



**Astrometrische Messungen an Kleinplaneten zur Beantragung eines
Observatory Codes der Internationalen Astronomischen Union
für die Taunus-Sternwarte**

Kurzbericht,
Email Korrespondenz und Messgenauigkeit

Erwin Schwab
Rainer Kling



Astrometrische Messungen an Kleinplaneten zur Beantragung eines Observatory Codes der Internationalen Astronomischen Union für die Taunus-Sternwarte.

Kurzbericht, Email Korrespondenz und Messgenauigkeit

Im Zeitraum vom 6.6.2006 bis 8.6.2006 wurden von Rainer Kling und Erwin Schwab die Asteroiden (612) Veronika und (2303) Retsina am 0,6 Meter Teleskop der Hans Ludwig Neumann Sternwarte des Standorts Taunus Observatorium mit der Digitalkamera SBIG 11000¹ fotografiert und anschließend von Erwin Schwab mit der Software Astrometrica² und dem Referenzstern - Katalog UCAC-2³ ausgewertet.

Die Ergebnisse wurden am 10.6.2006 zur INTERNATIONALEN ASTRONOMISCHEN UNION (IAU), Abteilung MINOR PLANET CENTER (MPC)⁴, im vorgeschriebenem Format via Email gesendet.

Am 14. 6. 2006 kam die Nachricht von Gareth Williams, associate director of the MINOR PLANET CENTER, dass die Taunus Sternwarte den **Observatory Code B01** (in Worten B Null Eins) erhalten hat. Der Observatory Code der Taunus Sternwarte wurde im Minor Planet Circular # 57067 vom Juli 2006 veröffentlicht⁵ und ist hier auszugsweise abgedruckt:

Code	Long.	$\rho \cdot \cos(\phi')$	$\rho \cdot \sin(\phi')$	Name
B01	8.4464	0.64117	+0.76499	Taunus Observatory, Frankfurt

(Erläuterung der Spalten: Observatory Code Nummer, geozentrischer Längengrad, Parallaxen-Konstanten für die geozentrische Breite des Erd - Ellipsoids, Name der Sternwarte)

Der Standort-Name **Taunus Observatory** wurde nach Absprache zwischen Rainer Kling, Erwin Schwab und dem Leiter des Astronomischen Arbeitskreises Volker Heinrich für diesen internationalen Eintrag bevorzugt gegenüber dem eigentlichen Sternwarten-Namen **Hans Ludwig Neumann**. Die Hinzufügung des Ortsnamens Frankfurt erfolgte nach Email Korrespondenz zwischen Gareth Williams und Erwin Schwab.

Zukünftige astrometrische Messungen an den Teleskopen der Taunus-Sternwarte können von nun an unter dem Observatory Code B01 der Wissenschaft zur Berechnung aktueller Bahnen von Asteroiden, Kometen und natürlichen Satelliten schnellstmöglich zur Verfügung gestellt werden.

Der mittlere Fehler der Positionsmessungen in Bezug zu den Referenzsternen liegt in Deklination und Rektaszension unter 0,08 Bogensekunden (siehe Anhang Protokoll der Auswertung). Im Vergleich zu den Bahnelementen liegen die Fehler unserer Messungen nach Berechnung des MINOR PLANET CENTERs (MPC) beim Asteroiden Veronika im Bereich 0,0" bis 0,1" und beim Asteroiden Retsina im Bereich 0,1" bis 0,3". Im Anhang „Residuals“ werden diese Fehler im Vergleich zu anderen Observatorien gezeigt.

Erwin Schwab

¹ <http://www.sbig.com/>

² <http://www.astrometrica.at/>

³ <http://ad.usno.navy.mil/ucac/>

⁴ <http://www.cfa.harvard.edu/iau/mpc.html>

⁵ <http://cfa-www.harvard.edu/iau/MPCSummary/20060711.pdf>

Anhang:

Email Korrespondenz

Protokoll der Auswertung

Residuals relativ zu der vom MPC berechneten Bahn der Asteroiden

Veröffentlichung des Observatory Codes im M.P.C. 57067 mit „Summary list“ M.P.C 57126

Position der Ostkuppel und Umrechnung von geographische in geozentrische Koordinaten

Betreff: [xxx] Routine Astrometry

Von: Erwin Schwab <erwinschwab@arcor.de>

Datum: Sat, 10 Jun 2006 17:37:50 +0200

An: mpc@cfa.harvard.edu

BCC: r.kling@physikalischer-verein.de, v.heinrich@physikalischer-verein.de, e.schwab@gsi.de

COD XXX

COM Long. 08 26 47.2 E, Lat. 50 13 18.0 N, Alt. 825m

COM Taunus Observatory

CON E. Schwab, Westendstr. 8, D-63329 Egelsbach, Germany [e.schwab@gsi.de]

OBS R. Kling, E. Schwab

MEA E. Schwab

TEL 0.6-m f/9.5 Cassegrain + CCD

ACK MPCReport file 2006.06.10 16:42:12

AC2 e.schwab@gsi.de , r.kling@physikalischer-verein.de

NET UCAC-2

00612	C2006	06	06.99461	19	22	31.59	+08	52	07.4	14.7	V	XXX
00612	C2006	06	07.00029	19	22	31.48	+08	52	10.8	14.8	V	XXX
00612	C2006	06	07.00353	19	22	31.41	+08	52	12.7	14.7	V	XXX
00612	C2006	06	07.00926	19	22	31.30	+08	52	16.1	14.7	V	XXX
00612	C2006	06	07.02308	19	22	31.03	+08	52	24.5	14.8	V	XXX
00612	C2006	06	07.03042	19	22	30.89	+08	52	28.7	14.7	V	XXX
00612	C2006	06	08.92299	19	21	54.49	+09	10	49.3	14.4	V	XXX
00612	C2006	06	08.93809	19	21	54.16	+09	10	57.9	14.5	V	XXX
02303	C2006	06	08.92654	18	24	06.32	+03	19	08.9	16.1	V	XXX
02303	C2006	06	08.93243	18	24	06.07	+03	19	10.0	16.2	V	XXX
02303	C2006	06	08.93520	18	24	05.95	+03	19	10.8	16.2	V	XXX

----- end -----

Betreff: Observatory code

Von: gwilliams@cfa.harvard.edu (gwilliams@cfa.harvard.edu)

Datum: Wed, 14 Jun 2006 18:15:47 -0400 (EDT)

An: ERWINSCHWAB@arcor.de

Your site is now code B01.

Gareth V. Williams, MS 18, 60 Garden Street, Cambridge, MA 02138, U.S.A.
Associate Director, Minor Planet Center gwilliams@cfa.harvard.edu
<http://cfa-www.harvard.edu/iau/mpc.html>
OpenVMS and RISC OS: Refined Choices in Operating Systems

Veroni ka Resi dual s. txt

612 Veroni ka

Epoch 2006 Mar. 6.0 TT = JDT 2453800.5
M 317.46071 (2000.0) P Goffi n
n 0.17574133 Peri. 119.85232 +0.78131978 +0.60758586 T = 2454042.55625
JDT
a 3.1566040 Node 203.66890 -0.62051057 +0.78079583 q = 2.3410838
e 0.2583537 Incl. 20.83000 +0.06712704 +0.14559290
P 5.61 H 11.2 G 0.15 U 0
From 171 observations at 15 oppositions, 1906-2000, mean residual 0".54.

Resi dual s

19061008	024	0.5+	1.7-	20000803	704	0.1+	0.4+	20030309	704	0.4+	1.0-
19061012	045	(5.9+	1.9-)	20000803	704	0.6+	0.4+	20030309	704	0.1-	1.1-
19061012	045	1.0+	1.2+	20000803	704	0.4+	0.6+	20030309	704	0.6+	1.0+
19061017	045	(3.5+	4.1-)	20000803	704	1.0+	0.5+	20030309	704	0.7+	0.5-
19061023	045	1.8+	1.4-	20010729	699	0.5+	0.7+	20030309	704	1.2+	0.4+
19061108	024	(3.9+	3.3-)	20010729	699	0.4+	0.6+	20030309	704	1.4+	1.0+
19061108	024	(5.2+	5.5-)	20010729	699	0.5+	0.7+	20040108	608	1.0+	0.2+
19061111	045	(4.9+	0.4-)	20010729	699	0.4+	0.7+	20040108	608	1.0+	0.1+
19340930	690	(3.6+	1.5+)	20010731	704	0.2-	0.2+	20040108	608	0.8+	0.2+
19341002	690	(2.6+	3.2+)	20010731	704	0.8+	0.6+	20040116	644	0.5+	0.0
19341004	690	(3.7+	1.0+)	20010731	704	0.1-	0.6+	20040116	644	0.4+	0.2+
19500607	760	2.4+	1.4-	20010731	704	1.4+	0.1+	20040116	644	0.4+	0.2+
19500607	760	(6.3-	0.1-)	20010817	704	1.4-	0.7+	20040124	608	0.3-	0.6-
19621101	760	1.0-	2.2+	20010817	704	0.2+	1.0+	20040124	608	0.1-	0.7-
19730907	095	(3.7+	10.1-)	20010817	689	0.2+	0.0	20040124	608	0.2-	0.7-
19730920	675	1.1+	0.9-	20010818	689	0.2+	0.0	20040128	704	1.3+	0.3+
19730920	675	1.1+	1.0+	20010822	704	0.8+	1.7+	20040128	704	0.1+	0.6+
19730924	675	0.6-	0.9+	20010824	704	0.3+	0.0	20040128	704	0.6+	0.7+
19730924	675	0.5+	1.8+	20010824	704	0.5+	1.5+	20040128	704	0.4+	0.7-
19730925	675	0.4-	0.5+	20010825	704	0.4-	1.7+	20040128	704	0.3-	0.8+
19730925	675	0.5-	0.8+	20010825	704	0.8-	1.9+	20040129	689	0.8-	0.3+
19730929	675	0.5-	0.8+	20010825	704	0.7+	0.2+	20040130	689	0.1-	0.1+
19730929	675	0.5-	0.1-	20010825	704	0.3-	0.1+	20040204	608	0.1-	0.2-
19730930	675	0.3-	0.1+	20010825	704	0.5+	0.5+	20040204	608	0.2-	0.3-
19730930	675	0.3+	0.0	20010825	704	0.7+	0.4+	20040204	608	0.1-	0.2-
19731001	095	(1.9-	2.9+)	20010825	704	0.5+	0.9-	20040212	689	0.1-	0.2+
19731004	675	0.6-	1.5-	20010826	689	0.1+	0.0	20040214	644	0.5+	0.2+
19731004	675	2.0-	1.9-	20010828	689	0.1+	0.0	20040214	644	0.3+	0.1+
19731005	675	(0.2-	3.7-)	20010830	689	0.0	0.0	20040214	644	0.4+	0.1-
19731005	675	0.7+	2.1-	20010901	689	0.1-	0.0	20040220	704	0.6+	0.0
19731029	095	0.8+	0.3+	20010905	689	0.1-	0.2+	20040220	704	0.1+	0.2+
19741213	808	0.5-	1.9+	20010908	689	0.0	0.1-	20040220	704	0.1-	0.7+
19741213	808	0.4-	0.3+	20010910	704	0.4-	1.3+	20040220	704	0.8+	1.4+
19741214	808	0.2-	0.8+	20010910	704	0.3-	0.5+	20040220	704	0.2+	0.2+
19741215	808	0.2+	0.8+	20010910	704	0.2-	0.6+	20040226	689	0.1-	0.3+
19741215	808	0.1+	0.4+	20010910	704	0.1+	0.6+	20040227	608	0.6-	1.7+
19741217	808	0.3-	1.0+	20010910	704	1.1-	0.6-	20040227	608	0.7-	1.8+
19741220	808	0.9+	0.9+	20010913	689	0.1+	0.1+	20040227	608	0.7-	1.6+
19741220	808	0.3+	1.0+	20010917	704	0.0	0.4+	20040309	608	0.6+	0.5+
19750111	808	0.4-	0.6+	20010917	704	0.3+	0.4+	20040309	608	0.9+	0.4+
19750111	808	0.6-	0.4+	20010917	704	0.1+	0.3-	20040309	608	0.5+	0.4+
19750115	808	2.0-	0.4+	20010917	704	0.1+	0.2+	20040314	644	0.4+	0.1+
19750115	808	1.6-	0.2+	20010917	689	0.1+	0.1-	20040314	644	0.0	0.1+
19791022	801	0.8+	0.5+	20010917	704	0.1+	0.0	20040314	644	0.4+	0.1+
19791023	801	1.2-	0.9+	20010918	689	0.1+	0.1+	20040314	644	0.0	0.0
19791023	323	2.0+	1.4+	20010920	704	0.3-	0.2+	20040314	644	0.4+	0.2+
19791023	323	1.9+	1.1+	20010920	704	0.2-	0.5+	20040314	644	0.1+	0.1-
19791024	323	0.6+	0.5+	20010920	704	0.0	0.5+	20040316	704	0.5+	0.1+
19791028	688	0.8+	1.9-	20010920	704	0.2-	0.5-	20040316	704	0.6+	0.4+
19791119	511	0.7-	0.3-	20010920	704	0.2+	0.4+	20040316	704	0.0	0.2+
19791121	511	1.9-	0.9-	20010920	704	0.2+	0.9+	20040316	704	0.6+	0.4+
19791121	511	1.1-	0.6-	20010920	704	0.2+	0.7+	20040316	704	0.2-	0.6+
19791121	511	0.5-	0.3-	20010920	704	0.3+	0.8+	20040326	699	0.1+	0.2+
19791121	808	1.0+	0.1+	20010920	704	0.0	0.4-	20040326	699	0.1+	0.3-
19791121	808	0.3-	0.8+	20010920	704	0.1+	0.5+	20040326	699	0.1+	0.2-
19791121	511	0.7-	0.1-	20010920	704	0.0	0.6+	20040326	699	0.0	0.1+
19791121	511	0.8-	0.2-	20010920	704	0.1-	0.6-	20040328	703	0.1-	0.1-
19791122	688	(0.7+	3.5-)	20010920	704	0.6-	1.1-	20040328	703	0.6+	0.2+
19791124	323	1.8-	1.0+	20010920	704	0.0	0.4+	20040328	703	1.1-	0.0
19791124	323	1.6-	0.6+	20010920	704	0.0	0.3+	20040328	703	(0.6-	2.8+)
19791208	688	1.4+	2.4-	20010923	689	0.0	0.1+	20040404	608	0.1-	1.0-
19791209	323	1.8-	0.2+	20010923	704	0.1-	0.6+	20040404	608	0.1+	1.0-
19791209	323	2.0-	0.4-	20010923	704	0.8-	0.7+	20040404	608	0.2+	0.9-
19800116	323	0.1+	1.8-	20010923	704	0.7-	0.3-	20040416	704	0.3+	0.8-
19830412	095	0.4+	0.4-	20010923	704	0.1-	0.3-	20040416	704	1.1+	0.3+
19830419	688	(0.9+	2.7-)	20010924	704	0.1-	0.7+	20040416	704	1.8+	0.1-
19830419	688	(1.1+	2.5-)	20010924	704	0.2-	0.4+	20040416	704	(2.0+	0.3-)
19880413	054	1.7+	0.7-	20010924	704	0.3-	0.5+	20040416	704	0.8+	1.1+
19901016	809	0.6-	0.7-	20010924	704	0.3-	0.4+	20040424	703	0.4+	0.0
19901016	809	1.0-	0.6-	20010924	704	0.3-	0.1+	20040424	703	0.3+	0.2-
19901016	809	0.9-	0.2-	20010927	689	0.0	0.1-	20040424	703	0.6+	0.3+
19901016	809	1.2-	0.4-	20010930	689	0.1+	0.0	20040424	703	0.3+	0.1+

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20000416	689	0.2-	0.1-	20011207	704	0.1-	0.7+	20050731	E12	0.3+	0.2-
20000417	689	0.3-	0.1-	20011207	704	0.3-	0.4+	20050731	E12	0.4-	0.1-
20000424	689	0.0	0.1+	20011210	689	0.0	0.0	20060408	704	0.1+	0.4+
20000426	689	0.2-	0.2-	20011218	704	(2.3-	0.3+)	20060408	704	0.0	0.3+
20000428	689	0.1+	0.3-	20011218	704	0.3+	0.7-	20060408	704	0.4-	0.9+
20000428	704	0.7+	0.1-	20011218	704	0.8+	0.1+	20060408	704	0.5-	0.7+
20000428	704	0.5+	0.7+	20020109	689	0.2+	0.3+	20060408	704	0.2+	0.6+
20000428	704	0.2+	0.4+	20020111	689	0.1-	0.3-	20060421	704	0.5-	0.5+
20000428	704	0.3-	1.1+	20020114	704	0.5-	0.7+	20060421	704	0.4-	0.4+
20000503	689	0.2-	0.0	20020114	704	0.2-	0.8+	20060421	704	0.5-	0.4+
20000506	704	0.5+	0.4+	20020114	699	0.3-	0.3+	20060421	704	0.2-	0.1+
20000506	704	0.1+	0.9+	20020114	704	0.3-	0.7+	20060421	704	0.5-	0.2-
20000506	704	0.3-	0.7+	20020114	699	0.3-	0.3+	20060425	704	1.6-	0.0
20000506	704	0.2-	0.7+	20020114	704	0.3-	0.6+	20060425	704	0.7-	0.0
20000506	704	0.6-	1.1+	20020114	699	0.1-	0.6-	20060425	704	1.6-	0.7+
20000507	689	0.2-	0.0	20020114	704	0.0	0.6+	20060425	704	0.3-	0.3-
20000512	704	0.1+	0.5+	20020114	699	0.2-	0.4+	20060425	704	1.4-	0.3+
20000512	704	0.3+	0.4+	20021008	673	0.1+	0.0	20060505	673	0.0	0.0
20000512	704	1.1+	0.3+	20021008	673	0.0	0.0	20060505	673	0.0	0.0
20000512	704	0.1-	1.5+	20021009	673	0.0	0.0	20060506	673	0.0	0.0
20000512	704	0.1+	0.3+	20021009	673	0.0	0.0	20060506	673	0.0	0.0
20000514	689	0.3+	0.2-	20021029	673	0.1+	0.1-	20060525	704	0.7-	1.7+
20000528	704	1.2+	0.0	20021029	673	0.1+	0.1-	20060525	704	0.0	0.4+
20000528	704	0.7+	0.9+	20021031	704	0.0	0.4-	20060525	704	1.0-	1.6+
20000528	704	0.8+	0.8+	20021031	704	0.2+	0.3-	20060525	704	1.1-	1.8+
20000528	704	0.9+	0.6+	20021031	704	1.2+	1.3-	20060525	704	0.2+	0.4+
20000528	704	0.4+	1.1+	20021031	704	0.3+	0.9-	20060529	A98	0.2+	1.1-
20000601	608	0.1-	0.3+	20021031	704	0.4+	1.5-	20060529	A98	0.1+	0.3-
20000601	608	0.0	0.2+	20021101	689	0.1-	0.2+	20060530	A98	1.2-	0.2-
20000601	608	0.1-	0.1+	20021104	689	0.0	0.1-	20060530	704	0.2-	0.7+
20000604	699	0.3+	0.3+	20021112	689	0.2+	0.1+	20060530	704	0.1-	0.6+
20000604	699	0.5+	0.3+	20021126	689	0.3+	0.3+	20060530	704	0.1+	0.7+
20000604	699	0.6+	0.3+	20021206	689	0.0	0.1+	20060530	704	1.3+	0.9+
20000604	699	0.3+	0.5+	20021213	689	0.0	0.2-	20060530	704	1.2+	1.7+
20000606	689	0.1-	0.0	20030102	704	0.1-	0.1+	20060601	A98	0.3+	0.5-
20000610	704	0.4+	0.2-	20030102	689	0.1-	0.1+	20060601	A98	0.3-	0.2-
20000610	704	0.7+	0.4-	20030102	704	0.1-	0.3-	20060602	673	0.0	0.0
20000610	704	0.0	0.2-	20030102	704	0.2-	0.1+	20060602	673	0.0	0.0
20000618	608	0.6-	0.3+	20030102	704	0.6-	0.1-	20060603	673	0.0	0.0
20000618	608	0.7-	0.0	20030102	704	0.3-	0.1-	20060603	673	0.0	0.0
20000618	608	0.8-	0.0	20030104	689	0.3+	0.0	20060606	B01	0.0	0.1-
20000620	689	0.0	0.1+	20030127	689	0.0	0.3-	20060607	B01	0.0	0.1-
20000623	689	0.1-	0.0	20030129	704	0.2+	0.3-	20060607	B01	0.1-	0.1-
20000625	689	0.0	0.1-	20030129	704	0.1+	0.0	20060607	B01	0.1-	0.1-
20000702	689	0.2-	0.1+	20030129	704	0.3+	0.2+	20060607	B01	0.1-	0.1+
20000707	689	0.3-	0.2-	20030129	704	0.2+	0.3+	20060607	B01	0.1-	0.1-
20000801	699	0.3+	0.5+	20030129	704	0.1+	0.5+	20060608	B01	0.1+	0.1+
20000801	699	0.2+	0.6+	20030309	704	0.7+	0.4-	20060608	B01	0.0	0.0
20000801	699	0.1+	0.4+	20030309	704	0.6+	0.2-	20060615	704	0.1+	0.8+
20000801	699	0.3+	0.3+	20030309	704	0.8+	0.4-	20060615	704	0.3-	0.7+
20000803	704	0.1+	0.6+	20030309	704	0.8+	0.4-	20060615	704	1.4+	0.5+

Last observed on 2006 June 26. Perturbed ephemeris below based on elements from MPO 3854.

Retsi na Resi dual s. txt

2303 Retsi na

Epoch 2006 Mar. 6.0 TT = JDT 2453800.5
 M 72.72900 (2000.0) P Forti Q
 n 0.19021268 Peri. 331.48494 -0.96731400 -0.23833165 T = 2453418.14380
 JDT
 a 2.9943995 Node 195.47481 +0.24579983 -0.96520724 q = 2.6441007
 e 0.1169846 Incl. 18.94226 -0.06233838 -0.10757790
 P 5.18 H 11.0 G 0.15 U 1
 From 44 observations at 11 oppositions, 1974-1997, mean resi dual 0".77.

Resi dual s											
19740320	095	0.0	0.8-	20000525	699	0.1+	0.4+	20031205	703	0.2+	0.2+
19740322	805	0.7-	1.2+	20000525	699	0.3+	0.6+	20031205	703	0.0	0.4+
19740323	805	0.1-	1.7+	20000624	704	0.2-	0.0	20031205	703	0.2+	0.3+
19790324	026	0.4+	1.2-	20000624	704	0.2+	0.1-	20031213	704	0.7+	0.2+
19790324	026	0.3-	0.1-	20000624	704	0.5+	0.4-	20031213	704	0.4+	0.2+
19790414	026	0.1-	1.3+	20000624	704	0.8+	0.2-	20031213	704	0.2-	0.5+
19790419	026	(2.6+ 1.9+)		20000624	704	1.7+	0.3-	20031213	704	0.6+	0.0
19790419	026	(3.5+ 2.5+)		20010523	704	0.0	0.5-	20031213	704	0.3+	0.2-
19790424	026	2.1+ 1.8+		20010523	704	0.1+	0.1-	20031224	608	0.4+	0.9+
19790424	026	0.7+ 1.8+		20010523	704	0.0	0.5+	20031224	608	0.4+	0.9+
19800417	801	1.5-	0.6+	20010523	704	0.9-	0.5+	20031224	608	0.4+	0.9+
19800516	801	0.1-	0.2-	20010526	683	0.0	1.6+	20040110	608	0.4-	0.2-
19800606	801	0.9+	0.3-	20010526	683	0.2+	1.1-	20040110	608	0.5-	0.2-
19800707	801	0.3+	0.4+	20010526	683	0.3+	0.6-	20040110	608	0.5-	0.1-
19800708	801	1.6-	0.7-	20010713	838	0.3+	0.3+	20040114	644	0.4+	0.3+
19800808	801	0.7-	0.8+	20010713	838	0.5+	0.6-	20040114	644	0.2+	0.2+
19800912	801	0.7+	1.1+	20010713	838	0.6-	0.8+	20040114	644	0.3+	0.1+
19821110	095	2.1+ 0.5+		20010816	233	0.4-	0.1-	20040203	608	0.8-	0.0
19840106	323	(3.6+ 0.4-)		20010816	233	0.7-	0.3-	20040203	608	0.3-	0.4-
19840224	323	(6.5- 0.1-)		20010816	233	0.3-	0.4+	20040203	608	0.3-	0.1-
19840327	323	0.3-	1.3-	20010816	233	0.9-	0.1+	20040214	699	0.0	0.1+
19840329	323	0.1+	0.3-	20010816	233	0.2+	1.0-	20040214	699	0.0	0.1+
19860709	688	0.9-	1.1+	20010816	233	0.9-	0.8-	20040214	699	0.0	0.0
19860709	688	0.2-	0.5-	20010916	704	0.1+	0.3+	20040214	699	0.2+	0.3+
19860807	095	2.2+ 0.0		20010916	704	0.6+	0.5+	20040219	704	0.3+	0.4+
19860814	095	0.2-	0.1-	20010916	704	0.7-	0.2+	20040219	704	0.4+	0.9+
19860831	095	0.1+	0.4+	20011110	704	0.4-	0.6+	20040219	704	0.0	0.0
19860908	095	1.1+ 0.4+		20011110	704	0.8+	0.6+	20040219	704	0.1-	0.3+
19871027	054	0.3+ 0.4+		20011110	704	1.2+	0.8+	20040222	097	0.3+	0.3-
19871027	054	0.2-	0.3-	20011110	704	1.9+	0.8+	20040222	097	0.5+	0.3-
19871030	054	0.1+	0.1-	20020810	704	1.5+	1.4+	20040222	097	0.4+	0.2-
19900429	026	0.6+	0.9-	20020810	704	1.1+	0.0	20040308	699	0.1+	0.3+
19900519	413	1.8-	0.9+	20020810	704	1.7+	1.2-	20040308	699	0.3-	0.4+
19900519	413	0.1-	0.3-	20020810	704	0.7+	0.2-	20040308	699	0.2-	0.2+
19900520	413	(2.1- 0.7-)		20020810	704	0.5-	0.6-	20040308	699	0.6+	0.7+
19900520	413	0.3-	0.0	20020811	704	0.4+	0.6+	20040315	704	0.7-	0.3+
19900526	413	1.6-	0.5+	20020811	704	1.1+	0.1+	20040315	704	1.0-	0.5+
19900526	413	0.3-	0.1-	20020811	704	1.1+	0.0	20040315	704	0.4+	0.3+
19900629	413	0.2+	0.4-	20020811	704	0.7+	0.1+	20040315	704	0.4+	0.6+
19920929	095	(1.4- 4.1-)		20020811	704	0.3-	0.8-	20040315	704	0.0	0.2+
19920929	095	0.6+	1.0-	20020816	704	1.1+	0.9+	20041210	703	0.2-	0.1-
19921126	675	(0.8+ 2.2-)		20020816	704	0.7+	1.2+	20041210	703	0.2-	0.1-
19921126	675	0.6+	0.9-	20020816	704	1.1+	0.4-	20041210	703	0.3-	0.1-
19921128	675	0.5-	1.0-	20020816	704	0.6+	0.6+	20041210	703	0.3-	0.1-
19921128	675	0.5-	2.0-	20020816	704	0.8+	0.2-	20041211	704	0.3+	0.4+
19950424	033	0.1-	0.5-	20020816	704	0.0	0.4+	20041211	699	0.1+	0.5+
19950424	033	1.0-	0.2+	20020816	704	1.2+	0.8-	20041211	704	0.5+	0.1+
19971002	098	0.7-	0.6+	20020816	704	0.4+	0.2+	20041211	699	0.3+	0.4+
19971002	098	(1.5- 2.9-)		20020816	704	0.1-	0.2-	20041211	704	0.9+	0.4+
19971030	704	0.5+	0.6+	20020816	704	0.7-	0.1+	20041211	704	0.9+	0.3+
19971030	704	0.5+	0.9+	20020905	699	0.6-	0.2+	20041211	699	0.3+	0.3+
19971030	704	0.2+	1.1+	20020905	699	0.6-	0.1+	20041211	699	0.2+	0.2+
19971030	704	0.9-	2.0+	20020905	699	0.4-	0.2+	20050307	704	0.3+	0.0
19971030	704	0.2-	0.7+	20020905	699	(2.3- 0.2+)		20050307	704	0.1+	0.1+
19971225	566	(1.1- 2.6+)		20020907	704	1.0-	0.9-	20050307	704	0.1+	0.2+
19971225	566	(1.7+ 2.4-)		20020907	704	1.3-	0.2-	20050307	704	0.5+	0.5-
19971225	566	(1.0- 2.4+)		20020907	704	1.0-	0.5-	20050307	704	0.2-	0.8+
19971225	566	(1.5+ 2.0-)		20020907	704	1.5-	0.5-	20050308	703	0.2-	0.0
19971225	566	1.4- 1.5+		20020907	704	1.5-	0.1-	20050308	703	0.4-	0.2+
19971225	566	(1.9+ 2.2-)		20020913	644	0.5-	0.3+	20050308	703	0.4-	0.2+
19981227	859	0.9-	0.2-	20020913	644	0.4-	0.5+	20050308	703	0.4-	0.2+
19981227	859	1.0-	0.1-	20020913	644	0.4-	0.4+	20050313	703	0.6-	0.1-
19981227	859	0.8-	0.3-	20020915	608	1.2-	0.2+	20050313	703	0.6-	0.0
19990108	699	0.8+	0.3+	20020915	608	1.3-	0.2+	20050313	703	0.7-	0.0
19990108	699	0.6+	0.3+	20020915	608	1.1-	0.3+	20050313	703	0.8-	0.0
19990108	699	0.7+	0.0	20020920	644	0.5-	0.5+	20050401	699	0.1+	0.1-
19990111	859	1.5-	0.1-	20020920	644	0.5-	0.5+	20050401	699	0.1-	0.1+
19990111	859	1.3-	0.1-	20020920	644	0.5-	0.5+	20050401	699	0.2-	0.0
19990111	859	1.5-	0.0	20021004	704	0.4+	0.9+	20050401	699	0.2+	0.1-
19990117	859	0.3-	0.1-	20021004	704	0.3+	0.8+	20050402	691	0.0	0.0
19990117	859	0.3-	0.5-	20021004	704	0.4+	0.7+	20050402	691	0.1+	0.0
19990118	859	0.4-	0.5-	20021004	704	0.4+	0.7+	20050402	691	0.2-	0.1-

Retsi na Resi dual s. txt											
19990119	859	0.9-	0.2-	20021004	704	0.1+	0.6+	20050405	703	0.4-	0.1-
19990119	859	0.8-	0.3-	20021007	699	0.3-	0.6+	20050405	703	0.4-	0.1+
19990119	859	0.9-	0.0	20021007	699	0.2-	0.6+	20050405	703	0.4-	0.0
20000202	704	(2.2-	0.7-)	20021007	699	0.2-	0.6+	20050405	703	0.3-	0.4+
20000202	704	0.0	1.2-	20021007	699	0.1-	0.5+	20050405	608	1.5+	2.0+
20000202	704	1.3+	0.5+	20021012	704	0.0	0.6+	20050405	608	1.2+	1.8+
20000309	704	0.3-	0.1-	20021012	704	0.3-	0.3+	20050405	608	1.3+	1.8+
20000309	704	0.6-	0.9+	20021012	704	0.0	0.5+	20050409	699	0.3+	0.2+
20000309	704	0.5-	1.2+	20021012	704	0.5-	0.6+	20050409	704	0.6+	0.6-
20000310	608	0.0	1.0-	20021012	704	0.6-	0.5+	20050409	704	1.2+	0.6+
20000310	608	0.3+	1.3-	20021030	608	0.8-	0.6+	20050409	699	0.3+	0.4+
20000310	608	0.4-	1.6-	20021030	608	0.9-	0.8+	20050409	704	0.7+	0.6+
20000327	699	0.1-	0.3+	20021030	608	0.6-	0.8+	20050409	704	0.4+	0.8+
20000327	699	0.0	0.3+	20021031	704	0.5+	1.9+	20050409	704	0.5+	1.5+
20000327	699	0.0	0.3+	20021031	704	0.3+	1.9+	20050409	699	0.4-	0.6+
20000327	699	0.1-	0.3+	20021031	704	0.2+	1.3+	20050415	703	0.5-	0.0
20000402	699	0.1+	0.4+	20021031	704	0.1+	1.4+	20050415	703	0.4-	0.1+
20000402	699	0.3+	0.6+	20021031	704	0.3+	1.2+	20050415	703	0.5-	0.1+
20000402	699	0.2+	0.4+	20021104	608	0.3-	0.5+	20050415	703	0.4-	0.0
20000402	699	0.3+	0.4+	20021104	608	0.5-	0.7+	20050417	608	0.9+	1.3+
20000405	691	0.7-	0.1+	20021104	608	0.5-	0.1-	20050417	608	0.9+	1.3+
20000405	691	0.6-	0.1+	20021108	704	0.1-	1.3+	20050417	608	0.8+	1.1+
20000405	691	0.7-	0.0	20021108	704	0.4+	0.8+	20050424	608	0.3-	0.0
20000405	699	0.2-	0.1+	20021108	645	0.1+	0.0	20050424	608	0.6-	0.1-
20000405	704	0.0	0.3+	20021108	645	0.1+	0.1+	20050424	608	0.5-	0.1-
20000405	699	0.2-	0.1+	20021108	704	0.1+	0.2+	20050430	699	0.2+	0.1+
20000405	704	0.1+	0.4+	20021108	704	0.4+	0.7+	20050430	699	0.1+	0.2+
20000405	699	0.2-	0.1+	20021108	704	0.1-	0.4-	20050430	699	0.0	0.2+
20000405	704	0.3+	0.6+	20021112	704	0.3-	1.0+	20050430	699	0.2-	0.1+
20000405	699	0.2-	0.2+	20021112	704	0.4+	0.7+	20050501	608	1.1+	0.8+
20000405	688	0.1+	0.3+	20021112	704	0.6-	1.1-	20050501	608	1.2+	0.9+
20000405	704	0.1+	0.7+	20021205	704	0.4-	0.6+	20050501	608	1.2+	0.6+
20000405	704	0.1+	0.7+	20021205	704	0.1-	0.4+	20050504	703	0.4-	0.2+
20000405	688	0.0	0.4+	20021205	704	0.3+	0.8+	20050504	703	0.0	0.2-
20000406	704	0.4-	1.4-	20021205	704	0.4+	0.3+	20050504	703	0.2-	0.2+
20000406	704	0.1-	1.0+	20021205	704	0.8+	0.1-	20050504	703	0.2-	0.0
20000406	704	0.2+	0.8+	20021210	704	0.1+	0.8+	20050506	704	1.1-	1.8-
20000406	704	0.2+	1.0+	20021210	704	0.1-	1.1+	20050506	704	0.9+	0.8-
20000406	704	0.0	1.3+	20021210	704	0.1+	1.0+	20050506	704	0.2+	0.2-
20000407	704	0.0	0.3+	20021210	704	0.0	1.3+	20050506	704	1.5+	0.9-
20000407	704	0.2+	0.5+	20021210	704	0.4+	1.7+	20050506	704	(0.6+	2.0+)
20000407	704	0.0	0.4+	20021216	608	0.0	0.4+	20050511	703	0.5-	0.1-
20000407	704	0.1+	0.5+	20021216	608	0.1-	0.5+	20050511	703	0.4-	0.2-
20000407	704	0.2+	0.5+	20021216	608	0.1-	0.7+	20050511	703	0.3-	0.0
20000408	704	0.7+	0.7+	20030102	704	0.1+	0.7+	20050511	703	0.6-	0.0
20000408	704	0.6+	0.5+	20030102	704	0.1+	0.8+	20050514	G96	0.5-	0.1-
20000408	704	0.7+	0.7+	20030102	704	0.2-	0.6+	20050514	G96	0.6-	0.2-
20000408	704	0.5+	0.5+	20030102	704	0.1-	0.4+	20050514	G96	0.5-	0.0
20000408	704	0.5+	0.0	20030102	704	0.9-	0.3-	20050514	G96	0.5-	0.1-
20000408	691	0.2+	0.6+	20030104	704	0.1+	0.4+	20050531	699	0.4-	0.3+
20000408	691	0.5+	0.0	20030104	704	0.3+	0.7+	20050531	699	0.0	0.1-
20000408	691	0.9+	0.5-	20030104	704	0.8+	1.0+	20050531	699	0.1-	0.2+
20000409	608	(0.3+	2.4-)	20030104	704	0.8+	1.6+	20050531	699	0.3-	0.2+
20000409	608	0.4-	0.7-	20030104	704	0.9+	1.4+	20050604	704	0.1+	0.6+
20000409	608	0.0	0.0	20030113	599	0.3-	0.5+	20050604	704	0.2+	0.9+
20000410	704	0.3+	0.7+	20030113	599	0.2-	0.3+	20050604	704	0.8+	0.8+
20000410	704	0.1+	0.9+	20030113	599	0.0	0.4+	20050604	704	0.8+	0.6+
20000410	704	0.1-	0.9+	20030113	599	0.2+	0.2+	20050606	704	0.1+	0.6+
20000410	704	0.3+	0.8+	20030120	699	0.3-	0.4+	20050606	704	0.2-	0.7+
20000410	704	0.3+	0.9+	20030120	699	0.2-	0.3+	20050606	704	0.3+	0.8+
20000411	691	0.4-	0.2-	20030120	699	0.3+	0.4+	20050606	704	0.1+	0.4+
20000411	691	0.4-	0.2-	20030120	699	0.5+	0.5+	20050606	704	0.8+	0.7+
20000411	691	0.3-	0.2-	20030904	704	0.2-	0.9+	20050612	703	0.3-	0.2-
20000425	699	0.2-	0.2+	20030904	704	0.2-	0.4+	20050612	703	0.6-	0.1+
20000425	699	0.3-	0.2+	20030904	704	0.3-	0.2+	20050612	703	0.7-	0.1+
20000425	699	0.2-	0.2+	20030920	704	0.1-	0.1-	20050612	703	1.2-	0.2-
20000425	699	0.3-	0.2+	20030920	704	0.0	0.1-	20050627	699	0.0	0.6+
20000427	704	1.4+	1.2-	20030920	704	0.1+	0.3-	20050627	699	0.4-	0.3+
20000427	704	(2.0+	1.8+)	20031009	699	0.1-	0.1+	20050627	699	0.4-	0.2+
20000427	704	(0.8-	2.6+)	20031009	699	0.2+	0.3+	20050627	699	0.1-	0.1-
20000427	704	0.0	0.1-	20031009	699	1.8-	0.5-	20050717	E12	0.5-	0.1-
20000427	704	0.0	0.0	20031009	699	0.1+	0.1+	20050717	E12	0.1-	0.1-
20000429	704	1.1+	0.6-	20031020	704	0.1+	0.6+	20050717	E12	0.2-	0.2+
20000429	704	1.3+	0.8+	20031020	704	0.5+	0.1-	20050717	E12	0.2-	0.2-
20000429	704	1.0+	0.7+	20031020	704	0.1+	0.9+	20060408	704	0.2-	0.3+
20000429	704	1.0+	0.9+	20031020	704	0.7+	0.0	20060408	704	0.5-	0.2+
20000429	704	0.3-	1.6+	20031020	704	0.3-	0.4-	20060408	704	0.5-	0.7+
20000430	608	0.1+	0.2-	20031121	703	0.1-	0.5+	20060408	704	0.4-	0.3+
20000430	608	0.0	0.4-	20031121	703	0.2+	0.5+	20060408	704	0.0	0.5+
20000430	608	0.2-	0.4-	20031121	703	0.1-	0.4+	20060421	704	(4.1+	0.6+)
20000505	704	0.6+	0.4-	20031121	703	0.4-	0.2+	20060421	704	(3.7+	0.1+)
20000505	704	0.3+	0.2+	20031123	699	0.0	0.0	20060421	704	(3.8+	0.1-)
20000505	704	1.3+	0.4+	20031123	699	0.1+	0.2+	20060421	704	(4.0+	0.4+)
20000505	704	1.2+	0.9+	20031123	699	0.2+	0.3+	20060529	704	0.1-	0.2-
20000505	704	(0.1-	2.5+)	20031123	699	0.1+	0.2+	20060529	704	0.5-	0.3+

Retsina Residuals.txt											
20000524	699	0.3+	0.4+	20031129	704	0.3+	0.5+	20060529	704	0.2+	0.2+
20000524	699	0.2+	0.4+	20031129	704	0.2+	0.3+	20060529	704	0.5-	0.2+
20000524	699	0.3+	0.4+	20031129	704	0.0	0.2+	20060608	B01	0.3-	0.1+
20000524	699	0.3+	0.4+	20031129	704	0.2+	0.3+	20060608	B01	0.3-	0.1-
20000525	699	0.2-	0.4+	20031129	704	0.6-	0.0	20060608	B01	0.3-	0.0
20000525	699	0.8-	0.4+	20031205	703	0.2+	0.3+				

Last observed on 2006 June 8. Perturbed ephemeris below based on elements from MPC 31002.

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EDITORIAL NOTICE

Contributors of perturbed orbital elements are advised that the use of the epoch 2006 Sept. 22.0 TT (rather than 2006 Mar. 6.0 TT) will become effective after the publication of *this* batch of *Minor Planet Circulars*.

ERRATUM

MPC Line 8 For Korolov read Korolev

NEW OBSERVATORY CODES

The following listing is a continuation to that on MPC 56919. The longitudes λ are measured in degrees eastward from Greenwich, and the parallax constants $\rho \cos \phi'$ and $\rho \sin \phi'$ are the product of the geocentric distance (in earth equatorial radii) and the cosine and sine, respectively, of the geocentric latitude.

Obs.	λ	$\rho \cos \phi'$	$\rho \sin \phi'$	Object	Date	UT	α_{2000}	δ_{2000}	Reference	Obs.	
B00	2.5767	0.66289	+0.74622	Savigny-le-Temple	1990	07	25.30590	20 00 45.48	-14 41 06.7	MPC16815	675
B01	8.4464	0.64117	+0.76499	Taunus Observatory, Frankfurt	1992	08	25.36319	00 12 52.75	+03 52 30.3	MPS170715	261
B02	20.6566	0.63224	+0.77224	Kielce	1992	08	25.41181	00 12 51.91	+03 52 24.4	MPS170715	261
B03	16.2698	0.66759	+0.74211	Alter Satzberg, Vienna	1992	08	27.34583	00 12 21.29	+03 47 44.2	MPS170715	261
B04	7.4783	0.69868	+0.71339	Saint-Barthelemy Observatory	1993	07	26.47865	23 48 45.72	-06 47 14.9	MPC29409	675
E26	153.3971	0.88414	-0.46566	RAS Observatory, Biggerra Waters	2000	09	25.35783	01 00 20.50	-03 49 19.2	MPC54923	704
J54	343.4906	0.88149	+0.47142	Bradford Robotic Telescope	2000	09	25.38817	01 00 18.06	-03 49 21.8	MPC54923	704
J59	356.2039	0.72693	+0.68441	Osservatorio Linceo, Santander	2000	09	25.40333	01 00 18.06	-03 49 22.7	MPC54923	704
1986 XL ₁	1986	12 05.49265	00 45 25.34	-26 08 39.2	MPC13353	413					
1986 XL ₁	1986	12 05.50920	00 45 25.83	-26 08 30.6	MPC13353	413					
1986 XL ₁	* 1986	12 05.56100	00 45 25.98	-26 08 00.3	MPC13353	18					
1987 MG	* 1987	06 30.76014	22 18 12.18	-19 12 10.1	MPC11914	413					

The following observations correct those previously published.

DELETED OBSERVATIONS

The following observations are to be deleted.

Object	Date	UT	α_{2000}	δ_{2000}	Reference	Obs.
1990 OA ₅	1990	07	25.30590	20 00 45.48	-14 41 06.7	MPC16815
1992 QC ₃	* 1992	08	25.36319	00 12 52.75	+03 52 30.3	MPS170715
1992 QC ₃	1992	08	25.41181	00 12 51.91	+03 52 24.4	MPS170715
1992 QC ₃	1992	08	27.34583	00 12 21.29	+03 47 44.2	MPS170715
1992 QC ₃	1992	08	27.38750	00 12 20.57	+03 47 38.3	MPS170715
1993 QW ₈	1993	07	26.47865	23 48 45.72	-06 47 14.9	MPC29409
2000 SM ₃₇₆	* 2000	09	25.35783	01 00 20.50	-03 49 19.2	MPC54923
2000 SM ₃₇₆	2000	09	25.38817	01 00 18.06	-03 49 21.8	MPC54923
2000 SM ₃₇₆	2000	09	25.40333	01 00 18.06	-03 49 22.7	MPC54923
2002 EG ₁₃₈	1999	08	03.37694	22 13 11.32	-10 35 28.0	MPS165035
2002 OJ ₂₇	2002	08	17.22531	21 47 48.57	-17 19 06.7	MPS155815
2002 OJ ₂₇	2002	08	17.29793	21 47 45.05	-17 19 34.3	MPS155815
2002 OJ ₂₇	2002	08	17.36039	21 47 42.04	-17 19 57.8	MPS155815

A91 Hankasalmi Observatory

A. Oksanen, Verkkolementie 30, FI-40950 Muurame, Finland

[[arto.oksanen@jkl Sirius.fi]]
0.40-m $f/8.4$ Ritchey-Chrétien + CCD
USNO-A2.0

[3, 1, 0*, 2006/03/20]

A94 Cormons

E. G. Basiglio Ribando, 22 Via Savaian, Cormons, I-34071 Italy

[pociotti@simail.it]

0.36-m Ritchey-Chrétien + CCD

UCAC-2, USNO-B1.0, USNO-A2.0

[126, 29, 0*, 2006/03/25-2006/06/26]

A95 Taurus Hill Observatory, Karhilaitepaaleentie

M. Nissinen, Warkauden Kassiopeia ry, Karhilaitepaaleentie 144 C, SF-79480

Kangaslampi, Finland [markku.nissinen@kassiopeia.net]

Observers M. Nissinen, V. P. Heutunen, H. Taino

0.3-m $f/10$ Schmidt-Cassegrain + CCD

[12, 3, 0*, 2006/03/22-2006/03/23]

A96 Klosterneuburg

E. Meyer, Ferd.-Markl-Str. 1/62, A-4040 Linz, Austria [er.meyer@oenet.at]

Observers E. Meyer, E. Pressberger, M. Stoll

Measurer E. Meyer

USNO-A2.0

[5, 2, 0*, 2006/05/12]

A97 Stammersdorf

W. Vollmann, Dammaeckergasse 28/D1/20, A-1210 Wien, Austria

[vollmann@gmx.at]

0.13-m $f/8$ refractor + CCD

USNO-B1.0

[50, 1, 0*, 2006/07/03]

A98 Taurus-1 Observatory, Baran'

S. E. Shurpakov, 211011, st. Korban, h. 1, f. 22, Baran', Belarus

[shurpakov@tut.by]

0.19-m $f/5.2$ reflector + CCD

USNO-A2.0

[26, 3, 0*, 2006/05/25-2006/06/01]

A99 Osservatorio del Monte Baldo

F. Castellani, no details supplied [flavio.castellani@libero.it]

0.4-m reflector + CCD

USNO-A2.0

[41, 6, 0*, 2006/05/28-2006/06/21]

B00 Savigny-le-Temple

P. Sogorb, 5 rue Faviere, F-77176 Savigny-le-Temple, France [p.sogorb@club-

internet.fr]

0.08-m $f/5.0$ refractor + CCD, 0.31-m $f/3.4$ reflector + CCD

USNO-A2.0

[77, 25, 0*, 2006/06/07-2006/07/02]

B01 Taurus Observatory, Frankfurt

E. Schwab, Westendstrasse 8, D-63329 Egelsbach, Germany [e.schwab@gsi.de]

Observers S. Hess, R. Kling, E. Schwab, M. Weigand

0.6-m $f/3.3$ Cassegrain + CCD

USNO-SA2.0

[38, 3, 0*, 2006/06/06-2006/07/03]

B02 Kielce

P. Kankiewicz, Swietokrzyska 15, PL-25406 Kielce, Poland

[pawel.kankiewicz@pu.kielce.pl]

0.35-m $f/11$ Schmidt-Cassegrain + CCD

USNO-A2.0

[12, 2, 0*, 2006/03/23-2006/04/28]

B03 Alter Satzberg, Vienna

M. Pletschnig, KLG Alter Satzberg 88, A-1140 Wien, Austria

[pletschnig@utanet.at]

0.35-m $f/11$ Schmidt-Cassegrain + CCD

USNO-B1.0

[16, 3, 0*, 2006/05/12-2006/06/15]

B04 Saint-Barthelemy Observatory

A. Carbognani, Osservatorio Astronomico della Regione Autonoma Valle

d'Aosta 39 Saint-Barthelemy Lignan, I-11020 NUS (Aosta), Italy

[albino@fis.univr.it]

Observers A. Carbognani, P. Calciolase

Measurer A. Carbognani

0.8-m $f/7.9$ reflector + CCD

USNO-B1.0

[29, 3, 0*, 2006/06/26-2006/07/01]

B18 Terskol

S. Barabanov, Institute of Astronomy of RAS, 48 Pyatnitskaya, Moscow 109017,

Russia [inasan@burbonz.nalnet.ru]

Observers S. Barabanov, A. Sergeev

Measurers S. Barabanov, M. Smirnov

2.0-m $f/1.78$ reflector + CCD

USNO-A2.0

[7, 2, 0*, 2000/02/11-2001/03/25]

D34 Kenting Observatory, Hengchun

Y.-S. Tsai, No. 1-1, Shimiu Lane, Kending Rd., Hengchun, Pingtung 94644, Taiwan

[tcom6740@hotmail.com]

Observer K.-C. Liu

Measurer Y.-S. Tsai

0.40-m $f/10$ Schmidt-Cassegrain + CCD

USNO-A2.0

[8, 2, 0*, 2006/03/16-2006/03/17]

D35 Lulin Observatory

H. C. Lin, 300 JungDa Rd, Chung-li City, Tao-yuan Country, Taiwan

[hclin@lulin.ncu.edu.tw]

Observers C. S. Lin, M. Yang, Q. Ye, T. C. Yang, H. C. Lin

1.0-m $f/8.0$ Cassegrain reflector + CCD, 1.23-m $f/2.5$ Schmidt, 0.41-m $f/8.8$

Ritchey-Chrétien + CCD

USNO-B1.0, UCAC-2, GSC-ACT, GSC-2.2

[3245, 762, 59*, 2006/03/11-2006/07/07]

Protokoll der Auswertung

Kurze Version, ohne die Einzelpositionen der jeweiligen Vergleichssterne, da dies ansonsten ca. 50 Seiten umfassen würde.

```

16: 25: 50 - Start 2006. 06. 10
Image 1: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_08\Retsina1. fit
Time Stamp: 2006 06 08 22: 14: 13 UT
Image 2: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_08\Retsina2. fit
Time Stamp: 2006 06 08 22: 22: 42 UT
Image 3: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_08\Retsina3. fit
Time Stamp: 2006 06 08 22: 26: 41 UT
Settings for Scale and Orientation:
Focal Length = 5716.0mm ± 10.0%, Position Angle = 0.0° ± 20.0°, Pointing = ± 5.0'
Image flipped: no
Settings for CCD:
Pixel Width = 9.0µm, Pixel Height = 9.0µm, Saturation = 60000
Settings for Object Detection:
Aperture Radius = 6, Detection Limit = 4.0, Min.FWHM = 0.70, PSF-Fit RMS = 0.20, Search Radius = 0.75
Settings for Reference Star Matching:
Number of Stars = 50, Search Radius = 2.0, Magnitude = 8.0mag - 18.0mag
16: 26: 04 - UCAC-2: 765 Records read (31.7' x 24.5')
Center Coordinates: RA = 18h 24m 20.20s, Dec = +03° 18' 49.0"
16: 26: 09 - Object List for Image 1 (Retsina1.fit):
1906 Detections (1342 Stars, 270 Ref. Stars, 9 Movers)
16: 26: 09 - Object List for Image 2 (Retsina2.fit):
1906 Detections (1364 Stars, 272 Ref. Stars, 9 Movers)
16: 26: 09 - Object List for Image 3 (Retsina3.fit):
1861 Detections (1317 Stars, 272 Ref. Stars, 9 Movers)
16: 26: 09 - Astrometry of Image 1 (Retsina1.fit):
270 of 270 Reference Stars used: dRA = 0.06", dDec = 0.07"
X = -1.347154177E-5 -3.149333968E-6*X' +1.019362610E-8*Y'
Y = +1.951715779E-5 +7.601389665E-9*X' +3.151569565E-6*Y'
Origin: x0 = 1002.0, y0 = 668.0
Center Coordinates: RA = 18h 24m 20.39s, Dec = +03° 18' 53.0"
Focal Length = 5713.4mm, Rotation = 179.86°
Pixel Size: 0.65" x 0.65", Field of View: 21.7' x 14.5'
16: 26: 09 - Photometry of Image 1 (Retsina1.fit):
270 of 270 Reference Stars used: dmag = 0.18mag
Zero Point: 25.05mag
16: 26: 09 - Astrometry of Image 2 (Retsina2.fit):
272 of 272 Reference Stars used: dRA = 0.06", dDec = 0.06"
X = -2.350616853E-6 -3.149367205E-6*X' +1.025197617E-8*Y'
Y = +1.067171219E-6 +7.781469350E-9*X' +3.151499161E-6*Y'
Origin: x0 = 1002.0, y0 = 668.0
Center Coordinates: RA = 18h 24m 20.23s, Dec = +03° 18' 49.2"
Focal Length = 5713.5mm, Rotation = 179.86°
Pixel Size: 0.65" x 0.65", Field of View: 21.7' x 14.5'
16: 26: 09 - Photometry of Image 2 (Retsina2.fit):
272 of 272 Reference Stars used: dmag = 0.18mag
Zero Point: 25.08mag
16: 26: 09 - Astrometry of Image 3 (Retsina3.fit):
272 of 272 Reference Stars used: dRA = 0.05", dDec = 0.06"
X = -1.623059230E-6 -3.149312331E-6*X' +1.007838624E-8*Y'
Y = +2.533588729E-6 +7.815046093E-9*X' +3.151239932E-6*Y'
Origin: x0 = 1002.0, y0 = 668.0
Center Coordinates: RA = 18h 24m 20.22s, Dec = +03° 18' 49.5"
Focal Length = 5713.8mm, Rotation = 179.86°
Pixel Size: 0.65" x 0.65", Field of View: 21.7' x 14.5'
16: 26: 09 - Photometry of Image 3 (Retsina3.fit):

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Veronni ka_Retsina_kurz. log

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272 of 272 Reference Stars used: dmag = 0.18mag
Zero Point: 25.11mag
16: 26: 37 - Moving Object detected (0.48"/min, PA 288.8°):
18 24 06.321 +03 19 08.86 -1.40 16.08 +0.36 677.87 693.15 3892 2.1 11.4 0.090
±0.10 ±0.05
02303 C2006 06 08.92654 18 24 06.32 +03 19 08.9 16.1 V XXX
0002303 1 C2006 06 08.92654 18 24 06.32 +03 19 08.9 16.1 V
0002303 2+C2006 06 08.92654 0.1 0.1 X.1 N 0.00001
18 24 06.069 -4.19 +03 19 10.03 -1.58 16.20 +0.48 675.61 700.83 1.33110821082
±0.10 ±0.06 3573 2.1 10.9 0.084
02303 C2006 06 08.93243 18 24 06.07 +03 19 10.0 16.2 V XXX
0002303 1 C2006 06 08.93243 18 24 06.07 +03 19 10.0 16.2 V
0002303 2+C2006 06 08.93243 0.1 0.1 X.1 N 0.00001
18 24 05.945 -4.24 +03 19 10.78 -1.46 16.24 +0.52 672.98 701.53 1.26910821082
±0.10 ±0.10 3526 2.1 10.4 0.081
02303 C2006 06 08.93520 18 24 05.95 +03 19 10.8 16.2 V XXX
0002303 1 C2006 06 08.93520 18 24 05.95 +03 19 10.8 16.2 V
0002303 2+C2006 06 08.93520 0.1 0.1 X.1 N 0.00001
16: 26: 37 - End 1.23510821082

16: 34: 05 - Start 2006.06.10
Image 1: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astronomie\2006_06_08\veronni ka4. fit
Time Stamp: 2006 06 08, 22:09:06 UT
Image 2: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astronomie\2006_06_08\veronni ka5. fit
Time Stamp: 2006 06 08, 22:30:51 UT
Settings for Scale and Orientation:
Focal Length = 5716.0mm ± 10.0%, Position Angle = 0.0° ± 20.0°, Pointing = ± 5.0'
Image Flipped: no
Settings for CCD:
Pixel Width = 9.0µm, Pixel Height = 9.0µm, Saturation = 60000
Settings for Object Detection:
Aperture Radius = 6, Detection Limit = 4.0, Min.FWHM = 0.70, PSF-Fit RMS = 0.20, Search Radius = 0.75
Settings for Reference Star Matching:
Number of Stars = 50, Search Radius = 2.0, Magnitude = 8.0mag - 18.0mag
16: 34: 14 - UCAC-2: 486 Records read (31.7' x 24.5')
Center Coordinates: RA = 19h 21m 55.00s, Dec = +09° 10' 32.0"
Object List for Image 1 (veronni ka4. fit):
1443 Detections (887 Stars, 171 Ref. Stars, 0 Movers)
16: 34: 15 - Object List for Image 2 (veronni ka5. fit):
1557 Detections (874 Stars, 172 Ref. Stars, 0 Movers)
16: 34: 15 - Astrometry of Image 1 (veronni ka4. fit):
171 of 171 Reference Stars used: dRA = 0.06", dDec = 0.07"
X = -9.565204558E-4 -3.150176742E-6*x' +1.156482460E-8*y'
Y = +8.218790591E-5 +7.662091086E-9*x' +3.151839057E-6*y'
Origin: x0 = 1002.0, y0 = 668.0
Center Coordinates: RA = 19h 22m 08.33s, Dec = +09° 10' 48.9"
Focal Length = 5712.4mm, Rotation = 179.86°
Pixel Size: 0.65" x 0.65", Field of View: 21.7' x 14.5'
16: 34: 15 - Photometry of Image 1 (veronni ka4. fit):
171 of 171 Reference Stars used: dmag = 0.18mag
Zero Point: 24.89mag
16: 34: 15 - Astrometry of Image 2 (veronni ka5. fit):
172 of 172 Reference Stars used: dRA = 0.05", dDec = 0.06"
X = -9.881202540E-4 -3.149772874E-6*x' +1.097239150E-8*y'
Y = +1.694776435E-5 +8.338841156E-9*x' +3.151127699E-6*y'
Origin: x0 = 1002.0, y0 = 668.0
Center Coordinates: RA = 19h 22m 08.77s, Dec = +09° 10' 35.5"
Focal Length = 5713.4mm, Rotation = 179.85°
Pixel Size: 0.65" x 0.65", Field of View: 21.7' x 14.5'

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Veroni ka_Retsina_kurz. log

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16: 34: 15 - Photometry of Image 2 (veronika5.fits):
172 of 172 Reference Stars used: dmag = 0.18mag
Zero Point: 24.94mag

16: 35: 12 - Position added manually:
19 21 54.161 -3.09 +09 10 57.94 -0.96 14.47 -0.71 669.28 703.41 15419 2.2 30.2 0.040
±0.06 ±0.02
00612 C2006 06 08.93809 19 21 54.16 +09 10 57.9 XXX
0000612 1 C2006 06 08.93809 19 21 54.16 +09 10 57.9 14.5 V XXX
0000612 2+C2006 06 08.93809 0.1 0.1 X.0 N 0.00001 1.82010821082
16: 35: 26 - Position added manually:
19 21 54.485 -3.13 +09 10 49.28 -0.97 14.44 -0.75 686.64 669.27 15042 2.3 28.3 0.062
±0.07 ±0.02
00612 C2006 06 08.92299 19 21 54.49 +09 10 49.3 XXX
0000612 1 C2006 06 08.92299 19 21 54.49 +09 10 49.3 14.4 V XXX
0000612 2+C2006 06 08.92299 0.1 0.1 X.0 N 0.00001 1.85210821082

16: 38: 04 - Start 2006.06.10
Image 1: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astronomie\2006_06_07\veronika2.fits
Time Stamp: 2006 06 06, 23:52:14 UT
Image 2: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astronomie\2006_06_07\veronika3.fits
Time Stamp: 2006 06 07, 0:00:25 UT
Image 3: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astronomie\2006_06_07\veronika4.fits
Time Stamp: 2006 06 07, 0:05:05 UT
Settings for Scale and Orientation:
Focal Length = 5716.0mm ± 10.0%, Position Angle = 0.0° ± 20.0°, Pointing = ± 5.0'
Image Flipped: no
Settings for CCD:
Pixel Width = 9.0µm, Pixel Height = 9.0µm, Saturation = 60000
Settings for Object Detection:
Aperture Radius = 6, Detection Limit = 4.0, Min.FWHM = 0.70, PSF-Fit RMS = 0.20, Search Radius = 0.75
Settings for Reference Star Matching:
Number of Stars = 50, Search Radius = 2.0, Magnitude = 8.0mag - 18.0mag
16: 38: 07 - UCAC-2: 256 Records read (20.8" x 17.2")
Center Coordinates: RA = 19h 22m 42.90s, Dec = +08° 50' 59.0"
Object List for Image 1 (veronika2.fits):
525 Detections (359 Stars, 45 Ref. Stars, 5 Movers)
16: 38: 11 - Object List for Image 2 (veronika3.fits):
497 Detections (352 Stars, 46 Ref. Stars, 5 Movers)
16: 38: 11 - Object List for Image 3 (veronika4.fits):
529 Detections (365 Stars, 45 Ref. Stars, 5 Movers)
16: 38: 11 - Astrometry of Image 1 (veronika2.fits):
45 of 45 Reference Stars used: dRA = 0.05", dDec = 0.07"
X = -1.325027595E-5 +3.144595755E-6*x' -1.630709355E-7*y'
Y = +4.679388976E-6 -1.620607433E-7*x' -3.145058537E-6*y'
Origin: x0 = 501.0, y0 = 334.0
Center Coordinates: RA = 19h 22m 43.09s, Dec = +08° 51' 00.0"
Focal Length = 5716.1mm, Rotation = -2.95°
Pixel Size: 0.65" x 0.65", Field of View: 10.8" x 7.2"
16: 38: 11 - Photometry of Image 1 (veronika2.fits):
45 of 45 Reference Stars used: dmag = 0.22mag
Zero Point: 25.07mag
16: 38: 11 - Astrometry of Image 2 (veronika3.fits):
46 of 46 Reference Stars used: dRA = 0.05", dDec = 0.08"
X = +1.859989070E-7 +3.144627420E-6*x' -1.628716726E-7*y'
Y = +1.730641625E-6 -1.619811160E-7*x' -3.144656851E-6*y'
Origin: x0 = 501.0, y0 = 334.0
Center Coordinates: RA = 19h 22m 42.90s, Dec = +08° 50' 59.4"

```

Focal Length = 5716.4mm, Rotation = -2.95°
 Pixel Size: 0.65" x 0.65", Field of View: 10.8' x 7.2'
 16: 38: 11 - Photometry of Image 2 (veronika3.fit):
 46 of 46 Reference Stars used: dmag = 0.22mag
 Zero Point: 25.07mag
 16: 38: 11 - Astrometry of Image 3 (veronika4.fit):
 45 of 45 Reference Stars used: dRA = 0.05", dDe = 0.07"
 X = -8.646274524E-6 +3.144682758E-6*x' -1.629123237E-7*y'
 Y = +1.391039700E-6 -1.619318454E-7*x' -3.145181777E-6*y'
 Origin: x0 = 501.0, y0 = 334.0
 Center Coordinates: RA = 19h 22m 43.02s, Dec = +08° 50' 59.3"
 Focal Length = 5715.9mm, Rotation = -2.95°
 Pixel Size: 0.65" x 0.65", Field of View: 10.8' x 7.2'
 16: 38: 11 - Photometry of Image 3 (veronika4.fit):
 45 of 45 Reference Stars used: dmag = 0.23mag
 Zero Point: 25.11mag
 16: 38: 29 - Moving Object detected (0.46"/min, PA 334.4°):
 19 22 31.586 -2.88 +08 52 07.42 -1.13 14.73 -0.49 757.65 216.77 13653 2.5 25.4 0.043
 ±0.06 ±0.02
 00612 C2006 06 06.99461 19 22 31.59 +08 52 07.4 XXX
 0000612 1 C2006 06 06.99461 19 22 31.59 +08 52 07.4 14.7 V 14.7 V
 0000612 2+C2006 06 06.99461 0.1 0.1 X.0 N 0.00001 1.83910821082
 19 22 31.477 -2.87 +08 52 10.79 -1.13 14.75 -0.47 755.57 210.74 13381 2.5 24.8 0.049
 ±0.06 ±0.02
 00612 C2006 06 07.00029 19 22 31.48 +08 52 10.8 XXX
 0000612 1 C2006 06 07.00029 19 22 31.48 +08 52 10.8 14.8 V 14.8 V
 0000612 2+C2006 06 07.00029 0.1 0.1 X.0 N 0.00001 1.83610821082
 19 22 31.415 -2.87 +08 52 12.74 -1.11 14.75 -0.47 759.62 207.45 13987 2.5 26.0 0.037
 ±0.06 ±0.02
 00612 C2006 06 07.00353 19 22 31.41 +08 52 12.7 XXX
 0000612 1 C2006 06 07.00353 19 22 31.41 +08 52 12.7 14.7 V 14.7 V
 0000612 2+C2006 06 07.00353 0.1 0.1 X.0 N 0.00001 1.84610821082
 16: 38: 29 - End
 16: 41: 38 - Start 2006.06.10
 Image 1: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_07\veroni ka5. fit
 Time Stamp: 2006 06 07, 0:13:20 UT
 Image 2: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_07\veroni ka7. fit
 Time Stamp: 2006 06 07, 0:33:14 UT
 Image 3: D:\Dateien Astronomie\Sternwarte_Frankfurt\Astrometrie\2006_06_07\veroni ka8. fit
 Time Stamp: 2006 06 07, 0:43:48 UT
 Settings for Scale and Orientation:
 Focal Length = 5716.0mm ± 10.0%, Position Angle = 0.0° ± 20.0°, Pointing = ± 5.0'
 Image Flipped: no
 Settings for CCD:
 Pixel Width = 9.0um, Pixel Height = 9.0um, Saturation = 60000
 Settings for Object Detection:
 Aperture Radius = 6, Detection Limit = 4.0, Min.FWHM = 0.70, PSF-Fit RMS = 0.20, Search Radius = 0.75
 Settings for Reference Star Matching:
 Number of Stars = 50, Search Radius = 2.0, Magnitude = 8.0mag - 18.0mag
 UCAC-2: 256 Records read (20.8' x 17.2')
 Center Coordinates: RA = 19h 22m 42.00s, Dec = +08° 50' 58.0"
 16: 41: 42 - Object List for Image 1 (veronika5.fit):
 537 Detections (385 Stars, 44 Ref. Stars, 5 Movers)
 16: 41: 45 - Object List for Image 2 (veronika7.fit):
 696 Detections (471 Stars, 49 Ref. Stars, 5 Movers)
 16: 41: 45 - Object List for Image 3 (veronika8.fit):
 685 Detections (463 Stars, 48 Ref. Stars, 5 Movers)
 16: 41: 45 - Astrometry of Image 1 (veronika5.fit):
 44 of 44 Reference Stars used: dRA = 0.05", dDe = 0.08"

X = -5.225055484E-5 +3.144164491E-6*x' -1.627693448E-7*y'
Y = +5.363190486E-6 -1.621427502E-7*x' -3.145234118E-6*y'
Origin: x0 = 501.0, y0 = 334.0
Center Coordi nates: RA = 19h 22m 42.73s, De = +08° 50' 59.1"
Focal Length = 5716.3mm, Rotation = -2.95°
Pixel Size: 0.65" x 0.65", Field of View: 10.8' x 7.2'
Photometry of Image 1 (veronika5.fit):
44 of 44 Reference Stars used: dmag = 0.22mag
Zero Point: 25.13mag

16: 41: 45 - Astrometry of Image 2 (veronika7.fit):
49 of 49 Reference Stars used: dRA = 0.08", dDe = 0.08"
X = -1.916768522E-6 +3.145302389E-6*x' -1.633385998E-7*y'
Y = +2.050676669E-6 -1.614108205E-7*x' -3.145940919E-6*y'
Origin: x0 = 501.0, y0 = 334.0
Center Coordi nates: RA = 19h 22m 42.03s, De = +08° 50' 58.4"
Focal Length = 5714.6mm, Rotation = -2.94°
Pixel Size: 0.65" x 0.65", Field of View: 10.8' x 7.2'
Photometry of Image 2 (veronika7.fit):
49 of 49 Reference Stars used: dmag = 0.23mag
Zero Point: 25.92mag

16: 41: 45 - Astrometry of Image 3 (veronika8.fit):
48 of 48 Reference Stars used: dRA = 0.06", dDe = 0.07"
X = +6.014901070E-6 +3.145104807E-6*x' -1.621731572E-7*y'
Y = +1.114019696E-6 -1.619590585E-7*x' -3.144970753E-6*y'
Origin: x0 = 501.0, y0 = 334.0
Center Coordi nates: RA = 19h 22m 41.92s, De = +08° 50' 58.2"
Focal Length = 5715.7mm, Rotation = -2.95°
Pixel Size: 0.65" x 0.65", Field of View: 10.8' x 7.2'
Photometry of Image 3 (veronika8.fit):
48 of 48 Reference Stars used: dmag = 0.24mag
Zero Point: 26.02mag

16: 42: 12 - Moving Object detected (0.46"/min, PA 334.1°):
19 22 31.304 -2.86 +08 52 16.14 -1.11 14.73 -0.49 755.22 202.13 14475 2.5 26.8 0.033
±0.09 ±0.01

00612 C2006 06 07.00926 19 22 31.30 +08 52 16.1 14.7 V XXX
0000612 1 C2006 06 07.00926 19 22 31.30 +08 52 16.1 14.7 V
0000612 2+C2006 06 07.00926 0.1 0.1 X,0 N 0.00001
19 22 31.026 -3.00 +08 52 24.49 -0.96 14.82 -0.40 744.76 188.84 27503 2.7 34.2 0.089
±0.09 ±0.01

00612 C2006 06 07.02308 19 22 31.03 +08 52 24.5 14.8 V XXX
0000612 1 C2006 06 07.02308 19 22 31.03 +08 52 24.5 14.8 V
0000612 2+C2006 06 07.02308 0.1 0.1 X,0 N 0.00001
19 22 30.890 -2.90 +08 52 28.74 -1.06 14.73 -0.49 745.06 181.90 32878 2.8 35.9 0.051
±0.06 ±0.01

00612 C2006 06 07.03042 19 22 30.89 +08 52 28.7 14.7 V XXX
0000612 1 C2006 06 07.03042 19 22 30.89 +08 52 28.7 14.7 V
0000612 2+C2006 06 07.03042 0.1 0.1 X,0 N 0.00001
16: 42: 12 - End 2.06310821082

Position der Ostkuppel der HLN-Sternwarte, Standort Taunus Observatory

Umrechnung von geographische in geozentrische Koordinaten

von Erwin Schwab

	°	min	sec		
Geogr. Länge	8	26	47,2	8,446444444 east	Geogr.Länge = Geozentr.Länge
Geogr. Breite	50	13	18,0	50,221666667 North	Geogr.Breite (phi)
Ortshöhe[m]			825	m	Höhe über NN

Konstanten:

e*e	0,0066943790	
e	0,0818191848	Exzentrizität
a	6378140 m	große Halbachse
b	6356755 m	kleine Halbachse

sin phi	0,768525529	
cos phi	0,639819124	
a*cos(phi)	4080856 m	
b*sin(phi)	4885329 m	
r	6366378 m	Abstand vom Geozentrum
roh = r/a	0,998155884	Wert 1 entspricht a (gr.Halbachse)
Tan(phi')	1,193120624	
Phi'	50,03234028 °	geozentr. Breite
cos (phi')	0,642355118	
sin (phi')	0,766407139	
roh*sin(phi')	0,764993795	Parallaxen Konstante
roh*cos(phi')	0,641170540	Parallaxen Konstante

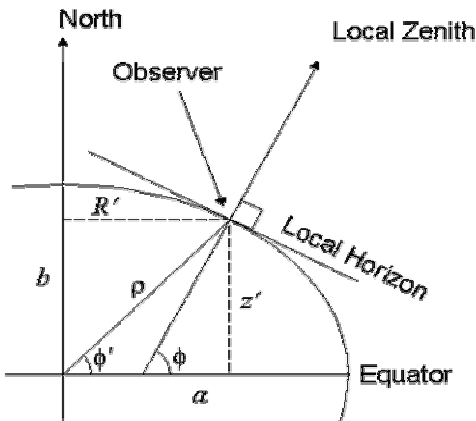
Benutzte Formeln:

$$\tan(\phi') = \frac{\tan(\phi) \cdot (h \cdot \sqrt{(a \cdot \cos(\phi))^2 + (b \cdot \sin(\phi))^2} + b^2)}{(h \cdot \sqrt{(a \cdot \cos(\phi))^2 + (b \cdot \sin(\phi))^2} + a^2)}$$

$$r^2 = h^2 + 2 \cdot h \cdot \sqrt{(a \cdot \cos(\phi))^2 + (b \cdot \sin(\phi))^2} + \frac{(a^4 - (a^4 - b^4) \cdot (\sin(\phi))^2)}{(a^2 - (a^2 - b^2) \cdot (\sin(\phi))^2)}$$

B01 8.4464 0.64117 +0.76499 Taunus Observatory, Frankfurt

: aus Obscodeliste



$$z' = roh \cdot \sin(\phi')$$

$$R' = roh \cdot \cos(\phi')$$