

Overview of all namoptions in DALES

Thijs Heus
Chiel van Heerwaarden
Johan van der Dussen
Huug Ouwersloot

July 17, 2013

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Chapter 1

Introduction

This document gives an overview of all namelist options in version 4 of the Dutch Atmospheric Large Eddy Simulation (DALES) model. Only general information concerning these options is presented. For more detailed information about the model, the reader is referred to Heus et al. (2009).

Much information in this document originates from Heus et al. (2009). All information from that document is checked and corrected where necessary. The options are also updated to match the current version.

Chapter 2

Namoptions overview

All options that can be set for the LES experiments will be discussed in the following paragraphs. These options are listed in a separate paragraph for all name lists. For all name lists, the options are given with their default values, possible values, a description and the unit. The possible values are denoted by an x . The paragraphs are grouped in two sections. In the first section, the main modules are discussed. In the second section an overview of the extra modules is presented.

2.1 Main modules

2.1.1 Namelist DOMAIN

| Option | Default | Possible values | Description | Unit |
|--------|--|---|---|------|
| imax | 64 | $x \in \mathbb{N}^*$ | Number of horizontal grid points in x-direction | - |
| jtot | 64 | $x = n \cdot N_{\text{processors}}, \quad n \in \mathbb{N}^*$ | Number of horizontal grid points in y-direction | - |
| kmax | 96 | $x \in \mathbb{N}^*$ | Number of vertical grid points | - |
| xsize | -1 | $x \in \mathbb{N}^*$ | Horizontal size of the simulated domain | m |
| ysize | -1 | $x \in \mathbb{N}^*$ | Horizontal size of the simulated domain | m |
| xlat | 52 | $x \in \mathbb{R}, \quad -90 \leq x \leq 90$ | Latitude | ° |
| xlon | 0 | $x \in \mathbb{R}, \quad 0 \leq x \leq 360$ | Longitude | ° |
| xday | 1 | $x \in \mathbb{R}, \quad 1 \leq x \leq 365$ | Number of the day | - |
| xtime | 0 | $x \in \mathbb{R}, \quad 0 \leq x < 24$ | UTC time of the day | h |
| ksp | $\min(\frac{3}{4}k_{\text{max}}, k_{\text{max}} - 15)$ | $x \in \mathbb{N}, \quad 0 \leq x \leq (k_{\text{max}} - 15)$ | Lower height of sponge layer | - |

2.1.2 Namelist DYNAMICS

| Option | Default | Possible values | Description | Unit |
|---|---------------------------|---------------------------------------|--|-------------------|
| cu | 0 | $x \in \mathbb{R}$ | Transformation velocity of the Galilei transformation in x-direction | m s^{-1} |
| cv | 0 | $x \in \mathbb{R}$ | Transformation velocity of the Galilei transformation in y-direction | m s^{-1} |
| llsadv | .false. | $x \in \{.false., .true.\}$ | Switch for large scale forcings | - |
| lqlnr | .true. | $x \in \{.false., .true.\}$ | Switch for Newton-Raphson approximation of the liquid water content | - |
| iadv_mom iadv_tke iadv_thl iadv_qt iadv_sv(1:nsv) | 5 -1 -1 -1 -1 | $x \in \{1, 2, 5, 52, 55, 6, 62, 7\}$ | Advection scheme for momentum, TKE, θ_l , q_t and scalars: 1 = 1 st order upwind 2 = 2 nd order central difference 5 = Option 6 + 5 th order upwind 52 = Horizontal 5 th & vertical 2 nd 55 = Hybrid scheme 6 = 6 th order central difference 62 = Horizontal 6 th & vertical 2 nd 7 = Kappa scheme | - |
| ibas_prf | 3 | $x \in \{1, 2, 3, 4, 5\}$ | Flag for density calculations based on 1 = Constant θ_v 2 = Boussinesq-like (similar to DALES 3) 3 = Standard lapse rate, based on surface temp. 4 = Standard lapse rate, based on $T_{\text{surf}} = 15^\circ\text{C}$ 5 = User defined (using the file baseprof.inp.###) | - |

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| Option | Default | Possible values | Description | Unit |
|-------------|---------|--------------------|---|------|
| lambda_crit | 100 | $x \in \mathbb{R}$ | Maximum value for the smoothness. This controls if WENO for the hybrid advection scheme | ? |

2.1.3 Namelist PHYSICS

| Option | Default | Possible values | Description | Unit |
|--------|---------|---------------------------------|---|------|
| thls | -1 | $x \in \mathbb{R}, \quad x > 0$ | Liquid water potential temperature at the surface | K |
| ps | -1 | $x \in \mathbb{R}, \quad x > 0$ | Pressure at the surface | Pa |
| isurf | -1 | $x \in \{1, 2, 3, 4, 10\}$ | Flag for surface parametrization 1 = Interactive scheme (using radiation) 2 = Forced surface temperature; fluxes are calculated 3 = Forced momentum, moisture and heat flux; surface temperature is calculated 4 = Forced moisture and heat flux; u_* and surface temperature are calculated 10 = User defined surface scheme. Can only be used for certain cases (using the file moduser.f90) | - |

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2.1 Main modules

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| Option | Default | Possible values | Description | Unit |
|----------------|---------|---------------------------------|---|-------------------------------------|
| z0 | -1 | $x \in \mathbb{R}, \quad x > 0$ | Surface roughness | m |
| ustin | -1 | $x \in \mathbb{R}, \quad x > 0$ | Prescribed friction velocity | m s^{-1} |
| wtsurf | -1 | $x \in \mathbb{R}, \quad x > 0$ | Flux of liq. water pot. temp. at the surface | K m s^{-1} |
| wqsurf | -1 | $x \in \mathbb{R}$ | Flux of total water content | $\text{kg kg}^{-1} \text{m s}^{-1}$ |
| wsvsurf(1:nsv) | 0 | $x \in \mathbb{R}$ | Flux of scalar n at the surface | ppb m s^{-1} |
| ltimedep | .false. | $x \in \{.false., .true.\}$ | Switch for timedependent fluxes and large scale forcings | - |
| lcoriol | .true. | $x \in \{.false., .true.\}$ | Switch for coriolis force | - |
| igrw_damp | 2 | $x \in \{0, 1, 2, 3\}$ | Flag for gravity wave damping 0 = no damping 1 = fast damping of wind to average wind & slow damping of average to geowind 2 = fast damping of wind to geowind 3 = fast damping of wind to average wind | - |
| geodamptime | 7200 | $x \in \mathbb{R}, \quad x > 0$ | Time scale for nudging to geowind in sponge layer | s |
| lmomsubs | .false. | $x \in \{.false., .true.\}$ | Switch to apply subsidence on momentum | - |
| lmoist | .true. | $x \in \{.false., .true.\}$ | Switch for calculation of moisture fields | - |
| chi_half | | | Obsolete | |
| timerad | 0 | $x \in \mathbb{R}, \quad x > 0$ | Value for sampling interval of radiation scheme | s |
| irradiation | 0 | $x \in \{0, 1, 2, 3, 10\}$ | Flag for radiation calculations 0 = No radiation 1 = Full radiation (not implemented yet) 2 = Parametrized radiation 3 = Simple surface radiation for land surface model | - |

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| Option | Default | Possible values | Description | Unit |
|------------|---------|--|--|-----------------------------|
| useMcICA | .true. | $x \in \{.false., .true.\}$ | 10 = User defined radiation (use <code>rad_user.f90</code>) Switch for the Monte Carlo Independent Column Approach | - |
| rad_ls | .true. | $x \in \{.false., .true.\}$ | Switch for prescribed radiative forcing | - |
| rad_longw | .true. | $x \in \{.false., .true.\}$ | Switch for parametrized longwave radiative forcing | - |
| rad_shortw | .true. | $x \in \{.false., .true.\}$ | Switch for parametrized shortwave radiative forcing | - |
| rad_smoke | .false. | $x \in \{.false., .true.\}$ | Switch for longwave divergence for smoke cloud | - |
| irad | -1 | $x \in \{-1, 0, 1, 2, 3, 4, 10\}$ | Deprecated flag to force (irradiation, <code>rad_ls</code> , <code>rad_longw</code> , <code>rad_shortw</code> , <code>rad_smoke</code>) -1 = - 0 = (0,--,--,--) 1 = (2,.true.,.false.,.false.,.false.) 2 = (2,.false.,.true.,.false.,.false.) 3 = (1,--,--,--) 4 = (2,.false.,.true.,.true.,.false.) 10 = (2,.false.,.false.,.false.,.true.) | - |
| rka | 130 | $x \in \mathbb{R}, \quad x > 0$ | Extinction coefficient (used if <i>irradiation</i> = 2) | $\text{m}^2 \text{kg}^{-1}$ |
| dlwbot | 0 | $x \in \mathbb{R}, \quad x \geq 0$ | Longwave radiative flux jump at cloud bottom | W m^{-2} |
| dlwtop | 74 | $x \in \mathbb{R}, \quad x \geq 0$ | Longwave radiative flux jump at cloud top | W m^{-2} |
| sw0 | 1100 | $x \in \mathbb{R}, \quad x \geq 0$ | Direct solar radiative component cloud top (assumes zero diffusive contribution) | W m^{-2} |
| gc | 0.85 | $x \in \mathbb{R}, \quad 0 \leq x \leq 1$ | Asymmetry factor of droplet scattering angle distribution | - |
| reff | 1e-5 | $x \in \mathbb{R}, \quad x > 0$ | Cloud drop effective radius | m |
| isvsmoke | 1 | $x \in \mathbb{N}, \quad 0 \leq x \leq \text{nsv}$ | Number of passive scalar fields to be used for optical depth calculation (not used when <i>rad_smoke</i> = .false.) | - |

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2.1 Main modules

Continued from previous page

| Option | Default | Possible values | Description | Unit |
|-------------|---------|-----------------------------|--|------|
| lforce_user | .false. | $x \in \{.false., .true.\}$ | Switch for user-defined forcing. Can only be used for certain cases (using the file moduser.f90) | - |

2.1.4 Namelist RUN

| Option | Default | Possible values | Description | Unit |
|-------------|---------|---|---|---------------------|
| iexpnr | 000 | $x \in \mathbb{R}, \quad x \geq 0$ | Experiment number; every output filename ends with [.iexpnr] | - |
| dtmax | 20 | $x \in \mathbb{R}, \quad x > 0$ | Maximum timestep that is used by the model | s |
| runtime | 300 | $x \in \mathbb{R}, \quad x > 0$ | Total simulation (or: run) time | s |
| lwarmstart | .false. | $x \in \{.false., .true.\}$ | Flag for a “cold” or a “warm” start | - |
| startfile | - | $x = \text{initd}\#\#\text{h}\#\#\text{mxxx}\#\#\#$ | Basis for the name of the restartfiles | - |
| trestart | 3600 | $x \in \mathbb{R}, \quad x > 0$ | Each <i>trestart</i> seconds, a restart file is written to disk | s |
| dtav_glob | 60 | $x = n \cdot \text{dtmax}, \quad n \in \mathbb{N}^*$ | Global value for sampling interval of statistical routines | s |
| timeav_glob | 3600 | $x = n \cdot \text{dtav_glob}, \quad n \in \mathbb{N}^*$ | Global value for writing interval of statistical routines | s |
| irandom | 0 | $x \in \mathbb{Z}$ | Number to feed randomnizer with | - |
| krand | kmax | $x \in \mathbb{N}, \quad 1 \leq x \leq \text{kmax}$ | Top vertical full level of randomization | - |
| randqt | 1e-5 | $x \in \mathbb{R}, \quad x > 0$ | Amplitude of randomnization of qt | kg kg ⁻¹ |
| randthl | 0.1 | $x \in \mathbb{R}, \quad x > 0$ | Amplitude of randomnization of thl | K |
| nsv | 0 | $x \in \mathbb{N}, \quad 0 \leq x \leq 100$ | Number of additional passive scalars | - |
| ladaptive | .false. | $x \in \{.false., .true.\}$ | If .true., this allows the model to vary time step, depending on numerical stability criteria | - |
| courant | 1.4 | $x \in \mathbb{R}, \quad x > 0$ | Courant number | - |
| peclet | 0.15 | $x \in \mathbb{R}, \quad x > 0$ | Peclet number | - |
| author | "" | $x = \text{"..."}"$ | Name of the author | - |

2.1.5 Namelist SUBGRID

| Option | Default | Possible values | Description | Unit |
|--------------|---------------|---------------------------------|--|------|
| ldelta | .false. | $x \in \{.false., .true.\}$ | Switch for diminished sfs in stable flow | - |
| lmason | .false. | $x \in \{.false., .true.\}$ | Switch for decreased length scale near the surface | - |
| cf | 2.5 | $x \in \mathbb{R}, \quad x > 0$ | Filter constant | - |
| cn | 0.76 | $x \in \mathbb{R}, \quad x > 0$ | Subfilter scale parameter | - |
| Rigc | 0.25 | $x \in \mathbb{R}, \quad x > 0$ | Critical Richardson number | - |
| Prandtl | $\frac{1}{3}$ | $x \in \mathbb{R}, \quad x > 0$ | Prandtl number | - |
| lsmagorinsky | .false. | $x \in \{.false., .true.\}$ | Switch for smagorinsky subgrid scheme | - |
| cs | -1 | $x \in \mathbb{R}, \quad x > 0$ | Smagorinsky constant | - |
| nmason | 2 | $x \in \mathbb{R}, \quad x > 0$ | Exponent in Mason correction function | - |

2.2 Extra modules

2.2.1 Namelist NAMBUDGET

| Option | Default | Possible values | Description | Unit |
|---------|-------------|---|---|------|
| lbudget | .false. | $x \in \{.false., .true.\}$ | Switch for turbulent TKE budget calculation | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.2 Namelist NAMBULKMICROSTAT

| Option | Default | Possible values | Description | Unit |
|------------|-------------|---|--|------|
| lmicrostat | .false. | $x \in \{.false., .true.\}$ | Switch for microphysics statistics calculation | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.3 Namelist NAMCAPE

| Option | Default | Possible values | Description | Unit |
|--------|-----------|---|--|------|
| lcape | .false. | $x \in \{.false., .true.\}$ | Switch to turn CAPE crosssections on and off | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |

2.2.4 Namelist NAMCHECKSIM

| Option | Default | Possible values | Description | Unit |
|--------|---------|---------------------------------|---|------|
| tcheck | 0 | $x \in \mathbb{R}, \quad x > 0$ | Time interval between checks of velocity divergence and Courant numbers | s |

2.2.5 Namelist NAMCHEM

| Option | Default | Possible values | Description | Unit |
|--------------|---------|---|---|---------------------|
| lchem | .false. | $x \in \{.false., .true.\}$ | Switch to turn chemistry on and off | - |
| tnor | - | $x \in \mathbb{N}, \quad x \geq N_{\text{reactions}}$ | Number of chemical reactions | - |
| firstchem | 1 | $x \in \mathbb{N}, \quad 1 \leq x \leq \text{lastchem}$ | Column number in scalar.inp of first chemical | - |
| lastchem | nsv | $x \in \mathbb{N}, \quad \text{firstchem} \leq x \leq \text{nsv}$ | Column number in scalar.inp of last chemical | - |
| ldiuvar | .false. | $x \in \{.false., .true.\}$ | Switches diurnal photolysis reaction rates | - |
| h_ref | 12 | $x \in \mathbb{R}, \quad 0 \leq x < 24$ | Hour used to calculate photolysis rates if ldiuvar = .false. | h |
| lcloudKconst | .false. | $x \in \{.false., .true.\}$ | Switch to make photolysis reaction rates independent of cloud presence if .true. | - |
| lchconst | .false. | $x \in \{.false., .true.\}$ | Reaction rates are based on t_ref, p_ref and q_ref instead of calculated T, p and q if .true. | - |
| t_ref | 298 | $x \in \mathbb{R}, \quad x \geq 0$ | Reference temperature | K |
| q_ref | 5.e-3 | $x \in \mathbb{R}, \quad x \geq 0$ | Reference humidity | kg kg ⁻¹ |
| p_ref | 100000 | $x \in \mathbb{R}, \quad x > 0$ | Reference pressure | Pa |
| lchmovie | .false. | $x \in \{.false., .true.\}$ | Switch for extra output to make movies | - |
| dtchmovie | 60 | $x \in \mathbb{R}, \quad x > 0$ | Time interval to write extra output | s |
| lsegr | .false. | $x \in \{.false., .true.\}$ | Switch for information about segregation in a Mixed Layer approach | - |

2.2.6 Namelist NAMCLOUDFIELD

| Option | Default | Possible values | Description | Unit |
|-------------|-----------|--|--|------|
| lcloudfield | .false. | $x \in \{.false., .true.\}$ | Switch for cloud field calculations | - |
| laddinfo | .false. | $x \in \{.false., .true.\}$ | Switch to enable writing of q_l and w values | - |
| dtav | dtav_glob | $x = n \cdot \text{dtmax}, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |

2.2.7 Namelist NAMCROSSECTION

| Option | Default | Possible values | Description | Unit |
|--------------------|------------|---|--|------|
| lcross | .false. | $x \in \{.false., .true.\}$ | Switch for dumping of crossections of the field | - |
| lbinary | .false. | $x \in \{.false., .true.\}$ | Switch to dump crossections in binary files | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| crossheight(1:100) | 1: $x = 2$ | $x \in \mathbb{N}, \quad 1 \leq x \leq kmax$ | Heights of the horizontal crossection | - |
| crossplane | 2 | $x \in \mathbb{N}, \quad 1 \leq x \leq jtot/N_{processors}$ | Location of the vertical (xz) plane on every processor | - |
| crossortho | 2 | $x \in \mathbb{N}, \quad 1 \leq x \leq imax$ | Location of the vertical (yz) plane | - |

2.2.8 Namelist NAMFIELD DUMP

| Option | Default | Possible values | Description | Unit |
|------------|-----------|---|---|------|
| lfielddump | .false. | $x \in \{.false., .true.\}$ | Switch for dumping of 3d-fields | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| lbinary | .false. | $x \in \{.false., .true.\}$ | Switch to dump crossections in binary files | - |
| ldiracc | .false. | $x \in \{.false., .true.\}$ | Switch to dump into binary direct access files instead of Fortran unformatted files | - |
| klow | 1 | $x \in \mathbb{N}, \quad 1 \leq x \leq khigh$ | Lowest level of the 3d-field output | - |
| khigh | kmax | $x \in \mathbb{N}, \quad klow \leq x \leq kmax$ | Highest level of the 3d-field output | - |

2.2.9 Namelist NAMGENSTAT

| Option | Default | Possible values | Description | Unit |
|--------|-------------|---|--|------|
| lstat | .false. | $x \in \{.false., .true.\}$ | Switch for calculating generic slabaveraged statistics | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.10 Namelist NAMHETEROSTATS

| Option | Default | Possible values | Description | Unit |
|--------------|-----------|---|---|------|
| lheterostats | .false. | $x \in \{.false., .true.\}$ | Switch for calculating generic x -averaged statistics | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| ncklimit | kmax | $x \in \mathbb{N}^*, \quad x \leq kmax$ | Maximum height index for which x -averages are calculated and written | - |

2.2.11 Namelist NAMLSMCROSSECTION

| Option | Default | Possible values | Description | Unit |
|-------------|-----------|---|---|------|
| lcross | .false. | $x \in \{.false., .true.\}$ | Switch to activate dumping of projections in the land surface layer | - |
| lbinary | .false. | $x \in \{.false., .true.\}$ | Switch to dump crosssections in binary files | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| crossheight | 2 | $x \in \mathbb{N}^*, \quad x \leq 4$ | Height of the xy-projection | - |
| crossplane | 2 | $x \in \mathbb{N}^*, \quad x \leq \frac{j_{tot}}{N_{processors}}$ | Position of the xz-plane on every processor | - |
| crossortho | 2 | $x \in \mathbb{N}, \quad 1 \leq x \leq imax$ | Location of the vertical (yz) plane | - |

2.2.12 Namelist NAMLSMSTAT

| Option | Default | Possible values | Description | Unit |
|--------|-------------|---|--|------|
| lstat | .false. | $x \in \{.false., .true.\}$ | Switch for calculating land surface statistics | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.13 Namelist NAMMICROPHYSICS

| Option | Default | Possible values | Description | Unit |
|-----------|---------|------------------------------------|---|------|
| imicro | 0 | $x \in \{0, 1, 2, 3, 10\}$ | Flag for the microphysical scheme: 0 = No microphysics (all-or-nothing scheme) 1 = Drizzle microphysics 2 = Bulk microphysics 3 = Bin microphysics (inactive) 10 = User defined microphysics. Can only be used for certain cases (using the file moduser.f90) | - |
| l_sb | .true. | $x \in \{.false., .true.\}$ | Switch for KK00 (Khairoutdinov and Kogan, 2000) or SB (Seifert and Beheng, 2001, 2006) scheme resp. | - |
| l_sedc | .true. | $x \in \{.false., .true.\}$ | Switch for cloud droplet sedimentation | - |
| l_rain | .true. | $x \in \{.false., .true.\}$ | Switch for rain formation and evolution | - |
| l_mur_cst | .false. | $x \in \{.false., .true.\}$ | Switch for a constant value of μ_r (in raindrop gamma distribution) | - |
| l_berry | .true. | $x \in \{.false., .true.\}$ | Berry-Hsie autoconversion instead of Kessler-Lin | - |
| l_graupel | .true. | $x \in \{.false., .true.\}$ | Switch for graupel | - |
| l_warm | .false. | $x \in \{.false., .true.\}$ | Check: rune ice micro in warm mode | - |
| mur_cst | 5 | $x \in \mathbb{R}, \quad x > 0$ | Value for μ_r , a shape parameter for the rain drop number density distribution (used only if l_mur_cst = .true.) | - |
| Nc_0 | 70e6 | $x \in \mathbb{R}, \quad x \geq 0$ | Initial number of cloud droplets | - |
| sig-g | 1.34 | $x \in \mathbb{R}, \quad x \geq 0$ | Geometric standard deviation of the cloud droplet drop size distribution | - |
| sig-gr | 1.5 | $x \in \mathbb{R}, \quad x \geq 0$ | Geometric standard deviation of the rain droplet drop size distribution | - |

2.2.14 Namelist NAMNETCDFSTATS

| Option | Default | Possible values | Description | Unit |
|---------|---------|-----------------------------|-------------------------------|------|
| lnetcdf | .true. | $x \in \{.false., .true.\}$ | Switch to write NetCDF output | - |

2.2.15 Namelist NAMNUDGE

| Option | Default | Possible values | Description | Unit |
|-----------|---------|---------------------------------|---------------------------------------|------|
| lnudge | - | $x \in \{.false., .true.\}$ | Switch to activate/deactivate nudging | - |
| tnudgefac | 1 | $x \in \mathbb{R}, \quad x > 0$ | Nudgefactor | - |

2.2.16 Namelist NAMPARTICLES

| Option | Default | Possible values | Description | Unit |
|-----------|---------|---|---|------|
| lpartic | .false. | $x \in \{.false., .true.\}$ | Switch to enable/disable this routine | - |
| lpartsgs | .true. | $x \in \{.false., .true.\}$ | Switch for subgrid diffusion | - |
| intmeth | 3 | $x \in \{0, 3\}$ | Flag for time integration scheme 0 = particles stand still 3 = Adams-Bashfort second order scheme | - |
| lstat | .false. | $x \in \{.false., .true.\}$ | Switch for particle statistics | - |
| dtav | 60 | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | 3600 | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |
| ldump | .false. | $x \in \{.false., .true.\}$ | Switch for dump of particle field | - |
| timedump | 3600 | $x \in \mathbb{R}, \quad x > 0$ | Time interval for particle field dump | s |
| npartdump | 10 | $x \in \mathbb{N}, \quad 0 \leq x \leq 10$ | Number of variables written at <i>timedump</i> , in order: $x, y, z, u, v, w, \theta_l, \theta_v, q_t, q_l$ | - |

2.2.17 Namelist NAMprojection

Old version of modcrosssection (Paragraph 2.2.7). Usage of modprojection is not advised.

| Option | Default | Possible values | Description | Unit |
|---------------|-----------|---|--|------|
| lproject | .false. | $x \in \{.false., .true.\}$ | Switch to activate dumping of projections of the field | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| projectheight | 2 | $x \in \mathbb{N}^*, \quad x \leq kmax$ | Height of the xy-projection | - |

2.2.18 Namelist NAMRADSTAT

| Option | Default | Possible values | Description | Unit |
|--------------|-------------|---|--|------|
| lstat | .false. | $x \in \{.false., .true.\}$ | Switch for calculating slabaveraged radiation statistics | - |
| lradclearair | .false. | $x \in \{.false., .true.\}$ | Another switch for calculating slabaveraged radiation statistics | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.19 Namelist NAMSAMPLING

| Option | Default | Possible values | Description | Unit |
|-----------|-------------|---|--|------|
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |
| lsampcl | .false. | $x \in \{.false., .true.\}$ | Switch for conditional sampling cloud ($q_l > 0$) | - |
| lsampco | .false. | $x \in \{.false., .true.\}$ | Switch for conditional sampling cloud core ($q_l > 0, \theta'_v > 0$) | - |
| lsampup | .false. | $x \in \{.false., .true.\}$ | Switch for conditional sampling updrafts ($w > 0$) | - |
| lsampbuup | .false. | $x \in \{.false., .true.\}$ | Switch for conditional sampling of buoyant updrafts ($w > 0, \theta'_v > 0$) | - |

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| Option | Default | Possible values | Description | Unit |
|------------|---------|-----------------------------|--|------|
| lsampcldup | .false. | $x \in \{.false., .true.\}$ | Switch for conditional sampling cloudy updrafts ($q_l > 0, w > 0$) | - |

2.2.20 Namelist NAMSIMPLEICESTAT

| Option | Default | Possible values | Description | Unit |
|------------|-------------|---|---|------|
| lmicrostat | .false. | $x \in \{.false., .true.\}$ | Switch for simple ice microphysics statistics calculation | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.21 Namelist NAMSTATTEND

| Option | Default | Possible values | Description | Unit |
|--------|-------------|---|--|------|
| ltend | .false. | $x \in \{.false., .true.\}$ | Switch for calculation of tendencies of prognostic variables | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.22 Namelist NAMSTRESS

| Option | Default | Possible values | Description | Unit |
|---------|-------------|---|--|------|
| lstress | .false. | $x \in \{.false., .true.\}$ | Switch for turbulent stress budget | - |
| dtav | dtav_glob | $x = n \cdot dtmax, \quad n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot dtav, \quad n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.23 Namelist NAMSURFACE

| Option | Default | Possible values | Description | Unit |
|----------------|---------|--|--|---|
| isurf | -1 | $x \in \{1, 2, 3, 4, 10\}$ | Overrides isurf flag of Namelist PHYSICS if used. | - |
| lmostlocal | .false. | $x \in \{.false., .true.\}$ | Switch to locally determine Obukhov length | - |
| lsmoothflux | .false. | $x \in \{.false., .true.\}$ | Switch to create uniform sensible and latent heat flux over domain | - |
| lneutral | .false. | $x \in \{.false., .true.\}$ | Switch to disable stability corrections | - |
| z0 | -1 | | Obsolete | |
| z0mav | -1 | $x \in \mathbb{R}, \quad x > 0$ | Roughness length of momentum | m |
| z0hav | -1 | $x \in \mathbb{R}, \quad x > 0$ | Roughness length of heat | m |
| thls | -1 | $x \in \mathbb{R}, \quad x > 0$ | Surface liquid water potential temperature | K |
| ps | -1 | $x \in \mathbb{R}, \quad x > 0$ | Surface pressure | Pa |
| ustin | -1 | $x \in \mathbb{R}, \quad x \geq 0$ | Prescribed friction velocity | m s^{-1} |
| wtsurf | -1 | $x \in \mathbb{R}$ | Prescribed kinematic temperature flux | K m s^{-1} |
| wqsurf | -1 | $x \in \mathbb{R}$ | Prescribed kinematic moisture flux | $\text{kg kg}^{-1} \text{m s}^{-1}$ |
| wsvsurf(1:nsv) | 0 | $x \in \mathbb{R}[100]$ | Prescribed surface scalar flux | ppb m s^{-1} |
| tsoilav | - | $x \in \mathbb{R}[4], \quad x[i] > 0$ | Initial soil temperature (for 4 layers, only used if isurf = 1) | K |
| tsoildeepav | - | $x \in \mathbb{R}, \quad x > 0$ | Soil bottom temperature (if isurf = 1) | K |
| phiwav | - | $x \in \mathbb{R}[4], \quad 0 \leq x[i] \leq 0.472$ | Soil moisture (if isurf = 1 and preferably below 0.323) | $\text{m}^3 \text{m}^{-3}$ |
| rootfav | - | $x \in \mathbb{R}[4], \quad 0 \leq x[i] \leq 1, \quad \sum_i x[i] = 1$ | Root fraction (if isurf = 1) | - |
| Cskinav | -1 | $x \in \mathbb{R}, \quad x \geq 0$ | Heat capacity skin layer (if isurf = 1) | $\text{J K}^{-1} \text{m}^{-2}$ |
| lambdaskinav | - | $x \in \mathbb{R}, \quad x \geq 0$ | Heat conductivity skin layer (if isurf = 1) | $\text{J s}^{-1} \text{K}^{-1} \text{m}^{-2}$ |
| albedoav | -1 | $x \in \mathbb{R}, \quad 0 \leq x \leq 1$ | Albedo (if isurf = 1) | - |
| Qnetav | -1 | $x \in \mathbb{R}$ | Net radiation (if irradiation $\neq 1$ and isurf = 1) | $\text{J s}^{-1} \text{m}^{-2}$ |
| cvegav | -1 | $x \in \mathbb{R}, \quad x \geq 0$ | Vegetation cover | - |
| Wlav | -1 | $x \in \mathbb{R}, \quad x \geq 0$ | Initial water cover on vegetation | m |

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| Option | Default | Possible values | Description | Unit |
|---------------------|---------|---|---|----------------------------|
| rsminav | -1 | $x \in \mathbb{R}, x \geq 0$ | Minimal vegetation resistance (if isurf = 1) | s m^{-1} |
| rssoilminav | -1 | $x \in \mathbb{R}, x \geq 0$ | Minimum soil evaporation resistance | - |
| LAIav | -1 | $x \in \mathbb{R}, x \geq 0$ | Leaf area index (if isurf = 1) | $\text{m}^2 \text{m}^{-2}$ |
| gDav | - | $x \in \mathbb{R}, x \geq 0$ | Correction for evaporation of tall vegetation (if isurf = 1) | - |
| rsisurf2 | 0 | $x \in \mathbb{R}, x \geq 0$ | Vegetation resistance (if isurf = 2) | s m^{-1} |
| lhetero | .false. | $x \in \{\text{.false.}, \text{.true.}\}$ | Switch to apply heterogeneous surfaces | - |
| xpatches | 2 | $x \in \mathbb{N}, 1 \leq x \leq 16$ | Amount of patches in the x-direction | - |
| ypatches | 1 | $x \in \mathbb{N}, 1 \leq x \leq 16$ | Amount of patches in the y-direction | - |
| land_use(1:16,1:16) | 0 | $x \in \mathbb{N}, 1 \leq x \leq 10$ | Indicator for the land type | - |
| loldtable | .false. | $x \in \{\text{.false.}, \text{.true.}\}$ | Switch to use surface.inp.xxx instead of updated surface.<name>.inp.xxx | - |

2.2.24 Namelist NAMTILT

| Option | Default | Possible values | Description | Unit |
|---------|-------------|--|--|------|
| ltilted | .false. | $x \in \{\text{.false.}, \text{.true.}\}$ | Switch for a tilted boundary layer | - |
| alfa | 0 | $x \in \mathbb{R}, -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ | Tilt angle | rad |
| lstat | .true. | $x \in \{\text{.false.}, \text{.true.}\}$ | Switch for statistics | - |
| dtav | dtav_glob | $x = n \cdot \text{dtmax}, n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |
| timeav | timeav_glob | $x = n \cdot \text{dtav}, n \in \mathbb{N}^*$ | Time interval for writing statistics | s |

2.2.25 Namelist NAMTIMESTAT

| Option | Default | Possible values | Description | Unit |
|-----------|-----------|--|--|------|
| ltimestat | .false. | $x \in \{\text{.false.}, \text{.true.}\}$ | Switch for calculation of time series | - |
| dtav | dtav_glob | $x = n \cdot \text{dtmax}, n \in \mathbb{N}^*$ | Time interval for sampling of statistics | s |

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2.2 Extra modules

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| Option | Default | Possible values | Description | Unit |
|-----------|-----------|--|---|--------------------------|
| iblh_var | iblh_thv | $x \in \{-1, -2, -3\}$ | Flag for the variable used to calculate boundary layer height -1 = virtual pot. temp. θ_v -2 = liquid water pot. temp. θ_l -3 = total humidity q_t | - |
| iblh_meth | iblh_grad | $x \in \{1, 2, 3\}$ | Flag for the method used to calculate boundary layer height 1 = use flux of selected variable 2 = use gradient of selected variable 3 = use a threshold (auto or user specified) | - |
| blh_thres | -1 | $x \in \mathbb{R}, \quad x \geq 0$ | Threshold for the selected variable, used only for iblh_thres method | K or kg kg ⁻¹ |
| blh_nsamp | 4 | $x \in \mathbb{N}^*, \quad x \leq \text{kmax}$ | Number of levels to integrate over | - |

Bibliography

- T. Heus, C. van Heerwaarden, and J. van der Dussen. *Dutch Atmospheric Large Eddy Simulation: user manual*, November 2009.
- M. Khairoutdinov and Y. Kogan. A new cloud physics parametrization in a large-eddy simulation model of marine stratocumulus. *Monthly Weather Review*, 128:229–243, 2000.
- A. Seifert and K.D. Beheng. A double-moment parameterization for simulating autoconversion, accretion and selfcollection. *Atmospheric Research*, 59-60:265–281, 2001.
- A. Seifert and K.D. Beheng. A two-moment cloud microphysics parameterization for mixed-phase clouds. part 1:model description. *Meteorology and Atmospheric Physics*, 92:45–66, 2006.