Variable Names	Input Option	Description
&time_control		***options for time control***
run_days	1	run time in days
run_hours	0	run time in hours *note: if it is more than 1 day, you may use both run_days and run_hours or just run_hours. e.g. if the total run length is 36 hrs, you may set run_days = 1, and run_hours = 12, or run_days = 0, and run_hours = 36
run_minutes	0	run time in minutes
run_seconds	0	run time in seconds
start_year (max_dom)	2012	4 digit year of starting time
start_month (max_dom)	06	2 digit month of starting time
start_day (max_dom)	11	2 digit day of starting time
start_hour (max_dom)	12	2 digit hour of starting time
start_minute (max_dom)	00	2 digit minute of starting time
start_second (max_dom)	00	2 digit second of starting time *note: the start time is used to name the first wrfout file. It also controls the start time for nest domains, and the time to restart
end_year (max_dom)	2012	4 digit year of ending time
end_month (max_dom)	06	2 digit month of ending time
end_day (max_dom)	12	2 digit day of ending time
end_hour (max_dom)	12	2 digit hour of ending time
end_minute (max_dom)	00	2 digit minute of ending time
end_second (max_dom_	00	2 digit second of ending time *note: all end times also control when the nest domain integrations end. All start and end times are used by *real.exe*. You may use either run_days/run_hours/etc. or end_year/month/day/hour/etc. to control the length of model integration; but run_days/run_hours takes precedence over the end times. The program *real.exe* uses start and end times only
interval_seconds	10800	time interval between the incoming real data, which will be the interval between the lateral boundary condition file (for *real* only)

input_from_file (max_dom)	.true.	(logical); whether the nested run will have input files for domains other than domain 1
fine_input_stream (max_dom)		selected fields from nest input
	0	(default) all fields from nest input are used
	2	only nest input specified from input stream 2 (defined in the Registry) are used. In V3.2, this requires `io_form_auxinput2` to be set
history_interval (max_dom)	60	history output file interval in minutes (integer only)
history_interval_d (max_dom)	1	history output file interval in days (integer only); used as an alternative to `history_interval`
history_interval_h (max_dom)	1	history output file interval in hours (integer only); used as an alternative to `history_interval`
history_interval_m (max_dom)	1	history output file interval in minutes (integer only); used as an alternative to `history_interval` and is equivalent to `history_interval`
history_interval_s (max_dom)	1	history output file interval in seconds (integer only); used as an alternative to `history_interval`
frames_per_outfile (max_dom)	1	number of output times bulked into each history file; used to split output files into smaller pieces
restart	.false.	(logical); whether this run is a restart
restart_interval	1440	restart output file interval in minutes
override_restart_timers	.false.	(default) uses restart output intervals given by the wrfrst files
	.true.	uses restart output intervals given by the namelist
write_hist_at_0h_rst	.false.	(default) does not give a history file at the initial time of restart (prevents overwriting original

		history file at this time)
	.true.	gives a history file at the initial time of restart
reset_simulation_start	.false.	whether to overwrite the simulation start date with the forecast start time
auxinput1_inname	"met_em.d<domain><date>"	(default); name of input file from WPS
auxinput4_inname	"wrflowinp_d<domain>"	name of input file for lower boundary file; works with `sst_update = 1`
auxinput4_interval (max_dom)	360	file interval in minutes for lower boundary file; works with `sst_update = 1`
io_form_auxinput4	2	IO format for wrflowinp files; required for V3.2; works with `sst_update = 1`
io_form_history		the format in which the history output file will be
	2	netCDF
	102	split netCDF files, one per processor *note: no supported post-processing software for split files
	1	binary format *note: no supported post-processing software available
	4	PHDF5 format *note: no supported post-processing software available
	5	GRIB1
	10	GRIB2
	11	parallel netCDF
io_form_restart		the format in which the restart output files will be
	2	nedCDF
	102	split netCDF files, one per processor (must restart with the same number of processors)
io_form_input		the format of the input files
	2	netCDF
	102	allows the program *real.exe* to read in split `met_em*` files, and write split `wrfinput` files. No split file for the `wrfbdy` file.
io_form_boundary		the format for the `wrfbdy` file

	2	netCDF format
	4	PHD5 format
	5	GRIB1 format
	10	GRIB2 format
	11	pnetCDF format
io_form_auxinput2		IO format for input stream 2 data
	2	netCDF format
	4	PHD5 format
	5	GRIB1 format
	10	GRIB2 format
	11	pnetCDF format
diag_print	0	(default) When set to 1 or 2, it allows some simple diagnostic fields to be output
	1	domain-averaged 3-hourly hydrostatic surface pressure tendency (Dpsfc/Dt), and dry-hydrostatic column pressure tendency (Dmu/Dt) will appear in stdout file.
	2	in addition to those listed above, domain-averaged rainfall, surface evaporation, and sensible and latent heat fluxes will be output in stdout file.
debug_level	0	giving this a larger value (50, 100, 200, etc.) increases the debugging print-outs when running WRF
auxhist2_outname	"rainfall_d<domain>"	file name to write additional output to a different unit or output stream.. If not specified, *auxhist2_d<domain>_<date>* will be used. Also note that to write variables in output other than the history file requires either a change in the Registry.EM_COMMON file, or the use of the option `iofields_filename` option.
auxhist2_interval (max_dom)	10	the interval in minutes for the output
io_form_auxhist2		output format for using auxhist2
	2	netCDF format
	4	PHD5 format
	5	GRIB1 format
	10	GRIB2 format
	11	pnetCDF format

frames_per_auxhist2 (max_dom)	1000	how many output times will be in each output file
auxinput11_interval	10	interval in minutes for obs nudging input. It should be set as the same (or more) frequency as `obs_ionf` (with the unit of the coarse domain time step)
auxinput11_end_h	6	end of the observation time (in hours), when using the `diag_print` option
nocolons	.false.	when set to .true. this replaces the colons with underscores in the output file names
write_input	.true.	write input-formatted data as output for 3DVAR application
inputout_interval	180	interval in minutes when using the `write_input` option
input_outname	"wrf_3dvar_input_d<domain>_<date>"	Output file name from 3DVAR
inputout_begin_y	0	beginning year to write 3DVAR data
inputout_begin_d	0	beginning day to write 3DVAR data
inputout_begin_h	3	beginning hour to write 3DVAR data
inputout_begin_m	0	beginning minute to write 3DVAR data
inputout_begin_s	0	beginning second to write 3DVAR data
inputout_end_y	0	ending year to write 3DVAR data
inputout_end_d	0	ending day to write 3DVAR data
inputout_end_h	12	ending hour to write 3DVAR data
inputout_end_m	0	ending minute to write 3DVAR data
inputout_end_s	0	ending second to write 3DVAR data
		NOTE: The above example shows that the input-formatted data are output starting from hour 3 to hour 12 in a 180-min interval.
all_ic_times	.false.	when set to .true., allows you to output a wrfinput file for all time periods
output_diagnostics	0	turned off

	1	36 surface diagnostic arrays (max/min/mean/std) in the time interval are specified. The output goes to auxiliary history output stream 3 with default file name 'wrfxtrm_d<domain>_<date>.' You must also set `io_form_auxhist3 =2, auxhist3_interval = 1440, 1440, and frames_per_auxhist3 = 1000, 1000.`
nwp_diagnostics	0	turned off
	1	output 7 history-interval maximum or mean diagnostic fields in wrfout: 10 m surface wind max, max positive and negative w, max helicity in the 2-5 km layer, mean w, max column-integrated graupel
iofileds_filename	"*my_iofields_list*.txt"	an option to request particular variables to appear in output, if they are not already, or to not appear if they do and you do not want them to. You must also create a text file (*my_iofields_list*.txt) in which you will declare the variables to be output. It will be a single line of text, e.g.: `+:h:7:RAINC,RAINNC` or `-:h:0:RAINC,RAINNC`
ignore_iofields_warning	.true.	tells the model to continue if an error is encountered in the user-specified files
	.false.	tells the model to abort if an error is encountered in the user-specified files
&domains		***dimensions, nesting, parameters***
time_step	60	time step for integration seconds (recommended 6*dx in km for a typical case)
time_step_fract_num	0	numerator for fractional time step
time_step_fract_den	1	denominator for fractional time step. E.g., if you want to use 60.3 sec as your time step, `set`

		time_step = 60, time_step_fract_num = 3, and time_step_fract_den = 10.
time_step_dfi	60	time step when setting dfi_opt = 1, may be different from the regular time step
max_dom	1	the number of domains over which you are running
s_we (max_dom)	1	start index in x (west-east) direction (leave as is)
e_we (max_dom)	91	end index in x (west_east) direction (staggered dimension)
s_sn (max_dom)	1	start index in y (south-north) direction (leave as is)
e_sn (max_dom)	82	end index in y (south-north) direction (staggered dimension)
s_vert (max_dom)	1	start index in z (vertical) direction (leave as is)
e_vert (max_dom)	30	end index in z (vertical) direction (staggered dimension -- this refers to full levels). Most variables are on unstaggered levels. *Note: Vertical dimensions need to be the same for all nests
dx (max_dom)	30000	grid length in x-direction (in meters)
dy (max_dom)	30000	grid length in y-direction (in meters)
ztop (max_dom)	19000	height in meters; used to define model top for idealized cases
grid_id (max_dom)	1	domain identifier
parent_id (max_dom)	0	ID of the parent domain
i_parent_start (max_dom)	1	the starting lower-left corner i-indice from the parent domain
j_parent_start (max_dom)	1	the starting lower-left corner j_indice from the parent domain
parent_grid_ratio (max_dom)	1	parent-to-nest domain grid size ratio. *Note: for real data cases the ratio must be odd; for ideal data cases, the ratio can be even if feedback is set to 0.
parent_time_step_ratio (max_dom)	1	parent-to-nest time step ratio; this can be different from the parent_grid_ratio

feedback	0	no feedback
	1	feedback from nest to its parent domain
smooth_option	0	no smoothing
	1	1-2-1 smoothing option for parent domain; used only with `feedback=1`
	2	(default) smoothing-desmoothing option for parent domain; used only with `feedback=1`
hypsometric_opt	2	(default) computes height in program *real.exe* and pressure in the model (ARW only) by using an alternative method (less biased when compared against input data)
	1	original method
Options for Program *real.exe*		
num_metgrid_levels	40	number of vertical levels in WPS output (type `ncdump -h` on one of the `met_em*` files to find out this number)
num_metgrid_soil_levels	4	number of soil levels or layers in WPS output (type `ncdump -h` on one of the `met_em*` files to find out this number)
eta_levels	1.0, 0.99, ...0.0	model *eta* levels from 1 to 0. If not given, *real* will provide a set of levels
force_sfc_in_vinterp	1	(default) use the surface level as the lower boundary when interpolating through this many eta levels
	0	perform traditional trapping interpolation
interp_theta	.false.	(default) vertically interpolates temperature (which may reduce bias when compared with input data)
	.true.	vertically interpolates potential temperature
p_top_requested	5000	pressure top (in Pa) to use in the model; must be available in WPS data
interp_type	2	(default) vertical interpolation that

		is linear in log(pressure)
	1	vertical interpolation that is linear in pressure
extrap_type	2	(default) vertical extrapolation of non-temperature variables, using the lowest level as constant below ground
	1	vertical extrapolation of non-temperature variables, using the 2 lowest levels
t_extrap_type		vertical extrapolation for potential temp:
	2	(default) -6.5 K/km lapse rate for temperature
	1	isothermal
	3	constant theta
use_levels_below_ground		in vertical interpolation, whether to use levels below input surface level
	.true.	(default) use input isobaric levels below input surface
	.false.	extrapolate when WRF location is below input surface level
use_surface	.true.	(default) uses input surface level data in vertical interpolation
	.false.	do not use input surface data
lagrange_order	2	(default) quadratic vertical interpolation order
	1	linear vertical interpolation order
lowest_lev_from_sfc	.false.	(default) use traditional interpolation
	.true.	use surface values for the lowest *eta* (u,v,t,q)
sfcp_to_sfcp	.true	optional method to compute model's surface pressure when incoming data only has surface pressure and terrain, but not sea-level pressure (default is .false.)
use_tavg_for_tsk	.true.	uses diurnally-averaged surface temp as skin temp. The diurnally-averaged surface temp can be computed using WPS utility `avg_tsfc.exe`. May use this option when SKINTEMP is not present (default is .false.)
rh2qv_wrt_liquid	.true.	(default) computes qv with respect

		to liquid water
	.false.	computes qv with respect to ice
smooth_cg_topo	.true.	smooths the outer rows and columns of the domain 1 topography with respect to the input data (default is .false.)
vert_refine_fact	1	vertical refinement factor for *ndown* (1 = same number of vertical levels as the coarse domain, 2 = double the vertical resolution, and so on)
Options for Preset Moving Nest		
num_moves	2	total # of moves for all domains
move_id (max_moves)	2, 2,	a list of nest domain ID's, one per move
move_interval (max_moves)	60, 120,	time in minutes since the start of this domain
move_cd_x (max_moves)	1, -1,	the # of parent domain grid cells to move in the i-direction
move_cd_y (max_moves)	-1, 1,	the # of parent domain grid cells to move in the j-direction (positive in increasing i/j directions, and negative in decreasing i/j directions. Only 1, 0, and -1 is permitted.
Options for Automatic Moving Nest		
vortex_interval (max_dom)	15	how often the new vortex position is computed (in mins)
max_vortex_speed (max_dom)	40	used to compute the search radius for the new vortex position (in m/s)
corral_dist (max_dom)	8	how close the moving nest is allowed to get to the coarse grid boundary. This # sets the minimum limit of grid cells allowed between them.
track_level	50000	pressure level value (Pa) at which the tropical storm vortex is tracked
time_to_move (max_dom)	0.,	time (in mins) to start moving nest
Options for Adaptive Time Step		
use_adaptive_time_step	.true.	use adaptive time step (default is .false.)
step_to_output_time	.true.	modifies the time step so that the

		exact history time is reached
target_cfl (max_dom)	1.2., 1.2., 1.2.,	if vertical CFL ≤ this value, then time step is increased
target_hcfl (max_dom)	0.84, 0.84, 0.84,	if horizontal CFL ≤ this value, the time step is increased
max_step_increase_pct (max_dom)	5, 51, 51,	percentage of previous time step to increase if the max CFL is ≤ `target_cfl`
starting_time_step (max_dom)	-1, -1, -1,	flag -1 implies 6*dx is used to start the model. Any positive integer specifies the time step the model will use to start (in seconds). *Note: when `use_adapative_time_step = .true.`, the value specified for `time_step` is ignored.
max_time_step (max_dom)	-1, -1, -1,	flag -1 implies the maximum time step is `3*starting_time_step`. Any positive integer specifies the maximum time step (in seconds).
min_time_step (max_dom)	-1, -1, -1,	flag -1 implies the minimum time step is 0.5*starting_time_step. Any positive integer specifies the minimum time step (in seconds).
adaptation_domain	1	(default) specifies which domain to use to drive adaptive time stepping
Options to Control Parallel Computing		
tile_sz_x	0	number of points in tile x direction (open MP only)
tile_sz_y	0	number of points in tile y direction; can be determined automatically (open MP only)
numtiles	1	number of tiles per patch (alternative to above 2 items; open MP only)
nproc_x	-1	(default) turned off; code will do automatic decomposition (MPI only)
	>1	number of processors in x for decomposition (MPI only)
nproc_y	-1	(default) turned off; code will do automatic decomposition (MPI only)

	>1	number of processors in y for decomposition (MPI only)
Options for 3D Ocean Model		
ocean_levels	30	(default) number of ocean levels when using `sf_ocean_physics = 2`
ocean_z	(values for # of ocean_levels)	vertical profile of layer depth (m) for number of `ocean_levels`. See /run/README.namelist for more details.
ocean_t	(values for # of ocean_levels)	vertical profile of ocean temps (K) for number of `ocean_levels.`
ocean_s	(values for # of ocean_levels	vertical profile of salinity.
&physics		
mp_physics (max_dom)	0	(default) no microphysics
	1	Kessler scheme
	2	Lin et al. scheme
	3	WSM 3-class simple ice scheme
	4	WSM 5-class scheme
	5	Ferrier (new Eta) microphysics, operational High-Resolution Window
	6	WSM 6-class graupel scheme
	7	Goddard GCE scheme (also uses `gsfcgce_hail` and `gsfcgce_2ice`)
	8	Thompson graupel scheme (2-moment scheme in V3.1)
	9	Milbrandt-Yau 2-moment scheme
	10	Morrison 2-moment scheme
	11	CAM 5.1 5-class scheme
	13	SBU-YLin, 5-class scheme
	14	WRF double moment, 5-class scheme
	16	WRF double moment, 6-class scheme
	17	NSSL 2-moment 4-ice scheme (steady background CCN)
	18	NSSL 2-moment 4-ice scheme with predicted CCN (better for idealized than real cases)

	19	NSSL 1-moment, 6-class scheme
	21	NSSL-LFO 1-moment, 6-class
	95	Ferrier (old Eta), operational NAM (WRF NMM)
	98	Thompson scheme in V3.0
do_radar_ref	0	allows radar reflectivity to be computed using mp-scheme-specific parameters. Currently works for `mp_physics` = 2,4,6,7,8,10,14,16 0: off 1: on
mp_zero_out		for non-zero mp_physics options, this keeps moisture variables above a threshold value ≥0. An alternative (and better) way to keep moisture variables positive is to use the `moist_adv_opt`.
	0	(default) no action taken; no adjustment to any moisture field
	1	except for Qv, all other moisture arrays are set to zero if they fall below a critical value
	2	Qv ≥ 0 and all other moisture arrays are set to zero if they fall below a critical value
mp_zero_out_thresh	1.e-8	critical value for moisture variable threshold, below which moisture arrays (except for Qv) are set to zero (unit: kg/kg)
mp_tend_lim	10.	limit on temp tendency from microphysics latent heating when radar data assimilation is used
gsfcgce_hail	0	(default) running gsfcgce scheme with graupel
	1	running gsfcgce scheme with hail
gsfcgce_2ice	0	(default) running gsfcgce scheme with snow, ice, and graupel/hail
	1	running gsfcgce scheme with only ice and snow (`gsfcgce_hail` is ignored)
	2	running gsfcgce scheme with only ice and graupel (used only in very extreme situation; `gsfcgce_hail` is ignored)

The following 9 namelists are for NSSL 1-moment schemes		
nssl_alpha	0	shape parameter for graupel
nssl_alphal	2	shape parameter for hail
nssl_cnoh	4.e5	graupel intercept
nssl_cnohl	4.e4	hail intercept
nssl_cnor	8.e5	rain intercept
nssl_cnos	3.e6	snow intercept
nssl_rho_qh	500.	graupel density
nssl_rho_ghl	900.	hail density
nssl_rho_qs	100.	snow density
no_mp_heating	1	turn off latent heating from a microphysics scheme (0 is off and is default)
ra_lw_physics (max_dom)	0	(default) no longwave radiation
	1	rrtm scheme (Default values for GHG in V3.5: co2vmr=379.e-6, n2ovmr=319.e-9, ch4vmr=1774.e-9; Values used in previous versions: co2vmr=330.e-6, n2ovmr=0., ch4vmr=0.)
	3	CAM scheme *Note: restart must be at 6-hourly interval; also requires `levsiz, paerlev, cam_abs_dim1(2)`; see below
	4	rrtmg scheme (Default values for GHG in V3.5: co2vmr=379.e-6, n2ovmr=319.e-9, ch4vmr=1774.e-9)
	5	Goddard scheme
	7	FLG (UCLA) scheme
	31	Earth Held-Suarez forcing
	99	GFDL (Eta) longwave (semi-supported); also must use `co2tf = 1` for ARW
ra_sw_physics (max_dom)	0	(default) no shortwave radiation
	1	Dudhia scheme (ptop > 50 mb)
	2	(old) Goddard shortwave scheme
	3	CAM scheme (restart must be at 6-hourly interval); must set `levsiz, paerlev, cam_abs_dim1/2`
	4	rrtmg scheme
	5	Goddard scheme
	7	FLG (UCLA) scheme

	99	GFDL (Eta) longwave (semi-supported); must use `co2tf = 1` for ARW
radt (max_dom)	30	minutes between radiation physics calls. Recommended 1 minute per km of dx (e.g. 10 for 10 km grid); use the same value for all nests
co2tf	1	CO2 transmission function flag for GFDL radiation only. Set it to 1 for ARW, which allows generation of CO2 function internally
** Note: The following 5 variables for CAM are automatically set since V3.2*		
cam_abs_freq_s	21600	default CAM clear sky longwave absorption calculation frequency (recommended minimum value to speed scheme up)
levsiz	59	(default) number of ozone data levels for CAM radiation
paerlev	29	(default) number of aerosol data levels for CAM radiation
cam_abs_dim1	4	(default) dimension for absnxt (absorption save array) in CAM radiation
cam_abs_dim2	same as e_vert	(default) dimension for abstot (2nd absorption save array) in CAM radiation
o3input		ozone input option (RRTMG only)
	0	using profile inside the scheme
	2	using CAM ozone data (`ozone.formatted`)
aer_opt		aerosol input option (RRTMG only)
	0	off
	1	using Tegen climatology
alevsiz	12	no of vertical levels in aerosol data. Value set automatically.
no_src_types	6	no of aerosol types: organic and black carbon, sea salt, sulfate, dust and stratospheric aerosol (volcanic ash – currently 0). Value set automatically.
sf_sfclay_physics (max_dom)		surface layer option
	0	(default) no surface-layer
	1	MM5 Monin-Obukhov scheme
	2	Monin-Obukhov (Janjic Eta)

		scheme
	3	NCEP GFS scheme (NMM only)
	4	QNSE
	5	MYNN
	7	Pleim-Xiu (ARW only), only tested with Pleim-Xiu surface and ACM2 PBL
	10	TEMF (ARW only)
	11	Revised MM5 surface layer scheme
iz0tlnd		switch to control land thermal roughness length
	0	(default) old, or non-vegetation dependent thermal roughness length over land
	1	veg dependent Chen-Zhang Czil
sf_surface_physics (max_dom)		land-surface option (set this before running *real.exe*; also make sure `num_soil_layers` is set correctly)
	0	(default) no surface temp prediction
	1	thermal diffusion scheme
	2	unified Noah land-surface model
	3	RUC land-surface model
	4	Noah-MP land-surface model (additional options under the `&noah_mp` section)
	5	CLM4 (Community Land Model Version 4)
	7	Pleim-Xiu scheme (ARW only)
	8	SSiB land-surface model (ARW only). Works with `ra_lw_physics = 1, 3, or 4`, and `ra_sw_physics = 1, 3, or 4`
ua_phys	.false.	Option to activate UA Noah LSM changes to use a different snow-cover physics. Aimed toward improving treatment of snow as it relates to the vegetation canopy.
num_soil_layers		number of soil layers in land surface model (set before running *real.exe*)
	5	(default) thermal diffusion scheme

		for temp only
	4	Noah land-surface model
	6	RUC land-surface model
	10	CLM4 land-surface model
	2	Pleim-Xu land-surface model
	3	SSiB land-surface model
bl_pbl_physics (max_dom)		boundary layer option
	0	(default) no boundary-layer
	1	YSU scheme; use `sf_sfclay_physics =1`
	2	Mellor-Yamada-Janjic (Eta) TKE scheme; use `sf_sfclay_physics=2`
	3	NCEP GFS scheme (NMM only); use `sf_sfclay_physics=3`
	4	QNSE-EDMF; use `sf_sfclay_physics=4`
	5	MYNN 2.5 level TKE; use `sf_sfclay_physics=1, 2,` or `5`
	6	MYNN 3rd level TKE; use `sf_sfclay_physics=5`
	7	ACM2 (Pleim) scheme (ARW only); use `sf_sfclay_physics=1` or `7`
	8	Bougeault and Lacarrere (BouLac) TKE; use `sf_sfclay_physics=1` or `2`
	9	Bretherton-Park/UW TKE scheme; use `sf_sfclay_physics=1` or `2`
	10	TEMF scheme (ARW only); use `sf_sfclay_physics=10`
	12	GBM TKE-type scheme (ARW only); use `sf_sfclay_physics=1`
	94	Quasi-Normal Scale Elimination PBL scheme (to be removed in the future)
	99	MRF scheme (to be removed in the future)
mfshconv	1	turns on day-time EDMF for QNSE (0=off)
bldt (max_dom)	0	minutes between boundary-layer physics calls (0=call every time

		step)
topo_wind (max_dom)		turns on topographic surface wind correction, and requires extra input from geogrid. YSU PBL only
	0	off
	1	Jimenez method
	2	UW method
bl_mynn_tkebudget	1	adds MYNN tke budget terms to output
	0	(default) turned off
grav_settling (max_dom)	1	activate gravitational settling of fog/cloud droplet, MYNN PBL only (0=off, default)
cu_physics (max_dom)		cumulus parameterization option
	0	(default) no cumulus parameterization
	1	Kain-Fritsch (new Eta) scheme
	2	Betts-Miller-Janjic scheme
	3	Grell-Freitas ensemble scheme
	4	Old GFS Simplified Arakawa-Schubert (SAS)
	5	New Grell scheme (G3)
	6	Tiedtke scheme (ARW only)
	7	Zhang-McFarlane from CESM (works with MYJ and UW PBL)
	14	New GFS SAS from YSU (ARW only)
	84	New SAS (HWRF)
	93	Grell-Devenyi ensemble scheme
	99	previous Kain-Fritsch scheme
cudt	0	minutes between cumulus physics calls; should be set to 0 when using all `cu_physics` except Kain-Fritsch (0 = call every time step)
kfeta_trigger	1	The way to determines whether a grid point is convective; used only with `cu_physics=1`. = 1, default, original.
	2	moisture-advection based trigger (Ma and Tan 2009; ARW only)
	3	relative humidity-dependent
ishallow	1	shallow convection used with `cu_physics=3 or 5` (default is 0 = off)

shcu_physics (max_dom)		independent shallow cumulus option (not tied to deep convection)
	0	no independent shallow cumulus
	2	Park and Bretherton shallow cumulus from CAM5
	3	GRIMS scheme
**Note: The following 5 options show recommended #'s. If you would like to use any other number, consult the code to understand what you are doing.*		
maxiens	1	Grell-Devenyi and G3 only
maxens	3	Grell-Devenyi only
maxens2	3	Grell-Devenyi only
maxens3	16	Grell-Devenyi only
ensdim	144	Grell-Devenyi only
cugd_avedx	1	(default) number of grid boxes over which subsidence is spread, for large grid distances
	3	for small grid distances (DX < 5 km)
cu_diag (max_dom)	0	Additional time-averaged diagnostics from cu_physics (use only with `cu_physics=3,5,`and `93`)
convtrans_avglen_m	30	averaging time for convective transport output variables (in minutes; only use with `cu_physics=3,5` and `93`)
isfflx		heat and moisture fluxes from the surface for real-data cases and when a PBL is used (only works with `sf_sfclay_physics=1, 5, 7, or 11`) 1 = fluxes are on 0 = fluxes are off It also controls surface fluxes when diff_opt = 2 and km_opt = 3, and a PBL isn't used 0 = constant fluxes defined by `tke_drag_coefficient` and `tke_heat_flux` 1 = use model-computed u* and heat and moisture fluxes 2 = use model-computed u* and specified heat flux by `tke_heat_flux`

ifsnow		snow-cover effects (only works for `sf_surface_physics=1`)
	1	(default) with snow-cover effect
	0	without snow-cover effect
icloud		(default) cloud effect to the optical depth in radiation (only works with `ra_sw_physics=1,4` and `ra_lw_physics=1,4`)
	1	with cloud effect
	0	without cloud effect
swrad_scat	1	scattering tuning parameter; default 1 is 1.e-5 m^{-2} kg^{-1} (only for `ra_sw_physics=1`). Increase for more scattering.
surface_input_source		where landuse and soil category data come from
	1	(default) WPS/geogrid, but with dominant categories recomputed in real
	2	GRIB data from another model (only if arrays VEGCAT/SOILCAT exist)
	3	use dominant land and soil categories from WPS/geogrid
pxlsm_smois_init (max_dom)		Pleim-Xu land-surface model soil moisture initialization option
	0	from analysis
	1	(default) from LANDUSE.TBL (SLMO, or moisture availability)
num_land_cat		number of land categories in input data
	24	(default) for USGS
	20	for MODIS
	28	for USGS if including lake category
	21	for MODIS if including lake category
	40	NLCD2006 (North America only)
num_soil_cat	16	number of soil categories in input data
usemonalb	.true.	use monthly albedo map instead of table values (recommended for `sst_update=1`)
	.false.	(default) use table values
rdmaxalb	.true.	(default) use snow albedo from

		geogrid
	.false.	use snow albedo from table
rdlai2d	.true.	use LAI (Leaf Area Index) from input data
	.false.	(default) use LAI from table
seaice_threshold	271.	If skin temp (TSK) is less than this value, water points are changed to sea ice. Works for `sf_surface_physics = 1,2,4,8`
sst_update		option to use time-varying SST, seaice, vegetation fraction, and albedo during a model simulation (set before running *real.exe*)
	0	(default) no SST update
	1	*real.exe* will create wrflowinp file(s) at the same time interval as the available input data. These files contain SST, XICE, ALBEDO, and VEGFRA. Also set `auxinput4_inname = "wrflowinp_d<domain>"`, `auxinput4_interval` and (in V3.2) `io_form_auxinput4` in namelist section *&time_control*
tmn_update	1	update deep layer soil temperature, useful for long simulations (multi-year runs; default is 0 = off)
lagday	150	days over which tnm (deep layer soil temp) is computed using skin temperature
sst_skin	1	calculate skin SST, useful for long simulations (multi-year runs; default is 0 = off)
bucket_mm		bucket reset values for water accumulation (unit in mm), useful for long simulations (multi-year runs)
	-1	(default) inactive
bucket_j		bucket reset value for energy accumulations (unit in Joules); useful for long simulations (multi-year runs)
	-1	(default) inactive
slope_rad (max_dom)	1	use slope-dependent radiation; for `ra_sw_physics`

	0	(default) off
topo_shading (max_dom)	1	applies neighboring-point shadow effects for `ra_sw_physics`
	0	(default) off
shadlen	25000	maximum length of orographic shadow (in meters); use with `topo_shading=1`
sf_ocean_physics (replacing omlcall)		activate ocean model
	0	off
	1	activate a simple ocean mixed layer (oml) model
	2	activate a 3D PWP ocean model
omdt	1.	3D PWP time step (minutes). It can be set t the same as the WRF time step in corresponding nested grids, but omdt should be no less than 1.0 minute.
oml_hml0 (for sf_ocean_physics=1)	≥ 0	initial ocean mixed layer depth value (m); constant everywhere (50 is default)
	< 0	use input
oml_gamma (for sf_ocean_physics=1)	0.14	(K m^{-1}) lapse rate in deep water (below the mixed layer) for oml
ocean_levels (for sf_ocean_physics=2)	30	number of vertical levels in 3D ocean model
isftcflx		alternative Ck (exchange coefficient for temp and moisture), Cd (drag coefficient for momentum) formulation for tropical storm application
	0	(default) off for Ck
	1	Donelan Cd + constant Z_{0q} for Ck
	2	Donelan Cd + Garratt Ck
fractional_seaice	1	treats seaice as a fractional field; works with `sf_sfclay_physics = 1, 2, 5, or 7`
	0	(default) either ice or no ice flag
seaice_albedo_opt		option to set albedo over sea ice
	0	seaice albedo is a constant value

		from namelist option `seaice_albedo_default`
	1	seaice albedo is a function of air temp, skin temp, and snow
	2	seaice albedo read in from input variable ALBSI
seaice_albedo_default	0.65 (changed from 0.8)	default value of seaice albedo for `seaice_albedo_opt`=0