

IUE Orbital Elements III

This report extends the previous compendium of IUE orbital elements (Broude and Bradley 1984) through the end of 1984. These elements can be used to derive radial velocity corrections as discussed by Jenkins (1979), Harvel (1980), and Schiffer (1982).

Table 1 is the list of orbital elements. Each epoch is given as year, month, and day in the format YYMMDD. The epoch is always at 00:00 GMT. The inclination, longitude of ascending node, argument of perigee, and mean anomaly are given in degrees. The semi-major axis is given in kilometers. The orbital period can be found from the equation

$$P = 1.6586 \times 10^{-4} a^{3/2} \text{ minutes.}$$

The orbit of IUE is continually changing due to anomalies in the Earth's gravitational field. For this reason the orbital elements also change and so are updated frequently. In addition, the satellite must be kept within the field of view of the receiving antennae, both at Goddard Space Flight Center and at Villa Franca, Spain. When the spacecraft drifts too far west, the orbit is corrected using the hydrazine jets. This corrective maneuver (a "delta V") causes the spacecraft drift to reverse direction and drift eastward. The changes in the drift direction represent discontinuities in the orbital elements, particularly the semi-major axis. Breaks in Table 1 indicate such discontinuities due to a delta V. Table 2 lists the dates (format YYMMDD) and GMT times at which the corrective maneuvers were performed. When deriving radial velocity corrections, caution should be used in interpolating values near the times of these discontinuities in order to ensure accurate results.

In addition, the orbital elements are now recorded in line 83 of the Image Header. The orbital elements have been routinely recorded at GSFC as of July 8, 1983. These are the most current orbital elements for the observation date, as used in the ground command computer. The format is the following: epoch of the orbit (Julian day), seconds, semi-major axis (kilometers), eccentricity, inclination (degrees), ascending node (degrees), argument of perigee (degrees), and mean anomaly (degrees). For all of these elements except the epoch, 8 characters are recorded in floating-point format with no delineations between the elements. An example is given in Figure 1.

Catherine L. Imhoff and Michael T. Butschky

1985 February 25

References

- Broude, S.M., and Bradley, R.E. 1984, NASA IUE Newsletter No. 24, p. 131.
- Jenkins, E.B. 1979, NASA IUE Newsletter, No. 5, p. 23.
- Harvel, C. 1980, NASA IUE Newsletter, No. 10, p. 32.
- Schiffer, F.H., III. 1982, Data Analysis Procedures for the IUE RDAF (Part I), p. 3-8.

Table 1
IUE Orbital Elements

<u>Epoch</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigee</u>	<u>Mean Anomaly</u>
840119	42170.4	0.2116813	029.009	161.913	302.587	310.927
840125	42172.0	0.2113155	029.028	161.801	302.671	316.387
840201	42171.5	0.2111912	029.042	161.647	302.875	322.667
840215	42151.4	0.2106955	029.076	161.384	303.318	334.952
840222	42153.0	0.2101979	029.086	161.271	303.392	343.001
840229	42153.0	0.2100285	029.103	161.159	303.535	350.963
840315	42155.6	0.2094236	029.112	160.875	303.796	007.853
840322	42156.3	0.2091834	029.111	160.767	303.821	015.726
840329	42157.9	0.2089624	029.131	160.614	303.966	023.470
840404	42158.0	0.2088152	029.155	160.514	303.992	031.225
840419	42158.9	0.2086675	029.097	160.226	304.215	046.506
840502	42160.2	0.2085459	029.097	159.972	304.401	060.490
840509	42160.6	0.2086128	029.104	159.811	304.605	067.875
840523	42161.3	0.2085731	029.110	159.507	304.863	082.601
840605	42161.4	0.2086486	029.119	159.230	305.173	095.998
840613	42163.0	0.2085860	029.117	159.053	305.321	104.190
840620	42162.8	0.2084486	029.146	158.907	305.526	111.221
840627	42164.4	0.2084168	029.141	158.766	305.677	118.237
840704	42163.2	0.2082288	029.175	158.607	305.913	125.120
840711	42165.2	0.2081155	029.180	158.454	306.061	132.041
840718	42164.6	0.2077936	029.212	158.321	306.253	138.826
840725	42166.6	0.2076538	029.216	158.176	306.415	145.601
840801	42165.2	0.2072706	029.251	158.059	306.605	152.258
840808	42167.8	0.2070422	029.256	157.911	306.743	157.911
840815	42166.9	0.2065603	029.280	157.794	306.910	165.522
840829	42168.0	0.2058921	029.307	157.552	307.181	178.539
840905	42170.4	0.2056443	029.304	157.411	307.296	185.024
840912	42169.9	0.2051700	029.321	157.309	307.391	191.393
840919	42172.0	0.2050492	029.314	157.176	307.510	197.735
840926	74171.1	0.2046192	029.323	157.072	307.590	204.005
841010	42173.0	0.2041265	029.320	156.805	307.773	216.469
841017	42174.7	0.2041514	029.307	156.654	307.909	222.600
841031	42176.4	0.2038779	029.308	156.366	308.104	234.744
841118	42155.1	0.2036618	029.314	156.003	308.573	250.370
841201	42156.4	0.2035784	029.321	155.720	308.837	265.044
841227	42157.8	0.2033677	029.374	155.149	309.483	293.631

Table 2

IUE Orbit Corrective Maneuvers in 1984

<u>Date</u>	<u>GMT</u>
840112	03:41:09 ± 1 sec
840214	20:00:00 ± 1 sec
841116	02:05:20 ± 1 sec

Figure 1: Orbital elements as listed in line 83 in the Image Header. The fields noted as epoch, seconds, semi-major axis, eccentricity, inclination, ascending node, argument of perigee, and mean anomaly.

69		69	C
70		70	C
71		71	C
72		72	C
73		73	C
74		74	C
75		75	C
76	38	76	C
77	# H I (77	C
78	# : ### A #	78	C
79	A1 I I I I I I I I I I I	79	C
80	+ >	80	C
81		81	C
82		82	C
83	2445856.0 43200.0 42161.4 208649 29.1185159 2301305.1726 95.997	83	C
84	163210656 2331149+483230283+04R	84	C
85		85	C
86	A5 I I I / /	86	C
87	D5 I I I / /	87	C
88	S I I I / /	88	C
89	S I I I / /	89	C
90	D5 R I I I / /	90	C
91	S I I I / /	91	C
92	S I I I / /	92	C
93	S R I I I / /	93	C
94	S I I I / /	94	C
95	A5 H I I / /	95	C
96	D5 I I I / /	96	C
97	S I I I / /	97	C
98	> A5 / I I I / /	98	C
99	S RR / I I I / /	99	C
100	S I I I / /	100	C