

# Regional Skew and Prior Distributions for Parameters DLS-114, Module 1.17



**U.S. ARMY**



**US Army Corps  
of Engineers®**

Dam and Levee  
Safety Programs

March 2026 / Version 1

OTTER BROOK DAM, NH (SOURCE: USACE)



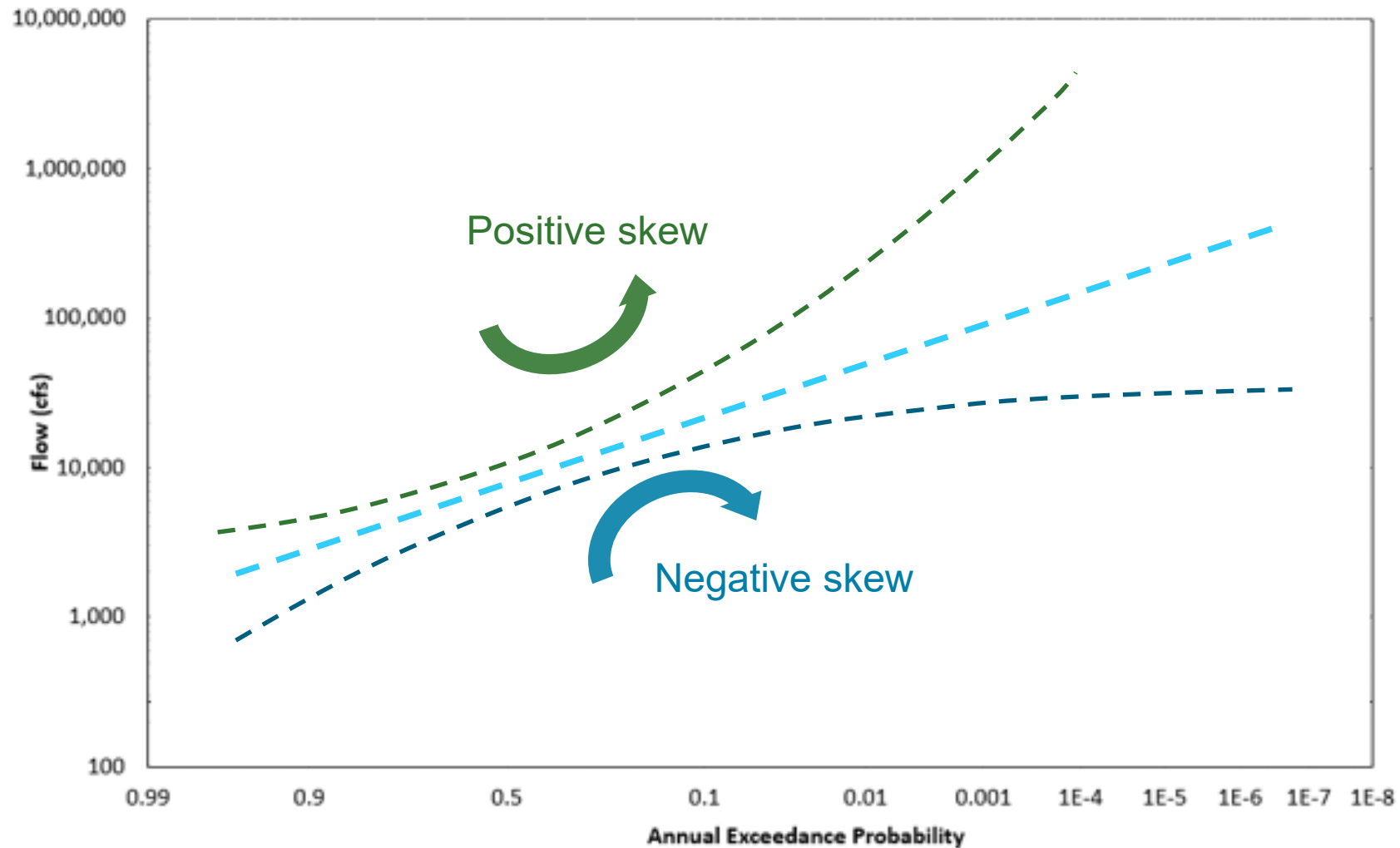
# Learning Objectives

- List some sources of regional skew information
- Describe how regional skew relates to the prior distribution of skew
- Demonstrate how to enter regional skew information in RMC-BestFit

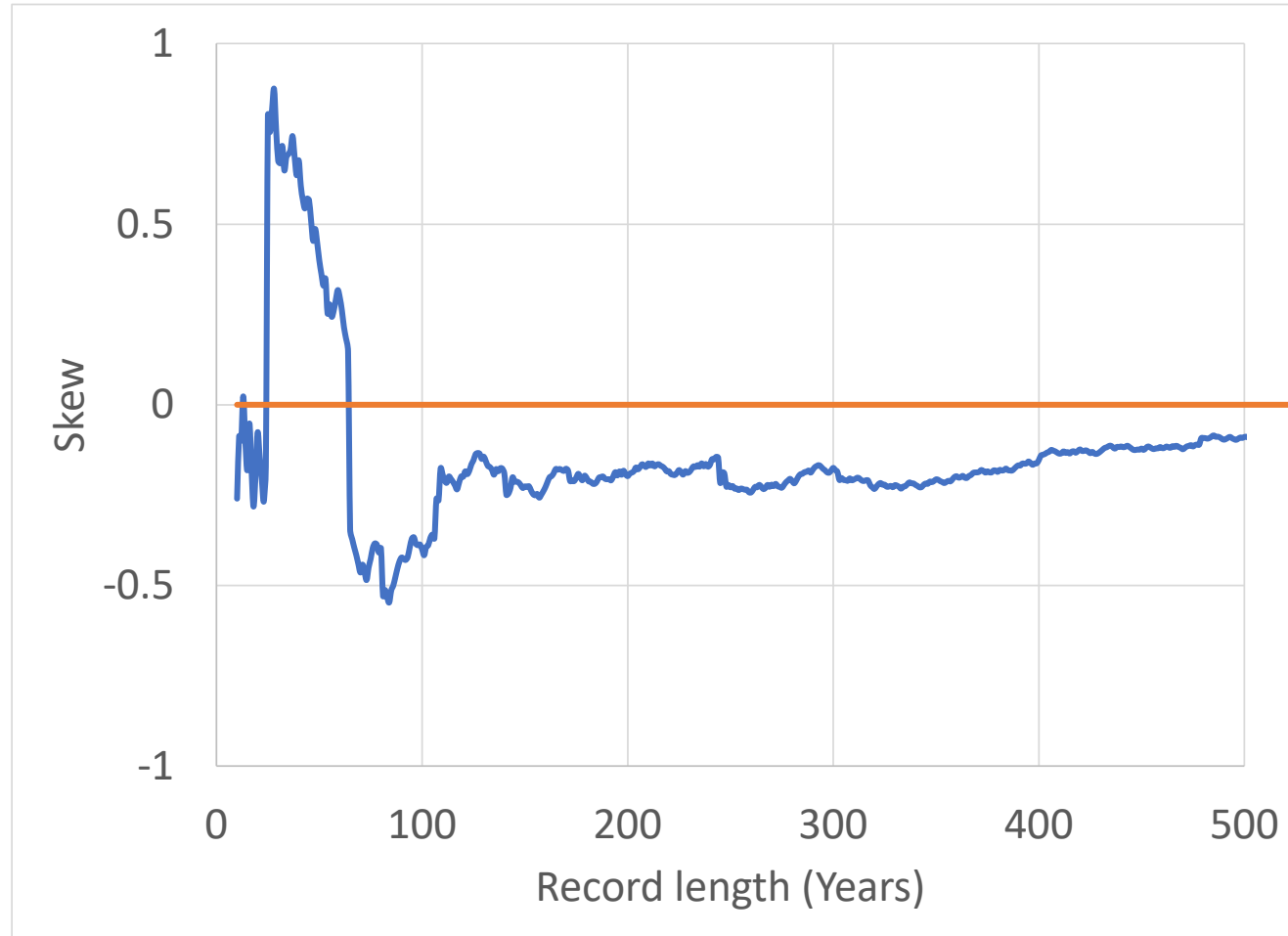


**Otter Brook Dam**

# Skew Parameter



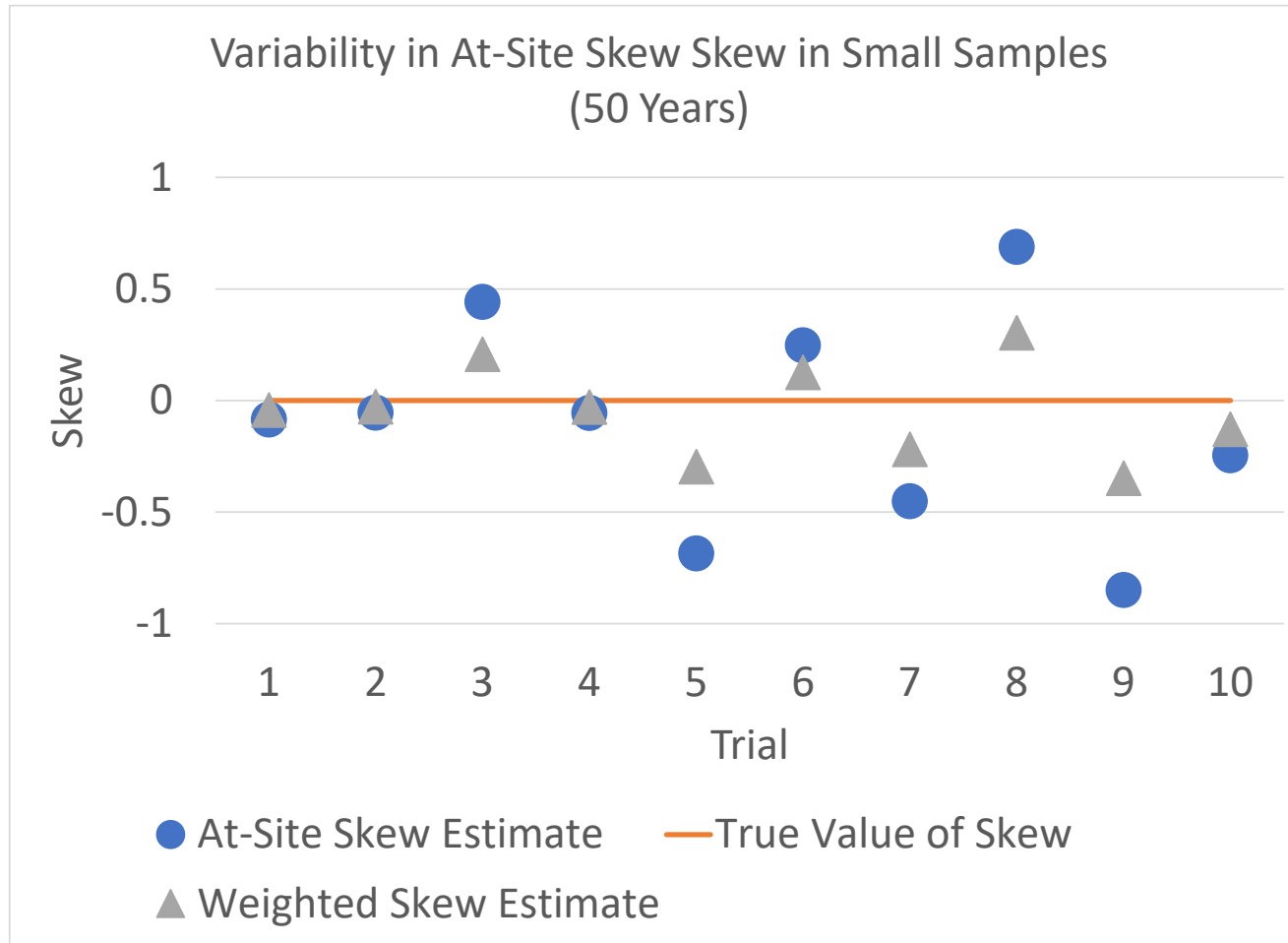
# Skew



- Large uncertainty
- Sensitive to extremes


# Regional Skew

- Trade space for time



# Flood Frequency Reports

An official website of the United States government [Here's how you know](#)



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## Flood Frequency Reports

ACTIVE

By [Water Resources](#) February 16, 2021



Overview

Science

Publications

Web Tools

Flood-frequency analysis provides information about the magnitude and frequency of floods based on records of annual maximum instantaneous peak discharges. Accurate flood-frequency estimates, created using consistent and uniformly applied methods, are a key component of any effective flood risk and management program. This is a list of current USGS flood frequency reports published by state.

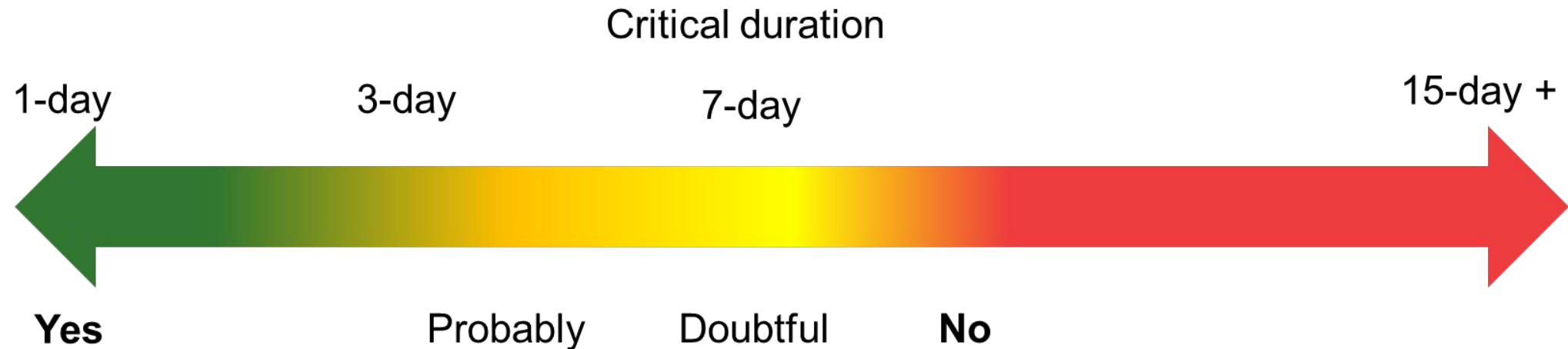
### Contacts

**USGS Flood Frequency and B17C**  
Email: [gs\\_b17c@usgs.gov](mailto:gs_b17c@usgs.gov)



# When to Use Regional Skew

- Watershed
  - Location
  - Size
- Critical duration
- Skew value



**Okay to use a peak flow regional skew estimate?**

# Where to Find Regional Skew

Model	Regression parameter	$\sigma_{\delta}^2$	ASEV	AVP <sub>new</sub>	Pseudo $R_{\delta}^2$ (percent)
CONSTANT:	-0.07	0.17	0.010	0.18	0

Regional skew value

Mean square error (MSE)

Based on the Bayesian GLS regression analysis, a constant generalized-skew value of **-0.019\*** was determined to be the most reasonable approach to predicting the generalized skew in the study area

The mean square error (MSE) associated with the constant generalized-skew model is **0.143**

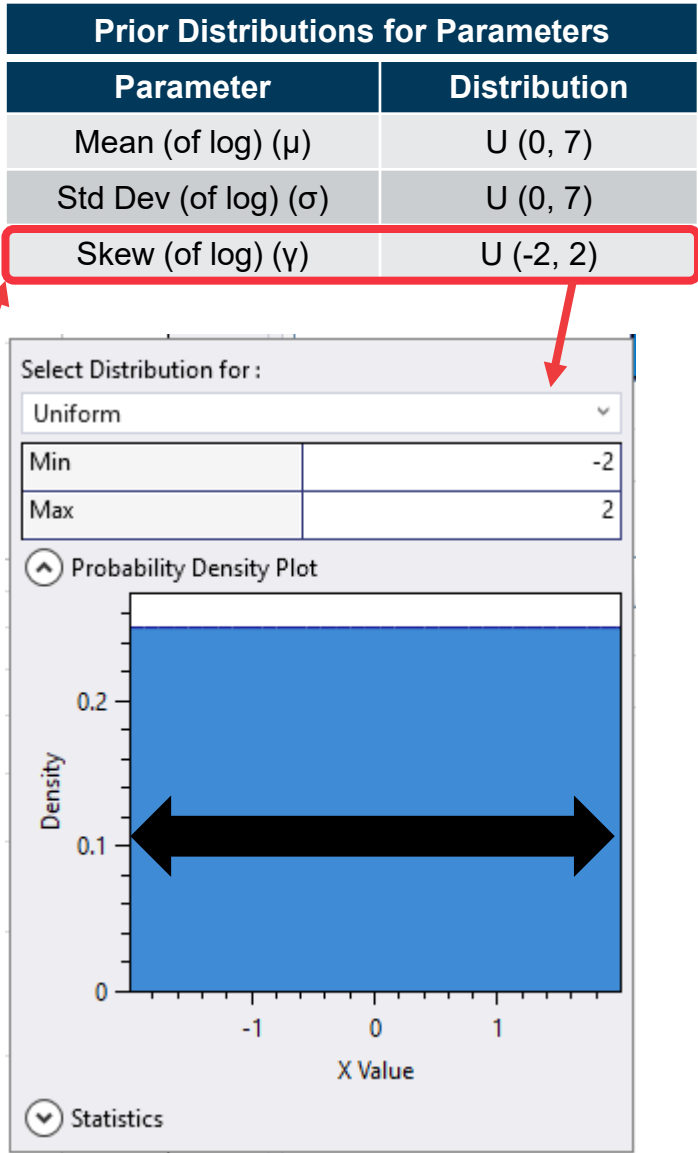
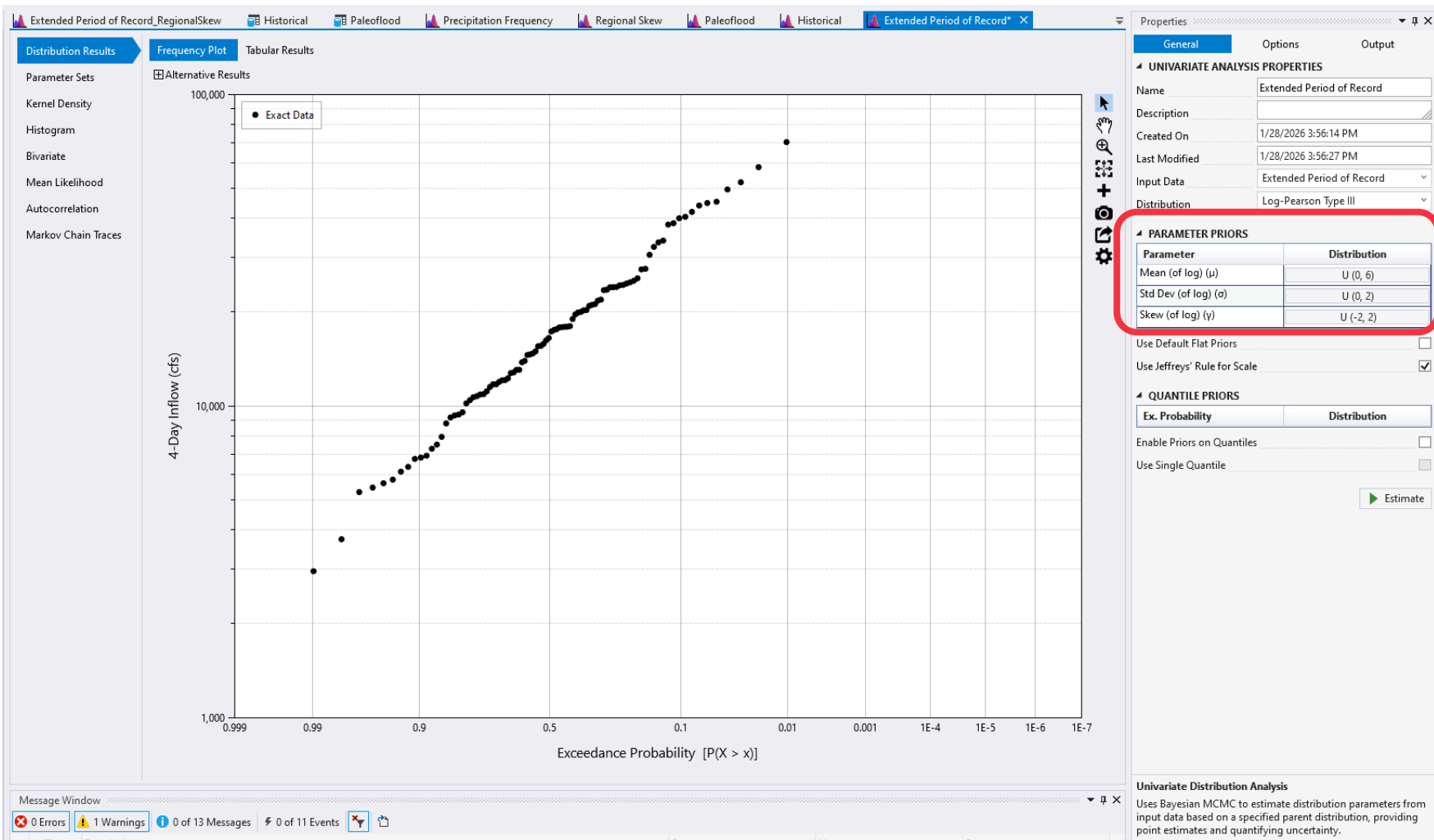
\*Regional skew value

Mean square error (MSE)

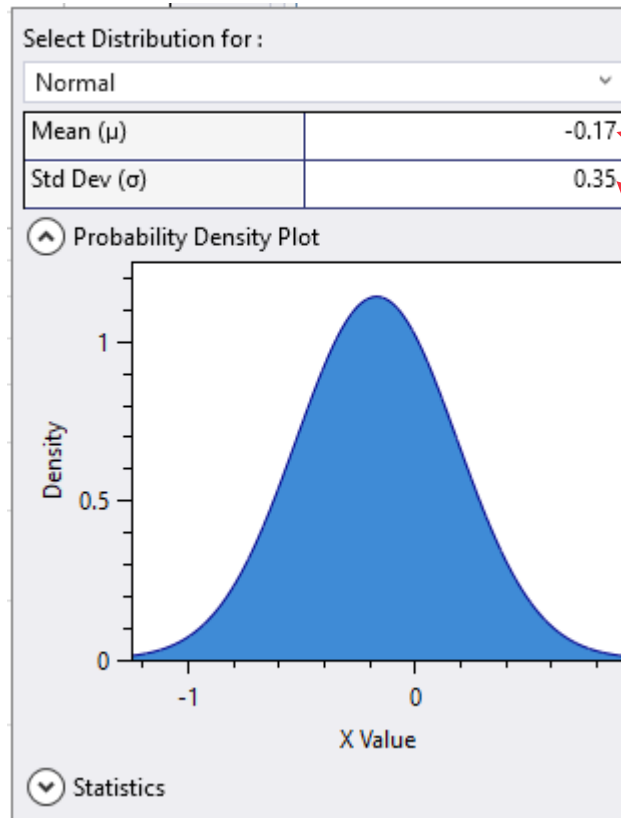
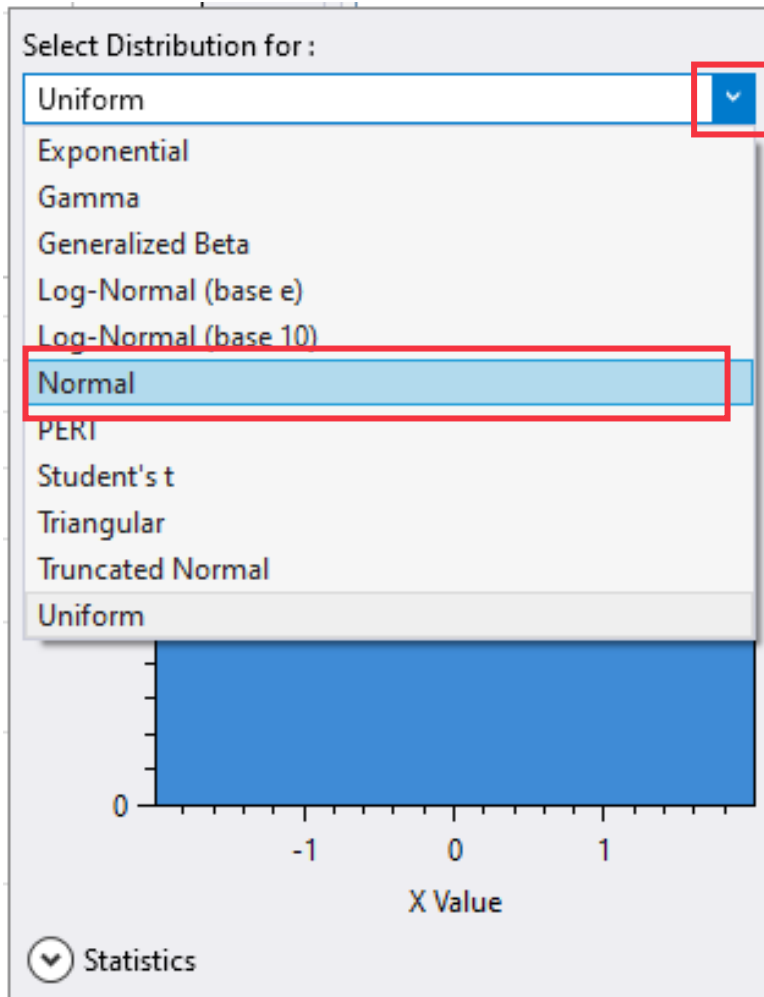




# Prior Distribution Skew Parameter (1 of 2)

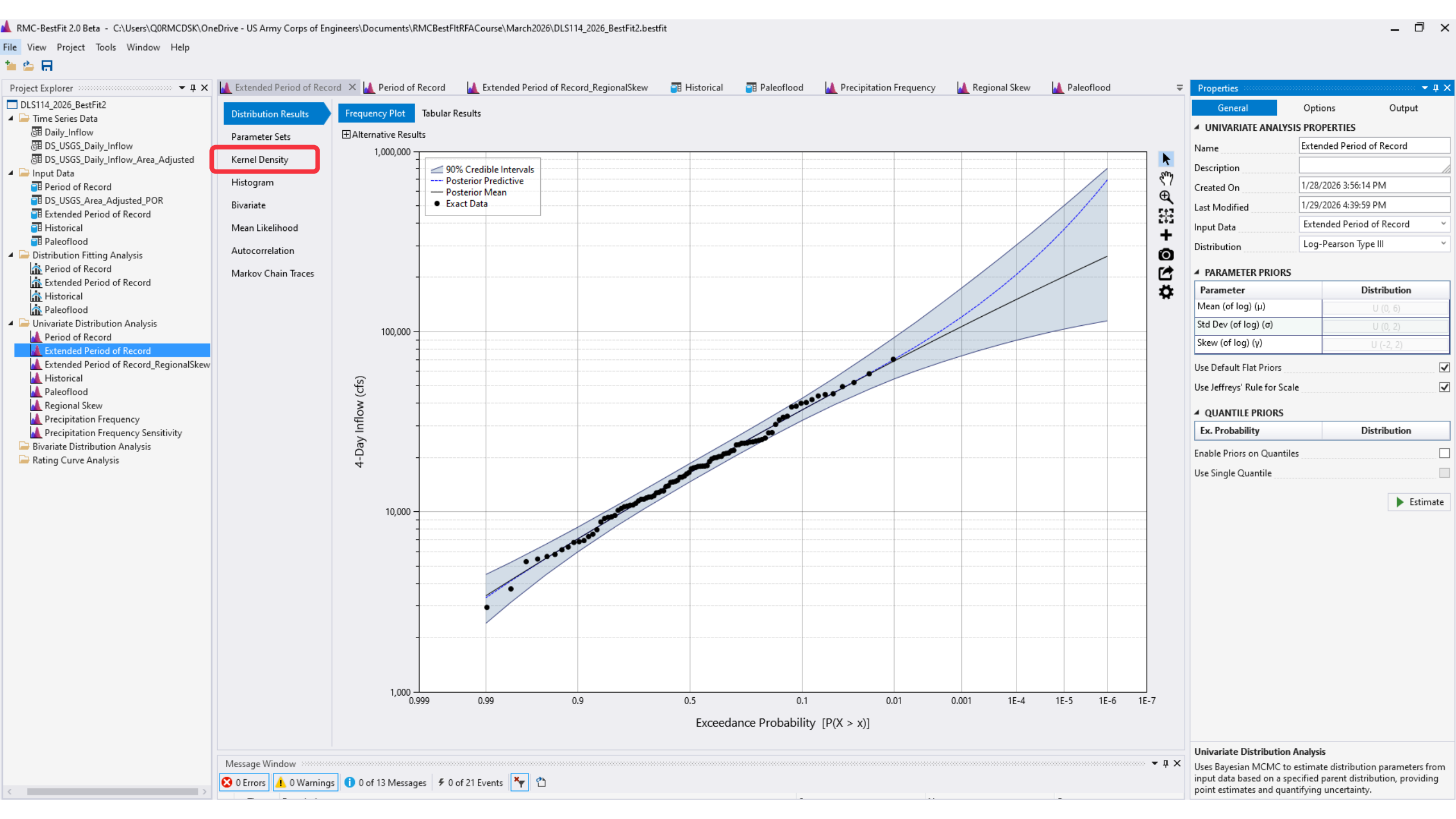


# Prior Distribution Skew Parameter (2 of 2)



Mean = Regional skew value

Standard deviation =  $\sqrt{\text{Mean square error (MSE)}}$



Properties

General

Options

Output

UNIVARIATE ANALYSIS PROPERTIES

Name

Extended Period of Record

Description

Created On

1/28/2026 3:56:14 PM

Last Modified

1/29/2026 4:39:59 PM

Input Data

Extended Period of Record

Distribution

Log-Pearson Type III

PARAMETER PRIORS

Parameter	Distribution
Mean (of log) ( $\mu$ )	U (0, 5)
Std Dev (of log) ( $\sigma$ )	U (0, 2)
Skew (of log) ( $\gamma$ )	U (-2, 2)

Use Default Flat Priors

☒

Use Jeffreys' Rule for Scale

☒

QUANTILE PRIORS

Ex. Probability	Distribution
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Enable Priors on Quantiles

☐

Use Single Quantile

☐

Estimate

Univariate Distribution Analysis

Uses Bayesian MCMC to estimate distribution parameters from input data based on a specified parent distribution, providing point estimates and quantifying uncertainty.

Message Window

0 Errors

0 Warnings

0 of 13 Messages

0 of 21 Events

Distribution Results

Parameter Sets

Kernel Density

Histogram

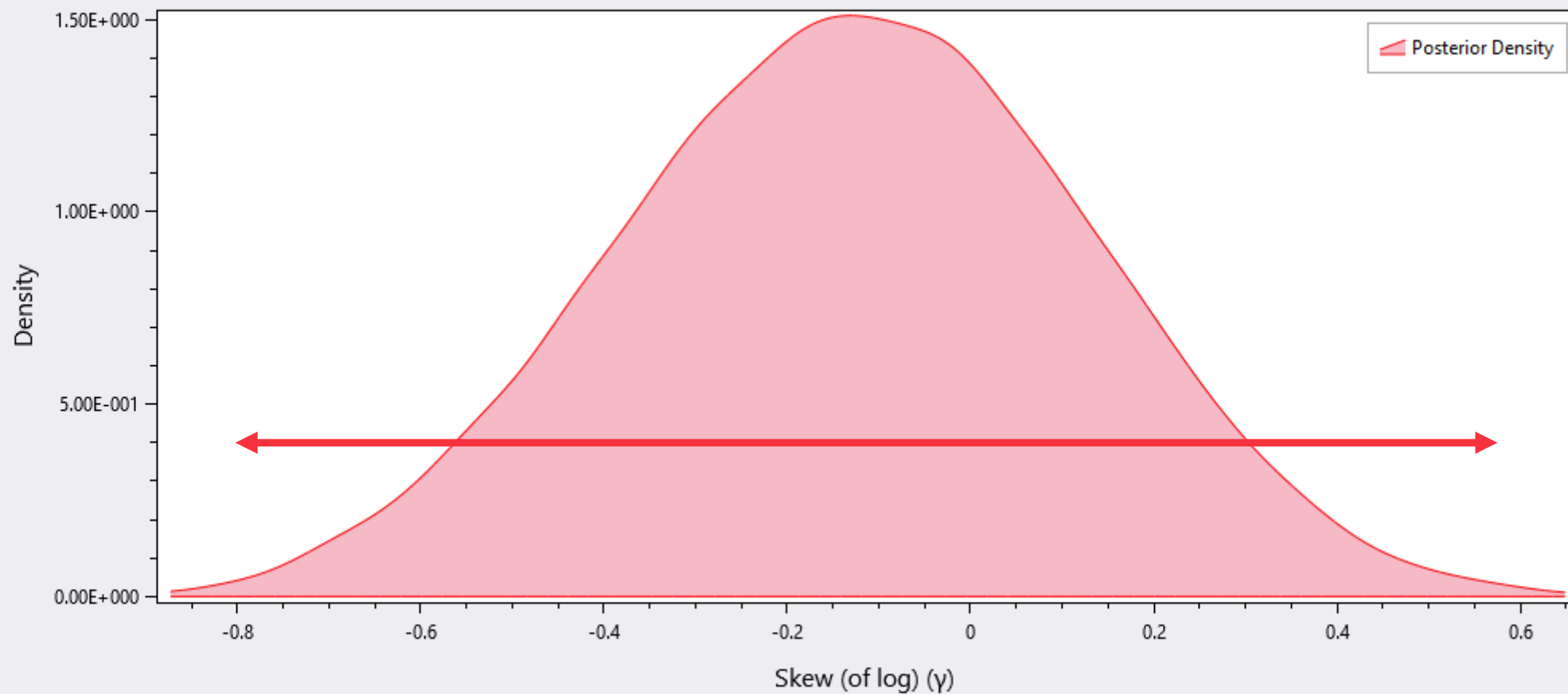
Bivariate

Mean Likelihood

Autocorrelation

Markov Chain Traces

Select Parameter

Skew (of log) ( $\gamma$ )☐ Show Prior

Summary Statistics

Rhat	ESS	Mean	Std Dev	5.0%	50%	95.0%
1.000	9,564	-0.1263	0.2529	-0.5461	-0.1247	0.2878



Distribution Results

Parameter Sets

Kernel Density

Histogram

Bivariate

Mean Likelihood

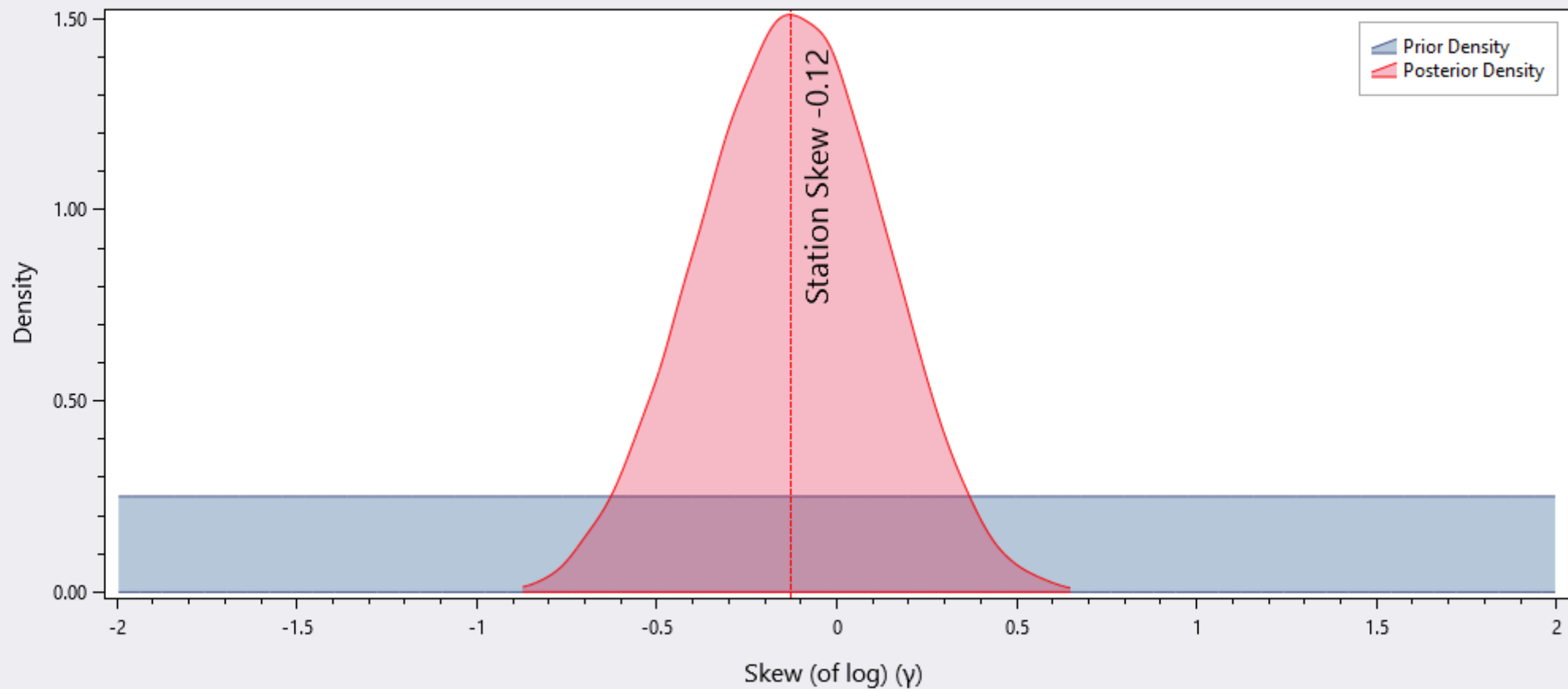
Autocorrelation

Markov Chain Traces

Select Parameter

Skew (of log) ( $\gamma$ )

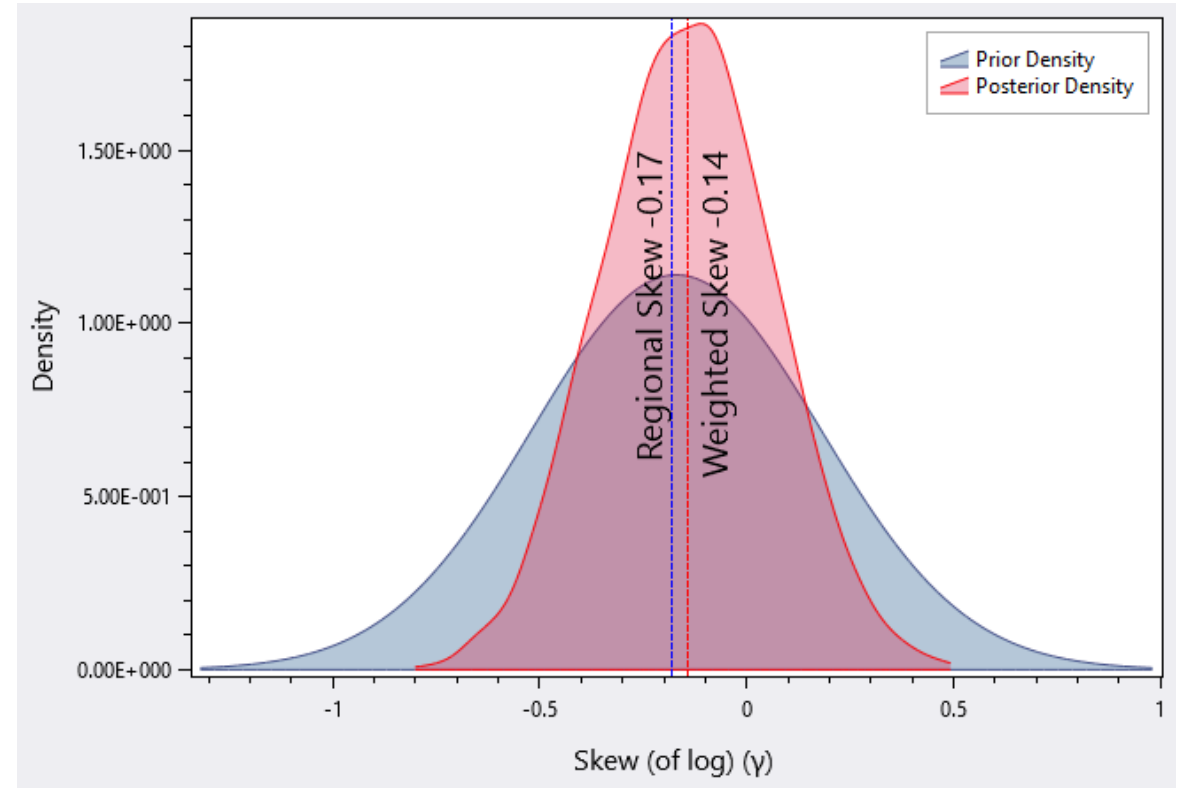
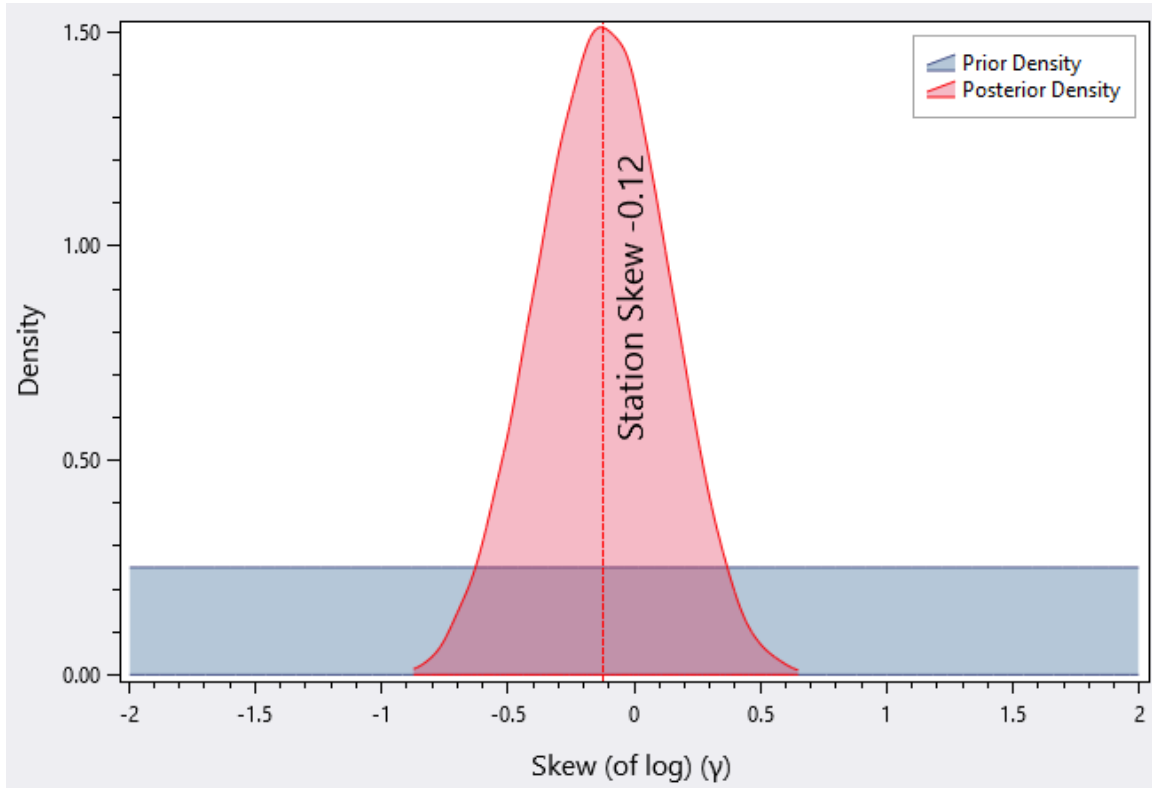
☒ Show Prior



Summary Statistics

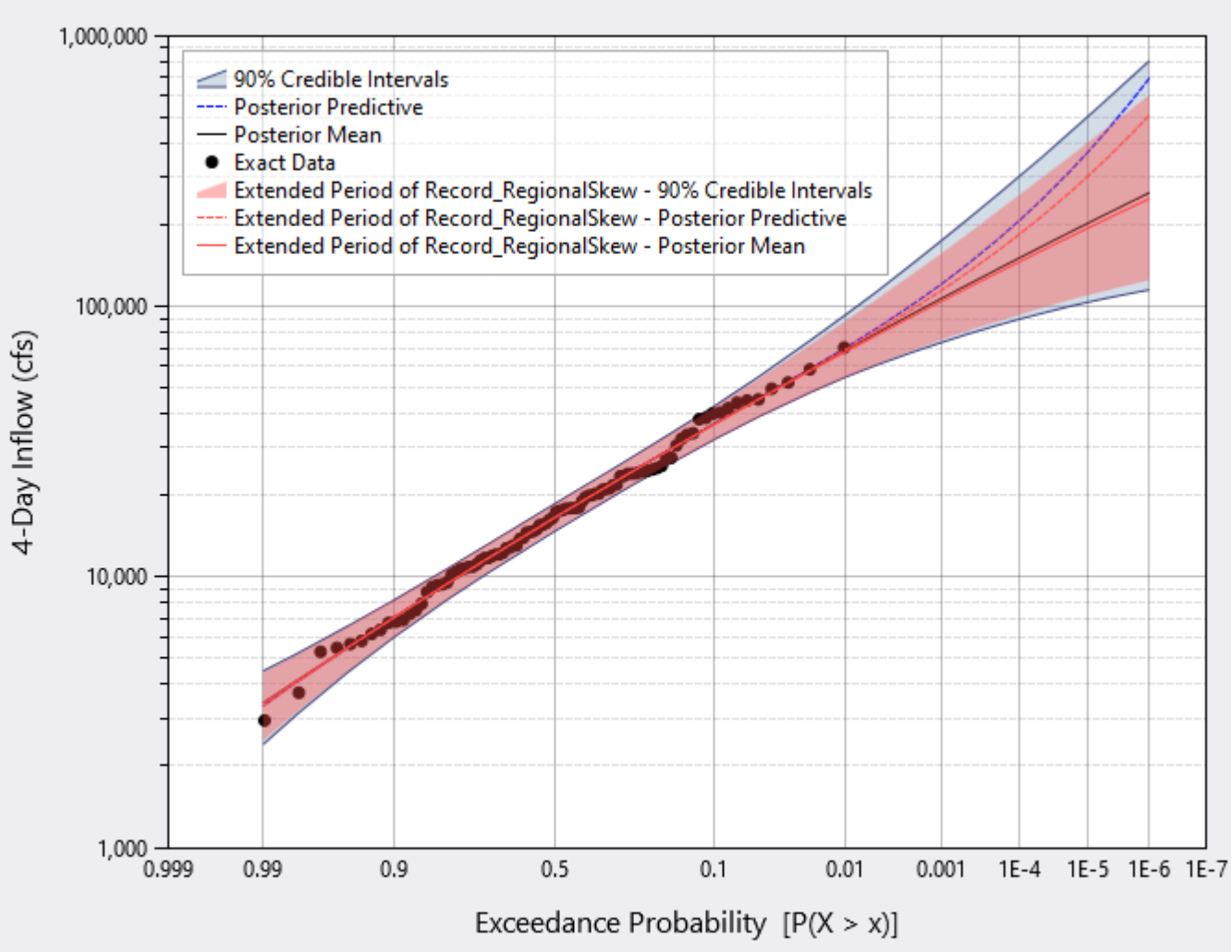
Rhat	ESS	Mean	Std Dev	5.0%	50%	95.0%
1.000	9,564	-0.1263	0.2529	-0.5461	-0.1247	0.2878

# Weighted Skew Example





# Weighted Skew Example Results



## Station Skew

### Summary Statistics

Measure	Posterior Mean
Mean (of log) ( $\mu$ )	4.2116
Std Dev (of log) ( $\sigma$ )	0.2802
Skew (of log) ( $\gamma$ )	-0.1263

## Weighted Skew

### Summary Statistics

Measure	Posterior Mean
Mean (of log) ( $\mu$ )	4.2111
Std Dev (of log) ( $\sigma$ )	0.2790
Skew (of log) ( $\gamma$ )	-0.1433



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# ? Questions

