Part 1

Step 1

The part 1 step 1 scraps the data of the table from the spaceweather website with the help of Beautiful Soup library. After scrapping the data, the region is four digit hence I added leading 0s and created the dataframe with the help of pandas. I even got rid of '+' and made '20' to '20.0' for consistency in the data with lambda equations

In [1]:
```
import requests
from bs4 import BeautifulSoup
from urllib.parse import urlparse
import pandas as pd
import lxml
import numpy as np
import matplotlib.pyplot as plt
import re
```

In [2]:
```
headers = {'User-Agent': 'Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/50.0.2661.102 Safari/537.36'}
r = requests.get('https://www.spaceweatherlive.com/en/solar-activity/top-50-solar-flares.html', headers=headers)
```

In [3]:
```
root = BeautifulSoup(r.content, 'lxml')
```

In [4]:
```
content = root.find("div", {"class": "col-md-8"}).find('table').prettify()
```

In [5]:
```
table = pd.read_html(content)
```

In [6]:
```
df = table[0]
df.columns = ['rank', 'x_classification', 'date', 'region', 'start_time', 'maximum_time', 'end_time', 'movie']
df = df.set_index([pd.Index(range(1,51))])
df['region'] = df['region'].apply(lambda x: '{0:0>4}'.format(x) if len(str(x)) < 4 else str(x))
df['x_classification'] = df['x_classification'].apply(lambda x: x[0]+str(float(x[1:-1])) if '+' in x else x)
df['x_classification'] = df['x_classification'].apply(lambda x: x[0]+str(float(x[1:])))
```

In [7]:
```
(r,c) = df.shape
print("Dimension: %d x %d" %(r,c))
df
```

```
Dimension: 50 x 8
```

Out[7]:

	rank	x_classification	date	region	start_time	maximum_time	end_time	movie
1	1	X28.0	2003/11/04	0486	19:29	19:53	20:06	Movie View archive
2	2	X20.0	2001/04/02	9393	21:32	21:51	22:03	Movie View archive
3	3	X17.2	2003/10/28	0486	09:51	11:10	11:24	Movie View archive
4	4	X17.0	2005/09/07	0808	17:17	17:40	18:03	Movie View archive
5	5	X14.4	2001/04/15	9415	13:19	13:50	13:55	Movie View archive
6	6	X10.0	2003/10/29	0486	20:37	20:49	21:01	Movie View archive
7	7	X9.4	1997/11/06	8100	11:49	11:55	12:01	Movie View archive
8	8	X9.3	2017/09/06	2673	11:53	12:02	12:10	Movie View archive
9	9	X9.0	2006/12/05	0930	10:18	10:35	10:45	Movie View archive
10	10	X8.3	2003/11/02	0486	17:03	17:25	17:39	Movie View archive
11	11	X8.2	2017/09/10	2673	15:35	16:06	16:31	Movie View archive
12	12	X7.1	2005/01/20	0720	06:36	07:01	07:26	Movie View archive
13	13	X6.9	2011/08/09	1263	07:48	08:05	08:08	Movie View archive
14	14	X6.5	2006/12/06	0930	18:29	18:47	19:00	Movie View archive
15	15	X6.2	2005/09/09	0808	19:13	20:04	20:36	Movie View archive
16	16	X6.2	2001/12/13	9733	14:20	14:30	14:35	Movie View archive
17	17	X5.7	2000/07/14	9077	10:03	10:24	10:43	Movie View archive
18	18	X5.6	2001/04/06	9415	19:10	19:21	19:31	Movie View archive
19	19	X5.4	2012/03/07	1429	00:02	00:24	00:40	Movie View archive
20	20	X5.4	2005/09/08	0808	20:52	21:06	21:17	Movie View archive
21	21	X5.4	2003/10/23	0486	08:19	08:35	08:49	Movie View archive
22	22	X5.3	2001/08/25	9591	16:23	16:45	17:04	Movie View archive
23	23	X4.9	2014/02/25	1990	00:39	00:49	01:03	Movie View archive
24	24	X4.9	1998/08/18	8307	22:10	22:19	22:28	View archive
25	25	X4.8	2002/07/23	0039	00:18	00:35	00:47	Movie View archive
26	26	X4.0	2000/11/26	9236	16:34	16:48	16:56	Movie View archive
27	27	X3.9	2003/11/03	0488	09:43	09:55	10:19	Movie View archive
28	28	X3.9	1998/08/19	8307	21:35	21:45	21:50	View archive
29	29	X3.8	2005/01/17	0720	06:59	09:52	10:07	Movie View archive
30	30	X3.7	1998/11/22	8384	06:30	06:42	06:49	Movie View archive
31	31	X3.6	2005/09/09	0808	09:42	09:59	10:08	Movie View archive
32	32	X3.6	2004/07/16	0649	13:49	13:55	14:01	Movie View archive
33	33	X3.6	2003/05/28	0365	00:17	00:27	00:39	Movie View archive
34	34	X3.4	2006/12/13	0930	02:14	02:40	02:57	Movie View archive
35	35	X3.4	2001/12/28	9767	20:02	20:45	21:32	Movie View archive
36	36	X3.3	2013/11/05	1890	22:07	22:12	22:15	Movie View archive
37	37	X3.3	2002/07/20	0039	21:04	21:30	21:54	Movie View archive
38	38	X3.3	1998/11/28	8395	04:54	05:52	06:13	Movie View archive
39	39	X3.2	2013/05/14	1748	00:00	01:11	01:20	Movie View archive
40	40	X3.1	2014/10/24	2192	21:07	21:41	22:13	Movie View archive
41	41	X3.1	2002/08/24	0069	00:49	01:12	01:31	Movie View archive
42	42	X3.0	2002/07/15	0030	19:59	20:08	20:14	Movie View archive
43	43	X2.8	2013/05/13	1748	15:48	16:05	16:16	Movie View archive
44	44	X2.8	2001/12/11	9733	07:58	08:08	08:14	Movie View archive
45	45	X2.8	1998/08/18	8307	08:14	08:24	08:32	View archive
46	46	X2.7	2015/05/05	2339	22:05	22:11	22:15	Movie View archive
47	47	X2.7	2003/11/03	0488	01:09	01:30	01:45	Movie View archive
48	48	X2.7	1998/05/06	8210	07:58	08:09	08:20	Movie View archive
49	49	X2.6	2005/01/15	0720	22:25	23:02	23:31	Movie View archive
50	50	X2.6	2001/09/24	9632	09:32	10:38	11:09	Movie View archive

Step 2

Step 2 of the project was to combine date and time of the events and dropping certain columns in the dataframe. With the help of pandas to_datetime() function created a datetime object and stored it with the help of .at[] on dataframe. I also renamed the columns name with the rename() function and dropped the unecessary columns.

In [8]:

```
# iterate over each row of the dataframe
for index, row in df.iterrows():
    # create the datetime objects
    row['start_time'] = pd.to_datetime(row['date'] + ' ' + row['start_time'])
    row['maximum_time'] = pd.to_datetime(row['date'] + ' ' + row['maximum_time'])
    row['end_time'] = pd.to_datetime(row['date'] + ' ' + row['end_time'])
    df.at[index,'start_time'] = row['start_time']
    df.at[index,'maximum_time'] = row['maximum_time']
    df.at[index,'end_time'] = row['end_time']

# replace the '-' with NaN
df['region'] = df['region'].apply(lambda x: np.nan if x == '-' else x)


df['temp'] = df['region']
df['region'] = df['movie']
df['movie'] = df['temp']

# renaming the columns
df = df.rename(columns={'start_time':"start_datetime",'end_time':"end_datetime",'maximum_time':"maximum_datetime", "x_classification":'x_class','temp':'region', 're
gion':'movie'})

# droping columns
df = df.drop('movie', 1)
df = df.drop('date',1)
```

In [9]:
```
(r,c) = df.shape
print("A dataframe: %d x %d" %(r,c))
df
```

```
A dataframe: 50 x 6
```

Out[9]:

	rank	x_class	start_datetime	maximum_datetime	end_datetime	region
1	1	X28.0	2003-11-04 19:29:00	2003-11-04 19:53:00	2003-11-04 20:06:00	0486
2	2	X20.0	2001-04-02 21:32:00	2001-04-02 21:51:00	2001-04-02 22:03:00	9393
3	3	X17.2	2003-10-28 09:51:00	2003-10-28 11:10:00	2003-10-28 11:24:00	0486
4	4	X17.0	2005-09-07 17:17:00	2005-09-07 17:40:00	2005-09-07 18:03:00	0808
5	5	X14.4	2001-04-15 13:19:00	2001-04-15 13:50:00	2001-04-15 13:55:00	9415
6	6	X10.0	2003-10-29 20:37:00	2003-10-29 20:49:00	2003-10-29 21:01:00	0486
7	7	X9.4	1997-11-06 11:49:00	1997-11-06 11:55:00	1997-11-06 12:01:00	8100
8	8	X9.3	2017-09-06 11:53:00	2017-09-06 12:02:00	2017-09-06 12:10:00	2673
9	9	X9.0	2006-12-05 10:18:00	2006-12-05 10:35:00	2006-12-05 10:45:00	0930
10	10	X8.3	2003-11-02 17:03:00	2003-11-02 17:25:00	2003-11-02 17:39:00	0486
11	11	X8.2	2017-09-10 15:35:00	2017-09-10 16:06:00	2017-09-10 16:31:00	2673
12	12	X7.1	2005-01-20 06:36:00	2005-01-20 07:01:00	2005-01-20 07:26:00	0720
13	13	X6.9	2011-08-09 07:48:00	2011-08-09 08:05:00	2011-08-09 08:08:00	1263
14	14	X6.5	2006-12-06 18:29:00	2006-12-06 18:47:00	2006-12-06 19:00:00	0930
15	15	X6.2	2005-09-09 19:13:00	2005-09-09 20:04:00	2005-09-09 20:36:00	0808
16	16	X6.2	2001-12-13 14:20:00	2001-12-13 14:30:00	2001-12-13 14:35:00	9733
17	17	X5.7	2000-07-14 10:03:00	2000-07-14 10:24:00	2000-07-14 10:43:00	9077
18	18	X5.6	2001-04-06 19:10:00	2001-04-06 19:21:00	2001-04-06 19:31:00	9415
19	19	X5.4	2012-03-07 00:02:00	2012-03-07 00:24:00	2012-03-07 00:40:00	1429
20	20	X5.4	2005-09-08 20:52:00	2005-09-08 21:06:00	2005-09-08 21:17:00	0808
21	21	X5.4	2003-10-23 08:19:00	2003-10-23 08:35:00	2003-10-23 08:49:00	0486
22	22	X5.3	2001-08-25 16:23:00	2001-08-25 16:45:00	2001-08-25 17:04:00	9591
23	23	X4.9	2014-02-25 00:39:00	2014-02-25 00:49:00	2014-02-25 01:03:00	1990
24	24	X4.9	1998-08-18 22:10:00	1998-08-18 22:19:00	1998-08-18 22:28:00	8307
25	25	X4.8	2002-07-23 00:18:00	2002-07-23 00:35:00	2002-07-23 00:47:00	0039
26	26	X4.0	2000-11-26 16:34:00	2000-11-26 16:48:00	2000-11-26 16:56:00	9236
27	27	X3.9	2003-11-03 09:43:00	2003-11-03 09:55:00	2003-11-03 10:19:00	0488
28	28	X3.9	1998-08-19 21:35:00	1998-08-19 21:45:00	1998-08-19 21:50:00	8307
29	29	X3.8	2005-01-17 06:59:00	2005-01-17 09:52:00	2005-01-17 10:07:00	0720
30	30	X3.7	1998-11-22 06:30:00	1998-11-22 06:42:00	1998-11-22 06:49:00	8384
31	31	X3.6	2005-09-09 09:42:00	2005-09-09 09:59:00	2005-09-09 10:08:00	0808
32	32	X3.6	2004-07-16 13:49:00	2004-07-16 13:55:00	2004-07-16 14:01:00	0649
33	33	X3.6	2003-05-28 00:17:00	2003-05-28 00:27:00	2003-05-28 00:39:00	0365
34	34	X3.4	2006-12-13 02:14:00	2006-12-13 02:40:00	2006-12-13 02:57:00	0930
35	35	X3.4	2001-12-28 20:02:00	2001-12-28 20:45:00	2001-12-28 21:32:00	9767
36	36	X3.3	2013-11-05 22:07:00	2013-11-05 22:12:00	2013-11-05 22:15:00	1890
37	37	X3.3	2002-07-20 21:04:00	2002-07-20 21:30:00	2002-07-20 21:54:00	0039
38	38	X3.3	1998-11-28 04:54:00	1998-11-28 05:52:00	1998-11-28 06:13:00	8395
39	39	X3.2	2013-05-14 00:00:00	2013-05-14 01:11:00	2013-05-14 01:20:00	1748
40	40	X3.1	2014-10-24 21:07:00	2014-10-24 21:41:00	2014-10-24 22:13:00	2192
41	41	X3.1	2002-08-24 00:49:00	2002-08-24 01:12:00	2002-08-24 01:31:00	0069
42	42	X3.0	2002-07-15 19:59:00	2002-07-15 20:08:00	2002-07-15 20:14:00	0030
43	43	X2.8	2013-05-13 15:48:00	2013-05-13 16:05:00	2013-05-13 16:16:00	1748
44	44	X2.8	2001-12-11 07:58:00	2001-12-11 08:08:00	2001-12-11 08:14:00	9733
45	45	X2.8	1998-08-18 08:14:00	1998-08-18 08:24:00	1998-08-18 08:32:00	8307
46	46	X2.7	2015-05-05 22:05:00	2015-05-05 22:11:00	2015-05-05 22:15:00	2339
47	47	X2.7	2003-11-03 01:09:00	2003-11-03 01:30:00	2003-11-03 01:45:00	0488
48	48	X2.7	1998-05-06 07:58:00	1998-05-06 08:09:00	1998-05-06 08:20:00	8210
49	49	X2.6	2005-01-15 22:25:00	2005-01-15 23:02:00	2005-01-15 23:31:00	0720
50	50	X2.6	2001-09-24 09:32:00	2001-09-24 10:38:00	2001-09-24 11:09:00	9632

Step 3

In Step 3 I scrapped information from the NASA pre tag and got rid of various html tags such as anchor tag and split the each line based of space and created rows and column of the dataframe. I even dropped of various columns and renamed the columns for better understanding.

In [10]:
```
r = requests.get('https://cdaw.gsfc.nasa.gov/CME_list/radio/waves_type2.html')
root = BeautifulSoup(r.content, 'lxml')
pre = root.find('pre').prettify()
result = []

# split the information based '\n' or newline
for each in pre.split('\n')[1:-1]:

    # split based on spaces
    if each != "" and each[0].isnumeric():
        # got rid of <a href..> and unecessary spaces
        each = re.sub('<.*?>','',each)
        row = re.split('\s+', each)
        result.append(row)

# created the dataframe
nasa_df = pd.DataFrame(result)
```

In [11]:
```
# delected the unecessary columns
nasa_df = nasa_df.drop([15,16,17,18,19,20,21,22,23],axis=1)
```

In [12]:
```
nasa_df.columns = ['start_date', 'start_time', 'end_date', 'end_time', 'start_frequency', 'end_frequency', 'flare_location', 'flare_region','flare_classification',
'cme_date', 'cme_time', 'cme_angle', 'cme_width', 'cme_speed','plot']
```

In [13]:

```
pd.set_option('display.max_rows', 550)
(r,c) = nasa_df.shape
print("A dataframe: %d x %d" %(r,c))
nasa_df
```

A dataframe: 518 x 15

Out[13]:

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
0	1997/04/01	14:00	04/01	14:15	8000	4000	S25E16	8026	M1.3	04/01	15:18	74	79	312	PHTX
1	1997/04/07	14:30	04/07	17:30	11000	1000	S28E19	8027	C6.8	04/07	14:27	Halo	360	878	PHTX
2	1997/05/12	05:15	05/14	16:00	12000	80	N21W08	8038	C1.3	05/12	05:30	Halo	360	464	PHTX
3	1997/05/21	20:20	05/21	22:00	5000	500	N05W12	8040	M1.3	05/21	21:00	263	165	296	PHTX
4	1997/09/23	21:53	09/23	22:16	6000	2000	S29E25	8088	C1.4	09/23	22:02	133	155	712	PHTX
5	1997/11/03	05:15	11/03	12:00	14000	250	S20W13	8100	C8.6	11/03	05:28	240	109	227	PHTX
6	1997/11/03	10:30	11/03	11:30	14000	5000	S16W21	8100	M4.2	11/03	11:11	233	122	352	PHTX
7	1997/11/04	06:00	11/05	04:30	14000	100	S14W33	8100	X2.1	11/04	06:10	Halo	360	785	PHTX
8	1997/11/06	12:20	11/07	08:30	14000	100	S18W63	8100	X9.4	11/06	12:10	Halo	360	1556	PHTX
9	1997/11/27	13:30	11/27	14:00	14000	7000	N17E63	8113	X2.6	11/27	13:56	98	91	441	PHTX
10	1997/12/12	22:45	12/12	23:20	14000	8000	N25W52	8116	B9.4	12/13	00:26	278	73	191	PHTX
11	1998/01/25	15:03	01/25	15:18	14000	10000	N21E25	8141	C1.1	01/25	15:26	Halo	360	693	PHTX
12	1998/03/29	03:40	03/29	03:52	14000	7000	SW90	-----	----	03/29	03:48	Halo	360	1397	PHTX
13	1998/04/20	10:25	04/22	06:00	10000	35	S22W90	8194	M1.4	04/20	10:07	284	165	1863	PHTX
14	1998/04/23	06:00	04/23	15:30	14000	200	S17E90	8210	X1.2	04/23	05:55	Halo	360	1691	PHTX
15	1998/04/24	09:17	04/24	09:25	4700	2600	S20E90	8210	C8.9	04/24	08:55	100	84	1184	PHTX
16	1998/04/27	09:20	04/27	10:00	10000	1000	S16E50	8210	X1.0	04/27	08:56	Halo	360	1385	PHTX
17	1998/04/29	16:30	04/29	17:00	10000	2000	S18E20	8210	M6.8	04/29	16:58	Halo	360	1374	PHTX
18	1998/05/02	14:25	05/02	14:50	5000	3000	S15W15	8210	X1.1	05/02	14:06	Halo	360	938	PHTX
19	1998/05/06	08:25	05/06	08:35	14000	5000	S11W65	8210	X2.7	05/06	08:29	309	190	1099	PHTX
20	1998/05/09	03:35	05/09	10:00	9000	400	S14W89	8210	M7.7	05/09	03:35	262	178	2331	PHTX
21	1998/05/11	21:40	05/11	22:00	10000	1000	N32W90	8214	B6.6	05/11	21:55	208	>301	830	PHTX
22	1998/05/19	10:00	05/19	11:30	14000	3000	N23W43	8222	B5.7	05/19	10:27	268	139	801	PHTX
23	1998/05/27	13:30	05/27	14:20	4000	1000	N19W62	8226	C7.5	05/27	13:45	175	268	878	PHTX
24	1998/06/11	10:15	06/11	10:20	8000	4000	N16E86	8243	M1.4	06/11	10:28	123	177	1223	PHTX
25	1998/06/16	18:20	06/17	21:00	12000	50	S22W90	8232	M1.0	06/16	18:27	341	281	1484	PHTX
26	1998/06/20	19:39	06/20	20:00	2600	1800	BACK	-----	----	06/20	18:20	Halo	360	964	PHTX
27	1998/06/22	07:15	06/22	09:20	6000	2000	N16W46	8243	C2.9	06/22	05:01	265	59	206	PHTX
28	1998/11/02	14:00	11/02	14:40	14000	4000	S25E44	8373	C4.4	11/02	14:18	116	169	661	PHTX
29	1998/11/05	22:00	11/07	08:00	5000	50	N22W18	8375	M8.4	11/05	20:44	Halo	360	1118	PHTX
30	1998/11/06	03:00	11/06	05:30	5000	1000	BACK	-----	----	11/06	02:18	159	>160	405	PHTX
31	1998/11/07	00:20	11/07	00:50	14000	6000	BACK	-----	----	11/07	01:54	296	19	381	PHTX
32	1998/11/08	11:20	11/08	11:30	10000	8000	S21W37	-----	C5.9	11/08	11:54	264	196	559	PHTX
33	1998/12/18	17:50	12/18	18:15	14000	5000	N19E64	8415	M8.0	12/18	18:09	Halo	360	1749	PHTX
34	1999/04/24	13:50	04/25	00:00	3700	100	NW90b	-----	----	04/24	13:31	Halo	360	1495	PHTX
35	1999/05/03	05:50	05/03	08:45	8000	200	N15E32	8525	M4.4	05/03	06:06	Halo	360	1584	PHTX
36	1999/05/27	10:55	05/28	10:00	14000	70	W90b	-----	----	05/27	11:06	Halo	360	1691	PHTX
37	1999/06/01	18:50	06/02	09:00	14000	400	NW90b	-----	----	06/01	19:37	Halo	360	1772	PHTX
38	1999/06/04	07:05	06/05	01:00	14000	60	N17W69	8552	M3.9	06/04	07:26	289	150	2230	PHTX
39	1999/06/11	11:45	06/11	17:00	14000	400	N38E90	-----	C8.8	06/11	11:26	35	>181	1569	PHTX
40	1999/06/22	18:25	06/22	18:40	3000	2000	N22E37	8592	M1.7	06/22	18:54	Halo	360	1133	PHTX
41	1999/06/23	05:50	06/23	07:10	12000	2000	BACK	-----	----	06/23	06:06	264	>154	450	PHTX
42	1999/06/23	07:07	06/23	07:14	14000	2000	N23E42	8596	M1.7	06/23	07:31	Halo	360	1006	PHTX
43	1999/06/28	21:03	06/28	21:10	3500	1500	N22W44	8592	C3.5	06/28	21:30	336	>184	903	PHTX
44	1999/06/29	19:20	06/29	19:55	14000	2000	S14E01	8603	M1.6	06/29	19:54	Halo	360	560	PHTX
45	1999/07/05	03:10	07/05	04:05	2000	1000	SW90b	8603	C7.6	07/05	02:54	284	190	670	PHTX
46	1999/08/28	18:25	08/28	18:33	16000	12000	S26W14	8674	X1.1	08/28	18:26	120	245	462	PHTX
47	1999/09/03	03:00	09/03	04:10	2000	1000	S36W24	8679	C2.1	09/03	00:06	184	175	512	PHTX
48	1999/09/10	07:30	09/10	07:35	5500	2000	NW90b	-----	----	09/10	07:54	18	125	1467	PHTX
49	1999/10/14	09:10	10/14	10:00	14000	4000	N11E32	8731	X1.8	10/14	09:26	Halo	360	1250	PHTX
50	1999/10/17	23:27	10/17	23:33	11500	10000	N03E38	-----	----	10/18	00:06	40	87	247	PHTX
51	1999/11/16	03:27	11/16	03:48	7000	4000	N17E38	8766	M3.8	11/16	03:06	81	98	636	PHTX
52	1999/11/16	05:17	11/16	05:34	14000	7000	N08W39	8759	M1.8	11/16	05:30	285	129	712	PHTX
53	2000/01/18	17:31	01/18	22:00	14000	500	S19E11	8831	M3.9	01/18	17:54	Halo	360	739	PHTX
54	2000/01/28	20:20	01/28	20:24	2200	1100	S31W17	8841	C4.7	01/28	20:12	Halo	360	1177	PHTX
55	2000/02/05	19:34	02/05	19:38	5800	2900	N26E52	8858	X1.2	02/05	19:54	60	76	632	PHTX
56	2000/02/08	09:05	02/11	02:20	12000	20	N25E26	8858	M1.3	02/08	09:30	Halo	360	1079	PHTX
57	2000/02/10	01:55	02/10	02:00	14000	8000	N31E04	8858	C7.3	02/10	02:30	Halo	360	944	PHTX
58	2000/02/12	03:55	02/12	09:20	4000	400	N26W23	8858	M1.7	02/12	04:31	Halo	360	1107	PHTX
59	2000/02/17	20:42	02/18	22:12	14000	100	S29E07	8872	M1.3	02/17	21:30	Halo	360	728	PHTX
60	2000/02/18	09:44	02/18	09:54	2000	1200	NW90b	-----	C1.1	02/18	09:54	286	118	890	PHTX
61	2000/03/02	13:50	03/02	14:03	14000	6000	S20W58	8882	M6.5	03/02	13:54	235	76	835	PHTX
62	2000/03/07	16:24	03/07	16:48	14000	4500	S22E77	8906	M1.2	03/07	16:30	120	108	644	PHTX
63	2000/03/27	06:56	03/27	06:58	14000	10000	S00E90	8932	C2.3	03/27	07:31	129	90	487	PHTX
64	2000/04/04	15:45	04/04	16:00	14000	9000	N16W66	8933	C9.7	04/04	16:32	Halo	360	1188	PHTX
65	2000/04/09	23:15	04/09	23:45	4500	1000	S14W01	8948	M3.1	04/10	00:30	Halo	360	409	PHTX
66	2000/04/18	15:00	04/18	16:00	14000	6000	S50W30	altr	FILA	04/18	14:54	195	105	668	PHTX
67	2000/05/04	11:10	05/04	13:00	6500	1000	S17W87	8970	M6.8	05/04	11:26	235	>170	1404	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
68	2000/05/05	16:35	05/05	17:30	14000	2500	S17W87	8970	M1.5	05/05	15:50	Halo	360	1594	PHTX
69	2000/05/07	21:15	05/07	24:00	14000	500	W90b	-----	----	05/07	20:50	Halo	360	1781	PHTX
70	2000/05/12	23:34	05/12	23:42	14000	7000	E90b	-----	----	05/12	23:26	Halo	360	2604	PHTX
71	2000/05/15	16:47	05/16	14:00	4800	40	S24W67	8993	C7.8	05/15	16:26	257	>165	1212	PHTX
72	2000/06/02	22:00	06/02	22:15	14000	8000	N16E60	9026	M7.6	06/02	21:30	69	104	547	PHTX
73	2000/06/06	15:20	06/08	09:00	14000	40	N20E18	9026	X2.3	06/06	15:54	Halo	360	1119	PHTX
74	2000/06/10	17:15	06/10	18:45	10000	1000	N22W38	9026	M5.2	06/10	17:08	Halo	360	1108	PHTX
75	2000/06/15	19:52	06/15	19:56	5000	2500	N20W65	9041	M1.8	06/15	20:06	298	116	1081	PHTX
76	2000/06/17	03:00	06/17	04:15	14000	1000	N22W72	9041	M3.5	06/17	03:28	298	133	857	PHTX
77	2000/06/23	14:40	06/23	15:05	14000	2000	N26W72	9042	M3.0	06/23	14:54	282	>198	847	PHTX
78	2000/06/25	08:10	06/25	09:00	12000	2500	N16W55	9046	M1.9	06/25	07:54	262	165	1617	PHTX
79	2000/07/10	22:00	07/10	23:30	14000	1000	N18E49	9077	M5.7	07/10	21:50	67	>289	1352	PHTX
80	2000/07/11	13:00	07/11	13:30	12000	1000	N18E27	9077	X1.0	07/11	13:27	Halo	360	1078	PHTX
81	2000/07/12	20:05	07/12	20:35	6000	1000	N19W61	9070	M1.5	07/12	20:30	281	101	820	PHTX
82	2000/07/14	10:30	07/15	14:30	14000	80	N22W07	9077	X5.7	07/14	10:54	Halo	360	1674	PHTX
83	2000/07/22	11:45	07/22	12:45	14000	2000	N14W56	9085	M3.7	07/22	11:54	259	>229	1230	PHTX
84	2000/08/11	11:35	08/11	11:59	2800	2000	NW90b	-----	----	08/11	07:31	273	70	1071	PHTX
85	2000/09/12	12:00	09/13	12:20	14000	60	S19W06	DSF	M1.0	09/12	11:54	Halo	360	1550	PHTX
86	2000/09/12	18:15	09/12	19:00	2000	1000	NE90b	-----	----	09/12	17:30	Halo	360	1053	PHTX
87	2000/09/16	04:30	09/16	10:30	14000	400	N14W07	9165	M5.9	09/16	05:18	Halo	360	1215	PHTX
88	2000/09/19	08:45	09/19	10:20	12000	1500	N14W46	9165	M5.1	09/19	08:50	283	76	766	PHTX
89	2000/09/25	02:20	09/25	03:00	14000	1000	N09W18	9169	M1.8	09/25	02:50	Halo	360	587	PHTX
90	2000/10/16	07:10	10/16	08:00	14000	1000	N03W90	9182	M2.5	10/16	07:27	Halo	360	1336	PHTX
91	2000/10/25	09:30	10/25	24:00	10000	300	N09W63	9199	C4.0	10/25	08:26	Halo	360	770	PHTX
92	2000/11/03	18:35	11/03	18:45	4000	2500	N02W02	9213	C3.2	11/03	18:26	Halo	360	291	PHTX
93	2000/11/08	23:20	11/09	12:00	4000	200	N10W77	9213	M7.4	11/08	23:06	271	>170	1738	PHTX
94	2000/11/09	16:15	11/11	04:00	10000	40	S11E10	9221	M1.0	--/--	--:--	----	----	----	PHTX
95	2000/11/12	14:25	11/12	14:40	3000	2000	S14E05	9227	C4.4	11/12	14:50	257	50	581	PHTX
96	2000/11/23	08:16	11/23	08:35	14000	9000	S26W40	9238	C5.4	11/23	06:06	Halo	360	492	PHTX
97	2000/11/23	21:00	11/23	21:06	3500	3000	S20E60	9239	C7.9	11/23	21:30	124	148	1198	PHTX
98	2000/11/24	05:10	11/24	15:00	14000	100	N20W05	9236	X2.0	11/24	05:30	Halo	360	1289	PHTX
99	2000/11/24	15:25	11/24	22:00	14000	200	N22W07	9236	X2.3	11/24	15:30	Halo	360	1245	PHTX
100	2000/11/24	22:24	11/24	22:36	4000	3000	N21W14	9236	X1.8	11/24	22:06	Halo	360	1005	PHTX
101	2000/11/25	01:25	11/25	02:25	14000	3000	N07E50	9240	M8.2	11/25	01:31	Halo	360	2519	PHTX
102	2000/11/25	19:00	11/25	19:35	6000	2000	N20W23	9236	X1.9	11/25	19:31	Halo	360	671	PHTX
103	2000/11/25	19:55	11/25	20:25	13000	4000	N20W27	9236	----	11/25	21:30	345	59	388	PHTX
104	2000/11/26	17:00	11/26	17:15	14000	7000	N18W38	9236	X4.0	11/26	17:06	Halo	360	980	PHTX
105	2000/12/28	12:40	12/28	13:38	14000	1900	Back	-----	----	12/28	12:06	Halo	360	930	PHTX
106	2001/01/20	19:12	01/20	19:16	14000	6000	S07E40	9313	M1.2	01/20	19:31	Halo	360	839	PHTX
107	2001/01/20	21:30	01/20	24:00	14000	500	S07E46	9313	M7.7	01/20	21:30	Halo	360	1507	PHTX
108	2001/01/26	12:06	01/26	14:20	14000	400	S23W57	9320	C1.6	01/26	12:06	276	176	928	PHTX
109	2001/01/28	15:45	01/28	17:00	14000	200	S04W59	9313	M1.5	01/28	15:54	Halo	360	916	PHTX
110	2001/02/11	01:40	02/11	01:55	12000	5500	N24W57	9346	C6.5	02/11	01:31	Halo	360	1183	PHTX
111	2001/03/10	04:18	03/10	04:32	14000	4000	N27W42	9368	M6.7	03/10	04:26	297	81	819	PHTX
112	2001/03/12	05:35	03/12	05:45	3000	1500	BACK	-----	----	03/12	05:50	233	48	829	PHTX
113	2001/03/27	02:35	03/27	03:15	6000	1000	N14E17	9393	C7.3	03/27	02:06	154	60	300	PHTX
114	2001/03/27	15:00	03/27	15:20	4000	1500	N15E14	9393	C5.6	03/27	17:06	46	66	340	PHTX
115	2001/03/29	10:12	03/30	06:00	4000	60	N20W19	9393	X1.7	03/29	10:26	Halo	360	942	PHTX
116	2001/04/02	11:30	04/02	12:00	14000	5000	N20W70	9393	X1.1	04/02	11:26	270	80	992	PHTX
117	2001/04/02	22:05	04/03	02:30	14000	250	N19W72	9393	X20.	04/02	22:06	261	244	2505	PHTX
118	2001/04/03	03:40	04/03	07:25	14000	400	S21E83	9415	X1.2	04/03	03:26	108	292	1613	PHTX
119	2001/04/04	09:50	04/04	10:10	13000	3000	S21E68	9415	M1.6	04/04	09:50	86	89	1065	PHTX
120	2001/04/05	09:14	04/05	09:34	14000	7500	N14W85	9393	M8.4	04/05	09:06	283	205	1750	PHTX
121	2001/04/06	19:35	04/07	01:50	14000	230	S21E31	9415	X5.6	04/06	19:30	Halo	360	1270	PHTX
122	2001/04/09	15:53	04/10	01:00	12000	100	S21W04	9415	M7.9	04/09	15:54	Halo	360	1192	PHTX
123	2001/04/10	05:24	04/10	24:00	14000	100	S23W09	9415	X2.3	04/10	05:30	Halo	360	2411	PHTX
124	2001/04/11	13:15	04/11	14:15	14000	1500	S22W27	9415	M2.3	04/11	13:31	Halo	360	1103	PHTX
125	2001/04/12	10:20	04/12	10:40	14000	7000	S19W43	9415	X2.0	04/12	10:31	Halo	360	1184	PHTX
126	2001/04/15	14:05	04/16	13:00	14000	40	S20W85	9415	X14.	04/15	14:06	245	167	1199	PHTX
127	2001/04/18	02:55	04/18	14:00	1000	100	SW90b	-----	C2.2	04/18	02:30	Halo	360	2465	PHTX
128	2001/04/26	12:40	04/28	05:00	5000	20	N20W05	9433	M1.5	04/26	12:30	Halo	360	1006	PHTX
129	2001/05/07	12:00	05/07	13:50	2000	280	NW90b	-----	----	05/07	12:06	286	205	1223	PHTX
130	2001/05/12	23:52	05/13	00:12	3000	1000	S17E00	9455	M3.0	05/13	02:21	190	132	527	PHTX
131	2001/05/30	00:25	05/30	01:38	14000	1000	E90b	9481	----	05/30	00:06	70	216	2087	PHTX
132	2001/06/15	10:50	06/15	11:15	7000	3000	S26E41	9502	M6.3	06/15	10:31	185	119	1090	PHTX
133	2001/06/15	16:05	06/15	16:20	14000	3500	W90b	-----	----	06/15	15:56	Halo	360	1701	PHTX
134	2001/08/16	00:10	08/16	16:10	5400	150	Back	-----	----	08/15	23:54	Halo	360	1575	PHTX
135	2001/08/25	16:50	08/25	23:00	8000	170	S17E34	9591	X5.3	08/25	16:50	Halo	360	1433	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
136	2001/08/30	20:43	08/30	20:47	12000	10000	N15E44	9601	M3.0	08/30	21:26	82	76	351	PHTX
137	2001/09/03	18:48	09/03	19:00	12000	7500	S23E90	9607	M2.5	09/03	18:35	127	207	1352	PHTX
138	2001/09/15	11:50	09/15	12:05	14000	6000	S21W49	9608	M1.5	09/15	11:54	263	130	478	PHTX
139	2001/09/16	13:50	09/16	14:10	3000	2000	S13E15	9616	C8.9	09/16	14:30	131	68	584	PHTX
140	2001/09/17	08:35	09/17	08:47	14000	5400	S14E04	9616	M1.5	09/17	08:54	198	166	1009	PHTX
141	2001/09/20	18:43	09/20	18:57	14000	10000	N09W11	9631	M1.5	09/20	19:31	306	207	446	PHTX
142	2001/09/24	10:45	09/25	20:00	7000	30	S16E23	9632	X2.6	09/24	10:30	Halo	360	2402	PHTX
143	2001/09/27	08:15	09/28	07:00	4000	80	S15W40	EP	C9.5	09/27	08:06	224	138	669	PHTX
144	2001/10/01	07:00	10/01	18:30	1000	150	S24W81	9628	M9.1	10/01	05:30	Halo	360	1405	PHTX
145	2001/10/05	11:35	10/05	12:55	1400	500	SW90b	-----	----	10/05	10:30	Halo	360	1537	PHTX
146	2001/10/09	11:15	10/09	16:00	8000	200	S28E08	9653	M1.4	10/09	11:30	Halo	360	973	PHTX
147	2001/10/09	11:20	10/09	11:55	14000	2000	S28E08	9653	----	--/--	--:--	----	----	----	PHTX
148	2001/10/09	13:10	10/09	23:00	5000	50	BACK	-----	----	--/--	--:--	----	----	----	PHTX
149	2001/10/19	01:15	10/19	02:25	14000	1300	N16W18	9661	X1.6	10/19	01:27	Halo	360	558	PHTX
150	2001/10/19	16:45	10/21	16:40	14000	30	N15W29	9661	X1.6	10/19	16:50	Halo	360	901	PHTX
151	2001/10/22	15:15	10/22	17:40	8000	1200	S21E18	9672	M6.7	10/22	15:06	Halo	360	1336	PHTX
152	2001/10/25	15:30	10/27	23:00	14000	30	S16W21	9672	X1.3	10/25	15:26	Halo	360	1092	PHTX
153	2001/11/04	16:30	11/06	11:00	14000	70	N06W18	9684	X1.0	11/04	16:35	Halo	360	1810	PHTX
154	2001/11/17	05:35	11/17	06:40	11000	1700	S13E42	9704	M2.8	11/17	05:30	Halo	360	1379	PHTX
155	2001/11/22	20:50	11/22	22:23	8000	1000	S25W67	9698	M3.8	11/22	20:30	Halo	360	1443	PHTX
156	2001/11/22	22:40	11/24	02:30	14000	40	S17W36	9704	M9.9	11/22	23:30	Halo	360	1437	PHTX
157	2001/12/11	12:45	12/11	17:00	4500	750	SW90b	-----	----	12/11	09:54	263	121	891	PHTX
158	2001/12/25	11:25	12/25	12:40	14000	1000	SE90b	-----	----	12/25	11:30	Halo	360	1773	PHTX
159	2001/12/26	05:20	12/27	05:00	14000	150	N08W54	9742	M7.1	12/26	05:30	281	>212	1446	PHTX
160	2001/12/28	20:35	12/29	03:00	14000	350	S26E90	9756	X3.4	12/28	20:30	Halo	360	2216	PHTX
161	2001/12/29	20:45	12/29	21:05	3000	1500	BACK	-----	----	12/29	20:30	297	>211	819	PHTX
162	2002/01/08	18:30	01/09	24:00	14000	90	NE90b	-----	----	01/08	17:54	Halo	360	1794	PHTX
163	2002/01/14	06:25	01/14	21:30	12000	100	S28W83	9772	M4.4	01/14	05:35	Halo	360	1492	PHTX
164	2002/01/27	12:49	01/27	13:25	14000	3000	Back?	-----	----	01/27	12:30	Halo	360	1136	PHTX
165	2002/02/01	19:23	02/01	19:31	14000	11000	BACK	-----	----	02/01	19:54	350	89	448	PHTX
166	2002/02/21	12:35	02/21	12:50	4000	1500	N16W79	9825	M3.9	02/21	12:54	275	108	358	PHTX
167	2002/03/11	00:00	03/11	00:15	14000	8000	S11E90	9866	M2.3	03/10	23:06	Halo	360	1429	PHTX
168	2002/03/12	00:00	03/12	02:20	14000	2200	S15E45	-----	M5.0	03/11	23:30	Halo	360	950	PHTX
169	2002/03/15	22:45	03/15	23:30	14000	6000	S08W03	9866	M2.2	03/15	23:06	Halo	360	957	PHTX
170	2002/03/17	06:00	03/17	06:35	3000	1000	S20E24	9871	C3.1	03/17	04:06	141	56	658	PHTX
171	2002/03/18	02:55	03/18	05:35	14000	1000	S10W30	9873	M1.0	03/18	02:54	Halo	360	989	PHTX
172	2002/03/22	11:30	03/22	12:40	14000	500	S09W90	9866	M1.6	03/22	11:06	Halo	360	1750	PHTX
173	2002/03/22	13:10	03/22	13:35	3000	2000	S00W90	9866	M1.6	03/22	12:30	243	120	875	PHTX
174	2002/04/10	12:59	04/10	13:02	13000	12000	N15W14	9893	M8.2	04/10	13:27	340	159	650	PHTX
175	2002/04/14	07:50	04/14	08:10	14000	8000	N19W57	9893	C9.6	04/14	07:50	323	76	757	PHTX
176	2002/04/15	03:35	04/15	04:15	11000	1500	S15W01	9906	M1.2	04/15	03:50	Halo	360	720	PHTX
177	2002/04/17	08:30	04/19	04:00	5000	40	S14W34	9906	M2.6	04/17	08:26	Halo	360	1240	PHTX
178	2002/04/21	01:30	04/21	24:00	10000	60	S14W84	9906	X1.5	04/21	01:27	Halo	360	2393	PHTX
179	2002/04/30	14:15	04/30	14:23	4000	2500	S16E77	9934	C3.2	04/30	14:26	92	90	618	PHTX
180	2002/04/30	22:30	04/30	23:20	2000	500	W90b	-----	----	04/30	23:26	254	199	1103	PHTX
181	2002/05/02	23:50	05/03	00:10	2800	900	E90b	9937	----	05/02	23:18	119	99	902	PHTX
182	2002/05/16	01:50	05/16	03:30	9000	2000	S22E01	9948	C4.5	05/16	00:50	Halo	360	600	PHTX
183	2002/05/22	00:00	05/22	00:30	14000	8000	S25W64	9948	C9.7	05/22	00:06	230	186	1246	PHTX
184	2002/05/27	12:50	05/27	13:50	14000	5000	N18E18	9967	C3.7	05/27	13:27	49	>161	1106	PHTX
185	2002/07/07	11:35	07/07	20:00	14000	200	S19W90	10017	M1.0	07/07	11:30	277	>228	1423	PHTX
186	2002/07/09	19:46	07/09	20:40	1000	650	W90b	-----	----	07/09	19:31	Halo	360	1076	PHTX
187	2002/07/15	21:15	07/16	05:00	5000	175	N19W01	10030	M1.8	07/15	21:30	14	>188	1300	PHTX
188	2002/07/17	07:30	07/17	07:45	3500	2000	N21W17	10030	M8.5	07/17	07:31	36	177	716	PHTX
189	2002/07/18	07:55	07/18	08:45	14000	1500	N19W30	10030	X1.8	07/18	08:06	Halo	360	1099	PHTX
190	2002/07/18	20:55	07/18	21:40	6000	3000	E90b	10036	C3.3	07/18	19:31	Halo	360	2191	PHTX
191	2002/07/19	16:40	07/19	17:10	5000	1000	S15E90	-----	----	07/19	16:30	Halo	360	2047	PHTX
192	2002/07/20	21:30	07/20	22:20	10000	2000	S13E90	10039	X3.3	07/20	22:06	Halo	360	1941	PHTX
193	2002/07/23	00:50	07/23	04:00	11000	400	S13E72	10039	X4.8	07/23	00:42	Halo	360	2285	PHTX
194	2002/07/26	22:27	07/26	23:30	14000	2000	S19E26	10039	M8.7	07/26	22:06	Halo	360	818	PHTX
195	2002/07/29	12:10	07/29	12:45	4200	1300	N10W15	FILA	----	07/29	12:07	13	>236	562	PHTX
196	2002/08/03	19:20	08/03	20:30	14000	2000	S16W76	10039	X1.0	08/03	19:31	259	138	1150	PHTX
197	2002/08/14	02:20	08/14	24:00	1000	30	N09W54	10061	M2.3	08/14	02:30	297	133	1309	PHTX
198	2002/08/16	06:15	08/16	09:30	14000	300	N07W83	10061	M2.4	08/16	06:06	293	162	1378	PHTX
199	2002/08/16	12:20	08/17	21:00	14000	60	S14E20	10069	M5.2	08/16	12:30	Halo	360	1585	PHTX
200	2002/08/22	02:50	08/22	04:13	14000	3500	S07W62	-----	M5.4	08/22	02:06	Halo	360	998	PHTX
201	2002/08/24	01:45	08/24	03:25	5000	400	S02W81	10069	X3.1	08/24	01:27	Halo	360	1913	PHTX
202	2002/09/05	16:55	09/07	16:22	14000	30	N09E28	10102	C5.2	09/05	16:54	Halo	360	1748	PHTX
203	2002/09/10	15:19	09/10	16:00	14000	8500	S10E43	10105	M2.9	09/10	15:30	127	38	273	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
204	2002/09/27	13:35	09/27	14:30	14000	8000	N13E45	10134	M1.8	09/27	13:56	64	64	591	PHTX
205	2002/10/13	18:10	10/13	18:40	14000	4000	S07W54	10150	C4.7	10/13	19:35	252	141	373	PHTX
206	2002/10/14	00:19	10/14	02:00	1700	500	S13E75	10159	M2.2	10/13	23:54	107	264	1009	PHTX
207	2002/10/14	14:35	10/14	16:50	14000	1200	NE90b	-----	C4.5	10/14	14:54	Halo	360	1694	PHTX
208	2002/10/27	23:06	10/28	01:20	14000	300	SE90b	-----	----	10/27	23:18	Halo	360	2115	PHTX
209	2002/11/09	13:20	11/10	03:00	14000	100	S12W29	10180	M4.6	11/09	13:31	Halo	360	1838	PHTX
210	2002/11/10	03:20	11/10	06:00	3000	300	S12W37	10180	M2.4	11/10	03:30	203	282	1670	PHTX
211	2002/11/11	16:15	11/11	17:50	14000	600	S13W60	10180	M1.8	11/11	15:54	212	93	1083	PHTX
212	2002/11/24	20:05	11/24	20:45	14000	7000	N20E35	-----	----	11/24	20:30	Halo	360	1077	PHTX
213	2002/12/19	21:45	12/19	22:30	14000	1500	N15W09	10229	M2.7	12/19	22:06	Halo	360	1092	PHTX
214	2002/12/22	04:20	12/22	04:50	5500	3500	N23W42	10223	M1.1	12/22	03:30	328	272	1071	PHTX
215	2003/01/20	19:10	01/20	20:00	14000	6000	N34W26	FILA	C1.7	01/20	18:30	315	105	733	PHTX
216	2003/01/27	22:20	01/27	22:26	11000	8000	S17W23	FILA	C2.4	01/27	22:23	205	267	1053	PHTX
217	2003/03/18	12:25	03/18	13:45	4500	500	S15W46	10314	X1.5	03/18	12:30	263	209	1601	PHTX
218	2003/03/18	13:55	03/18	14:10	14000	7000	S90b	-----	----	03/18	13:54	Halo	360	1042	PHTX
219	2003/03/19	02:30	03/19	03:15	14000	6000	SW90b	-----	----	03/19	02:30	Halo	360	1342	PHTX
220	2003/04/22	07:25	04/22	08:22	3500	700	NE90b	-----	----	04/22	07:36	87	171	918	PHTX
221	2003/05/27	23:12	05/27	23:45	14000	2000	S07W17	10365	X1.3	05/27	23:50	Halo	360	964	PHTX
222	2003/05/28	01:00	05/29	00:30	1000	200	S07W20	10365	X3.6	05/28	00:50	Halo	360	1366	PHTX
223	2003/05/29	01:10	05/29	08:00	13000	200	S06W37	10365	X1.2	05/29	01:27	Halo	360	1237	PHTX
224	2003/05/31	03:00	05/31	08:00	1000	150	S07W65	10365	M9.3	05/31	02:30	Halo	360	1835	PHTX
225	2003/06/05	00:00	06/05	00:00	????	????	W90b	-----	----	06/05	20:06	230	239	1458	PHTX
226	2003/06/16	00:00	06/16	03:00	14000	400	S07E80	10386	X1.3	06/15	23:54	Halo	360	2053	PHTX
227	2003/06/17	22:50	06/18	05:30	10000	200	S07E55	10386	M6.8	06/17	23:18	Halo	360	1813	PHTX
228	2003/07/10	14:10	07/10	16:10	4000	400	N13W90	10397	M3.6	--/--	--:--	----	----	----	PHTX
229	2003/08/19	11:15	08/19	12:00	14000	1000	S10W57	10431	M2.7	08/19	10:30	262	111	468	PHTX
230	2003/10/21	04:10	10/21	04:55	5000	1000	SE90b	-----	----	10/21	03:54	Halo	360	1484	PHTX
231	2003/10/26	07:00	10/26	09:15	8000	1500	S15E44	10486	X1.2	10/26	06:54	108	>207	1371	PHTX
232	2003/10/26	17:45	10/26	19:40	14000	1500	N02W38	10484	X1.2	10/26	17:54	270	>171	1537	PHTX
233	2003/10/28	11:10	10/29	24:00	14000	40	S16E08	10486	X17.	10/28	11:30	Halo	360	2459	PHTX
234	2003/10/29	20:55	10/29	24:00	11000	500	S15W02	10486	X10.	10/29	20:54	Halo	360	2029	PHTX
235	2003/11/01	22:55	11/02	00:50	14000	2000	S12W60	10486	M3.2	11/01	23:06	254	>93	899	PHTX
236	2003/11/02	09:23	11/02	11:22	14000	550	SW90b	-----	----	11/02	09:30	Halo	360	2036	PHTX
237	2003/11/02	17:30	11/03	01:00	12000	250	S14W56	10486	X8.3	11/02	17:30	Halo	360	2598	PHTX
238	2003/11/03	01:15	11/03	01:25	3000	1500	N10W83	10488	X2.7	11/03	01:59	304	65	827	PHTX
239	2003/11/03	10:00	11/03	12:30	6000	400	N08W77	10488	X3.9	11/03	10:06	293	103	1420	PHTX
240	2003/11/04	20:00	11/04	24:00	10000	200	S19W83	10486	X28.	11/04	19:54	Halo	360	2657	PHTX
241	2003/11/09	00:00	11/09	00:00	????	????	E90b	-----	----	11/09	06:30	Halo	360	2008	PHTX
242	2003/11/11	00:00	11/11	00:00	????	????	W90b	-----	----	11/11	02:30	Halo	360	1359	PHTX
243	2003/11/13	09:35	11/13	10:50	14000	4000	N12E90	10501	M1.4	11/13	09:30	49	217	1141	PHTX
244	2003/11/17	09:05	11/17	09:20	4000	1500	S01E33	10501	M4.2	11/17	09:26	72	>242	1061	PHTX
245	2003/11/18	00:00	11/18	00:00	????	????	N00E18	10501	M3.9	11/18	08:50	Halo	360	1660	PHTX
246	2003/11/18	10:15	11/18	11:30	5000	2000	S16E90	10508	M4.5	11/18	09:50	95	>197	1824	PHTX
247	2003/12/02	11:00	12/02	12:00	14000	9000	S14W70	10508	C7.2	12/02	10:50	261	>150	1393	PHTX
248	2004/01/05	03:40	01/05	03:50	9000	2500	S12E38	10536	M6.9	--/--	--:--	----	----	----	PHTX
249	2004/01/06	06:40	01/06	07:23	14000	2000	N05E90	10537	M5.8	01/06	08:53	88	166	1469	PHTX
250	2004/01/07	04:15	01/07	06:15	14000	750	N02E82	10537	M4.5	01/07	04:06	78	171	1581	PHTX
251	2004/01/07	10:35	01/07	11:35	14000	1500	N06E75	10537	M8.3	01/07	10:30	81	182	1822	PHTX
252	2004/04/06	13:05	04/06	16:00	8000	300	S18E15	10588	M2.4	04/06	13:31	Halo	360	1368	PHTX
253	2004/04/08	10:25	04/08	12:50	3000	500	S15W11	10588	C7.4	04/08	10:30	Halo	360	1068	PHTX
254	2004/04/08	13:30	04/08	14:00	6000	3000	S19W08	10588	C1.3	04/08	13:31	198	92	959	PHTX
255	2004/04/11	04:20	04/11	05:35	14000	500	S14W47	10588	C9.6	04/11	04:30	203	314	1645	PHTX
256	2004/06/02	23:13	06/02	23:55	14000	2100	W90b	-----	----	06/02	23:15	287	136	1102	PHTX
257	2004/06/03	16:48	06/03	17:10	12000	5000	W90b	-----	----	06/03	16:50	303	179	1226	PHTX
258	2004/06/04	07:50	06/04	09:55	14000	2500	W90b	-----	----	06/04	07:50	309	>273	1306	PHTX
259	2004/06/22	22:07	06/22	22:30	10000	7000	S12W24	10635	C1.7	--/--	--:--	----	----	----	PHTX
260	2004/06/23	06:30	06/23	08:55	14000	5000	S09W21	10635	C2.5	--/--	--:--	----	----	----	PHTX
261	2004/07/23	19:00	07/23	19:35	10000	2500	N04W05	10652	C4.1	07/23	19:31	209	100	874	PHTX
262	2004/07/25	15:00	07/26	22:25	1000	28	N08W33	10652	M1.1	07/25	14:54	Halo	360	1333	PHTX
263	2004/07/29	13:20	07/30	20:30	1000	50	N00W90	10652	C2.1	07/29	12:06	Halo	360	1180	PHTX
264	2004/07/31	07:10	07/31	11:30	1000	200	N05W89	10652	C8.4	07/31	05:54	259	>197	1192	PHTX
265	2004/08/08	09:15	08/08	09:22	14000	7000	BACK	-----	----	08/08	08:54	Halo	360	1004	PHTX
266	2004/09/12	00:45	09/13	21:00	14000	40	N03E49	10672	M4.8	09/12	00:36	Halo	360	1328	PHTX
267	2004/09/19	17:15	09/19	18:15	14000	2500	N03W58	10672	M1.9	--/--	--:--	----	----	----	PHTX
268	2004/10/24	03:12	10/24	03:21	14000	8000	N11E19	10687	C1.7	10/24	03:54	26	>109	417	PHTX
269	2004/10/30	06:40	10/30	07:40	4000	1000	N13W22	10691	M4.2	10/30	06:54	Halo	360	422	PHTX
270	2004/11/01	05:55	11/01	07:25	3000	400	W90b	-----	----	11/01	06:06	266	146	925	PHTX
271	2004/11/03	15:55	11/03	16:30	14000	3400	N09E38	10696	M5.0	11/03	16:06	Halo	360	1068	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
272	2004/11/03	03:35	11/03	04:10	2000	1200	N09E45	10696	M1.6	11/03	03:54	91	>239	918	PHTX
273	2004/11/06	01:50	11/06	02:45	6000	700	N09E05	10696	M3.6	11/06	02:06	351	>214	1111	PHTX
274	2004/11/07	16:25	11/08	20:00	14000	60	N09W17	10696	X2.0	11/07	16:54	Halo	360	1759	PHTX
275	2004/11/09	17:35	11/09	18:10	14000	5000	N08W51	10696	M8.9	11/09	17:26	Halo	360	2000	PHTX
276	2004/11/10	02:25	11/10	03:40	14000	1000	N09W49	10696	X2.5	11/10	02:26	Halo	360	3387	PHTX
277	2004/12/03	00:07	12/04	04:30	10000	60	N08W02	10708	M1.5	12/03	00:26	Halo	360	1216	PHTX
278	2004/12/08	20:05	12/08	20:10	14000	8000	N08W03	10709	C2.5	12/08	20:26	Halo	360	611	PHTX
279	2004/12/29	16:35	12/29	17:00	14000	4500	N04E62	10715	M2.3	12/29	16:45	71	140	774	PHTX
280	2004/12/30	23:45	12/31	04:20	5000	700	N04E46	10715	M4.2	12/30	22:30	Halo	360	1035	PHTX
281	2005/01/01	00:45	01/01	02:25	14000	450	N06E34	10715	X1.7	01/01	00:54	Halo	360	832	PHTX
282	2005/01/04	11:20	01/04	11:35	13000	6000	N05W11	10715	C7.3	--/--	--:--	----	----	----	PHTX
283	2005/01/15	06:15	01/15	09:30	14000	150	N16E04	10720	M8.6	01/15	06:30	Halo	360	2049	PHTX
284	2005/01/15	23:00	01/17	00:00	3000	40	N15W05	10720	X2.6	01/15	23:06	Halo	360	2861	PHTX
285	2005/01/17	09:25	01/17	16:00	14000	30	N15W25	10720	X2.0	01/17	09:30	Halo	360	2094	PHTX
286	2005/01/17	10:00	01/17	10:35	6100	1500	N15W25	10720	X3.8	01/17	09:54	Halo	360	2547	PHTX
287	2005/01/19	09:20	01/20	00:00	5300	40	N15W51	10720	X1.3	01/19	08:29	Halo	360	2020	PHTX
288	2005/01/20	07:15	01/20	16:30	14000	25	N14W61	10720	X7.1	01/20	06:54	Halo	360	882	PHTX
289	2005/02/01	11:40	02/01	11:50	8000	4000	BACK	-----	----	02/01	11:06	Halo	360	1380	PHTX
290	2005/05/02	22:40	05/02	23:00	14000	5500	S05E90	10758	C8.0	05/02	22:26	105	148	955	PHTX
291	2005/05/03	00:20	05/03	01:10	14000	1500	S05E90	10758	----	05/03	00:26	82	>66	978	PHTX
292	2005/05/06	17:52	05/06	18:03	5000	4000	S09E29	10758	C8.5	05/06	17:28	Halo	360	1128	PHTX
293	2005/05/13	17:00	05/15	02:10	5000	40	N12E11	10759	M8.0	05/13	17:12	Halo	360	1689	PHTX
294	2005/05/17	03:20	05/17	03:35	4500	1500	BACK	-----	----	05/17	03:06	252	89	311	PHTX
295	2005/06/03	12:50	06/03	15:00	10000	270	N15E90	10775	M1.0	06/03	12:32	Halo	360	1679	PHTX
296	2005/06/16	20:25	06/16	21:40	9000	1000	N08W90	10775	M4.0	--/--	--:--	----	----	----	PHTX
297	2005/07/07	16:30	07/07	16:40	4000	2000	N09E03	10786	M4.9	07/07	17:06	Halo	360	683	PHTX
298	2005/07/09	22:15	07/09	23:00	14000	600	N12W28	10786	M2.8	07/09	22:30	Halo	360	1540	PHTX
299	2005/07/13	14:15	07/13	15:05	14000	1000	N11W90	10786	M5.0	07/13	14:30	Halo	360	1423	PHTX
300	2005/07/14	11:00	07/14	12:54	3000	800	N11W90	10786	X1.2	07/14	10:54	Halo	360	2115	PHTX
301	2005/07/17	11:50	07/17	13:45	7000	300	BACK	-----	----	07/17	11:30	Halo	360	1527	PHTX
302	2005/07/24	13:50	07/24	22:30	14000	150	BACK	-----	----	07/24	13:54	Halo	360	2528	PHTX
303	2005/07/24	22:35	07/24	22:40	1000	700	BACK	-----	----	07/24	22:30	Halo	360	1234	PHTX
304	2005/07/27	05:20	07/27	06:45	1000	450	N11E90	10792	M3.7	07/27	04:54	Halo	360	1787	PHTX
305	2005/07/27	07:45	07/27	08:30	2500	1000	NE90b	-----	----	07/27	07:54	65	51	533	PHTX
306	2005/07/30	07:40	07/30	20:00	9000	80	N12E60	10792	X1.3	07/30	06:50	Halo	360	1968	PHTX
307	2005/08/01	14:15	08/01	14:50	14000	4500	N13E32	10792	M1.0	08/01	14:30	83	93	984	PHTX
308	2005/08/22	01:30	08/22	03:35	8000	550	S11W54	10798	M2.6	08/22	01:31	Halo	360	1194	PHTX
309	2005/08/22	17:15	08/23	13:00	12000	40	S13W65	10798	M5.6	08/22	17:30	Halo	360	2378	PHTX
310	2005/08/23	15:00	08/23	19:30	13000	400	S14W90	10798	M2.7	08/23	14:54	Halo	360	1929	PHTX
311	2005/08/29	11:10	08/29	11:14	10000	6000	BACK	-----	----	08/29	10:54	Halo	360	1600	PHTX
312	2005/08/31	11:40	08/31	12:10	6000	800	N13W13	10803	C2.0	08/31	11:30	Halo	360	825	PHTX
313	2005/08/31	22:10	08/31	23:00	14000	6000	BACK	-----	----	08/31	22:30	Halo	360	1808	PHTX
314	2005/09/03	03:20	09/03	05:15	2000	500	BACK	-----	----	09/03	03:12	Halo	360	1672	PHTX
315	2005/09/05	10:40	09/06	00:00	1500	60	S07E81	-----	C2.7	09/05	09:48	Halo	360	2326	PHTX
316	2005/09/07	18:05	09/08	00:00	12000	200	S11E77	10808	X1.7	--/--	--:--	----	----	----	PHTX
317	2005/09/09	19:45	09/09	22:00	10000	50	S12E67	10808	X6.2	09/09	19:48	Halo	360	2257	PHTX
318	2005/09/10	21:45	09/11	01:00	14000	200	S13E47	10808	X2.1	09/10	21:52	Halo	360	1893	PHTX
319	2005/09/11	13:10	09/11	15:15	3000	350	S16E39	10808	M3.0	09/11	13:00	Halo	360	1922	PHTX
320	2005/09/13	20:20	09/15	06:00	1100	35	S09E10	10808	X1.5	09/13	20:00	Halo	360	1866	PHTX
321	2006/04/30	16:20	05/02	01:00	1000	200	S09E08	10876	C1.8	04/30	09:54	Halo	360	544	PHTX
322	2006/07/06	08:45	07/06	17:18	14000	300	S09W34	10898	M2.5	07/06	08:54	Halo	360	911	PHTX
323	2006/08/16	15:45	08/16	22:15	14000	400	S16W08	10904	C3.6	08/16	16:30	Halo	360	888	PHTX
324	2006/08/26	20:40	08/26	21:00	7000	2000	S10E08	10905	C2.5	08/26	20:57	164	208	786	PHTX
325	2006/11/05	17:35	11/05	19:20	14000	400	E90b	-----	----	11/05	17:54	39	196	1398	PHTX
326	2006/11/06	10:35	11/06	11:05	14000	6000	E90b	-----	----	11/06	10:30	77	55	829	PHTX
327	2006/11/06	17:45	11/06	19:25	4000	300	E90b	-----	C8.8	11/06	17:54	Halo	360	1994	PHTX
328	2006/12/05	10:50	12/05	20:00	14000	250	S07E68	10930	X9.0	--/--	--:--	----	----	----	PHTX
329	2006/12/06	02:00	12/06	03:30	1000	200	S07E69	10930	M1.1	--/--	--:--	----	----	----	PHTX
330	2006/12/06	08:30	12/06	09:45	4000	600	S04E63	10930	M6.0	--/--	--:--	----	----	----	PHTX
331	2006/12/06	19:00	12/08	24:00	16000	30	S05E64	10930	X6.5	--/--	--:--	----	----	----	PHTX
332	2006/12/13	02:45	12/13	10:40	12000	150	S06W23	10930	X3.4	12/13	02:54	Halo	360	1774	PHTX
333	2006/12/14	22:30	12/14	23:40	14000	1500	S06W46	10930	X1.5	12/14	22:30	Halo	360	1042	PHTX
334	2007/01/25	06:55	01/25	23:30	14000	90	S08E90	10940	C6.3	01/25	06:54	Halo	360	1367	PHTX
335	2007/05/19	13:02	05/19	13:05	16000	13000	N07W06	10956	B9.5	05/19	13:24	260	106	958	PHTX
336	2007/12/31	01:05	12/31	01:22	16000	6000	S08E81	10980	C8.3	12/31	01:31	92	164	995	PHTX
337	2008/03/25	19:05	03/25	19:20	12000	800	S13E78	10989	M1.7	03/25	19:31	98	112	1103	PHTX
338	2008/04/26	14:23	04/26	14:39	7600	4900	N08E09	-----	B3.8	04/26	14:30	65	281	515	PHTX
339	2010/08/01	09:20	08/01	17:30	2000	700	N20E36	11092	C3.2	--/--	--:--	----	----	----	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
340	2010/08/07	18:35	08/07	19:50	14000	700	N11E34	11093	M1.0	08/07	18:36	Halo	360	871	PHTX
341	2010/08/18	06:05	08/18	07:45	13000	700	N18W88	11099	C4.5	08/18	05:48	255	184	1471	PHTX
342	2011/01/13	09:15	01/13	10:05	16000	3500	E90b	-----	----	01/13	09:36	79	122	664	PHTX
343	2011/01/27	12:20	01/27	12:35	16000	8000	N12W87	11149	C1.2	01/27	12:36	255	43	349	PHTX
344	2011/02/13	17:50	02/13	18:00	16000	8000	S20E04	11158	M6.6	02/13	18:36	359	276	373	PHTX
345	2011/02/15	02:10	02/15	07:00	16000	400	S20W12	11158	X2.2	02/15	02:24	Halo	360	669	PHTX
346	2011/02/24	12:50	02/24	15:10	1000	700	N15E87	11163	M3.5	02/24	07:48	70	158	1186	PHTX
347	2011/03/07	14:30	03/07	15:00	16000	7000	N10E18	11166	M1.9	03/07	14:48	354	261	698	PHTX
348	2011/03/07	20:00	03/08	08:30	16000	200	N31W53	11164	M3.7	03/07	20:00	Halo	360	2125	PHTX
349	2011/05/09	21:00	05/10	04:00	16000	900	N16E88	-----	C5.4	05/09	20:57	55	292	1318	PHTX
350	2011/05/29	21:10	05/30	13:40	16000	90	S19E72	11227	C8.7	05/29	21:24	107	186	1407	PHTX
351	2011/06/02	08:00	06/02	08:25	15000	4000	S19E25	11227	C3.7	06/02	08:12	Halo	360	976	PHTX
352	2011/06/04	07:00	06/04	13:45	16000	300	W90b	11222	----	06/04	06:48	Halo	360	1407	PHTX
353	2011/06/04	22:00	06/07	01:30	16000	25	W90b	11222	----	06/04	22:05	Halo	360	2425	PHTX
354	2011/06/07	06:45	06/07	18:00	16000	250	S21W54	11226	M2.5	06/07	06:49	Halo	360	1255	PHTX
355	2011/06/21	03:07	06/21	03:21	10000	7000	N16W08	11236	C7.7	06/21	03:16	Halo	360	719	PHTX
356	2011/08/02	06:15	08/02	07:30	16000	3000	N14W15	11261	M1.4	08/02	06:36	288	268	712	PHTX
357	2011/08/04	04:15	08/05	17:00	13000	60	N19W36	11261	M9.3	08/04	04:12	Halo	360	1315	PHTX
358	2011/08/08	18:10	08/08	20:10	6000	400	N16W61	11263	M3.5	08/08	18:12	305	237	1343	PHTX
359	2011/08/09	08:20	08/09	08:35	16000	4000	N17W69	11263	X6.9	08/09	08:12	Halo	360	1610	PHTX
360	2011/09/06	02:00	09/06	23:40	14000	200	N14W07	11283	M5.3	09/06	02:24	Halo	360	782	PHTX
361	2011/09/06	22:30	09/07	15:40	16000	150	N14W18	11283	X2.1	09/06	23:05	Halo	360	575	PHTX
362	2011/09/22	11:05	09/22	24:00	14000	70	N09E89	11302	X1.4	09/22	10:48	Halo	360	1905	PHTX
363	2011/09/24	12:50	09/24	22:45	16000	300	N10E56	11302	M7.1	09/24	12:48	Halo	360	1915	PHTX
364	2011/09/25	05:30	09/25	06:00	16000	8000	N11E47	11302	M7.4	09/25	05:12	98	193	788	PHTX
365	2011/10/21	13:15	10/21	13:50	16000	6500	N05W79	11319	M1.3	10/21	13:25	252	109	317	PHTX
366	2011/11/09	13:30	11/09	17:00	16000	400	N24E35	11343	M1.1	11/09	13:36	Halo	360	907	PHTX
367	2011/11/26	07:15	11/27	24:00	10000	50	N17W49	11353	C1.2	11/26	07:12	Halo	360	933	PHTX
368	2011/12/21	03:00	12/21	08:15	16000	400	BACK	-----	----	12/21	03:12	Halo	360	1064	PHTX
369	2011/12/25	18:45	12/25	18:55	14000	7000	S22W26	11387	M4.0	12/25	18:48	247	125	366	PHTX
370	2012/01/02	15:00	01/02	15:45	16000	4000	BACK	-----	----	01/02	15:12	Halo	360	1138	PHTX
371	2012/01/19	15:00	01/20	02:45	16000	100	N32E22	11402	M3.2	01/19	14:36	Halo	360	1120	PHTX
372	2012/01/23	04:00	01/24	15:00	16000	40	N28W21	11402	M8.7	01/23	04:00	Halo	360	2175	PHTX
373	2012/01/27	18:30	01/28	04:45	16000	150	N27W71	11402	X1.7	01/27	18:27	Halo	360	2508	PHTX
374	2012/03/05	04:00	03/05	12:20	16000	400	N17E52	11429	X1.1	03/05	04:00	Halo	360	1531	PHTX
375	2012/03/07	01:00	03/08	19:00	16000	30	N17E27	11429	X5.4	03/07	00:24	Halo	360	2684	PHTX
376	2012/03/09	04:10	03/09	06:05	14000	1000	N15W03	11429	M6.3	03/09	04:26	Halo	360	950	PHTX
377	2012/03/10	17:55	03/11	12:30	14000	30	N17W24	11429	M8.4	03/10	18:00	Halo	360	1296	PHTX
378	2012/03/13	17:35	03/13	24:00	16000	200	N17W66	11429	M7.9	03/13	17:36	Halo	360	1884	PHTX
379	2012/03/18	00:20	03/18	01:20	16000	200	BACK	-----	----	03/18	00:24	Halo	360	1210	PHTX
380	2012/03/24	00:40	03/24	10:40	16000	300	BACK	-----	----	03/24	00:24	Halo	360	1152	PHTX
381	2012/03/26	23:15	03/26	23:55	16000	1500	BACK	-----	----	03/26	23:12	Halo	360	1390	PHTX
382	2012/03/27	21:45	03/27	22:30	4000	1500	BACK	-----	----	03/27	22:00	261	101	622	PHTX
383	2012/04/09	12:20	04/09	13:00	16000	5000	N20W65	11451	C3.9	04/09	12:36	Halo	360	921	PHTX
384	2012/04/15	02:30	04/15	02:50	16000	4000	N10E90	11461	C1.7	04/15	02:24	79	173	1220	PHTX
385	2012/05/17	01:40	05/17	06:20	16000	300	N11W76	11476	M5.1	05/17	01:48	Halo	360	1582	PHTX
386	2012/07/04	17:00	07/04	17:20	14000	8000	N14W34	11513	M1.8	07/04	17:24	Halo	360	662	PHTX
387	2012/07/05	22:40	07/05	23:50	3000	800	S12W46	11515	M1.6	07/05	22:00	220	94	980	PHTX
388	2012/07/06	23:10	07/07	03:40	16000	300	S13W59	11515	X1.1	07/06	23:24	Halo	360	1828	PHTX
389	2012/07/08	16:35	07/08	22:00	16000	300	S17W74	11515	M6.9	07/08	16:54	212	157	1495	PHTX
390	2012/07/12	16:45	07/13	09:00	14000	250	S15W01	11520	X1.4	07/12	16:48	Halo	360	885	PHTX
391	2012/07/17	14:40	07/18	05:00	12000	150	S28W65	11520	C9.9	07/17	13:48	255	176	958	PHTX
392	2012/07/19	05:30	07/19	06:20	5000	600	S13W88	11520	M7.7	07/19	05:24	Halo	360	1631	PHTX
393	2012/07/23	02:30	07/23	21:40	16000	20	S17W132	11520	----	07/23	02:36	Halo	360	2003	PHTX
394	2012/08/31	20:00	08/31	23:45	16000	400	S25E59	11563	C8.1	08/31	20:00	Halo	360	1442	PHTX
395	2012/09/27	23:55	09/28	10:15	16000	250	N06W34	11577	C3.7	09/28	00:12	Halo	360	947	PHTX
396	2012/10/22	01:50	10/22	11:15	1000	200	S10E76	11598	M1.3	10/21	20:57	83	243	496	PHTX
397	2013/01/16	22:00	01/17	01:30	1000	200	S33W64	11650	C2.2	01/16	19:00	211	250	648	PHTX
398	2013/03/15	07:00	03/15	21:30	14000	100	N11E12	11692	M1.1	03/15	07:12	Halo	360	1063	PHTX
399	2013/04/11	07:10	04/11	15:00	10000	200	N09E12	11719	M6.5	04/11	07:24	Halo	360	861	PHTX
400	2013/04/18	18:00	04/18	19:10	16000	4000	N11W83	11719	C6.5	04/18	18:24	284	199	495	PHTX
401	2013/04/21	20:25	04/21	22:12	14000	1700	S19W53	11723	C2.7	04/21	20:36	255	212	562	PHTX
402	2013/05/13	02:20	05/13	03:00	16000	2000	N11E90	11748	X1.7	05/13	02:00	Halo	360	1270	PHTX
403	2013/05/13	16:15	05/13	19:10	16000	300	N11E85	11748	X2.8	05/13	16:07	Halo	360	1850	PHTX
404	2013/05/14	01:16	05/14	08:20	16000	240	N08E77	11748	X3.2	05/14	01:25	Halo	360	2625	PHTX
405	2013/05/15	01:49	05/15	07:57	16000	230	N12E64	11748	X1.2	05/15	01:48	Halo	360	1366	PHTX
406	2013/05/22	13:10	05/24	06:00	16000	150	N15W70	11745	M5.0	05/22	13:25	Halo	360	1466	PHTX
407	2013/06/21	03:35	06/21	05:15	14000	2000	S16E73	11777	M2.9	06/21	03:12	123	>207	1900	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
408	2013/06/28	01:53	06/28	03:26	14000	400	S18W19	11777	C4.4	06/28	02:00	Halo	360	1037	PHTX
409	2013/07/04	20:57	07/04	21:27	11000	2900	S14E62	11787	C6.8	07/04	20:12	111	188	468	PHTX
410	2013/08/06	02:01	08/06	02:11	14000	11000	N27E25	EP	B4.5	08/06	02:12	48	207	441	PHTX
411	2013/08/17	20:25	08/18	03:05	1800	150	S05W30	11818	M1.4	08/17	19:12	Halo	360	1202	PHTX
412	2013/08/30	02:34	08/31	04:00	14000	50	N15E46	11836	C8.3	08/30	02:48	Halo	360	949	PHTX
413	2013/09/06	22:29	09/06	22:34	5000	2000	N10E104	DIM	----	09/06	20:48	90	182	734	PHTX
414	2013/09/29	21:53	09/30	21:00	14000	60	N17W29	EP	C1.3	09/29	22:12	Halo	360	1179	PHTX
415	2013/10/02	20:46	10/02	21:10	10000	5200	N20W85	DIM	C1.2	10/02	20:36	309	263	619	PHTX
416	2013/10/05	07:00	10/05	14:46	16000	200	S22E118	11865	----	10/05	07:09	Halo	360	964	PHTX
417	2013/10/11	07:23	10/11	11:43	14000	100	N21E103	11869	----	10/11	07:24	Halo	360	1200	PHTX
418	2013/10/13	18:47	10/14	05:15	2100	600	------	-----	----	10/13	14:12	220	83	293	PHTX
419	2013/10/22	21:33	10/22	22:08	14000	650	N04W01	11875	M4.2	10/22	21:48	Halo	360	459	PHTX
420	2013/10/25	15:08	10/25	22:32	16000	200	S06E69	11882	X2.1	10/25	15:12	Halo	360	1081	PHTX
421	2013/10/26	03:01	10/26	04:00	14000	200	N09W44	11875	C4.5	10/26	03:12	271	208	473	PHTX
422	2013/10/26	09:34	10/26	10:10	14000	5000	N08W49	11875	M1.3	10/26	09:48	286	141	460	PHTX
423	2013/10/27	18:12	10/27	18:36	14000	1700	N06W70	11875	C9.1	10/27	18:12	308	189	795	PHTX
424	2013/10/28	04:41	10/28	11:51	14000	200	N08W71	11875	M5.1	10/28	04:48	315	156	1201	PHTX
425	2013/10/28	15:24	10/28	15:29	14000	9000	S06E28	11882	M4.4	10/28	15:36	Halo	360	812	PHTX
426	2013/11/04	05:10	11/04	08:00	16000	450	N03W165	11875	----	11/04	05:12	Halo	360	1040	PHTX
427	2013/11/07	10:26	11/07	20:40	16000	100	N02E151	11899	----	11/07	10:36	Halo	360	1405	PHTX
428	2013/11/19	10:39	11/19	20:20	14000	100	S14W70	11893	X1.0	11/19	10:36	Halo	360	740	PHTX
429	2013/11/29	22:18	11/30	09:20	1800	100	N06W183	11899	----	11/29	17:24	251	188	465	PHTX
430	2013/12/05	12:45	12/05	13:00	4200	1600	S20E119	DIM	----	12/05	10:24	133	148	549	PHTX
431	2013/12/05	20:48	12/05	21:35	14000	2500	------	-----	----	--/--	--:--	----	---	----	PHTX
432	2013/12/07	07:43	12/07	08:36	14000	3000	S16W49	11909	M1.2	12/07	07:36	Halo	360	1085	PHTX
433	2013/12/12	03:55	12/12	21:30	12000	70	S23W46	11912	C4.6	12/12	03:36	214	276	1002	PHTX
434	2013/12/20	08:23	12/20	13:24	1500	400	------	-----	----	12/20	04:36	255	26	337	PHTX
435	2013/12/28	17:31	12/28	18:05	16000	500	S15W125	11928	----	12/28	17:36	Halo	360	1118	PHTX
436	2014/01/04	17:41	01/04	18:47	9000	100	------	-----	----	--/--	--:--	----	---	----	PHTX
437	2014/01/04	19:03	01/05	09:00	6500	100	------	-----	----	--/--	--:--	----	---	----	PHTX
438	2014/01/06	07:57	01/06	22:30	14000	80	S15W112	11936	----	01/06	08:00	Halo	360	1402	PHTX
439	2014/01/07	18:33	01/08	21:00	14000	60	S15W11	11943	X1.2	01/07	18:24	Halo	360	1830	PHTX
440	2014/01/20	22:24	01/20	22:36	14000	8000	S07E67	DIM	C3.6	01/20	22:00	Halo	360	721	PHTX
441	2014/02/18	02:16	02/18	02:51	2000	900	S24W43	EP	----	02/18	01:36	Halo	360	779	PHTX
442	2014/02/20	08:05	02/20	08:29	12000	7700	S15W73	11976	M3.0	02/20	08:00	Halo	360	948	PHTX
443	2014/02/25	00:56	02/25	11:28	14000	100	S12E82	11990	X4.9	02/25	01:25	Halo	360	2147	PHTX
444	2014/03/04	18:24	03/04	20:10	16000	2000	N13W170	12005	----	03/04	18:48	Halo	360	794	PHTX
445	2014/03/05	13:33	03/05	17:10	16000	500	N14E180	-----	----	03/05	13:48	Halo	360	828	PHTX
446	2014/03/25	07:52	03/25	11:30	1700	400	S23W130	EP	----	03/25	05:36	261	223	651	PHTX
447	2014/03/29	00:12	03/29	00:48	14000	2200	N11W23	12017	M2.6	03/28	23:48	325	138	514	PHTX
448	2014/03/29	17:59	03/30	09:58	14000	200	S08W152	12011	----	03/29	18:12	Halo	360	528	PHTX
449	2014/04/02	13:42	04/03	08:10	14000	60	N11E53	12027	M6.5	04/02	13:36	Halo	360	1471	PHTX
450	2014/04/02	18:49	04/03	06:40	2400	200	------	-----	----	--/--	--:--	----	---	----	PHTX
451	2014/04/04	14:02	04/04	14:07	14000	11000	N13E26	12027	C8.3	04/04	14:12	54	96	467	PHTX
452	2014/04/18	13:05	04/18	22:50	14000	150	S20W34	12036	M7.3	04/18	13:25	Halo	360	1203	PHTX
453	2014/05/07	16:24	05/07	23:18	16000	200	N11E53	12027	----	05/07	16:24	Halo	360	923	PHTX
454	2014/05/08	03:21	05/08	05:26	16000	1100	S09W108	12051	----	05/08	03:24	Halo	360	847	PHTX
455	2014/05/09	02:40	05/09	04:30	14000	500	S11W122	12051	----	05/09	02:48	Halo	360	1099	PHTX
456	2014/05/10	04:32	05/10	08:37	16000	400	S11W136	12051	----	05/10	04:36	Halo	360	1086	PHTX
457	2014/06/10	12:58	06/10	15:00	16000	1000	S17E82	12087	X1.5	06/10	13:30	Halo	360	1469	PHTX
458	2014/06/12	22:14	06/12	22:35	14000	6000	S20W55	12085	M3.1	06/12	22:12	233	186	684	PHTX
459	2014/07/30	07:44	07/30	08:00	6300	4500	N10E30	EP?	C1.5	07/30	07:00	13	254	700	PHTX
460	2014/08/01	18:58	08/02	05:00	1000	150	S10E11	12127	M1.5	08/01	18:36	Halo	360h	789	PHTX
461	2014/08/22	10:37	08/22	11:18	14000	6000	N12E01	12146	C2.2	08/22	11:12	Halo	360	600	PHTX
462	2014/08/25	15:20	08/25	16:02	14000	4000	N05W36	12146	M2.0	08/25	15:36	Halo	360	555	PHTX
463	2014/08/25	20:43	08/25	21:00	14000	7200	N07W43	12146	M3.9	08/25	20:48	273	177	711	PHTX
464	2014/08/28	17:05	08/28	22:08	16000	600	S19E162	12157	----	08/28	17:24	Halo	360	766	PHTX
465	2014/09/01	11:12	09/01	20:05	16000	150	N14E127	12158	----	09/01	11:12	Halo	360	1901	PHTX
466	2014/09/09	00:05	09/09	13:00	11000	100	N12E29	12158	M4.5	09/09	00:06	Halo	360	920	PHTX
467	2014/09/10	17:45	09/11	12:00	14000	100	N14E02	12158	X1.6	09/10	18:00	Halo	360	1267	PHTX
468	2014/09/20	05:10	09/20	05:30	14000	9700	S11W89	12164	----	09/20	05:24	292	87	426	PHTX
469	2014/09/22	06:13	09/22	06:50	16000	4900	N14W142	12158	----	09/22	06:12	342	252	618	PHTX
470	2014/09/23	23:41	09/23	23:47	14000	12000	S13E33	12172	M2.3	09/23	23:36	109	134	331	PHTX
471	2014/09/24	20:54	09/24	23:48	16000	500	N13E179	EP	----	09/24	21:30	Halo	360	1350	PHTX
472	2014/10/02	21:34	10/02	21:56	3300	1900	S17W82	12173	M7.3	10/02	19:12	264	159	513	PHTX
473	2014/10/10	18:11	10/10	18:33	2500	1500	S20W51	EP	C3.0	10/10	16:12	309	>210	782	PHTX
474	2014/10/21	12:33	10/21	13:01	14000	8900	S18E36	12192	C4.4	10/21	12:48	152	142	260	PHTX
475	2014/11/08	16:57	11/08	17:18	14000	7800	W90b	12203	----	11/08	16:36	305	141	426	PHTX

	start_date	start_time	end_date	end_time	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_date	cme_time	cme_angle	cme_width	cme_speed	plot
476	2014/12/13	14:27	12/13	14:51	14000	3900	W90b	-----	----	12/13	14:24	Halo	360	2222	PHTX
477	2014/12/17	04:09	12/17	04:19	2900	2100	S11E33	12241	M1.1	12/17	02:00	107	108	869	PHTX
478	2014/12/17	05:00	12/17	05:09	14000	11500	S20E09	12242	M8.7	12/17	05:00	Halo	360	587	PHTX
479	2014/12/18	22:31	12/18	22:54	5100	1300	S11E15	12241	M6.9	12/19	01:04	Halo	360	1195	PHTX
480	2014/12/21	12:05	12/21	12:28	14000	7400	S14W25	12241	M1.0	12/21	12:12	Halo	360	669	PHTX
481	2015/03/03	02:33	03/03	02:37	8100	3600	W90b	12290	M8.2	03/03	01:48	329	213	764	PHTX
482	2015/03/06	08:00	03/06	11:30	4700	200	S20E87	12297	M1.5	03/06	07:12	83	155	880	PHTX
483	2015/03/10	00:10	03/10	00:27	14000	6200	S18E45	12297	M5.8	03/10	00:00	Halo	360	995	PHTX
484	2015/03/11	10:30	03/11	14:50	1000	250	S15E23	12297	M2.6	03/11	08:24	62	93	530	PHTX
485	2015/03/24	09:00	03/24	11:47	14000	400	SW90b	-----	----	03/24	08:24	Halo	360	1794	PHTX
486	2015/04/26	03:21	04/26	03:33	8000	4600	W90b	-----	----	04/26	03:24	Halo	360	820	PHTX
487	2015/05/05	22:24	05/05	23:14	14000	500	N15E79	12339	X2.7	05/05	22:24	Halo	360	715	PHTX
488	2015/05/12	03:00	05/12	03:04	14000	6400	W90b	-----	----	05/12	02:48	286	250	772	PHTX
489	2015/06/09	20:23	06/09	22:35	2300	200	S03E25	12364	C2.8	06/09	20:12	77	262	1036	PHTX
490	2015/06/14	05:26	06/14	05:41	3000	1250	S12W34	12365	C5.9	06/14	04:12	199	195	1228	PHTX
491	2015/06/18	17:42	06/18	19:40	3700	500	N15E50	12371	M3.0	06/18	17:24	Halo	360	1305	PHTX
492	2015/06/21	02:33	06/21	21:20	5500	150	N12E16	12371	M2.0	06/21	02:36	Halo	360	1366	PHTX
493	2015/06/22	18:20	06/22	21:55	14000	300	N12W08	12371	M6.5	06/22	18:36	Halo	360	1209	PHTX
494	2015/06/25	08:35	06/25	16:30	14000	150	N09W42	12371	M7.9	06/25	08:36	Halo	360	1627	PHTX
495	2015/07/01	16:08	07/01	20:47	1000	150	W90b	-----	----	07/01	14:36	Halo	360	1435	PHTX
496	2015/08/22	07:07	08/22	07:18	14000	7300	S15E13	12403	M1.2	08/22	07:12	Halo	360	547	PHTX
497	2015/09/18	04:54	09/18	09:52	14000	400	S21W10	12415	C2.6	09/18	05:00	201	131	823	PHTX
498	2015/09/20	18:23	09/21	01:46	14000	300	S20W24	12415	M2.1	09/20	18:12	Halo	360	1239	PHTX
499	2015/11/04	14:07	11/04	15:14	14000	440	N09W04	12443	M3.7	11/04	14:48	Halo	360	578	PHTX
500	2015/11/09	13:21	11/09	13:27	14000	9000	S11E41	12449	M3.9	11/09	13:25	142	273	1041	PHTX
501	2015/12/16	08:45	12/16	08:57	5300	3800	S13W04	12468	C6.6	12/16	09:36	Halo	360	579	PHTX
502	2015/12/23	01:18	12/23	01:23	12000	6700	S22E63	12473	M4.7	12/23	01:25	98	89	520	PHTX
503	2015/12/28	11:50	12/28	21:45	14000	180	S23W11	12473	M1.8	12/28	12:12	Halo	360	1212	PHTX
504	2016/01/02	00:55	01/02	03:08	1100	300	S25W82	12473	M2.3	01/01	23:24	Halo	360	1730	PHTX
505	2016/02/05	20:28	02/05	23:31	1650	500	------	-----	----	--/--	--:--	----	---	----	PHTX
506	2016/02/05	22:35	02/05	22:55	5200	1900	S17W29	-----	----	02/05	21:24	193	155	445	PHTX
507	2016/05/04	14:20	05/04	14:34	14000	10500	N06W61	12535	C1.3	05/04	14:12	255	134	390	PHTX
508	2016/05/24	17:00	05/24	20:50	1500	700	------	-----	----	--/--	--:--	----	---	----	PHTX
509	2016/08/15	18:21	08/15	18:28	11000	3400	E90b	-----	----	08/15	17:24	75	98	633	PHTX
510	2017/04/23	06:00	04/23	06:13	15000	8300	N16E41	-----	----	04/23	06:00	85	77	955	PHTX
511	2017/07/14	01:18	07/14	21:30	14000	70	S06W29	12665	M2.4	07/14	01:25	Halo	360	1200	PHTX
512	2017/07/23	05:27	07/23	06:12	4400	900	BACK	-----	----	07/23	04:48	Halo	360	1848	PHTX
513	2017/09/04	20:27	09/05	04:54	14000	210	S10W12	12673	M5.5	09/04	20:12	Halo	360	1418	PHTX
514	2017/09/06	12:05	09/07	08:00	16000	70	S08W33	12673	X9.3	09/06	12:24	Halo	360	1571	PHTX
515	2017/09/10	16:02	09/11	06:50	16000	150	S09W92	-----	X8.3	09/10	16:00	Halo	360	3163	PHTX
516	2017/09/12	07:38	09/12	07:43	16000	13000	N08E48	12680	C3.0	09/12	08:03	124	96	252	PHTX
517	2017/09/17	11:45	09/17	12:35	16000	900	S08E170	-----	----	09/17	12:00	Halo	360	1385	PHTX

Step 4

In Step 4 I cleaned up the dataframe with applymap() function which iterates over all the cells of the dataframe and checks for '--', '????' and other fields which determine that the information is incomplete or missing with NaN. The Dataframe is also used for detectign whether there was a halo by creating a new column is_Halo. It even checks for greater than signa and removes it while setting the width_lower_bound to be set to true. It also just extracts the number from the cme_angle and removes any alphabets. It even combines the date and time into a single datetime object and drops the other columns. It renames the columns for better understanding of the dataframe.

In [14]:

```
def remove_missingentries(entry):

    if "--" in entry:
        re.sub("-.*-","", entry)
        entry = np.nan

    elif "????" in entry:
        entry = np.nan

    elif "BACK" == entry:
        entry = np.nan

    return entry

new_nasa_df = nasa_df.applymap(remove_missingentries)
new_nasa_df['is_halo'] = new_nasa_df['cme_angle'].apply(lambda x: True if x == 'Halo' else False)
new_nasa_df['cme_angle'] = new_nasa_df['cme_angle'].apply(lambda x: pd.NA if x == 'Halo' else x)
new_nasa_df['width_lower_bound'] = new_nasa_df['cme_width'].apply(lambda x: True if '&gt;' in str(x) else False)
new_nasa_df['cme_width'] = new_nasa_df['cme_width'].apply(lambda x: re.sub('&gt;','',str(x)) if '&gt;' in str(x) else x)
new_nasa_df['cme_width'] = new_nasa_df['cme_width'].apply(lambda x: re.sub('h','',str(x)) if 'h' in str(x) else x)
new_nasa_df['flare_classification'] = new_nasa_df['flare_classification'].apply(lambda x: x[0]+str(float(x[1:])) if str(x) != str(np.nan) and str(x) != 'FILA' else
x)

# new_nasa_df

# Add date and time

for index, row in new_nasa_df.iterrows():

    year = str(row['start_date'])[:4]

    if str(row['start_date']) != 'nan' and str(row['start_time']) != "nan" and row['start_time'] == "24:00":
        new_nasa_df.at[index,'start_time'] = pd.to_datetime(row['start_date'] + ' ' + '00:00')
    elif str(row['start_date']) != 'nan' and str(row['start_time']) != "nan":
        new_nasa_df.at[index,'start_time'] = pd.to_datetime(row['start_date'] + ' ' + row['start_time'])

    if str(row['end_date']) != 'nan' and str(row['end_time']) != "nan" and row['end_time'] == "24:00":
        new_nasa_df.at[index ,'end_time'] = pd.to_datetime(year + '/' + row['end_date'] + ' ' + '00:00')
    elif str(row['end_date']) != 'nan' and str(row['end_time']) != "nan":
        new_nasa_df.at[index ,'end_time'] = pd.to_datetime(year + '/' + row['end_date'] + ' ' + row['end_time'])

    if str(row['cme_date']) != 'nan' and str(row['cme_time']) != "nan" and row['cme_time'] == "24:00":
        new_nasa_df.at[index,'cme_time'] = pd.to_datetime(year + '/' + row['cme_date'] + ' ' + '00:00')
    elif str(row['cme_date']) != 'nan' and str(row['cme_time']) != "nan":
        new_nasa_df.at[index,'cme_time'] = pd.to_datetime(year + '/' + row['cme_date'] + ' ' + str(row['cme_time']))


new_nasa_df = new_nasa_df.drop(['start_date','cme_date','end_date'],1)
new_nasa_df = new_nasa_df.rename(columns={'start_time':"start_datetime",'end_time':"end_datetime",'cme_time':"cme_datetime",'cme_angle':"cpa"
,'cme_width':"width",'cme_speed':"speed"})
```

In [15]:
```
new_nasa_df
```

Out[15]:

	start_datetime	end_datetime	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_datetime	cpa	width	speed	plot	is_halo	width_lower_bound
0	1997-04-01 14:00:00	1997-04-01 14:15:00	8000	4000	S25E16	8026	M1.3	1997-04-01 15:18:00	74	79	312	PHTX	False	False
1	1997-04-07 14:30:00	1997-04-07 17:30:00	11000	1000	S28E19	8027	C6.8	1997-04-07 14:27:00	<NA>	360	878	PHTX	True	False
2	1997-05-12 05:15:00	1997-05-14 16:00:00	12000	80	N21W08	8038	C1.3	1997-05-12 05:30:00	<NA>	360	464	PHTX	True	False
3	1997-05-21 20:20:00	1997-05-21 22:00:00	5000	500	N05W12	8040	M1.3	1997-05-21 21:00:00	263	165	296	PHTX	False	False
4	1997-09-23 21:53:00	1997-09-23 22:16:00	6000	2000	S29E25	8088	C1.4	1997-09-23 22:02:00	133	155	712	PHTX	False	False
5	1997-11-03 05:15:00	1997-11-03 12:00:00	14000	250	S20W13	8100	C8.6	1997-11-03 05:28:00	240	109	227	PHTX	False	False
6	1997-11-03 10:30:00	1997-11-03 11:30:00	14000	5000	S16W21	8100	M4.2	1997-11-03 11:11:00	233	122	352	PHTX	False	False
7	1997-11-04 06:00:00	1997-11-05 04:30:00	14000	100	S14W33	8100	X2.1	1997-11-04 06:10:00	<NA>	360	785	PHTX	True	False
8	1997-11-06 12:20:00	1997-11-07 08:30:00	14000	100	S18W63	8100	X9.4	1997-11-06 12:10:00	<NA>	360	1556	PHTX	True	False
9	1997-11-27 13:30:00	1997-11-27 14:00:00	14000	7000	N17E63	8113	X2.6	1997-11-27 13:56:00	98	91	441	PHTX	False	False
10	1997-12-12 22:45:00	1997-12-12 23:20:00	14000	8000	N25W52	8116	B9.4	1997-12-13 00:26:00	278	73	191	PHTX	False	False
11	1998-01-25 15:03:00	1998-01-25 15:18:00	14000	10000	N21E25	8141	C1.1	1998-01-25 15:26:00	<NA>	360	693	PHTX	True	False
12	1998-03-29 03:40:00	1998-03-29 03:52:00	14000	7000	SW90	NaN	NaN	1998-03-29 03:48:00	<NA>	360	1397	PHTX	True	False
13	1998-04-20 10:25:00	1998-04-22 06:00:00	10000	35	S22W90	8194	M1.4	1998-04-20 10:07:00	284	165	1863	PHTX	False	False
14	1998-04-23 06:00:00	1998-04-23 15:30:00	14000	200	S17E90	8210	X1.2	1998-04-23 05:55:00	<NA>	360	1691	PHTX	True	False
15	1998-04-24 09:17:00	1998-04-24 09:25:00	4700	2600	S20E90	8210	C8.9	1998-04-24 08:55:00	100	84	1184	PHTX	False	False
16	1998-04-27 09:20:00	1998-04-27 10:00:00	10000	1000	S16E50	8210	X1.0	1998-04-27 08:56:00	<NA>	360	1385	PHTX	True	False
17	1998-04-29 16:30:00	1998-04-29 17:00:00	10000	2000	S18E20	8210	M6.8	1998-04-29 16:58:00	<NA>	360	1374	PHTX	True	False
18	1998-05-02 14:25:00	1998-05-02 14:50:00	5000	3000	S15W15	8210	X1.1	1998-05-02 14:06:00	<NA>	360	938	PHTX	True	False
19	1998-05-06 08:25:00	1998-05-06 08:35:00	14000	5000	S11W65	8210	X2.7	1998-05-06 08:29:00	309	190	1099	PHTX	False	False
20	1998-05-09 03:35:00	1998-05-09 10:00:00	9000	400	S14W89	8210	M7.7	1998-05-09 03:35:00	262	178	2331	PHTX	False	False
21	1998-05-11 21:40:00	1998-05-11 22:00:00	10000	1000	N32W90	8214	B6.6	1998-05-11 21:55:00	208	301	830	PHTX	False	True
22	1998-05-19 10:00:00	1998-05-19 11:30:00	14000	3000	N23W43	8222	B5.7	1998-05-19 10:27:00	268	139	801	PHTX	False	False
23	1998-05-27 13:30:00	1998-05-27 14:20:00	4000	1000	N19W62	8226	C7.5	1998-05-27 13:45:00	175	268	878	PHTX	False	False
24	1998-06-11 10:15:00	1998-06-11 10:20:00	8000	4000	N16E86	8243	M1.4	1998-06-11 10:28:00	123	177	1223	PHTX	False	False
25	1998-06-16 18:20:00	1998-06-17 21:00:00	12000	50	S22W90	8232	M1.0	1998-06-16 18:27:00	341	281	1484	PHTX	False	False
26	1998-06-20 19:39:00	1998-06-20 20:00:00	2600	1800	NaN	NaN	NaN	1998-06-20 18:20:00	<NA>	360	964	PHTX	True	False
27	1998-06-22 07:15:00	1998-06-22 09:20:00	6000	2000	N16W46	8243	C2.9	1998-06-22 05:01:00	265	59	206	PHTX	False	False
28	1998-11-02 14:00:00	1998-11-02 14:40:00	14000	4000	S25E44	8373	C4.4	1998-11-02 14:18:00	116	169	661	PHTX	False	False
29	1998-11-05 22:00:00	1998-11-07 08:00:00	5000	50	N22W18	8375	M8.4	1998-11-05 20:44:00	<NA>	360	1118	PHTX	True	False
30	1998-11-06 03:00:00	1998-11-06 05:30:00	5000	1000	NaN	NaN	NaN	1998-11-06 02:18:00	159	160	405	PHTX	False	True
31	1998-11-07 00:20:00	1998-11-07 00:50:00	14000	6000	NaN	NaN	NaN	1998-11-07 01:54:00	296	19	381	PHTX	False	False
32	1998-11-08 11:20:00	1998-11-08 11:30:00	10000	8000	S21W37	NaN	C5.9	1998-11-08 11:54:00	264	196	559	PHTX	False	False
33	1998-12-18 17:50:00	1998-12-18 18:15:00	14000	5000	N19E64	8415	M8.0	1998-12-18 18:09:00	<NA>	360	1749	PHTX	True	False
34	1999-04-24 13:50:00	1999-04-25 00:00:00	3700	100	NW90b	NaN	NaN	1999-04-24 13:31:00	<NA>	360	1495	PHTX	True	False
35	1999-05-03 05:50:00	1999-05-03 08:45:00	8000	200	N15E32	8525	M4.4	1999-05-03 06:06:00	<NA>	360	1584	PHTX	True	False
36	1999-05-27 10:55:00	1999-05-28 10:00:00	14000	70	W90b	NaN	NaN	1999-05-27 11:06:00	<NA>	360	1691	PHTX	True	False
37	1999-06-01 18:50:00	1999-06-02 09:00:00	14000	400	NW90b	NaN	NaN	1999-06-01 19:37:00	<NA>	360	1772	PHTX	True	False
38	1999-06-04 07:05:00	1999-06-05 01:00:00	14000	60	N17W69	8552	M3.9	1999-06-04 07:26:00	289	150	2230	PHTX	False	False
39	1999-06-11 11:45:00	1999-06-11 17:00:00	14000	400	N38E90	NaN	C8.8	1999-06-11 11:26:00	35	181	1569	PHTX	False	True
40	1999-06-22 18:25:00	1999-06-22 18:40:00	3000	2000	N22E37	8592	M1.7	1999-06-22 18:54:00	<NA>	360	1133	PHTX	True	False
41	1999-06-23 05:50:00	1999-06-23 07:10:00	12000	2000	NaN	NaN	NaN	1999-06-23 06:06:00	264	154	450	PHTX	False	True
42	1999-06-23 07:07:00	1999-06-23 07:14:00	14000	2000	N23E42	8596	M1.7	1999-06-23 07:31:00	<NA>	360	1006	PHTX	True	False
43	1999-06-28 21:03:00	1999-06-28 21:10:00	3500	1500	N22W44	8592	C3.5	1999-06-28 21:30:00	336	184	903	PHTX	False	True
44	1999-06-29 19:20:00	1999-06-29 19:55:00	14000	2000	S14E01	8603	M1.6	1999-06-29 19:54:00	<NA>	360	560	PHTX	True	False
45	1999-07-05 03:10:00	1999-07-05 04:05:00	2000	1000	SW90b	8603	C7.6	1999-07-05 02:54:00	284	190	670	PHTX	False	False
46	1999-08-28 18:25:00	1999-08-28 18:33:00	16000	12000	S26W14	8674	X1.1	1999-08-28 18:26:00	120	245	462	PHTX	False	False
47	1999-09-03 03:00:00	1999-09-03 04:10:00	2000	1000	S36W24	8679	C2.1	1999-09-03 00:06:00	184	175	512	PHTX	False	False
48	1999-09-10 07:30:00	1999-09-10 07:35:00	5500	2000	NW90b	NaN	NaN	1999-09-10 07:54:00	18	125	1467	PHTX	False	False
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51	1999-11-16 03:27:00	1999-11-16 03:48:00	7000	4000	N17E38	8766	M3.8	1999-11-16 03:06:00	81	98	636	PHTX	False	False
52	1999-11-16 05:17:00	1999-11-16 05:34:00	14000	7000	N08W39	8759	M1.8	1999-11-16 05:30:00	285	129	712	PHTX	False	False
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61	2000-03-02 13:50:00	2000-03-02 14:03:00	14000	6000	S20W58	8882	M6.5	2000-03-02 13:54:00	235	76	835	PHTX	False	False
62	2000-03-07 16:24:00	2000-03-07 16:48:00	14000	4500	S22E77	8906	M1.2	2000-03-07 16:30:00	120	108	644	PHTX	False	False
63	2000-03-27 06:56:00	2000-03-27 06:58:00	14000	10000	S00E90	8932	C2.3	2000-03-27 07:31:00	129	90	487	PHTX	False	False
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67	2000-05-04 11:10:00	2000-05-04 13:00:00	6500	1000	S17W87	8970	M6.8	2000-05-04 11:26:00	235	170	1404	PHTX	False	True

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76	2000-06-17 03:00:00	2000-06-17 04:15:00	14000	1000	N22W72	9041	M3.5	2000-06-17 03:28:00	298	133	857	PHTX	False	False
77	2000-06-23 14:40:00	2000-06-23 15:05:00	14000	2000	N26W72	9042	M3.0	2000-06-23 14:54:00	282	198	847	PHTX	False	True
78	2000-06-25 08:10:00	2000-06-25 09:00:00	12000	2500	N16W55	9046	M1.9	2000-06-25 07:54:00	262	165	1617	PHTX	False	False
79	2000-07-10 22:00:00	2000-07-10 23:30:00	14000	1000	N18E49	9077	M5.7	2000-07-10 21:50:00	67	289	1352	PHTX	False	True
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84	2000-08-11 11:35:00	2000-08-11 11:59:00	2800	2000	NW90b	NaN	NaN	2000-08-11 07:31:00	273	70	1071	PHTX	False	False
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93	2000-11-08 23:20:00	2000-11-09 12:00:00	4000	200	N10W77	9213	M7.4	2000-11-08 23:06:00	271	170	1738	PHTX	False	True
94	2000-11-09 16:15:00	2000-11-11 04:00:00	10000	40	S11E10	9221	M1.0	NaN	NaN	NaN	NaN	PHTX	False	False
95	2000-11-12 14:25:00	2000-11-12 14:40:00	3000	2000	S14E05	9227	C4.4	2000-11-12 14:50:00	257	50	581	PHTX	False	False
96	2000-11-23 08:16:00	2000-11-23 08:35:00	14000	9000	S26W40	9238	C5.4	2000-11-23 06:06:00	<NA>	360	492	PHTX	True	False
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98	2000-11-24 05:10:00	2000-11-24 15:00:00	14000	100	N20W05	9236	X2.0	2000-11-24 05:30:00	<NA>	360	1289	PHTX	True	False
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104	2000-11-26 17:00:00	2000-11-26 17:15:00	14000	7000	N18W38	9236	X4.0	2000-11-26 17:06:00	<NA>	360	980	PHTX	True	False
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109	2001-01-28 15:45:00	2001-01-28 17:00:00	14000	200	S04W59	9313	M1.5	2001-01-28 15:54:00	<NA>	360	916	PHTX	True	False
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112	2001-03-12 05:35:00	2001-03-12 05:45:00	3000	1500	NaN	NaN	NaN	2001-03-12 05:50:00	233	48	829	PHTX	False	False
113	2001-03-27 02:35:00	2001-03-27 03:15:00	6000	1000	N14E17	9393	C7.3	2001-03-27 02:06:00	154	60	300	PHTX	False	False
114	2001-03-27 15:00:00	2001-03-27 15:20:00	4000	1500	N15E14	9393	C5.6	2001-03-27 17:06:00	46	66	340	PHTX	False	False
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117	2001-04-02 22:05:00	2001-04-03 02:30:00	14000	250	N19W72	9393	X20.0	2001-04-02 22:06:00	261	244	2505	PHTX	False	False
118	2001-04-03 03:40:00	2001-04-03 07:25:00	14000	400	S21E83	9415	X1.2	2001-04-03 03:26:00	108	292	1613	PHTX	False	False
119	2001-04-04 09:50:00	2001-04-04 10:10:00	13000	3000	S21E68	9415	M1.6	2001-04-04 09:50:00	86	89	1065	PHTX	False	False
120	2001-04-05 09:14:00	2001-04-05 09:34:00	14000	7500	N14W85	9393	M8.4	2001-04-05 09:06:00	283	205	1750	PHTX	False	False
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127	2001-04-18 02:55:00	2001-04-18 14:00:00	1000	100	SW90b	NaN	C2.2	2001-04-18 02:30:00	<NA>	360	2465	PHTX	True	False
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131	2001-05-30 00:25:00	2001-05-30 01:38:00	14000	1000	E90b	9481	NaN	2001-05-30 00:06:00	70	216	2087	PHTX	False	False
132	2001-06-15 10:50:00	2001-06-15 11:15:00	7000	3000	S26E41	9502	M6.3	2001-06-15 10:31:00	185	119	1090	PHTX	False	False
133	2001-06-15 16:05:00	2001-06-15 16:20:00	14000	3500	W90b	NaN	NaN	2001-06-15 15:56:00	<NA>	360	1701	PHTX	True	False
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138	2001-09-15 11:50:00	2001-09-15 12:05:00	14000	6000	S21W49	9608	M1.5	2001-09-15 11:54:00	263	130	478	PHTX	False	False
139	2001-09-16 13:50:00	2001-09-16 14:10:00	3000	2000	S13E15	9616	C8.9	2001-09-16 14:30:00	131	68	584	PHTX	False	False
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148	2001-10-09 13:10:00	2001-10-09 23:00:00	5000	50	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
149	2001-10-19 01:15:00	2001-10-19 02:25:00	14000	1300	N16W18	9661	X1.6	2001-10-19 01:27:00	<NA>	360	558	PHTX	True	False
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162	2002-01-08 18:30:00	2002-01-09 00:00:00	14000	90	NE90b	NaN	NaN	2002-01-08 17:54:00	<NA>	360	1794	PHTX	True	False
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165	2002-02-01 19:23:00	2002-02-01 19:31:00	14000	11000	NaN	NaN	NaN	2002-02-01 19:54:00	350	89	448	PHTX	False	False
166	2002-02-21 12:35:00	2002-02-21 12:50:00	4000	1500	N16W79	9825	M3.9	2002-02-21 12:54:00	275	108	358	PHTX	False	False
167	2002-03-11 00:00:00	2002-03-11 00:15:00	14000	8000	S11E90	9866	M2.3	2002-03-10 23:06:00	<NA>	360	1429	PHTX	True	False
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169	2002-03-15 22:45:00	2002-03-15 23:30:00	14000	6000	S08W03	9866	M2.2	2002-03-15 23:06:00	<NA>	360	957	PHTX	True	False
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174	2002-04-10 12:59:00	2002-04-10 13:02:00	13000	12000	N15W14	9893	M8.2	2002-04-10 13:27:00	340	159	650	PHTX	False	False
175	2002-04-14 07:50:00	2002-04-14 08:10:00	14000	8000	N19W57	9893	C9.6	2002-04-14 07:50:00	323	76	757	PHTX	False	False
176	2002-04-15 03:35:00	2002-04-15 04:15:00	11000	1500	S15W01	9906	M1.2	2002-04-15 03:50:00	<NA>	360	720	PHTX	True	False
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178	2002-04-21 01:30:00	2002-04-21 00:00:00	10000	60	S14W84	9906	X1.5	2002-04-21 01:27:00	<NA>	360	2393	PHTX	True	False
179	2002-04-30 14:15:00	2002-04-30 14:23:00	4000	2500	S16E77	9934	C3.2	2002-04-30 14:26:00	92	90	618	PHTX	False	False
180	2002-04-30 22:30:00	2002-04-30 23:20:00	2000	500	W90b	NaN	NaN	2002-04-30 23:26:00	254	199	1103	PHTX	False	False
181	2002-05-02 23:50:00	2002-05-03 00:10:00	2800	900	E90b	9937	NaN	2002-05-02 23:18:00	119	99	902	PHTX	False	False
182	2002-05-16 01:50:00	2002-05-16 03:30:00	9000	2000	S22E01	9948	C4.5	2002-05-16 00:50:00	<NA>	360	600	PHTX	True	False
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184	2002-05-27 12:50:00	2002-05-27 13:50:00	14000	5000	N18E18	9967	C3.7	2002-05-27 13:27:00	49	161	1106	PHTX	False	True
185	2002-07-07 11:35:00	2002-07-07 20:00:00	14000	200	S19W90	10017	M1.0	2002-07-07 11:30:00	277	228	1423	PHTX	False	True
186	2002-07-09 19:46:00	2002-07-09 20:40:00	1000	650	W90b	NaN	NaN	2002-07-09 19:31:00	<NA>	360	1076	PHTX	True	False
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188	2002-07-17 07:30:00	2002-07-17 07:45:00	3500	2000	N21W17	10030	M8.5	2002-07-17 07:31:00	36	177	716	PHTX	False	False
189	2002-07-18 07:55:00	2002-07-18 08:45:00	14000	1500	N19W30	10030	X1.8	2002-07-18 08:06:00	<NA>	360	1099	PHTX	True	False
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196	2002-08-03 19:20:00	2002-08-03 20:30:00	14000	2000	S16W76	10039	X1.0	2002-08-03 19:31:00	259	138	1150	PHTX	False	False
197	2002-08-14 02:20:00	2002-08-14 00:00:00	1000	30	N09W54	10061	M2.3	2002-08-14 02:30:00	297	133	1309	PHTX	False	False
198	2002-08-16 06:15:00	2002-08-16 09:30:00	14000	300	N07W83	10061	M2.4	2002-08-16 06:06:00	293	162	1378	PHTX	False	False
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202	2002-09-05 16:55:00	2002-09-07 16:22:00	14000	30	N09E28	10102	C5.2	2002-09-05 16:54:00	<NA>	360	1748	PHTX	True	False
203	2002-09-10 15:19:00	2002-09-10 16:00:00	14000	8500	S10E43	10105	M2.9	2002-09-10 15:30:00	127	38	273	PHTX	False	False

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206	2002-10-14 00:19:00	2002-10-14 02:00:00	1700	500	S13E75	10159	M2.2	2002-10-13 23:54:00	107	264	1009	PHTX	False	False
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211	2002-11-11 16:15:00	2002-11-11 17:50:00	14000	600	S13W60	10180	M1.8	2002-11-11 15:54:00	212	93	1083	PHTX	False	False
212	2002-11-24 20:05:00	2002-11-24 20:45:00	14000	7000	N20E35	NaN	NaN	2002-11-24 20:30:00	<NA>	360	1077	PHTX	True	False
213	2002-12-19 21:45:00	2002-12-19 22:30:00	14000	1500	N15W09	10229	M2.7	2002-12-19 22:06:00	<NA>	360	1092	PHTX	True	False
214	2002-12-22 04:20:00	2002-12-22 04:50:00	5500	3500	N23W42	10223	M1.1	2002-12-22 03:30:00	328	272	1071	PHTX	False	False
215	2003-01-20 19:10:00	2003-01-20 20:00:00	14000	6000	N34W26	FILA	C1.7	2003-01-20 18:30:00	315	105	733	PHTX	False	False
216	2003-01-27 22:20:00	2003-01-27 22:26:00	11000	8000	S17W23	FILA	C2.4	2003-01-27 22:23:00	205	267	1053	PHTX	False	False
217	2003-03-18 12:25:00	2003-03-18 13:45:00	4500	500	S15W46	10314	X1.5	2003-03-18 12:30:00	263	209	1601	PHTX	False	False
218	2003-03-18 13:55:00	2003-03-18 14:10:00	14000	7000	S90b	NaN	NaN	2003-03-18 13:54:00	<NA>	360	1042	PHTX	True	False
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224	2003-05-31 03:00:00	2003-05-31 08:00:00	1000	150	S07W65	10365	M9.3	2003-05-31 02:30:00	<NA>	360	1835	PHTX	True	False
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226	2003-06-16 00:00:00	2003-06-16 03:00:00	14000	400	S07E80	10386	X1.3	2003-06-15 23:54:00	<NA>	360	2053	PHTX	True	False
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229	2003-08-19 11:15:00	2003-08-19 12:00:00	14000	1000	S10W57	10431	M2.7	2003-08-19 10:30:00	262	111	468	PHTX	False	False
230	2003-10-21 04:10:00	2003-10-21 04:55:00	5000	1000	SE90b	NaN	NaN	2003-10-21 03:54:00	<NA>	360	1484	PHTX	True	False
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232	2003-10-26 17:45:00	2003-10-26 19:40:00	14000	1500	N02W38	10484	X1.2	2003-10-26 17:54:00	270	171	1537	PHTX	False	True
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235	2003-11-01 22:55:00	2003-11-02 00:50:00	14000	2000	S12W60	10486	M3.2	2003-11-01 23:06:00	254	93	899	PHTX	False	True
236	2003-11-02 09:23:00	2003-11-02 11:22:00	14000	550	SW90b	NaN	NaN	2003-11-02 09:30:00	<NA>	360	2036	PHTX	True	False
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238	2003-11-03 01:15:00	2003-11-03 01:25:00	3000	1500	N10W83	10488	X2.7	2003-11-03 01:59:00	304	65	827	PHTX	False	False
239	2003-11-03 10:00:00	2003-11-03 12:30:00	6000	400	N08W77	10488	X3.9	2003-11-03 10:06:00	293	103	1420	PHTX	False	False
240	2003-11-04 20:00:00	2003-11-04 00:00:00	10000	200	S19W83	10486	X28.0	2003-11-04 19:54:00	<NA>	360	2657	PHTX	True	False
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244	2003-11-17 09:05:00	2003-11-17 09:20:00	4000	1500	S01E33	10501	M4.2	2003-11-17 09:26:00	72	242	1061	PHTX	False	True
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248	2004-01-05 03:40:00	2004-01-05 03:50:00	9000	2500	S12E38	10536	M6.9	NaN	NaN	NaN	NaN	PHTX	False	False
249	2004-01-06 06:40:00	2004-01-06 07:23:00	14000	2000	N05E90	10537	M5.8	2004-01-06 08:53:00	88	166	1469	PHTX	False	False
250	2004-01-07 04:15:00	2004-01-07 06:15:00	14000	750	N02E82	10537	M4.5	2004-01-07 04:06:00	78	171	1581	PHTX	False	False
251	2004-01-07 10:35:00	2004-01-07 11:35:00	14000	1500	N06E75	10537	M8.3	2004-01-07 10:30:00	81	182	1822	PHTX	False	False
252	2004-04-06 13:05:00	2004-04-06 16:00:00	8000	300	S18E15	10588	M2.4	2004-04-06 13:31:00	<NA>	360	1368	PHTX	True	False
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255	2004-04-11 04:20:00	2004-04-11 05:35:00	14000	500	S14W47	10588	C9.6	2004-04-11 04:30:00	203	314	1645	PHTX	False	False
256	2004-06-02 23:13:00	2004-06-02 23:55:00	14000	2100	W90b	NaN	NaN	2004-06-02 23:15:00	287	136	1102	PHTX	False	False
257	2004-06-03 16:48:00	2004-06-03 17:10:00	12000	5000	W90b	NaN	NaN	2004-06-03 16:50:00	303	179	1226	PHTX	False	False
258	2004-06-04 07:50:00	2004-06-04 09:55:00	14000	2500	W90b	NaN	NaN	2004-06-04 07:50:00	309	273	1306	PHTX	False	True
259	2004-06-22 22:07:00	2004-06-22 22:30:00	10000	7000	S12W24	10635	C1.7	NaN	NaN	NaN	NaN	PHTX	False	False
260	2004-06-23 06:30:00	2004-06-23 08:55:00	14000	5000	S09W21	10635	C2.5	NaN	NaN	NaN	NaN	PHTX	False	False
261	2004-07-23 19:00:00	2004-07-23 19:35:00	10000	2500	N04W05	10652	C4.1	2004-07-23 19:31:00	209	100	874	PHTX	False	False
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264	2004-07-31 07:10:00	2004-07-31 11:30:00	1000	200	N05W89	10652	C8.4	2004-07-31 05:54:00	259	197	1192	PHTX	False	True
265	2004-08-08 09:15:00	2004-08-08 09:22:00	14000	7000	NaN	NaN	NaN	2004-08-08 08:54:00	<NA>	360	1004	PHTX	True	False
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268	2004-10-24 03:12:00	2004-10-24 03:21:00	14000	8000	N11E19	10687	C1.7	2004-10-24 03:54:00	26	109	417	PHTX	False	True
269	2004-10-30 06:40:00	2004-10-30 07:40:00	4000	1000	N13W22	10691	M4.2	2004-10-30 06:54:00	<NA>	360	422	PHTX	True	False
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271	2004-11-03 15:55:00	2004-11-03 16:30:00	14000	3400	N09E38	10696	M5.0	2004-11-03 16:06:00	<NA>	360	1068	PHTX	True	False

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273	2004-11-06 01:50:00	2004-11-06 02:45:00	6000	700	N09E05	10696	M3.6	2004-11-06 02:06:00	351	214	1111	PHTX	False	True
274	2004-11-07 16:25:00	2004-11-08 20:00:00	14000	60	N09W17	10696	X2.0	2004-11-07 16:54:00	<NA>	360	1759	PHTX	True	False
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397	2013-01-16 22:00:00	2013-01-17 01:30:00	1000	200	S33W64	11650	C2.2	2013-01-16 19:00:00	211	250	648	PHTX	False	False
398	2013-03-15 07:00:00	2013-03-15 21:30:00	14000	100	N11E12	11692	M1.1	2013-03-15 07:12:00	<NA>	360	1063	PHTX	True	False
399	2013-04-11 07:10:00	2013-04-11 15:00:00	10000	200	N09E12	11719	M6.5	2013-04-11 07:24:00	<NA>	360	861	PHTX	True	False
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401	2013-04-21 20:25:00	2013-04-21 22:12:00	14000	1700	S19W53	11723	C2.7	2013-04-21 20:36:00	255	212	562	PHTX	False	False
402	2013-05-13 02:20:00	2013-05-13 03:00:00	16000	2000	N11E90	11748	X1.7	2013-05-13 02:00:00	<NA>	360	1270	PHTX	True	False
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404	2013-05-14 01:16:00	2013-05-14 08:20:00	16000	240	N08E77	11748	X3.2	2013-05-14 01:25:00	<NA>	360	2625	PHTX	True	False
405	2013-05-15 01:49:00	2013-05-15 07:57:00	16000	230	N12E64	11748	X1.2	2013-05-15 01:48:00	<NA>	360	1366	PHTX	True	False
406	2013-05-22 13:10:00	2013-05-24 06:00:00	16000	150	N15W70	11745	M5.0	2013-05-22 13:25:00	<NA>	360	1466	PHTX	True	False
407	2013-06-21 03:35:00	2013-06-21 05:15:00	14000	2000	S16E73	11777	M2.9	2013-06-21 03:12:00	123	207	1900	PHTX	False	True

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408	2013-06-28 01:53:00	2013-06-28 03:26:00	14000	400	S18W19	11777	C4.4	2013-06-28 02:00:00	<NA>	360	1037	PHTX	True	False
409	2013-07-04 20:57:00	2013-07-04 21:27:00	11000	2900	S14E62	11787	C6.8	2013-07-04 20:12:00	111	188	468	PHTX	False	False
410	2013-08-06 02:01:00	2013-08-06 02:11:00	14000	11000	N27E25	EP	B4.5	2013-08-06 02:12:00	48	207	441	PHTX	False	False
411	2013-08-17 20:25:00	2013-08-18 03:05:00	1800	150	S05W30	11818	M1.4	2013-08-17 19:12:00	<NA>	360	1202	PHTX	True	False
412	2013-08-30 02:34:00	2013-08-31 04:00:00	14000	50	N15E46	11836	C8.3	2013-08-30 02:48:00	<NA>	360	949	PHTX	True	False
413	2013-09-06 22:29:00	2013-09-06 22:34:00	5000	2000	N10E104	DIM	NaN	2013-09-06 20:48:00	90	182	734	PHTX	False	False
414	2013-09-29 21:53:00	2013-09-30 21:00:00	14000	60	N17W29	EP	C1.3	2013-09-29 22:12:00	<NA>	360	1179	PHTX	True	False
415	2013-10-02 20:46:00	2013-10-02 21:10:00	10000	5200	N20W85	DIM	C1.2	2013-10-02 20:36:00	309	263	619	PHTX	False	False
416	2013-10-05 07:00:00	2013-10-05 14:46:00	16000	200	S22E118	11865	NaN	2013-10-05 07:09:00	<NA>	360	964	PHTX	True	False
417	2013-10-11 07:23:00	2013-10-11 11:43:00	14000	100	N21E103	11869	NaN	2013-10-11 07:24:00	<NA>	360	1200	PHTX	True	False
418	2013-10-13 18:47:00	2013-10-14 05:15:00	2100	600	NaN	NaN	NaN	2013-10-13 14:12:00	220	83	293	PHTX	False	False
419	2013-10-22 21:33:00	2013-10-22 22:08:00	14000	650	N04W01	11875	M4.2	2013-10-22 21:48:00	<NA>	360	459	PHTX	True	False
420	2013-10-25 15:08:00	2013-10-25 22:32:00	16000	200	S06E69	11882	X2.1	2013-10-25 15:12:00	<NA>	360	1081	PHTX	True	False
421	2013-10-26 03:01:00	2013-10-26 04:00:00	14000	200	N09W44	11875	C4.5	2013-10-26 03:12:00	271	208	473	PHTX	False	False
422	2013-10-26 09:34:00	2013-10-26 10:10:00	14000	5000	N08W49	11875	M1.3	2013-10-26 09:48:00	286	141	460	PHTX	False	False
423	2013-10-27 18:12:00	2013-10-27 18:36:00	14000	1700	N06W70	11875	C9.1	2013-10-27 18:12:00	308	189	795	PHTX	False	False
424	2013-10-28 04:41:00	2013-10-28 11:51:00	14000	200	N08W71	11875	M5.1	2013-10-28 04:48:00	315	156	1201	PHTX	False	False
425	2013-10-28 15:24:00	2013-10-28 15:29:00	14000	9000	S06E28	11882	M4.4	2013-10-28 15:36:00	<NA>	360	812	PHTX	True	False
426	2013-11-04 05:10:00	2013-11-04 08:00:00	16000	450	N03W165	11875	NaN	2013-11-04 05:12:00	<NA>	360	1040	PHTX	True	False
427	2013-11-07 10:26:00	2013-11-07 20:40:00	16000	100	N02E151	11899	NaN	2013-11-07 10:36:00	<NA>	360	1405	PHTX	True	False
428	2013-11-19 10:39:00	2013-11-19 20:20:00	14000	100	S14W70	11893	X1.0	2013-11-19 10:36:00	<NA>	360	740	PHTX	True	False
429	2013-11-29 22:18:00	2013-11-30 09:20:00	1800	100	N06W183	11899	NaN	2013-11-29 17:24:00	251	188	465	PHTX	False	False
430	2013-12-05 12:45:00	2013-12-05 13:00:00	4200	1600	S20E119	DIM	NaN	2013-12-05 10:24:00	133	148	549	PHTX	False	False
431	2013-12-05 20:48:00	2013-12-05 21:35:00	14000	2500	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
432	2013-12-07 07:43:00	2013-12-07 08:36:00	14000	3000	S16W49	11909	M1.2	2013-12-07 07:36:00	<NA>	360	1085	PHTX	True	False
433	2013-12-12 03:55:00	2013-12-12 21:30:00	12000	70	S23W46	11912	C4.6	2013-12-12 03:36:00	214	276	1002	PHTX	False	False
434	2013-12-20 08:23:00	2013-12-20 13:24:00	1500	400	NaN	NaN	NaN	2013-12-20 04:36:00	255	26	337	PHTX	False	False
435	2013-12-28 17:31:00	2013-12-28 18:05:00	16000	500	S15W125	11928	NaN	2013-12-28 17:36:00	<NA>	360	1118	PHTX	True	False
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437	2014-01-04 19:03:00	2014-01-05 09:00:00	6500	100	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
438	2014-01-06 07:57:00	2014-01-06 22:30:00	14000	80	S15W112	11936	NaN	2014-01-06 08:00:00	<NA>	360	1402	PHTX	True	False
439	2014-01-07 18:33:00	2014-01-08 21:00:00	14000	60	S15W11	11943	X1.2	2014-01-07 18:24:00	<NA>	360	1830	PHTX	True	False
440	2014-01-20 22:24:00	2014-01-20 22:36:00	14000	8000	S07E67	DIM	C3.6	2014-01-20 22:00:00	<NA>	360	721	PHTX	True	False
441	2014-02-18 02:16:00	2014-02-18 02:51:00	2000	900	S24W43	EP	NaN	2014-02-18 01:36:00	<NA>	360	779	PHTX	True	False
442	2014-02-20 08:05:00	2014-02-20 08:29:00	12000	7700	S15W73	11976	M3.0	2014-02-20 08:00:00	<NA>	360	948	PHTX	True	False
443	2014-02-25 00:56:00	2014-02-25 11:28:00	14000	100	S12E82	11990	X4.9	2014-02-25 01:25:00	<NA>	360	2147	PHTX	True	False
444	2014-03-04 18:24:00	2014-03-04 20:10:00	16000	2000	N13W170	12005	NaN	2014-03-04 18:48:00	<NA>	360	794	PHTX	True	False
445	2014-03-05 13:33:00	2014-03-05 17:10:00	16000	500	N14E180	NaN	NaN	2014-03-05 13:48:00	<NA>	360	828	PHTX	True	False
446	2014-03-25 07:52:00	2014-03-25 11:30:00	1700	400	S23W130	EP	NaN	2014-03-25 05:36:00	261	223	651	PHTX	False	False
447	2014-03-29 00:12:00	2014-03-29 00:48:00	14000	2200	N11W23	12017	M2.6	2014-03-28 23:48:00	325	138	514	PHTX	False	False
448	2014-03-29 17:59:00	2014-03-30 09:58:00	14000	200	S08W152	12011	NaN	2014-03-29 18:12:00	<NA>	360	528	PHTX	True	False
449	2014-04-02 13:42:00	2014-04-03 08:10:00	14000	60	N11E53	12027	M6.5	2014-04-02 13:36:00	<NA>	360	1471	PHTX	True	False
450	2014-04-02 18:49:00	2014-04-03 06:40:00	2400	200	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
451	2014-04-04 14:02:00	2014-04-04 14:07:00	14000	11000	N13E26	12027	C8.3	2014-04-04 14:12:00	54	96	467	PHTX	False	False
452	2014-04-18 13:05:00	2014-04-18 22:50:00	14000	150	S20W34	12036	M7.3	2014-04-18 13:25:00	<NA>	360	1203	PHTX	True	False
453	2014-05-07 16:24:00	2014-05-07 23:18:00	16000	200	N11E53	12027	NaN	2014-05-07 16:24:00	<NA>	360	923	PHTX	True	False
454	2014-05-08 03:21:00	2014-05-08 05:26:00	16000	1100	S09W108	12051	NaN	2014-05-08 03:24:00	<NA>	360	847	PHTX	True	False
455	2014-05-09 02:40:00	2014-05-09 04:30:00	14000	500	S11W122	12051	NaN	2014-05-09 02:48:00	<NA>	360	1099	PHTX	True	False
456	2014-05-10 04:32:00	2014-05-10 08:37:00	16000	400	S11W136	12051	NaN	2014-05-10 04:36:00	<NA>	360	1086	PHTX	True	False
457	2014-06-10 12:58:00	2014-06-10 15:00:00	16000	1000	S17E82	12087	X1.5	2014-06-10 13:30:00	<NA>	360	1469	PHTX	True	False
458	2014-06-12 22:14:00	2014-06-12 22:35:00	14000	6000	S20W55	12085	M3.1	2014-06-12 22:12:00	233	186	684	PHTX	False	False
459	2014-07-30 07:44:00	2014-07-30 08:00:00	6300	4500	N10E30	EP?	C1.5	2014-07-30 07:00:00	13	254	700	PHTX	False	False
460	2014-08-01 18:58:00	2014-08-02 05:00:00	1000	150	S10E11	12127	M1.5	2014-08-01 18:36:00	<NA>	360	789	PHTX	True	False
461	2014-08-22 10:37:00	2014-08-22 11:18:00	14000	6000	N12E01	12146	C2.2	2014-08-22 11:12:00	<NA>	360	600	PHTX	True	False
462	2014-08-25 15:20:00	2014-08-25 16:02:00	14000	4000	N05W36	12146	M2.0	2014-08-25 15:36:00	<NA>	360	555	PHTX	True	False
463	2014-08-25 20:43:00	2014-08-25 21:00:00	14000	7200	N07W43	12146	M3.9	2014-08-25 20:48:00	273	177	711	PHTX	False	False
464	2014-08-28 17:05:00	2014-08-28 22:08:00	16000	600	S19E162	12157	NaN	2014-08-28 17:24:00	<NA>	360	766	PHTX	True	False
465	2014-09-01 11:12:00	2014-09-01 20:05:00	16000	150	N14E127	12158	NaN	2014-09-01 11:12:00	<NA>	360	1901	PHTX	True	False
466	2014-09-09 00:05:00	2014-09-09 13:00:00	11000	100	N12E29	12158	M4.5	2014-09-09 00:06:00	<NA>	360	920	PHTX	True	False
467	2014-09-10 17:45:00	2014-09-11 12:00:00	14000	100	N14E02	12158	X1.6	2014-09-10 18:00:00	<NA>	360	1267	PHTX	True	False
468	2014-09-20 05:10:00	2014-09-20 05:30:00	14000	9700	S11W89	12164	NaN	2014-09-20 05:24:00	292	87	426	PHTX	False	False
469	2014-09-22 06:13:00	2014-09-22 06:50:00	16000	4900	N14W142	12158	NaN	2014-09-22 06:12:00	342	252	618	PHTX	False	False
470	2014-09-23 23:41:00	2014-09-23 23:47:00	14000	12000	S13E33	12172	M2.3	2014-09-23 23:36:00	109	134	331	PHTX	False	False
471	2014-09-24 20:54:00	2014-09-24 23:48:00	16000	500	N13E179	EP	NaN	2014-09-24 21:30:00	<NA>	360	1350	PHTX	True	False
472	2014-10-02 21:34:00	2014-10-02 21:56:00	3300	1900	S17W82	12173	M7.3	2014-10-02 19:12:00	264	159	513	PHTX	False	False
473	2014-10-10 18:11:00	2014-10-10 18:33:00	2500	1500	S20W51	EP	C3.0	2014-10-10 16:12:00	309	210	782	PHTX	False	True
474	2014-10-21 12:33:00	2014-10-21 13:01:00	14000	8900	S18E36	12192	C4.4	2014-10-21 12:48:00	152	142	260	PHTX	False	False
475	2014-11-08 16:57:00	2014-11-08 17:18:00	14000	7800	W90b	12203	NaN	2014-11-08 16:36:00	305	141	426	PHTX	False	False

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477	2014-12-17 04:09:00	2014-12-17 04:19:00	2900	2100	S11E33	12241	M1.1	2014-12-17 02:00:00	107	108	869	PHTX	False	False
478	2014-12-17 05:00:00	2014-12-17 05:09:00	14000	11500	S20E09	12242	M8.7	2014-12-17 05:00:00	<NA>	360	587	PHTX	True	False
479	2014-12-18 22:31:00	2014-12-18 22:54:00	5100	1300	S11E15	12241	M6.9	2014-12-19 01:04:00	<NA>	360	1195	PHTX	True	False
480	2014-12-21 12:05:00	2014-12-21 12:28:00	14000	7400	S14W25	12241	M1.0	2014-12-21 12:12:00	<NA>	360	669	PHTX	True	False
481	2015-03-03 02:33:00	2015-03-03 02:37:00	8100	3600	W90b	12290	M8.2	2015-03-03 01:48:00	329	213	764	PHTX	False	False
482	2015-03-06 08:00:00	2015-03-06 11:30:00	4700	200	S20E87	12297	M1.5	2015-03-06 07:12:00	83	155	880	PHTX	False	False
483	2015-03-10 00:10:00	2015-03-10 00:27:00	14000	6200	S18E45	12297	M5.8	2015-03-10 00:00:00	<NA>	360	995	PHTX	True	False
484	2015-03-11 10:30:00	2015-03-11 14:50:00	1000	250	S15E23	12297	M2.6	2015-03-11 08:24:00	62	93	530	PHTX	False	False
485	2015-03-24 09:00:00	2015-03-24 11:47:00	14000	400	SW90b	NaN	NaN	2015-03-24 08:24:00	<NA>	360	1794	PHTX	True	False
486	2015-04-26 03:21:00	2015-04-26 03:33:00	8000	4600	W90b	NaN	NaN	2015-04-26 03:24:00	<NA>	360	820	PHTX	True	False
487	2015-05-05 22:24:00	2015-05-05 23:14:00	14000	500	N15E79	12339	X2.7	2015-05-05 22:24:00	<NA>	360	715	PHTX	True	False
488	2015-05-12 03:00:00	2015-05-12 03:04:00	14000	6400	W90b	NaN	NaN	2015-05-12 02:48:00	286	250	772	PHTX	False	False
489	2015-06-09 20:23:00	2015-06-09 22:35:00	2300	200	S03E25	12364	C2.8	2015-06-09 20:12:00	77	262	1036	PHTX	False	False
490	2015-06-14 05:26:00	2015-06-14 05:41:00	3000	1250	S12W34	12365	C5.9	2015-06-14 04:12:00	199	195	1228	PHTX	False	False
491	2015-06-18 17:42:00	2015-06-18 19:40:00	3700	500	N15E50	12371	M3.0	2015-06-18 17:24:00	<NA>	360	1305	PHTX	True	False
492	2015-06-21 02:33:00	2015-06-21 21:20:00	5500	150	N12E16	12371	M2.0	2015-06-21 02:36:00	<NA>	360	1366	PHTX	True	False
493	2015-06-22 18:20:00	2015-06-22 21:55:00	14000	300	N12W08	12371	M6.5	2015-06-22 18:36:00	<NA>	360	1209	PHTX	True	False
494	2015-06-25 08:35:00	2015-06-25 16:30:00	14000	150	N09W42	12371	M7.9	2015-06-25 08:36:00	<NA>	360	1627	PHTX	True	False
495	2015-07-01 16:08:00	2015-07-01 20:47:00	1000	150	W90b	NaN	NaN	2015-07-01 14:36:00	<NA>	360	1435	PHTX	True	False
496	2015-08-22 07:07:00	2015-08-22 07:18:00	14000	7300	S15E13	12403	M1.2	2015-08-22 07:12:00	<NA>	360	547	PHTX	True	False
497	2015-09-18 04:54:00	2015-09-18 09:52:00	14000	400	S21W10	12415	C2.6	2015-09-18 05:00:00	201	131	823	PHTX	False	False
498	2015-09-20 18:23:00	2015-09-21 01:46:00	14000	300	S20W24	12415	M2.1	2015-09-20 18:12:00	<NA>	360	1239	PHTX	True	False
499	2015-11-04 14:07:00	2015-11-04 15:14:00	14000	440	N09W04	12443	M3.7	2015-11-04 14:48:00	<NA>	360	578	PHTX	True	False
500	2015-11-09 13:21:00	2015-11-09 13:27:00	14000	9000	S11E41	12449	M3.9	2015-11-09 13:25:00	142	273	1041	PHTX	False	False
501	2015-12-16 08:45:00	2015-12-16 08:57:00	5300	3800	S13W04	12468	C6.6	2015-12-16 09:36:00	<NA>	360	579	PHTX	True	False
502	2015-12-23 01:18:00	2015-12-23 01:23:00	12000	6700	S22E63	12473	M4.7	2015-12-23 01:25:00	98	89	520	PHTX	False	False
503	2015-12-28 11:50:00	2015-12-28 21:45:00	14000	180	S23W11	12473	M1.8	2015-12-28 12:12:00	<NA>	360	1212	PHTX	True	False
504	2016-01-02 00:55:00	2016-01-02 03:08:00	1100	300	S25W82	12473	M2.3	2016-01-01 23:24:00	<NA>	360	1730	PHTX	True	False
505	2016-02-05 20:28:00	2016-02-05 23:31:00	1650	500	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
506	2016-02-05 22:35:00	2016-02-05 22:55:00	5200	1900	S17W29	NaN	NaN	2016-02-05 21:24:00	193	155	445	PHTX	False	False
507	2016-05-04 14:20:00	2016-05-04 14:34:00	14000	10500	N06W61	12535	C1.3	2016-05-04 14:12:00	255	134	390	PHTX	False	False
508	2016-05-24 17:00:00	2016-05-24 20:50:00	1500	700	NaN	NaN	NaN	NaN	NaN	NaN	NaN	PHTX	False	False
509	2016-08-15 18:21:00	2016-08-15 18:28:00	11000	3400	E90b	NaN	NaN	2016-08-15 17:24:00	75	98	633	PHTX	False	False
510	2017-04-23 06:00:00	2017-04-23 06:13:00	15000	8300	N16E41	NaN	NaN	2017-04-23 06:00:00	85	77	955	PHTX	False	False
511	2017-07-14 01:18:00	2017-07-14 21:30:00	14000	70	S06W29	12665	M2.4	2017-07-14 01:25:00	<NA>	360	1200	PHTX	True	False
512	2017-07-23 05:27:00	2017-07-23 06:12:00	4400	900	NaN	NaN	NaN	2017-07-23 04:48:00	<NA>	360	1848	PHTX	True	False
513	2017-09-04 20:27:00	2017-09-05 04:54:00	14000	210	S10W12	12673	M5.5	2017-09-04 20:12:00	<NA>	360	1418	PHTX	True	False
514	2017-09-06 12:05:00	2017-09-07 08:00:00	16000	70	S08W33	12673	X9.3	2017-09-06 12:24:00	<NA>	360	1571	PHTX	True	False
515	2017-09-10 16:02:00	2017-09-11 06:50:00	16000	150	S09W92	NaN	X8.3	2017-09-10 16:00:00	<NA>	360	3163	PHTX	True	False
516	2017-09-12 07:38:00	2017-09-12 07:43:00	16000	13000	N08E48	12680	C3.0	2017-09-12 08:03:00	124	96	252	PHTX	False	False
517	2017-09-17 11:45:00	2017-09-17 12:35:00	16000	900	S08E170	NaN	NaN	2017-09-17 12:00:00	<NA>	360	1385	PHTX	True	False

Part 2

Question 1

In this part I give priority to specific alphabets such as 'X' gets 400 added to its actual float magnitude. This helped me arange the data based according to X followed by M, C and B. I also priortize based of the dates since the importance of when they occured and displayed the top 50. There were alot of similarity between the datasets. They were minute difference in time or sometimes value of the flare classification however many simalarity.

In [16]:
```
def sort_class(element):
    if str(element) == 'nan':
        return -99
    elif 'X' in element:
        return 400 + float(element[1:])
    elif 'M' in element:
        return 300 + float(element[1:])
    elif 'C' in element:
        return 200 + float(element[1:])
    elif 'B' in element:
        return 100 + float(element[1:])

    return 0

new_nasa_df['top'] = new_nasa_df['flare_classification'].apply(sort_class)
new_nasa_df.sort_values(by='top', axis = 0, inplace=True, ascending=False, na_position ='last')
nasa_50 = new_nasa_df.drop('top',1).set_index(np.arange(1,len(new_nasa_df)+1))
```

In [17]:
```
nasa_50 = nasa_50[:50]
nasa_50
```

Out[17]:

	start_datetime	end_datetime	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_datetime	cpa	width	speed	plot	is_halo	width_lower_bound
1	2003-11-04 20:00:00	2003-11-04 00:00:00	10000	200	S19W83	10486	X28.0	2003-11-04 19:54:00	<NA>	360	2657	PHTX	True	False
2	2001-04-02 22:05:00	2001-04-03 02:30:00	14000	250	N19W72	9393	X20.0	2001-04-02 22:06:00	261	244	2505	PHTX	False	False
3	2003-10-28 11:10:00	2003-10-29 00:00:00	14000	40	S16E08	10486	X17.0	2003-10-28 11:30:00	<NA>	360	2459	PHTX	True	False
4	2001-04-15 14:05:00	2001-04-16 13:00:00	14000	40	S20W85	9415	X14.0	2001-04-15 14:06:00	245	167	1199	PHTX	False	False
5	2003-10-29 20:55:00	2003-10-29 00:00:00	11000	500	S15W02	10486	X10.0	2003-10-29 20:54:00	<NA>	360	2029	PHTX	True	False
6	1997-11-06 12:20:00	1997-11-07 08:30:00	14000	100	S18W63	8100	X9.4	1997-11-06 12:10:00	<NA>	360	1556	PHTX	True	False
7	2017-09-06 12:05:00	2017-09-07 08:00:00	16000	70	S08W33	12673	X9.3	2017-09-06 12:24:00	<NA>	360	1571	PHTX	True	False
8	2006-12-05 10:50:00	2006-12-05 20:00:00	14000	250	S07E68	10930	X9.0	NaN	NaN	NaN	NaN	PHTX	False	False
9	2017-09-10 16:02:00	2017-09-11 06:50:00	16000	150	S09W92	NaN	X8.3	2017-09-10 16:00:00	<NA>	360	3163	PHTX	True	False
10	2003-11-02 17:30:00	2003-11-03 01:00:00	12000	250	S14W56	10486	X8.3	2003-11-02 17:30:00	<NA>	360	2598	PHTX	True	False
11	2005-01-20 07:15:00	2005-01-20 16:30:00	14000	25	N14W61	10720	X7.1	2005-01-20 06:54:00	<NA>	360	882	PHTX	True	False
12	2011-08-09 08:20:00	2011-08-09 08:35:00	16000	4000	N17W69	11263	X6.9	2011-08-09 08:12:00	<NA>	360	1610	PHTX	True	False
13	2006-12-06 19:00:00	2006-12-08 00:00:00	16000	30	S05E64	10930	X6.5	NaN	NaN	NaN	NaN	PHTX	False	False
14	2005-09-09 19:45:00	2005-09-09 22:00:00	10000	50	S12E67	10808	X6.2	2005-09-09 19:48:00	<NA>	360	2257	PHTX	True	False
15	2000-07-14 10:30:00	2000-07-15 14:30:00	14000	80	N22W07	9077	X5.7	2000-07-14 10:54:00	<NA>	360	1674	PHTX	True	False
16	2001-04-06 19:35:00	2001-04-07 01:50:00	14000	230	S21E31	9415	X5.6	2001-04-06 19:30:00	<NA>	360	1270	PHTX	True	False
17	2012-03-07 01:00:00	2012-03-08 19:00:00	16000	30	N17E27	11429	X5.4	2012-03-07 00:24:00	<NA>	360	2684	PHTX	True	False
18	2001-08-25 16:50:00	2001-08-25 23:00:00	8000	170	S17E34	9591	X5.3	2001-08-25 16:50:00	<NA>	360	1433	PHTX	True	False
19	2014-02-25 00:56:00	2014-02-25 11:28:00	14000	100	S12E82	11990	X4.9	2014-02-25 01:25:00	<NA>	360	2147	PHTX	True	False
20	2002-07-23 00:50:00	2002-07-23 04:00:00	11000	400	S13E72	10039	X4.8	2002-07-23 00:42:00	<NA>	360	2285	PHTX	True	False
21	2000-11-26 17:00:00	2000-11-26 17:15:00	14000	7000	N18W38	9236	X4.0	2000-11-26 17:06:00	<NA>	360	980	PHTX	True	False
22	2003-11-03 10:00:00	2003-11-03 12:30:00	6000	400	N08W77	10488	X3.9	2003-11-03 10:06:00	293	103	1420	PHTX	False	False
23	2005-01-17 10:00:00	2005-01-17 10:35:00	6100	1500	N15W25	10720	X3.8	2005-01-17 09:54:00	<NA>	360	2547	PHTX	True	False
24	2003-05-28 01:00:00	2003-05-29 00:30:00	1000	200	S07W20	10365	X3.6	2003-05-28 00:50:00	<NA>	360	1366	PHTX	True	False
25	2006-12-13 02:45:00	2006-12-13 10:40:00	12000	150	S06W23	10930	X3.4	2006-12-13 02:54:00	<NA>	360	1774	PHTX	True	False
26	2001-12-28 20:35:00	2001-12-29 03:00:00	14000	350	S26E90	9756	X3.4	2001-12-28 20:30:00	<NA>	360	2216	PHTX	True	False
27	2002-07-20 21:30:00	2002-07-20 22:20:00	10000	2000	S13E90	10039	X3.3	2002-07-20 22:06:00	<NA>	360	1941	PHTX	True	False
28	2013-05-14 01:16:00	2013-05-14 08:20:00	16000	240	N08E77	11748	X3.2	2013-05-14 01:25:00	<NA>	360	2625	PHTX	True	False
29	2002-08-24 01:45:00	2002-08-24 03:25:00	5000	400	S02W81	10069	X3.1	2002-08-24 01:27:00	<NA>	360	1913	PHTX	True	False
30	2013-05-13 16:15:00	2013-05-13 19:10:00	16000	300	N11E85	11748	X2.8	2013-05-13 16:07:00	<NA>	360	1850	PHTX	True	False
31	2015-05-05 22:24:00	2015-05-05 23:14:00	14000	500	N15E79	12339	X2.7	2015-05-05 22:24:00	<NA>	360	715	PHTX	True	False
32	1998-05-06 08:25:00	1998-05-06 08:35:00	14000	5000	S11W65	8210	X2.7	1998-05-06 08:29:00	309	190	1099	PHTX	False	False
33	2003-11-03 01:15:00	2003-11-03 01:25:00	3000	1500	N10W83	10488	X2.7	2003-11-03 01:59:00	304	65	827	PHTX	False	False
34	2005-01-15 23:00:00	2005-01-17 00:00:00	3000	40	N15W05	10720	X2.6	2005-01-15 23:06:00	<NA>	360	2861	PHTX	True	False
35	2001-09-24 10:45:00	2001-09-25 20:00:00	7000	30	S16E23	9632	X2.6	2001-09-24 10:30:00	<NA>	360	2402	PHTX	True	False
36	1997-11-27 13:30:00	1997-11-27 14:00:00	14000	7000	N17E63	8113	X2.6	1997-11-27 13:56:00	98	91	441	PHTX	False	False
37	2004-11-10 02:25:00	2004-11-10 03:40:00	14000	1000	N09W49	10696	X2.5	2004-11-10 02:26:00	<NA>	360	3387	PHTX	True	False
38	2000-06-06 15:20:00	2000-06-08 09:00:00	14000	40	N20E18	9026	X2.3	2000-06-06 15:54:00	<NA>	360	1119	PHTX	True	False
39	2001-04-10 05:24:00	2001-04-10 00:00:00	14000	100	S23W09	9415	X2.3	2001-04-10 05:30:00	<NA>	360	2411	PHTX	True	False
40	2000-11-24 15:25:00	2000-11-24 22:00:00	14000	200	N22W07	9236	X2.3	2000-11-24 15:30:00	<NA>	360	1245	PHTX	True	False
41	2011-02-15 02:10:00	2011-02-15 07:00:00	16000	400	S20W12	11158	X2.2	2011-02-15 02:24:00	<NA>	360	669	PHTX	True	False
42	2005-09-10 21:45:00	2005-09-11 01:00:00	14000	200	S13E47	10808	X2.1	2005-09-10 21:52:00	<NA>	360	1893	PHTX	True	False
43	2011-09-06 22:30:00	2011-09-07 15:40:00	16000	150	N14W18	11283	X2.1	2011-09-06 23:05:00	<NA>	360	575	PHTX	True	False
44	2013-10-25 15:08:00	2013-10-25 22:32:00	16000	200	S06E69	11882	X2.1	2013-10-25 15:12:00	<NA>	360	1081	PHTX	True	False
45	1997-11-04 06:00:00	1997-11-05 04:30:00	14000	100	S14W33	8100	X2.1	1997-11-04 06:10:00	<NA>	360	785	PHTX	True	False
46	2000-11-24 05:10:00	2000-11-24 15:00:00	14000	100	N20W05	9236	X2.0	2000-11-24 05:30:00	<NA>	360	1289	PHTX	True	False
47	2001-04-12 10:20:00	2001-04-12 10:40:00	14000	7000	S19W43	9415	X2.0	2001-04-12 10:31:00	<NA>	360	1184	PHTX	True	False
48	2004-11-07 16:25:00	2004-11-08 20:00:00	14000	60	N09W17	10696	X2.0	2004-11-07 16:54:00	<NA>	360	1759	PHTX	True	False
49	2005-01-17 09:25:00	2005-01-17 16:00:00	14000	30	N15W25	10720	X2.0	2005-01-17 09:30:00	<NA>	360	2094	PHTX	True	False
50	2000-11-25 19:00:00	2000-11-25 19:35:00	6000	2000	N20W23	9236	X1.9	2000-11-25 19:31:00	<NA>	360	671	PHTX	True	False

Question 2

I compared the datasets based of flare classification and year of occurance to determine the simialrity. The rank is stored in the 1st column so that we can find compare the ranking of nasa 50 and swl 50.

In [18]:
```
# Priortize based of time
nasa_50['top'] = nasa_50['flare_classification'].apply(sort_class)
nasa_50.sort_values(by=['top', 'start_datetime'], axis = 0, inplace=True, ascending=False, na_position ='last')
nasa_50 = nasa_50.drop('top',1)
nasa_50
```

Out[18]:

	start_datetime	end_datetime	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_datetime	cpa	width	speed	plot	is_halo	width_lower_bound
1	2003-11-04 20:00:00	2003-11-04 00:00:00	10000	200	S19W83	10486	X28.0	2003-11-04 19:54:00	<NA>	360	2657	PHTX	True	False
2	2001-04-02 22:05:00	2001-04-03 02:30:00	14000	250	N19W72	9393	X20.0	2001-04-02 22:06:00	261	244	2505	PHTX	False	False
3	2003-10-28 11:10:00	2003-10-29 00:00:00	14000	40	S16E08	10486	X17.0	2003-10-28 11:30:00	<NA>	360	2459	PHTX	True	False
4	2001-04-15 14:05:00	2001-04-16 13:00:00	14000	40	S20W85	9415	X14.0	2001-04-15 14:06:00	245	167	1199	PHTX	False	False
5	2003-10-29 20:55:00	2003-10-29 00:00:00	11000	500	S15W02	10486	X10.0	2003-10-29 20:54:00	<NA>	360	2029	PHTX	True	False
6	1997-11-06 12:20:00	1997-11-07 08:30:00	14000	100	S18W63	8100	X9.4	1997-11-06 12:10:00	<NA>	360	1556	PHTX	True	False
7	2017-09-06 12:05:00	2017-09-07 08:00:00	16000	70	S08W33	12673	X9.3	2017-09-06 12:24:00	<NA>	360	1571	PHTX	True	False
8	2006-12-05 10:50:00	2006-12-05 20:00:00	14000	250	S07E68	10930	X9.0	NaN	NaN	NaN	NaN	PHTX	False	False
9	2017-09-10 16:02:00	2017-09-11 06:50:00	16000	150	S09W92	NaN	X8.3	2017-09-10 16:00:00	<NA>	360	3163	PHTX	True	False
10	2003-11-02 17:30:00	2003-11-03 01:00:00	12000	250	S14W56	10486	X8.3	2003-11-02 17:30:00	<NA>	360	2598	PHTX	True	False
11	2005-01-20 07:15:00	2005-01-20 16:30:00	14000	25	N14W61	10720	X7.1	2005-01-20 06:54:00	<NA>	360	882	PHTX	True	False
12	2011-08-09 08:20:00	2011-08-09 08:35:00	16000	4000	N17W69	11263	X6.9	2011-08-09 08:12:00	<NA>	360	1610	PHTX	True	False
13	2006-12-06 19:00:00	2006-12-08 00:00:00	16000	30	S05E64	10930	X6.5	NaN	NaN	NaN	NaN	PHTX	False	False
14	2005-09-09 19:45:00	2005-09-09 22:00:00	10000	50	S12E67	10808	X6.2	2005-09-09 19:48:00	<NA>	360	2257	PHTX	True	False
15	2000-07-14 10:30:00	2000-07-15 14:30:00	14000	80	N22W07	9077	X5.7	2000-07-14 10:54:00	<NA>	360	1674	PHTX	True	False
16	2001-04-06 19:35:00	2001-04-07 01:50:00	14000	230	S21E31	9415	X5.6	2001-04-06 19:30:00	<NA>	360	1270	PHTX	True	False
17	2012-03-07 01:00:00	2012-03-08 19:00:00	16000	30	N17E27	11429	X5.4	2012-03-07 00:24:00	<NA>	360	2684	PHTX	True	False
18	2001-08-25 16:50:00	2001-08-25 23:00:00	8000	170	S17E34	9591	X5.3	2001-08-25 16:50:00	<NA>	360	1433	PHTX	True	False
19	2014-02-25 00:56:00	2014-02-25 11:28:00	14000	100	S12E82	11990	X4.9	2014-02-25 01:25:00	<NA>	360	2147	PHTX	True	False
20	2002-07-23 00:50:00	2002-07-23 04:00:00	11000	400	S13E72	10039	X4.8	2002-07-23 00:42:00	<NA>	360	2285	PHTX	True	False
21	2000-11-26 17:00:00	2000-11-26 17:15:00	14000	7000	N18W38	9236	X4.0	2000-11-26 17:06:00	<NA>	360	980	PHTX	True	False
22	2003-11-03 10:00:00	2003-11-03 12:30:00	6000	400	N08W77	10488	X3.9	2003-11-03 10:06:00	293	103	1420	PHTX	False	False
23	2005-01-17 10:00:00	2005-01-17 10:35:00	6100	1500	N15W25	10720	X3.8	2005-01-17 09:54:00	<NA>	360	2547	PHTX	True	False
24	2003-05-28 01:00:00	2003-05-29 00:30:00	1000	200	S07W20	10365	X3.6	2003-05-28 00:50:00	<NA>	360	1366	PHTX	True	False
25	2006-12-13 02:45:00	2006-12-13 10:40:00	12000	150	S06W23	10930	X3.4	2006-12-13 02:54:00	<NA>	360	1774	PHTX	True	False
26	2001-12-28 20:35:00	2001-12-29 03:00:00	14000	350	S26E90	9756	X3.4	2001-12-28 20:30:00	<NA>	360	2216	PHTX	True	False
27	2002-07-20 21:30:00	2002-07-20 22:20:00	10000	2000	S13E90	10039	X3.3	2002-07-20 22:06:00	<NA>	360	1941	PHTX	True	False
28	2013-05-14 01:16:00	2013-05-14 08:20:00	16000	240	N08E77	11748	X3.2	2013-05-14 01:25:00	<NA>	360	2625	PHTX	True	False
29	2002-08-24 01:45:00	2002-08-24 03:25:00	5000	400	S02W81	10069	X3.1	2002-08-24 01:27:00	<NA>	360	1913	PHTX	True	False
30	2013-05-13 16:15:00	2013-05-13 19:10:00	16000	300	N11E85	11748	X2.8	2013-05-13 16:07:00	<NA>	360	1850	PHTX	True	False
31	2015-05-05 22:24:00	2015-05-05 23:14:00	14000	500	N15E79	12339	X2.7	2015-05-05 22:24:00	<NA>	360	715	PHTX	True	False
33	2003-11-03 01:15:00	2003-11-03 01:25:00	3000	1500	N10W83	10488	X2.7	2003-11-03 01:59:00	304	65	827	PHTX	False	False
32	1998-05-06 08:25:00	1998-05-06 08:35:00	14000	5000	S11W65	8210	X2.7	1998-05-06 08:29:00	309	190	1099	PHTX	False	False
34	2005-01-15 23:00:00	2005-01-17 00:00:00	3000	40	N15W05	10720	X2.6	2005-01-15 23:06:00	<NA>	360	2861	PHTX	True	False
35	2001-09-24 10:45:00	2001-09-25 20:00:00	7000	30	S16E23	9632	X2.6	2001-09-24 10:30:00	<NA>	360	2402	PHTX	True	False
36	1997-11-27 13:30:00	1997-11-27 14:00:00	14000	7000	N17E63	8113	X2.6	1997-11-27 13:56:00	98	91	441	PHTX	False	False
37	2004-11-10 02:25:00	2004-11-10 03:40:00	14000	1000	N09W49	10696	X2.5	2004-11-10 02:26:00	<NA>	360	3387	PHTX	True	False
39	2001-04-10 05:24:00	2001-04-10 00:00:00	14000	100	S23W09	9415	X2.3	2001-04-10 05:30:00	<NA>	360	2411	PHTX	True	False
40	2000-11-24 15:25:00	2000-11-24 22:00:00	14000	200	N22W07	9236	X2.3	2000-11-24 15:30:00	<NA>	360	1245	PHTX	True	False
38	2000-06-06 15:20:00	2000-06-08 09:00:00	14000	40	N20E18	9026	X2.3	2000-06-06 15:54:00	<NA>	360	1119	PHTX	True	False
41	2011-02-15 02:10:00	2011-02-15 07:00:00	16000	400	S20W12	11158	X2.2	2011-02-15 02:24:00	<NA>	360	669	PHTX	True	False
44	2013-10-25 15:08:00	2013-10-25 22:32:00	16000	200	S06E69	11882	X2.1	2013-10-25 15:12:00	<NA>	360	1081	PHTX	True	False
43	2011-09-06 22:30:00	2011-09-07 15:40:00	16000	150	N14W18	11283	X2.1	2011-09-06 23:05:00	<NA>	360	575	PHTX	True	False
42	2005-09-10 21:45:00	2005-09-11 01:00:00	14000	200	S13E47	10808	X2.1	2005-09-10 21:52:00	<NA>	360	1893	PHTX	True	False
45	1997-11-04 06:00:00	1997-11-05 04:30:00	14000	100	S14W33	8100	X2.1	1997-11-04 06:10:00	<NA>	360	785	PHTX	True	False
49	2005-01-17 09:25:00	2005-01-17 16:00:00	14000	30	N15W25	10720	X2.0	2005-01-17 09:30:00	<NA>	360	2094	PHTX	True	False
48	2004-11-07 16:25:00	2004-11-08 20:00:00	14000	60	N09W17	10696	X2.0	2004-11-07 16:54:00	<NA>	360	1759	PHTX	True	False
47	2001-04-12 10:20:00	2001-04-12 10:40:00	14000	7000	S19W43	9415	X2.0	2001-04-12 10:31:00	<NA>	360	1184	PHTX	True	False
46	2000-11-24 05:10:00	2000-11-24 15:00:00	14000	100	N20W05	9236	X2.0	2000-11-24 05:30:00	<NA>	360	1289	PHTX	True	False
50	2000-11-25 19:00:00	2000-11-25 19:35:00	6000	2000	N20W23	9236	X1.9	2000-11-25 19:31:00	<NA>	360	671	PHTX	True	False

In [19]:

```
# Similar rows between
nasa_50.insert(0, "SWL_rank", [np.nan for i in range(50)], True)

for i in range(1,51):
    for j in range(1,51):
        if nasa_50.loc[i].start_datetime.year == df.loc[j].start_datetime.year and (nasa_50.loc[i].flare_classification)[0] == (df.loc[j].x_class)[0] and (nasa_50.l
oc[i].flare_classification)[1:] == (df.loc[j].x_class)[1:]:
            nasa_50.loc[i,'SWL_rank'] = str(j)
nasa_50
```

Out[19]:

	SWL_rank	start_datetime	end_datetime	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_datetime	cpa	width	speed	plot	is_halo	width_lower_bound
1	1	2003-11-04 20:00:00	2003-11-04 00:00:00	10000	200	S19W83	10486	X28.0	2003-11-04 19:54:00	<NA>	360	2657	PHTX	True	False
2	2	2001-04-02 22:05:00	2001-04-03 02:30:00	14000	250	N19W72	9393	X20.0	2001-04-02 22:06:00	261	244	2505	PHTX	False	False
3	NaN	2003-10-28 11:10:00	2003-10-29 00:00:00	14000	40	S16E08	10486	X17.0	2003-10-28 11:30:00	<NA>	360	2459	PHTX	True	False
4	NaN	2001-04-15 14:05:00	2001-04-16 13:00:00	14000	40	S20W85	9415	X14.0	2001-04-15 14:06:00	245	167	1199	PHTX	False	False
5	6	2003-10-29 20:55:00	2003-10-29 00:00:00	11000	500	S15W02	10486	X10.0	2003-10-29 20:54:00	<NA>	360	2029	PHTX	True	False
6	7	1997-11-06 12:20:00	1997-11-07 08:30:00	14000	100	S18W63	8100	X9.4	1997-11-06 12:10:00	<NA>	360	1556	PHTX	True	False
7	8	2017-09-06 12:05:00	2017-09-07 08:00:00	16000	70	S08W33	12673	X9.3	2017-09-06 12:24:00	<NA>	360	1571	PHTX	True	False
8	9	2006-12-05 10:50:00	2006-12-05 20:00:00	14000	250	S07E68	10930	X9.0	NaN	NaN	NaN	NaN	PHTX	False	False
9	NaN	2017-09-10 16:02:00	2017-09-11 06:50:00	16000	150	S09W92	NaN	X8.3	2017-09-10 16:00:00	<NA>	360	3163	PHTX	True	False
10	10	2003-11-02 17:30:00	2003-11-03 01:00:00	12000	250	S14W56	10486	X8.3	2003-11-02 17:30:00	<NA>	360	2598	PHTX	True	False
11	12	2005-01-20 07:15:00	2005-01-20 16:30:00	14000	25	N14W61	10720	X7.1	2005-01-20 06:54:00	<NA>	360	882	PHTX	True	False
12	13	2011-08-09 08:20:00	2011-08-09 08:35:00	16000	4000	N17W69	11263	X6.9	2011-08-09 08:12:00	<NA>	360	1610	PHTX	True	False
13	14	2006-12-06 19:00:00	2006-12-08 00:00:00	16000	30	S05E64	10930	X6.5	NaN	NaN	NaN	NaN	PHTX	False	False
14	15	2005-09-09 19:45:00	2005-09-09 22:00:00	10000	50	S12E67	10808	X6.2	2005-09-09 19:48:00	<NA>	360	2257	PHTX	True	False
15	17	2000-07-14 10:30:00	2000-07-15 14:30:00	14000	80	N22W07	9077	X5.7	2000-07-14 10:54:00	<NA>	360	1674	PHTX	True	False
16	18	2001-04-06 19:35:00	2001-04-07 01:50:00	14000	230	S21E31	9415	X5.6	2001-04-06 19:30:00	<NA>	360	1270	PHTX	True	False
17	19	2012-03-07 01:00:00	2012-03-08 19:00:00	16000	30	N17E27	11429	X5.4	2012-03-07 00:24:00	<NA>	360	2684	PHTX	True	False
18	22	2001-08-25 16:50:00	2001-08-25 23:00:00	8000	170	S17E34	9591	X5.3	2001-08-25 16:50:00	<NA>	360	1433	PHTX	True	False
19	23	2014-02-25 00:56:00	2014-02-25 11:28:00	14000	100	S12E82	11990	X4.9	2014-02-25 01:25:00	<NA>	360	2147	PHTX	True	False
20	25	2002-07-23 00:50:00	2002-07-23 04:00:00	11000	400	S13E72	10039	X4.8	2002-07-23 00:42:00	<NA>	360	2285	PHTX	True	False
21	26	2000-11-26 17:00:00	2000-11-26 17:15:00	14000	7000	N18W38	9236	X4.0	2000-11-26 17:06:00	<NA>	360	980	PHTX	True	False
22	27	2003-11-03 10:00:00	2003-11-03 12:30:00	6000	400	N08W77	10488	X3.9	2003-11-03 10:06:00	293	103	1420	PHTX	False	False
23	29	2005-01-17 10:00:00	2005-01-17 10:35:00	6100	1500	N15W25	10720	X3.8	2005-01-17 09:54:00	<NA>	360	2547	PHTX	True	False
24	33	2003-05-28 01:00:00	2003-05-29 00:30:00	1000	200	S07W20	10365	X3.6	2003-05-28 00:50:00	<NA>	360	1366	PHTX	True	False
25	34	2006-12-13 02:45:00	2006-12-13 10:40:00	12000	150	S06W23	10930	X3.4	2006-12-13 02:54:00	<NA>	360	1774	PHTX	True	False
26	35	2001-12-28 20:35:00	2001-12-29 03:00:00	14000	350	S26E90	9756	X3.4	2001-12-28 20:30:00	<NA>	360	2216	PHTX	True	False
27	37	2002-07-20 21:30:00	2002-07-20 22:20:00	10000	2000	S13E90	10039	X3.3	2002-07-20 22:06:00	<NA>	360	1941	PHTX	True	False
28	39	2013-05-14 01:16:00	2013-05-14 08:20:00	16000	240	N08E77	11748	X3.2	2013-05-14 01:25:00	<NA>	360	2625	PHTX	True	False
29	41	2002-08-24 01:45:00	2002-08-24 03:25:00	5000	400	S02W81	10069	X3.1	2002-08-24 01:27:00	<NA>	360	1913	PHTX	True	False
30	43	2013-05-13 16:15:00	2013-05-13 19:10:00	16000	300	N11E85	11748	X2.8	2013-05-13 16:07:00	<NA>	360	1850	PHTX	True	False
31	46	2015-05-05 22:24:00	2015-05-05 23:14:00	14000	500	N15E79	12339	X2.7	2015-05-05 22:24:00	<NA>	360	715	PHTX	True	False
33	47	2003-11-03 01:15:00	2003-11-03 01:25:00	3000	1500	N10W83	10488	X2.7	2003-11-03 01:59:00	304	65	827	PHTX	False	False
32	48	1998-05-06 08:25:00	1998-05-06 08:35:00	14000	5000	S11W65	8210	X2.7	1998-05-06 08:29:00	309	190	1099	PHTX	False	False
34	49	2005-01-15 23:00:00	2005-01-17 00:00:00	3000	40	N15W05	10720	X2.6	2005-01-15 23:06:00	<NA>	360	2861	PHTX	True	False
35	50	2001-09-24 10:45:00	2001-09-25 20:00:00	7000	30	S16E23	9632	X2.6	2001-09-24 10:30:00	<NA>	360	2402	PHTX	True	False
36	NaN	1997-11-27 13:30:00	1997-11-27 14:00:00	14000	7000	N17E63	8113	X2.6	1997-11-27 13:56:00	98	91	441	PHTX	False	False
37	NaN	2004-11-10 02:25:00	2004-11-10 03:40:00	14000	1000	N09W49	10696	X2.5	2004-11-10 02:26:00	<NA>	360	3387	PHTX	True	False
39	NaN	2001-04-10 05:24:00	2001-04-10 00:00:00	14000	100	S23W09	9415	X2.3	2001-04-10 05:30:00	<NA>	360	2411	PHTX	True	False
40	NaN	2000-11-24 15:25:00	2000-11-24 22:00:00	14000	200	N22W07	9236	X2.3	2000-11-24 15:30:00	<NA>	360	1245	PHTX	True	False
38	NaN	2000-06-06 15:20:00	2000-06-08 09:00:00	14000	40	N20E18	9026	X2.3	2000-06-06 15:54:00	<NA>	360	1119	PHTX	True	False
41	NaN	2011-02-15 02:10:00	2011-02-15 07:00:00	16000	400	S20W12	11158	X2.2	2011-02-15 02:24:00	<NA>	360	669	PHTX	True	False
44	NaN	2013-10-25 15:08:00	2013-10-25 22:32:00	16000	200	S06E69	11882	X2.1	2013-10-25 15:12:00	<NA>	360	1081	PHTX	True	False
43	NaN	2011-09-06 22:30:00	2011-09-07 15:40:00	16000	150	N14W18	11283	X2.1	2011-09-06 23:05:00	<NA>	360	575	PHTX	True	False
42	NaN	2005-09-10 21:45:00	2005-09-11 01:00:00	14000	200	S13E47	10808	X2.1	2005-09-10 21:52:00	<NA>	360	1893	PHTX	True	False

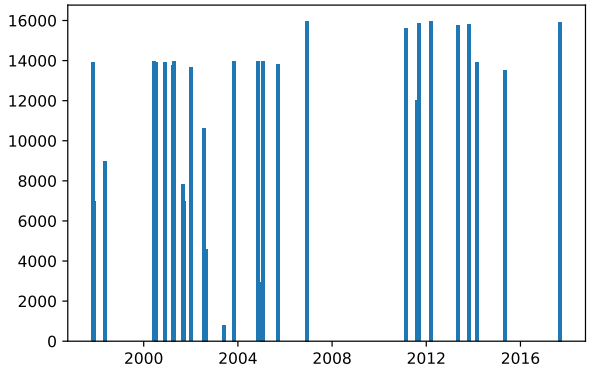
	SWL_rank	start_datetime	end_datetime	start_frequency	end_frequency	flare_location	flare_region	flare_classification	cme_datetime	cpa	width	speed	plot	is_halo	width_lower_bound
45	NaN	1997-11-04 06:00:00	1997-11-05 04:30:00	14000	100	S14W33	8100	X2.1	1997-11-04 06:10:00	<NA>	360	785	PHTX	True	False
49	NaN	2005-01-17 09:25:00	2005-01-17 16:00:00	14000	30	N15W25	10720	X2.0	2005-01-17 09:30:00	<NA>	360	2094	PHTX	True	False
48	NaN	2004-11-07 16:25:00	2004-11-08 20:00:00	14000	60	N09W17	10696	X2.0	2004-11-07 16:54:00	<NA>	360	1759	PHTX	True	False
47	NaN	2001-04-12 10:20:00	2001-04-12 10:40:00	14000	7000	S19W43	9415	X2.0	2001-04-12 10:31:00	<NA>	360	1184	PHTX	True	False
46	NaN	2000-11-24 05:10:00	2000-11-24 15:00:00	14000	100	N20W05	9236	X2.0	2000-11-24 05:30:00	<NA>	360	1289	PHTX	True	False
50	NaN	2000-11-25 19:00:00	2000-11-25 19:35:00	6000	2000	N20W23	9236	X1.9	2000-11-25 19:31:00	<NA>	360	671	PHTX	True	False

Question 3

I used the bar graph to denote a graph of start - end frequency vs date time since it can tell us about the trend of increasing or decreasing frequency. This would help in understanding and help explore why was there drastic change in frequency means amd since mmost of them are 'X' category we can anlysis whats the max chage in frequency to expect during an X category.

In [20]:
```
nasa_50['end_frequency'] = nasa_50['end_frequency'].apply(lambda x: int(x))
nasa_50['start_frequency'] = nasa_50['start_frequency'].apply(lambda x: int(x))
nasa_50['diff'] = nasa_50['start_frequency'].sub(nasa_50['end_frequency'], axis=0)
# nasa_50
ax = plt.subplot()
ax.bar(nasa_50['start_datetime'],nasa_50['diff'], width=50)
ax.xaxis_date()
plt.show()

# graph = plt.plot_date(nasa_50['start_datetime'],nasa_50['start_frequency'])
```



In [ ]: