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Consolidated Database of Worldwide Measured Monthly Medians of Ionospheric Characteristics foF2 and M(3000)F2

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Summary
Ionospheric foF2 and M(3000)F2 data were collected from various sources in order to create a consolidated new database. As the data was in different and in some cases confusing formats, it was checked, corrected where possible, and converted into a simple format with an individual self explaining header for each station.

Introduction

The database was created with the aim to check the data predicted by ionospheric models with actually measured ionospheric values. In particular it was considered useful to check if the measured data showed any long-term trend in contrast to the ITU-model which is static in long-term.

1. Identification of possible sources and their availability

From our contacts with the Kuehlungsborn Ionosonde people, we knew that Juergen Bremer's work (Trends in the ionospheric E and F regions over Europe, Ann. Geophysicae, 16, 986-996, 1998) was based on the data he obtained from the World Data Center Boulder on their two CDs. Bremer tediously updated and modified this data which is originally in the URSI code (see below). This data set from Bremer was our starting point for the present work.

Ionospheric data and in particular the parameters foF2 and M(3000)F2 derived from ionosonde measurements can be found in the World Data Centres. The World Data Center (WDC) system was originally created to archive and distribute data collected from the observational programs of the 1957 -1958 International Geophysical Year (IGY). The WDC system now includes 52 centres in 12 countries and is the home for all kinds of geophysical data. The WDCs are funded and maintained by their host countries on behalf of the international science community.

The WDC System can be accessed from their home page:
http://www.ngdc.noaa.gov/wdc/wdcmain.html

There is one WDC for Ionosphere:

- World Data Center for Ionosphere, Japan
  http://wdc-c2.nict.go.jp/index_eng.html

And there are four WDCs on Solar-terrestrial Physics, all of them hold ionospheric data:

- World Data Center (WDC) for Solar-Terrestrial Physics, Chilton, UK
  http://www.ukssdc.rl.ac.uk/wdcc1/iono_menu.html

- World Data Center for Solar-Terrestrial Physics, Moscow
  http://www.wdcb.ru/stp/index.en.html

- World Data Center A for Solar-Terrestrial Physics ,
  Environmental data Service NOAA, Boulder, USA
  http://www.ngdc.noaa.gov/wdc/wdcmain.html

- WDC for Solar-Terrestrial Science, Sydney, Australia
  http://www.ips.gov.au/World_Data_Centre

Ionospheric data is also available from the Space Physics Interactive Data Resource (SPIDR) operated by the National Geophsical Data Center (NGDC) in Boulder, USA:
http://spidr.ngdc.noaa.gov/spidr/
In fact, there are more ionosonde data in SPIDR than in the beforementioned WDCs. Finally, of course, there was the possibility to contact the organizations running the ionosondes and try to get their data directly.

As far as we could find out, all data from the internet sources are free, data from the ionosonde stations are mainly available free on an exchange basis. For some gaps in the data material there may be raw data (films, prints) with ionograms which need to be scaled. Although this may be possible in some cases, it is probably connected with high cost and this possibility was not taken into account for this database.

2. Gather data from as many ionosondes as possible.

For this task the above mentioned internet sites were checked and a number of organisations and individuals were contacted who either hold some of the required data or who have knowledge about the required data and their format.

The ionospheric data from the WDCs was downloaded which was quite a big task, as some sites did not allow to bulk-download the required data, other WDCs had very long loading times and others did not provide the monthly medians but only the daily values. Although the WDCs should mirror each other it was found that the data sets were far from being identical. The periods with measurements were different and even the data for the same station differed in some cases.

The WDC system is a bit unsatisfactory for the reasons mentioned above (data of the same stations not identical at the different sites). Moreover the websites very often contain outdated information, obsolete addresses etc.

A closer look at the data from the various sources yielded their incompatibility in so far as the time stamp on the measurements was either local time or UT or in some cases it was wrongly stamped, in other cases the stamp changed within the data record. We only learnt in the course of this work that the URSI code allows this change of time but this meant more effort in the work of combining and assembling the data into one simple format.

It is obvious that these discrepancies in the data are difficult to find but it is also obvious that they must be found in order for the data to be of the best possible use for further investigations. A smaller problem was that some data was in 10 x MHz, others in 100 x MHz (similarly for M(3000)F2) and there were very large gaps in the data.

In the following tables, examples of the data as downloaded from the various sources are listed in order to show the different formats:

Table 1 shows an example of data obtained from **Bremer.** There are foF2-values for 106 stations and M(3000)F2-data for 98 stations. Some of the data are in UT and some are in local time. There are two files, one for each parameter. Some of the M(3000)F2-values are with one decimal, some are with two decimals.
Table 2 shows an example as downloaded from the **World Data Center Chilton**. There are foF2-values for 189 stations and M(3000)F2-data for 167 stations. Some of the data are in UT some are in local time. There are two files, one for each parameter.
Table 3 shows an example of the data as downloaded from the **World Data Center Sydney**. There are foF2-values for 214 stations and M(3000)F2-data for 199 stations. Some of the data are in UT some are in local time. There are two files, one for each parameter.
Table 4 gives an example of the Okinawa data as downloaded from **World Data Center Tokyo**. There are foF2- and M(3000)F2-values for 8 stations . For each year there is one file which contains only the daily hourly values and the medians had to be calculated here. For the purpose of the present work it was assumed that measurements performed at least 10 days per month are sufficient to calculate a monthly median value.
Table 5 shows an example of the data as obtained from the ionosonde **Juliusruh** which is in the URSI format. This method described in INAG Bulletin No. 62 in 1998 is now widely used by ionosonde stations. Each SAO text file contains the scaled data for one station and one month including most of the important characteristics as well as the vertical electron density profile (where available). Because of all the details contained, these are large files.
Table 6 shows an example of the data as obtained from the Rome site. Some of the data are in UT and some are in local time.. There is only foF2 data and one file for each year.
Table 7 shows the data as obtained from Roberto Foppiano for Concepcion. There are foF2 and M(3000)F2 data and one file for each year. Information about the date and parameter stored is in the filename.
Table 8 shows the data as obtained from the Space Physics Interactive Data Resource (SPIDR)-website. Although the SPIDR website states the possibility of bulk-downloading the data, this is not possible due to a programming error. Download of the required data not available in the before-mentioned sources was therefore very tedious and time consuming. Because of this huge workload, only those data were downloaded which was not already obtained from one of the WDC's. At least for some of the newer data in SPIDR there are no monthly medians available but only the scaled values of ionosonde measurements which were in some cases taken in 5-minute intervals. In those cases where there are more than one measurement within an hour the measurement which is closest to the full hour was taken into account here. The monthly medians were again (as for the data of WDC Tokyo) calculated only for those months where there were more than 10 days with measurements for the relevant hour. "Descriptive letters" as mentioned in the "URSI Ionogram Interpretation Handbook" were not taken into account. There is a very small chance that this procedure introduces a small bias. If this bias proves to be of importance, the numbers can be easily recalculated taking into account either a different minimum number of days or taking into account the descriptive letters or both.

The different structure of the data from the different sources is obvious. Consequently there was no other way than to extract the required data and to totally reformat it. This had to be done individually for each data set by viewing the data and rearranging and/or extracting the wanted data. This task was performed by writing different software routines for each data set.

Table 9 shows an example of the proposed structure of the new data set containing only monthly medians of foF2 or M(3000)F2. The first two lines show the station name, URSI-code, geographical coordinates, parameter displayed (foF2 or M(3000)F2) and the source of the data. The first two columns show month and year and the following columns display the data in 24 hour format (00 to 23 UT). The letter C indicates "no data".

Table 10 shows the complete list of ionosonde stations which could be found in the above-mentioned sources together with the dates of available foF2 and M(3000)F2 data. Unfortunately there are gaps in the data which are not visible in this list. Figure 1 shows the geographical distribution of these stations.

Table 11 shows the number of monthly medians available for each ionosonde station in the various sources. The final column shows the number of monthly medians if the data from all sources is combined into one file. It is obvious that this number in all cases is higher than the number in any single source. It is not visible in this table that the data from the various sources are not identical. One of the tasks for the creation of the final database was to develop a method to decide which data are most probably the "correct" ones.

Fig. 1: Geographical positions of all available ionosonde stations

Most of the data was originally obtained from manually scaled ionograms according to the methods described in the “Ursi Ionogram Interpretation Handbook”

http://www.ips.gov.au/IPSHosted/INAG/uag_23a/UAG_23A_indexed.pdf

An increasing number of data, however, now comes from autoscaled (digital) ionograms. The problems and differences by the two methods have been discussed elsewhere in the literature. In this present report, which deals only with monthly medians, the differences of the two methods are probably very small and will be neglected.

The following tasks were performed in order to create the final database of all available monthly median foF2 and M(3000)F2:

a) Rearrange the data into UT format
b) Develop a method to decide which data are correct, if the databases show different data for the same station and hour.
c) Delete data which are obviously wrong.

MONATSMITTELWERTE : fof2(0.1) fuer Juliusru

		ST.ZEIT																							
MON	JAHR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
3	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
4	1957	58	59	58	52	53	57	55	66	74	94	100	109	108	108	108	104	103	104	97	95	82	74	62	62
5	1957	71	70	66	62	62	67	71	78	75	77	79	78	84	83	84	84	82	81	81	83	80	76	75	74
6	1957	77	74	72	68	68	71	72	75	76	79	78	76	76	75	76	75	73	75	75	76	76	76	78	77
7	1957	70	66	64	59	59	62	67	71	76	81	77	79	78	78	77	76	75	75	75	78	76	76	78	73
8	1957	61	57	55	53	46	54	63	71	72	82	82	84	85	82	79	79	78	80	80	77	76	69	66	67
9	1957	66	63	60	53	51	47	56	68	82	91	99	99	104	98	97	96	88	96	96	96	86	78	70	69
10	1957	60	56	56	54	50	47	51	77	106	121	135	135	135	134	133	124	124	121	C	C	C	75	69	63
11	1957	58	55	54	53	49	46	41	57	99	130	143	145	150	147	145	140	138	126	106	88	74	66	60	58
12	1957	42	38	38	36	36	35	C	35	68	102	139	150	C	151	150	142	134	106	C	C	C	52	47	44
1	1958	45	44	42	40	38	38	39	37	70	106	133	145	148	150	145	140	133	118	98	78	63	58	49	47
2	1958	44	44	42	42	39	38	36	52	78	101	113	124	126	133	134	133	128	119	101	79	66	56	48	45
3	1958	54	54	51	50	46	42	50	62	79	87	101	108	124	123	121	117	114	113	108	96	83	72	62	58
4	1958	66	65	60	60	57	54	65	76	85	90	95	96	97	99	103	100	103	98	98	93	92	83	77	71
5	1958	72	68	68	64	64	66	71	75	81	81	86	84	83	84	86	87	86	88	90	91	89	86	78	74
6	1958	77	70	69	68	70	72	71	73	74	73	73	77	76	74	75	73	74	75	78	78	78	77	77	78
7	1958	73	67	63	58	59	60	66	70	74	76	75	77	76	75	76	74	75	75	76	76	77	78	77	76
8	1958	69	66	61	57	54	59	66	69	75	79	83	86	87	83	81	80	80	80	82	84	83	80	75	72
9	1958	65	63	60	56	53	53	64	74	80	87	93	96	98	105	106	102	100	101	102	98	86	77	72	70
10	1958	66	65	59	56	55	54	55	78	100	123	134	136	140	139	138	136	131	124	116	101	87	77	74	69
11	1958	49	48	47	43	42	41	38	54	86	125	140	151	150	149	146	143	134	123	97	83	65	55	50	47
12	1958	38	38	35	34	35	35	33	35	63	103	118	131	135	137	133	125	117	99	74	58	49	43	42	38
1	1959	41	39	35	32	32	33	33	33	67	105	125	136	141	142	141	132	126	107	85	69	59	51	45	44
2	1959	46	41	38	38	35	31	34	48	74	97	115	128	132	132	130	127	123	115	98	83	69	58	51	50
3	1959	62	62	61	55	55	46	52	71	82	89	104	113	116	119	120	117	116	114	109	98	88	77	68	62
4	1959	65	62	59	57	51	52	62	67	79	87	93	101	105	102	101	99	99	96	96	93	86	82	73	68
5	1959	72	68	64	60	60	65	71	76	82	85	89	88	88	86	87	89	86	87	86	89	85	82	79	73
6	1959	75	75	69	68	68	73	77	79	79	81	81	80	80	76	76	76	75	77	74	78	77	79	79	78
7	1959	68	64	62	55	56	59	60	67	66	70	72	70	70	70	68	69	71	71	72	72	71	75	75	71
8	1959	61	58	54	51	48	54	61	68	70	75	78	82	78	77	77	78	79	78	79	83	82	79	75	68
9	1959	53	51	49	46	43	41	47	57	63	70	72	77	81	82	85	84	84	84	88	84	80	69	59	55
10	1959	48	47	45	43	38	36	39	58	76	87	102	109	114	115	113	110	107	100	89	76	69	58	53	51
11	1959	38	37	34	31	29	28	29	38	67	86	105	118	118	117	117	115	101	87	71	58	46	38	37	38
12	1959	28	28	27	27	27	28	26	27	50	78	98	110	113	113	118	103	93	80	56	42	35	31	31	28

Table 1: Sample of data structure by Bremer

```
Time is given as UT+00
YYYYMM CC V 00    01    02    03    04    05    06    07    08    09    10    11    12    13    14    15    16    17    18    19    20    21    22    23
195707 00 m  70    67    66    61    62    64    68    71    79    82    76    81    78    79    77    76    75    75    75    78    77    78    79    71
195707 00 c    18    21    21    21    22    26    26    24    23    24    24    22    25    21    24    22    27    25    26    22    20    16    15    18
195707 00 r
195707 00 Q
195707 00 q
195707 00 D
195707 00 d
Time is given as UT+00
YYYYMM CC V 00    01    02    03    04    05    06    07    08    09    10    11    12    13    14    15    16    17    18    19    20    21    22    23
195708 00 m  60    59    56    53    47    55    62    69    72    80    82    82    85    82    80    78    77    80    81    78    80    69    65    66
195708 00 c    17    25    22    22    20    23    25    23    18    22    26    23    23    23    25    27    27    25    22    20    17    15    13    21
195708 00 r
195708 00 Q
195708 00 q
195708 00 D
195708 00 d
Time is given as UT+00
YYYYMM CC V 00    01    02    03    04    05    06    07    08    09    10    11    12    13    14    15    16    17    18    19    20    21    22    23
195709 00 m  65    60    59    51    48    46    56    70    86    93    95    99   102   100    95    96    92    96    95    92    87    76    71    65
195709 00 c    20    19    18    19    18    18    24    23    19    20    18    24    25    24    25    26    22    23    19    18    16    18    18    15
195709 00 r
195709 00 Q
195709 00 q
195709 00 D
195709 00 d
Time is given as UT+00
YYYYMM CC V 00    01    02    03    04    05    06    07    08    09    10    11    12    13    14    15    16    17    18    19    20    21    22    23
195710 00 m  60    56    58    54    50    47    52    77   102         127   116   135   131         117   114   117               83    75          60
195710 00 c    15    21    23    22    21    18    16    23    14     9    13    11    15    14     8    10    12    11     4     7    10    11     9    16
195710 00 r
195710 00 Q
195710 00 q
195710 00 D
195710 00 d
Time is given as UT+00
YYYYMM CC V 00    01    02    03    04    05    06    07    08    09    10    11    12    13    14    15    16    17    18    19    20    21    22    23
195711 00 m  58    56    55    53    49    46    42    58   100   130   142   145   145   148   146   139   138   126   108    88    74          65    53
195711 00 c    20    20    20    21    22    20    24    17    18    15    14    11    11    10    12    10    11    14    14    15    17     9    10    18
195711 00 r
195711 00 Q
195711 00 q
195711 00 D
195711 00 d
```

Table 2: Sample of data structure from WDC Chilton

```
031800015840  44 99  42 99  40 99  38 99  38 99  39 99  37 99  70 99 106 99 133 99 145 99 148 99 150 99 145 99 140 99 13
45 99  39 99  30 99  25 99  22 99  23 99  26 99  28 99  28 99031800016440  25 99  25 99  23 99  19 99  18 99  19 99  19
5 26  49 26  75 25  87 27  93 28  95 26  96 24  94 24  86 25  76 24  65 27  52 25  39 25  31 26  29 27  30 26  30 27  3
5 22031800017540  27 21  26 22  24 24  21 22  16 22  18 24  19 29  33 29  49 27  56 28  59 27  60 30  59 27  59 31  56 3
29  98 26  87 21  72 23  52 28  40 29  38 28  34 28  34 28  34 26031800018140  33 25  33 27  29 24  29 27  29 28  28 28
6  22 26  40 29  64 29  78 28  80 30  84 28  85 30  86 30  77 30  68 31  59 31  48 31  34 31  26 29  25 30  24 29  24 2
1  27 31031800019940  28F29  28 29  27 28  25 30  26 31  25 30  26 30  42 31  70 31  85 31  90 30  93 31  86 31  86 31
 64 99  63 99  56 99  48 99  44 99  33 99  29 99  28 99  27 99  27 99031800026340  25 99  27 99  28 99  26 99  22 99  2
28 27  38 24  62 26  80 27  94 25 102 25 107 26 104 26 104 23 100 24  97 25  92 26  82 26  69 29  54 26  44 28  39 26  3
26 20  26 22031800027440  24 24  23 25  23 25  19 23  17 26  17 25  26 26  42 24  49 27  56 25  59 24  60 23  58 27  56
4 27 130 25 128 25 116 19 108 16  80 20  67 23  58 28  53 27  48 26  47 26031800028040  42 28  40 26  38 25  38 25  34 2
28  38 28  50 29  80 29 104 29 124 29 128 27 136 28 139 28 142 28 137 28 128 28 124 28 106R28  87 28  72 27  63 28  53 2
27  23 27  24 28031800029840  27 26  28 26  28F24U 26F25U 24F25  20 25  27 27  47 27  60 27  64 28  69 28  70 28  70 28
9  78 99  78 99  76 99  75 99  72 99  70 99  60 99  48 99  40 99  37 99  34 99031800036240  34 99  32 99  32 99  29 99
 39 27  43 30  64 30  78 26  92 26 103 25 104 28 105 29 108 29 106 29 103 29 101 28  97 27  94 28  87 27  75 29  63 30
47 27  44 29  43 28031800037340  25 21  26 21  22 22  22 20  20 24  28 28  39 29  44 28  51 31  55 26  59 28  61 25  62
0 30  90 28  92 28  90 29  86 29  81 28  76 19  64 25  51 23  44 27  44 29  42 28031800037940  56 28  52 24  50 25  44 2
29  45 29  46 30  68 28  86 30  92 25 114 30 116 31 126 31 126 31 126 31 115 19 120 27 115 27 112 27  98 28  87 26  78 3
30  27 30  25 30  24 30031800039740   0  0  26 31  26 31  25 30  25 25  28 27  38 31  44 31  47 31  49 31  52 31  53 30
9 102 99 101 99  99 99  99 99  96 99  96 99  93 99  86 99  82 99  73 99  68 99  65 99031800046040  46 99  44 99  41 99
 29 30  32 30  39 29  45 29  50 29  53 30  55 30  56 30  56 29  55 30  56 30  56 30  55 30  56 30  56 30  55 30  55 29
74 28  68 28  62 29  60 29031800047140  44 27  43 25  39 27  38 25  40 29  47 29  51 29  56 30  63 29  68 30  71 29  74
3 28  52 30  52 30  54 28  51 29  50 28  51 29  52 29  50 28  48 27  41 26  32 26  30 25031800047740  31 25  28 27  26 2
21  48 23  47 27  54 27  60 30  69 29  78 30  84 29  92 30  96 30  96 30  98 30  96 29  96 30  96 30  97 28  92 29  84 2
30  47 30  38 30  33 30  30 30031800049540  26 28  22 29  22 29  22 28  27 30  34 30  39 29  43 30  46 29  48 29  52 28
9  84 99  83 99  84 99  84 99  82 99  80 99  81 99  83 99  80 99  77 99  75 99  74 99  71 99031800055840  68 99  68 99
 37 99  38 99  41 99  46 99  48 99  54 99  57 99  58 99  57 99  58 99  57 99  57 99  56 99  55 99  56 99  58 99  61 99
75 15  74 16  69 17  65 17  60 18031800056940  58 27  54 30  52 30  50 30  56 31  60 30  65 29  69 31  73 31  73 31  76
6 28  55 29  54 29  55 28  54 28  54 29  57 29  58 29  60 29  64 28  60 30  54 26  47 25  41 26031800057540  31 27  28 2
19  60 22  59 25  65 29  69 29  75 29  79 27  86 30  91 29  91 30  91 31  88 30  84 30  88 30  86 29  88 29  88 30  90 3
30  70 31  72 31  64 31  56 30  52 30031800059440  35 28  30 29  28 28  30 29  36 30E 38G28E 42G30  48 29  50 30  53 30
1  75 30  72 30  75 31  72 31  74 31  72 30  73 31  74 31  76 31  78 31  78 30  74 30  67 30  65 30031800065740  74 99
 46 99  44 99  46 99  50 99  52 99  56 99  56 99  58 99  59 99  61 99  60 99  59 99  58 99  56 99  56 99  57 99  60 99
64 26  68 30  71 27  69 25  66 22  59 25031800066840  61 26  59 27  55 27  55 29  61 29  64 28  66 28  69 29  70 26  70
7 25  56 24  55 25  53 21  54 23  56 19  54 23  54 25  55 25  58 24  58 24  58 20  59 23  53 26  47 25031800067440  40 2
26  66 29  63 28  64 28  68 30  70 30  74 30  76 30  78 30  80 28  79 29  75 30  74 30  72 29  71 29  72 30  74 30  74 2
22  70 28  70 25  66R26  69 23  68 22  64R24031800069240  56 29  52 30  50 30  50 30  52 29  56Y29  60Y30  62 30  63 30
5  48 23  48 26  50 27  48 25  48 28  48 27  48 25  47 26  48 29  48 27  49 28  52 29  51 29  46 29  42 29031800069840
 60 99  57 99  52 99  52 99  57 99  60 99  65 99  63 99  67 99  68 99  72 99  72 99  71 99  73 99  70 99  68 99  66 99
48 28  50 30  54 31  56 30  56 31  49 30  41 29031800076640  49 29  44 28  42 29  43 30  50 29  54 26  56 28  58 27  59
1 29  61 29  63 29  62 31  61 31  59 29  60 29  58 27  58 30  60 28  62 28  66 29  69 30  68 30  61 26  56 2603180007724
```

Table 3: Sample of data structure from WDC Sydney

```
#                     fmin ,foE  ,h'E  ,foEs ,h'Es ,TYPES,fbEs ,foF1 ,M3F1 ,h'F  ,h'F2 ,foF2 ,fxF2 ,M3F2 ,fxI  ,dfs1 ,dfs2 ,dfs3 ,dfs4 ,f1MUF,f2MUF, hdF2, hpF2, ypF2
OK426,20090101000000: 13  ,     ,     , 13EB,    B,      , 13EB,     ,     ,216  ,     , 36  , 42  ,342  , 42 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101010000: 14  ,     ,     , 14EB,    B,      , 14EB,     ,     ,222  ,     , 33  , 39  ,329  , 39 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101020000: 14  ,     ,     , 14EB,    B,      , 14EB,     ,     ,278  ,     , 32  , 38  ,300  , 38 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101030000: 14  ,     ,     , 14EB,    B,      , 14EB,     ,     ,282  ,     , 30 F, 36 F,299 F, 37  , 25  , 28  , 31  , 37  ,     ,     ,     ,     ,
OK426,20090101040000: 12  ,     ,     , 14JA, 98  ,F1    , 12EB,     ,     ,262  ,     , 33  , 39  ,330  , 39 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101050000: 14  ,     ,     , 14EB,    B,      , 14EB,     ,     ,214  ,     , 33  , 39  ,358  , 39 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101060000: 14  ,     ,     , 14JA, 98  ,L1    , 14EB,     ,     ,224  ,     , 24  , 30  ,354  , 30 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101070000: 14  ,    B,    B, 16JA, 98  ,L1    , 14EB,     ,     ,224  ,     , 25  , 31  ,360  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101080000: 12  ,176  ,116  , 22  ,148  ,H1    , 22  ,     ,     ,224  ,     , 43  , 49  ,355  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101090000: 14  ,216  ,114  , 25  ,148  ,H1    , 23  ,348UL,389UL,188  ,234  , 50  , 56  ,363  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101100000: 14  ,256  , 98  , 29  ,138  ,H1    , 28  ,392UL,382UL,202  ,234  , 58  , 64  ,372  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101110000: 22  ,296  ,100  , 36  ,132  ,C1    , 33  ,392  ,445  ,192  ,272  , 52  , 58  ,358  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101120000: 18  ,296  , 98  , 39  ,136  ,H1C1  , 38  ,444UL,365UL,240EA,296  , 56  , 62  ,324  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101130000: 12  ,292  , 98  , 34  ,124  ,C1    , 34  ,428  ,371  ,240  ,278  , 74  , 80  ,346  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101140000: 12  ,292UA, 98  , 46JA,118  ,C1    , 33  ,424 L,367 L,240  ,280  , 68  , 74  ,328  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101150000: 10  ,284  , 98  , 36  ,130  ,H1C1  , 33  ,392UL,391UL,234 A,246  , 73  , 79  ,343  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101160000: 12  ,260  ,106  , 31  ,130  ,C2L1  , 30  ,L(37),    L,222 A,240  , 67  , 72  ,348  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101170000: 11  ,    A,    A, 37JA,112  ,C2    , 23  ,     ,     ,222  ,     , 62  , 68  ,366  ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101180000: 11  ,     ,     , 51JA,110  ,C7    , 28UA,     ,     ,     ,    A, 42UA, 48UA,541 A, 48 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101190000: 14  ,     ,     , 42JA,108  ,F4    , 17  ,     ,     ,224  ,     , 30  , 36  ,324  , 36 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101200000: 10  ,     ,     , 40JA,106  ,F4    , 20  ,     ,     ,224  ,     , 38  , 44  ,335  , 44 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101210000: 13  ,     ,     , 24JA,106  ,F2    , 18  ,     ,     ,232  ,     , 27  , 33  ,345  , 33 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101220000: 13  ,     ,     , 20JA, 98  ,F2    , 13EB,     ,     ,236  ,     , 27  , 31  ,338  , 31 X,     ,     ,     ,     ,     ,     ,     ,     ,
OK426,20090101230000:  8  ,     ,     , 19  , 94  ,F1    , 12  ,     ,     ,274  ,     , 26  , 30  ,294  , 30 X,     ,     ,     ,     ,     ,     ,     ,     ,
```

Table 4: Data from WDC Tokyo

```
 JULIUSRUH/RUEGEN              JR055   0 54.6 13.4MANUAL    MIXED     SP3
1980   5  31  13 744   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24   24
  24  24  24  24  24  24
     foF2   M3000F2      h'F2       foF1   M3000F1       h'F       foE       h'E       foEs       fbEs       h'Es  Types Es
     fmin
   0.1 MHz      0.01    1.0 km  0.01 MHz      0.01     1.0 km  0.01 MHz    1.0 km   0.1 MHz   0.1 MHz    1.0 km
   0.1 MHz
000304101316202430323436 42
 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000
200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000
160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000
120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000
 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000
 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000
 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000
200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000
160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000
120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000
 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000
 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000
 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000
200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000
160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000
120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000
 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000
 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000
 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000
200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000
160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000
120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000
 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000
 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000200000210000220000230000
 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000160000170000180000190000
200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000120000130000140000150000
160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000 80000 90000100000110000
120000130000140000150000160000170000180000190000200000210000220000230000 00000 10000 20000 30000 40000 50000 60000 70000
```

Table 5: Sample data from Juliusruh in URSI format

39	39	37	38	37	35	35	41	74	91	103	109	97	91	96	93	88	75	58	52	43	38	39	39
25	24	24	24	24	24	24	24	24	24	24	23	23	24	24	24	25	25	25	25	25	25	25	25
45	47	47	46	46	44	43	53	88	104	113	116	119	116	114	114	109	103	91	72	63	55	47	47
29	29	29	29	29	29	29	29	29	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29
73	72	70	69	66	61	64	87	106	120	127	131	132	132	128	127	124	120	114	103	90	85	77	73
31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
79	76	75	72	67	64	74	84	90	101	111	118	122	122	121	121	119	115	112	106	95	88	85	81
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
78	78	76	70	65	64	69	75	81	83	87	93	99	100	101	100	99	96	95	96	95	88	82	80
31	30	31	29	29	30	30	31	31	31	31	31	31	31	30	30	31	31	31	31	31	31	31	31
79	76	74	68	66	69	79	83	87	90	90	90	94	95	92	90	88	84	85	89	93	88	87	83
27	27	27	27	27	27	26	26	25	26	26	28	27	27	27	28	27	27	27	26	26	28	26	26
80	78	75	72	66	66	76	83	85	85	88	89	90	88	89	87	85	84	83	84	86	84	82	82
30	30	30	30	30	30	30	30	29	29	28	28	29	30	29	30	31	31	31	31	31	31	31	31
69	66	65	64	58	55	68	78	81	84	86	88	92	91	91	94	93	92	91	92	87	77	73	70
31	31	31	31	30	30	30	30	30	29	30	30	31	31	31	31	31	31	30	30	31	31	31	31
58	56	55	54	50	49	56	74	82	85	92	94	99	102	102	100	100	104	98	88	77	70	66	61
30	30	30	30	30	30	30	30	30	30	30	29	29	30	30	30	30	30	30	30	30	30	30	30
51	51	50	48	46	43	44	76	102	118	119	126	127	125	123	126	122	113	96	84	68	57	54	52
24	24	24	24	24	24	24	24	26	25	25	24	25	25	24	24	24	24	24	24	24	24	24	24
46	47	47	48	43	41	40	62	95	111	119	127	126	125	125	123	116	97	81	69	59	49	44	44
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
38	37	39	39	38	40	38	46	87	114	118	121	114	113	112	109	101	80	68	54	42	35	36	36
31	31	31	31	31	31	31	31	31	30	31	31	31	31	31	31	31	31	31	31	31	30	30	31

Table 6: Sample data from Rome

93,81	91,65	84,89	83,19	81,74	79,06	88,69	104,05	112,00	120,50
100,00	98,00	93,50	87,50	84,74	90,00	97,25	103,00	106,00	114,63
98,00	96,00	91,00	86,50	84,50	87,50	97,50	105,50	110,00	114,00
80,00	79,00	74,00	66,50	64,00	60,00	71,00	80,00	90,00	90,00
62,50	62,50	58,50	51,00	49,83	51,00	61,50	67,50	64,00	71,50
62,33	63,75	57,25	53,00	46,00	47,50	57,50	62,50	65,00	66,83
56,50	53,33	49,00	45,75	41,75	44,30	54,00	62,00	56,00	58,50
59,75	51,25	54,33	51,50	45,58	49,00	59,50	68,00	62,50	60,50
62,50	66,63	58,94	61,19	49,65	48,08	58,75	65,00	67,00	69,00
89,50	86,50	83,50	74,00	70,50	70,00	83,00	90,00	92,00	90,50
93,67	94,00	87,60	81,20	79,82	83,00	87,50	98,00	104,00	109,00
90,25	89,00	86,00	80,00	75,00	79,75	86,25	90,50	94,25	97,25
95,00	94,00	86,00	78,75	76,50	77,00	82,50	88,75	96,50	103,00
91,00	86,50	79,00	71,50	67,00	70,00	79,50	84,50	93,00	103,00
76,17	77,00	71,67	67,00	65,00	65,75	77,00	80,75	84,50	87,50
74,38	72,00	69,25	56,75	56,00	56,25	65,00	73,00	77,00	83,00
65,50	59,50	57,50	59,12	52,00	45,63	57,00	64,50	63,50	65,00
64,00	52,50	49,75	48,00	43,20	44,00	53,00	57,00	60,50	68,92
58,17	52,90	49,61	42,42	38,67	36,83	49,86	54,39	58,00	53,40
57,00	62,00	62,00	59,00	57,00	55,25	53,83	49,00	46,00	42,00
77,17	78,00	70,50	62,25	56,00	53,17	69,00	73,00	70,00	79,00
97,50	97,00	93,50	86,00	81,50	88,00	96,00	101,50	105,00	108,00
98,00	98,00	91,50	86,50	84,50	86,00	95,50	102,25	104,00	108,00

Table 7: Sample data structure from Concepcion

```
#Spidr data output file in ASCII format created at 2009-10-11 11:44#GMT time is used###-
0  14.60   "U"   "S"1958-09-01 21:00  14.80   "U"   "S"1958-09-01 22:00  13.60   "U"   "
  "S"1958-09-03 01:00  14.30   " "   "S"1958-09-03 02:00  14.00   " "   " "1958-09-03 03
4 05:00  11.50   " "   " "1958-09-04 06:00  10.20   " "   " "1958-09-04 07:00   8.20   "
" "   "H"1958-09-05 10:00   9.80   "U"   "F"1958-09-05 11:00  14.80   "U"   "R"1958-09-0
  " "   "C"1958-09-06 14:00  14.50   "U"   "R"1958-09-06 15:00  14.00   "U"   "R"1958-09-
  "C"1958-09-07 18:00 9999.00   " "   "C"1958-09-07 19:00 9999.00   " "   "C"1958-09-07
" "   " "1958-09-08 22:00  14.60   "U"   "S"1958-09-08 23:00  14.20   "U"   "S"1958-09-0
9.00   " "   "C"1958-09-10 02:00 9999.00   " "   "C"1958-09-10 03:00 9999.00   " "   "C"
05:00 9999.00   " "   "C"1958-09-11 06:00 9999.00   " "   "C"1958-09-11 07:00 9999.00
  8.30   " "   " "1958-09-12 10:00  11.50   " "   " "1958-09-12 11:00  12.40   " "   " "
 "R"1958-09-13 14:00  13.40   "U"   "R"1958-09-13 15:00  13.20   "U"   "R"1958-09-13 16:
58-09-14 18:00 9999.00   " "   "C"1958-09-14 19:00  10.80   " "   " "1958-09-14 20:00  1
22:00  11.40   "D"   "S"1958-09-15 23:00 9999.00   " "   "F"1958-09-16 00:00 9999.00   "
02:00 9999.00   " "   "C"1958-09-17 03:00 9999.00   " "   "C"1958-09-17 04:00 9999.00
1958-09-18 06:00 9999.00   " "   "C"1958-09-18 07:00   6.80   " "   " "1958-09-18 08:00
 " "1958-09-19 10:00 9999.00   " "   "C"1958-09-19 11:00 9999.00   " "   "C"1958-09-19 1
  " "   "C"1958-09-20 14:00 9999.00   " "   "C"1958-09-20 15:00 9999.00   " "   "C"1958-
"   " "1958-09-21 18:00  13.80   " "   " "1958-09-21 19:00  14.70   " "   " "1958-09-21
58-09-22 22:00  13.80   "U"   "S"1958-09-22 23:00  14.00   "U"   "S"1958-09-23 00:00 999
4 02:00 9999.00   " "   "C"1958-09-24 03:00  15.00   "U"   "R"1958-09-24 04:00  15.50
 " "   " "1958-09-25 07:00  12.20   " "   " "1958-09-25 08:00  11.00   " "   " "1958-09-
958-09-26 11:00  14.60   "U"   "R"1958-09-26 12:00  14.60   "U"   "R"1958-09-26 13:00  1
14.50   "U"   "R"1958-09-27 16:00  13.00   "D"   "R"1958-09-27 17:00  14.70   "U"   "R"1
"1958-09-28 20:00  14.40   " "   "R"1958-09-28 21:00  14.00   " "   "R"1958-09-28 22:00
00:00 9999.00   " "   "F"1958-09-30 01:00  14.60   "D"   "R"1958-09-30 02:00  16.00   "U"
```

Table 8: sample data from SPIDR

Station					Lat.		Long.		Code	Time		Parameter				Source									
Juliusruh/Rugen					54.6		13.4		JR055	UT		foF2 (0.1)				Station+Bremer+IPS									
Mon	Year	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
3	1957	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
4	1957	59	58	52	53	57	55	66	74	94	100	109	108	108	108	104	103	104	97	95	82	70	63	62	58
5	1957	70	66	62	62	67	71	78	75	77	79	78	84	83	84	84	82	80	81	83	80	77	75	74	71
6	1957	74	72	68	68	71	72	74	76	79	78	76	76	75	76	74	74	75	75	76	76	76	78	76	77
7	1957	66	63	59	60	62	67	71	79	81	76	79	78	78	77	76	75	75	75	78	76	76	77	72	70
8	1957	58	56	53	46	54	62	69	72	82	82	83	85	82	79	78	78	80	80	76	79	69	66	66	60
9	1957	60	60	50	51	45	55	68	82	92	100	99	102	100	96	96	90	96	96	95	85	76	70	64	64
10	1957	56	56	54	50	46	51	76	104	130	135	135	136	132	126	124	128	121	118	96	83	75	63	63	60
11	1957	55	54	51	49	46	42	57	99	134	146	146	150	146	144	140	138	126	106	87	72	63	60	57	58
12	1957	40	38	37	35	35	31	35	68	102	139	150	152	151	150	142	134	106	85	76	56	52	47	44	42
1	1958	44	41	38	38	38	39	37	70	105	133	146	150	150	145	141	133	118	98	78	62	58	49	45	45
2	1958	44	40	40	37	36	35	51	78	99	116	121	126	132	132	133	128	118	101	78	66	55	46	44	42
3	1958	53	47	50	37	36	44	62	79	87	100	108	122	121	121	116	114	116	108	96	83	72	62	58	55
4	1958	65	61	56	53	54	65	76	84	90	92	97	97	98	100	99	103	98	98	93	92	82	75	71	66
5	1958	68	68	66	63	67	71	74	81	81	86	84	96	84	86	87	86	85	90	92	89	86	78	74	72
6	1958	70	69	67	70	71	71	72	74	73	73	74	76	74	75	73	73	74	76	78	78	78	78	78	76
7	1958	66	62	58	58	60	66	70	73	76	75	76	76	76	76	74	75	75	76	76	77	78	76	74	73
8	1958	65	60	57	53	59	66	68	74	80	87	88	87	83	81	80	80	80	82	84	83	80	76	72	68
9	1958	61	59	55	53	53	64	74	80	85	93	97	98	106	104	99	102	100	103	95	86	77	72	69	64
10	1958	62	58	56	55	47	54	77	100	120	132	136	139	138	138	136	130	124	114	96	87	77	72	68	66
11	1958	48	44	43	42	40	38	46	84	124	139	150	150	148	146	143	134	122	97	83	66	54	49	46	47
12	1958	38	35	34	35	35	33	35	63	103	118	131	135	137	133	125	117	99	74	58	49	43	42	38	38

Table 9: Proposed format for foF2 and M(3000)F2 data

Station	Country	URSI Code	Lat.	Long.	foF2 av. data	M3000 av. data
Adak	USA, Alaska	AD651	51.9	-176.6	1945-1965	1945-1965
Ahmedabad	India	AH223	23.0	72.6	1955-1988	1955-1986
Akita	Japan	AK539	39.7	140.1	1947-1993	1947-1993
Alert	Canada	ALJ82	82.6	-62.6	1957-1958	0- 0
Alice Springs	Australia	AL52M	-23.4	133.5	1985-1985	1985-1985
Alma Ata	Kazakhstan	AA343	43.2	76.9	1945-1989	1957-1989
Amderma	Russia	AM269	69.5	61.4	1989-1991	1989-1991
Anchorage	USA, Alaska	AN761	61.2	-149.9	1949-1965	1949-1965
Archangelsk	Russia	AZ163	64.3	40.3	1969-1993	1969-1993
Arctica	Arctica	XG082	82.3	9.5	1957-1989	0- 0
Argentia	Canada	AFJ49	47.3	-54.0	1987-1994	1987-1994
Argentine Is	Antarctica	AIJ6N	-65.2	-64.3	1952-1995	1952-1995
Arkhangelsk	Russia	AZ163	64.6	40.5	1969-1993	1969-1993
Ascension Is	St. Helena	AS00Q	-7.9	-14.4	2001-2009	2001-2009
Ashkhabad	Turkmenistan	AS237	37.9	58.3	1948-2006	1950-2006
Athens	Greece	AT138	38.0	23.6	1961-2009	1961-2009
Auckland	New Zealand	AU63P	-37.0	175.0	1967-1978	1967-1978
Baker Lake	Canada	BL964	64.2	-96.0	1949-1959	1949-1959
Bangkok	Thailand	BK314	13.4	100.3	1963-1981	1963-1981
Bangui	Centr. Afr. Rep.	BI104	4.2	18.4	1958-1964	1958-1964
Barrow	USA, Alaska	BW771	71.3	-156.8	1949-1965	1949-1965
Baton Rouge	USA	04930	30.5	-91.2	1943-1953	1948-1949
Bear Lake	USA	BL841	41.9	-111.5	2003-2006	0- 0
Beijing	China	BP440	39.5	116.3	1976-2008	1978-2008
Bekescsaba	Hungary	BH148	46.7	21.2	1964-1990	1964-1990
Beograd	Serbia	BE145	44.8	20.5	1958-1993	1958-1993
Bermuda	Bermuda	BJJ32	32.4	-64.7	1988-1999	1988-1999
Biak	Indonesia	BX50J	-1.2	136.1	1994-1994	1994-1994
Bogota	Colombia	BGJ05	4.5	-74.2	1957-1967	1957-1967
Bombay	India	BM219	19.0	72.8	1945-1981	1946-1981
Boston	USA	56J43	42.4	-71.0	1945-1951	1945-1951
Boulder	USA	BC840	40.0	-105.3	1958-2009	1958-2009
Brisbane	Australia	BR52P	-27.5	152.9	1943-2009	1944-2009
Budapest	Hungary	BU147	47.4	19.0	1956-1959	1957-1957
Buenos Aires	Argentina	BAJ3M	-34.5	-58.5	1950-1985	1950-1985
Bunia	Congo	BN102	1.3	30.1	1957-1960	1957-1960
Byrd Station	Antarctica	BD88_	-80.0	-120.0	1957-1967	1957-1967
Calcutta	India	CU322	23.0	88.6	1957-1976	1957-1976
Camden	Australia	CN53L	-34.0	150.7	1980-2009	1980-2009
Campbell Is	Nes Zealand	CI65K	-52.5	169.2	1944-1985	1945-1985
Canberra	Australia	CB53N	-35.3	149.0	1941-2009	1944-2009
Cape Hallett	Antarctica	HT67K	-72.3	170.3	1957-1964	1957-1964
Cape Kennedy	USA	CC929	28.4	-80.6	1958-1991	1958-1991
Cape Schmidt	Russia	CE669	68.8	179.5	1960-1993	1960-1993
Cape York	Australia	0751J	-11.0	142.3	1944-1946	0- 0
Capetown	South Africa	CT13M	-34.1	18.3	1944-1992	1944-1992
Casablanca	Morocco	CA033	33.4	-7.3	1951-1958	1951-1958
Casey	Antarctica	CW46O	-66.3	110.5	1957-2009	1957-2009
Chiclayo	Peru	CY90P	-6.8	-79.8	1957-1958	1957-1958
Chilton	UK	RL052	51.6	-1.3	1993-2009	1993-2009
Chita	Russia	CX452	52.0	113.5	1946-1963	1957-1963
Chongqing	China	09429	29.5	106.4	1978-2008	1978-2008
Christchurch	New Zealand	GH64L	-43.6	172.8	1941-2009	1946-2009
Christmas Is	Kiribati	08701	1.5	-157.2	1945-1945	0- 0
Churchill	Canada	CH958	58.8	-94.2	1943-1996	1943-1996
Clyde River	Canada	CRJ70	70.3	-68.3	1943-1958	1944-1950
Cocos Is	Australia	CS31K	-12.2	96.8	1961-2009	1961-2009
College	USA, Alaska	CO764	64.9	-147.8	1941-2009	1944-2009
Concepcion	Chile	CPJ3O	-36.6	-73.0	1957-1991	1957-1991
Dakar	Senegal	DKA14	14.8	-18.4	1949-1993	1951-1993
Darwin	Australia	DW41K	-12.4	130.9	1982-2009	1982-2009
Davis	Australia	DV36Q	-68.3	77.6	1985-2001	1985-2001
De Bilt	Belgium	DT053	52.1	5.2	1949-1983	1949-1983
Deception	Antarctica	DEJ6L	-62.6	-60.4	1952-1963	1952-1963

Table 10: List of all available ionosonde stations

Station	URSI Code	Bremer count	Chilton count	IPS count	SPIDR count	Station count	Combined count
Adak	AD651	0	2473	5524	0	0	5524
Ahmedabad	AH223	6619	6471	8692	0	0	8863
Akita	AK539	8981	9005	13107	0	5783	13121
Alert	ALJ82	0	0	0	408	0	408
Alice Springs	AL52M	0	0	144	0	0	144
Alma Ata	AA343	9096	9083	12279	0	0	12567
Amderma	AM269	0	579	201	0	0	614
Anchorage	AN761	0	1581	4626	0	0	4626
Archangelsk	AZ163	7001	6661	696	0	0	7001
Arctica	XG082	8208	0	0	0	0	8208
Argentia	AFJ49	0	1825	0	0	0	1825
Argentine Is	AIJ6N	9120	10060	7580	0	0	12479
Arkhangelsk	AZ163	7001	6661	696	0	0	7001
Ascension Is	AS00Q	0	0	0	1617	0	1617
Ashkhabad	AS237	9908	10232	10804	527	0	13911
Athens	AT138	0	3414	2086	404	0	4985
Auckland	AU63P	0	1932	3401	0	0	3425
Baker Lake	BL964	0	0	2904	0	0	2904
Bangkok	BK314	0	0	2932	0	0	2932
Bangui	BI104	0	0	678	0	0	678
Barrow	BW771	0	1133	4088	0	0	4088
Baton Rouge	04930	0	0	2893	0	0	2893
Bear Lake	BL841	0	0	0	764	0	764
Beijing	BP440	0	1331	7915	0	0	8314
Bekescsaba	BH148	5256	5073	5677	0	0	5712
Beograd	BE145	6036	2712	3798	0	0	8813
Bermuda	BJJ32	0	1076	0	282	0	1334
Biak	BX50J	0	0	78	0	0	78
Bogota	BGJ05	0	1750	2026	0	0	2058
Bombay	BM219	1865	0	5871	0	0	6426
Boston	56J43	0	0	1806	0	0	1806
Boulder	BC840	10679	11678	6163	1946	0	13660
Brisbane	BR52P	10175	10524	15595	0	0	15623
Budapest	BU147	0	692	1117	0	0	1117
Buenos Aires	BAJ3M	0	243	7506	0	0	7506
Bunia	BN102	0	0	693	0	0	693
Byrd Station	BD88_	0	716	2254	0	0	2308
Calcutta	CU322	2605	1271	0	0	0	2679
Camden	CN53L	3480	3681	1127	2998	0	6726
Campbell Is	CI65K	4603	3688	10483	0	0	10587
Canberra	CB53N	11518	11907	19100	440	0	19394
Cape Hallett	HT67K	0	9	1877	0	0	1877
Cape Kennedy	CC929	0	1519	0	0	0	1519
Cape Schmidt	CE669	0	1864	1216	0	0	2099
Cape York	0751J	0	0	376	0	0	376
Capetown	CT13M	6381	6586	10193	0	0	10310
Casablanca	CA033	0	0	1795	0	0	1795
Casey	CW46O	5178	2560	0	3376	0	8434
Chiclayo	CY90P	0	322	0	0	0	322
Chilton	RL052	0	3534	0	0	0	3534
Chita	CX452	0	1578	3150	0	0	3150
Chongqing	09429	0	1235	8059	0	0	8059
Christchurch	GH64L	8112	8009	16889	693	0	17455
Christmas Is	08701	0	0	138	0	0	138
Churchill	CH958	12712	8638	13492	0	0	14406
Clyde River	CRJ70	0	0	2228	0	0	2228
Cocos Is	CS31K	0	216	3620	0	0	3620
College	CO764	4845	3923	7303	2896	0	12755
Concepcion	CPJ30	5520	5285	0	0	9792	9864
Dakar	DKA14	7314	5085	10914	0	0	11549
Darwin	DW41K	0	3016	7280	0	0	7280
Davis	DV36Q	0	0	4201	0	0	4201
De Bilt	DT053	6331	3648	9392	0	0	9456
Deception	DEJ6L	0	0	1741	0	0	1741
Delhi	DH328	0	4664	9499	0	0	9698
Dikson	DI373	3546	3464	4177	754	0	7298

Table 11: Number of data available in the various sources

After completing the data collection, data with wrong time stamps had to be rearranged, obviously wrong data had to be eliminated and a method had to be developed to decide which data from the different sources are assumed to be correct, if the sources show different values for the same station and hour. The format of the final database is shown in **Table 9**. The final database contains two data files (foF2 and M(3000)F2, respectively) for each ionosonde station. The database is included on the accompanying CD.

3. Creating the database using all available data

During the data collection it became obvious, that a frequent problem was that the time stamp (UT or local time) was not correct in many cases. In principle it is not difficult to check, as particularly the rise in foF2 with sunrise is quite pronounced and can be used to check the time stamp of the data. This can be performed either manually or simply by comparing the measurements with a prediction. This second method was chosen here in order to “synchronize” the data. As explained above, the resulting data base is strictly in UT (**Table 9**).

Several cases were found where such a synchronization was impossible. This may be due to wrong station names or wrong months. In these cases it was not possible to correct the data and they were simply removed (omitted, i.e. not included in the database). Altogether only about 850 months have been omitted, which is about 1% of the total hourly values.

Station	URSI Code	Source	Years	Para-meter	Reason	Action taken
Argentine Is	AIJ6N	Bremer	1990-1995	foF2	wrong data	removed
Argentine Is	AIJ6N	Chilton	1957-1959	foF2	wrong data	removed
Argentine Is	AIJ6N	Chilton	03/1989-12/1995	foF2 + M3000	Local time instead of UT	shifted by 4 hours
Ashkhabad	AS237	Chilton	11/1987–04/1988	M3000	wrong data	removed
Campbell Is	CI65K	Bremer	1970	foF2	wrong data	removed
Campbell Is	CI65K	Chilton	1970	foF2	wrong data	removed
Cape Kennedy	CC929	Chilton	11/1987-12/1988	M3000	wrong data	removed
Cape Schmidt	CE669	Chilton	11/1987-04/1988	M3000	wrong data	removed
Capetown	CT13M	Bremer + Chilton	06/1988-08/1988	foF2 + M3000	wrong data	removed, IPS data okay
Dyess AFB	DS932	Chilton	12/2003 + 11/2004 + 09/2005	M3000	wrong data	removed
Dikson	DI373	Chilton	11+12/1987	M3000	wrong data	removed
El Arenosillo	EA036	Chilton	03, 05, 09-11/1999	foF2 + M3000	wrong data	removed
Godhavn	GOJ69	Chilton	02/1975	M3000	wrong data	removed
Gorky	GK156	Chilton	1990-1993	foF2	wrong data	removed
Goosebay	GSJ53	Bremer + Chilton	11/1987–04/1988	M3000	wrong data	removed
Grahamstown	GR13L	Bremer + Chilton	09-12/1976	M3000	wrong data	removed
Hanscom AFB	HAJ43	Boulder	1998-1999	foF2	medians wrongly coded	recalculated

Johannesburg	JO120	Bremer + Chilton	06-08 + 10/1988	foF2 + M3000	wrong data	removed, IPS data okay
Kaliningrad	KL154	Bremer	01/1990	M3000	wrong data	removed
Karaganda	KR250	Bremer + Chilton	04/1978-07/1979	M3000	wrong data	removed
La Reunion	LR22J	Chilton	1989	foF2	wrong data	removed
Leningrad	LD160	Chilton	09/1998	M3000	wrong data	removed
Lycksele	Ly164	SPIDR	04/2000	M3000	wrong data	removed
Macquarie Is	MQ55M	IPS	1958	foF2	wrong data	removed
Macquarie Is	MQ55M	Bremer	1954-1957	foF2	LT instead of UT	shifted
Macquarie Is	MQ55M	Chilton	1954-1957	foF2	LT instead of UT	shifted
Macquarie Is	MQ55M	Chilton	08/1958	foF2 + M3000	wrong data	removed
Manila	MN414	Bremer	1991-1993	foF2	LT instead of UT	shifted
Manila	MN414	Chilton	1991-1993	foF2	LT instead of UT	shifted
Miedzeszyn	MZ152	Bremer	1976-1985	foF2	LT instead of UT	shifted
Millstone Hill	MH345	Chilton	09/2003 + 09/2004	M3000	wrong data	removed
Murmansk	MM168	Chilton	11/1987-04/1988	M3000	wrong data	removed
Nicosia	NC136	Chilton	11/1987-04/1988	M3000	wrong data	removed
Ottawa	OT945	IPS	1981	foF2	wrong data	removed
Port Stanley	PSJ5J	Chilton	1967-1995	foF2	LT instead of UT	shifted
Resolute Bay	RB974	IPS	1-12/1981	foF2 + M3000	wrong data	removed, Bremer + Chilton okay
Rome	RO041	IPS	01-04/1951	M3000	wrong data	removed
Rome	RO041	Bremer	1971-1972	foF2	wrong data	removed
Rome	RO041	Bremer	1958-1992	foF2	LT instead of UT	shifted (1h)
Rome	RO041	Bremer	1993-1994	foF2	1 h diff. in addition to LT	shifted (2h)
Rome	RO041	Bremer	1995-1998	foF2	LT instead of UT	shifted (1h)
Rome	RO041	Chilton	1971-1972	foF2	wrong data	removed
Rome	RO041	Chilton	1958-1992	foF2	LT instead of UT	shifted (1h)
Rome	RO041	Chilton	1993-1994	foF2	1 h diff. in addition to LT	shifted (2h)
Rome	RO041	Chilton	1995-1998	foF2	LT instead of UT	shifted (1h)
Rostov	RV149	IPS	10-12/1957	foF2 + M3000	wrong data	removed, Bremer + Chilton okay
Syowa Base	SW16R	Station	1959-2009	foF2	wrong data	removed
Tahiti	TT71P	Bremer	1989	foF2	neither LT or UT	shifted (+10h)
Tahiti	TT71P	Chilton	1989	foF2	neither LT or UT	shifted (+10h)
Tahihti	TT71P	IPS	01/1981-12/1983	foF2 + M3000	wrong data	removed, Bremer + Chilton okay
Tiksi Bay	TX471	IPS	10+11/1957	foF2 + M3000	wrong data	removed
Tucuman	TUJ20	IPS	1981-1985	foF2	wrong data	removed
Winnipeg	WI949	SPIDR	01/1950	M3000	wrong data	removed
Winnipeg	WI949	Chilton	01/1951	M3000	wrong data	removed

Table 12: This table shows the modifications made to the original ionosonde data

Finally it had to be decided which data should be included in the database if there were data available from more than one source and if the data was different in the various sources. By the way, there is no case where data are available in all five sources for the same station, year and month (the reason for so few SPIDR data was explained in the caption to Table 8). On the other hand the decision is quite simple if data exists only in one source.

One of the reasons for the small differences in the data from different sources is the calculation of median values (as shortly explained in the caption to **Table 8**). Some stations report only the hourly measurements and do not calculate the monthly median (this we did e.g. for our station St. Peter-Ording). A calculation of the monthly median depends amongst others on the consideration of descriptive letters. If they are considered, it is quite likely that the monthly median will be slightly different compared with the monthly median calculated without taking the descriptive letters into account.

After careful consideration we chose the following procedure:

1 If data exists in more than one source and one of them is the station itself, this data is taken.
2 If data is available from two sources, but no station data, the “ranking” is taken as: IPS, Bremer, Chilton, SPIDR. This ranking is based on the assumption that the larger the database, the more reliable it is.
3 If data is available from 3 or 4 sources, it was checked if two (or more) had identical values and then these were taken. If all sources showed different values, step 2 was taken.

This procedure is admittedly subjective but it seems to us that it is reasonable due to the absence of more detailed justification. It should be noted that in most cases the differences in the data are only very small, as is indicated in **Table 13**. This Table shows an example of the values for Concepcion, January 1959. The values we have received from Alberto Foppiano were originally two decimals more than used in the other data sources. We have rounded this to one decimal more than used in most other sources as shown in **Table 13** and these values we called here “Original”. The values called “Concepcion” are the rounded values we converted the “Original” values into in order to be of the same format as the others. Values for this same station, month and hour are available from three more sources and Table 13 shows the “combined” values in the last column calculated according to the above procedure. The reason for the differences (although quite small) in the Bremer and Chilton values are unknown, perhaps they were treated in a different way (e.g. calculation of medians, see above), perhaps they come from different sources.

UT	Original	Concepcion	Bremer	Chilton	Combined
00	95.5	96	95	93	96
01	95.0	95	94	93	95
02	94.0	94	96	93	94
03	100.0	100	96	96	100
04	104.0	104	100	99	104
05	100.0	100	100	97	100

06	98.0	98	95	93	98
07	93.5	94	88	87	94
08	87.5	88	86	87	88
09	84.7	85	86	86	85
10	90.0	90	90	90	90
11	97.3	97	95	94	97
12	103.0	103	100	102	103

Table 13: Sample treatment of data (see text above)

Table 14 shows a part of the final data file for the measurements from the Ionosonde Station Rome. The only difference in the format compared with **Table 9** is that in the second line it is indicated how many data in the final data base come from the different sources (in percent).

Station					Lat.		Long.		Code	Time		Parameter				Source									
Rome					41.8		12.5		RO041	UT		foF2 (0.1)				Stat(95)Bremer(3)IPS(2)									
Mon	Year	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1949	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2	1949	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
3	1949	C	C	64	C	C	59	76	90	90	89	95	102	C	C	102	C	C	100	90	83	80	77	77	71
4	1949	C	C	70	C	C	74	82	85	87	90	90	91	C	C	95	C	C	90	87	80	80	80	77	78
5	1949	C	C	70	66	63	69	75	80	80	80	80	80	C	C	80	80	78	80	77	73	73	73	73	73
6	1949	C	C	67	65	68	75	78	74	74	74	77	80	C	C	80	80	78	80	77	73	73	73	71	73
7	1949	C	C	61	60	56	71	71	70	73	76	76	77	C	C	76	75	76	76	78	77	75	73	67	70
8	1949	C	C	58	56	53	60	73	70	74	78	80	82	C	C	81	85	80	78	76	74	70	67	64	62
9	1949	C	C	53	52	51	56	71	75	75	76	78	80	C	C	78	77	78	75	70	C	C	65	61	60
10	1949	C	C	50	50	48	48	76	81	81	82	82	83	C	C	83	84	82	79	71	68	64	60	53	58
11	1949	C	C	43	41	40	39	60	77	81	85	87	89	C	C	85	77	74	68	60	58	55	53	46	47
12	1949	C	C	42	42	41	40	42	70	75	80	87	95	C	C	82	78	75	67	57	52	46	40	41	40
1	1950	C	C	44	44	42	39	42	80	90	100	105	110	C	C	110	110	95	75	61	51	47	43	41	42
2	1950	C	C	41	41	39	30	40	75	87	100	102	105	C	C	110	95	90	75	63	54	47	40	44	42
3	1950	C	C	45	40	33	48	60	73	78	83	88	93	C	C	90	85	80	85	80	67	83	58	59	48
4	1950	C	C	60	50	48	53	62	73	81	90	92	94	C	C	95	90	85	82	80	75	68	62	62	60
5	1950	C	C	59	52	56	61	68	66	72	78	81	85	C	C	78	76	78	77	73	73	69	64	55	63
6	1950	C	C	60	50	48	53	62	73	81	90	92	94	C	C	95	90	85	82	80	75	68	64	55	60
7	1950	C	C	59	52	56	61	68	66	72	78	81	85	C	C	78	76	78	77	73	73	69	64	55	63
8	1950	C	C	37	36	33	44	54	57	62	68	69	71	C	C	68	70	70	67	70	65	60	55	44	47
9	1950	C	C	30	29	27	32	42	54	55	57	60	62	C	C	62	64	70	70	63	65	51	37	34	33
10	1950	C	C	30	31	30	27	47	60	61	62	67	72	C	C	77	74	73	60	49	47	41	35	32	32
11	1950	C	C	28	28	29	25	36	64	69	75	76	77	C	C	77	75	60	43	42	32	30	28	28	30
12	1950	C	C	29	27	27	28	32	52	60	68	70	72	C	C	65	61	49	40	36	34	32	30	31	29

Table 14: Sample for two years of the Rome data in the Final Database

Table 15 shows the result of a comparison of the data contained in the various sources with the ITU predicted data. In the first two columns the station name and URSI code are shown. Columns 3 to 8 give the number of values contained in the source, the average deviation and the mean square deviation as compared with the ITU prediction. In the final column the number of values in the final database, their average and mean square deviation are given. In the final line the total count, average deviation and mean square deviations are shown.

The final database consists of about 1.6 million monthly median foF2- and slightly less M(3000)F2-data. Amazingly the average difference between the observed values and the ITU-predicted foF2-values is only 0.04 MHz with a mean square deviation of 0.81 MHz (see **Table 15**). This clearly indicates that the ITU predictions are on average almost perfect, but the large deviation suggests that the sunspot number may not be the best parameter for the prediction of monthly values (of foF2).

Station	URSI	Bremer			Chilton			IPS			SPIDR			Station			Kombiniert		
	Code	count	ave.	m.sq.	count	ave.	m.sq.	count	ave.	m.sq.	count	ave.	m.sq.	count	ave.	m.sq.	count	ave.	m.sq.
. . . .																			
Tennent Creek	TD42M	.	.	.	.	.	.	167	-0.7	0.9	.	.	.	.	.	.	167	-0.7	0.9
Terra Nova Bay	TL57N	.	.	.	.	.	.	120	0.2	0.5	.	.	.	.	.	.	120	0.2	0.5
Terre Adelie	DU56O	6925	-0.2	0.6	3283	-0.3	0.6	9600	-0.1	0.7	22	-0.3	0.4	.	.	.	10535	-0.1	0.7
Thule/Camp Tuto	THJ76	.	.	.	.	.	.	3760	0.0	0.6	.	.	.	.	.	.	3760	0.0	0.6
Thule/Qaanaaq	THJ77	3428	0.0	0.6	1025	0.2	0.5	.	.	.	2854	0.4	0.8	.	.	.	6316	0.2	0.7
Tiksi Bay	TX471	.	.	.	2456	0.0	0.8	4933	-0.1	0.6	.	.	.	.	.	.	6179	-0.1	0.7
Tiruchirapalli	TI311	6142	-0.2	1.3	5696	-0.2	1.3	7470	0.0	0.9	.	.	.	.	.	.	8644	-0.1	1.2
Togo (Dapango)	TG011	.	.	.	.	.	.	310	0.2	0.7	.	.	.	.	.	.	310	0.2	0.7
Tomsk	TK356	10932	-0.1	0.7	10909	-0.1	0.6	14255	0.0	0.6	1550	-0.1	0.8	.	.	.	17472	0.0	0.7
Tortosa	EB040	.	.	.	7536	0.1	1.5	7004	0.1	0.6	1557	0.3	0.7	.	.	.	10805	0.1	0.7
Townsville	TV51R	12078	-0.4	0.9	10095	-0.3	0.7	16169	-0.2	0.8	480	-0.4	0.7	.	.	.	16702	-0.3	0.8
Trinidad	51J10	.	.	.	.	.	.	2040	0.0	0.8	.	.	.	.	.	.	2040	0.0	0.8
Trivandrum	TM308	4217	-0.1	0.9	3715	-0.1	0.9	5001	-0.1	0.9	.	.	.	.	.	.	5290	-0.1	1.0
Tromso DPS-4	TR169	.	.	.	1702	0.3	0.6	5422	0.3	0.7	1038	0.7	1.8	.	.	.	7951	0.3	0.7
Tsumeb	TS11R	.	.	.	.	.	.	3131	0.0	0.7	.	.	.	.	.	.	3131	0.0	0.7
Tucuman	TUJ2O	.	.	.	16	1.2	1.4	6665	0.1	1.6	822	0.4	1.1	.	.	.	7487	0.1	1.5
Tunguska	TZ362	6668	-0.3	0.8	6794	-0.2	0.8	3923	-0.2	0.8	2582	-0.1	1.2	.	.	.	9869	-0.2	0.8
Uppsala	UP158	11464	0.0	0.7	10574	0.0	0.7	13531	0.0	0.7	.	.	.	.	.	.	13882	0.0	0.7
Ushuaia	UAJ5M	.	.	.	.	.	.	2261	0.3	1.0	.	.	.	.	.	.	2261	0.3	1.0
Vandenburg AFB	XXX01	.	.	.	.	.	.	504	0.3	0.6	.	.	.	.	.	.	504	0.3	0.6
Vanimo	VA50L	8294	0.1	1.2	5856	0.2	1.0	12126	0.4	1.2	452	-0.3	0.8	.	.	.	12689	0.3	1.2
Victoria	VI848	.	.	.	144	0.7	1.2	.	.	.	.	.	.	.	.	.	144	0.7	1.2
Vostok	VO47P	.	.	.	6	-0.3	0.6	2150	-0.3	0.7	.	.	.	.	.	.	2150	-0.3	0.7
Wakkanai	WK545	9384	0.3	0.7	9092	0.3	0.7	16951	0.3	0.7	.	.	.	12964	0.1	0.7	17423	0.2	0.7
Wallops Is DISS	WP937	7306	0.3	0.7	6925	0.4	0.7	4992	0.4	0.8	119	0.4	0.6	.	.	.	8600	0.3	0.7
Washington	WA938	.	.	.	3331	0.3	0.7	7911	0.2	0.6	.	.	.	.	.	.	7911	0.2	0.6
Watheroo	WT43_	.	.	.	302	0.0	0.8	5160	0.1	0.7	.	.	.	.	.	.	5160	0.1	0.7
Wellen	WE667	.	.	.	1184	-0.1	0.7	770	0.0	0.7	132	-0.1	0.4	.	.	.	1378	-0.1	0.7
White Sands	WS832	4608	0.0	0.6	5024	0.0	0.6	7463	0.0	0.6	.	.	.	.	.	.	8136	0.0	0.6
Winnipeg	WI949	3791	0.0	0.7	4669	0.0	0.6	7375	0.0	0.7	848	0.2	0.7	.	.	.	8294	0.0	0.7
Woomera	WO53J	.	.	.	.	.	.	1192	0.2	0.5	.	.	.	.	.	.	1192	0.2	0.5
Yakutsk	YA462	9596	-0.2	0.7	9482	-0.1	0.7	9505	-0.1	0.7	.	.	.	.	.	.	9971	-0.1	0.7
Yamagawa	YG431	9180	-0.3	0.9	8973	-0.3	0.9	16515	-0.3	0.9	.	.	.	7792	-0.6	1.0	16734	-0.4	1.0
Yellowknife	YE862	.	.	.	244	1.0	1.5	.	.	.	.	.	.	.	.	.	244	1.0	1.5
Yuzhno-Sakhalins	SA547	.	.	.	.	.	.	4002	0.2	0.9	.	.	.	.	.	.	4002	0.2	0.9
Zhongshan	ZS36R	.	.	.	.	.	.	.	.	.	1359	0.0	0.6	.	.	.	1359	0.0	0.6
average		816346	0.02	0.81	854108	0.05	1.01	1239501	0.03	0.77	84452	0.28	1.11	108707	-0.09	0.83	1601519	0.04	0.81

Table 15: Comparison of Final Data base foF2 values with ITU foF2 predictions

4. Computer program IONMW

The program “IONMW” was written particularly for viewing and accessing the measured foF2 and M(3000)F2 data collected from the various sources as well as the Final Data Base. It is possible to select a map which shows the geographical positions of all stations included in the data base. The option Graphic Years shows a display of the years for which measured data exists for each station. If any other option than Map is selected, it is possible to view the complete list of stations with their URSI codes, geographical coordinates and years where data is available from the various sources or for the combined Final Data Base (complete **Table 10**). When a station name is clicked in this list, the detailed map of all measured values for this station is displayed. Actually two windows open and it is possible to select two sources (if available) in order to compare the data. This program is the management center for all data. It contains a help file and should be easy to use.

There is a CDs which comes with this report. The data files appear twice, once in the folder Original_data or Final_database and in the IONMW program. This makes it easier to use (e.g. export) the data without using the IONMW program. The CD contains the following 8 files, resp. folders:

1. **Readme.txt** containing this paragraph (top 1 to 8)
2. **Document.DOC,** this present report
3. **Original_Data**, containing five subfolders: Bremer, Chilton, SPIDR, IPS and Station. The subfolders contain the stations' measured data, i.e. two files for each station if data exist for the two parameters. The filename is the station's 5-character URSI-code plus F2 or M3-information, e.g. AD651_F2.dat for Adak's foF2 values. The data is strictly in the format as in **Table 14**. It was not considered helpful to include the "real" original data because of their deficiencies (format, time stamp etc.).
4. **Final_Database** containing 497 files, i.e. 258 files for foF2 from 258 stations, and 239 files for M(3000)F2 from 239 stations. The filename is the station's 5-character URSI-code plus F2 or M3-information, e.g. AD651_F2.dat for Adak's foF2 values. The data is strictly in the format as in **Table 14**.
5. **Setupionmw.exe** which installs the program ionmw.exe. This program is the central access point to the original data as well as to the Final Database.
6. **station_list.txt** is the complete list of all ionosonde stations where data is available (actually this is the updated and completed **Table 10**). The years indicate those years where data is available but there may be large gaps which can not be seen in this table (see description of the program ionmw).
7. **Filedescr.doc** describes the data format of the database in detail.
8. **ionabw.txt** (last few lines are shown in **Table 15**)

Conclusions

This comprehensive database offers the possibility to check the predictions of ionospheric models with actually measured ionospheric data on a world-wide and long-term basis. In particular it is considered useful to check if the measured data shows any long-term trend proposed in various theoretical studies, in contrast e.g. to the ITU-model which is static in long-term.

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