Kappa Bump-on-Tail Simulation Notes 2/28

Base Parameters

- $p_1 = k = 0.5$ (wave number)
- $p_2 = \sigma_1 = 1.5$ (scale parameter)
- $p_3 = \sigma_2 = 0.7$ (scale parameter)
- $p_4 = \mu = 1$ (mean velocity)
- $p_5 = v_0 = 5$
- $p_6 = \beta = 0.95$ (size of bump)
- $p_7 = \kappa = \{2, 4\}$ (spectral index)

Numerical Parameters

- $Nparams = 7$
- $N = 1200$ (number of samples)
- $h = 10^{-6}$ (finite difference step size)
- $N_{fourier} = 1000$ (number of Fourier coefficients)
- $L = 4$ (parameter of basis transformation for FFT)
- $V_{max} = 86$
- $M = 2^{11}$, $2M$ = number of v grid points

Quantitative Results Eigenvalue ratio:

$$\nu_k = \frac{\sum_{i=1}^{k} \lambda_i}{\sum_{i=1}^{Nparams} \lambda_i}$$

Polynomial fit:

$$h(\omega^T p) = h(y) = a_0 + a_1 y + a_2 y^2$$

Parameter weights:

$$\omega^T p = \sum_{i=1}^{Nparams} \omega_i p_i$$

Table 1: Quantitative Data for $\kappa = 2$

	Eigenvalue Ratios		**Polynomial Fit**		
Variation	ν_1 (%)	ν_2 (%)	a_0	a_1	a_2
1%	0.9997	0.9999	-0.0831	0.0026	3.434E-5
5%	99.1112	99.9655	-0.0828	0.0131	-8.875E-4
15%	89.4741	98.8380	-0.0810	0.0394	-0.0070
25%	...	...	...	...	...

	Parameter Weights						
Variation	ω_1	ω_2	ω_3	ω_4	ω_5	ω_6	ω_7
1%	-0.6475	-0.6512	0.0022	0	0.0011	0.1558	-0.3640
5%	-0.6448	-0.6484	0.0024	0	0.0013	0.1440	-0.3782
15%	-0.6102	-0.6165	0.0021	0	0.0014	0.0981	-0.4878
25%	...	...	...	...	...	...	...

Table 2: Quantitative Data for $\kappa = 4$

	Eigenvalue Ratios		**Polynomial Fit**		
Variation	ν_1 (%)	ν_2 (%)	a_0	a_1	a_2
1%	0.9999	0.9999	-0.0864	0.0035	-4.663E-5
5%	0.9995	0.9999	-0.0865	0.0179	-0.0012
15%	0.7237	0.9967	-0.0892	0.0528	-0.0079
25%	0.7564	0.9553	-0.0982	0.0954	0.0536

	Parameter Weights						
Variation	ω_1	ω_2	ω_3	ω_4	ω_5	ω_6	ω_7
1%	-0.6913	-0.6910	0.0020	0	-0.0022	0.1944	0.0819
5%	-0.6933	-0.6930	0.0023	0	-0.0024	0.1803	0.0812
15%	-0.7877	-0.5448	0.0287	0	-0.2755	0.0416	0.0657
25%	-0.7281	-0.1254	0.0007	0	-0.6537	-0.1590	0.0402