In [1]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
typhoon_data = pd.read_csv("typhoon.csv")
```

In [3]:

```
typhoon_data.head()
```

Out[3]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer
0	1.980030e+11	13.16	177.34	990.0	24.3	137.7	GOE-3
1	1.980030e+11	15.97	177.20	987.0	27.5	182.9	GOE-3
2	1.980030e+11	17.90	178.28	987.0	25.9	140.8	GOE-3
3	1.980030e+11	18.75	179.01	992.0	22.2	111.6	GOE-3
4	1.980030e+11	19.40	179.68	994.0	22.1	125.5	GOE-3

In [4]:

```
typhoon_data.tail()
```

Out[4]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer
29983	2.016310e+11	14.95	116.37	983.0	29.2	125.3	MET-7
29984	NaN	NaN	NaN	NaN	NaN	NaN	NaN
29985	2.016310e+11	14.68	115.93	990.0	23.8	136.4	MET-7
29986	NaN	NaN	NaN	NaN	NaN	NaN	NaN
29987	2.016310e+11	14.24	115.45	997.0	18.5	180.1	MET-7

In [5]:

```
typhoon_data.shape
```

Out[5]:

```
(29988, 7)
```

In [6]:

```
typhoon_data.columns
```

Out[6]:

```
Index(['code', 'LAT', 'LONG', 'PRS', 'WND', 'SiR34', 'SATSer'], dtype='obj
ect')
```

In [7]:

```
typhoon_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 29988 entries, 0 to 29987
Data columns (total 7 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   code    14998 non-null  float64
 1   LAT     14998 non-null  float64
 2   LONG    14998 non-null  float64
 3   PRS     14998 non-null  float64
 4   WND     14998 non-null  float64
 5   SiR34   14998 non-null  float64
 6   SATSer  14998 non-null  object 
dtypes: float64(6), object(1)
memory usage: 1.6+ MB
```

In [8]:

```
typhoon_data.describe()
```

Out[8]:

	code	LAT	LONG	PRS	WND	SiR34
count	1.499800e+04	14998.000000	14998.000000	14998.000000	14998.000000	14998.000000
mean	1.997285e+11	20.689044	132.978030	970.767636	31.996806	184.908928
std	9.965561e+08	7.222782	13.798018	21.290629	10.736364	49.215084
min	1.980030e+11	1.500000	100.300000	879.000000	17.200000	54.100000
25%	1.989100e+11	15.440000	123.300000	958.000000	23.000000	149.100000
50%	1.996290e+11	19.820000	131.670000	977.000000	30.000000	179.900000
75%	2.005150e+11	25.380000	142.080000	988.000000	39.100000	215.800000
max	2.016310e+11	48.550000	179.680000	1004.000000	73.200000	447.500000

In [9]:

```
typhoon_data.isnull().sum()
```

Out[9]:

```
code      14990
LAT       14990
LONG      14990
PRS       14990
WND       14990
SiR34     14990
SATSer    14990
dtype: int64
```

In [10]:

```
typhoon_data.dropna(inplace = True)
```

In [11]:

```
typhoon_data.shape
```

Out[11]:

```
(14998, 7)
```

In [12]:

```
typhoon_data.isnull().sum()
```

Out[12]:

```
code      0
LAT       0
LONG      0
PRS       0
WND       0
SiR34     0
SATSer    0
dtype: int64
```

In [16]:

```
typhoon_data['Time']=pd.to_datetime(typhoon_data['code'])
typhoon_data['NO']=typhoon_data['code']//int(1e6)
```

In [20]:

```
typhoon_data.head()
```

Out[20]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer	Time	NO
0	1.980030e+11	13.16	177.34	990.0	24.3	137.7	GOE-3	1970-01-01 00:03:18.003	198003.0
1	1.980030e+11	15.97	177.20	987.0	27.5	182.9	GOE-3	1970-01-01 00:03:18.003	198003.0
2	1.980030e+11	17.90	178.28	987.0	25.9	140.8	GOE-3	1970-01-01 00:03:18.003	198003.0
3	1.980030e+11	18.75	179.01	992.0	22.2	111.6	GOE-3	1970-01-01 00:03:18.003	198003.0
4	1.980030e+11	19.40	179.68	994.0	22.1	125.5	GOE-3	1970-01-01 00:03:18.003	198003.0

In [21]:

```
typhoon_data.tail()
```

Out[21]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer	Time	NO
29979	2.016310e+11	14.38	118.65	977.0	34.5	161.4	MET-7	1970-01-01 00:03:21.631	201631.0
29981	2.016310e+11	14.75	117.23	980.0	32.3	132.2	MET-7	1970-01-01 00:03:21.631	201631.0
29983	2.016310e+11	14.95	116.37	983.0	29.2	125.3	MET-7	1970-01-01 00:03:21.631	201631.0
29985	2.016310e+11	14.68	115.93	990.0	23.8	136.4	MET-7	1970-01-01 00:03:21.631	201631.0
29987	2.016310e+11	14.24	115.45	997.0	18.5	180.1	MET-7	1970-01-01 00:03:21.631	201631.0

In [22]:

```
typhoon_data_198003 = typhoon_data[typhoon_data['NO'] == 198003.0]
```

In [26]:

```
typhoon_data['NO'].unique()
```

```
       200924., 200928., 201002., 201003., 201004., 201006., 201007.,
       201008., 201009., 201010., 201011., 201012., 201013., 201014.,
       201016., 201018., 201103., 201104., 201106., 201107., 201108.,
       201112., 201113., 201115., 201116., 201117., 201118., 201119.,
       201120., 201121., 201123., 201128., 201202., 201203., 201204.,
       201205., 201206., 201207., 201208., 201209., 201210., 201211.,
       201212., 201213., 201215., 201216., 201217., 201218., 201219.,
       201220., 201221., 201222., 201223., 201226., 201227., 201301.,
       201303., 201304., 201305., 201306., 201307., 201308., 201309.,
       201310., 201311., 201312., 201318., 201320., 201321., 201322.,
       201323., 201324., 201325., 201326., 201327., 201330., 201332.,
       201402., 201403., 201406., 201407., 201408., 201409., 201410.,
       201411., 201412., 201413., 201415., 201417., 201419., 201420.,
       201421., 201422., 201423., 201424., 201425., 201501., 201502.,
       201503., 201504., 201505., 201506., 201507., 201508., 201509.,
       201510., 201511., 201513., 201516., 201517., 201521., 201522.,
       201523., 201524., 201525., 201527., 201528., 201602., 201604.,
       201605., 201606., 201608., 201610., 201617., 201620., 201621.,
       201623., 201624., 201625., 201629., 201631.])
```

In [25]:

```
typhoon_data['NO'].value_counts()
```

Out[25]:

```
198620.0    59
199435.0    57
200301.0    56
198305.0    53
201412.0    51
            ..
201511.0     1
199406.0     1
199213.0     1
199011.0     1
199501.0     1
Name: NO, Length: 824, dtype: int64
```

In [27]:

```
typhoon_data_198003.head()
```

Out[27]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer	Time	NO
0	1.980030e+11	13.16	177.34	990.0	24.3	137.7	GOE-3	1970-01-01 00:03:18.003	198003.0
1	1.980030e+11	15.97	177.20	987.0	27.5	182.9	GOE-3	1970-01-01 00:03:18.003	198003.0
2	1.980030e+11	17.90	178.28	987.0	25.9	140.8	GOE-3	1970-01-01 00:03:18.003	198003.0
3	1.980030e+11	18.75	179.01	992.0	22.2	111.6	GOE-3	1970-01-01 00:03:18.003	198003.0
4	1.980030e+11	19.40	179.68	994.0	22.1	125.5	GOE-3	1970-01-01 00:03:18.003	198003.0

In [28]:

```
typhoon_data_198003.tail()
```

Out[28]:

	code	LAT	LONG	PRS	WND	SiR34	SATSer	Time	NO
0	1.980030e+11	13.16	177.34	990.0	24.3	137.7	GOE-3	1970-01-01 00:03:18.003	198003.0
1	1.980030e+11	15.97	177.20	987.0	27.5	182.9	GOE-3	1970-01-01 00:03:18.003	198003.0
2	1.980030e+11	17.90	178.28	987.0	25.9	140.8	GOE-3	1970-01-01 00:03:18.003	198003.0
3	1.980030e+11	18.75	179.01	992.0	22.2	111.6	GOE-3	1970-01-01 00:03:18.003	198003.0
4	1.980030e+11	19.40	179.68	994.0	22.1	125.5	GOE-3	1970-01-01 00:03:18.003	198003.0

In [44]:

```
def concat_func(x):
    return pd.Series({
        'Start':x['Time'].min(),
        'End':x['Time'].max(),
        'StLAT':x.loc[x['Time'].idxmin()]['LAT'],
        'EdLAT':x.loc[x['Time'].idxmax()]['LAT'],
        'StLONG':x.loc[x['Time'].idxmin()]['LONG'],
        'EdLONG':x.loc[x['Time'].idxmax()]['LONG'],
        'WND':x['WND'].max(),
        'SiR34':x['SiR34'].max(),
        'SATSer':','.join(x['SATSer'].unique()),
    })
weather_data=typhoon_data.groupby(typhoon_data['NO']).apply(concat_func).reset_index()
```

In [45]:

```
weather_data.head()
```

Out[45]:

	NO	Start	End	StLAT	EdLAT	StLONG	EdLONG	WND	SiR34	SATSer
0	198003.0	1970-01-01 00:03:18.003	1970-01-01 00:03:18.003	13.16	13.16	177.34	177.34	27.5	182.9	GOE-3
1	198015.0	1970-01-01 00:03:18.015	1970-01-01 00:03:18.015	14.15	14.15	157.04	157.04	31.3	199.7	GOE-3,GOE-3
2	198026.0	1970-01-01 00:03:18.026	1970-01-01 00:03:18.026	14.36	14.36	156.09	156.09	20.2	172.1	GOE-3
3	198101.0	1970-01-01 00:03:18.101	1970-01-01 00:03:18.101	7.46	7.46	165.92	165.92	46.9	236.5	GMS-1
4	198102.0	1970-01-01 00:03:18.102	1970-01-01 00:03:18.102	6.32	6.32	151.14	151.14	27.9	203.1	GMS-1

In [46]:

```
weather_data.tail()
```

Out[46]:

	NO	Start	End	StLAT	EdLAT	StLONG	EdLONG	WND	SiR34	SATSer
819	201623.0	1970-01-01 00:03:21.623	1970-01-01 00:03:21.623	20.48	20.48	117.80	117.80	26.2	126.6	MET-7
820	201624.0	1970-01-01 00:03:21.624	1970-01-01 00:03:21.624	13.83	13.83	126.48	126.48	53.4	232.3	MET-7
821	201625.0	1970-01-01 00:03:21.625	1970-01-01 00:03:21.625	16.03	16.03	126.00	126.00	64.6	302.4	MET-7
822	201629.0	1970-01-01 00:03:21.629	1970-01-01 00:03:21.629	11.78	11.78	120.73	120.73	26.3	133.3	MET-7
823	201631.0	1970-01-01 00:03:21.631	1970-01-01 00:03:21.631	13.60	13.60	126.72	126.72	61.7	262.6	MET-7

In [47]:

```
weather_data.shape
```

Out[47]:

```
(824, 10)
```

In [48]:

```
weather_data.columns
```

Out[48]:

```
Index(['NO', 'Start', 'End', 'StLAT', 'EdLAT', 'StLONG', 'EdLONG', 'WND',
       'SiR34', 'SATSer'],
      dtype='object')
```

In [49]:

```
weather_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 824 entries, 0 to 823
Data columns (total 10 columns):
 #   Column  Non-Null Count  Dtype         
---  ------  --------------  -----         
 0   NO      824 non-null    float64       
 1   Start   824 non-null    datetime64[ns]
 2   End     824 non-null    datetime64[ns]
 3   StLAT   824 non-null    float64       
 4   EdLAT   824 non-null    float64       
 5   StLONG  824 non-null    float64       
 6   EdLONG  824 non-null    float64       
 7   WND     824 non-null    float64       
 8   SiR34   824 non-null    float64       
 9   SATSer  824 non-null    object        
dtypes: datetime64[ns](2), float64(7), object(1)
memory usage: 64.5+ KB
```

In [50]:

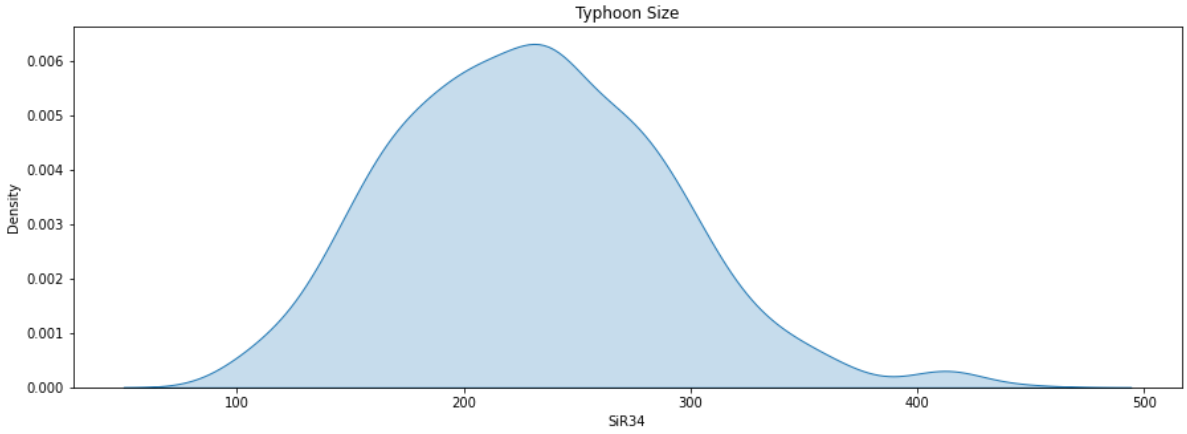
```
weather_data.describe()
```

Out[50]:

	NO	StLAT	EdLAT	StLONG	EdLONG	WND	SiR34
count	824.000000	824.000000	824.000000	824.000000	824.000000	824.000000	824.000000
mean	199755.842233	16.595328	16.595328	135.512002	135.512002	36.823422	229.755218
std	1019.999754	5.699368	5.699368	14.989767	14.989767	13.206671	59.636712
min	198003.000000	1.500000	1.500000	102.040000	102.040000	17.300000	96.700000
25%	198910.750000	12.267500	12.267500	125.337500	125.337500	24.775000	186.250000
50%	199702.500000	16.335000	16.335000	133.745000	133.745000	36.000000	228.350000
75%	200609.250000	20.135000	20.135000	146.395000	146.395000	47.400000	270.525000
max	201631.000000	32.970000	32.970000	177.340000	177.340000	73.200000	447.500000

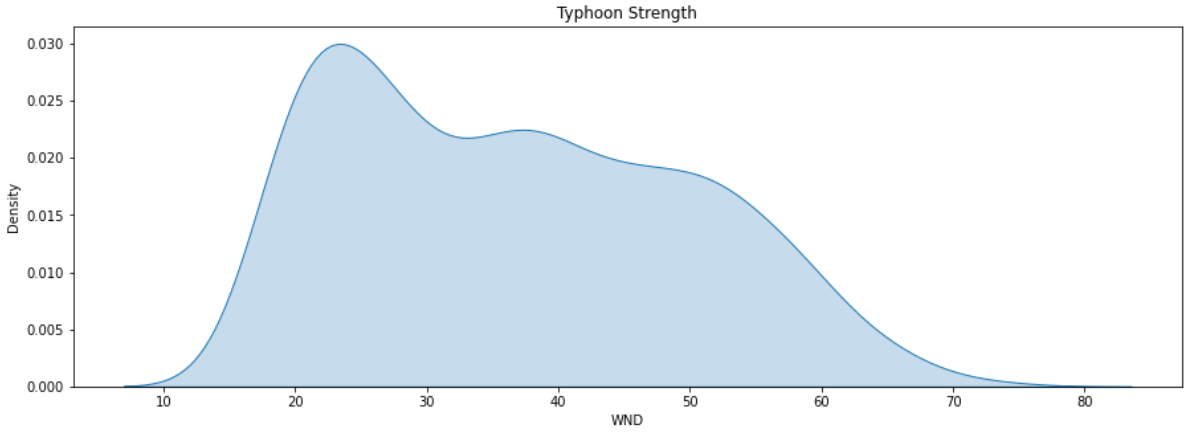
In [52]:

```
plt.figure(figsize=(15,5))
sns.kdeplot(data = weather_data['SiR34'], shade=True);
plt.title('Typhoon Size')
plt.xticks(rotation = 0)
plt.show()
```



In [53]:

```
plt.figure(figsize=(15,5))
sns.kdeplot(data = weather_data['WND'], shade=True);
plt.title('Typhoon Strength')
plt.xticks(rotation = 0)
plt.show()
```



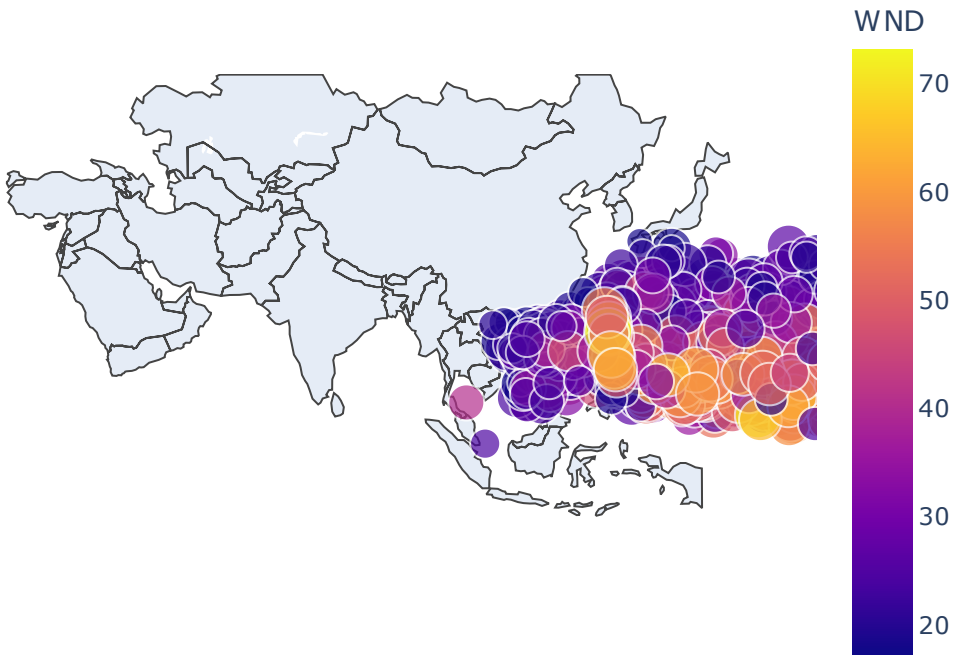
In [55]:

```
import plotly.graph_objects as go
import plotly.express as px
from plotly.subplots import make_subplots
import folium
```

In [57]:

```
fig_city = px.scatter_geo(weather_data, lat='StLAT', lon='StLONG',
                          scope="asia",
                          hover_name=weather_data['NO'],
                          size=weather_data['SiR34'],
                          color='WND',
                          title ='Typhoon Start')
fig_city.show()
```

Typhoon Start



In [59]:

```
weather_data_new = weather_data[['WND', 'SiR34']]
```

In [60]:

```
weather_data_new.corr()
```

Out[60]:

	WND	SiR34
WND	1.000000	0.598876
SiR34	0.598876	1.000000

In [61]:

```
sns.heatmap(weather_data_new.corr())
```

Out[61]:

<AxesSubplot:>