

The new starter package for ICON-CLM including the runtime environment SPICE

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Special thanks to

- *Trang Van Pham for creating the initial version in 2018 on the basis of the COSMO-CLM SP*
- *Ronny Petrik and Beate Geyer for implementing EVA-Suite lite*
- *Susanne Brienen and Christian Steger for implementation at DWD NEC*

Motivation

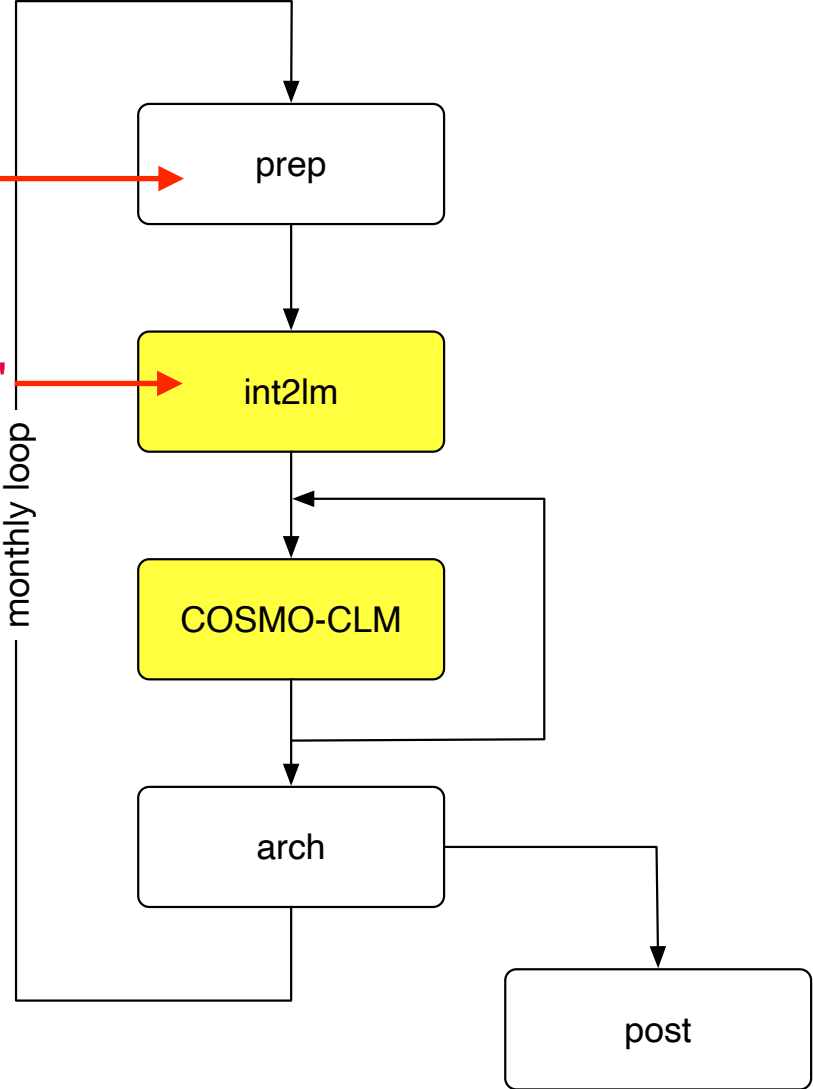
- ICON-CLM needs a starter package for newbies like the COSMO-CLM starter package (which is used also in the training course containing a runtime environment for climate simulations and an input data sets for initial tests).
- For long term simulations ICON-CLM needs a runtime environment similar to COSMO-CLM
- The Starter Package for **ICON-CLM** Experiments (**SPICE**) should have the similar structure as the the Starter Package for Experiments with **COSMO-CLM** (**SPECC**)
- Latest versions of SPICE will be distributed through RedC
<https://redc.clm-community.eu/projects/icon-clm-starter-package/wiki/SPICE>
- The online documentation <http://spice.clm-community.eu> is only valid for the latest SPICE version. Older document versions are stored on RedC as a PDF conversion of the web site.

Model Chain (subchain)

SPECC

get caf files

yinput_model='CM'



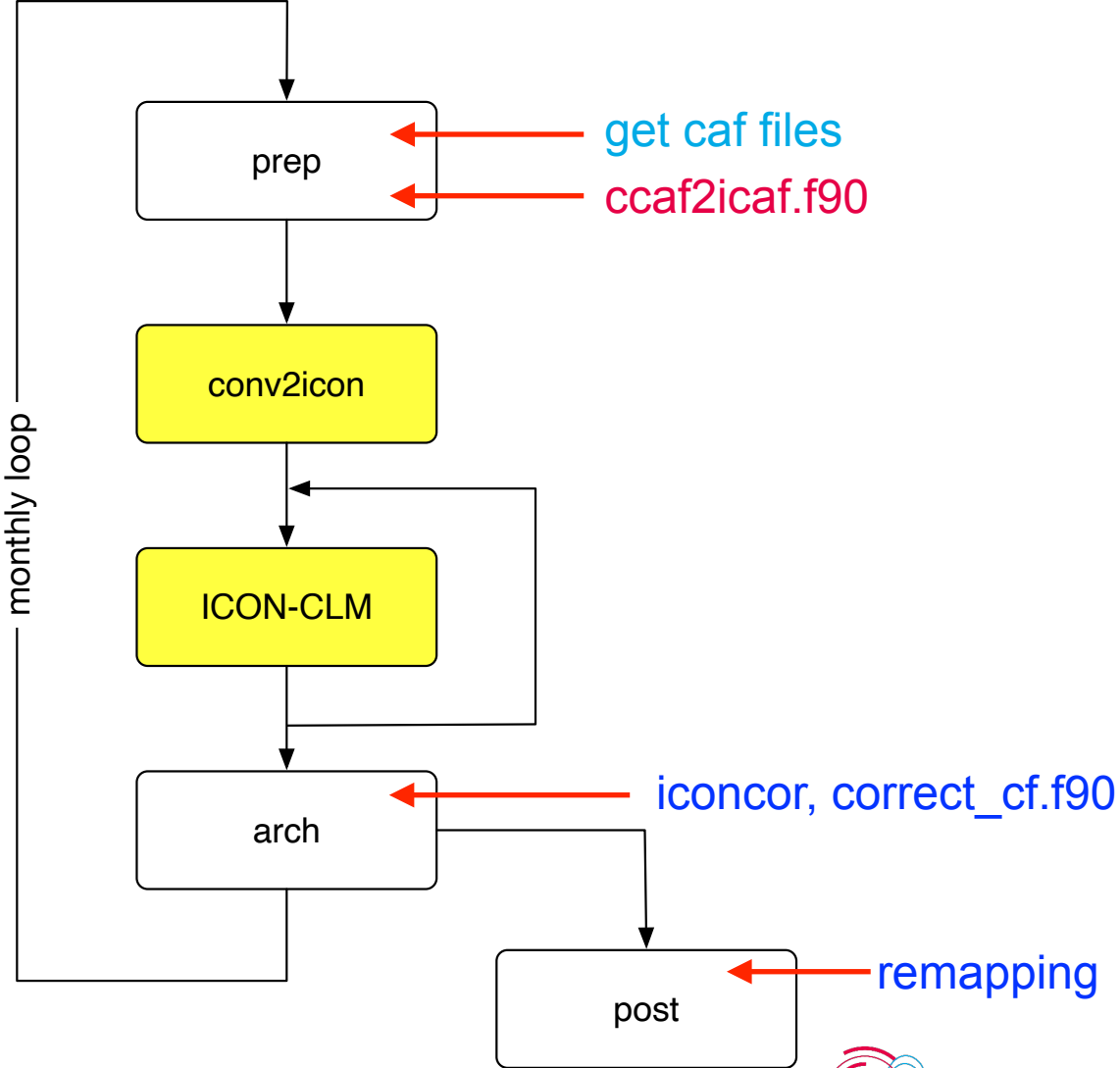
SPICE

get caf files

ccaf2icaf.f90

iconcor, correct_cf.f90

remapping



Mandatory Data



Initial and Boundary Data for

SPECC	SPICE
COSMO for double nesting	ICON for double nesting
IFS	IFS
Standard Climate Data Format (caf files) conversion of all major re-analyses and global climate models available	NO internal interface in ICON for re-analyses (except IFS) and global climate models

As a work around an external interface was developed to convert caf files into IFS format.

Domain Characteristics

	SPECC	SPICE
External Data (orography etc.)	EXTPAR through WebPEP	EXTPAR through the ICON Webservice*
Grid Parameter	Namelist input by user	Through the ICON Webservice*
Grid Parameter for interpolation of output fields	N/A	Any file that contains rlon, rlat, lon, lat, rotated_pole

*Help programs are available to determine basic grid values Rxx, Byy and fill out the ICON Webservice

Radiation

	SPECC	SPICE
Aerosol and cloud properties	Internally defined	Read in through additional data files depending on radiation scheme
Greenhouse gas concentrations	Internally defined. Select through namelist	Read in through additional data files

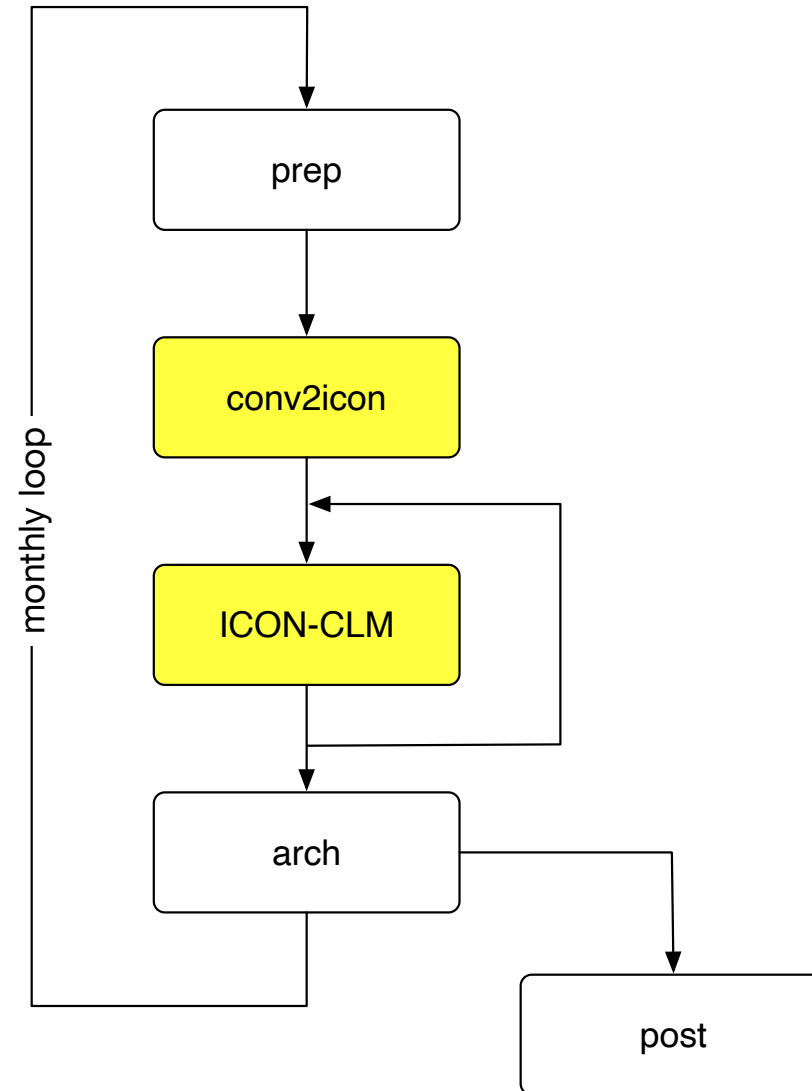
Name Mapping

	SPECC	SPICE
boundary to internal	N/A	Read by ICON from file. Default name: dict.latbc
internal to output	N/A	Read in post-processing from file. Default: mapping_to_cosmo.csv

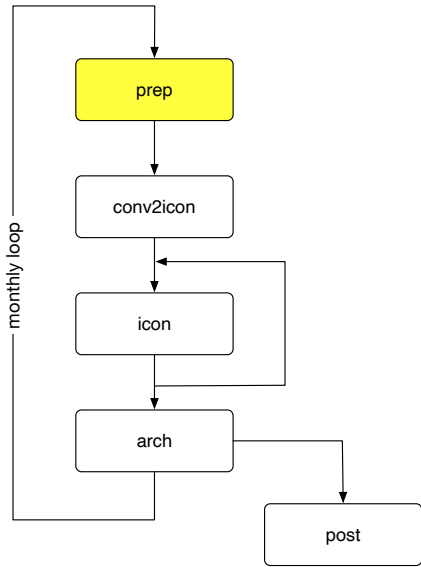
Job Chain in SPICE



Model Chain



Pre-Processing (prep)



Purpose:

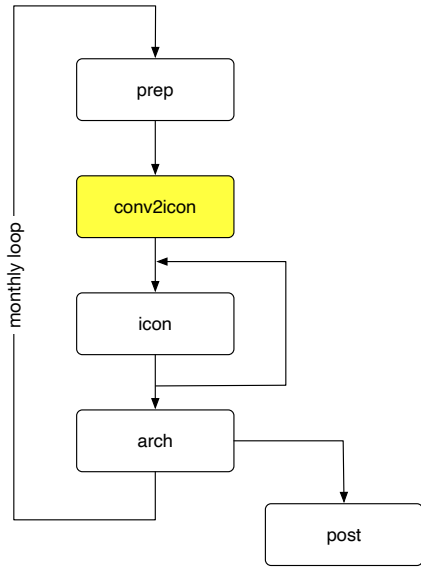
- gets initial and boundary data (caf files) month by month from the archive (e.g. /pool/data/CCLM/reanalyses/ERA5)
- converts caf files with the program ccac2icaf to mimic IFS ICON input files

ccac2icaf

converts caf-files used for COSMO-CLM into a IFS-like netCDF file

- works presently only for hybrid pressure coordinates (i.e. not for NCEP, sigma, or HadGEM, hybrid height)
- to be replaced in future by a general implementation in the ICON code

Interpolation to ICON Grid (conv2icon)



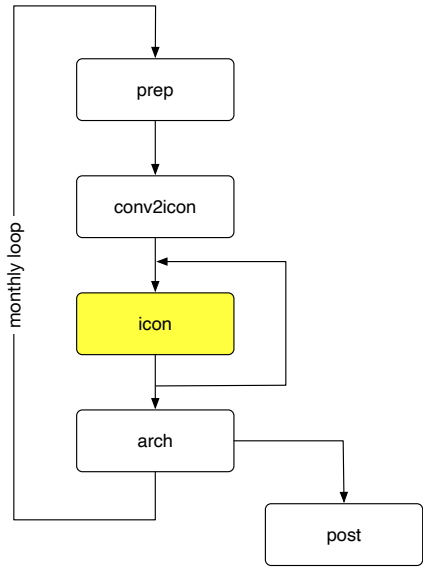
Purpose:

- horizontal remapping to ICON grid with CDO

Main difference to INT2LM

- INT2LM interpolates coarse grid data horizontally and vertically.
 - Data will be COSMO-CLM ready.
- CONV2ICON remaps GCM data horizontally to ICON grid with CDO.
 - The vertical interpolation is done in ICON itself.

ICON-CLM simulation



Purpose:

- provide the Namelist settings for ICON and runs ICON

Remarks

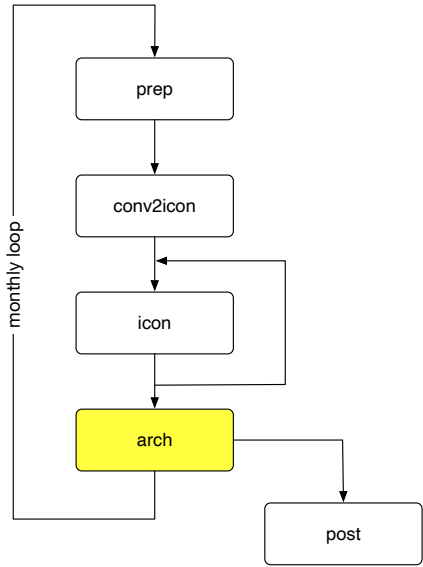
Do not use `remap=1` in the namelist (i.e. internal remapping to rotated coordinates for the output)!

The `operation='mean'` option does not work in this case.

Issues with `operation='mean'`:

- does only work on instantaneous values
- instantaneous and mean output values have the same netCDF attributes (no `cell_methods`)
- mean since model start parameters do not all have an instantaneous equivalent, e.g.:
 - alhf1_s has lhfl_s as equivalent
 - asodifu_s has no sodifu_s as equivalent

Output Archiving (arch)



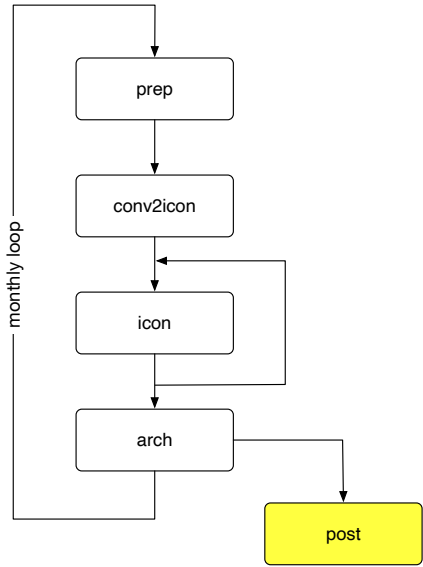
Purpose:

Compress, Tar and archive ICON output

Remarks

- script iconcor and program correct_cf (modify the original ICON output to fulfil CF-Conventions)
- SAMOA checks whether the values of the output quantities are in a reasonable range

Post-Processing (post)



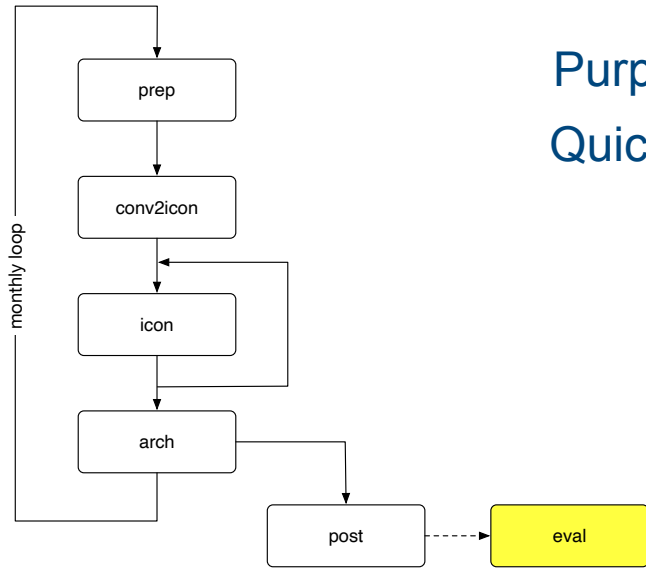
Purpose:

- remap output onto rotated grid
- build time series for user selected quantities

Remarks

- remapnn is used for remapping ICON output to rotated grid
 - this keeps the consistency among the quantities

Evaluation (eval) -- optional

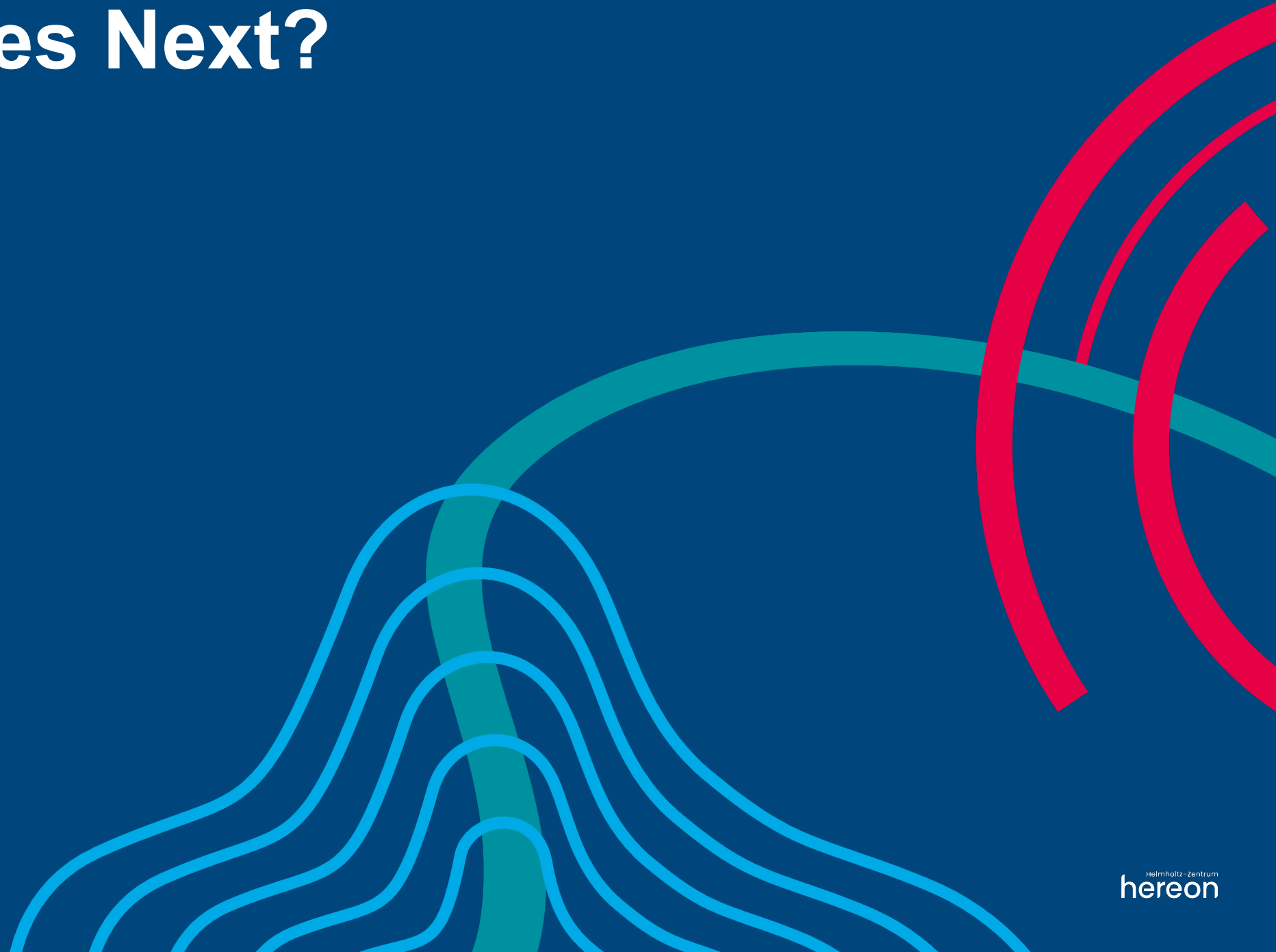


Purpose:
Quick lite weighted evaluation

Remarks

- The evaluation script requires the implementation of the EVA-Suite.
 - An install script is included to install a lite version of the EVA-Suite, i.e. evaluation only against EOBS data set.
 - The evaluation works only over Europe presently
- The evaluation include figures of
 - biases, added value skill scores, frequency distributions, qq plots for the quantities
 - PMSL, T_2M, TMAX_2M, TMIN_2M, TOT_PREC, ASOD_S

What Comes Next?



- Test the version with EVA-Suite lite at DWD NEC (-> SPICE 1.0)
- Get a DOI for SPICE 1.0
- Add CMIP6 model input to ccaf2icaf

CLM-Community Changes to ICON

CLM-Community changes to ICON

- Input
 - Time dependency of SST and sea ice
 - Time dependency of greenhouse gas concentrations
 - Initialisation without qc/qi (qc/qi = 0 in that case)
- Output
 - Precipitation accumulation over output interval
 - Runoff accumulation over output interval
 - Implementation of sunshine duration
 - Implementation of melting rate
 - Additional quantities for soil moisture budget
 - netCDF time dimension of vegetation quantities
- Other
 - Variable setting number/thickness of soil levels via namelist
 - Soil budget correction

magenta: available in the next release (ICON2.6.4)

red: merge request accepted but too late for ICON 2.6.4