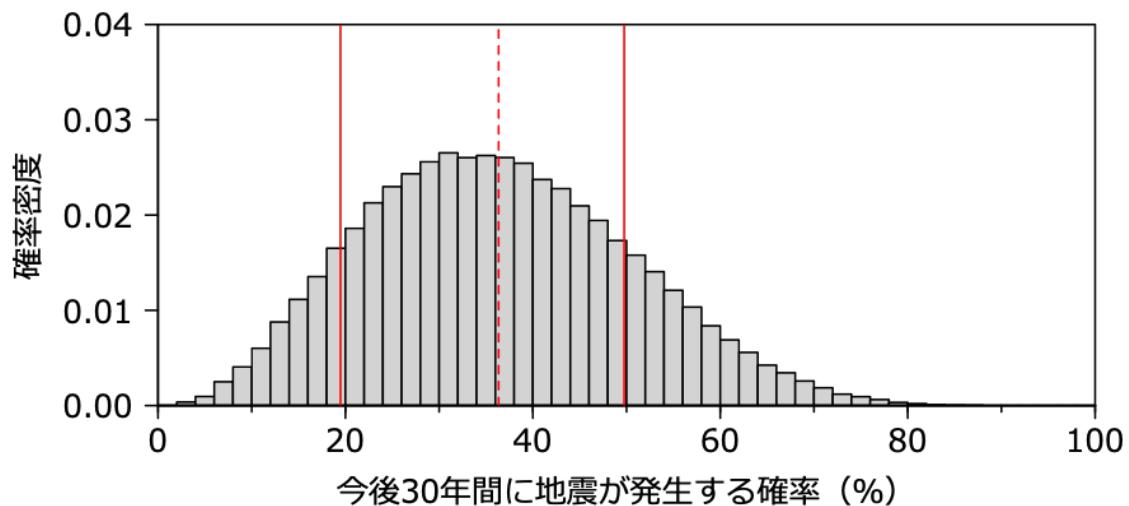


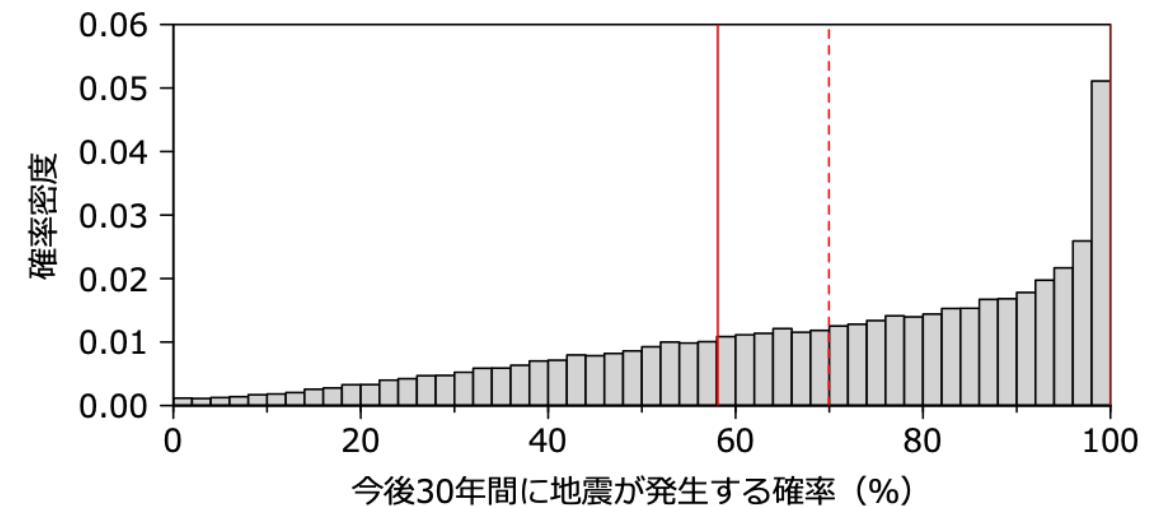
地震発生確率の頻度分布形状について

どうしてこんなに違うのか？

BPTモデル

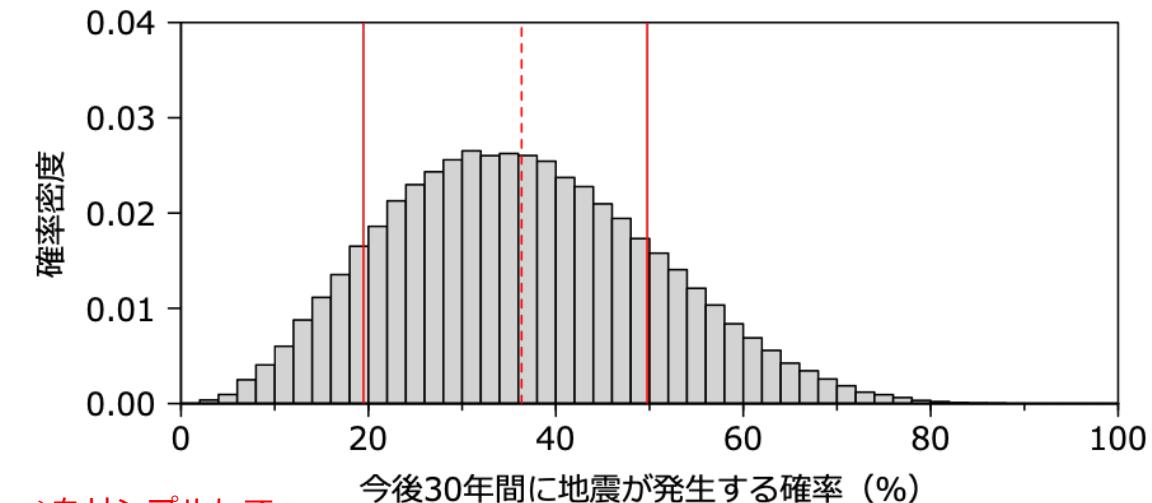
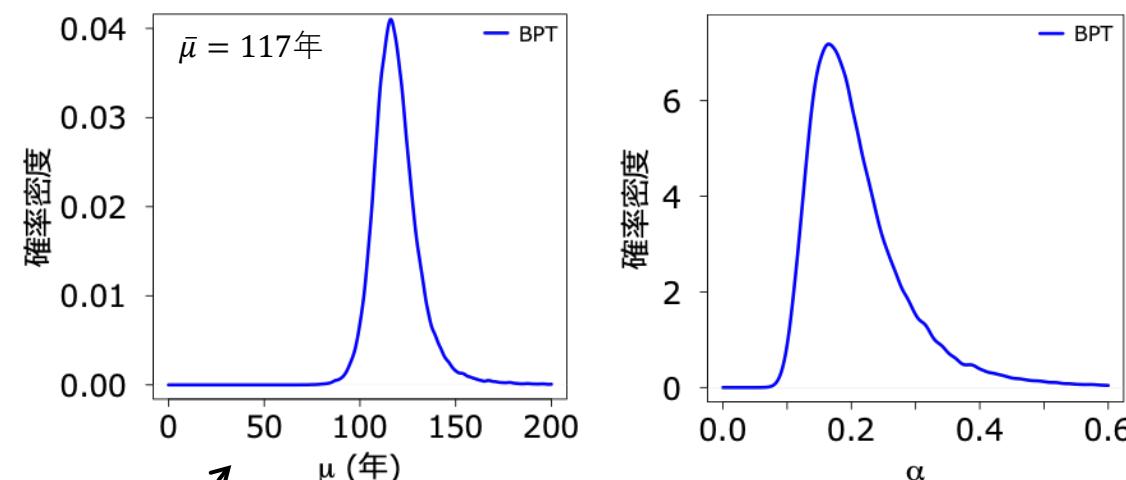


SSD-BPTモデル



発生確率の頻度分布は (μ, α) の事後分布に依存

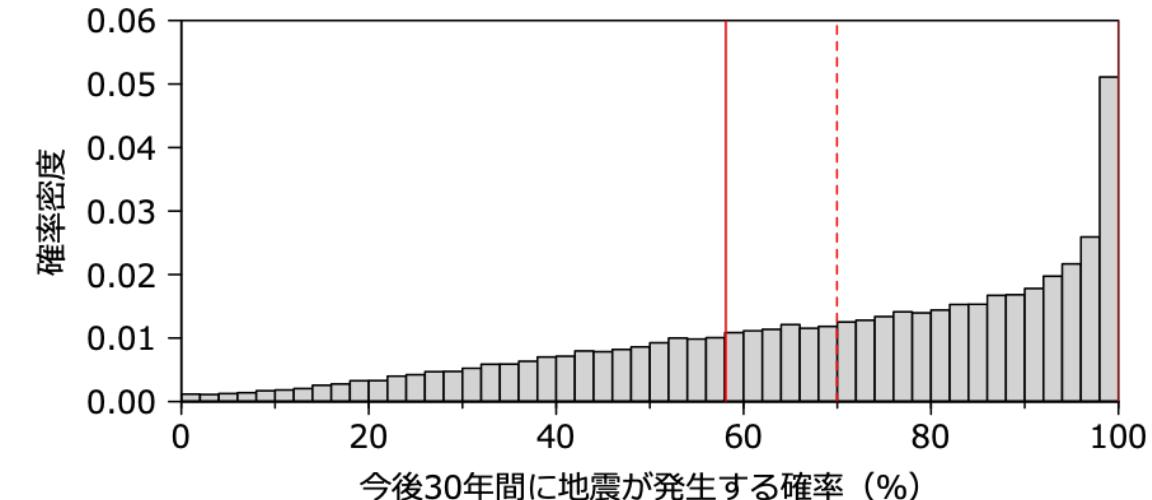
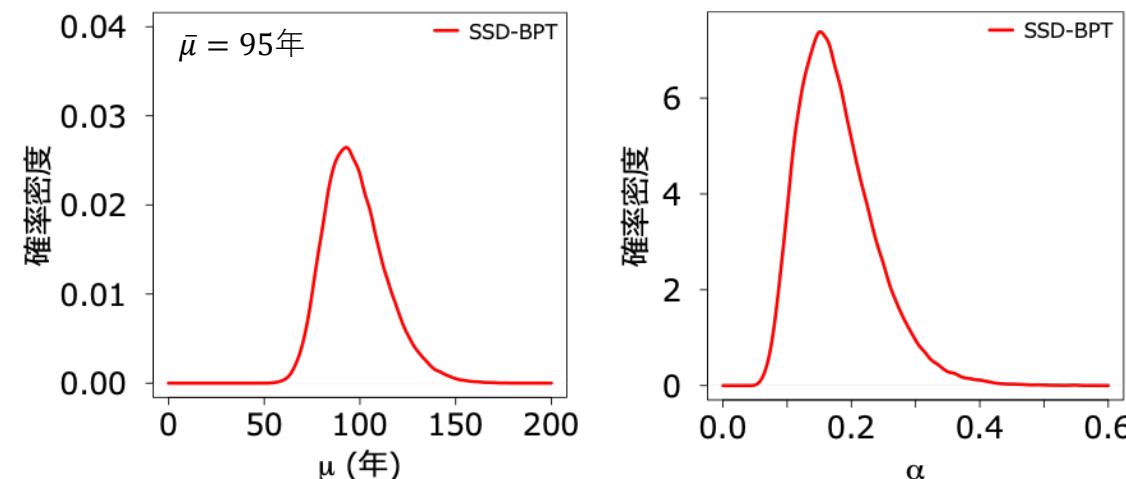
BPTモデルの事後分布



これらの違いが重要！

事後分布から (μ, α) をサンプルして
BPT分布の確率密度関数で計算された確率が頻度分布を形成する

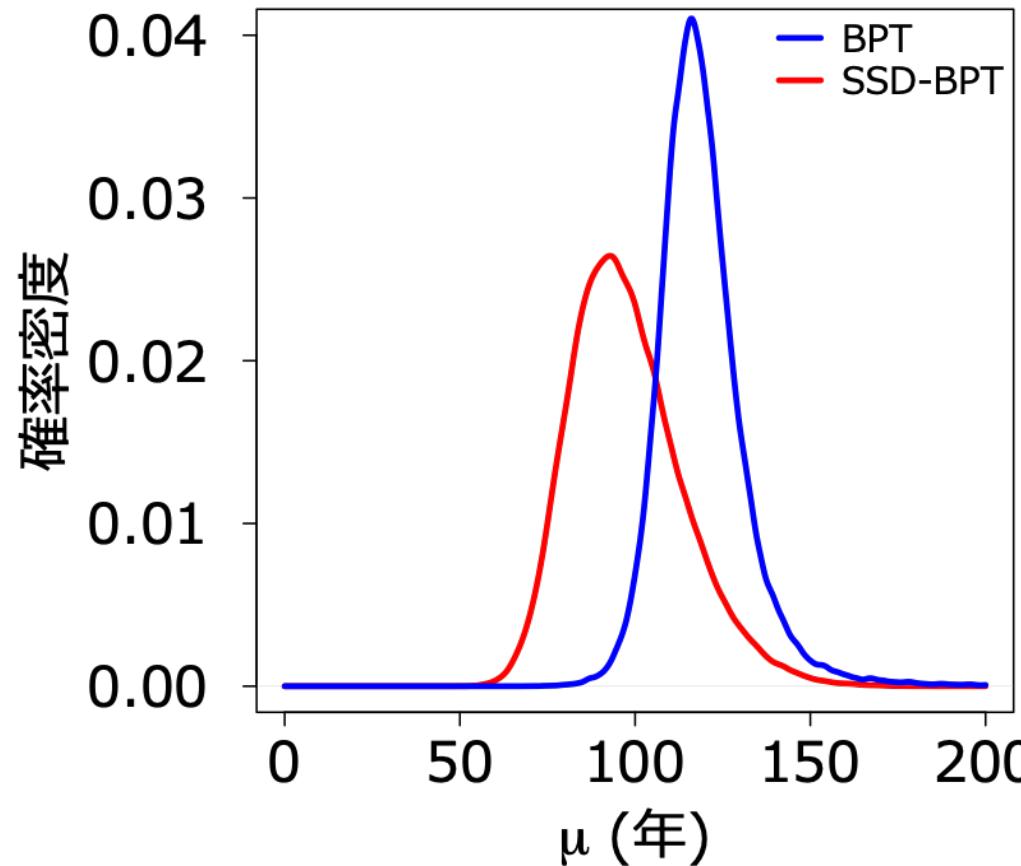
SSD-BPTモデルの事後分布



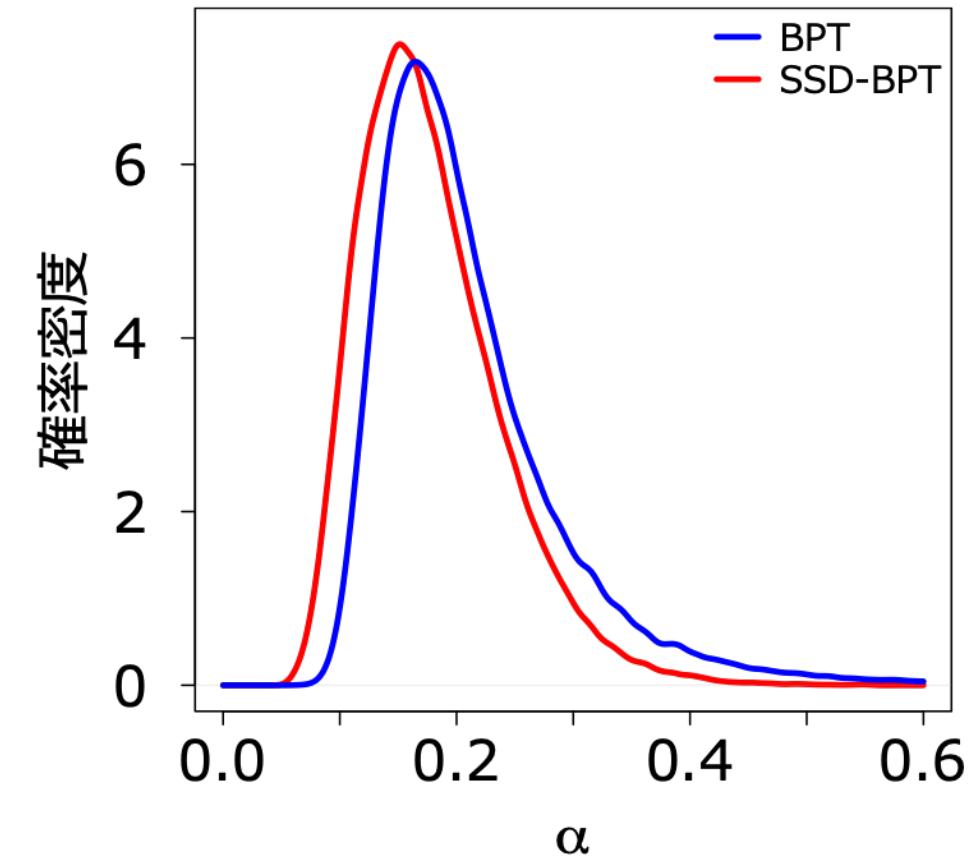
※SSD-BPTモデルから直接求まる事後分布は (β, γ, u) だが (μ, α) に換算して比較→参考1)

BPTモデルとSSD-BPTモデルの事後分布比較

形状はおそらく似ている（ガンマ分布？）
SSD-BPTの方がやや幅が広めで期待値が小さい

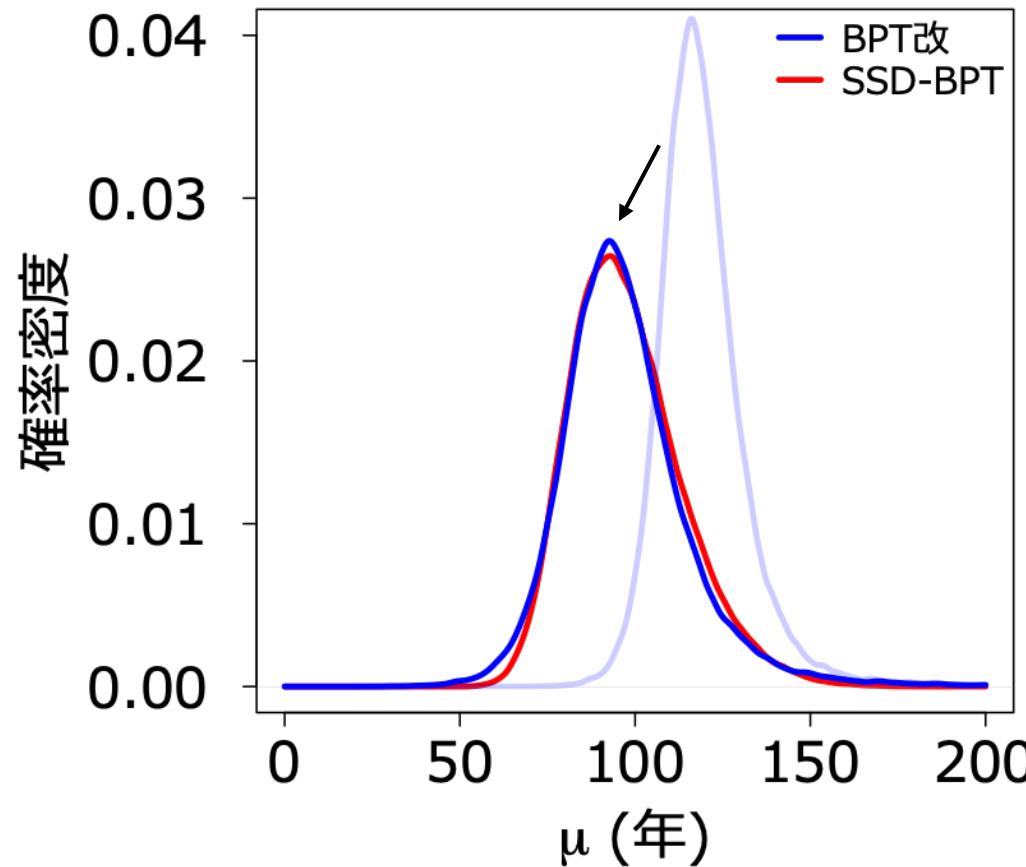


形状はよく似ている（ガンマ分布？）
SSD-BPTの方が全体的に少し小さい

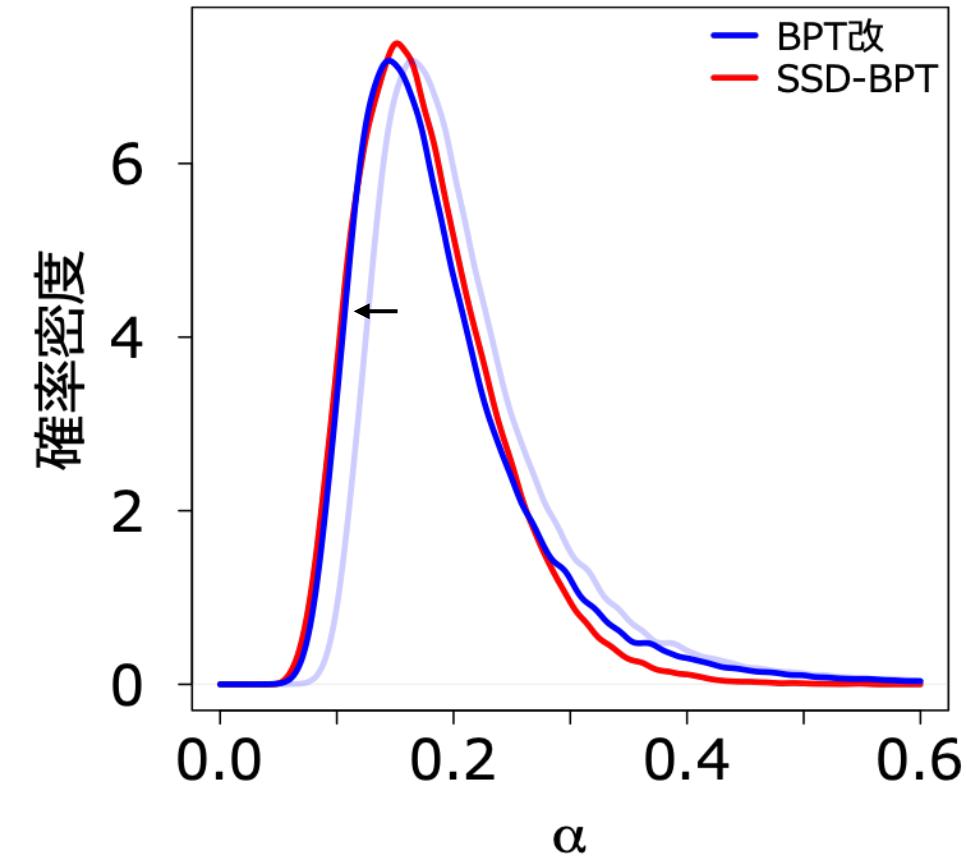


BPTの事後分布をSSD-BPTに合うように調整

BPTの事後分布の幅を少し拡大 ($\sigma_\mu \times 1.5$ 倍)
期待値が95年になるように左にシフト



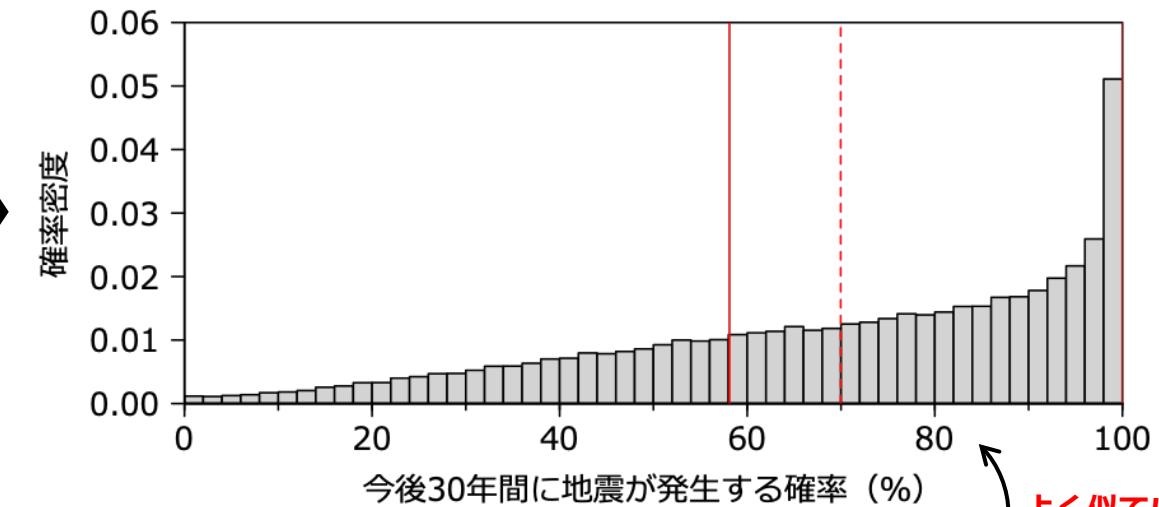
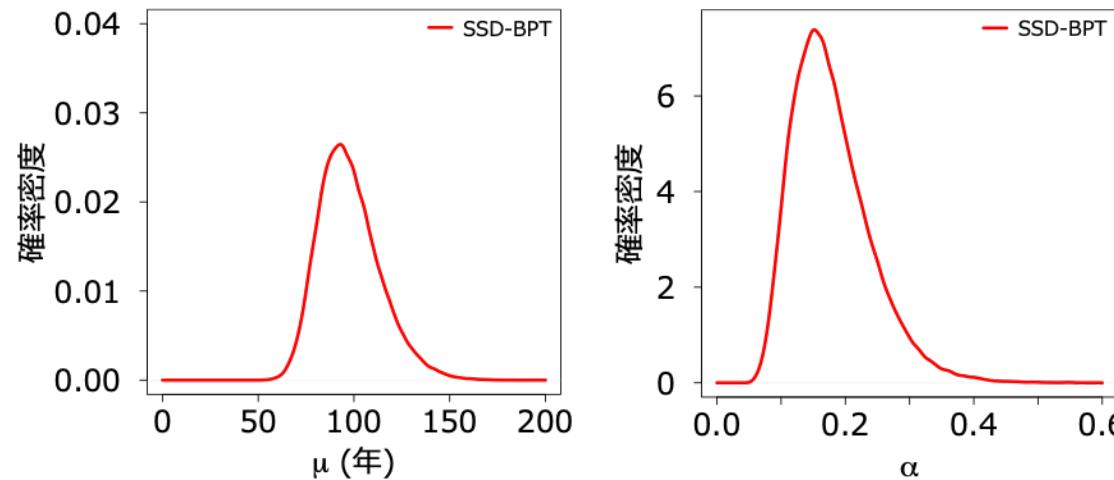
BPTの事後分布を0.02だけ左にシフト



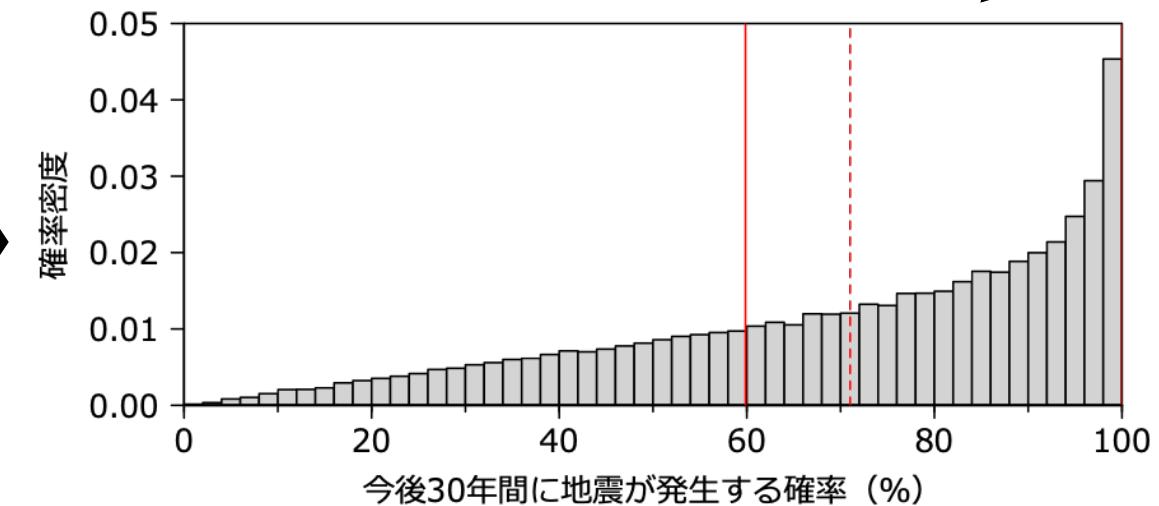
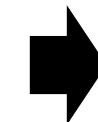
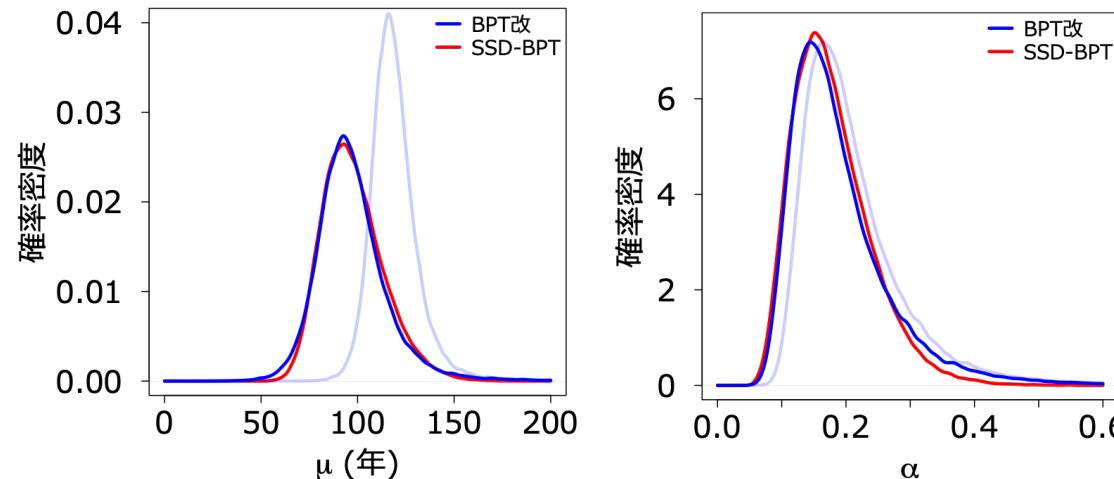
たったこれだけの調整でほぼ同じ分布になる！

BPTの事後分布を調整した分布で30年確率の頻度分布を計算

SSD-BPTモデルの事後分布



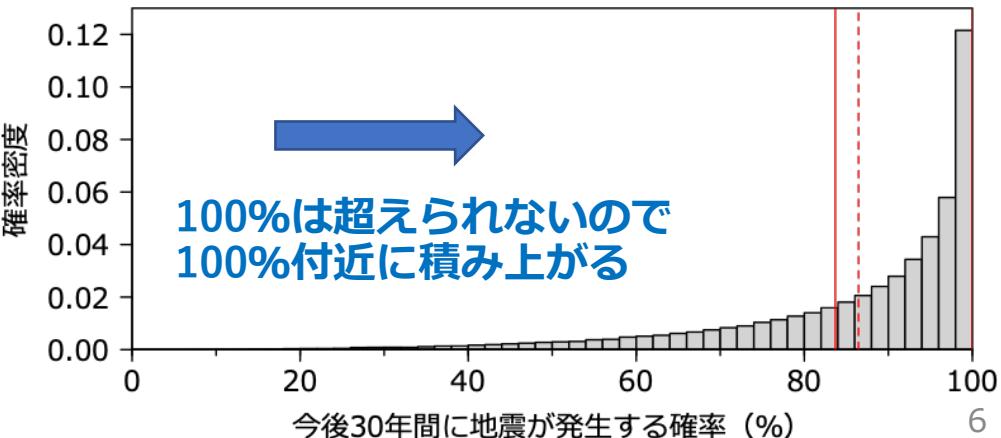
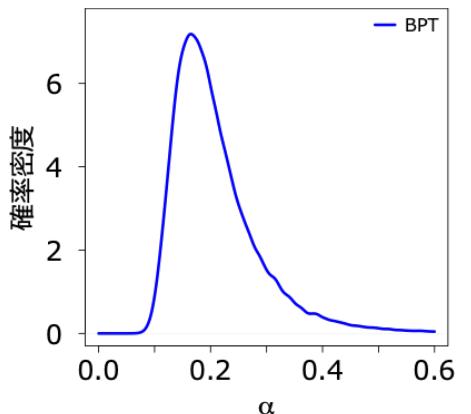
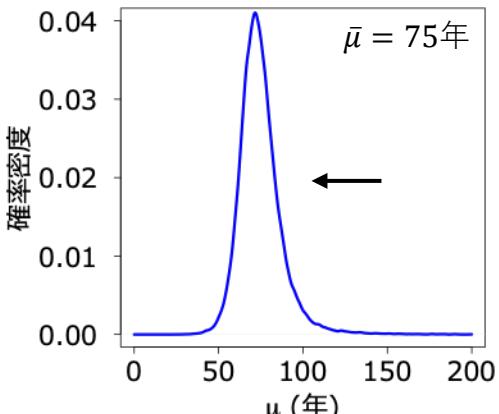
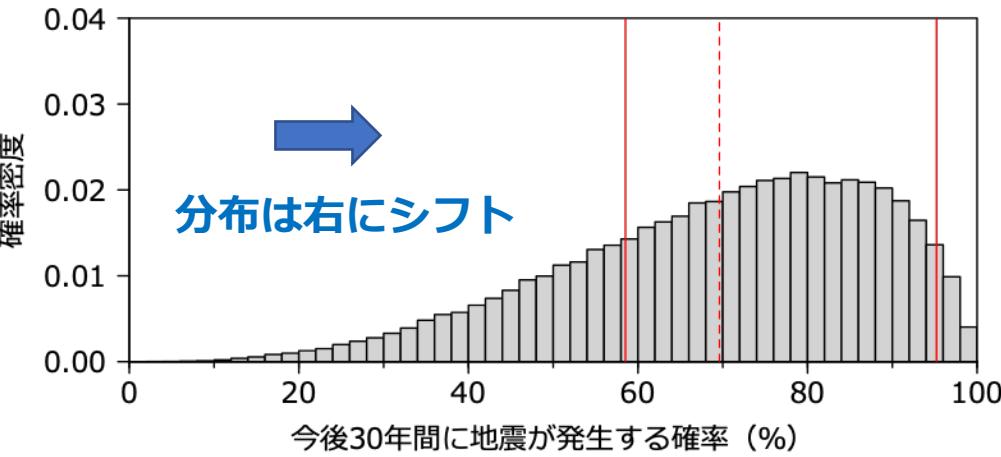
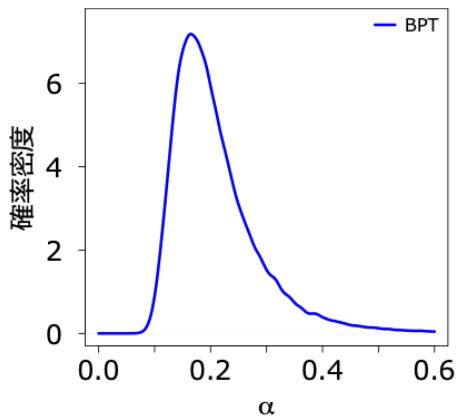
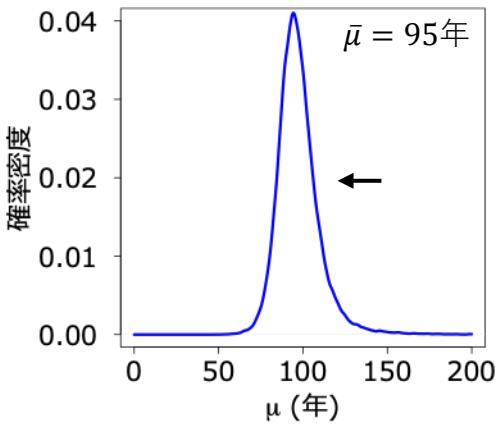
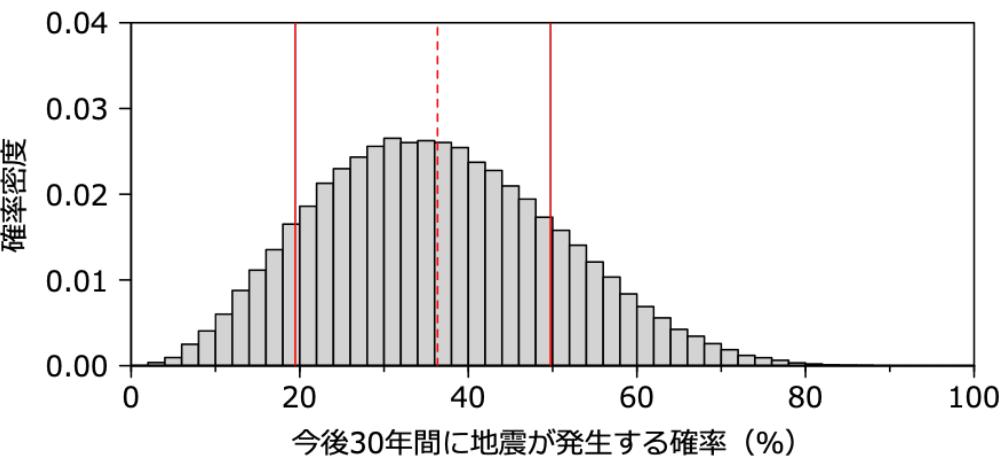
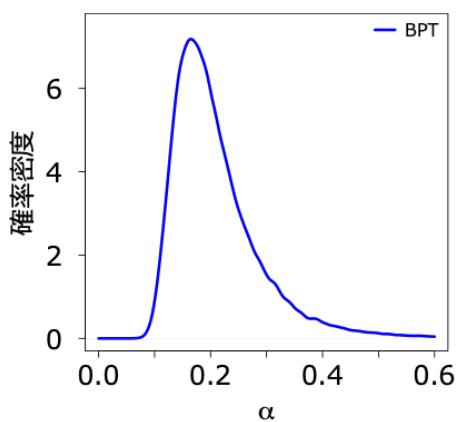
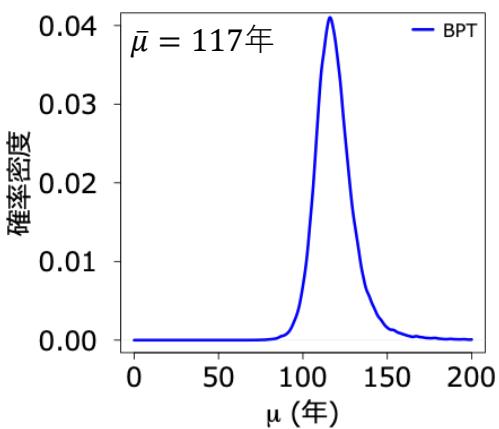
BPTモデルの事後分布を調整した分布



→大雑把な比較ができたので、以降はBPTモデルを基準に事後分布の違いが頻度分布に与える影響を見ていく

$\bar{\mu}$ の効果

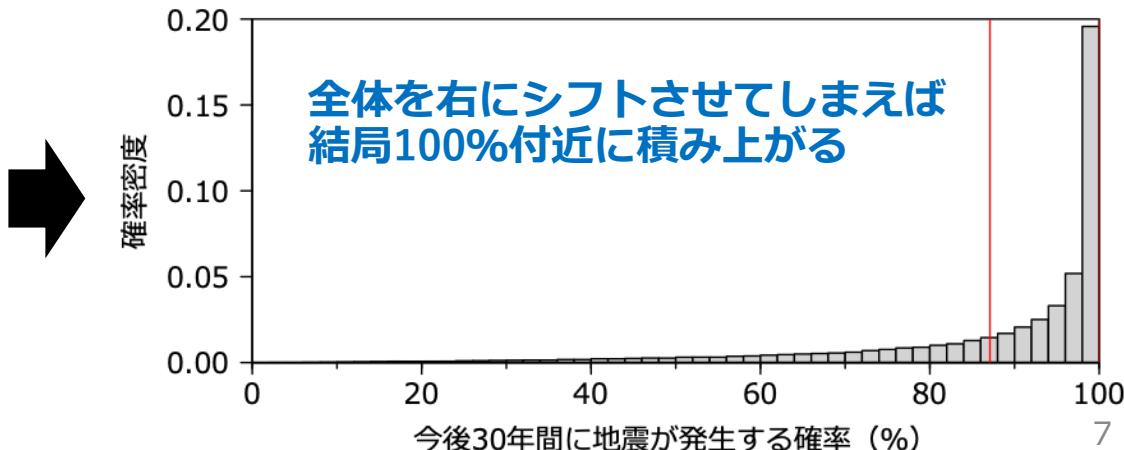
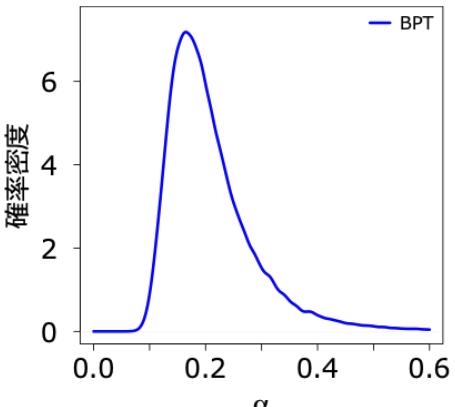
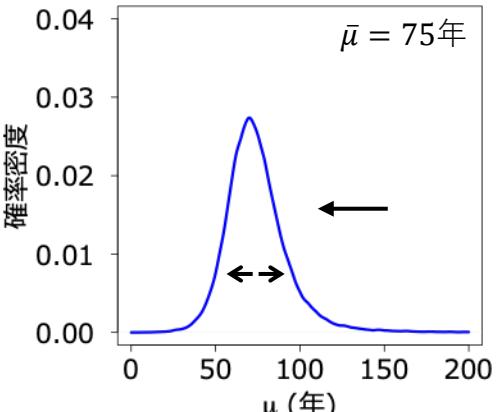
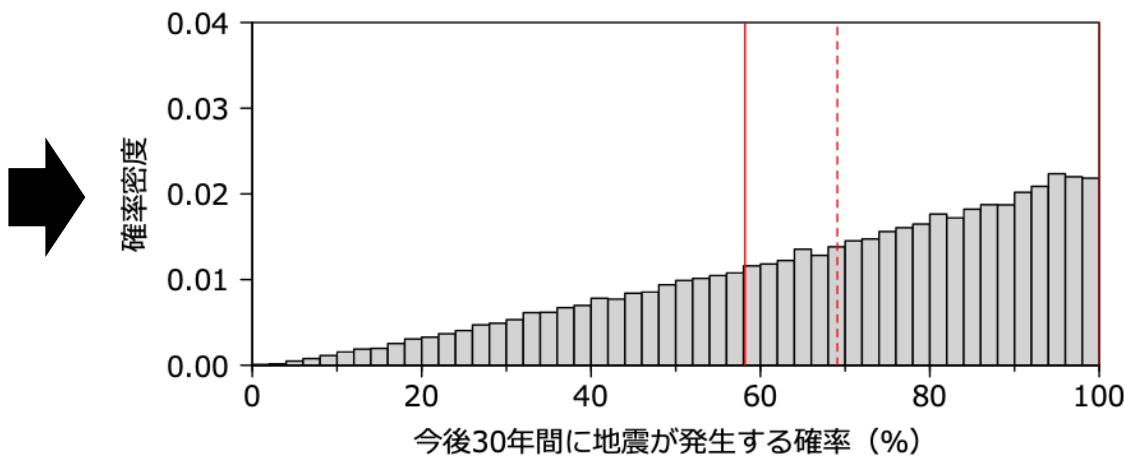
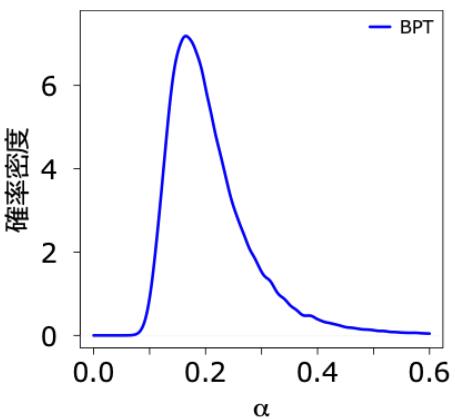
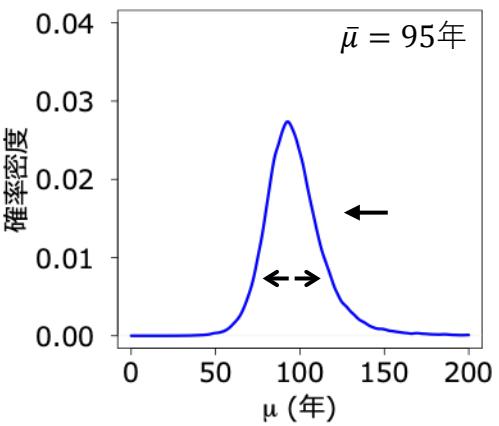
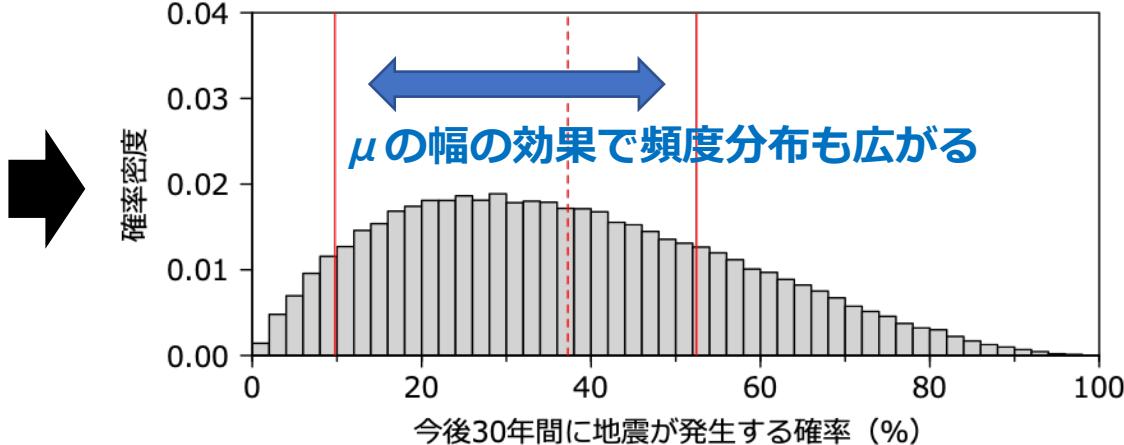
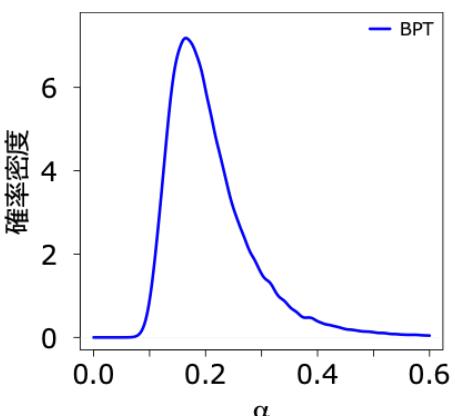
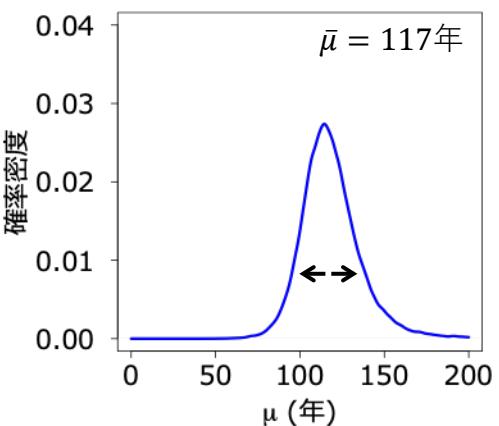
μ を左にシフト



σ_μ の効果

$\sigma_\mu \times 1.5$ 倍

μ を左にシフト

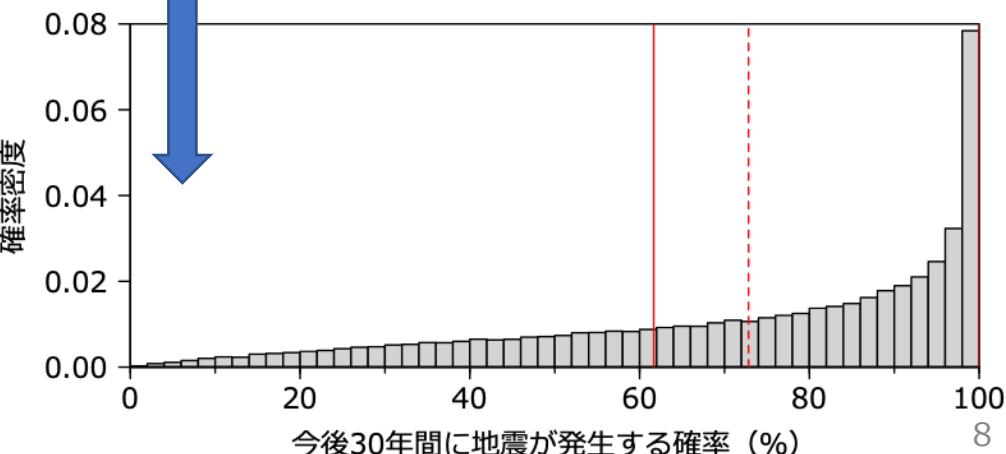
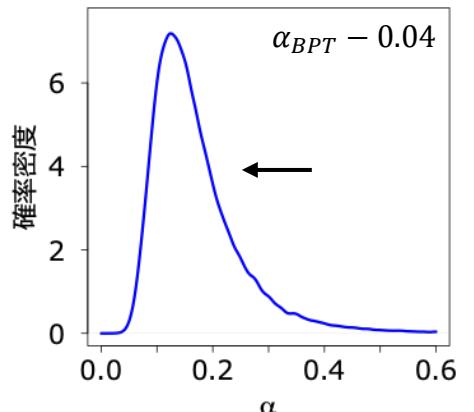
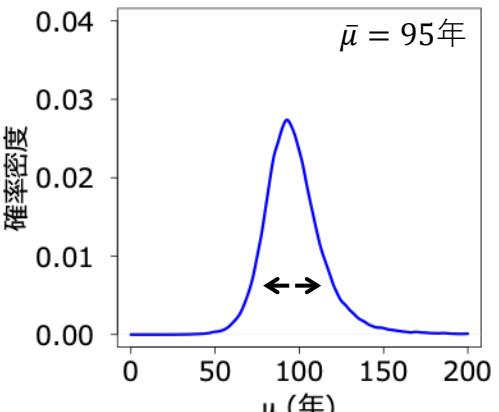
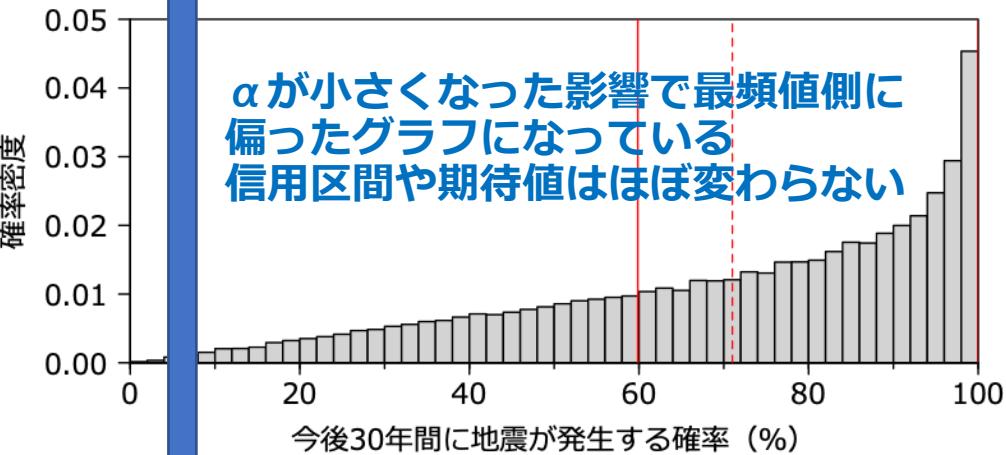
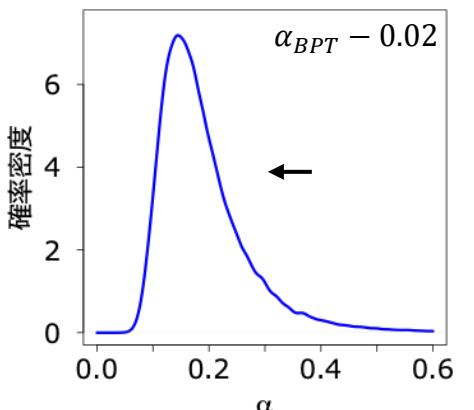
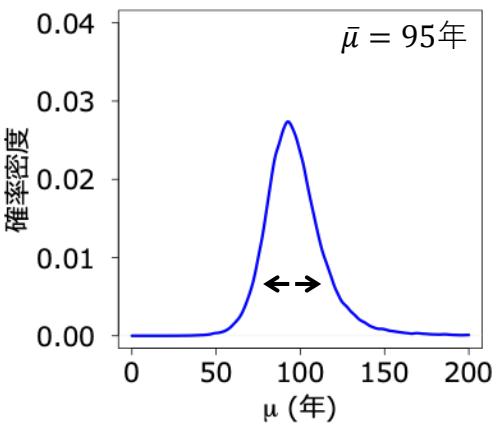
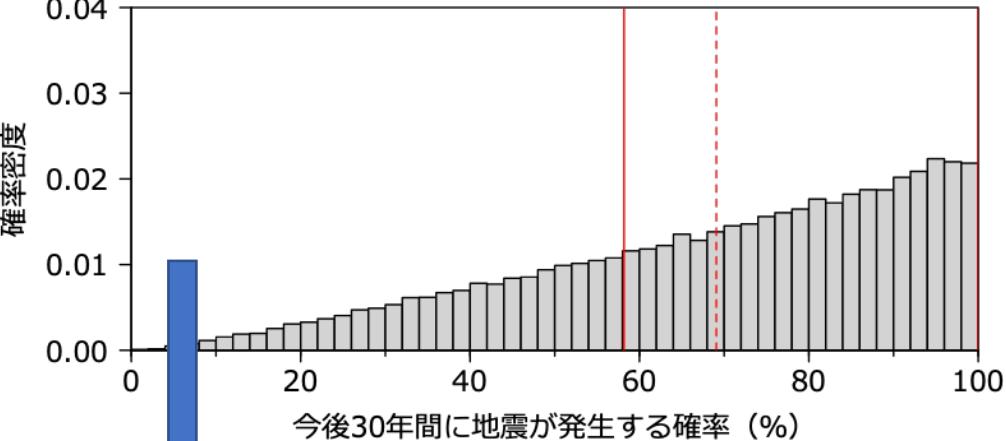
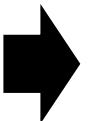
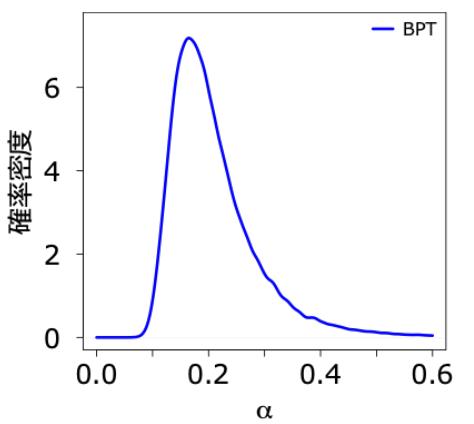
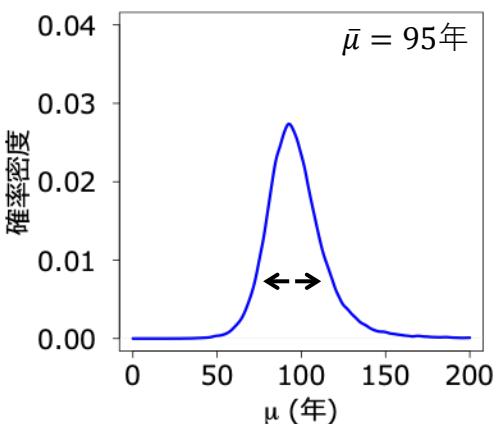


α の効果

$\sigma_\mu \times 1.5$ 倍

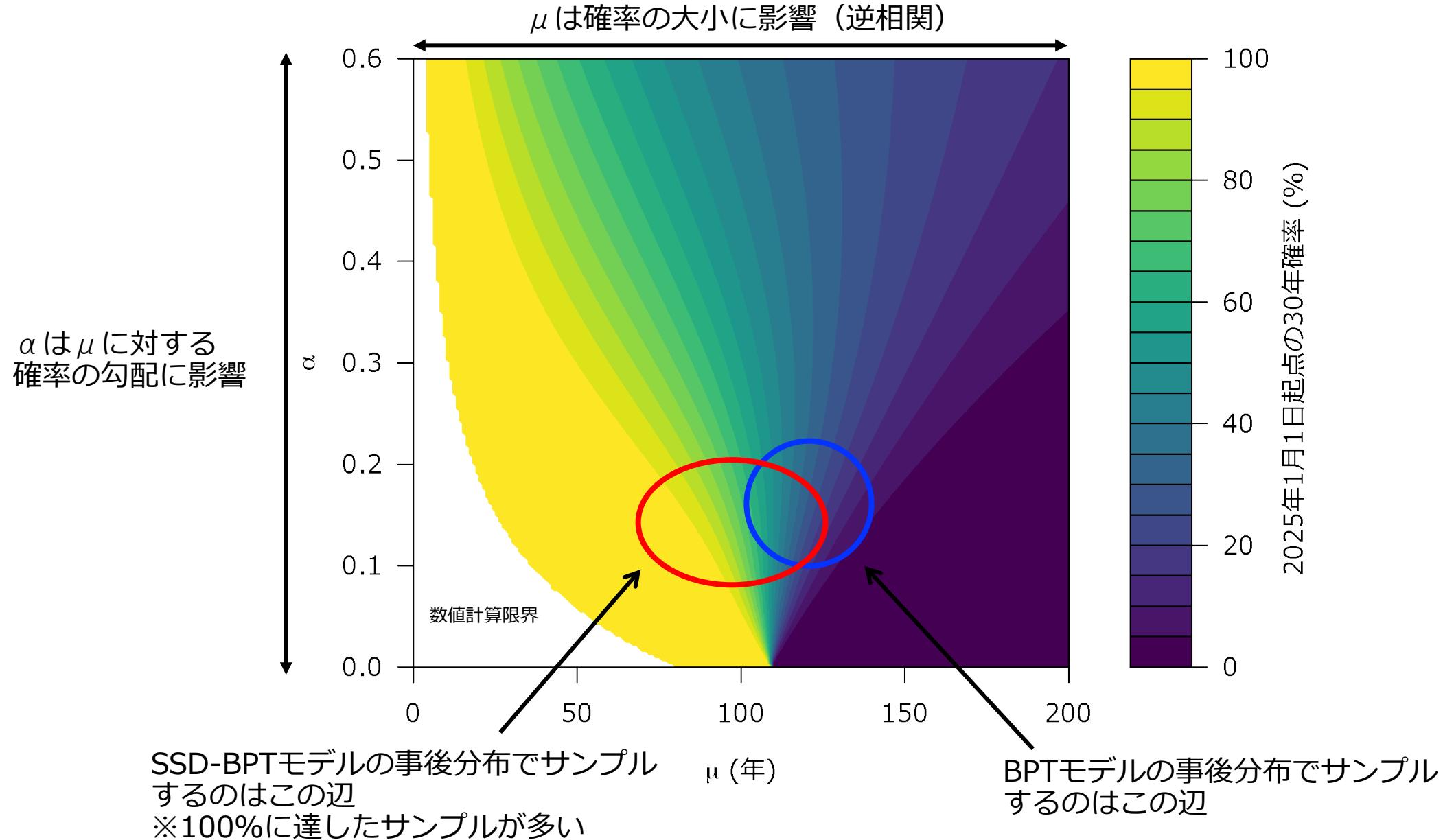
$\bar{\mu} = 95$ 年

α を左にシフト



(μ, α) と30年確率の関係

結局のところ、 (μ, α) 空間のどこをサンプリングしているのかが重要！

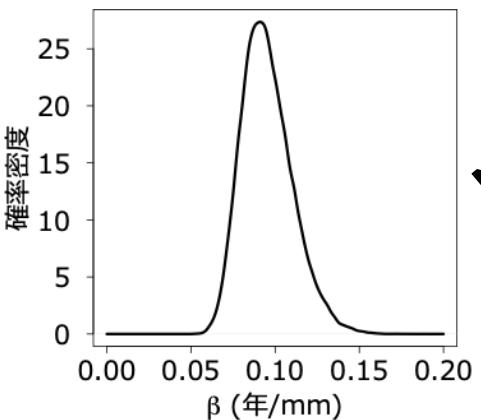


まとめ

- ・発生確率の頻度分布は(μ, α)の事後分布に依存
- ・BPTモデルとSSD-BPTモデルの事後分布は期待値や幅が異なるが、基本となる分布形状はそれほど変わらない
- ・SSD-BPTモデルの頻度分布形状がBPTモデルのと大きく違う理由は
 - ① μ の期待値が小さい（頻度分布全体を高い側にシフト）
 - ② μ の分散が大きい（頻度分布の幅を広げる）
 - ③ 上限100%に達するサンプルが多い（100%付近に強いピーク）これらの複合による（ α の違いも若干影響する）
- ・BPTモデルでも、データや経過時間によってはSSD-BPTモデルと同様の非対称な頻度分布になり得る→**SSD-BPTモデル特有の性質ではない**

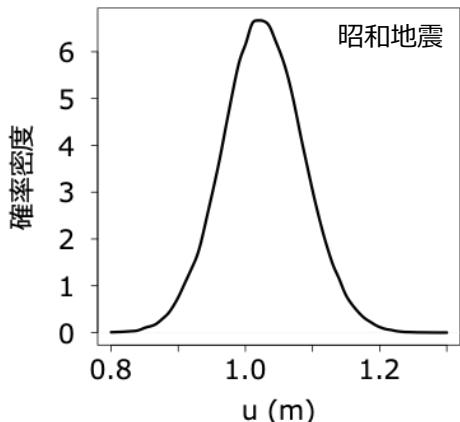
参考1：SSD-BPTモデルにおける (β, γ, u) から (μ, α) への変換

β の事後分布

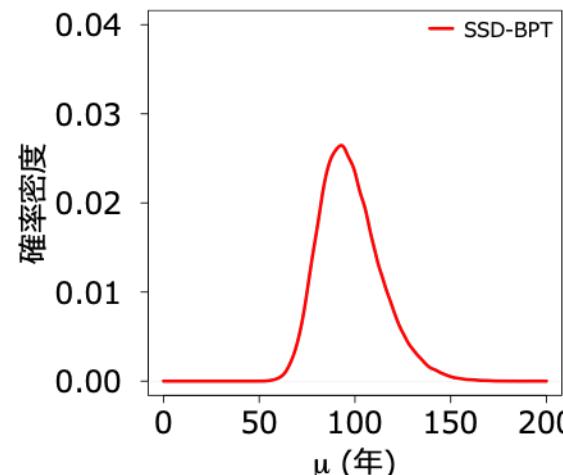
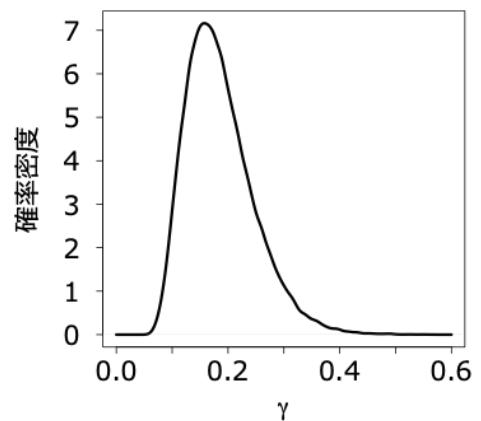


$$\mu = \beta u$$

昭和地震の隆起量
 u の事後分布

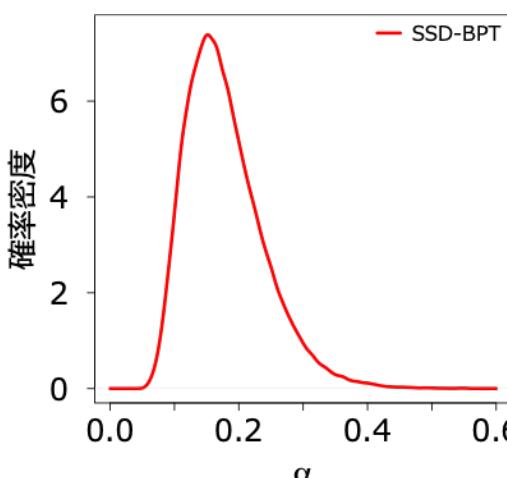


γ の事後分布



μ の事後分布

$$\alpha = \sqrt{\frac{\beta}{u}} \gamma$$



α の事後分布