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Responsable : KAZYMYRENKO Cyril

Version default

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a42a496f7b3d

Macro-order `POST_CZM_FISS`

1 Goal

This macro-order makes it possible to carry out the two types of following postprocessings:

- to provide to each increment of loading of information over the length of a rectilinear cohesive crack 2D (positions of the point of crack and cohesive point). More precisely the macro one provides the distance between a point origin `POINT_ORIG` and each of the two points in the direction and the direction of the directing vector `VECT_TANG` as well as the distance enters the two points (size of the cohesive zone);
- to calculate and store in a map the triaxiality of the constraints in the solid elements directly close to the cohesive elements.

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2   Syntax

```
Fr = POST_CZM_FISS (

        ♦ RESULT = resu                                    [evol_noli]

        ♦ OPTION   =/'LENGTH'
                    /'TRIAXIALITE'

          # IF OPTION = 'LENGTH'

                ♦ GROUP_MA   = group_ma                    [grma]
                ♦ POINT_ORIG = not                         ([R], [R])
                ♦ VECT_TANG  = vect                        ([R], [R])

            )
```

If OPTION = 'LENGTH', then Fr is   [table_sdaster].
If OPTION = 'TRIAXIALITE', then Fr is   [carte_sdaster].

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3 Operands

3.1 Operand RESULT

♦ RESULT   = resu

Name of the concept result of a nonlinear calculation with cohesive elements.

3.2 Operand OPTION

♦ OPTION =/'LENGTH'
           /'TRIAXIALITE'

Choice of the type of postprocessing carried out by the macro-order

3.3 Operand GROUP_MA

♦ GROUP_MA   = group_ma

Name of the group of cohesive meshs with modelings PLAN_JOINT, PLAN_INTERFACE, AXIS_JOINT or AXIS_INTERFACE. And having one of the cohesive behaviors: CZM_OUV_MIX, CZM_TAC_MIX, CZM_LIN_REG, CZM_EXP_REG.

This operand is not possible that when OPTION = 'LENGTH' .

3.4 Operand POINT_ORIG

♦ POINT_ORIG   = not

Not initial of the cohesive crack: two real components in the plan (X, Y) (see figures below)

This operand is not possible that when OPTION = 'LENGTH' .

3.5 Operand VECT_TANG

♦ VECT_TANG   = vector

Directing vector: two real components in the plan (X, Y) (see figures below).

This operand is not possible that when OPTION = 'LENGTH' .

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4   Produced concept

4.1   Case OPTION = 'LENGTH'

In Snettle one creates a table of the type `table_sdaster` containing four columns:
   INST : the moment of calculation
   LONG_FIS : distance enters the point of crack and the point of reference (LF to see figure 2).
   LONG_TOT : overall length (LF + LZC to see figure 2)
   LONG_COH : size of the cohesive zone (LZC to see figure 2)

4.2   Case OPTION = 'TRIAXIALITE'

The macro-order produces in this case a map (of NEUT_R with a component X1) dimensioned with the number of meshs carrying of the cohesive elements. For each mesh, the stored value is that of the triaxiality of the constraints, raised and realised in the elements of the solid mass directly close (by edge in 2D or face in 3D) to this mesh. The stress field used for this postprocessing is that which corresponds to the last step of time filed in evol_noli informed under the keyword RESULT .

5   Perimeter of use

5.1   Case OPTION = 'LENGTH'

evol_noli informed under the keyword RESULT must be it result of a nonlinear calculation 2D with cohesive elements. The crack must moreover être rectilinear.

The order transmits an error message or of alarm if the user leaves the framework of use:
*   The user is held to define the half-line starting from the point well POINT_ORIG (aligned with the PG) and of the directing vector VECT_TANG (colinéaire with the right-hand side of the PG). One checks these conditions but also which there exists many PG on the half-line in question (direction of the quite selected vector).
*   If one of these three conditions is not filled, one displays an error message indicating the problem encountered as well as the extremums of the coordinates of the PG to help the user with defining the half-line well.
*   Such as definite the lengths are valid only if the cohesive zone is related. If such is not the case a message of alarm is displayed.
*   If it is noted that the cohesive zone is made up only of three PG or less one displays a message of alarm stipulating that the grid does not seem sufficiently fine to collect this zone correctly (see Doc. U2.05.07 advices use of the cohesive models).

5.2   Case OPTION = 'TRIAXIALITE'

This postprocessing is available in 2D and 3D. The modelings supported in the solid mass and on the cohesive interface are recapitulated in the table below.

Modelings supported in the solid mass	Modelings supported on the cohesive interface
'D_PLAN', 'C_PLAN', 'AXIS', '3D'	'PLAN_JOINT', 'AXIS_JOINT', '3D_JOINT'
	'PLAN_INTERFACE' , 'AXIS_INTERFACE' , '3D_INTERFACE'
	'PLAN_INTERFACE_S' , 'AXIS_INTERFACE_S' , '3D_INTERFACE_S'

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6   Details of the order

6.1   Case OPTION = 'LENGTH'

The cohesive crack is represented on figure 1, it is supposed to be rectilinear, and breaks up into three zones distinct: healthy, cohesive (or damaged) and free surface (or fissured). One represents respectively in red, green and blue the points of Gauss (PG) of these zones.

From these zones one defines a cohesive point (not white) and of a point of crack (blackhead). The macro one gives the distance between the point origin POINT_ORIG (not red) and each of the two points in direction and the direction of the directing vector VECT_TANG (red vector) as well as the distance enters the two points.
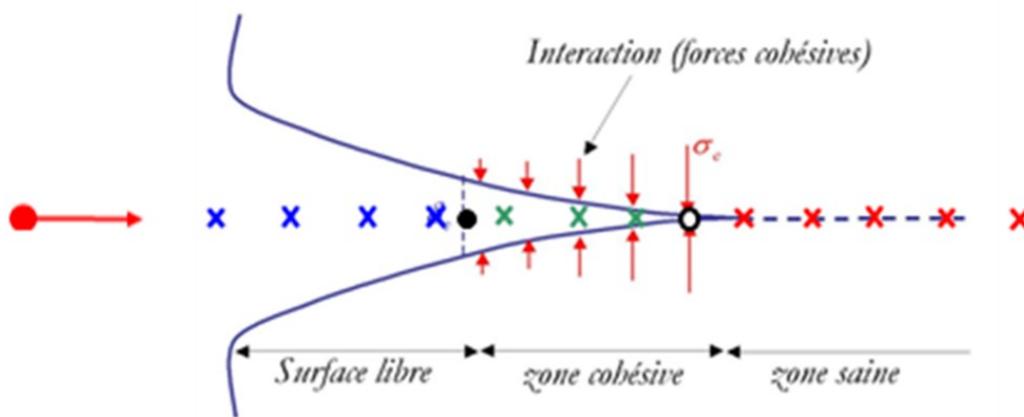

Figure 1 : Diagram of the cohesive crack and its points of Gauss.

To define the position of the points (see figure 2) one is pressed on the geometrical coordinates of the PG and the field of the internal variable VARI_ELGA V3 component of the laws CZM which takes as value 0 if the PG is healthy, 1 if the PG is damaged and 2 if the PG is fissured. For each one of these three states one defines Dmin and Dmax corresponding to the distances minimal and maximum compared to the point origin. The point of crack is positioned between the broken PG and the damaged PG, the cohesive point are positioned between the damaged PG and the healthy PG.

Figure 2 : Diagram of the field of PG of a cohesive crack 2D rectilinear with the position of the points (in example one traces Dmin and Dmax for the damaged PG).

6.2   Case OPTION = 'TRIAXIALITE'

For this option, the operation of the macro-order is the following.

1. Detection of the presence of cohesive elements (see the modelings supported in the paragraph "perimeter of use") in the model which was used to produce it evol_noli informed under the keyword RESULT . If no cohesive element is detected, an error message fatal is transmitted.

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2. Recovery of the stress field corresponding to the last step of filed time.
3. Realization of a loop on the meshs affected by cohesive elements. During this loop, for each cohesive mesh, one identifies the meshs of the solid mass which are directly close for him (by face in 3D, and edge in 2D) using the structure of data `sd_voisinage`. One makes sure that this cohesive mesh has only one or two meshs close to this type (the zone of the grid affected by the cohesive elements thus must: either to cross the structure completely, or to be located on part of the border as it is for example the case lorsqu one models a condition of symmetry). Once these identified close meshs, have calculates the rate of triaxiality of the constraints in all points of Gauss of these close elements. One carries out then the arithmetic mean of the triaxiality at the points of Gauss: by elements then on the number of neighbors if the current cohesive mesh has 2 neighbors in the solid mass. Lastly, in the map produced by the macro-order, one stores for the current cohesive mesh the value of this realised triaxiality.

map produced by the macro-order can then be used like variable of order in the operator `AFFE_MATERIAU` (`AFFE_VARC`/`CHAM_GD`) [U4.43.03] in order to vary the parameters of cohesive law with the triaxiality.

7 Example of use

For OPTION = 'LENGTH' : to see the CAS-test ssnp139 [V6.03.139].
For OPTION = 'TRIAXIALITE' : to see the CAS-test zzzz359 [V1.01.359]