Secular variation of the pulsation periods of the sdB pulsator HS2201+2610

PI: Roberto Silvotti

SHORT SCIENTIFIC JUSTIFICATION

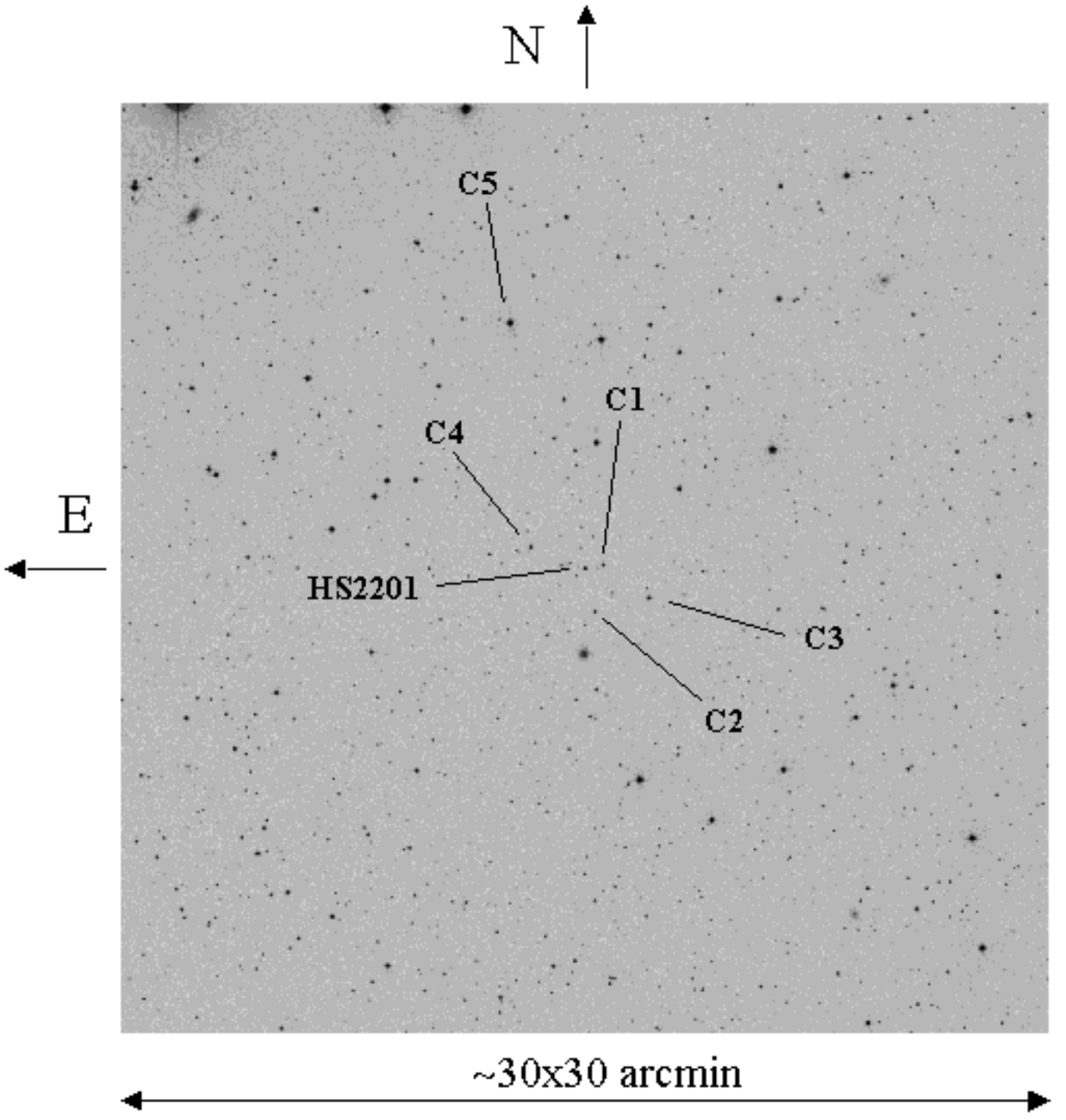
HS2201+2610 (hereafter HS2201) is a B~14.3 pulsating sdB star located near the low gravity boundary of the sdBV (=sdB Variable) instability strip, having logg=5.4, Teff=29300 K, log(He/H)=-3.0 by number (Ostensen et al. 2001). Its variability was discovered by Ostensen et al. (2001) and then studied in great detail by Silvotti et al. (2002), showing five close frequencies with periods between 342 and 365 s and amplitudes between 0.3 and 10.2 mma. Although the small number of excited modes renders more difficult the mode identification, which therefore is not univocally determined, on the other hand the relatively simple (and stable in time) spectrum of HS2201 makes it an ideal candidate for trying to measure for the first time the secular variation of the pulsation periods in an sdBV star. More than 190 hours of data over 20 months permit already to obtain an upper limit of 4x10^{-12} for the temporal derivative (Pdot) of the main pulsation period of HS2201. Following current models and depending on the evolutionary status of the star (close to or just after He core exhaustion), a negative Pdot is expected in the range from -1x10^{-13} to -1x10^{-11} (Charpinet et al. 2002), which is not far from the present upper limit. To observe HS2201 as a secondary target during the Xcov23 WET campaign in late August 2003 will significantly reduce the upper limit on Pdot and might even permit to measure for the first time this quantity, which is directly related to the evolutionary modification of the internal structure of the star. Moreover the new data from the WET campaign will also allow to study in more detail the temporal spectrum of this star (new modes might come up) and the amplitude variations of its known pulsation modes.

References

Charpinet S., Fontaine G., Brassard P., Dorman B., 2002, ApJS 140, 469
Ostensen R., Solheim J.-E., Heber U. et al., 2001, A&A 368, 175
Silvotti, R., Janulis, R., Schuh, S. L., et al., 2002, A&A 389, 180

Download the HS 2201 proposal in text format.

Back to the Xcov 23 page.



HS2201+2610 (sdBV) **B=14.3**

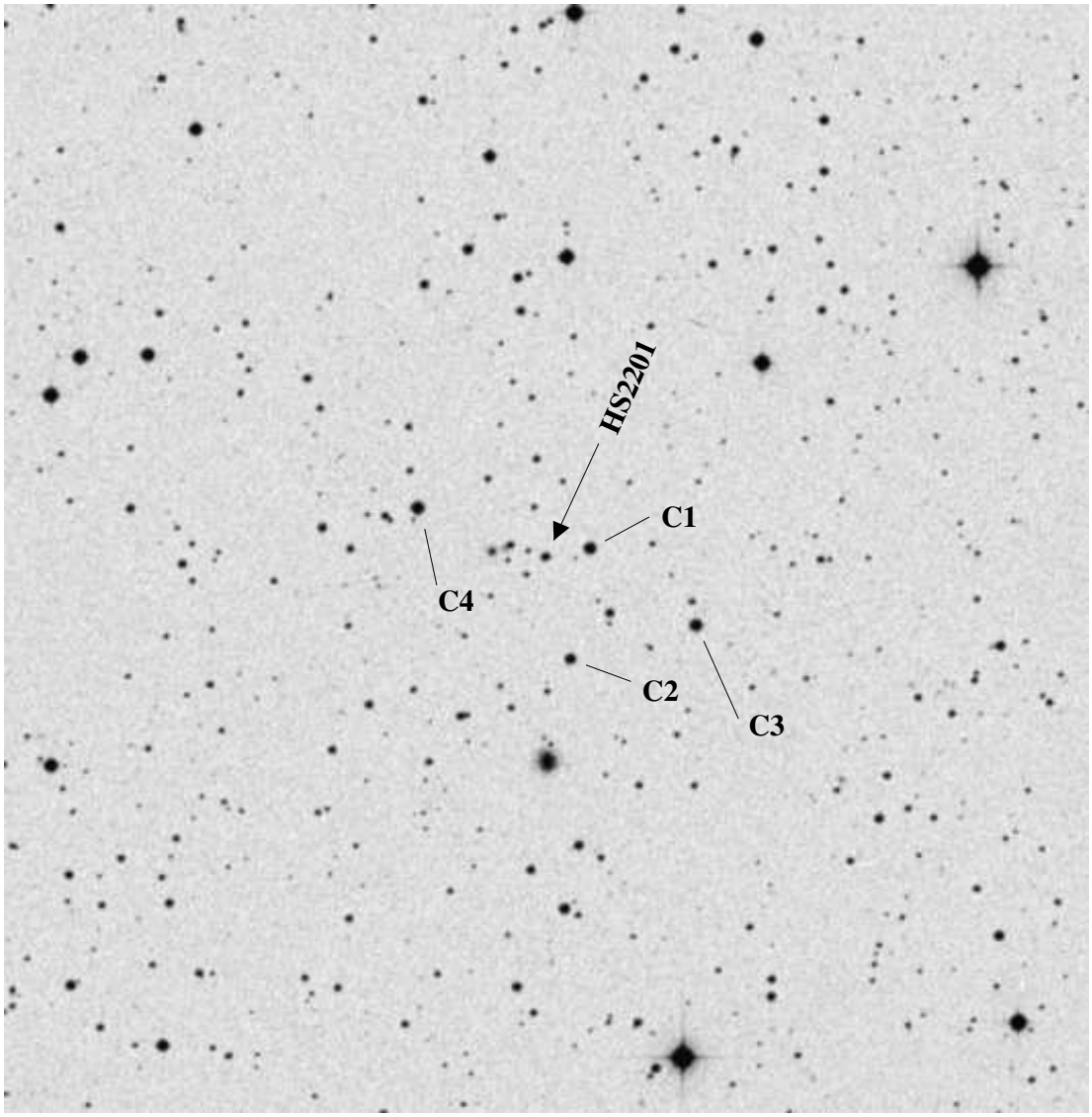
α_{2000} = 22:04:12.13 NO filter

δ_{2000} = +26:25:07.8 IT= 10 s

HS2201+2610

N

E



15 arcmin x 15 arcmin

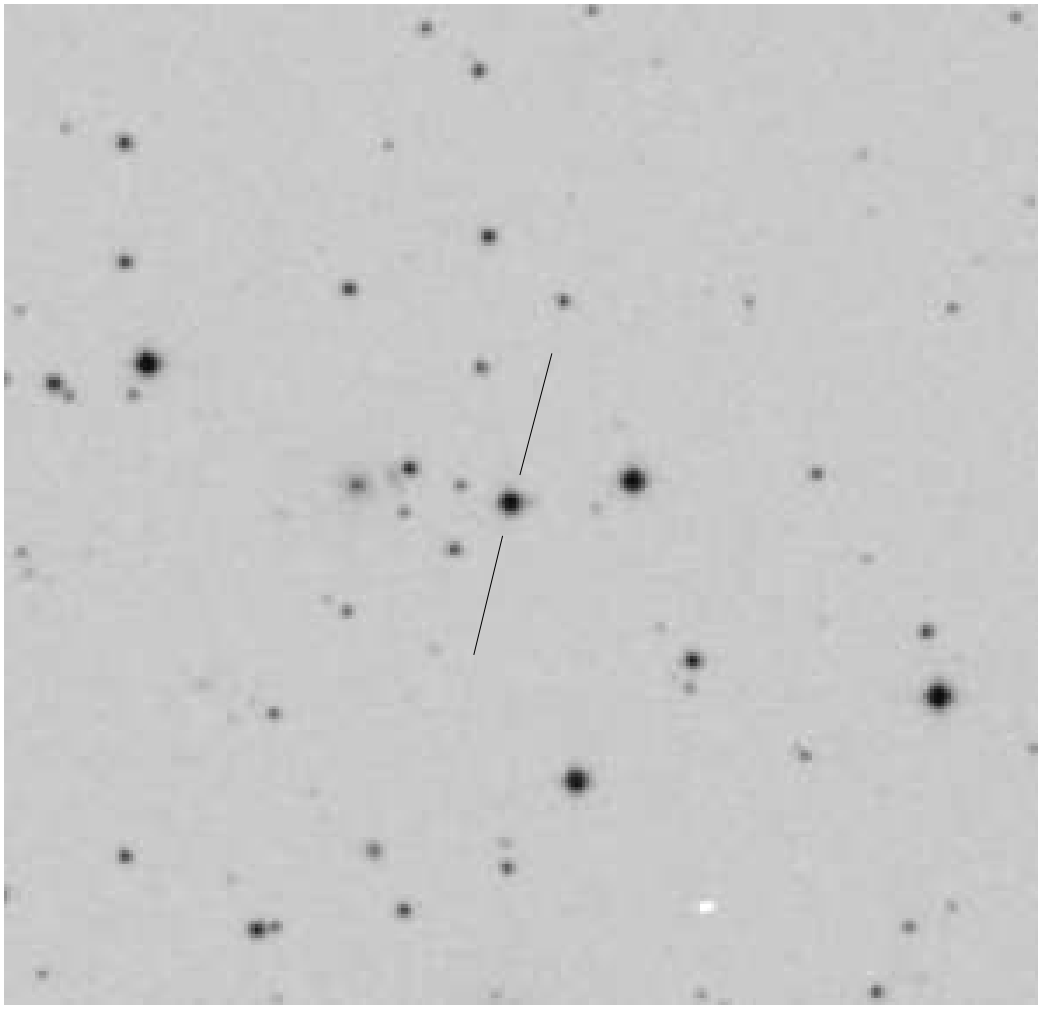
α_{2000}: 22 04 12.0 B$\simeq$14.3

δ_{2000}: +26 25 07

HS2201+2610

N

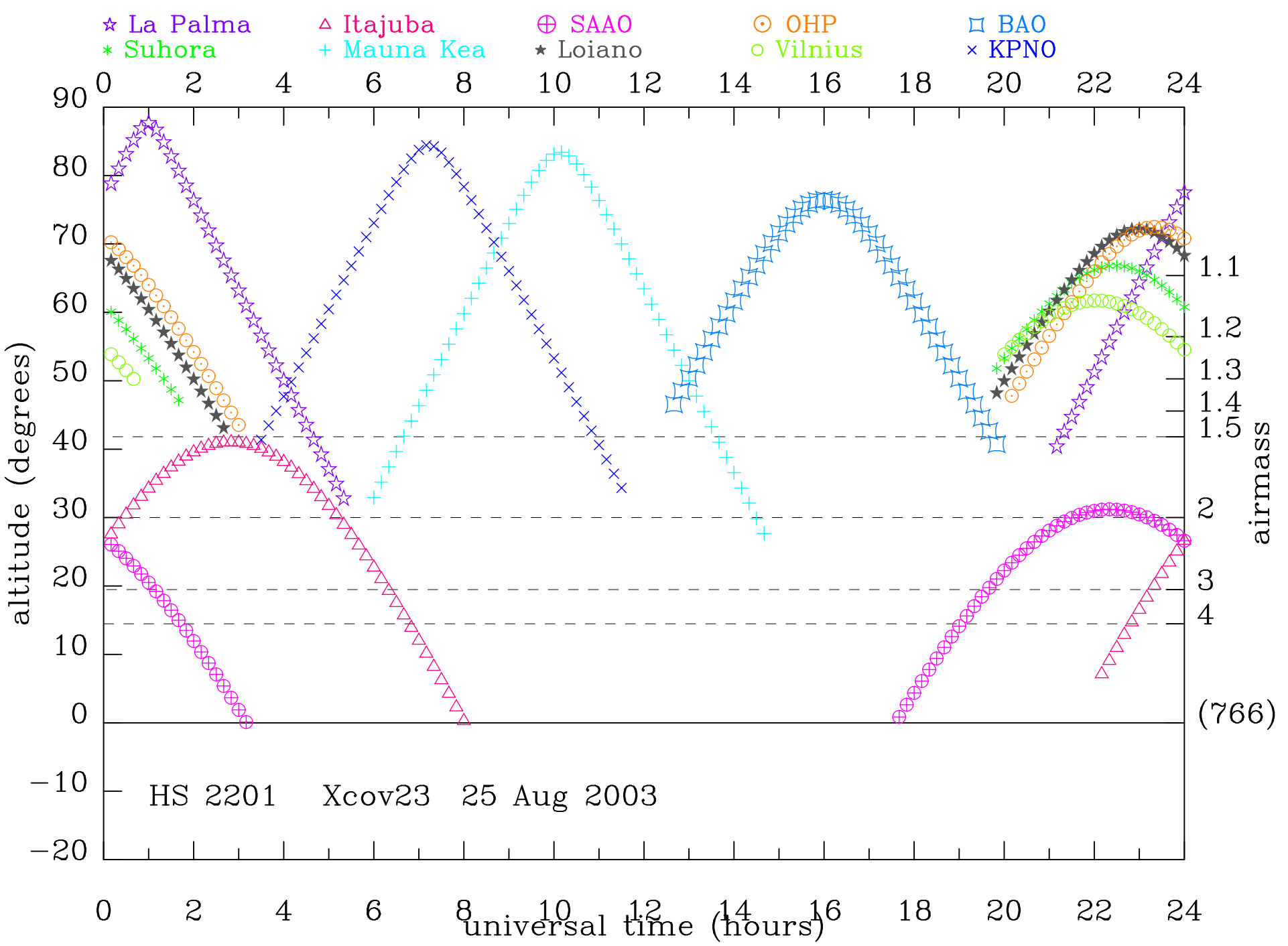
E

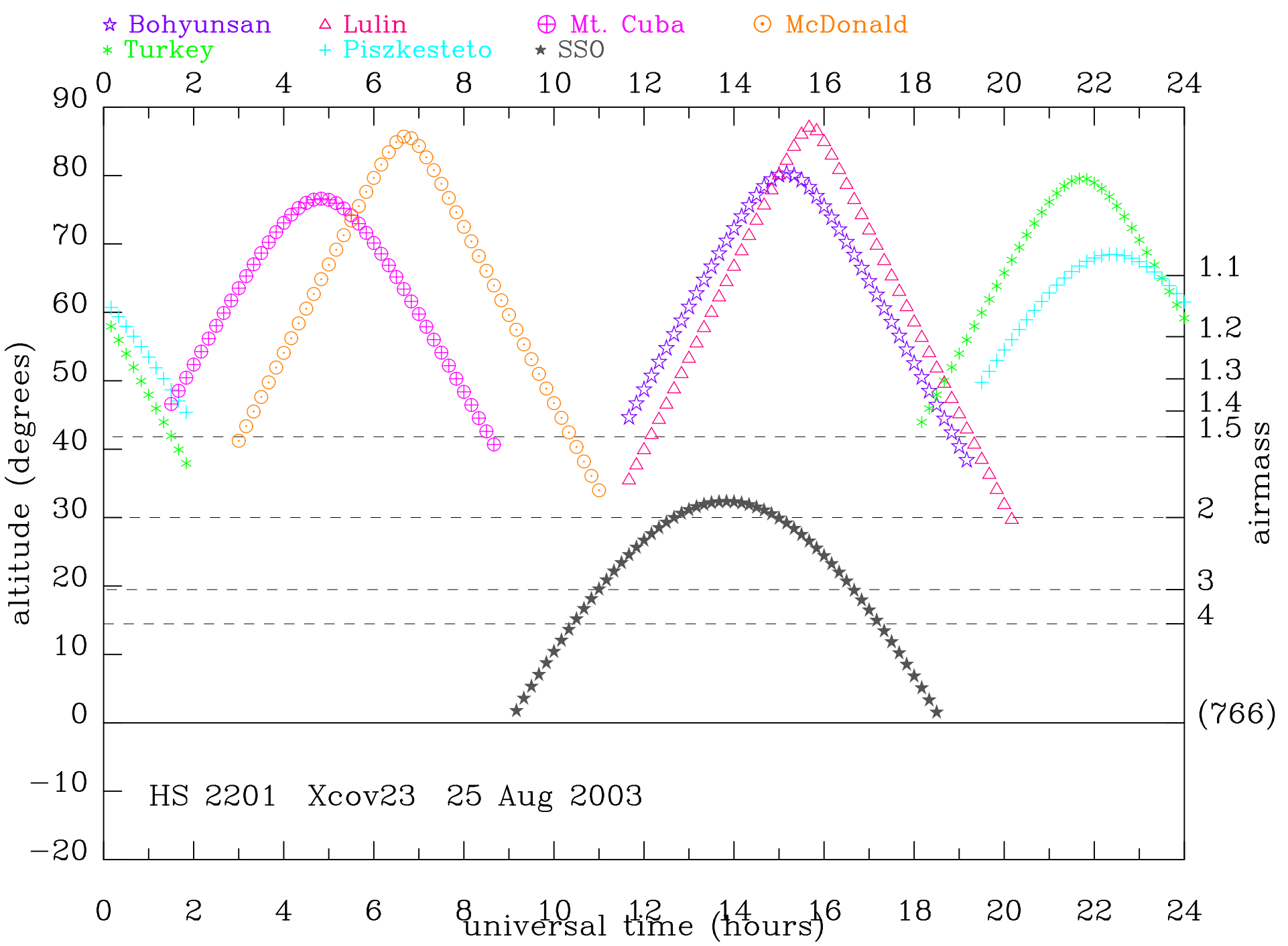


5 arcmin x 5 arcmin

α_{2000}: 22 04 12.0 B$\simeq$14.3

δ_{2000}: +26 25 07


La Palma
Itajuba
SAAO
OHP
BAO
Suhora
Mauna Kea
Loiano
Vilnius
KPNO
altitude (degrees)
airmass
universal time (hours)
HS 2201 Xcov23 25 Aug 2003
(766)


Bohyunsan
Lulin
Mt. Cuba
McDonald
Turkey
Piszkesteto
SSO
altitude (degrees)
airmass
universal time (hours)
HS 2201 Xcov23 25 Aug 2003
(766)

Wet Run Info for HS2201

RA: 22 04 12.2 **dec**: 26 25 08 Epoch 2000.00

2003 Aug 15 to 2003 Sep 11

computed using Wetcalc

August 11, 2003

HS2201: 2003 Aug 15, Moon 87% full								
Site	Universal Time					Airmass		
	f.v.[1]	l.v.[1]	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary								
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland	1 40	8 34	5 30	1 40	8 34	1.53	1.31	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Aug 16, Moon 80% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary								
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland	1 39	8 35	5 26	1 39	8 35	1.52	1.33	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

[1] *f.v.* and *l.v.* denote the time when the object is "first visible" and "last visible", respectively. This takes into account both the rise and set times as well as the evening and morning twilight times.

HS2201: 2003 Aug 17, Moon 71% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary								
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland	1 37	8 37	5 22	1 37	8 37	1.50	1.35	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Aug 18, Moon 62% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.	18 22	1 44	22 16	18 22	1 44	1.56	1.42	1.02
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 52	1 37	22 57	19 52	1 37	1.35	1.27	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland	1 35	8 38	5 18	1 35	8 38	1.49	1.38	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii	6 05	14 47	10 37	6 05	14 47	2.15	1.86	1.01

HS2201: 2003 Aug 19, Moon 53% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.	18 20	1 45	22 12	18 20	1 45	1.55	1.44	1.02
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 49	1 40	22 53	19 49	1 40	1.34	1.28	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope	21 12	5 20	1 24	21 12	5 20	1.77	1.62	1.00
Itajuba, Brazil								
Mount Cuba, Maryland	1 33	8 39	5 14	1 33	8 39	1.48	1.40	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii	6 04	14 47	10 33	6 04	14 47	2.11	1.91	1.01

HS2201: 2003 Aug 20, Moon 44% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea	11 42	19 13	15 34	11 42	19 13	1.55	1.47	1.01
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.	18 18	1 46	22 08	18 18	1 46	1.53	1.47	1.02
Moletai, Lithuania	20 24	0 19	22 27	20 24	0 19	1.24	1.23	1.14
South Africa								
Suhora, Poland	19 56	1 31	22 49	19 56	1 31	1.31	1.28	1.09
Piszkesteto, Hungary	19 46	1 42	22 49	19 46	1 42	1.34	1.30	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope	21 10	5 21	1 20	21 10	5 21	1.74	1.65	1.00
Itajuba, Brazil	22 58	7 23	3 10	22 04	8 07	5.00	5.00	1.52
Mount Cuba, Maryland	1 31	8 41	5 10	1 31	8 41	1.47	1.43	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii	6 03	14 47	10 29	6 03	14 47	2.06	1.96	1.01

HS2201: 2003 Aug 21, Moon 34% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea	11 41	19 14	15 30	11 41	19 14	1.54	1.50	1.01
Lulin Obs., Taiwan	11 44	20 16	16 03	11 44	20 16	1.90	1.84	1.00
Beijing Observatory								
Turkish Natl. Obs.	18 17	1 47	22 04	18 17	1 47	1.52	1.50	1.02
Moletai, Lithuania	20 20	0 23	22 23	20 20	0 23	1.24	1.24	1.14
South Africa								
Suhora, Poland	19 53	1 33	22 45	19 53	1 33	1.31	1.30	1.09
Piszkesteto, Hungary	19 44	1 44	22 45	19 44	1 44	1.33	1.32	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope	21 09	5 21	1 17	21 09	5 21	1.72	1.69	1.00
Itajuba, Brazil	22 54	7 19	3 07	22 04	8 06	5.00	5.00	1.52
Mount Cuba, Maryland	1 30	8 42	5 06	1 30	8 42	1.46	1.45	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii	6 02	14 48	10 25	6 02	14 48	2.02	2.02	1.01

HS2201: 2003 Aug 22, Moon 26% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea	11 39	19 16	15 26	11 39	19 16	1.52	1.53	1.01
Lulin Obs., Taiwan	11 43	20 17	15 59	11 43	20 17	1.87	1.89	1.00
Beijing Observatory								
Turkish Natl. Obs.	18 15	1 48	22 00	18 15	1 48	1.51	1.53	1.02
Moletai, Lithuania	20 15	0 27	22 19	20 15	0 27	1.25	1.25	1.14
South Africa								
Suhora, Poland	19 50	1 36	22 41	19 50	1 36	1.31	1.32	1.09
Piszkesteto, Hungary	19 41	1 46	22 41	19 41	1 46	1.33	1.34	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence	20 19	3 02	23 38	20 19	3 02	1.38	1.40	1.05
Nordic Optical Telescope	21 08	5 22	1 13	21 08	5 22	1.69	1.73	1.00
Itajuba, Brazil	22 50	7 15	3 03	22 04	8 06	5.00	5.00	1.52
Mount Cuba, Maryland	1 28	8 43	5 03	1 28	8 43	1.45	1.48	1.03
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii	6 01	14 48	10 21	6 01	14 48	1.98	2.08	1.01

HS2201: 2003 Aug 23, Moon 17% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea	11 37	19 17	15 22	11 37	19 17	1.51	1.57	1.01
Lulin Obs., Taiwan	11 42	20 17	15 55	11 42	20 17	1.84	1.94	1.00
Beijing Observatory								
Turkish Natl. Obs.	18 13	1 50	21 56	18 13	1 50	1.49	1.56	1.02
Moletai, Lithuania	20 11	0 31	22 15	20 11	0 31	1.25	1.27	1.14
South Africa								
Suhora, Poland	19 47	1 38	22 37	19 47	1 38	1.30	1.34	1.09
Piszkesteto, Hungary	19 39	1 48	22 38	19 39	1 48	1.32	1.36	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence	20 16	3 04	23 34	20 16	3 04	1.38	1.43	1.05
Nordic Optical Telescope	21 07	5 23	1 09	21 07	5 23	1.67	1.78	1.00
Itajuba, Brazil	22 46	7 12	2 59	22 05	8 05	5.00	5.00	1.52
Mount Cuba, Maryland	1 26	8 45	4 59	1 26	8 45	1.44	1.51	1.03
McDonald Observatory								
Kitt Peak	3 28	11 30	7 22	3 28	11 30	1.59	1.70	1.00
Mauna Kea, Hawaii	6 00	14 49	10 17	6 00	14 49	1.94	2.15	1.01

HS2201: 2003 Aug 24, Moon 11% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	10 16	17 41	13 58	9 04	19 08	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 36	19 18	15 18	11 36	19 18	1.50	1.60	1.01
Lulin Obs., Taiwan	11 41	20 18	15 51	11 41	20 18	1.81	2.00	1.00
Beijing Observatory								
Turkish Natl. Obs.	18 12	1 51	21 52	18 12	1 51	1.48	1.59	1.02
Moletai, Lithuania	20 06	0 35	22 11	20 06	0 35	1.25	1.28	1.14
South Africa								
Suhora, Poland	19 45	1 40	22 33	19 45	1 40	1.30	1.36	1.09
Piszkesteto, Hungary	19 36	1 50	22 34	19 36	1 50	1.32	1.38	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence	20 14	3 05	23 30	20 14	3 05	1.37	1.45	1.05
Nordic Optical Telescope	21 05	5 23	1 05	21 05	5 23	1.65	1.83	1.00
Itajuba, Brazil	22 42	7 08	2 55	22 05	8 04	5.00	5.00	1.52
Mount Cuba, Maryland	1 24	8 46	4 55	1 24	8 46	1.43	1.54	1.03
McDonald Observatory	2 53	11 04	6 48	2 53	11 04	1.60	1.78	1.00
Kitt Peak	3 26	11 31	7 18	3 26	11 31	1.57	1.74	1.00
Mauna Kea, Hawaii	5 59	14 49	10 13	5 59	14 49	1.90	2.22	1.01

HS2201: 2003 Aug 25, Moon 5% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	10 12	17 37	13 54	9 04	19 07	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 34	19 19	15 15	11 34	19 19	1.48	1.64	1.01
Lulin Obs., Taiwan	11 40	20 18	15 47	11 40	20 18	1.78	2.06	1.00
Beijing Observatory								
Turkish Natl. Obs.	18 10	1 52	21 48	18 10	1 52	1.47	1.63	1.02
Moletai, Lithuania	20 02	0 38	22 07	20 02	0 38	1.25	1.30	1.14
South Africa								
Suhora, Poland	19 42	1 43	22 29	19 42	1 43	1.30	1.38	1.09
Piszkesteto, Hungary	19 33	1 52	22 30	19 33	1 52	1.31	1.41	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence	20 12	3 07	23 26	20 12	3 07	1.36	1.48	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 38	7 04	2 51	22 05	8 03	5.00	5.00	1.52
Mount Cuba, Maryland	1 22	8 47	4 51	1 22	8 47	1.42	1.57	1.03
McDonald Observatory	2 52	11 05	6 44	2 52	11 05	1.58	1.82	1.00
Kitt Peak	3 25	11 32	7 14	3 25	11 32	1.55	1.78	1.00
Mauna Kea, Hawaii	5 58	14 49	10 09	5 58	14 49	1.87	2.29	1.01

HS2201: 2003 Aug 26, Moon 1% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	10 08	17 33	13 51	9 05	19 06	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 32	19 20	15 11	11 32	19 20	1.47	1.68	1.01
Lulin Obs., Taiwan	11 38	20 19	15 43	11 38	20 19	1.75	2.13	1.00
Beijing Observatory	12 34	19 59	16 01	12 34	19 59	1.41	1.58	1.03
Turkish Natl. Obs.	18 08	1 53	21 44	18 08	1 53	1.45	1.67	1.02
Moletai, Lithuania	19 58	0 42	22 03	19 58	0 42	1.25	1.32	1.14
South Africa	18 44	2 00	22 22	17 38	3 39	5.00	5.00	1.93
Suhora, Poland	19 39	1 45	22 25	19 39	1 45	1.29	1.41	1.09
Piszkesteto, Hungary	19 31	1 54	22 26	19 31	1 54	1.31	1.43	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence	20 10	3 09	23 22	20 10	3 09	1.35	1.51	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 34	7 00	2 47	22 05	8 02	5.00	5.00	1.52
Mount Cuba, Maryland	1 20	8 49	4 47	1 20	8 49	1.41	1.61	1.03
McDonald Observatory	2 51	11 05	6 40	2 51	11 05	1.56	1.87	1.00
Kitt Peak	3 24	11 33	7 10	3 24	11 33	1.54	1.83	1.00
Mauna Kea, Hawaii	5 58	14 50	10 05	5 58	14 50	1.83	2.38	1.01

HS2201: 2003 Aug 27, Moon 0% full

Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	10 04	17 29	13 47	9 05	19 05	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 31	19 21	15 07	11 31	19 21	1.46	1.72	1.01
Lulin Obs., Taiwan	11 37	20 19	15 39	11 37	20 19	1.72	2.20	1.00
Beijing Observatory	12 32	20 01	15 57	12 32	20 01	1.40	1.62	1.03
Turkish Natl. Obs.	18 07	1 54	21 40	18 07	1 54	1.44	1.71	1.02
Moletai, Lithuania	19 54	0 45	21 59	19 54	0 45	1.25	1.34	1.14
South Africa	18 40	1 56	22 18	17 38	3 38	5.00	5.00	1.93
Suhora, Poland	19 36	1 47	22 21	19 36	1 47	1.29	1.43	1.09
Piszkesteto, Hungary	19 28	1 56	22 22	19 28	1 56	1.31	1.46	1.07
Bologna Uni. Obs., Italy	19 46	2 46	22 56	19 46	2 46	1.34	1.53	1.05
Obs. of Haute-Provence	20 08	3 10	23 18	20 08	3 10	1.35	1.54	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 30	6 56	2 43	22 06	8 02	5.00	5.00	1.52
Mount Cuba, Maryland	1 18	8 50	4 43	1 18	8 50	1.40	1.64	1.03
McDonald Observatory	2 49	11 06	6 36	2 49	11 06	1.54	1.92	1.00
Kitt Peak	3 22	11 34	7 06	3 22	11 34	1.52	1.88	1.00
Mauna Kea, Hawaii	5 57	14 50	10 01	5 57	14 50	1.80	2.46	1.01

HS2201: 2003 Aug 28, Moon 1% full

Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	10 00	17 25	13 43	9 06	19 04	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 29	19 22	15 03	11 29	19 22	1.44	1.76	1.01
Lulin Obs., Taiwan	11 36	20 20	15 35	11 36	20 20	1.70	2.27	1.00
Beijing Observatory	12 30	20 02	15 53	12 30	20 02	1.39	1.66	1.03
Turkish Natl. Obs.	18 05	1 55	21 36	18 05	1 55	1.43	1.75	1.02
Moletai, Lithuania	19 50	0 49	21 55	19 50	0 49	1.25	1.36	1.14
South Africa	18 37	1 52	22 14	17 39	3 37	5.00	5.00	1.93
Suhora, Poland	19 33	1 49	22 17	19 33	1 49	1.29	1.46	1.09
Piszkesteto, Hungary	19 26	1 58	22 18	19 26	1 58	1.30	1.49	1.07
Bologna Uni. Obs., Italy	19 44	2 48	22 52	19 44	2 48	1.34	1.56	1.05
Obs. of Haute-Provence	20 06	3 12	23 14	20 06	3 12	1.34	1.57	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 26	6 52	2 39	22 06	8 01	5.00	5.00	1.52
Mount Cuba, Maryland	1 17	8 51	4 39	1 17	8 51	1.39	1.68	1.03
McDonald Observatory	2 48	11 07	6 32	2 48	11 07	1.53	1.98	1.00
Kitt Peak	3 21	11 35	7 03	3 21	11 35	1.50	1.93	1.00
Mauna Kea, Hawaii	5 56	14 50	9 57	5 56	14 50	1.77	2.56	1.01

HS2201: 2003 Aug 29, Moon 4% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	9 56	17 21	13 39	9 06	19 03	5.00	5.00	1.87
Bohyunsan Obs., Korea	11 28	19 23	14 59	11 28	19 23	1.43	1.80	1.01
Lulin Obs., Taiwan								
Beijing Observatory	12 28	20 03	15 49	12 28	20 03	1.38	1.69	1.03
Turkish Natl. Obs.	18 03	1 56	21 32	18 03	1 56	1.42	1.80	1.02
Moletai, Lithuania	19 46	0 52	21 51	19 46	0 52	1.25	1.38	1.14
South Africa	18 33	1 48	22 10	17 40	3 35	5.00	5.00	1.93
Suhora, Poland	19 31	1 51	22 13	19 31	1 51	1.28	1.48	1.09
Piszkesteto, Hungary	19 23	2 00	22 14	19 23	2 00	1.30	1.52	1.07
Bologna Uni. Obs., Italy	19 42	2 50	22 48	19 42	2 50	1.33	1.60	1.05
Obs. of Haute-Provence	20 03	3 13	23 11	20 03	3 13	1.33	1.61	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 22	6 48	2 35	22 06	8 00	5.00	5.00	1.52
Mount Cuba, Maryland	1 15	8 52	4 35	1 15	8 52	1.38	1.72	1.03
McDonald Observatory	2 46	11 08	6 28	2 46	11 08	1.51	2.04	1.00
Kitt Peak	3 19	11 36	6 59	3 19	11 36	1.49	1.99	1.00
Mauna Kea, Hawaii	5 55	14 51	9 54	5 55	14 51	1.74	2.66	1.01

HS2201: 2003 Aug 30, Moon 10% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	9 53	17 17	13 35	9 07	19 02	5.00	5.00	1.87
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory	12 26	20 05	15 45	12 26	20 05	1.37	1.74	1.03
Turkish Natl. Obs.	18 02	1 57	21 28	18 02	1 57	1.41	1.84	1.02
Moletai, Lithuania	19 42	0 55	21 47	19 42	0 55	1.25	1.40	1.14
South Africa	18 29	1 44	22 06	17 40	3 34	5.00	5.00	1.93
Suhora, Poland	19 28	1 54	22 09	19 28	1 54	1.28	1.51	1.09
Piszkesteto, Hungary	19 20	2 02	22 10	19 20	2 02	1.29	1.55	1.07
Bologna Uni. Obs., Italy	19 40	2 51	22 44	19 40	2 51	1.33	1.63	1.05
Obs. of Haute-Provence	20 01	3 15	23 07	20 01	3 15	1.33	1.64	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 18	6 44	2 31	22 06	7 59	5.00	5.00	1.52
Mount Cuba, Maryland	1 13	8 54	4 31	1 13	8 54	1.37	1.76	1.03
McDonald Observatory	2 45	11 08	6 24	2 45	11 08	1.49	2.11	1.00
Kitt Peak	3 18	11 36	6 55	3 18	11 36	1.47	2.05	1.00
Mauna Kea, Hawaii	5 54	14 51	9 50	5 54	14 51	1.71	2.77	1.01

HS2201: 2003 Aug 31, Moon 18% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia	9 49	17 13	13 31	9 07	19 00	5.00	5.00	1.87
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory	12 25	20 06	15 41	12 25	20 06	1.36	1.78	1.03
Turkish Natl. Obs.	18 00	1 58	21 24	18 00	1 58	1.40	1.89	1.02
Moletai, Lithuania	19 38	0 59	21 44	19 38	0 59	1.25	1.43	1.14
South Africa	18 25	1 40	22 02	17 41	3 33	5.00	5.00	1.93
Suhora, Poland	19 25	1 56	22 05	19 25	1 56	1.28	1.54	1.09
Piszkesteto, Hungary	19 18	2 04	22 06	19 18	2 04	1.29	1.58	1.07
Bologna Uni. Obs., Italy	19 38	2 53	22 40	19 38	2 53	1.32	1.67	1.05
Obs. of Haute-Provence	19 59	3 16	23 03	19 59	3 16	1.32	1.68	1.05
Nordic Optical Telescope								
Itajuba, Brazil	22 14	6 40	2 27	22 07	7 58	5.00	5.00	1.52
Mount Cuba, Maryland	1 11	8 55	4 27	1 11	8 55	1.36	1.81	1.03
McDonald Observatory	2 44	11 09	6 20	2 44	11 09	1.48	2.17	1.00
Kitt Peak	3 16	11 37	6 51	3 16	11 37	1.46	2.12	1.00
Mauna Kea, Hawaii	5 53	14 52	9 46	5 53	14 52	1.69	2.90	1.01

HS2201: 2003 Sep 1, Moon 27% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory	12 23	20 07	15 37	12 23	20 07	1.36	1.83	1.03
Turkish Natl. Obs.								
Moletai, Lithuania	19 35	1 02	21 40	19 35	1 02	1.25	1.45	1.14
South Africa	18 21	1 36	21 59	17 41	3 32	5.00	5.00	1.93
Suhora, Poland	19 22	1 58	22 02	19 22	1 58	1.28	1.57	1.09
Piszkesteto, Hungary	19 15	2 06	22 02	19 15	2 06	1.29	1.61	1.07
Bologna Uni. Obs., Italy	19 36	2 54	22 36	19 36	2 54	1.31	1.71	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak	3 15	11 38	6 47	3 15	11 38	1.45	2.18	1.00
Mauna Kea, Hawaii								

HS2201: 2003 Sep 2, Moon 38% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania	19 31	1 05	21 36	19 31	1 05	1.25	1.48	1.14
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 13	2 08	21 58	19 13	2 08	1.28	1.65	1.07
Bologna Uni. Obs., Italy	19 33	2 56	22 32	19 33	2 56	1.31	1.75	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 3, Moon 49% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania	19 27	1 08	21 32	19 27	1 08	1.25	1.51	1.14
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 10	2 10	21 54	19 10	2 10	1.28	1.69	1.07
Bologna Uni. Obs., Italy	19 31	2 57	22 28	19 31	2 57	1.30	1.80	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 4, Moon 61% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 08	2 12	21 50	19 08	2 12	1.27	1.73	1.07
Bologna Uni. Obs., Italy	19 29	2 59	22 25	19 29	2 59	1.30	1.84	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 5, Moon 71% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 05	2 14	21 46	19 05	2 14	1.27	1.77	1.07
Bologna Uni. Obs., Italy	19 27	3 00	22 21	19 27	3 00	1.29	1.89	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 6, Moon 81% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 03	2 15	21 43	19 03	2 15	1.27	1.81	1.07
Bologna Uni. Obs., Italy	19 25	3 02	22 17	19 25	3 02	1.28	1.95	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 7, Moon 89% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	19 00	2 17	21 39	19 00	2 17	1.26	1.86	1.07
Bologna Uni. Obs., Italy	19 22	3 03	22 13	19 22	3 03	1.28	2.00	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 8, Moon 94% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	18 58	2 19	21 35	18 58	2 19	1.26	1.91	1.07
Bologna Uni. Obs., Italy	19 20	3 05	22 09	19 20	3 05	1.27	2.06	1.05
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 9, Moon 98% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	18 55	2 21	21 31	18 55	2 21	1.25	1.97	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 10, Moon 99% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	18 53	2 22	21 27	18 53	2 22	1.25	2.02	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								

HS2201: 2003 Sep 11, Moon 99% full								
Site	Universal Time					Airmass		
	f.v.	l.v.	meridian	eve. tw	morn. tw	rise	set	meridian
Siding Spring, Australia								
Bohyunsan Obs., Korea								
Lulin Obs., Taiwan								
Beijing Observatory								
Turkish Natl. Obs.								
Moletai, Lithuania								
South Africa								
Suhora, Poland								
Piszkesteto, Hungary	18 50	2 24	21 23	18 50	2 24	1.25	2.08	1.07
Bologna Uni. Obs., Italy								
Obs. of Haute-Provence								
Nordic Optical Telescope								
Itajuba, Brazil								
Mount Cuba, Maryland								
McDonald Observatory								
Kitt Peak								
Mauna Kea, Hawaii								