

SWAT

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Contents

1	SWAT	1
2	Modules Index	7
2.1	Modules List	7
3	Data Type Index	9
3.1	Data Types List	9
4	File Index	11
4.1	File List	11
5	Module Documentation	13
5.1	parm Module Reference	13
5.1.1	Detailed Description	57
6	Data Type Documentation	59
6.1	parm::ascrv Interface Reference	59
6.2	parm::atri Interface Reference	59
6.3	parm::aunif Interface Reference	59
6.4	parm::dstn1 Interface Reference	60
6.5	parm::ee Interface Reference	60
6.6	parm::expo Interface Reference	60
6.7	parm::fcgd Interface Reference	60
6.8	parm::HQDAV Interface Reference	61
6.9	parm::layersplit Interface Reference	61
6.10	parm::ndenit Interface Reference	61
6.11	parm::qman Interface Reference	61
6.12	parm::regres Interface Reference	62
6.13	parm::rsedaa Interface Reference	62
6.14	parm::tair Interface Reference	62
6.15	parm::theta Interface Reference	62
6.16	parm::vbl Interface Reference	62

7 File Documentation	63
7.1 getallo.f90 File Reference	63
7.1.1 Detailed Description	63
7.2 main.f90 File Reference	63
7.2.1 Detailed Description	63
7.2.2 Function/Subroutine Documentation	64
7.2.2.1 main()	64
Index	65

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 `generate-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 `sfstedstdev<=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_dpht" subroutine at line 267 in first bucle iteration

- In clicon.f:
 - "tmxbsb", "tmnbsb", "rbsb", "rstpbsb", "rhdbbsb", "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:
 - "rhdbbsb" 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 if `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_tnyllda" 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:

parm	Main module contatining the global variables	13
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Chapter 3

Data Type Index

3.1 Data Types List

Here are the data types with brief descriptions:

parm::ascrv	59
parm::atri	59
parm::aunif	59
parm::dstn1	60
parm::ee	60
parm::expo	60
parm::fcgd	60
parm::HQDAV	61
parm::layersplit	61
parm::ndenit	61
parm::qman	61
parm::regres	62
parm::rsedaa	62
parm::tair	62
parm::theta	62
parm::vbl	62

Chapter 4

File Index

4.1 File List

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

getallo.f90	This subroutine calculates the number of HRUs, subbasins, etc. in the simulation. These values are used to allocate array sizes	63
main.f90	This is the main program that reads input, calls the main simulation model, and writes output .	63

Chapter 5

Module Documentation

5.1 parm Module Reference

main module containing 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 **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 **sepdlay**
- 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 **respccp**
- 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 **hmp1l**
- 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 **iyр_atmo**
- integer **iyр_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 **mrq**
- integer **mcut**
maximum number of cuttings per year
- integer **mqr**
maximum number of grazings per year
- integer **mnr**
max number of years of rotation

- integer **myr**
- integer **msubo**
- integer **mrcho**
- 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**
- integer **ntgage**
- integer **nrgfil**
- integer **ntgfil**
- integer **nrtot**
- integer **nttot**
- 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**
 - integer **mvaro**
 - integer **idist**
 - integer **mudb**
 - 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 **mstdo**
 - integer **ifirsts**
 - integer **ifirsth**
 - integer **ifirstw**
 - integer **nstot**
 - integer **nhtot**
 - integer **nwtot**
 - integer **icst**
 - integer **ilog**
 - integer **i**
 - integer **iy**
 - 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 **msub**
- integer **mhruo**
- integer **mres**
- integer **igen**
- integer **iprint**
- integer **iida**
- integer **fcstcnt**
- integer **icn**
- integer **ised_det**
- integer **mtran**
- integer **idtill**
- integer **motot**
- integer, dimension(100) **ida_lup**
- integer, dimension(100) **iyр_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**
- 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(:), allocatable **ifirstr**
- integer, dimension(:), allocatable **idg**
- integer, dimension(:), allocatable **ifirsthr**
- integer, dimension(:), allocatable **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(:), allocatable **ndays**
- integer, dimension(:), allocatable **ndays_noleap**
- integer, dimension(:), allocatable **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(:), allocatable **mo_transb**
- integer, dimension(:), allocatable **mo_transe**
- integer, dimension(:), allocatable **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_psorpmx**
- 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(:), allocatable **icolb**
- integer, dimension(:), allocatable **icolr**
- integer, dimension(:), allocatable **icolrsv**
- integer, dimension(:), allocatable **icols**
- integer, dimension(:), allocatable **ipdvar**
- integer, dimension(:), allocatable **ipdvab**
- integer, dimension(:), allocatable **ipdvas**
- integer, dimension(:), allocatable **ipdhru**
- real *8, dimension(:), allocatable **wshddayo**
- real *8, dimension(:), allocatable **wshdmono**
- real *8, dimension(:), allocatable **wshdyro**
- real *8, dimension(:), allocatable **wshdaao**
- real *8, dimension(:), allocatable **fcstaaao**
- 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 **wpstaaao**
- 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(:,:), allocatable **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 **depprpf**
- 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**
- real *8, dimension(:), allocatable **ch_bed_d50**
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- real *8, dimension(:,:), allocatable **pv_grvpor**
- real *8, dimension(:,:), allocatable **pv_farea**
- real *8, dimension(:,:), allocatable **pv_drcoef**
- real *8, dimension(:,:), allocatable **pv_fc**
- real *8, dimension(:,:), allocatable **pv_wp**
- real *8, dimension(:,:), allocatable **pv_ksat**
- real *8, dimension(:,:), allocatable **pv_por**
- real *8, dimension(:,:), allocatable **pv_hydeff**
- real *8, dimension(:,:), allocatable **pv_soldpt**
- real *8, dimension(:,:), allocatable **pv_dummy1**
- real *8, dimension(:,:), allocatable **pv_dummy2**
- real *8, dimension(:,:), allocatable **pv_dummy3**
- real *8, dimension(:,:), allocatable **pv_dummy4**
- real *8, dimension(:,:), allocatable **pv_dummy5**
- integer, dimension(:,:), allocatable **lid_onoff**
- real *8, dimension(:,:), allocatable **sol_bmc**
- real *8, dimension(:,:), allocatable **sol_bmn**
- real *8, dimension(:,:), allocatable **sol_hsc**
- real *8, dimension(:,:), allocatable **sol_hsn**
- real *8, dimension(:,:), allocatable **sol_hpc**
- real *8, dimension(:,:), allocatable **sol_hpn**
- real *8, dimension(:,:), allocatable **sol_lm**
- real *8, dimension(:,:), allocatable **sol_lmc**
- real *8, dimension(:,:), allocatable **sol_lmn**
- real *8, dimension(:,:), allocatable **sol_ls**
- real *8, dimension(:,:), allocatable **sol_lsl**
- real *8, dimension(:,:), allocatable **sol_lsc**
- real *8, dimension(:,:), allocatable **sol_lsn**
- real *8, dimension(:,:), allocatable **sol_rnmn**
- real *8, dimension(:,:), allocatable **sol_lslc**
- real *8, dimension(:,:), allocatable **sol_lslnc**
- real *8, dimension(:,:), allocatable **sol_rspc**
- real *8, dimension(:,:), allocatable **sol_woc**
- real *8, dimension(:,:), allocatable **sol_won**
- real *8, dimension(:,:), allocatable **sol_hp**
- real *8, dimension(:,:), allocatable **sol_hs**
- real *8, dimension(:,:), allocatable **sol_bm**

- real *8, dimension(:,:), allocatable **sol_cac**
- real *8, dimension(:,:), allocatable **sol_cec**
- real *8, dimension(:,:), allocatable **sol_percc**
- real *8, dimension(:,:), allocatable **sol_latc**
- real *8, dimension(:), allocatable **sedc_d**
- real *8, dimension(:), allocatable **surfqc_d**
- real *8, dimension(:), allocatable **latc_d**
- real *8, dimension(:), allocatable **percc_d**
- real *8, dimension(:), allocatable **foc_d**
- real *8, dimension(:), allocatable **nppc_d**
- real *8, dimension(:), allocatable **rsdc_d**
- real *8, dimension(:), allocatable **grainc_d**
- real *8, dimension(:), allocatable **stoverc_d**
- real *8, dimension(:), allocatable **soc_d**
- real *8, dimension(:), allocatable **rspc_d**
- real *8, dimension(:), allocatable **emitc_d**
- real *8, dimension(:), allocatable **sub_sedc_d**
- real *8, dimension(:), allocatable **sub_surfqc_d**
- real *8, dimension(:), allocatable **sub_latc_d**
- 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**
- real *8, dimension(:), allocatable **sub_grainc_d**
- real *8, dimension(:), allocatable **sub_stoverc_d**
- real *8, dimension(:), allocatable **sub_emitc_d**
- real *8, dimension(:), allocatable **sub_soc_d**
- real *8, dimension(:), allocatable **sub_rspc_d**
- real *8, dimension(:), allocatable **sedc_m**
- real *8, dimension(:), allocatable **surfqc_m**
- 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**
- real *8, dimension(:), allocatable **grainc_m**
- real *8, dimension(:), allocatable **stoverc_m**
- real *8, dimension(:), allocatable **emitc_m**
- real *8, dimension(:), allocatable **soc_m**
- real *8, dimension(:), allocatable **rspc_m**
- real *8, dimension(:), allocatable **sedc_a**
- real *8, dimension(:), allocatable **surfqc_a**
- real *8, dimension(:), allocatable **latc_a**
- real *8, dimension(:), allocatable **percc_a**
- real *8, dimension(:), allocatable **foc_a**
- real *8, dimension(:), allocatable **nppc_a**
- real *8, dimension(:), allocatable **rsdc_a**
- real *8, dimension(:), allocatable **grainc_a**
- real *8, dimension(:), allocatable **stoverc_a**
- real *8, dimension(:), allocatable **emitc_a**
- real *8, dimension(:), allocatable **soc_a**
- 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 containing 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 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**

7.1.1 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

7.2 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.

7.2.1 Detailed Description

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

7.2.2 Function/Subroutine Documentation

7.2.2.1 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

Index

getallo.f90, [63](#)

main

main.f90, [64](#)

main.f90, [63](#)

main, [64](#)

parm, [13](#)

parm::HQDAV, [61](#)

parm::ascrv, [59](#)

parm::atri, [59](#)

parm::aunif, [59](#)

parm::dstn1, [60](#)

parm::ee, [60](#)

parm::expo, [60](#)

parm::fcgd, [60](#)

parm::layersplit, [61](#)

parm::ndenit, [61](#)

parm::qman, [61](#)

parm::regres, [62](#)

parm::rsedaa, [62](#)

parm::tair, [62](#)

parm::theta, [62](#)

parm::vbl, [62](#)