The Hipparcos and Tycho Catalogues

SP–1200
June 1997

The Hipparcos and Tycho Catalogues

Astrometric and Photometric Star Catalogues

derived from the

ESA Hipparcos Space Astrometry Mission

A Collaboration Between

the European Space Agency

and

the FAST, NDAC, TDAC and INCA Consortia

and the Hipparcos Industrial Consortium led by

Matra Marconi Space

and

Alenia Spazio

European Space Agency
Agence spatiale européenne

Cover illustration: an impression of selected stars in their true positions around the Sun, as determined by Hipparcos, and viewed from a distant vantage point. Inset: sky map of the mean observation epoch of stars in the Hipparcos Catalogue, relative to J1991.25, in ecliptic coordinates.

Published by:	ESA Publications Division, c/o ESTEC, Noordwijk, The Netherlands
Scientific Coordination:	M.A.C. Perryman, ESA Space Science Department and the Hipparcos Science Team
Composition:	Volume 1: M.A.C. Perryman Volume 2: K.S. O'Flaherty Volume 3: F. van Leeuwen, L. Lindegren & F. Mignard Volume 4: U. Bastian & E. Høg Volumes 5–11: Hans Schrijver Volume 12: Michel Grenon Volume 13: Michel Grenon (charts) & Hans Schrijver (tables) Volumes 14–16: Roger W. Sinnott Volume 17: Hans Schrijver & W. O'Mullane Typeset using TEX (by D.E. Knuth) and dvips (by T. Rokicki) in Monotype Plantin (Adobe) and Frutiger (URW)
Film Production:	Volumes 1–4: ESA Publications Division, ESTEC, Noordwijk, The Netherlands Volumes 5–13: Imprimerie Louis-Jean, Gap, France Volumes 14–16: Sky Publishing Corporation, Cambridge, Massachusetts, USA
ASCII CD-ROMs:	Swets & Zeitlinger B.V., Lisse, The Netherlands
Publications Management:	B. Battrick & H. Wapstra
Cover Design:	C. Haakman
©1997	European Space Agency ISSN 0379–6566 ISBN 92–9092–399-7 (Volumes 1–17)
Price:	650 Dfl ($400) (17 volumes) 165 Dfl ($100) (Volumes 1 & 17 only)

Volume 1

Introduction and Guide to the Data

Contents

Volume 1: Part 1. The Hipparcos and Tycho Catalogues

Volume 1: Part 2. Description of Catalogues and Annexes

Volume 1: Part 3. Properties of the Catalogues

Volume 1: Appendices

Contents of Volumes 2–17

Preface

The Hipparcos astrometry mission was accepted within the European Space Agency's scientific programme in 1980. The Hipparcos satellite was designed and constructed under ESA responsibility by a European industrial consortium led by Matra Marconi Space (France) and Alenia Spazio (Italy), and launched by Ariane 4 on 8 August 1989. High-quality scientific data were acquired between November 1989 and March 1993, and communications with the satellite were terminated on 15 August 1993. All of the scientific goals motivating the mission's adoption in 1980 were surpassed.

The products of the Hipparcos mission are two major astrometric catalogues, the Hipparcos Catalogue (of 118 218 stars) and the Tycho Catalogue (of more than one million stars), both derived from instruments on board the Hipparcos satellite. The global data analysis tasks, proceeding from nearly 1000 Gbit of raw satellite data to the final catalogues, was a lengthy and complex process, and was undertaken by the NDAC and FAST Consortia, together responsible for the production of the Hipparcos Catalogue, and the Tycho Consortium, responsible for the production of the Tycho Catalogue. A fourth scientific consortium, the INCA Consortium, was responsible for the construction of the Hipparcos observing programme, compiling the best-available data for the selected stars before launch into the Hipparcos Input Catalogue. The production of the Hipparcos and Tycho Catalogues marks the formal end of the involvement in the mission by the European Space Agency and the four scientific consortia.

Each of the catalogues includes a large quantity of very high quality astrometric and photometric data, as well as annexes featuring variability and double/multiple star data. In the case of the Hipparcos Catalogue, the principal parts are provided in both printed and machine-readable form. In the case of the Tycho Catalogue, results are provided in machine-readable form only. Although in general only the final reduced and calibrated astrometric and photometric data are provided, some auxiliary files containing results from intermediate stages of the data processing, of relevance for the more-specialised user, have also been retained for publication.

The printed volumes include both a description of the Hipparcos and Tycho Catalogues and associated annexes, a description of the satellite operational phase, a description of the corresponding data analysis tasks, and the appropriate subsets of the final data. Machine-readable versions of the catalogues are provided in two forms: the definitive mission products are released as a set of ASCII files on a series of CD-ROMs, which contain all of the printed catalogue information as well as some additional data. A distinct CD-ROM product, *Celestia 2000*, contains the principal astrometric and photometric data, in compressed form, along with specific interrogation software.

Considerable emphasis has been placed on presenting a unique set of fully reduced and calibrated astrometric and photometric parameters. An almost conflicting requirement has been to make the final results available promptly. The Hipparcos and Tycho Catalogues have been finalised, documented, and archived within three years of the termination of the satellite operations, and the compilers trust that deviations from a perfect product may be viewed in this context.

M.A.C. Perryman, ESA Project Scientist
E. Høg, Tycho Consortium
J. Kovalevsky, FAST Consortium
L. Lindegren, NDAC Consortium
C. Turon, INCA Consortium

Summary of the Hipparcos and Tycho Catalogues

Measurement period	1989.85–1993.21
Catalogue epoch	J1991.25
Reference system	ICRS
Coincidence with respect to ICRS (all 3 axes)	±0.6 mas
Proper motion deviation from inertial (all 3 axes)	±0.25 mas/yr
Hipparcos Catalogue:	
Number of entries	118 218
Entries with associated astrometry	117 955
Entries with associated photometry	118 204
Mean sky density	~ 3 per square degree
Limiting magnitude	V ~ 12.4 mag
Completeness	Up to V = 7.3 – 9.0 mag
Median precision of positions, J1991.25 ($Hp < 9$ mag)	0.77/0.64 mas (RA/dec)
Median precision of parallaxes ($Hp < 9$ mag)	0.97 mas
Median precision of proper motions ($Hp < 9$ mag)	0.88/0.74 mas/yr (RA/dec)
10 per cent (each of the five parameters) better than	0.47–0.66 mas
Distance determined to better than 10 per cent ($\sigma_\pi/\pi < 0.1$)	20853
Distance determined to better than 20 per cent ($\sigma_\pi/\pi < 0.2$)	49399
Inferred ratio of external errors to standard errors	~ 1.0 – 1.2
Estimated systematic errors in astrometry	< 0.1 mas
Total number of independent astrometric abscissae	~ 3.6×10^6
Median photometric precision (Hp, for $Hp < 9$ mag)	0.0015 mag
Mean number of photometric observations per star	110
Total number of Hp photometric measurements	~ 13×10^6
Number of entries variable or possibly variable	11597 (8237 new)
Periodic variables	2712 (970 new)
Cepheid type	273 (2 new)
RR Lyrae type	186 (9 new)
δ Scuti and SX Phoenicis type	108 (35 new)
Eclipsing binaries (e.g. EA, EB, EW,..)	917 (343 new)
Other types (e.g. M, SR, RV Tau,..)	1238 (576 new)
Non-periodic and unsolved (e.g. RCrB, γ Cas, Z And)	5542 (4145 new)
Not investigated (including micro-variables)	3343 (3122 new)
Number of solved or suspected double/multiple systems	23882
Systems with component data (annex part C)	12195 (2996 new)
Orbital systems (annex part O)	235
Astrometric binaries (annex parts G and V)	2910
Suspected non-single (including annex part X)	8542
Tycho Catalogue:	
Number of entries (including 6301 HIP only)	1 058 332
Mean sky density	~ 25 per square degree
Limiting magnitude	V_T ~ 11.5 mag
Completeness	V_T ~ 10.5 mag
Median astrometric precision (all stars), J1991.25	25 mas
Median astrometric precision ($V_T < 9$ mag), J1991.25	7 mas
Inferred ratio of external errors to standard errors	~ 1.0 – 1.5
Systematic errors in astrometry	< 1 mas
Mean number of astrometric and photometric observations per star	130
Total number of astrometric and photometric observations	~ 130×10^6
Median photometric precision (all stars): B_T, V_T, $B_T - V_T$	0.07, 0.06, 0.10 mag
Median photometric precision ($V_T < 9$ mag): B_T, V_T, $B_T - V_T$	0.014, 0.012, 0.019 mag

Scientific Involvement in the Hipparcos Mission

The Hipparcos observing programme was based upon a single, uniquely-defined Input Catalogue. Compiled at the Observatoire de Paris, Meudon, the preparation of this catalogue involved the collaboration of a large number of ESA Member State scientists—for the detailed assessment of existing astrometric and photometric data, for the extensive compilation of ground-based observations necessary to bring the observing catalogue to the quality required for the satellite observations and data analyses, and for the iterative selection of programme stars made by simulating the satellite observations. While the INCA Consortium Leader was responsible for the Hipparcos Input Catalogue compilation as a whole, various 'task leaders' were responsible for the various subsets of the work. The Consortium included institutes from Belgium, Denmark, France, Germany, The Netherlands, Spain, Switzerland, the U.K., and the U.S.A.

The data analysis tasks were substantial, and the entire organisation of the preparation and execution of the work was complex. The leaders of the three Consortia were assisted by Executive Committees comprising the 'task leaders' responsible for the various disciplines and data processing stages and, where appropriate, by evaluation or software maintenance groups. The work of each Consortium was 'monitored' by a Steering Committee with representatives of each participating country.

Within the NDAC Consortium, the data analysis was performed in the countries which developed the respective software elements—that is, in Denmark, Sweden, and in the U.K., with the individual participating institutes responsible for their own software quality, data interfaces, and data management.

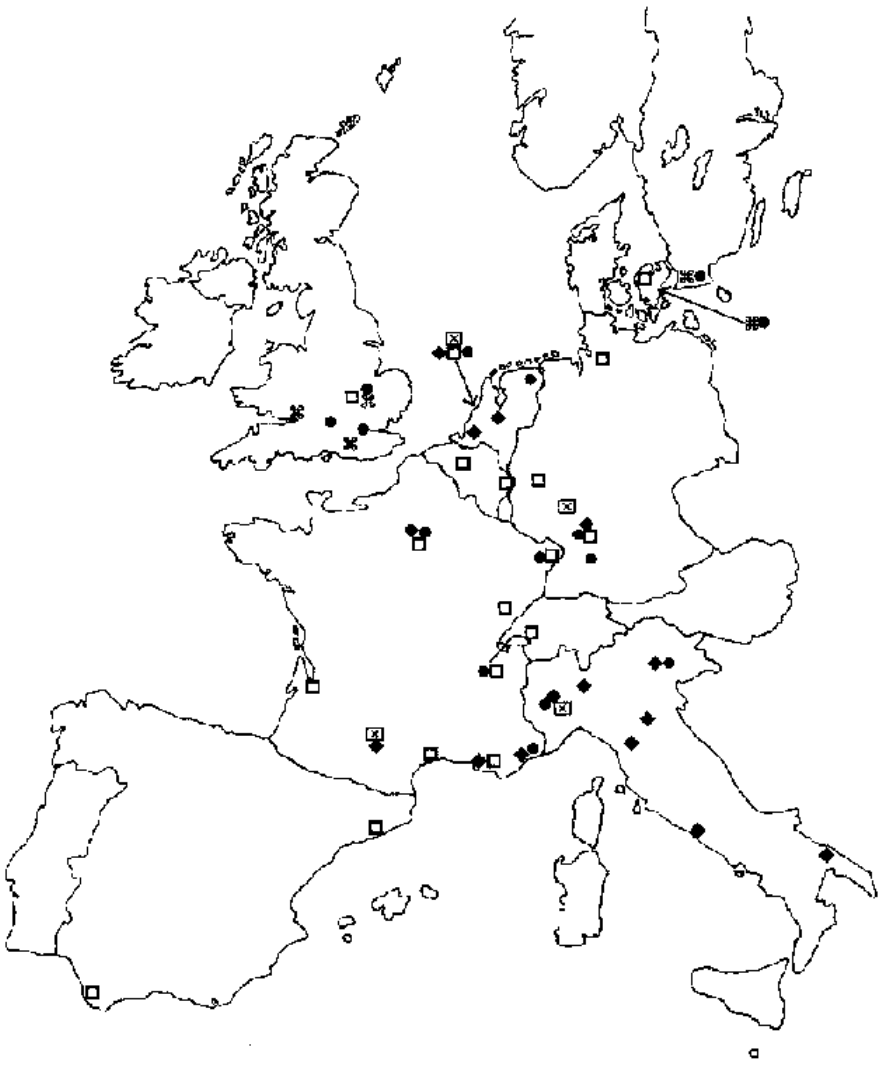
Within the FAST Consortium, all of the integrated software was run within the CNES (Toulouse) computing centre; substantial elements of the integrated software also ran within the Consortium's First-Look Facility at SRON (Utrecht). The software elements of the scientific data processing package were developed within participating institutes in France, Germany, Italy, and The Netherlands. Acceptance tests were run before and after software integration, and the responsible institutes participated closely in the evaluation of results during execution.

The Tycho Consortium relied on some software elements and results of the data processing within NDAC and FAST (in particular, the satellite attitude for TDAC was derived by the NDAC Consortium within Denmark, based upon the first analysis steps carried out in U.K.). The data processing activities specific to the Tycho Catalogue construction were carried out at institutes within Denmark, France, and Germany.

Extensive cross-checking of the intermediate data processing stages was carried out where the expertise and resources permitted. Thus, the one-dimensional 'great-circle' results from FAST and NDAC were intercompared at the Geodetic Institute in Delft, where the relevant FAST software was developed; the precise reconstructed satellite attitude data from both Consortia were intercompared and evaluated at CSS (Torino) where the software for the first stages of the FAST data treatment were developed and coded. Other major intercomparison exercises were carried out at various institutes.

All results, including intermediate catalogues, were compiled in a centralised data base at SRON (Utrecht) where final verification was undertaken.

The scientific activities related to the project were coordinated by the ESA Project Scientist, supported by the Hipparcos Science Team.



FAST: ◆
Asiago
Bari
Bologna
Delft
Firenze
Frascati
Grasse
Haystack (U.S.A.)
Heidelberg
Leiden
Marseille
Milano
Paris
Pasadena (U.S.A.)
Torino
Tououse
Utrecht

NDAC: ⌘
Cambridge
Cardiff
Copenhagen
Dorking
Lund

TDAC: ●
Asiago
Baltimore (U.S.A.)
Cambridge
Chilton
Copenhagen
Geneve
Grasse
Groningen
Heidelberg
Leiden
London
Lund
Paris
Strasbourg
Torino
Tubingen
Washington (U.S.A.)

INCA: ◘
Barcelona
Besancon
Bonn
Bordeaux
Btorfelde
Bruxelles
Cambridge
Cambridge (U.S.A.)
Geneve
Hamburg
Heidelberg
Lausanne
Leiden
Liege
Marseille
Montpellier
Paris
San Fernando
Strasbourg
Texas (U.S.A.)

ESA / Industry: ⊠
ESA/ESTEC
ESA/ESOC
Toulouse (Matra)
Torino (Alenia)

Location of scientific institutes participating in Hipparcos
(irrespective of level of contribution)
ESA-ESTEC, ESA-ESOC and the main industrial contractors are also indicated

The Hipparcos and Tycho Catalogues

resulting from the
European Space Agency's Hipparcos Space Astrometry Mission
have been prepared by:

The NDAC Consortium
under the leadership of
L. Lindegren
Consortium Leader (1990–97)
Lund Observatory
Lund, Sweden
[formerly E. Høg (1982–90)]

The FAST Consortium
under the leadership of
J. Kovalevsky
Consortium Leader (1982–97)
Observatoire de la Côte d'Azur
Grasse, France

for the Hipparcos Catalogue and associated annexes

and

The Tycho Consortium
under the leadership of
E. Høg
Consortium Leader (1983–97)
Copenhagen University Observatory
Copenhagen, Denmark

for the Tycho Catalogue and associated annexes

based on

The Hipparcos Input Catalogue
compiled by
The INCA Consortium
under the leadership of
C. Turon
Consortium Leader (1982–94)
Observatoire de Paris-Meudon
France

and

data from the ESA Hipparcos satellite, operated in orbit 1989–93
acquired under the scientific responsibility of
M.A.C. Perryman
ESA Hipparcos Project Scientist (1981–97)
Space Science Department
European Space Agency, Noordwijk
The Netherlands

Scientific coordination of the Hipparcos project has been led by

M.A.C. Perryman
ESA Hipparcos Project Scientist (1981–97)
European Space Agency, Noordwijk
The Netherlands

and

The Hipparcos Science Team (1981–97 unless otherwise noted):

U. Bastian	Astronomisches Rechen-Institut, Heidelberg, Germany (from 1993)
P.L. Bernacca	Astrophysical Observatory, Asiago, Italy (from 1989)
M. Crézé	Observatoire de Strasbourg, France (from 1983)
F. Donati	Centro di Studi Sui Sistemi, Torino, Italy
M. Grenon	Observatoire de Genève, Switzerland (from 1982)
M. Grewing	Astronomisches Institut, Tübingen, Germany (from 1983)
E. Høg	Copenhagen University Observatory, Denmark
J. Kovalevsky	Observatoire de la Côte d'Azur/CERGA, Grasse, France
F. van Leeuwen	Royal Greenwich Observatory, Cambridge, U.K. (from 1986)
L. Lindegren	Lund Observatory, Sweden
H. van der Marel	Delft University of Technology, The Netherlands (from 1987)
F. Mignard	Observatoire de la Côte d'Azur/CERGA, Grasse, France (from 1991)
C.A. Murray	Royal Greenwich Observatory, Herstmonceux, U.K.
M.A.C. Perryman	European Space Agency, The Netherlands *(Chairman)*
R.S. Le Poole	University of Leiden, The Netherlands
H. Schrijver	SRON, Utrecht, The Netherlands (from 1990)
C. Turon	Observatoire de Paris-Meudon, France

The Hipparcos Science Team, whose composition changed slightly during the lifetime of the Hipparcos project, advised ESA on all scientific aspects of the mission, and held responsibility for the overall scientific conduct of the Hipparcos project, through to the completion and distribution of the final catalogues. Previous members of the Science Team during the satellite design and development phase were P. Brosche (1982), C. Coleman (1981–82), A.M. Cruise (1983–86), D.T. van Daalen (1986), C. Jaschek (1981), M. Saisse (1981), H.G. Walter (1981), C.G. Wynne (1981–84).

The FAST Consortium

France:

M.T. Dumoulin†, J. Falin, J.L. Falin, M. Frœschlé, F. Gazengel, F. Genova, A. Guerry, D. Hestroffer, C. Huc, J. Kovalevsky *(Consortium Leader)*, P. Lacroute†, J.F. Lestrade, C. Martin, F. Mignard, B. Morando†, J.L. Pieplu, G. Serieys, M. Vadel

A. Bec-Borsenberger*, E. Bois*, A. Budowski*, B. Chausserie-Laprée*, S. Daillet*, J. Dupic*, J.Y. Le Gall*, M.H. Gomez*, V. Roman*, C. Taieb*, A. Vargas*, M. Villenave*

Germany:

H.H. Bernstein, C. Dettbarn, R. Hering, H. Lenhardt, S. Röser, H.G. Walter, R. Wielen

U. Bastian*, W. Fricke†

Italy:

M. Badiali, P.L. Bernacca, L. Borriello, B. Bucciarelli, E. Canuto, D. Cardini, F. Donati, A. Emanuele, B. Fassino, M.G. Lattanzi, F.P. Murgolo, R. Pannunzio, G. Prezioso, G. Sechi, A. Spagna

M. Amoretti*, P. Belforte*, D. Bertani*, B. Betti*, D. Carlucci*, M. Cetica*, W. Delaney*, I.I. Galligani*, M. Gonano*, D. Iorio-Fili*, F. Migliaccio*, F. Sansò*, M.G. Schirone*, T. Tommasini*, V. Zappala*

The Netherlands:

W.N. Brouw, H. van der Marel, R.S. Le Poole, H. Schrijver

D.T. van Daalen*, F.A. van den Heuvel*, P.J. de Jonge*, T.M. Kamperman*, J.J. Kok†, G.J. Wiersma*

United States of America:

D.L. Jones, R.B. Phillips, R.A. Preston

* former member, or not active during the data reductions † deceased

The NDAC Consortium

Denmark:
E. Høg, C.S. Petersen

G.K. Andreasen*, P.C. Hansen*, N. Lund*, K. Poder*

Sweden:
L. Lindegren *(Consortium Leader)*, S. Söderhjelm

United Kingdom:
D.W. Evans, F. van Leeuwen, C.A. Murray,
M.J. Penston, N. Ramamani

J.R. Allington-Smith*, S.A. Cowling*, A.M. Cruise*,
N. Elton*, M.A.J. Snijders*, G. Whitfield*

* former member, or not active during the data reductions

The Tycho Consortium

Denmark:
C. Fabricius, E. Høg *(Consortium Leader)*, V.V. Makarov, H. Pedersen, C.S. Petersen

G.K. Andreasen*, P.C. Hansen*, N. Lund*, A.B. Saust*, M. Yoshizawa*

France:
D. Egret, J.L. Halbwachs, J. Kovalevsky, C. Turon

P. Didelon*

Germany:
G. Bässgen, U. Bastian, M. Grewing, V. Großmann,
H. Mauder, D. Scales, P. Schwekendiek, M.A.J. Snijders, K. Wagner, A. Wicenec

Italy:
P.L. Bernacca, F. Donati

The Netherlands:
M.A.C. Perryman

P.R. Wesselius*

Sweden:
L. Lindegren

Switzerland:
M. Grenon

United Kingdom:
F. van Leeuwen

A. Butchins*, D. McNally*, B. Stewart*

United States of America:
B. McLean

J.L. Russell*

* former member, or not active during the data reductions

The INCA Consortium

Belgium:
J. Dommanget, O. Nys

P. Lampens, J. Manfroid

Denmark:
L. Helmer

France:
F. Arenou, A. Bec-Borsenberger, M. Chareton, M. Crézé, F. Crifo, D. Egret, A. Gómez, M.O. Mennessier, D. Morin, L. Prévot, Y. Réquième, M. Rousseau, C. Turon *(Consortium Leader)*

J.E. Arlot, A. Baglin, D. Barthés, M.O. Baylac, J. Delhaye, J.M. Mazurier, E. Oblak, J.P. Périé, M. Rapaport, A. Sellier

Germany:
H. Jahreiß,

P. Brosche, C. Dettbarn, M. Erbach, W. Fricke†, T. Lederle, H.-J. Tucholke, C. de Vegt

The Netherlands:
M.A.C. Perryman

J. Lub, R.S. Le Poole

Spain:
F. Figueras, C. Jordi, L. Quijano, J. Torra

Switzerland:
M. Grenon, J.C. Mermilliod, B. Nicolet

M. Burnet, M. Mermilliod, B. Pernier

United Kingdom:
A.N. Argue

L.V. Morrison, C.A. Murray

United States of America:
P.D. Hemenway, J.A. Mattei

[A complete membership list of the consortium is given in the Hipparcos Input Catalogue, ESA SP–1136, 1992]

† deceased

The Scientific Proposals Selection Committee

(for determining the scientific objectives of the observing programme, 1982–88)

A. Blaauw *(Chairman)*, J. Dommanget, W. Gliese†, M. Hack,
E.P.J. van den Heuvel, C. Jaschek, J. Lequeux, P.O. Lindblad,
A. Maeder, P.E. Nissen, B.E.J. Pagel, A. Renzini,
C. de Vegt, P.A. Wayman, R. Wielen

† deceased

Contributors by Subject: Hipparcos Data Analysis

Image Dissector Tube and
Star Mapper Data Processing
Leaders: F. van Leeuwen (NDAC) & F. Donati (FAST)
E. Canuto, B. Fassino, C.A. Murray

Instrument Calibration
Leaders: J. Kovalevsky, H. Schrijver & F. van Leeuwen
D.W. Evans, J.L. Falin, M.J. Penston

Attitude Determination
Leaders: F. Donati (FAST) & F. van Leeuwen (NDAC)
E. Canuto, M.J. Penston, G. Sechi

Great-Circle Reductions
Leaders: H. van der Marel (FAST) & C.S. Petersen (NDAC)
J.L. Falin

Sphere Solution in FAST
Leader: M. Frœschlé
B. Bucciarelli, M.G. Lattanzi

Astrometric Parameter Determination in FAST
Leaders: H.G. Walter & R. Hering
H.H. Bernstein, C. Dettbarn, J.L. Falin,
M. Frœschlé, H. Lenhardt, F. Mignard

Sphere Solution and
Astrometric Parameter Determination in NDAC
Leader: L. Lindegren
S. Söderhjelm

...continued

Hipparcos Data Analysis (cont.)

Double & Multiple Star Reductions
Leaders: S. Söderhjelm (NDAC) & F. Mignard (FAST)
M. Badiali, P.L. Bernacca, H.H. Bernstein, L. Borriello, D. Cardini,
A. Emanuele, J.L. Falin, F. Gazengel, J. Kovalevsky,
L. Lindegren, C. Martin, R. Pannunzio, G. Prezioso, A. Spagna

Photometric Reductions
Leaders: F. Mignard (FAST) & F. van Leeuwen (NDAC)
D.W. Evans, J.L. Falin, M. Grenon

Operational Software System in NDAC
Leaders: F. van Leeuwen & C.S. Petersen
D.W. Evans, M.J. Penston, S. Söderhjelm

Operational Software System in FAST
Leaders: J.L. Pieplu, J. Kovalevsky & J.L. Falin
E. Canuto, R. Hering, C. Huc, J.J. Kok†, F.P. Murgolo
A. Guerry, J. Dupic, M. Villenave

† deceased

Contributors by Subject: Tycho Data Analysis

Signal Prediction
Leader: U. Bastian
P. Schwekendiek

Signal Detection and Estimation
Leader: A. Wicenec
G. Bässgen

Tycho Input Catalogue Revision
Leader: J.L. Halbwachs
G. Bässgen, U. Bastian, P. Schwekendiek, A. Wicenec

Signal Identification
Leader: K. Wagner
A. Wicenec, P. Schwekendiek

Astrometric Reductions
Leaders: E. Høg & V.V. Makarov
C. Fabricius, H. Pedersen

Photometric Reductions
Leaders: V. Großmann & J.L. Halbwachs
A. Wicenec

Catalogue Production
Leader: E. Høg
D. Egret, C. Fabricius, V. Großmann, V.V. Makarov, A. Wicenec

Scientific Working Groups

Double Star Working Group
Leader: F. Mignard

S. Söderhjelm & L. Lindegren

M. Badiali, H.H. Bernstein, J. Dommanget°, P. Lampens°, R. Pannunzio

Photometry Working Group
Leader: D.W. Evans

F. Mignard & F. van Leeuwen

M. Grenon°, V. Großmann

Variable Star Working Group
Leaders: F. van Leeuwen & M. Grenon°

L. Eyer*, J.A. Mattei°, M.J. Penston

Astrometric Results Merging Working Group
Leader: F. Arenou°

C.A. Murray

M. Frœschlé, F. Mignard, L. Lindegren

Reference Frame Working Group
Leaders: J. Kovalevsky & L. Lindegren

P. Hemenway°, K.J. Johnston*, V. Kislyuk*,
J.F. Lestrade, L.V. Morrison°, I. Platais*, S. Röser,
E. Schilbach*, H.-J. Tucholke°, C. de Vegt°, J. Vondrak*

Documentation Working Group
Leader: M.A.C. Perryman

E. Høg, J. Kovalevsky, F. van Leeuwen, L. Lindegren,
F. Mignard, H. Schrijver, C. Turon°

° INCA Consortium * not a formal member of a Hipparcos scientific consortium

Catalogue Production and Publication

The Hipparcos Catalogue (Volumes 5–9)
Leaders: L. Lindegren & J. Kovalevsky
J.L. Falin, M. Frœschlé, M. Grenon, F. van Leeuwen
F. Mignard, M.A.C. Perryman, H. Schrijver

The Tycho Catalogue
Leader: E. Høg
G. Bässgen, U. Bastian, D. Egret, C. Fabricius,
V. Großmann, J.L. Halbwachs, V.V. Makarov,
P. Schwekendiek, K. Wagner, A. Wicenec

Double and Multiple Systems Annex (Volume 10)
Leaders: S. Söderhjelm, L. Lindegren & F. Mignard
F. Arenou°, M. Badiali, H.H. Bernstein, J. Kovalevsky,
C. Martin, R. Pannunzio, R. Wielen

Solar System Observations (Volume 10)
Leaders: D. Hestroffer & B. Morando†
U. Bastian, E. Høg, J. Kovalevsky, L. Lindegren,
V.V. Makarov, F. Mignard, C.A. Murray

Variability Annex (Volume 11)
Leaders: F. van Leeuwen & M. Grenon°
D.W Evans, L. Eyer*, M.J. Penston
M.B. van Leeuwen-Toczko*, S. Meara*, C. Waelkens*, I. Zegelaar*
N.N. Samus*, M.S. Frolov*, O.V. Durlevich*, E.V. Kazarovets*

Light Curves (Volume 12)
Leaders: M. Grenon° & F. van Leeuwen
D.W Evans, L. Eyer*, G. Foster*, J.A. Mattei°, M.J. Penston

Identification Charts (Volume 13)
Leader: M. Grenon°
D. Mégevand*, L. Weber*

Millennium Star Atlas (Volumes 14–16)
Leaders: R.W. Sinnott* & M.A.C. Perryman
H. Schrijver, E. Høg
E.T. Mentall*, R.T. Fienberg*, G. Dinderman*, S.M. MacGillivray*, L.J. Robinson*

...continued

° INCA Consortium † deceased
* not a formal member of a Hipparcos scientific consortium

Catalogue Production and Publication (cont.)

Hipparcos Catalogue: Epoch Photometry Annex
Leaders: D.W. Evans & F. Mignard
M. Grenon°, F. van Leeuwen

Tycho Catalogue: Epoch Photometry Annex
Leader: V. Großmann
A. Wicenec, G. Bässgen, U. Bastian,
J.L. Halbwachs, V.V. Makarov, K. Wagner

Hipparcos Intermediate Astrometry
Leaders: F. Arenou° & C.A. Murray
J.L. Falin, M. Frœschlé, L. Lindegren, F. Mignard

Hipparcos Transit Data
Leaders: S. Söderhjelm & L. Lindegren

ASCII CD-ROM Organisation
Leaders: H. Schrijver & M.A.C. Perryman
K.S. O'Flaherty*, W. O'Mullane*

***Celestia 2000* CD-ROM**
Leaders: D. Priou* & C. Turon°
M.A.C. Perryman, E. Høg, L. Lindegren,
U. Bastian, D. Morin°, H. Schrijver

Results Data Base and Catalogue Unification
Leader: H. Schrijver

Printed Catalogue: Layout and Production
Leaders: H. Schrijver & M.A.C. Perryman

Star Identification Tables (Volume 13)
Leader: H. Schrijver
D. Morin°

Statistical Properties (Section 3)
Leader: H. Schrijver
J.L. Falin, L. Lindegren, F. Mignard
C. Fabricius, V.V. Makarov

° INCA Consortium * not a formal member of a Hipparcos scientific consortium

Catalogue and Annex Descriptions and Formats

Leader: M.A.C. Perryman
U. Bastian, E. Høg, F. van Leeuwen, L. Lindegren,
F. Mignard, H. Schrijver, C. Turon

Technical and Industrial Involvement

The ESA Hipparcos Project Team

(management of the satellite development and operations by ESA-ESTEC since 1981)

L. Emiliani (Project Manager, 1980–84)
H. Hassan (Project Manager, 1984–89)
M.A.C. Perryman (Project Manager, 1990–93)

Section Heads (at Flight Acceptance Review):
K. Clausen (spacecraft), K. van Katwijk (payload),
O. Pace (integration), M. Schuyer (system analysis)

T. Batut, K.D. Bock, R. Bonnefoy, H.A. Eggel, A. Errington,
H.K. Fiebrich, P. Gleadle, J. van der Ha (ESOC), L. Hansson, K. Hühn,
D. Huthoff, E. Jäkel, G. Jung, B. Kroese, T. van der Laan,
H. Laue (ESOC), W. Liebrandt, P.N. Morgan, G. Ratier, S. Schroeder†,
M. Setzke, M.J. Smith, S. Vaghi, R.D. Wills, D.R. Wotton

The ESOC Mission Operations Team

(operation of the Hipparcos satellite in orbit by ESA-ESOC)

Operations & Mission Analysis:
D. Heger, H. Nye
M. McCaig, J. Nolan, O. Ojanguren, C. Sollazzo
R. Leroux, M. Monaldi, E. Schambion, P. Vogt

Mission Analysis:
J. van der Ha, H.-H. Klinkrad

Flight Dynamics:
A. Schütz
A. Batten, P. Davies, A. McDonald, S. Retbøll
P. de Broeck†, P. Kristiansen

Software Support:
N. Head
J. Allan, R. Blake, J. Harborne, M. Keenan, C. Spanholtz

[A complete list of the ESOC Mission Operations Team is given in Volume 2]

† deceased

The Hipparcos Industrial Development Team

(for industrial development of the Hipparcos satellite)

Matra Marconi Space, Toulouse, France
(Satellite Prime Contractor and Payload Development)

C. Guionnet, Project Manager: 1982–85
M. Bouffard, Project Manager: 1985–90

Assistant Project Managers (at Flight Acceptance Review):
M. Le Moine (system), G. Fade (payload), R. Giralt (integration),
J. Tisserant (project control), M. Siguier (product assurance), G. Martin (contracts)

J.J. Arnoux, I. Asseman, A. Bader, G. Bajard, J.J. Bertier, C. Biscans,
E. Bonnes, C. Bousquet, L. Brett, B. Calvel, J.P. Camus, C. Cantone,
S. Carthade, G. Chenut, M. Comet-Barthe, H. Costard, C. Dagras,
D. Dubet, M. Duran, A.M. Florentin, M. Fruit, J.P. Gardelle, V. Gardes,
B. Gonzalez, F.X. Guerre, M. Hervieux, P. Hollier, N. Iche, G. Laffaye,
A. Le Nenaon, J.P. Noel, C. Page, D. Pawlak, G. Planche, J.M. Pochet,
P. Ranzoli, J.P. Roujas, I. Rouvière, J.M. Rupil, K. Soukhavong, G. Soulat,
P. Temporelli, E. Truelle, D. Valat, E. Zeis, D. Zeller

Alenia Spazio, Torino, Italy
(Co-Prime Contractor: Spacecraft Procurement
and Satellite Assembly, Integration & Test)

B. Strim, Project Manager

Assistant Project Managers:
G. Finocchiaro (spacecraft procurement), W. Cugno (integration and test),
S. Rota (project control), G. Giusiano (product assurance),
C. Fea (contracts)

B. Bonafede, M. Braida, P. Baù, M. Bonato, M. Bianco,
G. Bria Berter, M. Casale, M. Cernicchiaro, M. Curletti, A. De Biasi,
G. De Bernardi, G. Fimognari, F. Frittella, E. Giorgio, G. Giulianelli,
C. Godoli, G. Morsillo, L. Matteotti, A. Marotta, M. Marchi,
G. Marocco, M. Mottica, C. Ostorero, A. Pavarani, O. Piersanti,
A. Polirpo, G. Patti, F. Pradotto, V. Roberto, S. Rustichelli,
F. Raineri, A. Regis, P. Rossotto, P. Santoro, P. Strada,
M. Teghille, R. Tosini, L. Terrasi, R. Veneri, D. Vettorato

Payload Industrial Sub-Contractors:

Carl Zeiss, Oberkochen, Germany
Spherical and Folding Mirrors, Relay Optics
W. Egle

CASA, Madrid, Spain
Payload External Baffles
J. Larrauri

CSEM, Neuchatel, Switzerland
Modulating Grid
M. Roulet

Dornier Satellitensysteme, Friedrichshafen, Germany
Mechanism Drive Electronics & Thermal Control Electronics
W. Wlaka

IAL, Liège, Belgium
Optical Ground Support Equipment and Payload Calibration
C. Jamar

LAS, Marseille, France
Optical Performance and Alignment
M. Saisse, J.-Y. Le Gall

Matra Marconi Space, Velizy, France
Optical Filters
D. Laroche

Matra Marconi Space, Velizy, France
Payload Structure
J.-P. Allard

Oerlikon-Contraves, Zurich, Switzerland
Flip-Flop Mechanisms
M. Gygax

REOSC, St Pierre du Perray, France
Beam Combiner
R. Geyl

SRON, Utrecht, The Netherlands
Detection Subsystem
R. Hoekstra

TPD-TNO, Delft, The Netherlands
Refocusing Assembly, Grid Calibration, Straylight Analysis
M. Hammerschlag†, H.J. van Agthoven

† deceased

Spacecraft Industrial Sub-Contractors (at Subsystem Level):

British Aerospace, Bristol, United Kingdom
Electrical Power and Harness
R.H.W. Fox

Daimler-Benz Aerospace (formerly MBB-ERNO), Bremen, Germany
Structure and Reaction Control
J. Thaeter

Fokker Space and Systems, Leiden, The Netherlands
Solar Arrays
C.W. Claassens

Fokker Space and Systems, Leiden, The Netherlands
Thermal Control
T. Olievierse

Matra Marconi Space, Velizy, France
Attitude and Orbit Control
R. Cau

Saab-Ericsson Space, Gotenborg, Sweden
Data Handling and Telecommunications
B. Lind

SEP - Société Européenne de Propulsion, Moissy, France
Apogee Boost Motor
W. Asad

Software Industrial Sub-Contractors:

CAPTEC, Dublin, Ireland
In-Orbit Payload Calibration
F. Kennedy

Logica UK, London, United Kingdom
Accuracy Assessment
P.E. Davies