith observations, it is therefore important that the zenith corrections for the instrument provide the best possible results. Additionally there is now an ozonesonde program at the station; a key parameter of the ozonesonde profile is the correction factor - the ratio of the integrated profile and the Dobson total ozone reading. This parameter is used by OMU to assess the quality of the sounding. Considering the changes in the instrument and the requirement that the ozonesonde correction factor is not compromised due to a poor zenith correction a review of the zenith corrections is necessary.

While OMU was at Macquarie Island over the period November 1997 to January 1998 many attempts were made at taking long series specialised observations. These observations consist of a direct sun observation followed as closely as possible by a zenith blue observation (referred to as a DS/ZB pair). Analysis of these pairs allows a zenith correction to be derived. It should be realized that collection of these pairs requires that the operator spends several hours taking observation on a particular day, and many days of observations are required. This large commitment of time is unlikely to be allowed to field staff. The climatology and latitude of the Macquarie Island also increases the difficulty as there are very few days available which have clear skies and in summer the sun rises very early and sets very late.

The zenith corrections are that are currently applied have the form;

$$X_{Corrected} = X + \sum_{i=0}^6 C_i \mu^i$$

Where;

X is the total ozone calculated in the normal manner
 $C_{0...6}$ are to coefficients of the zenith correction polynomial
 μ is the optical air mass

- Did you mark
this to me? If
you did, I suggest
you put why in
the job (for info
with do).
the red/4/98

The zenith corrections currently in use for Dobson #6 are linear in μ and have the coefficients;

For AD observations $-39.293 + 21.1331 \mu$

For CD observations $-67.850 + 26.5833 \mu$

AD Zenith Correction

The data collected by OMU was analysed; 89 DS/ZB pairs were found. The pairs were selected from 19 days over the period 23 Nov 97 to 31 Dec 97 and cover the range of 289 to 338 DU. Figure 1 shows the error in the current zenith correction for AD observations.

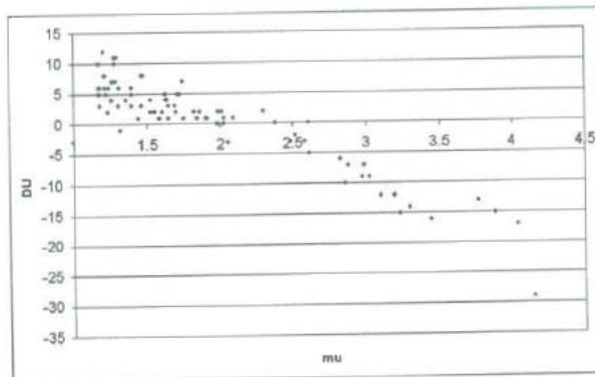


Figure 1. Error in current AD zenith correction

Figure 1 shows that the current zenith correction could be improved. There appears to be a μ dependent error.

New zenith corrections were derived using the data. The new zenith correction coefficients are:

For AD observations

$$-57.530 + 30.241 \mu$$

Figure 2 show the error in the new zenith correction

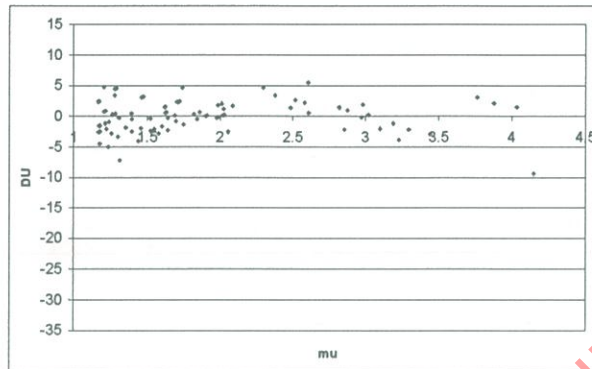


Figure 2. Error in new AD zenith correction

Figure 2 shows that the μ dependent error has been removed. The zenith correction should give an error less than 2%

CD Zenith Correction

new report #6 recommends CD zenith ^{blue} obs range 1.8 < μ < 5.8

As requested to OMU ^{blue} the CD zenith blue observations were compared with AD direct sun observations. Analysis of the CD zenith correction was performed in a similar manner to the AD zenith correction; 82 DS/ZB pairs were found. The pairs were selected from 18 days over the same period and total ozone range as for the AD observations. Figure 3 show the error in the CD zenith correction (relative to AD direct sun)

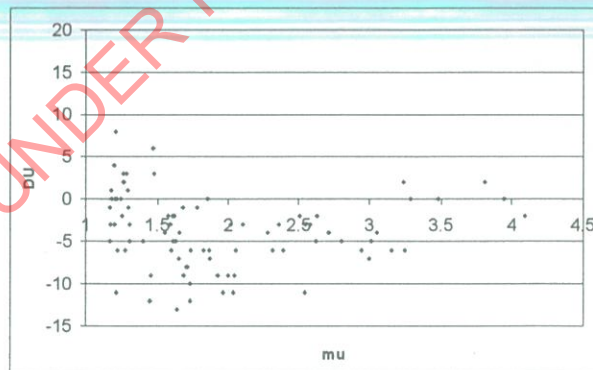


Figure 3. Error in current CD zenith correction

As requested by OMU only pairs with $\mu > 1.8$ were chosen to derive a new zenith correction. This reduced the number of pairs to 36. The new zenith ^{blue} correction coefficients are:

For CD observations

$$-55.342 + 23.562 \mu$$

Figure 4 shows the error in the new zenith ^{blue} correction.

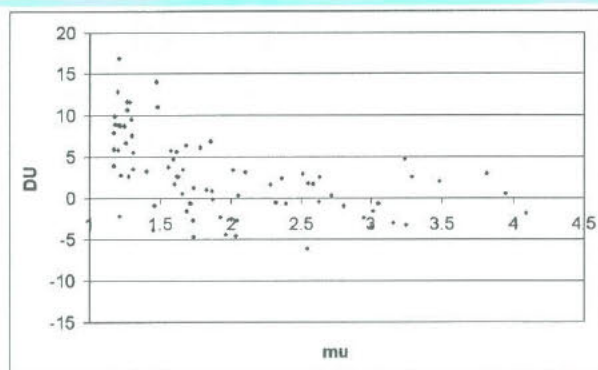


Figure 4. Error in CD zenith correction (relative to AD DS) derived for $\mu > 1.8$

With this correction the error would be less than 2% for $\mu > 1.8$

CD direct sun compared with AD direct sun

Figure 5 shows that for $\mu > 1.8$ CD DS observations agree well with AD DS observations.



Figure 5. Comparison of direct sun observations (CD - AD)

Recommendation

I would recommend that the new zenith corrections are implemented and the data collected to date is back corrected for the following reasons;

- i) There is sufficient data so indicate that new corrections are required.
- ii) It is imperative that the best correction possible is used considering the ozonesonde program.
- iii) In normal operation it will take a very long time – many months – to obtain significantly more DS/ZB pairs.
- iv) At present the back correction of (the relatively small) amount of data does not present too many difficulties in terms of OMU staff time

(v) No correction be applied to CDS obs in the range $1.8 > \mu > 3.5$

Ozone Monitoring Unit

12 February 1998

SROG

File: 25/5716

Status of Dobson No. 6

STAN.

with leadership from [redacted] has done a great job. This makes a significant contribution to the integrity of the network. I'd like you to bring this good work to the attention ADO

17/4

The instrument has been optically aligned and is now located in the Dobson room on the roof of the Head Office building with the RA V standard (Dobson No. 105). Some mechanical components that were missing (Q Stops) were redesigned and fabricated.

A very brief comparison of the instrument with the regional standard indicates that the readings are within 1%. This comparison was very brief and an intercomparison with the regional standard over a range of sun angles is required. This will require two or three clear days and two operators that are available full time over that period.

New Q tables and N tables have been generated. The N tables were in very good agreement with previous results (1986, 1988, 1990).

Two sets of N tables were generated using the current (DOS) and developmental (Windows) software and compared. Even though the same input data was used there is a significant difference; about 5 DU difference at 270 DU. This difference is not caused by the instrument.

Zenith corrections for the instrument need to be derived. This requires a series of Direct Sun / Zenith Blue observation pairs over a matrix of sun angles and total ozone. At least 100 pairs are required and would take some months to obtain. The situation presents an excellent opportunity to test the zenith correction theory proposed by the Ozone Science Unit.

The standard lamps for the instrument have had little use and their stability is questionable.

Conclusions

The instrument is currently functioning and appears to be within tolerance. At present it cannot be used operationally until the calibration has been verified and zenith corrections derived.

Recommendations

The instrument should be used routinely in parallel with the RA V standard on clear days to build up a data set for the derivation of zenith corrections and to confirm that the instrument is operating within tolerance. The data set from the instrument should not be distributed until the instrument has been intercompared with the regional standard and the data set reprocessed.

The instrument should undergo monthly lamp checks. When these checks are performed the standard lamps from both Dobson No. 105 and Dobson No. 6 should be used. This process should be continued until the stability of the instruments standard lamps has been verified.

The instrument should be intercompared with the RA V standard at the first available opportunity. The data set collected in the intervening period can then be reprocessed (if necessary) and then used to derive zenith corrections.

The discrepancy between the two methods of generating N tables should be resolved by the Ozone Science Unit.

17 April 97

As discussed:
the handle

25/4/97

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6.3 OZONE PROGRAM

6.3.1 Total ozone

Dobson No. 6 was replaced with No. 12 by [REDACTED] at the December changeover. The instrument should have arrived with [REDACTED] in October but unfortunately did not get off the boat. [REDACTED]

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212

SREG

21/7

STAW

Re plans for Macquarie Island visit 1993

Purpose: To inform you of my Macquarie Island visit in October this year.

Background: A member of the Ozone Monitoring Unit visits Macquarie Island every two years to recalibrate the optical wedge on the Dobson spectrophotometer. Every second year the Dobson should be intercompared with a reference instrument following a WMO recommendation. Due to the difficulties of obtaining blue sky conditions at Macquarie Island and the lack of an available instrument to intercompare it, the instrument will be changed over on this years visit. The current instrument has operated since 1986.

We are on schedule to reference a Dobson for Macquarie Island. Due to a lack of suitably qualified staff, it is planned that I will be going down for approximately 9 weeks (beginning 22 October) to install the referenced Dobson and rederive zenith correction tables for the AD and CD wavelength pairs.

Action: That you note the above.

23 July 1993

Notes

1. \$
 forest + TA ≈ \$800 (budgeted for)
 Consumables ≈ \$10K (already bought)
 Boat + Aircon from Antarctic Div

2. Either [redacted] or [redacted]
 will act

12/8/93



Bureau of Meteorology
Ozone Monitoring Group
Observations and Engineering Branch

Telephone: 03 669 4238
Facsimile: 03 669 4699

Address: GPO Box 1289K
Melbourne Vic 3001
Australia

Ref: 45/389

Atten: [REDACTED]

Subject: Application for places on voyages to Macquarie Island for 1993.

Outline:

1. The Ozone Monitoring Group are hoping to accomplish the following tasks at Macquarie Island during the 1993/94 summer:

a) Remove the current Dobson spectrophotometer for optical adjustment in Melbourne and replace with an alternative instrument.

b) Carry out the necessary inter comparison, calibrations and initial observations required for the change of instrumentation.

[REDACTED]

d) Carry out the routine Dobson spectrophotometer observations program with the aim of increasing the quantity and quality of readings during the period associated with the ozone sonde flights.

2. The following voyage places and cargo handling would be required:

- 1 place for Voyage 3, Hobart to Macquarie Island.

Cargo: equipment associated with making several ozone sonde flights ≈ 50 kg

- 1 place for Voyage 5, Hobart to Macquarie Island.

Cargo: 1 Dobson spectrophotometer and associated equipment (1.5m x .5m x .5m) ≈ 140 kg

- 2 places for Voyage 5, Macquarie Island to Hobart

Cargo: 1 Dobson spectrophotometer and associated equipment (1.5m x .5m x .5m) ≈ 140 kg

3. The Macquarie Island Dobson is nearly four years overdue it's routine comparison with the world standard instrument and any further delay in replacing it with a calibrated instrument could bring into doubt the integrity of the Macquarie Island total ozone data set.

Requested Action:

4. Could you please take the necessary steps to obtain the places requested in 2. and inform me of the outcome.

Thank you.

Yours sincerely,



20 January 1993.

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Ref 45/389

[REDACTED]

Just a quick update to my last fax.

We will not be carrying out any maintenance on the Macquarie Island Dobson this year so our plans for swapping Dobsons will have to wait until 93.

I have also included some information on the ozone hole and an update of the M.I. total ozone plot.

Regards,

[REDACTED]

7 October 1992

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(193)

pls file

SBIN

29/9

45/389

Cancellation of Macquarie Island Visit 1992**Purpose**

To inform you that the Dobson changeover at Macquarie Island will not go ahead as planned.

Background

2. [REDACTED] from the ozone monitoring section was selected for the long summer at Macquarie Island. It was planned that he would change-over the existing Dobson spectrophotometer and re-derive zenith sky correction tables for the newly installed Dobson.

Reasons

3. The visit was cancelled for the 1992/3 season because either we had insufficient time or logistical problems. These can be summarised as follows:

.Dobson not prepared. While the instrument may be optically aligned in time, Melbourne's unseasonally cloudy weather may prevent a referencing with the RA V standard instrument.

Requested Action

4. Note the above.

25/9/92

cc. [REDACTED]

Has a copy been sent to ALO? If not
pls send a copy asap

29/8/92.



BUREAU OF METEOROLOGY

HEAD OFFICE 150 Lonsdale Street Melbourne Victoria Australia. Tel: (03) 669 4000 Telex: AA 30664 Fax: (03) 669 4699
ADDRESS CORRESPONDENCE TO: Director of Meteorology GPO Box 1289K Melbourne Victoria 3001 Australia

190

In reply please quote

45/389

[REDACTED]
Hobart Regional Office

[REDACTED],
The Ozone Group's requirements with regard to the 1992/3 Antarctic Voyage schedule, subject to your approval are:

[REDACTED]
Voyage 2 Cargo:

1 Dobson Spectrophotometer (1.53m x .5m x .5m, approx. 140 kgs).
Equipment related to ozone sonde flights (approx. 50 kgs).

Voyage 3 Cargo:

Returning Dobson Spectrophotometer,
[REDACTED]

Purpose:

1. Replace current Dobson Spectrophotometer.
 2. Conduct various installation tests and calibration procedures for replacement instrument.
- [REDACTED]

Regards,

[REDACTED]
[REDACTED]
Ozone Group
6 May 1992

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DOBSON SPECTROPHOTOMETER

The Dobson Spectrophotometer gave good service throughout the year. A couple of minor problems were experienced, but loss of data was minimal. The null-balance meter went U/S in June with a faulty meter movement requiring the spare to be used. Three spare movements were delivered on a subsequent air-drop to replenish stocks. The only other problem encountered was one of the small trays of silica gel tended to jump of its locating spike and get loose inside the machine on one occasion jamming the chopper motor. This problem was addressed by asking the observers to be gentle when wheeling the machine out over the door-sill to take ozone readings, as man-handling the instrument over this obstruction is undoubtedly the cause of the problem. Co-operation in this respect has been good, and the problem has not re-appeared.

The construction of the ANARESAT radome near the ozone hut has prejudiced the exposure of the site to the sun, as the dome occupies the skyline from approximately 0 degrees to 58 degrees in azimuth and extends up to 40 degrees above the horizon at its highest point. Consequently direct sun observations are impossible for a couple of hours in the morning during winter as the ozone hut is in the shade. However the actual number of direct sun observations missed due to the presence of the dome is small due to the combined effects of cloud cover and high μ values.

[REDACTED]

Dobson (#6) from Macquarie Island,

The removal of the previous

Removal of the RAV reference instrument #105 from Melbourne to Macquarie Island for in-situ re-calibration of Dobson #6 (with Dobson #6 then being left at Macquarie Island) was not an option because Dobson #105 is used for routine observations at Melbourne.

[REDACTED]

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[REDACTED] Dobson #6 (Macquarie Island) was last referenced in
1986, with a wedge calibration in November 1991. [REDACTED]

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Conclusions and Recommendations

The RAV network of Dobson and Brewer spectrophotometers is, in general, in good order. All RAV instruments, with the exception of Dobson #115, have been calibrated against the RAV or world standard Dobson/Brewer instrument. To ensure ongoing traceability and high quality of all RAV Dobson and Brewer data, Members of the Association are urged to meet their respective calibration schedule in accordance with WMO recommended procedures.

All Members are urged to continue regular and careful standard and mercury lamp tests, and to introduce Umkehr observations at stations where they are currently not made routinely. Members are also encouraged to examine and collate Dobson instrument calibration histories, carry out data back-corrections where possible, and to submit instrument calibration details and re-evaluated ozone data to the World Ozone Data Center, Toronto, for publication and dissemination amongst the international scientific community.

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