CELESTIA 2000

C. Turon[1], D. Priou[1], M.A.C. Perryman[2]

[1] DASGAL/URA CNRS 335, Observatoire de Paris, 92 195 Meudon Cedex, France
[2] Astrophysics Division, ESTEC, 2200AG Noordwijk, The Netherlands

ABSTRACT

Celestia 2000 is a CD-ROM containing the Hipparcos and Tycho Catalogues (main catalogues and some annexes) in compressed 'bit-optimised' binary format, along with dedicated software permitting interrogation, sample construction and information display. The mission results are complemented by additional data taken from an updated version of the Hipparcos Input Catalogue or from the SIMBAD database.

Interrogating facilities: the data are available per star, through windows displaying all data available in one catalogue (HIP, TYC or HIC) or annex (Double and Multiple Systems Annex, Parts C, G, O, V, and X; Variability Annex, Section 1 and 2), including notes and references, identification charts and variable stars light curves, if any.

Sampling facilities: samples can be defined using data or identifiers from the Hipparcos and Tycho Catalogues, or from the Hipparcos Input Catalogue. A total of 135 parameters (62 for HIP, 52 for TYC, and 21 for HIC and updates) can be used to define a criterion. Once a sample has been selected, it is then possible: to list the identifiers of the selected stars; to display the HIP or TYC window by clicking on the selected identifier; to draw a global or a local sky map for the selected sample; to prepare a file for external use, with data from HIP and/or TYC and/or HIC.

Mapping facilities: The global or local sky distribution of HIP and/or TYC stars can be displayed in various ways.

Key words: Hipparcos and Tycho Catalogues; Double and Multiple Systems Annex; Variability Annex; updated Hipparcos Input Catalogue; Celestia 2000.

1. INTRODUCTION

Besides the printed and ASCII versions, the Hipparcos and Tycho Catalogues (main catalogues and some annexes, ESA 1997) also appear on one (non-ASCII) CD-ROM which includes software to interrogate the catalogues and annexes, to select samples from the main catalogues, and to draw global and local charts. *Celestia 2000* includes all data from the Hipparcos and Tycho Catalogues, and the data from the Hipparcos Catalogue annexes, including notes and references, identification charts and variable stars light curves, if any. The mission results are complemented by additional data taken from an updated version of the Hipparcos Input Catalogue (including cross-identifications, spectral types, etc.) for Hipparcos stars, and by data (PPM proper motions) or cross-identifications taken from the SIMBAD database for Tycho stars.

The data are 'bit-optimised', with an ordering optimised to take account of the requirements of the interrogation software. The CD-ROM follows the ISO-9660 standard. The software offers a wide range of possibilities which are briefly presented below. A complete user's manual and help are included in *Celestia 2000*, as well as technical requirements and instructions for installation and use.

2. INTERROGATING FACILITIES

The data are available per star, through windows displaying all data available in one catalogue or annex. Eight windows can be opened:

- Satellite data: Hipparcos Catalogue. For each entry, this window provides all data from the main Hipparcos Catalogue, including notes and the identification chart if any. The availability of detailed data in the double/multiple and variability annexes is indicated, and this information can be accessed through appropriate option keys. An example is given in Figure 1.

- Satellite data: Tycho Catalogue. For each entry, this window provides all data from the main Tycho Catalogue, including notes. These data are complemented by some additional data made available from the SIMBAD data base: cross-identifications to major catalogues and proper motions from the PPM (Bastian & Röser 1991).

- Hipparcos data: Double and Multiple Systems Annex, Part C. For each entry, this window provides global information on the system, as given in the main Hipparcos Catalogue, a chart of the

Detailed information

HIP	TYC	HIC
DMSA(C)	DMSA(G,O,V,X)	CCDM(HIC)	Var.(1/2)

Satellite data : Hipparcos Catalogue

HIP 27309
05h 47m 07.91s   +00° 17' 56.2"
(Approximate position, J1991.25, ICRS)

V		9.70
Variability flag [mag]		> 0.6
Survey star		
Proximity flag		
	HIP entry or comp. within 10" (H)	
TYC		116 1263 1
TYC		

Astrometric parameters
Epoch J1991.25, ICRS
α, δ in deg. Others in mas (/yr)

		σ
α	86.78297087	5.90
δ	0.29895046	5.06
π	5.70	4.95
$\mu_{\alpha}{}^{*}$	-4.72	6.18
μ_{δ}	2.42	4.87
Astrometry of		A

$\sigma_{\alpha}{}^{*} = \sigma_{\alpha} \cos\delta, \mu_{\alpha}{}^{*} = \mu_{\alpha} \cos\delta$

V   (5')

Magnitudes (satellite)

Hp	9.8614	σ		0.0087
		s		0.100
Accepted transits (Hp)				68
Photometry of	**Combined photometry (*)**			
BT	11.186	σ		0.073
VT	10.077	σ		0.044
Photometry of	**Combined BT, VT (*)**			

Correlations and flags

	α^{*}	δ	π	$\mu_{\alpha}{}^{*}$
δ	-0.03			
π	0.10	0.06		
$\mu_{\alpha}{}^{*}$	-0.11	-0.31	-0.42	
μ_{δ}	-0.13	-0.50	-0.14	0.48

Percentage of rejected data (F1)	6
Goodness of fit (F2)	1.92

Variability

Hp (max)	9.78
Hp (min)	10.47
Period [days]	5.81
Type	**Periodic variable [P]**
Details in annex	1
Light curve	A

Photometry (satellite or ground-based or combined)

		σ	Source
V	9.70	-	H
B - V	0.956	0.066	T
V - I	0.94	0.05	L
Joint photometry	**Combined V, B-V, V-I (*)**		

Note

Multiplicity

CCDM	05471+0018
History	**System discovered by Hipparcos [H]**
Resolved in [components]	2
Number of HIP entries with same CCDM	1
Solution quality	**Reliable [A]**
Source of astrometry	
Details in annex	
	Component solution [C]

Figure 1. An example of the HIP window.

system, and detailed data per component. If several solutions were derived for different parts of the system, each solution can be examined by choosing the appropriate option key. An example is given in Figure 2.

- Hipparcos data: Double and Multiple Systems Annex, Parts G, O, V, and X. For each entry, this window provides the descriptor of the Hipparcos star as given in the main Hipparcos Catalogue, the detailed data derived for the system, and notes and references if any.

- Hipparcos data: Variability Annex, Section 1. For each entry, this window provides the descriptor of the Hipparcos star as given in the main Hipparcos Catalogue, data for the star when considered to be a periodic variable, and the light curve as provided in Parts A, B, or C of the Variability Annex. An example is given in Figure 3.

- Hipparcos data: Variability Annex, Section 2. For each entry, this window provides the descriptor of the Hipparcos star as given in the main Hipparcos Catalogue, data for the star when considered to be an unsolved variable, and the light curve as provided in Part B or C of the Variability Annex.

- Ground-based data: Hipparcos Input Catalogue and further updates. For each entry, this window provides data from the Hipparcos Input Catalogue, with a few corrections in the cross-identifications, and some updates, mainly in the spectral types, luminosity classes, radial velocities and in the multiplicity part of the window.

- Ground-based data: Double and Multiple Star Annex of the Hipparcos Input Catalogue and further updates. For each entry, this window provides the data per component as provided in the annex of the HIC, updated with the errata provided to the CCDM (Dommanget & Nys 1996).

All these windows can be printed or saved in a text file. It is possible to switch from one window to any of the other windows, where relevant, using the different option keys.
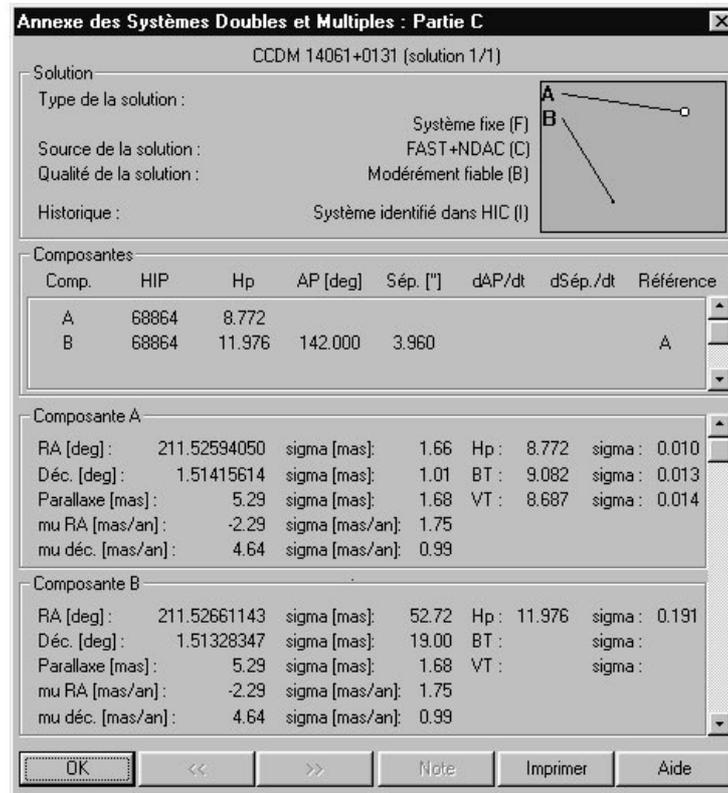
Figure 2. An example of the window for a system included in Part C of the Double and Multiple Systems Annex.

3. SAMPLING FACILITIES

Samples can be defined using data from the Hipparcos and Tycho Catalogues or from the Hipparcos Input Catalogue, or using identifiers from the Hipparcos Input Catalogue for HIP stars or from SIMBAD for TYC stars. If the sample is defined using Hipparcos (Tycho) data, stars are sampled, by default, in the Hipparcos (Tycho) Catalogue, but it is also possible to only select stars in the part of the Tycho Catalogue which is not included in the Hipparcos Catalogue ('TYC only' stars) or in the part of the Hipparcos Catalogue which is not included in the Tycho Catalogue ('HIP only' stars).

More than 130 parameters from HIP, TYC, or HIC and updates can be used to define a criterion, as illustrated in Figure 4. Once a catalogue is chosen (HIP, TYC or HIC), the criteria related to this catalogue are accessible (displayed in black in the window). The other criteria are not accessible (displayed in grey). A sample can be selected on the basis of one criterion, or of any logical combination of criteria.

Examples:

- data from HIP: select all HIP stars with a HIP parallax in the range 10–20 mas, as illustrated in Figure 5.

- data from HIP: select all HIP stars which are included in the Double and Multiple Systems Annex, Part C;

- combination of two criteria: select all HIP stars with a HIP parallax in the range 10–20 mas and included in the Double and Multiple Systems Annex, Part C;

- data from TYC: select TYC stars not in HIP with V_T in the range 5–6 mag;

- data from TYC: select all HIP stars with V_T in the range 6–7 mag.

All the criteria used to create samples are collected in the 'Criteria window', illustrated in Figure 6.

The minimum and/or maximum values may be included in the selection range as desired. A personal sample can also be imported.

Once a sample has been selected, it is then possible:

- to list the identifiers of the selected stars (HIP number if the star is in HIP, TYC number *only* if the star is in TYC but not in HIP);

- to display the HIP or TYC window by clicking on the selected identifier;

- to switch from any of these windows to any other one, where relevant;

- to draw a global or a local sky map for the selected sample;

- to prepare a file for external use, with selected data and/or identifiers from HIP and/or TYC and/or HIC.
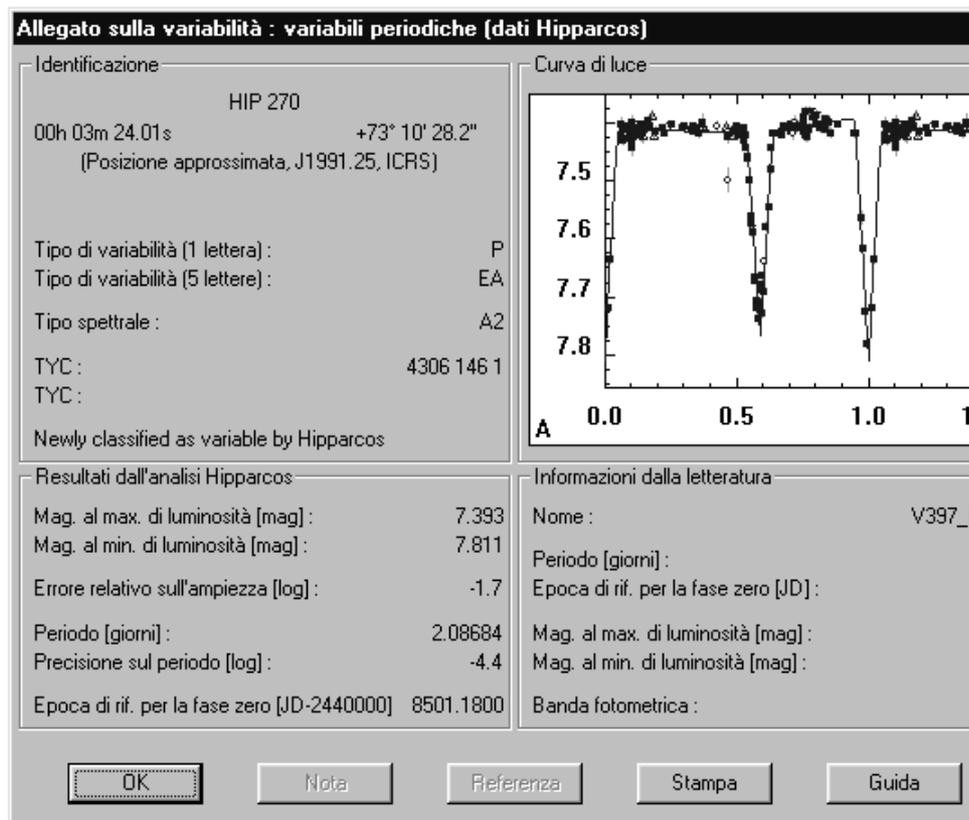
Figure 3. An example of the window for a star included in the Variability Annex, Section 1: Periodic Variables.

The list of identifiers and all graphical displays can be printed and saved.

4. MAPPING FACILITIES

The global or local sky distribution of HIP and/or TYC stars can be displayed in various ways:

- draw a local map centred on given coordinates;

- draw a global sky distribution for a sample previously selected, with one point per star (only possible if the selected sample includes less than 1000 stars). The HIP or TYC window of any star can be displayed by clicking on the corresponding point;

- draw a density distribution over the whole sky, in grey levels, in $10° \times 10°$ zones. A local chart of a zone can be displayed by clicking in this zone.

The sizes of symbols in local charts are related to the magnitudes of the stars. Different symbols can be used for stars selected by a given criteria, for other HIP stars, or for other TYC stars. For global charts, it is possible to choose the coordinate system (equatorial ICRS, ecliptic, or galactic) and the type of projection. For local charts, it is possible to use a zoom and to move towards north, south, east or west from the selected centre. All maps can be printed.

5. ADDITIONAL FACILITIES

For an object previously selected, it is possible to compute the absolute magnitude from the Hp, V or V_T apparent magnitudes and the parallax as given in the Hipparcos Catalogue; or from the V or V_T apparent magnitudes and the parallax as given in the Tycho Catalogue. It is also possible to compute the astrometric parameters, their errors and the correlation coefficients for another epoch than 1991.25, and to obtain the ecliptic or galactic coordinates of a star.

Celestia 2000 will be available, by the end of 1997, for IBM PC and compatibles running under Windows 3.1, Windows 95, or Windows NT (minimum graphics requirement: 800 by 600 resolution, colour desirable). The software instructions are accessible in various languages: English, French, Spanish, Italian and Dutch. Details can be found on the Hipparcos WWW page (http://astro.estec.esa.nl/Hipparcos/catalog.htm).

REFERENCES

Bastian, U., Röser, S., 1991, PPM star catalogue, Astronomisches Rechen-Institut Heidelberg Eds.

Dommanget, J., Nys, O., 1996, Bull. CDS, 48, 19.

ESA, 1997, The Hipparcos and Tycho Catalogues, ESA SP–1200

Figure 4. Sampling parameters accessible for HIP data (in black). Parameters from TYC and HIC are not accessible (in grey).
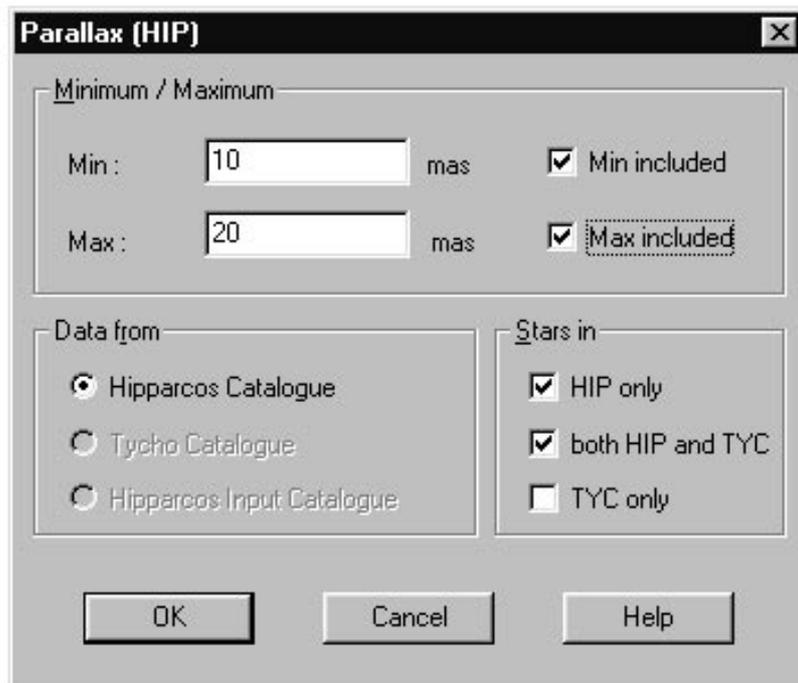
Figure 5. Selection of a sample of HIP stars with a HIP parallax in the range 10–20 mas.
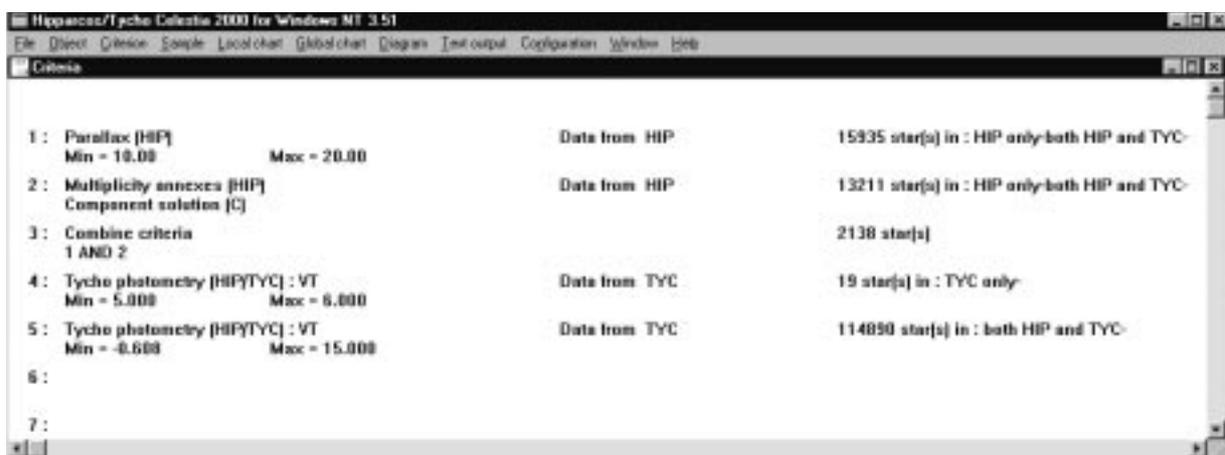
Figure 6. Criteria window