New telemac3d features for v5p1 links from New version features

 v5p1 TELEMAC-3D

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The principal features of this version v5p1 of TELEMAC-3D are:

- A number of new options and modifications programmed by Sogreah engineers (turbulence, source terms, etc.)
- A re-writing of the input/outputs part, to use the common subroutines from BIEF.
- Source terms moved to the diffusion step.
- Diffusion step in tetrahedrons, discretized in the physical space.
- New options of Telemac-2D available (edge-based storage, wave equation).

 New or modified key-words
 HORIZONTAL TURBULENCE MODEL and VERTICAL TURBULENCE MODEL

The keyword **TURBULENCE MODEL** has been split into two: **HORIZONTAL TURBULENCE MODEL** and **VERTICAL TURBULENCE MODEL**. There are two main innovations for turbulence:

- The introduction of two new mixing length model for the vertical turbulence model: Quetin and Tsanis models which are very useful for wind forcing.
- A new turbulence model for the horizontal turbulence :Smagorinsky.

 VERTICAL TURBULENCE MODEL (MODELE DE TURBULENCE VERTICAL)

Integer value. The default value is 1
Six choices are currently possible:

1 Constant viscosity
2 Classical mixing length
3 k-epsilon model
4 Mixing length with jet
5 Mixing length "Quetin model"
6 Mixing length "Tsanis model"

 HORIZONTAL TURBULENCE MODEL (MODELE DE TURBULENCE HORIZONTAL)

Integer value. The default is 1
This is the previous **NPRIV** in the PRINCI program.
Three choices are currently possible:

1 Constant viscosity
3 k-epsilon model
7 Smagorinsky model

 ABSCISSAE OF SOURCES (ABSCISSES DES SOURCES)

Some improvement in the management of sources. We can now introduce sources in the domain like in TELEMAC-2D.
Real value. The default value is None
Real numbers giving the abscissae of possible water inflow (also called sources) in the domain (in meters).

ORDINATES OF SOURCES (ORDONNEES DES SOURCES)

Real value. The default value is None
Real numbers giving the ordinate of possible water inflow (also called sources) in the domain (in meters).

ELEVATIONS OF SOURCES (COTES DES SOURCES)

Real value. The default value is None
Real numbers giving the elevation of possible water inflow (also called sources) in the domain (in meters).

WATER DISCHARGE OF SOURCES (DEBITS DES SOURCES)

Real value. The default value is None
Real numbers giving the flowrates at the sources in m3/s.

VALUE OF THE ACTIVE TRACERS AT THE SOURCES (VALEURS DES TRACEURS ACTIFS DES SOURCES)

Real value. The default value is None
Real numbers giving the value of the active tracers at the source.

VALUE OF THE PASSIVE TRACERS AT THE SOURCES (VALEURS DES TRACEURS PASSIFS DES SOURCES)

Real value. The default value is None
Real numbers giving the value of the passive tracers at the source.

VELOCITIES OF THE SOURCES ALONG X (VITESSE DES SOURCES SELON X)

Real value. The default value is None
Real numbers specified the component of the velocity ejection at each source (m/s) along X.

VELOCITIES OF THE SOURCES ALONG Y (VITESSE DES SOURCES SELON Y)

Real value. The default value is None
Real numbers specified the component of the velocity ejection at each source (m/s) along Y.

TRACERS

There is now only tracers, not passive and active tracers. Consequently all the duplicated key-words have been simplified and do not mention 'active' or 'passive'. All the tracers are potentially active, depending on the density law used.

Example :

ADVECTION OF PASSIVE TRACERS and
ADVECTION OF ACTIVE TRACERS

Are now only :

ADVECTION OF TRACERS

For density laws, see the key-word **DENSITY LAW** below

NAMES OF TRACERS (NOMS DES TRACEURS)

Character strings with ";" as a separator. The default value is None
Names of tracers as in **NOMVAR_TELEMAC3D** subroutine are given in 32 characters (16 for the name, 16 for the unit).
When not specified by the user, the names are:

"TRACER " and "?? " for unit (active tracers) (english)
"TRACEUR " and "?? " (french)

The MNEMO strings used in key-word **VARIABLES FOR GRAPHIC PRINTOUTS** are: TA1, TA2, … for tracers
The names of viscosities associated with each tracer are called: NUX NAME_OF_TRACER (unit M2/S), NUY NAME_OF_TRACER (unit M2/S), and NUZ NAME_OF_TRACER (unit M2/S)
And the MNEMO strings are, for example, **NAX1**, **NAY1**, **NAZ1** for tracer number 1.

DENSITY LAW (LOI DE DENSITE)

Integer value. The default value is 0
Replaces the key-word **DENSITY ACCORDING TO T AND S** (DENSITE FONCTION DE T ET S)

if 0 : no density variations taken into account
if 1 : density function of temperature in which case, a tracer must be called **TEMPERATURE** (use key-word **NAMES OF TRACERS**)
if 2 : density function of salinity in which case, a tracer must be called **SALINITY**
if 3 : density function of both temperature and salinity in which case, a tracer must be called **TEMPERATURE** and a tracer must be called **SALINITY** :if 4 : density function of all tracers, in which case, the density will be computed with all tracers and the "BETA EXPANSION COEFFICIENT FOR ACTIVE TRACERS" will be used (it is now an array and the SUBROUTINE INBETA has been suppressed). If it is different between tracers, use user SUBROUTINE **INBETA**. The beta coefficients are used only in case 4 (built in coefficients are used in cases 1, 2 and 3, in SUBROUTINE **DRSURR**)

The order of tracers has no importance, in cases 1, 2 and 3, only their names is important.

MATRIX STORAGE (STOCKAGE DES MATRICES)

Integer value, The default value is 1
This is the Telemac-2D key-word with:

1 : classical EBE storage

3 : edge-based storage

So far it is used in Telemac-3D only when calling Telemac-2D (as you will be notified by a message if youtry option 3). Option 3 will save a few percents (up to 15% in some cases) in the computation times.

INITIAL CONDITIONS (CONDITIONS INITIALES)

Character*72 value. The default value is **ZERO ELEVATION** (COTE NULLE)
This is now exactly like in TELEMAC-2D, choices are :

> **ZERO ELEVATION** (COTE NULLE)
> **CONSTANT ELEVATION** (COTE CONSTANTE)
> **ZERO DEPTH** (HAUTEUR NULLE)
> **CONSTANT DEPTH** (HAUTEUR CONSTANTE)
> **SPECIAL** (PARTICULIERES)

In the latter case SUBROUTINE **CONDIM** must be modified. All the choices will act only on the depth, velocities are set to 0. With **CONSTANT ELEVATION**, the new key-word **INITIAL ELEVATION** (COTE INITIALE) must be used. With **CONSTANT DEPTH**, the new key-word **INITIAL DEPTH** (HAUTEUR INITIALE) must be used. Another possibility for initial conditions is the key-word: **2D CONTINUATION** (SUITE 2D). If set to yes, the **BINARY FILE 1** (FICHIER BINAIRE 1) will be considered as a 2D result and read to find the depth and the two components of the horizontal velocity.

TELEMAC-2D OPTIONS (OPTIONS POUR TELEMAC-2D)

Integer array. The default value is 1;1
This is a new key-word for driving different options when TELEMAC-2D is called (hydrostatic mode).
So far two integers, separated by semicolons.
First integer:

> if 1 : classical technique, TELEMAC-2D only deals with propagation terms.
> if 2 : new option, TELEMAC-2D solves a full Saint-Venant problem.

Second integer:

> if 1 : classical technique, primitive equations of TELEMAC-2D
> if 2 : new option, "wave equation" in TELEMAC-2D. This latter option will save time, but is rather suited for steady-state computations.

PARALLEL PROCESSORS (PROCESSEURS PARALLELES)

Integer array. The default value is 0;0
This is the new name for **NUMBER OF PROCESSORS** (NOMBRE DE PROCESSEURS), for coherence with TELEMAC-2D.

> 0 or 1 means that there is no parallelism. With 1, the parallel libraries are linked, with 0 they are not.

LIQUID BOUNDARIES FILE (FICHIER DES FRONTIERES LIQUIDES)

This is now exactly as in TELEMAC-2D, for prescribing boundary conditions variable in time. Functions **Q3**, **SL3** and **VIT3** have been created and will act as **Q**, **SL** and **VIT** in 2D. Here is an example of liquid boundaries file:

```
#
# Variations in time at liquid boundaries
#
T Q(1) SL(2)
s m3/s m
0. 10. 135.
25. 12. 135.2
100. 20. 136.
```

Lines beginning with **#** are comments. Line with **T Q(1) SL(2)** says that the time is the first column, the discharge at liquid boundary number 1 is the second column and the free surface elevation at liquid boundary 2 is the third column.
The following line is mandatory but not used, you may give the units or explicit names for each column. Then the variations in time are given, T being the first figure of the line.
The only requirement for the values of T is that they must be increasing. The time of your computation must be in the range described by the file. Interpolations will be done to cope with your time-steps. A linear variation thus needs only two lines of data.

Important notes:

1.) The numbering is the numbering of liquid boundaries, as given at the beginning of the listing (by SUBROUTINE **FRONT2**, or by the boundary conditions file in parallelism)
2.) The key-words **PRESCRIBED ELEVATIONS**, **PRESCRIBED DISCHARGES** and **PRESCRIBED VELOCITIES** must be given in the steering file, with constant values, even if the values will be read after in the liquid boundaries file.
3.) All this automatic setting of boundary conditions can be erased in the user SUBROUTINE **BORD3D**, and changed into a simple setting of prescribed values. **Q3**, **SL3** and **VIT3** may also be reprogrammed for complex cases.

New user subroutine and modifications in user subroutines
BORD3D

The SUBROUTINE **BORD3D** has undergone many changes, see also **Q3**, **SL3** and **VIT3**.

VISCO

:The SUBROUTINE **VISCO** has been modified to take into account the two new keywords for turbulence models.

Q3D

The SUBROUTINE **Q3D** and SUBROUTINE **SOURCES** have been modified to take into account the sources.

LONGLM and VISCLM

The SUBROUTINE **LONGML** and SUBROUTINE **VISCLM** were modified by the introduction of the new turbulence models.

TRISOU

The SUBROUTINE **TRISOU** includes the new improvement for the sources.

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