

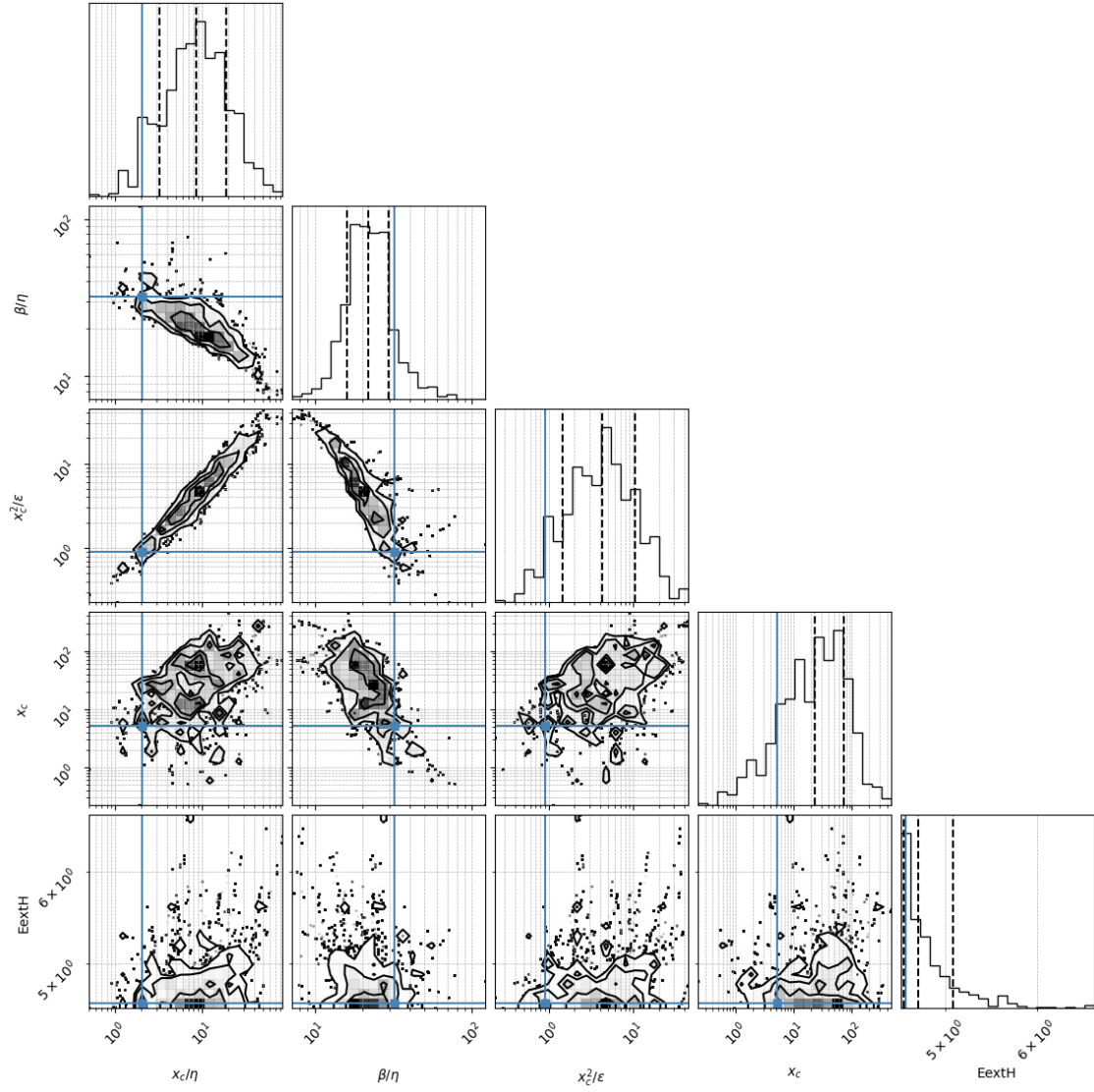
mcmc_analysis_cats_vp_F_baysian

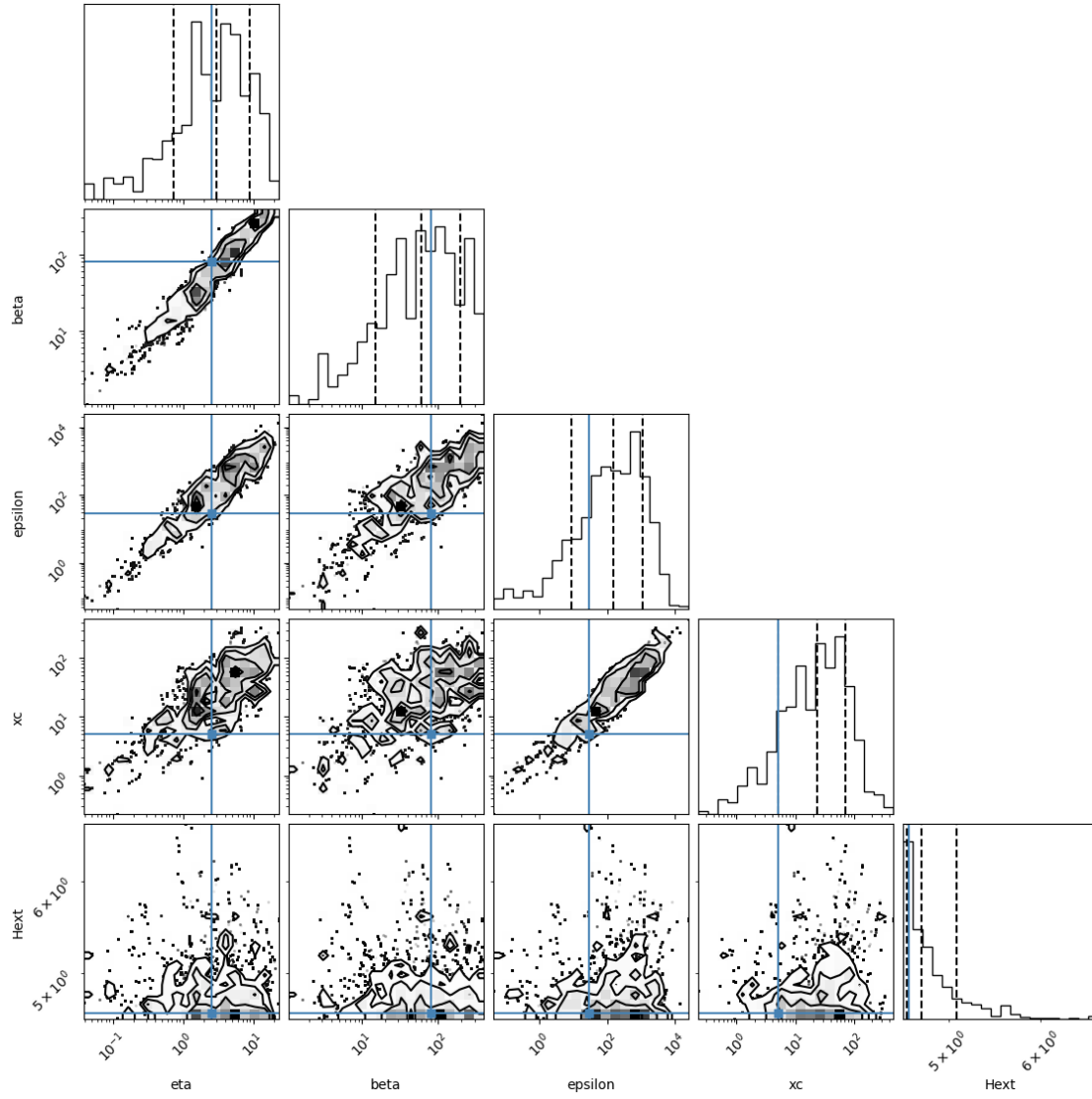
November 24, 2025

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

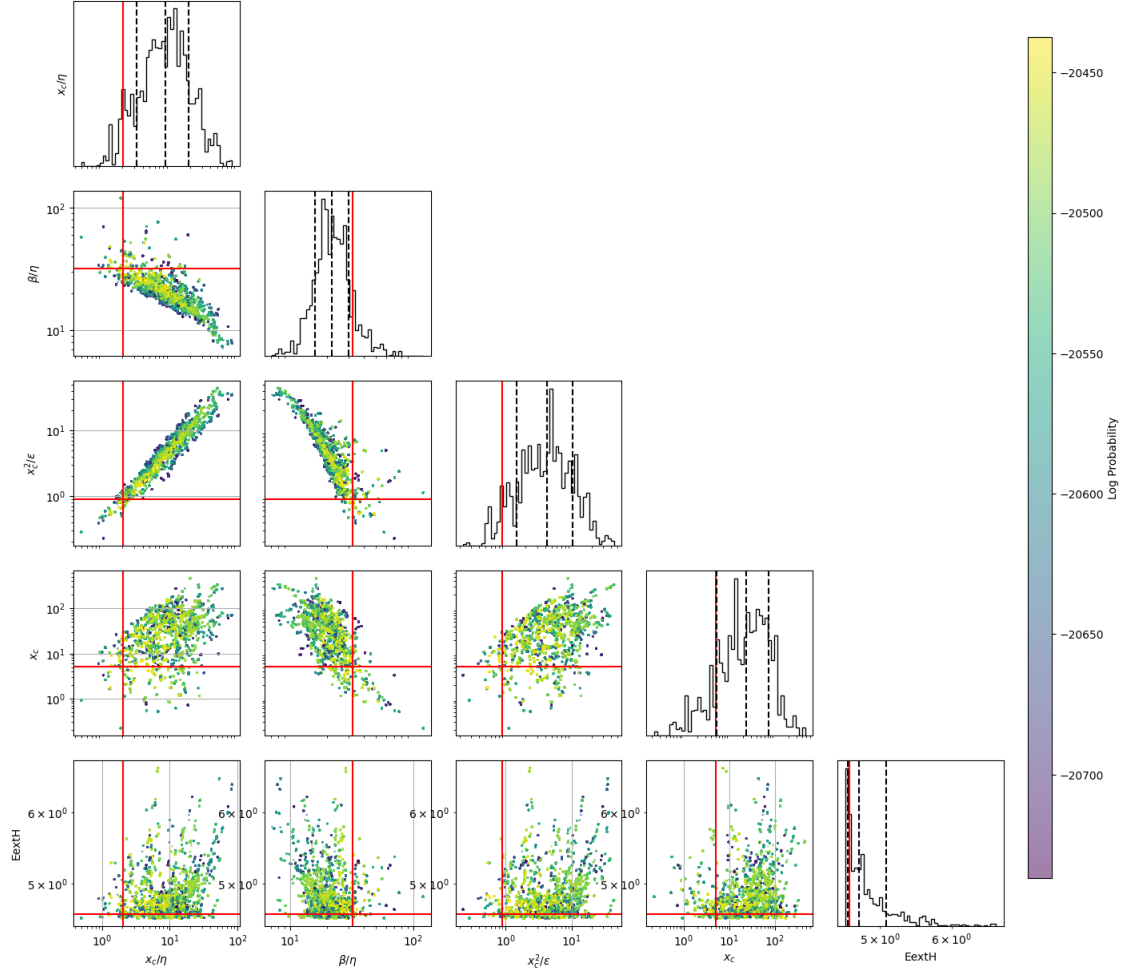
(25,)





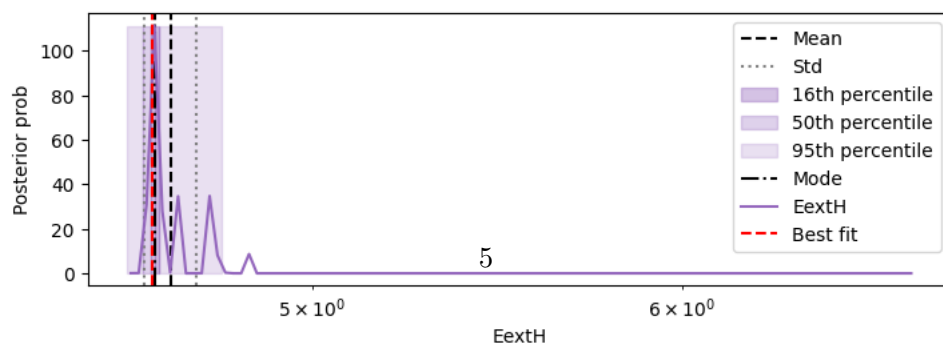
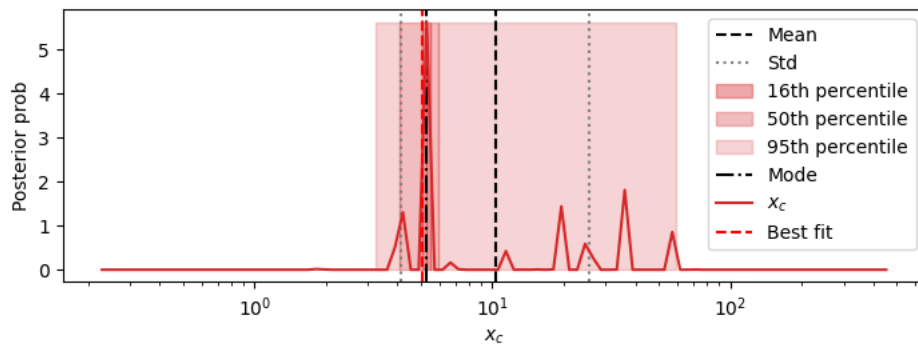
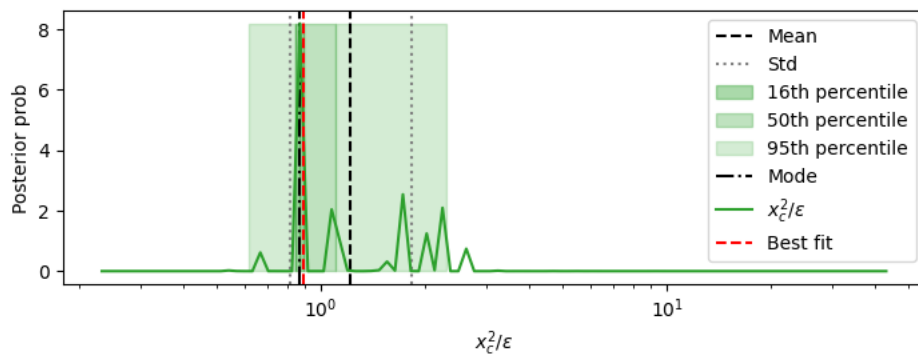
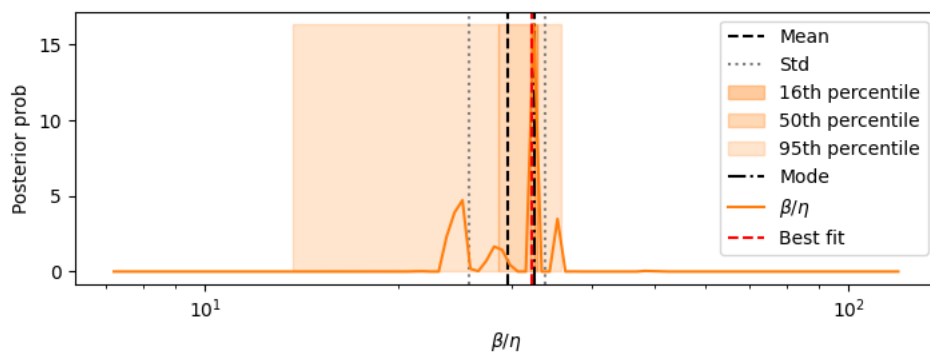
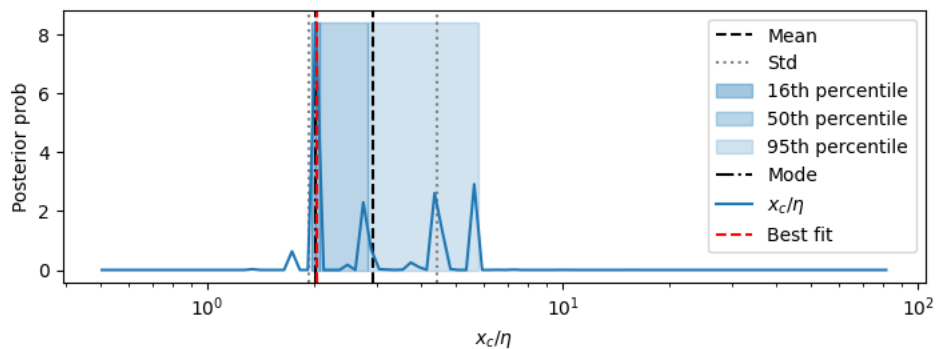
2. Heat map corner plot of raw samples

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

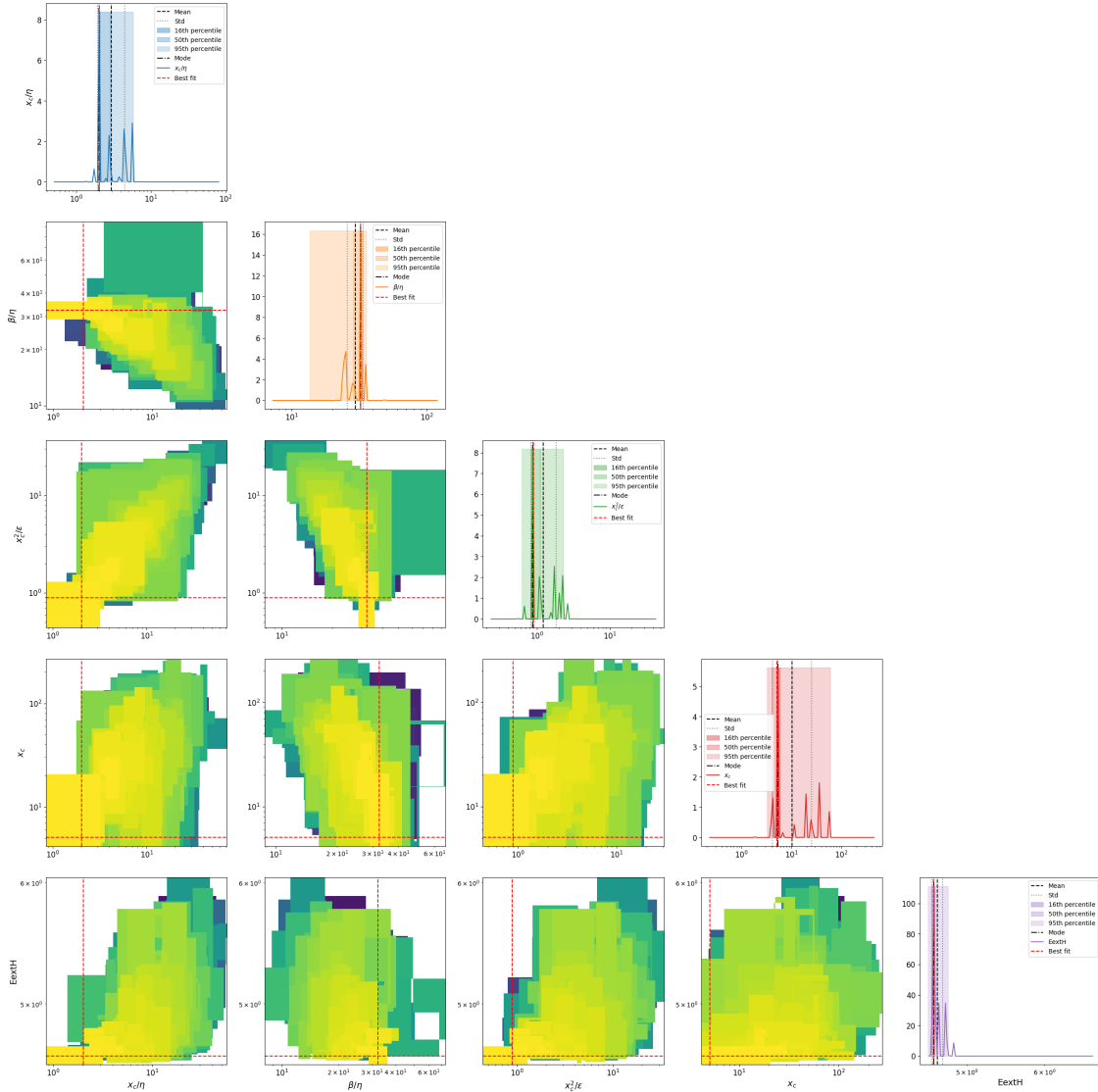


2D marginalizations of posterior distributions

/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	2.928	
beta/eta	29.497	
xc^2/epsilon	1.219	
xc	10.292	
ExtH	4.663	
eta	3.647	
beta	106.481	
epsilon	99.059	
sqrt(xc/eta)	1.754	
s= eta^0.5*xc^1.5/epsilon	0.736	
beta*xc/epsilon	12.169	
eta*xc/epsilon	0.419	
Fx=beta^2/eta*xc	293.153	
Dx =beta*epsilon/eta*xc^2	24.029	
Pk=beta*k/epsilon	0.555	
Fk=beta^2/eta*k	6086.824	
Dk =beta*epsilon/eta*k^2	10989.815	
Fk^2/Dk=beta^3/eta*epsilon	3268.57	
epsilon/beta^2	0.00873	
k/beta	0.00475	
k^2/epsilon	0.00258	
eta/xc	0.341	
beta/xc	9.804	
epsilon/xc^2	0.819	
k/xc	0.0479	
best fit no ext hazard_MedianLifetime	14.86	
best fit no ext hazard_MaxLifetime	24.66	
best fit_MedianLifetime	14.21	
best fit_MaxLifetime	24.45	
data_MedianLifetime	14.25	
data_MaxLifetime	25.1	
ML_lnprob	-20437.24889	
std	\	
xc/eta		[0.993,
1.503]		
beta/eta		[3.759,
4.307]		
xc^2/epsilon		[0.406,
0.609]		
xc		[6.139,

15.216]	
ExtH	[0.0597,
0.0605]	
eta	[1.918,
4.048]	
beta	[52.002,
101.641]	
epsilon	[80.44,
427.954]	
$\sqrt{xc/eta}$	[0.33,
0.406]	
$s= eta^{0.5}*xc^{1.5}/epsilon$	[0.133,
0.163]	
$beta*xc/epsilon$	[1.796,
2.107]	
$eta*xc/epsilon$	[0.0217,
0.0229]	
$Fx=beta^2/eta*xc$	[141.265,
272.65]	
$Dx =beta*epsilon/eta*xc^2$	[9.863,
16.731]	
$Pk=beta*k/epsilon$	[0.369,
1.1]	
$Fk=beta^2/eta*k$	[2749.517,
5014.768]	
$Dk =beta*epsilon/eta*k^2$	[8705.627,
41885.005]	
$Fk^2/Dk=beta^3/eta*epsilon$	[1790.63,
3960.103]	
$epsilon/beta^2$	[0.0043,
0.00849]	
$k/beta$	[0.00231,
0.00449]	
$k^2/epsilon$	[0.00209,
0.0111]	
eta/xc	[0.116,
0.175]	
$beta/xc$	[3.988,
6.722]	
$epsilon/xc^2$	[0.274,
0.412]	
k/xc	[0.0286,
0.0712]	
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 [-20437.248890420808,
-20437.248890420808]

```

	mode \
xc/eta	2.019
beta/eta	32.418
xc^2/epsilon	0.869
xc	5.304
ExtH	4.627
eta	2.559
beta	83.437
epsilon	30.624
sqrt(xc/eta)	1.421
s= eta^0.5*xc^1.5/epsilon	0.632
beta*xc/epsilon	14.289
eta*xc/epsilon	0.438
Fx=beta^2/eta*xc	506.722
Dx =beta*epsilon/eta*xc^2	37.261
Pk=beta*k/epsilon	1.402
Fk=beta^2/eta*k	5196.008
Dk =beta*epsilon/eta*k^2	3758.499
Fk^2/Dk=beta^3/eta*epsilon	7016.16
epsilon/beta^2	0.00445
k/beta	0.00599
k^2/epsilon	0.00815
eta/xc	0.495
beta/xc	15.467
epsilon/xc^2	1.15
k/xc	0.0942
best_fit_no_ext_hazard_MedianLifetime	14.86
best_fit_no_ext_hazard_MaxLifetime	24.66
best_fit_MedianLifetime	14.21
best_fit_MaxLifetime	24.45
data_MedianLifetime	14.25
data_MaxLifetime	25.1
ML_lnprob	-20437.24889

```

percentile_16 \
xc/eta [1.968,

```

2.072]	
beta/eta	[31.962,
32.881]	
xc^2/epsilon	[0.847,
0.892]	
xc	[5.104,
5.511]	
ExtH	[4.618,
4.636]	
eta	[2.478,
2.642]	
beta	[81.011,
85.936]	
epsilon	[28.659,
32.723]	
sqrt(xc/eta)	[1.403,
1.439]	
s= eta^0.5*xc^1.5/epsilon	[0.621,
0.642]	
beta*xc/epsilon	[14.07,
14.51]	
eta*xc/epsilon	[0.434,
0.441]	
Fx=beta^2/eta*xc	[483.806,
530.724]	
Dx =beta*epsilon/eta*xc^2	[35.897,
38.676]	
Pk=beta*k/epsilon	[1.333,
1.474]	
Fk=beta^2/eta*k	[5034.066,
5363.159]	
Dk =beta*epsilon/eta*k^2	[3539.423,
3991.135]	
Fk^2/Dk=beta^3/eta*epsilon	[6596.492,
7462.527]	
epsilon/beta^2	[0.00425,
0.00467]	
k/beta	[0.00582,
0.00617]	
k^2/epsilon	[0.00763,
0.00871]	
eta/xc	[0.483,
0.508]	
beta/xc	[14.925,
16.028]	
epsilon/xc^2	[1.12,
1.181]	

k/xc	[0.0907,
0.0979]	
best fit no ext hazard_MedianLifetime	[14.37,
15.37]	
best fit no ext hazard_MaxLifetime	[24.66,
24.66]	
best fit_MedianLifetime	[13.72,
14.72]	
best fit_MaxLifetime	[24.45,
24.45]	
data_MedianLifetime	[13.77,
14.77]	
data_MaxLifetime	[25.1,
25.1]	
ML_lnprob	[-20437.248890420808,
-20437.248890420808]	
percentile_50 \	
xc/eta	[1.968,
2.819]	
beta/eta	[28.536,
32.881]	
xc^2/epsilon	[0.847,
1.102]	
xc	[4.055,
5.95]	
ExtH	[4.6,
4.636]	
eta	[2.478,
6.469]	
beta	[81.011,
208.289]	
epsilon	[21.983,
209.458]	
sqrt(xc/eta)	[1.403,
1.723]	
s= eta^0.5*xc^1.5/epsilon	[0.621,
0.664]	
beta*xc/epsilon	[12.828,
14.51]	
eta*xc/epsilon	[0.434,
0.455]	
Fx=beta^2/eta*xc	[441.036,
530.724]	
Dx =beta*epsilon/eta*xc^2	[30.924,
38.676]	
Pk=beta*k/epsilon	[1.333,

1.801]	
Fk=beta^2/eta*k	[3667.837,
7360.878]	
Dk =beta*epsilon/eta*k^2	[584.082,
5722.53]	
Fk^2/Dk=beta^3/eta*epsilon	[5830.962,
7462.527]	
epsilon/beta^2	[0.0035,
0.00566]	
k/beta	[0.0024,
0.00617]	
k^2/epsilon	[0.00119,
0.0114]	
eta/xc	[0.355,
0.508]	
beta/xc	[12.05,
18.486]	
epsilon/xc^2	[0.907,
1.181]	
k/xc	[0.084,
0.123]	
best fit no ext hazard_MedianLifetime	[14.37,
15.37]	
best fit no ext hazard_MaxLifetime	[24.66,
24.66]	
best fit_MedianLifetime	[13.72,
14.72]	
best fit_MaxLifetime	[24.45,
24.45]	
data_MedianLifetime	[13.77,
14.77]	
data_MaxLifetime	[25.1,
25.1]	
ML_lnprob	[-20437.248890420808,
-20437.248890420808]	
percentile_95 \	
xc/eta	[1.968,
5.786]	
beta/eta	[13.656,
35.8]	
xc^2/epsilon	[0.617,
2.305]	
xc	[3.222,
59.354]	
ExtH	[4.565,
4.782]	

eta	[1.079,
13.074]	
beta	[50.522,
354.292]	
epsilon	[14.768,
5765.303]	
$\sqrt{xc/eta}$	[1.403,
2.405]	
$s= eta^{0.5}*xc^{1.5}/epsilon$	[0.544,
1.094]	
$beta*xc/epsilon$	[9.722,
14.51]	
$eta*xc/epsilon$	[0.383,
0.462]	
$Fx=beta^2/eta*xc$	[100.304,
638.65]	
$Dx =beta*epsilon/eta*xc^2$	[10.106,
60.498]	
$Pk=beta*k/epsilon$	[0.0892,
1.801]	
$Fk=beta^2/eta*k$	[1033.652,
14772.339]	
$Dk =beta*epsilon/eta*k^2$	[517.977,
165263.661]	
$Fk^2/Dk=beta^3/eta*epsilon$	[1036.86,
10804.495]	
$epsilon/beta^2$	[0.0035,
0.0239]	
$k/beta$	[0.00141,
0.00989]	
$k^2/epsilon$	[4.33e-05,
0.0169]	
eta/xc	[0.173,
0.508]	
$beta/xc$	[4.133,
18.486]	
$epsilon/xc^2$	[0.434,
1.621]	
k/xc	[0.00842,
0.155]	
best fit no ext hazard_MedianLifetime	[14.37,
15.37]	
best fit no ext hazard_MaxLifetime	[24.66,
24.66]	
best fit_MedianLifetime	[13.72,
14.72]	
best fit_MaxLifetime	[24.45,

```

24.45]
data_MedianLifetime           [13.77,
14.77]
data_MaxLifetime              [25.1,
25.1]
ML_lnprob                     [-20437.248890420808,
-20437.248890420808]

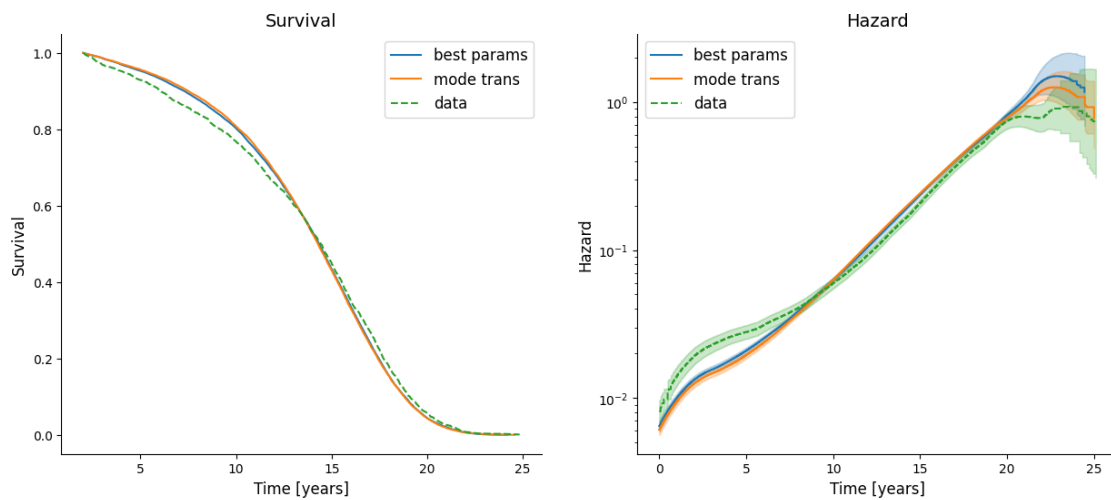
```

	max_likelihood	mode_overall
xc/eta	2.027	2.027
beta/eta	32.246	32.246
xc^2/epsilon	0.891	0.891
xc	5.108	5.108
ExtH	4.622	4.622
eta	2.52	2.52
beta	81.259	81.259
epsilon	29.282	29.282
sqrt(xc/eta)	1.424	1.424
s= eta^0.5*xc^1.5/epsilon	0.626	0.626
beta*xc/epsilon	14.176	14.176
eta*xc/epsilon	0.44	0.44
Fx=beta^2/eta*xc	512.938	512.938
Dx =beta*epsilon/eta*xc^2	36.184	36.184
Pk=beta*k/epsilon	1.388	1.388
Fk=beta^2/eta*k	5240.622	5240.622
Dk =beta*epsilon/eta*k^2	3777.015	3777.015
Fk^2/Dk=beta^3/eta*epsilon	7271.382	7271.382
epsilon/beta^2	0.00443	0.00443
k/beta	0.00615	0.00615
k^2/epsilon	0.00854	0.00854
eta/xc	0.493	0.493
beta/xc	15.907	15.907
epsilon/xc^2	1.122	1.122
k/xc	0.0979	0.0979
best fit no ext hazard_MedianLifetime	14.86	NaN
best fit no ext hazard_MaxLifetime	24.66	NaN
best fit_MedianLifetime	14.21	NaN
best fit_MaxLifetime	24.45	NaN
data_MedianLifetime	14.25	NaN
data_MaxLifetime	25.1	NaN
ML_lnprob	-20437.24889	-20437.24889

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')

