Technical notes on Gamsberg Namibian site

I.R Quality

Part II.b: Water Vapour Monitoring Update

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1 Introduction

Part I of the Gamsberg study (April 24, 1994) dealt with the general climatology and described a set of proposed measurements, including water vapor monitoring using a KPNO radiometer. Such monitors (WVM, [Morse 82]), designed to measure the sky infrared emissivity in the zenith area, were used during the VLT site survey. They are briefly described in Part II.a of the Gamsberg study (August 3, 1994) which also presents a study of water vapor content from upper-air soundings. In that report, cloud free flights above Windhoek (launching site at 180 km North-East of Gamsberg) have been compared to those above Antofagasta (launching site at 150 km North of Paranal) to estimate an upper limit of precipitable water vapor increase from Paranal to Gamsberg. The main result of the upper-air study have been summarized in Figure 1 reprinted here.

In situ measurements started at Gamsberg on July 21, 1994 and will continue over the year with the contribution of local observers also operating the seeing, meteorology and microthermal turbulence stations. The first results are presented in what follows.

2 Water Vapour Monitor Data Processing

In view of accurately comparing the chilean and namibian sites, the data processing will be performed later on, as in the previous years, by the same scientific team of Lund Observatory [Ardeberg 87b]. A quasi-real time monitoring of the Gamsberg measurements is however necessary, considering the current pressure by the VLT decision-making process. The preliminary results presented here are processed at ESO using an aproximate law from [Schulz 90] on the 20 μm absorption band only.

Measurements are taken every two hours at nighttime (from 18h UT to 04h UT) when the zenith area is free of clouds. The records of mid-July to mid-September are shown on Fig. 2 along with the 20 days median, and compared with in situ measurements at Paranal for the same period during the VLT site survey (1983-1989).

Table 1 also shows comparison with Upper-Air data from Windhoek as well as with La Silla in situ measurements during the VLT site survey (1983-1989).

References

[Ardeberg 87b] A. Ardeberg; *Modern Methods for Site Testing*; Proc. of the Int. Conf. on "Identification, Optimization, and Protection of Optical Sites", Flagstaff, Arizona (May 22-23, 1986). R.L. Millis et al., edit., Lowell Observatory, Flagstaff (1987) p. 20.

[Morse 82] D. Morse, F. Gillet; *Water vapor monitor engineering report*; AURA Engineering Technical Report **73**, 1982 KPNO, Tucson Az.

[Schulz 90] A. Schulz; *Precipitable Water Vapor Measurements on La Silla. A Calibrational check*; MPI fuer Radioastronomie, Bonn, Division of Submillimeter Technology- Memorandum 121.

[Vlt 90] VLT Site Selection Working Group; *Final Report*; November 14, 1990, VLT Report n^o62.

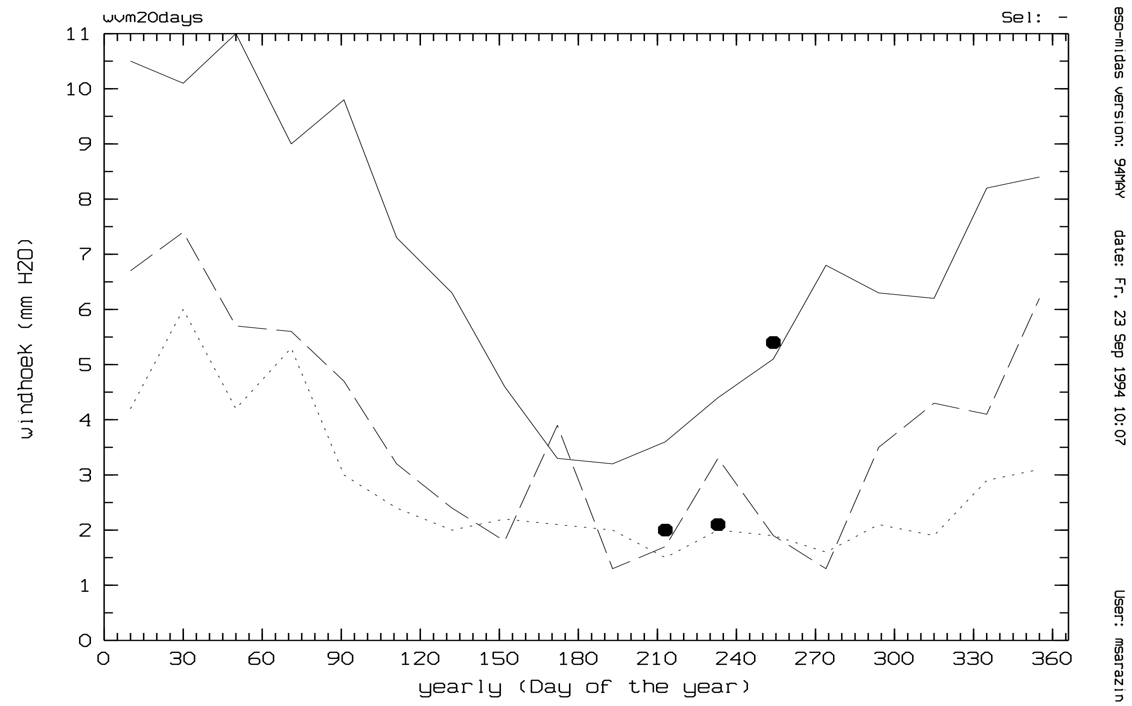

Figure 1: Seasonal variation of precipitable H_2O computed on the basis of 20 days median from 1985-1993 Windhoek radiosonde night flights (full line) from the altitude of Gamsberg compared to 1983-1989 in situ Paranal (dotted line) and La Silla (dashed line) nighttime statistics. The Gamsberg in situ measurements are overplotted as filled squares.

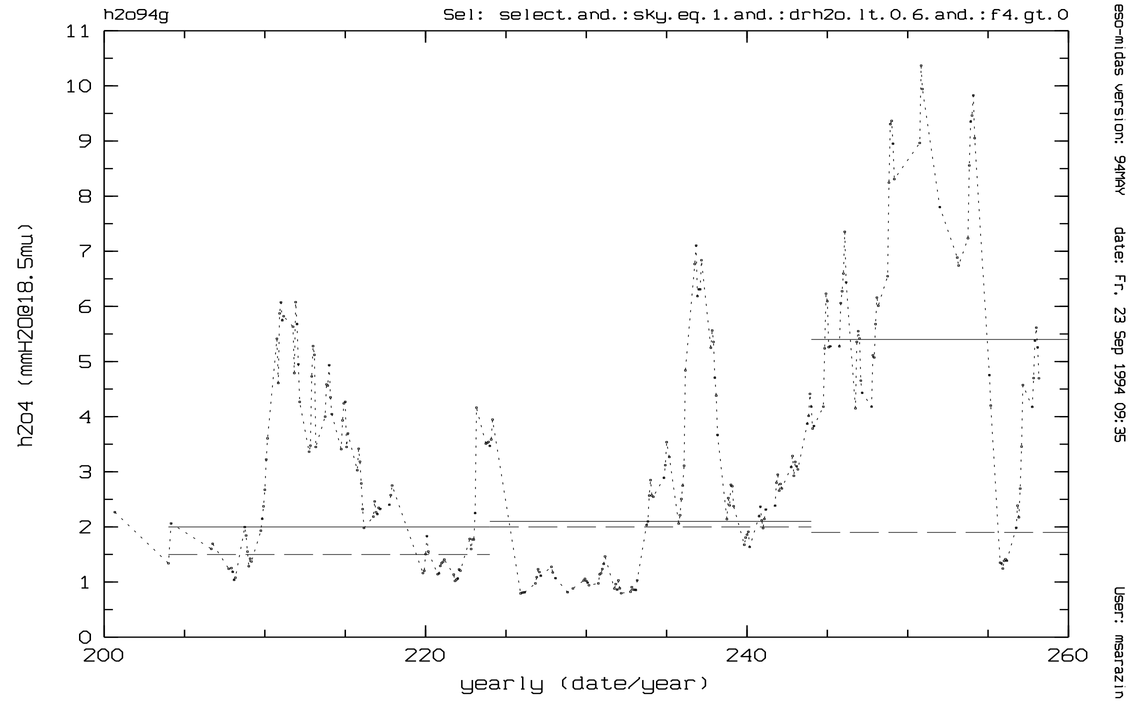

Figure 2: Gamsberg precipitable H_2O measured every two hours during clear nights with a KPNO Infrared radiometer (preliminary data processing). The 20 days median is represented by full straight lines compared to the 20 days medians for the corresponding periods at Paranal (1983-1989) as dashed lines.

Period	1985-1993	1983-1989		1994/95
(month and day)	Windhoek	Paranal	La Silla	Gamsberg
0101-0120	10.5	4.2	6.7	5.7
0121-0210	10.1	6.0	7.4	-
0211-0228	11.0	4.2	5.7	-
0301-0320	9.0	5.3	5.6	-
0321-0410	9.8	3.0	4.7	8.2
0411-0430	7.3	2.4	3.2	5.6
0501-0520	6.3	2.0	2.4	6.6
0521-0610	4.6	2.2	1.8	6.0
0611-0630	3.3	2.1	3.9	3.7
0701-0720	3.2	2.0	1.3	2.8
0721-0810	3.6	1.5	1.7	2.4
0811-0831	4.4	2.0	3.3	2.0
0901-0920	5.1	1.9	1.9	5.3
0921-1010	6.8	1.6	1.3	5.4
1011-1031	6.3	2.1	3.5	6.0
1101-1120	6.2	1.9	4.3	8.2
1121-1210	8.2	2.9	4.1	6.6
1211-1231	8.4	3.1	6.2	6.4
Total (*)	**6.1**	**2.3**	**3.9**	**5.0**

Table 1: 50 percentile value of water vapor in the atmosphere above the altitude of the sites for periods of 20 days . The in-situ Gamsberg measurements are compared to values computed from balloon flights launched from Windhoek, and to in situ radiometric measurements made at night at Paranal and La Silla [Vlt 90]. (*) the yearly median H_2O takes into account the respective weights of each 20 days period in terms of photometric night probability at the given site (Windhoek data are corrected for Gamsberg conditions).