SWAT

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Chapter 1

SWAT

An updated SWAT 2012 revision 670 code

Objectives

- Standard indentation and translation to Fortran 90 by using `findent`. See the translate-fortran90.pl perl script file (:heavy_check_mark:)
- Exhaustive use of the "implicit none" directive to detect bad variable usage (:heavy_check_mark:)
- Generate a GNU `Make` makefile and compile with GNU `GFortran`. See the gernerate-makefile.pl perl script file (:heavy_check_mark:)
- Remove non-used variables and format labels (:heavy_check_mark:)
- Detect and solve all uninitialized variables (:heavy_check_mark: :construction:, some proposed solutions could be incorrect)
- Remove unneeded variable initializations (:heavy_check_mark:) as:

```
j=0 !  this line is not necessary
j=ihru
```

- Remove redundant code (:heavy_check_mark:)
- Exhaustive use of the "parameter" directive on constants (:heavy_check_mark:)
- Generate a detailed list of issues detected in the original code (:heavy_check_mark:, see at the end of this README)
- Remove obsolete commented code (:x:)
- Update variable descriptions in comments (:construction:, a lot of work)
- Standardize comments by using Doxygen style in order to generate documentation. See at latex/refman.pdf (:construction:, a lot of work)

Required tools

- GFortran (to compile the source code)
- Make (to build the executable file)
- Perl (optional: to execute the perl scripts to update the makefile or to translate original files to Fortran 90)
- Findent (optional: to translate original files to Fortran 90 with a standard indentation)
- Doxygen (optional: to generate a reference programming manual from source code)
- TeX Live or MiKTeX (optional: to generate a reference programming manual from source code)
- On Microsoft Windows systems you have to install MSYS2 and the required utilities (GFortran and Make). You can follow detailed instructions in install-unix

Instructions to generate Fortran 90 style code from original code

In order to generate Fortran 90 style code with standard indentation from original code you have to type on a UNIX type terminal (you need Perl and Findent):

```
$ perl translate-fortran90.pl
```

Instructions to generate an initial GNU make Makefile

Type on the UNIX type terminal, when translated the original code to Fortran 90 style (you need Perl):

```
$ perl generate-makefile.pl
```

Instructions to generate an executable to test

Type on the UNIX type terminal (you need GFortran and Make)

- In UNIX type operative systems:

  ```
  $ make
  ```

- In a MSYS2 terminal in Microsoft Windows:

  ```
  $ EXE=".exe" LDFLAGS="-static" make
  ```

- Cross-compiling a 32 bits Microsoft Windows executable in a UNIX type operative system:

  ```
  $ prefix="i686-w64-mingw32-" EXE=".exe" LDFLAGS="-static" make
  ```

- Cross-compiling a 64 bits Microsoft Windows executable in a UNIX type operative system:

  ```
  $ prefix="x86\_64-w64-mingw32-" EXE=".exe" LDFLAGS="-static" make
  ```

Instructions to generate an optimized executable file

Type on the UNIX type terminal (you need GFortran and Make)

- In UNIX type operative systems:

  $ CFLAGS="-march=native -flto" LDFLAGS="-flto" make strip

- In a MSYS2 terminal in Microsoft Windows:

  $ EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

- Cross-compiling a 32 bits Microsoft Windows executable in a UNIX type operative system:

  $ prefix="i686-w64-mingw32-" EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

- Cross-compiling a 64 bits Microsoft Windows executable in a UNIX type operative system:

  $ prefix="x86_64-w64-mingw32-" EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

Instructions to generate a reference programming manual from source code

Type on the UNIX type terminal (you need Doxygen and TeX Live or MiKTeX):

$ doxygen
$ cd latex
$ make

The reference programming manual file latex/refman.pdf is generated from source code in PDF format

Issues in the original source code

This is a list of possible issues detected in the original source code. These issues have been mostly detected by the GFortran compiler warnings. Some of them could not arise because the logic of the variables is not possible.

- In biofilm.f:
  - "dcoef" is used but not initialized. `dcoef=3` as in watqual.f? Then, I propose at beginning: `real*8, parameter :: dcoef = 3.`
- In bmp_ri_pond.f:
  - "qseep" and "qet" could be used not initialized at lines 133 and 134. However the problem only arises for `nstep<1`
- In bmp_sand_filter.f:
  - "sed_removed" at line 342 could be used not initialized if `sfsedstdev<=0`
- In bpm_sed_pond.f:
  - `bmp_sed _pond` seems to be `bmp_sed_pond` at line 186

- In bmp_wet_pond.f:
  - "hvol" could be used not initialized in "ext_dpth" subroutine at line 267 in first bucle iteration
- In clicon.f:
  - "tmxbsb", "tmnbsb", "rbsb", "rstpbsb", "rhdbsb", "rabsb", "rmxbsb", "daylbsb", "fradbsb" and "u10bsb" could be used not initialized at 186-207 lines
- In conapply.f:
  - "k" and "kk" could be used not initialized at 121-122 lines if `iday_pest(j)/=ipst_freq(j)` and `curyr>nyskip`
- In confert.f:
  - "ifrt" seems to be "it" at line 214
- In curno.f:
  - "smxold" could be used not initialized if `cn1(h)<=1.e-6` and `curyr/=0` at line 96
- In drains.f:
  - "nlayer" could be used not initialized at line 23. However, the problem only arises if it is not set in the previous bucle (`mlyr<=1` or `sol_z(j1,j)<=0`)
- In etact.f:
  - "sev" could be used not initialized at line 286 if `dep>=esd` and `ly==2`
- In filter.f:
  - "remove21" seems to be "remove2" at line 316
- In grass_wway.f:
  - "sf_depth" and "sf_sed" could be used not initialized at lines 133 and 137 if `sf_area>0` and `sf_area<=1.e-6`
- In hhnoqual.f:
  - "algon" seems to be "algcon" at line 190
- In hhwatqual.f
  - "orgnpin" seems to be "orgpin" at line 278
  - `thour=1.0` at line 377 overwrites previous "thour" calculation. It is wrong
- In hmeas.f:
  - "rhdbsb" could be used not initialized at line 84
- In killop.f:
  - "ff1" and "ff2" are used but not initialized at lines 167 and 267. They are set in harvkillop.f file (lines 257-258). They have to be included in modparm.f to share harvkillop.f values? or they have to be redefined as in harvkillop.f?
- In NCsed_leach.f90:
  - "perc_clyr" could be used not initialized at line 221 if `sol_nly(j)<2`
- In nrain.f:
  - "no2pcp" seems to be "no3pcp" at line 72
- In pmeas.f:

  - "rbsb" could be used not initialized at line 143
  - "flag" could be used not initialized if 'a==' 'at line 210
  - "rainsb" could be used not initialized, however only ifnstep<=0`
- In pminrl2.f:
  - at line 95 a comma is necessary between "base" and "vara"
  - "ssp" could be used not initialized at line 196 if xx<=1.e-6
- In pothole.f:
  - "solp_tileo" could be used not initialized at line 593 if pot_vol(j)<=1.e-6 or potvol_↩ tile<=1.e-6
- In potholehr.f:
  - "potflow" seems to be "potflwo" at line 447
- In readatmodep.f:
  - momax=12*nbyr is defined at line 65 but not used. It has to be "mo_max"? but then, it overwrites the file read
- In readops.f:
  - year = 0. seems to be iyear = 0 at line 98
  - "mg13" seems to be "mgt13" at line 206
- In readpnd.f:
  - "vselsetlpnd" seems to be "velsetlpnd" at line 279
- In readru.f:
  - "tck" is used but not initialized at line 79
- In readsepticbz.f:
  - at line 135 4. e-8 seems to be 4.e-8
- In rewind_init.f:
  - "orig_tnylda" is used but not initialized at line 174
- In routels.f:
  - "dstor" is used but not initialized at line 134. It has to be calculated as in watbal.f? or as in the commented line 109?
  - "latqout" and "gwqout" could be used not initialized at lines 142-143
- In rtbact.f:
  - "netwtr" could be used not initialized at line 124, however only if nstep<1
- In rthpest.f:
  - thour=1.0 at line 183 overwrites previous "thour" calculation. It is wrong
  - "frsol" and "frsrb" could be used not initialized at lines 289-290 if hrtwtr(ii)>0.001 and hrtwtr(ii)/(idt*60)<=0.01
- In rtpest.f:
  - tday=1.0 at line 180 overwrites previous "tday" calculation. It is wrong
- In sched_mgt.f:
  - < = seems to be <= at 202 line

  - "husc" and "igrow" at lines 264-265 are used but not initialized. "husc" has to be `phu_op(iop,ihru)` has in readmgt.f? "igrow" has to be `igro(ihru)` has in readmgt.f?

- In smeas.f:
  - "rabsb" could be used not initialized at line 86
- In sweep.f:
  - "fr_curb" is used but not initialized at line 56. It has to be added to modparm.f to share result with sched_mgt.f? or it has to be `mgt5op(nop(ihru),ihru)` as in sched_mgt.f?
- In tmeas.f:
  - "tmxbsb" and "tmnbsb" could be used not initialized at lines 109-110
- In transfer.f:
  - "ratio", "xx" and "ratio1" could be used not initialized at lines 236, 239 and 241 if `ihout==2`
- In wmeas.f:
  - "u10bsb" could be used not initialized at line 85
- In zero0.f:
  - "sol_sumn03" seems to be "sol_sumno3" at line 508
- In zero_urbn.f:
  - "stp_stagdis" seems to be "dtp_stagdis" at line 84
  - "subdr_kg" seems to be "subdr_km" at line 149
  - "spl_eros" is not defined at line 21, it could be "eros_spl"?

Chapter 2

Modules Index

2.1 Modules List

Here is a list of all documented modules with brief descriptions:

Chapter 3

Data Type Index

3.1 Data Types List

Here are the data types with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 5

Module Documentation

5.1 parm Module Reference

main module contatining the global variables

Data Types

- interface ascrv
- interface atri
- interface aunif
- interface dstn1
- interface ee
- interface expo
- interface fcgd
- interface HQDAV
- interface layersplit
- interface ndenit
- interface qman
- interface regres
- interface rsedaa
- interface tair
- interface theta
- interface vbl

Variables

- integer, parameter mvaro = 33

  max number of variables routed through the reach
- integer, parameter mhruo = 79

  max number of variables in output.hru
- integer, parameter mrcho = 62

  max number of variables in reach file
- integer, parameter msubo = 24

  max number of variables in output.sub
- integer, parameter mstdo = 113

max number of variables summarized in output.std

- integer, parameter **motot** = 600
- integer **icalen**
- real ∗8 **prf_bsn**
- real ∗8 **co2_x2**
- real ∗8 **co2_x**
- real ∗8, dimension(:), allocatable **alph_e**
- real ∗8, dimension(:), allocatable **co_p**
- real ∗8, dimension(:), allocatable **surlag**
- real ∗8, dimension(:), allocatable **cdn**
- real ∗8, dimension(:), allocatable **nperco**
- real ∗8, dimension(:), allocatable **cmn**
- real ∗8, dimension(:), allocatable **phoskd**
- real ∗8, dimension(:), allocatable **psp**
- real ∗8, dimension(:), allocatable **sdnco**
- real ∗8 **yield**
- real ∗8 **burn_frlb**
- real ∗8 **pst_kg**
- real ∗8 **r2adj_bsn**
- real ∗8 **yieldgrn**
- real ∗8 **yieldbms**
- real ∗8 **yieldtbr**
- real ∗8 **yieldn**
- real ∗8 **yieldp**
- real ∗8 **hi_bms**
- real ∗8 **hi_rsd**
- real ∗8 **yieldrsd**
- real ∗8, dimension(:), allocatable **l_k1**
- real ∗8, dimension(:), allocatable **l_k2**
- real ∗8, dimension(:), allocatable **l_lambda**
- real ∗8, dimension(:), allocatable **l_beta**
- real ∗8, dimension(:), allocatable **l_gama**
- real ∗8, dimension(:), allocatable **l_harea**
- real ∗8, dimension(:), allocatable **l_vleng**
- real ∗8, dimension(:), allocatable **l_vslope**
- real ∗8, dimension(:), allocatable **l_ktc**
- real ∗8, dimension(:), allocatable **biofilm_mumax**
- real ∗8, dimension(:), allocatable **biofilm_kinv**
- real ∗8, dimension(:), allocatable **biofilm_klw**
- real ∗8, dimension(:), allocatable **biofilm_kla**
- real ∗8, dimension(:), allocatable **biofilm_cdet**
- real ∗8, dimension(:), allocatable **biofilm_bm**
- real ∗8, dimension(:,:), allocatable **hru_rufr**
- real ∗8, dimension(:,:), allocatable **daru_km**
- real ∗8, dimension(:,:), allocatable **ru_k**
- real ∗8, dimension(:,:), allocatable **ru_c**
- real ∗8, dimension(:,:), allocatable **ru_eiq**
- real ∗8, dimension(:,:), allocatable **ru_ovsl**
- real ∗8, dimension(:,:), allocatable **ru_a**
- real ∗8, dimension(:,:), allocatable **ru_ovs**
- real ∗8, dimension(:,:), allocatable **ru_ktc**
- real ∗8, dimension(:), allocatable **gwq_ru**
- real ∗8, dimension(:), allocatable **qdayout**
- integer, dimension(:), allocatable **ils2**
- integer, dimension(:), allocatable **ils2flag**

- integer **iru**
- integer **mru**
- integer **irch**
- integer **isub**
- integer **idum**
- integer **mhyd_bsn**
- integer **ipest**
- integer **ils_nofig**
- integer **mhru1**
- integer, dimension(:), allocatable **mhyd1**
- integer, dimension(:), allocatable **irtun**
- real ∗8 **wshd_sepno3**
- real ∗8 **wshd_sepnh3**
- real ∗8 **wshd_seporgn**
- real ∗8 **wshd_sepfon**
- real ∗8 **wshd_seporgp**
- real ∗8 **wshd_sepfop**
- real ∗8 **wshd_sepsolp**
- real ∗8 **wshd_sepbod**
- real ∗8 **wshd_sepmm**
- integer, dimension(:), allocatable **isep_hru**
- real ∗8 **fixco**
- real ∗8 **nfixmx**
- real ∗8 **rsd_covco**
- real ∗8 **vcrit**
- real ∗8 **res_stlr_co**
- real ∗8 **wshd_sw**
- real ∗8 **wshd_snob**
- real ∗8 **wshd_pndfr**
- real ∗8 **wshd_pndv**
- real ∗8 **wshd_pndsed**
- real ∗8 **wshd_wetfr**
- real ∗8 **wshd_resfr**
- real ∗8 **wshd_resha**
- real ∗8 **wshd_pndha**
- real ∗8 **percop**
- real ∗8 **wshd_fminp**
- real ∗8 **wshd_ftotn**
- real ∗8 **wshd_fnh3**
- real ∗8 **wshd_fno3**
- real ∗8 **wshd_forgn**
- real ∗8 **wshd_forgp**
- real ∗8 **wshd_ftotp**
- real ∗8 **wshd_yldn**
- real ∗8 **wshd_yldp**
- real ∗8 **wshd_fixn**
- real ∗8 **wshd_pup**
- real ∗8 **wshd_wstrs**
- real ∗8 **wshd_nstrs**
- real ∗8 **wshd_pstrs**
- real ∗8 **wshd_tstrs**
- real ∗8 **wshd_astrs**
- real ∗8 **wshd_hmn**
- real ∗8 **wshd_rwn**
- real ∗8 **wshd_hmp**

- real ∗8 **wshd_rmn**
- real ∗8 **wshd_dnit**
- real ∗8 **ffcb**
- real ∗8 **wshd_rmp**
- real ∗8 **wshd_voln**
- real ∗8 **wshd_nitn**
- real ∗8 **wshd_pas**
- real ∗8 **wshd_pal**
- real ∗8 **wdpq**
- real ∗8 **wshd_plch**
- real ∗8 **wshd_raino3**
- real ∗8 **ressedc**
- real ∗8 **basno3f**
- real ∗8 **basorgnf**
- real ∗8 **wof_p**
- real ∗8 **wshd_pinlet**
- real ∗8 **wshd_ptile**
- real ∗8 **basminpf**
- real ∗8 **basorgpf**
- real ∗8 **sftmp**
- real ∗8 **smtmp**
- real ∗8 **smfmx**
- real ∗8 **smfmn**
- real ∗8 **wgpq**
- real ∗8 **wshd_resv**
- real ∗8 **wshd_ressed**
- real ∗8 **basno3i**
- real ∗8 **basorgni**
- real ∗8 **basminpi**
- real ∗8 **wdlpq**
- real ∗8 **basorgpi**
- real ∗8 **peakr**
- real ∗8 **pndsedin**
- real ∗8 **sw_excess**
- real ∗8 **albday**
- real ∗8 **wglpq**
- real ∗8 **wdps**
- real ∗8 **wtabelo**
- real ∗8 **timp**
- real ∗8 **tilep**
- real ∗8 **wt_shall**
- real ∗8 **sq_rto**
- real ∗8 **tloss**
- real ∗8 **inflpcp**
- real ∗8 **snomlt**
- real ∗8 **snofall**
- real ∗8 **fixn**
- real ∗8 **qtile**
- real ∗8 **crk**
- real ∗8 **latlyr**
- real ∗8 **pndloss**
- real ∗8 **wetloss**
- real ∗8 **potloss**
- real ∗8 **lpndloss**
- real ∗8 **lwetloss**

- real ∗8 **sedrch**
- real ∗8 **fertn**
- real ∗8 **sol_rd**
- real ∗8 **cfertn**
- real ∗8 **cfertp**
- real ∗8 **sepday**
- real ∗8 **bioday**
- real ∗8 **sepcrk**
- real ∗8 **sepcrktot**
- real ∗8 **fertno3**
- real ∗8 **fertnh3**
- real ∗8 **fertorgn**
- real ∗8 **fertsolp**
- real ∗8 **fertorgp**
- real ∗8 **fertp**
- real ∗8 **grazn**
- real ∗8 **grazp**
- real ∗8 **soxy**
- real ∗8 **qdfr**
- real ∗8 **sdti**
- real ∗8 **rtwtr**
- real ∗8 **ressa**
- real ∗8 **wgps**
- real ∗8 **rttime**
- real ∗8 **rchdep**
- real ∗8 **rtevp**
- real ∗8 **rttlc**
- real ∗8 **da_km**
- real ∗8 **resflwi**
- real ∗8 **wdlps**
- real ∗8 **wglps**
- real ∗8 **resflwo**
- real ∗8 **respcp**
- real ∗8 **resev**
- real ∗8 **ressep**
- real ∗8 **ressedi**
- real ∗8 **ressedo**
- real ∗8 **dtot**
- real ∗8 **wdprch**
- real ∗8 **nperco_bsn**
- real ∗8 **pperco_bsn**
- real ∗8 **rsdco**
- real ∗8 **phoskd_bsn**
- real ∗8 **voltot**
- real ∗8 **volcrmin**
- real ∗8 **msk_x**
- real ∗8 **uno3d**
- real ∗8 **canev**
- real ∗8 **usle**
- real ∗8 **rcn**
- real ∗8 **surlag_bsn**
- real ∗8 **bactkdq**
- real ∗8 **precipday**
- real ∗8 **wdpf**
- real ∗8 **thbact**

- real ∗8 **wpq20**
- real ∗8 **wlpq20**
- real ∗8 **wps20**
- real ∗8 **wlps20**
- real ∗8 **bactrop**
- real ∗8 **bactsedp**
- real ∗8 **bactlchp**
- real ∗8 **bactlchlp**
- real ∗8 **enratio**
- real ∗8 **wetpcp**
- real ∗8 **pndpcp**
- real ∗8 **wetsep**
- real ∗8 **wgpf**
- real ∗8 **pndsep**
- real ∗8 **wetev**
- real ∗8 **pndev**
- real ∗8 **pndsedo**
- real ∗8 **wetsedo**
- real ∗8 **pndflwi**
- real ∗8 **wetflwi**
- real ∗8 **pndflwo**
- real ∗8 **wetflwo**
- real ∗8 **wetsedi**
- real ∗8 **da_ha**
- real ∗8 **vpd**
- real ∗8 **bactrolp**
- real ∗8 **bactsedlp**
- real ∗8 **evrch**
- real ∗8 **evlai**
- real ∗8 **pet_day**
- real ∗8 **ep_day**
- real ∗8 **wdlpf**
- real ∗8 **snoev**
- real ∗8 **sno3up**
- real ∗8 **adj_pkr**
- real ∗8 **n_updis**
- real ∗8 **p_updis**
- real ∗8 **nactfr**
- real ∗8 **reactw**
- real ∗8 **sdiegropq**
- real ∗8 **sdiegrolpq**
- real ∗8 **sdiegrops**
- real ∗8 **sdiegrolps**
- real ∗8 **es_day**
- real ∗8 **sbactrop**
- real ∗8 **sbactrolp**
- real ∗8 **sbactsedp**
- real ∗8 **sbactsedlp**
- real ∗8 **ep_max**
- real ∗8 **wof_lp**
- real ∗8 **sbactlchp**
- real ∗8 **sbactlchlp**
- real ∗8 **psp_bsn**
- real ∗8 **rchwtr**
- real ∗8 **resuspst**

- real ∗8 **setlpst**
- real ∗8 **bsprev**
- real ∗8 **bssprev**
- real ∗8 **spadyo**
- real ∗8 **spadyev**
- real ∗8 **spadysp**
- real ∗8 **spadyrfv**
- real ∗8 **spadyosp**
- real ∗8 **qday**
- real ∗8 **usle_ei**
- real ∗8 **al5**
- real ∗8 **pndsedc**
- real ∗8 **no3pcp**
- real ∗8 **rcharea**
- real ∗8 **volatpst**
- real ∗8 **wetsedc**
- real ∗8 **uobw**
- real ∗8 **ubw**
- real ∗8 **uobn**
- real ∗8 **uobp**
- real ∗8 **respesti**
- real ∗8 **wglpf**
- real ∗8 **snocovmx**
- real ∗8 **snocov1**
- real ∗8 **snocov2**
- real ∗8 **rexp**
- real ∗8 **rcor**
- real ∗8 **lyrtile**
- real ∗8 **lyrtilex**
- real ∗8 **ai0**
- real ∗8 **ai1**
- real ∗8 **ai2**
- real ∗8 **ai3**
- real ∗8 **ai4**
- real ∗8 **ai5**
- real ∗8 **ai6**
- real ∗8 **rhoq**
- real ∗8 **tfact**
- real ∗8 **sno50cov**
- real ∗8 **mumax**
- real ∗8 **lambda0**
- real ∗8 **lambda1**
- real ∗8 **lambda2**
- real ∗8 **k_l**
- real ∗8 **k_n**
- real ∗8 **k_p**
- real ∗8 **p_n**
- real ∗8 **rnum1**
- real ∗8 **autop**
- real ∗8 **auton**
- real ∗8 **etday**
- real ∗8 **hmntl**
- real ∗8 **rwntl**
- real ∗8 **hmptl**
- real ∗8 **rmn2tl**

- real ∗8 **rmptl**
- real ∗8 **wdntl**
- real ∗8 **cmn_bsn**
- real ∗8 **rmp1tl**
- real ∗8 **roctl**
- real ∗8 **gwseep**
- real ∗8 **revapday**
- real ∗8 **reswtr**
- real ∗8 **bury**
- real ∗8 **difus**
- real ∗8 **reactb**
- real ∗8 **solpesto**
- real ∗8 **petmeas**
- real ∗8 **wdlprch**
- real ∗8 **wdpres**
- real ∗8 **sorpesto**
- real ∗8 **spcon_bsn**
- real ∗8 **spexp_bsn**
- real ∗8 **solpesti**
- real ∗8 **sorpesti**
- real ∗8 **wdlpres**
- real ∗8 **snoprev**
- real ∗8 **swprev**
- real ∗8 **shallstp**
- real ∗8 **deepstp**
- real ∗8 **msk_co1**
- real ∗8 **msk_co2**
- real ∗8 **ressolpo**
- real ∗8 **resorgno**
- real ∗8 **resorgpo**
- real ∗8 **resno3o**
- real ∗8 **reschlao**
- real ∗8 **resno2o**
- real ∗8 **resnh3o**
- real ∗8 **qdbank**
- real ∗8 **potpcpmm**
- real ∗8 **potevmm**
- real ∗8 **potsepmm**
- real ∗8 **potflwo**
- real ∗8 **potsedo**
- real ∗8 **pest_sol**
- real ∗8 **trnsrch**
- real ∗8 **wp20p_plt**
- real ∗8 **bactminp**
- real ∗8 **bactminlp**
- real ∗8 **wp20lp_plt**
- real ∗8 **cncoef**
- real ∗8 **cdn_bsn**
- real ∗8 **sdnco_bsn**
- real ∗8 **bact_swf**
- real ∗8 **bactmx**
- real ∗8 **bactmin**
- real ∗8 **chla_subco**
- real ∗8 **tb_adj**
- real ∗8 **cn_froz**

- real ∗8 **dorm_hr**
- real ∗8 **smxco**
- real ∗8 **depimp_bsn**
- real ∗8 **ddrain_bsn**
- real ∗8 **tdrain_bsn**
- real ∗8 **gdrain_bsn**
- real ∗8 **rch_san**
- real ∗8 **rch_sil**
- real ∗8 **rch_cla**
- real ∗8 **rch_sag**
- real ∗8 **rch_lag**
- real ∗8 **rch_gra**
- real ∗8 **hlife_ngw_bsn**
- real ∗8 **ch_opco_bsn**
- real ∗8 **ch_onco_bsn**
- real ∗8 **bc1_bsn**
- real ∗8 **bc2_bsn**
- real ∗8 **bc3_bsn**
- real ∗8 **bc4_bsn**
- real ∗8 **rcn_sub_bsn**
- real ∗8 **decr_min**
- real ∗8 **anion_excl_bsn**
- real ∗8, dimension(:), allocatable **wat_tbl**
- real ∗8, dimension(:), allocatable **sol_swpwt**
- real ∗8, dimension(:,:), allocatable **vwt**
- real ∗8 **re_bsn**
- real ∗8 **sdrain_bsn**
- real ∗8 **sstmaxd_bsn**
- real ∗8 **drain_co_bsn**
- real ∗8 **pc_bsn**
- real ∗8 **latksatf_bsn**
- integer **i_subhw**
- integer **imgt**
- integer **idlast**
- integer **iwtr**
- integer **ifrttyp**
- integer **mo_atmo**
- integer **mo_atmo1**
- integer **ifirstatmo**
- integer **iyr_atmo**
- integer **iyr_atmo1**
- integer **matmo**
- integer mch

  maximum number of channels
- integer mcr

  maximum number of crops grown per year
- integer mcrdb

  max number of lu/lc defined in crop.dat
- integer mfcst

  maximum number of forecast stations
- integer mfdb

  max number of fertilizers in fert.dat
- integer mhru

  maximum number of HRUs in watershed

- integer mhyd

  maximum number of hydrograph nodes
- integer mpdb

  max number of pesticides in pest.dat
- integer mrg

  max number of rainfall/temp gages
- integer mcut

  maximum number of cuttings per year
- integer mgr

  maximum number of grazings per year
- integer mnr

  max number of years of rotation
- integer myr

  max number of years of simulation
- integer **isubwq**
- integer **ffcst**
- integer isproj

  special project code: 1 test rewind (run simulation twice)
- integer **nhru**
- integer **mo**
- integer **nbyr**
- integer **immo**
- integer **nrch**
- integer **nres**
- integer **irte**
- integer **i_mo**
- integer **icode**
- integer **ihout**
- integer **inum1**
- integer **inum2**
- integer **inum3**
- integer **inum4**
- integer **wndsim**
- integer **ihru**
- integer **inum5**
- integer **inum6**
- integer **inum7**
- integer **inum8**
- integer **icfac**
- integer mrech

  maximum number of rechour files
- integer nrgage

  number of raingage files
- integer nrgfil

  number of rain gages per file
- integer nrtot

  total number of rain gages
- integer ntgage

  number of temperature gage files
- integer ntgfil

  number of temperature gages per file
- integer nttot

total number of temperature gages

- integer **lao**
- integer **igropt**
- integer **npmx**
- integer **irtpest**
- integer **curyr**
- integer **tmpsim**
- integer **icrk**
- integer **iihru**
- integer **ismax**
- integer **itdrn**
- integer **iwtdn**
- integer **iroutunit**
- integer **ires_nut**
- integer iclb

  auto-calibration flag
- integer mrecc

  maximum number of reccnst files
- integer mrecd

  maximum number of recday files
- integer mrecm

  maximum number of recmon files
- integer mtil

  max number of tillage types in till.dat
- integer mudb

  maximum number of urban land types in urban.dat
- integer **idist**
- integer mrecy

  maximum number of recyear files
- integer **ipet**
- integer **nyskip**
- integer **ideg**
- integer **ievent**
- integer **slrsim**
- integer **iopera**
- integer **id1**
- integer **idaf**
- integer **idal**
- integer **leapyr**
- integer **mo_chk**
- integer **rhsim**
- integer nhtot

  number of relative humidity records in file
- integer nstot

  number of solar radiation records in file
- integer nwtot

  number of wind speed records in file
- integer **ifirsts**
- integer **ifirsth**
- integer **ifirstw**
- integer **icst**
- integer **ilog**
- integer **i**

- integer **iyr**
- integer **itotr**
- integer **iwq**
- integer **iskip**
- integer **ifirstpet**
- integer **itotb**
- integer **itots**
- integer **iprp**
- integer **pcpsim**
- integer **itoth**
- integer **nd_30**
- integer **iops**
- integer **iphr**
- integer **isto**
- integer **isol**
- integer fcstcycles

  number of times forecast period is simulated (using different weather generator seeds each time)
- integer fcstday

  beginning date of forecast period (julian date)
- integer fcstyr

  beginning year of forecast period
- integer iscen

  scenarios counter
- integer **subtot**
- integer **ogen**
- integer mapp

  maximum number of applications
- integer mlyr

  maximum number of soil layers
- integer mpst

  max number of pesticides used in wshed
- integer mres

  maximum number of reservoirs
- integer msub

  maximum number of subbasins
- integer **igen**
- integer **iprint**
- integer **iida**
- integer **fcstcnt**
- integer **icn**
- integer **ised_det**
- integer **mtran**
- integer **idtill**
- integer, dimension(100) **ida_lup**
- integer, dimension(100) **iyr_lup**
- integer **no_lup**
- integer **no_up**
- integer **nostep**
- character(len=8) date

  date simulation is performed where leftmost eight characters are set to a value of yyyymmdd, where yyyy is the year, mm is the month and dd is the day
- character(len=10) time

time simulation is performed where leftmost ten characters are set to a value of hhmmss.sss, where hh is the hour, mm is the minutes and ss.sss is the seconds and milliseconds

- character(len=5) zone

  time difference with respect to Coordinated Universal Time (ie Greenwich Mean Time)
- character(len=80) prog

  SWAT program header string.
- character(len=13) **slrfile**
- character(len=13) **wndfile**
- character(len=13) **rhfile**
- character(len=13) **petfile**
- character(len=13) **calfile**
- character(len=13) **atmofile**
- character(len=13) **lucfile**
- character(len=13) septdb

  name of septic tank database file (septwq1.dat)
- character(len=13) **dpd_file**
- character(len=13) **wpd_file**
- character(len=13) **rib_file**
- character(len=13) **sfb_file**
- character(len=13) **lid_file**
- integer, dimension(9) **idg**
- integer, dimension(:), allocatable **ifirstr**
- integer, dimension(:), allocatable **ifirsthr**
- integer, dimension(8) values

  values(1): year simulation is performed
  values(2): month simulation is performed
  values(3): day in month simulation is performed
  values(4): time difference with respect to Coordinated Universal Time (ie Greenwich Mean Time)
  values(5): hour simulation is performed
  values(6): minute simulation is performed
  values(7): second simulation is performed
  values(8): millisecond simulation is performed
- integer, dimension(13) **ndays**
- integer, dimension(13) **ndays_noleap**
- integer, dimension(13) **ndays_leap**
- integer **mapex**
- real ∗8, dimension(:), allocatable **flodaya**
- real ∗8, dimension(:), allocatable **seddaya**
- real ∗8, dimension(:), allocatable **orgndaya**
- real ∗8, dimension(:), allocatable **orgpdaya**
- real ∗8, dimension(:), allocatable **no3daya**
- real ∗8, dimension(:), allocatable **minpdaya**
- real ∗8, dimension(:), allocatable hi_targ

  index target of cover defined at planting
- real ∗8, dimension(:), allocatable **bio_targ**
- real ∗8, dimension(:), allocatable **tnyld**
- integer, dimension(:), allocatable **idapa**
- integer, dimension(:), allocatable **iypa**
- integer, dimension(:), allocatable **ifirsta**
- integer, dimension(100) **mo_transb**
- integer, dimension(100) **mo_transe**
- integer, dimension(100) **ih_tran**
- integer **msdb**
- integer **iseptic**
- real ∗8, dimension(:), allocatable **sptqs**

- real ∗8, dimension(:), allocatable **percp**
- real ∗8, dimension(:), allocatable **sptbodconcs**
- real ∗8, dimension(:), allocatable **spttssconcs**
- real ∗8, dimension(:), allocatable **spttnconcs**
- real ∗8, dimension(:), allocatable **sptnh4concs**
- real ∗8, dimension(:), allocatable **sptno3concs**
- real ∗8, dimension(:), allocatable **sptno2concs**
- real ∗8, dimension(:), allocatable **sptorgnconcs**
- real ∗8, dimension(:), allocatable **spttpconcs**
- real ∗8, dimension(:), allocatable **sptminps**
- real ∗8, dimension(:), allocatable **sptorgps**
- real ∗8, dimension(:), allocatable **sptfcolis**
- real ∗8, dimension(:), allocatable **failyr**
- real ∗8, dimension(:), allocatable **qstemm**
- real ∗8, dimension(:), allocatable **bio_amn**
- real ∗8, dimension(:), allocatable **bio_bod**
- real ∗8, dimension(:), allocatable **biom**
- real ∗8, dimension(:), allocatable **rbiom**
- real ∗8, dimension(:), allocatable **fcoli**
- real ∗8, dimension(:), allocatable **bio_ntr**
- real ∗8, dimension(:), allocatable **bz_perc**
- real ∗8, dimension(:), allocatable **plqm**
- real ∗8, dimension(:), allocatable **sep_cap**
- real ∗8, dimension(:), allocatable **bz_area**
- real ∗8, dimension(:), allocatable **bz_z**
- real ∗8, dimension(:), allocatable **bz_thk**
- real ∗8, dimension(:), allocatable **bio_bd**
- real ∗8, dimension(:), allocatable **cmup_kgh**
- real ∗8, dimension(:), allocatable **cmtot_kgh**
- real ∗8, dimension(:), allocatable **coeff_bod_dc**
- real ∗8, dimension(:), allocatable **coeff_bod_conv**
- real ∗8, dimension(:), allocatable **coeff_fc1**
- real ∗8, dimension(:), allocatable **coeff_fc2**
- real ∗8, dimension(:), allocatable **coeff_fecal**
- real ∗8, dimension(:), allocatable **coeff_plq**
- real ∗8, dimension(:), allocatable **coeff_mrt**
- real ∗8, dimension(:), allocatable **coeff_rsp**
- real ∗8, dimension(:), allocatable **coeff_slg1**
- real ∗8, dimension(:), allocatable **coeff_slg2**
- real ∗8, dimension(:), allocatable **coeff_nitr**
- real ∗8, dimension(:), allocatable **coeff_denitr**
- real ∗8, dimension(:), allocatable **coeff_pdistrb**
- real ∗8, dimension(:), allocatable **coeff_solpslp**
- real ∗8, dimension(:), allocatable **coeff_solpintc**
- real ∗8, dimension(:), allocatable **coeff_psorpmax**
- integer, dimension(:), allocatable **i_sep**
- integer, dimension(:), allocatable **isep_typ**
- integer, dimension(:), allocatable **isep_opt**
- integer, dimension(:), allocatable **sep_tsincefail**
- integer, dimension(:), allocatable **isep_tfail**
- integer, dimension(:), allocatable **isep_iyr**
- integer, dimension(:), allocatable **sep_strm_dist**
- integer, dimension(:), allocatable **sep_den**
- real ∗8, dimension(:), allocatable **sol_sumno3**
- real ∗8, dimension(:), allocatable **sol_sumsolp**

- real ∗8, dimension(:), allocatable **strsw_sum**
- real ∗8, dimension(:), allocatable **strstmp_sum**
- real ∗8, dimension(:), allocatable **strsn_sum**
- real ∗8, dimension(:), allocatable **strsp_sum**
- real ∗8, dimension(:), allocatable **strsa_sum**
- real ∗8, dimension(:), allocatable **spill_hru**
- real ∗8, dimension(:), allocatable **tile_out**
- real ∗8, dimension(:), allocatable **hru_in**
- real ∗8, dimension(:), allocatable **spill_precip**
- real ∗8, dimension(:), allocatable **pot_seep**
- real ∗8, dimension(:), allocatable **pot_evap**
- real ∗8, dimension(:), allocatable **pot_sedin**
- real ∗8, dimension(:), allocatable **pot_solp**
- real ∗8, dimension(:), allocatable **pot_solpi**
- real ∗8, dimension(:), allocatable **pot_orgp**
- real ∗8, dimension(:), allocatable **pot_orgpi**
- real ∗8, dimension(:), allocatable **pot_orgn**
- real ∗8, dimension(:), allocatable **pot_orgni**
- real ∗8, dimension(:), allocatable **pot_mps**
- real ∗8, dimension(:), allocatable **pot_mpsi**
- real ∗8, dimension(:), allocatable **pot_mpa**
- real ∗8, dimension(:), allocatable **pot_mpai**
- real ∗8, dimension(:), allocatable **pot_no3i**
- real ∗8, dimension(:), allocatable **precip_in**
- real ∗8, dimension(:), allocatable **tile_sedo**
- real ∗8, dimension(:), allocatable **tile_no3o**
- real ∗8, dimension(:), allocatable **tile_solpo**
- real ∗8, dimension(:), allocatable **tile_orgno**
- real ∗8, dimension(:), allocatable **tile_orgpo**
- real ∗8, dimension(:), allocatable **tile_minpso**
- real ∗8, dimension(:), allocatable **tile_minpao**
- integer **ia_b**
- integer **ihumus**
- integer **itemp**
- integer **isnow**
- integer, dimension(41) **icolrsv**
- integer, dimension(mhruo) **icols**
- integer, dimension(mrcho) **icolr**
- integer, dimension(msubo) **icolb**
- integer, dimension(46) **ipdvar**
- integer, dimension(mhruo) **ipdvas**
- integer, dimension(msubo) **ipdvab**
- integer, dimension(:), allocatable **ipdhru**
- real ∗8, dimension(mstdo) **wshddayo**
- real ∗8, dimension(mstdo) **wshdmono**
- real ∗8, dimension(mstdo) **wshdyro**
- real ∗8, dimension(16) **fcstaao**
- real ∗8, dimension(mstdo) **wshdaao**
- real ∗8, dimension(:,:), allocatable **wpstdayo**
- real ∗8, dimension(:,:), allocatable **wpstmono**
- real ∗8, dimension(:,:), allocatable **wpstyro**
- real ∗8, dimension(:,:), allocatable **yldkg**
- real ∗8, dimension(:,:), allocatable **bio_hv**
- real ∗8, dimension(:,:), allocatable **wpstaao**
- real ∗8, dimension(:,:), allocatable **rchmono**

- real ∗8, dimension(:,:), allocatable **rchyro**
- real ∗8, dimension(:,:), allocatable **rchaao**
- real ∗8, dimension(:,:), allocatable **rchdy**
- real ∗8, dimension(:,:), allocatable **hrumono**
- real ∗8, dimension(:,:), allocatable **hruyro**
- real ∗8, dimension(:,:), allocatable **hruaao**
- real ∗8, dimension(:,:), allocatable **submono**
- real ∗8, dimension(:,:), allocatable **subyro**
- real ∗8, dimension(:,:), allocatable **subaao**
- real ∗8, dimension(:,:), allocatable **resoutm**
- real ∗8, dimension(:,:), allocatable **resouty**
- real ∗8, dimension(:,:), allocatable **resouta**
- real ∗8, dimension(12, 8) **wshd_aamon**
- real ∗8, dimension(:,:), allocatable **wtrmon**
- real ∗8, dimension(:,:), allocatable **wtryr**
- real ∗8, dimension(:,:), allocatable **wtraa**
- real ∗8, dimension(:,:), allocatable **sub_smfmx**
- real ∗8, dimension(:,:), allocatable **sub_smfmn**
- real ∗8, dimension(:,:,:), allocatable **hrupstd**
- real ∗8, dimension(:,:,:), allocatable **hrupsta**
- real ∗8, dimension(:,:,:), allocatable **hrupstm**
- real ∗8, dimension(:,:,:), allocatable **hrupsty**
- integer, dimension(:), allocatable **ifirstt**
- integer, dimension(:), allocatable **ifirstpcp**
- integer, dimension(:), allocatable **elevp**
- integer, dimension(:), allocatable **elevt**
- real ∗8, dimension(:,:), allocatable **ftmpstdmn**
- real ∗8, dimension(:,:), allocatable **ftmpmn**
- real ∗8, dimension(:,:), allocatable **ftmpmx**
- real ∗8, dimension(:,:), allocatable **ftmpstdmx**
- real ∗8, dimension(:,:,:), allocatable **fpr_w**
- real ∗8, dimension(:,:,:), allocatable **fpcp_stat**
- real ∗8, dimension(:), allocatable **flwin**
- real ∗8, dimension(:), allocatable **flwout**
- real ∗8, dimension(:), allocatable **bankst**
- real ∗8, dimension(:), allocatable **ch_wi**
- real ∗8, dimension(:), allocatable **ch_d**
- real ∗8, dimension(:), allocatable **ch_onco**
- real ∗8, dimension(:), allocatable **ch_opco**
- real ∗8, dimension(:), allocatable **ch_orgn**
- real ∗8, dimension(:), allocatable **ch_orgp**
- real ∗8, dimension(:), allocatable **drift**
- real ∗8, dimension(:), allocatable **rch_dox**
- real ∗8, dimension(:), allocatable **rch_bactp**
- real ∗8, dimension(:), allocatable **alpha_bnk**
- real ∗8, dimension(:), allocatable **alpha_bnke**
- real ∗8, dimension(:), allocatable **disolvp**
- real ∗8, dimension(:), allocatable **algae**
- real ∗8, dimension(:), allocatable **sedst**
- real ∗8, dimension(:), allocatable **rchstor**
- real ∗8, dimension(:), allocatable **organicn**
- real ∗8, dimension(:), allocatable **organicp**
- real ∗8, dimension(:), allocatable **chlora**
- real ∗8, dimension(:), allocatable **nitraten**
- real ∗8, dimension(:), allocatable **nitriten**

- real ∗8, dimension(:), allocatable **ch_li**
- real ∗8, dimension(:), allocatable **ch_si**
- real ∗8, dimension(:), allocatable **ch_bnk_san**
- real ∗8, dimension(:), allocatable **ch_bnk_sil**
- real ∗8, dimension(:), allocatable **ch_bnk_cla**
- real ∗8, dimension(:), allocatable **ch_bnk_gra**
- real ∗8, dimension(:), allocatable **ch_bed_san**
- real ∗8, dimension(:), allocatable **ch_bed_sil**
- real ∗8, dimension(:), allocatable **ch_bed_cla**
- real ∗8, dimension(:), allocatable **ch_bed_gra**
- real ∗8, dimension(:), allocatable **depfp**
- real ∗8, dimension(:), allocatable **depsanfp**
- real ∗8, dimension(:), allocatable **depsilfp**
- real ∗8, dimension(:), allocatable **depclafp**
- real ∗8, dimension(:), allocatable **depsagfp**
- real ∗8, dimension(:), allocatable **deplagfp**
- real ∗8, dimension(:), allocatable **depch**
- real ∗8, dimension(:), allocatable **depsanch**
- real ∗8, dimension(:), allocatable **depsilch**
- real ∗8, dimension(:), allocatable **depclach**
- real ∗8, dimension(:), allocatable **depsagch**
- real ∗8, dimension(:), allocatable **deplagch**
- real ∗8, dimension(:), allocatable **depgrach**
- real ∗8, dimension(:), allocatable **depgrafp**
- real ∗8, dimension(:), allocatable **grast**
- real ∗8, dimension(:), allocatable **depprch**
- real ∗8, dimension(:), allocatable **depprfp**
- real ∗8, dimension(:), allocatable **prf**
- real ∗8, dimension(:), allocatable **r2adj**
- real ∗8, dimension(:), allocatable **spcon**
- real ∗8, dimension(:), allocatable **spexp**
- real ∗8, dimension(:), allocatable **sanst**
- real ∗8, dimension(:), allocatable **silst**
- real ∗8, dimension(:), allocatable **clast**
- real ∗8, dimension(:), allocatable **sagst**
- real ∗8, dimension(:), allocatable **lagst**
- real ∗8, dimension(:), allocatable **pot_san**
- real ∗8, dimension(:), allocatable **pot_sil**
- real ∗8, dimension(:), allocatable **pot_cla**
- real ∗8, dimension(:), allocatable **pot_sag**
- real ∗8, dimension(:), allocatable **pot_lag**
- real ∗8, dimension(:), allocatable **potsani**
- real ∗8, dimension(:), allocatable **potsili**
- real ∗8, dimension(:), allocatable **potclai**
- real ∗8, dimension(:), allocatable **potsagi**
- real ∗8, dimension(:), allocatable **potlagi**
- real ∗8, dimension(:), allocatable **sanyld**
- real ∗8, dimension(:), allocatable **silyld**
- real ∗8, dimension(:), allocatable **clayld**
- real ∗8, dimension(:), allocatable **sagyld**
- real ∗8, dimension(:), allocatable **lagyld**
- real ∗8, dimension(:), allocatable **grayld**
- real ∗8, dimension(:), allocatable **res_san**
- real ∗8, dimension(:), allocatable **res_sil**
- real ∗8, dimension(:), allocatable **res_cla**

- real ∗8, dimension(:), allocatable **res_sag**
- real ∗8, dimension(:), allocatable **res_lag**
- real ∗8, dimension(:), allocatable **res_gra**
- real ∗8, dimension(:), allocatable **pnd_san**
- real ∗8, dimension(:), allocatable **pnd_sil**
- real ∗8, dimension(:), allocatable **pnd_cla**
- real ∗8, dimension(:), allocatable **pnd_sag**
- real ∗8, dimension(:), allocatable **pnd_lag**
- real ∗8, dimension(:), allocatable **wet_san**
- real ∗8, dimension(:), allocatable **wet_sil**
- real ∗8, dimension(:), allocatable **wet_cla**
- real ∗8, dimension(:), allocatable **wet_lag**
- real ∗8, dimension(:), allocatable **wet_sag**
- real ∗8 **ressano**
- real ∗8 **ressilo**
- real ∗8 **resclao**
- real ∗8 **ressago**
- real ∗8 **reslago**
- real ∗8 **resgrao**
- real ∗8 **ressani**
- real ∗8 **ressili**
- real ∗8 **resclai**
- real ∗8 **ressagi**
- real ∗8 **reslagi**
- real ∗8 **resgrai**
- real ∗8 **potsano**
- real ∗8 **potsilo**
- real ∗8 **potclao**
- real ∗8 **potsago**
- real ∗8 **potlago**
- real ∗8 **pndsanin**
- real ∗8 **pndsilin**
- real ∗8 **pndclain**
- real ∗8 **pndsagin**
- real ∗8 **pndlagin**
- real ∗8 **pndsano**
- real ∗8 **pndsilo**
- real ∗8 **pndclao**
- real ∗8 **pndsago**
- real ∗8 **pndlago**
- real ∗8, dimension(:), allocatable **ch_di**
- real ∗8, dimension(:), allocatable **ch_erod**
- real ∗8, dimension(:), allocatable **ch_l2**
- real ∗8, dimension(:), allocatable **ch_cov**
- real ∗8, dimension(:), allocatable **ch_cov1**
- real ∗8, dimension(:), allocatable **ch_cov2**
- real ∗8, dimension(:), allocatable **ch_bnk_bd**
- real ∗8, dimension(:), allocatable **ch_bed_bd**
- real ∗8, dimension(:), allocatable **ch_bnk_kd**
- real ∗8, dimension(:), allocatable **ch_bed_kd**
- real ∗8, dimension(:), allocatable **ch_bnk_d50**
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  flag for types of pesticide used in watershed array location is pesticide ID number
  0: pesticide not used
  1: pesticide used
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- integer **idt**

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- integer **dorm_flag**
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- real ∗8, dimension(:,:), allocatable **lid_cumirr_last**
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- real ∗8, dimension(:,:), allocatable **gr_dummy4**
- real ∗8, dimension(:,:), allocatable **gr_dummy5**
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- real ∗8, dimension(:,:), allocatable **sol_lsn**
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- real ∗8, dimension(:), allocatable **grainc_d**
- real ∗8, dimension(:), allocatable **stoverc_d**
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- real ∗8, dimension(:), allocatable **emitc_d**
- real ∗8, dimension(:), allocatable **sub_sedc_d**
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- real ∗8, dimension(:), allocatable **sub_percc_d**
- real ∗8, dimension(:), allocatable **sub_foc_d**
- real ∗8, dimension(:), allocatable **sub_nppc_d**

- real ∗8, dimension(:), allocatable **sub_rsdc_d**
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- real ∗8, dimension(:), allocatable **sedc_m**
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- real ∗8, dimension(:), allocatable **latc_m**
- real ∗8, dimension(:), allocatable **percc_m**
- real ∗8, dimension(:), allocatable **foc_m**
- real ∗8, dimension(:), allocatable **nppc_m**
- real ∗8, dimension(:), allocatable **rsdc_m**
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- real ∗8, dimension(:), allocatable **stoverc_m**
- real ∗8, dimension(:), allocatable **emitc_m**
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- real ∗8, dimension(:), allocatable **sedc_a**
- real ∗8, dimension(:), allocatable **surfqc_a**
- real ∗8, dimension(:), allocatable **latc_a**
- real ∗8, dimension(:), allocatable **percc_a**
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- real ∗8, dimension(:), allocatable **rspc_a**
- integer, dimension(:), allocatable **tillage_switch**
- real ∗8, dimension(:), allocatable **tillage_depth**
- integer, dimension(:), allocatable **tillage_days**
- real ∗8, dimension(:), allocatable **tillage_factor**
- real ∗8 dthy

  time interval for subdaily routing
- integer, dimension(4) **ihx**
- integer, dimension(:), allocatable **nhy**
- real ∗8, dimension(:), allocatable **rchx**
- real ∗8, dimension(:), allocatable **rcss**
- real ∗8, dimension(:), allocatable **qcap**
- real ∗8, dimension(:), allocatable **chxa**
- real ∗8, dimension(:), allocatable **chxp**
- real ∗8, dimension(:,:,:), allocatable **qhy**
- real ∗8 **ff1**
- real ∗8 **ff2**

5.1.1 Detailed Description

main module contatining the global variables

Author

modified by Javier Burguete Tolosa

Chapter 6

Data Type Documentation

6.1 parm::ascrv Interface Reference

Public Member Functions

- subroutine **ascrv** (x1, x2, x3, x4, x5, x6)

The documentation for this interface was generated from the following file:

- modparm.f90

6.2 parm::atri Interface Reference

Public Member Functions

- real ∗8 function **atri** (at1, at2, at3, at4i)

The documentation for this interface was generated from the following file:

- modparm.f90

6.3 parm::aunif Interface Reference

Public Member Functions

- real ∗8 function **aunif** (x1)

The documentation for this interface was generated from the following file:

- modparm.f90

6.4 parm::dstn1 Interface Reference

Public Member Functions

- real ∗8 function **dstn1** (rn1, rn2)

The documentation for this interface was generated from the following file:

- modparm.f90

6.5 parm::ee Interface Reference

Public Member Functions

- real ∗8 function **ee** (tk)

The documentation for this interface was generated from the following file:

- modparm.f90

6.6 parm::expo Interface Reference

Public Member Functions

- real ∗8 function **expo** (xx)

The documentation for this interface was generated from the following file:

- modparm.f90

6.7 parm::fcgd Interface Reference

Public Member Functions

- real ∗8 function **fcgd** (xx)

The documentation for this interface was generated from the following file:

- modparm.f90

6.8 parm::HQDAV Interface Reference

Public Member Functions

- subroutine **hqdav** (A, CBW, QQ, SSS, ZCH, ZX, CHW, FPW, jrch)

The documentation for this interface was generated from the following file:

- modparm.f90

6.9 parm::layersplit Interface Reference

Public Member Functions

- subroutine **layersplit** (dep_new)

The documentation for this interface was generated from the following file:

- modparm.f90

6.10 parm::ndenit Interface Reference

Public Member Functions

- subroutine **ndenit** (k, j, cdg, wdn, void)

The documentation for this interface was generated from the following file:

- modparm.f90

6.11 parm::qman Interface Reference

Public Member Functions

- real ∗8 function **qman** (x1, x2, x3, x4)

The documentation for this interface was generated from the following file:

- modparm.f90

6.12 parm::regres Interface Reference

Public Member Functions

- real ∗8 function **regres** (k)

The documentation for this interface was generated from the following file:

- modparm.f90

6.13 parm::rsedaa Interface Reference

Public Member Functions

- subroutine **rsedaa** (years)

The documentation for this interface was generated from the following file:

- modparm.f90

6.14 parm::tair Interface Reference

Public Member Functions

- real ∗8 function **tair** (hr, jj)

The documentation for this interface was generated from the following file:

- modparm.f90

6.15 parm::theta Interface Reference

Public Member Functions

- real ∗8 function **theta** (r20, thk, tmp)

The documentation for this interface was generated from the following file:

- modparm.f90

6.16 parm::vbl Interface Reference

Public Member Functions

- subroutine **vbl** (evx, spx, pp, qin, ox, vx1, vy, yi, yo, ysx, vf, vyf, aha)

The documentation for this interface was generated from the following file:

- modparm.f90

Chapter 7

File Documentation

7.1 allocate_parms.f90 File Reference

this subroutine allocates array sizes

Functions/Subroutines

- subroutine **allocate_parms**

7.1.1 Detailed Description

this subroutine allocates array sizes

Author

modified by Javier Burguete

7.2 caps.f90 File Reference

this subroutine reads the input and output names given in file.cio and converts all capital letters to lowercase letters.

Functions/Subroutines

- subroutine **caps** (file_name)

7.2.1 Detailed Description

this subroutine reads the input and output names given in file.cio and converts all capital letters to lowercase letters.

Author

modified by Javier Burguete

Parameters

file_name	dummy argument, file name character string

7.3 getallo.f90 File Reference

This subroutine calculates the number of HRUs, subbasins, etc. in the simulation. These values are used to allocate array sizes.

Functions/Subroutines

- subroutine **getallo**

7.3.1 Detailed Description

This subroutine calculates the number of HRUs, subbasins, etc. in the simulation. These values are used to allocate array sizes.

Author

modified by Javier Burguete

7.4 main.f90 File Reference

this is the main program that reads input, calls the main simulation model, and writes output.

Functions/Subroutines

- program main

  this is the main program that reads input, calls the main simulation model, and writes output.

7.4.1 Detailed Description

this is the main program that reads input, calls the main simulation model, and writes output.

7.4.2 Function/Subroutine Documentation

7.4.2.1 main()

```
program main ( )
```

this is the main program that reads input, calls the main simulation model, and writes output.

Author

modified by Javier Burguete Tolosa

7.5 readfile.f90 File Reference

this subroutine opens the main input and output files and reads watershed information from the file.cio

Functions/Subroutines

- subroutine **readfile**

7.5.1 Detailed Description

this subroutine opens the main input and output files and reads watershed information from the file.cio

Author

modified by Javier Burguete

7.6 simulate.f90 File Reference

this subroutine contains the loops governing the modeling of processes in the watershed

Functions/Subroutines

- subroutine **simulate**

7.6.1 Detailed Description

this subroutine contains the loops governing the modeling of processes in the watershed

Author

modified by Javier Burguete

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