

## What Will We See During the 2001 Leonids?

Up until 1998, folks wishing to observe meteors had to rely on their personal experience or the experience of others in deciding which meteor showers would put on a good display. The Leonids were not generally spectacular – only 10 to 20 meteors per hour, compared to the annual Perseid shower's hourly rates of 80 to 100. Based on historical accounts, it was realized that, every 33 years, there was a chance for the Leonids to put on a dazzling sky show; such extravaganzas had been observed in 1799, 1832, and 1866. Little activity was observed in the first half of the 20<sup>th</sup> century, and some astronomers thought the Leonid meteor stream had been depleted or had moved well away from the Earth. 1966 proved them wrong, as the Leonids came back, with a vengeance – somewhere around 100,000 meteors per hour were seen over the western United States that year!

As in weather forecasting, modern computers have now made it possible to “predict” shower activity; as of now, forecasts have been developed for the Leonid and the Perseid meteor showers. Such meteor activity forecasts are similar to weather forecasts in another way – they often are not reliable. The reasons for this are many, but some of them are:

- 1) We are not certain how fast meteoroids are ejected from the parent comet.
- 2) We do not, as of yet, have a good handle on how dense shower meteors are.
- 3) Small particles, like meteors, can have their orbits changed by non-gravitational forces, such as the pressure of sunlight (radiation pressure, Poynting-Robertson drag). The models account for these forces in different ways, giving different results.
- 4) Some models have all the meteoroids ejected at the comet's closest approach to the Sun. Others try to be “more realistic” by changing the number of particles ejected according to the comet's distance from the Sun.

Given all the above differences, it is surprising that the models agree at all. They did in 1999, but that was a relatively easy prediction because only meteors ejected from the comet in 1899 would produce major activity here at Earth. 2001 is different; Earth will pass close to many streams, some from the 17<sup>th</sup> and 18<sup>th</sup> centuries, and the levels of Leonid activity, along with the times and durations of these peaks, will provide an “acid” test for the different forecasts. Who (if anybody) will be close to right? The answer will come in the early morning hours of November 18<sup>th</sup>.

The following tables give the predicted number of Leonids seen every fifteen minutes from radiant rise to twilight according to four Leonid forecasts: those of Peter Brown/Bill Cooke, David Asher/Robert McNaught, Esko Lyytinen/Tom Van Flandern, and Peter Jenniskens. Sky conditions are assumed to be perfectly clear and extremely dark (like in a desert). The elevation of the Leonid radiant in degrees is also given.

**NOTE:** These tables do not include the background Leonid rate, which can be anywhere from 10 to 20 Leonids per hour.

*Aberdeen:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:00 PM	1	0	0	0	0.6
11/18/01 10:15 PM	2	0	0	1	2.2
11/18/01 10:30 PM	3	0	0	1	3.8
11/18/01 10:45 PM	5	0	0	1	5.5
11/18/01 11:00 PM	5	0	0	2	7.2
11/18/01 11:15 PM	6	0	0	2	9
11/18/01 11:30 PM	7	0	0	2	10.8
11/18/01 11:45 PM	7	0	0	2	12.7
11/19/01 12:00 AM	7	0	0	3	14.7
11/19/01 12:15 AM	7	0	0	3	16.6
11/19/01 12:30 AM	7	0	0	3	18.6
11/19/01 12:45 AM	7	0	0	3	20.6
11/19/01 1:00 AM	7	0	0	3	22.6
11/19/01 1:15 AM	6	0	0	3	24.7
11/19/01 1:30 AM	6	0	0	3	26.7
11/19/01 1:45 AM	5	0	0	3	28.7
11/19/01 2:00 AM	5	0	0	3	30.8
11/19/01 2:15 AM	4	0	0	3	32.8
11/19/01 2:30 AM	4	0	0	3	34.8
11/19/01 2:45 AM	4	0	0	3	36.7
11/19/01 3:00 AM	3	0	0	3	38.7
11/19/01 3:15 AM	3	0	0	3	40.5
11/19/01 3:30 AM	2	0	0	3	42.4
11/19/01 3:45 AM	2	0	0	3	44.1
11/19/01 4:00 AM	2	0	0	3	45.8
11/19/01 4:15 AM	1	0	0	3	47.4
11/19/01 4:30 AM	1	0	0	3	48.9
11/19/01 4:45 AM	1	0	0	3	50.2
11/19/01 5:00 AM	1	0	0	3	51.4
11/19/01 5:15 AM	1	0	0	3	52.4
11/19/01 5:30 AM	0	0	0	3	53.3
11/19/01 5:45 AM	0	0	0	3	54
11/19/01 6:00 AM	0	0	0	2	54.5

*Amsterdam:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:00 PM	1	0	0	0	0.7
11/18/01 11:15 PM	3	0	0	1	2.6
11/18/01 11:30 PM	4	0	0	1	4.5
11/18/01 11:45 PM	5	0	0	2	6.5
11/19/01 12:00 AM	6	0	0	2	8.6
11/19/01 12:15 AM	7	0	0	2	10.7
11/19/01 12:30 AM	8	0	0	3	12.8
11/19/01 12:45 AM	8	0	0	3	15
11/19/01 1:00 AM	8	0	0	3	17.2
11/19/01 1:15 AM	8	0	0	3	19.5
11/19/01 1:30 AM	8	0	0	3	21.7
11/19/01 1:45 AM	8	0	0	3	24
11/19/01 2:00 AM	8	0	0	3	26.3
11/19/01 2:15 AM	7	0	0	4	28.6
11/19/01 2:30 AM	7	0	0	4	30.9
11/19/01 2:45 AM	6	0	0	4	33.2
11/19/01 3:00 AM	6	0	0	4	35.5
11/19/01 3:15 AM	5	0	0	4	37.7
11/19/01 3:30 AM	5	0	0	4	39.9
11/19/01 3:45 AM	4	0	0	4	42.1
11/19/01 4:00 AM	3	0	0	4	44.2
11/19/01 4:15 AM	3	0	0	3	46.3
11/19/01 4:30 AM	3	0	0	3	48.3
11/19/01 4:45 AM	2	0	0	3	50.2
11/19/01 5:00 AM	2	0	0	3	52
11/19/01 5:15 AM	2	0	0	3	53.6
11/19/01 5:30 AM	1	0	0	3	55.1
11/19/01 5:45 AM	1	0	0	3	56.4
11/19/01 6:00 AM	1	0	0	3	57.6
11/19/01 6:15 AM	1	0	0	3	58.5

*Bangkok:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 12:30 AM	10	33	53	46	3.1
11/19/01 12:45 AM	22	101	150	106	6.5
11/19/01 1:00 AM	32	251	296	151	10
11/19/01 1:15 AM	43	458	448	134	13.4
11/19/01 1:30 AM	52	502	529	102	16.8
11/19/01 1:45 AM	60	317	488	79	20.3
11/19/01 2:00 AM	66	115	355	65	23.8
11/19/01 2:15 AM	71	24	210	54	27.2
11/19/01 2:30 AM	74	3	105	47	30.7
11/19/01 2:45 AM	75	0	49	41	34.2
11/19/01 3:00 AM	75	0	25	37	37.7
11/19/01 3:15 AM	74	0	14	33	41.2
11/19/01 3:30 AM	73	0	9	30	44.6
11/19/01 3:45 AM	71	0	6	27	48.1
11/19/01 4:00 AM	68	0	4	25	51.6
11/19/01 4:15 AM	66	0	3	23	55.1
11/19/01 4:30 AM	63	0	2	21	58.5
11/19/01 4:45 AM	60	0	1	20	61.9
11/19/01 5:00 AM	57	0	1	18	65.3
11/19/01 5:15 AM	53	0	0	17	68.6

*Beijing:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:30 PM	9	0	4	5	2.3
11/18/01 11:45 PM	19	0	12	12	4.9
11/19/01 12:00 AM	28	0	24	25	7.6
11/19/01 12:15 AM	36	0	43	46	10.2
11/19/01 12:30 AM	45	2	71	82	13
11/19/01 12:45 AM	53	13	110	141	15.7
11/19/01 1:00 AM	61	53	165	219	18.5
11/19/01 1:15 AM	69	137	247	286	21.3
11/19/01 1:30 AM	78	241	383	339	24.2
11/19/01 1:45 AM	86	395	593	419	27
11/19/01 2:00 AM	93	717	849	437	29.9
11/19/01 2:15 AM	100	1067	1047	316	32.8
11/19/01 2:30 AM	105	1015	1066	206	35.6
11/19/01 2:45 AM	108	574	879	143	38.5
11/19/01 3:00 AM	109	190	586	106	41.4
11/19/01 3:15 AM	108	37	321	83	44.3
11/19/01 3:30 AM	106	4	152	67	47.1
11/19/01 3:45 AM	102	0	68	56	49.9
11/19/01 4:00 AM	98	0	32	48	52.7
11/19/01 4:15 AM	93	0	18	41	55.5
11/19/01 4:30 AM	88	0	11	36	58.1
11/19/01 4:45 AM	83	0	7	32	60.7
11/19/01 5:00 AM	78	0	4	28	63.1
11/19/01 5:15 AM	73	0	3	26	65.4
11/19/01 5:30 AM	68	0	2	23	67.5
11/19/01 5:45 AM	63	0	1	21	69.2

**Cairo:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:30 PM	2	0	0	1	1.8
11/18/01 11:45 PM	6	0	0	2	4.8
11/19/01 12:00 AM	8	0	0	3	7.8
11/19/01 12:15 AM	11	0	0	3	10.9
11/19/01 12:30 AM	13	0	0	4	14
11/19/01 12:45 AM	14	0	0	4	17.1
11/19/01 1:00 AM	15	0	0	5	20.3
11/19/01 1:15 AM	16	0	0	5	23.4
11/19/01 1:30 AM	16	0	0	5	26.6
11/19/01 1:45 AM	16	0	0	5	29.8
11/19/01 2:00 AM	16	0	0	6	33
11/19/01 2:15 AM	15	0	0	6	36.2
11/19/01 2:30 AM	14	0	0	6	39.5
11/19/01 2:45 AM	13	0	0	6	42.7
11/19/01 3:00 AM	13	0	0	6	46
11/19/01 3:15 AM	11	0	0	6	49.2
11/19/01 3:30 AM	10	0	0	5	52.5
11/19/01 3:45 AM	9	0	0	5	55.7
11/19/01 4:00 AM	8	0	0	5	59
11/19/01 4:15 AM	7	0	0	5	62.2
11/19/01 4:30 AM	6	0	0	5	65.4
11/19/01 4:45 AM	6	0	0	5	68.5
11/19/01 5:00 AM	5	0	0	5	71.6

*Delhi:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 12:00 AM	6	54	59	11	1.9
11/19/01 12:15 AM	15	76	119	19	4.9
11/19/01 12:30 AM	23	38	121	22	8
11/19/01 12:45 AM	30	10	87	23	11.1
11/19/01 1:00 AM	35	1	50	22	14.2
11/19/01 1:15 AM	40	0	26	22	17.4
11/19/01 1:30 AM	43	0	14	21	20.6
11/19/01 1:45 AM	46	0	9	20	23.8
11/19/01 2:00 AM	47	0	6	19	27
11/19/01 2:15 AM	48	0	4	18	30.2
11/19/01 2:30 AM	48	0	3	18	33.5
11/19/01 2:45 AM	48	0	2	17	36.7
11/19/01 3:00 AM	47	0	1	16	40
11/19/01 3:15 AM	46	0	1	15	43.3
11/19/01 3:30 AM	45	0	1	15	46.6
11/19/01 3:45 AM	44	0	0	14	49.9
11/19/01 4:00 AM	42	0	0	13	53.2
11/19/01 4:15 AM	40	0	0	13	56.5
11/19/01 4:30 AM	37	0	0	12	59.8
11/19/01 4:45 AM	35	0	0	11	63.1
11/19/01 5:00 AM	32	0	0	11	66.3
11/19/01 5:15 AM	30	0	0	10	69.5
11/19/01 5:30 AM	27	0	0	10	72.7

*Dublin:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:45 PM	1	0	0	0	1.4
11/18/01 11:00 PM	2	0	0	1	3.2
11/18/01 11:15 PM	3	0	0	1	5.1
11/18/01 11:30 PM	4	0	0	1	7.1
11/18/01 11:45 PM	5	0	0	2	9.1
11/19/01 12:00 AM	5	0	0	2	11.1
11/19/01 12:15 AM	6	0	0	2	13.2
11/19/01 12:30 AM	6	0	0	2	15.4
11/19/01 12:45 AM	6	0	0	2	17.6
11/19/01 1:00 AM	6	0	0	3	19.8
11/19/01 1:15 AM	6	0	0	3	22
11/19/01 1:30 AM	5	0	0	3	24.2
11/19/01 1:45 AM	5	0	0	3	26.4
11/19/01 2:00 AM	5	0	0	3	28.7
11/19/01 2:15 AM	4	0	0	3	30.9
11/19/01 2:30 AM	4	0	0	3	33.2
11/19/01 2:45 AM	3	0	0	3	35.4
11/19/01 3:00 AM	3	0	0	3	37.6
11/19/01 3:15 AM	3	0	0	3	39.7
11/19/01 3:30 AM	2	0	0	3	41.9
11/19/01 3:45 AM	2	0	0	3	43.9
11/19/01 4:00 AM	2	0	0	3	45.9
11/19/01 4:15 AM	1	0	0	3	47.8
11/19/01 4:30 AM	1	0	0	3	49.7
11/19/01 4:45 AM	1	0	0	3	51.4
11/19/01 5:00 AM	1	0	0	3	53
11/19/01 5:15 AM	1	0	0	3	54.4
11/19/01 5:30 AM	1	0	0	3	55.7
11/19/01 5:45 AM	0	0	0	3	56.7
11/19/01 6:00 AM	0	0	0	3	57.6



*Edinburgh:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:15 PM	1	0	0	0	1
11/18/01 10:30 PM	2	0	0	1	2.6
11/18/01 10:45 PM	4	0	0	1	4.3
11/18/01 11:00 PM	5	0	0	1	6.1
11/18/01 11:15 PM	5	0	0	2	7.9
11/18/01 11:30 PM	6	0	0	2	9.8
11/18/01 11:45 PM	6	0	0	2	11.8
11/19/01 12:00 AM	7	0	0	2	13.7
11/19/01 12:15 AM	7	0	0	3	15.7
11/19/01 12:30 AM	7	0	0	3	17.8
11/19/01 12:45 AM	7	0	0	3	19.8
11/19/01 1:00 AM	6	0	0	3	21.9
11/19/01 1:15 AM	6	0	0	3	24
11/19/01 1:30 AM	6	0	0	3	26.1
11/19/01 1:45 AM	5	0	0	3	28.2
11/19/01 2:00 AM	5	0	0	3	30.3
11/19/01 2:15 AM	4	0	0	3	32.4
11/19/01 2:30 AM	4	0	0	3	34.5
11/19/01 2:45 AM	4	0	0	3	36.5
11/19/01 3:00 AM	3	0	0	3	38.6
11/19/01 3:15 AM	3	0	0	3	40.5
11/19/01 3:30 AM	2	0	0	3	42.4
11/19/01 3:45 AM	2	0	0	3	44.3
11/19/01 4:00 AM	2	0	0	3	46.1
11/19/01 4:15 AM	1	0	0	3	47.8
11/19/01 4:30 AM	1	0	0	3	49.3
11/19/01 4:45 AM	1	0	0	3	50.8
11/19/01 5:00 AM	1	0	0	3	52.1
11/19/01 5:15 AM	1	0	0	3	53.2
11/19/01 5:30 AM	0	0	0	3	54.2
11/19/01 5:45 AM	0	0	0	3	55
11/19/01 6:00 AM	0	0	0	2	55.6

**Frankfurt:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:00 PM	1	0	0	0	1.4
11/18/01 11:15 PM	3	0	0	1	3.4
11/18/01 11:30 PM	5	0	0	2	5.5
11/18/01 11:45 PM	6	0	0	2	7.7
11/19/01 12:00 AM	7	0	0	2	9.9
11/19/01 12:15 AM	8	0	0	3	12.1
11/19/01 12:30 AM	9	0	0	3	14.4
11/19/01 12:45 AM	9	0	0	3	16.7
11/19/01 1:00 AM	9	0	0	3	19.1
11/19/01 1:15 AM	9	0	0	3	21.4
11/19/01 1:30 AM	9	0	0	4	23.8
11/19/01 1:45 AM	9	0	0	4	26.2
11/19/01 2:00 AM	8	0	0	4	28.6
11/19/01 2:15 AM	8	0	0	4	31
11/19/01 2:30 AM	7	0	0	4	33.4
11/19/01 2:45 AM	7	0	0	4	35.8
11/19/01 3:00 AM	6	0	0	4	38.2
11/19/01 3:15 AM	5	0	0	4	40.6
11/19/01 3:30 AM	5	0	0	4	42.9
11/19/01 3:45 AM	4	0	0	4	45.1
11/19/01 4:00 AM	4	0	0	4	47.3
11/19/01 4:15 AM	3	0	0	4	49.5
11/19/01 4:30 AM	3	0	0	4	51.5
11/19/01 4:45 AM	2	0	0	4	53.4
11/19/01 5:00 AM	2	0	0	3	55.2
11/19/01 5:15 AM	2	0	0	3	56.9
11/19/01 5:30 AM	1	0	0	3	58.3
11/19/01 5:45 AM	1	0	0	3	59.6
11/19/01 6:00 AM	1	0	0	3	60.6

*Hong Kong:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 12:15 AM	7	0	8	9	1.9
11/19/01 12:30 AM	18	1	28	33	5.1
11/19/01 12:45 AM	28	7	59	76	8.3
11/19/01 1:00 AM	39	34	105	139	11.6
11/19/01 1:15 AM	49	97	175	202	14.9
11/19/01 1:30 AM	59	185	293	259	18.2
11/19/01 1:45 AM	69	320	480	340	21.6
11/19/01 2:00 AM	79	608	719	369	24.9
11/19/01 2:15 AM	87	935	917	277	28.3
11/19/01 2:30 AM	94	914	960	186	31.7
11/19/01 2:45 AM	100	529	810	132	35.1
11/19/01 3:00 AM	103	179	551	100	38.5
11/19/01 3:15 AM	104	35	307	79	41.9
11/19/01 3:30 AM	103	4	147	65	45.3
11/19/01 3:45 AM	101	0	66	55	48.8
11/19/01 4:00 AM	97	0	32	48	52.2
11/19/01 4:15 AM	93	0	18	41	55.7
11/19/01 4:30 AM	89	0	11	37	59.1
11/19/01 4:45 AM	84	0	7	33	62.6
11/19/01 5:00 AM	80	0	5	29	66.1
11/19/01 5:15 AM	75	0	3	26	69.5
11/19/01 5:30 AM	71	0	2	24	73

***Istanbul:***

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:15 PM	3	0	0	1	2
11/18/01 11:30 PM	6	0	0	2	4.6
11/18/01 11:45 PM	8	0	0	3	7.2
11/19/01 12:00 AM	11	0	0	3	9.8
11/19/01 12:15 AM	12	0	0	4	12.5
11/19/01 12:30 AM	14	0	0	4	15.2
11/19/01 12:45 AM	15	0	0	5	17.9
11/19/01 1:00 AM	15	0	0	5	20.7
11/19/01 1:15 AM	16	0	0	5	23.5
11/19/01 1:30 AM	16	0	0	5	26.3
11/19/01 1:45 AM	15	0	0	5	29.1
11/19/01 2:00 AM	15	0	0	5	32
11/19/01 2:15 AM	14	0	0	5	34.8
11/19/01 2:30 AM	14	0	0	5	37.6
11/19/01 2:45 AM	13	0	0	5	40.5
11/19/01 3:00 AM	12	0	0	5	43.3
11/19/01 3:15 AM	11	0	0	5	46.1
11/19/01 3:30 AM	10	0	0	5	48.8
11/19/01 3:45 AM	9	0	0	5	51.6
11/19/01 4:00 AM	8	0	0	5	54.3
11/19/01 4:15 AM	7	0	0	5	56.9
11/19/01 4:30 AM	6	0	0	5	59.4
11/19/01 4:45 AM	5	0	0	5	61.8
11/19/01 5:00 AM	4	0	0	5	64
11/19/01 5:15 AM	4	0	0	4	66.1
11/19/01 5:30 AM	3	0	0	4	67.9

*Jakarta:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 12:30 AM	5	16	25	21	1.5
11/19/01 12:45 AM	16	76	114	80	4.9
11/19/01 1:00 AM	27	212	249	127	8.4
11/19/01 1:15 AM	38	403	395	118	11.8
11/19/01 1:30 AM	47	454	478	92	15.2
11/19/01 1:45 AM	55	291	448	73	18.6
11/19/01 2:00 AM	62	106	329	60	21.9
11/19/01 2:15 AM	66	22	195	51	25.2
11/19/01 2:30 AM	69	3	98	44	28.5
11/19/01 2:45 AM	70	0	46	39	31.8
11/19/01 3:00 AM	71	0	23	34	35
11/19/01 3:15 AM	70	0	13	31	38.1
11/19/01 3:30 AM	68	0	8	28	41.1
11/19/01 3:45 AM	66	0	5	26	44.1
11/19/01 4:00 AM	64	0	4	23	46.9
11/19/01 4:15 AM	61	0	2	21	49.7

*Jerusalem:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:00 PM	0	0	0	0	-0.2
11/18/01 11:15 PM	4	0	0	1	2.6
11/18/01 11:30 PM	7	0	0	2	5.6
11/18/01 11:45 PM	10	0	0	3	8.6
11/19/01 12:00 AM	12	0	0	4	11.6
11/19/01 12:15 AM	14	0	0	5	14.6
11/19/01 12:30 AM	16	0	0	5	17.7
11/19/01 12:45 AM	17	0	0	5	20.8
11/19/01 1:00 AM	17	0	0	6	23.9
11/19/01 1:15 AM	18	0	0	6	27
11/19/01 1:30 AM	18	0	0	6	30.2
11/19/01 1:45 AM	17	0	0	6	33.3
11/19/01 2:00 AM	17	0	0	6	36.5
11/19/01 2:15 AM	16	0	0	6	39.7
11/19/01 2:30 AM	15	0	0	6	42.9
11/19/01 2:45 AM	14	0	0	6	46.1
11/19/01 3:00 AM	13	0	0	6	49.3
11/19/01 3:15 AM	12	0	0	6	52.5
11/19/01 3:30 AM	11	0	0	6	55.7
11/19/01 3:45 AM	10	0	0	6	58.8
11/19/01 4:00 AM	9	0	0	5	62
11/19/01 4:15 AM	8	0	0	5	65
11/19/01 4:30 AM	7	0	0	5	68.1
11/19/01 4:45 AM	6	0	0	5	71
11/19/01 5:00 AM	5	0	0	5	73.8

*Johannesburg:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 1:15 AM	0	0	0	0	0.3
11/19/01 1:30 AM	2	0	0	1	3.4
11/19/01 1:45 AM	4	0	0	1	6.4
11/19/01 2:00 AM	5	0	0	2	9.3
11/19/01 2:15 AM	5	0	0	2	12.2
11/19/01 2:30 AM	6	0	0	2	15
11/19/01 2:45 AM	6	0	0	3	17.8
11/19/01 3:00 AM	6	0	0	3	20.4
11/19/01 3:15 AM	6	0	0	3	23
11/19/01 3:30 AM	6	0	0	3	25.5
11/19/01 3:45 AM	5	0	0	3	27.8

**London:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:30 PM	1	0	0	0	1.5
11/18/01 10:45 PM	3	0	0	1	3.5
11/18/01 11:00 PM	4	0	0	1	5.5
11/18/01 11:15 PM	5	0	0	2	7.6
11/18/01 11:30 PM	6	0	0	2	9.7
11/18/01 11:45 PM	7	0	0	2	11.9
11/19/01 12:00 AM	7	0	0	2	14.1
11/19/01 12:15 AM	7	0	0	3	16.3
11/19/01 12:30 AM	7	0	0	3	18.6
11/19/01 12:45 AM	7	0	0	3	20.9
11/19/01 1:00 AM	7	0	0	3	23.2
11/19/01 1:15 AM	7	0	0	3	25.5
11/19/01 1:30 AM	6	0	0	3	27.9
11/19/01 1:45 AM	6	0	0	3	30.2
11/19/01 2:00 AM	5	0	0	3	32.5
11/19/01 2:15 AM	5	0	0	3	34.9
11/19/01 2:30 AM	4	0	0	3	37.2
11/19/01 2:45 AM	4	0	0	3	39.4
11/19/01 3:00 AM	3	0	0	3	41.7
11/19/01 3:15 AM	3	0	0	3	43.9
11/19/01 3:30 AM	2	0	0	3	46
11/19/01 3:45 AM	2	0	0	3	48.1
11/19/01 4:00 AM	2	0	0	3	50.1
11/19/01 4:15 AM	1	0	0	3	51.9
11/19/01 4:30 AM	1	0	0	3	53.7
11/19/01 4:45 AM	1	0	0	3	55.3
11/19/01 5:00 AM	1	0	0	3	56.7
11/19/01 5:15 AM	1	0	0	3	58
11/19/01 5:30 AM	1	0	0	3	59
11/19/01 5:45 AM	0	0	0	3	59.7



**Manila:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 12:00 AM	6	0	5	5	1.6
11/19/01 12:15 AM	18	0	21	23	4.9
11/19/01 12:30 AM	29	1	46	53	8.3
11/19/01 12:45 AM	40	10	83	106	11.7
11/19/01 1:00 AM	50	44	136	180	15.2
11/19/01 1:15 AM	61	120	217	251	18.6
11/19/01 1:30 AM	71	222	352	311	22.1
11/19/01 1:45 AM	81	375	563	398	25.5
11/19/01 2:00 AM	91	698	826	425	29
11/19/01 2:15 AM	99	1059	1039	314	32.5
11/19/01 2:30 AM	106	1022	1074	208	36
11/19/01 2:45 AM	110	585	896	146	39.4
11/19/01 3:00 AM	112	196	603	109	42.9
11/19/01 3:15 AM	112	38	333	86	46.4
11/19/01 3:30 AM	111	4	158	70	49.9
11/19/01 3:45 AM	107	0	71	59	53.4
11/19/01 4:00 AM	103	0	34	50	56.8
11/19/01 4:15 AM	98	0	19	44	60.3
11/19/01 4:30 AM	93	0	11	38	63.7
11/19/01 4:45 AM	88	0	7	34	67.1

*Mexico City:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 12:30 AM	1	0	0	0	0.7
11/18/01 12:45 AM	5	0	0	1	4
11/18/01 1:00 AM	9	0	0	2	7.3
11/18/01 1:15 AM	15	0	1	4	10.6
11/18/01 1:30 AM	22	0	1	6	14
11/18/01 1:45 AM	30	0	3	8	17.4
11/18/01 2:00 AM	39	0	7	11	20.7
11/18/01 2:15 AM	49	0	17	16	24.1
11/18/01 2:30 AM	61	0	37	23	27.6
11/18/01 2:45 AM	74	0	73	34	31
11/18/01 3:00 AM	88	0	128	52	34.4
11/18/01 3:15 AM	103	5	201	85	37.9
11/18/01 3:30 AM	119	30	281	155	41.3
11/18/01 3:45 AM	137	93	349	320	44.8
11/18/01 4:00 AM	155	145	387	654	48.3
11/18/01 4:15 AM	174	113	382	745	51.7
11/18/01 4:30 AM	194	44	338	431	55.2
11/18/01 4:45 AM	214	9	269	231	58.7
11/18/01 5:00 AM	233	1	196	142	62.2
11/18/01 5:15 AM	253	0	133	100	65.7
11/18/01 5:30 AM	271	0	89	78	69.2
11/18/01 5:45 AM	288	0	62	65	72.6

*Moscow:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:30 PM	1	0	2	1	0.6
11/18/01 10:45 PM	5	0	3	3	2.2
11/18/01 11:00 PM	8	0	3	4	4
11/18/01 11:15 PM	11	0	2	5	5.7
11/18/01 11:30 PM	14	0	2	6	7.6
11/18/01 11:45 PM	16	0	1	6	9.4
11/19/01 12:00 AM	17	0	1	6	11.4
11/19/01 12:15 AM	19	0	1	6	13.4
11/19/01 12:30 AM	20	0	1	7	15.4
11/19/01 12:45 AM	20	0	0	7	17.4
11/19/01 1:00 AM	21	0	0	7	19.5
11/19/01 1:15 AM	21	0	0	7	21.6
11/19/01 1:30 AM	21	0	0	7	23.7
11/19/01 1:45 AM	21	0	0	7	25.8
11/19/01 2:00 AM	20	0	0	6	27.9
11/19/01 2:15 AM	20	0	0	6	30
11/19/01 2:30 AM	19	0	0	6	32.1
11/19/01 2:45 AM	18	0	0	6	34.2
11/19/01 3:00 AM	17	0	0	6	36.3
11/19/01 3:15 AM	16	0	0	6	38.3
11/19/01 3:30 AM	15	0	0	6	40.3
11/19/01 3:45 AM	13	0	0	6	42.2
11/19/01 4:00 AM	12	0	0	5	44.1
11/19/01 4:15 AM	11	0	0	5	45.9
11/19/01 4:30 AM	10	0	0	5	47.6
11/19/01 4:45 AM	9	0	0	5	49.2
11/19/01 5:00 AM	8	0	0	5	50.7
11/19/01 5:15 AM	7	0	0	5	52
11/19/01 5:30 AM	6	0	0	4	53.2
11/19/01 5:45 AM	5	0	0	4	54.2
11/19/01 6:00 AM	4	0	0	4	55.1
11/19/01 6:15 AM	3	0	0	4	55.7

*Nairobi:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 1:00 AM	1	0	0	0	1.2
11/19/01 1:15 AM	5	0	0	1	4.7
11/19/01 1:30 AM	7	0	0	2	8.2
11/19/01 1:45 AM	10	0	0	3	11.6
11/19/01 2:00 AM	11	0	0	4	15.1
11/19/01 2:15 AM	12	0	0	4	18.6
11/19/01 2:30 AM	13	0	0	4	22
11/19/01 2:45 AM	14	0	0	5	25.4
11/19/01 3:00 AM	14	0	0	5	28.8
11/19/01 3:15 AM	13	0	0	5	32.2
11/19/01 3:30 AM	13	0	0	5	35.5
11/19/01 3:45 AM	12	0	0	5	38.8
11/19/01 4:00 AM	12	0	0	5	42
11/19/01 4:15 AM	11	0	0	5	45.2
11/19/01 4:30 AM	10	0	0	5	48.2
11/19/01 4:45 AM	9	0	0	5	51.2
11/19/01 5:00 AM	8	0	0	5	54.1

*Paris:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:30 PM	1	0	0	0	1.2
11/18/01 10:45 PM	3	0	0	1	3.3
11/18/01 11:00 PM	4	0	0	1	5.5
11/18/01 11:15 PM	5	0	0	2	7.7
11/18/01 11:30 PM	6	0	0	2	10
11/18/01 11:45 PM	7	0	0	2	12.3
11/19/01 12:00 AM	7	0	0	3	14.7
11/19/01 12:15 AM	7	0	0	3	17.1
11/19/01 12:30 AM	8	0	0	3	19.5
11/19/01 12:45 AM	7	0	0	3	21.9
11/19/01 1:00 AM	7	0	0	3	24.4
11/19/01 1:15 AM	7	0	0	3	26.9
11/19/01 1:30 AM	6	0	0	3	29.4
11/19/01 1:45 AM	6	0	0	3	31.9
11/19/01 2:00 AM	5	0	0	3	34.3
11/19/01 2:15 AM	5	0	0	4	36.8
11/19/01 2:30 AM	4	0	0	4	39.3
11/19/01 2:45 AM	4	0	0	4	41.7
11/19/01 3:00 AM	3	0	0	3	44.1
11/19/01 3:15 AM	3	0	0	3	46.4
11/19/01 3:30 AM	3	0	0	3	48.7
11/19/01 3:45 AM	2	0	0	3	50.9
11/19/01 4:00 AM	2	0	0	3	53
11/19/01 4:15 AM	2	0	0	3	55
11/19/01 4:30 AM	1	0	0	3	56.8
11/19/01 4:45 AM	1	0	0	3	58.5
11/19/01 5:00 AM	1	0	0	3	60
11/19/01 5:15 AM	1	0	0	3	61.3
11/19/01 5:30 AM	1	0	0	3	62.3

*Perth:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/19/01 1:45 AM	6	29	42	29	1.8
11/19/01 2:00 AM	15	118	138	69	4.6
11/19/01 2:15 AM	24	253	247	74	7.3
11/19/01 2:30 AM	31	301	317	61	10
11/19/01 2:45 AM	38	199	307	50	12.6
11/19/01 3:00 AM	43	74	230	42	15.2
11/19/01 3:15 AM	47	16	138	36	17.6
11/19/01 3:30 AM	49	2	70	31	19.9
11/19/01 3:45 AM	50	0	33	28	22.2

**Reykjavik:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:00 PM	0	0	0	0	-0.1
11/18/01 10:15 PM	1	0	0	0	0.8
11/18/01 10:30 PM	2	0	0	1	1.8
11/18/01 10:45 PM	2	0	0	1	2.8
11/18/01 11:00 PM	3	0	0	1	3.9
11/18/01 11:15 PM	3	0	0	1	5
11/18/01 11:30 PM	4	0	0	1	6.3
11/18/01 11:45 PM	4	0	0	1	7.6
11/19/01 12:00 AM	4	0	0	2	8.9
11/19/01 12:15 AM	5	0	0	2	10.3
11/19/01 12:30 AM	5	0	0	2	11.8
11/19/01 12:45 AM	5	0	0	2	13.3
11/19/01 1:00 AM	4	0	0	2	14.8
11/19/01 1:15 AM	4	0	0	2	16.3
11/19/01 1:30 AM	4	0	0	2	17.9
11/19/01 1:45 AM	4	0	0	2	19.5
11/19/01 2:00 AM	4	0	0	2	21.1
11/19/01 2:15 AM	3	0	0	2	22.8
11/19/01 2:30 AM	3	0	0	2	24.4
11/19/01 2:45 AM	3	0	0	2	26
11/19/01 3:00 AM	2	0	0	2	27.7
11/19/01 3:15 AM	2	0	0	2	29.3
11/19/01 3:30 AM	2	0	0	2	30.9
11/19/01 3:45 AM	2	0	0	2	32.5
11/19/01 4:00 AM	1	0	0	2	34
11/19/01 4:15 AM	1	0	0	2	35.5
11/19/01 4:30 AM	1	0	0	2	37
11/19/01 4:45 AM	1	0	0	2	38.4
11/19/01 5:00 AM	1	0	0	2	39.8
11/19/01 5:15 AM	1	0	0	2	41

*Rio de Janeiro:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 2:00 AM	0	0	0	0	1
11/18/01 2:15 AM	1	0	0	0	4.2
11/18/01 2:30 AM	2	0	0	1	7.2
11/18/01 2:45 AM	4	0	0	1	10.3
11/18/01 3:00 AM	6	0	0	2	13.3
11/18/01 3:15 AM	8	0	0	2	16.2
11/18/01 3:30 AM	11	0	0	3	19.1
11/18/01 3:45 AM	14	0	0	4	21.9
11/18/01 4:00 AM	18	0	0	5	24.6
11/18/01 4:15 AM	23	0	0	6	27.2
11/18/01 4:30 AM	29	0	0	7	29.7
11/18/01 4:45 AM	35	0	1	8	32.1



**Rome:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:15 PM	2	0	0	1	1.6
11/18/01 11:30 PM	4	0	0	1	4.1
11/18/01 11:45 PM	5	0	0	2	6.6
11/19/01 12:00 AM	7	0	0	2	9.2
11/19/01 12:15 AM	8	0	0	3	11.8
11/19/01 12:30 AM	9	0	0	3	14.5
11/19/01 12:45 AM	9	0	0	3	17.2
11/19/01 1:00 AM	10	0	0	3	19.9
11/19/01 1:15 AM	10	0	0	4	22.7
11/19/01 1:30 AM	10	0	0	4	25.4
11/19/01 1:45 AM	9	0	0	4	28.2
11/19/01 2:00 AM	9	0	0	4	31
11/19/01 2:15 AM	8	0	0	4	33.8
11/19/01 2:30 AM	8	0	0	4	36.6
11/19/01 2:45 AM	7	0	0	4	39.4
11/19/01 3:00 AM	7	0	0	4	42.2
11/19/01 3:15 AM	6	0	0	4	44.9
11/19/01 3:30 AM	5	0	0	4	47.7
11/19/01 3:45 AM	5	0	0	4	50.4
11/19/01 4:00 AM	4	0	0	4	53
11/19/01 4:15 AM	3	0	0	4	55.6
11/19/01 4:30 AM	3	0	0	4	58.1
11/19/01 4:45 AM	2	0	0	4	60.5
11/19/01 5:00 AM	2	0	0	4	62.7
11/19/01 5:15 AM	2	0	0	4	64.8
11/19/01 5:30 AM	1	0	0	4	66.6

*Santiago:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 3:15 AM	1	0	0	0	1.4
11/18/01 3:30 AM	4	0	0	1	4.1
11/18/01 3:45 AM	8	0	0	2	6.8
11/18/01 4:00 AM	12	0	0	3	9.4
11/18/01 4:15 AM	17	0	1	4	12
11/18/01 4:30 AM	23	0	1	6	14.5
11/18/01 4:45 AM	29	0	3	8	16.8
11/18/01 5:00 AM	36	0	7	11	19.1

*Sao Paulo:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 2:15 AM	0	0	0	0	1.2
11/18/01 2:30 AM	1	0	0	1	4.3
11/18/01 2:45 AM	3	0	0	1	7.3
11/18/01 3:00 AM	4	0	0	1	10.4
11/18/01 3:15 AM	7	0	0	2	13.3
11/18/01 3:30 AM	9	0	0	3	16.2
11/18/01 3:45 AM	13	0	0	3	19.1
11/18/01 4:00 AM	17	0	0	4	21.8
11/18/01 4:15 AM	21	0	0	5	24.5
11/18/01 4:30 AM	26	0	0	6	27.1
11/18/01 4:45 AM	32	0	1	8	29.6
11/18/01 5:00 AM	39	0	1	9	31.9

*Seoul:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:45 PM	3	0	1	1	0.7
11/19/01 12:00 AM	15	0	4	5	3.4
11/19/01 12:15 AM	26	0	8	10	6.1
11/19/01 12:30 AM	36	0	16	18	8.9
11/19/01 12:45 AM	45	0	27	29	11.7
11/19/01 1:00 AM	53	0	45	48	14.5
11/19/01 1:15 AM	61	0	72	77	17.4
11/19/01 1:30 AM	69	3	109	127	20.3
11/19/01 1:45 AM	77	18	160	205	23.2
11/19/01 2:00 AM	84	73	228	303	26.2
11/19/01 2:15 AM	93	182	330	382	29.1
11/19/01 2:30 AM	101	313	496	440	32.1
11/19/01 2:45 AM	108	499	749	530	35.1
11/19/01 3:00 AM	115	886	1049	541	38
11/19/01 3:15 AM	121	1294	1270	384	41
11/19/01 3:30 AM	125	1210	1271	246	44
11/19/01 3:45 AM	127	675	1031	168	47
11/19/01 4:00 AM	126	220	678	123	49.9
11/19/01 4:15 AM	124	42	367	95	52.8
11/19/01 4:30 AM	119	5	171	76	55.7
11/19/01 4:45 AM	114	0	75	63	58.5
11/19/01 5:00 AM	108	0	35	53	61.3
11/19/01 5:15 AM	102	0	19	45	63.9
11/19/01 5:30 AM	95	0	12	39	66.5
11/19/01 5:45 AM	89	0	7	34	68.8
11/19/01 6:00 AM	83	0	5	30	70.9

**Stockholm:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 9:15 PM	0	0	0	0	-0.1
11/18/01 9:30 PM	2	0	0	1	1.2
11/18/01 9:45 PM	4	0	0	2	2.6
11/18/01 10:00 PM	6	0	0	2	4.1
11/18/01 10:15 PM	8	0	0	3	5.7
11/18/01 10:30 PM	9	0	0	3	7.3
11/18/01 10:45 PM	10	0	0	3	8.9
11/18/01 11:00 PM	11	0	0	4	10.6
11/18/01 11:15 PM	12	0	0	4	12.4
11/18/01 11:30 PM	13	0	0	4	14.2
11/18/01 11:45 PM	13	0	0	4	16
11/19/01 12:00 AM	13	0	0	4	17.9
11/19/01 12:15 AM	13	0	0	4	19.7
11/19/01 12:30 AM	13	0	0	4	21.6
11/19/01 12:45 AM	13	0	0	4	23.5
11/19/01 1:00 AM	12	0	0	4	25.5
11/19/01 1:15 AM	12	0	0	4	27.4
11/19/01 1:30 AM	11	0	0	4	29.3
11/19/01 1:45 AM	10	0	0	4	31.2
11/19/01 2:00 AM	9	0	0	4	33.1
11/19/01 2:15 AM	9	0	0	4	34.9
11/19/01 2:30 AM	8	0	0	4	36.7
11/19/01 2:45 AM	7	0	0	4	38.5
11/19/01 3:00 AM	6	0	0	4	40.2
11/19/01 3:15 AM	6	0	0	4	41.9
11/19/01 3:30 AM	5	0	0	4	43.5
11/19/01 3:45 AM	4	0	0	4	45
11/19/01 4:00 AM	4	0	0	4	46.4
11/19/01 4:15 AM	3	0	0	4	47.7
11/19/01 4:30 AM	3	0	0	3	48.9
11/19/01 4:45 AM	2	0	0	3	49.9
11/19/01 5:00 AM	2	0	0	3	50.8
11/19/01 5:15 AM	1	0	0	3	51.6
11/19/01 5:30 AM	1	0	0	3	52.1
11/19/01 5:45 AM	1	0	0	3	52.5

**Tokyo:**

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 11:00 PM	5	0	1	1	0.9
11/18/01 11:15 PM	19	0	3	4	3.7
11/18/01 11:30 PM	32	0	5	7	6.5
11/18/01 11:45 PM	44	0	9	11	9.3
11/19/01 12:00 AM	55	0	13	17	12.2
11/19/01 12:15 AM	65	0	21	24	15.1
11/19/01 12:30 AM	73	0	32	35	18.1
11/19/01 12:45 AM	80	0	48	52	21
11/19/01 1:00 AM	87	0	73	77	24
11/19/01 1:15 AM	93	0	109	118	27
11/19/01 1:30 AM	99	4	158	183	30.1
11/19/01 1:45 AM	106	25	221	283	33.1
11/19/01 2:00 AM	113	98	305	406	36.2
11/19/01 2:15 AM	120	237	429	497	39.2
11/19/01 2:30 AM	127	396	628	557	42.3
11/19/01 2:45 AM	134	617	927	656	45.3
11/19/01 3:00 AM	140	1074	1272	656	48.4
11/19/01 3:15 AM	144	1540	1512	457	51.4
11/19/01 3:30 AM	146	1417	1487	288	54.4
11/19/01 3:45 AM	146	778	1189	193	57.4
11/19/01 4:00 AM	143	251	770	139	60.3
11/19/01 4:15 AM	138	47	411	106	63.1
11/19/01 4:30 AM	132	5	189	84	65.9
11/19/01 4:45 AM	124	0	82	68	68.5
11/19/01 5:00 AM	116	0	38	57	70.9

*Vienna:*

Local Time	Brown/ Cooke	Asher/ McNaught	Lyytinen/ Van Flandern	Jenniskens	Radiant Altitude
11/18/01 10:30 PM	0	0	0	0	0.4
11/18/01 10:45 PM	3	0	0	1	2.5
11/18/01 11:00 PM	5	0	0	2	4.7
11/18/01 11:15 PM	7	0	0	2	6.9
11/18/01 11:30 PM	8	0	0	3	9.2
11/18/01 11:45 PM	10	0	0	3	11.5
11/19/01 12:00 AM	10	0	0	3	13.9
11/19/01 12:15 AM	11	0	0	4	16.3
11/19/01 12:30 AM	11	0	0	4	18.7
11/19/01 12:45 AM	12	0	0	4	21.2
11/19/01 1:00 AM	11	0	0	4	23.7
11/19/01 1:15 AM	11	0	0	4	26.2
11/19/01 1:30 AM	11	0	0	4	28.7
11/19/01 1:45 AM	10	0	0	4	31.2
11/19/01 2:00 AM	10	0	0	4	33.7
11/19/01 2:15 AM	9	0	0	4	36.2
11/19/01 2:30 AM	8	0	0	4	38.7
11/19/01 2:45 AM	7	0	0	4	41.1
11/19/01 3:00 AM	7	0	0	4	43.5
11/19/01 3:15 AM	6	0	0	4	45.9
11/19/01 3:30 AM	5	0	0	4	48.2
11/19/01 3:45 AM	5	0	0	4	50.5
11/19/01 4:00 AM	4	0	0	4	52.6
11/19/01 4:15 AM	3	0	0	4	54.7
11/19/01 4:30 AM	3	0	0	4	56.6
11/19/01 4:45 AM	2	0	0	4	58.4
11/19/01 5:00 AM	2	0	0	4	59.9
11/19/01 5:15 AM	2	0	0	4	61.3
11/19/01 5:30 AM	1	0	0	3	62.4