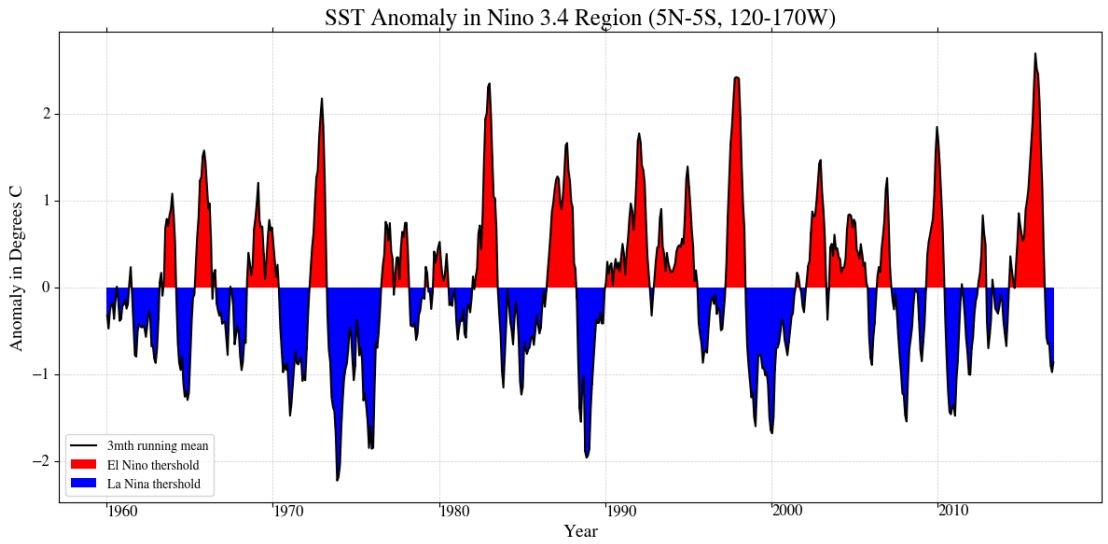
PS3_1

1.1

First select latitude and longitude. Then make groups according to month and calculate monthly average. Lastly, subtract climatology from monthly SST.

1.2

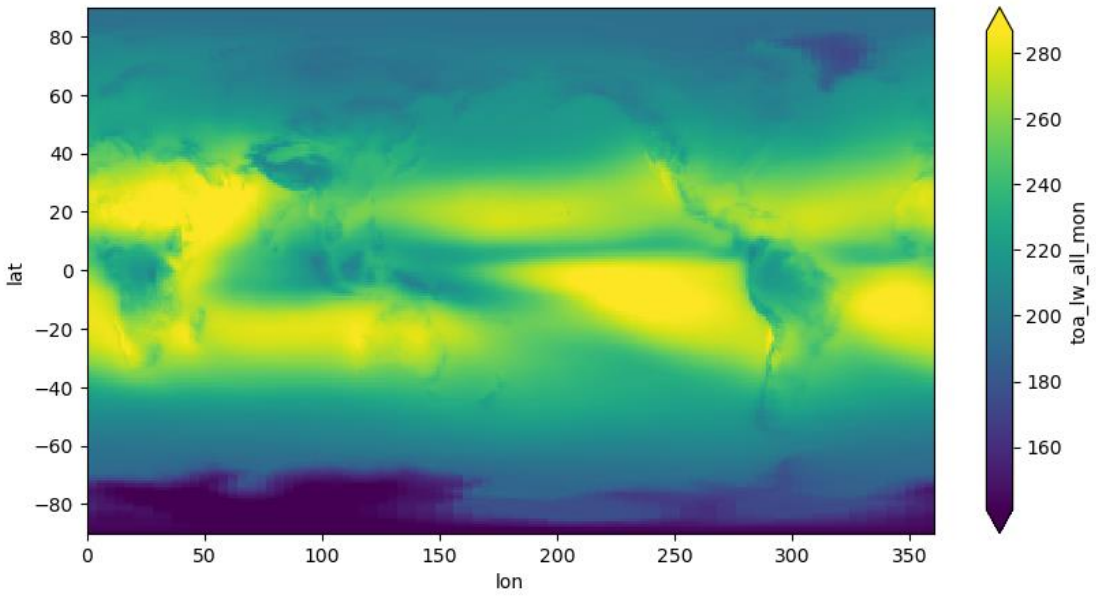
Visualize the computed Niño 3.4 as follows:



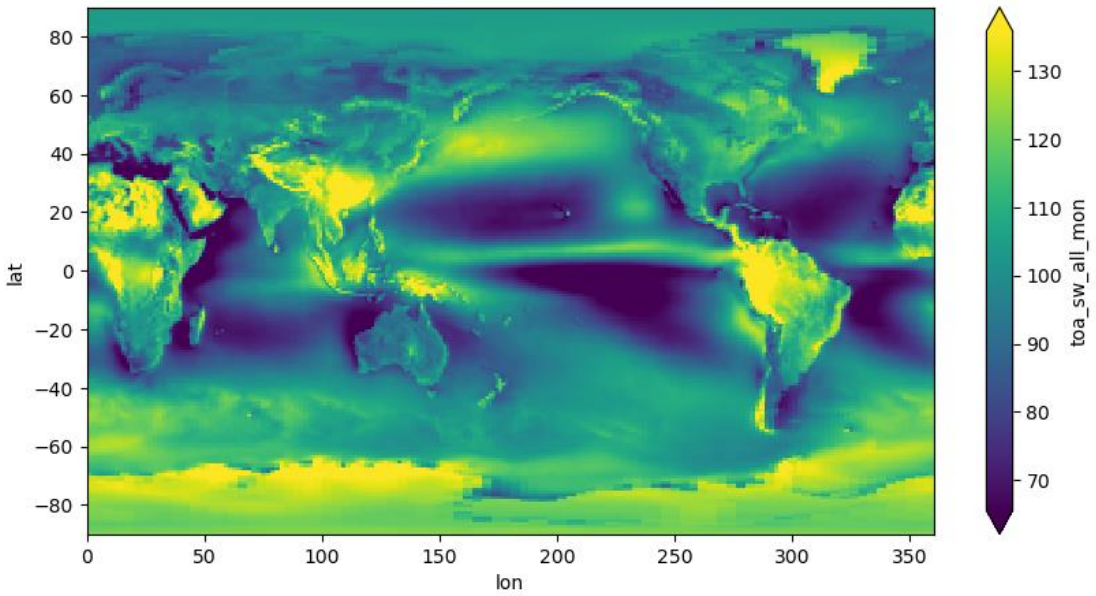
PS3_2

2.1

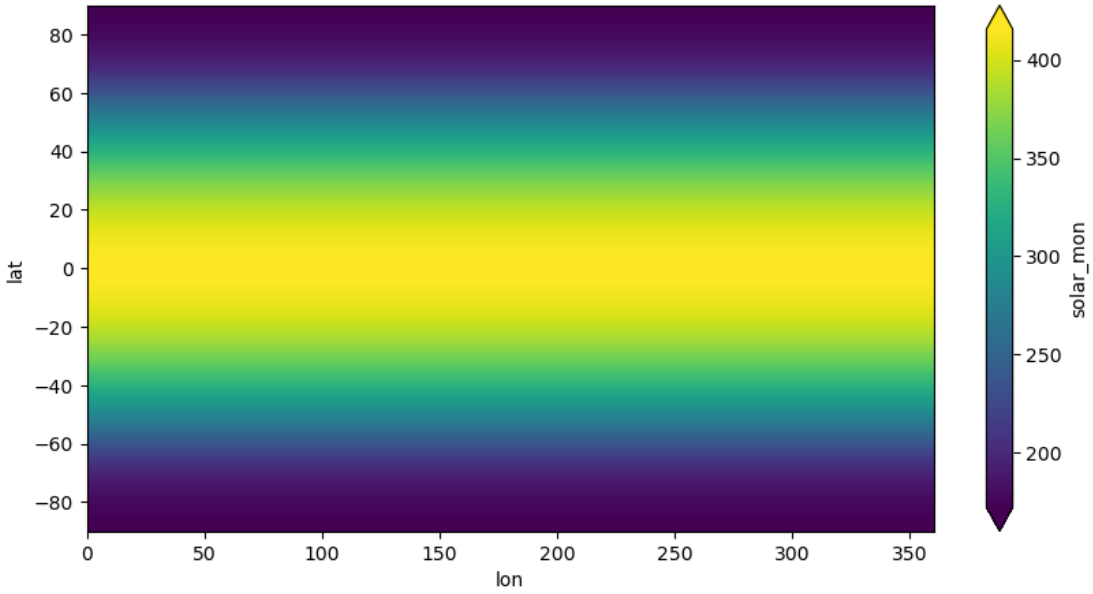
Plots of the time-mean TOA longwave, shortwave, and solar radiation for all-sky conditions are as follows:



(a) time-mean TOA longwave radiation for all-sky conditions

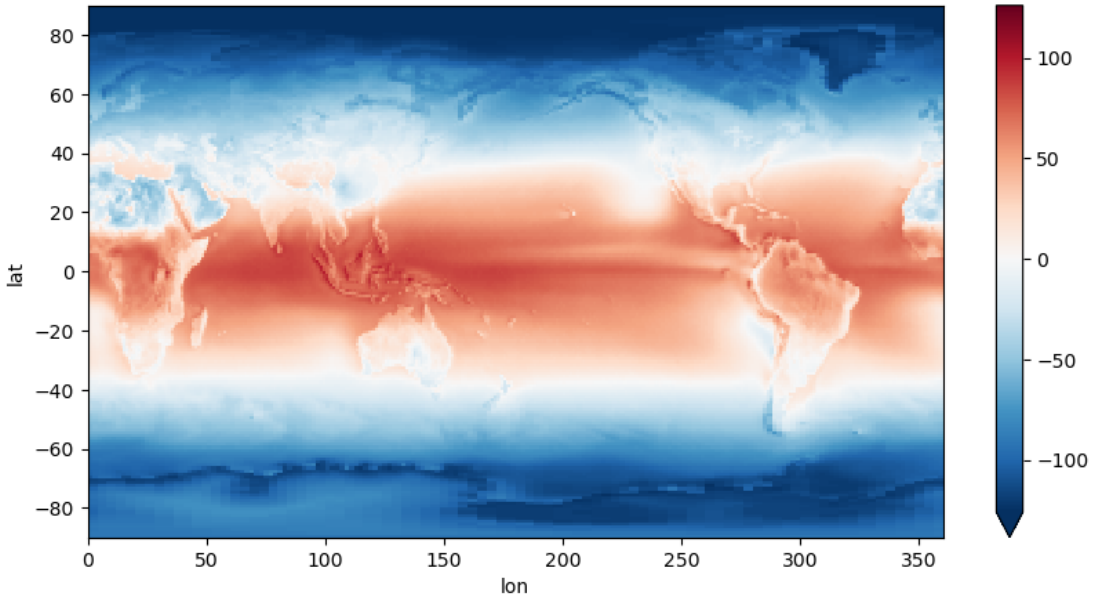


(b) time-mean TOA shortwave radiation for all-sky conditions



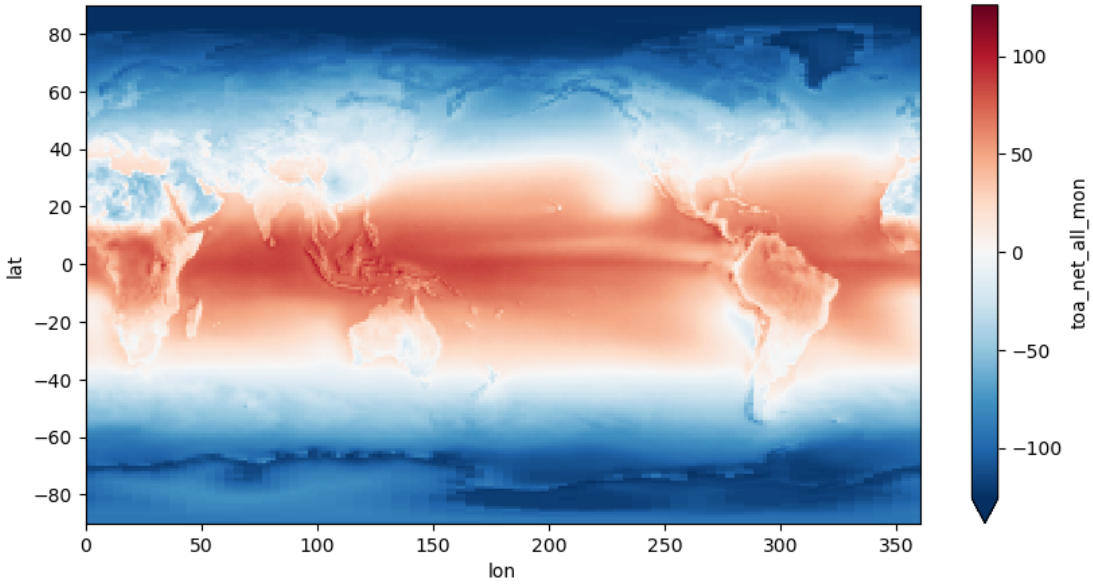
(c) time-mean TOA sloar radiation for all-sky conditions

Add up the three variables in (a) ~ (c) and plot:



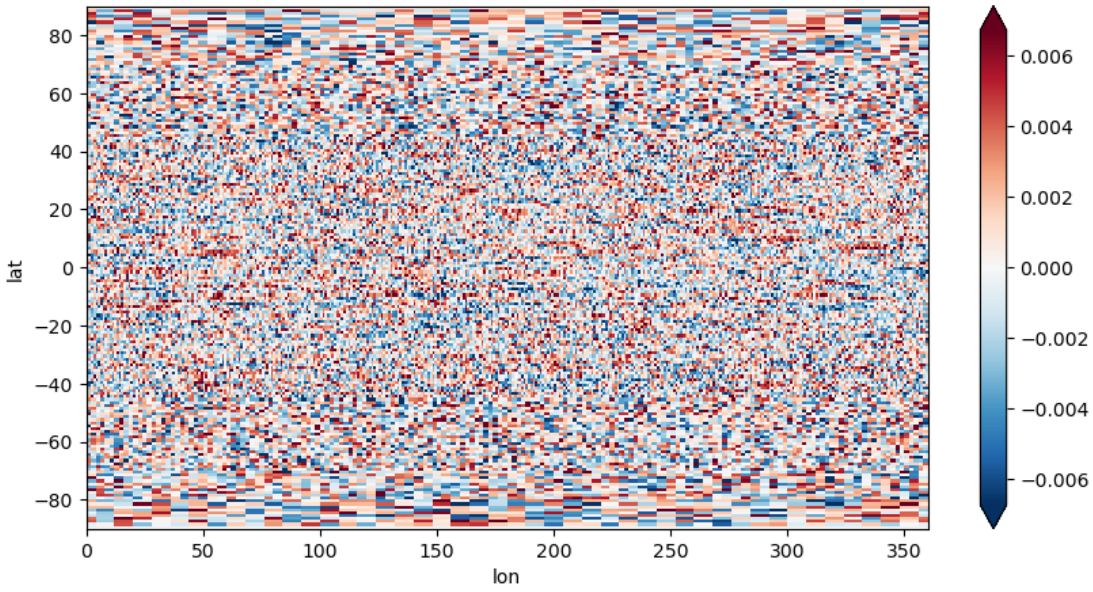
(d) the sum of variables in (a) ~ (c)

Plot the TOA net flux:



(e) the TOA net flux

Fig.(d) and (e) look the same, and I calculate their difference to verify that they are equivalent:



(f) the difference between (d) and (e)

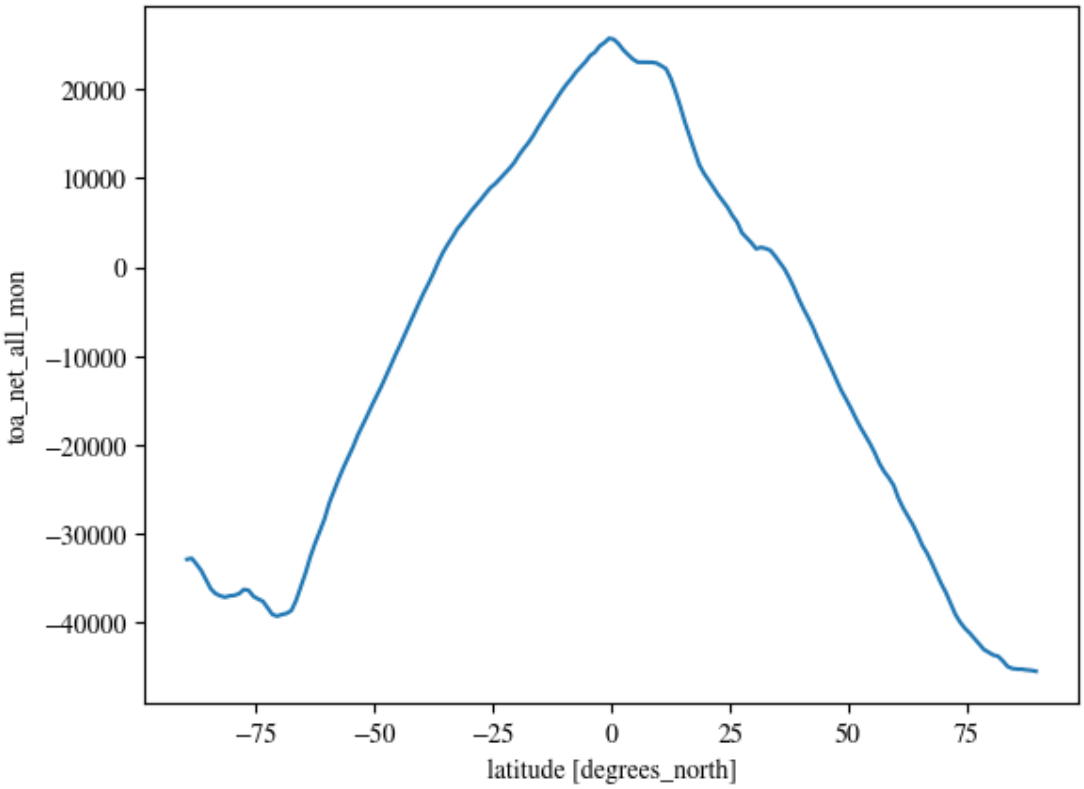
The difference is so small that can be neglected. So they are equivalent.

2.2

The TOA incoming solar, outgoing longwave, and outgoing shortwave are about 233 W/m^2, 172 W/m^2 and 164 W/m^2 respectively.

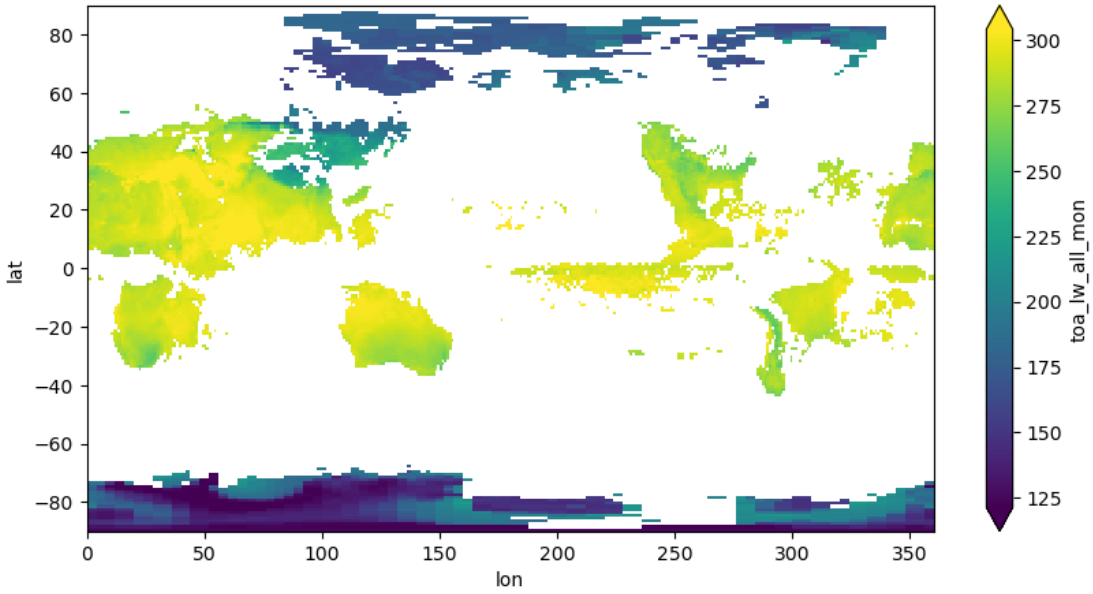
2.3

Plot the total amount of net radiation in each 1-degree latitude band as follows:

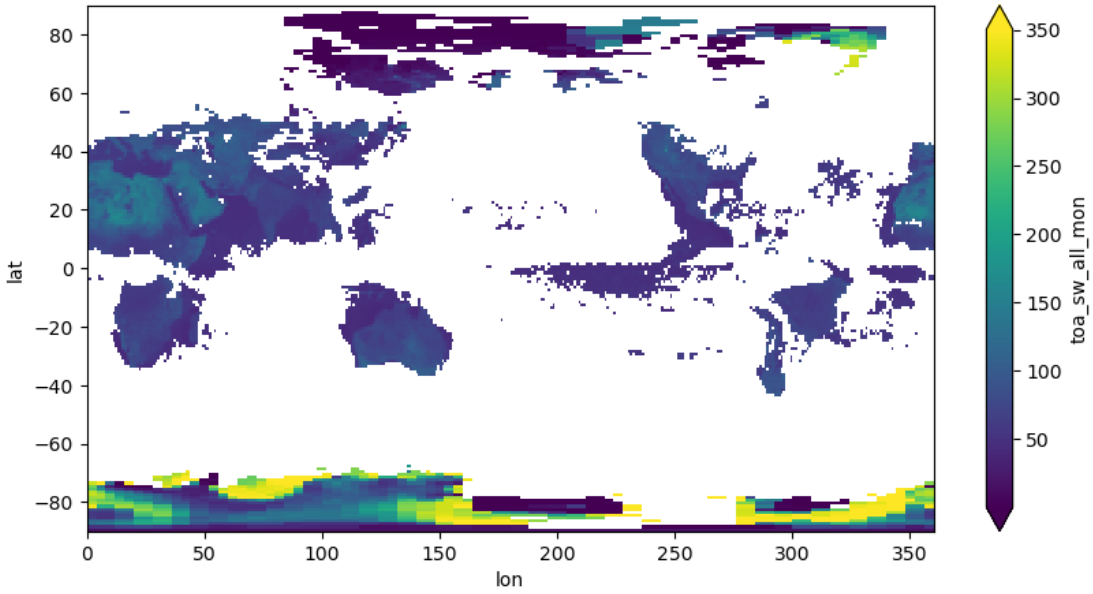


2.4

Choose regions where cldarea_total_daynight_mon<=25 and plot time-mean outgoing shortwave and longwave radiation respectively for low cloud area regions as figure (a) and (b).

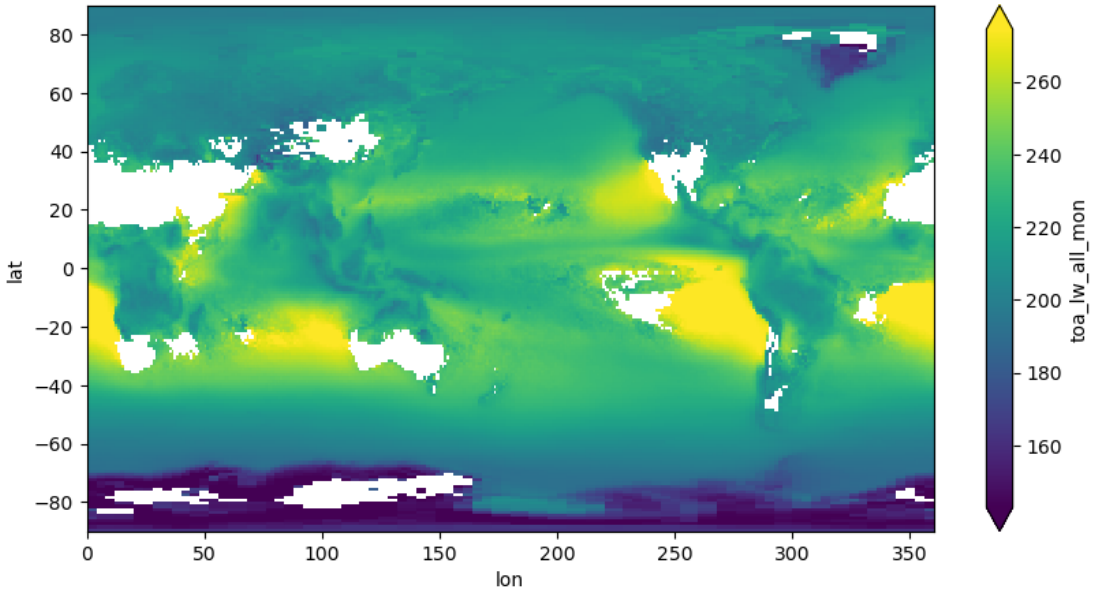


(a) time-mean outgoing longwave radiation for low cloud area regions

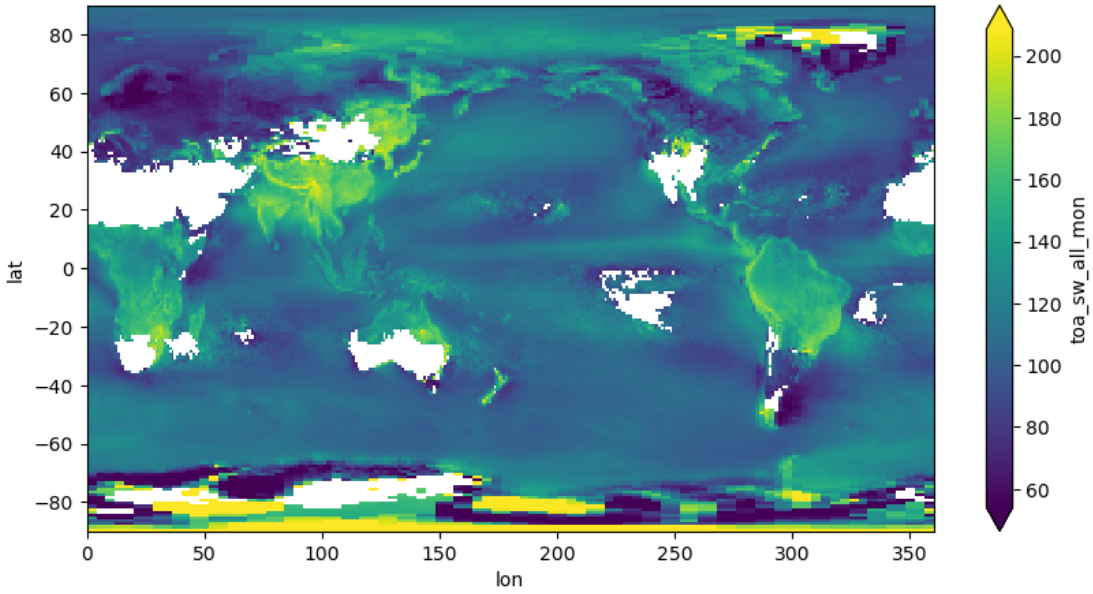


(b) time-mean outgoing shortwave radiation for low cloud area regions

Choose regions where cldarea_total_daynight_mon>=75 and plot time-mean outgoing shortwave and longwave radiation respectively for high cloud area regions as figure (c) and (d).



(c) time-mean outgoing longwave radiation for high cloud area regions



(d) time-mean outgoing shortwave radiation for high cloud area regions

2.5

The global mean values of longwave radiation in low cloud regions: 247.33109 W/m^2

The global mean values of shortwave radiation in low cloud regions: 97.11116 W/m^2

The global mean values of longwave radiation in high cloud regions: 215.39049 W/m^2

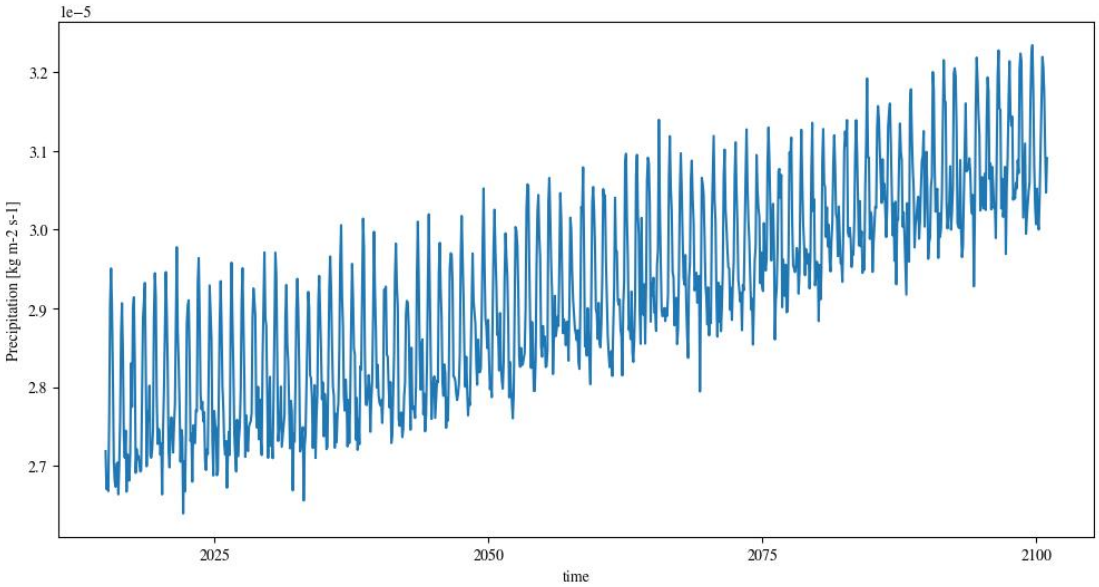
The global mean values of shortwave radiation in high cloud regions: 111.76594 W/m^2

We can draw a conclusion that clouds decrease longwave radiation but increase shortwave radiation. The total solar radiation under high cloud condition is slightly smaller than that under low cloud condition.

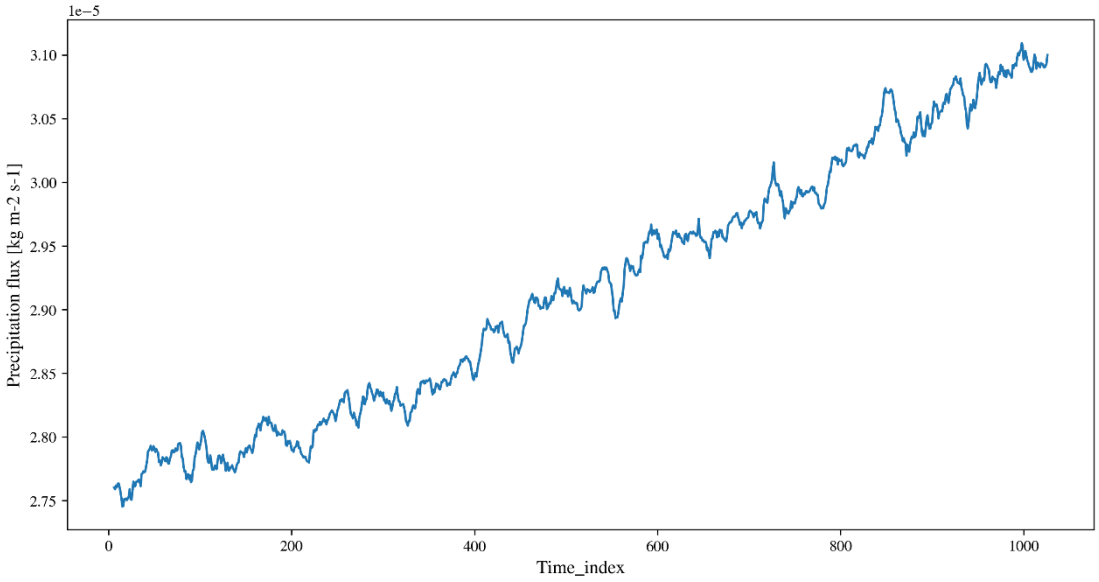
PS3_3

3.1

Time series of precipitation flux in the future (2015-2100):

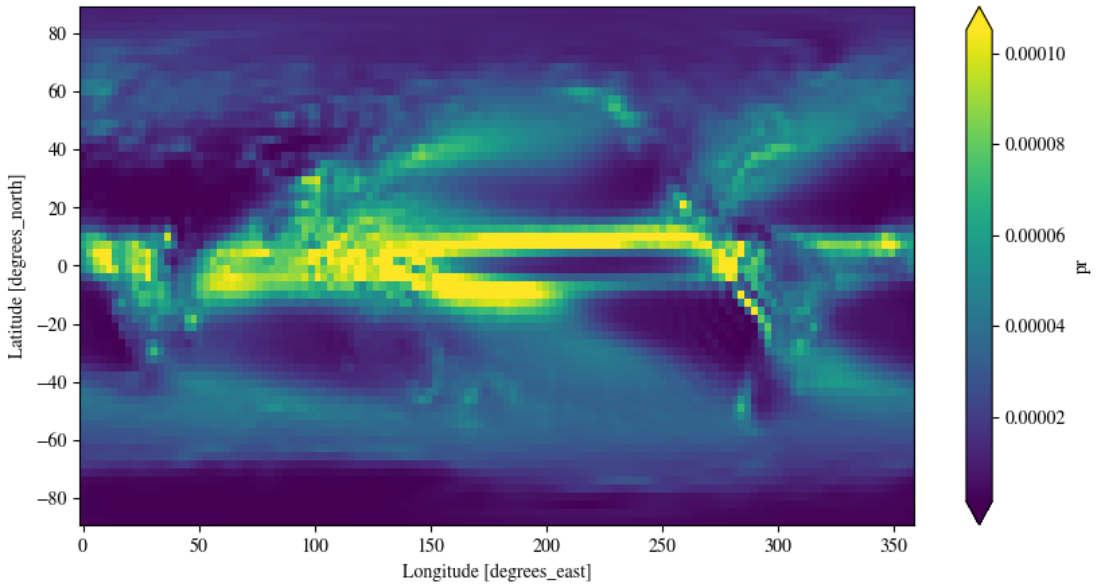


Time series of future precipitation flux with monthly seasonal cycle removed:

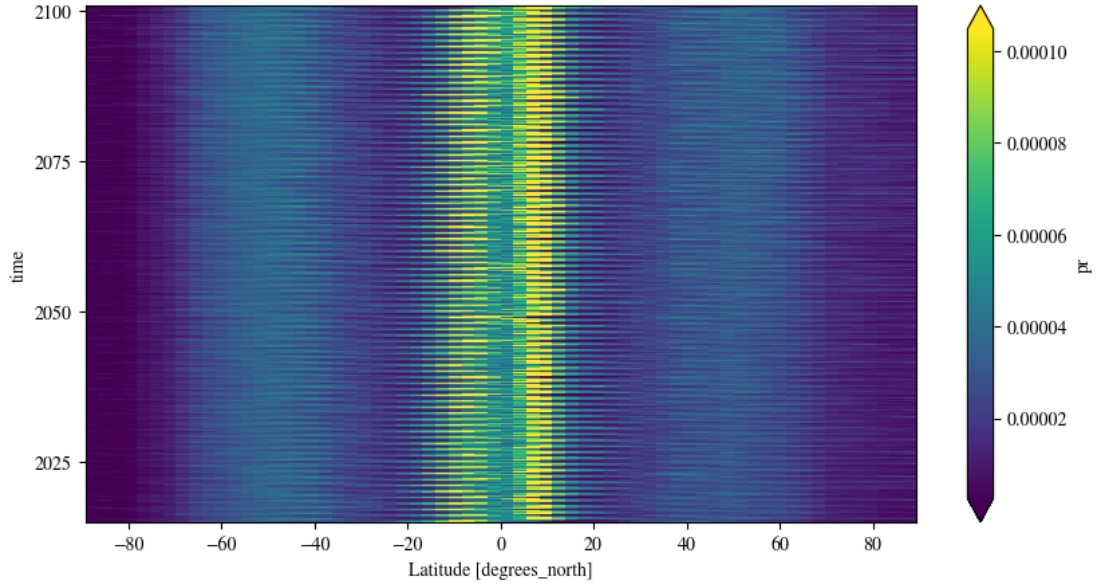


3.2

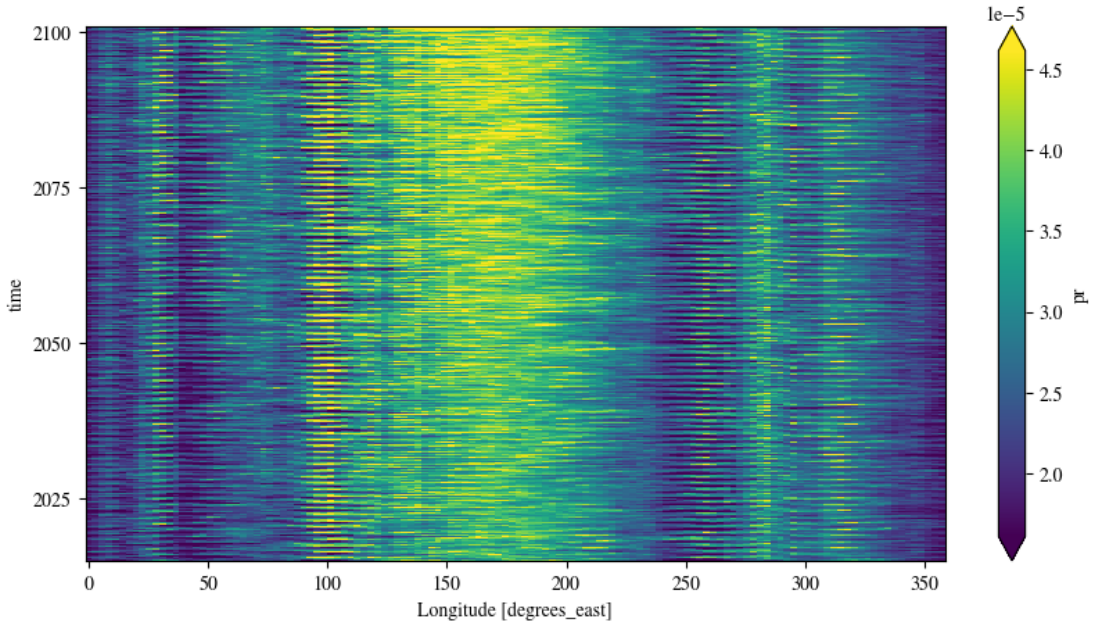
(1) 2015-2100 global mean precipitation flux:



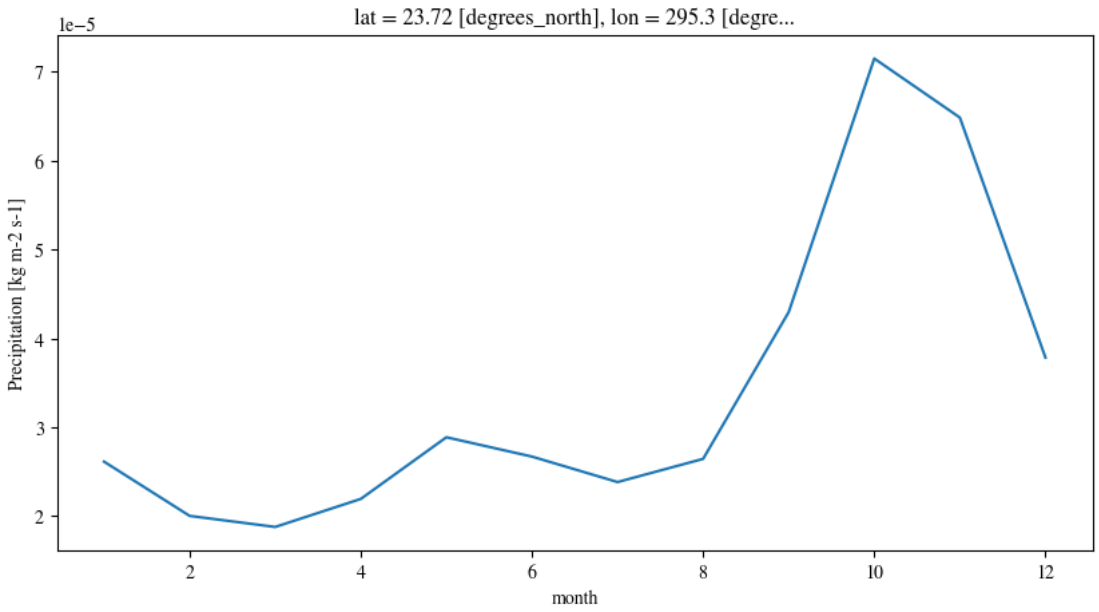
(2) 2015-2100 mean precipitation flux in each latitude:



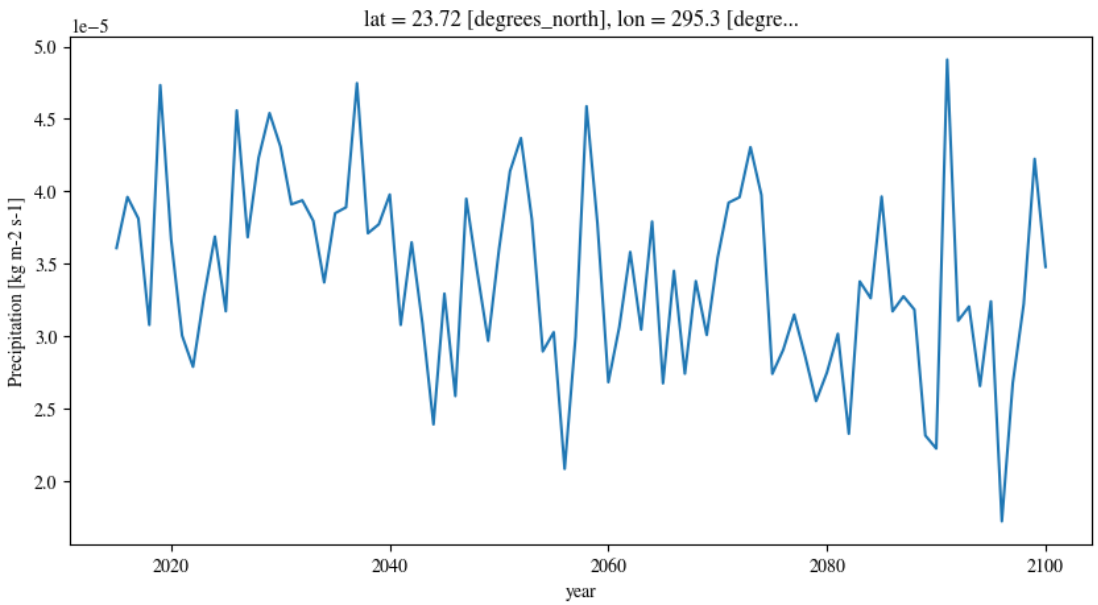
(3) 2015-2100 mean precipitation flux in each longitude:



(4) 2015-2100 mean precipitation flux in each month in Shenzhen:



(5) 2015-2100 mean precipitation flux in each year in Shenzhen:


lat = 23.72 [degrees_north], lon = 295.3 [degre...
1e−5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
Precipitation [kg m-2 s-1]
2020
2040
2060
2080
2100
year