GEOS
SR 11

GEOS CIRCULAR ON RED VARIABLE STARS

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PHOTOELECTRIC B- AND V-BAND PHOTOMETRY OF COMPARISON STARS IN 12 VARIABLE-STAR FIELDS

SUMMARY : Within the context of the flight of the HIPPARCOS astrometric satellite and its preparation, magnitudes in the comparison sequences of 12 variable stars included in the satellite's observation program have been measured in both B- and V-colours at the Jungfraujoch Observatory. The stars are XY Aql, T Cas, W Cas, SX Cyg, BF Cyg, CN Cyg, W Lyr, X Oph, RV Peg, U Per, RR Per and W Sge.

RESUME : Dans le cadre de la préparation du vol du satellite Hipparcos, 12 séquences de comparaison d'étoiles variables qui seront observées par le satellite, ont été mesurées en deux couleurs B et V à l'Observatoire du Jungfraujoch. Il s'agit de XY Aql, T Cas, W Cas, SX Cyg, BF Cyg, CN Cyg, W Lyr, X Oph, RV Peg, U Per, RR Per et W Sge.

SOMMARIO : Nel quadro della preparazione della missione del satellite Hipparcos, sono state misurate, presso l'osservatorio dello Jungfraujoch, 12 sequenze di confronto per altrettante variabili che saranno osservate dal satellite, nei due colori B e V. Le variabili in questione sono : XY Aql, T Cas, W Cas, SX Cyg, BF Cyg, CN Cyg, W Lyr, X Oph, RV Peg, U Per, RR Per e W Sge.

RESUMEN : En el marco de la preparación del vuelo del satélite Hipparcos, 12 secuencias de comparación de estrellas variables que serán observadas por el satélite, han sido medidas en dos colores, B y V, desde el Observatorio de Jungfraujoch. Se trata de XY Aql, T Cas, W Cas, SX Cyg, BF Cyg, CN Cyg, W Lyr, X Oph, RV Peg, U Per, RR Per y W Sge.

1. PREPARATION TO THE HIPPARCOS PROGRAM

The HIPPARCOS astrometric satellite is due to be launched in 1989. Its program includes, in particular, the observation of several variable stars with peculiarities such as changes in the période or in the brightness at maximum light and radio emissions (OH masers), the latter being essential to correlate the highly accurate system of reference defined by radiosources with the satellite's own system.

Before observing a large-amplitude variable, it is important to know whether the star is actually observable by the satellite, i.e. whether its magnitude is brighter than 12.7. Amateurs can therefore contribute by announcing regularly the magnitude of some of these variables during the satellite's flight. Now, the most important cause of error in amateur observations is the inaccuracy of the magnitude of some comparison stars. It is therefore of great importance to supply amateurs with reliable comparison sequences whose magnitudes have been determined by photoelectric photometry. Such is the scope of the photoelectric missions described in this newsletter.

The work was begun in 1983 and has been reported in three GEOS Circulars, namely SR5 describing the sequences for R Aql, R Cas, V Cas, T Cep, Z Cyg, T Her, W Lyr and W Peg; SR 7 (U Cyg and X Oph) and SR 9 (RR Aql, SY Aql, S Cep, RT Cyg, Khi Cyg, V Lyr and AG Peg).

In 1986, the sequences for W Lyr (already observed in 1983) and X Oph were extended by adding the comparison stars used by AFOEV observers.

2. MISSIONS AT THE JUNGFRAUJOCH

All these observations were made at the Jungfraujoch Observatory during missions organized by the Palais de la Découverte, Paris, France. The instrument used was the 76 cm reflector equipped with a photometer of the Geneva Observatory at its Cassegrain focus. All the measurements were made in the B- and V- colours of the Geneva photometric system.

In the Tables, $(B-V)_G$ means the colour index as measured in the Geneva system while (B-V) is the classical Johnson and Morgan index, recalculated from $(B-V)_G$ by the Meylan and Hauck formulae.

The correlation with standards was ensured by frequent observations of standard stars selected from the Geneva catalogue. The reduction to exoatmospheric magnitudes is described in GEOS circular RR7 and assumes that the extinction coefficients were stable throughout the night.

3. RESULTS

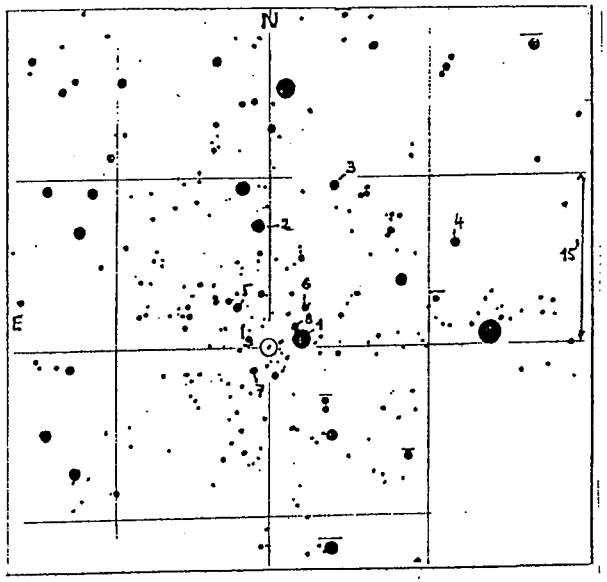
3.1. Sequence for XY Aql (figure 1)

The star was observed on the night 07/08 August 1988. The tracking was done by Joseph REMIS. The correlation with standard was ensured by the observation of 8 standard stars. The extinction coefficients calculated for the night show that the atmospheric conditions were good.

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1988 AUG 07	23h52	8.86	0.66	1.28
2	-	23h59	10.41	0.04	0.81
3	1988 AUG 08	0h05	10.59	-0.43	0.44
4	-	0h11	10.81	-0.36	0.49
5	-	0h36	11.67	-0.01	0.77
6	-	0h44	12.92	0.17	0.91
7	-	1h03	11.74	0.84	1.42
8	-	0h54	13.16	1.64	(2.1) Too red,not a standard

Table 1 : Sequence for XY Aql.

Figure 1



3.2. Sequence for T Cas (figure 2)

The star was observed on the night 05/06 August 1988. The tracking was done by J. REMIS. The correlation was ensured by the observation of 7 standard stars.
Good photometric conditions.

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1988 AUG 05	23h44	7.13	0.57	1.21
2	-	23h48	8.36	-0.79	0.14
3	-	23h51	9.17	-0.29	0.55
4	1988 AUG 06	0h00	9.95	0.41	1.09
5	-	0h14	10.72	0.48	1.14
6	-	0h22	12.24	-0.53	0.35
T Cas	1988 AUG 05	23h37	10.22	1.02	1.56

Table 2 : Sequence for T Cas

Figure 2

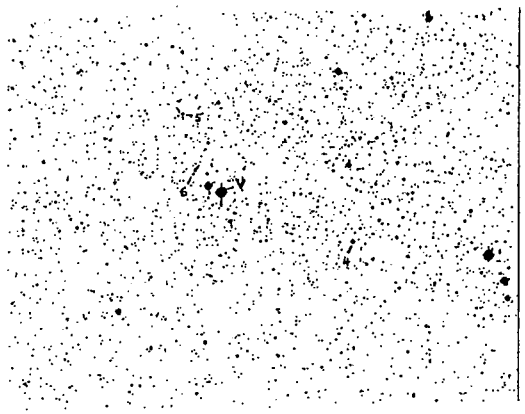


Chart Scale : 1.79 mm/'

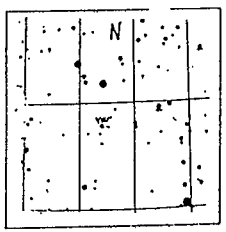
3.3. Sequence for W Cas (figure 3)

Same night and same conditions as for T Cas

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1988 AUG 06	1h04	9.53	0.62	1.25
2	-	0h47	10.16	0.82	1.40
3	-	0h44	11.15	-0.15	0.66
4	-	0h59	12.42	-0.03	0.76
5	-	0h55	12.88	-0.25	0.58
W Cas	-	0h39	9.32	3.06	

Table 3 : Sequence for W Cas

Figure 3



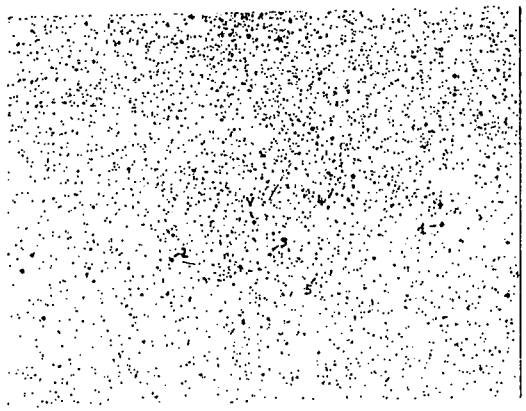


Chart Scale : 1.79 '/mm

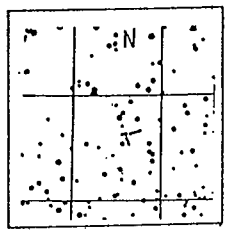
3.4. Sequence for SX Cyg (figure 4)

The sequence was observed on the night 12/13 August 1986.
The tracking was done by Roland BONINSEGNA.
6 standard stars. Good photometric conditions.

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1986 AUG 13	0h21	8.67	-0.85	0.09
2	-	1h14	9.14	-0.51	0.37
3	-	0h45	9.80	0.06	0.82
4	-	0h29	11.06	0.76	1.35
5	-	0h53	11.22	-0.32	0.52
6	-	0h38	11.95	-0.08	0.72
7	-	1h06	13.23	1.15	1.68
SX Cyg	-	0h59	12.32	1.07	1.61

Table 4 : Sequence for SX Cyg

Figure 4



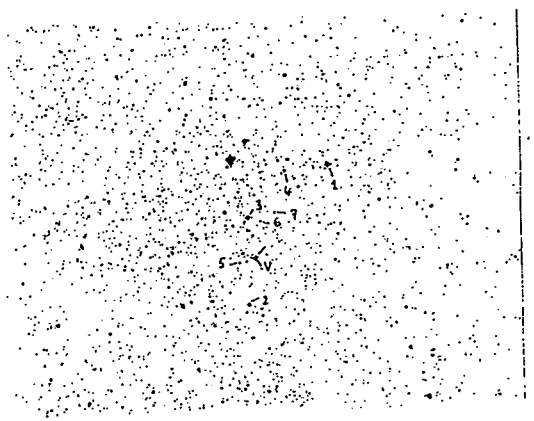


Chart Scale : 1.79 mm/'

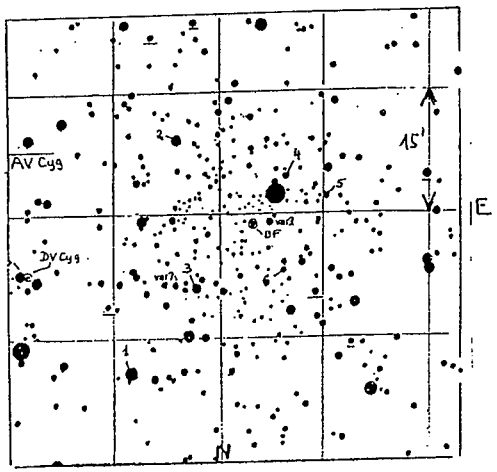
3.5. Sequence for BF Cyg (figure 5)

First, the star was observed on the night 31 July/01 August 1987. The tracking was done by Roland BONINSEGNA. Three standard stars were observed. The photometric conditions were poor. The sequence was observed a second time on the night 06/07 August 1988. The tracking was under the responsibility of Joseph REMIS. 6 standard stars were observed and the sky was photometric.

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1987 AUG 01	0h25	8.86	-0.62	0.28
1	1988 AUG 07	0h02	8.86	-0.63	0.27
2	1988 AUG 06	23h46	9.73	1.24	1.75
3	1987 AUG 01	0h13	10.28	1.16	1.69
3	1988 AUG 06	23h55	10.24	1.21	1.73
4	-	23h39	10.83	-0.24	0.59
5	-	23h32	11.21	0.50	1.15
6	1987 AUG 01	0h07	11.50	-0.19	0.63
6	1988 AUG 06	23h23	11.40	-0.13	0.68
BF Cyg	1987 AUG 01	0h01	10.82	-0.05	0.74
BF Cyg	1988 AUG 06	23h09	11.40	-0.27	0.56

Table 5 : Sequence for BF Cyg

Figure 5



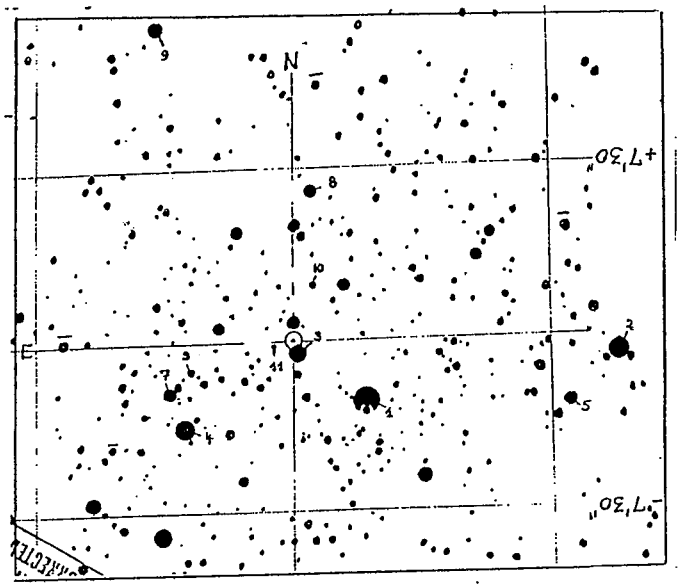
3.6. Sequence for CN Cyg (figure 6)

The sequence was observed on the night 06/07 August 1988.
Tracking : J. REMIS. 6 standard stars. Photometric sky.

STAR	DATE	UT	M_V	$(B-V)_G$	(B-V)
1	1988 AUG 07	1h52	8.64	-0.79	0.14
2	-	2h04	9.03	0.18	0.91
3	-	1h44	9.49	-0.70	0.22
4	-	1h38	10.41	-0.22	0.60
5	-	1h58	11.26	1.06	1.59
6	-	1h14	10.41	-0.18	0.64
7	-	1h32	11.76	0.73	1.33
8	-	1h02	12.33	0.50	1.16
9	-	1h22	13.00	0.95	1.51
10	-	0h54	13.62	0.12	0.87
11	-	0h41	13.84	0.55	1.19
CN Cyg	-	0h34	9.36	1.23	1.75

Table 6 : Sequence for CN Cyg

Figure 6



3.7. SEQUENCE FOR W Lyr (figure 7)

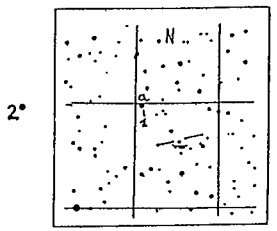
The sequence had already been observed (see GEOS SR5) on the night of 22/23 September 1983 (Bernard PERNIER and Michel DUMONT - 5 standard stars).
A few additional stars, plotted on the AFOEV chart, were also observed:
01/02 August 1986. Tracking R. BONINSEGNA. 4 standard stars. The photometric conditions were average.
05/06 August 1986. R. BONINSEGNA. 6 standard stars; Photometric sky.

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
W Lyr	1986 AUG 02	1h42	9.27	0.57	1.20
a	-	1h21	8.00	0.67	1.29
c	1986 AUG 05	23h09	9.20	-0.57	0.32
d	-	23h24	10.00	-0.25	0.58
k	-	23h17	11.17	-0.61	0.29
1	1983 SEP 22/23		8.07	0.77	1.36
2	-		9.22	-0.60	0.29
3	-		10.52	-0.50	0.38
4	-		11.17	0.88	1.45
5	-		11.49	0.06	0.82
6	-		12.61	0.78	1.37
7	-		12.84	-0.50	0.38

Note : a=1 and c=2

Table 7 : Sequence for W Lyr

Figure 7



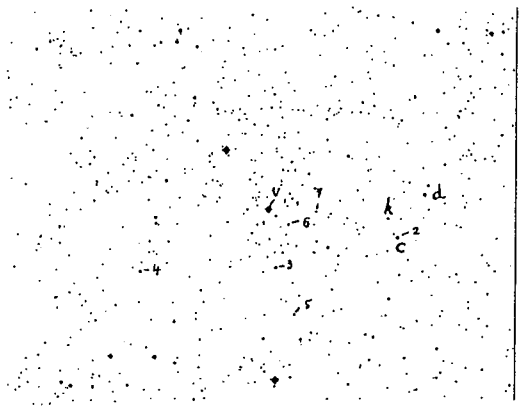


Chart Scale : 1.79 mm/'

3.8. Sequence for X Oph (figure 8)

The sequence had already been observed (see GEOS SR7) on the nights 01/02 and 02/03 August 1984.

The tracking was done by Hélène BOITHIAS, Marie-Pierre GAGNANT, Florence GERBAULT and Michel DUMONT.

A few additional stars, plotted on the AFOEV chart, were observed on the night of 02/03 August 1986.

(R. BONINSEGNA, 6 standard stars, Photometric sky).

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
X Oph	1986 AUG 02	22h41	7.52	0.72	1.32
a	-	22h50	6.37	-0.99	-0.02
b	-	22h59	7.14	-0.58	0.31
c	-	23h03	6.86	-0.71	0.21
d	-	23h07	6.98	0.39	1.07
e	1986 AUG 03	0h17	7.90	0.90	1.47
g	-	0h24	8.63	0.22	0.94
l	-	0h32	9.68	0.55	1.19
m	-	0h05	9.84	-0.48	0.39
1	1984 AUG 02	1h07	7.19	-0.56	0.33
2	-	1h13	8.03	-0.31	0.53
3	-	1h17	8.84	-0.46	0.40
4	-	1h25	9.08	0.36	1.05
5	-	23h30	9.42	-0.24	0.58

Note 1=b. Table 8 : Sequence for X Oph.

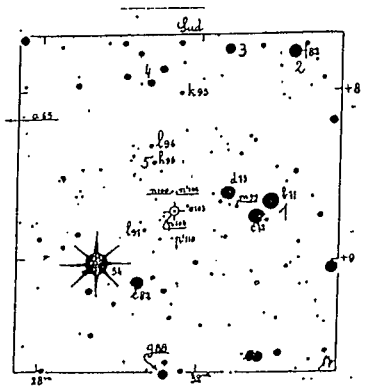


Figure 8

3.9. Sequence for RV Peg (figure 9)

The sequence was observed on the night 13/14 August 1988.
Telescope : J. REMIS. 9 standard stars, photometric sky.

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
1	1988 AUG 14	2h16	9.68	0.31	1.01
2	-	1h28	10.69	0.36	1.05
3	-	1h44	10.78	0.49	1.15
4	-	1h35	11.10	-0.29	0.55
5	-	1h51	11.69	-0.29	0.54
6	-	1h48	11.82	0.60	1.23
7	-	1h55	12.64	-0.31	0.53
8	-	1h59	13.25	0.30	1.00
9	-	2h05	14.36	-0.12	0.68

Table 9 : Sequence for RV Peg

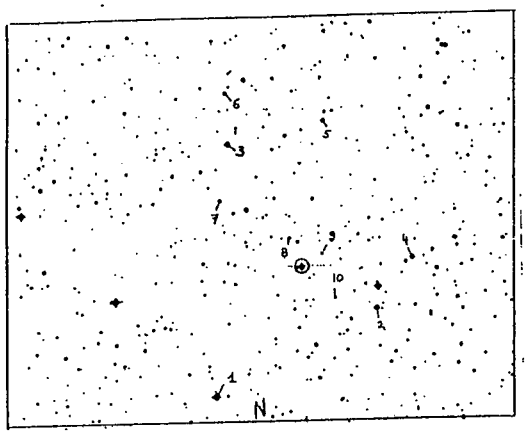


Figure 9

3.10. Sequence for U Per (figure 10)

The sequence was observed on the night 09/10 August 1988.
Telescope : J. REMIS. 8 standard stars. The photometric conditions were poor.

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
U Per	1988 AUG 10	1h13	9.09	1.12	1.65
1	-	1h45	7.84	-0.29	0.55
2	-	2h12	8.88	1.14	1.66
3	-	2h05	9.54	-0.02	0.76
4	-	1h34	10.21	-0.46	0.41
5	-	1h52	10.81	-0.32	0.52
6	-	1h25	11.18	0.18	0.91
7	-	1h20	11.83	-0.33	0.52

Table 10 : Sequence for U Per

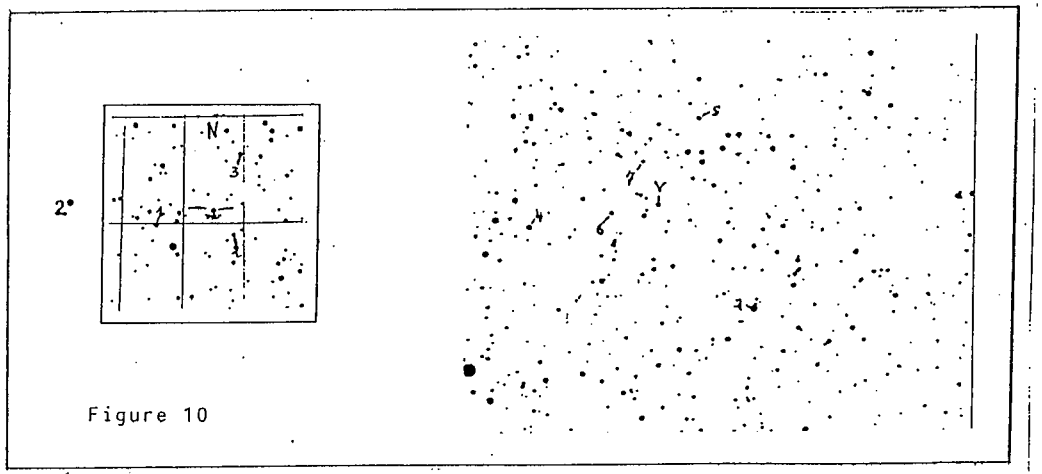


Figure 10

3.11. Sequence for RR Per (figure 11)

The sequence was observed on the night 17/18 August 1988.
Telescope : J. REMIS. 9 standard stars.
The conditions gradually evolved to "photometric" in the course of the night. This sequence was observed at the end of the night.

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
RR Per	1988 AUG 18	1h37	11.14	0.84	1.42
1	-	1h16	8.39	0.40	1.08
2	-	1h21	9.36	0.43	1.10
3	-	1h25	9.52	-0.82	0.11
4	-	1h30	10.73	-0.15	0.66
5	-	1h56	11.37	-0.65	0.26
6	-	2h00	12.12	1.27	1.79
7	-	1h52	12.35	0.18	0.92
8	-	1h43	13.09	-0.38	0.47

Table 11 : Sequence for RR Per

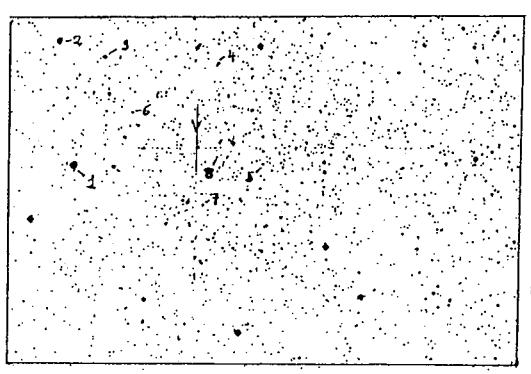


Figure 11

3.12. Sequence for W Sge (figure 12)

This sequence was observed on the night 26/27 July 1987.
Telescope : R. BONINSEGNA, J. REMIS and Carine BRIAND.
9 standard stars. The photometric conditions were average.

STAR	DATE	UT	Mv	$(B-V)_G$	(B-V)
W Sge	1987 JUL 26	23h34	11.14	1.79	
1	1987 JUL 27	1h17	9.36	-0.49	0.39
2	-	1h01	10.00	-0.31	0.53
3	-	0h21	10.15	-0.18	0.63
4	-	1h11	10.81	-0.41	0.45
5	1987 JUL 26	23h55	11.22	-0.12	0.68
6	1987 JUL 27	0h14	11.74	-0.25	0.58
7	1987 JUL 26	23h44	12.38	0.03	0.80
8	1987 JUL 27	0h42	12.81	0.25	0.96
9	-	0h06	12.97	-0.02	0.76
10	-	0h52	13.61	0.06	0.82

Table 12 : Sequence for W Sge

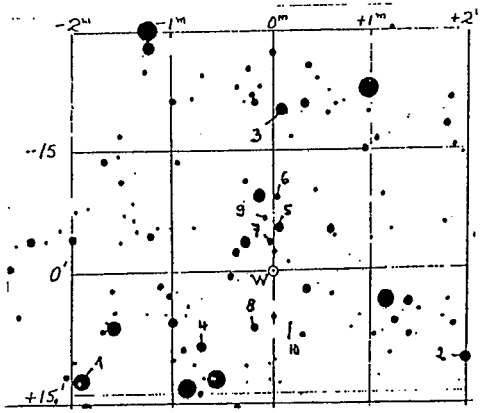


Figure 12

4. CONCLUSIONS

Of the whole program, proposed in 1983, only the sequence BC Oph remains unobserved. We hope to be able to fill that gap during the Summer of 1989.

In addition to the names of those who were at the telescope's controls, it is felt proper to mention also those who looked after the recorder, particularly Patrick LOUIS, Jean ORTEGA, Jean-Claude MISSON and Régis LE COCGUEN.

Michel DUMONT

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