ICON Namelist Overview

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1 ICON Namelists

1.1 Scripts, Namelist files and Programs

Run scripts starting the programs for the grid generation and the models are stored in run/. These scripts wr
the specified Fortran namelists. Programs are stored in <icon home>/build/<architecture>/bin/.

Table 1: Namelist files

Namelist file	Purpose	Made by script	Used b
NAMELIST_GRAPH	Generate graphs	create_global_grids.run	grid_c
NAMELIST_GRID	Generate grids	create_global_grids.run	grid_c
NAMELIST_GRIDREF	Gen. nested domains	create_global_grids.run	grid_c
NAMELIST_OCEAN_GRID	Gen. ocean grid	create_ocean_grid.run	grid_c
NAMELIST_TORUS_GRID	Gen. torus grid	create_torus_grid.run	grid_c
NAMELIST_ICON	Run ICON models	exp.<name>.run	control

1.2 Namelist parameters

The following subsections tabulate all available Fortran namelist parameters by name, type, default value, u

- *Type* refers to the type of the Fortran variable, in which the value is stored: I=INTEGER, L=LOGICA
  string
- *Default* is the preset value, if defined, that is assigned to this parameter within the programs.
- *Unit* shows the unit of the control parameter, where applicable.
- *Description* explains in a few words the purpose of the parameter.
- *Scope* explains under which conditions the namelist parameter has any effect, if its scope is restricted
  namelist parameters.

Information on the file, where the namelist is defined and used, is given at the end of each table.

2 Namelist parameters for grid generation

2.1 Namelist parameters defining the atmosphere grid

2.1.1 graph_ini (NAMELIST_GRAPH)

Parameter	Type	Default	Unit	Description
nroot	I	2		root subdivision of initial edges
grid_levels	I	4		number of edge bisections following the root subdivision
lplane	L	.FALSE.		switch for generating a double periodic planar gri The root level consists of 8 triangles.

Defined and used in: src/grid_generator/mo_io_graph.f90

2.1.2 grid_ini (NAMELIST_GRID)

Parameter	Type	Default	Unit	Description
nroot	I	2		root subdivision of initial edges
grid_levels	I	4		number of edge bisections following the root subdivision
lplane	L	.FALSE.		switch for generating planar grid. The root level consists of 8 triangles.

Defined and used in: src/grid_generator/mo_io_grid.f90

2.1.3 grid_options (NAMELIST_GRID)

Parameter	Type	Default	Unit	Description
x_rot_angle	R	0.0	deg	Rotation of the icosahedron about the x-axis (connecting the origin and [0°E, 0°N])

Parameter	Type	Default	Unit	Description
y_rot_angle	R	0.0	deg	Rotation of the icosahedron about the y-axis (connecting the origin and [90°E, 0°N), done afte the rotation about the x-axis.
z_rot_angle	R	0.0	deg	rotation of the icosahedron about the z-axis (connecting the origin and [0°E, 90°N), done afte the rotation about the y-axis.
itype_optimize	I	4		Grid optimization type 0: no optimization 1: Heikes Randall 2: equal area 3: c-grid small circle 4: spring dynamics
l_c_grid	L	.FALSE.		C-grid constraint on last level
maxlev_optim	I	100		Maximum grid level where the optimization is applied
beta_spring	R	0.90		tuning factor for target grid length

Defined and used in: src/grid_generator/mo_io_grid.f90

2.1.4 plane_options (NAMELIST_GRID)

Parameter	Type	Default	Unit	Description
tria_arc_km	R	10.0	km	length of triangle edge on plane

The number of grid points is generated by root level section and further bisections. The double periodic root
The spatial coordinates are $-1 <= x <= 1$, and $-\sqrt{3}/2 <= y <= \sqrt{3}/2$. Currently the planar option can o
Defined and used in: src/grid_generator/mo_io_grid.f90

2.1.5 gridref_ini (NAMELIST_GRIDREF)

Parameter	Type	Default	Unit	Description

Parameter	Type	Default	Unit	Description
grid_root	I	2		root subdivision of initial edges
start_lev	I	4		number of edge bisections following the root subdivision
n_dom	I	2		number of logical model domains, including the global one
n_phys_dom	I	n_dom		number of physical model domains, may be large than n_dom (in this case, domain merging is applied)
parent_id	I(n_phys_dom-1)	i		ID of parent domain (first entry refers to first nested domain; needs to be specified only in case more than one nested domain per grid level)
logical_id	I(n_phys_dom-1)	i+1		logical grid ID of domain (first entry refers to firs nested domain; needs to be specified only in case domain merging, i.e. n_dom < n_phys_dom)
l_plot	L	.FALSE.		produces GMT plots showing the locations of the nested domains
l_circ	L	.TRUE.		Create circular (.T.) or rectangular (.F.) refined domains
l_rotate	L	.FALSE.		Rotates center point into the equator in case of l_circ = .FALSE.
write_hierarchy	I	1		0: Output only computational grids 1: Output in addition parent grid of global mode domain (required for computing physics on a reduced grid) 2: Output all grids back to level 0 (required for hierarchical search algorithms)
bdy_indexing_depth	I	max_rlcell (=8)		Number of cell rows along the lateral boundary o model domain for which the refin_ctrl fields contain the distance from the lateral boundary; needs to be enlarged when lateral boundary nudging is required for one-way nesting

Parameter	Type	Default	Unit	Description
radius	R(n_dom-1)	30.	deg	radius of nested domain (first entry refers to first nested domain; needs to be specified for each nest domain separately)
hwidth_lon	R(n_dom-1)	20.	deg	zonal half-width of refined domain (first entry ref to first nested domain; needs to be specified for each nested domain separately)
hwidth_lat	R(n_dom-1)	20.	deg	meridional half-width of refined domain (first ent refers to first nested domain; needs to be specifie for each nested domain separately)
center_lon	R(n_dom-1)	90.	deg	center longitude of refined domain (first entry ref to first nested domain; needs to be specified for each nested domain separately)
center_lat	R(n_dom-1)	30.	deg	center latitude of refined domain (first entry refer to first nested domain; needs to be specified for each nested domain separately)

Defined and used in: src/grid_generator/mo_gridrefinement.f90

2.2 Namelist parameters defining the local grid generation

The ocean grids are created by the script `run/create_ocen_grid.run`

2.2.1 grid_geometry_conditions

Parameter	Type	Default	Unit	Description
no_of_conditions	I	0		Number of geometric conditions
patch_shape	I(no_of_conditions)	0		1=rectangle; 2=circle
patch_center_x	R(no_of_ conditions)	0.0	degrees	longitude of patch center

Parameter	Type	Default	Unit	Description
patch_center_y	R(no_of_ conditions)	0.0	degrees	latitude of patch center
rectangle_xradious	R(no_of_ conditions)	0.0	degrees	half meridional extension of a rectangular patch
rectangle_yradious	R(no_of_ conditions)	0.0	degrees	half zonal extension of a rectangular patch
circle_radious	R(no_of_ conditions)	0.0	degrees	radius of a circular patch

Defined in `mo_grid_conditions.f90`

2.2.2 local_grid_optimization

Parameter	Type	Default	Unit	Description
use_optimization	L	.FALSE.		Apply, or not, optimization
use_edge_springs	L	.FALSE.		Use spring dynamics
prime_ref_length _coeff	R	1.0		Spring length coefficient
use_adaptive_ spring_length	L	.FALSE.		Use adaptive spring length
use_local_reference _length	L	.FALSE.		Use locally adaptive spring length
local_reference_ length_coeff	R	0.0		Coefficient of local vs global spring length
use_isotropy_force	L	.FALSE.		Use isotropy force, tends to create symmetric triangles
isotropy_rotation _coeff	R	0.0		Coefficient of the rotational isotropy force

Parameter	Type	Default	Unit	Description
isotropy_stretch _coeff	R	0.0		Coefficient of the stretch isotropy force
optimize_vertex _depth	I	1		For patches the min depth of the vertices that wi be optimized. The boundary vertices have depth the next level 1, etc.

Defined in `mo_local_grid_optimization.f90`

2.2.3 create_ocean_grid

Parameter	Type	Default	Unit	Description
only_get_sea_ land_mask	L	.false.		.true.:returns the whole grid with a sea-land mas .false.:returns only the ocean grid
smooth_ocean_ boundary	L	.true.		.true.:smooths the ocean boundaries so no triabg has two boundary edges; .false.:no smoothing
input_file	C			name of the input grid file
elevation_file	C			name of the file containing cell elevation values fo the input_file
elevation_field	C			name of the field containing the cell elevation val
min_sea_depth	R	0.0	m (negative)	if cell elevation < min_sea_depth then the cell i consider sea
set_sea_depth	R	0.0	m (negative)	if not 0, then sea cells are of set_sea_depth elevation
set_min_sea_depth	R	0.0	m (negative)	if not 0, then sea cells have a maximum of set_min_sea_depth elevation
edge_elev_ interp_method	I	2		compute edge elevation from cells using: linear interpolation=1; min value = 2
output_refined_ ocean_file	C			name of the output refined ocean grid file

Defined in `mo_create_ocean_grid.f90`

2.2.4 torus_grid_parameters

Parameter	Type	Default	Unit	Description
y_no_of_rows	I		4	number of triangle rows of the torus grid
x_no_of_columns	I		8	number of triangle columns of the torus grid
edge_length	R	m	1000.0	the triangle edge length
x_center	R	m	0.0	the x coordinate of the torus center
y_center	R	m	0.0	the y coordinate of the torus center
out_file_name	C			the torus grid file name
unfolded_torus_ file_name	C			the unfolded torus grid file name (for plotting)
ascii_filename	C			the unfolded torus grid ascci file name (for plottin

Defined in `mo_create_torus_grid.f90`. See the run script `run/create_torus_grid.run`.

3 Namelist parameters defining the ICON model

Namelist parameters for the ICON models are organized in several thematic Fortran namelists controlin
properties of dynamics, transport, physics etc.

3.1 master_nml

Parameter	Type	Default	Unit	Description
l_restart	L	.FALSE.		If .TRUE.: Current experiment is started from a restart.

3.2 master_model_nml (reapeated for each model)

Parameter	Type	Default	Unit	Description
model_name	C			Character string for naming this component.
model_namelist_ filename	C			File name containing the model namelists.
model_type	I	0		Identifies which component to run. atmosphere= ocean=2, radiation=3, dummy_model=99
model_min_rank	I	0		Start MPI rank for this model.
model_max_rank	I	-1		End MPI rank for this model.
model_inc_rank	I	0		Stride of MPI ranks.
model_restart_info _filename	C	restart.info		Name (including full path) of the restart info file this model

3.3 time_nml

Parameter	Type	Default	Unit	Description
dt_restart	R	86400.*30.	s	Length of restart cycle in seconds. Note that the frequency of writing restart files is controlled by io_nml:dt_checkpoint. If the value of dt_checkpoint resulting from model default or user's specification is longer than dt_restart, it w be reset (by the model) to dt_restart so that at least one restart file is generated during the resta cycle. If dt_restart is larger than but not a multiple of dt_checkpoint, restart file will NOT b generated at the end of the restart cycle.
calendar	I	1		Calendar type: 0=Julian/Gregorian 1=proleptic Gregorian 2=30day/month,360day/year
ini_datatime_string	C	'2008-09-01T00:00:00Z'		Initial date and time of the simulation
end_datatime_string	C	2008-09-01T01:40:00Z'		End date and time of the simulation

Parameter	Type	Default	Unit	Description
				Length of the run If "nsteps" in run_nml (see below) is positive, th nsteps*dtime is used to compute the end date an time of the run. Else the initial date and time, the end date and time, dt_restart, as well as the time step are use to compute "nsteps".

3.4 parallel_nml

Parameter	Type	Default	Unit	Description
nproma	I	1		chunk length
n_ghost_rows	I	1		number of halo cell rows
division_method	I	1		method of domain decomposition 0: read in from file 1: use built-in geometric subdivision 2: use METIS
division_file_name	C			Name of division file
p_test_run	L	.FALSE.		.TRUE. means verification run for MPI parallelization (PE 0 processes full domain)
l_test_openmp	L	.FALSE.		if .TRUE. is combined with p_test_run=.TRUE and OpenMP paralllelization, the test PE gets or 1 thread in order to verify the OpenMP paralllelization
l_log_checks	L	.FALSE.		if .TRUE. messages are generated during each synchonization step (use for debugging only)
l_fast_sum	L	.FALSE.		if .TRUE., use fast (not processor-configuration-invariant) global summati
iorder_sendrecv	I	1		Sequence of send/receive calls: 1 = irecv/send; 2 isend/recv; 3 = isend/irecv

Parameter	Type	Default	Unit	Description
itype_comm	I	1		1: use local memory for exchange buffers 2: use global memory for exchange buffers 3: asynchronous halo communication for dynamic core (NH tria only)
num_io_procs	I	0		Number of I/O processors (running exclusively fo doing I/O)
pio_type	I	1		Type of parallel I/O. Only used if number of I/O processors greater number of domains. Experimental!
nh_stepping_threads	I	1		The number of OpenMP threads to be used by th non-hydrostatic dycore. Only used if the __OMP_RADIATION__ flag is set during compilation. Experimental!
radiation_threads	I	1		The number of OpenMP threads to be used by th radiation. Only used if the __OMP_RADIATION__ flag is set during compilation. Experimental!
use_icon_comm	L	.FALSE.		Enable the use of MPI bulk communication throu the icon_comm_lib
icon_comm_debug	L	.FALSE.		Enable debug mode for the icon_comm_lib
max_send_recv _buffer_size	I	131072		Size of the send/receive buffers for the icon_comm_lib.

Defined and used in: src/namelists/mo_parallel_nml.f90

3.5 coupling_nml

Parameter	Type	Default	Unit	Description
name	C	blank		short name of the coupling field
dt_coupling	I	0	s	coupling time step / coupling interval
dt_model	I	0	s	model time step

Parameter	Type	Default	Unit	Description
lag	I	0		offset to coupling event in number of model time steps
l_time_average	L	.FALSE.		.TRUE.: time averaging between two coupling events
l_time_accumulation	L	.FALSE.		.TRUE.: accumulation of coupling fields in time between two coupling events
l_diagnostic	L	.FALSE.		.TRUE.: simple diagnostics (min, max, avg) for coupling fields is switched on
l_activated	L	.FALSE.		.TRUE.: activate the coupling of the respective coupling field

Defined and used in: src/namelists/mo_coupling_nml.f90

3.6 run_nml

Parameter	Type	Default	Unit	Description
ldump_states	L	.FALSE.		Dump patch/interpolation/grid refinement state every patch (after subdivision in case of a paralle run) to a Netcdf file and exit program.
lrestore_states	L	.FALSE.		Restore patch/interpolation/grid refinement state from NetCDF dump files instead of calculating them.
l_one_file_per_patch	L	.FALSE.		Use one file per patch for all processors. This will decrease the amount of files used for dump/restore considerably, especially for massive parallel runs on hundreds or thousands of processors. Time for dumping will increase since the file has be written sequentially, the time for restore shoul stay roughly the same, however.

Parameter	Type	Default	Unit	Description
ldump_dd	L	.FALSE.		Dump the domain decomposition (and a few relat fields). This can be done either in a parallel run o in a single-CPU run. When done in a parallel run the domain decoposition is for the number of parallel processes in use. When done in a single-CPU run, nproc_dd (see below) determine the number of processes for the decomposition. Uses always only one file per patch,
lread_dd	L	.FALSE.		Read the domain decomposition when dumped w ldump_dd.
nproc_dd	I	1		Number of processors for the target domain decomposition (only relevant when running on a single processor).
nsteps	I	0		number of time steps of this run.
dtime	R	600.0	s	time step
ltestcase	L	.TRUE.		Idealized testcase runs
ldynamics	L	.TRUE.		Compute adiabatic dynamic tendencies
iforcing	I	0		Forcing of dynamics and transport by parameterized processes. Use positive indices for the atmosphere and negative indices for the ocea 0: no forcing 1: Held-Suarez forcing 2: ECHAM forcing 3: NWP forcing 4: local diabatic forcing without physics 5: local diabatic forcing with physics -1: MPIOM forcing (to be done)
ltransport	L	.FALSE.		Compute large-scale tracer transport
ntracer	I	0		Number of advected tracers handled by the large-scale transport scheme
lvert_nest	L	.FALSE.		If set to .true. vertical nesting is switched on (i.e variable number of vertical levels)
num_lev	I(max_dom)	31		Number of full levels (atm.) for each domain

Parameter	Type	Default	Unit	Description
nshift	I(max_dom)	0		vertical half level of parent domain which coincid with upper boundary of the current domain
ltimer	L	.TRUE.		TRUE: Timer for monitoring thr runtime of spec routines is on (FALSE = off)
timers_level	I	1		
activate_sync_timers	L	F		TRUE: Timer for monitoring runtime of communication routines (FALSE = off)
msg_level	I	10		controls how much printout is written during runtime. For values less than 5, only the time step is writt

Defined and used in: src/namelists/mo_run_nml.f90

3.7 grid_nml

Parameter	Type	Default	Unit	Description
cell_type	I	3		Cell type 3: triangular cells 4: quadrilateral cells (to be done) 6: pentagonal/hexagonal cells
lplane	L	.FALSE.		planar option
corio_lat	R	0.0	deg	Center of the f-plane is located at this geographic latitude
l_limited_area	L	.FALSE.		
lfeedback	L(n_dom)	.TRUE.		Specifies if feedback to parent grid is performed. Setting lfeedback(1)=.false. turns off feedback for all nested domains; to turn off feedback for select nested domains, set lfeedback(1)=.true. and set ".false." for the desired model domains
ifeedback_type	I	1		1: incremental feedback 2: relaxation-based feedback

Parameter	Type	Default	Unit	Description
patch_weight	R(n_dom)	0.		If patch_weight is set to a value > 0 for any of th first level child patches, processor splitting will be performed, i.e. every of the first level child patche gets a subset of the total number or processors corresponding to its patch_weight. A value of 0. corresponds to exactly 1 processor for this patch, regardless of the total number of processors. For t root patch and higher level childs, patch_weight not used. However, patch_weight must be set to for these patches to avoid confusion.
lredgrid_phys	L	.FALSE.		If set to .true. is calculated on a reduced grid (= one grid level higher)
dynamics_grid_ filename	C			Array of the grid filenames to be used by the dycore.
dynamics_parent_ grid_id	I			Array of the indexes of the parent grid filenames, described by the dynamics_grid_filename array. Indexes start at 1, an index of 0 indicates no pare
radiation_grid_ filename	C			Array of the grid filenames to be used for the radiation model. Filled only if the radiation grid different from the dycore grid.
dynamics_radiation _grid_link	I			Array of the indexes linking the dycore grids, as described by the dynamics_grid_filename array, and the radiation_grid_filename array. It provid the link index of the radiation_grid_filename, fo each entry of the dynamics_grid_filename array. Indexes start at 1, an index of 0 indicates that th radiation grid is the same as the dycore grid. Onl needs to be filled when the radiation_grid_filename is defined.

Defined and used in: src/namelists/mo_grid_nml.f90

3.8 gridref_nml

Parameter	Type	Default	Unit	Description
grf_intmethod_c	I	2		Interpolation method for grid refinement (cell-bas dynamical variables): 1: parent-to-child copying 2: gradient-based interpolation
grf_intmethod_ct	I	2		Interpolation method for grid refinement (cell-bas tracer variables): 1: parent-to-child copying 2: gradient-based interpolation
grf_intmethod_e	I	4		Interpolation method for grid refinement (edge-based variables): 1: inverse-distance weighting (IDW) 2: RBF interpolation 3: combination gradient-based / IDW 4: combination gradient-based / RBF
grf_velfbk	I	1		Method of velocity feedback: 1: average of child edges 1 and 2 2: 2nd-order method using RBF interpolation
grf_scalfbk	I	2		Feedback method for dynamical scalar variables (T, p_{sfc}): 1: area-weighted averaging 2: bilinear interpolation
grf_tracfbk	I	2		Feedback method for tracer variables: 1: area-weighted averaging 2: bilinear interpolation
grf_idw_exp_e12	R	1.2		exponent of generalized IDW function for child edges 1/2
grf_idw_exp_e34	R	1.7		exponent of generalized IDW function for child edges 3/4
rbf_vec_kern_grf_e	I	1		RBF kernel for grid refinement (edges): 1: Gaussian 2: $1/(1+r^2)$

Parameter	Type	Default	Unit	Description
				3: inverse multiquadric
rbf_scale_grf_e	R	0.5		RBF scale factor for grid refinement (edges)
denom_diffu_t	R	135		Deniminator for lateral boundary diffusion of temperature
denom_diffu_v	R	200		Deniminator for lateral boundary diffusion of velocity

Defined and used in: src/namelists/mo_gridref_nml.f90

3.9 prepicon_nml

Remark: prepicon_nml contains switches controlling the real-data initialization functionality of ICON. The using it:

- Using the preprocessing tool prep_icon, it is possible to
(a) generate the three-dimensional coordinate fields needed by IFS2ICON if IFS2ICON is requeste vertical interpolation from the IFS grid to the ICON grid
(b) convert the hydrostatic set of variables provided by IFS2ICON to the nonhydrostatic set of equa and
(c) perform the vertical interpolation to the ICON grid if IFS2ICON is requested to do only the horiz
- If ICONAM (iequations=3) is combined with NWP physics (iforcing=3), setting ltestcase=.false. acti running the ICON executable.

Parameter	Type	Default	Unit	Description
i_oper_mode	I	1		Operating mode if the prep_icon executable is ru 1: generate coordinate fields 2: convert IFS2ICON output to NH prognostic variables 3: do vertical interpolation
nlev_in	I	91		number of model levels of input data
nlevsoil_in	I	4		number of soil levels of input data
zpbl1	R	500.0	m	bottom height (AGL) of layer used for gradient computation

Parameter	Type	Default	Unit	Description
zpbl2	R	1000.0	m	top height (AGL) of layer used for gradient computation
l_w_in	L	.FALSE.		Logical switch if vertical wind is provided as inpu
l_sfc_in	L	.TRUE.		Logical switch if surface fields are provided as inp (mandatory when inwp_surface >0)
l_zp_in	L	.FALSE.		Logical switch for diagnostic output on pressure and height levels
l_extdata_out	L	.FALSE.		Logical switch to write extdata fields into output

Defined and used in: src/namelists/mo_prepicon_nml.f90

3.10 interpol_nml

Parameter	Type	Default	Unit	Description
llsq_lin_consv	L	.FALSE.		conservative (T) or non-conservative (F) least-squares reconstruction for 2nd order (linear) transport
llsq_high_consv	L	.TRUE.		conservative (T) or non-conservative (F) least-squares reconstruction for high order transpo
lsq_high_ord	I	3		polynomial order for high order reconstruction 2: quadratic 30: cubic (no 3^{rd} order cross deriv.) 3: cubic
rbf_vec_kern_c	I	1		Kernel type for reconstruction at cell centres: 1: Gaussian 3: inverse multiquadric
rbf_vec_kern_e	I	3		Kernel type for reconstruction at edges: 1: Gaussian 3: inverse multiquadric
rbf_vec_kern_v	I	1		Kernel type for reconstruction at vertices: 1: Gaussian 3: inverse multiquadric

Parameter	Type	Default	Unit	Description
rbf_vec_scale_c	R(n_dom)	resolution-dependent		Scale factor for RBF reconstruction at cell centre
rbf_vec_scale_e	R(n_dom)	resolution-dependent		Scale factor for RBF reconstruction at edges
rbf_vec_scale_v	R(n_dom)	resolution-dependent		Scale factor for RBF reconstruction at vertices
nudge_max_coeff	R	0.02		Maximum relaxation coefficient for lateral boundary nudging
nudge_efold_width	R	2.5		e-folding width (in units of cell rows) for lateral boundary nudging coefficient
nudge_zone_width	I	8		Total width (in units of cell rows) for lateral boundary nudging zone
i_cori_method	I	3		Selector for tangential wind reconstruction metho 1: Almut's method for tangential wind, but PV usage as in TRSK 2: method of Thuburn, Ringler, Skamarock and Klemp (TRSK) 3: Almut's method for tangential wind and PV usage
l_corner_vort	L	.TRUE.		switch whether the rhombus averaged corner vorticity is averaged to the hexagon (.TRUE.) or the rhombi are directly averaged to the hexagon (.FALSE.)

Defined and used in: src/namelists/mo_interpol_nml.f90

3.11 dynamics_nml

This namelist is relevant if run_nml:ldynamics=.TRUE.

Parameter	Type	Default	Unit	Description

Parameter	Type	Default	Unit	Description
iequations	I	1		Equations and prognostic variables. Use positive indices for the atmosphere and negative indices fo the ocean. 0: shallow water model 1: hydrostatic atmosphere, T 2: hydrostatic atm., θ·dp 3: non-hydrostatic atmosphere -1: hydrostatic ocean
idiv_method	I	1		Method for divergence computation: 1: Standard Gaussian integral. Hydrostatic atm. model: for unaveraged normal components, Non-hydrostatic atm. model: for averaged norma components 2: bilinear averaging of divergence
divavg_cntrwgt	R	0.5		Weight of central cell for divergence averaging
sw_ref_height	R	0.9*2.94e4/gm		Reference height of shallow water model used for linearization in the semi-implicit time stepping scheme
lcoriolis	L	.TRUE.		Coriolis force

Defined and used in: src/namelists/mo_dynamics_nml.f90

3.12 ha_dyn_nml

This namelist is relevant if run_nml:ldynamics=.TRUE. and dynamics_nml:iequations=IHS_ATM_TEM

Parameter	Type	Default	Unit	Description
itime_scheme	I	4		Time integration scheme: 11: pure advection (no dynamics) 12: 2 time level semi implicit (not yet implement 13: 3 time level explicit 14: 3 time level with semi implicit correction 15: standard 4th-order Runge-Kutta method (4-stage)

Parameter	Type	Default	Unit	Description
				16: SSPRK(5,4) scheme (5-stage)
ileapfrog_startup	I	1		How to integrate the first time step when the leapfrog scheme is chosen. 1 = Euler forward; 2 = series of sub-steps.
asselin_coeff	R	0.1		Asselin filter coefficient
si_2tls	R	0.6		weight of time step n+1. Valid range: [0,1]
si_expl_scheme	I	2		scheme for the explicit part used in the 2 time lev semi-implicit time stepping scheme. 1 = Euler forward; 2 = Adams-Bashforth 2nd order
si_cmin	R	30.0	m/s	semi implicit correction is done for eigenmodes w speeds larger than si_cmin
si_coeff	R	1.0		weight of the semi implicit correction
si_offctr	R	0.7		
si_rtol	R	1.0e-3		relative tolerance for GMRES solver
lsi_3d	L	.FALSE.		3D GMRES solver or decomposistion into 2D problems
ldry_dycore	L	.TRUE.		Assume dry atmosphere
lref_temp	L	.FALSE.		Set a background temperature profile as base sta when computing the pressure graident force

3.13 nonhydrostatic_nml (relevant if run_nml:iequations=3)

Parameter	Type	Default	Unit	Description
itime_scheme	I	4		Time integration scheme: 3: same as default, but computation of velocity tendencies in corrector step only 4: Matsuno scheme 6: same as default, but usage of velocity tendenci at (nnow+nnew)/2
rayleigh_coeff	R(n_dom)	0.05		Rayleigh damping coefficient (Klemp, Dudhia, Hassiotis: MWR136, pp.3987-4004)

Parameter	Type	Default	Unit	Description
damp_height	R(n_dom)	30000	m	Height at which Rayleigh damping of vertical wir starts
htop_moist_proc	R	200000.0	m	Height above which moist physics and advection cloud and precipitation variables are turned off
htop_qvadv	R	250000.0	m	Height above which QV advection is turned off (c not use except for debugging purposes)
hbot_qvsubstep	R	250000.0	m	Height above which QV is advected with substepping scheme (do not use except for debugging purposes)
k2_updamp_coeff	R	2.0e6		enhanced 2nd order diffusion coefficient in upper damping layer
vwind_offctr	R	0.05		Off-centering in vertical wind solver
ivctype	I	1		Type of vertical coordinate: 1: Gal-Chen hybrid 2: SLEVE (uses sleve_nml)
iadv_rcf	I	1		reduced calling frequency (rcf) for transport 1: no rcf (every dynamics-step) 2: transport every 2. step 4: ...
l_nest_rcf	L	.TRUE.		Synchronize interpolation/feedback calls with advection (transport) time steps. l_nest_rcf is automatically reset to .FALSE. if iadv_rcf=1
l_masscorr_nest	L	.FALSE.		Apply mass conservation correction also in nestec domain
iadv_rhotheta	I	2		Advection method for rho and rhotheta: 1: centred differences horiz. + vert. 2: 2nd order Miura horizontal 3: 3rd order Miura horizontal (not recommended)

Parameter	Type	Default	Unit	Description
igradp_method	I	1		Discretization of horizontal pressure gradient: 1: conventional discretization with metric correction term 2: Taylor-expansion-based reconstruction of pressure (advantageous at very high resolution) 3: Similar discretization as option 2, but uses hydrostatic approximation for downward extrapolation over steep slopes
l_zdiffu_t	L	.FALSE.		.TRUE.: Compute Smagorinsky temperature diffusion truly horizontally over steep slopes
thslp_zdiffu	R	0.025		Slope threshold above which truly horizontal temperature diffusion is activated
thhgtd_zdiffu	R	200	m	Threshold of height difference between neighborin grid points above which truly horizontal temperature diffusion is activated (alternative criterion to thslp_zdiffu)
exner_expol	R	0.5		Temporal extrapolation (fraction of dt) of Exner function for computation of horizontal pressure gradient
l_open_ubc	L	.FALSE.		.TRUE.: Use open upper boundary condition (rather than w=0) to better conserve sea-level pressure in the presence of diabatic heating
ltheta_up_hori	L	.FALSE.		upstream biased horizontal advection for theta (s also upstr_beta)
upstr_beta	R	1.0		Selection of order for horiz. theta advection: 3rd order=1.0, 4th order=0.0
gmres_rtol_nh	R	1.0e-6		relative tolerance for convergence in gmres solver

Defined and used in: src/namelists/mo_nonhydrostatic_nml.f90

3.14 sleve_nml (relevant if nonhydrostatic_nml:ivctype=2)

Parameter	Type	Default	Unit	Description
min_lay_thckn	R	50	m	Layer thickness of lowermost layer
top_height	R	23500.0	m	Height of model top
stretch_fac	R	1.0		Stretching factor to vary distribution of model levels; values <1 increase the layer thickness near the model top
decay_scale_1	R	4000	m	Decay scale of large-scale topography component
decay_scale_2	R	2500	m	Decay scale of small-scale topography component
decay_exp	R	1.2		Exponent of decay function
flat_height	R	16000	m	Height above which the coordinate surfaces are fl

Defined and used in: src/namelists/mo_sleve_nml.f90

3.15 diffusion_nml

Parameter	Type	Default	Unit	Description
lhdiff_temp	L	.TRUE.		Diffusion on the temperature field
lhdiff_vn	L	.TRUE.		Diffusion on the horizontal wind field
hdiff_order	I	4		Order of ∇ operator for diffusion: -1: no diffusion 2: ∇^2 diffusion 3: Smagorinsky ∇^2 diffusion for the hexagonal model (includes frictional heating if lhdiff_temp=.TRUE.) 4: ∇^4 diffusion 5: Smagorinsky ∇^2 diffusion combined with ∇^4 background diffusion as specified via hdiff_efdt_ratio defaults: 2 for hexagonal model, 4 for triangular model

Parameter	Type	Default	Unit	Description
				24 or 42: ∇2 diffusion from model top to a certai level (cf. k2_pres_max and k2_klev_max below ∇^4 for the lower levels.
k2_pres_max	R	-99.	Pa	Pressure level above which ∇^2 diffusion is applied
k2_klev_max	I	0		Index of the vertical level till which (from the mo top) ∇^2 diffusion is applied. If a positive value is specified for k2_pres_max, k2_klev_max is rese accordingly during the initialization of a model ru
hdiff_efdt_ratio	R	1.0		ratio of e-folding time to time step (or 2* time st when using a 3 time level time stepping scheme) (only for triangles currently)
hdiff_min_efdt_ratio	R	1.0		minimum value of hdiff_efdt_ratio near model to
hdiff_tv_ratio	R	1.0		Ratio of diffusion coefficients for temperature and normal wind: $T : v_n$
hdiff_multfac	R	1.0		Multiplication factor of normalized diffusion coefficient for nested domains
hdiff_smag_fac	R	0.15		Scaling factor for Smagorinsky diffusion

Defined and used in: src/namelists/mo_diffusion_nml.f90

3.16 io_nml

Parameter	Type	Default	Unit	Description
no_output	L	.FALSE.		Main switch for turning off 'old' output

Parameter	Type	Default	Unit	Description
out_expname	C	'IIIEEEETTTT'		Outfile basename
out_filetype	I	2		Type of output format: 1: GRIB1 (not yet implemented) 2: netCDF
lkeep_in_sync	L	.FALSE.		Sync output stream with file on disk after each timestep
dt_data	R	21600.0	s	Output time interval
dt_diag	R	86400.		diagnostic integral output interval
dt_file	R	2592000	s	Time interval of triggering new output file
dt_checkpoint	R	2592000	s	Time interval for writing restart files. Note that i the value of dt_checkpoint resulting from model default or user's specification is longer than time_nml:dt_restart, it will be reset (by the model) to dt_restart so that at least one restart i is generated during the restart cycle.
lwrite_vorticity	L	.TRUE.		write out averaged vorticity at vertices
lwrite_initial	L	.TRUE.		write out initial state
lwrite_dblprec	L	.FALSE.		write out double precision
lwrite_oce_timestepping	L	.FALSE.		write out intermediate ocean vars
lwrite_divergence	L	.TRUE.		write out divergence at cells
lwrite_omega	L	.TRUE.		write out vertical velocity in pressure coords.
lwrite_pres	L	.TRUE.		write out full level pressure
lwrite_z3	L	.TRUE.		write out geopotential on full levels
lwrite_tracer	L(ntracer)	.TRUE.		write out tracer at cells
lwrite_tend_phy	L	.TRUE. .FALSE. (Scope)		Physics induced tendencies.
lwrite_radiation	L	.FALSE.		Radiation related fields.

Parameter	Type	Default	Unit	Description
lwrite_precip	L	.FALSE.		Precipitation
lwrite_cloud	L	.FALSE.		Cloud variables
lwrite_tke	L	.TRUE.		TKE
lwrite_surface	L	.FALSE.		surface variables
lwrite_extra	L	.FALSE.		debug fields
inextra_2d	I	0		Number of 2D Fields for diagnostic/debugging output.
inextra_3d	I	0		Number of 3D Fields for diagnostic/debugging output.
lwrite_pzlev	L	.FALSE.		activate output on p- and/or z-levels
lflux_avg	L	.FALSE.		if .FALSE. the output fluxes are accumulated from the beginning of the run if .TRUE. the output fluxes are average values from the beginning of the run, except of TOT_PREC that would be accumulated

Defined and used in: src/namelists/mo_io_nml.f90

3.17 output_nml

Please note: There may be several instances of output_nml in the namelist file, every one defining a list attributes for output.

Parameter	Type	Default	Unit	Description
filetype	I	4		One of CDI's FILETYPE_XXX constants. Possible values: 2 (=FILETYPE_GRB2), 4 (=FILETYPE_NC2), 5 (=FILETYPE_NC4)
namespace	C	' '		'DWD' - DWD short names (or 'MPIM', 'CMIP', 'ECMWF') Currently unused. RJ: For what exactly should that be used?
map_file	C	' '		File containig the mapping from internal names t names written to NetCDF. The format of this file: One mapping per line, first the internal name, th the name written to NetCDF, separated by an arbitrary number of blanks. The line may also st and end with an arbitrary number of blanks. Empty lines or lines starting with # are treated comments. Names not covered by the mapping are output as they are. Note that the specification of output variables, e. in `ml_varlist`, is independent from this renamin
mode	I	1		1 = forecast mode, 2 = climate mode Currently unused. RJ: For what exactly should that be used?
dom(:)	I	-1		Array of domains for which this name-list is used If not specified (or specified as -1 as the first arra member), this name-list will be used for all domains. Attention: Depending on the setting of the parameter l_output_phys_patch these are eithe logical or physical domain numbers!
output_time_unit	I	1		1 = second, 2=minute, 3=hour, 4=day, 5=month 6=year

Parameter	Type	Default	Unit	Description
output_bounds(3,:)	R	None		post-processing times in units defined by output_time_unit: start, end, increment. There may be specified several triples (up to 100) which must be in increasing order.
steps_per_file	I	100		Max number of output steps in one output file. I this number is reached, a new output file will be opened.
include_last	L	.TRUE.		Flag whether to include the last time step
output_grid	L	.FALSE.		Flag whether grid information is output (in NetCDF output)
output_filename	C	None		Output filename prefix (which may include path) Domain number, level type, file number and extension will be added, so specifying 'XXX' for output_filename you will end up in a name like XXX_DOM01_ML_0001.nc
lwrite_ready	L	.FALSE.		Flag if a "ready file" (sentinel file) should be written at the end of each output stage. Not yet implemented.
ready_directory	C	None		Output directory for ready files. Not yet implemented.
ml_varlist(:)	C	None		Name of model level fields to be output.
pl_varlist(:)	C	None		Name of pressure level fields to be output.
p_levels(:)	R	None		pressure levels [hPa] Not yet implemented. The pressure levels are currently always taken fro array plevels in namelist nh_pzlev_nml.
hl_varlist(:)	C	None		Name of height level fields to be output.
h_levels(:)	R	None		height levels Not yet implemented. The height levels are currently always taken from array zlevels in namelist nh_pzlev_nml.

Parameter	Type	Default	Unit	Description
remap	I	0		interpolate horizontally, 0: none, 1: to regular lat-lon grid, 2: to Gaussian grids, (3:...) Currently only 0 and 1 are implemented.
remap_internal	L	.FALSE.		do interpolations online in the model or external (including triggering) Currently unused, interpolations are always done internally.
reg_lon_def(3)	R	None		if remap=1: start, increment, end longitude in degrees
reg_lat_def(3)	R	None		if remap=1: start, increment, end latitude in degrees
gauss_tgrid_def	I	None		if remap=2: triangular truncation (e.g.63 for T63 for which the Gauss grid should be used Currently unused since Gaussian grids are not implemented.
north_pole(2)	R	0,90		definition of north pole for rotated lon-lat grids.

Defined and used in: src/namelists/mo_name_list_output.f90

3.18 lonlat_intp_nml

Parameter	Type	Default	Unit	Description
llonlat_enabled	L(n_dom)	.FALSE.		Flag. True, if lon-lat interpolation of output variables is desired.
lsupersede	L	.FALSE.		Flag. True, if standard grid variable is not writte for lon-lat vars.
lonlat_var_list	C	" 'PS', 'Q7', 'normal_velocity' "		List of variables for lon-lat interpolation or "all".
lon_delta	R(n_dom)	2.0	deg	Interpolation to lon-lat grid: resolution.

Parameter	Type	Default	Unit	Description
lat_delta	R(n_dom)	2.0	deg	Interpolation to lon-lat grid: resolution.
lon_corner1	R(n_dom)	-180.0	deg	South western corner of interpolation area (lon/la
lat_corner1	R(n_dom)	-90.0	deg	South western corner of interpolation area (lon/la
lon_corner2	R(n_dom)	180.0	deg	North eastern corner of interpolation area (lon/la Overrides corresponding "dimen" value.
lat_corner2	R(n_dom)	90.0	deg	North eastern corner of interpolation area (lon/la Overrides corresponding "dimen" value.
lon_poleN	R(n_dom)	0.	deg	Position of north pole for interpolation grid.
lat_poleN	R(n_dom)	90.	deg	Position of north pole for interpolation grid.
lon_dimen	I(n_dom)	-1		Dimensions of interpolation grid. Computed automatically when a second area corner is provided.
lat_dimen	I(n_dom)	-1		Dimensions of interpolation grid. Computed automatically when a second area corner is provided.

Defined and used in: src/namelists/mo_lonlat_intp_nml.f90

3.19 meteogram_output_nml

Parameter	Type	Default	Unit	Description
lmeteogram_enabled	L(n_dom)	.FALSE.		Flag. True, if meteogram of output variables is desired.
zprefix	C(n_dom)	"METEOGRAM_"		string with file name prefix for output file
ldistributed	L(n_dom)	.TRUE.		Flag. Separate files for each PE.
n0_mtgrm	I(n_dom)	1		initial time step for meteogram output
ninc_mtgrm	I(n_dom)	1		output interval (in time steps)
stationlist_tot		53.633, 9.983, 'Ham-burg'		list of meteogram stations (triples with lat, lon, name string)

Defined and used in: src/namelists/mo_mtgrm_nml.f90

3.20 nh_pzlev_nml

Parameter	Type	Default	Unit	Description
lwrite_zlev	L	.TRUE.		Output on height levels
lwrite_plev	L	.TRUE.		Output on pressure levels
nzlev	I	10		number of height levels
nplev	I	10		number of pressure levels
zlevels	R	0,1000, 2000, ..., 10000	m	array of height levels
plevels	R	100000, 90000, 80000, ..., 10000	Pa	array of pressure levels

Defined and used in: src/namelists/mo_nh_pzlev_nml.f90

3.21 transport_nml (used if run_nml/ltransport=.TRUE.)

Parameter	Type	Default	Unit	Description
lvadv_tracer	L	.TRUE.		TRUE : compute vertical tracer advection FALSE: do not compute vertical tracer advection
ihadv_tracer	I(ntracer)	2		Tracer specific method to compute horizontal advection:

Parameter	Type	Default	Unit	Description
		4		0: no horiz. transport 1: upwind (1st order) 2: miura (2nd order, lin. reconstr.) 20: miura (2nd order, lin. reconstr.) with subcycling 3: miura3 (quadr. or cubic reconstr.) 22: combination of miura and miura with subcycling 32: combination of miura3 and miura with subcycling 4: up3 (3rd or 4th order upstream)
ivadv_tracer	I(ntracer)	3		Tracer specific method to compute vertical advection: 0: no vert. transport 1: upwind (1st order) 2: muscl_cfl (2nd order, handles CFL > 1) 20: muscl (2nd order) 3: ppm_cfl (3^{rd} order, handles CFL > 1) 30: ppm (3rd order)
lstrang	L	.FALSE.		splitting into fractional steps - second order Strang splitting (.TRUE.) - first order Godunov splitting (.FALSE.)
ctracer_list	C	”		list of tracer names
itype_hlimit	I(ntracer)	3 4		Type of limiter for horizontal transport: 0: no limiter 1: semi-monotonous slope limiter 2: monotonous slope limiter 3: monotonous flux limiter 4: positive definite flux limiter
itype_vlimit	I(ntracer)	1		Type of limiter for vertical transport: 0: no limiter 1: semi-monotone slope limiter

Parameter	Type	Default	Unit	Description
				2: monotonous slope limiter 4: positive definite flux limiter
iord_backtraj	I	1		order of backward trajectory calculation: 1: first order 2: second order (iterative; currently 1 iteration hardcoded)
igrad_c_miura	I	1		Method for gradient reconstruction at cell center for 2nd order miura 1: Least-squares (linear, non-consv) 2: Green-Gauss 3: gradient reconstruction (RBF) at cell center on the basis of normal gradients at edges
lclip_tracer	L	.FALSE.		Clipping negative values
upstr_beta_adv	R	1.0		parameter to select 3rd order (=1) or 4th order (=0) advection, or something inbetween (0..1)
ivcfl_max	I	5		determines stability range of vertical PPM-scheme in terms of the maximum allowable CFL-number
llsq_svd	L	.FALSE.		use QR decomposition (FALSE) or SV decomposition (TRUE) for least squares design matrix A

Defined and used in: src/namelists/mo_advection_nml.f90

3.22 nwp_phy_nml

Parameter	Type	Default	Unit	Description
inwp_gscp	I	1		cloud microphysics and precipitation 0: none 1: hydci (COSMO-EU microphysics)
$qi0$	R	0.0	kg/kg	cloud ice threshold for autoconversion
$qc0$	R	0.0	kg/kg	cloud water threshold for autoconversion

Parameter	Type	Default	Unit	Description
inwp_convection	I	1		convection 0: none 1: Tiedtke/Bechtold convection
inwp_cldcover	I	3		cloud cover scheme for radiation 0: no clouds (only QV) 1: grid-scale clouds and QV 2: clouds from COSMO turbulence scheme 3: clouds from COSMO SGS cloud scheme
inwp_radiation	I	1		radiation 0: none 1: RRTM radiation 2: Ritter-Geleyn radiation
inwp_satad	I	1		saturation adjustment 0: none 1:
inwp_turb	I	1		vertical diffusion and transfer 0: none 1: COSMO diffusion and transfer 2: ECHAM diffusion 3: EDMF-DUALM (to be implemented)
inwp_sso	I	1		subgrid scale orographic drag 0: none 1: (COSMO) Lott and Miller scheme
inwp_gwd	I	1		non-orographic gravity wave drag 0: none 1:Orr-Ern-Bechtold-scheme(IFS)
inwp_surface	I	1		surface scheme 0: none 1: TERRA
ustart_raylfric	R	160.0	m/s	wind speed at which extra Rayleigh friction start
efdt_min_raylfric	R	10800.	s	minimum e-folding time of Rayleigh friction (effective for u > ustart_raylfric + 90 m/s)

Parameter	Type	Default	Unit	Description
latm_above_top	L (max_dom)	.FALSE.		.TRUE.: take into account atmosphere above mo top for radiation computation
dt_conv	R (max_dom)	600.	seconds	time interval of convection call currently each subdomain has the same value
dt_ccov	R (max_dom)	dt_conv	seconds	time interval of cloud cover call currently each subdomain has the same value
dt_rad	R (max_dom)	1800.	seconds	time interval of radiation call currently each subdomain has the same value
dt_sso	R (max_dom)	1200.	seconds	time interval of sso call currently each subdomain has the same value
dt_gwd	R (max_dom)	1200.	seconds	time interval of gwd call currently each subdomain has the same value

Defined and used in: src/namelists/mo_atm_phy_nwp_nml.f90

3.23 radiation_nml

Parameter	Type	Default	Unit	Description
ldiur	L	.TRUE.		switch for solar irradiation: .TRUE.:diurnal cycle, .FALSE.:zonally averaged irradiation
nmonth	I	0		0: Earth circles on orbit 1-12: Earth orbit position fixed for specified mon
lyr_perp	L	.FALSE.		.FALSE.: transient Earth orbit following VSOP8 .TRUE.: Earth orbit of year yr_perp of the VSOP87 orbit is perpertuated
yr_perp	L	-99999		year used for lyr_perp = .TRUE.

Parameter	Type	Default	Unit	Description
isolrad	I	0		Insolation scheme 0: Use insolation defined in code. 1: Use insolation from external file containing the spectrally resolved insolation averaged over a yea (not yet implemented)
dt_rad	R	7200.	second	time interval of full radiation computation
izenith	I	3 4 (for iforcing = inwp)		Choice of zenith angle formula for the radiative transfer computation. 0: Sun in zenith everywhere 1: Zenith angle depends only on latitude 2: Zenith angle depends only on latitude. Local time of day fixed at 07:14:15 for radiative transfe computation (sin(time of day) = 1/pi 3: Zenith angle changing with latitude and time c day 4: Zenith angle and irradiance changing with season, latitude, and time of day (iforcing=inwp only)

Parameter	Type	Default	Unit	Description
irad_h2o irad_co2 irad_ch4 irad_n2o irad_o3 irad_o2 irad_cfc11 irad_cfc12 irad_aero	I	1 2 3 3 3 2 2 2 2		Switches for the concentration of radiative agents 0: 0. 1: prognostic variable 2: global constant 3: externally specified irad_aero = 5: Tanre aerosol climatology for run_nml/iforcing = 3 (NWP) irad_aero = 6: Tegen aerosol climatology for run_nml/iforcing = 3 (NWP) .AND. itopo =1 irad_o3 = 2: ozone climatology from MPI irad_o3 = 4: ozone clim for Aqua Planet Exp irad_o3 = 6: ozone climatology with T5 geographical distribution and Fourier series for seasonal cycle for run_nml/iforcing = 3 (NWP) irad_o3 = 7: GEMS ozone climatology (from IFS for run_nml/iforcing = 3 (NWP)
vmr_co2 vmr_ch4 vmr_n2o vmr_o2 vmr_cfc11 vmr_cfc12	R	353.9e-6 1693.6e-9 309.5e-9 0.20946 252.8e-12 466.2e-12		Volume mixing ratio of the radiative agents

Defined and used in: src/namelists/mo_radiation_nml.f90

3.24 nwp_lnd_nml

Parameter	Type	Default	Unit	Description
nlev_snow	I	1		number of snow layers for `lmulti_snow=.true.`
nsfc_subs	I	1		number of tiles

Parameter	Type	Default	Unit	Description
nsfc_snow	I	0		number of static surface types which can have sn as a tile
nztlev	I	2		used time integration scheme
lmulti_snow	L	.FALSE.		.TRUE. for use of multi-layer snow model
lseaice	L	.FALSE.		.TRUE. for use of sea-ice model
llake	L	.FALSE.		.TRUE. for use of lake model

Defined and used in: src/namelists/mo_nwp_lnd_nml.f90

3.25 echam_phy_nml

Parameter	Type	Default	Unit	Description
lrad	L	.TRUE.		Switch on radiation.
lvdiff	L	.TRUE.		Switch on turbulent mixing (i.e. vertical diffusion
lconv	L	.TRUE.		Switch on cumulus convection.
lcond	L	.TRUE.		Switch on large scale condensation.
lcover	L	.FALSE.		.TRUE. for prognostic cloud cover scheme, .FALS for diagnostic scheme.
lgw_hines	L	.FALSE.		.TRUE. for atmospheric gravity wave drag by the Hines scheme
lssodrag	L	.FALSE.		.TRUE. for subgrid scale orographic drag
llandsurf	L	.FALSE.		.TRUE. for surface exchanges
lice	L	.FALSE.		.TRUE. for sea-ice temperature calculation
lmeltpond	L	.FALSE.		.TRUE. for calculation of meltponds
lhd	L	.FALSE.		.TRUE. for hydrologic discharge model

Parameter	Type	Default	Unit	Description
lmlo	L	.FALSE.		.TRUE. for mixed layer ocean

Defined and used in: src/namelists/mo_echam_phy_nml.f90

3.26 echam_conv_nml

Parameter	Type	Default	Unit	Description
iconv	I	1		Choice of cumulus convection scheme. 1: Nordeng scheme 2: Tiedtke scheme 3: hybrid scheme
ncvmicro	I	0		Choice of convective microphysics scheme.
lmfpen	L	.TRUE.		Switch on penetrative convection.
lmfmid	L	.TRUE.		Switch on midlevel convection.
lmfdd	L	.TRUE.		Switch on cumulus downdraft.
lmfdudv	L	.TRUE.		Switch on cumulus friction.
cmftau	R	10800.		Characteristic convective adjustment time scale.
cmfctop	R	0.3		Fractional convective mass flux (valid range [0,1]) across the top of cloud
cprcon	R	1.0e-4		Coefficient for determining conversion from cloud water to rain.
cminbuoy	R	0.025		Minimum excess buoyancy.
entrpen	R	1.0e-4		Entrainment rate for penetrative convection.

Parameter	Type	Default	Unit	Description
dlev	R	3.e4	Pa	Critical thickness necessary for the onset of convective precipitation.

Defined and used in: src/namelists/mo_echam_conv_nml.f90

3.27 vdiff_nml

Parameter	Type	Default	Unit	Description
lsfc_mon_flux	L	.TRUE.		Switch on surface momentum flux.
lsfc_heat_flux	L	.TRUE.		Switch on surface sensible and latent heat flux.

Defined and used in: src/namelists/mo_vdiff_nml.f90

3.28 turbdiff_nml

Parameter	Type	Default	Unit	Description
itype_tran	I	2		type of surface-atmosphere transfer
imode_tran	I	1		mode of surface-atmosphere transfer
icldm_tran	I	0		mode of cloud representation in transfer paramet
imode_turb	I	3		mode of turbulent diffusion parametrization
icldm_turb	I	2		mode of cloud representation in turbulence parametr
itype_sher	I	1		type of shear production for TKE
ltkesso	L	.FALSE.		calculation SSO-wake turbulence production for TKE
ltkecon	L	.FALSE.		consider convective buoyancy production for TKI
lexpcor	L	.FALSE.		explicit corrections of the implicit calculated turb diff.
ltmpcor	L	.FALSE.		consideration of thermal TKE-sources in the enthalpy budget

Parameter	Type	Default	Unit	Description
lprfcor	L	.FALSE.		using the profile values of the lowest main level instead of the mean value of the lowest layer for surface flux calulations
lnonloc	L	.FALSE.		nonlocal calculation of vertical gradients used for turbul. diff.
lcpfluc	L	.FALSE.		consideration of fluctuations of the heat capacity air
limpltkediff	L	.TRUE.		consideration of fluctuations of the heat capacity air
itype_wcld	I	2		type of water cloud diagnosis
itype_synd	I	2		type of diagnostics of synoptical near surface variables
lconst_z0	L	.FALSE.		TRUE: horizontally homogeneous roughness leng z0
const_z0	R	0.001	m	value for horizontally homogeneous roughness lenght z0

Defined and used in: src/namelists/mo_turbdiff_nml.f90

3.29 gw_hines_nml (Scope: lgw_hines = .TRUE. in echam_phy_nml)

Parameter	Type	Default	Unit	Description
lheatcal	L	.FALSE.		.TRUE.: compute drag, heating rate and diffusio coefficient from the dissipation of gravity waves .FALSE.: compute drag only
emiss_lev	I	10		Index of model level, counted from the surface, from which the gravity wave spectra are emitted
rmscon	R	1.0	m/s	Root mean square gravity wave wind at the emission level
kstar	R	5.0e-5	1/m	Typical gravity wave horizontal wavenumber
m_min	R	0.0	1/m	Minimum bound in vertical wavenumber
lrmscon_lat	L	.FALSE.		.TRUE.: use latitude dependent rms wind

Parameter	Type	Default	Unit	Description
				- |latitude| >= lat_rmscon: use rmscon - |latitude| <= lat_rmscon_eq: use rmscon_eq - lat_rmscon_eq < |latitude| < lat_rmscon: use linear interpolation between rmscon_eq and rmsc .FALSE.: use globally constant rms wind rmscon
lat_rmscon_eq	R	5.0	deg N	rmscon_eq is used equatorward of this latitude
lat_rmscon	R	10.0	deg N	rmscon is used polward of this latitude
rmscon_eq	R	1.2	m/s	is used equatorward of latitude lat_rmscon_eq

Defined and used in: src/namelists/mo_gw_hines_nml.f90

4 Namelist parameters for testcases (NAMELIST_ICON)

The ICON model code includes several experiments, so-called test cases, for the shallow water model as atmosphere. Depending on the specified experiment, initial conditions and boundary conditions are comput

4.1 ha_testcase_nml (Scope: ltestcase=.TRUE. and iequations=[0,1,2] in run

Parameter	Type	Default	Unit	Description
ctest_name	C	'JWw'		Name of test case: 'SW_GW': gravity wave 'USBR': unsteady solid body rotation 'Will_2': Williamson test 2 'Will_3': Williamson test 3 'Will_5': Williamson test 5 'Will_6': Williamson test 6 'GW': gravity wave (nlev=20 only!) 'LDF': local diabatic forcing test without physics 'LDF-Moist': local diabatic forcing test with physics initalised with zonal wind field

Parameter	Type	Default	Unit	Description
				'HS': Held-Suarez test 'JWs': Jablonowski-Will. steady state 'JWw': Jablonowski-Will. wave test 'JWw-Moist': Jablonowski-Will. wave test including moisture 'APE': aqua planet experiment 'MRW': mountain induced Rossby wave 'MRW2': modified mountain induced Rossby wav 'PA': pure advection 'SV': stationary vortex 'DF1': deformational flow test 1 'DF2': deformational flow test 2 'DF3': deformational flow test 3 'DF4': deformational flow test 4 'RH': Rossby-Haurwitz wave test
rotate_axis_deg	R	0.0	deg	Earth's rotation axis pitch angle
gw_brunt_vais	R	0.01	1/s	Brunt Vaisala frequency
gw_u0	R	0.0	m/s	zonal wind parameter
gw_lon_deg	R	180.0	deg	longitude of initial perturbation
gw_lat_deg	R	0.0	deg	latitude of initial perturbation
jw_uptb	R	1.0	m/s (?)	amplitude of the wave pertubation
mountctr_lon_deg	R	90.0	deg	longitude of mountain peak
mountctr_lat_deg	R	30.0	deg	latitude of mountain peak
mountctr_height	R	2000.0	m	mountain height
mountctr_half_width	R	1500000.0	m	mountain half width
mount_u0	R	20.0	m/s	wind speed for MRW cases
rh_wavenum	I	4		wave number
rh_init_shift_deg	R	0.0	deg	pattern shift

Parameter	Type	Default	Unit	Description
ihs_init_type	I	1		Choice of initial condition for the Held-Suarez tes 1: the zonal state defined in the JWs test case; other integers: isothermal state (T=300 K, ps=1000 hPa, u=v=0.)
lhs_vn_ptb	L	.TRUE.		Add random noise to the initial wind field in the Held-Suarez test.
hs_vn_ptb_scale	R	1.	m/s	Magnitude of the random noise added to the initi wind field in the Held-Suarez test.
lrh_linear_pres	L	.FALSE.		Initialize the relative humidity using a linear function of pressure.
rh_at_1000hpa	R	0.75		relative humidity $0, 1$ at 1000 hPa
linit_tracer_fv	L	.TRUE.		Finite volume initialization for tracer fields
ape_sst_case	C	'sst1'		SST distribution selection 'sst1': Control experiment 'sst2': Peaked experiment 'sst3': Flat experiment 'sst4': Control-5N experiment 'sst_qobs': Qobs SST distribution exp 'sst_ice': Control SST distribution with -1.8 C above 64 N/S.
ildf_init_type	I	0		Choice of initial condition for the Local diabatic forcing test. 1: the zonal state defined in the JWs test case; other: isothermal state (T=300 K, ps=1000 hPa, u=v=0.)
ldf_symm	L	.TRUE.		Shape of local diabatic forcing: .TRUE.: local diabatic forcing symmetric about t equator (at 0 N) .FALSE.: local diabatic forcing asym. about the equator (at 30 N)

Defined and used in: src/testcases/mo_ha_testcases.f90

4.2 nh_testcase_nml (Scope: ltestcase=.TRUE. and iequations=3 in run_nm

Parameter	Type	Default	Unit	Description
nh_test_name	C	'jabw'		testcase selection 'zero': no orography 'bell': bell shaped mountain at 0E,0N 'schaer': hilly mountain at 0E,0N 'jabw': Initializes the full Jablonowski Williamso test case. 'jabw_s': Initializes the Jablonowski Williamson steady state test case. 'jabw_m': Initializes the Jablonowski Williamso test case with a mountain instead of the wind perturbation (specify mount_height). 'mrw_nh': Initializes the full Mountain-induced Rossby wave test case. 'mrw2_nh': Initializes the modified mountain-induced Rossby wave test case. 'mwbr_const': Initializes the mountain wave wit two layers test case. The lower layer is isotherma and the upper layer has constant brunt vaisala frequency. The interface has constant pressure. 'PA': Initializes the pure advection test case. 'HS_nh': Initializes the Held-Suarez test case. A the moment with an isothermal atmosphere at re (T=300K, ps=1000hPa, u=v=0, topography=0.0 'HS_jw': Initializes the Held-Suarez test case wit Jablonowski Williamson initial conditions and ze topography. 'APE_nh': Initializes the APE experiments. Wit the jabw test case, including moisture. 'wk82': Initializes the Weisman Klemp test case

Parameter	Type	Default	Unit	Description
jw_up	R	1.0	m/s	amplitude of the u-perturbation in jabw test case
u0_mrw	R	20.0	m/s	wind speed for mrw(2) and mwbr_const cases
mount_height_mrw	R	2000.0	m	maximum mount height in mrw(2) and mwbr_const
mount_half_width	R	1500000.0	m	half width of mountain in mrw(2), mwbr_const and bell
mount_lonctr_mrw_deg	R	90.	degrees	lon of mountain center in mrw(2) and mwbr_con
mount_latctr_mrw_deg	R	30.	degrees	lat of mountain center in mrw(2) and mwbr_cons
temp_i_mwbr_const	R	288.0	K	temp at isothermal lower layer for mwbr_const ca
p_int_mwbr_const	R	70000.	Pa	pres at the interface of the two layers for mwbr_const case
bruntvais_u_mwbr_const	R	0.025	1/s	constant brunt vaissala frequency at upper layer f mwbr_const case
mount_height	R	100.0	m	peak height of mountain
layer_thickness	R	-999.0	m	thickness of vertical layers
n_flat_level	I	2		level number for which the layer is still flat and n terrain-following
nh_u0	R	0.0	m/s	initial constant zonal wind speed
nh_t0	R	300.0	K	initial temperature at lowest level
nh_brunt_vais	R	0.01	1/s	initial Brunt-Vaisala frequency

Parameter	Type	Default	Unit	Description
torus_domain_length	R	100000.0	m	length of slice domain
rotate_axis_deg	R	0.0	deg	Earth's rotation axis pitch angle
lhs_nh_vn_ptb	L	.TRUE.		Add random noise to the initial wind field in the Held-Suarez test.
lhs_fric_heat	L	.FALSE.		add frictional heating from Rayleigh friction in th Held-Suarez test.
hs_nh_vn_ptb_scale	R	1.	m/s	Magnitude of the random noise added to the initi wind field in the Held-Suarez test.
rh_at_1000hpa	R	0.7	1	relative humidity at 1000 hPa
qv_max	R	20.e-3	kg/kg	specific humidity in the tropics
ape_sst_case	C	'sst1'		SST distribution selection 'sst1': Control experiment 'sst2': Peaked experiment 'sst3': Flat experiment 'sst4': Control-5N experiment 'sst_qobs': Qobs SST distribution exp.
linit_tracer_fv	L	.TRUE.		Finite volume initialization for tracer fields
qv_max_wk	R	0.014	Kg/kg	maximum specific humidity near the surface, range 0.012 - 0.016 used to vary the buoyancy
u_infty_wk	R	20.	m/s	zonal wind at infinity height range 0. - 45. used to vary the wind shear
bub_amp	R	2.	K	maximum amplitud of the thermal perturbation
bubctr_lat	R	0.	deg	latitude of the center of the thermal perturbation
bubctr_lon	R	90.	deg	longitude of the center of the thermal perturbatic
bubctr_z	R	1400.	m	height of the center of the thermal perturbation
bub_hor_width	R	10000.	m	horizontal radius of the thermal perturbation
bub_ver_width	R	1400.	m	vertical radius of the thermal perturbation

Defined and used in: src/testcases/mo_nh_testcases.f90

5 External data

5.1 ext_par_nml (Scope: itopo=1 in run_nml)

Parameter	Type	Default	Unit	Description
itopo	I	0		0: analytical topography/ext. data 1: topography/ext. data read from file
n_iter_smooth_topo	I(n_dom)	0		iterations of topography smoother
fac_smooth_topo	R	0.015625		pre-factor of topography smoother
heightdiff_threshold	R(n_dom)	3000.	m	height difference between neighboring grid points above which additional local nabla2 diffusion is applied
l_emiss	L	.TRUE.		read and use external surface emissivity map

Defined and used in: src/namelists/mo_extpar_nml.f90

6 External packages

6.1 art_nml

Parameter	Type	Default	Unit	Description
lart	L	.FALSE.		main switch for ART-package

Defined and used in: src/namelists/mo_art_nml.f90

7 Information on vertical level distribution

The hydrostatic and nonhydrostatic models need hybrid vertical level information to generate the terrain hybrid level specification is stored in <icon home>/hyb_params/HYB_PARAMS_<nlev>. The **hydros** **pressure based** coordinates, the **nonhydrostatic** model expects **height based** coordinates. For fur home>/hyb_params/README.