SDLV135 – Creation of space seismic signals

Summary:

The objective of it case test is of to check the creation of space seismic signals to the nodes of the structure via the order GENE_ACCE_SEISME [U4.36.04]. There exists the possibility of creating a set of signals which take account of the dephasing of at different times from arrival of seismic waves to oblique incidence or of generating a field (discretized with the nodes) whose properties are defined by a function of coherence.

1 Modeling A

1.1 Characteristics of modeling

One test the keyword factor MATR_COHE who allows to define the correlation space of the fields seismic through a function of coherence. This allows of to simulate seismic signals with various nodes structure. One tests the various functions of coherence of Abrahamson available in code_aster (ABRAHAMSON, ABRA_ROCHER, ABRA_SOLMOYEN) as well as the function of coherence of MITA_LUCO.

1.2 Characteristics of the grid

One considers a linear grid with three nodes. The coordinates of these nodes are:

COOR_3D
N1 0.00000000000000E+00 0.00000000000000E+00 0.00000000000000E+00
N2 2.50000000000000E+00 0.00000000000000E+00 0.00000000000000E+00
N3 2.50000000000000E+01 0.00000000000000E+00 0.00000000000000E+00

1.3 Sizes tested and results

One evaluate S spectra of answer of oscillator (SRO) of the signals simulated to the three nodes and one them compared to the target. The value of ZPA (Zero Period Acceleration) corresponds to the asymptote of the SRO for the high frequencies.

Identification	Type of reference	Value of reference	Precision
ZPA	ANALYTICAL	0,16	0.1 %
SRO with 25Hz	ANALYTICAL	0.1901	0.1 %
SRO with 10Hz	ANALYTICAL	0.3183	0.1 %
SRO with 1Hz	ANALYTICAL	0.1415	0.1 %

2 Modeling B

2.1 Characteristics of modeling

One test the keyword factor PHASE who allows to define the direction of propagation wave in order to calculate times of arrival to the various nodes.

2.2 Characteristics of the grid

One considers a linear grid with three nodes. The coordinates of these nodes are:

COOR_3D			
N1	0.00000000000000E+00	0.00000000000000E+00	0.00000000000000E+00
N2	2.50000000000000E+00	0.00000000000000E+00	0.00000000000000E+00
N3	2.50000000000000E+01	0.00000000000000E+00	0.00000000000000E+00

2.3 Sizes tested and results

It is testedS spectra of response of the signals simulated to the three nodes. These tests are carried out in nonregression. In addition one checks times of dephasing for a series of temporal signals. In particular, for a wave of vertical incidence and a horizontal structure, there is no dephasing.

3 Modeling C

3.1 Characteristics of modeling

This test aims to determine the function of coherence of seismic signals generated by the operator GENE_ACCE_SEISME . For that one uses and tests keyword factor COHERENCE of the operator CALC_FONCTION .

More precisely, one calculates the function of coherence for
- correlated signals 2D whose coefficient of correlation is defined by COEF_CORR in GENE_ACCE_SEISME.
- space signals whose function of coherence is defined by the keyword MATR_COHE in GENE_ACCE_SEISME.

In the first case, the theoretical function of coherence does not depend on time but is constant, equal to the coefficient of correlation. In the second case, the function of coherence estimated is comparedE with the well informed ideal model via GENE_ACCE_SEISME.

3.2 Characteristics of the grid

One considers a linear grid with three nodes. The coordinates of these nodes are:

COOR_3D
N1 0.00000000000000E+00 0.00000000000000E+00 0.00000000000000E+00
N2 2.50000000000000E+00 0.00000000000000E+00 0.00000000000000E+00
N3 2.50000000000000E+01 0.00000000000000E+00 0.00000000000000E+00

3.3 Sizes tested and results

One calculate the functions of coherence between the nodes N1 and N3 and one them compared to theoretical values.

1) One draws 2 accélérogrammes, one calculates the function of coherence and one compares results with the theoretical value (COEF_CORR = 0.5) :

Identification	Type of reference	Value of reference	Precision
Coherence with 5Hz	ANALYTICAL	0.5	0.1 %
Coherence with 10Hz	ANALYTICAL	0.5	0.1 %

2) One draws 5 accélérogrammes (they are read in a file), one calculates the function of coherence and one compares results with the theoretical value (function of coherence of Became moth-eaten & Luco) :

Identification	Type of reference	Value of reference	Precision
Coherence with 5Hz	ANALYTICAL	0.9338	0.1 %
Coherence with 10Hz	ANALYTICAL	0.7602	0.1 %
Coherence with 22Hz	ANALYTICAL	0.2653	0.1 %

The functions of coherence theoretical (black) and estimated (green) are represented in the figure below: