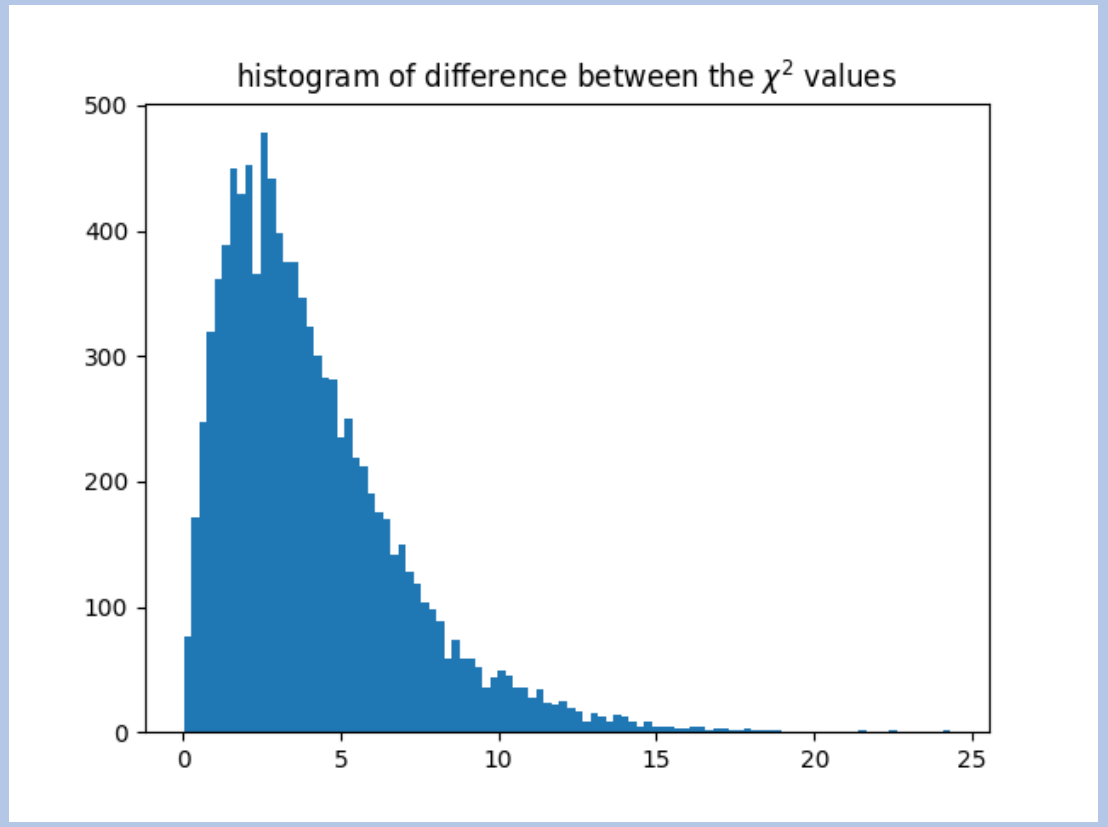
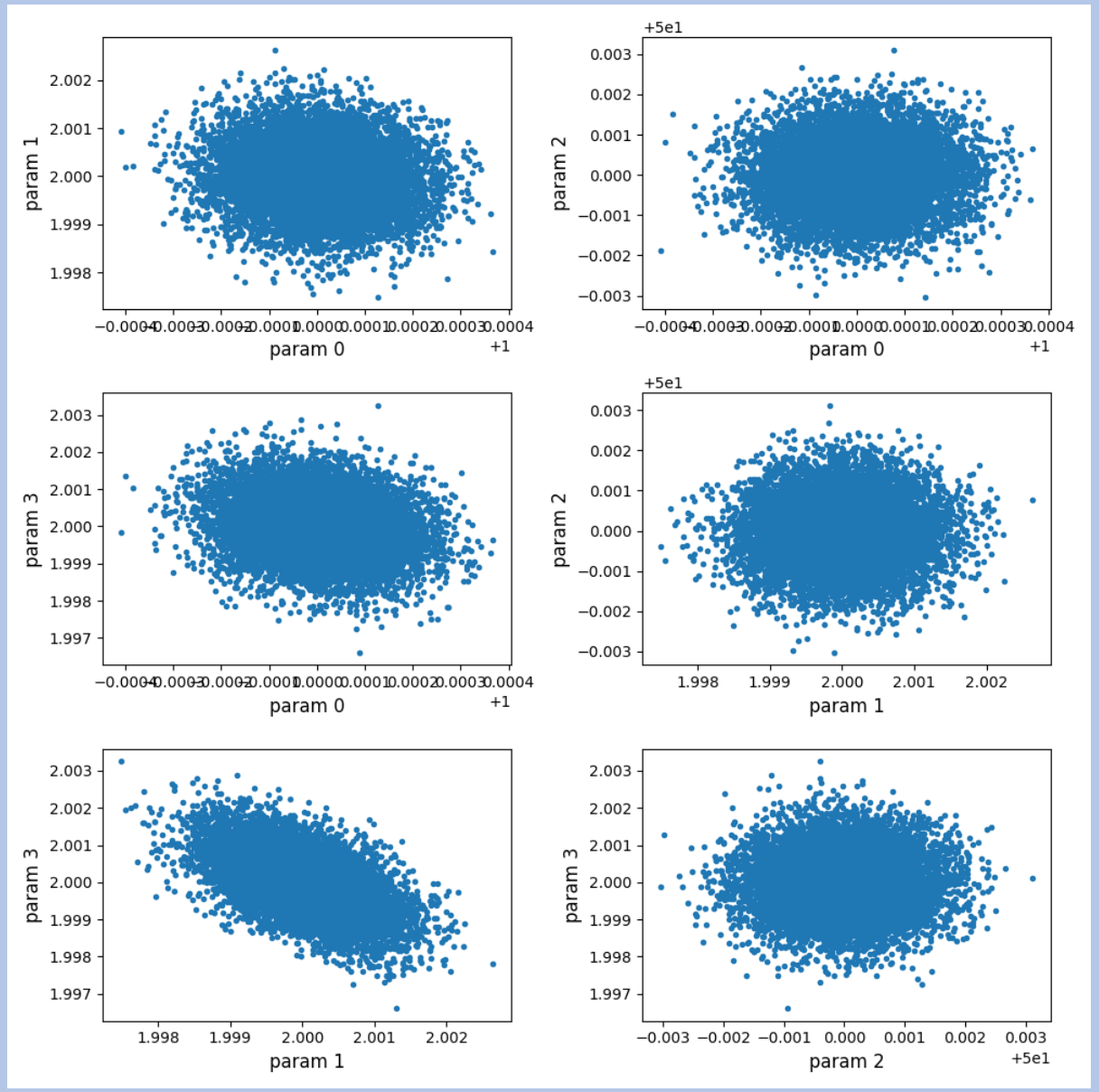
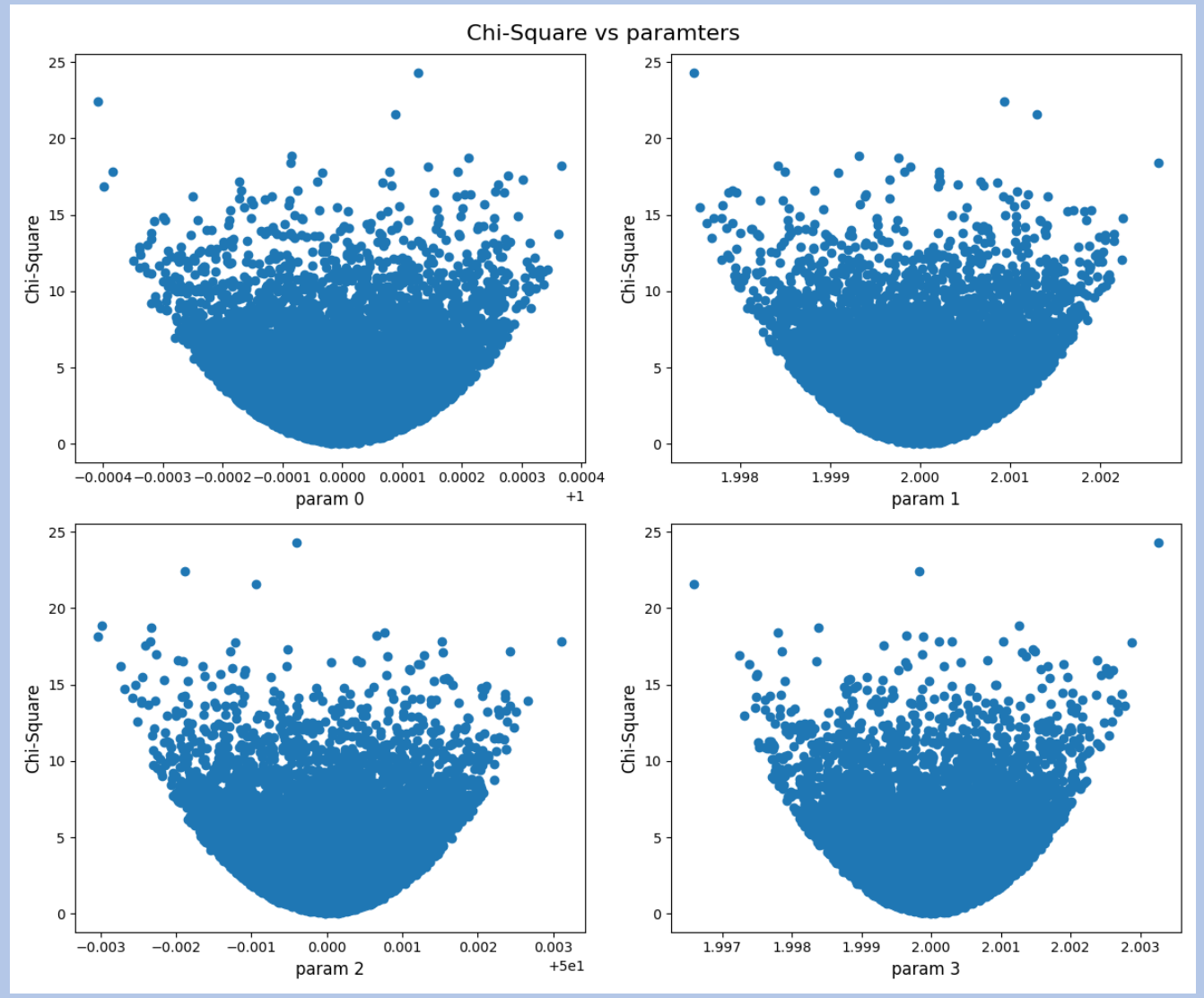
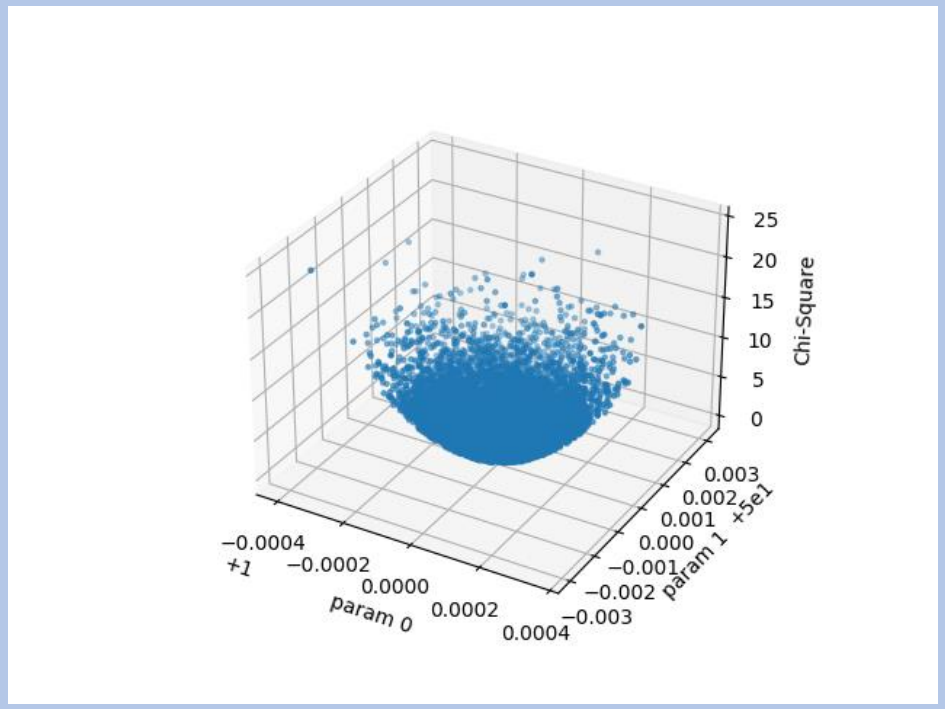
Gaussian Version

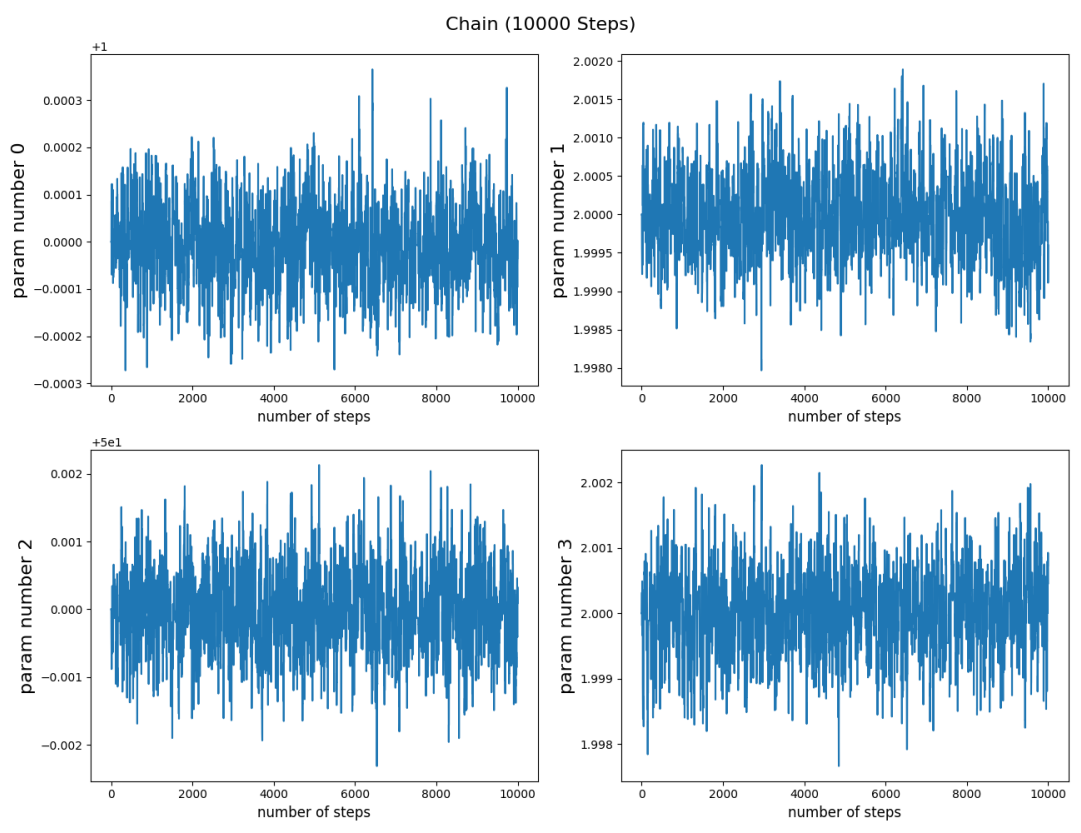
$$y = a + be^{\frac{(x-x_0)^2}{2\sigma^2}}$$

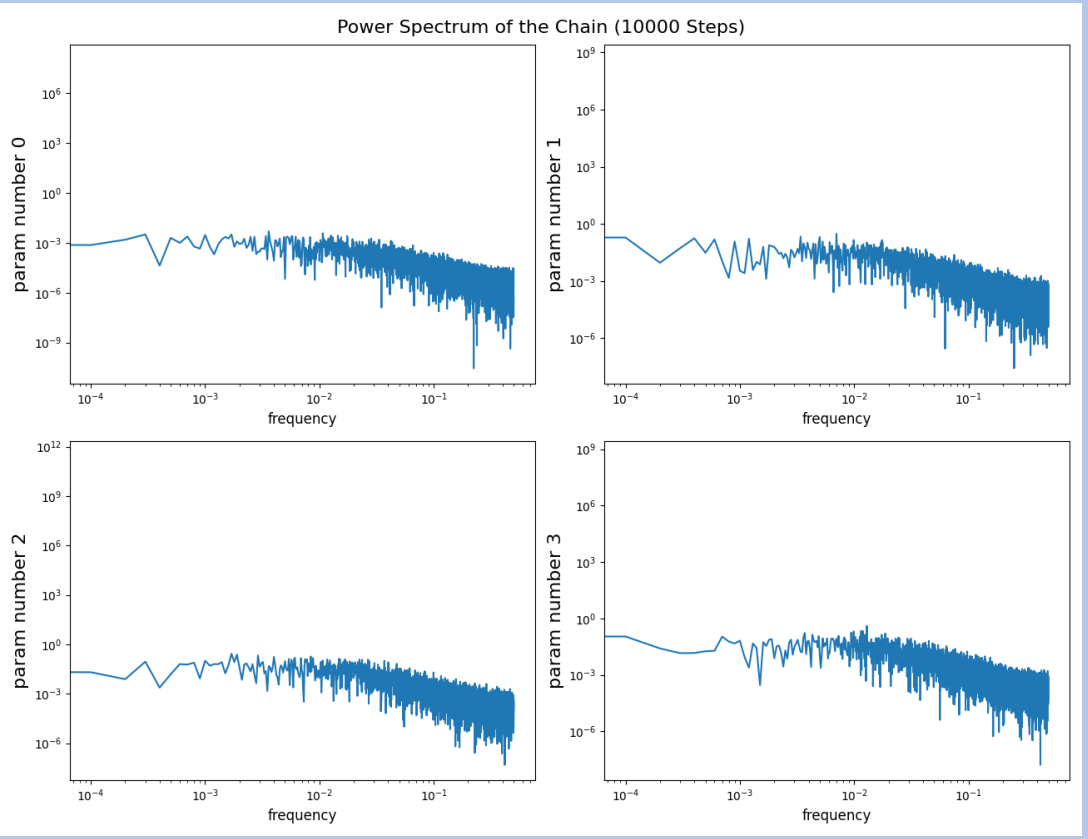





Chi-Square vs paramters
Chi-Square
param 0
+1
param 1
param 2
+5e1
param 3


Chi-Square
param 0
+1
param 1
+5e1

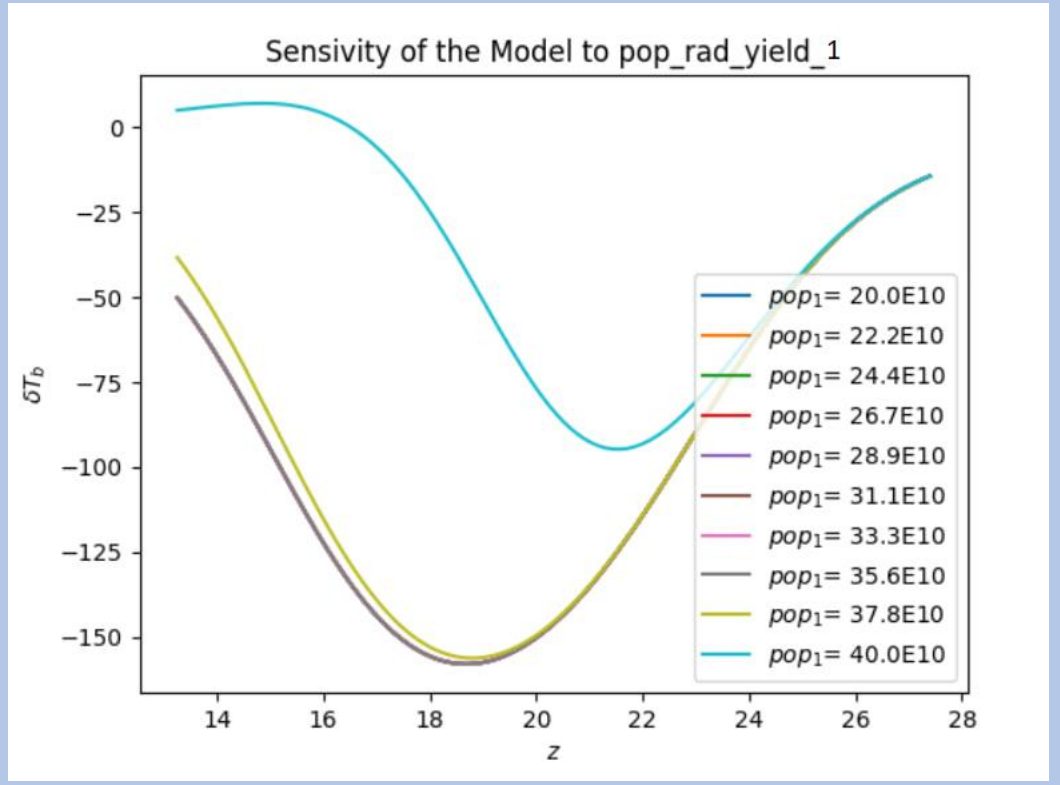




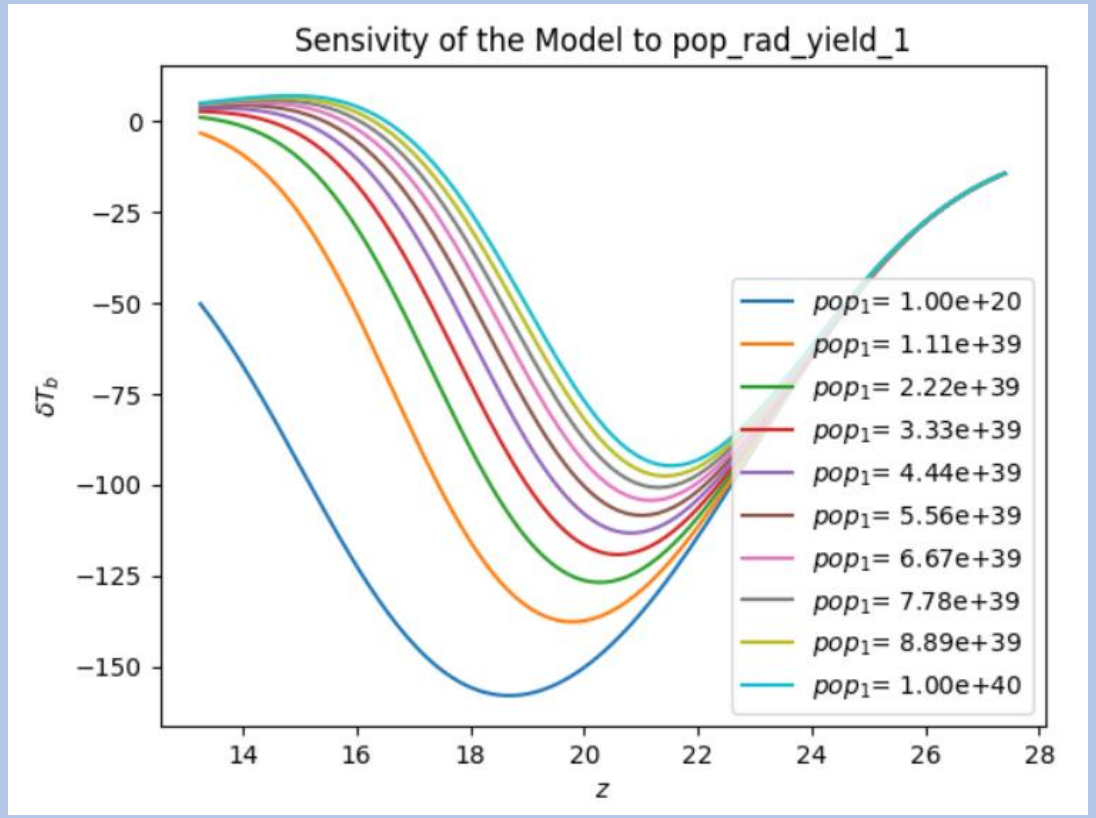

```
Chi-Square of original guess:  25181787.125625763
Chi-Square of LM: 2.1650561868926 36e-07
Chi-Square of MCMC:  0.00368893530690 7828
Acceptance Ratio:  24.73 %
```

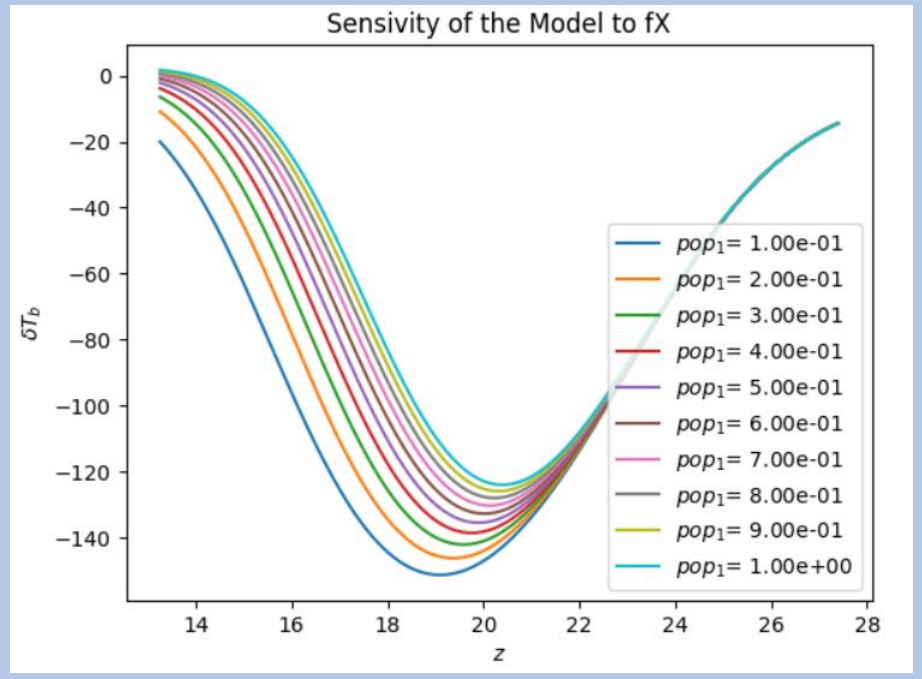
LM + MCMC on a known ARES curve

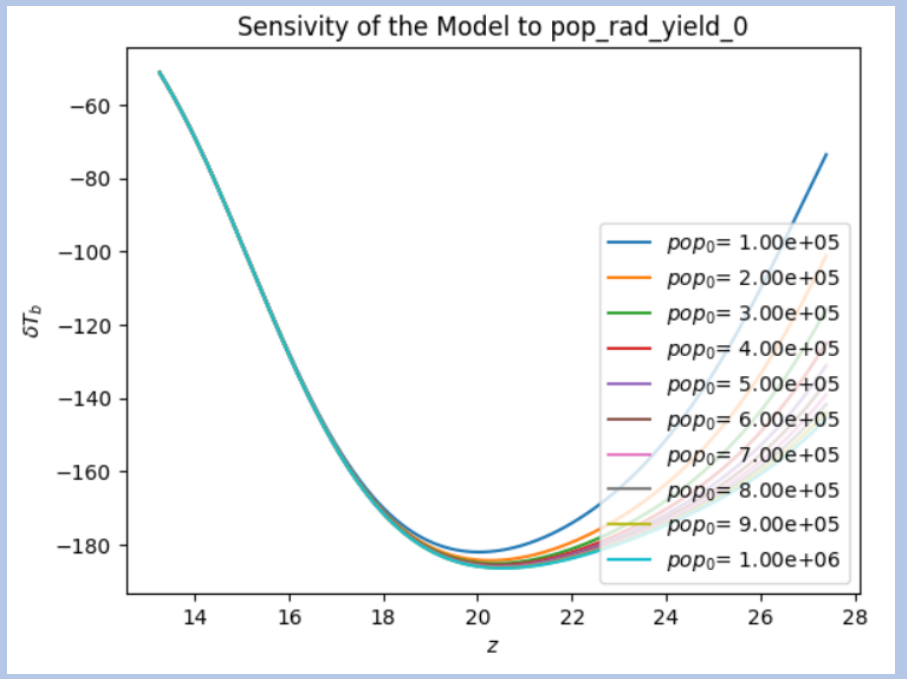
- A very strange covariance matrix: one of the diagonal elements was ~ 1E60, but others were between 1E-5 to 1E-3
- Messing the drawn samples
- Went back to check the sensitivity of the model to this parameter
- The model was not showing enough change with the change of parameter

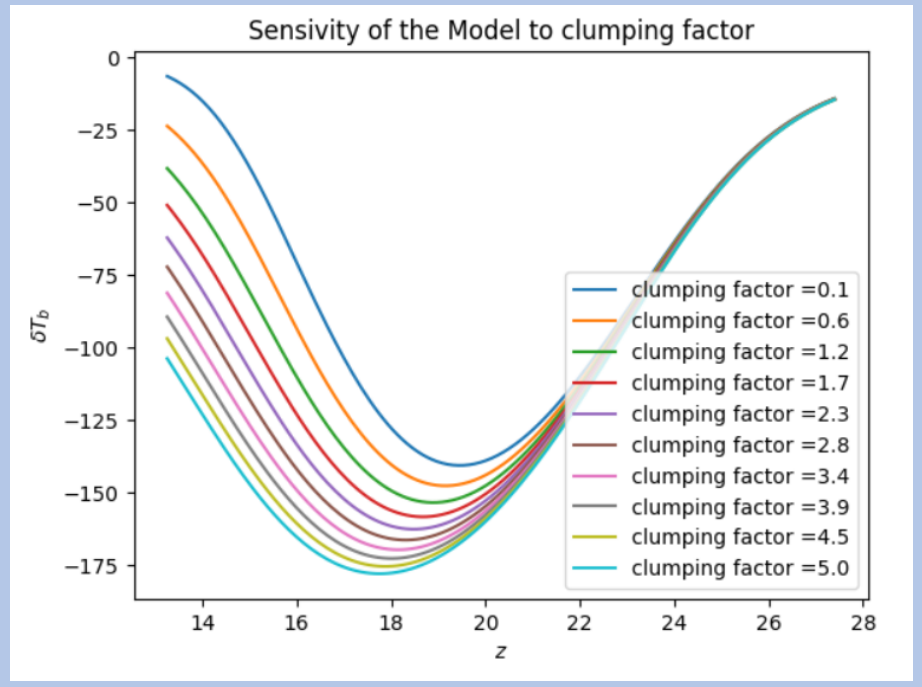


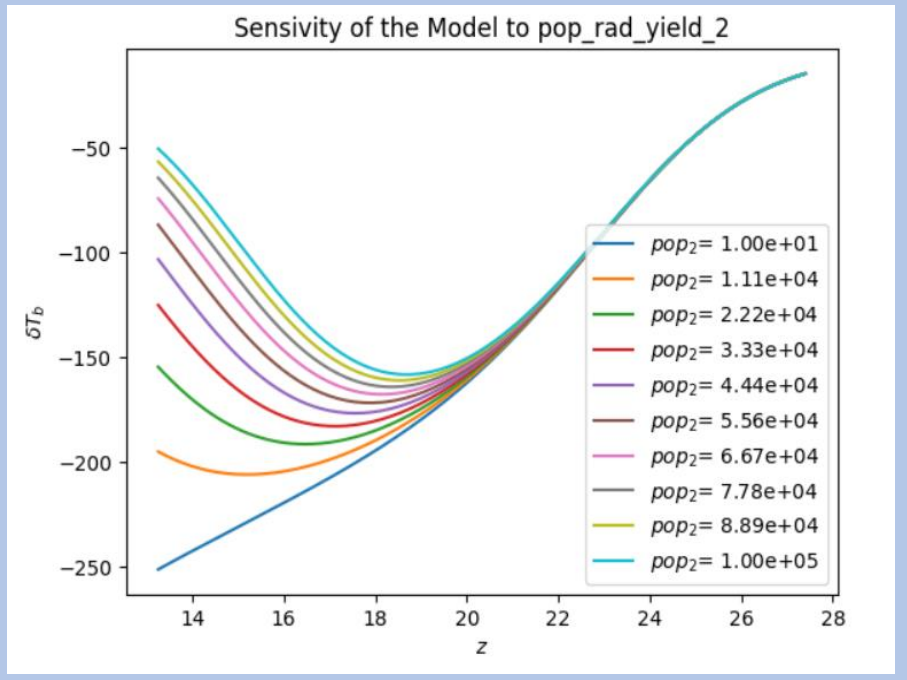
- Changed the search method in phase space for log to normal
- The sensitivity problem seemed to be solved, but the covariance matrix was still messed up
- Eventually, I decided to change the parameter to it's alternative: The issue was solved



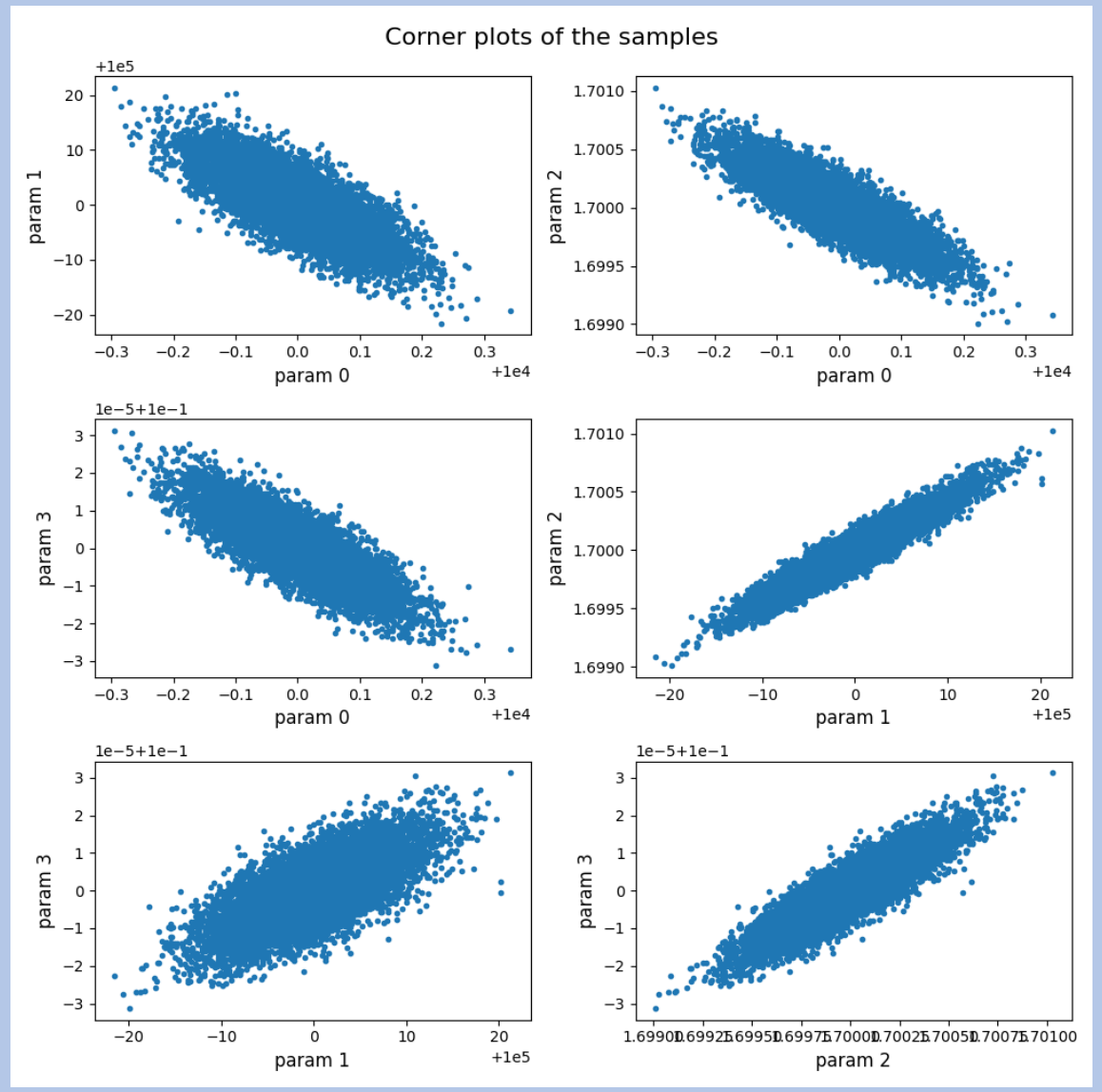

Sensivity of the Model to fX
δT_b
z
pop_1= 1.00e-01
pop_1= 2.00e-01
pop_1= 3.00e-01
pop_1= 4.00e-01
pop_1= 5.00e-01
pop_1= 6.00e-01
pop_1= 7.00e-01
pop_1= 8.00e-01
pop_1= 9.00e-01
pop_1= 1.00e+00

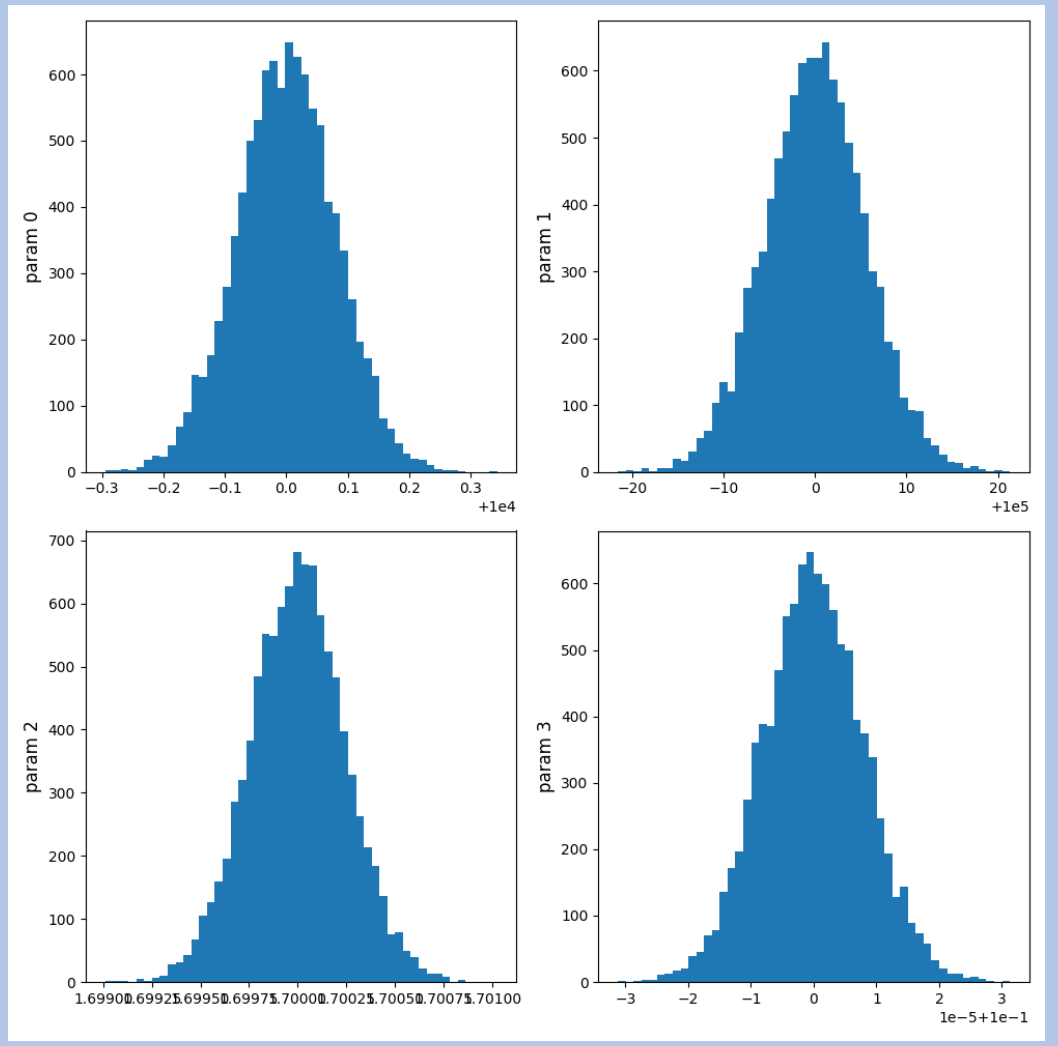

Sensivity of the Model to pop_rad_yield_0
δT_b
z
pop_0= 1.00e+05
pop_0= 2.00e+05
pop_0= 3.00e+05
pop_0= 4.00e+05
pop_0= 5.00e+05
pop_0= 6.00e+05
pop_0= 7.00e+05
pop_0= 8.00e+05
pop_0= 9.00e+05
pop_0= 1.00e+06

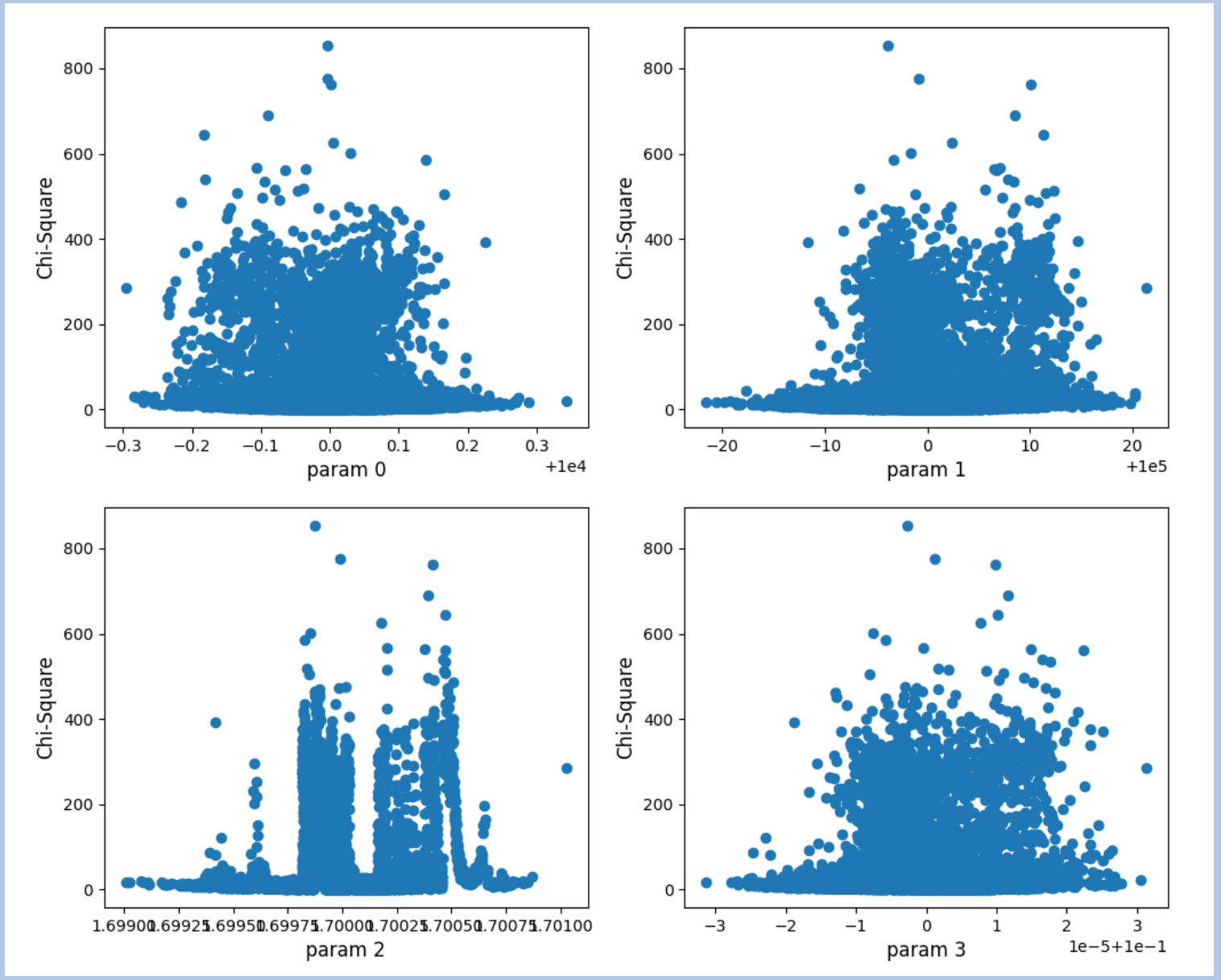

Sensivity of the Model to clumping factor
δT_b
z
clumping factor =0.1
clumping factor =0.6
clumping factor =1.2
clumping factor =1.7
clumping factor =2.3
clumping factor =2.8
clumping factor =3.4
clumping factor =3.9
clumping factor =4.5
clumping factor =5.0


Sensivity of the Model to pop_rad_yield_2
δT_b
z
pop_2= 1.00e+01
pop_2= 1.11e+04
pop_2= 2.22e+04
pop_2= 3.33e+04
pop_2= 4.44e+04
pop_2= 5.56e+04
pop_2= 6.67e+04
pop_2= 7.78e+04
pop_2= 8.89e+04
pop_2= 1.00e+05

Drawing samples from the covariance matrix







- Does not look like a parabola
- Mean of difference between the chi-squares: ~45 which should be ~4

MCMC with these parameters:

- Not yet converged after 10000 steps
- The acceptance ratio was fixed at 99.99 percent (does not respond to the change of error bars values)