1 Niño 3.4 index

In [ ]:

```
import numpy as np
import pandas as pd
import xarray as xr
from matplotlib import pyplot as plt
%matplotlib inline
```

In [4]:

```
# 读取文件
ds = xr.open_dataset("NOAA_NCDC_ERSST_v3b_SST.nc")

# 检查文件
ds
```

Out[4]:

xarray.Dataset

▶ Dimensions: (**lat**: 89, **lon**: 180, **time**: 684)

▼ Coordinates:

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

▼ Data variables:

sst	(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

1.1

In [24]:

```
# 摘取计算3.4区域的数据
ds1=ds.sst.sel(lat=slice(-5, 5),lon=slice(10, 60))
ds1
#计算3.4区域各位置的平均值，并减去sst的气候值
ds2=ds1.mean(dim='time')-ds1
ds2
```

Out[24]:

xarray.DataArray 'sst' (**lat**: 5, **lon**: 26, **time**: 684)

```
array([[[-1.004528  , -1.8285618 , -2.2452126 , ..., -0.383667  ,
         -0.6728592 , -1.0273018 ],
        [-1.1610947 , -1.9651756 , -2.3912334 , ..., -0.6437073 ,
         -0.80529976, -0.90241814],
        [        nan,         nan,         nan, ...,         nan,
                 nan,         nan],
        ...,
        [ 0.24967003, -0.05447006, -0.8625393 , ..., -0.00475502,
         -0.92225266, -0.81147957],
        [ 0.46184158,  0.13824463, -0.6850414 , ..., -0.04487038,
         -0.75979424, -0.6269226 ],
        [ 0.6226711 ,  0.28199196, -0.510376  , ..., -0.04141617,
         -0.58410645, -0.481081  ]],

       [[-0.8986187 , -1.5936432 , -1.9410095 , ..., -0.51493645,
         -0.62761307, -0.9115143 ],
        [        nan,         nan,         nan, ...,         nan,
                 nan,         nan],
        [        nan,         nan,         nan, ...,         nan,
                 nan,         nan],
...
        [ 1.3947067 ,  0.96014214, -0.4323387 , ..., -0.08880424,
         -0.6650791 , -0.07707977],
        [ 1.4182034 ,  0.9852257 , -0.17288017, ..., -0.0618248 ,
         -0.34746933,  0.13201523],
        [ 1.3659973 ,  0.9655247 ,  0.01981926, ..., -0.11645126,
         -0.16812515,  0.24064064]],

       [[-0.34181213, -0.21745491, -0.42479324, ...,  0.0191021 ,
         -1.166605  , -1.0420856 ],
        [        nan,         nan,         nan, ...,         nan,
                 nan,         nan],
        [        nan,         nan,         nan, ...,         nan,
                 nan,         nan],
        ...,
        [ 1.2989388 ,  0.83397293, -0.4882202 , ...,  0.02097321,
         -0.63876534, -0.06719589],
        [ 1.3597069 ,  0.9213886 , -0.20220757, ..., -0.04068375,
         -0.43735313,  0.07088661],
```

```
       [ 1.3442955 ,  0.95373726,  0.01660156, ..., -0.13644218,
        -0.29737282,  0.17019653]]], dtype=float32)
```

▼ Coordinates:

lat	(lat)	float32	-4.0 -2.0 0.0 2.0 4.0	
lon	(lon)	float32	10.0 12.0 14.0 ... 56.0 58.0 60.0	
time	(time)	datetime64[ns]	1960-01-15 ... 2016-12-15	

► Attributes: (0)

1.2

In [ ]:

```
#
nino_index_3_4_mean = ds2.rolling(time=3, center=True).mean()
y = ds2.data
t = np.arange(0, len(y))
plt.figure(figsize=(10, 5))
plt.bar(t, y)
```

In [ ]:

```

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In [ ]:

```

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