3

In [52]:

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

In [30]:

```
#读取文件-感谢李娟同学提供的数据
ds = xr.open_dataset("slp.mon.mean.nc")

# Check the data

ds
```

Out[30]:

xarray.Dataset

▶ Dimensions: (**lat**: 73, **lon**: 144, **time**: 886)

▼ Coordinates:

lat	(lat)	float32	90.0 87.5 85.0 ... -87.5 -90.0
lon	(lon)	float32	0.0 2.5 5.0 ... 352.5 355.0 35…
time	(time)	datetime64[ns]	1948-01-01 ... 2021-10-01

▼ Data variables:

slp	(time, lat, lon)	float32	...

▼ Attributes:

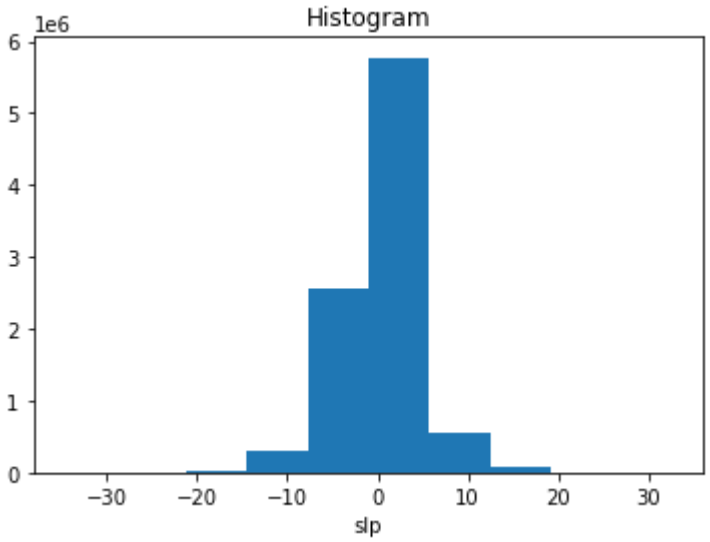
description :	Data is from NMC initialized reanalysis (4x/day). These are the 0.9950 sigma level values.
platform :	Model
Conventions :	COARDS
NCO :	20121012
history :	Thu May 4 18:12:35 2000: ncrcat -d time,0,622 /Datasets/ncep.reanalysis.derived/surface/slp.mon.mean.nc ./surface/slp.mon.mean.nc Mon Jul 5 23:22:35 1999: ncrcat slp.mon.mean.nc /Datasets/ncep.reanalysis.derived/surface/slp.mon.mean.nc /dm/dmwork/nmc.rean.ingest/combinedMMs/slp.mon.mean.nc /home/hoop/crdc/cpreanjuke2farm/cpreanjuke2farm Thu Oct 26 23:42:16 1995 from pre.sig995.85.nc created 95/02/06 by Hoop (netCDF2.3) Converted to chunked, deflated non-packed NetCDF4 2014/09
title :	monthly mean slp from the NCEP Reanalysis
dataset_title :	NCEP-NCAR Reanalysis 1
References :	http://www.psl.noaa.gov/data/gridded/data.ncep.reanalysis.derived.html

In [45]:

```
#3.1
# 消除周期季节性循环

group_data = ds.slp.groupby('time.month')

#对分组数据应用均值，然后计算异常值
slp_anom = group_data - group_data.mean(dim='time')
slp_anom

#绘制异常值分布
slp_anom.isel(time=slice(0,886)).plot()
```

Out[45]:

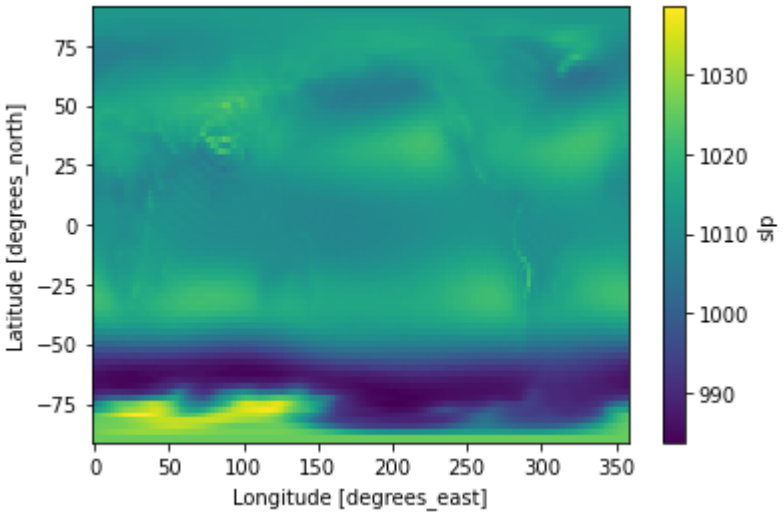
```
(array([2.900000e+01, 1.638000e+03, 3.055600e+04, 2.989340e+05,
        2.572520e+06, 5.772375e+06, 5.582180e+05, 7.139400e+04,
        7.525000e+03, 4.430000e+02]),
 array([-34.748657 , -28.002247 , -21.255835 , -14.509424 ,  -7.763013 ,
        -1.0166016,   5.7298098,  12.476221 ,  19.222631 ,  25.969044 ,
        32.715454 ], dtype=float32),
 <BarContainer object of 10 artists>)
```

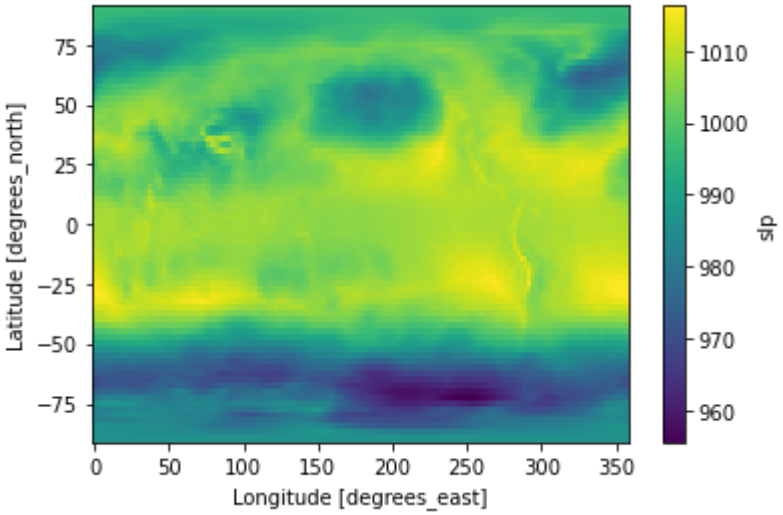


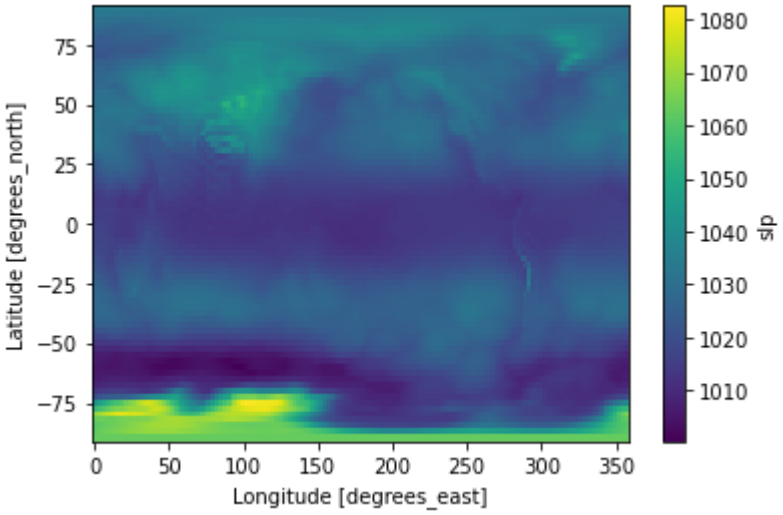
3.2

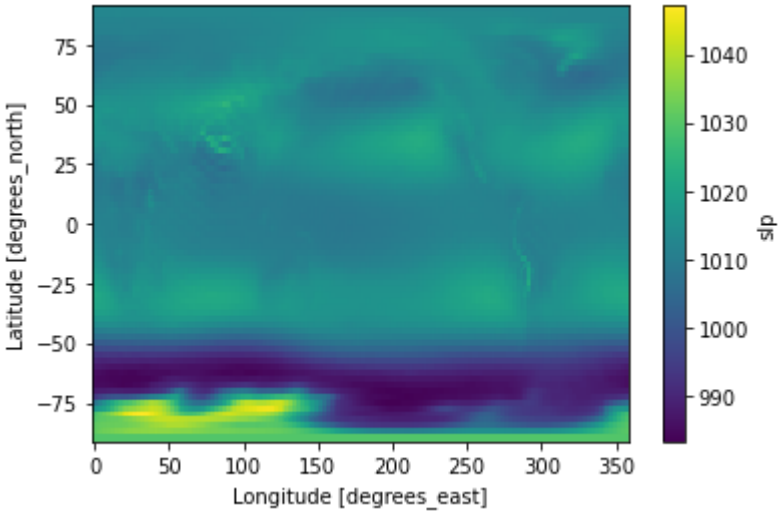
In [51]:

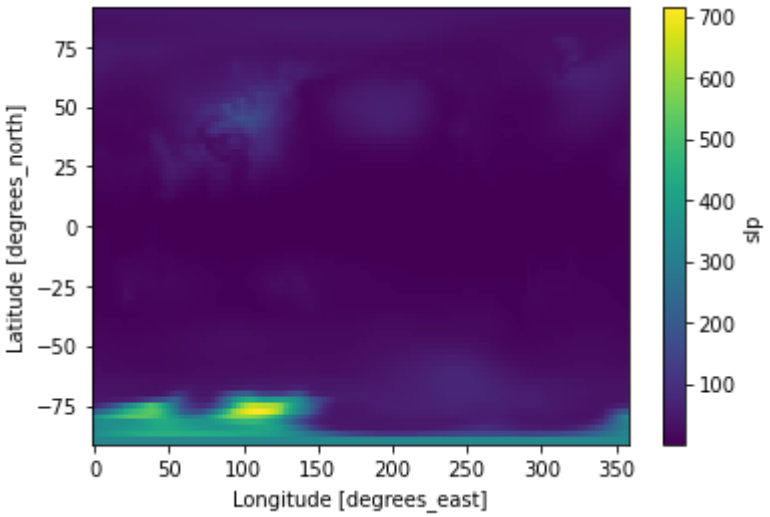
```
#slp数据时间平均2-D图
ds.slp.mean(dim="time").plot()
plt.show()

#slp数据时间序列上最小值2-D图
ds.slp.min(dim="time").plot()
plt.show()

#slp数据时间序列上最大值2-D图
ds.slp.max(dim="time").plot()
plt.show()

#slp数据时间序列上中位数2-D图
ds.slp.median(dim="time").plot()
plt.show()

#slp数据时间序列上方差2-D图
ds.slp.var(dim="time").plot()
plt.show()
```






Latitude [degrees_north]
75
50
25
0
−25
−50
−75
0
50
100
150
200
250
300
350
Longitude [degrees_east]
1080
1070
1060
1050
1040
1030
1020
1010
slp


Latitude [degrees_north]
75
50
25
0
−25
−50
−75
0
50
100
150
200
250
300
350
Longitude [degrees_east]
1040
1030
1020
1010
1000
990
slp


Latitude [degrees_north]
75
50
25
0
−25
−50
−75
0
50
100
150
200
250
300
350
Longitude [degrees_east]
700
600
500
400
300
200
100
slp

In [ ]: