Code_Aster

Version default

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Responsable : Nicolas SELLENET

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Procedure `IMPR_RESU` (FORMAT "MED")

1 Drank

To write result computation in a file with med format. One describes of the command all keywords `IMPR_RESU` [U4.91.01] concerning this format of output only.

One can write with the choice in a file with med format:

- a mesh,
- fields at nodes,
- fields with the elements.

At the time of the writing of the fields by elements to Gauss points, one also writes the localization of the elements of reference (coordinated and weight of Gauss points).

MED (Modelization and Data exchanges) is a neutral format of data developed by EDF R & D and the French atomic energy agency for the data exchanges between computer codes. The data which one can exchange according to this format are the meshes and the fields of results with the nodes and by elements. The MED files are binary and portable files (leaning on the library HDF5, Hierarchical Dated Format). The writing of results in one med file allows any other reading, computer code interfaced with MED the results produced by *Code_Aster* via command `IMPR_RESU`.

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2   Syntax

```
IMPR_RESU      (

#Syntaxe   of procedure IMPR_RESU to format "MED"

◊UNITE=unit           ,

◊FORMAT=/          "MED",

◊IMPR_NOM_VARI=/            "NON",                          [DEFAULT]
                  / "OUI',

/RESU     =_F    (
    ♦ |  MAILLAGE=  my,                               [mesh]
      | /RESULTAT=       resu,                        [sd_resultat]

          ◊/NOM_CHAM=l_nomsymb               ,          [l_K16]

          ◊/NUMÉRIQUE_ORDRE=lordre           ,          [l_I]
            /NUME_MODE        =lmode   ,               [l_I]
            /NOEUD_CMP        =lnoecmp ,               [l_K16]
            /NOM_CAS       =ncas ,                  [l_K16]
            /ANGLE        =langl   ,                 [l_K16]
           //FREQ        =lfreq   ,                   [l_R]
             /INST       =linst   ,                   [l_R]
             ◊  |  PRECISION=/prec       ,          [R]
                           /1.0D-3   ,            [DEFAULT]
                   | CRITERE=/      "RELATIF",       [DEFAULT]
                              / "ABSOLU",

       /CHAM_GD       =chgd ,                       [cham_gd]

       ◊/ NOM_CHAM_MED=l_nomcham    ,               [l_K64]
         /  NOM_RESU_MED=l_nomresu ,                [K8]

        ◊ CARA_ELEM  = carele,                        [cara_elem]

        ◊PARTIE=/          "REEL",
                 /  "IMAG",
   ◊INFO_MAILLAGE   = "YES"
                   /"NON"                              [DEFAULT]
       ),
# to print some fields of "data":
/CONCEPT      =_F   (
   /CHAM_MATER     = chmat,                            [cham_mater]
   /CARA_ELEM       = carele,
[cara_elem]
       ◊REPERE_LOCAL            =   "OUI' ,
                           / "NON",                 [DEFAULT]
       # if REPERE_LOCAL = "OUI',
            ♦MODELE=             Mo                   [model]
   /CHARGE        = charg,                            [load]
       )

# Restriction of the results (if RESU=_F (RESULTAT=…))
◊RESTREINT=_F           (
```

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```
        ♦/MAILLE=l_maille                        ,
[l_maille]
        /GROUP_MA                 =l_grma   ,                    [l_gr_maille]

    ◊   |              TOUT_GROUP_MA=/  "OUI',
                                     /"NON",                     [DEFAULT]
        ◊   |            GROUP_NO=l_grno   ,                     [l_gr_noeud]
            |            TOUT_GROUP_NO=/  "OUI',
                                     /"NON",                     [DEFAULT]
        ),
```

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3   Operands FORMAT and UNITE

3.1   Operand FORMAT

operand FORMAT makes it possible to specify the format of the file where to write result.

Format "MED" means with procedure IMPR_RESU that result must be written in a file with med format.

3.2   Operand UNITE

Defines in which unit one writes med file. By default, UNITE = 80 and corresponds to the unit per default of the rmed type in astk.

4   Key word IMPR_NOM_VARI

This key word is useful in the case of the local variables. When it is used and that the printing of a field VARI_* was required, it is in fact a field VARI_*_NOMME which will be printed. This field will have of the components whose name will be based on the catalog of the constitutive laws used in computation. If two constitutive laws have common local variables, those will be amalgamated in a single component.

5   Key word RESU

This key word factor makes it possible to specify the results to print and the format according to which one wants to print them.

5.1   Operand MAILLAGE

If result is a mesh (operand mesh [U4.91.01]), the data deferred in the results file to med format are:

- the list of the nodes   number, name, coordinated,
- the list of meshes   the number, name, type, name of the nodes,
- the list of the number   nodes groups, name, many nodes, names of the nodes,
- the list of the number   mesh groups, name, number of meshes, names of meshes.

Note :

In one med file, there is partition of the nodes and meshes according to the groups. A partition corresponds to a family MED. In one med file, the groups are distributed within the families: families of nodes and families of elements are thus found there.

5.2   Operand RESULTAT

operand RESULTAT makes it possible to print in one med file , of the fields contained in a result concept . With med format , one can print only fields at nodes indicated by key word NOM_CHAM.

One writes in the file "MESSAGE" following information:
- operand "RESULTAT",
- operand "NOM_CHAM",
- operand "NUME_ORDRE",
- name of the field stored in file med: concatenation of the three preceding operands.

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If `INFO_MAILLAGE` = = "YES", of more detailed information are printed in the file "MESSAGE" at the time of the writing of mesh MED. One will be able for example meshes to obtain the types of printed, the names of the families MED which are created, etc

5.3   Operand `CARA_ELEM`

operand `CARA_ELEM` is used for the printing of the fields for subpoints. When the `CARA_ELEM` east provides, the fields at subpoints are printed by adding information in med file making it possible to position the subpoints of Gauss by taking account of the information contained in the `sd_cara_elem` (thickness of a shell, angle of gimlet of a multifibre beam,…).

This functionality thus makes it possible during visualization of the MED file to see the subpoints correctly positioned in space.

5.4   Operand `CHAM_GD`

operand `CHAM_GD` makes it possible to print in the file a data structure of the cham_gd `type`. Concretely, one can thus print with this key word a card, a field by elements or a field at nodes.

5.5   Operand `NOM_CHAM_MED`

operand `NOM_CHAM_MED` makes it possible to define the name of field MED. It is a character string of 64 characters. This can be useful in particular when one wishes med file to print certain components of the field like several fields in the same one (for example for the visualization of `SIRO_ELEM`).

5.6   Operand `NOM_RESU_MED`

operand `NOM_RESU_MED` is an alternative to `NOM_CHAM_MED` concerning the terminology of fields MED. Its use will make it possible not to name fields MED explicitly more, which means that all the fields contained as a result will be printed. Each field name MED will be built to leave:
*   character string provided to `NOM_RESU_MED` (character string of with more the 8 characters),
*   symbolic name of the field Aster.

For example:

```
IMPR_RESU = (
    FORMAT=     "MED",
    RESU=   _F ( RESULTAT=      U,
                 NOM_RESU_MED= "U_HAUT",
                 GROUP_MA      = "HIGH",
                 NUME_ORDRE=   1,)
        )
```
If result U contains fields `DEPL` and `SIEF_ELGA`, then the command above will produce fields MED:
*   "U_HAUT__DEPL",
*   "U_HAUT__SIEF_ELGA" ,

This can be useful in particular when one wishes to print in the same med file same field restricted with different mesh groups.

5.7   Operand `PARTIE`

It is not possible to write complex fields. This is why it is necessary to choose between the real part (`PARTIE=' REEL'`) and the complex part (`PARTIE=' IMAG'`).

5.8   Operands `NOM_CHAM` / `NUME_ORDRE` / `NUME_MODE` / `NOEUD_CMP` / `NOM_CAS` / `ANGLE` / `FREQ` / `INST` / `accuracy` / `CRITERE` / `FICHIER`

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cf document [U4.91.01].

6 Key word CONCEPT

This key word factor makes it possible to print in a displayable form the quantities affected by the user with commands AFFE_MATERIAU, AFFE_CARA_ELEM and AFFE_CHAR_MECA.
That enables him to check that the rules of overload of the code lead to satisfactory assignments.

It will be able to write for example:
```
IMPR_RESU (FORMAT=' MED',
          CONCEPT= (
            _F (CHAM_MATER = CHAMPMAT),
            _F (CARA_ELEM  = CARA_ELE),
            _F (CHARGE     = CHARG1),
          ))
```

The fields contained in these data structures are printed in two very different forms:
• The form "A" (easiest to interpret graphically): each component is separately printed like a real number. For example, the thickness of the shell elements is displayable like a scalar field (scalar map in Salomé).
• The form "B": one assigns to each mesh a whole code: 1,2,3,… N. Meshes affected by the same code TOUTES their identical components have then. The "definition" of the codes, i.e. the values of these components is printed in the message file. One can visualize the "codes" like a scalar field, which makes it possible "to see" the zones where "all is constant".

The form "A" is used systematically for format "MED", except for the field of materials because this field contains the name of the affected material on meshes and this name is not a number.
The form "A" is not programmed with format "RESULTAT"

the form "B" is systematically used for format "RESULTAT" and for the field of materials.

For the form "B", the correspondence between the quantities affected and the code is given in the file .mess.
For example, for the field of materials:

```
PRINTING OF A FIELD OF CONCEPT: Material field
NOM OF FIELD: CHAMPMAT_CHAMP_MAT
CORRESPONDENCE VALEUR <-> CONTENU:
VALEUR =          1.
    X1        = MAT_1
VALEUR =          2.
    X1        = MAT_2
VALEUR =          3.
    X1        = MAT_3
```

6.1.1 Operands REPERE_LOCAL

If REPERE_LOCAL has the value "OUI', the 3 vectors constituting the local coordinate system of each element are printed.

6.2 Fields being able to be visualized

CHAM_MATER :

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Material field

CARA_ELEM :
General characteristics of the Characteristic
bars géom. general
bars Characteristic of the Characteristic
beams géom. beams
Specification the wires
Characteristic of the curved beams
Characteristic of the "fluid" beams
Characteristics of the discrete elements K_*
Characteristics of the discrete elements M_*
Characteristics of the discrete elements A_*
Characteristics géom. shells
Directional sense of the elements 2D and 3D
Directional sense of the shells and beams

CHARGE :
Loading of PESANTEUR
Loading of ROTATION
Loading of PRES_REP
Loading of volume forces in 3D
Loading of surface forces in 3D
Loading of linear forces in 3D
Loading of surface forces in 2D
Loading of linear forces in 2D
Loading of distributed forces for the shells
Loading of PRE_EPSI
Loading of FORCE_ELEC
Loading of FLUX_THM_REP
Loading d'IMPE_FACE
Loading d'ONDE_FLUI

7   Key word RESTREINT

key word RESTREINT makes it possible to reduce the mesh to be printed. The fields are obviously also reduced and they lean on the reduced mesh. The use of this key word is strongly disadvised. The user wanting result to carry out an operation of restriction of sound should rather use command EXTR_RESU.

When RESTREINT is used :
• It is necessary obligatorily to inform GROUP_MA or MESH to indicate meshes which one wants to preserve.
• One can use key keys GROUP_NO, TOUT_GROUP_MA, TOUT_GROUP_NO to preserve certain groups in the reduced mesh (see CREA_MAILLAGE/RESTREINT).
• Under RESU, key keys INST, NUME_ORDRE,…, NOM_CHAM make it possible to select times fields and the.

Useful points for the relecture of the file:
• The noun of the result concept which is restricted is modified. It is coded on 8 characters "&RESURii": result restricted n° ii with $ii \in [1,99]$. Number 1 corresponds to the 1st saved result concept, etc… For $ii \in [1,9]$ a "_" is added at the end of the name.
• The name of field MED is built starting from the name of the field existing Aster in the result concept. It is coded on 64 characters. The 8 first correspond in the name of the restricted concept to which the name of the field Aster supplemented by blanks is concaténé to obtain a character string of 64 characters.

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- For reading the result restricted one, it is necessary to read the mesh restricted and to affect a model and if necessary to him to define a material on the restricted mesh.

Example extracted the case test zzzz240a: Saves with med format result thermal RTEMP and of result a nonlinear RSTNL.
Saves:

```
IMPR_RESU (
    FORMAT= "MED" ,
    RESTREINT= _F ( GROUP_MA= ( "CARRE1" , "G1" ) , MAILLE= ( "M1" ,
"M16" ) ) ,
    RESU= (
        _F ( RESULTAT= RTEMP, NOM_CHAM= ( "TEMP" , "FLUX_ELGA" ) ,
            NUME_ORDRE= (0 , 3) ) ,
        _F ( RESULTAT= RSTNL, NUME_ORDRE= (1 , 2) , ) ,
    ) ,
)
```

Reading of the mesh and assignment of the thermal model:

```
LMAIL =LIRE_MAILLAGE ( FORMAT= "MED" )
LMOTH =AFFE_MODELE (
    MAILLAGE= LMAIL,
    AFFE= _F ( TOUT= "OUI' , " THERMAL" PHENOMENE= , " PLANE"
MODELISATION= )
)
```

Reading of result thermal restricted:
- It is an EVOL_THER
- It 1st is saved it thus names &RESUR1_ (8 characters).
- The field is TEMP, the NOM_CHAM_MED is thus "&RESUR1_TEMP"

```
LTEMP =LIRE_RESU (
    TYPE_RESU= "EVOL_THER" , FORMAT= "MED" ,
    MODELE= LMOTH, TOUT_ORDRE= "OUI' ,
    FORMAT_MED= _F ( NOM_CHAM_MED= "&RESUR1_TEMP" ,
                    NOM_CHAM= "TEMP" ) ,
)
```

Reading of the mesh and assignment of the mechanical model:

```
LMAIL =LIRE_MAILLAGE ( FORMAT= "MED" )
LMOME =AFFE_MODELE (
    MAILLAGE= LMAIL,
    AFFE= _F ( TOUT= "OUI' , " MECHANICAL" PHENOMENE= , MODELISATION=
"D_PLAN" )
)
```

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Reading of result thermal restricted:
- It is an EVOL_NOLI
- They 2nd is saved, it thus names &RESUR2
- the fields which one wants to read are DEPL, SIEF_ELGA, VARI_ELGA, SIEF_ELNO. The NOM_CHAM_MED are the concatenation of &RESUR2_ (8 characters) and the name of the field Aster.
- It is necessary to define a material, in particular for the fields of local variables.

```
LSTNL =LIRE_RESU (
    TYPE_RESU= "EVOL_NOLI" , FORMAT= "MED" ,
    MODELE= LMOME, CHAM_MATER= CMME2, TOUT_ORDRE= "OUI' ,
    FORMAT_MED= (
       _F ( NOM_CHAM_MED= "&RESUR2_DEPL" ,
          NOM_CHAM= "DEPL" ) ,
       _F ( NOM_CHAM_MED= "&RESUR2_SIEF_ELGA" ,
          NOM_CHAM= "SIEF_ELGA" ) ,
       _F ( NOM_CHAM_MED= "&RESUR2_VARI_ELGA" ,
          NOM_CHAM= "VARI_ELGA" ,
          NOM_CMP= ( "V1" , ) , NOM_CMP_MED= ( "V1" , ) , ) ,
       _F ( NOM_CHAM_MED= "&RESUR2_SIEF_ELNO" ,
          NOM_CHAM= "SIEF_ELNO" ) ,
    ) ,
)
```

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8   Example

```
IMPR_RESU = (
    FORMAT=      "MED",
    RESU=    _F ( RESULTAT=      REMEZERO,
          NOM_CHAM=  "ERME_ELEM",
          NUME_ORDRE=    3,)
    )
```

execution of the command IMPR_RESU will cause the following display in the file "MESSAGE" :

```
RESULTAT                   :   REMEZERO
FIELD:                         ERME_ELEM
NUME_ORDRE:                    3
    ==> NOM MED             :   REMEZEROERME_ELEM
```

Example of use of NOM_CHAM_MED for the printing of SIRO_ELEM :

```
IMPR_RESU (FORMAT=' MED',
          RESU= (
                _F (RESULTAT=RESUNL,
                   NOM_CHAM= ("SIRO_ELEM",),
                   NOM_CHAM_MED= ("RESUNL__SIRO_ELEM_NORMAL"),
                   NOM_CMP= ("SIG_NX", "SIG_NY", "SIG_NZ", "SIG_N",),
                   GROUP_MA=' PRES',),
                _F (RESULTAT=RESUNL,
                   NOM_CHAM= ("SIRO_ELEM",),
                   NOM_CHAM_MED= ("RESUNL__SIRO_ELEM_TANGENT"),
                   NOM_CMP= ("SIG_TX", "SIG_TY", "SIG_TZ",),
                   GROUP_MA=' PRES',),
                _F (RESULTAT=RESUNL,
                   NOM_CHAM= ("SIRO_ELEM",),
                   NOM_CHAM_MED= ("RESUNL__SIRO_ELEM_T1"),
                   NOM_CMP= ("SIG_T1X", "SIG_T1Y","SIG_T1Z", "SIG_T1",),
                   GROUP_MA=' PRES',),
                _F (RESULTAT=RESUNL,
                   NOM_CHAM= ("SIRO_ELEM",),
                   NOM_CHAM_MED= ("RESUNL__SIRO_ELEM_T2"),
                         NOM_CMP= ("SIG_T2X", "SIG_T2Y", "SIG_T2Z",
"SIG_T2",),
                   GROUP_MA=' PRES',),
                ),);
```

9   Interest of the writing of one result in a file with med format

the MED is a format of file for the data exchanges between codes. Any computer code having an interface MED is able to exchange information with any other code having this same interface. In fact, one result (mesh or field) written in a file with med format by the command the IMPR_RESU can be read by any computer code having an interface of reading MED and in particular, post-treaty in Salome.