Schweizerische Eidgenossenschaft
Confédération suisse
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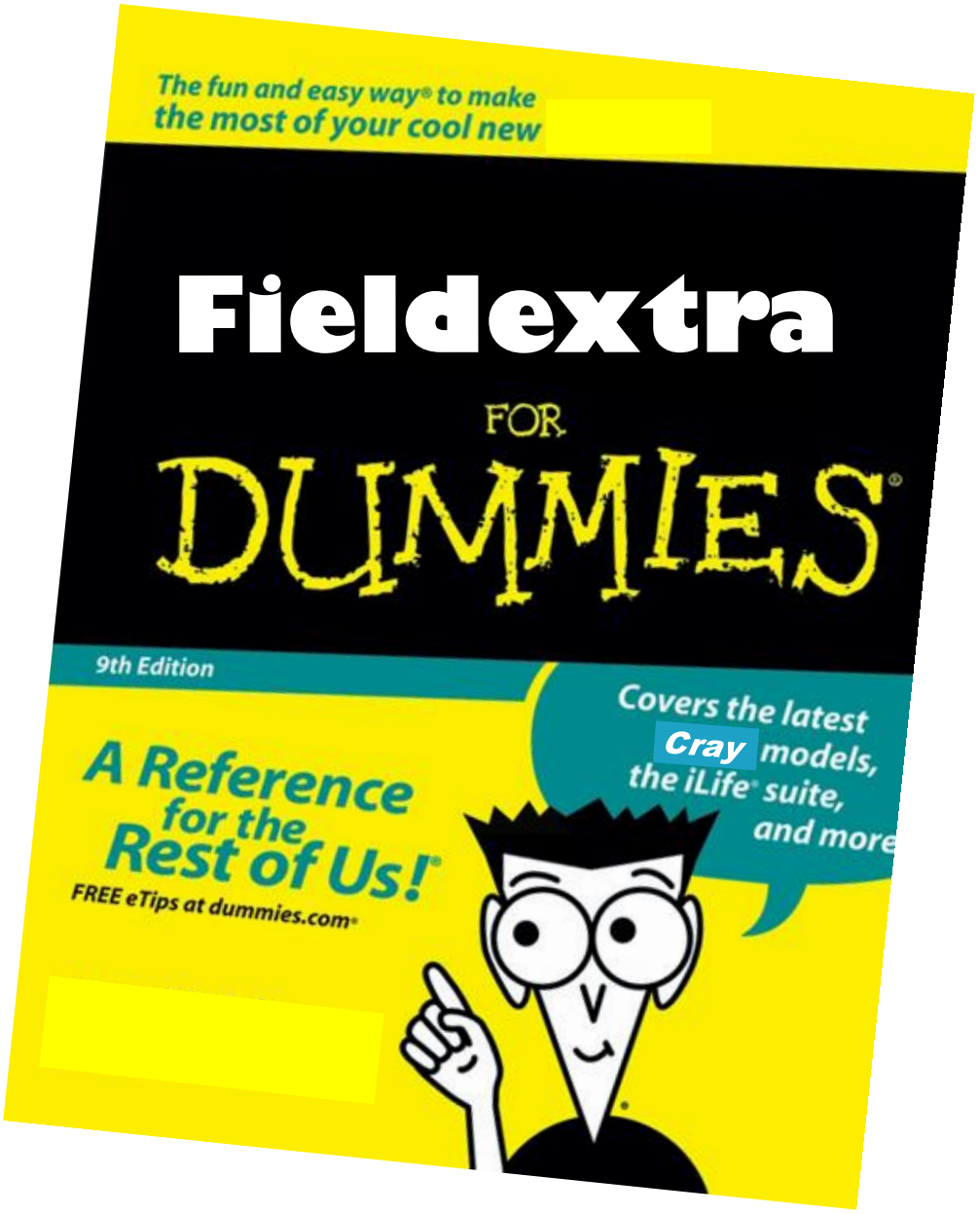
Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

CONSORTIUM FOR SMALL SCALE MODELING
COSMO



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P. Baumann
MeteoSwiss
November 2025

fieldextra v16.0.0

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

bettems@tsa: fieldextra **control_file**

fieldextra is the fortran program executable
control_file contains the namelist defining the program behaviour

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

Control_file

```
in_file = "./support/input/cosmo-e/000/lfff<DDHH>0000"
tstart  = 3,  tstop = 9,  tincr = 3,
out_file = "./support/results/meteogram_precipitation.txt"
out_type = "METEOG",  out_type_fmt = "f71_dh_prec",
out_type_text1 = "Precipitation rain+snow in the last 3 hours mm : mean over 5 gridpoints"
locgroup = "nat"
loclist  = "GVE", "DOL", "FRE", "NEU", "CDF", "CHA", "CGI", "PUY", "PAY"


       in_field="RAIN_GSP", hoper = "c5", toper = "delta,3,hour" , toper_mask = "lead_time>3"/
       in_field="RAIN_CON", hoper = "c5", toper = "delta,3,hour" , toper_mask = "lead_time>3"/
        n_field="SNOW_GSP", hoper = "c5", toper = "delta,3,hour" , toper_mask = "lead_time>3"/
       in_field="SNOW_CON", hoper = "c5", toper = "delta,3,hour" , toper_mask = "lead_time>3"/


       out_field="TOT_PREC" /
```

Available in ./cookbook/meteogram_precipitation.nl

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

Define input and output characteristics, define domain subset

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

Define fields to collect

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

Define operations to apply on collected fields
(large choice of operators available)

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

Define fields to compute
(refers to some fieldextra internal procedure, easily extensible)

Commented example – Meteogram

Table of total precipitation

3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

- **control_file** contains the namelist defining the program behaviour

  &RunSpecification
  &GlobalResource
  &GlobalSettings
  &ModelSpecification
  &Process

- **external resources**

  dictionary in &GlobalResource
  location_list in &GlobalResource

Commented example – Meteogram

Table of total precipitation

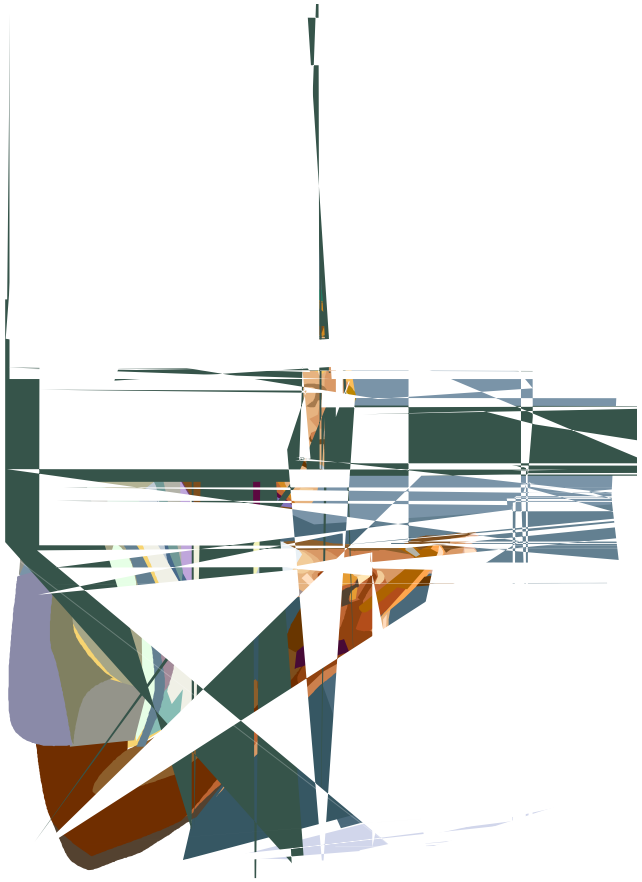
3-hourly precipitation sum, mean over 5 grid points, every 3 hours at chosen locations

- program **diagnostic** and **profiling**

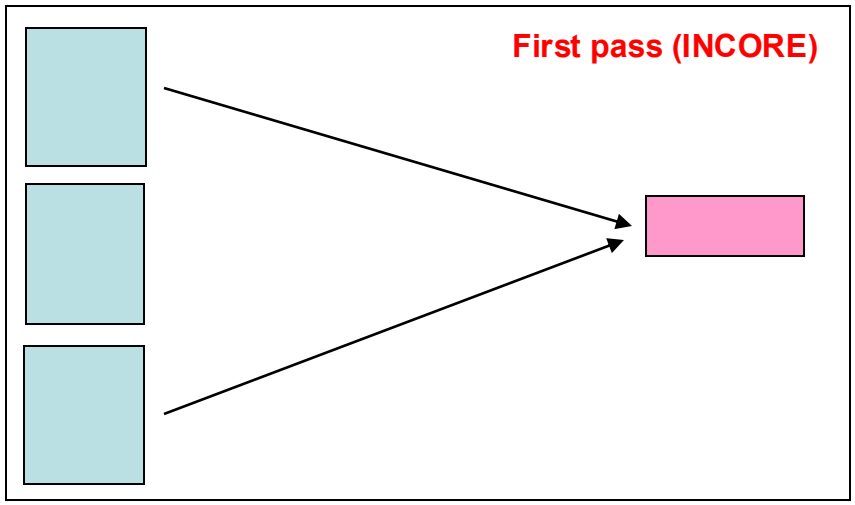
fieldextra.diagnostic

controlled by the values of verbosity and additional_diagnostic
verbosity = 'high'
additional_diagnostic = .true.
additional_profiling = .true.

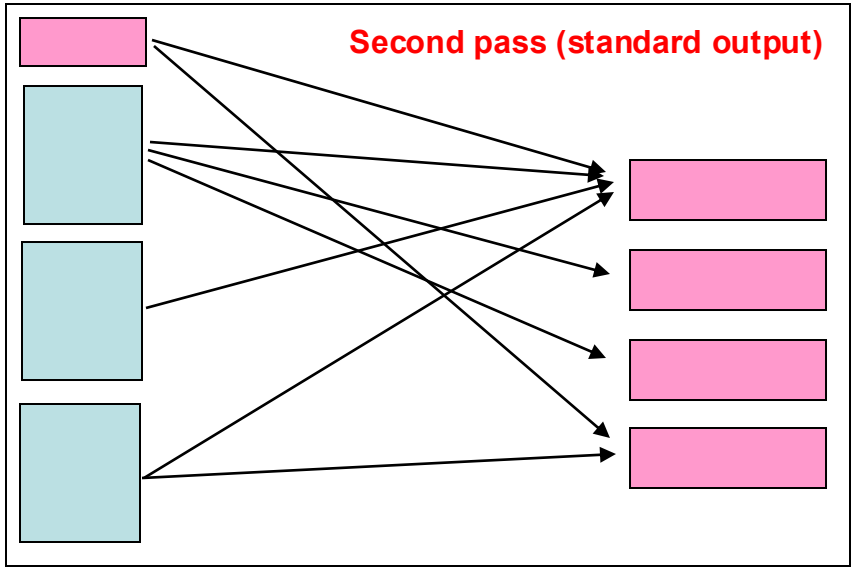
Selected topics



Design – Input & output



- **INCORE storage** used to store resources for common operations (see next slide).



- Each **input** is read **once.**
- Storage is allocated **on demand** for each **output**.
- Each input record is evaluated, and dispatched in the corresponding output storage as required (in memory).

→ **io optimization at the cost of memory usage !**

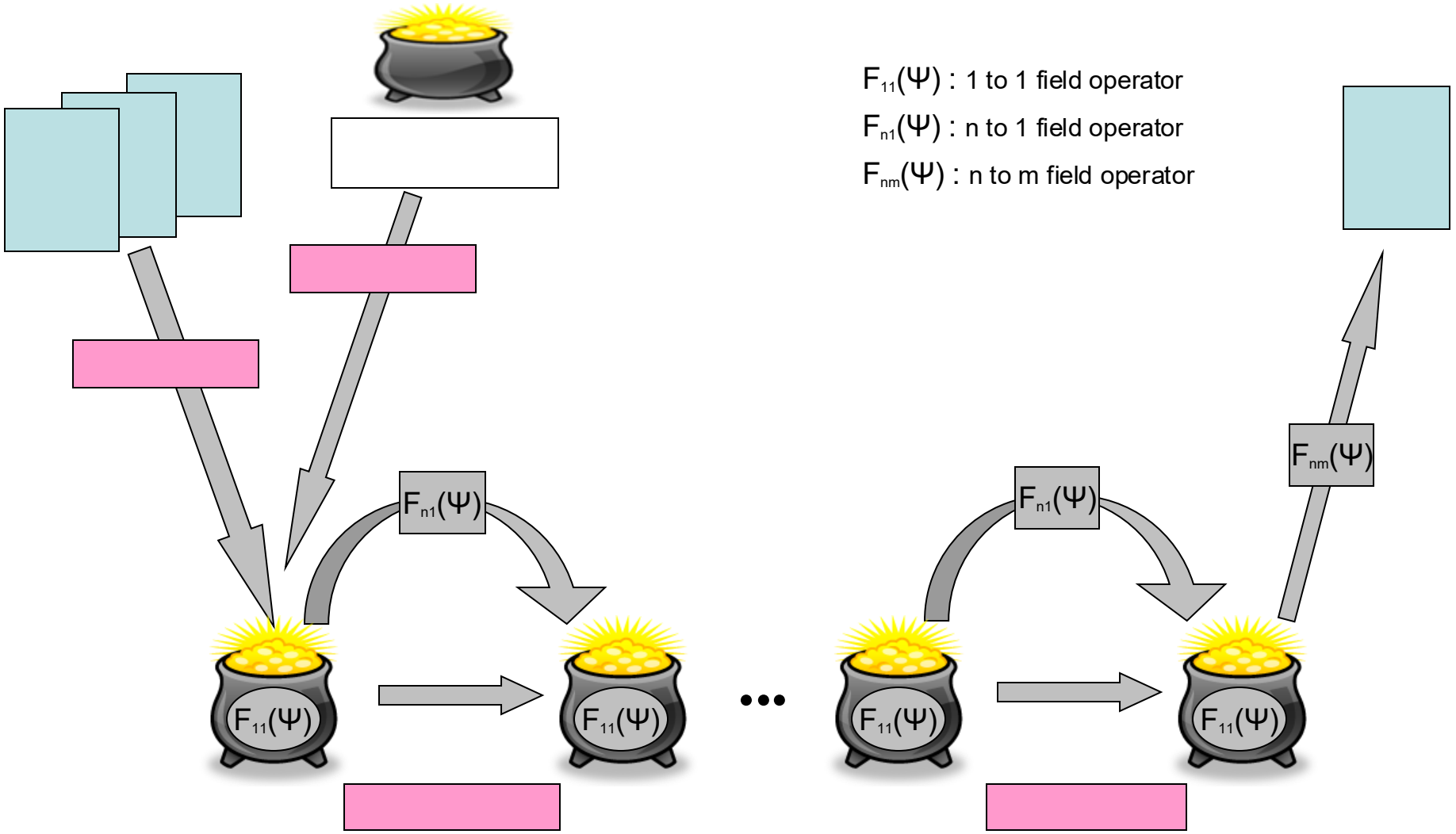
- When all data for some output have been collected, the corresponding data is written to disk and the memory is released.
- For output supporting append mode, data is processed piecewise after reading each related validation time (‚**just on time**‘ **mode**).

Design – Incore storage

- **INCORE** global persistent storage is used e.g. to :
  - associate grid points to specified &
  - produce grid point for some ASCII output
  - specify model when working with staggered fields, or fields defined on a larger domain
  - specify target grid for
  - and different fields
  - provide access to constant fields (see below)

- **Programmatically derived constant fields** will be available from INCORE storage, e.g. when HSURF is present:
  - RLAT, RLON (geog. latitude, longitude [deg])
  - CLAT, CLON, ELAT, ELON, VLAT, VLON (geog. latitude, longitude [deg])
  - SWISS_WE / SWISS_SN (swiss coord. [m])
  - BOAGAW_WE / BOAGAW_SN (Gauss-Boaga coord., west sector [m])
  - BOAGAE_WE / BOAGAE_SN (Gauss-Boaga coord., east sector [m])
  - HHL / HFL (COSMO height of model levels [m])
  - T0FL, P0FL, DP0FL (COSMO reference atmosphere)

Design – Iterative processing (1)



Design – Iterative processing (2)

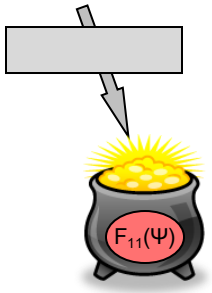
- For each output, define the set of **associated input files**
  - data can only be extracted from this set
  - storage can be part of this set

- **First iteration**: **collect** all necessary input fields
  - all fields must be (condition can be relaxed with out_duplicate_infield)
  - all field must be defined on a (cropping & re-gridding are available)
  - fields required in a subsequent iteration must be collected at that stage

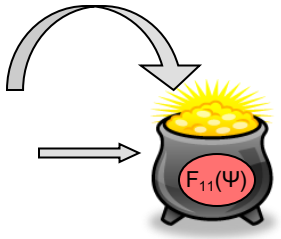
- **Next iterations (repeated up to 6 times)**: **collect** or **compute** fields
  - only data in recipient are available
  - if fields are not available, they must be computed:
    in this case the must be available in the previous recipient
  - the (defined in dictionary or by the type of required operator)
    defines the characteristics of the produced field

- Only the last recipient is available for **output generation**
  - fields available in the last recipient are written in the output file

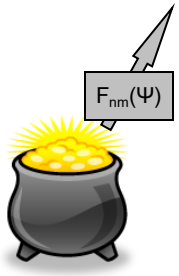
Design – Iterative processing (3)



First iteration:
Each extracted field may be transformed by one or more operators, in the order
regridding ( ), change meta-information ( ),
merge ( ), compare ( ), lateral transform ( ),
, vertical transform ( ),
temporal transform ( ), local transform ( ),
spatial filter ( ), reset identity ( )

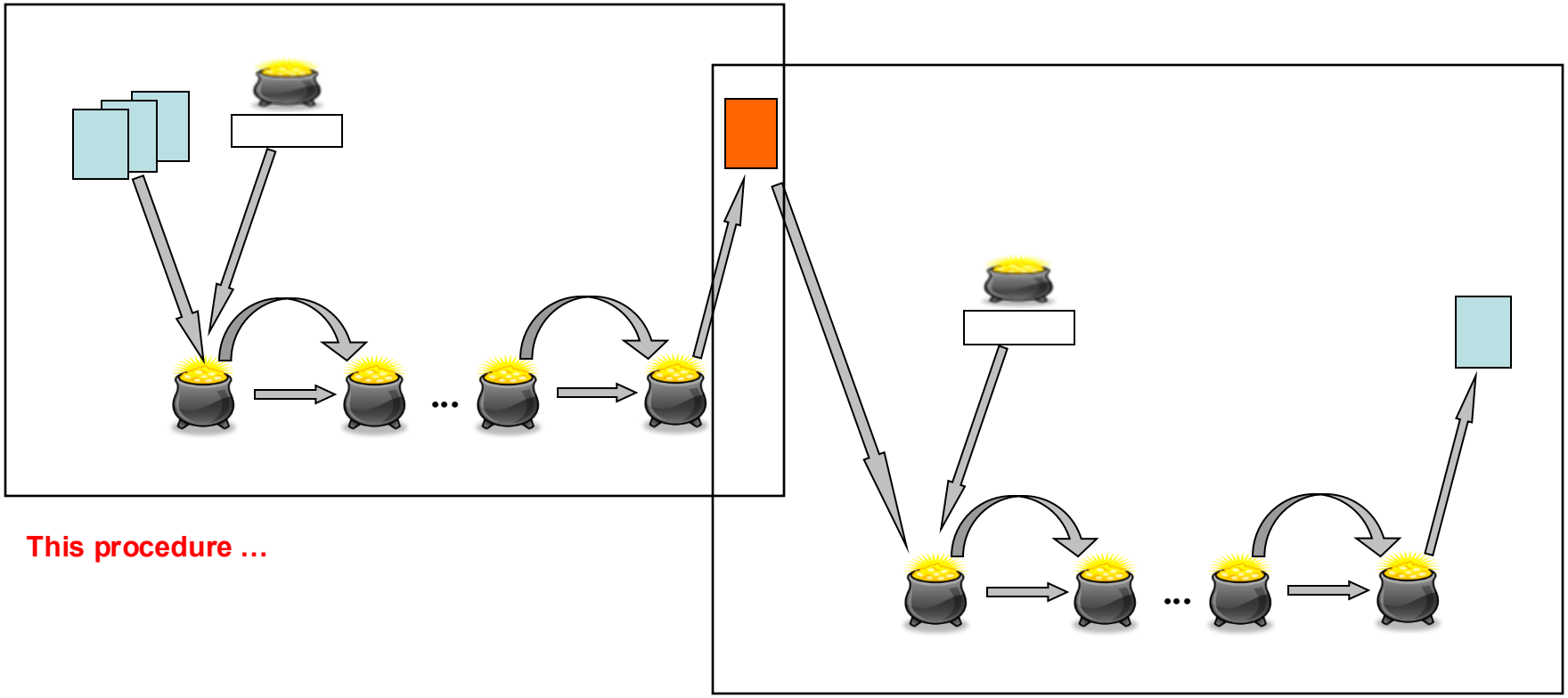


Next iteration(s):
Each extracted field may be transformed by one or more operators, in the order
lateral transform ( ), ,
vertical transform ( ), temporal transform ( ),
local transform ( ), spatial filter ( ),
change meta-information ( ) , reset identity ( )



After last iteration:
A last set of global operations may be applied, in the order
n to m operator ( ), regridding ( ),
reset meta-info (…), filter data ( )

Design – Iterative processing (4)



This procedure …

… can be repeated once!

- write a temporary GRIB file at the end of the first iteration
- use this temporary file as input for the second iteration
- dependencies are detected and files are processed in the correct order

Design – Namelist : basic

A single namelist file to produce n output

Global settings
- resources files
- run specifications
- default values

Definitions for output_1

Definitions for output_2

Definitions for output_n

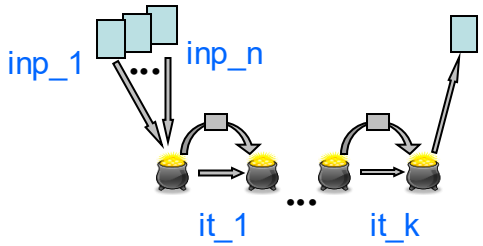
Definitions for output_2

inp_1 — **Fields to collect from input_1**

inp_n — **Fields to collect from input_m**

it_1 — **Fields to generate, first iteration**

it_k — **Fields to generate, last iteration**



Collecting fields for output_2, from input_1

*) **in_file** = input_1
+ input characteristic

out_file = output_2
+ output characteristics
+ geographical subset
+ computation mode
+ more (filter, interpolation, dictionary)

selection_mode = interpretation of in_field

in_field = infield_1,
+ associated transformations

in_field = infield_i,
+ associated transformations

COMPULSORY

*) out_file information **must** be repeated with each new definition of in_file

Generation of fields for output_2 last iteration

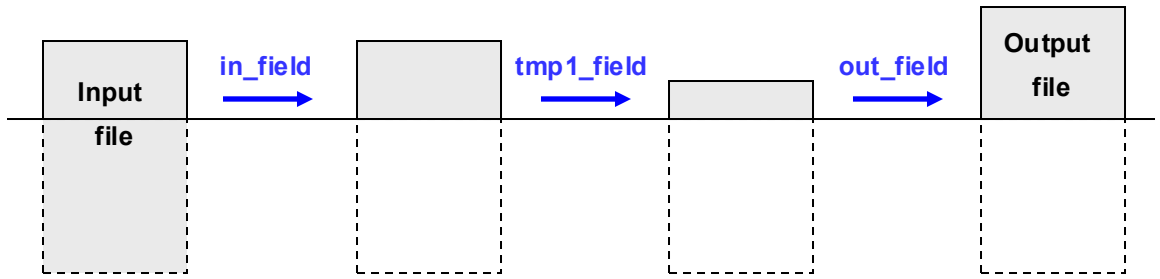
out_field = outfield_1
+ associated transformations

out_field = outfield_j
+ associated transformations

OPTIONAL

Design – Namelist : selection_mode

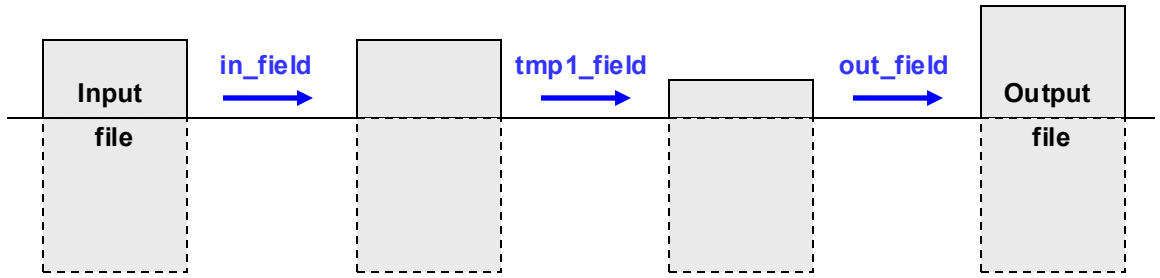
INCLUDE_ONLY (default)



Typical usage:

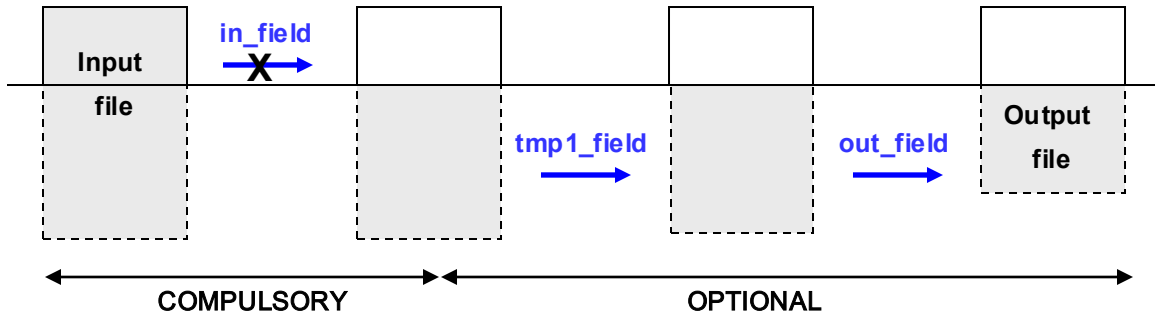
Product generation

INCLUDE_ALL

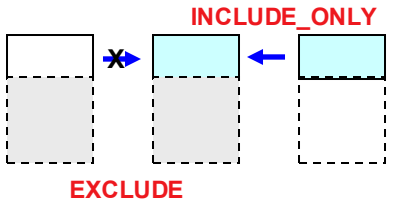


Transformation of input file

EXCLUDE



Merging 2 input



Design – Namelist : time levels (1)

- **A generic name may be used to loop over a set of input files**
  - typically to process a standard set of model output, characterized by one file per validation date
  - a key is inserted in the input file name (<DDHH>, <DDHHMMSS>, <YYYYMMDDHH:initial_date> …)
  - a list of times is defined explicitly (tlist) or by an implicit loop (tstart, tstop, tincr)

    →
- **Time operators may be applied on collected and generated fields**
  - all collected time levels are available, and only those
- **It is possible to filter the times collected in output**
  - another list of times defined by an implicit loop (out_tstart, out_tstop, out_tincr) is used, when available, to filter the list of times defined by (tlist) or (tstart, tstop, tincr)

    →
  - this filter does not influence the set of time levels available for the time operators

Example: centered T2m mean, 6-hourly output	&Process	
	in_file="Ifff**<DDHH>**0000“ , in_type="GRIB",	← **key in input file name**
	tstart=0, tstop=24, tincr=1,	← **implicit time loop**
	out_file=“product“ , out_type="GRIB1",	
	out_tstart=3, out_tincr=6 /	← **filter output date, implicit time loop**
	&Process	
	in_field= “T_2m“ , **toper**= “mean**,-3,3,1,hour**“ /	← **time operator**

Design – Namelist : time levels (2)

- **Instead of collecting all validation times in the same output, one file per validation time is created by using a generic name for the output file**
  - a key is inserted in the output file name (<DDHH>, <DDHHMMSS>, <YYYYMMDDHH:initial_date> …)
  - the list of times defined by (tlist) or by (tstart, tstop, tincr) is used to set the key values
  - filtering defined by (out_tstart ...) is respected

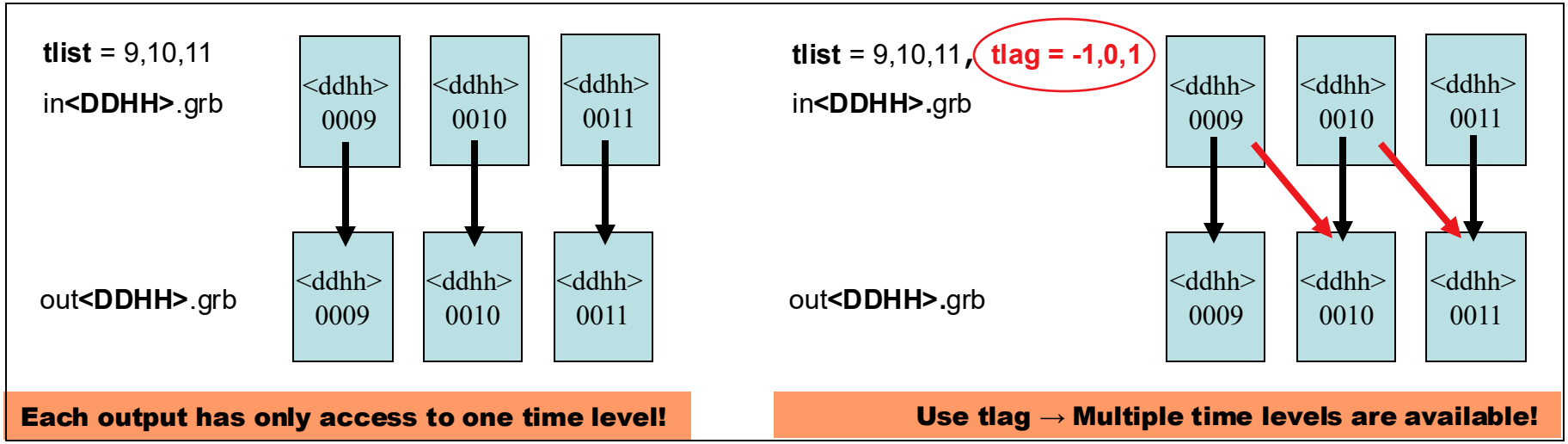
  - **in this case, the set of input files contributing to each output must be explicitely specified!**
    → use tlag (see next slide)

- **These mechanisms are based on the assumption that any file whose name matches**
  …<key>… , key in {DDHH, DDHHMMSS…}
  contains fields valid for the same date, and that the value of <key> represents this date!

Example: **centered T2m mean,** **6-hourly output,** **one output per date**	&Process in_file="Ifff**<DDHH>**0000“ , in_type="GRIB", **tstart=0, tstop=24, tincr=1**, out_file=" product_**<DDHH>“** , out_type="GRIB1", **out_tstart=3**, **out_tincr=6, tlag=-3,3,1** / &Process in_field= “T_2m“ , **toper**= “mean**,-3,3,1,hour**“ /	← **key in output file name** ← **input/output association (for toper)**

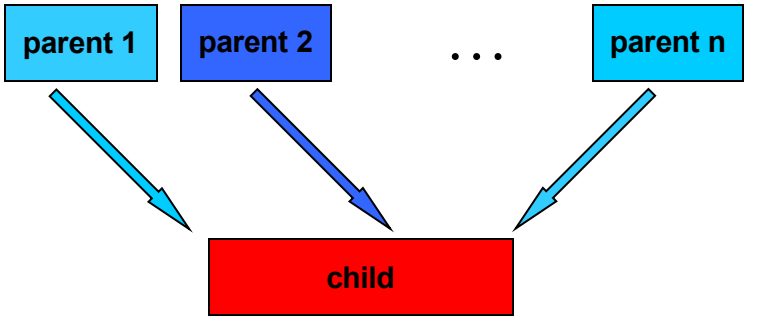
Design – Namelist : tlag

- **Explicit specification of contributing input files**
  - for each output file, fieldextra constructs the set of contributing input files
  - data can only be collected from this set
  - the set of contributing input files is not univoquely defined when multiple output files are defined within the same &Process group, which is the case when a time key is also used in the name of the output file
  - in this case a one to one correspondence is assumed, meaning that each output has only access to a single input, i.e. a single time level (see below)
  - when temporal operators requiring multiple time levels are used, the set of input files contributing to each output must be explicitly specified
  - this is done by using the namelist variable **tlag;** tlag defines an **interval of contributing input files** relative to the currently processed output (and refers to the list of times defined by tlist or tstart…)



Design – Computation of new fields (1)

Meteorological operator, activated via the name of the new field [$F_{n1}(\Psi)$]



parents defined in computing routine

iteration k

iteration k+1

Example

RELHUM_2M from T_2M and TD_2M	&Process in_field = "**TD_2M**" /	← **parent 1**
	&Process in_field = "**T_2M**" /	← **parent 2 (main parent, defined in field dictionary)**
	&Process out_field = "**RELHUM_2M**" /	← **new field**

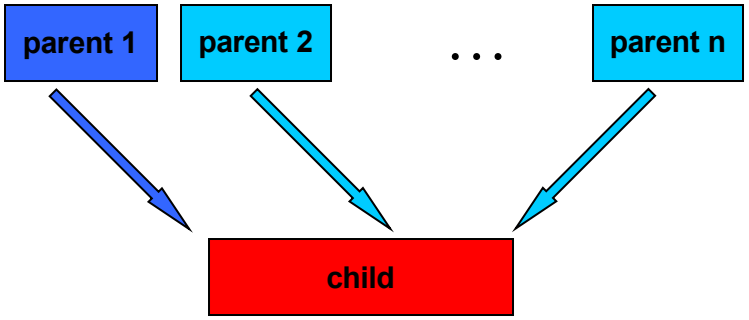
Implementation

Operators of common interest
- add new routine in fxtr_operator_generic
- extend case statement in fxtr_operator_generic:field_compute_generic

Operators of local interest
- add new routine in fxtr_operator_specific
- extend case statement in fxtr_operator_specific:field_compute_specific

Design – Computation of new fields (2)

Named operator, activated by setting “use_operator=…” [$F_{n1}(\Psi)$]



parents defined in computing routine

iteration k

↓

use_operator = “operator name”
use_tag = “parent 1, …, parent n”

↓

iteration k+1

Example

W_SO_CST from W_SO, FR_LAND, and SOILTYP

```
&Process in_field = “W_SO“ /          ← parent 1 (main parent)
&Process in_field = “FR_LAND“ /       ← parent 2
&Process in_field = “SOILTYP” /       ← parent 3

&Process out_field = “W_SO_CST”,      ← new field
    use_operator = “wso_offset_v001”, ← operator to use
    use_tag  = “W_SO,FR_LAND,SOILTYP” / ← list of parents (main parent first)
```

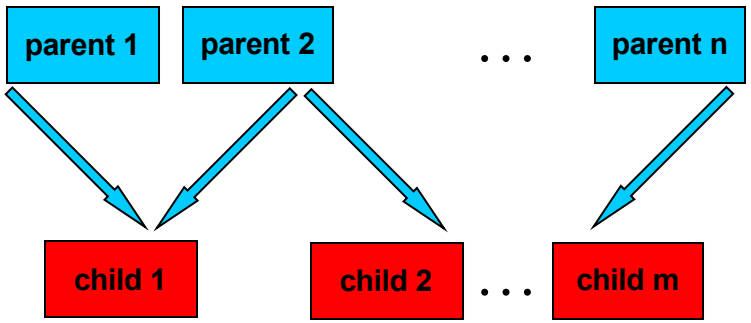
Implementation

Operators of common interest
- add new routine in fxtr_operator_generic
- extend case statement in fxtr_operator_generic:field_compute_generic
- extend module parameter fxtr_operator_generic:allowed_generic_nm_operator

Operators of local interest
- add new routine in fxtr_operator_specific
- extend case statement in fxtr_operator_specific:field_compute_specific
- extend module parameter fxtr_operator_specific:allowed_specific_nm_operator

Design – Computation of new fields (3)

Post-processing operator, activated by setting "out_postproc_module=…" [$F_{nm}(\Psi)$]



parents defined in pp routine

m ≠ n is possible, children defined in pp routine

final iteration

out_postproc_module = "post-processing routine name"

output file

Example

Transform wind and cloud cover to derive MeteoSwiss forecast matrix input

```
&Process
 in_file = "lfff<DDHH>0000",
 tstart = 0, tstop = 24, tincr = 1,
 locgroup = "nat",  loclist = "GVE",
 out_file = "forecast_matrix.txt",
 out_type = "FLD_TABLE",
 out_postproc_module = "pp_forecast_matrix" /
 …
 &Process out_field = "DD10MC_AM" /
 …
 &Process out_field = "DRSRRG_D" /
```

← operator applies to entire output

← parent 1

…

← parent n

Implementation

Operators of common interest

- add new post-processing routine in fxtr_operator_generic
- extend case statement in fxtr_operator_generic:data_postprocess_generic
- extend module parameter fxtr_operator_generic:allowed_generic_pp_procedure

Operators of local interest

- add new post-processing routine in fxtr_operator_specific
- extend case statement in fxtr_operator_specific:data_postprocess_specific
- extend module parameter fxtr_operator_specific:allowed_specific_pp_procedure

Design – Shared memory parallelism (1)

- Shared memory multitasking is available and implemented with **OpenMP directives**

- **File import :** .
  In addition, in the case of fields defined on the native ICON grid:
  - of each ICON grid definition
  - from native ICON grid to any regular grid

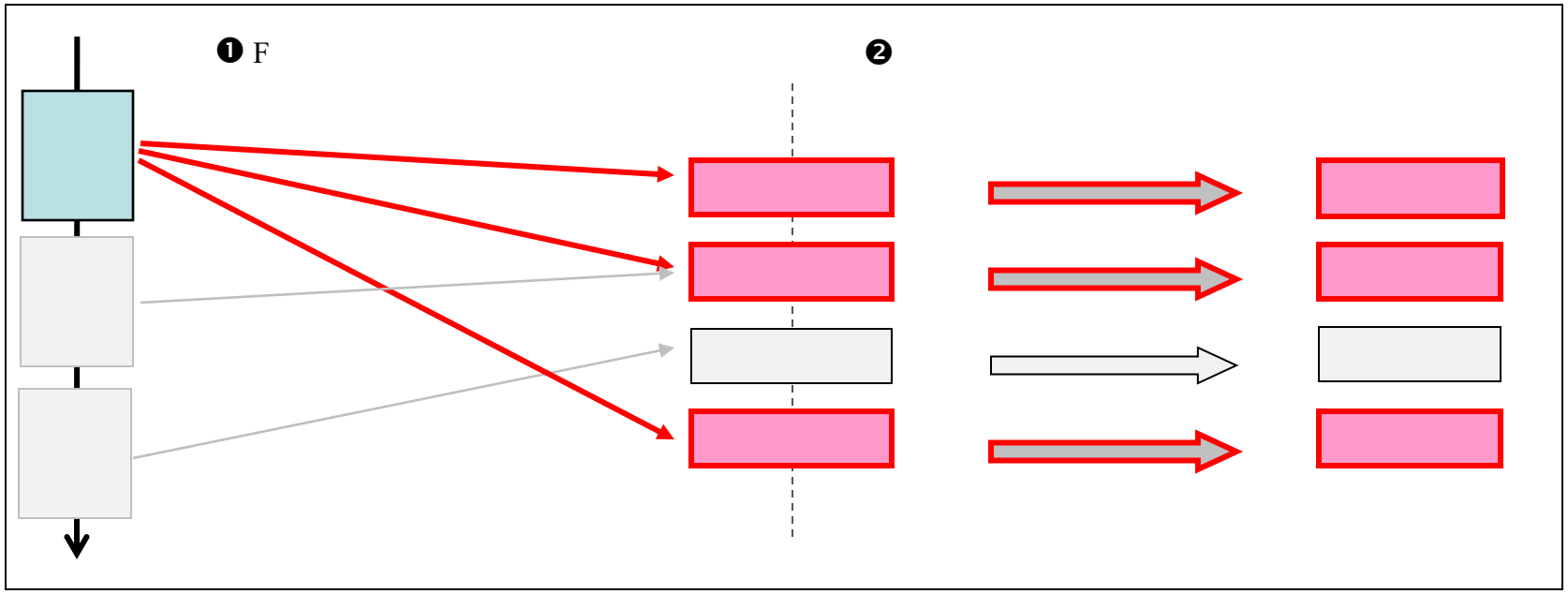
- **Product generation :** are implemented and can be simultaneously used
  - (outer loop parallelism)
  - used in product generation (inner loop parallelism)
- Two (exclusive) types of are available
  - (horizontal grid), if possible
  - Otherwise, , when the same operator is applied on multiple records within the current iteration

- Only shared memory parallelism

See the example./cookbook/multiple_products.nl

Design – Shared memory parallelism (2)

Parallel production of output (outer loop parallelism, marked with ——— below)



The following operations are applied in parallel (loop over output):

(1) For each record in turn :
check use of current record by output, process and store record

(2) Once a complete set of records is available :
iterative processing of fields , format and write output

Some typical applications

See commented exampes in ./cookbook
*See standard regression cases in ./test_**

Some typical applications

Pre-processing

- **Interpolate** Swiss radar composite from kilometric grid onto the COSMO-2 grid for feeding the latent heat nudging process.
- **Merge** surface temperature from ERA5 over sea and from ICON-CH over land to produce a single field suited for initial conditions to start ICON-CH re-analysis.
- **Rebuild IFS ensemble used as LBC** by adding IFS EPS perturbation to a more recent determinist IFS forecast.
- **Interpolate and process pollen fields from the ICON-DE model** to produce lateral boundary conditions for the ICON-CH model.
- **Upscale ICON-CH1-EPS analysis** from a 1.1km to a 2.2.km ICON grid to produce initial conditions for ICON-CH2-EPS.

Some typical applications
Post-processing

- **Meteograms** (as text) at specified locations
- **Cropping** and **regridding** for user specific grids
- **Data thinning** of model output for verification purposes
- Computation of **geostrophic** wind and related quantities
- **Interpolation** of wind field on specified theta and PV surfaces
- **Split** file with multiple EPS members or validation dates in pieces
- **Fill holes** in a 2-dimensional field not defined everywhere (e.g HZEROCL)
- Mix multiple model output in a single XML file for **seamless forecast**
- **Convert** GRIB1 to GRIB2, incl. the specification of generalized height based vertical coord.
- **Kalman** correction at selected locations
- **MOS** based estimation of fields (including fields not part of model output!)
  -
  -

- Generation of **EPS products**
- Generate **lagged ensemble** from COSMO-2 rapid update cycle
- **Clone** missing member in ICON output by changing member id

- **Real time production**: wait for model output, produce partial output every Δh hours

Some typical applications
More complex products

- Generate a **soil type dependent field offset** and apply it to correct W_SO
- Find **3D location** of points where some conditions are fulfilled
  (e.g. over-saturation over ice and temperature above -20C)
- Compute spatially **upscaled EPS probability**
- Create a **bitmap** for the condition
  'probability of 6h sum of total precipitation exceeding 25mm is larger than 0'
- **Warn product** : compute region based quantiles of some fields under side conditions
  (e.g. 50% quantile of wind gust for all points below 800m where T_2m below 0C)
- **Freezing rain**: compute the integral of the temperature between the two lowest 0C isotherm in case of an inversion over a cold air pool
- **CAT for aviation**: compute indicators, find the height-surface of maximum CAT, compute the CAT category (low, medium, high) on this surface
- **FABEC product** : compute air density on a set of pressure and height above ground levels, interpolated on a geographical lat/lon grid, in GRIB 2
- **Monitoring** of model output : field values statistics, when values are outside of pre-defined validity range

Access, installation and usage

See ./README.md ,
also available from https://github.com/COSMO-ORG/fieldextra

Access

- **Licenced software**
  - free to all COSMO members.
  - free licences for the **R&D community**, but without support.
  - The COSMO Steering Committee decided in 2024 to offer this software under an open-source license, but this is not yet in force.

- **Access**
  - **Master code repository on GitHub**
    https://github.com/COSMO-ORG/fieldextra (private repository)
  - **Package on COSMO web site**
    http://www.cosmo-model.org/content/support/software/default.htm
  - **Full installation at ECMWF on atos** (UNIX group cfxtra)
    /ec/res4/hpcperm/chcosmo/projects/fieldextra
  - **Full installation at CSCS on balfrin** (UNIX group s83c)
    /scratch/mch/jenkins/fieldextra/balfrin

Access

Package on COSMO web site

- **Only latest major release!**
- Tar file on COSMO web site, password protected
  http://www.cosmo-model.org/content/support/software/default.htm
  - Source code for libraries (incl. config. script)
  - Source code for fieldextra
  - All necessary Makefiles (for gfortran, ifortran …)
  - All necessary resources (dictionary, location list ...)
  - Documentation (admin, compatibility, documentation)
  - Cookbook (used to validate installation)
  - Tools (including fx tools)

Fieldextra is only validated against the libraries and the associated resources included in the distribution package !

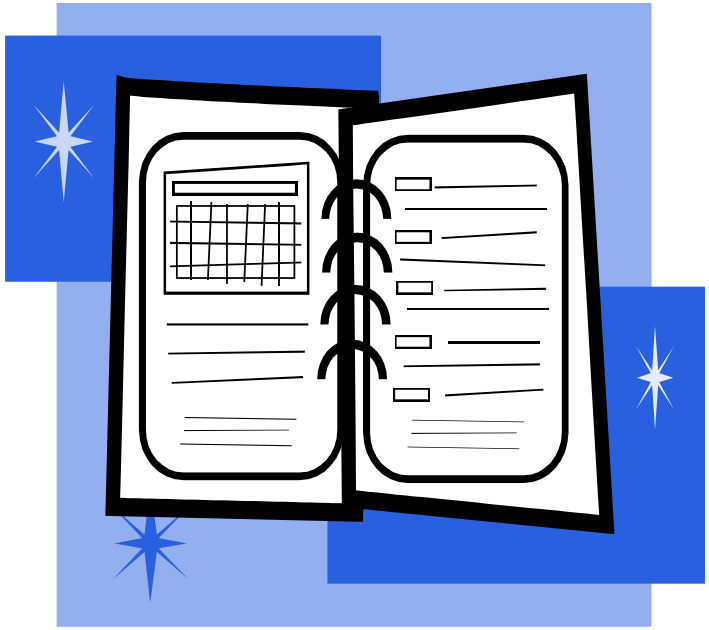
Installation

- Follow steps in ./documentation/INSTALLATION
- New features are documented in ./documentation/HISTORY
- Backward compatibility issues are documented in section of ./documentation/HISTORY

Things never work as planned …

- **Problem by installation ?**
  - carefully read and follow ./documentation/**INSTALLATION**
  - look at ./documentation/usr/**FAQ**
- **Namelist not working with newer release?**
  - consider compatibility issues decribed in **./documentation/HISTORY**
- **Problem by usage ?**
  - set **verbosity** to (or) and **additional_diagnostic** to
  - consider ./documentation/**READE.user**
  - consider ./documentation/usr/**FAQ**
- **Do not know how to write the namelist for some application?**
  - get inspired by the **cookbook** examples
- **Get community support at** fieldextra@cosmo-model.org

Roadmap



What shall I expect next?

Release x.x

https://github.com/COSMO-ORG/fieldextra/milestones

Final discussion

Final discussion

```
!+*****************************************************************************
SUBROUTINE generate_output(multi_pass_mode, just_on_time, last_call,              &
                           datacache, data_origin, tot_nbr_input,                 &
                           out_paths, out_types, out_modes,                       &
                           out_grib_keys, out_spatial_filters,                    &
                           out_subset_size, out_subdomain, out_gplist, out_loclist, &
                           out_data_reduction, out_postproc_modules,              &
                           nbr_gfield_spec, gen_spec, ierr, errmsg                )
!=============================================================================
!
! Root procedure to generate output files
!
!-----------------------------------------------------------
  ! Dummy arguments
  LOGICAL, INTENT(IN)                          :: multi_pass_mode      ! Multiple pass mode?
  LOGICAL, DIMENSION(:), INTENT(IN)            :: just_on_time         ! True if prod. now
  LOGICAL, INTENT(IN)                          :: last_call            ! True if last call
  CHARACTER(LEN=*), INTENT(IN)                 :: datacache            ! Data cache file
  TYPE(ty_fld_orig), INTENT(IN)                :: data_origin          ! Data origin
  INTEGER, DIMENSION(:), INTENT(IN)            :: tot_nbr_input        ! Expected nbr. input
  CHARACTER(LEN=*), DIMENSION(:), INTENT(IN)   :: out_paths            ! Output files names
  TYPE(ty_out_spec), DIMENSION(:), INTENT(IN)  :: out_types            !   types
  TYPE(ty_out_mode), DIMENSION(:), INTENT(IN)  :: out_modes            !   modes
  INTEGER, DIMENSION(:,:), INTENT(IN)          :: out_grib_keys        !   grib specs
  INTEGER, DIMENSION(:), INTENT(IN)            :: out_subset_size      !   subset size
  INTEGER, DIMENSION(:,:), INTENT(IN)          :: out_subdomain        !   subdomain definition
  INTEGER, DIMENSION(:,:,:), INTENT(IN)        :: out_gplist           !   gp definition
  CHARACTER(LEN=*), DIMENSION(:,:), INTENT(IN) :: out_loclist          !   locations definition
  CHARACTER(LEN=*), DIMENSION(:,:), INTENT(IN) :: out_spatial_filters  ! definition defining filter
  TYPE(ty_out_data_reduction), DIMENSION(:), INTENT(IN) :: out_data_reduction  ! Data reduction specs
  CHARACTER(LEN=*), DIMENSION(:,:), INTENT(IN) :: out_postproc_modules ! Specific post-processing
  INTEGER, DIMENSION(:,:), INTENT(IN)          :: nbr_gfield_spec      ! Specifications of
  TYPE(ty_fld_spec_root), DIMENSION(:), INTENT(IN) :: gen_spec         != fields to generate
  INTEGER, INTENT(OUT)                         :: ierr                 ! Error status
  CHARACTER(LEN=*), INTENT(OUT)                :: errmsg               !   error message

  ! Local parameters
  CHARACTER(LEN=*), PARAMETER          :: nm='generate_output: ' ! Tag

  ! Local variables
  LOGICAL                              :: exception_detected, exception, use_postfix
  LOGICAL                              :: unique_ftype, multiple_grid, exist
  LOGICAL, DIMENSION(3*mx_iteration+1) :: tmp_fddata_alloc, tmp_gpdata_alloc
  LOGICAL, DIMENSION(3*mx_iteration+1) :: tmp_value_alloc, tmp_flag_alloc
  INTEGER                              :: i1, i2, i3, i_fd, i_vd
  INTEGER                              :: nbr_input
  INTEGER                              :: out_idx, ios, idx_vd_defined
  CHARACTER(LEN=strlen)                :: messg, temporal_res, out_path
  TYPE(ty_fld_type)                    :: out_ftype



  ! Initialize variables
  !---------------------
  ierr = 0  ;  errmsg = ''
  exception_detected = .FALSE.
  tmp_fddata_alloc(:) = .FALSE.  ;  tmp_gpdata_alloc(:) = .FALSE.
  tmp_value_alloc(:) = .FALSE. ; tmp_flag_alloc(:) = .FALSE.


  ! Create/update data cache file
  !------------------------------
  ! The cache file must reflect the state of data(:) after the last call to
  ! collect_output (i.e. before any field manipulation done in prepare_pout)
```

```
  ! Loop over each output file
  !---------------------------
  output_file_loop: &
  DO i1 = 1, nbr_ofile
    out_idx = data(i1)%ofile_idx
    nbr_input = COUNT( data(i1)%ifile_used )

    ! Skip bogus output
    IF ( data(i1)%ofile_bogus ) CYCLE output_file_loop
    ! Skip completed output
    IF ( data(i1)%ofile_complete ) CYCLE output_file_loop
    ! Skip empty data array
    IF ( ALL(.NOT. data(i1)%defined) ) CYCLE output_file_loop
    ! Only prepare output when all possible associated data have been collected
    ! or when 'just on time' production is active
    IF ( .NOT. last_call                    .AND.                    &
         nbr_input < tot_nbr_input(out_idx) .AND.                    &
         .NOT. just_on_time(out_idx)            ) CYCLE output_file_loop

    ! At this point the corresponding output file will be produced
    ! Keep track of completed output file
    IF ( nbr_input >= tot_nbr_input(out_idx) ) data(i1)%ofile_complete = .TRUE.

    ! Build name of output, considering a possible temporary postfix
    use_postfix = .FALSE.
    IF ( LEN_TRIM(out_postfix) /= 0 .AND. data(i1)%ofile_usepostfix .AND.   &
         .NOT. (data(i1)%ofile_firstwrite .AND. data(i1)%ofile_complete) )  &
                                                use_postfix = .TRUE.
    out_path = out_paths(out_idx)
    IF ( use_postfix ) out_path = TRIM(out_path)//TRIM(out_postfix)
    ! Release memory allocated in previous call to prepare_pout (if any)
    DO i2 = 1, 3*mx_iteration+1
      IF ( tmp_value_alloc(i2) ) DEALLOCATE(data_tmp(i2)%values, data_tmp(i2)%defined)
      IF ( tmp_flag_alloc(i2) ) DEALLOCATE(data_tmp(i2)%flag)
      IF ( tmp_fddata_alloc(i2) ) THEN
        DEALLOCATE(data_tmp(i2)%field_type, data_tmp(i2)%field_origin,       &
  data_tmp(i2)%field_name, data_tmp(i2)%field_grbkey,       &
                   data_tmp(i2)%field_trange,                              &
                   data_tmp(i2)%field_level, data_tmp(i2)%field_ltype,     &
                   data_tmp(i2)%field_prob, data_tmp(i2)%field_epsid,      &
                   data_tmp(i2)%field_vref, data_tmp(i2)%field_ngrid,      &
                   data_tmp(i2)%field_scale, data_tmp(i2)%field_offset,    &
                   data_tmp(i2)%field_vop, data_tmp(i2)%field_vop_usetag,  &
                   data_tmp(i2)%field_vop_nlev, data_tmp(i2)%field_vop_lev, &
                   data_tmp(i2)%field_pop, data_tmp(i2)%field_hop,         &
                   data_tmp(i2)%field_top, data_tmp(i2)%nbr_level,         &
                   data_tmp(i2)%level_idx, data_tmp(i2)%nbr_eps_member,    &
                   data_tmp(i2)%eps_member_idx, data_tmp(i2)%field_idx      )
      ENDIF
      IF ( tmp_gpdata_alloc(i2) ) THEN
        DEALLOCATE(data_tmp(i2)%gp_coord, data_tmp(i2)%gp_idx,             &
                   data_tmp(i2)%gp_lat, data_tmp(i2)%gp_lon, data_tmp(i2)%gp_h)
      ENDIF
    END DO

    ! Prepare data for print out (calculate new fields, ... ; populate data_pout)
    ! * Info message
    IF ( just_on_time(out_idx) ) THEN
      messg = ' (just on time output)'
    ELSE IF ( nbr_input >= tot_nbr_input(out_idx) ) THEN
      messg = ' (all associated input collected)'
    ELSE
      messg = ''
    ENDIF
```

Thank you for your attention!