Instructions for running R scripts:

1. Install required R packages: “evir”, “akima”
2. Ensure that the working directory is set to the R folder containing the scripts.

Running the bootstraps for each *w* simultaneously on multicore PC:

Bootstrap scripts for each method are designed to run simultaneously for different values of the *w* parameter in separate instances of R on a multiple-core PC. The SpawnBoot.R script controls this automatically in Windows by running multiple instances of Rscript.exe in the background.

1. Start R and set the working directory to the folder containing the R scripts.
2. Open the SpawnBoot.R script:
    a. Set the value of ncores to the number of available cores.
    b. Remove # to activate the Src parameter for the desired bootstrap.
3. To start with first *w* value, delete the Nextw.Rdata file if it exists.
4. Run the script and wait until the results files for each *w* appear in the BootData sub-folder.
5. It helps to monitor progress using Resource Monitor until all instances of Rscript.exe close.
6. Run script again until bootstraps are complete for all *w* values.
7. Run the consolidation script for the bootstrap method, e.g., Epoch.Consolidate.R, to combine the individual runs into a single Rdata file.
8. The individual files in BootData may now be deleted.

Charting scripts:

The charting scripts Epoch.plot.R, Pot.plot.R, etc., plot more charts in more combinations of parameter than are included in the published paper. The scripts are in the state they were last run, and the user may need to make minor adjustments. In some cases, setting SVG<-TRUE will send the chart to an .SVG file. In other cases lines calling the svg() function and the dev.off() function to close the file have been commented out by the # character.

Consolidated Rdata files:

The consolidated Rdata file for each bootstrap contain two R dataframes, named: “means” and “variances”.

Each row presents a particular set of source parameters and the ensemble mean & variance of the 10^4 trials for all bootstrapped parameters.

The column headings use a common (almost) coding system to identify the parameter to allow convenient addressing by the R scripts. The source parameters vary between methods as indicated below:

Source parameter column headings:

w	– the source Weibull index, *w*	All methods
R	– the source number of epochs, *R*	Epoch methods only
M	– the number of ranks fitted, *M*	POT methods only
PI	– the source characteristic product, Π	Epoch and POT methods
r	– the source annual rate, *r*	Phase 2, Weibull-POT methods only
mu	– the GEV source location, μ	Phase 3, GEV source only
sigma	– the GEV source scale, σ	Phase 3, GEV source only
xi	– the GEV shape location, ξ	Phase 3, GEV source only

Bootstrapped parameter column headings:

The fitting methods are identified by the codes:

grg with G – the Gringorten-Cook-Harris epoch method fitting *U* and *D* using source *w*.

grw with W – the Gringorten-Cook-Harris epoch method fitting *U, D* and *w*.

xms with X – the XIMIS POT method fitting *U* and *D* using source *w*.

xmw with W – the XIMIS POT method fitting *U, D* and *w*.

gev with G – the GEV epoch method fitting μ, σ and ξ.

gpd with G – the GPD POT method fitting *u*, σ and ξ.

The fitted parameters are identified by a single letter preceding the method code:

U – the mode, *U*, GEV location, μ, or GPD threshold, *u*.

D – the dispersion, *U*, or GEV/GPD scale, σ.

w – the shape index, *w*.

except for the GEV/GPD shape parameter which is “shp”.

So “Uxms” and “Dxms” identify the mode and dispersion for the XIMIS method using source *w*, while , “Ugev” and “Dgev” identify the location and scale parameters of the GEV method.

Exceptions to these general rules are:

1. In the POT data files the GPD location, scale and shape parameters are: “u”, “scl” and “shp”, respectively.
2. The Wsens.R20.Rdata file (See below)

The projected *V/D* values are identified by the single uppercase letter method code, followed by the MRI value: hence W50 represents the value for MRI=50 from either the grw or xmw methods, depending on the file.

The Weibull index sensitivity test:

The results of the Phase 2 Weibull index sensitivity test in Wsens.R20.Rdata are in an unique format. Columns headed "w", "M" and "PI" are the source parameters as before. The remaining columns give the fitted modes and dispersions for various percentage errors in the source *w*: "Uw" and "Dw" correspond to no error; "Up10" and "Dp10" correspond to +10% error, while "Um10" and "Dm10" correspond to -10% error. Other percentage errors are ±20%, ±30% and ±50%.