Design and Implementation of Wuzhou Meteorological Statistical Yearbook System Based on Python

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Abstract Based on Python language, this system implements the Wuzhou Meteorological Statistical Yearbook system, which automatically calculates and generates Excel table. This system can accurately and quickly collect annual meteorological data, form meteorological yearbook reports for government departments, and is of great significance for the development of meteorological data business by the Wuzhou Meteorological Bureau.

Key words Python language; Y file; Yearbook

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The Wuzhou Statistical Yearbook belongs to the local yearbook, and the Wuzhou Meteorological Bureau provides meteorological data for the annual production of the Wuzhou Statistical Bureau. The Wuzhou Meteorological Bureau provides meteorological data for the previous year from five national meteorological stations in Wuzhou, Cenxi, Mengshan, Cangwu, and Tengxian each year, including the monthly average temperature (℃), precipitation (mm), and sunshine hours (h) of each national meteorological station, as well as the annual average temperature (℃), total precipitation (mm), and sunshine hours (h), as well as the interval values of annual and monthly average temperature (℃), precipitation (mm) and sunshine hours (h) of each national meteorological station, a total of 234 values. At present, the statistics of various meteorological elements mainly use the surface meteorological forecasting software (OSSMO) to open the Y file (ground annual report), query the temperature (℃), precipitation (mm), and sunshine hours (h) one by one, and then perform calculation and statistics on the meteorological elements. The manually queried data are input into the table. After opening the message by OSSMO, the displayed numbers are small, making it difficult to search, requiring multiple pages of searching. Moreover, frequent manual data entry can lead to data entry errors. In this paper, a Wuzhou Meteorological Statistical Yearbook system is developed, which uses Python[1-3] to read Y file and automatically generate standardized Excel table. The purpose is to use computers to replace manual data queries, improve the query speed of reports, quickly form Wuzhou Meteorological Statistical Yearbook tables, improve work efficiency, and reduce human errors.

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1 Data

The research object is the Wuzhou Meteorological Statistical Yearbook, which is required by the Wuzhou Statistical Bureau every year. This study mainly focuses on statistical meteorological elements. The experimental data includes temperature, precipitation, and sunshine hours at five national meteorological stations in Wuzhou, Cenxi, Mengshan, Cangwu, and Tengxian in 2021. The data carrier is Y file (ground annual report)[4], which is downloaded from the meteorological data business system (MDOS). The downloaded data is complete, complete, and reliable.

Format of Y file name: Y district station number-year. TXT. Station number in Mengshan District: 59058; station number in Tengxian District: 59256, station number in Wuzhou District: 59265, station number in Cangwu District: 59266. Name of Mengshan Y file in 2021 is Y59058-2021. TXT; name of Tengxian Y file in 2021 is Y59256-2021. TXT; name of Wuzhou Y file in 2021 is Y59265-2021; name of Cangwu Y file in 2021 is Y59266-2021. TXT; name of Cenxi Y file in 2021 is Y59454-2021. TXT. The format of Y file table refers to the *Format of Ground Meteorological Observation Data File and Record Book Table*[5].

2 Design and realization

2.1 Temperature The temperature data is read from the Y file (ground annual report), and the loop statement uses the range function. The starting position of the first cycle count in the first line is 1, and the ending position of the count is 13, and the step size is 1. The starting position of the second cycle count in the second line is 1, and the ending position of the count is 11, and the step size is 1. The third line reads the average temperature from the file, and the fourth line determines whether this average temperature exists. If the data is "…", the fifth line sets the average temperature to "0 ℃", and the sixth line sets the data to be stored in the subscript value of corresponding Excel. The read av-

erage temperature in the seventh line is converted into int divided by 10 and assigned to the corresponding Excel table. The myfile. readline ( ) statement in the eighth line clears the remaining data in this line and loops back to the code in the second line until all the average temperatures from January to December are placed in the corresponding Excel table. The ninth line reads the annual average temperature, and the tenth row converts the average temperature to int divided by 10 and assigns to the 'B4' Excel table. Some of the codes are as follows:

```
for i in range(1, 13, 1): # read temperature
    for j in range(1, 11, 1):
        content = myfile.read(5)
        if content == '…': # determine if there is a temperature
            content = 0
    AvgTemp = 'B' + str(i+4)
    sheet1[AvgTemp] = int(content)/10
    myfile.readline()
avgdata = myfile.read(5)
sheet1['B4'] = int(avgdata)/10
```

2.2 Total precipitation The precipitation data is read from the Y file (ground annual report), and the loop statement uses the range function. After reading the temperature data, 58 consecutive lines are read. Starting from line 59, the starting position of the first cycle count in the first line is 1, and the ending position of the count is 13, with a step size of 1. One line of data are read in the second line. In the third line, characters 54 to 60 are truncated, and the fourth line determines whether the characters 54 to 60 are "…", that is, whether there is rainfall. If the rainfall in the fifth line is "…", it assigns the variable R to 0. It sets the data to be stored in the subscript value of corresponding Excel in the sixth line. The seventh line converts the total amount of precipitation read into an int type divided by 10 and assigns it to the corresponding Excel table. It loops back to the second line of code until the average temperature from January to December is fully processed and assigned to the corresponding Excel table. It reads the total annual amount in eighth line. The ninth line converts the total amount to int divided by 10 and assigns it to the 'C4' Excel table.

```
for i in range(1, 13, 1): # read rainfall
    content = myfile.readline()
    R = content[54:60]
    if R == '…': # determine if there is rainfall
        R=0
    Rainindex = 'C' + str(i+4)
    sheet1[Rainindex] = int(R)/10
Rtotalyear = myfile.read(5)
sheet1['C4'] = int(Rtotalyear)/10
```

2.3 Sunshine hours The total value of sunshine hours is read from the Y file (ground annual report), and the loop statement uses the range function. After reading the temperature data, 267 lines are read consecutively. Starting from line 268, the starting position of the first cycle count in the first line is 1, and the ending position of the count is 13, with a step size of 1. It reads one row of data in the second row.

```
for i in range(1, 13, 1): # read sunshine
    content = myfile.readline()
    S = content[18:23]
    if S == '…': # determine if the sunlight has value
        S=0
    Sindex = 'D' + str(i+4)
    sheet1[Sindex] = int(S)/10
Stotalyear = myfile.read(5)
sheet1['D4'] = int(Stotalyear)/10
```

2.4 Range value After read from the Y file, the range value is stored in the corresponding table of the Excel document (annual meteorological element values of various stations in Wuzhou City in * * * year, Mengshan in * * * year, Tengxian in * * * year, urban area in * * year, Cangwu in * * year, Cenxi in * * year) to obtain. Then, the interval values of annual and January – December average temperature (℃), total precipitation (mm), and sunshine hours (h) at five national stations in Mengshan, Tengxian, Wuzhou, Cangwu, and Cenxi are judged.

Example: the first step is to obtain the annual average temperature of Mengshan; the second step is to obtain the annual average temperature of Tengxian; the third step is to compare the annual average temperature of Mengshan and Tengxian, and assigns the larger value to the temporary file maxtemp; the fourth step is to obtain the annual average temperature of the urban area, compare the average temperature of urban area with the temporary file maxtemp, and assigns the larger value to the temporary file maxtemp; the fifth step is to obtain the annual average temperature of Cangwu, compare the annual average temperature of Cangwu with the temporary file maxtemp, and assign the larger value to the temporary file maxtemp; the sixth step is to obtain the annual average temperature of Cenxi, compare the annual average temperature of Cenxi with the temporary file maxtemp, and assign the larger value to the temporary file maxtemp. Then the annual average temperatures of Mengshan and Tengxian are obtain again, and the two values are compared. The smaller value is assigned to mintemp. Using the same method, the minimum values of the five national meteorological stations are selected. The minimum and maximum values are taken as interval values for the annual average and are assigned to the corresponding Excel table.

2.5 Generating Excel table The main method for generating Excel tables is the openpyxl module, and the table color is set based on the fixed format of the template table provided by the Wuzhou Statistical Bureau. It sets parameters such as font, font size, virtual and solid border, and whether the font is centered in the box in the program. After completion, the program operation will generate a table with standardized format.

3 Test results and comparative analysis

3.1 Environmental setup and testing results The system en-

vironment chooses to install Anaconda3 and Python3.9.7 64-bit, and the third-party libraries which need to download and install Python contain PyQt5, datetime, and openpyxl. The PyQt5 library is used for creating graphical interfaces, and the datetime library is used to obtain year, month, and day, and the openpyxl library is used to generate Excel tables. The design interface elements include one label "Year:", one text box, and one "OK" button. The interface title is "Wuzhou Meteorological Statistical Yearbook", and the interface size is 424 * 143. The interface of the Wuzhou Meteorological Statistical Yearbook system is shown in Fig. 1. It enters the year "2021" in the text box of the Wuzhou Meteorological Statistical Yearbook system interface, clicks the "OK" button, and generates an Excel table.

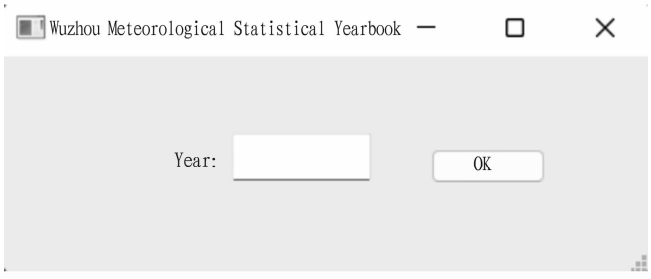

Fig. 1 Wuzhou Meteorological Statistical Yearbook system interface

The interval values of average temperature (℃), precipitation (mm), and sunshine hours (h) for each station in Wuzhou City throughout 2021 and from January to December are judged. The annual meteorological element values of each station in Wuzhou City in 2021 are shown in Table 1.

Table 1 Annual meteorological element values of each station in Wuzhou City in 2021

Annual meteorological element values of each station in Wuzhou City in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	21.0 – 22.7	976.6 – 1 182.8	1 521.9 – 2 080.4
January	10.7 – 12.9	2.4 – 5.6	130.1 – 203.3
February	16.2 – 18.2	82.5 – 104.6	121.7 – 227.9
March	17.5 – 20.5	37.9 – 69.8	48.5 – 206.0
April	19.9 – 22.6	71.5 – 148.6	47.0 – 102.1
May	25.3 – 27.9	92.3 – 233.3	80.4 – 185.7
June	27.0 – 28.0	137.9 – 226.2	126.2 – 170.1
July	28.7 – 29.8	35.9 – 94.7	178.2 – 251.7
August	27.3 – 28.6	45.4 – 226.4	155.3 – 220.2
September	27.4 – 29.0	52.2 – 154.7	194.6 – 259.1
October	21.3 – 22.9	72.1 – 154.1	120.4 – 144.0
November	16.1 – 18.6	8.0 – 65.5	84.8 – 157.9
December	12.2 – 14.4	8.8 – 17.9	149.1 – 197.1
Filled by:		Telephone:	

Statistics of meteorological elements such as average temperature (℃), precipitation (mm), and sunshine hours (h) in Mengshan throughout 2021 and from January to December is shown in Table 2.

Table 2 Statistics of meteorological elements in Mengshan in 2021

Mengshan in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	21.0	1 024.2	1 521.9
January	10.7	3.7	139.2
February	16.2	94.6	121.7
March	17.5	41.3	48.5
April	19.9	127.2	47.0
May	25.3	233.3	80.4
June	27.0	161.1	131.4
July	28.7	35.9	214.4
August	28.6	45.4	155.3
September	27.9	135.3	221.9
October	21.3	72.1	128.2
November	16.1	65.5	84.8
December	12.2	8.8	149.1
Filled by:		Telephone:	

Statistics of meteorological elements such as average temperature (℃), precipitation (mm), and sunshine hours (h) in Tengxian County throughout 2021 and from January to December is shown in Table 3.

Table 3 Statistics of meteorological elements in Tengxian in 2021

Tengxian in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	22.7	999.0	2 074.2
January	12.9	3.7	203.3
February	18.2	82.5	227.9
March	20.2	50.7	206.0
April	22.4	144.1	94.2
May	27.6	171.5	149.9
June	28.0	145.5	133.4
July	29.8	52.7	207.8
August	28.6	155.0	171.9
September	29.0	71.6	231.7
October	22.9	72.2	126.9
November	18.6	31.6	136.5
December	14.4	17.9	184.7
Filled by:		Telephone:	

Statistics of meteorological elements such as average temperature (℃), precipitation (mm), and sunshine hours (h) in the urban area throughout 2021 and from January to December is shown in Table 4.

Statistics of meteorological elements such as average temperature (℃), precipitation (mm), and sunshine hours (h) in Cangwu throughout 2021 and from January to December is shown in Table 5.

Table 4 Statistics of meteorological elements in the urban area in 2021

Urban area in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	22.6	1 121.3	2 080.4
January	12.8	4.7	132.1
February	18.1	88.4	173.2
March	20.1	38.3	87.2
April	22.5	148.6	102.1
May	27.6	92.3	185.7
June	27.8	226.2	170.1
July	29.7	94.7	251.7
August	28.5	216.8	220.2
September	29.0	52.2	259.1
October	22.6	134.5	144.0
November	18.6	8.0	157.9
December	14.4	16.6	197.1
Filled by:		Telephone:	

Table 5 Statistics of meteorological elements in Cangwu in 2021

Cangwu in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	22.5	976.6	1 702.4
January	12.6	2.4	136.4
February	18.0	86.3	166.9
March	20.4	37.9	54.1
April	22.6	142.7	63.0
May	27.7	100.8	144.3
June	27.7	137.9	126.2
July	29.6	51.5	197.6
August	28.2	226.4	164.5
September	28.4	78.8	228.1
October	22.6	80.6	121.3
November	18.3	16.9	126.9
December	13.8	14.4	173.1
Filled by:		Telephone:	

Statistics of meteorological elements such as average temperature (℃), precipitation (mm), and sunshine hours (h) in Cenxi throughout 2021 and from January to December is shown in Table 6.

Table 6 Statistics of meteorological elements in Cenxi in 2021

Cenxi in 2021			
Reporting unit: (Stamp)			
Time	Average temperature//℃	Precipitation//mm	Sunshine hours//h
Whole year	22.2	1 182.8	1 694.4
January	12.6	5.6	130.1
February	17.8	104.6	163.4
March	20.5	69.8	62.4
April	22.6	71.5	80.5
May	27.9	96.1	152.1
June	27.5	186.2	140.1
July	28.8	90.3	178.2
August	27.3	222.4	159.9
September	27.4	154.7	194.6
October	21.8	154.1	120.4
November	17.9	15.3	147.1
December	13.8	12.2	165.6
Filled by:		Telephone:	

3.2 Comparative analysis Temperature element query method: it opens the Y file (annual report of ground meteorological records) using software of the *Surface Meteorological Observation and Reporting Business Software* OSSMO 2004, selects "the first page of the annual report (P, P0, T, E, U, N, R)", and searches the monthly average value from January to December and annual average value in the temperature (0.1 ℃) area. To find multiple sites, it needs to open multiple reports. The 2021 annual report of Mengshan is taken as an example (Fig. 2).

The range values adopt manual comparison. The average temperature values of the same month from 5 stations are extracted, and the lowest and highest values are found from the average temperature values of the 5 stations as the range values of annual average temperature. The precipitation of 5 stations in the same month is extracted, and the lowest and highest values are found from the 5 precipitation levels as the range values of annual precipitation. The sunshine hours of 5 stations in the same month are extracted, and the lowest and highest values are found from the 5 sunshine hours as the range values of annual sunshine hours.

Precipitation query method: on the same page as the "first page of the annual report (P, P0, T, E, U, N, R)", it searches the total amount of each month from January to December and annual average in the precipitation area. Mengshan is taken as an example.

Query method for sunshine hours: it selects "the fourth page of the annual report (ground 0 cm – 3.20 m, A, DYF, S)" and searches the total value of each month from January to December and annual average in the sunshine hours area. Mengshan is taken as an example (Fig. 3).

The Wuzhou Meteorological Statistical Yearbook system is operating normally, and the automatically generated meteorological element value data of Mengshan, Tengxian, urban area, Cangwu, and Cenxi stations are consistent with those manually queried in the *Surface Meteorological Observation and Reporting Business Software* OSSMO 2004 software.

2021年 蒙山国家基本气象站

月份	本站气压(0.1hpa) 平均	平均 最高	平均 最低	极端 最高	极端 日期	极端 最低	极端 日期	平均海面气压 (0.1hpa)
1	10004	10032	9968	10123	11	9899	24	10227
2	9960	9987	9930	10067	18	9853	25	10178
3	9941	9968	9910	10067	22	9784	31	10157
4	9926	9948	9898	9999	5	9800	1	10140
5	9871	9893	9843	9954	5	9805	22	10080
6	9838	9855	9813	9893	4	9775	20	10045
7	9831	9849	9805	9909	8	9737	27	10036
8	9848	9866	9823	9923	2天	9746	5	10054
9	9888	9910	9860	9950	24	9798	12	10096
10	9942	9964	9917	10035	22	9844	2天	10155
11	9976	10002	9947	10056	30	9864	6	10194
12	10016	10042	9986	10121	27	9914	15	10237
年极值	---	---	---	10123	11/1	9737	27/7	---
年平均	9920	9943	9892	---	---	---	---	10133

月份	气温(0.1℃) 候平均 1	2	3	4	5	6	旬平均 上	中	下	平均	平均 最高	平均 最低	极端 最高	极端 日期	极端 最低	极端 日期
1	100	56	79	106	165	133	78	93	148	107	175	66	244	24	-09	12
2	186	153	152	155	196	108	170	154	163	162	227	121	290	23	71	13
3	136	138	172	211	149	234	137	191	195	175	211	153	317	31	101	21
4	204	174	204	187	234	189	189	196	212	199	235	176	319	23	130	5
5	233	260	266	229	256	270	246	248	264	253	297	224	336	28	179	1
6	239	269	274	295	270	272	254	285	271	270	319	239	358	6	164	6
7	284	284	299	287	277	292	284	293	285	287	344	250	381	27	233	26
8	301	280	278	281	292	287	291	280	289	286	345	250	390	3	233	30
9	290	280	289	268	265	281	285	278	273	279	349	239	375	12	225	25
10	277	245	202	195	163	198	261	198	182	213	259	183	362	5	113	25
11	191	169	158	166	135	146	180	162	140	161	206	132	287	6	78	26
12	113	140	141	140	140	68	127	140	101	122	187	79	255	16	18	27
年极值	---	---	---	---	---	---	---	---	---	---	---	---	390	3/8	-09	12/1
年平均	---	---	---	---	---	---	---	---	---	210	263	176	---	---	---	---

月份	水汽压(0.1hpa) 平均	最大	日期	最小	日期	相对湿度(%) 平均	最小	日期
1	82	192	25	28	2天	62	15	12
2	135	208	2天	85	19	75	32	17
3	172	279	31	90	2	84	39	24
4	198	286	22	130	9	85	36	30
5	271	355	29	186	1	85	45	1
6	293	350	21	127	5	83	21	5
7	299	359	1	243	16	77	39	27
8	294	344	8	226	28	77	37	3
9	281	335	7	231	13	77	37	2天
10	190	297	3	111	23	75	33	5
11	141	281	7	54	30	75	23	30
12	97	175	16	45	1	70	20	2
年极值	---	359	1/7	28	2天/1	---	15	12/1
年平均	204	---	---	---	---	77	---	---

月份	平均总云量(0.1成) 总云量	低云量	日平均云量量别日数 总云量 0.0~1.9	2.0~8.0	8.1~10.0	低云量 0.0~1.9	2.0~8.0	8.1~10.0
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
年合计	---	---						
年极值	---	---	---	---	---	---	---	---
年平均			---	---	---	---	---	---

月份	降水量(0.1mm) 候总量 1	2	3	4	5	6	旬总量 上	中	下	总量	一日最大	日期
1		20	08		09		20	08	09	37	10	7
2		629			152	165	629		317	946	379	9
3	142	153	69	06	35	08	295	75	43	413	109	10
4	04	44	49	855	110	210	48	904	320	1272	337	19
5	663	94	364	417	240	547	757	781	795	2333	408	31
6	605		94	255	335	322	605	349	657	1611	251	25
7	112	46		99	98	04	158	99	102	359	95	20
8		185	109	127		33	185	236	33	454	114	6
9	35	798	272	145	103		833	417	103	1353	632	7
10		150	17	46	246	262	150	63	508	721	246	21
11	175	149	81	60	190		324	141	190	655	184	21
12				32	37	19		32	56	88	37	21
年合计	---	---	---	---	---	---	---	---	---	10242	---	---
年极值	---	---	---	---	---	---	---	---	---	---	632	7/9
年平均			---	---	---	---	---	---	---	---	---	---

月份	各级降水日数 ≥0.1	≥1.0	≥5.0	≥10.0	≥25.0	≥50.0	≥100.0	≥150.0
1	5	1						
2	6	4	4	4	2			
3	15	8	3	1				
4	20	14	7	3	2			
5	26	22	14	8	3			
6	19	18	11	6	1			
7	11	7	3					
8	9	8	4	2				
9	11	8	6	4	2	1		
10	11	9	5	2				
11	15	9	5	2				
12	3	3						
年合计	151	111	62	32	10	1		
年极值	---	---	---	---	---	---	---	---
年平均	---	---	---	---	---	---	---	---

月份	各时段年最大降水量(0.1mm) 时段	降水量	开始时间
	5	153	9月7日15时42分
	10	278	9月7日15时41分
	15	312	9月7日15时37分
	20	364	9月7日15时41分
	30	451	9月7日15时37分
	45	462	9月7日15时36分
	60(1)	472	9月7日15时36分
	90(1.5)	477	9月7日15时36分
	120(2)	478	9月7日15时36分
	180(3)	480	9月7日15时36分
	240(4)	519	9月7日12时36分
	360(6)	632	9月7日11时54分
	540(9)	632	9月7日11时54分
	720(12)	632	9月7日11时54分
	1440(24)	782	9月6日17时55分

Fig. 2 The first page of the annual report in Mengshan in 2021 (P, P0, T, E, U, N, R)

2021年 蒙山国家基本气象站

月份	地面(0cm)温度(0.1℃) 平均	平均 最高	平均 最低	极端 最高	极端 日期	极端 最低	极端 日期	日最低≤ 0.0℃日数
1	136	297	64	453	21	-15	12	1
2	186	337	121	471	1	74	13	
3	184	252	152	389	29	104	2	
4	215	299	180	423	1	141	5	
5	268	367	227	453	1	182	1	
6	300	429	245	546	11	180	6	
7	334	503	259	601	29	243	26	
8	333	516	261	604	3	245	30	
9	317	482	250	605	6	232	26	
10	240	366	184	558	1	114	25	
11	172	267	131	347	7	76	27	
12	143	288	75	398	16	31	2	
年合计	---	---	---	---	---	---	---	1
年极值	---	---	---	605	6/9	-15	12/1	---
年平均	236	367	179	---	---	---	---	---

月份	浅层地温(0.1℃) 5cm	10cm	15cm	20cm	40cm
1	130	132	133	136	140
2	177	178	178	179	170
3	180	180	178	179	179
4	212	212	210	212	210
5	263	261	258	258	249
6	287	286	284	284	278
7	319	318	315	315	294
8	320	319	316	317	294
9	308	308	307	308	289
10	235	238	240	244	248
11	174	178	181	184	204
12	141	145	148	150	163
年合计	---	---	---	---	---
年极值	---	---	---	---	---
年平均	229	230	229	231	227

月份	深层地温(0.1℃) 0.8m	1.6m	3.2m
1	155	196	227
2	174	192	216
3	181	194	211
4	207	204	211
5	239	221	214
6	268	243	223
7	284	260	234
8	288	269	243
9	285	273	250
10	257	267	253
11	219	242	249
12	183	216	238
年合计	---	---	---
年极值	---	---	---
年平均	228	231	231

月份	草面(雪面)温度(0.1℃) 平均	平均 最高	平均 最低	极端 最高	极端 日期	极端 最低	极端 日期	日最低≤ 0.0℃日数
1	128	313	42	483	21	-76	12	5
2	182	357	105	494	1	36	13	
3	188	284	144	522	24	78	24	
4	217	317	176	497	1	119	30	
5	267	370	223	513	1	168	1	
6	288	368	240	484	11	148	6	
7	308	439	250	546	28	234	24	
8	309	458	247	561	4	220	30	
9	290	417	235	578	6	217	25	
10	223	311	180	462	7	102	25	
11	166	247	114	316	13	31	27	
12	118	240	46	320	16	-29	2	7
年合计	---	---	---	---	---	---	---	12
年极值	---	---	---	---	6/9	-76	12/1	---
年平均	224	345	167	---	---	---	---	---

月份	冻土深度(cm) 最大	日期	风速(0.1m/s) 平均	最大风速 风速	风向	日期	极大风速 风速	风向	日期
1			25	77	NW	2天	119	NW	2天
2			22	88	NW	26	134	NW	26
3			23	82	NNW	20	119	SSW	31
4			24	89	NW	25	149	NW	25
5			21	72	2个	2天	125	WNW	8
6			17	77	S	26	139	S	26
7			15	105	NE	28	172	NE	28
8			17	71	NNW	3	112	NNW	6
9			14	111	NE	6	185	NE	6
10			29	76	NW	3天	127	NNW	13
11			23	84	NW	7	136	NW	7
12			26	79	NW	12	119	2个	2天
年合计	---	---	---	---	---	---	---	---	---
年极值			---	111	NE	6/9	185	NE	6/9
年平均	---	---	21	---	---	---	---	---	---

月份	日照时数(0.1h) 旬合计 上	中	下	合计	百分率	量别日数 ≥60%	≤20%
1	378	679	335	1392	42	12	12
2	351	643	223	1217	39	8	8
3	115	121	249	485	13	2	24
4	84	49	337	470	12	2	22
5	293	200	311	804	20	1	16
6	607	513	194	1314	32	8	15
7	581	864	699	2144	51	14	6
8	359	433	761	1553	39	8	9
9	736	638	845	2219	60	17	1
10	630	267	385	1282	36	11	15
11	182	214	452	848	26	4	18
12	852	504	135	1491	45	13	11
年合计	---	---	---	15219	年百分率	100	157
年极值	---	---	---	---		---	---
年平均	---	---	---	---	34	---	---

Fig. 3 The fourth page of the annual report in Mengshan in 2021 (ground 0 cm – 3.20 m, A, DYF, S)

4 Conclusions

It assists in providing relevant data for the Wuzhou Climate Yearbook every year. Due to the issues of error prone and low efficiency in manual operations, automated processing is particularly important for filling climate yearbook. In this paper, it introduces how to design a Wuzhou Meteorological Statistical Yearbook System based on Python, and briefly explains the implementation of each functional module of the system. The implementation of this system is of great significance for the statistical work of the Wuzhou Climate Yearbook.

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(From page 22)

exceeded 30 m/s, and the lower south branch jet at 700 hPa reached 22 m/s (at the strongest time), which provided powerful thermal and dynamic conditions and abundant water vapor for the heavy snowfall weather.

(4) From the analysis of θ_{se}, it is found that the low layer always had certain warm and wet conditions during the heavy snowfall, and the rising and sinking movement coexisted. The relationship between the rising and sinking movement led to the southward movement of the θ_{se} steep area, which provided enough dynamic lifting and condensation conditions for the snowfall. The snowfall occurred near the steep area and in the warm-wet unstable region.

(5) The vertical distribution of temperature had a good indication of precipitation form. The middle and lower troposphere was controlled by warm advection, and there was a warm inversion layer, while the upper layer was controlled by strong cold advection, which was conducive to the transformation of ice crystals into snowflakes, so that they fell to the ground in the form of snowflakes.

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