

IUE Orbital Elements

In this report I am presenting a compendium of the IUE orbital elements from 1978 February 22 until the end of 1980. These elements can be used to derive radial velocity corrections as discussed by Jenkins (1979) and, in more detail, by Harvel (1980).

Table 1 is the list of orbital elements. Each epoch is given as year, month and day in the format YYMMDD. The epochs are always at 00:00 GMT. The inclination, longitude of ascending node, argument of perigee and mean anomaly are all 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 which accelerate the spacecraft westward. 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 antennas, 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 causes the spacecraft drift to reverse direction and become eastward. The changes in the drift direction represent discontinuities in the orbital elements. 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.

Ruth Ehlers
1981 March 4

References

- Jenkins, E.B. 1979, NASA IUE Newsletter No. 5, p. 23.
Harvel, C. 1980, NASA IUE Newsletter No. 10, p.32.

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>
780222	42168.0	0.2395473	028.639	207.566	-102.352	342.655
780301	42168.7	0.2392656	028.641	207.441	-102.278	349.342
780308	42168.9	0.2391520	028.648	207.260	-102.072	355.910
780315	42169.3	0.2390043	028.655	207.144	257.960	002.513
780322	42170.0	0.2389189	028.652	206.984	258.167	008.944
780329	42170.7	0.2388213	028.653	206.886	258.159	015.456
780405	42171.8	0.2387689	028.651	206.703	258.360	021.820
780412	42171.5	0.2388617	028.651	206.591	258.393	028.212
780419	42173.8	0.2388630	028.635	206.455	258.573	034.444
780426	42173.1	0.2390331	028.626	206.332	258.596	040.742
780503	42175.2	0.2390400	028.612	206.168	258.781	046.905
780510	42174.6	0.2393258	028.600	206.035	258.825	053.091
780517	42176.0	0.2393832	028.588	205.902	259.049	059.111
780524	42175.9	0.2397106	028.564	205.783	259.104	056.211
780531	42177.1	0.2396866	028.560	205.591	259.325	071.167
780607	42176.8	0.2400471	028.530	205.475	259.433	077.124
780613	42177.1	0.2400538	028.527	205.324	259.657	082.112
780620	42177.2	0.2402467	028.515	205.252	259.816	087.939
780627	42177.4	0.2402030	028.504	204.944	260.056	093.742
780725	42151.9	0.2396312	028.483	204.298	260.813	116.560
780803	42152.8	0.2396814	028.472	204.134	261.062	126.799
780810	42152.7	0.2393209	028.489	203.970	261.247	134.727
780817	42153.1	0.2393500	028.475	203.786	261.436	142.646
780824	42153.9	0.2389324	028.487	203.629	261.554	150.528
780831	42154.5	0.2389063	028.496	203.437	261.753	158.330
780914	42155.5	0.2384953	028.496	203.172	262.033	173.847
780921	42155.3	0.2381839	028.504	203.050	262.097	181.562
780928	42157.2	0.2381510	028.517	202.849	262.242	189.188
781005	42155.7	0.2379313	028.521	202.787	262.373	196.790
781012	42158.4	0.2379517	028.514	202.631	262.472	204.336
781019	42157.1	0.2378601	028.514	202.571	262.554	211.849

Table 1 (continued)

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>
781026	42159.6	0.2379101	028.480	202.370	262.674	219.273
781102	42158.3	0.2379695	028.499	202.188	262.728	226.695
781109	42161.1	0.2380262	028.486	202.130	262.894	234.039
781116	42160.0	0.2381961	028.466	202.000	262.934	241.362
781123	42162.4	0.2382739	028.448	201.831	263.142	248.544
781130	42161.6	0.2384876	028.431	201.696	263.223	255.748
781207	42164.2	0.2385020	028.405	201.472	263.472	262.852
781214	42163.1	0.2387844	028.389	201.316	263.569	269.924
781221	42165.2	0.2387389	028.390	201.192	263.803	276.858
790104	42167.5	0.2387801	028.382	200.852	264.143	290.707
790111	42166.8	0.2389980	028.362	200.579	264.301	297.566
790118	42167.8	0.2387210	028.369	200.495	-095.416	304.276
790125	42168.7	0.2388393	028.364	200.385	-095.327	311.040
790201	42169.0	0.2384144	028.372	200.160	-095.044	317.711
790208	42169.1	0.2385111	028.353	200.058	-094.886	324.340
790215	42169.6	0.2380755	028.383	199.851	-094.661	330.881
790222	42170.5	0.2381567	028.379	199.759	-094.563	337.433
790301	42170.0	0.2376248	028.402	199.548	-094.404	343.922
790308	42171.1	0.2377645	028.395	199.418	-094.264	350.354
790315	42170.9	0.2372990	028.409	199.290	-094.124	356.711
790322	42172.4	0.2374896	028.403	199.168	265.944	003.073
790329	42171.8	0.2370599	028.414	198.955	266.070	009.391
790405	42173.1	0.2373532	028.400	198.846	266.150	015.611
790412	42173.8	0.2370299	028.412	198.746	266.281	021.788
790419	42174.9	0.2373967	028.388	198.597	266.373	027.951
790426	42175.9	0.2371330	028.394	198.454	266.422	034.070
790503	42176.4	0.2375415	028.368	198.327	266.585	040.079
790510	42177.1	0.2373966	028.371	198.199	266.705	046.068
790517	42177.0	0.2378410	028.347	198.043	266.864	052.026
790524	42178.0	0.2376979	028.340	197.865	266.963	057.969

Table 1 (continued)

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>
790531	42177.3	0.2380957	028.317	197.700	267.165	063.795
790607	42179.0	0.2380043	028.323	197.594	267.324	069.608
790614	42179.8	0.2382941	028.258	197.904	267.697	075.273
790621	42154.3	0.2377629	028.291	197.235	267.637	081.244
790629	42152.9	0.2379556	028.288	197.052	267.951	090.280
790706	42155.1	0.2378887	028.280	196.903	268.075	098.214
790713	42153.2	0.2379262	028.287	196.707	268.353	106.076
790718	42155.3	0.2377404	028.282	196.578	268.425	111.705
790727	42153.7	0.2377012	028.295	196.412	268.782	121.664
790803	42156.0	0.2375410	028.288	196.245	268.877	129.440
790810	42154.2	0.2373446	028.299	196.060	269.118	137.141
790816	42156.7	0.2371688	028.300	195.929	269.203	143.747
790823	42155.6	0.2369590	028.314	195.761	269.448	151.331
790906	42156.1	0.2365011	028.331	195.463	269.738	166.490
790913	42158.2	0.2363013	028.324	195.328	269.795	174.024
790920	42157.8	0.2360332	028.342	195.155	269.967	181.456
790927	42158.5	0.2359336	028.338	195.078	270.038	188.885
791004	42158.9	0.2357176	028.345	194.897	270.181	196.270
791011	42160.2	0.2357182	028.331	194.799	270.231	203.611
791018	42160.7	0.2355197	028.340	194.653	270.384	210.863
791025	42160.8	0.2356650	028.321	194.529	270.438	218.124
791115	42163.7	0.2356312	028.296	194.130	270.814	239.510
791122	42163.2	0.2359693	028.273	193.962	270.913	246.560
791129	42165.6	0.2358468	028.277	193.767	271.067	253.553
791206	42164.8	0.2361983	028.247	193.648	271.225	260.454
791213	42166.7	0.2360669	028.257	193.456	271.411	267.313
791220	42166.0	0.2363979	028.234	193.295	271.562	274.142
800103	42167.4	0.2364190	028.221	192.961	271.980	287.609
800110	42169.2	0.2361310	028.238	192.805	272.171	294.264
800117	42168.7	0.2363326	028.229	192.622	-087.630	300.884

Table 1 (continued)

IUE Orbital Elements

<u>EPOCH</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigree</u>	<u>Mean Anomaly</u>
800124	42170.9	0.2359093	028.251	192.434	-087.478	307.477
800131	42169.9	0.2360137	028.248	192.268	-087.237	313.945
800207	42171.3	0.2355873	028.270	192.145	-087.089	320.409
800214	42151.6	0.2352898	028.262	191.978	-086.884	327.054
800228	42152.4	0.2347928	028.293	191.667	-086.589	343.250
800306	42152.6	0.2343690	028.304	191.549	-086.497	351.301
800313	42153.9	0.2344326	028.299	191.396	-086.352	359.283
800320	42153.7	0.2340191	028.312	191.268	273.707	007.268
800327	42155.5	0.2340853	028.314	191.110	273.870	015.107
800403	42155.5	0.2338467	028.312	191.017	273.930	022.976
800410	42157.3	0.2340265	028.301	190.867	274.065	030.759
800424	42158.6	0.2339765	028.292	190.575	274.322	046.184
800501	42158.9	0.2339681	028.287	190.481	274.342	053.847
800508	42159.5	0.2341761	028.266	190.319	274.520	061.405
800515	42160.0	0.2341846	028.261	190.207	274.564	068.967
800522	42160.3	0.2343342	028.255	190.025	274.812	076.368
800529	42161.4	0.2344403	028.239	189.895	274.900	083.796
800605	42160.6	0.2346075	028.234	189.683	275.133	091.122
800613	42161.9	0.2347554	028.215	189.500	275.277	099.475
800619	42161.3	0.2347040	028.227	189.354	275.511	105.603
800625	42165.8	0.2347760	028.217	189.244	275.604	111.755
800703	42164.4	0.2347936	028.225	189.015	275.887	119.613
800717	42165.4	0.2346093	028.234	188.696	276.284	133.184
800724	42167.7	0.2345723	028.233	188.548	276.431	139.913
800731	42165.9	0.2343032	028.253	188.361	276.666	146.559
800807	42168.7	0.2342317	028.248	188.212	276.801	153.181
800815	42167.5	0.2338159	028.280	188.050	277.022	160.630
800822	42169.9	0.2337357	028.278	187.884	277.167	167.142
800829	42168.3	0.2332867	028.299	187.720	277.322	173.590
800905	42170.9	0.2332170	028.298	187.574	277.480	179.977

Table 1 (continued)

IUE Orbital Elements

<u>EPOCH</u>	<u>Semi-Major Axis</u>	<u>Eccentricity</u>	<u>Inclination</u>	<u>Ascending Node</u>	<u>Arg of Perigree</u>	<u>Mean Anomaly</u>
800912	42170.0	0.2327891	028.307	187.466	277.591	186.296
800919	42172.2	0.2327463	028.302	187.308	277.707	192.606
800926	42170.7	0.2323634	028.328	187.178	277.786	198.867
801003	42173.6	0.2323506	028.307	187.035	277.943	205.034
801009	42172.8	0.2320975	028.321	186.948	277.998	210.300
801016	42174.3	0.2321704	028.321	186.866	278.083	216.401
801023	42173.9	0.2319303	028.305	186.680	278.177	222.472
801030	42176.2	0.231272	028.292	186.520	278.305	228.441
801106	42175.9	0.2319964	028.292	186.403	278.394	234.379
801113	42176.9	0.2322767	028.276	186.305	278.526	240.247
801120	42177.2	0.2321134	028.274	186.087	278.628	246.111
801127	42178.8	0.2323635	028.252	185.933	278.842	251.832
801217	42153.3	0.2318607	028.243	185.471	279.253	268.300
801225	42153.4	0.2320597	028.242	185.248	279.536	277.442

Table 2
Orbit Corrective Maneuvers

<u>Date</u>	<u>Time</u>
780213	01:50 ± 15 min
780724	16:29:28 ± 10 min
790620	18:37:07 ± 1 sec
800213	02:16:01 ± 1 sec
800624	16:34:57 ± 1 sec
801216	06:10:02 ± 1 sec