


Data from the ULYSSES FINAL ARCHIVE

Open



ulysses_daily_heliocentric_data_1990-2009.txt

~/Pul-Fun/Ulysses/Trajectory/trajectory_data

lat: Sun Mean Equator and Equinox of 1950

RA and DEC: Earth Mean Orbit and Equinox of 1950

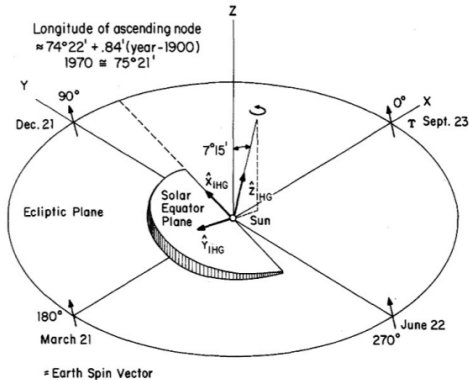
long: long of Ulysses wrt Earth in Sun Mean Equator and Equinox of 1950

YYYY	MM	DD	YYYY	DOY	JD	HH	MM	SS	ESP	SPE	SEP	R	R	dR	V	lat	RA	DEC	long
[UTC]									[deg]	[deg]	[deg]	[AU]	[km]	[km/s]	[km/s]	[deg]	[deg]	[deg]	[deg]
1990	10	07	1990	280	2448171.5	00	00	00	0.08	97.86	82.06	0.999	149497071.034	-2.512	41.092	6.35	12.98	0.01	0.08
1990	10	08	1990	281	2448172.5	00	00	00	0.45	98.57	80.97	0.998	149301115.851	-2.035	40.987	6.32	14.34	0.06	0.46
1990	10	09	1990	282	2448173.5	00	00	00	0.83	97.43	81.74	0.997	149145073.980	-1.577	40.996	6.28	15.70	0.10	0.83
1990	10	10	1990	283	2448174.5	00	00	00	1.20	96.17	82.63	0.996	149028578.950	-1.119	41.008	6.24	17.06	0.15	1.21
1990	10	11	1990	284	2448175.5	00	00	00	1.58	94.86	83.56	0.996	148951687.780	-0.661	41.017	6.20	18.42	0.20	1.59
1990	10	12	1990	285	2448176.5	00	00	00	1.96	93.54	84.50	0.995	148914448.678	-0.201	41.020	6.15	19.78	0.24	1.96
1990	10	13	1990	286	2448177.5	00	00	00	2.33	92.21	85.46	0.995	148916887.222	0.258	41.019	6.10	21.14	0.29	2.34
1990	10	14	1990	287	2448178.5	00	00	00	2.71	90.88	86.42	0.996	148958991.852	0.717	41.012	6.05	22.51	0.34	2.72
1990	10	15	1990	288	2448179.5	00	00	00	3.09	89.55	87.38	0.996	148901747.422	1.184	41.005	6.00	23.87	0.39	3.10
1990	10	16	1990	289	2448180.5	00	00	00	3.47	88.22	88.34	0.996	148844503.992	1.651	40.998	5.95	25.23	0.44	3.48
1990	10	17	1990	290	2448181.5	00	00	00	3.85	86.89	89.30	0.996	148787260.562	2.118	40.991	5.90	26.59	0.49	3.86
1990	10	18	1990	291	2448182.5	00	00	00	4.23	85.56	90.26	0.996	148730017.132	2.585	40.984	5.85	27.95	0.54	4.23
1990	10	19	1990	292	2448183.5	00	00	00	4.61	84.23	91.22	0.996	148672773.702	3.052	40.977	5.80	29.31	0.59	4.61
1990	10	20	1990	293	2448184.5	00	00	00	4.99	82.90	92.18	0.996	148615530.272	3.519	40.970	5.75	30.67	0.64	4.99
1990	10	21	1990	294	2448185.5	00	00	00	5.37	81.57	93.14	0.996	148558286.842	3.986	40.963	5.70	32.03	0.69	5.37
1990	10	22	1990	295	2448186.5	00	00	00	5.75	80.24	94.10	0.996	148501043.412	4.453	40.956	5.65	33.39	0.74	5.75
1990	10	23	1990	296	2448187.5	00	00	00	6.13	78.91	95.06	0.996	148443799.982	4.920	40.949	5.60	34.75	0.79	6.13
1990	10	24	1990	297	2448188.5	00	00	00	6.51	77.58	96.11	0.996	148386556.552	5.387	40.942	5.55	36.11	0.84	6.51
1990	10	25	1990	298	2448189.5	00	00	00	6.89	76.31	97.11	0.996	148329313.122	5.854	40.935	5.50	37.47	0.89	6.89
1990	10	26	1990	299	2448190.5	00	00	00	7.27	74.99	98.12	0.996	148272069.692	6.321	40.928	5.45	38.83	0.94	7.27
1990	10	27	1990	300	2448191.5	00	00	00	7.65	73.67	99.14	0.996	148214826.262	6.788	40.921	5.40	40.19	0.99	7.65
1990	10	28	1990	301	2448192.5	00	00	00	8.03	72.35	100.20	0.996	148157582.832	7.255	40.914	5.35	41.55	1.04	8.03
1990	10	29	1990	302	2448193.5	00	00	00	8.41	71.03	101.20	0.996	148100339.402	7.722	40.907	5.30	42.91	1.09	8.41
1990	10	30	1990	303	2448194.5	00	00	00	8.79	69.72	102.20	0.996	148043095.972	8.189	40.900	5.25	44.27	1.14	8.79
1990	10	31	1990	304	2448195.5	00	00	00	9.17	68.41	103.30	0.996	147985852.542	8.656	40.893	5.20	45.63	1.19	9.17
1990	11	01	1990	305	2448196.5	00	00	00	9.55	67.10	104.40	0.996	147928609.112	9.123	40.886	5.15	46.99	1.24	9.55
1990	11	02	1990	306	2448197.5	00	00	00	9.93	65.79	105.40	0.996	147871365.682	9.590	40.879	5.10	48.35	1.29	9.93
1990	11	03	1990	307	2448198.5	00	00	00	10.31	64.49	106.50	0.996	147814122.252	10.057	40.872	5.05	49.71	1.34	10.31
1990	11	04	1990	308	2448199.5	00	00	00	10.69	63.19	107.59	0.996	147756878.822	10.524	40.865	5.00	51.07	1.39	10.69
1990	11	05	1990	309	2448200.5	00	00	00	11.07	61.90	108.69	0.996	147699635.392	10.991	40.858	4.95	52.43	1.44	11.07
1990	11	06	1990	310	2448201.5	00	00	00	11.45	60.60	109.79	0.996	147642391.962	11.458	40.851	4.90	53.79	1.49	11.45
1990	11	07	1990	311	2448202.5	00	00	00	11.83	59.30	110.89	0.996	147585148.532	11.925	40.844	4.85	55.15	1.54	11.83
1990	11	08	1990	312	2448203.5	00	00	00	12.21	58.00	111.99	0.996	147527905.102	12.392	40.837	4.80	56.51	1.59	12.21
1990	11	09	1990	313	2448204.5	00	00	00	12.59	56.70	113.09	0.996	147470661.672	12.859	40.830	4.75	57.87	1.64	12.59
1990	11	10	1990	314	2448205.5	00	00	00	12.97	55.40	114.19	0.996	147413418.242	13.326	40.823	4.70	59.23	1.69	12.97
1990	11	11	1990	315	2448206.5	00	00	00	13.35	54.10	115.29	0.996	147356174.812	13.793	40.816	4.65	60.59	1.74	13.35
1990	11	12	1990	316	2448207.5	00	00	00	13.73	52.80	116.39	0.996	147298931.382	14.260	40.809	4.60	61.95	1.79	13.73
1990	11	13	1990	317	2448208.5	00	00	00	14.11	51.50	117.49	0.996	147241687.952	14.727	40.802	4.55	63.31	1.84	14.11
1990	11	14	1990	318	2448209.5	00	00	00	14.49	50.20	118.59	0.996	147184444.522	15.194	40.795	4.50	64.67	1.89	14.49
1990	11	15	1990	319	2448210.5	00	00	00	14.87	48.90	119.69	0.996	147127201.092	15.661	40.788	4.45	66.03	1.94	14.87
1990	11	16	1990	320	2448211.5	00	00	00	15.25	47.60	120.79	0.996	147069957.662	16.128	40.781	4.40	67.39	1.99	15.25
1990	11	17	1990	321	2448212.5	00	00	00	15.63	46.30	121.89	0.996	147012714.232	16.595	40.774	4.35	68.75	2.04	15.63
1990	11	18	1990	322	2448213.5	00	00	00	16.01	45.00	122.99	0.996	146955470.802	17.062	40.767	4.30	70.11	2.09	16.01
1990	11	19	1990	323	2448214.5	00	00	00	16.39	43.70	124.09	0.996	146898227.372	17.529	40.760	4.25	71.47	2.14	16.39
1990	11	20	1990	324	2448215.5	00	00	00	16.77	42.40	125.19	0.996	146840983.942	17.996	40.753	4.20	72.83	2.19	16.77
1990	11	21	1990	325	2448216.5	00	00	00	17.15	41.10	126.29	0.996	146783740.512	18.463	40.746	4.15	74.19	2.24	17.15
1990	11	22	1990	326	2448217.5	00	00	00	17.53	39.80	127.39	0.996	146726497.082	18.930	40.739	4.10	75.55	2.29	17.53
1990	11	23	1990	327	2448218.5	00	00	00	17.91	38.50	128.49	0.996	146669253.652	19.397	40.732	4.05	76.91	2.34	17.91
1990	11	24	1990	328	2448219.5	00	00	00	18.29	37.20	129.59	0.996	146612010.222	19.864	40.725	4.00	78.27	2.39	18.29
1990	11	25	1990	329	2448220.5	00	00	00	18.67	35.90	130.69	0.996	146554766.792	20.331	40.718	3.95	79.63	2.44	18.67
1990	11	26	1990	330	2448221.5	00	00	00	19.05	34.60	131.79	0.996	146497523.362	20.798	40.711	3.90	80.99	2.49	19.05
1990	11	27	1990	331	2448222.5	00	00	00	19.43	33.30	132.89	0.996	146440279.932	21.265	40.704	3.85	82.35	2.54	19.43
1990	11	28	1990	332	2448223.5	00	00	00	19.81	32.00	133.99	0.996	146383036.502	21.732	40.697	3.80	83.71	2.59	19.81
1990	11	29	1990	333	2448224.5	00	00	00	20.19	30.70	135.09	0.996	146325793.072	22.199	40.690	3.75	85.07	2.64	20.19
1990	11	30	1990	334	2448225.5	00	00	00	20.57	29.40	136.19	0.996	146268549.642	22.666	40.683	3.70	86.43	2.69	20.57
1990	11	31	1990	335	2448226.5	00	00	00	20.95	28.10	137.29	0.996	146211306.212	23.133	40.676	3.65	87.79	2.74	20.95
1990	12	01	1990	336	2448227.5	00	00	00	21.33	26.80	138.39	0.996	146154062.782	23.600	40.669	3.60	89.15	2.79	21.33
1990	12	02	1990	337	2448228.5	00	00	00	21.71	25.50	139.49	0.996	146096819.352	24.067	40.662	3.55	90.51	2.84	21.71
1990	12	03	1990																

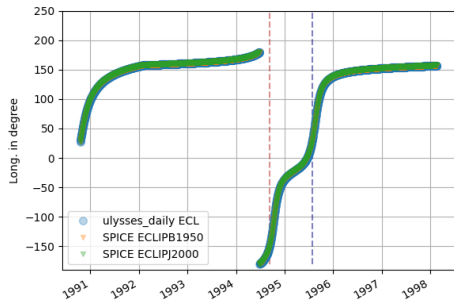
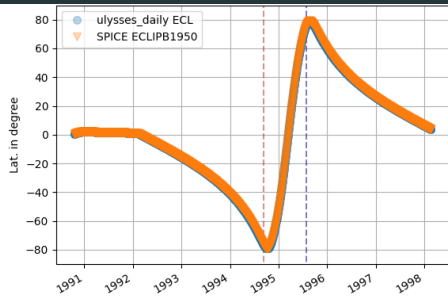
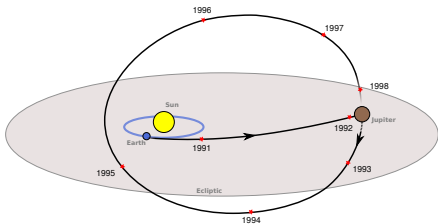
Coordinate Systems

There seem to be two options for coordinate systems:

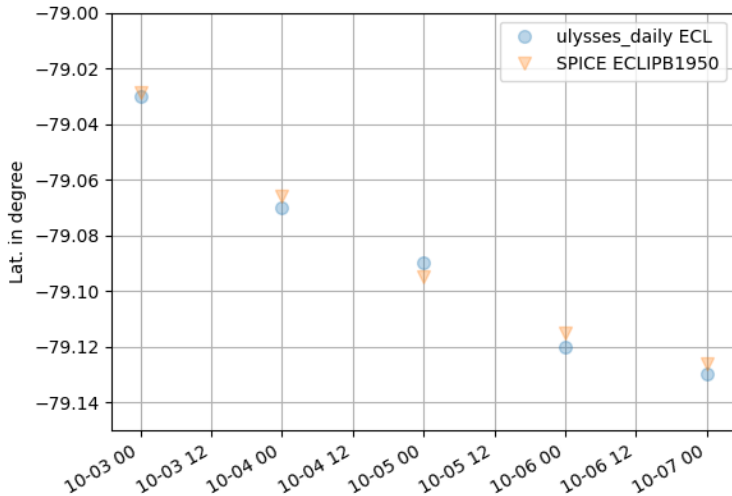
- **Heliocentric Inertial (HCI)** system
- **Heliocentric Aries Ecciptic (HAE)** system



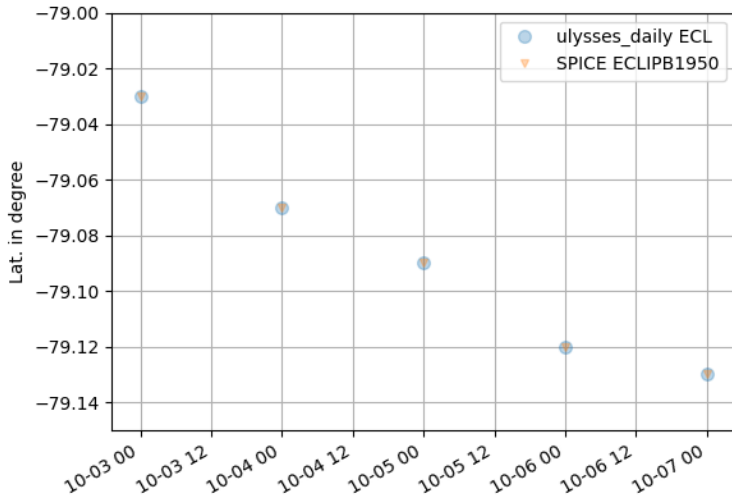
Ulysses' 1st Orbit



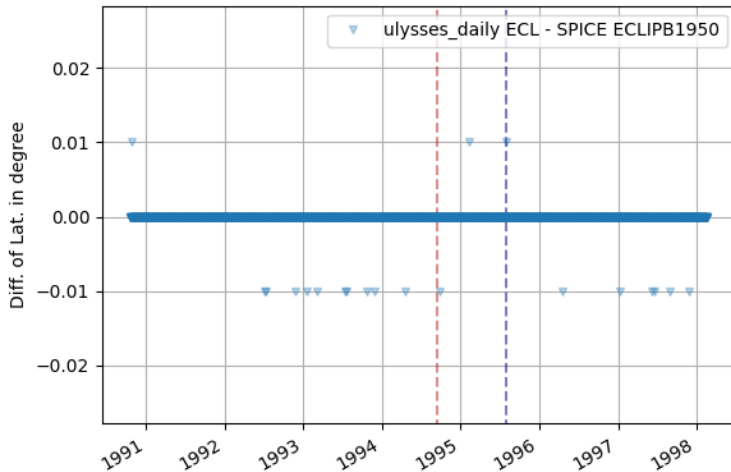
Ecliptic System – Latitude



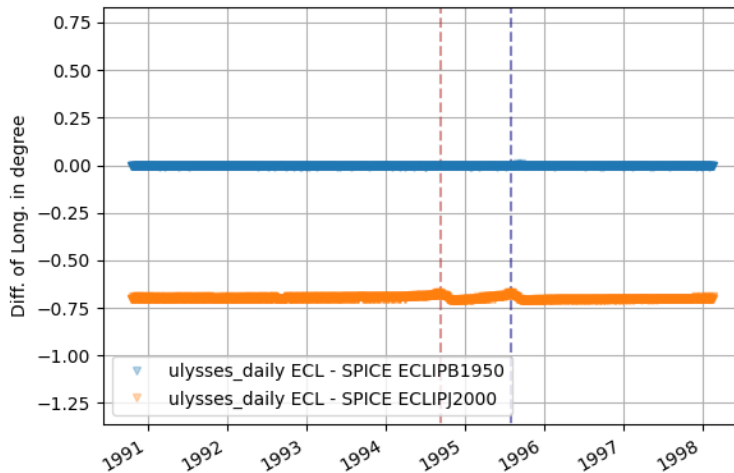
Ecliptic System – Latitude



Ecliptic System – Latitude



Ecliptic System – Longitude



Equatorial System

628-53, Rev. G Controlled Document

Ulysses Reference Trajectory Characteristics

Krystyna Kiedron

March 15, 1993



JPL-D-243

Earth - Sun - S/C Angle	deg
Sun - S/C - Earth Angle	deg
Sun - Earth - S/C Angle	deg
Heliocentric Range of S/C	AU
Heliocentric Range Rate	km/sec
Heliocentric Velocity Magnitude	km/sec
Heliographic Latitude of S/C (SMEQ) ^a	deg
Heliocentric Sun Equator Right Ascension ^b	deg
Ecliptic Latitude of S/C Relative to Sun (EMEC) ^c	deg
Solar Longitude With Respect to Earth ^d	deg

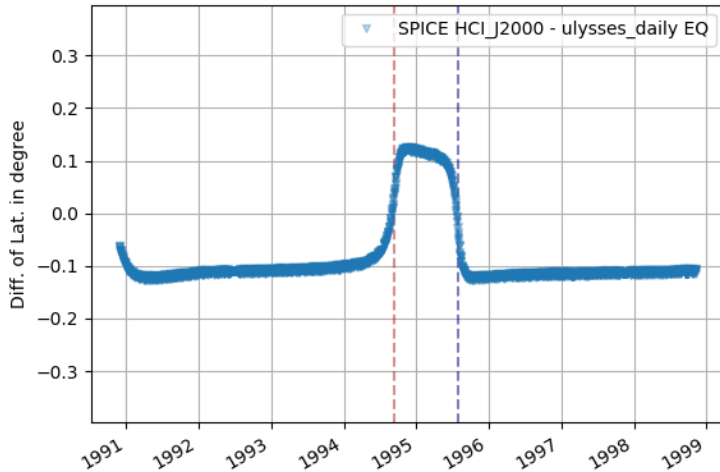
^aSMEQ - Sun mean equator and equinox of 1950

^bThe right ascension of the S/C in the Sun's equatorial plane measured from the ascending node of Earth's orbit plane of 1950

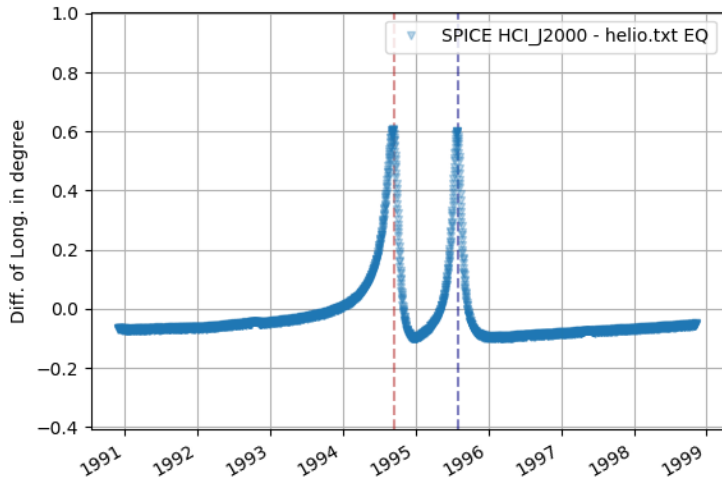
^cEarth mean ecliptic and equinox of 1950

^dThe Earth-Sun-S/C angle projected on the sun's equatorial plane where the current Earth-Sun line is always longitude = 0.0°

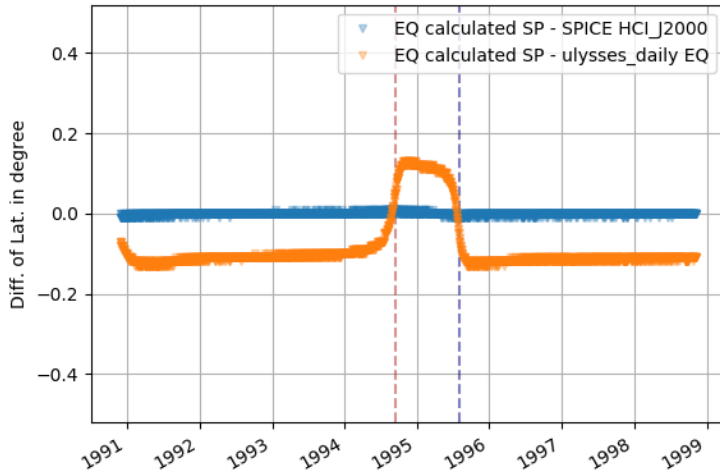
Equatorial System – Latitude



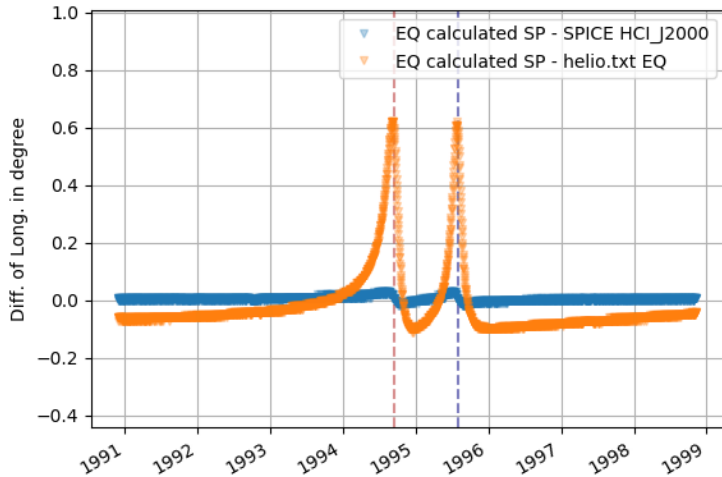
Equatorial System – Longitude



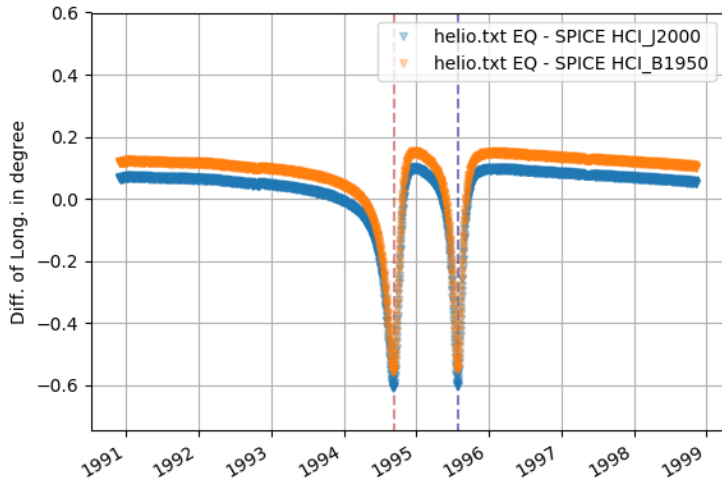
Equatorial System – Latitude



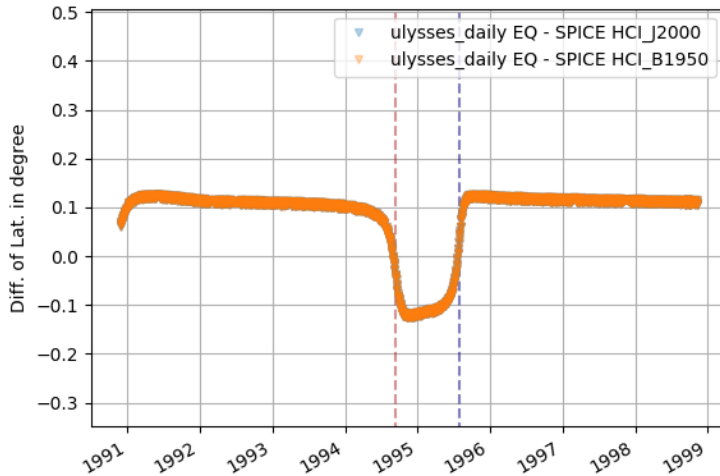
Equatorial System – Longitude



Equatorial System – Longitude



Equatorial System – Latitude





Two-Vector Frame Concepts - 3

Navigation and Ancillary Information Facility

• Secondary Vector

- A specified positive or negative axis of the two-vector frame is aligned with the component of the secondary vector orthogonal to the primary vector.
 - » The frame kernel creator associates with this vector one of the axis designations { +X, -X, +Y, -Y, +Z, -Z }, where the axis is orthogonal to that associated with the primary vector.

Heliocentric Inertial (HCI) Frame

Definition of the Heliocentric Inertial frame:

All vectors are geometric: no aberration corrections are used.

The solar rotation axis is the primary vector: the Z axis points in the solar north direction (IAU_SUN frozen at J2000 epoch).

The ascending node on the ecliptic of J2000 of the IAU_SUN equator forms the X axis. *** N.B this is accomplished by using the +Z axis of the ecliptic of J2000 as the secondary vector and HCI +Y as the secondary axis

The Y axis is Z cross X, completing the right-handed reference frame.

\begindata

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FRAME_1810420_RELATIVE                   = 'J2000'
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FRAME_1810420_FAMILY                    = 'TWO-VECTOR'
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FRAME_1810420_PRI_AXIS                   = 'Z'
FRAME_1810420_PRI_VECTOR_DEF             = 'CONSTANT'
FRAME_1810420_PRI_FRAME                  = 'IAU_SUN'
FRAME_1810420_PRI_SPEC                   = 'RECTANGULAR'
FRAME_1810420_PRI_VECTOR                 = ( 0, 0, 1 )
FRAME_1810420_SEC_AXIS                   = 'Y'
FRAME_1810420_SEC_VECTOR_DEF             = 'CONSTANT'
FRAME_1810420_SEC_FRAME                  = 'ECLIPJ2000'
FRAME_1810420_SEC_SPEC                   = 'RECTANGULAR'
FRAME_1810420_SEC_VECTOR                 = ( 0, 0, 1 )
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