ALARO-0 baseline namelist documentation CY38T1 (bf3).

This is a short description on the switches and tunings of the ALARO-0 baseline version as implemented in the CY38T1, version bugfix 3, as recommended for the export. This documentation is not exhaustive one for each scheme, only useful switches and tunings are mentioned.

1. Radiation scheme ACRANEB (not yet the new one)

Logical switches in **NAMPHY**

Switch	Description	default	recommended
LRAY	Main switch for ACRANEB	.TRUE.	.TRUE.
	Transmission		
LNEWSTAT	Use new statistical model for Net Exchange Rate computations	.TRUE.	.TRUE.
LREWS	Option for the specific computation of the exchange with surface	.FALSE.	.TRUE.
LRMIX	Exchange between layers – solution mixing maximum and minimum optical depths results	.FALSE.	.TRUE.
LRPROX	Exchange between layers - no LRMIX approximation for the case of adjacent layers	.FALSE.	.TRUE.
LRSTAB	Stabilization of main NER terms for long time-steps	.FALSE.	.TRUE.
LRTDL	If LRPROX=.TRUE. : nonlinear computation	.FALSE.	.TRUE.
LRTPP	If LRPROX=.TRUE. : continuous temperature profile	.FALSE.	.TRUE.
LVOIGT	Voigt effect activated	.FALSE.	.TRUE.
LVFULL	Maximum accuracy Voigt effect – very expensive	.FALSE.	.FALSE.
LRAUTOEV	Exchange between layers – exact expensive comp.	.FALSE.	.FALSE.
	Cloudiness treatment		
LRNUMX	Cloud geometry – maximum-random overlap, random overlap otherwise	.FALSE.	.TRUE.
LCLSATUR	Cloud optical depth saturation model	.FALSE.	.TRUE.
	Aerosols and ozone		
LRSTAER	Use of standard (older) aerosols, not new ones	.TRUE.	.FALSE.
LAERODES	Desert aerosols	.FALSE.	.TRUE.
LAEROLAN	Land aerosols	.FALSE.	.TRUE.
LAEROSEA	Sea aerosols	.FALSE.	.TRUE.
LAEROSOO	Soot aerosols	.FALSE.	.TRUE.
LO3ABC	Use of climatologic ozone profiles	.FALSE.	.TRUE.
	Other		
LRAYLU	Option to compute moonlight	.TRUE.	.FALSE.

Tuning constants are in **NAMPHY3/YOMPHY3**. We use default values.

2. Gravity wave drag and mountain lift

(Maybe not needed below 5km but it was not tested if it is true.)

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	description	default	recommended
LGWD	Main switch for gravity wave drag ACDRAG	.TRUE.	.TRUE.
LNEWD	Main switch for the"new" gravity wave drag scheme	.FALSE.	.TRUE.
LGLT	Geostrophic wind used in mountain lift computation	.FALSE.	.TRUE.
Associated recommended tuning			
The following is recommended for mean orography (i.e. without envelope). *GWDCD=5.4* (drag coefficient) *GWDLT=1.* (surface lift coefficient; it should be lowered when envelope orography is used) *GWDSE=0.02* (soil aspect ratio coefficient – multiplicating factor for all effects) *GWDVALI=0.5* (valley isolation coefficient)			

3. Turbulence, shallow convection and exchange with surface

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0** and **NAMPHY2**

Switch	description	default	recommended
LVDIF	Main switch for vertical diffusion	.TRUE.	.TRUE.
LPTKE	Pseudo-prognostic TKE	.FALSE.	.TRUE.
LPRGML	Situation-dependent mixing length	.FALSE.	.TRUE.
CGMIXLEN	Mixing length way of computation – Ayotte type	'Z'	'AY'
LDIFCONS	Diffusion of moist conservative variables (LCONDWT=.TRUE. – see prognostic-type cloud scheme)	.FALSE.	.TRUE.
LRRGUST	Moist gustiness	.FALSE.	.TRUE.
LPHSPSH	Pseudo-historic surface precipitation heat	.FALSE.	.TRUE.
LMULAF	Anti-fibrillation scheme	.FALSE.	.TRUE.
Associated recommended tuning			
ALMAV=200. (mixing length of wind – asymptotic value) *BEDIFV=0.1* (vertical diffusion profile form coefficient) *EDD=1.* (asymptotic stable regime coefficient) *GCISMIN=5.5E-04* (minimum value of shear in turbulence computation) *NUPTKE=0.52* (pTKE tuning value; it is a real number despite its name not conform to Doctor norms) *USURIC=1.* (inverse of critical Richardson number Ric) *USURICE=0.5* (height exponent in Ri number computation) *USURICL=4.* (coefficient relating Ri computation with the height) *USURID=0.048* (inverse Ri transition number to go from Ri to Ric) *USURIDE=0.25* (exponent in the computation of Rid local) *VZ0CM=1.0E-4* (neutral condition minimum roughness length on sea for gustiness) *VZIUSTAR0=12.* (scaling inverse roughness velocity – for moist gustiness) *FACRAF=10.* (coefficient for gust diagnostics – no active impact on the model, but one should tune it, since it depends on the vertical resolution and surface representation settings) *XDAMP=1.* (shallow convection damping factor) *XMULAF=-1.85* (anti-fibrillation coefficient)			

Associated GFL arrays	
YTKE_NL%LGP=.T. (prognostic TKE) YTKE_NL%LADV=.T. (advection of TKE activated)	YTKE_NL%LSLHD=.T. (hor. diffusion by SLHD) YTKE_NL%NREQIN=1 (cycled when assimilation)

4. Cloud scheme for radiation scheme and for diagnostic output

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	Description	default	recommended
LNEBN	Main switch for radiation cloudiness ACNEBN	.TRUE.	.TRUE.
LNEBNXR	Main switch for Xu-Randall scheme	.FALSE.	.TRUE.
LQXRTGH	Relative humidity – use of TANH curve	.FALSE.	.TRUE.
LHUCN	Critical relative humidity profile computation for use in both prognostic and radiation-diagnostic scheme	.FALSE.	.TRUE.
LACPANMX	Use combined overlap assumption – diagnostics only without active role in the model	.FALSE.	.TRUE.
Associated recommended tuning			
HUCOE=1.4 (tuning coefficient when LHUCN=.TRUE.) *QSSC=400.* (dry static energy threshold for shallow convection computation of cloudiness) *QSSUSC=0.75* (factor relating convective precipitation with condensed convective cloud water – not used with L3MT=.TRUE.) *QSSUSS=0.4* (factor relating super-saturation with condensed stratiform cloud water) *QSSUSV=250.* (factor relating super-saturation with condensed stratiform cloud water) *QSUSXC=0.0002* (maximum of cloud water for deep convection part, not used with L3MT=.TRUE.) *QSUSXS=0.0003* (maximum of cloud water for shallow convection part) *QXRAL=130.* (parameter in Xu-Randall cloudiness computation) *QXRDEL=0.5* (parameter in Xu-Randall cloudiness computation; not to be changed if L3MT=.TRUE. due to inverse computation at place) *QXRR=0.25* (parameter in Xu-Randall cloudiness computation; not to be changed if L3MT=.TRUE. due to inverse computation at place) ***QXRTGH=1.6*** (parameter in Xu-Randall cloudiness computation when LQXRTGH=.TRUE.): the value depends on vertical resolution, this one holds for 87 levels; maximum value: 3.5 (for app. 40 levels) *RPHI0=1250.* (parameter for enhancing cloudiness in conditions of temperature inversion) *WMXOV=0.8* (weight of the maximum-random overlap when mixed overlap is used (LACPANMX=.TRUE. for diagnostics only)). It should be tuned, may depend on vertical resolution.			

5. Thermodynamic adjustment and prognostic-type cloud scheme

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	Description	default	recommended
LCONDWT	Prognostic condensed cloud water main switch	.FALSE.	.TRUE.
LXRCDEV	Adjustment uses Xu-Randall type of cloud scheme	.FALSE.	.TRUE.
LHUCN	Critical relative humidity profile computation for use in both prognostic and radiation-diagnostic scheme	.FALSE.	.TRUE.
LNEBCV	Protect deep convective cloud water against re-evaporation, in case L3MT=.TRUE.	.FALSE.	.TRUE.
Associated recommended tuning			
HUCOE=1.4 (tuning coefficient when LHUCN=.TRUE., used also in the diagnostic scheme)			

QXRAL=130. (parameter in Xu-Randall cloudiness computation, used also in the diagnostic scheme) *HUCRED=1. 0* (parameter for critical relative humidity profile in adjustment) *SCLESPR=248000.* (liquid condensation length scale of the adjustment – tuning with the exponent coefficient ZEXPLDX=0.3 hardcoded in ACNEBCOND; recommended value is set by default, here mentioned for completeness, see remark (*) below) *SCLESPS=15500.* (solid condensation length scale of the adjustment – tuning with the exponent coefficient ZEXPLDX=0.3 hardcoded in ACNEBCOND; recommended value is set by default, here mentioned for completeness, see remark (*) below)	
Associated GFL arrays	
YI_NL%LGP=.T., (cloud water – solid phase) YI_NL%LADV=.T., (advection) YI_NL%LSLHD=.T., (diffusion by SLHD) YI_NL%NREQIN=1, (cycled in assimilation)	YL_NL%LGP=.T., (cloud water – liquid phase) YL_NL%LADV=.T. (advection) YL_NL%LSLHD=.T. (diffusion by SLHD) YL_NL%NREQIN= 1, (cycled in assimilation)

(*) Critical humidity dependency on horizontal resolution was recently revisited. While the dependency was written via the ratio of the mesh size to SCLESPR/S, it now uses the less rapidly varying power 0.3 of this ratio. Accordingly, the length scales had to be changed to obtain the same result at the delta(x) where the previous system was correct. If one wishes ascending compatibility (not recommended though) one should overwrite the '0.3' value by '1.' in the code and return to the old values of the namelist parameters. In higher cycles the power coefficient (RHCEXPDX) will appear in namelist.

6. Prognostic microphysics

Prognostic microphysics requires a prognostic-type cloud scheme.

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	**description**	**default**	**recommended**
LSTRA	Main switch for **old** stratiform precipitation	.TRUE.	.FALSE.
LSTRAPRO or L3MT	Main switches: prognostic microphysics APLMPHYS can be used in prognostic mode either in 3MT (**complex way, L3MT=.TRUE.**), or independently of the moist deep convection (switching LSTRAPRO=.TRUE., accompanied either by the old ACCVIMP moist deep convection with LCVRA=.TRUE., or not).	.FALSE. .FALSE.	L3MT=.TRUE. and LSTRAPRO=.FALSE.
LA0MPS	ALARO-0 microphysics	.TRUE.	.TRUE.
LSEDSTA	Statistical sedimentation	.TRUE.	.TRUE.
LFSVAR	Variable fall speed of falling species	.TRUE.	.TRUE.
LSEDCL	Sedimentation of cloud water and ice	.FALSE.	.TRUE.
Associated recommended tuning			
RAUTEFR=1.E-03 (inverse of autconversion time for rain) *RAUTEFS=1.E-03* (inverse of autconversion time for snow) *RQICRMAX=5.E-05* (maximum critical ice content for autoconversion of ice) *RQICRMIN=8.E-07* (minimum critical ice content for autoconversion of ice) *RQLCR=3.E-04* (critical liquid water content for autoconversion of liquid cloud water) *RWBF1=1600.* (Wegener-Bergeron-Findeisen process parameter) *TFVI=0.08* (sedimentation speed of cloud ice) *TFVL=0.02* (sedimentation speed of cloud water)			

Associated GFL arrays	
YR_NL%LGP=.T., (rain) YR_NL%LADV=.T., (advection) YR_NL%NREQIN=1, (cycled in assimilation)	YS_NL%LGP=.T., (snow) YS_NL%LADV=.T. (advection) YS_NL%NREQIN= 1, (cycled in assimilation)

7. Moist deep convection 3MT

Prognostic moist deep convection 3MT requires prognostic microphysics and prognostic-type cloud scheme.

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	description	default	recommended
LCVRA	Main switch for **old** moist deep convection	.TRUE.	.FALSE.
L3MT	Main switch for L3MT	.FALSE.	.TRUE.
LSTRA	Main switch for old stratiform precipitation	.TRUE.	.FALSE.
LSTRAPRO	Switch for prognostic microphysics outside 3MT	.FALSE.	.FALSE.
LCVPRO	Prognostic updraft	.FALSE.	.TRUE.
LCDDPRO	Prognostic downdraft	.FALSE.	.TRUE.
LSCMF	Significant mesh fraction's influence on the entrainment rate	.FALSE.	.TRUE.
LNOIAS	Stop convection in case of absolute dry instability	.FALSE.	.TRUE.
LCVGQM	Modulation of humidity convergence closure	.FALSE.	.TRUE.
NIMELIT	Number of iterations for simple microphysics call within updraft. When set to 1 (default), there is no impact	1	2
LENTCH	Memory in adaptive detrainment	.FALSE.	.TRUE.
LCVGQD	Humidity convergence computed from dynamical advection only (no turbulence contribution). It should be kept .FALSE.	.FALSE.	.FALSE.
LRCVOTT	Obsolete option, make sure it is .FALSE.	.FALSE.	.FALSE.

Associated recommended tuning

GCOMOD=0. (old scaling factor for humidity convergence, value "*0.*" is mandatory for L3MT=.TRUE.)
GCVACHI=20. (maintenance of activity; minimum updraft velocity to be allowed crossing a stable layer)
GCVALFA=4.5E-05 (main coefficient for the buoyancy-modulation of entrainment)
GCVNU=1.E-05 (coefficient of convective cloud profile when LENTCH)
GCVTAUDE=900. (convective cloud decay time to stabilize and introduce memory)
GDDEVF=0.12 (efficiency coefficient of downdraft)
GENVSRH=1. (coefficient driving use of relative humidity integral difference cloud-environment in entrainment)
GPEFDC=0.18 (coefficient of cold pool effect – when LENTCH=.TRUE.)
GPETAU=0.1371E+05 (time scale of cold pool effect – when LENTCH=.TRUE.)
GPEIPHI=0. (minimum of GCVNU-like coefficient when LENTCH=.TRUE.)
RCIN=1. (coefficient of cloud profile computation)
***RMULACVG**=15.* (humidity convergence closure modulation coefficient when LCVGQM=.TRUE., for its tuning see remark (*))
TDDFR=0.0012 (downdraft friction coefficient)
TENTR=5.E-06 (minimum updraft entrainment coefficient)
TENTRD=1.6E-04 (downdraft entrainment coefficient)
TENTRX=1.6E-04 (maximum updraft entrainment coefficient)

Associated GFL arrays

YQ_NL%LSLHD=.T. (SLHD horizontal diffusion)	YUNEBH_NL%LGP=.T. (hist. detrained fraction)
YQ_NL%LSP=.T. (spectral water vapor)	YUNEBH_NL%LADV=.T. (advection)
YQ_NL%LREQOUT=.T.,	YUNEBH_NL%NREQIN=1 (cycled in assimilation)
YDAL_NL%LGP=.T. (downdraft mesh fraction)	YUAL_NL%LGP=.T. (updraft mesh fraction)
YDAL_NL%LADV=.T. (advection)	YUAL_NL%LADV=.T. (advection)

YDAL_NL%NREQIN=1 (cycled in assimilation) YDOM_NL%LGP=.T. (downdraft velocity) YDOM_NL%LADV=.T. (advection) YDOM_NL%NREQIN=1 (cycled in assimilation) YUEN_NL%LGP=.T. (adaptive detrainment) YUEN_NL%LADV=.F. (no advection) YUEN_NL%NREQIN=1 (cycled in assimilation)	YUAL_NL%NREQIN=1 (cycled in assimilation) YUOM_NL%LGP=.T. (updraft velocity) YUOM_NL%LADV=.T. (advection) YUOM_NL%NREQIN=1 (cycled in assimilation)

(*) Parameter RMULACVG should vary within the grey zone, empirically delimited by 6000m and 1200m: RMULACVG=MIN(25., MAX(1.,(dx/1200.)**2)). This formula is not yet coded in the setup, but it is recommended. Value *15* was tuned at dx=4700m.

8. Various

Logical switches in **NAMPHY** and tuning constants in **NAMPHY0**

Switch	description	default	recommended
NPHYREP	Reproducibility of results with physics. NPHYREP=1 means reproducibility, important for validations, other mean some CPU savings. Value *-4* means savings in radiation	1	-4
LFPCOR	Switch used with the convection scheme ACCVIMP (LCVRA=.TRUE.), its setting is neutral in 3MT. It serves to smooth convective precipitation flux serving only to the computation of convective cloudiness.	.FALSE.	.TRUE. (in case LCVRA=.TRUE., i.e. L3MT=.FALSE.)
LVGSN	Vegetation and snow combination in ISBA. In case of SURFEX it is not used (all three ISBA switches LSOLV, LFGELS and LVGSN are set to .FALSE.)	.FALSE.	.TRUE.