

Photometry of Uranus and Neptune, 1972-2007

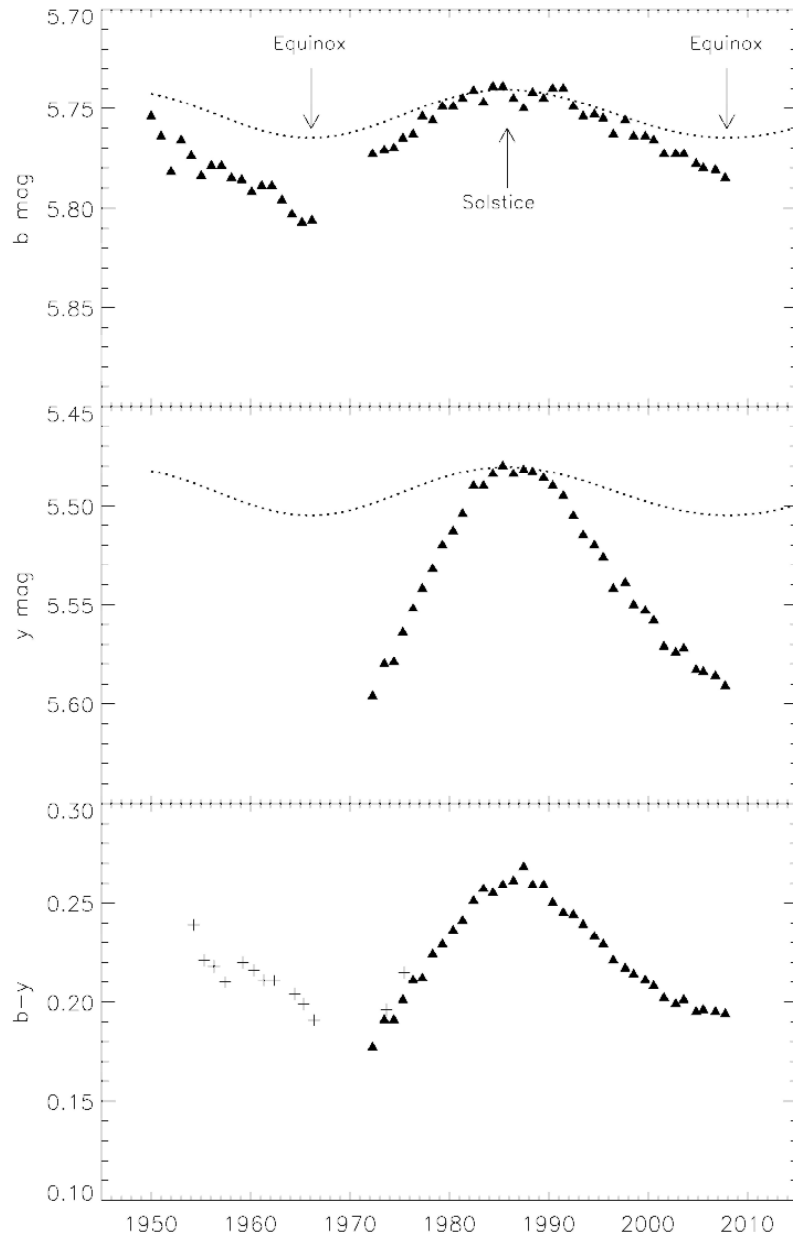
At Lowell Observatory, we have made b (472 nm) and y (551 nm) photometric measurements of Uranus and Neptune at every opposition from 1972 to 2007, thirty six apparitions in all (Lockwood 1977, 1978; Lockwood and Thompson 1999, 2002; Lockwood and Jerzykiewicz 2006). Each year we observe these planets on a half-dozen or more nights, comparing their brightness with that of two nearby comparison stars of roughly solar color. We adjust the differential magnitudes to a solar phase angle of zero and to standard epoch 1950 heliocentric opposition distances of 19.191 and 30.071 AU, respectively.

Separate observations of a running 5-year string of comparison star pairs including those for a particular apparition tie the system of comparison star magnitudes into our local standard b , y photometric system.

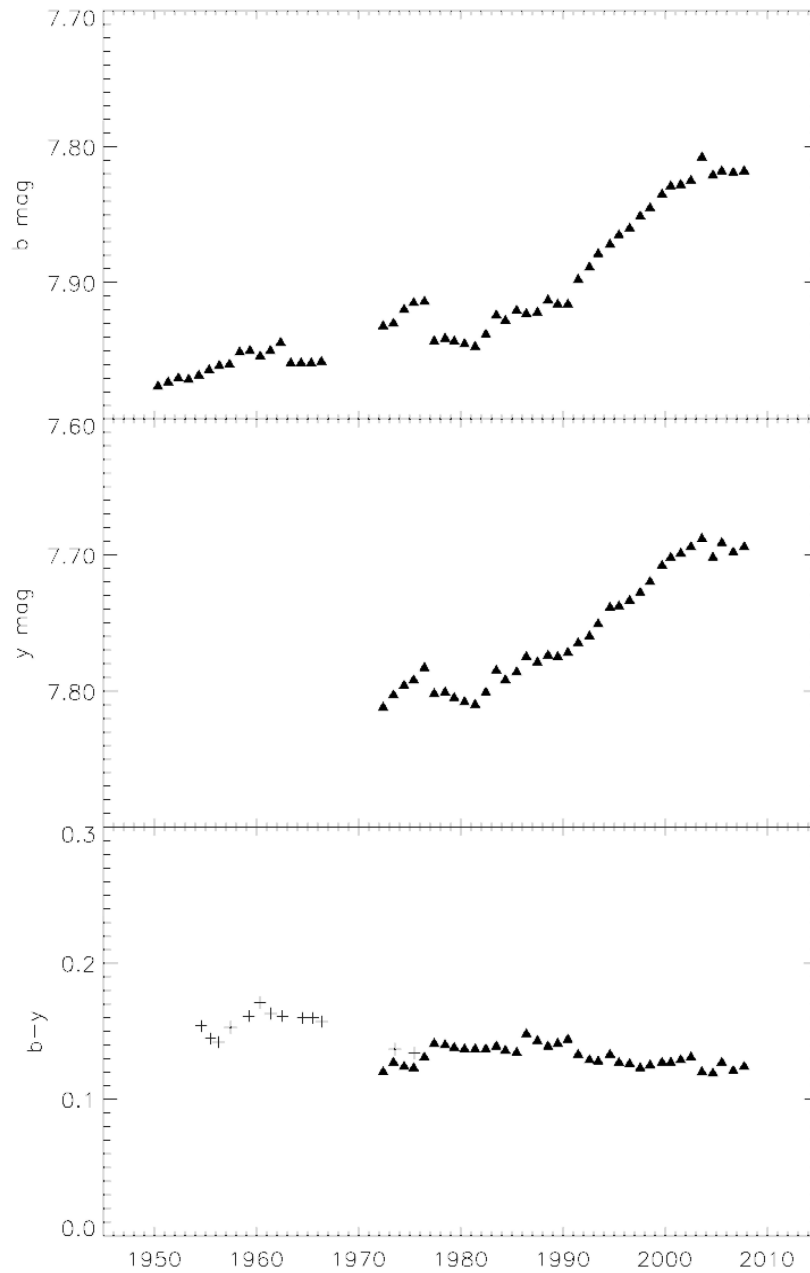
The figures show the light curves in b , y , and $b-y$ color and the table lists the opposition magnitudes updated through the 2007 apparition.

References

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- Lockwood, G. W. 1978. Analysis of photometric variations of Uranus and Neptune since 1953. *Icarus*, 35, 79–92
- Lockwood, G. W., and Jerzykiewicz, M. 2006. Photometric variability of Uranus and Neptune, 1950–2004. *Icarus*, 180, 442–452
- Lockwood, G. W., and Thompson, D. T. 1999. Photometric variability of Uranus, 1972–1996. *Icarus*, 137, 2–12
- Lockwood, G. W., and Thompson, D. T. 2002. Photometric variability of Neptune 1972–2000. *Icarus*, 156, 37–51



Lightcurve of Uranus. (top) b magnitude. Triangles – differential B magnitudes transformed to b , 1950–1966, and b magnitudes 1972–2007; crosses – B magnitudes from two-color photometry, 1954–1966, 1973, 1975, converted to b (offset by +0.15 year for clarity). (center) y magnitude. Triangles – differential y magnitudes; crosses – V magnitudes 1954–1966, 1973, and 1975 converted to y (offset by +0.15 year for clarity). (bottom) $b-y$ color. Triangles – $b-y$ color; crosses – $B-V$ converted to $b-y$. The dotted line indicates the “geometrical lightcurve” variation due to oblateness and apparent area on the sky as Uranus circles the Sun.



Lightcurve of Neptune. (top) b magnitude. Triangles – differential B magnitudes transformed to b , 1950–1966, and b magnitudes 1972–2007; crosses – B magnitudes from two-color photometry, 1954–1966, 1973, 1975, converted to b (offset by +0.15 year for clarity). (center) y magnitude. Triangles – differential y magnitudes; crosses – V magnitudes 1954–1966, 1973, and 1975 converted to y (offset by +0.15 year for clarity). (bottom) $b-y$ color. Triangles – $b-y$ color; crosses – $B-V$ converted to $b-y$.

b, y Photometry of Uranus and Neptune

Uranus						Neptune					
Year	<i>y</i>	s.d.	<i>b</i>	s.d.	n	Year	<i>y</i>	s.d.	<i>b</i>	s.d.	n
1972.27	5.596	0.006	5.773	0.002	9	1972.39	7.812	0.002	7.932	0.002	12
1973.45	5.580	0.003	5.771	0.003	4	1973.40	7.803	0.004	7.930	0.004	18
1974.41	5.579	0.003	5.770	0.001	4*	1974.44	7.796	0.004	7.920	0.003	20
1975.31	5.564	0.002	5.765	0.004	13	1975.37	7.792	0.005	7.915	0.004	8
1976.34	5.552	0.001	5.763	0.003	10	1976.44	7.783	0.005	7.914	0.005	9
1977.27	5.542	0.004	5.754	0.003	13	1977.39	7.802	0.002	7.943	0.004	11
1978.31	5.532	0.002	5.756	0.003	30	1978.46	7.801	0.003	7.941	0.004	20
1979.29	5.520	0.003	5.749	0.003	22	1979.35	7.805	0.005	7.943	0.004	15
1980.36	5.513	0.003	5.749	0.003	12	1980.36	7.808	0.005	7.945	0.004	8*
1981.32	5.504	0.004	5.745	0.002	12	1981.40	7.810	0.004	7.947	0.003	10
1982.42	5.490	0.003	5.741	0.002	7	1982.44	7.801	0.006	7.938	0.002	6
1983.42	5.490	0.003	5.747	0.005	7*	1983.47	7.785	0.004	7.924	0.004	7
1984.37	5.484	0.003	5.739	0.002	8	1984.35	7.792	0.003	7.928	0.004	7
1985.36	5.480	0.002	5.739	0.003	6	1985.46	7.786	0.005	7.920	0.004	7*
1986.43	5.484	0.004	5.745	0.004	8	1986.41	7.775	0.009	7.923	0.008	11
1987.46	5.482	0.005	5.750	0.007	7*	1987.49	7.779	0.007	7.922	0.006	9
1988.36	5.483	0.005	5.742	0.002	5	1988.53	7.774	0.012	7.913	0.009	11*
1989.47	5.486	0.001	5.745	0.003	6	1989.48	7.775	0.008	7.916	0.005	20
1990.39	5.490		5.740		2	1990.47	7.772	0.006	7.916	0.005	15
1991.45	5.495	0.004	5.740	0.004	6	1991.48	7.765	0.005	7.898	0.004	9
1992.46	5.505	0.003	5.749	0.002	7	1992.59	7.760	0.004	7.889	0.004	9
1993.45	5.515	0.005	5.754	0.007	10	1993.44	7.751	0.006	7.879	0.008	8
1994.58	5.520	0.004	5.753	0.004	10	1994.59	7.739	0.005	7.872	0.004	8
1995.47	5.526	0.002	5.755	0.003	10	1995.47	7.738	0.004	7.865	0.003	11
1996.48	5.542	0.007	5.763	0.001	4	1996.52	7.734	0.005	7.860	0.004	9
1997.68	5.539	0.003	5.756	0.002	6	1997.56	7.728	0.004	7.851	0.003	10
1998.52	5.550	0.004	5.764	0.004	7	1998.52	7.720	0.003	7.845	0.004	10
1999.70	5.553	0.008	5.764	0.005	8	1999.69	7.708	0.005	7.835	0.003	8
2000.54	5.558	0.003	5.766	0.002	9	2000.45	7.702	0.003	7.829	0.005	9
2001.57	5.571	0.002	5.773	0.003	7	2001.52	7.699	0.005	7.828	0.003	11
2002.76	5.574	0.004	5.773	0.003	6	2002.52	7.694	0.004	7.825	0.004	7
2003.71	5.572	0.007	5.773	0.008	7	2003.50	7.688	0.004	7.808	0.002	7*
2004.81	5.583	0.003	5.778	0.004	9*	2004.67	7.702	0.005	7.821	0.003	9
2005.53	5.584	0.003	5.780	0.005	6	2005.53	7.691	0.003	7.818	0.003	8
2006.75	5.586	0.004	5.781	0.004	7	2006.66	7.698	0.005	7.819	0.003	8
2007.70	5.591	0.001	5.785	0.002	6	2007.70	7.694	0.005	7.818	0.001	6

*only one comparison star used

Updated November 2007. Some values may have changed slightly from the version published by Lockwood and Jerzykiewicz (2006),