esa DOCUMENT

document title/ titre du document

LONG-TERM MONITORING OF THE GOME THERMAL ENVIRONMENT, 1995-2002

prepared by/*préparé par* Angelika Dehn

reference/*réference* ERSE-SPPA-EOAD-TN-02-0024
issue/*édition* 1
revision/*révision* 0
date of issue/*date d'édition*
status/*état*
Document type/*type de document* Technical Note
Distribution/*distribution*

European Space Agency
Agence spatiale européenne

ESRIN
Via Galileo Galilei - Casella Postale 64 - 00044 Frascati - Italy
Tel. (39) 06 941801 - Fax (39) 06 94180 280

APPROVAL

Title *titre*	Long-term monitoring of the GOME thermal environment, 1995-2002	issue *issue* 1	revision *revision* 0

author *auteur*	A. Dehn	date *date*

approved by *approuvé by*	R.M. Koopman	date *date*

CHANGE LOG

reason for change /*raison du changement*	issue/*issue*	revision/*revision*	date/*date*

CHANGE RECORD

Issue: 1 Revision: 0

reason for change/*raison du changement*	page(s)/*page(s)*	paragraph(s)/*paragraph(s)*

TABLE OF CONTENTS

1 INTRODUCTION

The Global Ozone Monitoring Experiment (GOME) was launched on ERS-2 in April 1995. It is a scanning nadir-viewing spectrometer, with the primary scientific objective to globally retrieve total column ozone. A more detailed description of the instrument can be found in *[1]*.
The Digital Data Handling Unit (DDHU) and the scan mirror electronics assembly have radiative surfaces for their own thermal control. The other external instrument surfaces have been covered by MLI blankets. The temperature of the detectors and optical bench is actively controlled by Peltier coolers.
The behaviour of the GOME thermal environment was studied and presented in technical note *[3]*. In this document the analysis of the thermal environment during lifetime was updated to cover the period April 1995- March 2002, for the pre-disperser prism, the radiator, the four charge amplifiers, the scan unit electronics and motor, the DDHU DC/DC converter and the DDHU Peltier board.

2 DATA SETS AND ALGORITHMS DESCRIPTION

The monitoring of the GOME thermal environment was performed on:

- the predisperser prism temperature
- the radiator temperature
- the four charge amplifiers temperatures
- the scan unit electronics temperature
- the scan unit motor temperature
- the DDHU DC/DC converter temperature
- the DDHU Peltier board temperature

The data used for the analysis are mean temperature values per Orbit, which are determined and stored into a database by the tool Extended Rascals for GOME (ERGO) *[2]*. As presented in technical note *[3]*, the thermal orbital behaviour follows a sine curve with an increase of temperature at the dayside and a decrease during eclipse.
The lifetime trend has been analysed as follows:

- the data of the commissioning phase (data until Orbit 1250) have been discarded, because the thermal environment is not stable yet (e.g. many test measurements, many switch-offs) and such measurements would have biased the result
- low values caused by instrument switch-offs (see also *[3]*) have also been discarded; the thermal environment decreases by up to about 20K during an instrument switch-off and reaches nominal values again after ~2 days after switch-on
- the resulting values have been smoothed over a number of 450 orbits (~1 month)
- a linear fit is perfomed on the resulting data set as a function of orbit number

3 RESULTS

Qualitatively all elements of the thermal environment show similar behaviour during life. Typical characteristics for the GOME thermal environment for different instrument operations and time periods like seasonal effects, temperature decrease due to instrument switch-offs, warm up due to monthly calibration operations were explained in technical note *[3]*.
In comparison to the previous analyses *[3]* a new characteristic can be noticed in this study. After orbit ~30340 an offset in all temperature plots is visible, which is due to a long ERS-2 payload switch-off in January/February 2001 for three weeks.
At the expected seasonal minimum during year 2001 a sub-maximum appears for all temperatures, with its local maximum centered near orbit 32100.

The GOME thermal environment shows an increase of temperature during life time. The trend during lifetime is determined as described in 2. The results for the ten analysed temperatures are as follows:

- predisperser prism: +0.34% accordingly 0.95 K
- radiator : 0.22% accordingly +0.55K
- charge amplifier 1: 0.32% accordingly +0.94K
- charge amplifier 2: 0.33% accordingly +0.98K
- charge amplifier 3: 0.37% accordingly +1.09K
- charge amplifier 4: 0.37% accordingly +1.09K
- scan unit electronics: 0.24% accordingly +0.68K
- scan unit motor: 0.32% accordingly +0.89K
- DDHU DC/DC converter: 0.37% accordingly +1.08K
- DDHU Peltier board: +0.36% accordingly +1.05K

The results are shown in Fig. 1-10. The red colour shows the smoothed values, that are used to determine the trend. The values in green, magenta are the values after discarding the commissioning period and the low values caused by switch-offs.

4 CONCLUSIONS

Over a period of about 7 years, the following conclusions regarding trends and special operations in the GOME thermal environment can be drawn:

The temperatures of all parameters analysed, increase during life by ~0.6 - ~1.0 K.
The temperatures show a seasonal variation: towards months June/July the thermal environment shows a minimum which is ~1.5 K lower than in months December/January.
Starting with orbit ~30340 an offset in all temperature curves can be noticed. This coincidences with a long ERS2-payload switch-off in January/February 2001, which lasted for about 3 weeks.

5 REFERENCES

[1]: GOME User's Manual SP-1182
ESA Publications Division September 1995.

[2]: ERGO Software User's Manual
DOR-GO-QA-SUM Issue 2.0 27/03/1997

[3]: Long Term Monitoring of the GOME Thermal Environment
ERS2-GO-AD Issue 1.0 17/03/2000

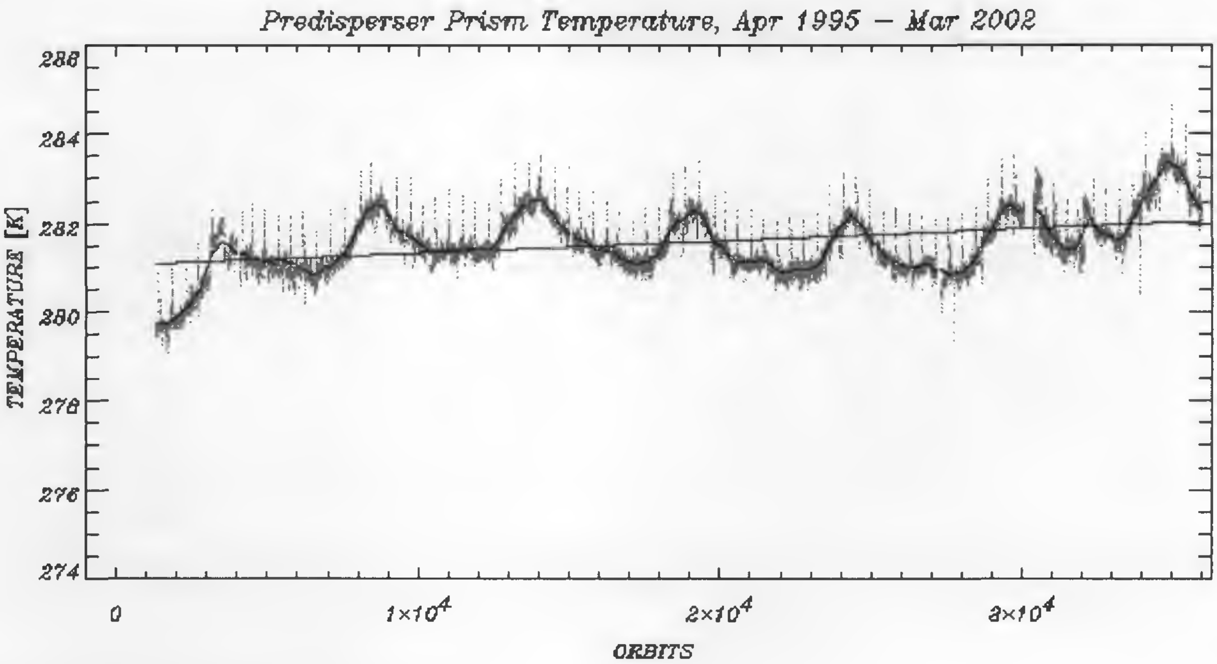

Figure 1: Predisperser Prism temperature

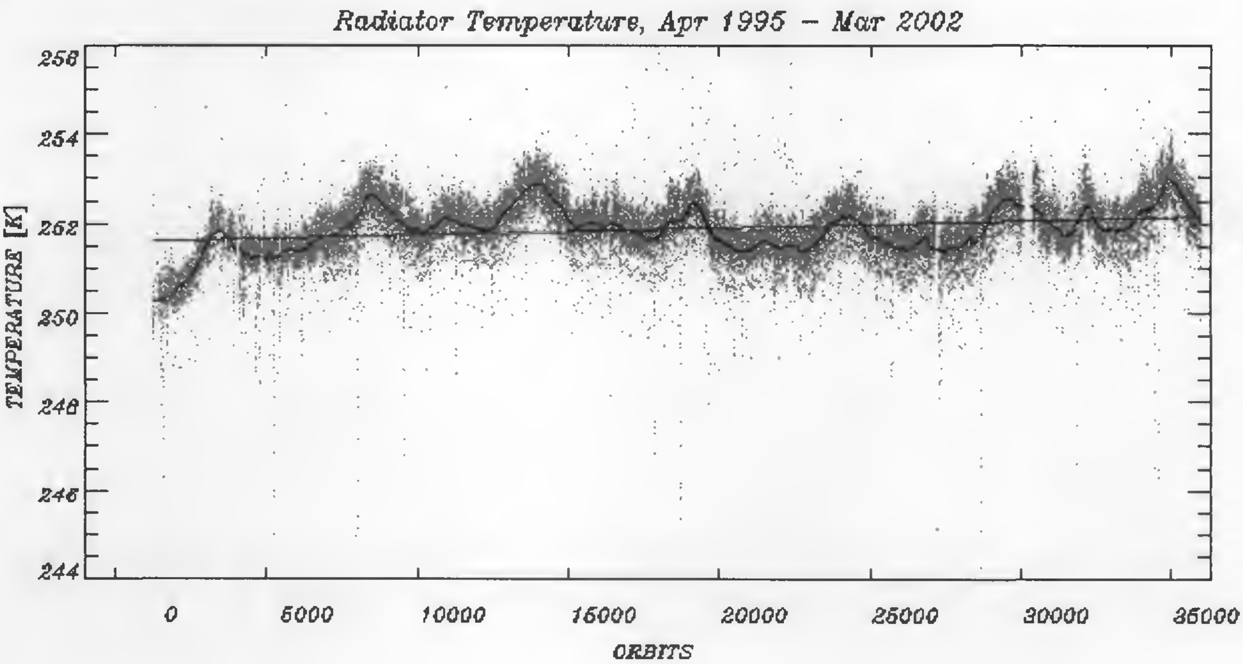

Figure 2: Radiator temperature

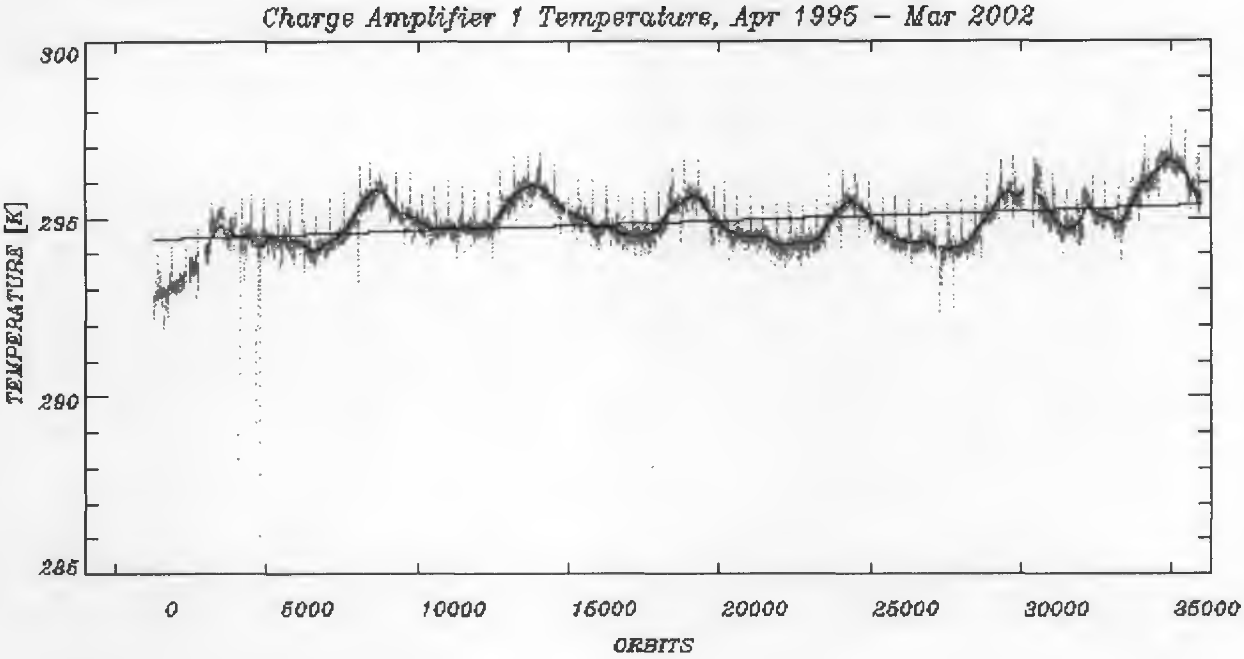

Figure 3: Charge Amplifier 1 temperature

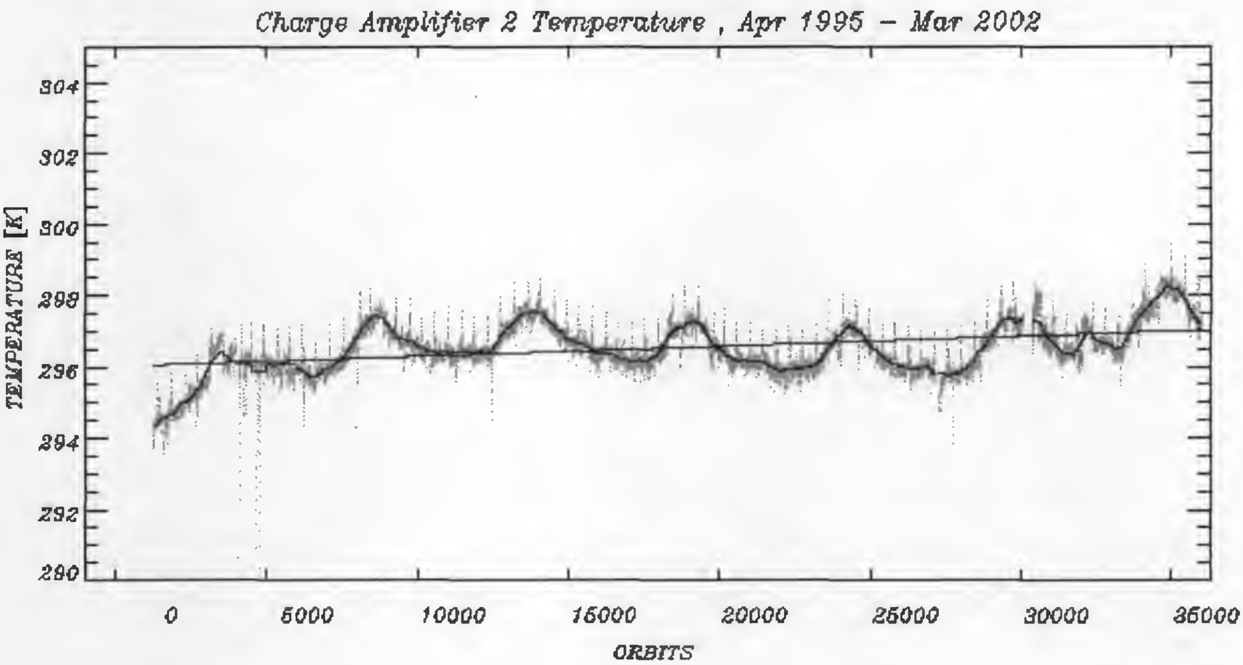

Figure 4: Charge Amplifier 2 temperature

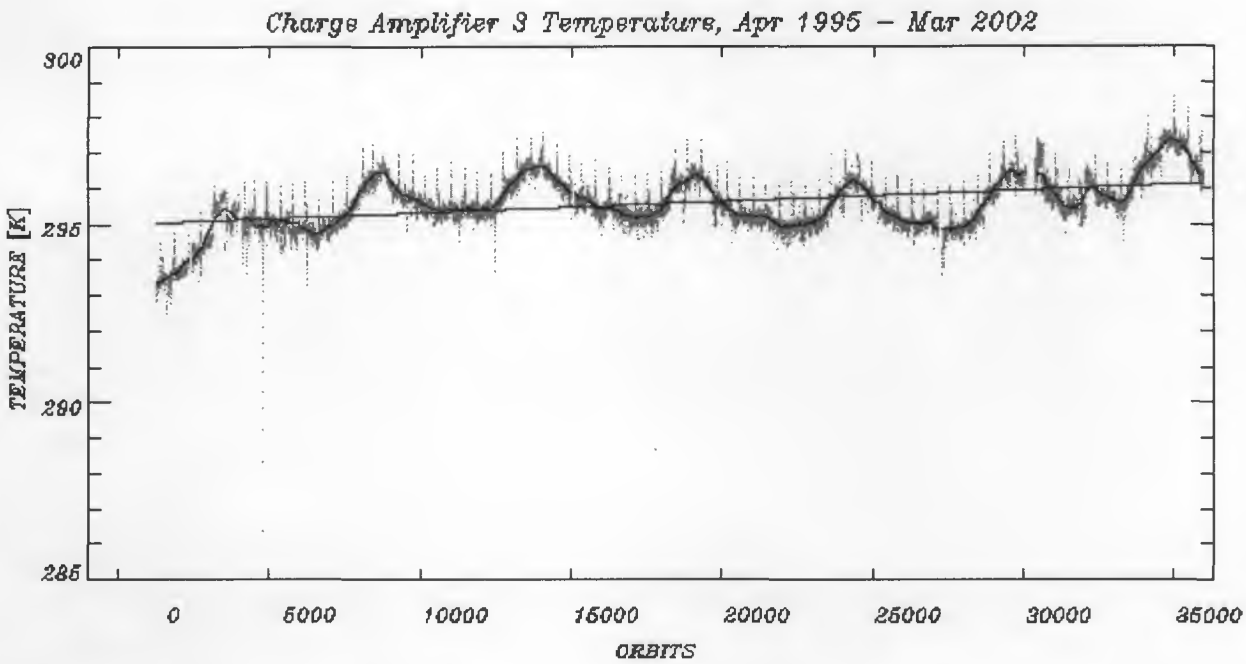

Figure 5: Charge Amplifier 3 temperature

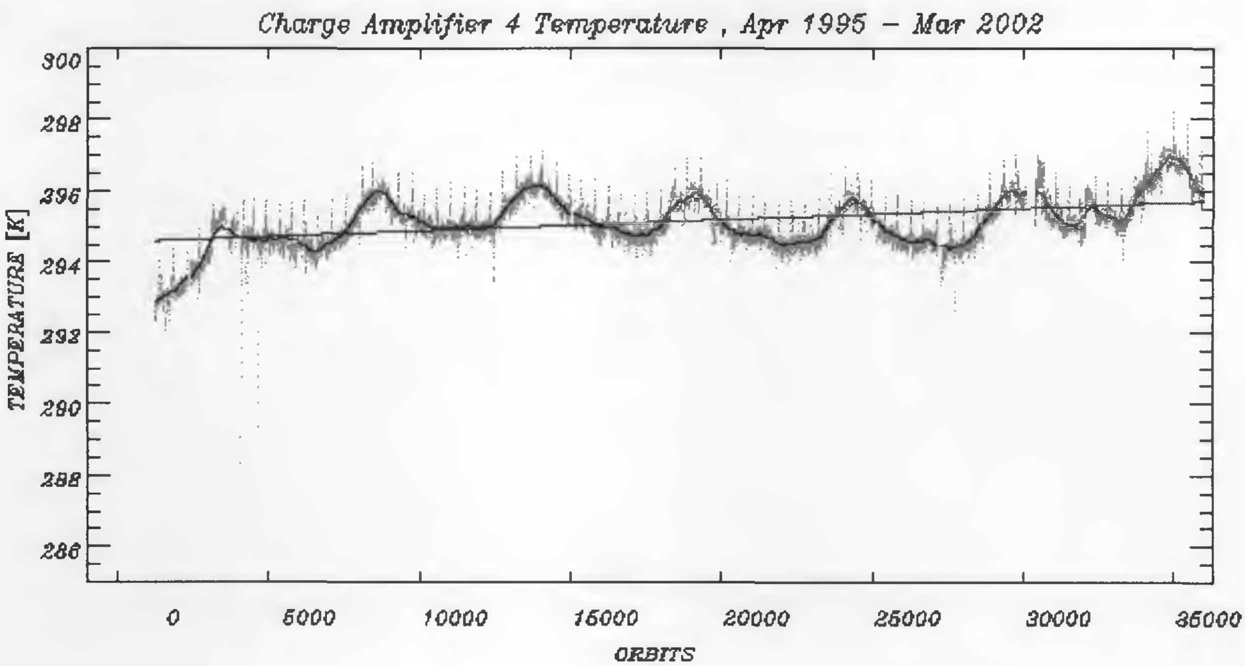

Figure 6: Charge Amplifier 4 temperature

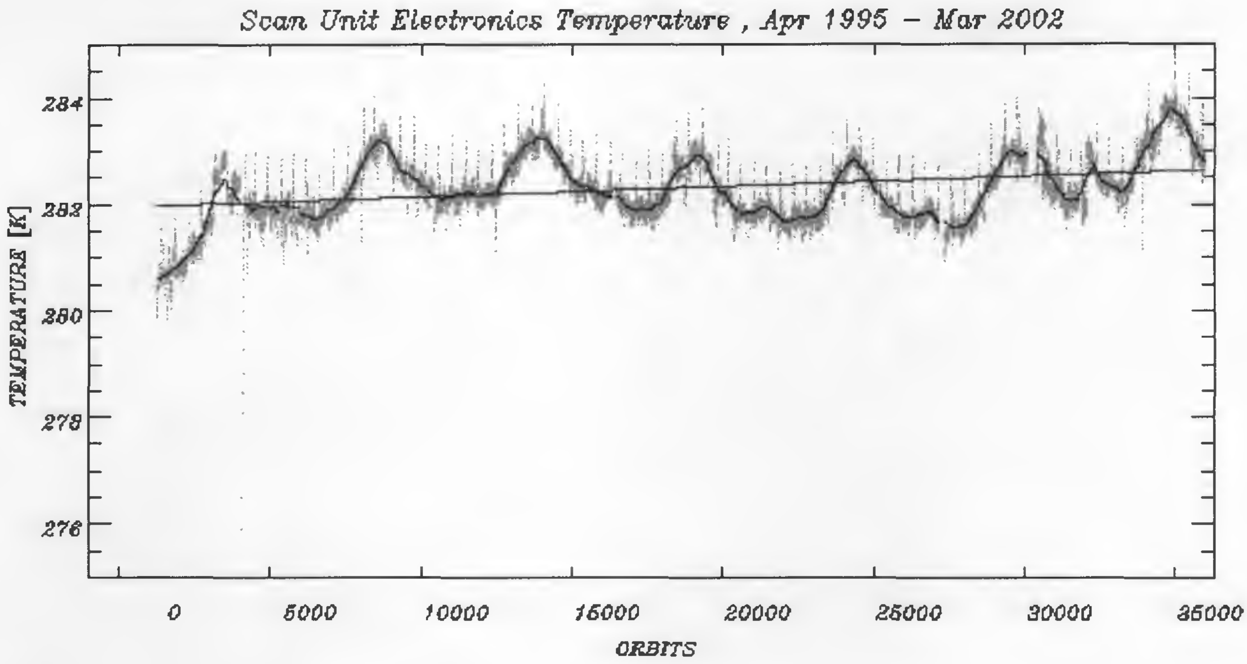

Figure 7: Scan Unit Electronics temperature

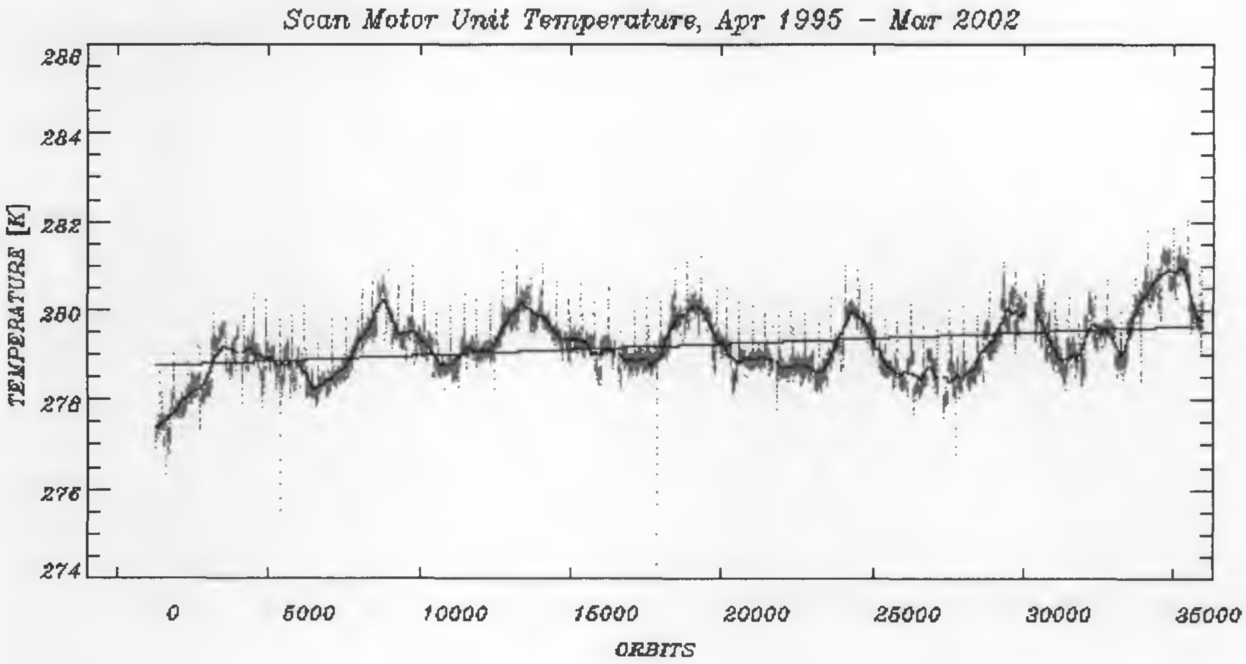

Figure 8: Scan Motor Unit temperature

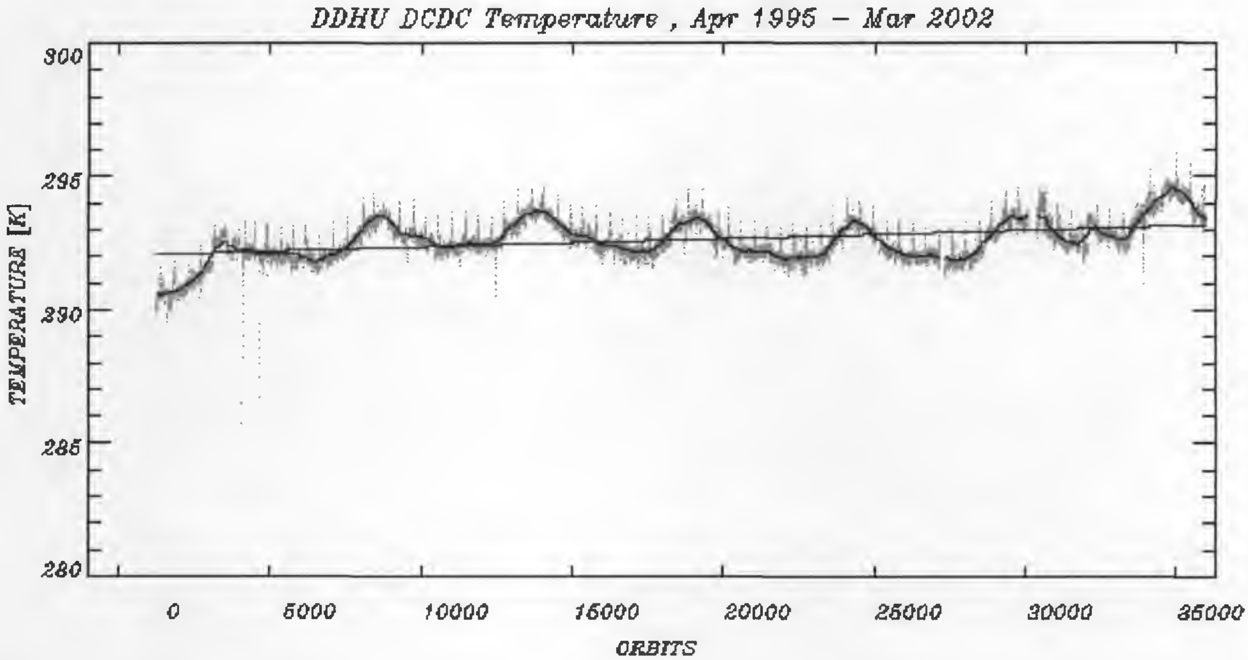

Figure 9: DDHU DCDC temperature

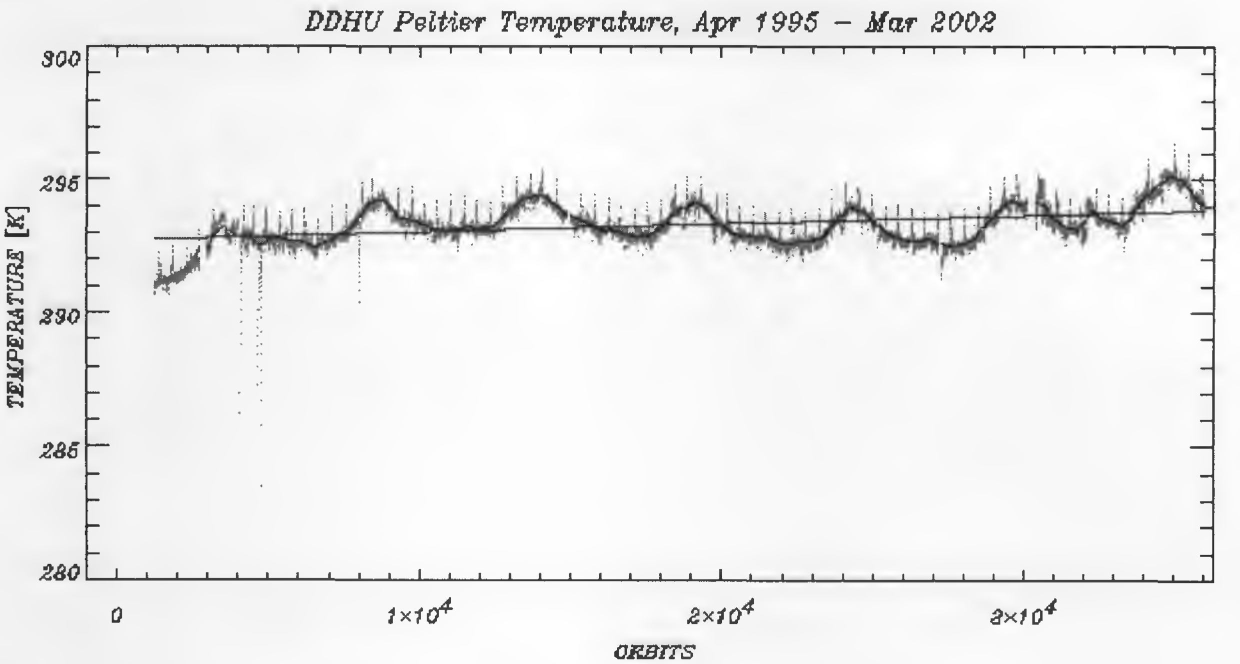

Figure 10: DDHU Peltier temperature