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Description Tool functions that can be used by several madrat-dependent or magpie4 output functions.

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URL https://github.com/pik-piam/magpie4, https://doi.org/10.5281/zenodo.1158582

BugReports https://github.com/pik-piam/magpie4/issues

Depends madrat, magclass (>= 2.40)

Imports magpiesets, stringr

Suggests covr, testthat

Encoding UTF-8

RoxygenNote 7.3.1

Repository https://pik-piam.r-universe.dev

RemoteUrl https://github.com/pik-piam/mstools

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`mstools-package` *mstools: Tool functions that can be used by several madrat-dependent or magpie4 output functions*

Description

Tool functions that can be used by several madrat-dependent or magpie4 output functions.

Author(s)

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Authors:

- Kristine Karstens
- Felicitas Beier
- Jan Philipp Dietrich <dietrich@pik-potsdam.de>

See Also

Useful links:

- https://github.com/pik-piam/magpie4
- doi:10.5281/zenodo.1158582
- Report bugs at https://github.com/pik-piam/magpie4/issues

`toolAggregateCell2Country` *toolAggregateCell2Country*

Description

Aggregate cellular data (with coordinate information) to countries and perform consistency checks

Usage

```
toolAggregateCell2Country(x, weight = NULL, ...)
```

Arguments

`x`	cellular magpie object with coordinates
`weight`	aggregation weight
`...`	additional options forwarded to ‘toolCountryFill‘

Value

return country ISO level data

Author(s)

Jan Philipp Dietrich

`toolCell2isoCell` *toolCell2isoCell*

Description

Sets cell names to "iso country code"."cell number"

Usage

```
toolCell2isoCell(x, cells = "magpiecell")
```

Arguments

`x`	magpie object on cellular level
`cells`	switch between magpie cells (59199) and lpj cells (67420)

Value

return changed input data

Author(s)

Kristine Karstens

`toolConv2CountryByCelltype` *toolConv2CountryByCelltype*

Description

Aggregates cellular data to ISO country level after conversion of cellular data to a specific cell setup (this type is relevant as some settings, such as "magpiecell" remove some cells and therby affect country sums)

Usage

```
toolConv2CountryByCelltype(x, cells)
```

Arguments

`x`	magpie object on cellular level
`cells`	switch between 59199 ("magpiecell") and 67420 ("lpjcell") cells

Value

return selected input data on ISO country level

Author(s)

Jan Philipp Dietrich

`toolCoord2Isocell` *toolCoord2Isocell*

Description

Transforms an object with coordinate spatial data (on half-degree) to isocell (59199) standard

Usage

```
toolCoord2Isocell(
  x,
  cells = "magpiecell",
  fillMissing = NULL,
  warnMissing = TRUE
)
```

Arguments

x	Object to be transformed from coordinates to (old) magpie isocell standard
cells	Switch between "magpiecell" (59199) and "lpjcell" (67420)
fillMissing	if NULL cells missing from the total 59199 are just being ignore. If set to a value missing cells will be added with this value (e.g. all set to 0 if fillMissing is 0)
warnMissing	Switch which controls whether missing cells should trigger a warning or not

Value

magpie object with 59199 cells in isocell naming

Author(s)

Kristine Karstens, Felicitas Beier, Jan Philipp Dietrich

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toolCoord2Isocoord *toolCoord2Isocoord*

Description

Transforms an object with coordinate spatial data (on half-degree) to object with 67420 cells and coordinate and iso country information

Usage

```
toolCoord2Isocoord(x)
```

Arguments

x	object to be transformed from coordinates to iso-coordinate object

Value

magpie object with 67420 cells in x.y.iso naming

Author(s)

Felicitas Beier

toolCountryFillBilateral *toolCountryFillBilateral*

Description

Fills bilateral iso-level magpie objects to 249 x 249 countries

Usage

```
toolCountryFillBilateral(x, fill = NA)
```

Arguments

x	input variable, a bilateral magclass object
fill	fill value, default NA

toolExpectLessDiff *toolExpectLessDiff*

Description

tool function for status reporting. It performs a difference check between two objects and returns either a message via `toolStatusMessage`, that the test was successful or that it failed.

Usage

```
toolExpectLessDiff(x, y, maxdiff, description, level = 0, maxdiff2 = NULL)
```

Arguments

x	object 1
y	object 2 which has the same format as object 1
maxdiff	allowed maximum difference per element between x and y.
description	a description of the check
level	as the test result will be linked to a function call, the function needs to know to which call it should be linked. by default (`level = 0`) the parent function call is being used. Increasing the number by one will let the function go up by one in the call stack, `level = -1` will use `toolExpectTrue` itself as function call.
maxdiff2	optional additional threshold. If set it will serve as a second, critial threshold which will throw a warning (instead of a simple note in case of `maxdiff`) if being surpassed.

Author(s)

Jan Philipp Dietrich

See Also

getMadratMessage, toolExpectTrue, toolStatusMessage

Examples

```
toolExpectLessDiff(1:3, 2:4, 10, "data is sufficiently close", level = -1)
getMadratMessage("status")
```

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toolExpectTrue *toolExpectTrue*

Description

tool function for status reporting. It performs a logical check and returns either a message via toolStatusMessage, that the test was successful or that it failed.

Usage

```
toolExpectTrue(check, description, level = 0, falseStatus = "note")
```

Arguments

check	logical check to be run (has to be either TRUE or FALSE)
description	a description of the check
level	as the test result will be linked to a function call, the function needs to know to which call it should be linked. by default (level = 0) the parent function call is being used. Increasing the number by one will let the function go up by one in the call stack, level = -1 will use toolExpectTrue itself as function call.
falseStatus	the type of status that is used when the check fails (typically "note" for a simple message or "warn" for a warning).

Author(s)

Jan Philipp Dietrich

See Also

getMadratMessage, toolExpectLessDiff, toolStatusMessage, toolWriteMadratLog

Examples

```
toolExpectTrue(is.numeric(1), "data is numeric", level = -1)
getMadratMessage("status")
```

`toolFertilizerDistribution` *toolFertilizerDistribution*

Description

Disaggregates fertilizer usage, trying to best match a certain soil nitrogen uptake efficiency (SNUpE). Also used in magpie4 library

Usage

```
toolFertilizerDistribution(
  iteration_max = 50,
  max_snupe = 0.85,
  mapping,
  from,
  to,
  fertilizer,
  SNUpE,
  withdrawals,
  organicinputs,
  threshold = 0.5
)
```

Arguments

`iteration_max`	maximum iteration for downscaling
`max_snupe`	the maximum level of nue or snupe
`mapping`	mapping used for disaggregation
`from`	name of from column in mapping
`to`	name of to column in mapping
`fertilizer`	total inorganic fertilizer to be distributed on regional leve
`SNUpE`	Nitrogen use efficiency or SNUPE on regional level which should be matched best possible
`withdrawals`	nitrogen withdrawals on cell level
`organicinputs`	non-inroganic fertilizer inputs on cell level
`threshold`	threshold in Tg Nr until when the distribution counts as converged

Value

magpie object with fertilizer usage on cell level

Author(s)

Benjamin Leon Bodirsky

toolFreezeEffect *toolFreezeEffect*

Description

This function freeze values given a specific year and optionally additionally at the first non-zero value

Usage

```
toolFreezeEffect(x, year, constrain = FALSE)
```

Arguments

x	data set to freeze
year	year to hold constant (onwards)
constrain	if FALSE, no constrain. Other options: 'first_use' (freeze from 'first use' (<=> !=0))

Value

magpie object with global parameters

Author(s)

Kristine Karstens

toolGetMappingCoord2Country *toolGetMappingCoord2Country*

Description

loads mapping of cellular coordinate data (67420 halfdegree cells) to country iso codes

Usage

```
toolGetMappingCoord2Country(pretty = FALSE, extended = FALSE)
```

Arguments

pretty	If TRUE, coordinate data is returned as numeric 'lon' and 'lat' columns
extended	If TRUE, additional cells missing in the original 67420 data set will be returned as well.

Value

data frame of mapping

Author(s)

Felicitas Beier, Kristine Karstens

`toolHarmonize2Baseline` *toolHarmonize2Baseline*

Description

toolHarmonize2Baseline

Usage

```
toolHarmonize2Baseline(
  x,
  base,
  ref_year = "y2015",
  method = "limited",
  hard_cut = FALSE
)
```

Arguments

`x`	magclass object that should be set on baseline
`base`	magclass object for baseline
`ref_year`	Reference year
`method`	additive: x is harmonized to base by additive factor multiplicative: x is harmonized to base by multiplicative factor limited: multiplicative harmonization, but for an underestimated baseline the signal is limited to the additive term rather than the multiplicative factor
`hard_cut`	Switch to TRUE for data that can not be harmonized, but have to be glued together

Value

the averaged data in magclass format

Author(s)

Kristine Karstens, Felicitas Beier

`toolHoldConstant` *toolHoldConstant*

Description

Holds a historical dataset constant for the entire period `years`.

Usage

```
toolHoldConstant(x, years)
```

Arguments

`x`	MAgPIE object to be continued.
`years`	years for which the data should exist (hold constant, if missing)

Value

MAgPIE object with completed time dimensionality.

Author(s)

Benjamin Leon Bodirsky, Jan Philipp Dietrich

`toolHoldConstantBeyondEnd` *toolHoldConstantBeyondEnd*

Description

Holds a historical dataset constant for the entire simulation period "time".

Usage

```
toolHoldConstantBeyondEnd(x)
```

Arguments

`x`	MAgPIE object to be continued.

Value

MAgPIE object with completed time dimensionality.

Author(s)

Benjamin Leon Bodirsky

toolIso2CellCountries *toolIso2CellCountries*

Description

Select country names of countries which are present on cellular level

Usage

```
toolIso2CellCountries(x, cells = "magpiecell", absolute = NULL)
```

Arguments

x	magpie object on iso country level
cells	switch between 59199 ("magpiecell") and 67420 ("lpjcell") cells
absolute	switch declaring the values as absolute (TRUE) or relative (FALSE) for additional (type-specific) diagnostic information. If not defined (NULL) additional diagnostics will not be shown.

Value

return selected input data

Author(s)

Kristine Karstens, Felicitas Beier, Jan Philipp Dietrich

toolIsocode2Country *toolIsocode2Country*

Description

Translate iso country code to country names

Usage

```
toolIsocode2Country(x)
```

Arguments

x	Array of iso country codes

Value

return array of country names

Author(s)

Kristine Karstens

`toolSmooth` *toolSmooth*

Description

Smooth a time series using a given method and its default settings

Usage

```
toolSmooth(x, method = "spline")
```

Arguments

`x`	magclass object that should be smoothed
`method`	spline, average or more (See default argument for current default setting)

Value

smoothed data in magclass format

Author(s)

Kristine Karstens

`toolStatusMessage` *toolStatusMessage*

Description

tool to trigger status messages describing the data quality at different stages of processing. Messages are directly written to the log at execution but also collected to be finally returned as data report.

Usage

```
toolStatusMessage(status, message, level = 0)
```

Arguments

status	status indicator of the messages. Currently either "ok" (check succesful / quality ok), "note" (check unsuccessful but still acceptable) or "warn" (check unsuccessful / undesired result).
message	message to be triggered.
level	as the test result will be linked to a function call, the function needs to know to which call it should be linked. by default (level = 0) the parent function call is being used. Increasing the number by one will let the function go up by one in the call stack, level = -1 will use toolExpectTrue itself as function call.

Author(s)

Jan Philipp Dietrich

See Also

getMadratMessage, toolExpectLessDiff, toolStatusMessage

Examples

```
toolStatusMessage("ok", "everything is ok", level = -1)
toolStatusMessage("note", "this is not optimal but probably acceptable", level = -1)
toolStatusMessage("warn", "this is not ok", level = -1)
getMadratMessage("status")
```

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toolSum2Country *toolSum2Country*

Description

Efficient method to sum cellular data with country dimension as first sub-dimension to country level

Usage

```
toolSum2Country(x)
```

Arguments

x	magpie object on cellular level with countries in dim 1.1

Value

return selected input data on ISO country level

Author(s)

Jan Philipp Dietrich

toolWriteMadratLog *toolWriteMadratLog*

Description

Tool function for writing madrat messages to a log file. Useful after running madrat calculations which are performing checks via `toolExpectTrue` or other toolExpect functions.

Usage

```
toolWriteMadratLog(
  checkResults = getMadratMessage("status"),
  logPath = "status.log"
)
```

Arguments

`checkResults`	list of check results as returned by `getMadratMessage`
`logPath`	path to the log file to be written

Author(s)

Pascal Sauer

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