Package ‘CDFt’

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Title Statistical downscaling through CDF-transform

Author Mathieu Vrac <mathieu.vrac@lsce.ipsl.fr> and Paul-Antoine Michelangeli <pam@climpact.com>

Maintainer Mathieu Vrac <mathieu.vrac@lsce.ipsl.fr>

Depends R (>= 1.8.0)

Description This package proposes a statistical downscaling method for cumulative distribution functions (CDF), as well as the computation of the Cramèr-von Mises statistics U, and the Kolmogorov-Smirnov statistics KS.

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R topics documented:

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Description

Downscales (or corrects the model outputs) cumulative distribution function (CDF) of a climate variable from large- to local-scale by applying a equivalent of proportionality transformation: i.e., based on a CDF representing a variable at large scale (i.e., low spatial resolution) and the equivalent CDF at a local scale (e.g., modeled at a weather station), this method finds a mathematical transformation allowing to go from the large- to the local-scale CDF. Hence, when a new large-scale CDF is given, a new local-scale CDF is downscaled based on this transformation.

Usage

CDFt(ObsRp, DataGp, DataGf, npas=100, dev=2)

Arguments

- **ObsRp**: Observed time series of the variable (e.g., temperature) at the local scale to be used for estimation of the calibration local-scale CDF.
- **DataGp**: Large-scale time series to be used for estimation of the calibration large-scale CDF.
- **DataGf**: Large-scale time series to be used for estimation of the large-scale CDF to be downscaled.
- **npas**: Number of "cuts" for which quantiles will be empirically estimated (Default is 100).
- **dev**: Coefficient of development (of the difference between the mean of the large-scale historical data and the mean of the large-scale future data to be downscaled). This development is used to extend range of data on which the quantiles will be calculated for the CDF to be downscaled (Default is 2).

Details

For details on the mathematical formulation of the transformation used to translate the large-scale CDF to the local-scale one, see the reference below. Note that in this R package, the large-scale data (i.e., DataGp and DataGf) are automatically transformed to have the same mean as the ObsRp time series. This avoid to get out of the range of applicability of the CDFt method. However, the large-scale output CDFs have their initial mean (i.e., not centered).


Value

A message is returned if the "dev" parameter is too small to capture the whole range of the downscaled CDF. Otherwise, CDFt returns a list with components

- **Ds**: Downscaled time series generated by "Quantile-matching" method performed between large-scale CDF to be downscaled, and the local-scale downscaled CDF. Note that the length of this array is equal to the length of DataGf
- **x**: An array containing values of the variable (e.g., temperature) where the downscaled (and other) CDF has been estimated.
CDFt

**FRp**
an array containing the values of the local-scale CDF used for calibration, evaluated at the points in x.

**FGp**
an array containing the values of the large-scale CDF used for calibration, evaluated at the points in x.

**FGf**
an array containing the values of the large-scale CDF used for downscaling, evaluated at the points in x.

**FRf**
an array containing the values of the downscaled CDF evaluated at the points in x.

**Author(s)**

M. Vrac (mathieu.vrac@lsce.ipsl.fr) and P.-A. Michelangeli (pam@climpact.com)

**See Also**

*CramervonMisesTwoSamples,KolmogorovSmirnov*

**Examples**

```r
## Example

### Generation of example data
O <- rnorm(2100,mean=0,sd=1)
Gp <- rnorm(300,mean=3,sd=1)
Gf <- rnorm(300,mean=4,sd=1)

### Call of the CDFt method
CT <- CDFt(O,Gp,Gf)

x <- CT$x
FGp <- CT$FGp
FGF <- CT$FGF
FRp <- CT$FRp
FRF <- CT$FRF
ds <- CT$DS

### Plot the results
par(mfrow=c(1,2))

plot(x, FGp,type="1",lty=2,ylim=c(0,1),xlab="x",ylab="CDF(x)")
lines(x,FGF,type="1",lty=2,col=2)
lines(x,FRp,type="1")
lines(x,FRF,type="1",col=2)

plot(Gf,ds,xlab="Large-scale data", ylab="Downscaled data")
```

CramerVonMisesTwoSamples

Computation of the two-sample Cramer-von Mises statistics

Description

This function computes the two-sample Cramer-von Mises statistics U.

Usage

CramerVonMisesTwoSamples(S1, S2)

Arguments

  S1  Vector containing the sample 1 from which CDF1 will be estimated.
  S2  Vector containing the sample 2 from which CDF2 will be estimated.

Details

CDF1 and CDF2 are estimated empirically to compute the two-sample Cramer-von Mises statistics.

Value


Author(s)

  P.-A. Michelangeli (pam@climpact.com) and M. Vrac (mathieu.vrac@lsce.ipsl.fr)

References


See Also

  KolmogorovSmirnov.CDFt
KolmogorovSmirnov

Computation of the Kolmogorov-Smirnov statistics

Description
This function computes the Kolmogorov-Smirnov statistics (KS).

Usage
KolmogorovSmirnov(S1, S2)

Arguments
S1 Vector containing the sample 1 from which CDF1 will be estimated.
S2 Vector containing the sample 2 from which CDF2 will be estimated.

Details
CDF1 and CDF2 are estimated empirically to compute the Kolmogorov-Smirnov statistics.

Value
Returns the value of the Kolmogorov-Smirnov statistics.

Author(s)
P.-A. Michelangeli (pam@climpact.com) and M. Vrac (mathieu.vrac@lsce.ipsl.fr)

References

See Also
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