WRF-Hydro hydro.namelist File with Description of Options for use with WRF-Hydro V5

Below is an annotated hydro.namelist file. Annotations follow what is being described, indicated with <<-- and blue text. Note that annotations describing options are meant to accompany the commented description in the namelist which precedes the option.

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&HYDRO_nlist
!!!! ---------------- SYSTEM COUPLING -------------- !!!! <<-- Section

! Specify what is being coupled:  1=HRLDAS (offline Noah-LSM),
! 2=WRF, 3=NASA/LIS, 4=CLM
sys_cpl = 1 <<-- For offline runs, including Noah and NoahMP,  this will be option 1.

!!!! ------------ MODEL INPUT DATA FILES ------------ !!!! <<-- Section

! Specify land surface model gridded input data file
!(e.g.: "geo_em.d01.nc")
GEO_STATIC_FLNM = "./DOMAIN/geo_em.d01.nc" <<-- Path to the “GEOGRID” file which contains base information on the LSM grid (this file is generally created via WPS in the model preprocessing steps).

! Specify the high-resolution routing terrain input data file (e.g.: "Fulldom_hires.nc")
GEO_FINEGRID_FLNM = "./DOMAIN/Fulldom_hires.nc" <<-- Path to the “routing stack” which contains base information on the high-resolution routing grid. This file is generally created via the GIS pre-processing tools.

! Specify the spatial hydro parameters file (e.g.: "hydro2dtbl.nc")
! If you specify a filename and the file does not exist, it will
!be created for you.
HYDROTBL_F = "./DOMAIN/hydro2dtbl.nc" <<-- Path to the new 2d hydro parameters file. If this file does not exist, it will be created for you based on HYDRO.TBL and the soil and land class grids found in the GEOGRID netCDF file

! Specify spatial metadata file for land surface grid. (e.g.:
! "GEOGRID_LDASOUT_Spatial_Metadata.nc")
LAND_SPATIAL_META_FLNM = "./DOMAIN/GEOGRID_LDASOUT_Spatial_Metadata.nc" <<-- Path to the geospatial metadata file for your domain. This file is required if using any of the io_form_outputs options (i.e., io_form_outputs > 0). This file is generally created via the GIS pre-processing tools.


! Specify the name of the restart file if starting from
! restart...comment out with '!' if not...
RESTART_FILE  = 'HYDRO_RST.2013-09-12_04:00_DOMAIN3' <<-- Path to hydro restart file if using; this contains a "warm" model state from a previous model run.

!!!! ------------- MODEL SETUP OPTIONS ------------ !!!! <<-- Section

! Specify the domain or nest number identifier...(integer)
IGRID = 1    <<-- Domain ID number. This comes from the WRF coupling framework and is intended to specify which nested domain you are running. For standalone runs, this is not relevant HOWEVER this ID must match the number specified after DOMAIN in your forcing file names (e.g., the "1" in "2013091200.LDASIN_DOMAIN1").

! Specify the restart file write frequency...(minutes)
! A value of -99999 will output restarts on the first day
! of the month only.
rst_dt = 120  <<-- Specify how often hydro restart files should be generated, in minutes. This should generally track your LSM restart file frequency (as specified in namelist.hrldas). A value of -99999 will simply output restarts on the start of each month, useful for longer model runs. Hydro restart files are generally quite large, so be cognizant of storage space and runtime impacts when specifying.
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! Reset the LSM soil states from the high-res routing restart
! file (1=overwrite, 0=no overwrite)
! NOTE: Only turn this option on if overland or subsurface
! routing is active!
rst_typ = 1 <<-- Specify whether or not to use the soil conditions (soil moisture and ponded water) from the high-resolution hydro restart file, if "warm" starting the model with a provided HYDRO_RST file. If this option is 0, the LSM restart states will be used instead. IMPORTANT: If you are NOT running with terrain routing turned on, do not set this option to 1 as it may bring in invalid values.

! Restart file format control <<-- Options to whether restart files (input and output separately) should be in binary or netCDF format. Generally recommend using netCDF format (option 0) for both.
rst_bi_in = 0       !0: use netCDF input restart file (default)
                    !1: use parallel io for reading multiple restart
                    !   files, 1 per core
rst_bi_out = 0      !0: use netCDF output restart file (default)
                    !1: use parallel io for outputting multiple
                    !   restart files, 1 per core

! Restart switch to set restart accumulation variables to 0
! (0=no reset, 1=yes reset to 0.0)
RSTRT_SWC = 0 <<-- Specify whether or not to reset any accumulated output variables to 0 (option 1) or to continue accumulating from the values in the hydro restart file (option 0). Note that this only applies to the hydrologic model outputs; the LSM outputs will always continue to accumulate from the LSM restart file.

! Specify baseflow/bucket model initialization…
! (0=cold start from table, 1=restart file)
GW_RESTART = 1 <<-- Specify whether to initialize the groundwater bucket states from the hydro restart file (option 1) or "cold" start the bucket states from the parameter table, GWBUCKPARM.TBL or GWBUCKPARM.nc.


!!!! ------------ MODEL OUTPUT CONTROL ------------ !!!!  <<-- Section

! Specify the output file write frequency...(minutes)
out_dt = 60  <<-- Timestep for hydro model outputs, in minutes. This covers all output options listed below (CHRTOUT, GWOUT, RTOUT, LAKEOUT, etc.) so be cognizant of impacts on disk space and runtime when specifying.

! Specify the number of output times to be contained
! within each output history file...(integer)
!  SET = 1 WHEN RUNNING CHANNEL ROUTING ONLY/CALIBRATION SIMS!!!
!  SET = 1 WHEN RUNNING COUPLED TO WRF!!!
SPLIT_OUTPUT_COUNT = 1 <<-- Number of timesteps to put in a single output file.

! Specify the minimum stream order to output to netcdf
! point file...(integer)
! Note: lower value of stream order produces more output.
order_to_write = 4  <<-- Lowest stream order to include in output files. Selecting 1 gives you output for every reach/channel cell, selecting a higher order number gives you fewer channel output elements.

! Flag to turn on/off new I/O routines:
! 0 = deprecated output routines (only use when running with the Noah LSM),
! 1 = with scale/offset/compression,
! 2 = with scale/offset/NO compression,
! 3 = compression only,
! 4 = no scale/offset/compression (default)
io_form_outputs = 1 <<-- Specify which output option to use (NOTE: option 0 is the only supported option when running with the Noah LSM)
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! Realtime run configuration option:
! 0=all (default), 1=analysis, 2=short-range, 3=medium-range,
! 4=long-range, 5=retrospective,
! 6=diagnostic (includes all of 1-4 outputs combined)
io_config_outputs = 1 <<-- Specify which configuration of output variables to generate (NOTE: not active when io_form_outputs=0).

! Option to write output files at time 0 (restart cold start time):
! 0=no, 1=yes (default)
t0OutputFlag = 1   <<-- Select whether or not to create outputs at the initial timestep.

! Options to output channel & bucket influxes. Only active
! for UDMP_OPT=1.
! Nonzero choice requires that out_dt above matches NOAH_TIMESTEP in
! namelist.hrldas.
! 0=None (default), 1=channel influxes (qSfcLatRunoff, qBucket)
! 2=channel+bucket fluxes    (qSfcLatRunoff, qBucket,
!                             qBtmVertRunoff_toBucket)
! 3=channel accumulations    (accSfcLatRunoff, accBucket) *** NOT
! TESTED ***
output_channelBucket_influx = 0 <<-- Select which additional channel and groundwater bucket outputs will be generated. These additional variables can be used to drive the channel-only model.

! Output netCDF file control <<-- Subsection: Specify which outputs to generate for the run.

CHRTOUT_DOMAIN = 1           ! NetCDF point timeseries output at all
                             ! channel points (1d)
                             ! 0 = no output, 1 = output <<-- Channel output variables (streamflow, velocity, head, etc.)

CHANOBS_DOMAIN = 0           ! NetCDF point timeseries at forecast
                             ! points or gage points (defined in
                             ! Route_Link.nc)
                             ! 0 = no output, 1 = output at forecast
                             ! points or gage points. <<-- Streamflow for forecast points (gridded routing) or Route Link gages (reach routing) in netCDF format

CHRTOUT_GRID = 0             ! NetCDF grid of channel
                             ! streamflow values (2d)
                             ! 0 = no output, 1 = output
                             ! NOTE: Not available with
                             ! reach-based routing <<-- Channel output variables on the 2D grid (gridded channel routing only)

LSMOUT_DOMAIN = 0            ! NetCDF grid of variables passed
                             ! between LSM and routing components
                             !(2d)
                             ! 0 = no output, 1 = output
                             ! NOTE: No scale_factor/add_offset
                             ! available <<-- Variables passed between the routing code and the LSM (generally used for diagnostics only)

RTOUT_DOMAIN = 1             ! NetCDF grid of terrain routing
                             ! variables on routing grid (2d)
                             ! 0 = no output, 1 = output <<-- Terrain variables on the high-res grid; these files can be large

output_gw = 1                ! NetCDF GW output
                             ! 0 = no output, 1 = output <<-- Groundwater bucket outputs (level,
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inflow, outflow)

outlake  = 1                    ! NetCDF grid of lake values (1d)
                                ! 0 = no output, 1 = output <<-- Lake output variables if lakes are
included in the domain (level, inflow, outflow)

frxst_pts_out = 0               ! ASCII text file of forecast points or
                                ! gage points (defined in Route_Link.nc)
                                ! 0 = no output, 1 = output <<-- Streamflow for forecast points (gridded
routing) or Route Link gages (reach routing) in txt format


!!!! ---- PHYSICS OPTIONS AND RELATED SETTINGS ---- !!!! <<-- Section

! Specify the number of soil layers (integer) and the depth of the
! bottom of each layer... (meters)
! Notes: In Version 1 of WRF-Hydro these must be the same as in the
! namelist.input file.
! Future versions will permit this to be different.
NSOIL=4  <<-- Number of soil layers
ZSOIL8(1) = -0.10 <<-- Depth of bottom boundary of top soil layer in meters
ZSOIL8(2) = -0.40 <<-- Depth of bottom of second soil layer in meters (note that this is specified differently than the
namelist.hrldas; this is total depth from the surface instead of thickness)
ZSOIL8(3) = -1.00 <<-- Depth of bottom of third soil layer in meters (note that this is specified differently than the
namelist.hrldas; this is total depth from the surface instead of thickness)
ZSOIL8(4) = -2.00 <<-- Depth of bottom of the last soil layer in meters (note that this is specified differently than the
namelist.hrldas; this is total depth from the surface instead of thickness)

! Specify the grid spacing of the terrain routing grid...(meters)
DXRT = 100.0 <<-- Resolution of the high-res routing grid

! Specify the integer multiple between the land model grid and
! the terrain routing grid...(integer)
AGGFACTRT = 10 <<-- Aggregation factor between the high-res routing grid and the LSM grid; e.g., a 100-m routing
grid resolution and a 1km LSM grid resolution would be AGGFACTRT = 10.

! Specify the channel routing model timestep...(seconds)
DTRT_CH = 10 <<-- Timestep for the channel routing module to cycle, in seconds; model runtime will be sensitive to
this timestep, so choose something appropriate for your domain resolution (finer resolutions generally require finer
timesteps).

! Specify the terrain routing model timestep...(seconds)
DTRT_TER = 10 <<-- Timestep for the terrain routing module to cycle, in seconds; model runtime will be sensitive to
this timestep, so choose something appropriate for your domain resolution (finer resolutions generally require finer
timesteps).

! Switch to activate subsurface routing...(0=no, 1=yes)
SUBRTSWCRT = 1 <<-- Turn on/off subsurface routing module.

! Switch to activate surface overland flow routing...(0=no, 1=yes)
OVRTSWCRT = 1 <<-- Turn on/off overland routing module.

! Specify overland flow routing option:
! 1=Seepest Descent (D8) 2=CASC2D (not active)
! NOTE: Currently subsurface flow is only steepest descent
rt_option = 1 <<-- For both terrain routing modules, specify whether flow should follow the steepest path (option 1)
or multi-directional (option 2). Option 2 is currently unsupported.

! Switch to activate channel routing...(0=no, 1=yes)
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CHANRTSWCRT = 1 <<-- Turn on/off channel routing module.

! Specify channel routing option:
! 1=Muskingam-reach, 2=Musk.-Cunge-reach, 3=Diff.Wave-gridded
channel_option = 3 <<-- If channel routing module is active, select which physics option to use.

! Specify the reach file for reach-based routing options (e.g.:
! "Route_Link.nc")
!route_link_f = "./DOMAIN/Route_Link.nc" <<-- If using one of the reach-based channel routing options
(channel_option = 1 or 2), specify the path to the Route_Link.nc file, which provides the channel-reach parameters.

! Specify the lake parameter file (e.g.: "LAKEPARM.nc" for netCDF
! or "LAKEPARM.TBL" for text).
! Note REQUIRED if lakes are on.
route_lake_f = "./DOMAIN/LAKEPARM.nc" <<-- If lakes are active, specify the path to the lake parameter file,
which provides the lake parameters.

! Switch to activate baseflow bucket model…
! (0=none, 1=exp. bucket, 2=pass-through)
GWBASESWCRT = 1  <<-- Turn on/off the ground water bucket module. Option 1 activates the exponential bucket
model, option 2 bypasses the bucket model and dumps all flow from the bottom of the soil column directly into the
channel, and option 0 creates a sink at the bottom of the soil column (water draining from the bottom of the soil column
leaves the system, so note that this option will not have water balance closure).

! Groundwater/baseflow 2d mask specified on land surface model grid
! (e.g.: "GWBASINS.nc" for netCDF
! or "gw_basns_geogrid.txt" for ascii). Note: Only required if baseflow
! model is active (1 or 2) and UDMP_OPT=0.
gwbasmskfil = "./DOMAIN/GWBASINS.nc" <<-- For configurations where the bucket or pass-through groundwater
modules are active, provide the path to the 2d ascii or netCDF file (LSM grid resolution) that maps the groundwater basin
IDs. Bucket parameters will be specified through the GWBUCKPARM.TBL or GWBUCKPARM.nc file, whose IDs should
match those in the groundwater basin mask file.

! Groundwater bucket parameter file (e.g.: "GWBUCKPARM.nc" for
! netCDF or "GWBUCKPARM.TBL" for text)
GWBUCKPARM_file = "./DOMAIN/GWBUCKPARM.nc" <<-- For configurations where the groundwater bucket model is
active, specify the path to the bucket parameter file, which provides bucket parameters by catchment.

! User defined mapping, such NHDPlus: 0=no (default), 1=yes
UDMP_OPT = 0  <<-- If 1, this tells the model to use a "user-defined mapping" scheme to translate between terrain and
groundwater flow and reaches, e.g., NHDPlus.

! If on, specify the user-defined mapping file (e.g.:
! "spatialweights.nc")
!udmap_file = "./DOMAIN/spatialweights.nc" <<-- If UDMP_OPT=1 (user defined mapping is active), provide
the path to the required spatial weights file, which maps between grid cells and catchments.

/ <<-- End of hydro namelist HYDRO_nlist

&NUDGING_nlist  <<-- Start of separate namelist for nudging is only used if the model is compiled with the
compile-time option WRF_HYDRO_NUDGING=1. Ignore otherwise

! Path to the "timeslice" observation files.
timeSlicePath = "./nudgingTimeSliceObs/" <<--  Path to a directory containing nuding “time slice” observation
files. There are no requirements on the existence of files in the directory

nudgingParamFile = "DOMAIN/nudgingParams.nc" <<-- Path to the require nudging parameter file.
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! Nudging restart flie = "nudgingLastObsFile"
! nudgingLastObsFile defaults to '', which will look for
! nudgingLastObs.YYYY-mm-dd_HH:MM:SS.nc
!   **AT THE INITALIZATION TIME OF THE RUN**. Set to a missing file
! to use no restart.
!nudgingLastObsFile = '/a/nonexistent/file/gives/nudging/cold/start' <<-- Optional path to optional nuding restart file.  See comments.

!! Parallel input of nudging timeslice observation files?
readTimesliceParallel = .TRUE. <<-- Can read the observation files in parallel (on different cores) for quicker run speeds.

! temporalPersistence defaults to true, only runs if necessary
! params present.
temporalPersistence = .FALSE.  <<-- This option uses the expCoeff parameter for persisting observations

! The total number of last (obs, modeled) pairs to save in
! nudgingLastObs for removal of bias. This is the maximum array
! length. (This option is active when persistBias=FALSE)
! (Default=960=10days @15min obs resolution, if all the obs are
! present and longer if not.)
nLastObs = 960 <<-- The maximum trailing window size for calculating bias correction.

! If using temporalPersistence the last observation persists
! by default. This option instead persists the bias after the
! last observation.
persistBias = .FALSE. <<-- Apply bias correction as observations move in to the past?

! AnA (FALSE)  vs Forecast (TRUE) bias persistence.
! If persistBias: Does the window for calculating the bias end at
! model init time (=t0)?
! FALSE = window ends at model time (moving),
! TRUE = window ends at init=t0(fcst) time.
! (If commented out, Default=FALSE)
! Note: Perfect restart tests require this option to be .FALSE.
biasWindowBeforeT0 = .FALSE. <<-- Is the bias window shifting with model integration?

! If persistBias: Only use this many last (obs, modeled) pairs.
! (If Commented out, Default=-1*nLastObs)
! > 0: apply an age-based filter, units=hours.
! = 0: apply no additional filter, use all available/usable obs.
! < 0: apply an count-based filter, units=count
maxAgePairsBiasPersist = -960

! If persistBias: The minimum number of last (obs, modeled) pairs,
! with age less than maxAgePairsBiasPersist, required to apply a bias
! correction. (default=8)
minNumPairsBiasPersist = 8

! If persistBias: give more weight to observations closer in time?
! (default=FALSE)
invDistTimeWeightBias = .TRUE. <<-- The exact form of this weighting is currently hard-coded.

! If persistBias: "No constructive interference in bias correction?",
! Reduce the bias adjustment when the model and the bias adjustment
! have the same sign relative to the modeled flow at t0?
! (default=FALSE)
! Note: Perfect restart tests require this option to be .FALSE.
noConstInterfBias = .FALSE. <<-- Tactical response to phase errors.
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