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TABLES OF MEDIAN HOURLY VALUES OF THE COSINE OF THE SOLAR ZENITH ANGLE (χ) FOR THIRTY-FIVE LOCATIONS

by R. E. McDuffie

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Tables of Median Hourly Values of the Cosine of the Solar Zenith Angle (χ) for Thirty-five Locations

Many parameters of the lower ionosphere, notably D and E region maximum electron densities and D region absorption, vary as a simple function of the cosine of the zenith angle (χ) of the sun. It is convenient, therefore, to have tabulations of cosine χ for the locations at which ionospheric vertical soundings are being made. This report consists of tables of hourly values of cosine χ from sunrise to sunset for the 15th day of each month appropriate to thirty-five vertical incidence ionospheric stations associated with the National Bureau of Standards, including fourteen new stations established for IGY (see Table 1). The tables were prepared in response to the recommendation by the U.R.S.I. Mixed Commission on the Ionosphere (see Proc. Mixed Comm. on the Ionosphere, p. 77 Resolution 2, Brussels, 1954).

The calculations were made in compliance with the suggestions of W. J. G. Beynon and G. M. Brown, expressed in a paper entitled "On the calculation of solar zenith angle" published in U.R.S.I. Information Bulletin, No. 97. In addition to a comprehensive discussion of the merits and accuracy of their method of computation they list a table of values of solar declination δ and equation of time ϵ for the 15th day of each month that are considered to be the best compromise values which allow for the year-to-year variations. Since the period of the International Geophysical Year (1957-1958) falls midway between the times of extreme variations of δ and ϵ, i.e., midway between consecutive leap years, the values given will be quite adequate for the determination of cos χ at all stations.

The basic equation is:

$$\cos X = \sin \varphi \cdot \sin \delta + \cos \varphi \cdot \cos \delta \cdot \cos (h_m + \epsilon + \beta)$$

where

φ is latitude

δ is solar declination

h_m is the hour angle of the mean sun from noon, reckoned positive westwards

ϵ is the correction applied to h_m due to the Equation of Time, reckoned positive when the true sun is ahead of the mean sun

β is the local time correction, reckoned positive when the time meridian is west of the station.

Since the values of δ and ϵ for the 15th day of a month are close to the monthly median values, it is legitimate to employ the resulting cos X values in conjunction with monthly median ionospheric parameters. Interpolation between stations is not correct because of the time correction for distance from the standard meridians.

TABLE 1

Location	Geographic Lat.		Geographic Long.		Time	Page
Adak, Alaska	N51°	54'	W176°	36'	180°W	4
Amundsen-Scott (Pole), Antarctica	S90	00	--	--	GCT	5
Anchorage, Alaska	N61	14	W149	53	150 W	6
Baguio, Philippines	N16	25	E120	35	120 E	7
Barrow, Alaska	N71	20	W156	46	150 W	8
Belvoir, Virginia	N38	44	W 77	08	75 W	9
Bogota, Colombia	N 4	32	W 74	15	75 W	10
Byrd Base, Antarctica	S80	00	W120	00	120 W	11
Cape Canaveral, Florida	N28	24	W 80	36	75 W	12
Cape Hallett (Adare), Antarctica	S72	25	E170	55	165 E	13
Chiclayo, Peru	S 6	48	W 79	49	75 W	14
Chimbote, Peru	S 9	04	W 78	35	75 W	15
College-Fairbanks, Alaska	N64	54	W147	48	150 W	16
Concepcion, Chile	S36	35	W 72	59	75 W	17
Ellsworth, Antarctica	S77	43	W 41	07	45 W	18
Ft. Monmouth, New Jersey	N40	18	W 74	12	75 W	19
Godhavn, Greenland	N69	15	W 53	33	45 W	20
Grand Bahama Island	N26	36	W 78	15	75 W	21
Guam, Mariana Islands	N13	27	E144	45	150 E	22
Huancayo, Peru	S12	03	W 75	20	75 W	23
La Paz, Bolivia	S16	29	W 68	03	75 W	24
Little America, Antarctica	S78	17	W162	15	165 W	25
Maui, T. of Hawaii	N20	48	W156	30	150 W	26
Narsarssuak, Greenland	N61	09	W 45	22	45 W	27
Okinawa, Ryukyu Islands	N26	19	E127	47	135 E	28
Panama, Canal Zone	N 9	24	W 79	54	75 W	29
Puerto Rico, W. Indies	N18	30	W 67	10	60 W	30
Reykjavik, Iceland	N64	08	W 21	47	15 W	31
San Francisco, California	N37	24	W122	10	120 W	32
San Salvador, Bahama Islands	N24	05	W 74	30	75 W	33
St. John's, Newfoundland	N47	37	W 52	42	60 W	34
Talara, Peru	S 4	38	W 81	18	75 W	35
Thule, Greenland	N76	33	W 68	50	75 W	36
White Sands, New Mexico	N32	18	W106	30	105 W	37
Wilkes, Antarctica	S66	15	E110	35	105 E	38

Adak, Alaska (51.9°N, 176.6°W) Time: 180°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04					.000	.057	.020					
05				.009	.148	.197	.160	.061				
06				.167	.297	.345	.309	.216	.093			
07			.140	.323	.447	.490	.457	.370	.250	.113		
08	.012	.124	.278	.466	.583	.623	.593	.512	.384	.252	.108	.012
09	.129	.249	.414	.587	.688	.735	.709	.632	.512	.365	.217	.122
10	.219	.329	.510	.676	.780	.818	.796	.722	.599	.446	.294	.202
11	.274	.406	.568	.728	.828	.866	.848	.776	.649	.489	.335	.247
12	.291	.427	.586	.740	.840	.877	.863	.790	.657	.490	.336	.254
13	.269	.407	.563	.710	.805	.849	.838	.763	.623	.450	.297	.223
14	.209	.348	.498	.641	.736	.785	.776	.697	.549	.372	.221	.156
15	.115	.252	.398	.537	.645	.688	.681	.597	.441	.260	.113	.056
16		.128	.268	.406	.507	.566	.559	.469	.306	.122		
17			.119	.256	.363	.426	.418	.323	.156			
18				.098	.210	.279	.279	.167				
19					.061	.133	.062	.013				
20						.000						
21												
22												
23												

Amundsen-Scott (Pole Station), Antarctica (90.0°S, --) Time: GCT

Hourly values of cos X for 15th day of each month

GCT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00	.363	.225	.042							.144	.315	.394
01	.363	.224	.041							.144	.314	.394
02	.363	.224	.041							.145	.314	.394
03	.363	.224	.041							.145	.314	.394
04	.362	.224	.040							.145	.314	.394
05	.362	.224	.040							.146	.314	.395
06	.362	.223	.040							.146	.313	.395
07	.362	.223	.040							.146	.313	.395
08	.362	.223	.039							.146	.313	.395
09	.362	.223	.039							.146	.313	.395
10	.362	.222	.039							.147	.313	.395
11	.362	.222	.038							.147	.313	.395
12	.362	.222	.038							.147	.312	.395
13	.361	.222	.038							.148	.312	.395
14	.361	.221	.037							.148	.312	.395
15	.361	.221	.037							.148	.312	.395
16	.361	.221	.037							.148	.312	.395
17	.361	.221	.036							.149	.312	.395
18	.361	.220	.036							.149	.312	.395
19	.361	.220	.036							.149	.311	.395
20	.361	.220	.036							.149	.311	.395
21	.360	.220	.035							.150	.311	.395
22	.360	.220	.035							.150	.311	.395
23	.360	.219	.035							.150	.311	.396

Anchorage, Alaska (61.2°N, 149.9°W) Time: 150°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03						.034						
04					.061	.126	.090					
05				.025	.172	.233	.197	.086				
06				.147	.290	.347	.312	.207	.059			
07			.072	.270	.408	.462	.428	.327	.183	.024		
08		.015	.190	.385	.518	.568	.537	.441	.298	.136		
09		.116	.293	.483	.611	.660	.631	.538	.395	.229	.066	
10	.063	.197	.373	.559	.681	.730	.704	.614	.469	.298	.136	.042
11	.112	.250	.426	.606	.725	.774	.759	.662	.514	.338	.175	.084
12	.131	.274	.447	.622	.738	.789	.769	.680	.528	.346	.182	.096
13	.121	.266	.436	.606	.721	.774	.757	.666	.508	.322	.159	.078
14	.080	.226	.392	.559	.673	.729	.715	.622	.458	.267	.106	.031
15	.013	.157	.320	.483	.599	.659	.650	.549	.379	.185	.027	
16		.065	.223	.385	.504	.568	.554	.453	.277	.081		
17			.110	.271	.393	.461	.448	.341	.163			
18				.148	.275	.347	.332	.221	.035			
19				.026	.158	.232	.216	.099				
20					.049	.126	.107					
21						.034	.012					
22												
23												

Baguio, Philippines (16.4°N, 120.6°E) Time: 120°E

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06				.056	.115	.120	.090	.060	.045	.026		
07	.103	.132	.209	.301	.349	.347	.322	.302	.291	.269	.214	.144
08	.321	.362	.443	.528	.466	.559	.538	.527	.519	.491	.427	.354
09	.510	.563	.647	.722	.750	.740	.725	.721	.713	.676	.604	.531
10	.658	.722	.805	.871	.889	.879	.869	.870	.859	.812	.733	.666
11	.754	.827	.907	.963	.974	.965	.962	.965	.948	.890	.807	.747
12	.792	.871	.947	.993	.999	.993	.996	.999	.973	.905	.820	.769
13	.769	.852	.922	.958	.962	.961	.969	.970	.932	.855	.771	.732
14	.686	.771	.833	.862	.865	.871	.883	.879	.829	.744	.663	.637
15	.550	.632	.687	.710	.716	.729	.744	.733	.671	.591	.505	.491
16	.369	.447	.493	.512	.524	.546	.562	.541	.468	.372	.305	.305
17	.156	.226	.265	.283	.303	.332	.348	.318	.235	.137	.079	.089
18			.018	.038	.067	.104	.117	.077				
19												
20												
21												
22												
23												

Barrow, Alaska (71.3°N, 156.8°W) Time: 150°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00					.002	.083	.055					
01					.005	.083	.054					
02					.028	.104	.073					
03					.070	.143	.111					
04					.127	.198	.165	.042				
05				.041	.197	.266	.231	.112				
06				.121	.274	.340	.306	.189	.021			
07				.204	.353	.417	.384	.270	.104			
08			.077	.283	.429	.490	.459	.349	.184	.004		
09			.151	.354	.497	.556	.526	.419	.255	.072		
10		.027	.212	.412	.551	.610	.582	.476	.311	.126		
11		.072	.256	.453	.589	.648	.622	.517	.350	.161		
12		.097	.280	.473	.607	.667	.643	.538	.369	.177	.008	
13		.101	.282	.472	.605	.666	.644	.539	.366	.170	.001	
14		.084	.263	.450	.582	.645	.624	.518	.342	.143		
15		.047	.224	.408	.541	.606	.586	.478	.297	.096		
16			.166	.350	.484	.551	.532	.421	.236	.033		
17			.095	.259	.414	.485	.465	.351	.166			
18			.016	.198	.337	.410	.390	.272	.080			
19				.116	.289	.334	.312	.191				
20					.183	.260	.237	.112				
21					.116	.194	.169	.041				
22					.062	.140	.113					
23					.024	.103	.073					

Belvoir, Virginia (38.7°N, 77.1°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05						.036						
06				.075	.186	.220	.185	.110	.021			
07			.118	.276	.378	.406	.374	.307	.223	.126	.017	
08	.087	.174	.312	.464	.558	.582	.553	.494	.412	.310	.194	.102
09	.246	.342	.483	.628	.713	.734	.710	.657	.576	.467	.344	.252
10	.373	.478	.619	.756	.834	.854	.834	.785	.702	.587	.457	.368
11	.459	.573	.711	.840	.911	.932	.917	.871	.783	.658	.526	.442
12	.499	.618	.753	.874	.940	.964	.954	.908	.813	.679	.545	.469
13	.489	.612	.743	.855	.919	.946	.941	.893	.789	.648	.514	.448
14	.430	.555	.680	.786	.849	.881	.880	.828	.714	.566	.435	.379
15	.327	.450	.568	.670	.735	.773	.774	.717	.593	.439	.313	.267
16	.186	.306	.417	.515	.585	.629	.631	.567	.434	.276	.156	.121
17	.017	.131	.236	.333	.408	.460	.461	.389	.250	.088		
18			.037	.135	.218	.255	.275	.194	.046			
19					.026	.089	.086					
20												
21												
22												
23												

Bogota, Colombia (4.5°N, 74.2°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06				.025	.053	.043	.018	.013	.037	.062	.051	.001
07	.187	.187	.229	.279	.297	.279	.258	.264	.294	.314	.293	.237
08	.413	.426	.472	.515	.521	.499	.483	.497	.530	.544	.513	.454
09	.602	.635	.682	.717	.712	.687	.677	.698	.731	.736	.696	.639
10	.763	.799	.846	.870	.856	.830	.826	.853	.882	.877	.829	.778
11	.862	.908	.952	.966	.944	.918	.922	.951	.974	.957	.907	.861
12	.900	.953	.993	.996	.969	.947	.956	.986	.999	.972	.919	.884
13	.876	.933	.966	.959	.929	.913	.928	.955	.957	.919	.867	.845
14	.789	.847	.873	.858	.828	.818	.838	.860	.849	.803	.755	.746
15	.647	.703	.720	.699	.672	.671	.693	.707	.684	.633	.589	.594
16	.459	.509	.518	.494	.473	.480	.503	.508	.473	.416	.382	.399
17	.237	.280	.280	.255	.243	.258	.280	.275	.230	.172	.147	.175
18		.030	.023	.001		.020	.041	.025				
19												
20												
21												
22												
23												

Byrd Base, Antarctica (80.0°S, 120.0°W) Time: 120°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00	.196	.052									.145	.229
01	.200	.055									.154	.235
02	.214	.069									.173	.252
03	.238	.094								.029	.201	.278
04	.270	.127								.066	.237	.312
05	.309	.166								.109	.277	.351
06	.350	.209	.032							.154	.320	.392
07	.392	.253	.077							.198	.362	.433
08	.432	.295	.119						.036	.239	.400	.472
09	.466	.331	.156						.071	.273	.432	.504
10	.493	.360	.185						.098	.298	.456	.529
11	.511	.379	.204						.115	.313	.470	.544
12	.518	.387	.211	.005					.120	.316	.472	.549
13	.514	.384	.206						.114	.308	.464	.542
14	.499	.370	.191						.096	.289	.444	.525
15	.475	.345	.164						.068	.260	.416	.499
16	.442	.311	.129						.031	.223	.380	.466
17	.404	.271	.088							.181	.339	.427
18	.362	.228	.043							.136	.296	.386
19	.320	.183								.092	.253	.345
20	.280	.141								.052	.215	.307
21	.245	.104								.019	.182	.274
22	.218	.075									.158	.250
23	.200	.055									.144	.235

Cape Canaveral, Florida (28.4°N, 80.6°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06					.086	.109	.075	.017				
07			.090	.221	.303	.320	.288	.240	.187	.125	.042	
08	.136	.213	.312	.438	.510	.522	.494	.454	.405	.338	.234	.162
09	.322	.396	.512	.630	.693	.701	.678	.645	.597	.523	.423	.339
10	.474	.559	.672	.785	.838	.845	.828	.800	.750	.667	.554	.479
11	.583	.677	.791	.892	.938	.944	.933	.909	.854	.762	.651	.574
12	.640	.741	.852	.943	.983	.992	.987	.963	.901	.799	.686	.617
13	.642	.748	.854	.935	.973	.985	.985	.960	.889	.777	.664	.606
14	.588	.696	.796	.870	.906	.924	.928	.893	.817	.698	.587	.540
15	.483	.590	.683	.750	.788	.812	.820	.785	.692	.566	.460	.425
16	.332	.436	.521	.585	.627	.659	.668	.625	.521	.391	.291	.268
17	.148	.246	.324	.386	.434	.473	.482	.431	.319	.184	.093	.080
18		.031	.102	.165	.221	.268	.275	.215	.092			
19					.005	.057	.061					
20												
21												
22												
23												

Cape Hallett (Adare), Antarctica (72.4°S, 170.9°E) Time: 165°E

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00	.065										.017	.101
01	.079										.039	.119
02	.111										.079	.155
03	.160	.014									.134	.206
04	.220	.077								.033	.200	.268
05	.290	.149								.110	.273	.339
06	.363	.225	.057							.188	.348	.411
07	.435	.300	.134						.061	.263	.419	.481
08	.501	.370	.205	.011					.129	.329	.482	.544
09	.556	.429	.264	.071					.186	.383	.533	.596
10	.597	.473	.307	.111				.032	.226	.420	.567	.633
11	.621	.499	.333	.133				.056	.247	.437	.584	.651
12	.626	.506	.338	.136				.060	.248	.435	.581	.652
13	.612	.492	.322	.117				.043	.228	.413	.558	.634
14	.579	.460	.287	.080				.009	.190	.372	.518	.598
15	.531	.410	.235	.026					.135	.315	.463	.547
16	.470	.347	.169						.067	.246	.397	.484
17	.400	.276	.094							.171	.323	.414
18	.327	.198	.015							.093	.248	.342
19	.254	.122								.018	.177	.272
20	.188	.052									.113	.209
21	.132										.062	.158
22	.091										.027	.121
23	.067										.010	.102

Chiclayo, Peru (6.8°S, 79.8°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06												
07	.169	.138	.141	.153	.143	.114	.097	.123	.188	.250	.266	.228
08	.402	.383	.391	.396	.376	.341	.328	.364	.433	.489	.495	.453
09	.611	.604	.614	.611	.580	.541	.534	.578	.649	.696	.693	.651
10	.781	.785	.796	.783	.742	.701	.701	.751	.819	.857	.846	.807
11	.900	.915	.924	.901	.851	.811	.817	.871	.933	.960	.944	.912
12	.961	.984	.989	.955	.899	.862	.875	.929	.983	.999	.980	.957
13	.960	.988	.987	.943	.884	.851	.869	.922	.966	.972	.952	.941
14	.896	.926	.918	.866	.805	.779	.802	.851	.882	.879	.862	.864
15	.774	.803	.787	.728	.669	.650	.677	.719	.738	.727	.715	.731
16	.602	.610	.602	.539	.485	.475	.503	.537	.543	.527	.523	.551
17	.392	.410	.377	.312	.265	.263	.292	.315	.310	.293	.297	.337
18	.159	.167	.126	.062	.025	.031	.058	.071	.057	.040	.053	.104
19												
20												
21												
22												
23												

Chimbote, Peru (9.1°S 78.6°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06										.022	.054	.026
07	.202	.167	.163	.166	.149	.117	.101	.133	.206	.275	.296	.261
08	.432	.409	.410	.406	.379	.341	.330	.371	.448	.510	.522	.484
09	.637	.626	.629	.617	.579	.537	.532	.581	.659	.713	.716	.677
10	.802	.802	.806	.784	.736	.693	.694	.749	.824	.868	.864	.829
11	.917	.927	.928	.896	.840	.797	.805	.863	.932	.966	.956	.928
12	.973	.990	.988	.945	.883	.843	.857	.916	.977	1.000	.987	.969
13	.966	.989	.980	.928	.862	.827	.847	.904	.954	.967	.954	.947
14	.898	.922	.906	.845	.779	.750	.775	.828	.865	.870	.859	.866
15	.772	.795	.771	.703	.639	.618	.646	.692	.717	.714	.710	.730
16	.598	.616	.584	.512	.453	.440	.470	.507	.520	.520	.515	.548
17	.386	.398	.357	.284	.232	.227	.257	.285	.286	.277	.288	.333
18	.153	.154	.106	.034			.023	.040	.033	.024	.045	.100
19												
20												
21												
22												
23												

College - Fairbanks, Alaska (64.9°N, 147.8°W) Time: 150°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02						.028						
03					.023	.093	.058					
04					.110	.176	.141	.023				
05				.058	.209	.272	.236	.123				
06				.168	.313	.373	.338	.230	.075			
07			.073	.275	.417	.473	.440	.336	.183	.016		
08			.176	.374	.511	.566	.535	.434	.283	.113		
09		.084	.264	.459	.591	.644	.615	.518	.366	.192	.030	
10	.015	.155	.332	.522	.650	.703	.677	.581	.428	.250	.085	
11	.054	.196	.375	.560	.685	.738	.715	.620	.464	.281	.115	.024
12	.068	.212	.389	.570	.693	.748	.727	.632	.472	.284	.118	.031
13	.055	.201	.375	.552	.674	.731	.712	.616	.451	.259	.093	.012
14	.016	.163	.333	.507	.629	.688	.672	.573	.402	.207	.043	
15		.099	.266	.438	.561	.623	.608	.506	.330	.131		
16		.015	.179	.349	.474	.541	.525	.419	.238	.038		
17			.077	.246	.376	.445	.429	.319	.137			
18				.138	.271	.344	.327	.212	.022			
19				.031	.168	.244	.225	.105				
20					.074	.152	.130	.006				
21						.073	.049					
22						.014						
23												

Concepcion, Chile (36.6°S, 73.0°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05	.018										.066	.086
06	.212	.112	.020						.011	.163	.265	.278
07	.406	.315	.228	.132	.043			.067	.217	.366	.458	.467
08	.586	.506	.421	.319	.222	.155	.160	.254	.406	.549	.633	.640
09	.742	.671	.588	.479	.372	.303	.314	.413	.565	.700	.778	.786
10	.862	.800	.716	.599	.485	.415	.431	.535	.683	.810	.882	.894
11	.938	.883	.797	.671	.551	.483	.504	.610	.753	.871	.939	.958
12	.964	.915	.825	.691	.567	.501	.528	.634	.768	.878	.945	.972
13	.940	.894	.799	.656	.530	.469	.501	.604	.730	.832	.899	.936
14	.866	.820	.719	.570	.445	.390	.425	.523	.639	.734	.804	.852
15	.748	.700	.592	.439	.316	.267	.304	.397	.503	.593	.668	.727
16	.594	.541	.426	.270	.153	.111	.149	.234	.330	.417	.498	.567
17	.413	.354	.232	.077				.045	.130	.219	.307	.386
18	.220	.152	.024							.012	.108	.194
19	.026											.005
20												
21												
22												
23												

Ellsworth, Antarctica (77.7°S, 41.1°W) Time: 45°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00	.157	.012									.107	.191
01	.165	.019									.120	.202
02	.185	.040									.147	.226
03	.218	.073								.013	.185	.260
04	.260	.116								.061	.230	.303
05	.308	.166								.114	.281	.352
06	.359	.219	.045							.170	.334	.403
07	.410	.273	.099						.019	.223	.384	.453
08	.457	.322	.150						.068	.271	.430	.498
09	.498	.365	.193						.109	.310	.467	.536
10	.528	.398	.225	.024					.139	.338	.493	.563
11	.546	.418	.244	.041					.156	.352	.506	.578
12	.552	.424	.250	.045					.159	.353	.505	.581
13	.543	.417	.241	.034					.147	.339	.492	.569
14	.522	.395	.218	.009					.122	.312	.465	.546
15	.489	.362	.182						.084	.273	.427	.511
16	.447	.319	.137						.038	.226	.381	.468
17	.399	.268	.085							.173	.330	.420
18	.347	.214	.029							.118	.277	.369
19	.296	.160								.065	.226	.319
20	.249	.110								.018	.180	.274
21	.208	.067									.143	.236
22	.178	.034									.116	.209
23	.159	.013									.103	.193

Ft. Monmouth, New Jersey (40.3°N, 74.1°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05					.043	.084	.047					
06				.120	.231	.266	.231	.156	.064			
07		.017	.156	.315	.418	.448	.415	.348	.261	.159	.046	
08	.110	.201	.343	.496	.591	.616	.588	.527	.442	.336	.214	.122
09	.260	.361	.504	.651	.737	.760	.736	.681	.596	.482	.355	.263
10	.377	.486	.629	.768	.847	.869	.850	.800	.711	.590	.457	.369
11	.453	.569	.710	.841	.914	.937	.923	.874	.781	.651	.515	.433
12	.482	.604	.741	.863	.932	.958	.949	.900	.799	.661	.524	.449
13	.462	.587	.719	.856	.901	.931	.926	.875	.765	.619	.484	.418
14	.395	.521	.647	.756	.823	.858	.856	.801	.682	.529	.397	.341
15	.285	.409	.529	.633	.703	.744	.744	.683	.554	.396	.269	.224
16	.140	.260	.373	.475	.549	.596	.597	.529	.391	.230	.109	.074
17		.083	.191	.292	.372	.426	.426	.350	.206	.042		
18				.096	.183	.243	.241	.157	.004			
19						.062	.057					
20												
21												
22												
23												

Godhavn, Greenland (69.2°N, 53.5°W) Time: 45°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00						.048	.020					
01						.046	.017					
02						.067	.035					
03					.034	.108	.075					
04					.096	.167	.133	.010				
05				.016	.172	.240	.205	.086				
06				.104	.256	.321	.285	.171	.006			
07				.196	.344	.406	.373	.261	.098			
08			.080	.284	.429	.489	.457	.348	.187	.011		
09			.162	.364	.505	.563	.533	.427	.267	.088		
10		.048	.232	.430	.567	.624	.596	.493	.332	.150		
11		.100	.283	.478	.611	.668	.642	.540	.378	.192	.024	
12		.130	.312	.503	.634	.692	.668	.567	.401	.211	.043	
13		.138	.318	.505	.635	.693	.672	.570	.401	.207	.039	
14		.122	.299	.483	.612	.673	.653	.550	.377	.179	.012	
15		.083	.258	.439	.569	.632	.613	.508	.330	.130		
16		.025	.197	.376	.507	.573	.555	.446	.264	.062		
17			.120	.298	.431	.501	.482	.370	.188			
18			.032	.211	.347	.419	.400	.284	.094			
19				.120	.260	.334	.314	.194	.002			
20				.032	.175	.252	.230	.107				
21					.100	.177	.154	.027				
22					.038	.116	.090					
23						.073	.043					

Grand Bahama (26.6°N, 78.2°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06				.024	.110	.130	.097	.043				
07		.024	.129	.254	.330	.344	.313	.270	.224	.168	.088	.008
08	.182	.243	.352	.471	.538	.546	.520	.485	.442	.380	.292	.209
09	.367	.439	.551	.662	.718	.723	.702	.674	.632	.563	.467	.384
10	.516	.598	.710	.812	.860	.864	.848	.825	.781	.702	.600	.520
11	.618	.710	.820	.912	.953	.957	.947	.927	.878	.790	.683	.613
12	.668	.766	.872	.955	.990	.997	.993	.974	.916	.818	.710	.644
13	.661	.764	.864	.938	.970	.981	.983	.961	.894	.787	.678	.624
14	.598	.702	.796	.863	.894	.911	.916	.891	.813	.698	.591	.549
15	.483	.586	.673	.733	.767	.790	.799	.767	.678	.556	.455	.424
16	.324	.423	.502	.559	.597	.628	.638	.598	.498	.372	.278	.259
17	.132	.225	.297	.353	.396	.435	.445	.396	.287	.158	.072	.064
18		.005	.069	.126	.179	.224	.233	.174	.056			
19						.011	.016					
20												
21												
22												
23												

Guam, Mariana Islands (13.6°N, 144.9°E) Time: 150°E

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06					.006	.010						
07	.033	.050	.117	.201	.246	.243	.216	.198	.196	.187	.144	.079
08	.261	.291	.362	.440	.474	.465	.443	.435	.437	.422	.369	.300
09	.467	.508	.582	.652	.675	.663	.646	.646	.649	.625	.564	.468
10	.634	.708	.762	.822	.836	.821	.811	.816	.817	.784	.716	.649
11	.753	.816	.889	.939	.944	.930	.926	.935	.930	.887	.813	.753
12	.815	.886	.955	.994	.993	.981	.984	.994	.981	.927	.851	.799
13	.815	.891	.955	.984	.980	.972	.981	.989	.966	.902	.825	.785
14	.754	.833	.889	.910	.905	.903	.916	.921	.886	.813	.739	.704
15	.637	.714	.762	.777	.773	.779	.796	.793	.746	.666	.597	.572
16	.470	.543	.583	.593	.594	.608	.626	.616	.556	.471	.409	.395
17	.265	.331	.363	.371	.379	.402	.420	.400	.330	.242	.189	.184
18	.037	.094	.118	.127	.144	.175	.191	.161	.081			
19												
20												
21												
22												
23												

Huancayo, Peru (12.0°S, 75.3°W) Time: 75°W

Hourly values of cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06	.033								.002	.084	.123	.097
07	.270	.230	.218	.209	.182	.144	.131	.171	.255	.332	.360	.329
08	.494	.466	.458	.442	.404	.361	.353	.402	.489	.560	.578	.544
09	.689	.673	.667	.642	.594	.548	.546	.602	.689	.752	.761	.728
10	.843	.838	.831	.797	.739	.692	.696	.758	.841	.894	.897	.868
11	.944	.949	.940	.894	.829	.783	.794	.859	.936	.978	.976	.954
12	.986	.998	.984	.929	.858	.815	.832	.897	.965	.997	.992	.981
13	.966	.982	.962	.897	.824	.786	.809	.871	.928	.950	.946	.946
14	.886	.903	.875	.802	.729	.698	.725	.782	.827	.840	.841	.853
15	.750	.765	.729	.650	.580	.557	.586	.637	.669	.676	.681	.708
16	.568	.578	.534	.452	.390	.371	.403	.444	.465	.467	.480	.519
17	.353	.355	.303	.219	.162	.156	.186	.218	.227	.229	.250	.301
18	.119	.111	.052								.008	.069
19												
20												
21												
22												
23												

La Paz, Bolivia (16.5°S, 68.0°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05											.023	.008
06	.175	.119	.089	.066	.034			.025	.119	.213	.260	.238
07	.403	.358	.334	.305	.262	.216	.208	.261	.360	.449	.489	.459
08	.610	.578	.556	.520	.466	.416	.413	.475	.575	.657	.684	.657
09	.783	.762	.742	.696	.633	.581	.584	.652	.750	.823	.842	.818
10	.910	.899	.877	.822	.749	.698	.707	.779	.873	.936	.949	.930
11	.982	.979	.954	.888	.809	.759	.775	.849	.935	.987	.997	.987
12	.994	.996	.966	.890	.807	.762	.784	.856	.933	.974	.983	.984
13	.945	.950	.913	.829	.744	.705	.731	.800	.865	.898	.909	.922
14	.839	.843	.799	.707	.624	.592	.622	.685	.738	.763	.778	.805
15	.682	.684	.630	.535	.456	.431	.463	.518	.559	.579	.601	.640
16	.486	.481	.420	.322	.250	.233	.266	.312	.342	.359	.388	.439
17	.264	.251	.182	.084	.020	.012	.043	.079	.098	.117	.155	.217
18	.031	.007										
19												
20												
21												
22												
23												

Little America, Antarctica (78.3°S, 162.2°W) Time: 165°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00	.165	.021									.115	.199
01	.172	.026									.127	.209
02	.191	.045									.152	.230
03	.221	.076								.015	.187	.263
04	.261	.117								.061	.230	.304
05	.307	.165								.112	.279	.351
06	.356	.216	.041							.165	.329	.400
07	.405	.267	.093						.012	.216	.378	.448
08	.451	.315	.142						.060	.263	.422	.492
09	.490	.357	.184						.100	.301	.458	.528
10	.520	.389	.216	.015					.130	.328	.485	.555
11	.539	.409	.235	.032					.147	.344	.498	.571
12	.545	.417	.242	.036					.151	.345	.499	.574
13	.538	.410	.234	.027					.140	.333	.486	.564
14	.518	.391	.213	.004					.117	.307	.461	.542
15	.487	.360	.180						.082	.271	.426	.510
16	.448	.318	.137						.038	.227	.382	.469
17	.401	.270	.087							.176	.333	.423
18	.352	.219	.034							.124	.283	.374
19	.302	.167								.072	.233	.326
20	.256	.118								.026	.189	.282
21	.216	.076									.152	.245
22	.189	.044									.126	.218
23	.168	.023									.112	.203

Maui, Territory of Hawaii (20.8°N, 156.5°W) Time: 150°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06					.029	.043	.010					
07			.087	.195	.260	.267	.237	.203	.176	.141	.079	.006
08	.186	.232	.324	.427	.481	.482	.457	.432	.412	.368	.297	.220
09	.386	.443	.538	.633	.677	.674	.654	.637	.615	.567	.487	.409
10	.550	.619	.715	.800	.834	.830	.816	.805	.781	.724	.636	.561
11	.669	.747	.841	.917	.943	.939	.931	.923	.894	.827	.735	.666
12	.733	.819	.910	.975	.995	.993	.992	.985	.949	.871	.776	.715
13	.738	.830	.916	.971	.987	.990	.993	.986	.939	.852	.757	.706
14	.685	.778	.857	.905	.920	.928	.936	.925	.867	.771	.678	.640
15	.576	.669	.740	.781	.798	.813	.825	.807	.737	.634	.546	.520
16	.419	.508	.572	.608	.629	.652	.665	.640	.558	.450	.369	.356
17	.225	.308	.363	.398	.425	.456	.470	.435	.344	.232	.159	.157
18	.007	.081	.129	.165	.200	.239	.251	.206	.105			
19						.015	.024					
20												
21												
22												
23												

Narsarssuak, Greenland (61.2°N, 45.4°W) Time: 45°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03						.031						
04					.057	.122	.086					
05				.020	.168	.229	.193	.082				
06				.143	.286	.343	.308	.202	.055			
07			.068	.266	.405	.458	.425	.324	.179	.021		
08			.187	.382	.515	.565	.534	.438	.295	.133		
09		.114	.291	.481	.609	.658	.629	.536	.393	.227	.069	
10	.062	.196	.372	.558	.680	.729	.703	.613	.468	.297	.136	.042
11	.112	.250	.426	.606	.725	.774	.751	.662	.514	.338	.175	.084
12	.133	.275	.448	.623	.739	.790	.770	.681	.529	.348	.184	.097
13	.123	.268	.438	.608	.723	.776	.759	.668	.511	.324	.161	.080
14	.083	.229	.395	.562	.676	.732	.717	.624	.461	.270	.109	.035
15	.017	.161	.324	.487	.603	.662	.649	.552	.382	.189	.031	
16		.069	.228	.389	.508	.571	.558	.457	.281	.085		
17			.114	.275	.397	.465	.451	.345	.168			
18				.152	.279	.350	.335	.224	.039			
19				.029	.161	.235	.219	.103				
20					.052	.128	.109					
21						.036	.014					
22												
23												

Okinawa, Ryukyu (26.3°N, 127.8°E) Time: 135°E

Hourly values of cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06					.050	.071	.037					
07			.068	.193	.272	.286	.255	.209	.163	.109	.033	
08	.131	.189	.296	.416	.484	.494	.466	.429	.387	.328	.243	.161
09	.324	.393	.503	.615	.674	.679	.657	.627	.587	.520	.427	.344
10	.484	.563	.674	.778	.827	.831	.814	.790	.748	.673	.572	.492
11	.600	.688	.798	.893	.934	.937	.926	.906	.859	.775	.669	.594
12	.664	.760	.867	.951	.986	.992	.987	.968	.914	.819	.712	.644
13	.672	.773	.875	.950	.982	.991	.991	.971	.908	.804	.696	.638
14	.623	.727	.822	.890	.920	.935	.939	.916	.842	.729	.623	.577
15	.521	.645	.712	.773	.805	.827	.835	.805	.720	.600	.498	.465
16	.373	.473	.553	.610	.645	.674	.684	.647	.550	.426	.330	.309
17	.188	.282	.355	.409	.451	.488	.498	.452	.346	.218	.131	.120
18		.066	.131	.186	.236	.280	.288	.233	.117			
19					.015	.065	.071	.006				
20												
21												
22												
23												

Panama, Canal Zone (9.4°N, 79.9°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06												
07	.065	.073	.128	.197	.232	.223	.198	.189	.201	.206	.175	.114
08	.297	.317	.376	.439	.463	.448	.428	.429	.445	.444	.402	.338
09	.504	.536	.598	.653	.666	.648	.633	.642	.659	.649	.599	.535
10	.673	.717	.779	.825	.827	.807	.799	.814	.828	.809	.752	.690
11	.792	.846	.907	.942	.936	.916	.915	.933	.942	.912	.850	.794
12	.853	.915	.972	.996	.984	.967	.972	.991	.992	.951	.886	.840
13	.853	.920	.971	.985	.969	.957	.967	.985	.975	.924	.859	.824
14	.789	.859	.902	.908	.892	.885	.901	.914	.892	.832	.769	.748
15	.669	.737	.772	.772	.757	.758	.777	.784	.749	.682	.624	.616
16	.498	.562	.589	.584	.574	.584	.604	.602	.556	.484	.433	.438
17	.290	.347	.366	.359	.356	.374	.394	.383	.325	.251	.209	.226
18	.058	.105	.117	.111	.117	.143	.162	.140	.072			
19												
20												
21												
22												
23												

Puerto Rico, West Indies (18.5°N, 67.2°W) Time: 60°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06					.005	.016						
07			.079	.180	.239	.243	.215	.185	.165	.138	.083	.013
08	.195	.234	.320	.415	.464	.463	.438	.418	.402	.370	.305	.231
09	.398	.450	.539	.626	.665	.659	.640	.627	.613	.573	.500	.424
10	.570	.630	.720	.798	.827	.819	.806	.799	.783	.734	.653	.581
11	.690	.762	.851	.919	.939	.932	.925	.922	.901	.842	.755	.689
12	.757	.838	.923	.981	.995	.990	.989	.987	.959	.889	.800	.741
13	.766	.852	.931	.980	.989	.988	.993	.991	.952	.873	.783	.735
14	.714	.803	.875	.915	.924	.929	.938	.932	.882	.794	.706	.670
15	.606	.694	.759	.792	.802	.814	.827	.815	.753	.657	.574	.551
16	.448	.533	.590	.619	.633	.653	.667	.647	.573	.472	.396	.386
17	.253	.331	.380	.407	.427	.455	.470	.440	.357	.252	.185	.186
18	.032	.102	.144	.171	.200	.235	.249	.209	.115	.012		
19						.008	.018					
20												
21												
22												
23												

Reykjavik, Iceland (64.1°N, 21.8°W) Time: 15°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03						.041	.007					
04					.047	.116	.080					
05					.143	.207	.171	.056				
06				.099	.247	.308	.273	.162	.007			
07			.009	.212	.356	.413	.379	.273	.121			
08			.120	.320	.459	.514	.481	.379	.229	.063		
09		.041	.221	.417	.551	.604	.574	.475	.326	.156		
10		.124	.304	.496	.625	.677	.649	.554	.403	.229	.066	
11	.046	.185	.364	.551	.676	.728	.703	.609	.456	.278	.113	.020
12	.076	.219	.396	.579	.701	.754	.732	.638	.482	.298	.133	.044
13	.080	.225	.400	.578	.698	.753	.734	.639	.478	.290	.124	.040
14	.055	.202	.373	.547	.667	.724	.707	.611	.445	.252	.088	.009
15	.005	.151	.319	.490	.611	.671	.655	.556	.385	.189	.027	
16		.077	.241	.410	.533	.596	.581	.478	.301	.103		
17			.145	.312	.438	.505	.490	.383	.204	.001		
18			.036	.204	.333	.404	.388	.276	.090			
19				.093	.226	.300	.282	.165				
20					.123	.199	.179	.058				
21					.031	.109	.087					
22						.036	.011					
23												

San Francisco, California (37.4°N, 122.2°W) Time: 120°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05						.025						
06				.071	.179	.212	.177	.104	.020			
07			.121	.275	.375	.402	.369	.305	.225	.133	.026	
08	.099	.183	.319	.467	.558	.580	.552	.495	.418	.320	.206	.115
09	.261	.355	.493	.634	.716	.735	.712	.661	.584	.487	.359	.268
10	.391	.494	.631	.765	.839	.858	.838	.792	.713	.601	.474	.387
11	.478	.590	.725	.850	.918	.937	.923	.880	.795	.674	.544	.462
12	.519	.636	.768	.885	.948	.969	.960	.917	.826	.696	.565	.490
13	.509	.630	.757	.866	.926	.952	.947	.902	.802	.664	.533	.468
14	.449	.572	.693	.795	.855	.886	.885	.836	.726	.581	.453	.398
15	.344	.465	.580	.677	.739	.776	.778	.723	.603	.452	.328	.284
16	.201	.318	.426	.520	.586	.630	.632	.570	.441	.286	.169	.135
17	.029	.140	.252	.334	.406	.457	.459	.389	.253	.095		
18			.039	.133	.213	.269	.269	.191	.045			
19					.018	.079	.077					
20												
21												
22												
23												

San Salvador, Bahama Is. (24.1°N, 74.5°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06				.076	.153	.168	.136	.090	.049	.004		
07	.046	.093	.192	.308	.376	.385	.356	.320	.284	.235	.159	.081
08	.254	.312	.415	.525	.582	.586	.562	.534	.501	.446	.361	.281
09	.434	.504	.609	.710	.759	.759	.740	.719	.685	.622	.530	.450
10	.575	.655	.760	.852	.891	.891	.878	.862	.825	.752	.654	.578
11	.667	.756	.858	.940	.972	.973	.966	.952	.909	.827	.725	.655
12	.703	.798	.896	.969	.996	1.000	.999	.985	.933	.841	.737	.677
13	.682	.781	.873	.936	.960	.970	.974	.957	.895	.793	.691	.642
14	.603	.703	.788	.844	.869	.884	.892	.871	.798	.688	.589	.552
15	.474	.572	.649	.700	.727	.750	.760	.732	.647	.532	.438	.414
16	.302	.395	.465	.513	.545	.575	.587	.550	.454	.335	.248	.236
17	.100	.186	.248	.295	.334	.372	.383	.337	.233	.111	.033	.031
18			.013	.062	.110	.155	.164	.108				
19												
20												
21												
22												
23												

St. John's, Newfoundland (47.6°N, 52.7°W) Time: 60°W

Hourly values of cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04					.001	.053	.015					
05				.034	.163	.209	.172	.081				
06			.029	.207	.329	.370	.336	.251	.140	.017		
07		.046	.201	.375	.490	.527	.495	.417	.309	.183	.051	
08	.093	.200	.358	.526	.633	.667	.639	.567	.459	.328	.190	.095
09	.214	.329	.487	.650	.749	.782	.758	.690	.581	.444	.301	.207
10	.302	.425	.582	.737	.831	.863	.843	.778	.666	.521	.375	.285
11	.352	.480	.635	.783	.872	.906	.890	.826	.709	.556	.408	.324
12	.359	.492	.643	.784	.870	.906	.895	.830	.706	.546	.398	.321
13	.324	.459	.605	.739	.825	.865	.857	.790	.657	.491	.344	.276
14	.248	.383	.524	.654	.740	.785	.779	.707	.566	.395	.252	.193
15	.138	.270	.405	.532	.621	.672	.667	.589	.440	.265	.126	.076
16		.128	.257	.382	.475	.532.	.528	.443	.286	.109		
17			.089	.215	.314	.376	.371	.279	.118			
18				.041	.148	.215	.207	.108				
19						.058	.048					
20												
21												
22												
23												

Talara, Peru (4.6°S, 81.3°W) Time: 75°W

Hourly values of cos X for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06												
07	.132	.105	.115	.135	.132	.106	.087	.108	.166	.220	.231	.190
08	.368	.352	.367	.381	.368	.335	.321	.351	.414	.463	.463	.418
09	.580	.577	.595	.600	.576	.515	.531	.570	.634	.674	.665	.620
10	.755	.764	.782	.778	.743	.705	.703	.748	.810	.841	.824	.782
11	.880	.900	.916	.902	.859	.821	.825	.874	.930	.951	.928	.892
12	.948	.975	.988	.963	.913	.878	.889	.939	.987	.997	.971	.944
13	.953	.986	.993	.958	.904	.873	.890	.939	.976	.975	.949	.934
14	.895	.930	.930	.886	.831	.806	.829	.873	.899	.889	.865	.862
15	.778	.813	.804	.753	.700	.683	.709	.747	.759	.742	.723	.734
16	.610	.641	.624	.568	.520	.511	.538	.568	.568	.545	.534	.558
17	.402	.426	.401	.343	.302	.301	.329	.349	.338	.313	.309	.346
18	.169	.184	.151	.094	.062	.069	.096	.105	.085	.060	.066	.113
19												
20												
21												
22												
23												

Thule, Greenland (76.6°N, 68.8°W) Time: 75°W

Hourly values of cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00					.094	.172	.143	.015				
01					.108	.185	.155	.027				
02					.137	.212	.181	.055				
03				.018	.177	.250	.218	.094				
04				.069	.227	.298	.266	.143				
05				.127	.283	.352	.319	.199	.023			
06				.187	.340	.407	.376	.258	.083			
07			.037	.246	.396	.462	.431	.315	.142			
08			.092	.299	.446	.511	.481	.367	.194	.005		
09			.138	.342	.487	.551	.522	.410	.237	.045		
10			.171	.374	.517	.580	.553	.442	.267	.073		
11		.006	.191	.390	.532	.596	.570	.459	.283	.086		
12		.011	.195	.392	.533	.597	.573	.462	.283	.083		
13		.001	.183	.378	.518	.584	.561	.449	.267	.065		
14			.157	.350	.490	.558	.535	.421	.236	.033		
15			.117	.309	.450	.519	.497	.381	.193			
16			.067	.258	.400	.472	.449	.331	.145			
17			.009	.201	.345	.418	.395	.275	.082			
18				.141	.288	.363	.339	.216	.021			
19				.083	.232	.308	.284	.158				
20				.031	.183	.259	.233	.105				
21					.142	.219	.191	.062				
22					.113	.190	.160	.030				
23					.094	.173	.146	.018				

White Sands, New Mexico (32.3°N, 106.5°W) Time: 105°W

Hourly values of cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												
02												
03												
04												
05												
06				.067	.164	.191	.156	.093	.025			
07		.023	.143	.283	.372	.392	.361	.307	.243	.167	.072	
08	.154	.220	.352	.487	.566	.581	.554	.508	.447	.365	.262	.175
09	.325	.410	.536	.663	.733	.745	.723	.683	.623	.533	.423	.336
10	.461	.556	.681	.800	.861	.873	.856	.821	.758	.660	.544	.460
11	.553	.655	.779	.889	.943	.956	.944	.912	.843	.736	.616	.538
12	.593	.702	.822	.923	.972	.987	.981	.949	.873	.757	.635	.565
13	.580	.693	.808	.900	.947	.966	.965	.931	.845	.721	.600	.540
14	.514	.629	.738	.823	.869	.894	.896	.858	.762	.630	.512	.463
15	.401	.514	.615	.695	.744	.775	.780	.736	.629	.491	.378	.341
16	.246	.355	.450	.526	.579	.618	.624	.572	.454	.313	.206	.180
17	.062	.165	.252	.327	.387	.433	.439	.378	.253	.108	.010	
18			.036	.113	.181	.233	.237	.167	.033			
19						.031	.032					
20												
21												
22												
23												

Wilkes, Antarctica (66.3°S, 110.6°E) Time: 105°E

Hourly values cos χ for 15th day of each month

LST	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00												
01												.018
02	.018											.065
03	.082										.065	.133
04	.163	.021									.153	.216
05	.255	.116								.092	.250	.309
06	.353	.218	.060							.196	.350	.406
07	.449	.319	.163						.098	.296	.445	.499
08	.537	.412	.257	.077					.190	.385	.530	.583
09	.611	.491	.336	.153	.004			.073	.266	.457	.598	.652
10	.666	.550	.395	.207	.054		.001	.129	.320	.506	.644	.702
11	.699	.586	.429	.237	.082	.003	.032	.161	.348	.531	.667	.728
12	.706	.596	.437	.241	.083	.006	.037	.166	.350	.528	.663	.729
13	.687	.578	.417	.217	.059		.018	.145	.324	.498	.634	.705
14	.645	.535	.371	.168	.011			.099	.273	.444	.581	.658
15	.581	.470	.302	.097				.031	.200	.369	.508	.590
16	.500	.386	.214	.009					.110	.278	.420	.507
17	.406	.290	.115						.006	.177	.322	.414
18	.309	.188	.010							.073	.223	.318
19	.213	.086									.127	.224
20	.124										.042	.140
21	.050											.071
22												.022
23												

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