```
&HMC_Parameters

! PARAMETER(S) INFO ------------------------------------------------------------------------------
! Friction coefficient in channels [m^0.5 s^-1]
dUc=30
! Flow motion coefficient in hillslopes [s^-1]
dUh=1.7
! Mean field capacity [-]
dCt=0.4
! Infiltration capacity at saturation [-]
dCf=0.1
! Domain name
sDomainName='vda'
! Soil humidity average initialization [-]
dCPI=0.5
! Maximum water capacity of the aquifer [mm]
dWTableHbr=1000
! Related to anisotropy between the vertical and horizontal saturated conductivity, and to soil porosity [-]
dKSatRatio=0.0000000001
! Subsoil maximum slope [%]
dSlopeMax=80
! Curve Number average initialization [-]
dCN = 33
! Fracturation average initialization [-]
dFrac = 0.0
! Watertable sources average initialization [1/t]
dWS = 0.0
! Watertable deep losses average initialization [1/t]
dWDL = 0.0
! Soil saturated vertical hydraulic conductivity (for infiltration capacity) [mm/h]
dSoil_ksat_infilt = 9
! Soil total storage capacity (gravitational+capillary) [mm]
dSoil_vmax = 700
! Soil saturated vertical hydraulic conductivity (for drainage capacity) [mm/h]
dSoil_ksat_drain = 3
! Aquifer saturated horizontal hydraulic conductivity [mm/h]
dWtable_ksath = 10
! ------------------------------------------------------------------------------------------------
```

Domain name and
parameters used by the model if the related static map
is not provided in txt format.

```
&HMC_Namelist

! FLAG(S) INFO ------------------------------------------------------------------------------
! Debug flag set (iDEBUG = 0, iDEBUG = 1)
iFlagDebugSet = 0
! Debug flag level (iNFO_Basic = 0; iINFO_Main = 1, iINFO_Verbose = 2, iINFO_Extra = 3)
iFlagDebugLevel = 0

! Data type land (1 = ascii grid; 2 = netcdf)
iFlagTypeData_Static = 1
! Data type dynamic forcing (1 = binary; 2 = netcdf)
iFlagTypeData_Forcing_Gridded = 2
! Data type dynamic forcing (1 = ascii; 2 = unknown)
iFlagTypeData_Forcing_Point = 1
! Data type dynamic forcing (1 = ascii; 2 = unknown)
iFlagTypeData_Forcing_TimeSeries = 1
! Data type dynamic updating (1 = binary; 2 = netcdf)
iFlagTypeData_Updating_Gridded = 2
! Data type dynamic gridded output (1 = binary; 2 = netcdf)
iFlagTypeData_Output_Gridded = 2
! Data type dynamic point output (1 = ascii; 2 = netcdf)
iFlagTypeData_Output_Point = 1
! Data type dynamic timeseries output (1 = ascii; 2 = unknown)
iFlagTypeData_Output_TimeSeries = 1
! Data type dynamic gridded state (1 = binary; 2 = netcdf)
iFlagTypeData_State_Gridded = 2
! Data type dynamic point state (1 = ascii; 2 = unknown)
iFlagTypeData_State_Point = 1
! Data type dynamic gridded restart (1 = binary; 2 = netcdf)
iFlagTypeData_Restart_Gridded = 2
! Data type dynamic point restart (1 = ascii; 2 = unknown)
iFlagTypeData_Restart_Point = 1

! Type of model (1=Windows, 10=Linux)
iFlagOs=10
! Computing deep Flow (1=yes, 0=no)
iFlagFlowDeep = 1
! Restart a run (1=yes, 0=no)
iFlagRestart=1
! Dynamic integration step of convolution (1=yes, 0=no)
iFlagVarDtPhysConv = 1
! Computing snow (1=yes, 0=no)
iFlagSnow = 0
! Computing snow assimilation (1=yes, 0=no)
iFlagSnowAssim = 0
! Computing soil moisture assimilation (1=yes, 0=no)
iFlagSMAssim = 0
! LAI mode (0=empiric relationship, 1=using data)
iFlagLAI = 0
! Albedo mode (0=static value, 1=dynamic monthly values)
iFlagAlbedo = 0
! Coeff Resolution default mode (0=null ,1=empiric relationship) [--> VdA old cases set flag to zero]
iFlagCoeffRes = 1
! Watertable sources mode (0=deactivate, 1=activate)
```

Information on the model setup and in the i/o format

Model dynamics and settings

```
iFlagWS = 0
! Watertable deep losses mode (0=deactivate, 1=activate)
iFlagWDL = 0
! Release MassBalance control (0=deactivate, 1=activate)
iFlagReleaseMass = 1
! Channel treatment type (1=channel network, 2=channel fraction)
iFlagCType = 1
! Groundwater bedrock fracturation (0=deactivate, 1=activate)
iFlagFrac = 0
! Vegetation Dynamic module (0=deactivate, 1=activate)
iFlagDynVeg = 1
! Flooding Dynamic module (0=deactivate, 1=activate)
iFlagFlood = 0
! Energy Balance module (0=deactivate, 1=activate)
iFlagEnergyBalance = 1
! Soil parametrization type (1=through CN --> classic, is default, 2=through ksatv & vmax)
iFlagSoilParamsType = 2
! Soil infiltration capacity variability with soil saturation (0=no variability, 1=linear variability, 2=non linear variability)
! (non linear is from Yang et al. 2020, Improving the Horton infiltration ...)
iFlagInfiltRateVariable = 0
! Evapotranspiration reduction with water stress
! (0=no reduction except for mass balance constraint; 1=classical beta function-different between Jarvis and pre-Jarvis ET module)
iFlagBetaET = 0
! ------------------------------------------------------------------------------------------

! GEOGRAPHICAL INFO -------------------------------------------------------------------------
! Forcing data lower left angle coordinate (dGeoMETEO)
a1dGeoForcing=45.461001, 6.793001
! Forcing data lat and lon cellsize (passMeteo)
a1dResForcing=0.0025822, 0.0025822
! Forcing data dimensions (passMeteo)
a1iDimsForcing=206, 446
! ------------------------------------------------------------------------------------------

! DT INFO -----------------------------------------------------------------------------------
! Simulation length [hours]
iSimLength=72
! Model dT [seconds]
iDtModel=3600

! Method to compute physics integration step (1=scalar, 2=linear) [1 for old and actual case-study, 2 is experimental]
iDtPhysMethod = 1
! Physics convolution integration dT [seconds]
iDtPhysConv = 30
! Dem average step range to select integration step [m]
a1dDemStep = 1, 10, 100, 1000
! Minimum integration step range to select integration step [seconds]
a1dIntStep = 1, 5, 25, 600
! Dt integration step range to select integration step [seconds]
a1dDtStep = 1, 6, 6, 60
! Dt ratio integration step range to select integration step [seconds]
a1dDtRatioStep = 3, 3, 3, 2
! Data forcing gridded and point dT [seconds]
iDtData_Forcing = 3600
```

Geographical information (ignored if netcdf forcing are used)

Time settings: length and frequency

```
! Data updating gridded dT [seconds] --> minimum commom step between updating data
iDtData_Updating = 3600

! Data output gridded dT [seconds]
iDtData_Output_Gridded = 3600
! Data output point dT [seconds]
iDtData_Output_Point = 3600
! Data state gridded dT [seconds]
iDtData_State_Gridded = 3600
! Data state point dT [seconds]
iDtData_State_Point = 3600
! Data output generic subsets (1 = BASIC [Q, ET, SOIL_MOISTURE], 2 = EXTENDED [ALL], 3 = DEBUG [ALL + RELATED TO DEBUG])
iActiveData_Output_Generic = 2
! Data output flooding subsets (0 = NOT ACTIVE [-], 1 = ACTIVE [Qfloodleft, Qfloodright])
iActiveData_Output_Flooding = 0
! Data output snow subsets (0 = NOT ACTIVE [-], 1 = ACTIVE [SWE, MeltingS, RhoS, SnowFall, AlbedoS, AgeS, MeltingSDayCum])
iActiveData_Output_Snow = 0
! Hour for computing and dumping accumulated variable(s) [0 - 23]
iAccumData_Output_Hour = 23
! ------------------------------------------------------------------------------------------

! DATA INFO ---------------------------------------------------------------------------------
! Forcing data rescaling factor (permitted: 10 or 100 or 1000) --> used for binary data
iScaleFactor=10
! Number of hours of routing after last observation (to undefined value = -9999)
iTcMax = 0
! Number of iDtModel within which LAI should be updated (to undefined value = -9999)
iTVeg = -9999
! ------------------------------------------------------------------------------------------

! TIME INFO ---------------------------------------------------------------------------------
! Start time (yyyymmddHHMM format)
sTimeStart=202010020000
! Re-start time (yyyymmddHHMM format)
sTimeRestart=202010012300
! ------------------------------------------------------------------------------------------

! PATH(S) INFO ------------------------------------------------------------------------------
! DATA STATIC
! Static gridded data path (land data)
sPathData_Static_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/static_
! Static point data path (point info file and dam Tank-Volume curve)
sPathData_Static_Point='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/static_dat

! DATA DYNAMIC
! Forcing gridded data path
sPathData_Forcing_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/forcings/$yyyy/$mm/$dd/'
! Forcing point data path [~DamVolume]
sPathData_Forcing_Point='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/fake/'
! Forcing time-series data path [~Turbinate]
sPathData_Forcing_TimeSeries='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/time_series_20201002_20201031/'

! Updating gridded data path
sPathData_Updating_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/forcings/$yyyy/$mm/$dd/'
```

Additional data settings

Reference dates

Path(s)

```
! Output gridded data path
sPathData_Output_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/outputs/$yyyy/$mm/$dd/'
! Output point data path
sPathData_Output_Point='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/outputs/$yyyy/$mm/$dd/'
! Output time-series data path
sPathData_Output_TimeSeries='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/outputs/'

! State gridded data path
sPathData_State_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/states/$yyyy/$mm/$dd/'
! State point data path
sPathData_State_Point='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/states/$yyyy/$mm/$dd/'

! Restart gridded data path
sPathData_Restart_Gridded='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/restart/'
! Restart point data path
sPathData_Restart_Point='/home/giulia/CIMA/Working/01_VDA_Forecasts/Data_HMCdebug/run7782/restart/'
! ------------------------------------------------------------------------------------------
```

Parameters of the different model components

```
&HMC_Snow

! SNOW MODEL DEFAULT CONSTANTS ------------------------------------------------------------------
! [-]
a1dArctUp = 3.0, 4.5, 3.0, 4.0
! Frequency to snow rhow max limit [1/day] --> no melting
a1dExpRhoLow = 0.0333, 0.0222, 0.0250, 0.0333
! Frequency to snow rhow max limit[1/day] --> melting
a1dExpRhoHigh = 0.0714, 0.0714, 0.0714, 0.0714
! Altitude range to select ExpRho low and high [m asl]
a1dAltRange = 1500.0, 2000.0, 2500.0, 2500.0
! Value of glacier(s) in nature map [-]
iGlacierValue = 2
! Fresh snow density [kg/m^3]
dRhoSnowFresh = 100
! Maximum snow density [kg/m^3]
dRhoSnowMax = 400
! Quality threshold of snow cover area map [-]
dSnowQualityThr = 0.3
! Soil melting reference temperature [C]
dMeltingTRef = 1
! ------------------------------------------------------------------------------------------------

&HMC_Constants

! VARIABLE(S) MONTHLY INITIALIZATION -------------------------------------------------------------
! Monthly albedo value(s) [0.18,  0.17, 0.16,  0.15,  0.15,  0.15,  0.15,  0.16,  0.16,  0.17,  0.17,  0.18]
a1dAlbedoMonthly        = 0.23,  0.23, 0.23,  0.23,  0.23,  0.23,  0.23,  0.23,  0.23,  0.23,  0.23,  0.23
! Monthly LAI value(s)
a1dLAIMonthly           = 4.00,  4.00, 4.00,  4.00,  4.00,  4.00,  4.00,  4.00,  4.00,  4.00,  4.00,  4.00
! ------------------------------------------------------------------------------------------------

! WATERTABLE DEFAULT CONSTANTS -------------------------------------------------------------------
! Watertable minimum height [mm]
dWTableHMin = 0.0
! Watertable maximum height under the soil [mm] ---> fmin
dWTableHUSoil = 150.0
! Watertable maximum height under the channels [mm] ---> fcan
dWTableHUChannel = 5.0
! Maximum slope BM for initializing watertable using beta [-] ---> fpen
dWTableSlopeBM = 0.2
! Watertable maximum height over the bedrock (considering the limit of maximum slope BM)  [mm] ---> fov
dWTableHOBedRock = 15.0
! ------------------------------------------------------------------------------------------------

! MASS BALANCE CONSTANTS -------------------------------------------------------------------------
! Min hypodermicFlow ratio
dRateMin = 0.01
! Rescaling factor for hypodermic flow ratio; allowed values = [dRateMin : 1]
! (1=no rescaling; dRateMin=dRate always at minum value)
dRateRescaling = 0.1
! Exp of dUcT=dUc*h^dBc
dBc = 0.5
! Maximum watertable losses (water sources losses and water deep losses) [-]
```

```
dWTLossMax = 0.25
! Decay parameter (k) of "Infilt = ksat_infilt + (ksat_infilt/cf-ksat_infilt)*exp(-k*(sat/1-sat))"
! (active only if iFlagVariableInfiltRate=2)
dPowVarInfiltRate = 7
! ------------------------------------------------------------------------------------------

! ENERGY BALANCE CONSTANTS ------------------------------------------------------------------
! Reference temperature [K]
dTRef = 273.15
! TDeep shift steps
iTdeepShift = 2
! CH Monthly Constant [-7.3, -7.3, -5.8, -5.8, -5.8, -4.8, -4.8, -4.8, -4.8, -5.9, -5.9, -7.3]
a1dCHMonthly = -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85, -5.85
! Soil emissivity [-]
dEpsS = 0.96
! Stefan-Boltzmann Constant [W/m^2 K]
dSigma = 0.00000005576
! Min value beta function
dBFMin = 0.1
! Max value beta function
dBFMax = 0.9
! LST maximum delta to limit runge-kutta integration method [K]
dLSTDeltaMax = 40.0

! Z reference for wind [m]
dZRef = 3.0
! Gravity acceleration [m s^-2]
dG = 9.81
! Specific heat at constant pressure [J/kg/K]
dCp = 1004.0
! Gas constant for air [J/kg K]
dRd = 287.0

! Soil density [kg m^-3]
dRhoS = 2700
! Water density [kg m^-3]
dRhoW = 1000
! Soil specific heat [J kg^-1 K^-1]
dCpS = 733
! Water specific heat [J kg^-1 K^-1]
dCpW = 4186
! Quartz thermic conductivity [W m^-1 K^-1]
dKq = 7.7
! Water thermic conductivity [W m^-1 K^-1]
dKw = 0.57
! Other minerals thermic conductivity [W m^-1 K^-1] --> Orba = 4; Casentino = 2
dKo = 4
! Soil Porosity [-]
dPorS = 0.4
! Quartz soil fraction [-]
dFqS = 0.5
! ------------------------------------------------------------------------------------------
```

```
! HYDRAULIC STRUCTURE CONSTANTS ------------------------------------------------------------------
! Volume percentage to start dam outgoing flow [-]
dTV = 0.90
! Difference between dam height and spill height [m]
dDamSpillH = 3
! ------------------------------------------------------------------------------------------------

! SOIL MOISTURE ASSIMILATION CONSTANTS ------------------------------------------------------------
! Soil moisture gain [-] [1 = Obs direct insertion, 0=Model without updating] [H16: 0.45]
dSMGain = 0.45
! ------------------------------------------------------------------------------------------------
```

Information and commands

```
&HMC_Command

! COMMAND LINE -----------------------------------------------------------------------------------
! Line to zip file (tag(s): filenameunzip)
sCommandZipFile = 'gzip -f filenameunzip > LogZip.txt'
!sCommandZipFile = "7z.exe a -tzip filenamezip filenameunzip > LogZip.txt'
! Line to unzip file (tag(s): filenameunzip and filenamezip)
sCommandUnzipFile = 'gunzip -c filenamezip > filenameunzip'
!sCommandUnzipFile = '7z.exe e -tgzip filenamezip > LogUnzip.txt'
! Line to remove file (tag(s): filename)
sCommandRemoveFile = 'rm filename'
!sCommandRemoveFile = 'rm filename'
! Line to create folder (tag(s): path)
sCommandCreateFolder = 'mkdir -p path'
!sCommandCreateFolder = 'mkdir path'
! ------------------------------------------------------------------------------------------------

&HMC_Info

! INFO MODEL -------------------------------------------------------------------------------------
! Release version     (x.x.x)
sReleaseVersion = '3.1.6'
! Author(s)          (Surname N.)
sAuthorNames = 'Delogu F., Silvestro F., Gabellani S., Libertino A., Ercolani G.'
! Release Date       (yyyy/mm/dd)
sReleaseDate = '2022/03/28'
! ------------------------------------------------------------------------------------------------
```