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

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

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mstools-package	<i>mstools: Tool functions that can be used by several madrat-dependent or magpie4 output functions</i>
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Description

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

Author(s)

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See Also

Useful links:

- <https://github.com/pik-piam/magpie4>
- [doi:10.5281/zenodo.1158582](https://doi.org/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	<i>toolCell2isoCell</i>
------------------	-------------------------

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	<i>toolConv2CountryByCelltype</i>
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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 thereby 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	<i>toolCoord2Isocell</i>
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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

toolCoord2Isocoord	<i>toolCoord2Isocoord</i>
--------------------	---------------------------

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

Value

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

Author(s)

Felicitas Beier, Michael Crawford

toolCountryFillBilateral	<i>toolCountryFillBilateral</i>
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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	<i>toolExpectLessDiff</i>
--------------------	---------------------------

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, 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
maxdiff2	optional additional threshold. If set it will serve as a second, critical 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")
getMadratMessage("status")
```

toolExpectTrue	<i>toolExpectTrue</i>
----------------	-----------------------

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, falseStatus = "note")

Arguments

check	logical check to be run (has to be either TRUE or FALSE)
description	a description of the check
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")
getMadratMessage("status")
```

toolFertilizerDistribution	<i>toolFertilizerDistribution</i>
----------------------------	-----------------------------------

Description

Disaggregates fertilizer usage to best match soil nitrogen uptake efficiency (snupe).

Usage

```
toolFertilizerDistribution(  
  iterMax = 50,  
  maxSnupe = 0.85,  
  fertilizer,  
  mapping = NULL,  
  from = NULL,  
  to = NULL,  
  snupe,  
  withdrawals,  
  organicinputs,  
  threshold = 0.5,  
  progress = TRUE  
)
```

Arguments

iterMax	Maximum number of iterations for downscaling. 10 iterations are done at least.
maxSnupe	Maximum allowed snupe (used to cap NA's during iteration)
fertilizer	Total inorganic fertilizer to distribute (regional level)
mapping	mapping used for disaggregation
from	name of from column in mapping
to	name of to column in mapping
snupe	Regional soil nitrogen uptake efficiency
withdrawals	Nitrogen withdrawals at the cell level
organicinputs	Non-inorganic fertilizer inputs at the cell level
threshold	Tg N difference below which we consider convergence "good enough"
progress	Logical, should progress messages be printed

Value

magpie object of fertilizer usage at cell level

Author(s)

Benjamin Leon Bodirsky, Michael Crawford

toolFreezeEffect	<i>toolFreezeEffect</i>
------------------	-------------------------

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	<i>toolGetMappingCoord2Country</i>
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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	<i>toolHoldConstant</i>
------------------	-------------------------

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	<i>toolHoldConstantBeyondEnd</i>
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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 = "lpjcell", absolute = NULL)
```

Arguments

<code>x</code>	magpie object on iso country level
<code>cells</code>	switch between 59199 ("magpiecell") and 67420 ("lpjcell") cells
<code>absolute</code>	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

<code>x</code>	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)
```

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.

Details

The function which a message is attached to is selected automatically: it is the innermost function call in the call stack whose name follows madrat function naming conventions (starting with download, correct, convert, read, calc or full, followed by an upper case letter), thereby skipping engine functions such as readSource or calcOutput as well as helper functions (e.g. toolExpectTrue). This ensures that the message ends up in the cache file of this function and of all functions depending on it. If no such function is found in the call stack, the nearest enclosing named function call is being used, or .GlobalEnv if there is none.

Author(s)

Jan Philipp Dietrich

See Also

[getMadratMessage](#), [toolExpectLessDiff](#), [toolStatusMessage](#)

Examples

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

toolSum2Country	<i>toolSum2Country</i>
-----------------	------------------------

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	<i>toolWriteMadratLog</i>
--------------------	---------------------------

Description

Tool function for writing madrat messages to a log file in the YAML format. 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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