Procédure IMPR_RESU (FORMAT "MED")

1 Drank

Écrire the result of a computation in a file with format MED. One only describes all the key words of command IMPR_RESU [U4.91.01] concerning this format of output.

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

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

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

MED (Modelization and Échanges de Données) 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 to the nodes and by elements. Files MED are binary and portable files (lean on the library HDF5, Hierarchical Data Format). The writing of results in a file MED allows any other reading, computer code interfaced with MED the results produced by *Code_Aster* via command IMPR_RESU.

2 Syntax

```
IMPR_RESU     (

#Syntaxe   of procedure IMPR_RESU to format “MED”

◊UNITE=unit         ,

◊FORMAT=         /   “MED”,

◊IMPR_NOM_VARI=            /   “NON”,                              [DEFECT]
                         /   “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]
                 /ANGL            =langl ,                    [l_K16]
                 //FREQ           =lfreq ,                    [l_R]
                    /INST         =linst ,                    [l_R]
                    ◊   |   PRECISION=       /  prec,             [R]
                                          /1.0D-3   ,          [DEFAUT]
                        |   CRITERE=      /   “RELATIF”,       [DEFECT]
                                          /   “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    = /“OUI'
                         /“NON'                                [DEFAUT]
      ),
# Pour to print some fields of “data”:
/CONCEPT     =_F  (
   /CHAM_MATER      = chmat,                                    [cham_mater]
   /CARA_ELEM          = carele,                                   [cara_elem]
      ◊       REPERE_LOCAL              =   / “OUI” ,
                                        / “NON”,                [DEFAUT]
      # if REPERE_LOCAL = “OUI”,
            ♦MODELE=             Mo                           [model]
   /CHARGE             = charg,                                    [load]
      )

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

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

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

3 Opérandes FORMAT and UNITE

3.1 Opérande FORMAT

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

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

3.2 Operand UNITE

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

4 Key word IMPR_NOM_VARI

This key word is useful in the case of the intern 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 components whose name will be based on the catalogue of the constitutive laws used in computation. If two constitutive laws have common intern 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 MESH

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

- the list of the nodes number, name, coordinated,
- the list of the meshes 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 the meshes.

Note:

In a file MED, there is partition of the nodes and the meshes according to the groups. A partition corresponds to a family MED. In a file MED, 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 a file MED, fields contained in a result concept . With format MED, one can print only fields with the nodes indicated by key word NOM_CHAM.

One writes in 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.

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

5.3 Opérande 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 file MED 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 the visualization of file MED 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 structure of data of the champ_gd type. Concretely, one can thus print with this key word a card, a field by elements or a field with the nodes.

5.5 Operand NOM_CHAM_MED

operand NOM_CHAM_MED makes it possible to define the name of field MED. It is a warp of 64 characters. This can be useful in particular when one wishes to print certain components of the field like several fields in same file MED (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 in the result will be printed. Each field name MED will be built to leave:

- character string provided to NOM_RESU_MED (warp of with more the 8 characters),
- symbolic name of the Aster field.

For example:

```
IMPR_RESU = (
    FORMAT=     "MED",
    RESU=    _F (  RESULTAT=      U,
                   NOM_RESU_MED= "U_HAUT",
                  GROUP_MA       = "HAUT",
                   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",

Ceci can be useful in particular when one wishes to print in same file MED the 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 / ANGL / FREQ / INST / PRECISION / CRITERE / FICHIER

Cf. document [U4.91.01].

6 Key word CONCEPT

This key word factor makes it possible to print in an easily displayable form the quantities affected by the user with commands AFFE_MATERIAU, AFFE_CARA_ELEM and AFFE_CHAR_MECA.
This key word gives access to 3 single-ended spanner words dedicated to these 3 commands: CHAM_MATER, CARA_ELEM and LOAD.

One will be able to write for example:

```
IMPR_RESU (FORMAT='MED",
           CONCEPT= (
              _F (CHAM_MATER = CHAMPMAT),
              _F (CARA_ELEM  = CARA_ELE),
              _F (LOAD     = CHARG1),
           ))
```

The idea of this printing is to transform each quantity affected on the meshes of the mesh into an integer value: 1,2,3,…

the correspondence between the affected quantities and the integers are given in the file .mess.
For example, for the material field:

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

Dans file MED, one will find the field (CHAMPMAT_CHAMP_MAT) which will contain the numerical values 0. , 1. , 2. ,… and that one will be able to visualize to check the good assignment of the materials.
Note: Value 0. corresponds to nonaffected meshes.

In file MED, one will also find the field (CHAMPMAT#CHAMP_MAT) which will contain the values of the components. Currently that is available only for the shells and the grids.

6.1.1 Operands REPERE_LOCAL

If REPERE_LOCAL has value “OUI”, the 3 vectors constituting the local coordinate system of each element are printed in the file.

6.2 Fields being able to be visualized

CHAM_MATER :
Material field

CARA_ELEM :

General features of the bars
Caractéristiques géom. bars
General features of the beams
Caractéristiques géom. Caractéristiques
beams of the Caractéristiques
cables of the Caractéristiques
curved beams of the “fluid” beams
Caractéristiques of the discrete elements K_*
Caractéristiques of the discrete elements M_*
Caractéristiques of the discrete elements A_*
Caractéristiques géom. shells
Directional sense of elements 2D and 3D
Directional sense of the shells and beams

CHARGES :
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 Chargement
shells of PRE_EPSI
Chargement of FORCE_ELEC
Loading of FLUX_THM_REP
Loading of IMPE_FACE
Loading of 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.

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

Useful points for the second reading of the file:
- The noun of the result concept which is restricted is modified. It is coded on 8 characters “&RESURii”: restricted result n° ii with $ii \in [1,99]$. Number 1 corresponds to the 1st saved result concept, etc... Pour $ii \in [1,9]$ a “_“is added at the end of the name.
- The name of field MED is built starting from the name of existing the Aster field 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 Aster field is concaténé supplemented by white to obtain a warp of 64 characters.
- For reading the restricted result, 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 format MED of a thermal result RTEMP and a nonlinear result 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) , ) ,
   ) ,
)
```

Lecture 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= )
)
```

Lecture of the restricted thermal result:

- 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" ) ,
)
```

Lecture of the mesh and assignment of the mechanical model:

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

Lecture of the restricted thermal result:

- It is an EVOL_NOLI
- It 2nd is saved, it thus names &RESUR2
- Les 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 Aster field.
- It is necessary to define a material, in particular for the fields of intern 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" ) ,
   ) ,
)
```

8 Example

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

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

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

Exemple 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 a result in a file with format MED

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, a result (mesh or field) written in a file with format MED by command IMPR_RESU can be read by any computer code having an interface of reading MED and in particular, post-treaty in Salome.