

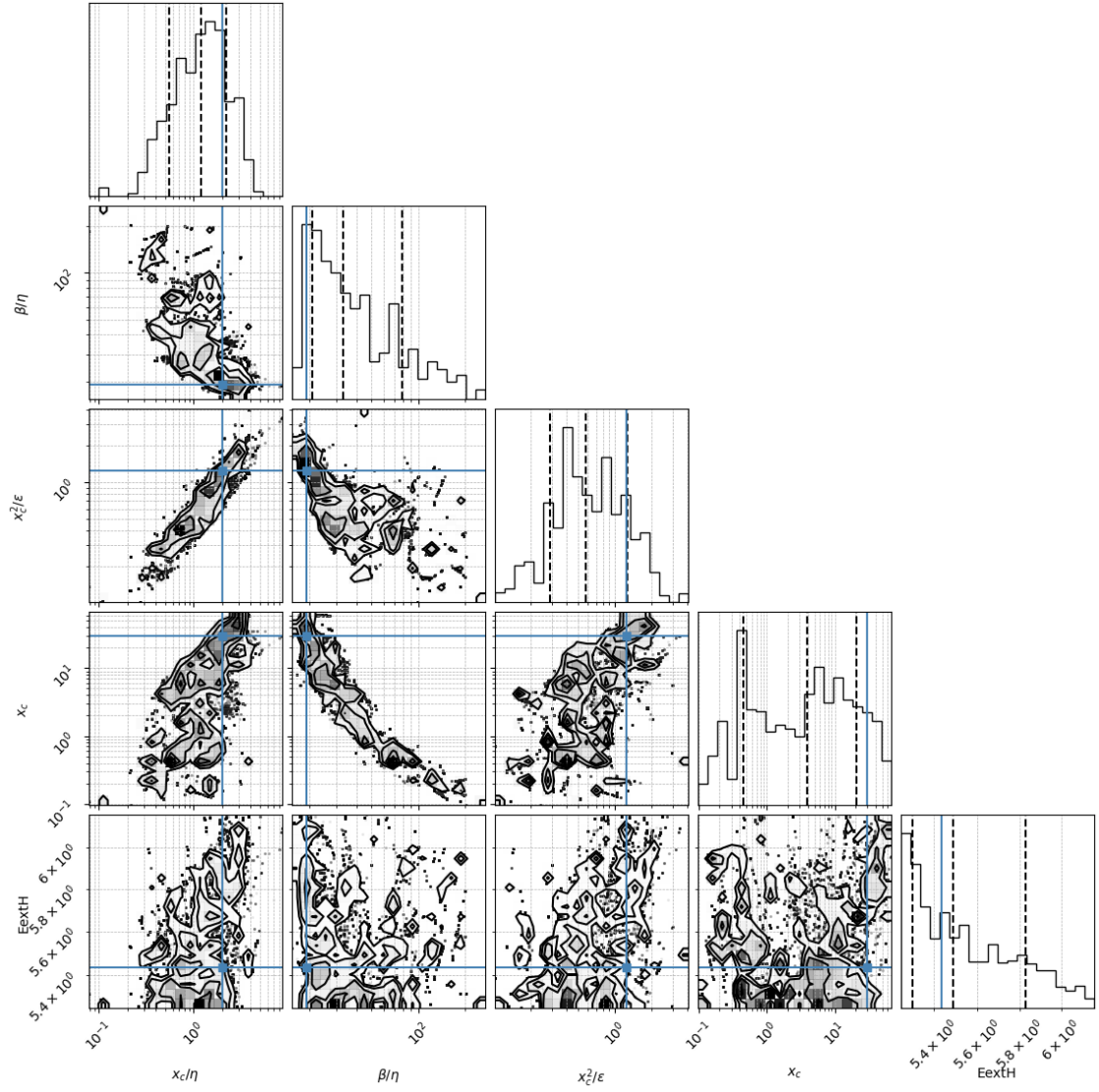
mcmc_analysis_Staffy_vetCompass_baysian

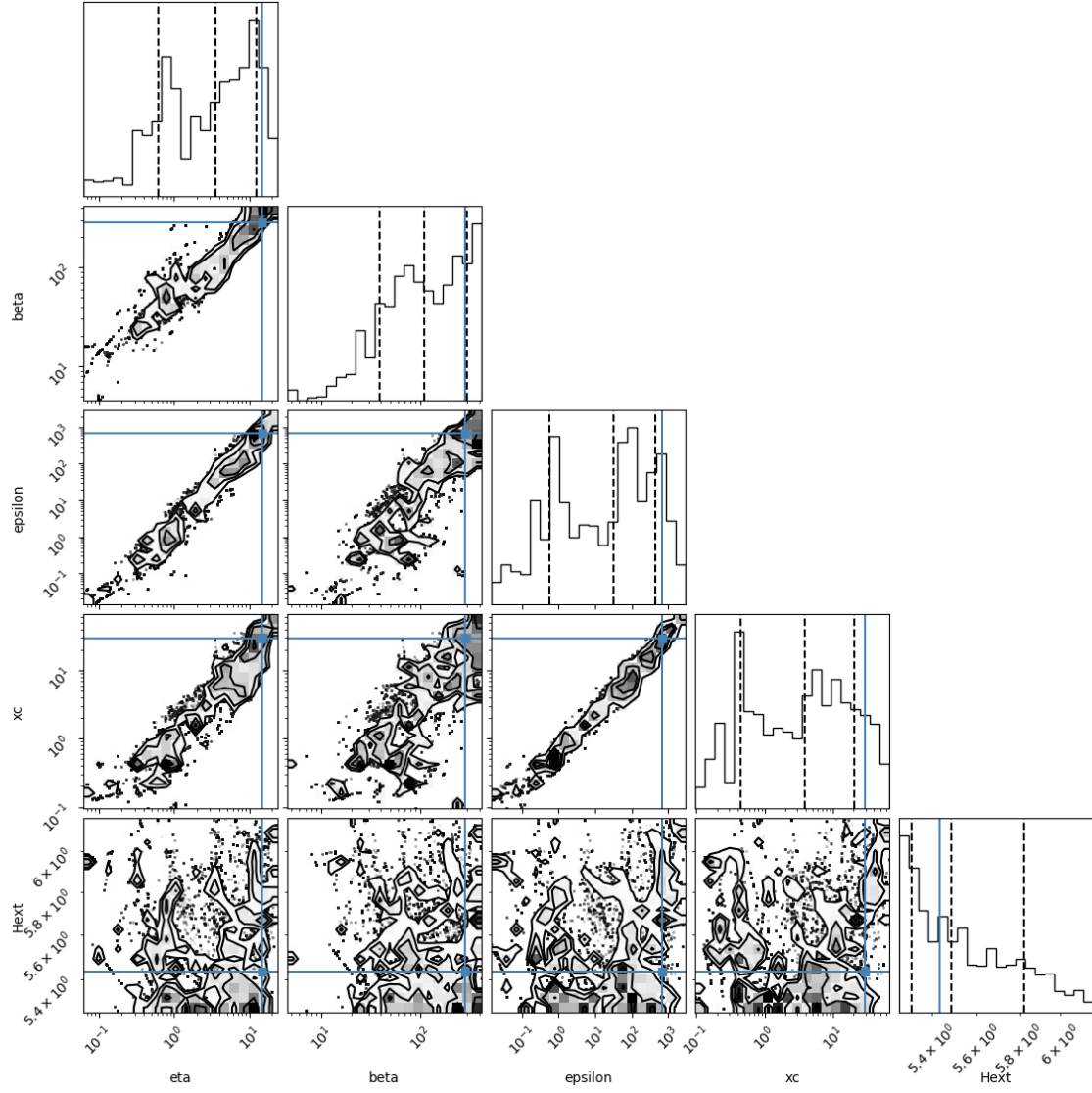
November 24, 2025

1 # 1. Density coner plot

A sample is 1 parameter set scanned. For the corner plot below, the quantiles (represented by the solid lines) are 0.16,0.5,0.84 of the samples. Dots represent individual samples (outside the line surrounding 0.84 of the samples) The parameter search is performed in the transformed space of x_c/η , β/η , x_c^2/ϵ , x_c but we also show the regular parameters

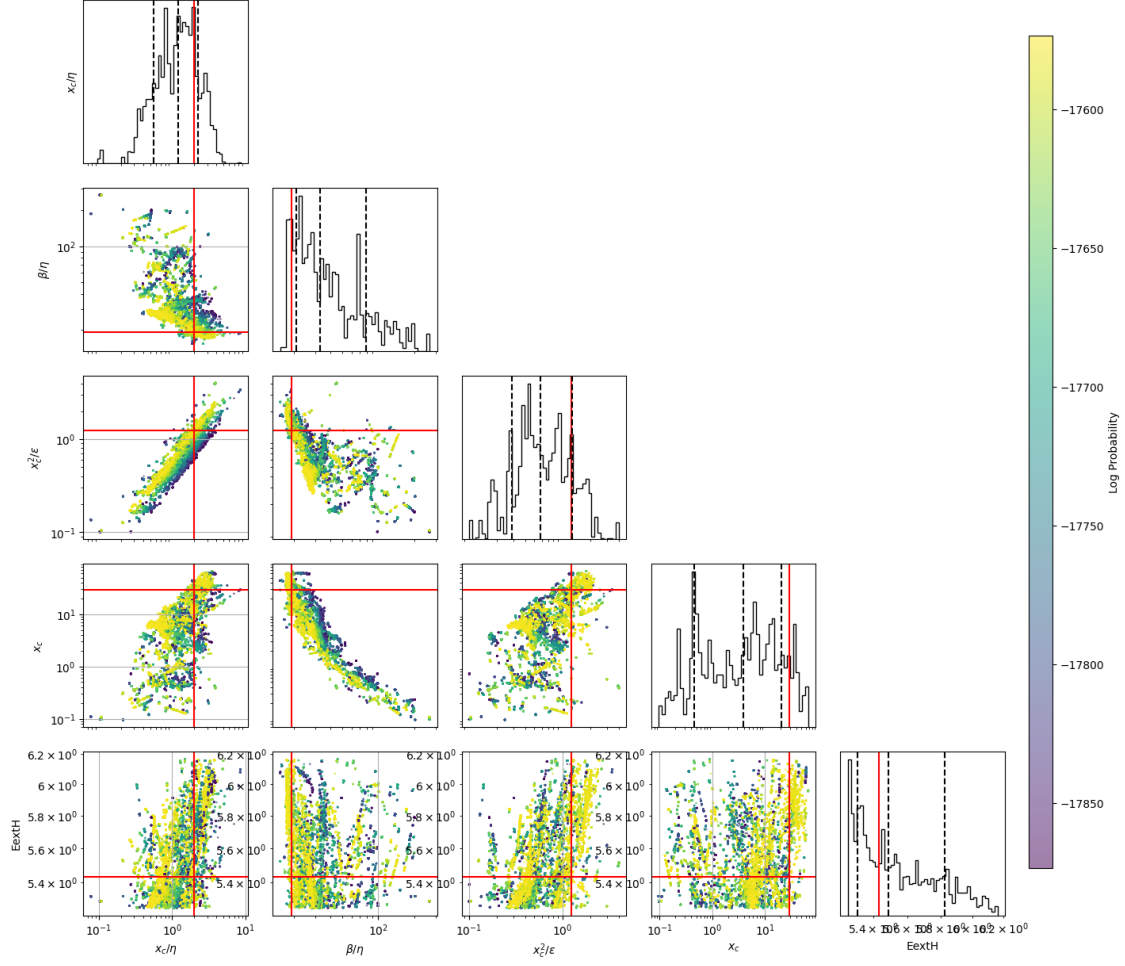
(25,)





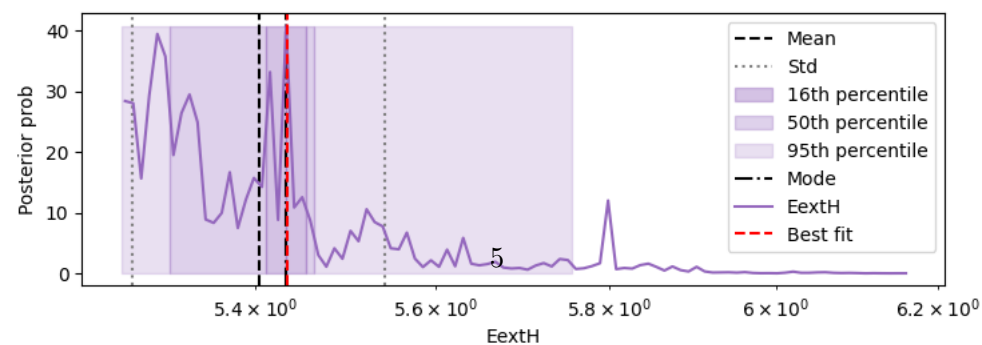
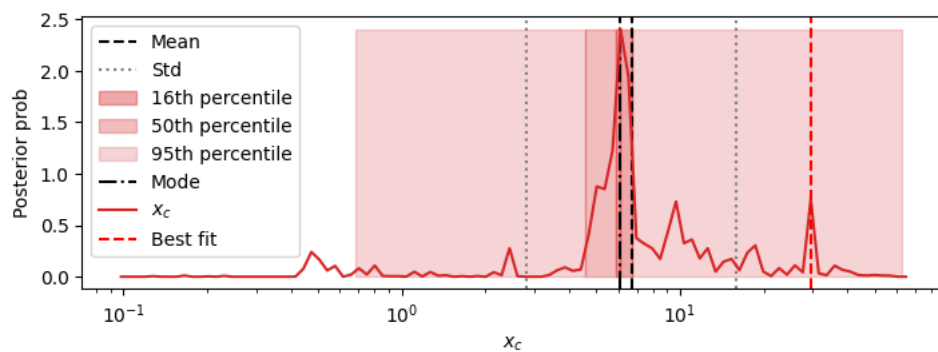
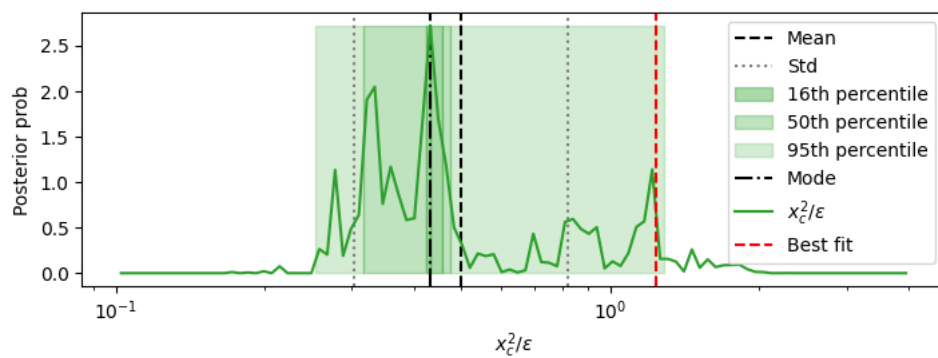
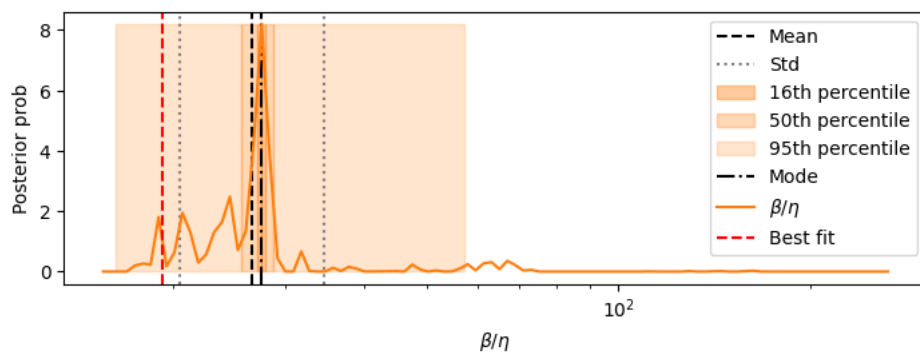
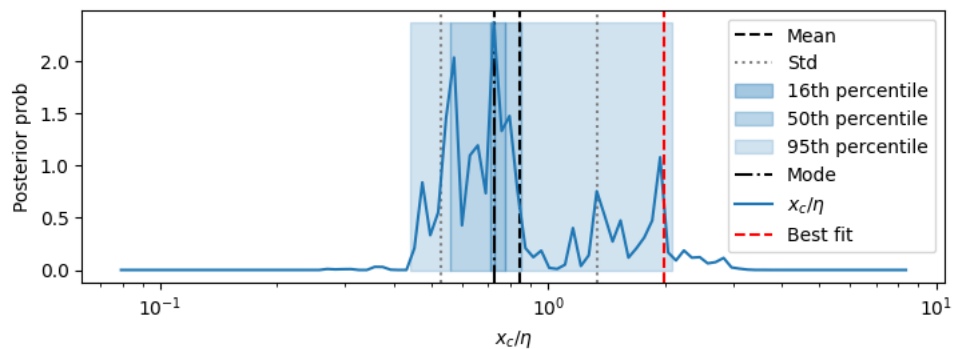
2. Heat map corner plot of raw samples

This plot shows all the raw sample points and their lnprobability



3. Posterior distributions of parameters

1d marginalizations of posterior distributions. we use a grid of size nbins=100-150

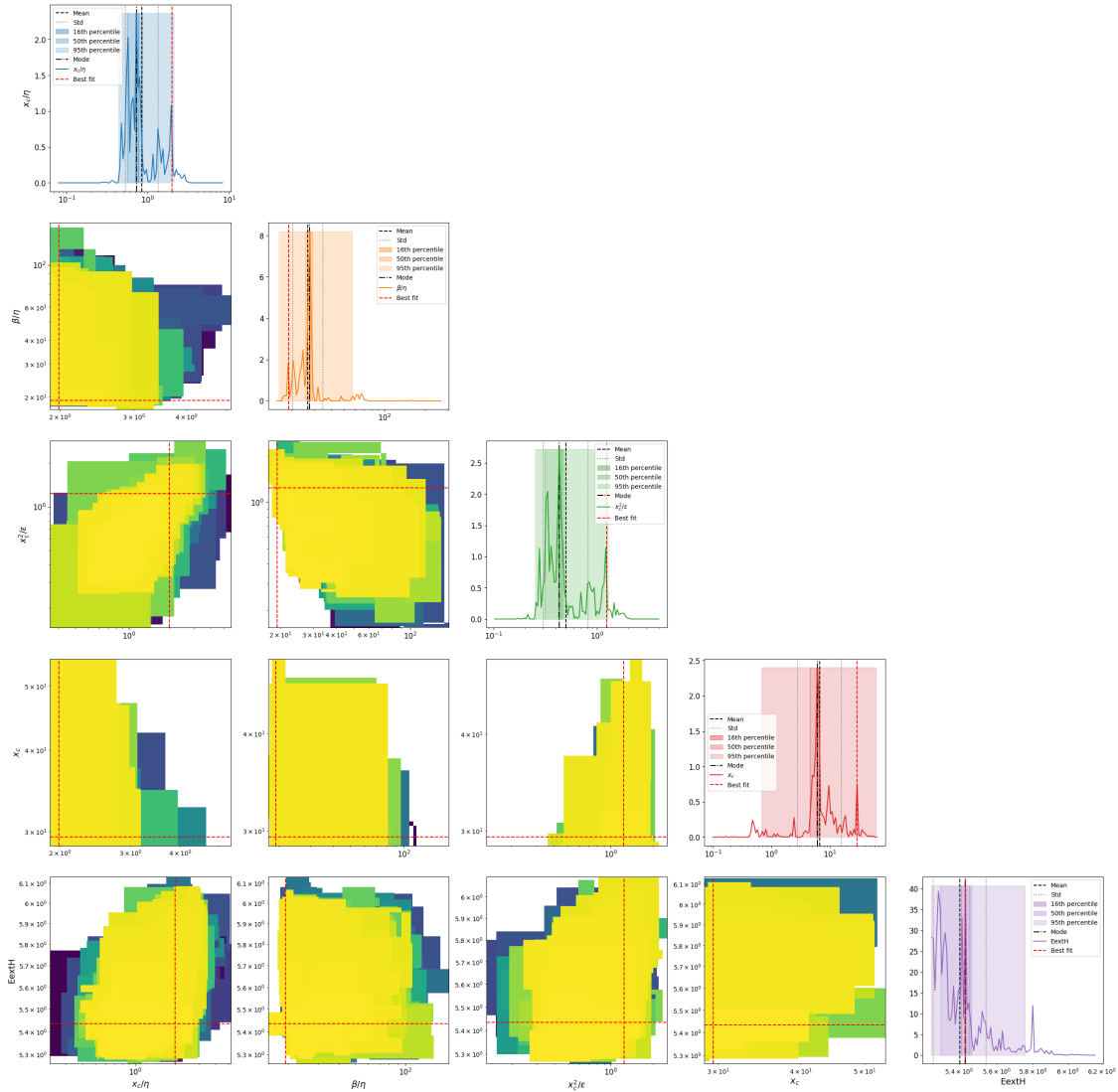


2D marginalizations of posterior distributions

/Volumes/alon/navehr/SRtools/SRtools/samples_utils.py:474: UserWarning: The input coordinates to pcolormesh are interpreted as cell centers, but are not monotonically increasing or decreasing. This may lead to incorrectly calculated cell edges, in which case, please supply explicit cell edges to pcolormesh.

```
ax.pcolormesh(X, Y, Z, **kwargs)
```

2D Marginalized Posterior



Rescaling the samples TIME by 365

4 4. Table of results

mode is the marginalized mode, max_likwlihood is the sample with highest likelihood mode_overall is the 4D posterior mode

	mean \	
xc/eta	0.843	
beta/eta	26.63	
xc^2/epsilon	0.499	
xc	6.695	
ExtH	5.403	
eta	8.051	
beta	211.956	
epsilon	94.426	
sqrt(xc/eta)	0.921	
s= eta^0.5*xc^1.5/epsilon	0.546	
beta*xc/epsilon	15.751	
eta*xc/epsilon	0.593	
Fx=beta^2/eta*xc	827.417	
Dx =beta*epsilon/eta*xc^2	52.684	
Pk=beta*k/epsilon	1.12	
Fk=beta^2/eta*k	11154.037	
Dk =beta*epsilon/eta*k^2	9597.415	
Fk^2/Dk=beta^3/eta*epsilon	12946.632	
epsilon/beta^2	0.00212	
k/beta	0.00237	
k^2/epsilon	0.00264	
eta/xc	1.186	
beta/xc	31.404	
epsilon/xc^2	2.003	
k/xc	0.0737	
best fit no ext hazard_MedianLifetime	12.3	
best fit no ext hazard_MaxLifetime	20.07	
best fit_MedianLifetime	12.1	
best fit_MaxLifetime	19.99	
data_MedianLifetime	12.06	
data_MaxLifetime	19.87	
ML_lnprob	-17573.376625	
std \		
xc/eta		[0.314,
0.501]		
beta/eta		[6.12,
7.947]		
xc^2/epsilon		[0.195,
0.321]		
xc		[3.89,

9.287]	
ExtH	[0.136,
0.14]	
eta	[4.174,
8.668]	
beta	[91.726,
161.707]	
epsilon	[74.244,
347.375]	
$\sqrt{xc/eta}$	[0.193,
0.245]	
$s= eta^{0.5}*xc^{1.5}/epsilon$	[0.128,
0.168]	
$beta*xc/epsilon$	[3.627,
4.712]	
$eta*xc/epsilon$	[0.0264,
0.0276]	
$Fx=beta^2/eta*xc$	[483.617,
1163.914]	
$Dx =beta*epsilon/eta*xc^2$	[25.897,
50.933]	
$Pk=beta*k/epsilon$	[0.758,
2.344]	
$Fk=beta^2/eta*k$	[4321.733,
7055.418]	
$Dk =beta*epsilon/eta*k^2$	[7204.147,
28889.875]	
$Fk^2/Dk=beta^3/eta*epsilon$	[8845.039,
27919.262]	
$epsilon/beta^2$	[0.00124,
0.00295]	
$k/beta$	[0.00103,
0.00183]	
$k^2/epsilon$	[0.00209,
0.0101]	
eta/xc	[0.442,
0.705]	
$beta/xc$	[15.009,
28.751]	
$epsilon/xc^2$	[0.784,
1.288]	
k/xc	[0.0423,
0.099]	
best fit no ext hazard_MedianLifetime	
0.51	
best fit no ext hazard_MaxLifetime	
0	


```

best_fit_MedianLifetime
0.51
best_fit_MaxLifetime
0
data_MedianLifetime
0.52
data_MaxLifetime
0
ML_lnprob [-17573.376625049652,
-17573.376625049652]

```

```

mode \
xc/eta 0.724
beta/eta 27.563
xc^2/epsilon 0.432
xc 6.112
ExtH 5.433
eta 13.51
beta 285.312
epsilon 116.609
sqrt(xc/eta) 0.851
s= eta^0.5*xc^1.5/epsilon 0.436
beta*xc/epsilon 16.106
eta*xc/epsilon 0.573
Fx=beta^2/eta*xc 1321.287
Dx =beta*epsilon/eta*xc^2 81.37
Pk=beta*k/epsilon 1.304
Fk=beta^2/eta*k 15878.04
Dk =beta*epsilon/eta*k^2 13458.642
Fk^2/Dk=beta^3/eta*epsilon 18112.769
epsilon/beta^2 0.00131
k/beta 0.00175
k^2/epsilon 0.00214
eta/xc 1.381
beta/xc 47.982
epsilon/xc^2 2.313
k/xc 0.0817
best_fit_no_ext_hazard_MedianLifetime 12.3
best_fit_no_ext_hazard_MaxLifetime 20.07
best_fit_MedianLifetime 12.1
best_fit_MaxLifetime 19.99
data_MedianLifetime 12.06
data_MaxLifetime 19.87
ML_lnprob -17573.376625

```

```

percentile_16 \
xc/eta [0.707,

```

0.777]	
beta/eta	[27.171,
27.961]	
xc^2/epsilon	[0.424,
0.457]	
xc	[5.915,
6.744]	
ExtH	[5.411,
5.455]	
eta	[13.114,
15.671]	
beta	[278.929,
305.35]	
epsilon	[109.668,
140.177]	
sqrt(xc/eta)	[0.841,
0.881]	
s= eta^0.5*xc^1.5/epsilon	[0.43,
0.451]	
beta*xc/epsilon	[15.804,
16.414]	
eta*xc/epsilon	[0.568,
0.579]	
Fx=beta^2/eta*xc	[1258.589,
1387.109]	
Dx =beta*epsilon/eta*xc^2	[78.895,
89.269]	
Pk=beta*k/epsilon	[1.241,
1.371]	
Fk=beta^2/eta*k	[15420.16,
17334.883]	
Dk =beta*epsilon/eta*k^2	[11451.889,
14202.865]	
Fk^2/Dk=beta^3/eta*epsilon	[16950.03,
22101.815]	
epsilon/beta^2	[0.00124,
0.00154]	
k/beta	[0.00164,
0.00179]	
k^2/epsilon	[0.00178,
0.00228]	
eta/xc	[1.287,
1.414]	
beta/xc	[43.155,
49.709]	
epsilon/xc^2	[2.189,
2.445]	

k/xc	[0.0741,
0.0845]	
best fit no ext hazard_MedianLifetime	[11.81,
12.81]	
best fit no ext hazard_MaxLifetime	[20.07,
20.07]	
best fit_MedianLifetime	[11.61,
12.61]	
best fit_MaxLifetime	[19.99,
19.99]	
data_MedianLifetime	[11.58,
12.58]	
data_MaxLifetime	[19.87,
19.87]	
ML_lnprob	[-17573.376625049652,
-17573.376625049652]	
percentile_50 \	
xc/eta	[0.559,
0.853]	
beta/eta	[25.659,
28.773]	
xc^2/epsilon	[0.316,
0.474]	
xc	[4.55,
6.744]	
ExtH	[5.306,
5.464]	
eta	[9.746,
15.671]	
beta	[232.748,
365.938]	
epsilon	[52.516,
158.481]	
sqrt(xc/eta)	[0.748,
0.924]	
s= eta^0.5*xc^1.5/epsilon	[0.42,
0.52]	
beta*xc/epsilon	[14.651,
16.414]	
eta*xc/epsilon	[0.558,
0.599]	
Fx=beta^2/eta*xc	[774.018,
1387.109]	
Dx =beta*epsilon/eta*xc^2	[54.463,
89.269]	
Pk=beta*k/epsilon	[1.016,

1.851]	
Fk=beta^2/eta*k	[10854.075,
19487.356]	
Dk =beta*epsilon/eta*k^2	[6685.441,
21846.084]	
Fk^2/Dk=beta^3/eta*epsilon	[11383.722,
28819.431]	
epsilon/beta^2	[0.00124,
0.00236]	
k/beta	[0.00131,
0.00205]	
k^2/epsilon	[0.00158,
0.00475]	
eta/xc	[1.172,
1.79]	
beta/xc	[30.306,
49.709]	
epsilon/xc^2	[2.109,
3.165]	
k/xc	[0.0741,
0.11]	
best fit no ext hazard_MedianLifetime	[11.81,
12.81]	
best fit no ext hazard_MaxLifetime	[20.07,
20.07]	
best fit_MedianLifetime	[11.61,
12.61]	
best fit_MaxLifetime	[19.99,
19.99]	
data_MedianLifetime	[11.58,
12.58]	
data_MaxLifetime	[19.87,
19.87]	
ML_lnprob	[-17573.376625049652,
-17573.376625049652]	
percentile_95 \	
xc/eta	[0.442,
2.087]	
beta/eta	[16.228,
57.204]	
xc^2/epsilon	[0.253,
1.284]	
xc	[0.679,
62.698]	
ExtH	[5.255,
5.757]	

eta	[0.962,
23.745]	
beta	[57.236,
419.144]	
epsilon	[1.17,
2665.866]	
$\sqrt{xc/eta}$	[0.665,
1.445]	
$s= eta^{0.5}*xc^{1.5}/epsilon$	[0.383,
0.938]	
$beta*xc/epsilon$	[10.032,
30.087]	
$eta*xc/epsilon$	[0.548,
0.655]	
$Fx=beta^2/eta*xc$	[75.043,
4042.063]	
$Dx =beta*epsilon/eta*xc^2$	[9.082,
114.287]	
$Pk=beta*k/epsilon$	[0.0835,
20.389]	
$Fk=beta^2/eta*k$	[4013.476,
21907.102]	
$Dk =beta*epsilon/eta*k^2$	[213.378,
168893.317]	
$Fk^2/Dk=beta^3/eta*epsilon$	[914.826,
240849.117]	
$epsilon/beta^2$	[0.000524,
0.0164]	
$k/beta$	[0.00119,
0.00914]	
$k^2/epsilon$	[9.36e-05,
0.213]	
eta/xc	[0.479,
2.264]	
$beta/xc$	[6.399,
70.784]	
$epsilon/xc^2$	[0.779,
3.95]	
k/xc	[0.00797,
0.645]	
best fit no ext hazard_MedianLifetime	[11.81,
12.81]	
best fit no ext hazard_MaxLifetime	[20.07,
20.07]	
best fit_MedianLifetime	[11.61,
12.61]	
best fit_MaxLifetime	[19.99,

```

19.99]
data_MedianLifetime                                [11.58,
12.58]
data_MaxLifetime                                    [19.87,
19.87]
ML_lnprob                                           [-17573.376625049652,
-17573.376625049652]

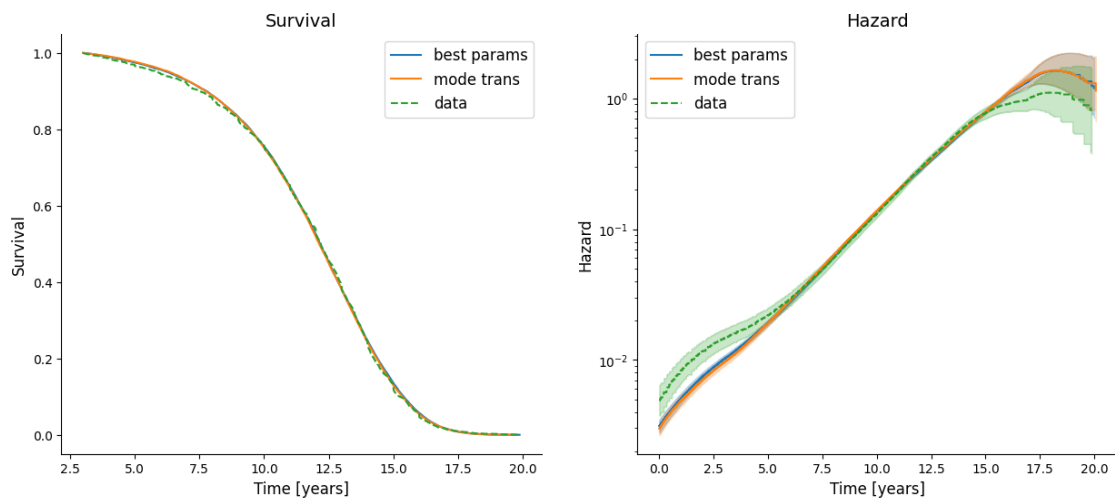
```

	max_likelihood	mode_overall
xc/eta	1.986	1.986
beta/eta	19.215	19.215
xc^2/epsilon	1.237	1.237
xc	29.48	29.48
ExtH	5.434	5.434
eta	14.845	14.845
beta	285.241	285.241
epsilon	702.564	702.564
sqrt(xc/eta)	1.409	1.409
s= eta^0.5*xc^1.5/epsilon	0.878	0.878
beta*xc/epsilon	11.969	11.969
eta*xc/epsilon	0.623	0.623
Fx=beta^2/eta*xc	185.912	185.912
Dx =beta*epsilon/eta*xc^2	15.533	15.533
Pk=beta*k/epsilon	0.203	0.203
Fk=beta^2/eta*k	10961.539	10961.539
Dk =beta*epsilon/eta*k^2	53997.652	53997.652
Fk^2/Dk=beta^3/eta*epsilon	2225.196	2225.196
epsilon/beta^2	0.00863	0.00863
k/beta	0.00175	0.00175
k^2/epsilon	0.000356	0.000356
eta/xc	0.504	0.504
beta/xc	9.676	9.676
epsilon/xc^2	0.808	0.808
k/xc	0.017	0.017
best fit no ext hazard_MedianLifetime	12.3	NaN
best fit no ext hazard_MaxLifetime	20.07	NaN
best fit_MedianLifetime	12.1	NaN
best fit_MaxLifetime	19.99	NaN
data_MedianLifetime	12.06	NaN
data_MaxLifetime	19.87	NaN
ML_lnprob	-17573.376625	-17573.376625

5 5. Fits of simulations to data

best params is the sample with highest likelihood. mode trans is the 4D posterior mode in the transformed space of x_c/η , β/η , x_c^2/ϵ , x_c

Text(0, 0.5, 'Hazard')



Text(0, 0.5, 'Prob density')

