Operator POST_RELEVE_T

1 Drank

To extract from the values of components of fields of variables and to carry out computations of averages and invariants. The values are recorded on nodes, meshes, broken lines connecting of the nodes or on beforehand definite loci like concepts of the curved type (INTE_MAIL_2D [U4.81.11]) or surfaces (INTE_MAIL_3D [U4.81.12]). They can be the subject, by this same procedure:

- computations of:
  - averages,
  - resultants and moments of vector fields,
  - invariants of tensorial fields,
  - directional trace of fields,
  - extrema and arithmetic mean on nodes or meshes
- of statement in references GLOBAL, LOCAL, POLAIRE, UTILISATEUR or CYLINDRIQUE.

POST_RELEVE_T produces a concept of the type counts, which can be printed using IMPR_TABLE [U4.91.03].

2 General syntax

```
tresu [tabl_sdaster]    =POST_RELEVE_T      (

   ♦ACTION    = _F   (
         ♦INTITULE  =nom     ,                          [K8]
         ♦  OPERATION =    | "EXTRACTION",              [K16]
                           | "AVERAGE",
                           | "EXTREMA",
                           | "MOYENNE_ARITH",

         ♦/   case OPERATION = "EXTRACTION" or "MOYENNE":

            /CHEMIN    =/courbe     ,                   [curve]
                        /surface   ,                    [surface]
            /♦      |  NOEUD    = lnoe,                 [l_noeud]
                    |  GROUP_NO = lgrno,                [l_gr_noeud]
               ◊/TOUT     = "OUI',
                  /   |  NET =lmail    ,               [l_maille]
                      |  GROUP_MA=lgrma   ,                  [l_gr_maille]

            /  case OPERATION = "EXTREMA" or "MOYENNE_ARITH":

                    |  TOUT = "OUI",
                    |  NOEUD    = lnoe,                 [l_noeud]
                    |  GROUP_NO = lgrno,                [l_gr_noeud]
                       |  NET    = lmail,                [l_maille]
                    |  GROUP_MA=lgrma   ,                  [l_gr_maille]


          ◊FORMAT_C     =      "MODULE",                 [DEFAULT]
                         /   "REEL"  ,
                         /   "IMAG"  ,
          ♦ /CHAM_GD    = chpgd,                 /      [cham_no_sdaster]
                                                 /      [cham_elem]

            /RESULTAT   = resu,                  /      [evol_elas]
                                                 /      [evol_ther]
                                                 /      [evol_noli]
                                                 /      [mode_flamb]
                                                 /      [dyna_trans]
                                                 /      [dyna_harmo]
                                                 /      [mode_meca]
                                                 /      [mode_stat]
                                                  /     [fourier_elas]
                                                 /      [fourier_ther]
                                                 /      [mult_elas]
                                                 /      [mode_acou]
                                                 /      [acou_harmo]
                                                 /      [base_modale]

               ♦NOM_CHAM  =chpsymbo    ,                          [K16]
                          ♦/TOUT_ORDRE=' OUI',
                  /NUME_ORDRE       =lordre   ,                  [l_I]
                  /LIST_ORDRE       =lenti    ,
[listis]
```

```
                        /NUME_MODE           =lmode   ,
      [l_I]
                        /LIST_MODE           =lenti   ,
      [listis]
                        /NOM_CAS          =nomcas  ,                    [K24]
                        /NOEUD_CMP           =noeucmp ,                    [K24]
                        //FREQ            =lfreq   ,                    [l_R]
                           /LIST_FREQ        =lreel   ,
      [listr8]
                           /INST          =linst   ,                    [l_R]
                           /LIST_INST        =lreel   ,
      [listr8]
                           ◊  |    PRECISION=/prec,                    [R]
                                          /1.D-6,
      [DEFAULT]
                           ◊  |  CRITERE=/"RELATIF",                [DEFAULT]
                                         /"ABSOLU",
                     ♦/TOUT_CMP        =   ' OUI',
                        /NOM_CMP       =lcmp ,                       [l_K8]
                           ◊REPERE     =      "GLOBAL",
      [DEFAULT]
                                       /   "POLAIRE",
                                       /   "LOCAL"  ,
                                            ◊ VECT_Y = (oy1, oy2, oy3),   [l_R]
                                       /   "UTILISATEUR",
                                           ♦ANGL_NAUT    = (has, B, c),   [l_R]
                                       /   "CYLINDRIQUE",
                                           ♦ORIGINE   = (X, there, Z),
      [l_R]
                                           ♦AXE_Z=    (oz1, oz2, oz3),    [l_R]
                           |  TRAC_NOR   =  ' OUI',
                           |  TRAC_DIR   =  ' OUI',
                              ♦DIRECTION      =    (X, there, [Z]),
          [l_R]
                        /INVARIANT         =    ' OUI',
                        /ELEM_PRINCIPAUX  =  ' OUI',
                        /RESULTANTE       =lcmp    ,
      [l_K8]
                           ◊MOMENT         =lcmp   ,
      [l_K8]
                           ♦POINT        =   (X, there, [Z]),
      [l_R]

                     ◊  MOYE_NOEUD=/     "OUI',
      [DEFAULT]
            )                          /   "NON",
            ◊TITER  =titer                                    [l_Kn]
         )
```

3 Principles of use of POST_RELEVE_T : operand ACTION

the postprocessing carried out by POST_RELEVE_T requires the data of three information:

- place,
- object,
- nature.

Each occurrence of factor key word the ACTION defines this triplet.

The place of postprocessing indicates a geometrical figure connecting the points of post - processing. This place is defined by means of the key words:

PATH

NOEUD

GROUP_NO

the object of postprocessing is defined by the choice of a field of variables, components and possibly of associated quantities chosen by various key words.

The fields of variables are chosen by one of the key words:

RESULTAT and the key words allowing for choice of the fields at nodes or the fields with the elements of data structure result.

CHAM_GD field of variables produced by an operator elementary, or extracted from a result concept by CREA_CHAMP [U4.72.04].

components by:

TOUT_CMP

NOM_CMP

and the quantities associated by:

INVARIANT

ELEM_PRINCIPAUX

TRAC_NOR

TRAC_DIR and DIRECTION

RESULTANTE and, optionally, MOMENT and POINT

the nature of postprocessing corresponds to the operations: key word OPERATION

- of extraction of values: "EXTRACTION"
- of computation of averages (with the meaning integration), of minimum and maximum on a path or an ordered group of nodes: "AVERAGE"
- of computation of minimum and maximum on groups or entities: "EXTREMA"
- of computation of averages to the arithmetic meaning on groups or entities: "MOYENNE_ARITH"

4 Choice of the place of postprocessing

4.1 OPERATION = "EXTRACTION" or "AVERAGE"

4.1.1 Syntax

```
♦/CHEMIN      =/courbe     ,                [curve]
                /surface   ,                [surface]
   /  |  NOEUD =lnoe    ,                  [l_noeud]
      |  GROUP_NO = lgrno,                  [l_gr_noeud]
   ◊/TOUT     = "OUI',
      /  |  NET = lmail,                [l_maille]
         |  GROUP_MA = lgrma,              [l_gr_maille]
```

4.1.2 Operands PATH / NOEUD / GROUP_NO/TOUT/MESH/GROUP_MA

- the argument of PATH is a product concept by one of the following operators:

  INTE_MAIL_2D [U4.81.11]

  the concept is reduced then either to the intersection of line segment and/or arc of circle with meshes 2D of the mesh Ω, or at a set of paths built on meshes 1D of the mesh of Ω.

  INTE_MAIL_3D [U4.81.12]

  the concept is reduced then to the intersection of line segments with meshes 3D of the mesh of Ω.

  The place obtained in this case is always included in Ω.

- The argument of NOEUD is one nodes list while that of GROUP_NO is a list of nodes groups. The nodes are treated in the order provided by the user. To reorder the nodes of a list, it is necessary to use the command DEFI_GROUP/OPTION = `NOEUD_ORDO' [U4.22.01]

- the key words NETS and GROUP_MA make it possible meshes to limit postprocessing to a list of ou/et a list of mesh groups.

  TOUT = "OUI' returns to the standard case (one considers all meshes). These key words are usable that with NOEUD and/or GROUP_NO.

4.1.3 Notions of points of postprocessing and examples

the points of postprocessing are the points of Ω where the components (or quantities derived) are evaluated. The operation of extraction carries out this evaluating.

The points of postprocessing can be classified according to two families:

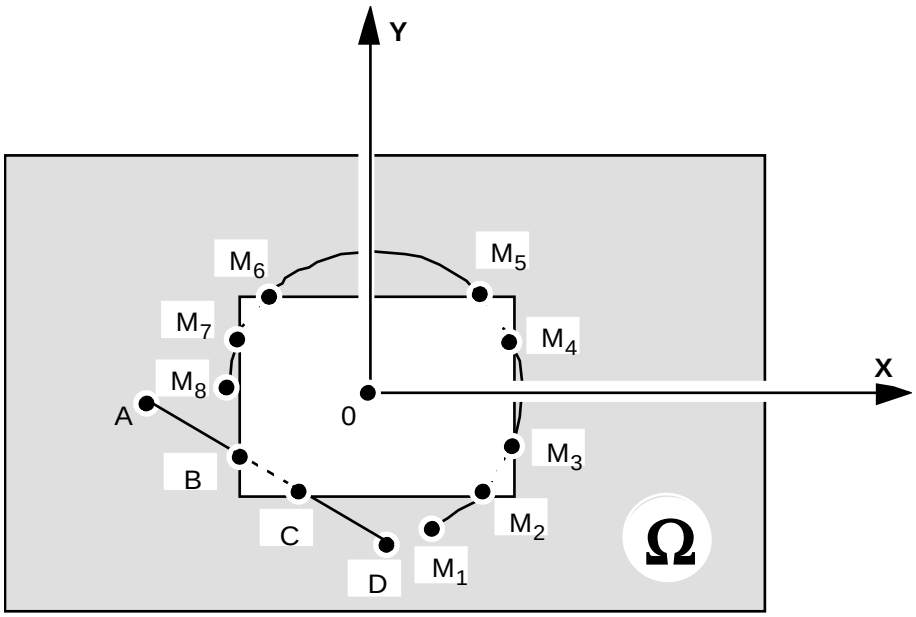
- Nodes :

  Case where the place of postprocessing is defined either by means of the key words NOEUD and/or GROUP_NO, or by means of the key word PATH with concept of a curved type obtained like lists of mesh 1D.

- Geometrical points:

  Case where the place of postprocessing is defined by means of the key word PATH with concept of a curved type or surface obtained like meeting of line segments and/or arcs of circle.

4.1.4 Example of curves and parts of curve of a PATH

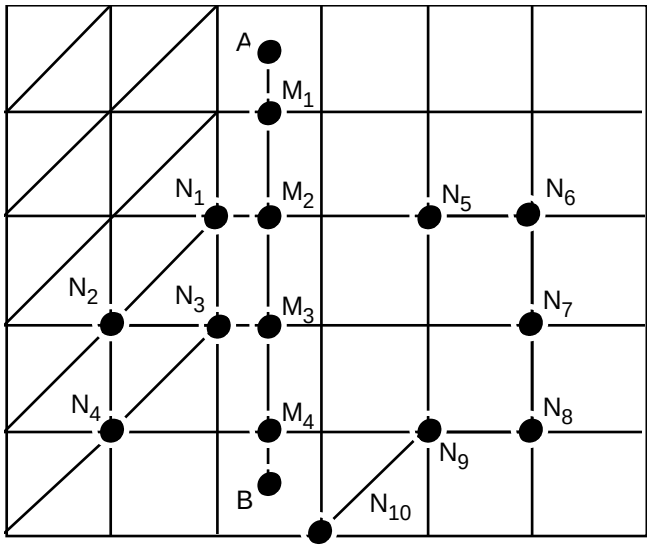


Appears 4.3.1-the

path represented on this figure consists of two curves: the first curve corresponds at the segment of right $[AD]$ and the second to the arc of a circle of center O which connects the point M_1 to the point M_8. The curve corresponding to the arc connecting M_1 and M_8 breaks up into four parts: arcs connecting respectively M_1 to M_2, M_3 with M_4, M_5 with M_6, M_7 with M_8, other ends of arc being external with the field.

The curve corresponding at the segment $[AB]$ breaks up into two parts: the segment $[AB]$ and the segment $[CD]$ because $[BC]$ are external with the field Ω.

4.1.5 Example of points of postprocessing corresponding to a PATH



Is reproduced 4.3.2-a

On this figure are visualized two paths.

Path n°1: the segment $[AB]$

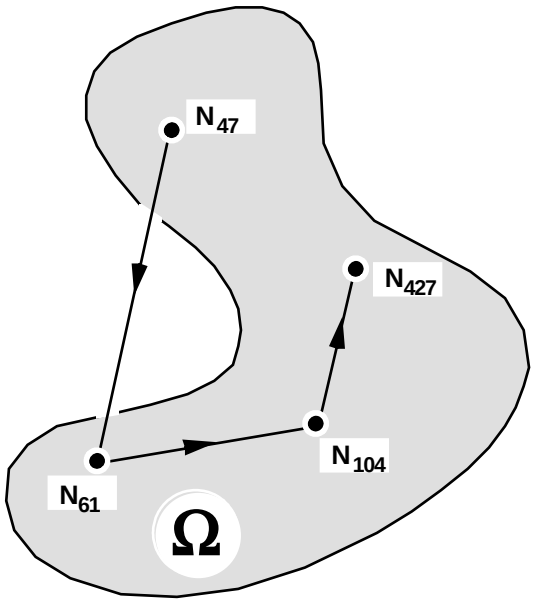
- the points of postprocessing are reduced to $\{A, M_1, M_2, M_3, M_4, B\}$.
- The point M_i is located by the curvilinear abscisse $(M_i)=\|AM_i\|$
  In the case of an arc of a circle the curvilinear abscisse is defined by $s=R\alpha$ where R is the radius and α is the alternate angle to the point in question.

Path n°2: meeting of two paths (two parts)

- the points of postprocessing are reduced to $\{N_1, N_2, N_3, N_4\}$ and $\{N_5, N_6, N_7, N_8, N_9, N_{10}\}$.
- The curvilinear abscisse locating N_i on the path of points of postprocessing $\{N_i, ... N_p\}$ is defined by the relations:

$$s(N_1)=0$$
$$s(N_i)=\sum_{j=1}^{j=i-1}\|N_j N_{j+1}\| \text{ for } i=2,...,p$$

4.1.6 Example of points of postprocessing specified by the key words NOEUD or GROUP_NO



4.3.3-a This

figure Appears nodes list visualizes a place of postprocessing built from one.

The points of postprocessing are the nodes represented, the place of postprocessing broken line connecting them according to the order provided by the user, which makes it possible to define a curvilinear abscisse by means of the relations presented for the paths seen previously. The value extracted on these paths is interpolated linearly between the values recorded on the nodes. Thus it should be noticed that if postprocessing operation is a computation of average, all occurs as if the segment $[N_{47}\ N_{61}]$ were contained entire in **formula** Ω **.**

In this case, the curvilinear abscisse is calculated starting from the path defined by the path of the nodes, such as defined in nodes list.

4.2 OPERATION = "EXTREMA" or "MOYENNE_ARITH"

4.2.1 Syntax

```
♦   | TOUT = "OUI",
    | NOEUD    = lnoe,                  [l_noeud]
    | GROUP_NO = lgrno,                 [l_gr_noeud]
      | NET    = lmail,                 [l_maille]
    | GROUP_MA =lgrma  ,                [l_gr_maille]
```

4.2.2 Operands TOUT / NOEUD / GROUP_NO/MESH/GROUP_MA

- the argument of NOEUD is one nodes list while that of GROUP_NO is a list of nodes groups. The nodes are not ordered.
- The key words NETS and GROUP_MA make it possible meshes to limit postprocessing to a list of ou/et a list of mesh groups.
- TOUT = "OUI' returns to the standard case (one considers all meshes).

5 Object-choices of postprocessing

These key words make it possible to define the object of postprocessing. They indicate:

- a field of variables: key words CHAM_GD, RESULTAT (and its key words associated),
- a quantity associated with the components with the field: key words TOUT_CMP, NOM_CMP, INVARIANT, ELEM_PRINCIPAUX, TRAC_NOR, TRAC_DIR, DIRECTION, coordinate, SUM, RESULTANTE, MOMENT, POINT.

5.1 Field of variables

5.1.1 Syntax

```
♦/CHAM_GD      = chpgd,
   /RESULTAT   = resu,
   ♦NOM_CHAM   = chpsymbo,                              [K16]
   ♦/TOUT_ORDRE      =   ' OUI',
      /NUME_ORDRE    =lordre  ,                           [l_I]
      /LIST_ORDRE    =lenti   ,                              [listis]
      /NUME_MODE      =lmode  ,                              [l_I]
      /LIST_MODE      =lenti  ,                              [listis]
      /NOM_CAS       =nomcas  ,                           [K24]
       //FREQ        =     lfreq,                         [l_R]
          /LIST_FREQ    =lreel   ,                           [listr8]
         /INST         =linst ,                           [l_R]
          /LIST_INST    =lreel   ,                           [listr8]
          ◊ |  accuracy    =  /prec,                      [R]
                             /1.D-6,                       [DEFAULT]
        ◊   |  CRITERE =  "RELATIF",                       [DEFAULT]
                          /"ABSOLU",
◊FORMAT_C  =      "MODULE",                                [DEFAULT]
                 /  "REEL"  ,
                 /  "IMAG"  ,
```

5.1.2 Operand CHAM_GD

the argument of CHAM_GD is the name of a concept of the cham_no_* type or cham_elem_*.

5.1.3 Operands RESULTAT / NOM_CHAM / TOUT_ORDRE / NUME_ORDRE / LIST_ORDRE / NUME_MODE / LIST_MODE / NOM_CAS / FREQ / LIST_FREQ / INST / LIST_INST / accuracy / CRITERE

See [U4.71.00].

5.1.4 Operand FORMAT_C

In the case of the complex fields, one can extract:

/ "MODULE' the modulus
/ "REEL' the real part
/ "Component IMAG' the imaginary

5.2 part of the field and derived quantities

For the vectors and the tensor D" order 2, it is possible of the components to require L" evaluating in a reference and to derive from the quantities obtained by contracted product. The key words LOCATES, TRAC_NOR, TRAC_DIR and DIRECTION make it possible to define these quantities.

5.2.1 Syntax

```
♦  /TOUT_CMP  =  ' OUI',
   /NOM_CMP      =lcmp ,                          [l_K8]
      ◊  /REPERE    =     "GLOBAL",                [DEFAULT]
                        /  "POLAIRE",
                        /  "LOCAL"  ,
                          ◊ VECT_Y = (oy1, oy2, oy3),   [l_R]
                        /  "UTILISATEUR",
                           ♦ANGL_NAUT    = (has, B, c), [l_R]
                        /  "CYLINDRIQUE",
                           ♦ORIGINE   = (X, there, Z),    [l_R]
                           ♦AXE_Z=    (oz1, oz2, oz3), [l_R]
      ◊  /TRAC_NOR      = ' OUI',
         /TRAC_DIR        = ' OUI',
            ♦DIRECTION      =   (X, there, [Z]),          [l_R]
   /INVARIANT         =    ' OUI',
   /ELEM_PRINCIPAUX  =  ' OUI',
   /RESULTANTE       =lcmp   ,                      [l_K8]
      ◊MOMENT         =lcmp  ,                      [l_K8]
      ♦POINT       =   (X, there, [Z]),               [l_R]
```

5.2.2 Operand TOUT_CMP

/TOUT_CMP

This key word admits for argument only the text "OUI' and selects all the components defined in the catalog of quantities for the quantity relating to the fields specified by the keys - key RESULTAT and CHAM_GD.

5.2.3 Operands NOM_CMP

Makes it possible to define the components of the quantity of the treated field:

/NOM_CMP : the components are introduced by name

5.2.4 Operand LOCATES

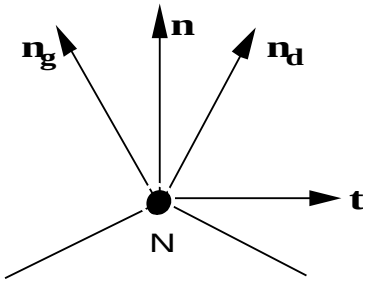
/REPERE

Allows the choice of a reference among the following references:

- locate GLOBAL: cartesian coordinate system of definition of the mesh,
- polar coordinate system : standard polar coordinate system of the plane (OXY) (order of the components: (r,θ),
- local coordinate system : locate plane made up of the tangent and normal vectors (in this order) instead of postprocessing. The normal vector is defined in each point of post - processing like average of the norms on the right and on the left.

Definition of the norm instead of postprocessing.

In each point of postprocessing the norm is defined like average of the norms on the right and on the left.



Appear 5.2.4-the

tangent vector is obtained by a rotation of $-\pi/2$ starting from the normal vector.

In the case of the local coordinate system and a path 3D (case of ASPIC for example), it will be necessary to provide:

```
VECT_Y = (oy1, oy2, oy3)
```

coordinates of a vector whose projection on the orthogonal level with the directing axis of the path will be taken as the norm at the path. The order of the components in a local coordinate system is (t, n, k).

Example of use:

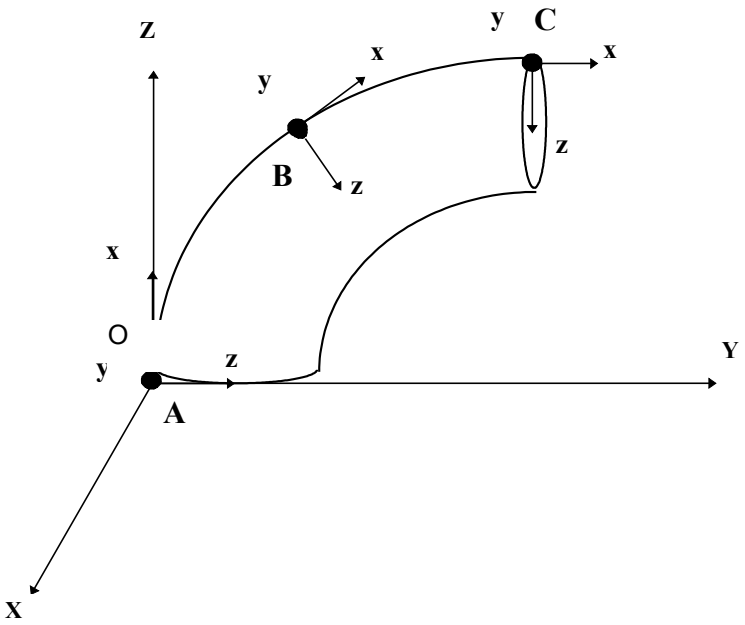
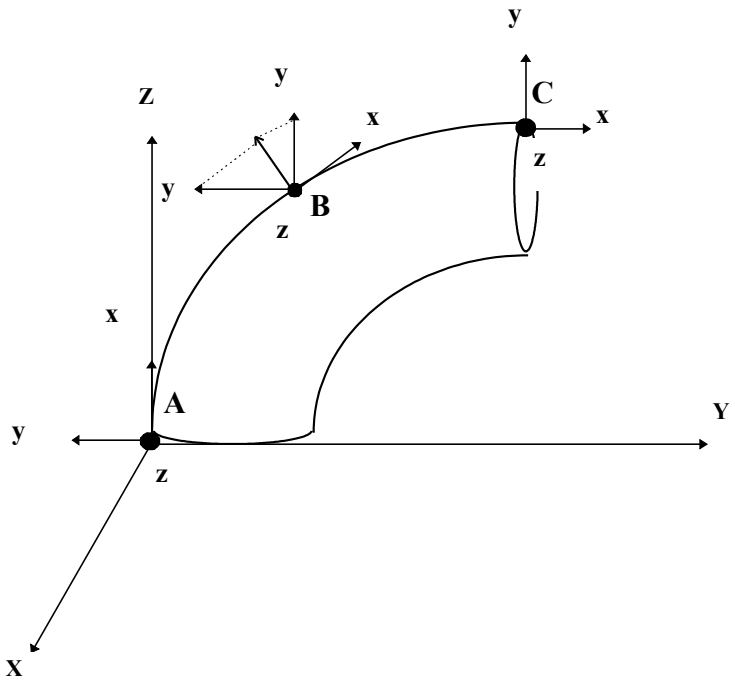


Figure 5.2.4-b

One wants to make an extraction on the path ABC according to the local coordinate system defined above (local axis there in the total direction OX).

Here, one can find a vector constant in any point of the path to define the vector `VECT_Y = (1. , 0. , 0.)`.

This is possible because in any point this vector is already in the orthogonal plane at the path.



Appear 5.2.4-c

So on the other hand, one wishes to have the local axis z in the total direction OX [Figure 5.2.4-c], vector VECT_Y will depend on the point considered:

$(0.,0.,1.)$ is appropriate except in A (where $(0.,-1.,0.)$ is appropriate)
$(0.,-1.0.)$ is appropriate except in C (where $(0.,0.,1.)$ is appropriate)

It will thus be necessary in this case to cut out the path in two paths (AB and BC) and to define a VECT_Y different on each path.

- locate UTILISATEUR : defined by the data of 3 nautical angles (in degrees):

  ANGL_NAUT = (has, B, c)

- cylindrical coordinate system defined by:

  ORIGINE = (X, there, Z) coordinates of the origin O of reference
  AXE_Z= (oz1, oz2, oz3) coordinates of a vector defining the axis Oz (axis of the cylinder).
  The order of the components in a cylindrical coordinate system is (r,z,θ).

5.2.5 Operand TRAC_NOR

/TRAC_NOR : only for the modelizations 2D and 3D.

Determination of the normal trace of a vector or a tensor of order 2: it is the typical case of the directional trace obtained when the direction u is identified with the norm n instead of post - processing.

5.2.6 Operands TRAC_DIR/DIRECTION

/TRAC_DIR : only for the modelizations 2D and 3D.
♦DIRECTION

Determination of the directional trace of a vector $\boldsymbol{v}=(v_i)$ or a tensor of order 2 $\boldsymbol{\sigma}=(\sigma_i)$ in the direction $\boldsymbol{u}=(u_i)$; i.e. scalar $v_k u_k$ or vector $\sigma_{ik} u_k$.

The direction u is defined by means of the key word DIRECTION whose arguments are the components of the vector u given in the order X, Y, Z and evaluated in the total reference. If this list contains only two values then, conventionally, the component following Z of the vector u is regarded as null.

5.2.7 Operand INVARIANT

Postprocessing of a stress tensor or strain of order 2 partners to the principal directions of the tensor:

TRACE $Tr(\sigma)=\sum_{i=1}^{2ou3}\sigma_{ii}$

VON_MIS $VM(\sigma)=\sqrt{\sum_{i=1}^{2ou3}\frac{3}{2}\left(\sigma_{ij}-\frac{1}{3}Tr(\sigma)\delta_{ij}\right)^2}$

TRESCA $TR(\sigma)=max\left(\left|\lambda_i-\lambda_j\right|\right)$ with λ_i eigenvalues of σ

DETER $DET(\sigma)=déterminant\ de\ \sigma$

5.2.8 Operand ELEM_PRINCIPAUX

/ELEM_PRINCIPAUX

Determination of the principal values of a tensor 2×2 or 3×3 of order 2. They are arranged in the order ascending their values.

5.2.9 Operands RESULTANTE / MOMENT / POINT

Determination of the resultant and the moment of a field of torsor on the place of post - processing.

By means of computer, these key words can apply to any field of variables but so that the results have a physical meaning, one will have to limit oneself to the fields of nodal forces and nodal reactions.

In this last case, 2 possibilities arise:

- the user wants to calculate the resultant of certain components of the field: he will behind the key word enter RESULTANTE a list of components to take among $\left\{'DX','DY'\right\}$ in 2D and $\left\{'DX','DY','DZ'\right\}$ in 3D or structural elements (the resultant of components of rotations not having a physical meaning),
- the user wants to calculate the resultant and the moment of certain components of the field: he will enter behind key word RESULTANTE and MOMENT 2 lists of the same components length to be taken among

formuleformule $\left\{'DX','DY','DZ'\right\}$	behind the key word RESULTANTE
formuleformule $\left\{'DRX','DRY','DRZ'\right\}$	behind the key word MOMENT

Moreover, he will behind the key word introduce POINT the list of the coordinates of the point compared to which the moment is evaluated.

If one notes P this point and the M_i points of postprocessing, the evaluated quantities will be:

- Resultant: $\mathbf{F}=\sum_i \mathbf{F}_i=\sum_i \left(FX_{M_i}, FY_{M_i}, FZ_{M_i}\right)$
- Moment: $\mathbf{m}=\sum_i \left(P\vec{M}_i \wedge \mathbf{F}_i\right)+\sum_i \mathbf{m}_i^c$

where $\mathbf{m}_i^c$ indicates the list of the concentrated moments corresponding to the components of rotation introduced by the key word MOMENT, relevant only in the case of the structural elements (beams, shells, discrete).

Note:

In continuums, one should not introduce behind MOMENT translation of the components which would be regarded as concentrated moments and thus added with the true moments.

6 Nature of postprocessing

6.1 Operand OPERATION

♦OPERATION =

| ' EXTRACTION'

the operation extraction of a field of variables makes it possible to recover the values of one or more components or quantities derived from these components at the points of the place of postprocessing.

In the case of an extraction on a cham_elem, the values of the components extracted from this field are calculated as follows:

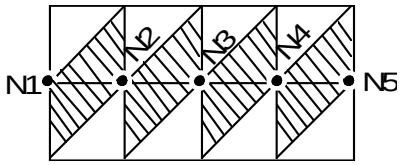
- if the place of postprocessing is determined by the key words NOEUD or GROUP_NO, for each node the components are realized on all the elements contributing in this node,

  Note:

  > *The moyennations with the nodes of computed fields in local coordinate systems are licit only if the angles between these references are weak. In the contrary case, they do not have a meaning.*

- if the place of postprocessing is a path confused with one or more edges of the mesh, one makes the average on the elements having an intersection of non-zero measurement with the path.

This can lead, for the same place of postprocessing, with appreciably different results:



- if the place of postprocessing is a zone having double nodes (example of a crack) it is preferable to use the key words or GROUP_NO NOEUD, rather than PATH. Indeed, if the path is on a zone of discontinuity, it is then not possible to distinguish the site from the nodes compared to this zone in the table of output of *POST_RELEVE_T*.

If the place of postprocessing is defined by NOEUD = $(N1, N2, N3, N4, N5)$, the values are realized on all the elements of the mesh above.

If the place of postprocessing is defined as being the segment of origin $N1$ and end $N5$, the values will be realized on the hatched elements.

In the case of quadratic elements (presence of nodes mediums), the average with the nodes tops can lead to more important weights of certain elements (function of cutting) compared to the nodes mediums which realize on 2 elements (thus of the same weight). One can thus be in the presence of oscillations between the values at the tops and the mediums.

| ' MOYENNE'

This operation is restricted with 6 components of field at the same time. Being given a scalar field U (typically a component of a quantity), the " AVERAGE" operation calculates the following quantities (L indicating the length of the place of post - processing C considered):

MOMENT_0= $\frac{1}{L}\int_c U(s)\,ds$

MOMENT_1= $\frac{12}{L^2}\int_c U(s)\left(s-\frac{L}{2}\right)ds$

MINIMUM= $\underset{c}{Min}\,U$

MAXIMUM= $\underset{c}{Max}\,U$

MOYE_INT=MOMENT_0 - ½ MOMENT_1
MOYE_EXT=MOMENT_0 + ½ MOMENT_1

It is important that the place of postprocessing is traversed in a meaning. If a nodes group is used, one will take care to reorder the nodes, by means of command DEFI_GROUP OPTION "NOEUD_ORDO", [U4.22.01]. Thus, the curvilinear abscisse is defined since the node origin of the group, while following broken line consisted the nodes.
The integrals above are evaluated while supposing U linear between two nodes. Thus, by noting U_i the values of the field at nodes (numbered by $i=1,\ldots,N$) of X-coordinate s_i, one a:

$$\text{MOMENT\_0}=\frac{1}{2(s_N-s_1)}\sum_{i=1}^{N-1}(s_{i+1}-s_i)(U_i+U_{i+1})$$

$$\text{MOMENT\_1}=\frac{2}{(s_N-s_1)^2}\sum_{i=1}^{N-1}(s_{i+1}-s_i)\left(U_i(s_{i+1}+2s_i)+U_{i+1}(2s_{i+1}+s_i)\right)$$
$$-\frac{3}{(s_N-s_1)}\sum_{i=1}^{N-1}(s_{i+1}-s_i)(U_i+U_{i+1})$$

| ' EXTREMA'

calculate the MIN, MAX, MINI_ABS, MAXI_ABS of a field possibly reduces on one nodes list or of meshes, on all the components or a list of components.

6.2 Operand MOYE_NOEUD

Key word allowing for choice of a printing detailed or realised in a point. This key word is significant only for the quantities of the cham_elem type and operation EXTRACTION.

MOYE_NOEUD = "OUI'

For each point of postprocessing, the displayed value of a component or a deducted quantity is obtained like average of the values given by each convergent mesh in this point. The way of making the average is the same one as for fields calculated by CALC_CHAMP [U4.81.04].

MOYE_NOEUD = "NON"

the list of the values obtained for each convergent mesh at the point of postprocessing is displayed.

7 Operands of access and printing of the contents of the arrays created by POST_RELEVE_T

7.1 Principles of addressing of the contents of the arrays

the statements of values are arranged in concepts of the type counts. The arrays are Bi - subscripted. The first index is the parameter, this one is defined by the operator according to the action considered (see [Table 7.4-a]). The second index is the variable, this one is defined by the user. The variables can be the names of the nodes, the names of the components or the numbers of the points of post - processing along a path.

7.2 Operand INTITULE

♦INTITULE = matable [K8]

Name of the array of statements of values.

7.3 Operand TITER

◊TITER = title

Titrates that one wants to give to the array of statements of values. For more details, to see [U4.03.01].

7.4 Definition of the parameters and the variables

To the printing on the results file , each parameter is printed on a column, the variables being printed line by line.

Variable	key words	Parameters
OPERATION = "AVERAGE" (key words TOUT_CMP, NOM_CMP) (example [§9.2.2])	MINIMUM MOMENT_0 MOMENT_1 MAXIMUM MOYE_INT MOYE_EXT	Names of the components
OPERATION = "MOYENNE_ARITH" (key words TOUT_CMP, NOM_CMP)	AVERAGE	Names of the components
OPERATION = "EXTREMA" (key words TOUT_CMP, NOM_CMP)	VALE	Names of the components
OPERATION = "EXTRACTION" (key word IMPR_NOEUD = "OUI')	-	Names of the nodes so NOEUD or GROUP_NO Number of the point if PATH
OPERATION = "EXTRACTION" (key word IMPR_NOEUD = "NON")	-	Names of the nodes concaténés with the names of meshes so NOEUD or GROUP_NO Number of the point if PATH
TOUT_CMP NOM_CMP (examples [§9.1] and [§9.2.1])	followed ABSC_CURV COOR_X COOR_Y COOR_Z by name of the components	-
NOM_CMP TRAC_NOR TRAC_DIR (examples [§9.3] and [§9.4])	ABSC_CURV COOR_X COOR_Y COOR_Z DIR_1 DIR_2 DIR_3	-
INVARIANT (example [§9.5])	ABSC_CURV COOR_X COOR_Y COOR_Z VON_MIS TRESCA TRACES DETER	-
ELEM_PRINCIPAUX (example [§9.6])	ABSC_CURV COOR_X COOR_Y COOR_Z VAL_PR_1 VAL_PR_2 VAL_PR_3	-

Variable	key words	Parameters
RESULTANTE MOMENT (examples [§9.7] and [§9.8])	Names of the components	-
coordinate = "POLAIRE" (example [§9.9])	ABSC_CURV COOR_X COOR_Y COOR_Z followed by the name of the components	-
coordinate = "CYLINDRIQUE"	ABSC_CURV COOR_X COOR_Y COOR_Z followed by the name of components	

Table 7.4-a

For the meaning of parameter ABSC_CURV, to see §4.1.5 and §4.1.6
For references POLAIRE and CYLINDRIQUE, the meaning of the components is:
DX : radius r , DY : Y-coordinate on the axis of the cylinder z , DZ : angle θ (see U2.07.01 §2 and §5.2)

8 Phase of checking

One checks that the headings all are different.

8.1 During the execution

This phase checks the coherence of the arguments between them. It factor key word relates to all the occurrences of the ACTION. One distinguishes 2 groups from checks.

The first group is common to the arguments of key word CHAM_GD and RESULTAT (which is excluded mutually) and is reduced to the following checks:

- acceptability of the components:
  it is checked that the required components are quite present at the catalog of description of the quantity to treating,
- coherence of mesh:
  it is checked that the mesh on which the quantity was calculated is the mesh on which the place of postprocessing (case of the key word PATH) is built or contains the nodes passed in argument (case of the key words NOEUD and/or GROUP_NO).

The second group is specific to the key word RESULTAT, and is reduced to the checks:

- checking of the acceptability of the symbolic field:
  one makes sure that the symbolic field argument of key word NOM_CHAM exists well for the type of result concept argument of key word RESULTAT,
- existence of at least a data structure for the field symbolic system with treating.

At the conclusion of the phase of checking, in stage of execution the following alternative arises:

- all the occurrences of ACTION are correct and the operations are launched,
- at least an occurrence of ACTION is incorrect, then a message d'error fatal is produced with stop of the command. Information informs about the nature of the errors and the layer to correct them.

8.2 During the processing

a new filter of checking arises but never causes the stop of the command. This filter is reduced to the following checks:

- existence of data structure indicated by CHAM_GD or RESULTAT and one of the key words giving access in a data structure RESULTAT.
  In the event of failure a message is transmitted and the following occurrence is treated,

- in the case of a computation of tensorial invariants, one checks that the object of the processing indicates well a tensor of order 2,
- in the case of a computation of average or a request for extraction of values, one checks that the components with treating were indeed calculated on the place of the post - processing. In the event of failure of this checking, a message details the components nonavailable according to meshes or nodes of the place of post - processing.

If this last filter does not detect any impossibility of computation, postprocessing is launched and the results are inserted in the array.

9 Examples

the examples which follow apply to the same physical problem (case test SHLV100G).

9.1 Key words "EXTRACTION" "MOYENNE" "EXTREMA" "MOYENNE_ARITH"

9.1.1 "EXTRACTION"

9.1.1.1 Commands

```
#  extraction of the CMP of the tensor of the stresses on nodes list
#
   t2 = POST_RELEVE_T (ACTION = _F (
                           INTITULE  = "ex_2",
                           NOEUD     = ("N1", "N347", "N21", "N432", "N39",
"N229"),
                           CHAM_GD   = SIGMA,
                           NOM_CMP   = ("SIXX", "SIYY", "SIZZ", "SIXY"),
                           OPERATION = "EXTRACTION"    )  )
```

9.1.1.2 Result

```
--- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO          : 1

 FIELD PAR ELEMENT WITH NODES

 EXTRACTION  TENSOR FORCED
 COORDINATE GLOBAL

 PATH OF NODES

  CONCEPT T2 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
    COUNTS: EX_2     RESULTING FROM the ARRAY "

        AVERAGE    "       T2       ABSC_CURV       COOR_X
 COOR_Y    COOR_Z  SIXX SIYY SIZZ SIXY  N1  0.00000E+00 1.00000E-01 0.00000E+00  0.00000E+00 -9.96843E-01
 1.66549E+00  2.00595E-01  -2.97371E-04  N347  1.00000E-01 2.00000E-01 0.00000E+00  0.00000E+00 -2.39383E-04
 6.67596E-01   2.00207E-01  -2.65146E-05  N21  2.14214E-01 9.23880E-02 3.82683E-02  0.00000E+00 -6.06951E-01
 1.27563E+00  2.00603E-01  -9.41280E-01  N432  3.14214E-01  1.84776E-01 7.65367E-02  0.00000E+00 9.75617E-02
 5.69793E-01   2.00206E-01  -2.36114E-01  N39  4.28428E-01  7.07107E-02 7.07107E-02  0.00000E+00 3.34029E-01
 3.34628E-01  2.00597E-01  -1.33117E+00  N229  5.28428E-01  1.41421E-01 1.41421E-01  0.00000E+00 3.33660E-01
```

9.1.2 3.33711E-01 2.00211E-01 -3.33924E-01

9.1.2.1 average

```
Commands  # of the CMP of the tensor of the stresses on nodes list
#
   T3 = POST_RELEVE_T (ACTION=_F (INTITULE  = "ex_3",
                           NOEUD     = ("N1", "N347", "N21", "N432",
"N39","N229"),
                           CHAM_GD   = SIGMA,
                           NOM_CMP   = ("SIXX", "SIYY", "SIZZ", "SIXY"),
                           OPERATION = "AVERAGE",       ),)
```

9.1.2.2 Result

```
 --- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO          : 1

 FIELD PAR ELEMENT WITH THE NODES

 MOYENNE  TENSOR FORCED
 COORDINATE GLOBAL

 PATH CONNECTING THE NODES:

 N1       N347     N21      N432     N39      N229

  CONCEPT T3 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
    COUNTS: EX_3     RESULTING FROM ARRAY T3
```

	MOMENT_0	MOMENT_1	MINIMUN	MAXIMUN	MOYE_INT	MOYE_EXT
SIXX	-9.83430E-02	1.17015E+00	-9.96843E-01	3.34029E-01	-6.83419E-01	4.86733E-01
SIYY	7.66354E-01	-1.17020E+00	3.33711E-01	1.66549E+00	1.35145E+00	1.81254E-01
SIZZ	2.00403E-01	-1.44941E-05	2.00206E-01	2.00603E-01	2.00411E-01	2.00396E-01
SIXY	-5.40089E-01	-1.03327E+00	-1.33117E+00	-2.65146E-05	-2.34562E-02	-1.05672E+00

9.1.3 "EXTREMA"

9.1.3.1 Commands

```
#  extrema of dx displacements and drz
#
   T3 = POST_RELEVE_T (ACTION=_F (
                        INTITULE  = "DEPL",
                        RESULTAT     =RESU1,
                        NOM_CHAM   = "DEPL",
                        NOM_CMP   = ("DX", "DRZ",),
                        OPERATION = "EXTREMA",      ),)
```

9.1.3.2 Result

```
                INTITULERESUNOM_CHAMNUME_ORDREEXTREMANOEUDCMPVALE
DEPLRESU1DEPL1MAXDDX3.47E-03

DEPLRESU1DEPL1MINDDRZ
-6.27E-03
DEPLRESU1DEPL1MAXI_ABSDDRZ6.27E-03

DEPLRESU1DEPL1MINI_ABSADX8.99E-22
```

9.1.4 "MOYENNE_ARITH"

9.1.4.1 average

```
      Commands  # of dx displacements and dz on nodes
      #
         t4 = POST_RELEVE_T (ACTION=_F (
                        INTITULE  = "DEPL",
                        RESULTAT     =RESU1,
                        NOM_CHAM   = "DEPL",
                        GROUP_NO   = ("GNAB",),
                        NOEUD   = ("It, "Of,),
                            NOM_CMP   = ("DX", "DZ",),
                        OPERATION = "MOYENNE_ARITH",      ),)
```

9.1.4.2 Result

```
                INTITULERESUNOM_CHAMNUME_ORDRECMPMOYENNE
DEPLRESU1DEPL1DX9.47536E-04
DEPLRESU1DEPL1DZ                                        0.00000E+00
```

9.2 Operands PATH / TRAC_NOR

9.2.1 Commands

```
#  traces normal has a segment of the tensor of stresses
#
   t4 = POST_RELEVE_T (ACTION = _F (
                              INTITULE  = "ex_4",
                              PATH    = AB,
                              CHAM_GD   = SIGMA,
                              NOM_CMP   = ("SIXX", "SIYY", "SIZZ", "SIXY"),
                              TRAC_NOR  = "OUI',
                              OPERATION =  "EXTRACTION",    )  )
```

9.2.2 Result

```
--- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO           : 1
 FIELD PAR ELEMENT WITH TENSOR
 NODES  EXTRACTION  TRACE_NORMALE STRESS
 LOCAL COORDINATE SYSTEM
 LINE SEGMENT
 ORIGINE               : (  1.000000E-01,  0.000000E+00)
 ENDING             : (  2.000000E-01,  0.000000E+00)
 Curvilinear abscisses: (  0.000000E+00,  1.000000E-01)
  CONCEPT T4 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
    COUNTS: EX_4     RESULTING FROM the ARRAY T4
```

	ABSC_CURV	COOR_X	COOR_Y	COOR_Z	DIR_1	DIR_2	DIR_3
00000001	0.00000E+00	1.00000E-01	0.00000E+00	0.00000E+00	2.97371E-04	-1.66549E+00	0.00000E+00
00000002	9.99995E-03	1.10000E-01	0.00000E+00	0.00000E+00	1.65667E-04	-1.43451E+00	0.00000E+00
00000003	1.99999E-02	1.20000E-01	0.00000E+00	0.00000E+00	1.49649E-04	-1.25935E+00	0.00000E+00
00000004	2.99999E-02	1.30000E-01	0.00000E+00	0.00000E+00	1.28087E-04	-1.12286E+00	0.00000E+00
00000005	3.99999E-02	1.40000E-01	0.00000E+00	0.00000E+00	1.10722E-04	-1.01444E+00	0.00000E+00
00000006	4.99999E-02	1.50000E-01	0.00000E+00	0.00000E+00	9.64779E-05	-9.26905E-01	0.00000E+00
00000007	6.00000E-02	1.60000E-01	0.00000E+00	0.00000E+00	8.49028E-05	-8.55210E-01	0.00000E+00
00000008	7.00000E-02	1.70000E-01	0.00000E+00	0.00000E+00	7.51468E-05	-7.95754E-01	0.00000E+00
00000009	7.99999E-02	1.80000E-01	0.00000E+00	0.00000E+00	6.71302E-05	-7.45902E-01	0.00000E+00
00000010	8.99999E-02	1.90000E-01	0.00000E+00	0.00000E+00	6.04973E-05	-7.03691E-01	0.00000E+00
00000011	1.00000E-01	2.00000E-01	0.00000E+00	0.00000E+00	2.65146E-05	-6.67596E-01	0.00000E+00

9.3 Operands TRAC_DIR / DIRECTION

9.3.1 Commands

```
#  traces directional data by a vector
#
   t5 = POST_RELEVE_T (ACTION = _F (
                              INTITULE       = "ex_5",
                              PATH         = AB,
                              CHAM_GD        = SIGMA,
                              NOM_CMP        = ("SIXX", "SIYY", "SIZZ",
"SIXY"),
                              TRAC_DIR        = "OUI',
                              DIRECTION      = (1. , 0. , 0. ),
                              OPERATION      =  "EXTRACTION"    ),)
```

9.3.2 Result

```
 --- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO           : 1

 FIELD PAR ELEMENT WITH TENSOR
 NODES  EXTRACTION  TRACE_DIRECTIONELLE STRESS
```

```
LOCATES GLOBAL

LINE SEGMENT
ORIGINE                : (  1.000000E-01,  0.000000E+00)
ENDING              : (  2.000000E-01,  0.000000E+00)
Curvilinear abscisses: (  0.000000E+00,  1.000000E-01)

 CONCEPT T5 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
   COUNTS: EX_5     RESULTING FROM the ARRAY T5
```

	ABSC_CURV	COOR_X	COOR_Y	COOR_Z	DIR_1	DIR_2	DIR_3
00000001	0.00000E+00	1.00000E-01	0.00000E+00	0.00000E+00	-9.96843E-01	-2.97371E-04	0.00000E+00
00000002	9.99995E-03	1.10000E-01	0.00000E+00	0.00000E+00	-7.66170E-01	-1.65667E-04	0.00000E+00
00000003	1.99999E-02	1.20000E-01	0.00000E+00	0.00000E+00	-5.91136E-01	-1.49649E-04	0.00000E+00
00000004	2.99999E-02	1.30000E-01	0.00000E+00	0.00000E+00	-4.54764E-01	-1.28087E-04	0.00000E+00
00000005	3.99999E-02	1.40000E-01	0.00000E+00	0.00000E+00	-3.46463E-01	-1.10722E-04	0.00000E+00
00000006	4.99999E-02	1.50000E-01	0.00000E+00	0.00000E+00	-2.59035E-01	-9.64779E-05	0.00000E+00
00000007	6.00000E-02	1.60000E-01	0.00000E+00	0.00000E+00	-1.87445E-01	-8.49028E-05	0.00000E+00
00000008	7.00000E-02	1.70000E-01	0.00000E+00	0.00000E+00	-1.28092E-01	-7.51468E-05	0.00000E+00
00000009	7.99999E-02	1.80000E-01	0.00000E+00	0.00000E+00	-7.83393E-02	-6.71302E-05	0.00000E+00
00000010	8.99999E-02	1.90000E-01	0.00000E+00	0.00000E+00	-3.62263E-02	-6.04973E-05	0.00000E+00
00000011	1.00000E-01	2.00000E-01	0.00000E+00	0.00000E+00	-2.39383E-04	-2.65146E-05	0.00000E+00

9.4 Operand INVARIANT

9.4.1 Commands

```
#  invariants of the tensor of stresses
#
   t6 = POST_RELEVE_T (ACTION = _F (
                              INTITULE  = "ex_6",
                              PATH    = AB,
                              CHAM_GD   = SIGMA,
                              INVARIANT = "OUI',
                              OPERATION =  "EXTRACTION"    ),)
```

9.4.2 Result

```
--- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO           : 1

FIELD PAR ELEMENT WITH NODES

EXTRACTION  INVARIANTS  TENSOR FORCED
COORDINATE GLOBAL

LINE SEGMENT
 ORIGINE               : (  1.000000E-01,  0.000000E+00)
ENDING             : (  2.000000E-01,  0.000000E+00)
Curvilinear abscisses: (  0.000000E+00,  1.000000E-01)

 CONCEPT T6 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA

   COUNTS: EX_6     RESULTING FROM the ARRAY T6
```

	ABSC_CURV	COOR_X	COOR_Y	COOR_Z	VON_MIS	TRESCA	TRACES	DETER
00000001	0.00000E+00	1.00000E-01	0.00000E+00	0.00000E+00	2.30953E+00	2.66234E+00	8.69246E-01	-3.33035E-01
00000002	9.99995E-03	1.10000E-01	0.00000E+00	0.00000E+00	1.91053E+00	2.20068E+00	8.68843E-01	-2.20368E-01
00000003	1.99999E-02	1.20000E-01	0.00000E+00	0.00000E+00	1.60813E+00	1.85049E+00	8.68679E-01	-1.49235E-01
00000004	2.99999E-02	1.30000E-01	0.00000E+00	0.00000E+00	1.37278E+00	1.57762E+00	8.68524E-01	-1.02346E-01
00000005	3.99999E-02	1.40000E-01	0.00000E+00	0.00000E+00	1.18613E+00	1.36091E+00	8.68375E-01	-7.04321E-02
00000006	4.99999E-02	1.50000E-01	0.00000E+00	0.00000E+00	1.03570E+00	1.18594E+00	8.68232E-01	-4.81069E-02
00000007	6.00000E-02	1.60000E-01	0.00000E+00	0.00000E+00	9.12789E-01	1.04266E+00	8.68094E-01	-3.21138E-02
00000008	7.00000E-02	1.70000E-01	0.00000E+00	0.00000E+00	8.11140E-01	9.23846E-01	8.67961E-01	-2.04163E-02
00000009	7.99999E-02	1.80000E-01	0.00000E+00	0.00000E+00	7.26193E-01	8.24241E-01	8.67831E-01	-1.17024E-02
00000010	8.99999E-02	1.90000E-01	0.00000E+00	0.00000E+00	6.54545E-01	7.39918E-01	8.67704E-01	-5.10453E-03
00000011	1.00000E-01	2.00000E-01	0.00000E+00	0.00000E+00	5.93563E-01	6.67835E-01	8.67563E-01	-3.19954E-05

9.5 Operand ELEM_PRINCIPAUX

9.5.1 Commands

```
#  principal values of the tensor stresses
#
   t7 = POST_RELEVE_T (ACTION = _F (
                              INTITULE        = "ex_7",
                              PATH          =  AB,
                              CHAM_GD         =  SIGMA,
                              ELEM_PRINCIPAUX = "OUI',
                              OPERATION       = "EXTRACTION",    )  )
```

9.5.2 Result

```
 --- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO           : 1

 FIELD PAR ELEMENT WITH NODES

 EXTRACTION  TENSOR FORCED
 COORDINATE GLOBAL

 LINE SEGMENT
 ORIGINE               : (  1.000000E-01,  0.000000E+00)
 ENDING             : (  2.000000E-01,  0.000000E+00)
 Curvilinear abscisses: (  0.000000E+00,  1.000000E-01)

  CONCEPT T7 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
    COUNTS: EX_7     RESULTING FROM the ARRAY T7
```

	ABSC_CURV	COOR_X	COOR_Y	COOR_Z	VAL_PR_1	VAL_PR_2	VAL_PR_3
00000001	0.00000E+00	1.00000E-01	0.00000E+00	0.00000E+00	-9.96844E-01	2.00594E-01	1.66549E+00
00000002	9.99995E-03	1.10000E-01	0.00000E+00	0.00000E+00	-7.66170E-01	2.00501E-01	1.43451E+00
00000003	1.99999E-02	1.20000E-01	0.00000E+00	0.00000E+00	-5.91137E-01	2.00463E-01	1.25935E+00
00000004	2.99999E-02	1.30000E-01	0.00000E+00	0.00000E+00	-4.54764E-01	2.00428E-01	1.12286E+00
00000005	3.99999E-02	1.40000E-01	0.00000E+00	0.00000E+00	-3.46464E-01	2.00393E-01	1.01444E+00
00000006	4.99999E-02	1.50000E-01	0.00000E+00	0.00000E+00	-2.59035E-01	2.00361E-01	9.26905E-01
00000007	6.00000E-02	1.60000E-01	0.00000E+00	0.00000E+00	-1.87445E-01	2.00329E-01	8.55210E-01
00000008	7.00000E-02	1.70000E-01	0.00000E+00	0.00000E+00	-1.28092E-01	2.00298E-01	7.95754E-01
00000009	7.99999E-02	1.80000E-01	0.00000E+00	0.00000E+00	-7.83395E-02	2.00268E-01	7.45902E-01
00000010	8.99999E-02	1.90000E-01	0.00000E+00	0.00000E+00	-3.62266E-02	2.00239E-01	7.03691E-01
00000011	1.00000E-01	2.00000E-01	0.00000E+00	0.00000E+00	-2.39623E-04	2.00207E-01	6.67596E-01

9.6 Operand RESULTANTE

9.6.1 Commands

```
   # computation of the resultants of the CMP quoted on a group_no
   T8 =POST_RELEVE_T    (ACTION = _F
           ( RESULTAT=resu    ,             NOM_CHAM=' FORC_NODA',
                    INTITULE=' RESULTANTE',
                       REPERE=' GLOBAL',          OPERATION = "EXTRACTION",
                    GROUP_NO=' su',            RESULTANTE= ("DX", "DY",
"DZ"),
          ))
```

9.6.2 Result

```
   ---POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO       :  1
   NUME_ORDRE:                1
   FIELD AT NODES OF SYMBOLIC NAME FORC_NODA
    NUMERO OF ODRDRE: 1 INST: 0.00000E+00

   RESULTANTE_MOMENTDEPLACEMENTS
   LOCATES GLOBAL

   PATH CONNECTING the NODES:
   N69N70N71N87N88N89N97N98

   CONCEPT T8 OF TABL_POST_RELE CALCULATES FROM CONCEPT RESUTABLE :
```

```
   RESULTAN_1           RESULTING FROM ARRAY T8INST               :
0.00000E+00
    RESULTANTE-1.000000000E+01-2.724281611E-117.218027734E-11
```

9.7 Operands MOMENT and POINT

9.7.1 Commands

```
#  computation of the resultants and the moments of the CMP quoted on a
group_no
   T9 =POST_RELEVE_T    (ACTION = _F
          (  RESULTAT=resu    ,                NOM_CHAM=' FORC_NODA',
                   INTITULE=' RESULTANTE-MOMENT',
                      REPERE=' GLOBAL',              OPERATION =
"EXTRACTION",
                   GROUP_NO=' su',
              MOMENT=           ("DRX", "DRY", "DRZ"), POINT=    (0. , 0. ,
0.),)
          )
```

9.7.2 Result

```
   ---POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO       :   1
   NUME_ORDRE:                  1
   FIELD AT NODES OF SYMBOLIC NAME FORC_NODA
    NUMERO OF ODRDRE: 1 INST: 0.00000E+00

    RESULTANTE_MOMENTDEPLACEMENTS
   MOMENT COMPARED TO Point:    0.00000E+00    0.00000E+000.00000E+00
   LOCATES GLOBAL

   PATH CONNECTING the NODES:
   N69N70N71N87N88N89N97N98

   CONCEPT T9 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT RESU COUNTS:
   RESULTAN_1         RESULTING FROM ARRAY T9INST              : 0.00000E+00
                                                  RESULT_XRESULT_YRESULT_ZMOMENT_X
    RESULTANTE-1.000000000E+01-2.724281611E-117.218027734E-11
-9.744077883E-12
   RESULTANTE-2.000000000E+00-3.000000000E+00
```

9.8 Operand LOCATES : "POLAIRE"

9.8.1 Commands

```
# printing of the tensor of the stresses out of polar coordinate system on
arc AC
#
  t10 = POST_RELEVE_T (ACTION = _F (
                              INTITULE  = "ex_10",
                              PATH    = AC,
                              coordinate    = "POLAIRE",
                              CHAM_GD   = SIGMA,
                              NOM_CMP   = ("SIXX", "SIYY", "SIZZ", "SIXY"),
                              OPERATION =  "EXTRACTION"    ),)
```

9.8.2 Results

```
--- POST_TRAITEMENT NUMERO: 1 - FIELD NUMERO          : 1

 FIELD PAR ELEMENT WITH NODES

 EXTRACTION  TENSOR FORCED
 POLAR COORDINATE SYSTEM

 ARC OF CERCLE
 CENTER               : (  0.000000E+00,  0.000000E+00)
 RADIUS                :    ANGULAR
```

```
1.000000E-01 SECTEUR     : (  0.000000E+00,  2.250000E+01)

 CONCEPT T10 OF TYPE TABL_POST_RELE CALCULATES FROM CONCEPT SIGMA
   COUNTS: EX_10     RESULTING FROM the ARRAY T10

           ABSC_CURV    COOR_X      COOR_Y       COOR_Z       SIXX SIYY SIZZ SIXY
00000001  0.00000E+00 1.00000E-01 0.00000E+00 0.00000E+00 -9.80501E-01 1.64914E+00 2.00593E-01  2.07951E-01
00000002  7.85455E-03 9.96917E-02 7.84647E-03 0.00000E+00 -9.88675E-01 1.65731E+00 2.00591E-01  1.03814E-01
00000003  1.57084E-02 9.87688E-02 1.56438E-02 0.00000E+00 -9.88675E-01 1.65730E+00 2.00588E-01  1.03815E-01
00000004  2.35622E-02 9.72369E-02 2.33448E-02 0.00000E+00 -9.88674E-01 1.65730E+00 2.00589E-01  1.03810E-01
00000005  3.14159E-02 9.51056E-02 3.09017E-02 0.00000E+00 -9.88673E-01 1.65732E+00 2.00594E-01  1.03813E-01
00000006  3.92699E-02 9.23880E-02 3.82683E-02 0.00000E+00 -9.96843E-01 1.66550E+00 2.00598E-01 -3.06827E-04
```