
Macro-command OBSERVATION

1 Drank

macro-command `OBSERVATION` uses operators `PROJ_CHAMP`, `CREA_CHAMP`, `CREA_RESU`, `MODI_REPERE` and `POST_RELEVE_T` for:

- to project a field of a digital model towards an experimental model,
- to modify the local coordinate systems,
- to select the degrees of freedom "of measurement",
- to calculate the mean value of a strain field in order to obtain the equivalent of the information delivered by a strain gauge

This macro-command accepts as starter a concept `evol_elas`, `dyna_trans`, `dyna_harmo` or a `mode_meca`. The product concept is of the same type as the concept as starter. Caution: *Code_Aster* does not memorize the references in which the fields are written. Result of this macro-command does not have to thus be used in later computations of Code-Aster. One can use it for postprocessings in python, or visualizations.

Contents

1	But1.....	
2	Syntaxe3.....	
3	Opérandes6.....	
3.1	Key word RESULTAT6.....	
3.2	Key word MODELE_16.....	
3.3	Key word MODELE_26.....	
3.4	Key word PROJECTION6.....	
3.5	Operand CAS_FIGURE6.....	
3.6	Key word VIS_A_VIS7.....	
3.7	Operand TYPE_CHAM = "NOEU".....	7
3.8	Selection of the names of the champs7.....	
3.9	Operands MATR_RIGI, MATR_MASS7.....	
3.10	Selection of the numbers of ordre7.....	
3.11	Operand MODI_REPERE7.....	
3.11.1	Key words TYPE_CHAM/NOM_CMP7.....	
3.11.2	key Keys REPERE/VECT_X/VECT_Y/ANGL_NAUT/ORIGINE/AXE_Z7.....	
3.12	Operand FILTRES8.....	
3.12.1	Key word DDL_ACTIF8.....	
3.12.2	Key words NOEUD/GROUP_NO/MAILLE/GROUP_MA8.....	
3.12.3	Key word NOM_CHAM8.....	
3.13	Operand EPSI_MOYENNE8.....	
3.13.1	Key words NOEUD/GROUP_NO/MAILLE/GROUP_MA9.....	
3.13.2	Key word MASQUE9.....	
3.13.3	Key word SEUIL_VARI9.....	
3.14	Operand TITRE9.....	

2 Syntax

```

resu_out = OBSERVATION (
    ◆RESULTAT=resu_in          ,          / [evol_elas]
                                / [dyna_trans]
                                / [dyna_harmo]
                                / [mode_meca]

    ◆MODELE_1=mo1              ,          [model]
    ◆MODELE_2=mo2              ,          [model]
    ◇CAS_FIGURE=/              "3D",
                                / "2D",
                                / "2.5D",
                                / "1.5D",

    ◇VIS_A_VIS=_F              (
        ◆ | TOUT_1=' OUI',
          | GROUP_MA_1=lgamma1 ,          [l_gr_maille]
          | MAILLE_1=lmail1   ,          [l_maille]
          | GROUP_NO_1=ligno1 ,          [l_gr_noeud]
          | NOEUD_1=lnoe1     ,          [l_noeud]
        ◆ | TOUT_2=' OUI',
          | GROUP_MA_2=lgamma2 ,          [l_gr_maille]
          | MAILLE_2=lmail2   ,          [l_maille]
          | GROUP_NO_2=ligno2 ,          [l_gr_noeud]
          | NOEUD_2=lnoe2     ,          [l_noeud]
        ) ,

    #Sélection of the names of the fields to treating
    ◆NOM_CHAM=l_noch          ,          [l_Kn]

    #Sélection of sequence numbers
    ◇/TOUT_ORDRE=' OUI',
    [DEFAULT]
    /NUME_ORDRE =l_nuor ,          [l_I]
    /INST       =l_inst ,          [l_R]
    /FREQ       =l_freq ,          [l_R]
    /LIST_INST  =l_inst ,          [listr8]
    /LIST_FREQ=l_freq ,          [listr8]
    /LIST_ORDRE =l_ordr ,          [listr8 ]
    /NUME_MODE  =n_mod ,          [ I ]
    /NOEUD_CMP  =l_nocmp ,          [l_K16]

    ◇ | PRECISION=/prec ,
      | /1.0E-3,          [DEFAULT]
      | CRITERE=/ "RELATIF", [DEFAULT]
      | / "ABSOLU",

    ◇DISTANCE_MAX=d_max ,          [R]
    ◇ALARME=/ "OUI",          [DEFAULT]
      / "NON",
    ◇TYPE_CHAM=NOEU',

    ◇PROJECTION=/ "OUI",          [DEFAULT]
      / "NON",

    #si the SD projected is of standard "mode":

```

```

      ◇MATR_RIGI=k_ass
[matr_asse_depl_r]
      ◇MATR_MASS=m_ass
[matr_asse_depl_r]

# Definition of the local coordinate systems for sensors
      ◇MODI_REPERE=_F      (
      ◆REPERE=/           "UTILISATEUR",
                          / "CYLINDRIQUE",
                          / "NORMAL",
                          / "DIR_JAUGE",
      ◇TYPE_CHAM=/       "VECT_2D",
                          / "VECT_3D",           [DEFAULT]
                          / "TENS_2D",
                          / "TENS_3D",
      ◇/TOUT=' OUI',
[DEFAULT]
      /NOEUD              =L_NOEU   ,           [l_noeud]
      /GROUP_NO          =L_GRNO   ,           [l_gr_noeud]
      /MAILLE            =L_MAILLE  ,
[l_maille]
      /GROUP_MA          =L_GRMA   ,           [l_gr_maille]
      ◇NOM_CMP=/cmp      [l_Kn]
                          / ("DX", "DY", "DZ")   [DEFAULT]

case: LOCATE = "UTILISATEUR":
      ◆ANGL_NAUT=        (  $\alpha$   $\beta$  ,  $\gamma$  )           [R*3]

case: LOCATE = "CYLINDRIQUE":
      ◆ORIGINE=          (X, there, Z)                 [R*3]
      ◆AXE_Z=            (X, there, Z)                 [R*3]

case: LOCATE = "NORMAL":
      ◆/VECT_X=          (X, there, Z)                 [R*3]
      /VECT_Y            = (X, there, Z)                 [R*3]

case: LOCATE = "DIR_JAUGE":
      ◆ |                VECT_X= (X, there, Z)         [R*3]
      |                VECT_Y= (X, there, Z)         [R*3]
      ),

#Filtrage of not measured degrees of freedom
      ◇FILTRE=_F      (
      ◇DDL_ACTIF=liste_ddl           [l_Kn]
      ◆/TOUT=' OUI',
      /NOEUD              =L_NOEU   ,           [l_noeud]
      /GROUP_NO          =L_GRNO   ,           [l_gr_noeud]
      /MAILLE            =L_MAILLE  ,
[l_maille]
      /GROUP_MA          =L_GRMA   ,           [l_gr_maille]
      ◆NOM_CHAM=noch      ,           [kN]
      ),

#Valor average of strain field
      ◇EPSI_MOYENNE=_F      (
      ◇SEUIL_VARI=/seuil      ,           [R]
                          /0.1,           [DEFAULT]

```

Titre : Macro-commande OBSERVATION
Responsable : Harinaivo ANDRIAMBOLOLONA

Date : 02/09/2013 Page : 5/9
Clé : U4.90.03 Révision : 11319

```

      ◇MASQUE=lcmp                               ,                               [l_cmp]
      ◆/NOEUD=L_NOEUD                             ,                               [l_noeud]
      /GROUP_NO =L_GRNO ,                               [l_gr_noeud]
      /MAILLE =L_MAILLE ,
[l_maille]
      /GROUP_MA =L_GRMA ,                               [l_gr_maille]
      ),

      ◇TITER=titer                               [kN]
    );
```

3 Operands

the first simple key words are those used in operator `PROJ_CHAMP`. Some of these concepts are however re-used in the following phases of the macro-command (modification of the references and filter of the degrees of freedom). In the macro-command, operator `PROJ_CHAMP` is used by default with the method "COLLOCATION" (cf [U4.72.04]). But one can explicitly use the method by group of dots by adding the key words necessary detailed in documentation of this operator.

The product concept is of the same type as the concept in entry, definite by the key word `RESULTAT`.

3.1 Key word `RESULTAT`

◆`RESULTAT`

Data format which one wishes to handle. Currently, only the structures of the `evol_elas` type, `dyna_trans`, `dyna_harmo` and `mode_meca` can be given as starter.

3.2 Key word `MODELE_1`

◆`MODELE_1`

Structure of the `modele_sdaster` type associated with the result concept. It is in general the model numerical support.

3.3 Key word `MODELE_2`

◆`MODELE_2`

Structure of the `modele_sdaster` type. It is in general the model associated with the experiment. Caution: `PROJ_CHAMP` functions only if the degrees of freedom of the nodes of model 1 are the same ones as those of model 2. For example, so the model 1 is 3D, and thus has only degrees of freedom of translation, one cannot take the model a modelization `POU_D_T` (beam of Timoshenko, with degrees of freedom of translation and rotation) for 2. One will choose in this case a modelization of the type `BARS`.

3.4 Key word `PROJECTION`

◇ `PROJECTION= / "OUI" [DEFAULT]`
`/ "NON"`

This key word makes it possible the model to carry out or not the projection of the results of the processing towards 2.

If one does not make projection, the results of the processing the model overloads the results already present on 1.

3.5 Operand `CAS_FIGURE`

This key word (optional) is used to direct the program towards one of the 4 following cases:

- "3D" the only elements of the mesh "1" which will be used for projection are the voluminal elements: hexahedrons, pentahedrons, tetrahedrons and pyramids. The nodes have 3 cordonnées (X, Y, Z).
- "2D" the only elements of the mesh "1" which will be used for projection are the surface elements: quadrangles and triangles. The mesh is supposed to be plane. The nodes have 2 cordonnées (X, Y).
- "2.5D" the only elements of the mesh "1" which will be used for projection are the surface elements: quadrangles and triangles. The mesh is "3D". The nodes have 3 cordonnées (X, Y, Z). It is the case of the "shells" plunged in 3D.

- "1.5D" the only elements of the mesh "1" which will be used for projection are the linear elements: segments. The mesh can be 2D or 3D. The nodes have 2 or 3 cordonnées (X, Y, Z).

3.6 Key word **VIS_A_VIS**

One will be able to refer to [U4.72.04] (documentation of operator `PROJ_CHAMP`), for the use of this optional key word, who allows to explicitly declare the restrains between entities of model 1 and model 2 for projection.

3.7 Operand **TYPE_CHAM = "NOEU"**

This key word is used to force the fields projected to be fields "with the nodes". This key word is systematically used (for example) by the command `MACR_LIGN_COUPE` because one cannot the model create fields by elements on "fictitious" of beam created by this macro-command of visualization.

3.8 Selection of the names of the fields

the key word `NOM_CHAM = 1_noch` makes it possible to choose which are the fields of the `SD RESULTAT` which one wants to project. This key word is compulsory. One can also project the fields by elements "ELNO" and "ELEM" (but not "ELGA").

3.9 Operands **MATR_RIGI, MATR_MASS**

These 2 keys key make it possible to associate (for a data structure of type "mode") their `matr_asse` with produced data structure. They also make it possible to go back to the classification of the degrees of freedom. They are necessary if one wishes to use result of the command in later computations (commands `REST_GENE_PHYS`, `PROJ_BASE`, `MAC_MODES`,...).

3.10 Selection of the sequence numbers

Confer [U4.71.00].

3.11 Operand **MODI_REPERE**

◇ `MODI_REPERE = _F (`

Factor key word allowing to define a local coordinate system for the entities (nodes or meshes) of model 2 selected.

3.11.1 Key words **TYPE_CHAM/NOM_CMP**

operator `MODI_REPERE` must know the components to be transformed. One in general uses in entry a field of displacement, this is why entries "VECT_3D" and ("DX", "DY", "DZ") are proposed by default. But if one wishes, for example, process the case of a strain field (measured using the gauges), one will write `TYP_CHAM = "TENS_3D"` and `NOM_CMP= ("EXX", "EYY"...)`

3.11.2 Key keys **REPERE/VECT_X/VECT_Y/ANGL_NAUT/ORIGINE/AXE_Z**

•`LOCATES = "UTILISATEUR"`

the user can define itself the local coordinate system associated with a node by the data with the three nautical angles. One will find a definition of the nautical angles in [U4.42.01-11], U4 documentation of `AFFE_CARA_ELEM`, paragraph 10.4.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

•LOCATE = "CYLINDRIQUE"

to define a cylindrical coordinate system, one must give the origin (key word ORIGINE) and the direction of the vertical axis (key word AXE_Z).

•LOCATE = "NORMAL"

the axes of the local coordinate system are noted (Xl, Yl, Zl) . In general, the sensors, for a measurement, have the axis Zl according to the norm with the wall of this structure. This option makes it possible to calculate a reference associated with this norm:

- computation of the field of normal vectors to model 1 (most precise); these vectors will be the axes Zl of the local coordinate system,
- projection of this field on the entities of model 2 selected,
- given explicit of the second vector of the reference; if it is wished that the vector Yl be the same vector as Y in the total reference, one writes $VECT_Y = (0.0, 1.0, 0.0)$
- One thus needs two equations to compute: the local coordinate system: one of them is given by the normal vector, the other is given by the key word $VECT_X$ or $VECT_Y$, according to whether the additional condition carries on the vector Xl or Yl of the local coordinate system.

•LOCATE = "DIR_JAUGE"

the user can define the local coordinate system associated with the strain gauge by informing $VECT_X$ ou/et $VECT_Y$. These two vectors correspond to the first two basic vectors of the local coordinate system.

3.12 Operand FILTRE

◇ FILTRE = _F (

describing Key word, for all the entities (nodes, meshes, nodes groups,...) degrees of freedom to be preserved.

3.12.1 Key word DDL_ACTIF

◇ DDL_ACTIF = liste_ddl

List of the degrees of freedom to be preserved for result.

3.12.2 Key words NOEUD/GROUP_NO/MAILLE/GROUP_MA

Each filter of degree of freedom corresponds to a topological entity to choose (by default, all the structure is selected).

3.12.3 Key word NOM_CHAM

◆ NOM_CHAM = noch

Symbolic name of the field to be filtered. This key word is compulsory. It amongst other things makes it possible to differentiate the component DX from the field of displacement of the component DX of the velocity field.

3.13 Operand EPSI_MOYENNE

◇ EPSI_MOYENNE = _F (

Factor key word allowing to calculate the mean value of the strain field on a given topological entity. This mean value of the strain field can be seen as being information that a strain gauge stuck on surface considered would have delivered. This is valid if the field is not too variable on the surface on which the gauge is stuck. The user is informed if the fluctuation of the strain field is too important.

For each occurrence of this key word a computation of average corresponds on the indicated entities. The computed values are then projected on the model 2, except if the user specifies explicitly PROJECTION = "NON". In this case, one overloads the entering concept `resu_in` and one pours the computation results in `resu_out`.

3.13.1 Key words NOEUD/GROUP_NO/MAILLE/GROUP_MA

This key word indicates the topological entity on which one wants to calculate the average.

3.13.2 Key word MASQUE

◇ MASQUE = lcmp

This key word makes it possible to list of the components not measured strain field.

3.13.3 Key word SEUIL_VARI

◇ SEUIL_VARI = threshold

One gives here a relative value of threshold from which the user is informed if the fluctuation of the components field, not masked, is too isolated mean value. The value taken by default is equal to 0.1.

3.14 Operand TITER

◇ TITER = titr,

Title which one wants to give to the result concept.