fundamental_fixaccretionrate

June 13, 2017

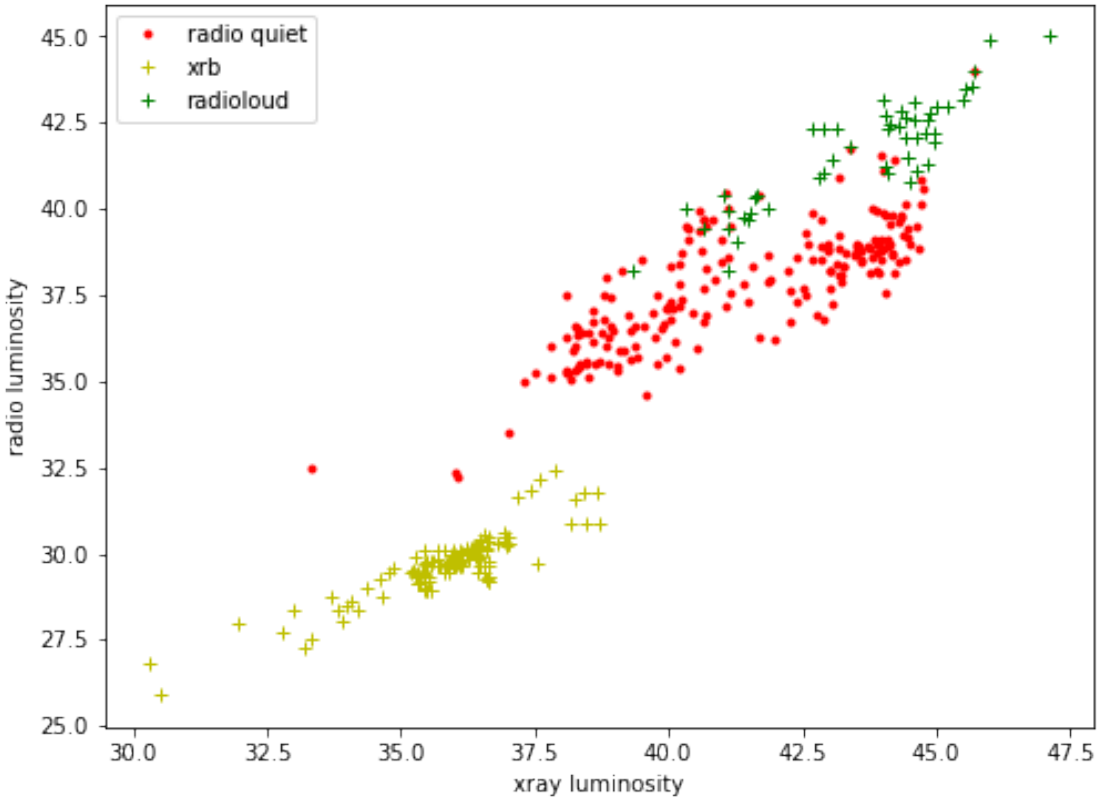
In [1]:
```
import numpy as np
from numpy import cov,corrcoef
import matplotlib.pyplot as plt
import astropy.units as u
from scipy.optimize import curve_fit
import scipy

ledd=np.log10(1.3)+38#Eddington luminosity of Solar Mass
```

In [ ]:

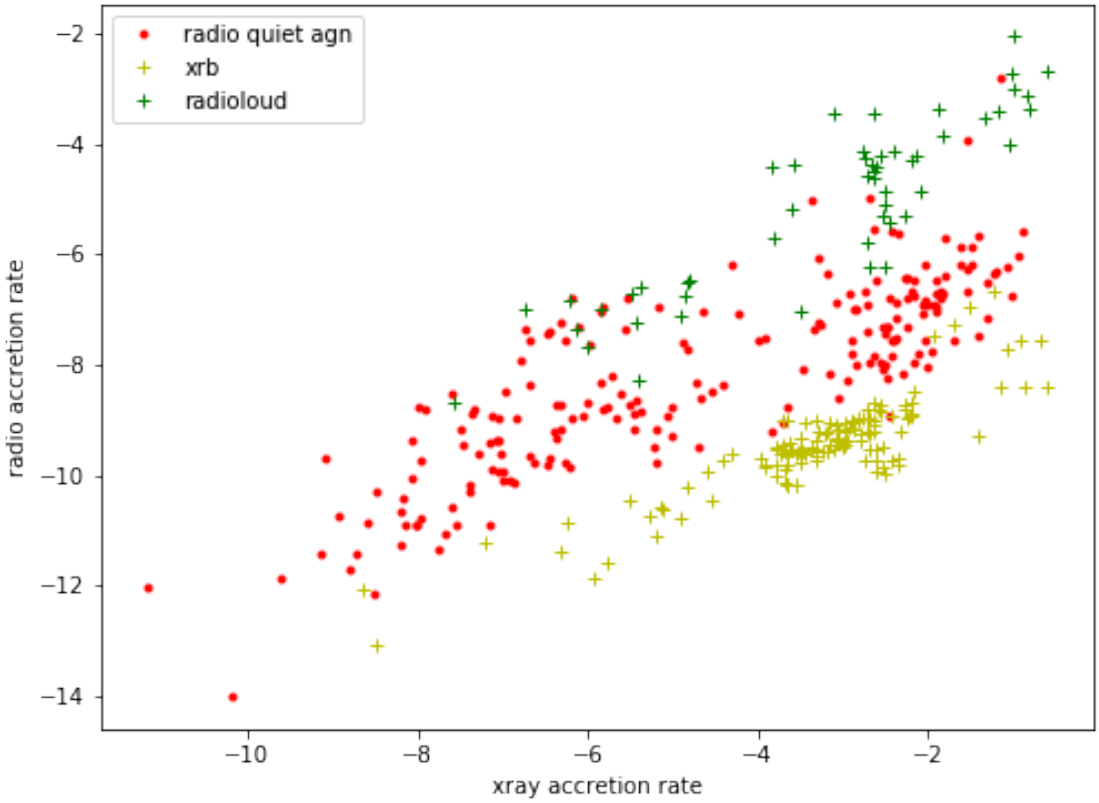
In [7]:
```
rqa=np.loadtxt('Downloads/fundamental_data/data0612radioquiet.txt')#radio q
xrb=np.loadtxt('Downloads/fundamental_data/data0612allxrb.txt')#all xrb dat
aax=np.loadtxt('Downloads/fundamental_data/data0612allagnandxrb.txt')#all a
allradioloud=np.loadtxt('Downloads/fundamental_data/data0612radioloud.txt')
rqx=np.loadtxt('Downloads/fundamental_data/data0612radioquietagnandxrb.txt'
agn=np.loadtxt('Downloads/fundamental_data/data0612allagn.txt')

#fri=np.loadtxt('Downloads/fundamental_data/frI.txt')#all fri
#onlyradioloud=np.loadtxt('Downloads/fundamental_data/radioloud.txt')#radio
#youngradiosource=np.loadtxt('Downloads/fundamental_data/youngrs.txt')#your
#dong14=np.loadtxt('Downloads/fundamental_data/dong14.txt')


#data for agns and xrb
raax=aax[:,0]
xaax=aax[:,1]
maax=aax[:,2]
raaxedd=raax-ledd-maax
xaaxedd=xaax-ledd-maax


#data for radio quiet agn
rrqa=rqa[:,0]
xrqa=rqa[:,1]
mrqa=rqa[:,2]
rrqaedd=rrqa-ledd-mrqa
xrqaedd=xrqa-ledd-mrqa
```

```
        #data for agn
        r=agn[:,0]
        x=agn[:,1]
        m=agn[:,2]
        redd=r-ledd-m
        xedd=x-ledd-m

        #for x-ray binary
        rxrb=xrb[:,0]
        xxrb=xrb[:,1]
        mxrb=xrb[:,2]
        rxrbedd=rxrb-ledd-mxrb
        xxrbedd=xxrb-ledd-mxrb

        #for radio loud agn
        rarl=allradioloud[:,0]
        xarl=allradioloud[:,1]
        marl=allradioloud[:,2]
        rarledd=rarl-ledd-marl
        xarledd=xarl-ledd-marl
```

In [8]:
```
        plt.figure(figsize=(8,6))
        plt.plot(xrqa,rrqa,'r.',label='radio quiet')
        plt.plot(xxrb,rxrb,'y+',label='xrb')
        plt.plot(xarl,rarl,'g+',label='radioloud')

        plt.ylabel('radio luminosity')
        plt.xlabel('xray luminosity')
        plt.legend()
        plt.show()
```




```
In [9]: plt.figure(figsize=(8,6))
        plt.plot(xrqaedd,rrqaedd,'r.',label='radio quiet agn')
        plt.plot(xxrbedd,rxrbedd,'y+',label='xrb')
        plt.plot(xarledd,rarledd,'g+',label='radioloud')

        plt.ylabel('radio accretion rate')
        plt.xlabel('xray accretion rate')
        plt.legend()
        plt.show()
```

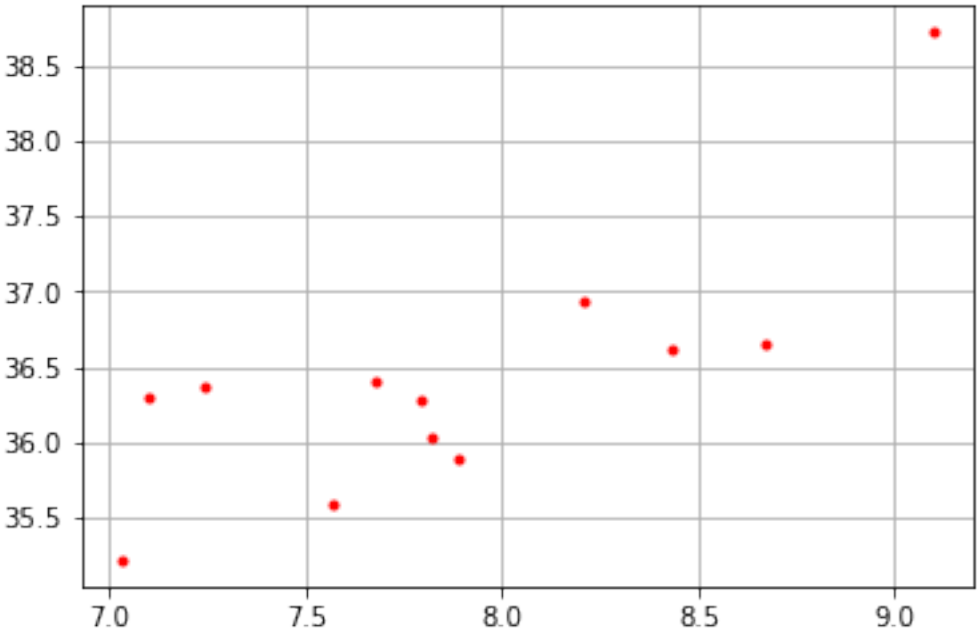


In [12]:
```
#fix the x-ray Eddington rate
#consider R-M
def fixaccretionrate(binrange,radio,mass,xedd,binsize=0.15):
    judge=(abs(xedd-binrange)<binsize)
    rnew=radio[judge]
    mnew=mass[judge]
    size=rnew.size
    if size >10:
        fitrm=np.polyfit(mnew,rnew,1)
        #fitrx=np.polyfit(xnew,rnew,1)
        rmR2=np.corrcoef(mnew,rnew)
        #rxR2=np.corrcoef(xnew,rnew)
        #print('num in range is  ',xnew.size)
        print(size,binrange,fitrm[0],rmR2[0,1])
        plt.plot(mnew,rnew,'r.')
        plt.grid()
    plt.show()
```

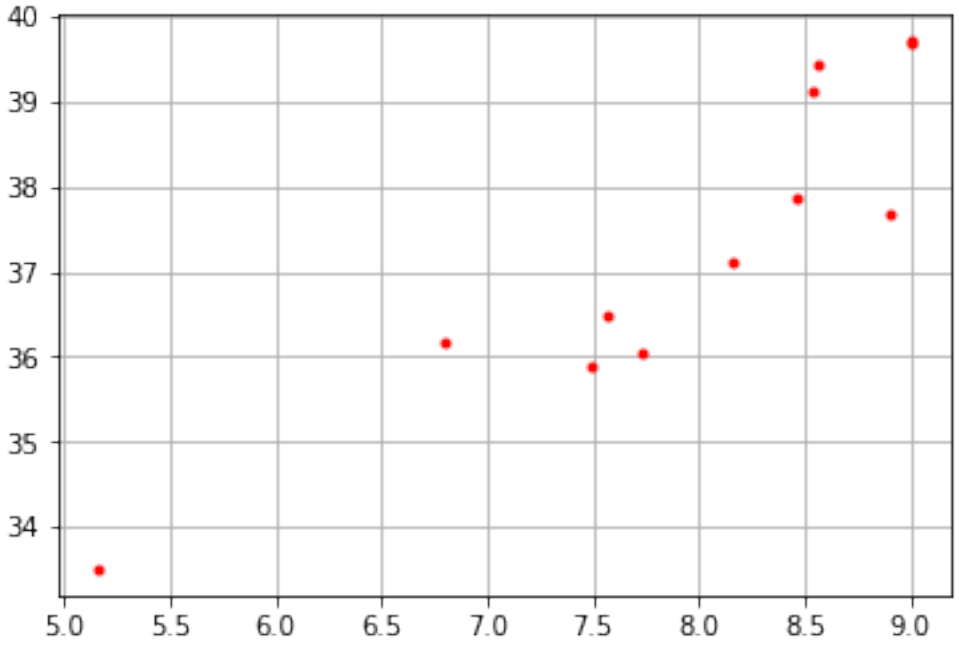
In [14]:
```
#all agn
#fix xray accretion rate
print('num,accretion_range,   R_M_coeff,  rmR2, ')
```

```
        for i in np.arange(-10,0,0.3):
            fixaccretionrate(i,r,m,xedd,0.15)
```

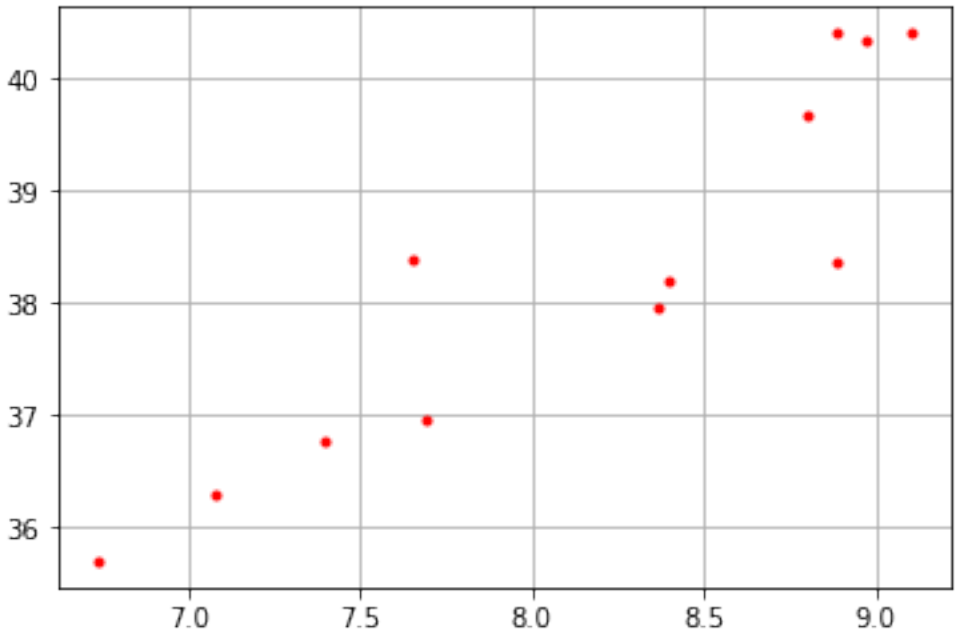
```
num,accretion_range,   R_M_coeff,  rmR2,
12 -7.0 1.06666704441 0.780827550717
```



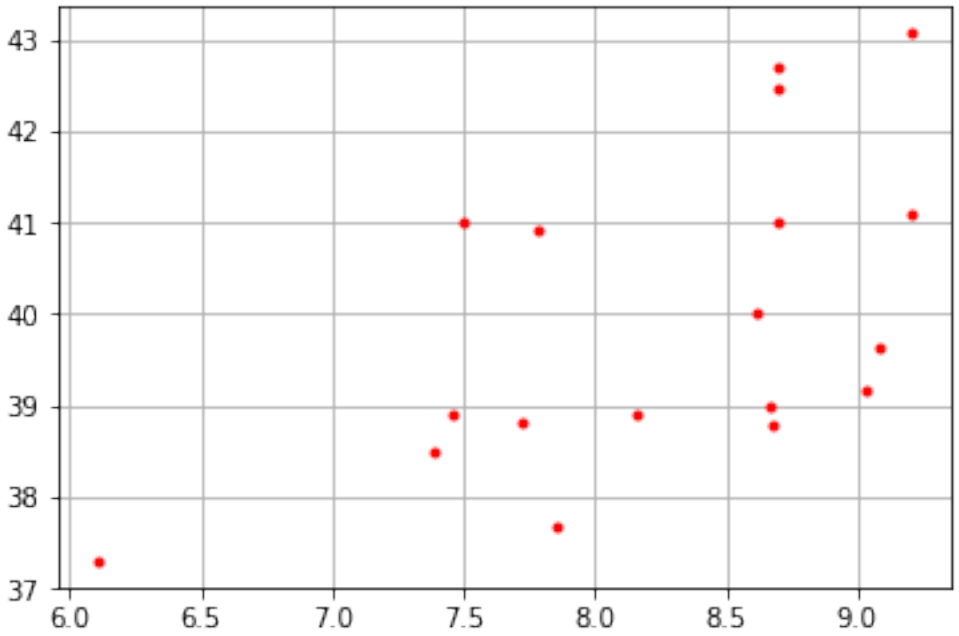

```
12 -6.4 1.54790061948 0.907810595
```



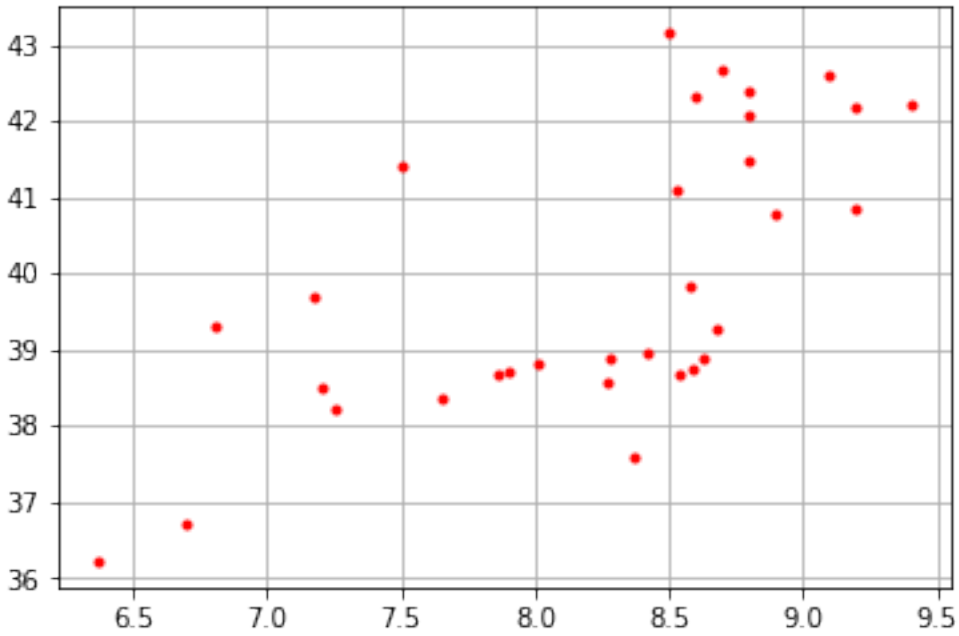

```
12 -5.5 1.84939996466 0.915614812119
```



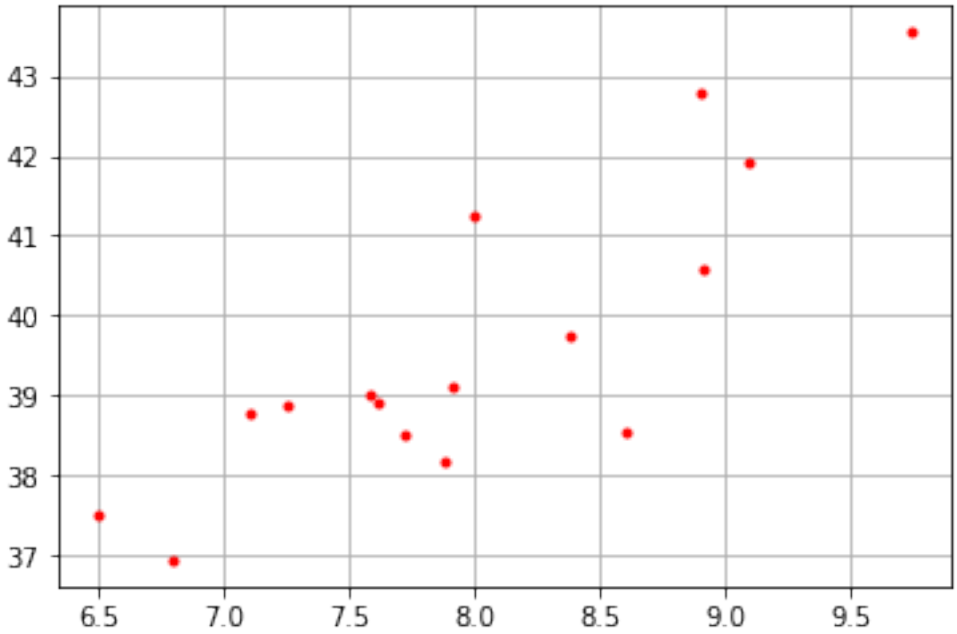
```
18 -2.8 1.16106953522 0.560674026082
```



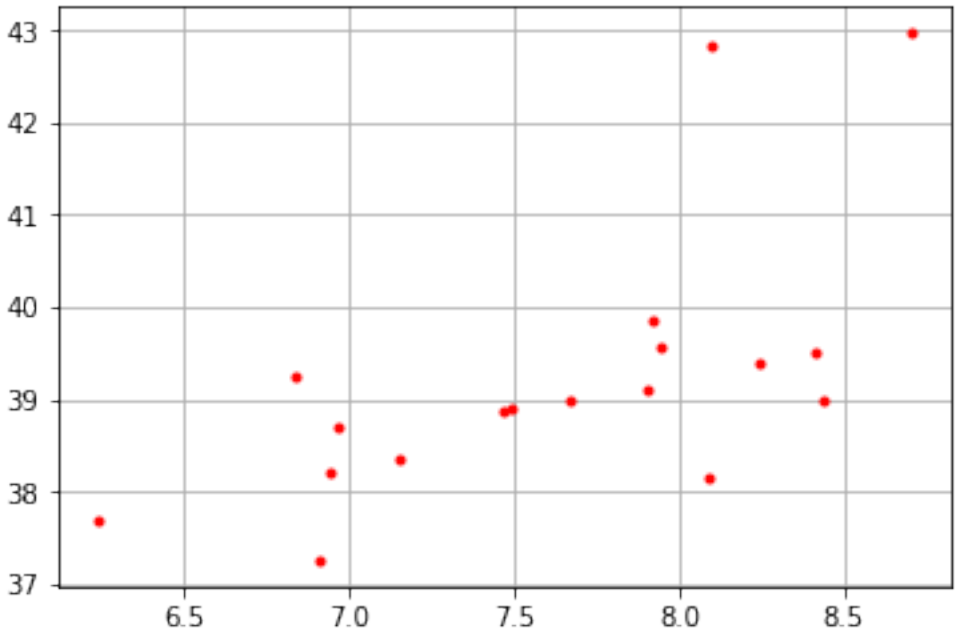

```
32 -2.5 1.6131915785 0.668889221123
```



```
16 -2.2 1.78305197525 0.847876209204
```




```
18 -1.9 1.37709766973 0.625754479169
```



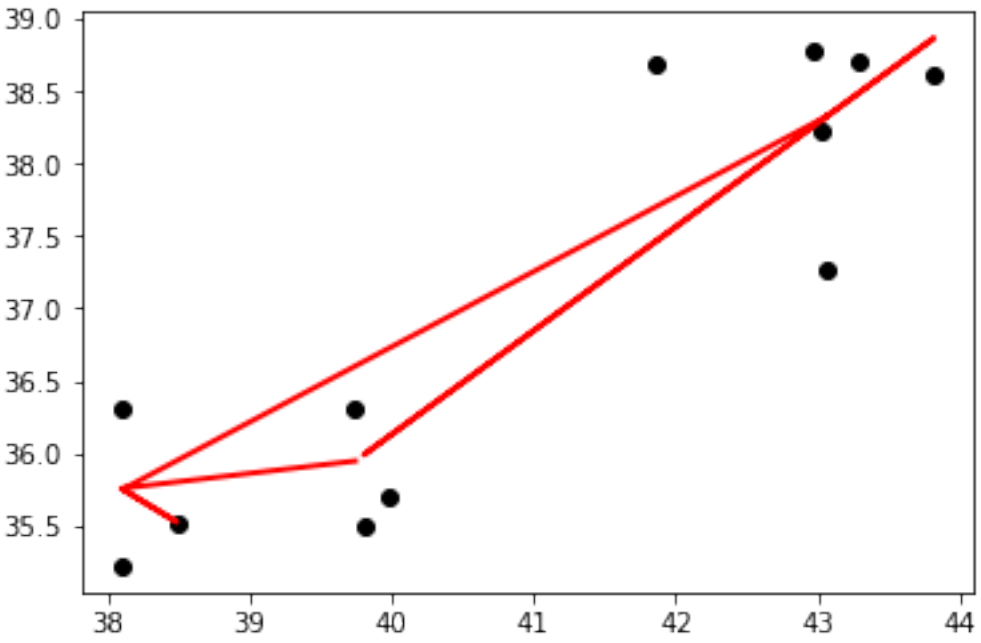
In [26]:
```
import numpy as np
from astropy.modeling.models import custom_model
from astropy.modeling.fitting import LevMarLSQFitter
from astropy.modeling import models,fitting

#sgn = lambda x: 1 if x > 0 else -1 if x < 0 else 0
# Define model
@custom_model
def sum_of_linear(x,a=0.6,b=0.6,x0=42,y0=37):
#    if x.all() < x0:
    return np.where(x<x0,a*(x-x0)+y0,b*(x-x0)+y0)
# Generate fake data
# Fit model to data
```

In [18]:
```
#fix the M in a bin
#consider R-X
def fixmass(binrange,radio,xray,mass,binsize=0.15):
    judge=(abs(mass-binrange)<binsize)
    rnew=radio[judge]
    xnew=xray[judge]
    size=rnew.size
    if size > 10 :
        fit=np.polyfit(xnew,rnew,1)
        R2=np.corrcoef(xnew,rnew)
        if R2[0,1]>0.6:
        #print('num in range is  ',xnew.size)
            print(size,binrange,fit[0],R2[0,1])
            plt.scatter(xnew,rnew)
    plt.show()
```

In [32]:
```
#fix the M in a bin
#consider R-X
def fixmass_bilinear(binrange,radio,xray,mass,binsize=0.15):
    judge=(abs(mass-binrange)<binsize)
    rnew=radio[judge]
    xnew=xray[judge]
    size=rnew.size
    if size > 10 :
        m_init = sum_of_linear()
        #fit = fitting.LinearLSQFitter()
        fit=fitting.LevMarLSQFitter()
        m = fit(m_init, xnew, rnew)
        # Plot the data and the best fit
        print(binrange,m)
        plt.plot(xnew,rnew,  'o' , color= 'k' )
```

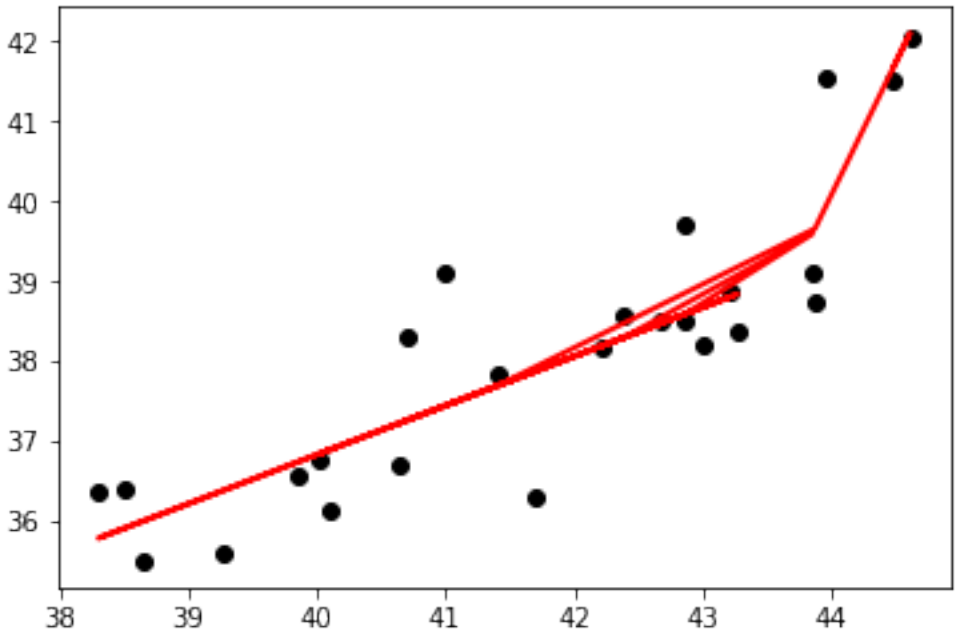
```
                plt.plot(xnew, m(xnew),'-', color= 'r' , lw=2)
            plt.show()

        #fix mass for all agn
        print('num,mass_range, R_X_coeff,    R2')
        for i in np.arange(7,11,0.3):
            fixmass_bilinear(i,r,x,m,0.15)
```

```
num,mass_range, R_X_coeff,    R2
7.0 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
           a               b              x0             y0
    --------------- --------------- ------------- -------------
    -0.594403236923 0.716353505627 38.8471742376 35.3058536139
```

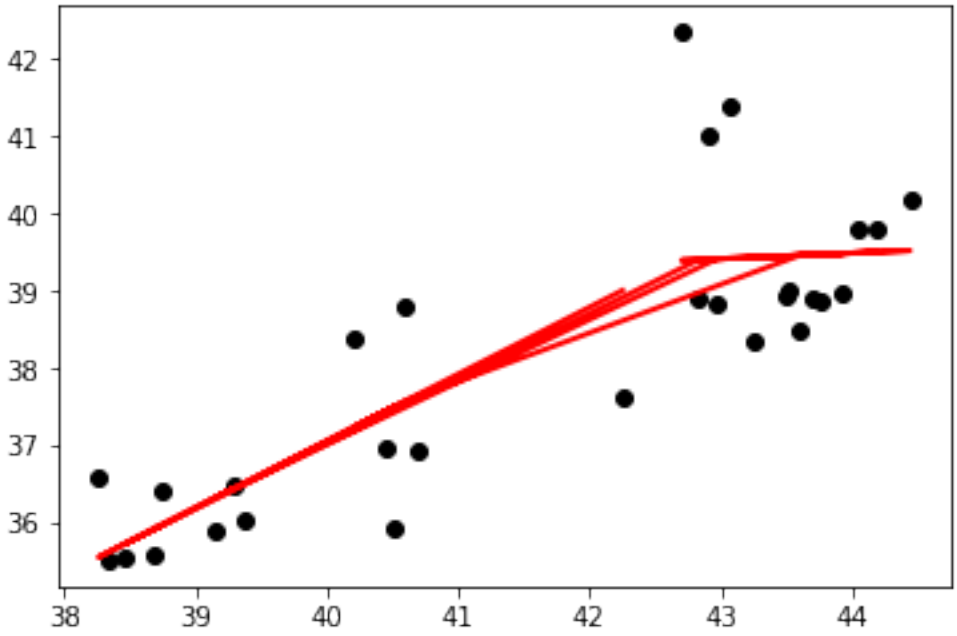



```
7.3 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a               b              x0             y0
    --------------- --------------- ------------- -------------
```

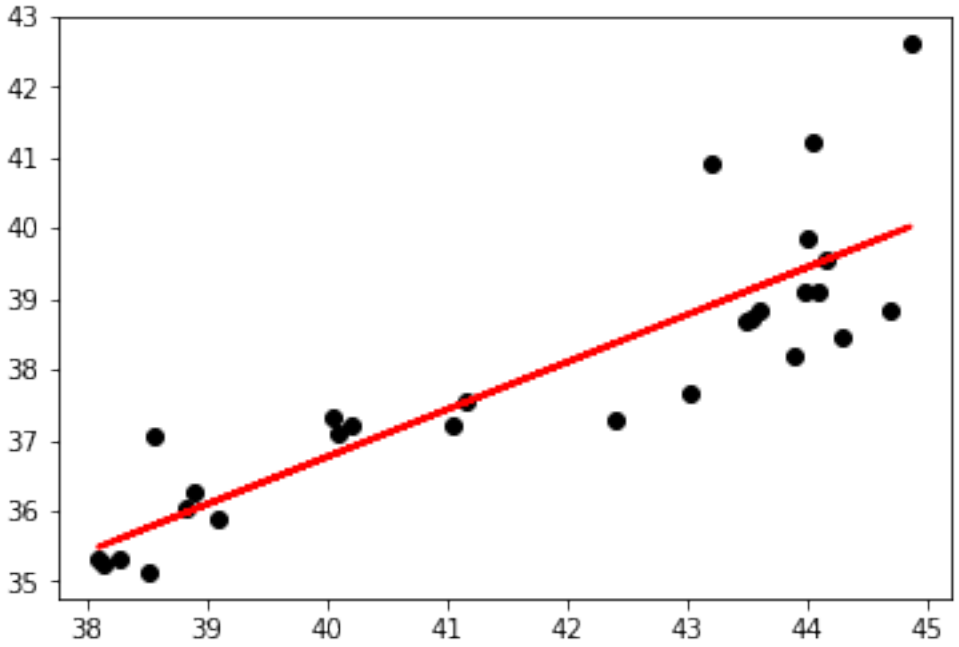
```
0.614965607195 3.30846101938 43.7041893026 39.1090378875
```



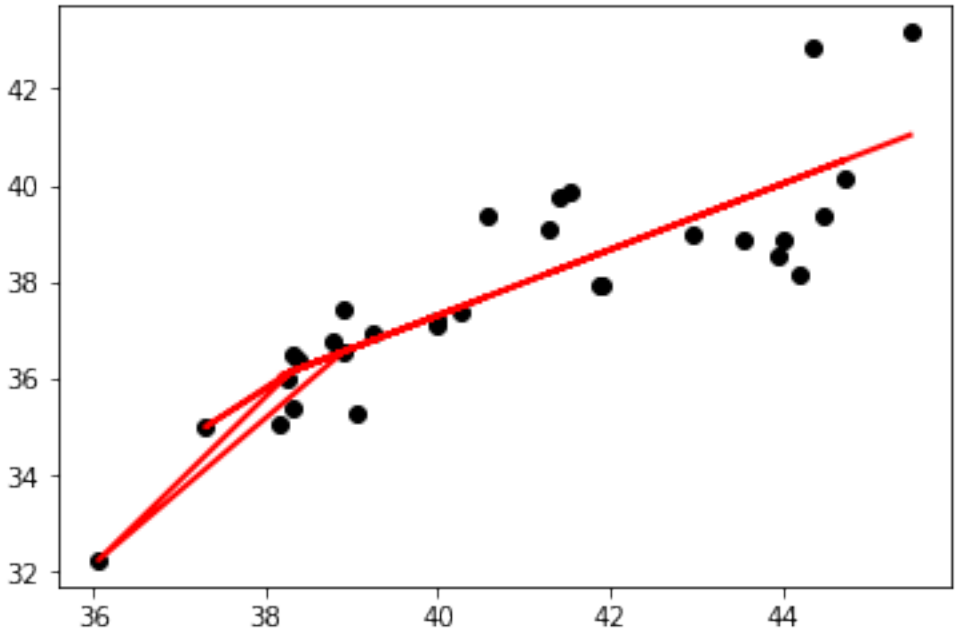

```
7.6 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a                b              x0             y0
    -------------- --------------- ------------- -------------
    0.865660010507 0.0730813969037 42.6991622174 39.3977376042
```



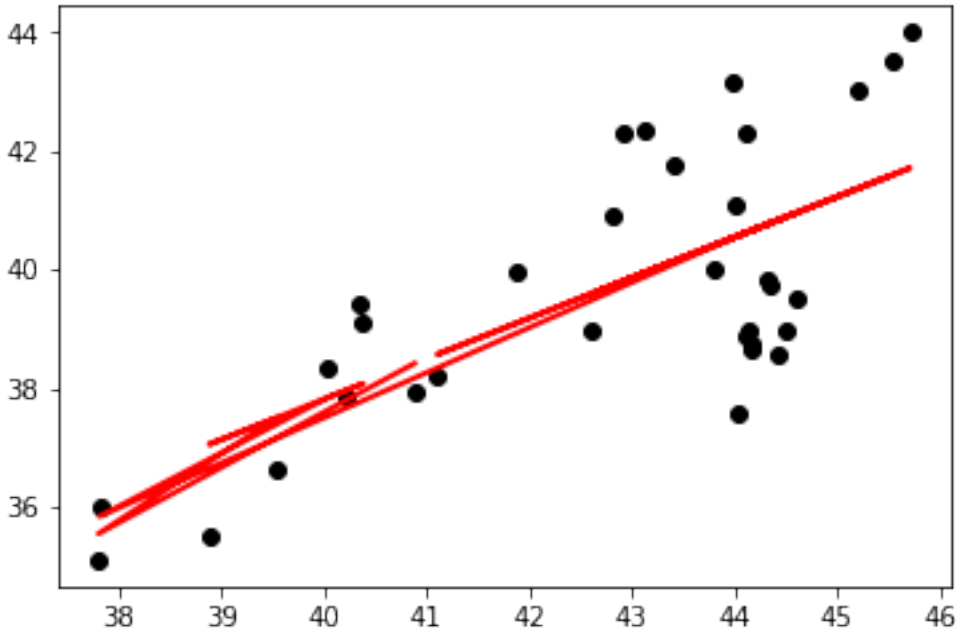

```
7.9 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b              x0             y0
    -------------- -------------- -------------- --------------
    0.672496488974 0.882440236848 50.8759379953 44.0737615294
```



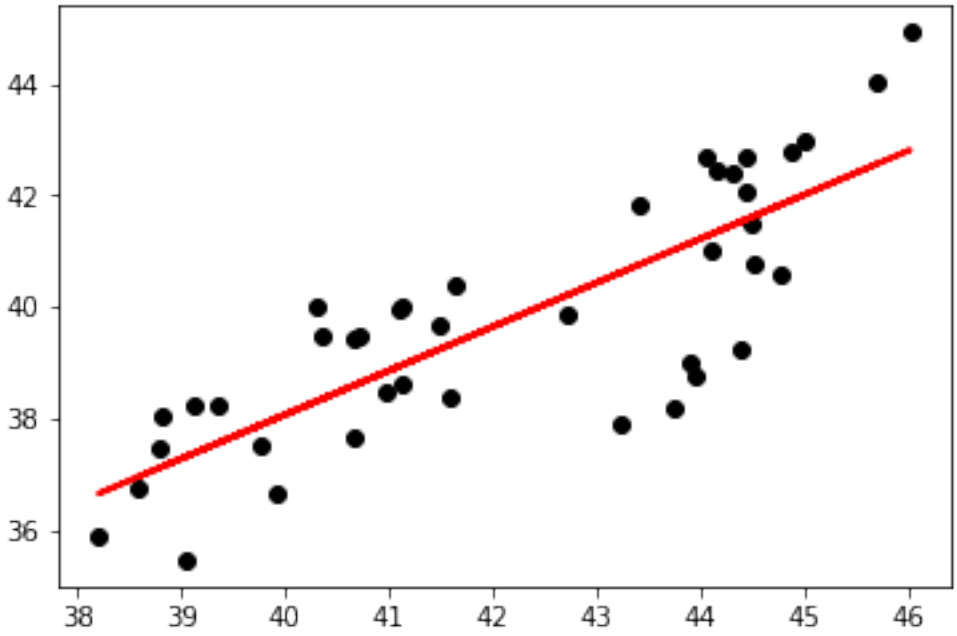

```
8.2 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b             x0            y0
    ------------- ------------- ------------ ------------
    2.21774193548 0.68144981662 37.605161019 35.676768389
```



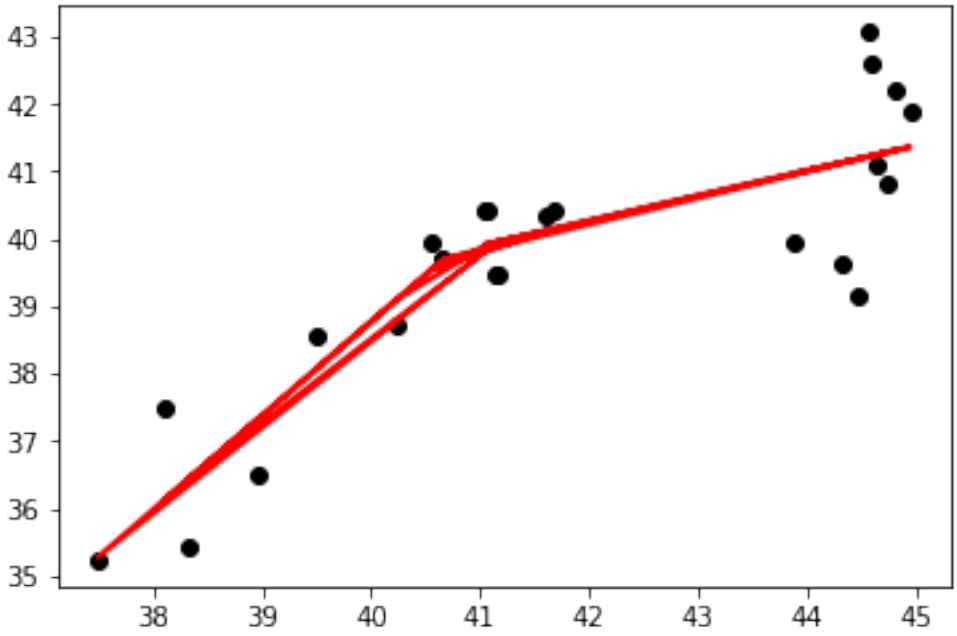

```
8.5 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a             b              x0           y0
    ------------- -------------- ------------- ------------
    29.1248848449 0.682040275744 37.8270641835 36.331919365


WARNING: The fit may be unsuccessful; check fit_info['message'] for more informatio
```



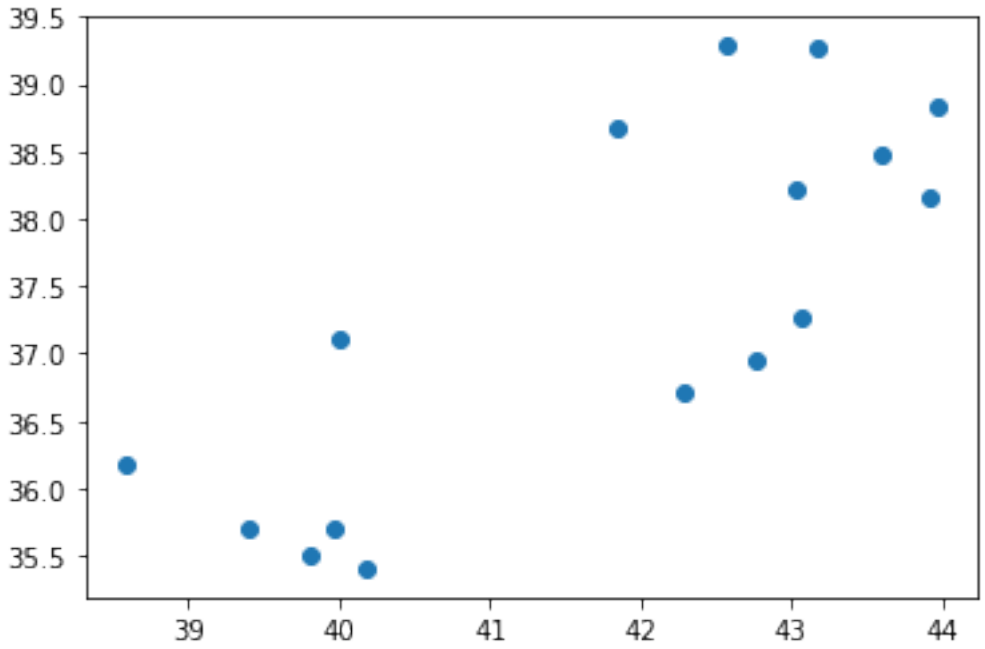

```
8.8 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a               b               x0             y0
    --------------- --------------- -------------- --------------
    0.789474513803 0.932942975781 87.6098939647 75.6574435835
```



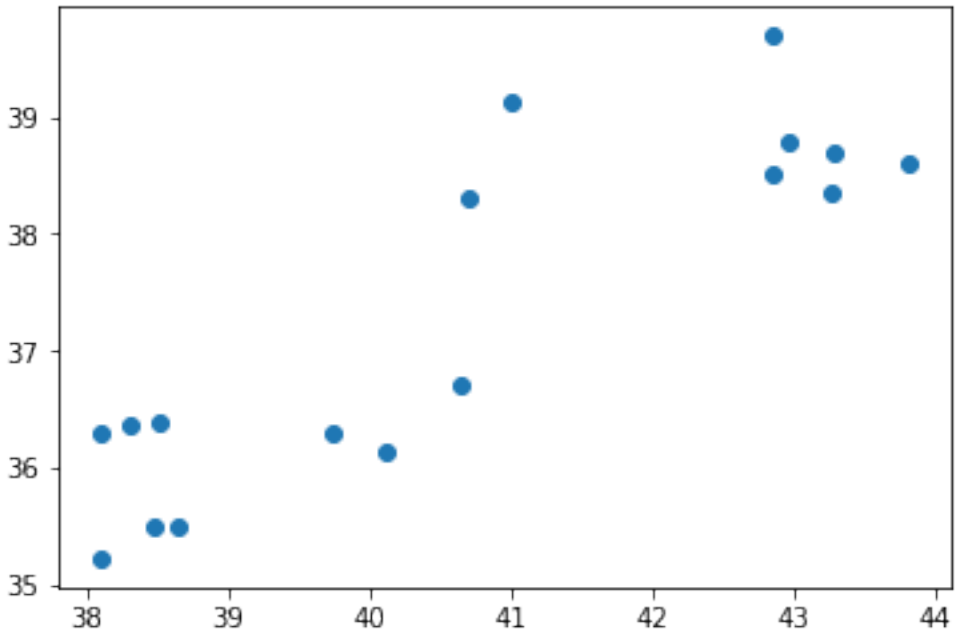

```
9.1 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b               x0             y0
    ------------- --------------- ------------- -------------
    1.39672309045 0.371939949739 40.7390533641 39.8029133686
```



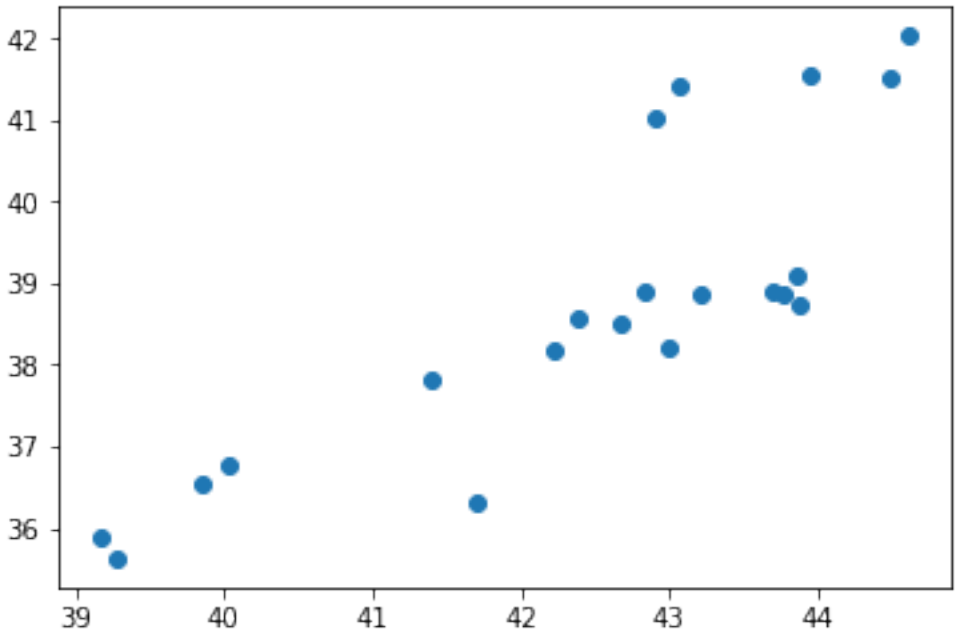

```
In [19]: #fix mass for all agn
         print('num,mass_range, R_X_coeff,    R2')
         for i in np.arange(5,10,0.3):
             fixmass(i,r,x,m,0.15)

num,mass_range, R_X_coeff,    R2
16 6.8 0.608700733132 0.789538347248
```



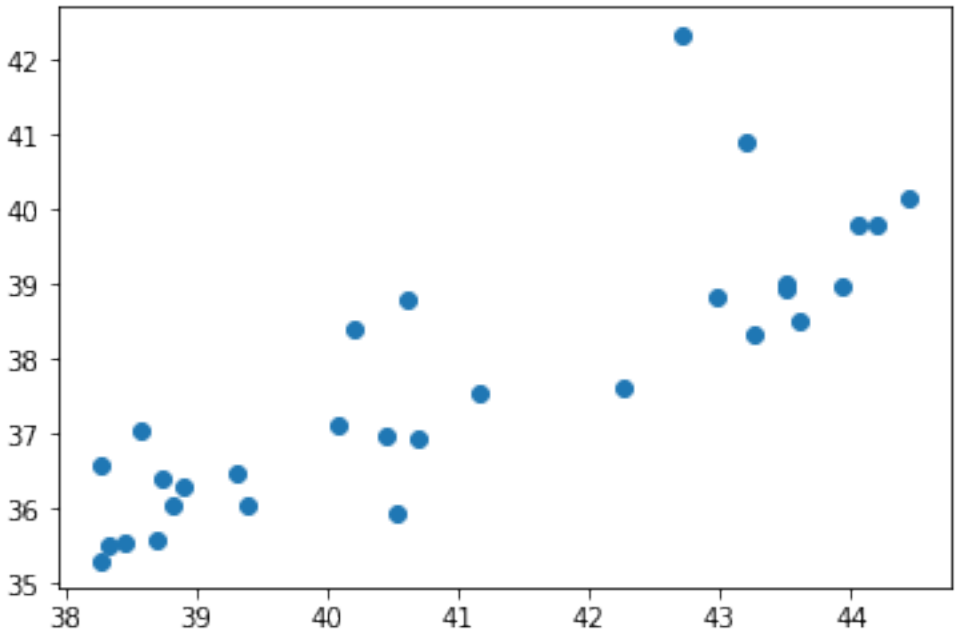

```
17 7.1 0.60590756889 0.874017175148
```



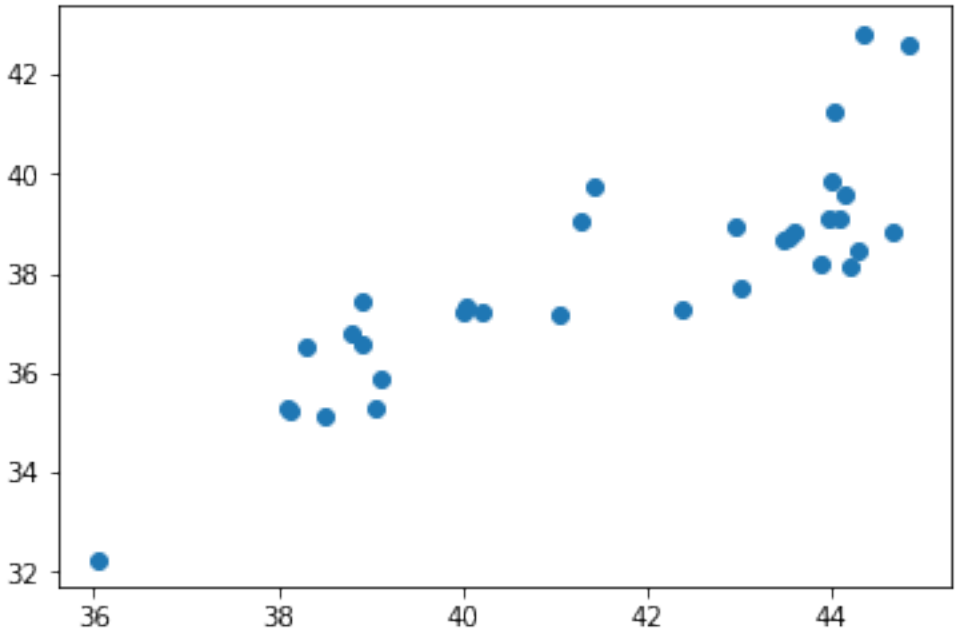
```
21 7.4 0.960099510182 0.835434114667
```



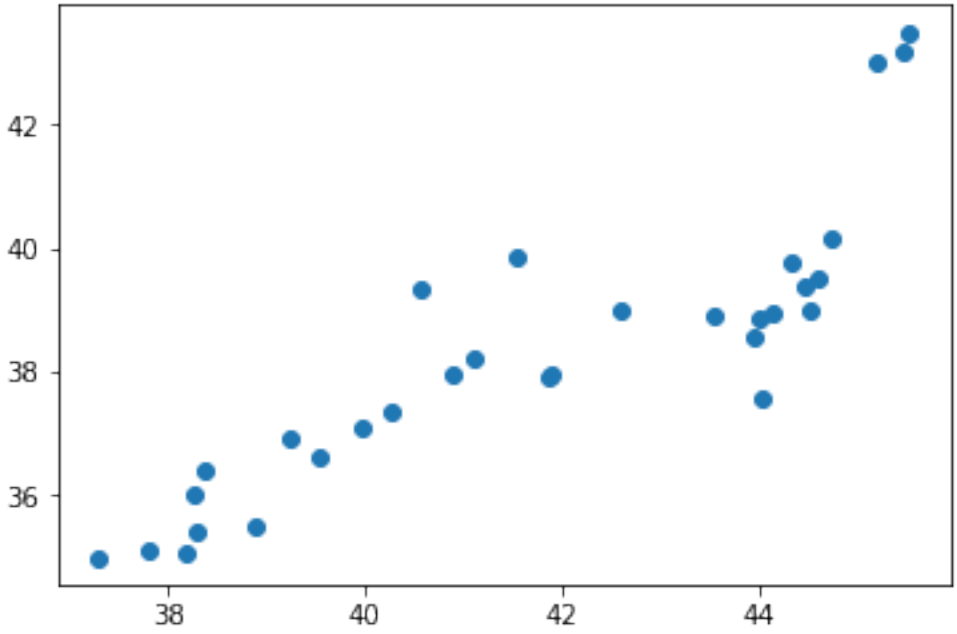

```
30 7.7 0.682473280282 0.837797376613
```



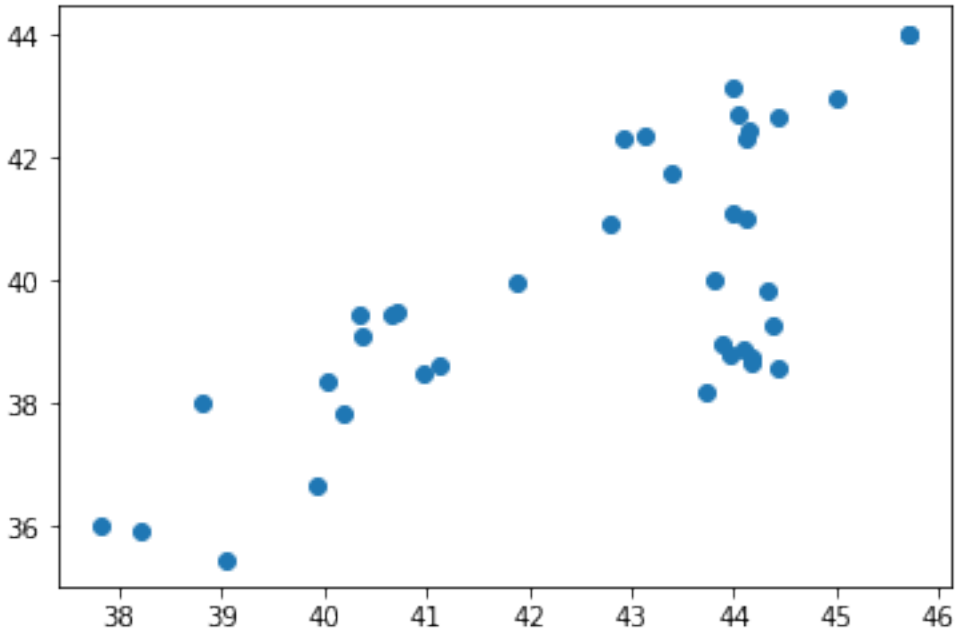
```
33 8.0 0.702414593473 0.837406735242
```



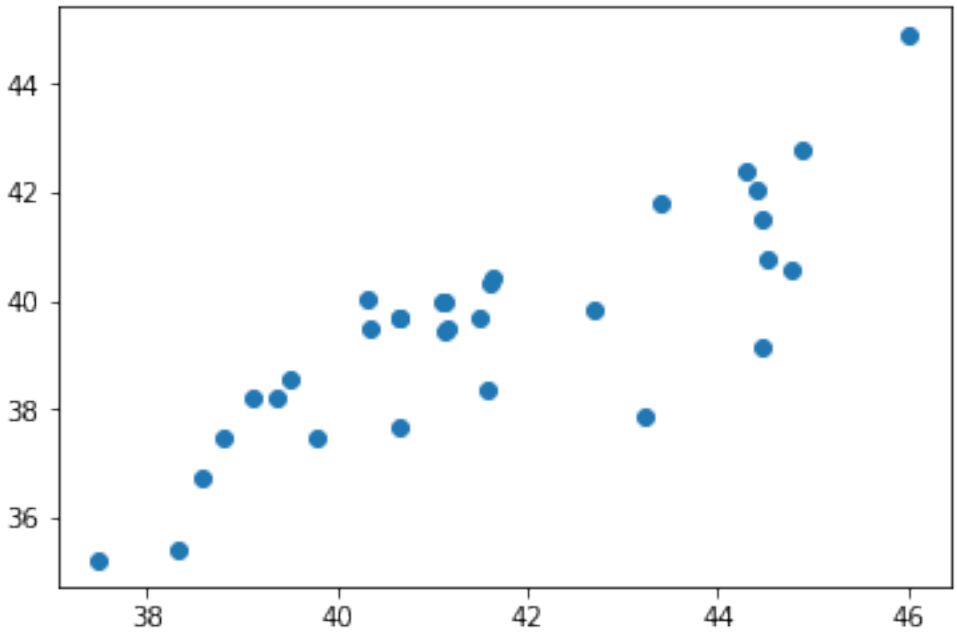

```
31 8.3 0.725144007887 0.86376747397
```



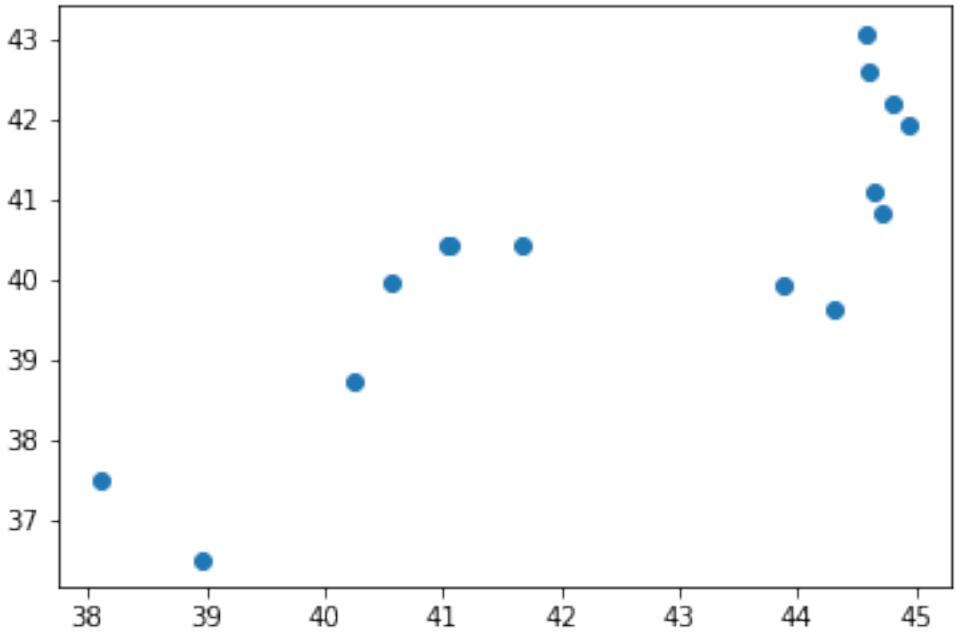
```
38 8.6 0.752680617032 0.729100273801
```



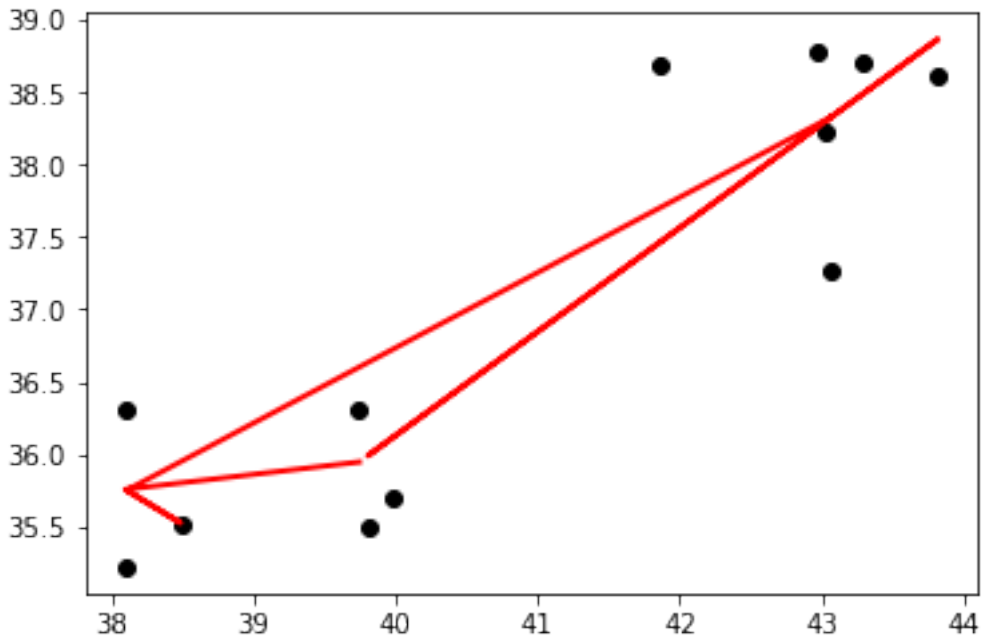

```
32 8.9 0.762342520682 0.834411167812
```



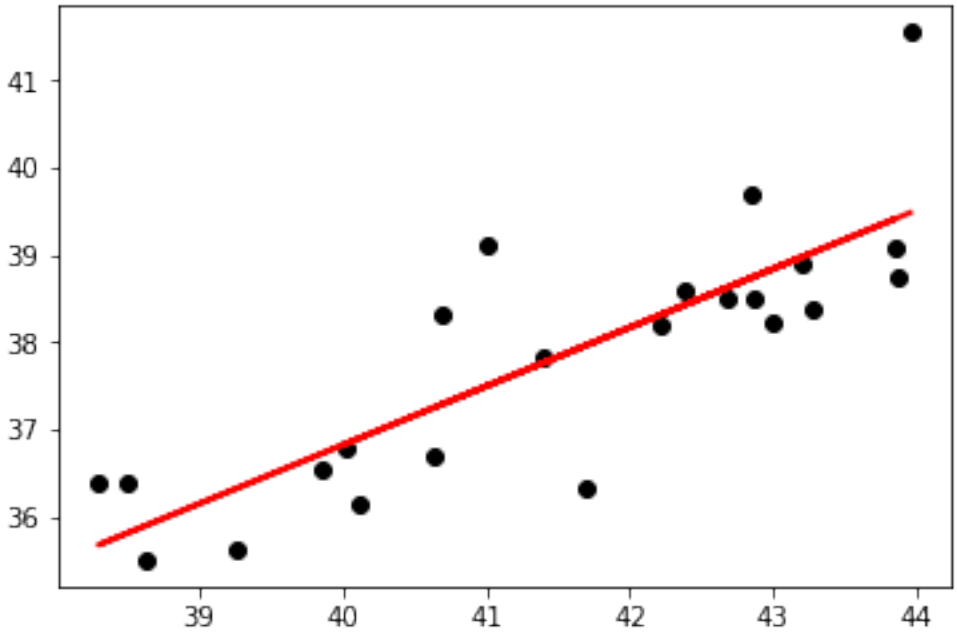
```
15 9.2 0.618992038974 0.819763184856
```



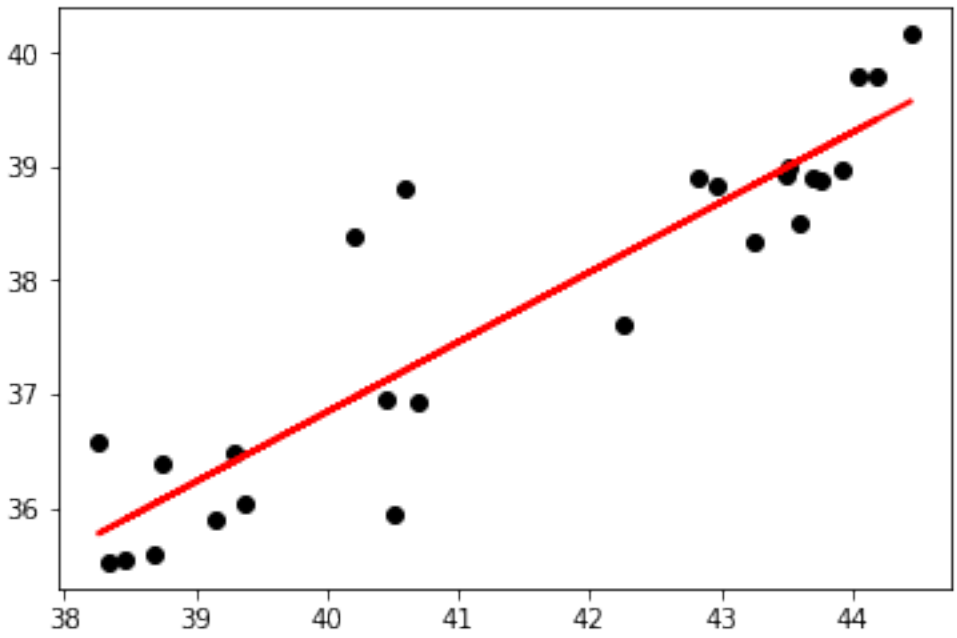

```
In [33]: #fix mass for radio quiet agn
         print('num,mass_range, R_X_coeff,    R2')
         for i in np.arange(7.0,11.0,0.3):
             fixmass_bilinear(i,rrqa,xrqa,mrqa,0.15)

num,mass_range, R_X_coeff,    R2
7.0 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
            a               b               x0             y0
    --------------- --------------- ------------- -------------
    -0.594403236923 0.716353505627 38.8471742376 35.3058536139
```



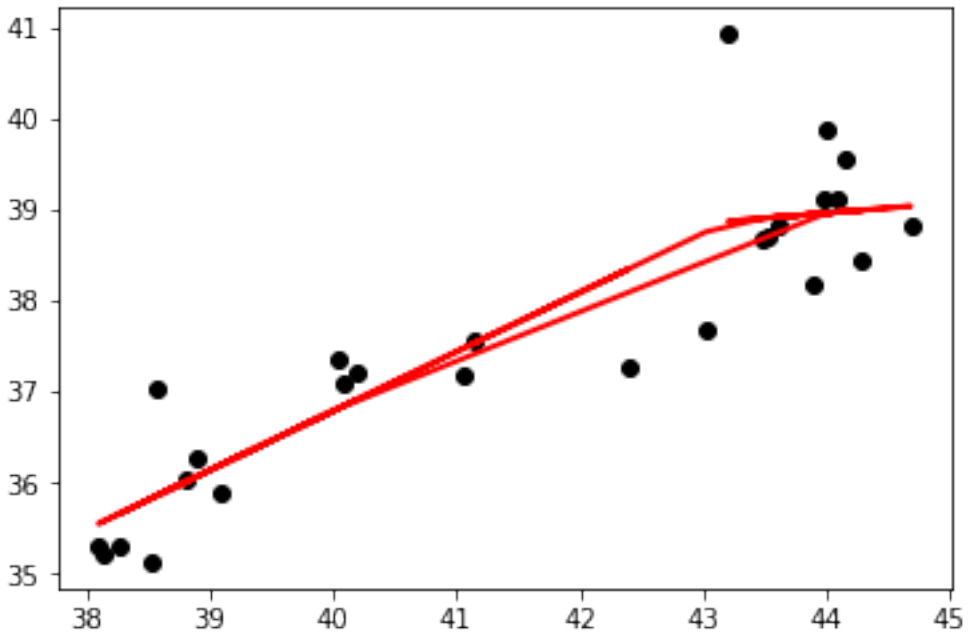

```
7.3 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a               b              x0             y0
    --------------- -------------- -------------- --------------
    0.673889993556 0.92427389908 68.7743925987 56.2088530656
```



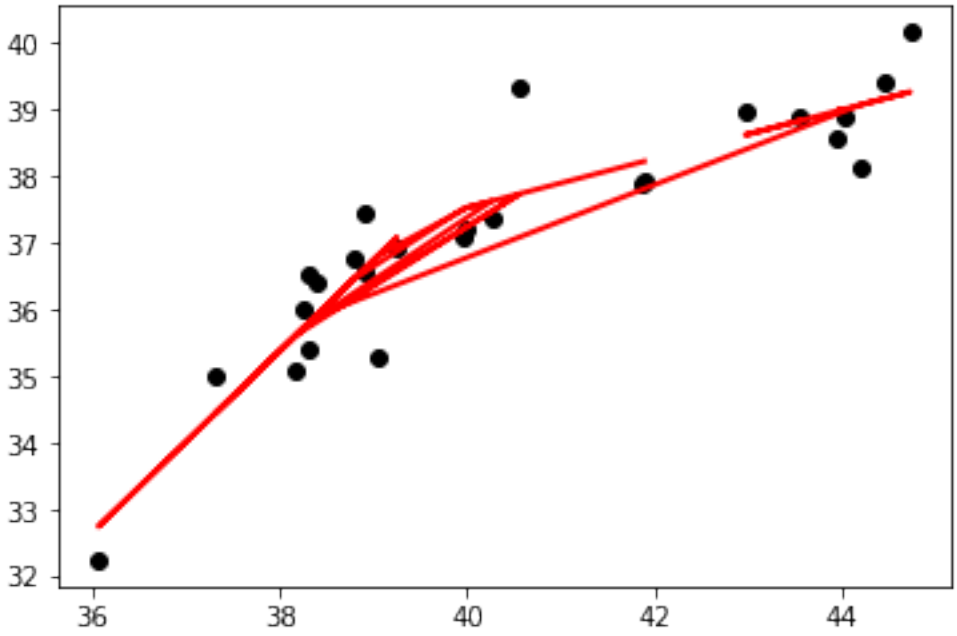

```
7.6 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b              x0             y0
    -------------- -------------- ------------- -------------
    0.555995646883 0.615658712115 26.5071121165 28.5347963429
```



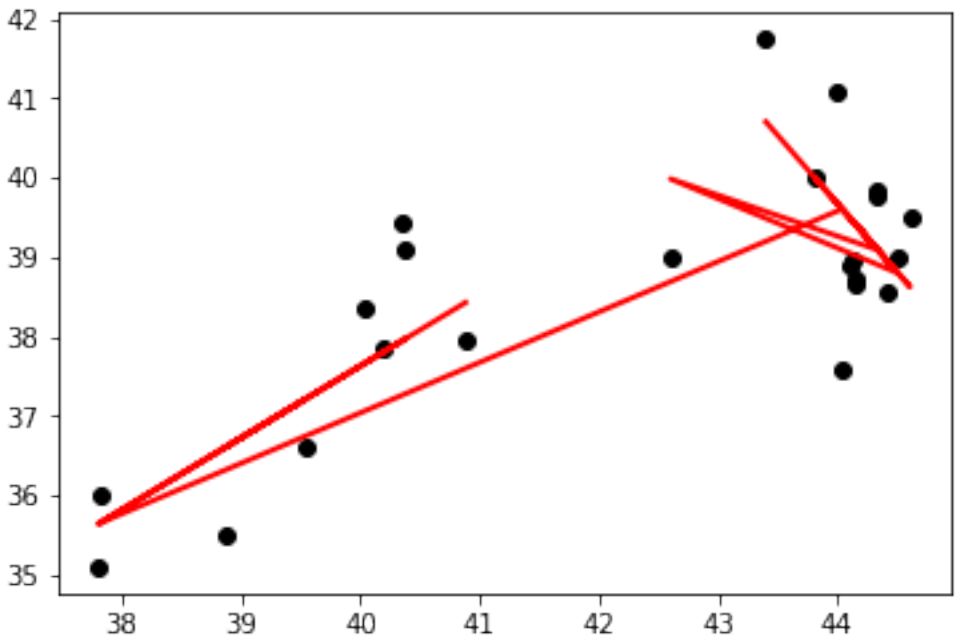

```
7.9 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b              x0             y0
    -------------- -------------- ------------- -------------
    0.650632436122 0.111213694872 43.2001487811 38.8682040495


WARNING: The fit may be unsuccessful; check fit_info['message'] for more informatio
```



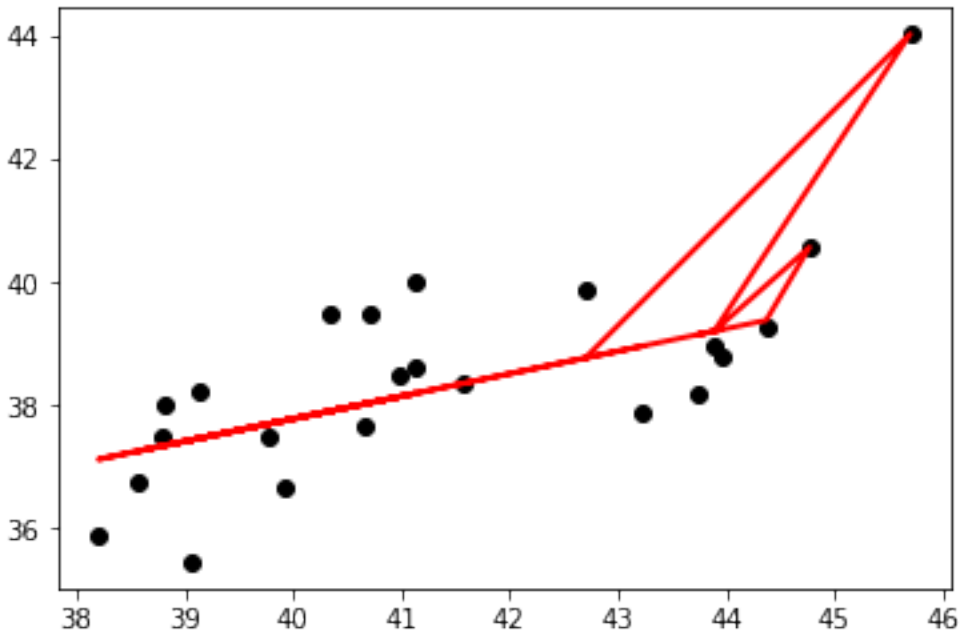

```
8.2 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b              x0           y0
    ------------- -------------- ----------- -------------
    1.35984423211 0.366349736621 39.42449247 37.3275689711
```



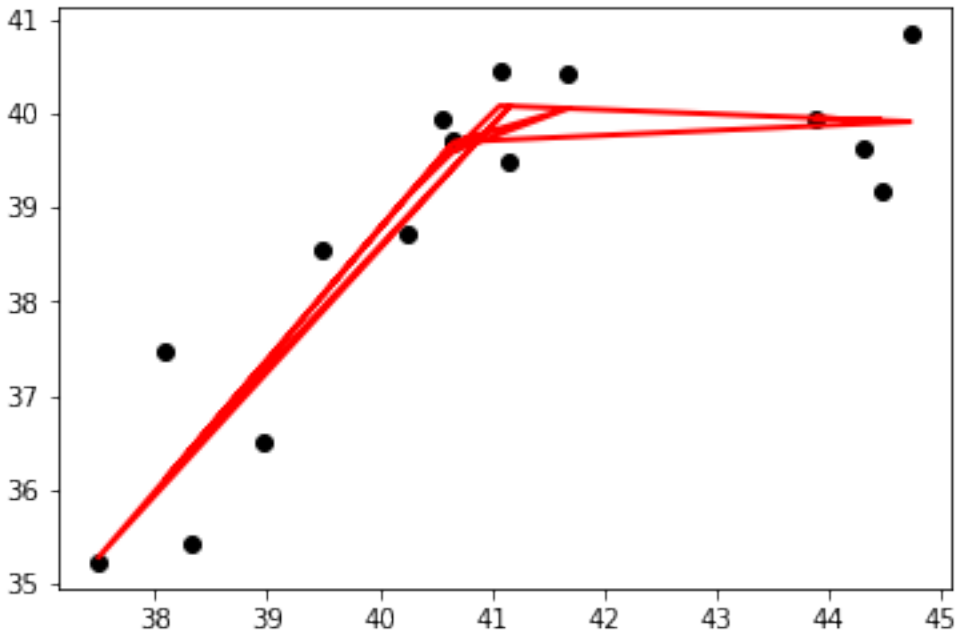

```
8.5 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a              b               x0             y0
    ------------- --------------- ------------- -------------
    0.90393473954 -1.71558543696 43.3984818549 40.7028024652
```




```
8.8 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a               b              x0             y0
    --------------- -------------- -------------- --------------
    0.365613988148 3.72043010753 44.4596891723 39.4155102539
```

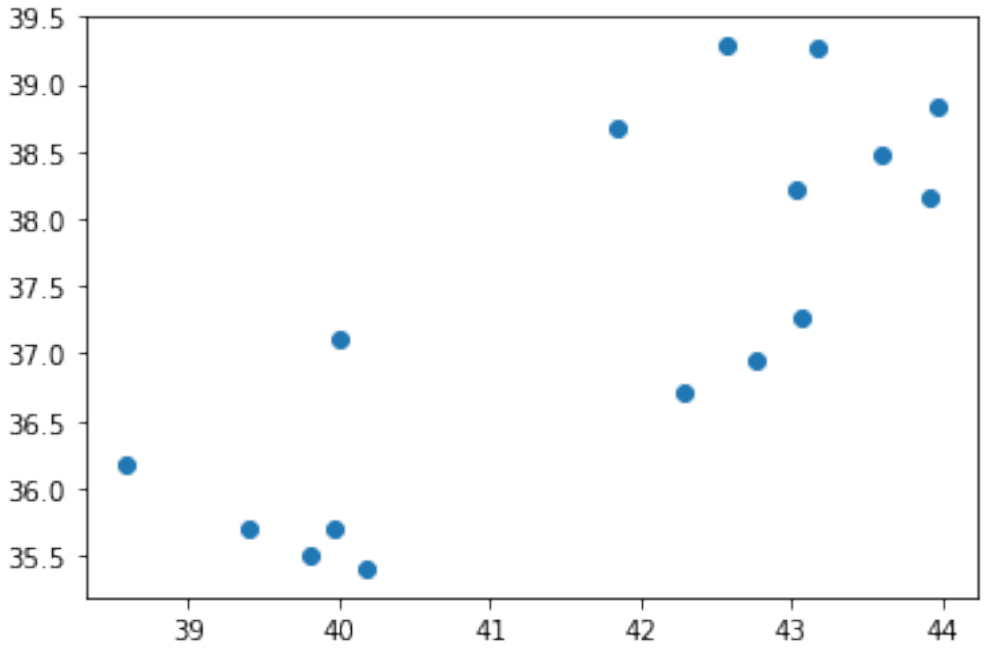



```
9.1 Model: sum_of_linear
Inputs: ('x',)
Outputs: ('x',)
Model set size: 1
Parameters:
          a                b                x0            y0
    ------------- ----------------- ------------- -------------
    1.39672309044 -0.0463823360396 40.9406691043 40.0845147282
```

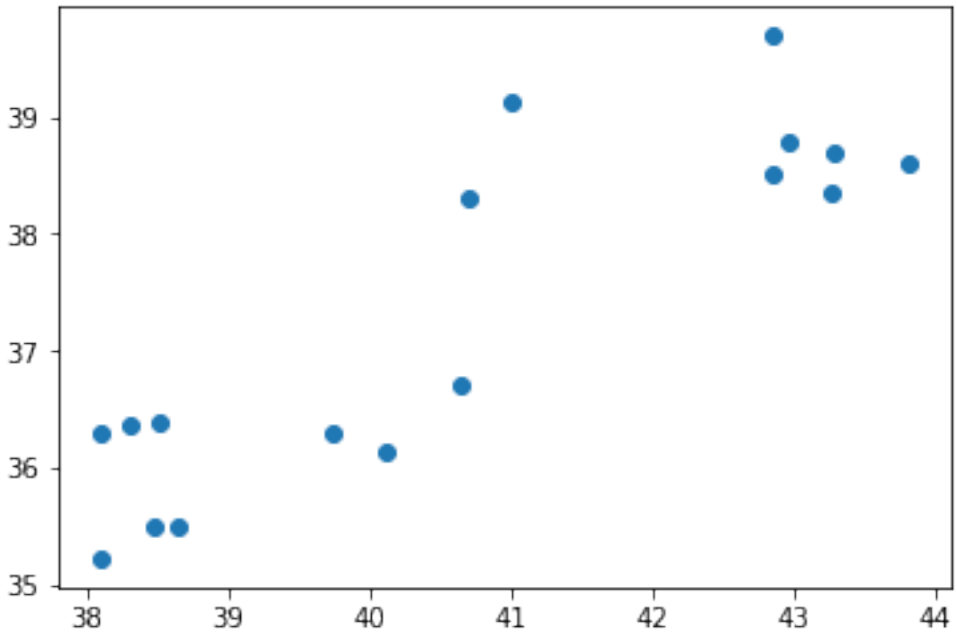



```
In [20]: #fix mass for radio quiet agn
         print('num,mass_range, R_X_coeff,    R2')
         for i in np.arange(7.0,11.0,0.3):
             fixmass(i,rrqa,xrqa,mrqa,0.15)
```

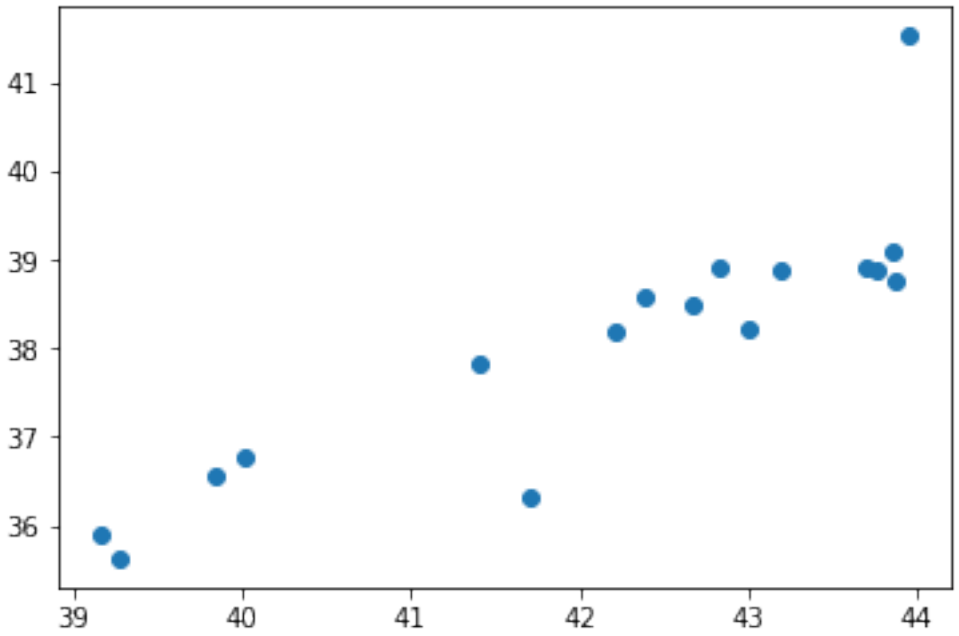
```
num,mass_range, R_X_coeff,    R2
16 6.8 0.608700733132 0.789538347248
```



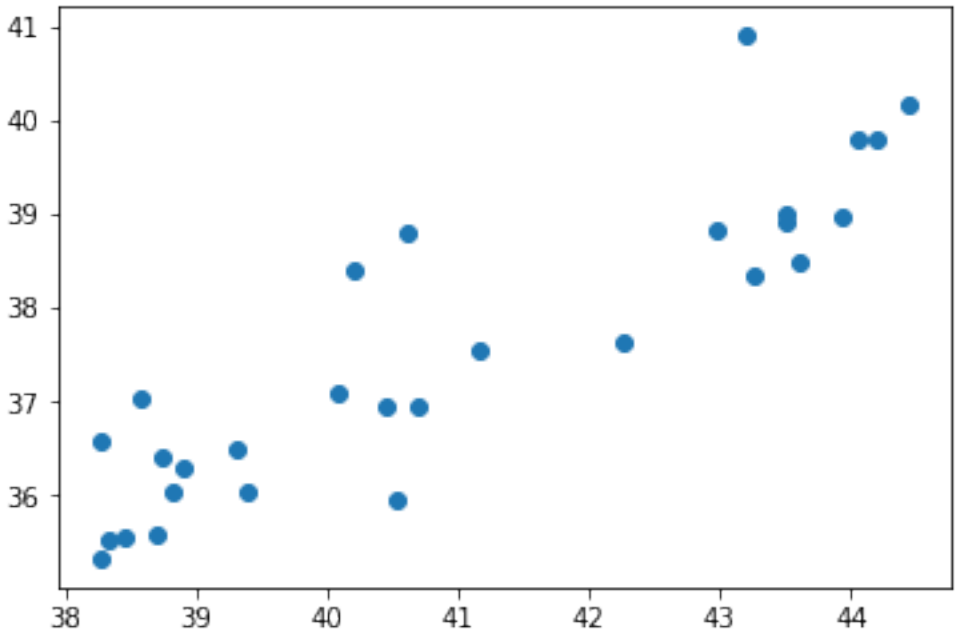

```
17 7.1 0.60590756889 0.874017175148
```



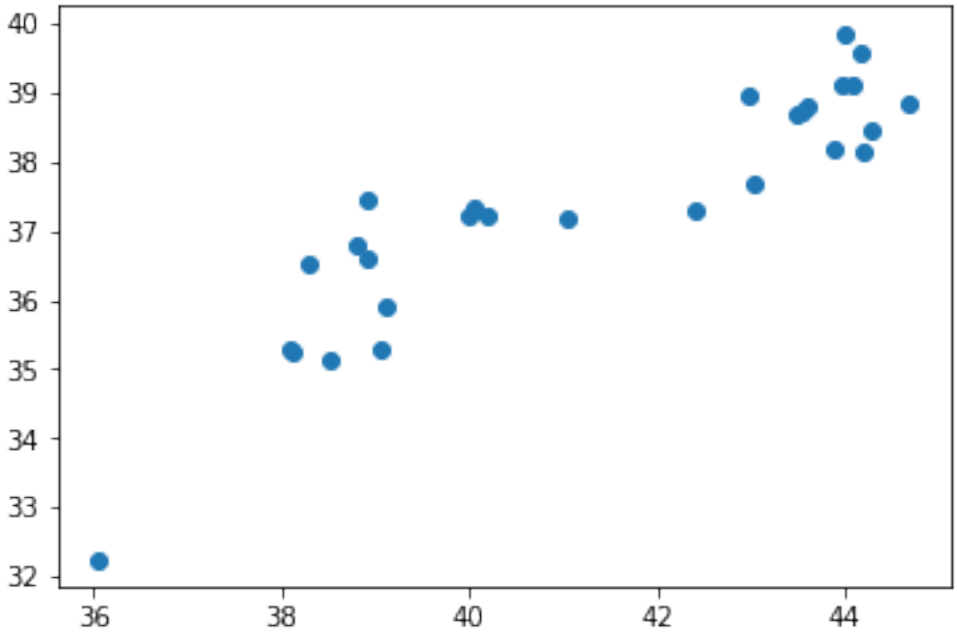
```
17 7.4 0.773487662117 0.876549146283
```



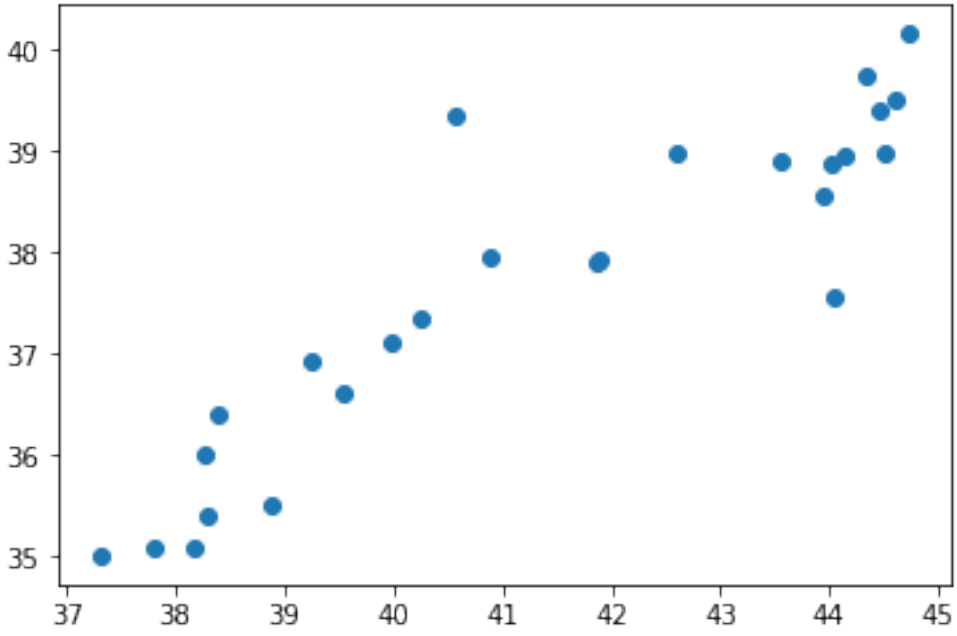

```
29 7.7 0.638366547706 0.889386337457
```



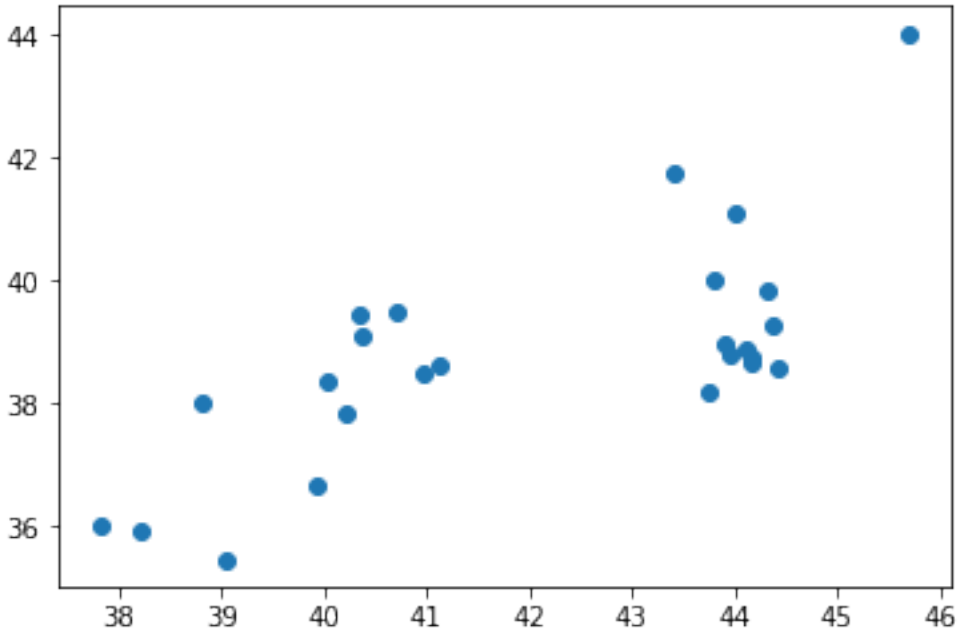
```
28 8.0 0.584498332825 0.8977471865
```



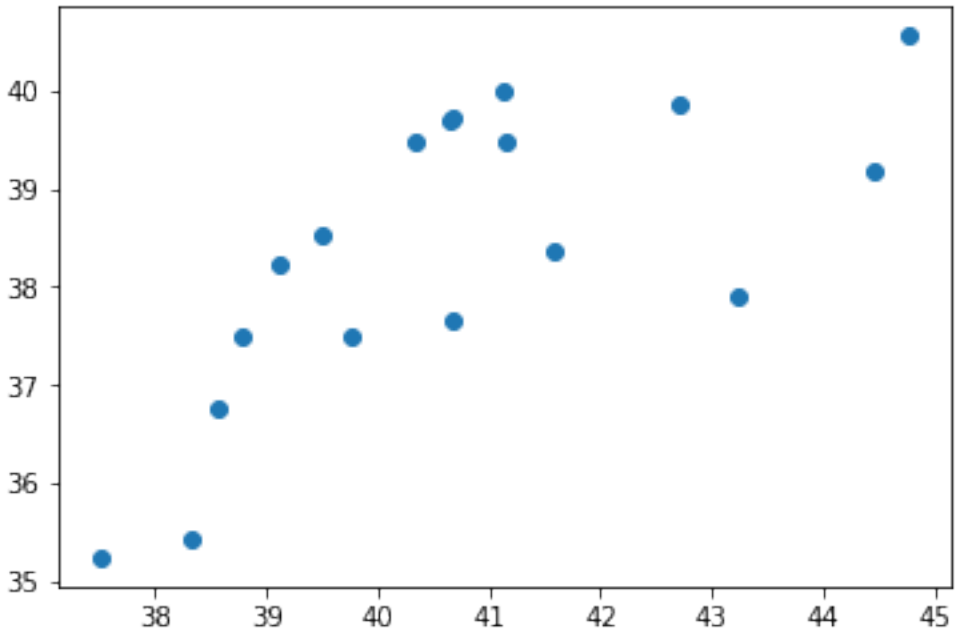

```
26 8.3 0.562220402966 0.907696836209
```



```
25 8.6 0.534599915561 0.69772063644
```




```
18 8.9 0.525465538074 0.702871605401
```



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