

Thirty Fifth Meeting of the Hipparcos Science Team

CERGA, 5-6 October 1994

Attendance:

HST: Dr U. Bastian, Prof. P.L. Bernacca, Dr M. Cr  z  , Prof. F. Donati, Dr M. Grenon, Prof. E. H  g, Prof. J. Kovalevsky, Dr F. van Leeuwen, Dr L. Lindegren, Dr H. van der Marel, Dr F. Mignard, Mr C.A. Murray, Mr R.S. Le Poole, Dr H. Schrijver, Dr C. Turon

ESTEC: M.A.C. Perryman

Unable to attend: Prof. M. Grewing

For the 20-year 'Frascati' celebration: A. Blaauw, L. Emiliani, H. Hassan, M. Le Moine (Matra), B. Strim (Alenia), *A. McDonald (ESOC)*

The agenda attached was adopted.

Actions agreed at the meeting are included at the end of the Minutes.

1. General Project Status

Perryman gave an overview of the overall project status. The main activities outstanding are the double star processing, catalogue merging, reference frame link, Tycho photometry, catalogue publication (printed and CD-ROM versions) and associated documentation.

Schedule: the consortia are continuing to target completion of all mission products (or necessary preparatory work) by end 1995, with availability of these mission products at end 1996, thus: main catalogue (merged), annexes, TBD per cent of double stars, epoch photometry, definition of data products and data formats, catalogue introduction, 3-volume technical accompanying volumes, concepts for printed version, CD-ROM, inclusion within CDS data base. The revised schedule for TDAC involves catalogue finalisation 6 months after the main mission, i.e. mid 1996, with general data release mid-1997. This schedule should permit coordination of the data values appearing on the Tycho and HIP CD-ROMs, but some details of this agreed scheduling remain unclear.

Further details of the recommendations of the Documentation Working Group, which met on 4 October, are given under Item 12.

2. TDAC Progress

Høg reported on the overall TDAC status and schedule. Plots of H30-T30 were shown, indicating systematic errors below 1 mas in positions and proper motions, except for differences in declination where a small systematic trend was evident. Parallaxes presently show a systematic error of -2 mas, with investigations underway.

Bastian reported on the progress in photometry: it had progressed in numerous minor directions since the last meeting, with a catalogue for one fifth of the sky expected by end 1994. Grenon reported on his studies of some of the data forwarded by Grossmann, indicating that observations were possibly being rejected due to undetected duplicity. This explanation was not necessarily accepted by TDAC, and some discussions indicated that there was quite some confusion on this topic, and certain concerns were re-expressed and questions raised: whether the Tycho photometry results would allow investigations into variability in the presence of binarity, how valuable would the faint star photometry be, how did what AIT were doing compare with what RGO were doing on double stars, etc. It was agreed at the meeting that F. van Leeuwen would make some effort to unravel what was happening, and provide some further guidance to AIT, but this was later reconsidered as being an unreasonable load on van Leeuwen. Perryman again expressed concern that the HST was not being given adequate visibility of the results, and raised the urgent need for effort to be put in this task in AIT to answer the HST's concerns. Bastian/Grewing were requested to follow the developments of the photometry in more detail and report back to the HST accordingly (Action 1). It emerged during the discussions of the Documentation Working Group that the flags for the Tycho catalogue, especially for the photometry, were also not as advanced as had been assumed, and this underlined the need for the above efforts (Action 2).

Høg reported that he, with agreement of Bastian, was now in favour of dropping the concept of a T -magnitude, the inclusion of which would generate additional effort for a relatively small gain in overall accuracy. For the schedule, Høg and Bastian expected that the final B_T and V_T were expected to be available (including the epoch photometry) for the 100 000 Hipparcos stars by mid-1996, i.e. on a time-scale consistent with the printed catalogue production, with the remaining data expected by end 1996, i.e. 6 months later than that implied by the CD-ROM publication schedule. Høg reported that TYC had been agreed as the catalogue abbreviation, and that this catalogue identifier has now been reserved at the CDS.

Høg reported on the investigation into high proper motion stars detected by the Tycho processing. The distribution of 'new' high p.m. stars reflected the coverage of the sky by the previous high p.m. surveys with, for example, few new high p.m. stars being found in the galactic plane.

3. NDAC Report

Van Leeuwen reported on the work at RGO, in particular the efforts at improving the final attitude modelling. A summary paper was planned.

Lindegren presented results of studies conducted on the 37-month solution (N37.01), which had been completed a few days previously. Improvements carried out since N30 included: merging of observations for certain IC numbers (48 stars); introduction of $V - I$ for the chromaticity rather than $B - V$ (used in the sphere but not in the RGCs); radial velocity set non-zero for about 22 objects (Action 3); the mesh search for slit errors extended to 5 arcsec (providing 182 new solutions); the 6th harmonic solved for 2300 out of 2328 sets; outlier rejection (leading to a rejection of about 3 per cent of observations); an off-line analysis for quadratic motion (a few hundred stars yielding better solutions with the quadratic term). Lindegren hoped that the sphere solution experiments (with attitude iterations) could be completed by the end of 1994, providing the definitive CHF's for the double star processing, which would be the major activity in Lund during 1995. 108 790 stars now satisfied the inclusion criteria of N30, leading to median errors on position, parallax and annual proper motion of about 1.91 (at 1990), 1.48 and 1.27 mas, respectively. The set solution parameters are still left as free parameters in the solution; results on light-bending were not yet available.

4. FAST Report

Kovalevsky and Mignard reported results of the FAST 37-month iterated solution which had recently been completed. All RGCs are now solved in smoothing mode, and the origins and residuals appear well-behaved. Various studies would be made over the coming months, including the effect of a linear chromatic term, and the light-bending effect. There is no plan to solve for the 6th harmonic term. A solution using pole adjustment had been attempted, but results were not significantly different.

5. Sphere Comparisons, etc

No recent exchange of solutions had been made. The exchange of the 37-month solutions was expected by about the end of October, with some results of the analysis expected to be available well before the end of the year.

6. Main Astrometric Catalogue Merging

Murray presented his proposal for the implementation of the catalogue merging, arguing that it had to be done rigorously. Mignard at first expressed serious concerns about the commitment of effort that would be needed in an already over-committed team. Lindegren argued that all would be needed from FAST would be their output file. A report by F. Arenou on the merging of FAST and NDAC data had been distributed and was briefly

discussed, and the question was raised whether Arenou might be in a position to undertake this merging activity. An overall procedure was adopted as a baseline, and the relevant groups would consider whether it could indeed be implemented (Action 4). If adopted, it could lead to appropriate software development over the next 2–3 months, with merging work commencing in early 1995. The merged results would eventually be sent to Schrijver, who would be in the best position to rule on whether a star is double/multiple (in which case a merging is considered unrealistic), and whether the merged covariances would replace the individual solution values.

7. Global Sphere Solutions

The global sphere solution software had been written in Copenhagen, but had not yet been fully debugged. The future schedule was uncertain.

8. Double Star Working Group Report

Mignard provided a short report on the progress of the Double Star Working Group. Reduction and comparison activities were proceeding. The next meeting of the group is foreseen for 14 December, at CERGA.

9. Photometry Working Group Report

Van Leeuwen provided a short report on the progress of the Photometry Working Group. Reduction and comparison activities were proceeding. The next meeting of the group is foreseen for 13 December, at CERGA. Small systematic offsets in the zero-point offset were being corrected. In the final reductions, the FAST background will be replaced by the NDAC background, which has been considered by the PWG as being more accurate. Plans for the catalogue merging were well in hand; the expectation that a preliminary merged catalogue will be available early in 1995. See also Item 2 for a reference to the dropping of T -magnitudes from the Tycho Catalogue.

10. Report from Reference Frame Working Group

Kovalevsky reported on the status of the activities. There were no new results to report on (the next meeting of the RFWG was scheduled for 15 February (TBC) in CERGA). Kovalevsky and Lindegren had been reflecting on the merging of the solutions. See also Action 5.

now planned for Hipparcos. Cross-identifications will be performed by D. Egret, and are likely to include DM, HD, and PPM (Action 12). $V - I$ was not to be included in the Tycho Catalogue. As for the main catalogue, blanks will be represented by the ASCII 'blank' character.

HST members agreed that the final CD-ROM results should contain a straight ASCII file (not FITS) of the definitive data, that could be copied into machines other than those for which the interrogation software would be constructed (Action 13).

Intermediate data file archiving: there were considered to be two categories of intermediate astrometric data: (i) those generated by the data reduction consortia, and archived and documented and accessed under their own responsibility (e.g., similar to the Hipparcos Photometric Catalogue *Extension*, which would be prepared under the responsibility of the PWG); (ii) those considered as a 'formal' output of the mission. The latter would be placed on a CD-ROM, distributed with the other final data, but without access or interrogation software. An example of such a format is that being used by Lindegren (see Annex II). Mignard and Lindegren would reflect on its contents (Action 14).

Plans were discussed for the Finding Chart Volume of the main catalogue, which will be carried out by Grenon/Turon (Action 15).

13. Minor Planet Status in NDAC/FAST

Short reports were made on the status in FAST and NDAC. It was agreed that the process of finalising the data from both groups for publication (inter-comparison, merging, proposal of an optimum format, use of a fixed reference ephemeris for each planet throughout the mission, etc) was more than could be taken on by present HST members. It was agreed that Mignard would ask B. Morando whether he could take charge of the above details (Action 16).

14. Miscellaneous

(a) A&A Papers: the status of the papers was reviewed (see Annex III). Bernacca asked that M. Lattanzi be considered as first author for the paper on the Schmidt plate reductions, if Le Poole was no longer considering himself as first author, and if no other significant work on the paper had yet been carried out: Perryman believed that Turon was in the process of preparing this paper on the basis of work that had already been carried out in Meudon. A few papers were still missing: Kovalevsky considered that all papers completed by 30 November should then be submitted to A&A (M. Grewing), to allow refereeing to commence—this proposal was agreed by the others present. Note that this means that Perryman, nor other HST members, will have a visibility of which 'internal' comments have or have not been implemented, but this was not considered as a particular problem (Action 17).

(b) Project completion conference/ceremony: various locations were discussed. These included Rhodes (link with Hipparchus, favourable location); ESTEC (conference facilities); Strasbourg, or Paris (ESA association and location in France); Cambridge (conference facilities); Rome, or elsewhere in Italy. Perryman invited HST members to reflect on their favoured location, with proponents of a particular location preparing more fully their case in advance of the next HST meeting (Action 18).

(c) INCA CD-ROM: the INCA CD-ROM had been despatched. HST members could ask Perryman/Turon if they wished to see the relevant distribution list, or if they had additional persons to propose for receipt of the CD-ROM.

(d) Horizon 2000+: Perryman reported that the Horizon 2000+ Survey Committee, which had met last week in Rome, had recommended the selection of a cornerstone programme related to interferometry, with the GAIA astrometric concept being a front runner for this interferometric mission if an accuracy of 10 micro-arcsec could be demonstrated. The precise implementation details of this decision had not been discussed.

(e) Data despatch from Meudon: Turon continues to maintain a list of data despatched from Meudon, which is available from her on request.

(f) Ad Hoc papers: the Tycho variability paper was discussed (first author, Bastian). Perryman said that if this paper was approved by van Leeuwen and by Mignard, then the HST could also give its approval.

15. Next Meetings

HST: The 36th meeting of the HST will be held on 5–6 April 1995, in Italy, either in Venezia or in Padova (TBC by Bernacca, Action 19). A meeting of the documentation working group will probably be scheduled for the previous day (4 April).

Dates arranged for other meetings were as follows: (i) Documentation Working Group meeting, 12 December (from 14:00), CERGA; (ii) PWG Meeting, 13 December 1994, CERGA; (iii) DSWG Meeting, 14 December, CERGA.

M.A.C. Perryman, 11 October 1994

Distribution: HST, DRC Participants, A. Wicenec, J.L. Halbwachs

Actions

- ✓ 35.1 Bastian/Grewing to provide renewed guidance and clarification of the progress on the Tycho photometry.
- ✓ 35.2 Bastian to solicit comments on the Tycho Catalogue flags/format in TDAC, and provide these to Perryman asap and in any case by the end of November.
- ✓ 35.3 Mignard/Lindegren to agree on inclusion of radial velocities (for which stars, and whether the solar motion was to be included).
Handwritten: "including" with arrow pointing to "inclusion", "yes" with arrow pointing to "agree"
- ✓ 35.4 Catalogue merging: Mignard to consider what effort would be needed to produce the required output files; Mignard/Lindegren/Murray to agree that the proposed output files from NDAC and FAST would satisfy the merging requirements; Turon to investigate whether Arenou would be prepared to undertake the merging work, with appropriate guidance (and a possible visit) from Murray.
- ✓ 35.5 Kovalevsky (with Feissel) to provide written guidance on the use of the term ERF 2000 as the catalogue reference frame description.
- ✓ 35.6 Høg to communicate an appropriate Tycho astrometric solution, for deposit in the Utrecht results data base, in due course.
- 35.7 Van Leeuwen/Evans to consider provision of the photometric catalogue star header and epoch photometry to the Utrecht results data base.
- 35.8 Notes for the Utrechts results data base would be expected as follows: (a) misidentifications collated by Meudon, from Turon; (b) stars not detected by the star mapper, or wrong by 15–60 arcsec, or incorrectly identified double systems or variable stars, from van Leeuwen; (c) notes on finding charts and other photometric discrepancies (e.g. $V - I$ updates), from Grenon; (d) anomalies from the sphere solution, from Mignard and Lindegren (who would reflect on the categorisation of such discrepancies).
- 35.9 Printed Variable Star Annex: Grenon/Turon/Priou to consider how the smoothed light curves (e.g., from AAVSO) are to be incorporated into the CD-ROM.
- 35.10 Grenon/van Leeuwen to provide an iterated variable star annex format proposal (and how the data are to be incorporated within the CD-ROM) by end October; including a proposed schedule for 1995 covering the cleaning/merging and construction of light curves. Perryman would then 'take over' the proposed format definition as part of the overall catalogue format definition.
- ✓ 35.11 Schrijver, van Leeuwen, Bastian, and all other interested HST members, to provide critical comments on Tables 2.8, 2.9, 2.10 of the CD-ROM design document, by 21 October.
- ✓ 35.12 Bastian/Egret to finalise proposal for cross-identifiers to be contained in the Tycho

Catalogue (e.g., DM, HD and PPM).

~~unresolved~~
→ 35.13 Crézé to provide document or specification of the agreed formats adopted by data centres for catalogue distribution (mentioned at the meeting).

→ 35.14 Mignard and Lindegren to reflect on possible contents/format of the intermediate astrometric data file for release with the final catalogue data (whether independent FAST/NDAC results are to be made available, how this fits with the concept of a merged solution, etc). See Annex II.

→ 35.15 Grenon/Turon to finalise plans and schedule for the Finding Chart Volume of the main catalogue (e.g. LMC/SMC and cluster charts to be based on GSC scans, etc; update INCA volume using revised identifications and photometry, etc).

/ 35.16 Mignard to investigate with B. Morando whether he could take charge of the various aspects related to the preparation of the NDAC and FAST minor planet data for publication (inter-comparison, merging, proposal of an optimum format, use of a fixed reference ephemeris for each planet throughout the mission, etc).

/ 35.17 First authors of the A&A papers to submit their completed papers on 30 November, to M. Grewing, taking into consideration the comments made by the identified internal referees.

→ 35.18 HST members to reflect on the location of the Hipparcos catalogue completion ceremony. Proponents to prepare their cases in advance of the next HST meeting, to allow a decision to be made on the location.

/ 35.19 Bernacca to communicate the chosen location of the April 1995 HST Meeting.

From Previous Meeting(s)

/ 33.13 Bastian/Høg/Grewing/Grenon to consider applicability of the mass processing approach to variable star analysis for the Tycho data (as being proposed by Geneva for the main mission).

Thirty Fifth Meeting
of the
HIPPARCOS SCIENCE TEAM

CERGA, Grasse

5-6 October 1994
Start of meeting: 09.00 (5 October)

AGENDA

1. Overview of progress and problem areas (Perryman)
2. TDAC progress report and schedule (Hoeg)
 - Tycho astrometry, and comparison with NDAC sphere solution
 - light curves; publication of epoch photometry, policy for faint stars
 - checks of high proper motion stars
3. NDAC final sphere solution, related studies, major problems (Lindegren)
4. FAST final sphere solution, related studies, major problems (Kovalevsky)
5. NDAC/FAST sphere comparisons (Lindegren/Mignard/Kovalevsky)
 - chromaticity/Arenou study
6. Main astrometric catalogue merging: proposal and discussions (Murray)
7. Report on the global sphere solution in NDAC (L. Lindegren)
8. Report from Double Star Working Group (Mignard)
 - progress in NDAC (Lindegren) and FAST (Kovalevsky/Mignard)
 - results of comparison activities
 - status of ground-based preparatory programmes
 - problem areas and future plans
9. Report from Photometry Working Group (F. van Leeuwen/D. Evans)
 - plans for Hipparcos/Tycho light curve analysis (Grenon/van Leeuwen)
 - problem areas and future plans
10. Report from Reference Frame Working Group and future schedule (Kovalevsky)
11. Results data base activities (Schrijver)
 - schedule of expected inputs from NDAC (LL), FAST (FM), TDAC (EH)
12. Report of Documentation Working Group (Perryman)
 - printed catalogue contents/formats for main catalogue (Perryman)
 - intermediate data file archiving (Mignard/Lindegren)
 - double star annex: printed and machine-readable (Lindegren)
 - printed variable stars annex (Grenon)
 - status of CD-ROM preparations (HIC - Turon/HIP - Perryman)
 - status of final documentation: Volumes I-III
13. Minor planet update: FAST/NDAC (Mignard/Lindegren)
14. Miscellaneous:
 - ESLAB Symposium (Feb 97): location (Strasbourg, Cambridge, ESTEC)
 - status and review of papers for A&A 1994 issue
 - H18/H30 data distribution from Meudon (Turon)
 - photometric observations of nearby stars (Grenon)
 - status of ad hoc/Form B/TDAC internal proposals (to carry forward)
 - next HST meeting: date and place

---> please review any outstanding actions from 34th HST (see minutes)

*** Note: starting at 16:00 on Wednesday 5, a small "celebration" has been organised by J. Kovalevsky, commemorating the 20th anniversary of the Frascati meeting, 5 years since launch, and the 37-month sphere solution. Confirmed participants are: H. Hassan, L. Emiliani, M. Bouffard, B. Strim and A. Blaauw. There will be 3-4 four presentations (history since Frascati, operations, and present status of scientific results) followed by a dinner.

ANNEX ON VARIABLES

ANNEX I

I. CATALOGUE OF PERIODS & AMPLITUDES

left hand page : Hipparcos results $< 39000 \times$
GENOVA + F + N' $< P >$, $< A >$, Epoch, flag
right hand page : Results from literature
NOTE. $P_1, P_2, A_1, A_2 \dots$, References

+ 1 Table of notes & long remarks

II. CATALOGUE OF "AMPLITUDES"

of microvariables, multiperiodic, irregulars
 $\sim 40000 \times$ GENOVA

+ 1 Table of notes GENOVA + NOTE.

III. TABLE OF BIBLIOGRAPHICAL REFERENCES

Correspondence between codes number
in Catalogues I and II and the references
NOTE.

IV. ATLAS OF LIGHT-CURVES

- a) Full light-curves with/out GRAVSO
mean curves 800 / 400
- b) Partial light-curves for special events (TRD)
few hundred
- GENEVA + GRAVSO + N+P

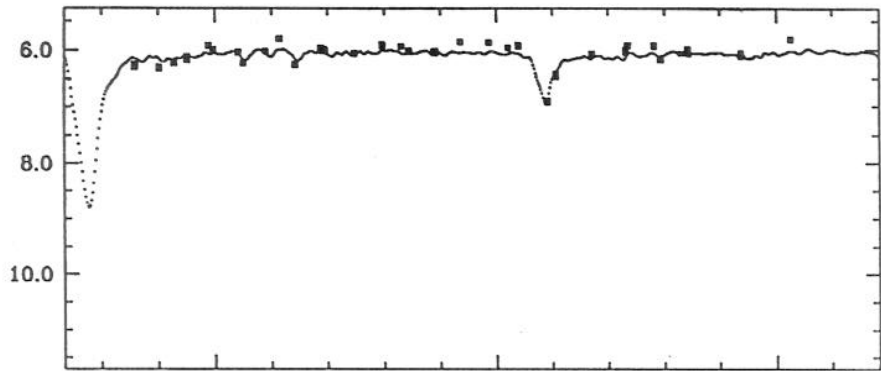
V. ATLAS OF FOLDED LIGHT-CURVES

Curves published if $A/\text{noise} > A_0$
($A_0 \geq 1.8$) ~ 12000 / 24/pch

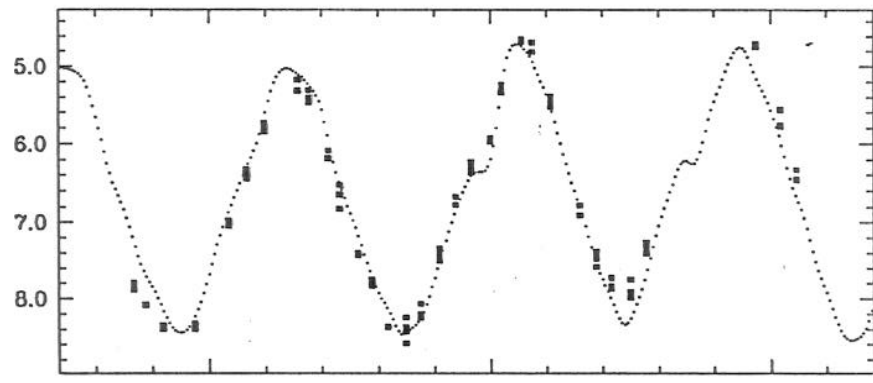
NB: A variable may be present in both
Attaches

GENEVA + check by NDAC.

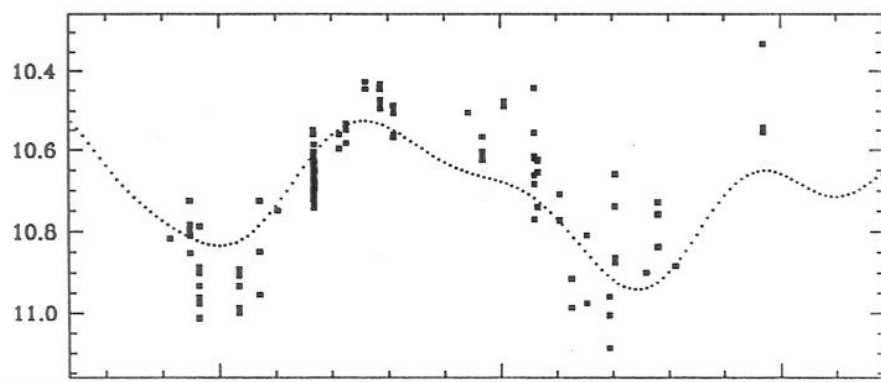
A SEPARATE STUDY BY NDAC ON
PULSATING VARIABLES TO BE READY
AT THE SAME TIME AS THE ANNEX
NDAC.



HC 077442
Name : R CrB
Sp. Type : CII
Var. Type : RCB
Min,Max : 5.84, 6.69



HC 104451
Name : T Cep
Sp. Type : M5.5:e
Var. Type : M
Period : 388.1
Min,Max : 4.69, 8.42



HC 116287
Name : Z And
Sp. Type : M2III+
Var. Type : ZAnd
Min,Max : 10.42,11.02

8000 8500 9000

ANNEX II

HIC	nrec	nobs	nrej	nrej0	mult	iasy	irun	npar	tl	Hp	V-I	Chr	SDchr
116727	36	35	1	1	0	0	-256	6	-.820	3.490	.990	-.191	.502

Epoch	RA(deg)	Dec(deg)	Par	PMA	PMD	Vr
90.001	-5.16243414	77.63193523	72.04	-48.02	126.41	.00

#	GCR	t	a	d	p	pma	pmd	chr	res	sd	res/sd
1	77	89.9375	-.5468	.8373	.5343	.0349	-.0535	1.0146	2.29	2.60	.88
2	113	89.9812	.4177	.9086	-.5736	-.0084	-.0183	1.0044	-.02	2.62	-.01
3	189	90.0736	-1.0002	.0012	.6559	-.0722	.0001	.9828	-.89	2.65	-.34
4	190	90.0746	-1.0001	.0017	.6516	-.0732	.0001	.9826	2.25	2.67	.84
5	242	90.1379	-.4412	.8974	-.6746	-.0603	.1226	.9678	2.06	2.66	.77
6	307	90.2171	-.6784	-.7347	.6444	-.1464	-.1585	.9493	-.85	2.67	-.32
7	383	90.3096	-.9999	-.0176	-.5731	-.3082	-.0054	.9277	-3.08	2.72	-1.13
8	438	90.3764	.1819	-.9833	.5329	.0682	-.3688	.9121	.94	2.72	.35
9	439	90.3776	.2070	-.9784	.5456	.0779	-.3681	.9118	1.59	2.77	.57
10	525	90.4821	-.4012	-.9160	-.5916	-.1928	-.4403	.8874	-2.87	2.73	-1.05
11	586	90.5562	.9896	-.1444	.6552	.5491	-.0801	.8701	-.37	2.76	-.13
12	587	90.5574	.9920	-.1278	.6629	.5516	-.0711	.8698	4.56	3.03	1.50
13	652	90.6366	.3969	-.9179	-.6885	.2522	-.5831	.8513	1.41	2.79	.50
14	727	90.7276	.6782	.7349	.6486	.4925	.5337	.8301	-3.99	2.81	-1.42
15	771	90.7811	.9661	-.2583	-.6025	.7533	-.2014	.8176	-2.06	2.84	-.73
16	853	90.8808	-.1699	.9855	.5296	-.1494	.8666	.7943	-.50	2.87	-.17
17	-887	90.9221	.7195	.6944	-.5307	.6625	.6394	.7846	-14.23	2.91	-4.88 *
18	967	91.0193	-.9304	.3664	.6101	-.9471	.3730	.7619	.75	2.88	.26
19	1012	91.0739	-.0934	.9956	-.6522	-.1001	1.0679	.7492	-1.98	2.89	-.68
20	1148	91.2393	-.8881	.4598	-.6281	-1.0993	.5692	.7106	4.14	2.99	1.39
21	1206	91.3097	-.2323	-.9727	.5630	-.3040	-1.2726	.6941	.94	3.00	.31
22	1293	91.4154	-.7251	-.6887	-.5463	-1.0253	-.9738	.6694	.08	2.99	.03
23	1350	91.4847	.8162	-.5778	.5964	1.2107	-.8571	.6532	2.49	3.09	.80
24	1426	91.5768	.0890	-.9961	-.6715	.1402	-1.5693	.6317	.43	3.08	.14
25	1495	91.6608	.8917	.4527	.6866	1.4798	.7512	.6121	1.32	3.06	.43
26	1547	91.7241	.7994	-.6009	-.6538	1.3770	-1.0351	.5973	-1.00	3.09	-.32
27	1628	91.8224	.2215	.9753	.5524	.4033	1.7760	.5744	-5.94	3.18	-1.87
28	1663	91.8650	.9353	.3538	-.5338	1.7430	.6594	.5644	-2.86	3.18	-.90
29	1745	91.9645	-.7128	.7014	.5642	-1.3994	1.3769	.5412	-.77	3.19	-.24
30	1784	92.0119	.2535	.9674	-.6030	.5096	1.9450	.5301	1.60	3.19	.50
35	1858	92.1018	-.9852	-.1713	.6696	-2.0694	-.3598	.5091	-3.00	3.23	-.93
31	1915	92.1710	-.6074	.7945	-.6669	-1.3178	1.7236	.4930	1.96	3.23	.61
32	1978	92.2474	-.5488	-.8360	.6205	-1.2325	-1.8777	.4751	-3.41	3.24	-1.05
33	2059	92.3458	-.9589	-.2837	-.5431	-2.2481	-.6652	.4521	-1.07	3.27	-.33
34	2113	92.4113	.4074	-.9133	.5332	.9819	-2.2010	.4368	-4.29	3.33	-1.29
36	2114	92.4126	.4314	-.9022	.5467	1.0402	-2.1754	.4365	1.36	3.31	.41