



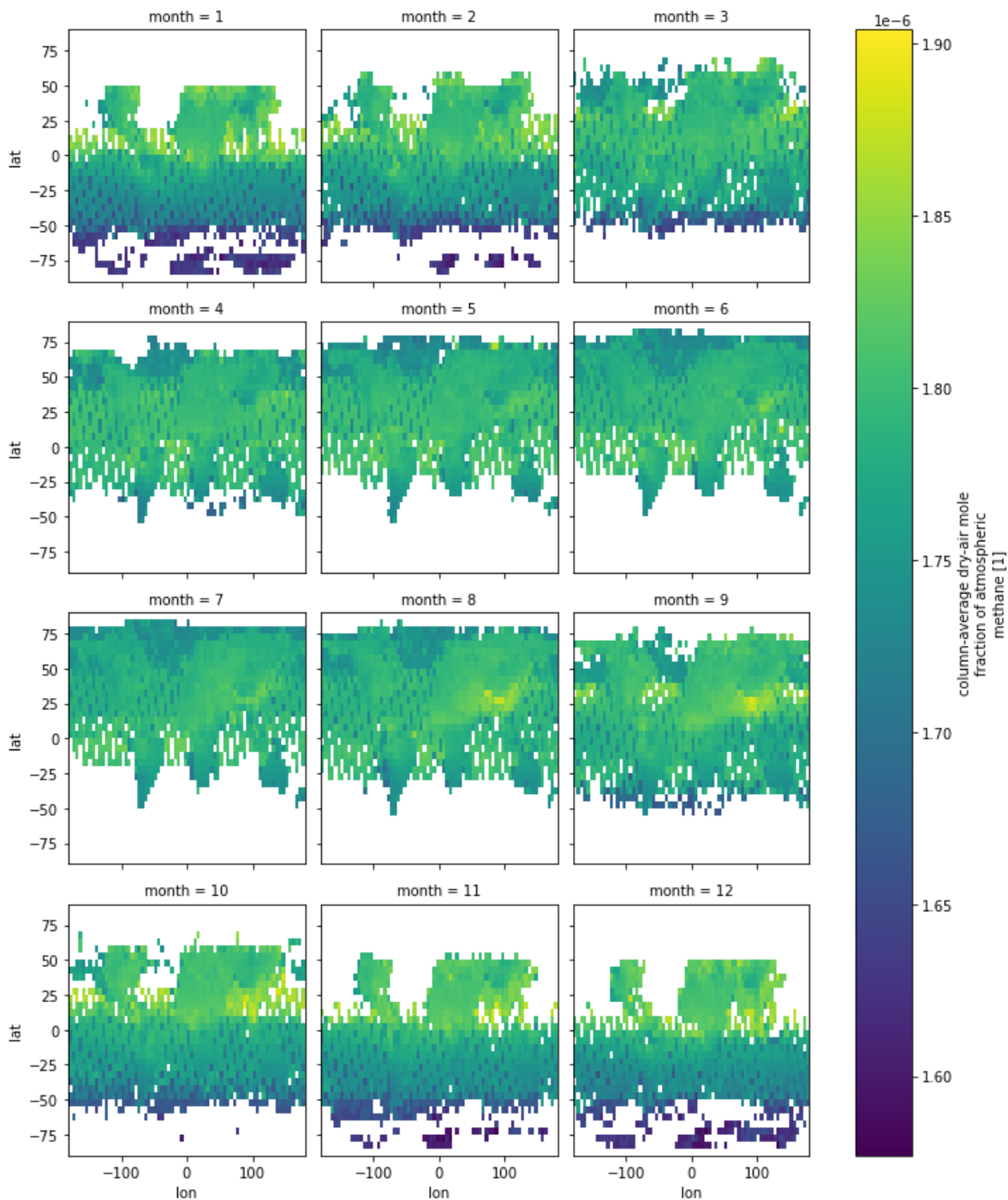
In [1]:

```
import xarray as xr
import netCDF4
import numpy as np
import pandas as pd
import matplotlib as mpl
import matplotlib.pyplot as plt
import matplotlib.gridspec as gridspec
from matplotlib import pyplot as plt
%matplotlib inline

ds = xr.open_dataset("200301_202006-C3S-L3_GHG-PRODUCTS-OBS4MIPS-MERGED-v4.3.nc", engine="netcdf4")
ds1 = ds.xch4.groupby("time.month").mean() # get mean value of month data
ds1.plot(x="lon", y="lat", col="month", col_wrap=3) # plot 12 panels
```

Out[1]:

<xarray.plot.facetgrid.FacetGrid at 0x1d19b0ca8e0>

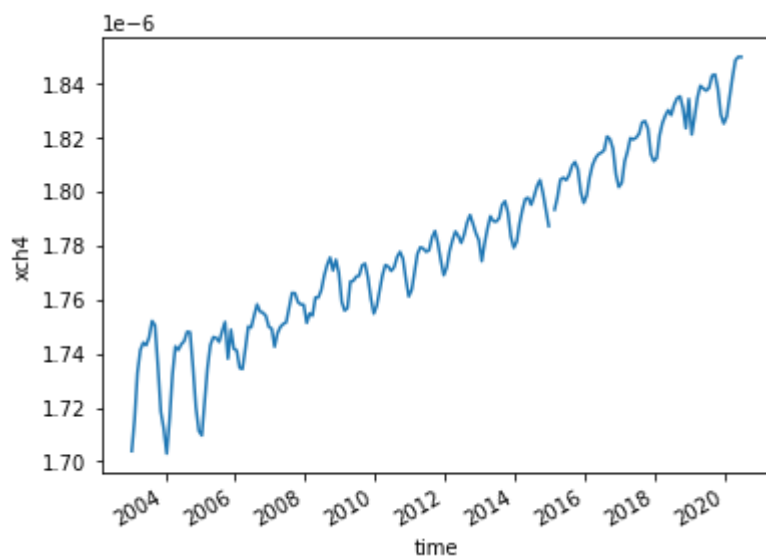


In [2]:

```
ds.xch4.mean(("lon", "lat")).plot() #Because the date only has date on 2003-01 to 2020-06
```

Out[2]:

[<matplotlib.lines.Line2D at 0x1d19cd42d30>]



In [3]:

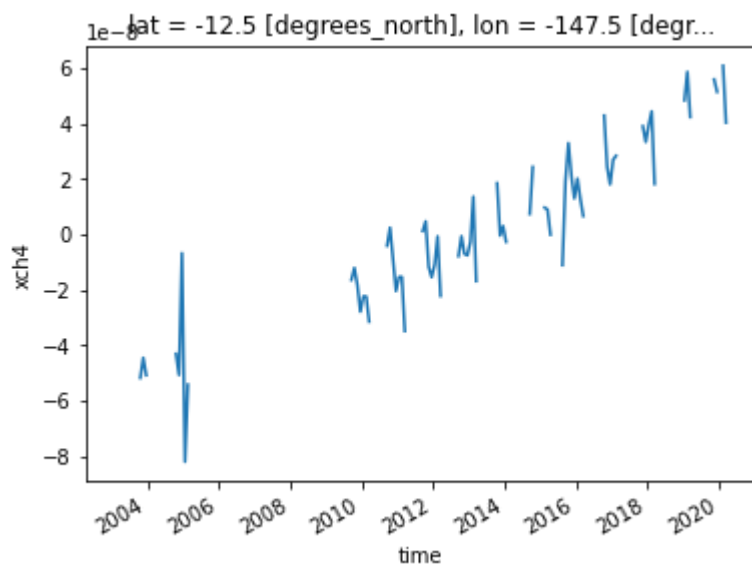
```
group_data = ds.xch4.groupby("time.month")
```

```
xch4_anom = group_data - group_data.mean(dim = 'time')
```

```
xch4_anom.sel(lon = -150, lat = -15, method = "nearest").plot()
```

Out[3]:

[<matplotlib.lines.Line2D at 0x1d19d2171f0>]



In [4]:







```
ds = xr.open_dataset("NOAA_NCDC_ERSST_v3b_SST.nc", engine="netcdf4")
ds
```

Out[4]:



xarray.Dataset

► Dimensions: (lat: 89, lon: 180, time: 684)

▼ Coordinates:

<b>lat</b>	(lat)	float32	-88.0 -86.0 -84.0 ... 86.0 88.0	 
<b>lon</b>	(lon)	float32	0.0 2.0 4.0 ... 354.0 356.0 35...	 
<b>time</b>	(time)	datetime64[ns]	1960-01-15 ... 2016-12-15	 

▼ Data variables:

<b>sst</b>	(time, lat, lon)	float32	...	 
------------	------------------	---------	-----	---

▼ Attributes:

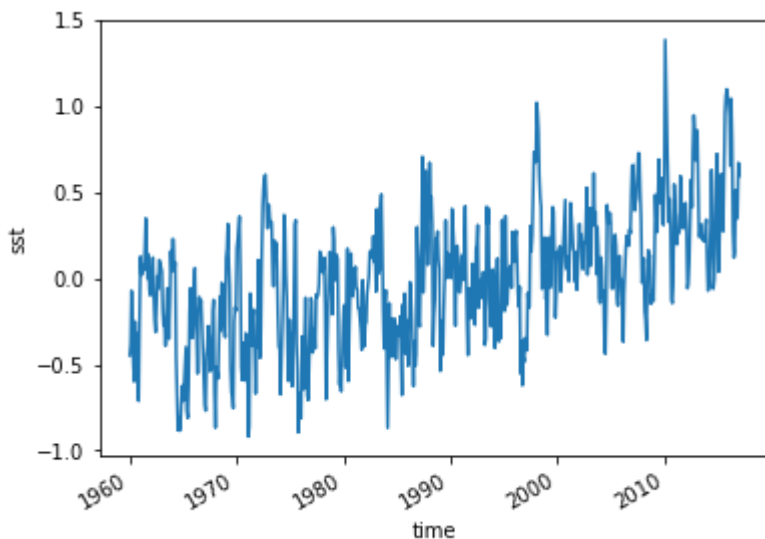
Conventions : IRIDL  
source : <https://iridl.ldeo.columbia.edu/SOURCES/.NOAA/.NCDC/.ERSST/.version3b/.sst/>  
history : extracted and cleaned by Ryan Abernathey for Research Computing in Earth Science

In [5]:

```
nino = ds.sst.sel(lon = slice(10, 60), lat = slice(-5, 5))
nino_month = nino.groupby("time.month")
nino_2 = nino_month - nino_month.mean(dim = "time")
nino_2.mean(dim=["lat", "lon"]).plot()
```

Out[5]:

[<matplotlib.lines.Line2D at 0x1d19d296e20>]



In [6]:

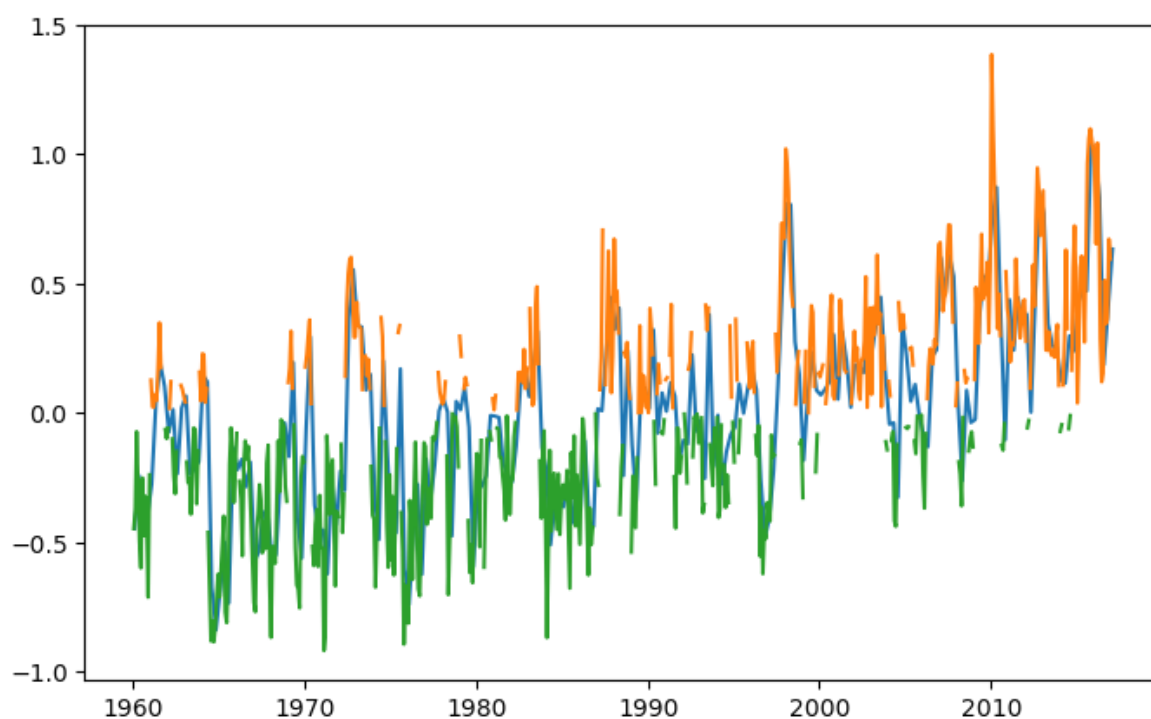
```
fig, ax1 = plt.subplots(1,1,figsize=(8,5), dpi=100)
nino3 = nino_2.mean(dim=["lat", "lon"]).resample(time = "3M")
index = nino3.mean(dim = "time")
nino4 = nino_2.mean(dim=["lat", "lon"])
el_nino = nino4.where(nino4 > 0)
la_nino = nino4.where(nino4 < 0)
ax1.plot(index.time, index)

ax1.plot(el_nino.time, el_nino)

ax1.plot(la_nino.time, la_nino)
```

Out[6]:

[<matplotlib.lines.Line2D at 0x1d19d856820>]



In [7]:







```
ds = xr.open_dataset("precipitation00-21.nc", engine="netcdf4")
ds.tp.mean(dim=["longitude", "latitude"]).plot()
ds
```

Out[7]:



xarray.Dataset

► Dimensions: (longitude: 401, latitude: 181, time: 252)

▼ Coordinates:

longitude	(longitude)	float32	65.0 65.1 65.2 ... ..	 
latitude	(latitude)	float32	42.0 41.9 41.8 ... ..	 
time	(time)	datetime64[ns]	2000-01-01 ... 20...	 

▼ Data variables:

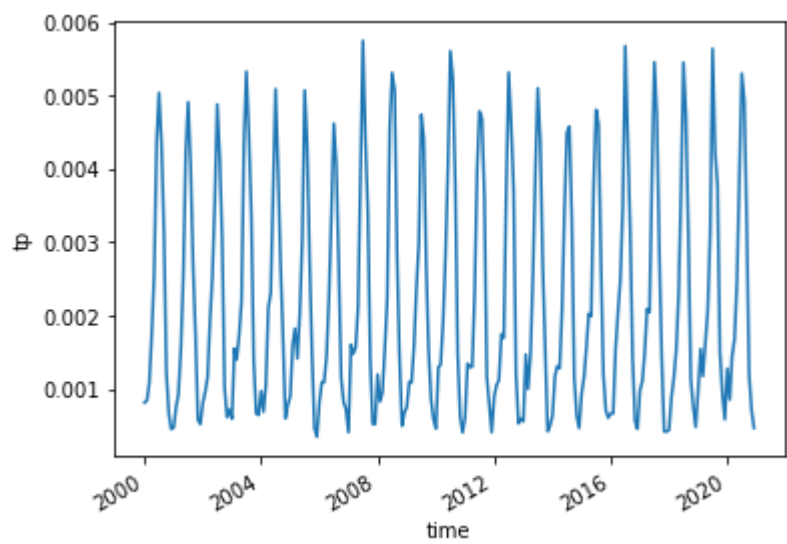
tp	(time, latitude, longitude)	float32	0.0005054 0.0005...	 
----	-----------------------------	---------	---------------------	---

▼ Attributes:

Conventions :

history :

CF-1.6  
2022-03-31 02:29:44 GMT by grib\_to\_netcdf-2.24.3: /opt/ecmwf/mars-client/bin/grib\_to\_netcdf -S param -o /cache/data7/adaptor.mars.internal-1648693782.131751-20681-8-d73724b4-218f-450f-9abe-0fce92d156d0.nc /cache/tmp/d73724b4-218f-450f-9abe-0fce92d156d0-adaptor.mars.internal-1648693643.7192304-20681-7-tmp.grib

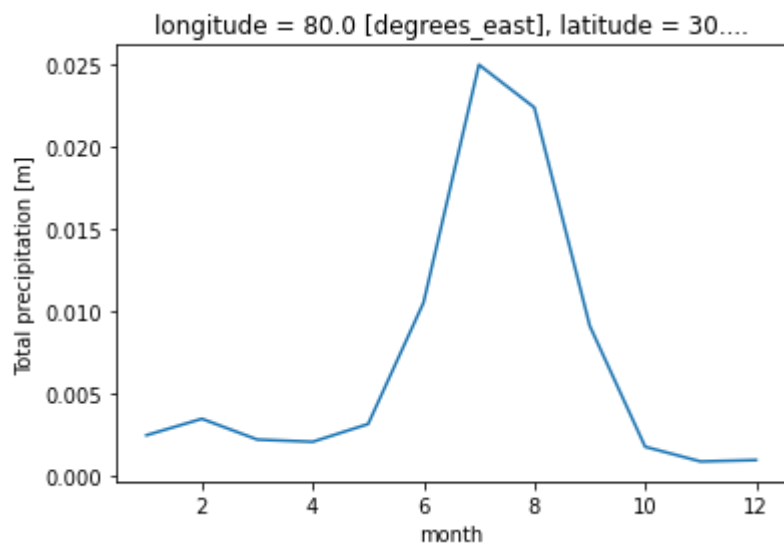


In [8]:

```
group_data = ds.tp.groupby("time.month").mean()  
group_data.sel(latitude = 30, longitude = 80, method = "nearest").plot()
```

Out[8]:

[<matplotlib.lines.Line2D at 0x1d19d92e5b0>]

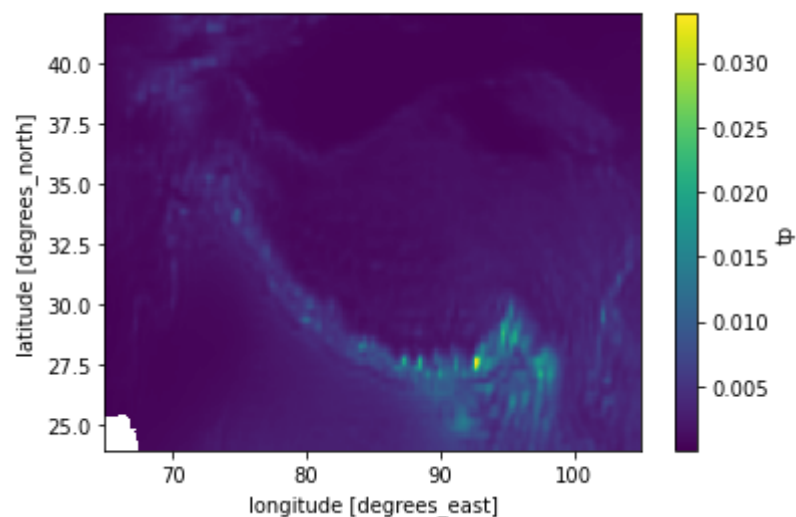


In [9]:

```
ds.tp.mean(dim = "time").plot()
```

Out[9]:

<matplotlib.collections.QuadMesh at 0x1d19cb5e7f0>



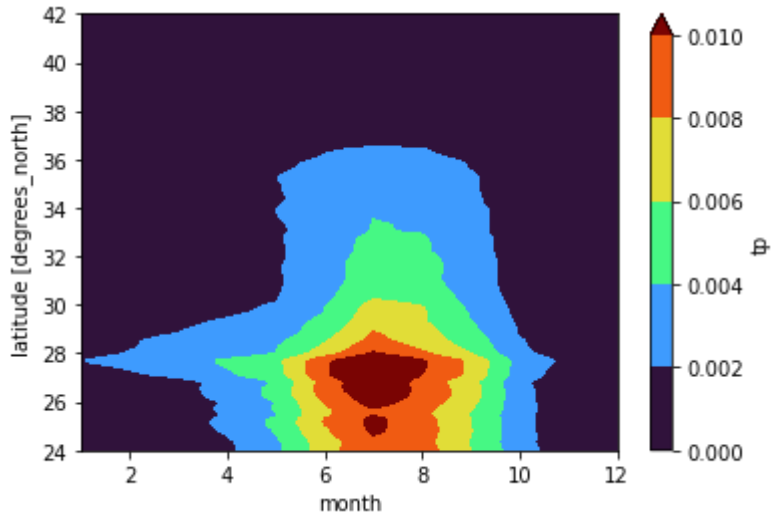
In [10]:

```
ds.tp.groupby("time.month").mean().mean(dim = "longitude").transpose().plot.contourf(level = 12, rob
```

D:\Anaconda3\envs\aaaa\lib\site-packages\xarray\plot\plot.py:1485: UserWarning: The following kwargs were not used by contour: 'level'  
primitive = ax.contourf(x, y, z, \*\*kwargs)

Out[10]:

<matplotlib.contour.QuadContourSet at 0x1d19cc2a310>



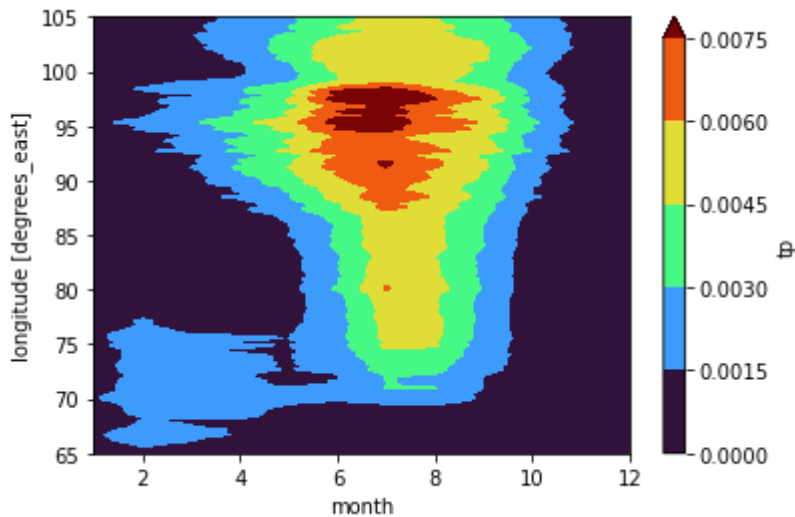
In [11]:

```
ds.tp.groupby("time.month").mean().mean(dim = "latitude").transpose().plot.contourf(level = 12, rob
```

D:\Anaconda3\envs\aaaa\lib\site-packages\xarray\plot\plot.py:1485: UserWarning: The following kwargs were not used by contour: 'level'  
primitive = ax.contourf(x, y, z, \*\*kwargs)

Out[11]:

<matplotlib.contour.QuadContourSet at 0x1d19d85ce50>





In [12]:

```
group_data = ds.tp.groupby("time.month")
anom = group_data-group_data.mean(dim = "time")
anom.sel(latitude = 30, longitude = 80, method = "nearest").plot()
```

Out[12]:

[<matplotlib.lines.Line2D at 0x1d19d95e040>]

