



MARSEILLE 2022
27 MAY-3 JUNE

SHORT COURSES
FRIDAY MAY 27 2022

ICOLD
27TH CONGRESS
90TH ANNUAL
MEETING

CIGB
27^{ÈME} CONGRÈS
90^{ÈME} RÉUNION
ANNUELLE



www.cigb-icold2022.fr

Analysis methods of dam monitoring data

Les Méthodes d'analyse des mesures d'auscultation des barrages

Tutorial: statistical analysis with SURVEY software

TD : analyse statistique avec le logiciel SURVEY

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INRAE

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EDF (Électricité De France)

Dam Surveillance expert

INRAE

French National Research
Institute for Agriculture, Food
and Environment



Presentation of the SURVEY software

Présentation du logiciel SURVEY

- SURVEY is a software that allows statistical analysis of dam monitoring data.
- SURVEY was developed by INRAE. It integrates the HST and HST-P analysis methods:
 - HST model: Hydrostatic Seasonal Time
 - HST-P model: HST - Rain
- SURVEY est un logiciel qui permet d'effectuer une analyse statistique des mesures d'auscultation de barrages.
- SURVEY a été développé par INRAE. Il intègre les méthodes d'analyse HST et HST-P:
 - HST: Hydrostatique Saisonnier Temps
 - HST-P: HST-Pluie



Presentation of the SURVEY software

Présentation du logiciel SURVEY

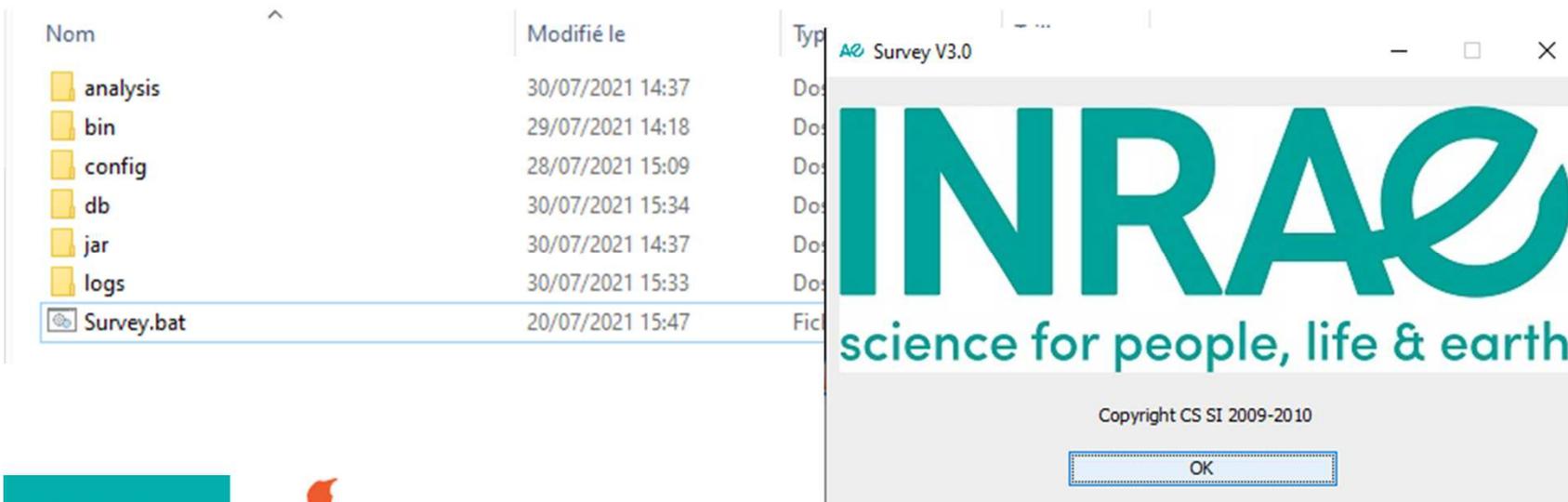
- The SURVEY software has 2 modules:
 - A calculation module written in FORTRAN 90
 - A user interface written in JAVA
- Requirements:
 - Windows
 - JAVA, version 1.8 or later
- Le logiciel SURVEY présente 2 modules:
 - Un module de calcul écrit en FORTRAN 90
 - Une interface utilisateur écrite en JAVA
- Prérequis:
 - Windows
 - JAVA, version 1.8 ou ultérieure



Tutorial – Case study

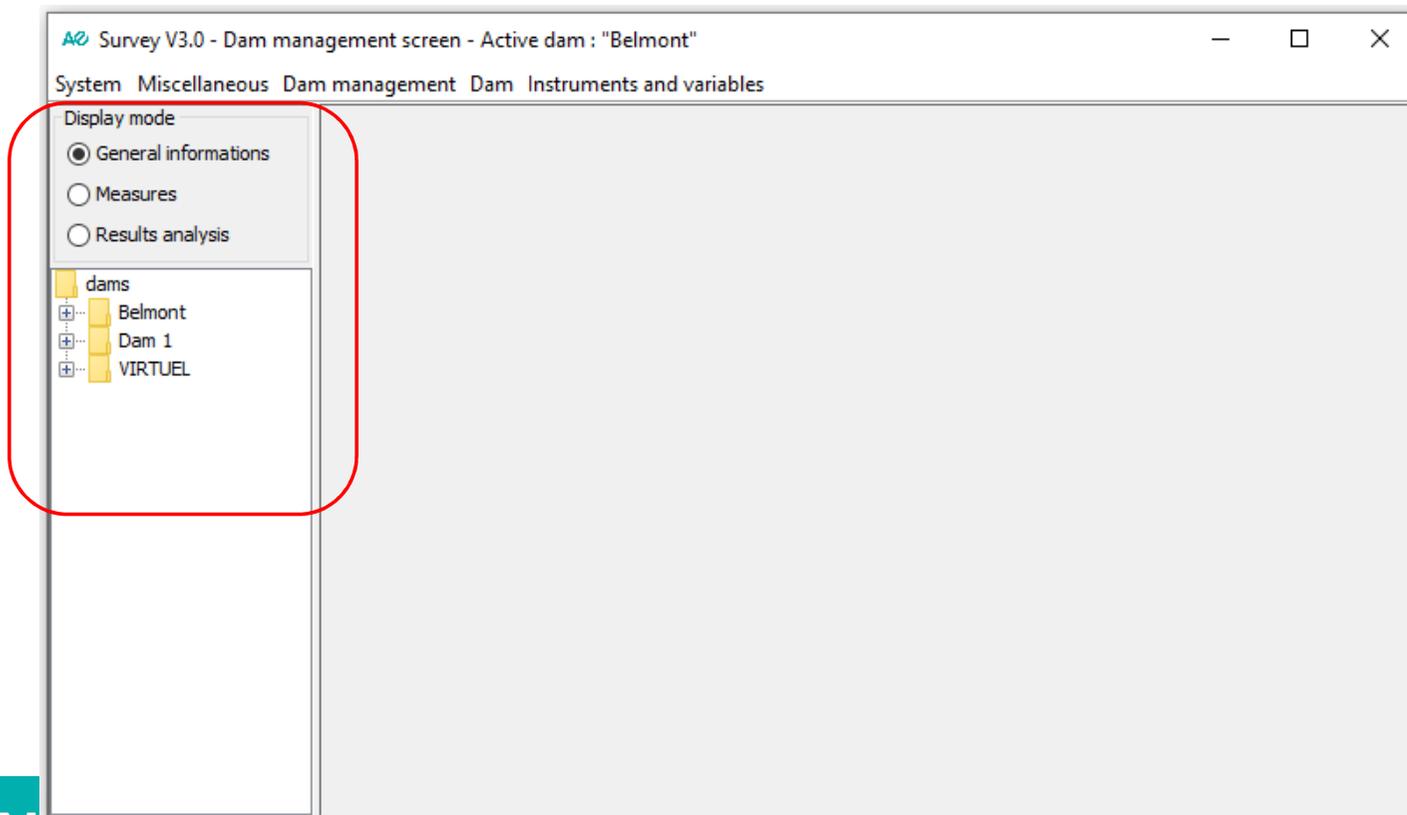
TD – Cas d'étude

- Let's start !
- Open the "Survey" folder and double click on "Survey.bat".
- Ouvrir le dossier "Survey" et double click sur "Survey.bat"



Explore the database

Explorer la base des données

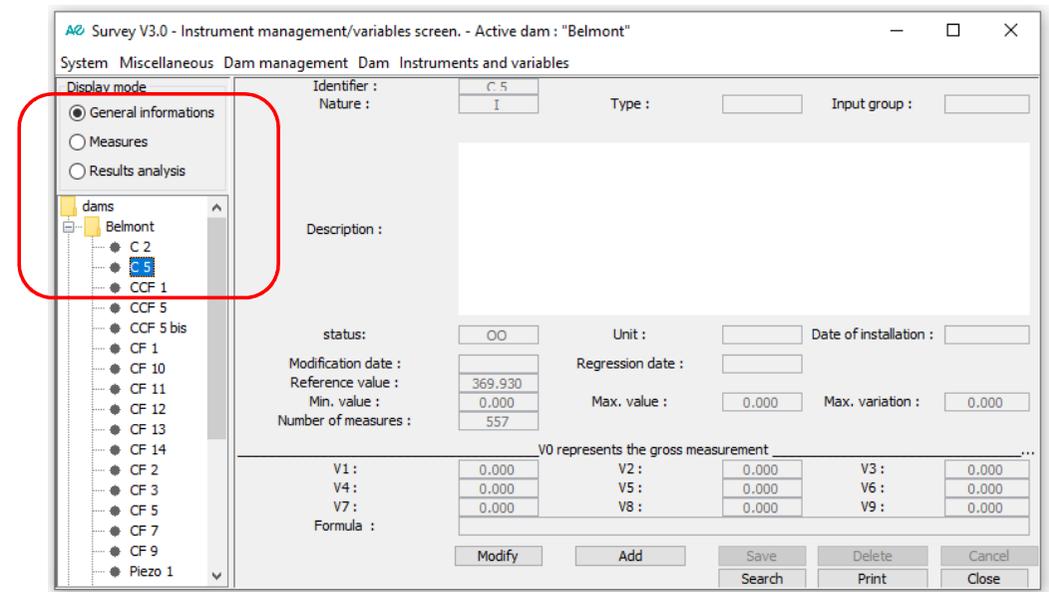
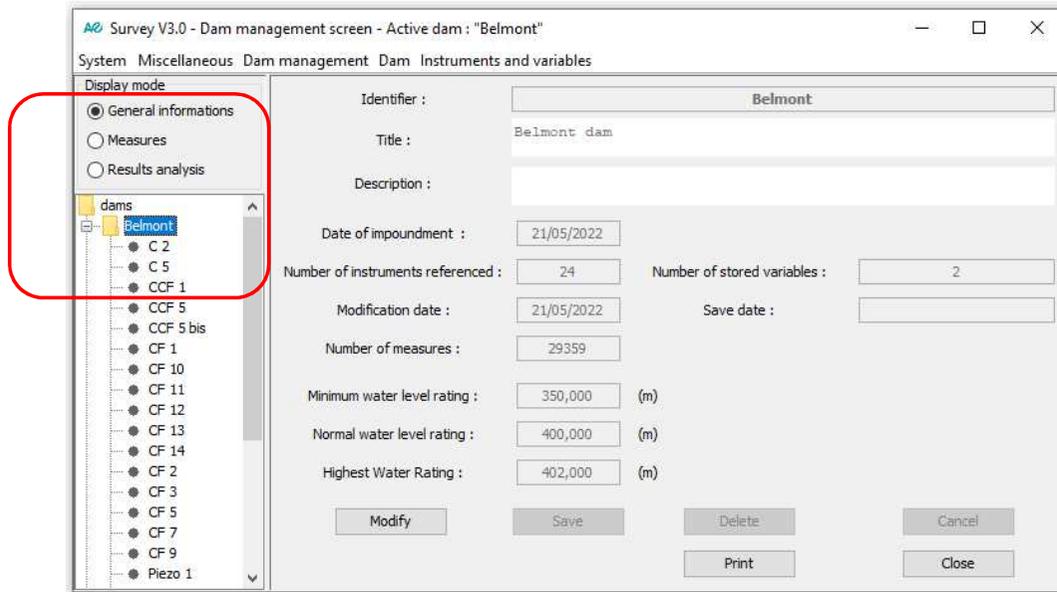


Explore the database

Explorer la base des données

General information:
- about the dam

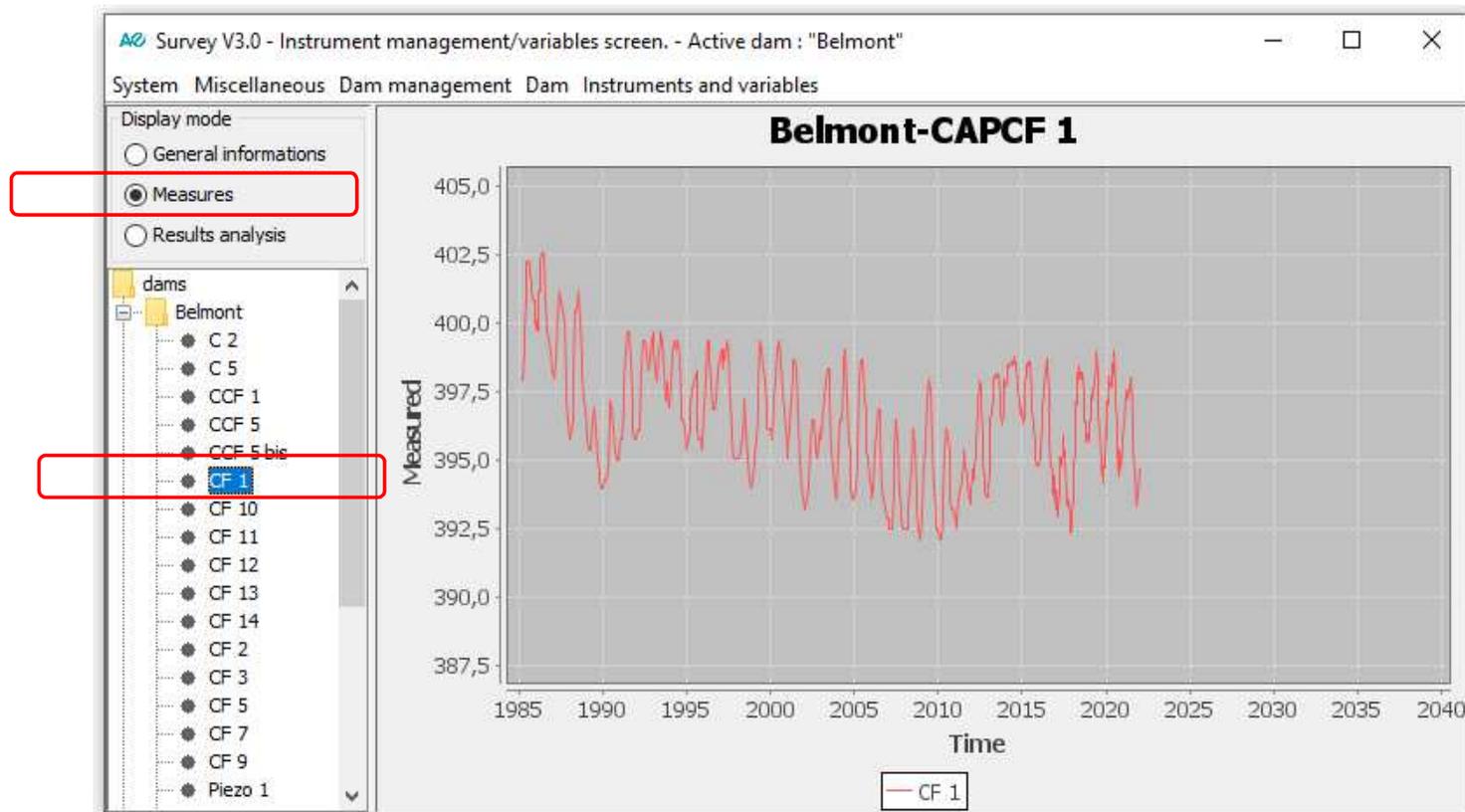
- Monitoring instruments



Explore the database

Explorer la base des données

Measures



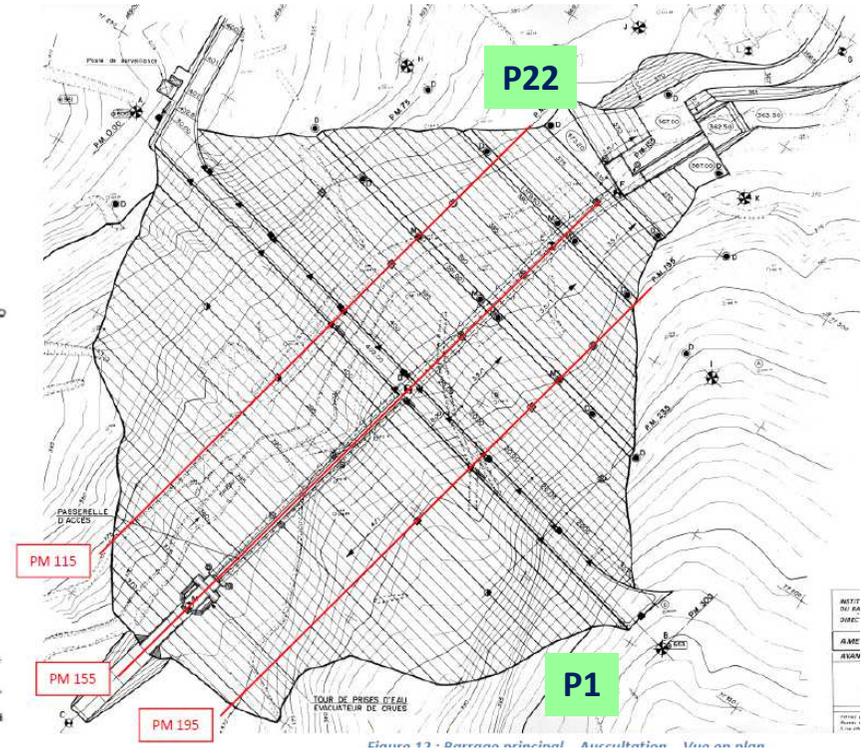
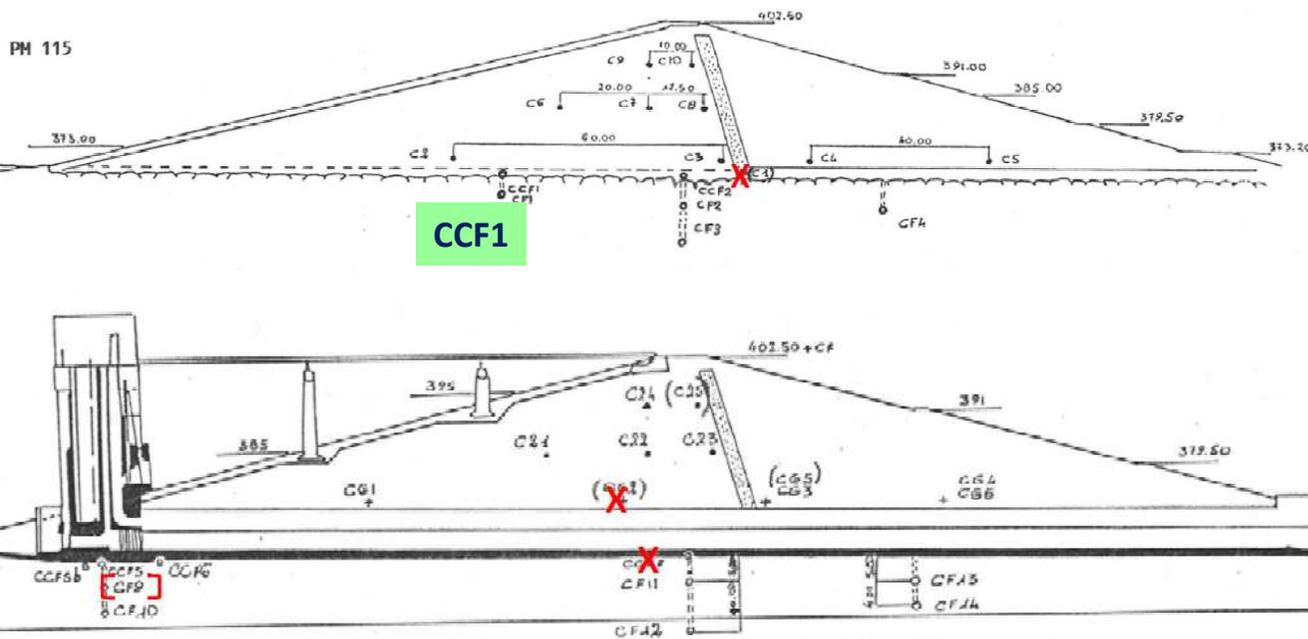
HST analysis (over the whole period)

Analyse HST (sur toute la période)

CIGB-ICOLD Marseille 2022 - Analysis methods of dam
monitoring data - 27/05/2022

Case study

Cas d'étude



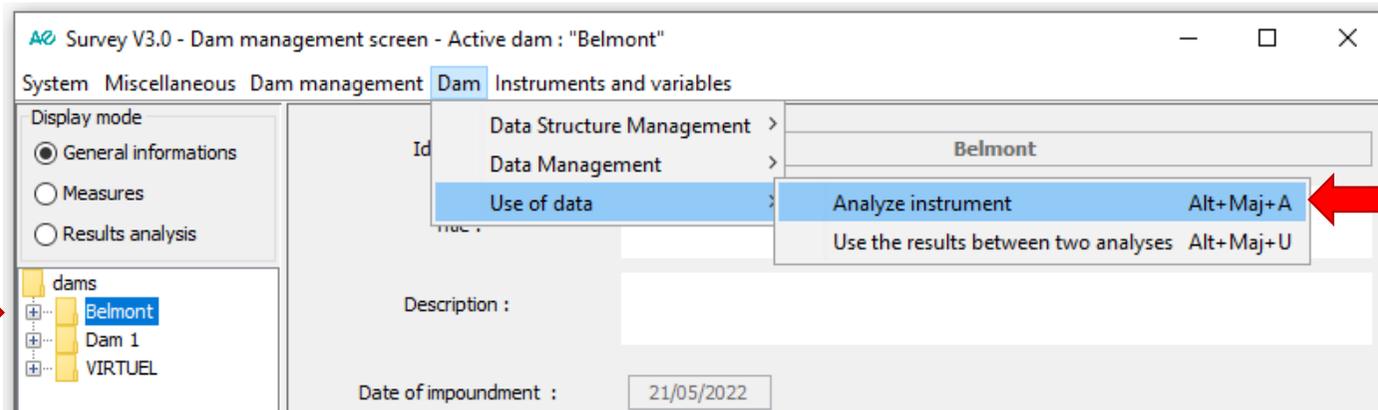
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HST analysis (over the whole period)

Analyse HST (sur toute la période)

1
Choose a dam



2
Analyse
instrument

HST analysis (over the whole period)

Analyse HST (sur toute la période)

Choose CCF 1



Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Selection of instruments

Instrument(s) :	Installation	Regression	First measure	Last measure	Nb measures
C 2			31/01/1985	31/12/2021	557
C 5			31/01/1985	31/12/2021	557
CCF 1			31/01/1985	31/12/2021	559
CCF 5			31/01/1985	31/12/2021	559
CCF 5 bis			31/01/1985	31/12/2021	559
CF 1			31/01/1985	31/12/2021	557
CF 10			31/01/1985	31/12/2021	559
CF 11			28/02/1997	31/12/2021	405
CF 12			31/01/1985	31/12/2021	559
CF 13			31/01/1985	31/12/2021	559
CF 14			31/01/1985	31/12/2021	559
CF 2			31/01/1985	31/12/2021	557
CF 3			31/01/1985	31/12/2021	557
CF 5			31/01/1985	31/12/2021	559
CF 7			31/01/1985	31/12/2021	559
CF 9			31/01/1985	31/12/2021	559
Piezo 1			14/11/1984	31/12/2021	504
Piezo 16			14/11/1984	31/12/2021	503
Piezo 19			14/11/1984	31/12/2021	501
Piezo 2			14/11/1984	31/12/2021	504
Piezo 21			14/11/1984	31/12/2021	503
Piezo 22			14/11/1984	31/12/2021	502
Piezo 4			14/11/1984	31/12/2021	463
Piezo 5			14/11/1984	31/12/2021	455
RAIN			01/02/1987	13/04/2022	12668

Previous Next Save Close

HST analysis (over the whole period)

Analyse HST (sur toute la période)

Choose HST

**Analysis period
01/01/1985**

**Activate these
three options**

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Parameters of the analysis (1/2)

Nature of the desired adjustment : Model without rain (H+S+T)

Start date : 01/01/1985 End date : 21/05/2022

Output of results : y-Extrait\V3.0\SURVEY_V3.0_EN\db\analysis\Belmont-21-05-2022-13-36-07.zip Browse...

Edit the table of actual measurements

Calculate and edit the 95% confidence interval

Draw the theoretical curve $F(t)$ on the constant condition graphs

Previous Next Save Close

HST analysis (over the whole period)

Analyse HST (sur toute la période)

Try the default values

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Parameters of the analysis (2/2)

Select the explanatory variables (according to the stepwise process)

Fisher-Snedecor entry threshold : 4,000

Fisher-Snédecór output threshold : 4,000

Pre-select drift terms

Fisher-Snedecor entry threshold : 4,000

Fisher-Snédecór output threshold : 4,000

Previous Next Save Close

Computations are finished

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Execution of calculations

CCF 1

Instruments	Nasous	Duration	Beginning	End	No. of values	R2	MOYCOT
Instrument analysis<CCF 1>							
... Generation GENERAL.PAR							
... Generation REGRESSI.TXT							
... Generation ANSWER.txt							
... Regression calculation							
... Reading RESULTAT.REG							

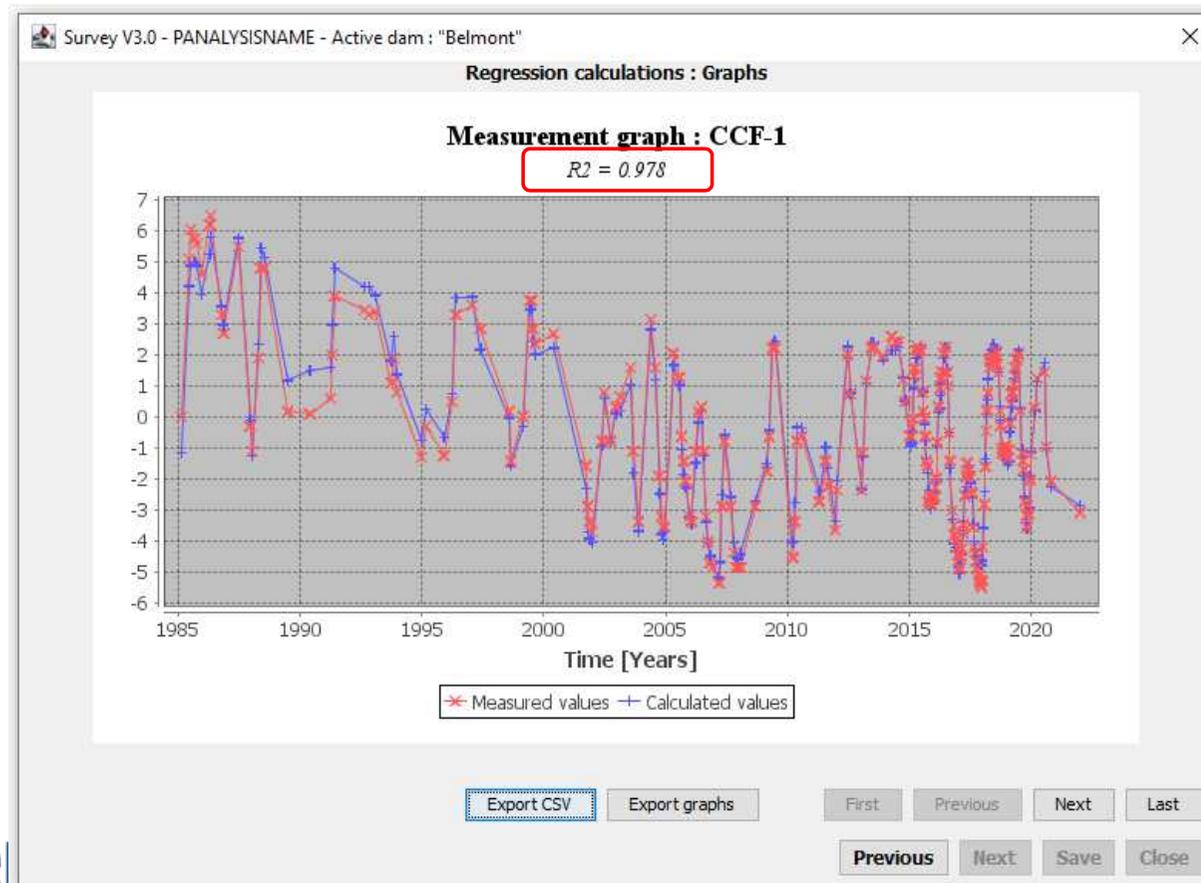
Previous Next Save Close

HST analysis (over the whole period)

Analyse HST (sur toute la période)

**Comparison graph
between:**

- **measured values**
- **calculated values**



INRAE



monitoring data - 27/05/2022

14

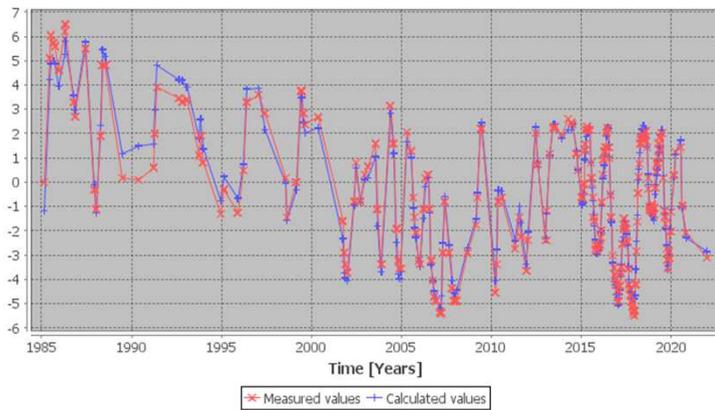
Cfbr
comité français
des barrages
et réservoirs

HST analysis (over the whole period)

Analyse HST (sur toute la période)

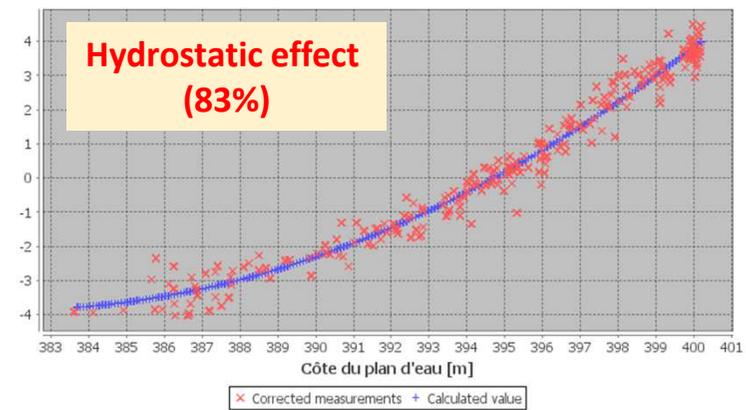
Measurement graph : CCF-1

$R^2 = 0.978$



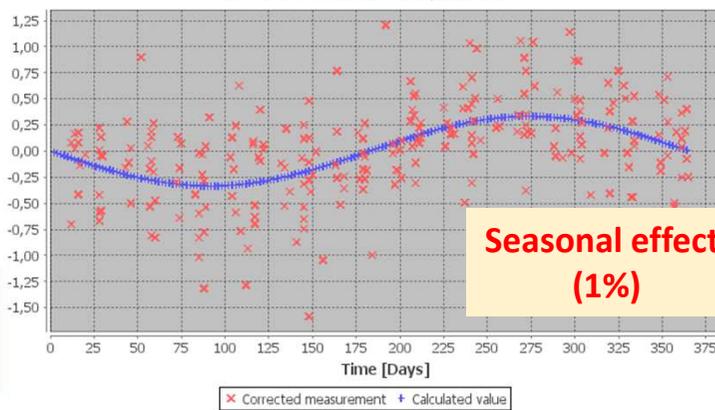
Analysis of the effects of the variation of the water body : CCF-1

$R^2 = 0.978$ / Contribution to R^2 (in%): 82.62



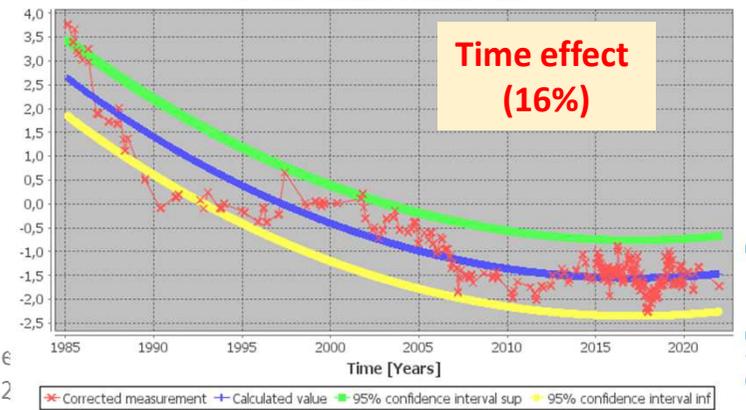
Seasonal Analysis : CCF-1

$R^2 = 0.978$ / Contribution to R^2 (in%): 0.65



Constant condition analysis : CCF-1

$R^2 = 0.978$ / Contribution to R^2 (in%): 16.72



Marseille 2022 - Analysis monitoring data - 27/05/202



HST analysis (over the whole period)

Analyse HST (sur toute la période)

Survey V3.0 - Instrument management/variables screen. - Active dam : "Belmont"

System Miscellaneous Dam management Dam Instruments and variables

Display mode
 General informations
 Measures
 Results analysis

Belmont
 ● C 2
 ● C 5
 ● CCF 1
 ● CCF 5
 ● CCF 5 bis
 ● CF 1
 ● CF 10
 ● CF 11
 ● CF 12
 ● CF 13
 ● CF 14
 ● CF 2
 ● CF 3
 ● CF 5
 ● CF 7
 ● CF 9
 ● Piezo 1
 ● Piezo 16
 ● Piezo 19
 ● Piezo 2

Data relating to a regression calculation of type

Instrument : Title :

Analysis done on : on : value(s)
 Found between : and the : or a duration of : day(s)
 R2 coefficient :

Average : Standard deviation : (m)
 level :

Regression equation (reduced levels and times) :

<input type="text" value="-11,9912"/>							
+ <input type="text" value="0,0000"/>	x	T	+ <input type="text" value="2,1876"/>	x	EXP(T)	+ <input type="text" value="12,4493"/>	x EXP(-T)
+ <input type="text" value="-0,3330"/>	x	SIN	+ <input type="text" value="0,0000"/>	x	COS	+ <input type="text" value="0,0000"/>	x SICO
+ <input type="text" value="0,0000"/>	x	SIN2	+ <input type="text" value="2,6205"/>	x	Z	+ <input type="text" value="0,4434"/>	x Z2
+ <input type="text" value="0,0000"/>	x	Z3	+ <input type="text" value="0,0000"/>	x	Z4	+ <input type="text" value="0,0000"/>	x P1
+ <input type="text" value="0,0000"/>	x	Z2	+ <input type="text" value="0,0000"/>	x	P3	+ <input type="text" value="0,0000"/>	x P4
+ <input type="text" value="0,0000"/>	x	P56	+ <input type="text" value="0,0000"/>	x	P78		

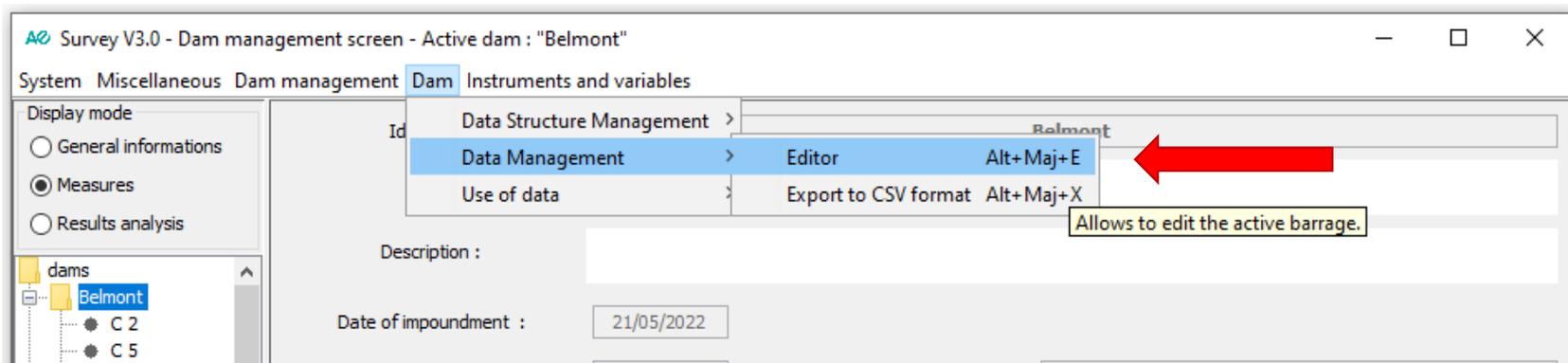
Model parameters after multivariate regression analysis

Merging graphs

Fusionner des graphiques

2
Editor

1
Choose
a dam



Merging graphs

Fusionner des graphiques

Choose CCF 1 and Z
Click “Edition”

Number	Identfier	Title	Nature	Type	Input group
1/26	CCF 5 bis	CAPCCF 5 bis	I		
2/26	Piezo 19	Piezo D 19	I		
3/26	Piezo 16	Piezo D 16	I		
4/26	CF 14	CAPCF 14	I		
5/26	Piezo 22	Piezo D 22	I		
6/26	Piezo 5	Piezo D 5	I		
7/26	Piezo 21	Piezo D 21	I		
8/26	Piezo 4	Piezo D 4	I		
9/26	Piezo 2	Piezo D 2	I		
10/26	C 2	CAPC 2	I		
11/26	Piezo 1	Piezo D 1	I		
12/26	C 5	CAPC 5	I		
13/26	Z	Water level	V		
14/26	CF 9	CAPCF 9	I		
15/26	CF 7		I		
16/26	CF 5		I		
17/26	CF 3	CAPCF 3	I		
18/26	CF 2	CAPCF 2	I		
19/26	CF 1	CAPCF 1	I		
20/26	CF 10	CAPCF 10	I		
21/26	CF 11	CAPCF 11	I		
22/26	CF 12	CAPCF 12	I		
23/26	CF 13	CAPCF 13	I		
24/26	RAIN	Daily rain	V		
25/26	CCF 5	CAPCCF 5	I		
26/26	CCF 1	CAPCCF 1	I		

Click “Merge graphs”

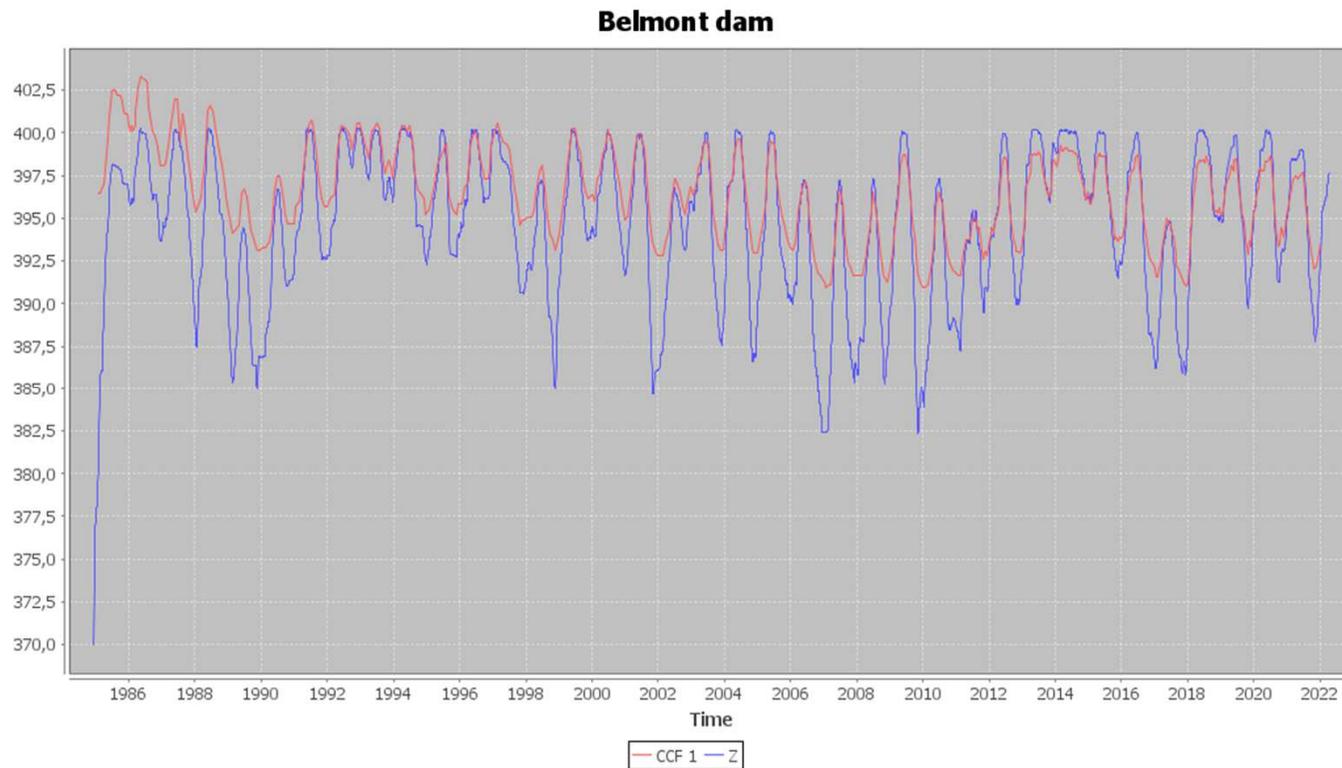
Date	Z	CCF 1
11/12/1984	370,000	
12/12/1984		
13/12/1984		
14/12/1984		
15/12/1984	373,260	
16/12/1984		
17/12/1984		
18/12/1984		
19/12/1984	375,650	
20/12/1984		
21/12/1984		
22/12/1984		
23/12/1984	376,370	
24/12/1984		
25/12/1984		
26/12/1984		
27/12/1984	376,900	
28/12/1984		
29/12/1984		
30/12/1984		
31/12/1984	377,180	
01/01/1985		
02/01/1985		
03/01/1985		

Choose CCF 1 and Z
Click “Next”

Number	Identfier	Title	Nature	Type	Input group
1/2	Z	Water level	V		
2/2	CCF 1	CAPCCF 1	I		

Merging graphs

Fusionner des graphiques



HST analysis (over a selected period)

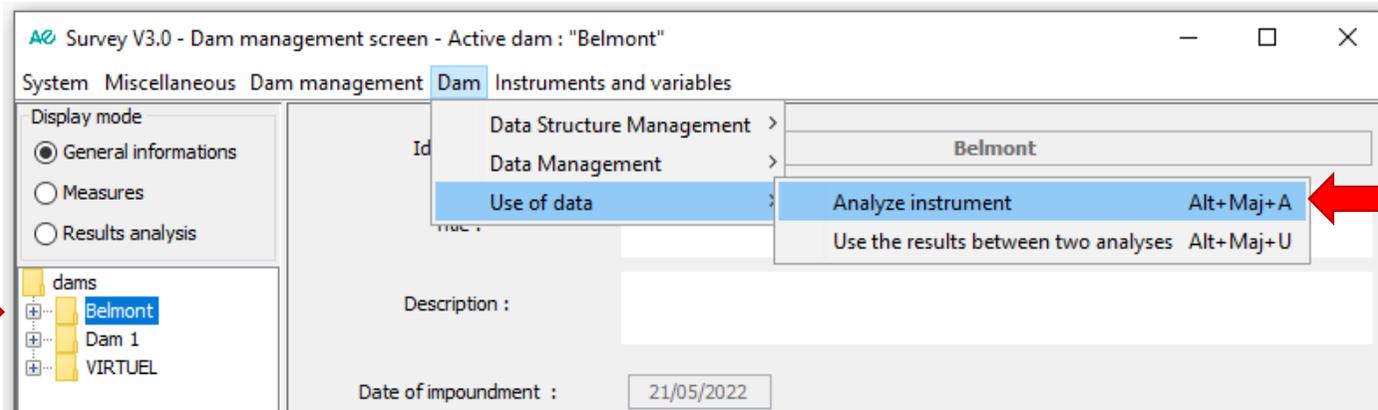
Analyse HST (sur une période sélectionnée)

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monitoring data - 27/05/2022

HST analysis (over a selected period)

Analyse HST (sur une période sélectionnée)

1
Choose a dam



2
Analyse
instrument

3
Choose CCF 1



Instrument(s)	Installation	Regression	First measure	Last measure	Nb measures
C 2			31/01/1985	31/12/2021	557
C 5			31/01/1985	31/12/2021	557
CCF 1			31/01/1985	31/12/2021	559
CCF 5			31/01/1985	31/12/2021	559
CCF 5 bis			31/01/1985	31/12/2021	559
CF 1			31/01/1985	31/12/2021	557
CF 10			31/01/1985	31/12/2021	559
CF 11			28/02/1997	31/12/2021	405
CF 12			31/01/1985	31/12/2021	559
CF 13			31/01/1985	31/12/2021	559
CF 14			31/01/1985	31/12/2021	559
CF 2			31/01/1985	31/12/2021	557
CF 3			31/01/1985	31/12/2021	557
CF 5			31/01/1985	31/12/2021	559
CF 7			31/01/1985	31/12/2021	559



HST analysis (over a selected period)

Analyse HST (sur une période sélectionnée)

Choose HST

Analysis period:
From 01/01/2000

Activate these
three options

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Parameters of the analysis (1/2)

Nature of the desired adjustment :

Start date : End date :

Output of results :

Edit the table of actual measurements

Calculate and edit the 95% confidence interval

Draw the theoretical curve $F(t)$ on the constant condition graphs

Try the default values

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Parameters of the analysis (2/2)

Select the explanatory variables (according to the stepwise process)

Fisher-Snedecor entry threshold :

Fisher-Snedecor output threshold :

Pre-select drift terms

Fisher-Snedecor entry threshold :

Fisher-Snedecor output threshold :

Computations are finished

Survey V3.0 - PANALYSISNAME - Active dam : "Belmont"

Regression calculations : Execution of calculations

CCF: 1

Instruments	Nasous	Duration	Beginning	End	No. of values	R2	MOYCOT
Instrument analysis-CCF 1->							
...Generation GENERAL.PAR							
...Generation REGRESSI.TXT							
...Generation ANSWER.txt							
...Regression calculation							
...Reading RESULTAT.REG							

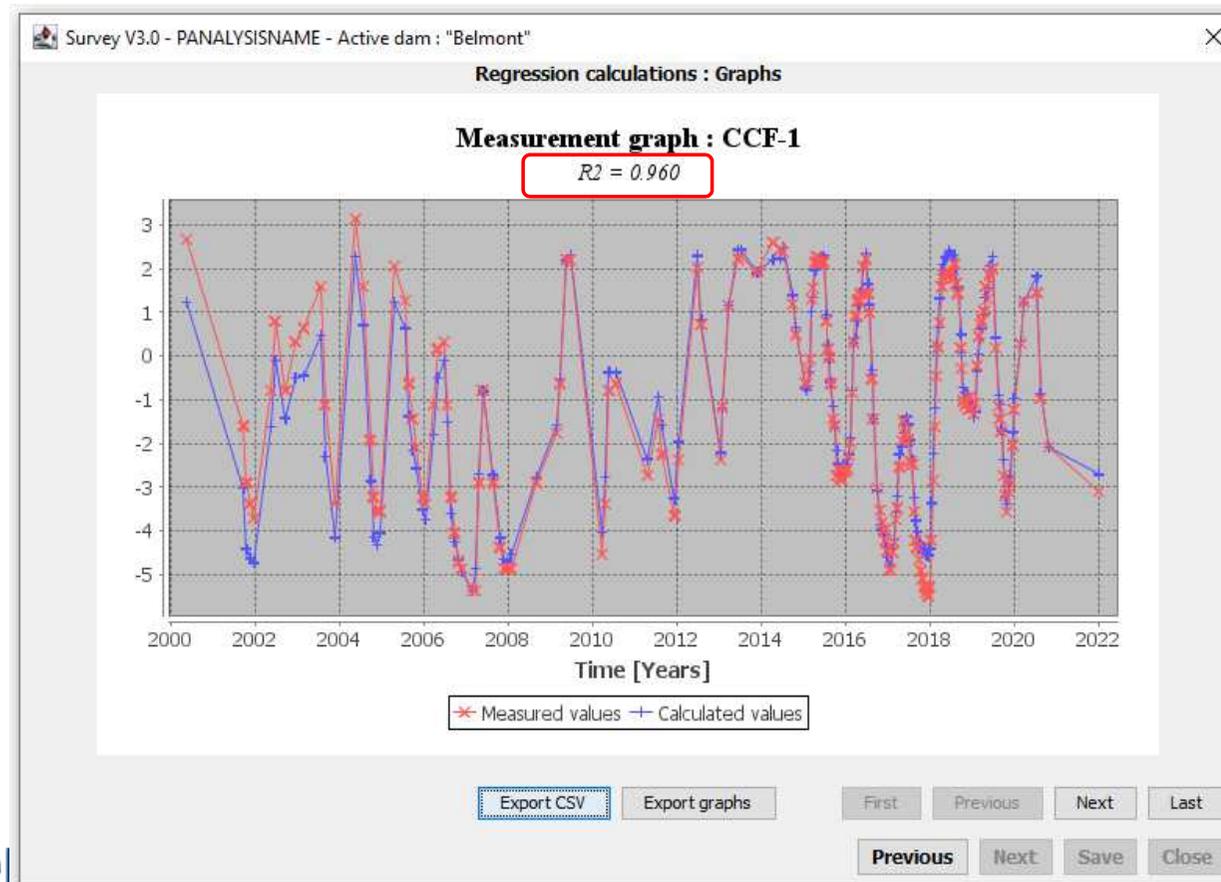


HST analysis (over a selected period)

Analyse HST (sur une période sélectionnée)

Comparison graph between:

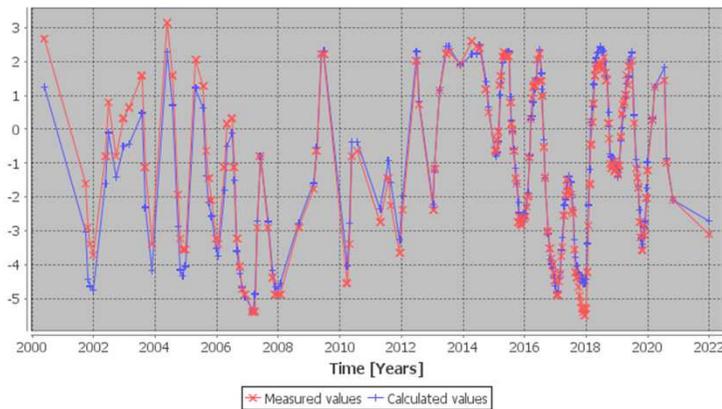
- **measured values**
- **calculated values**



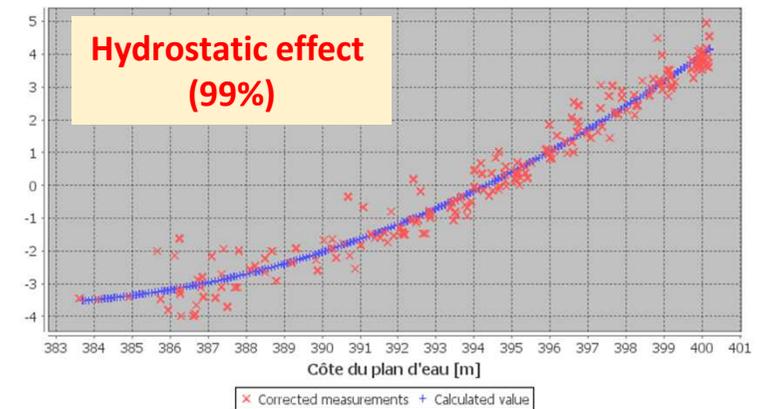
HST analysis (over a selected period)

Analyse HST (sur une période sélectionnée)

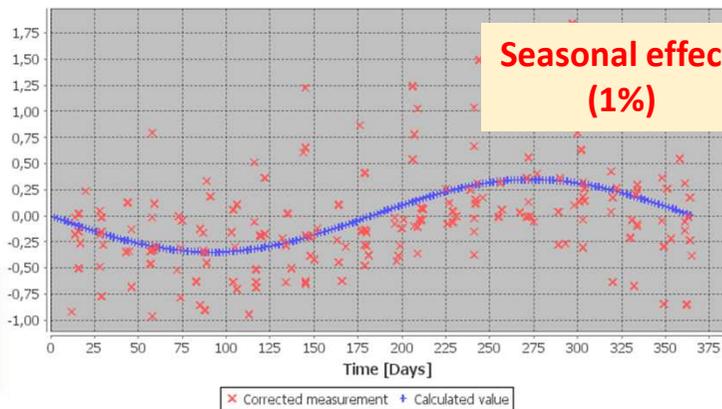
Measurement graph : CCF-1
R2 = 0.960



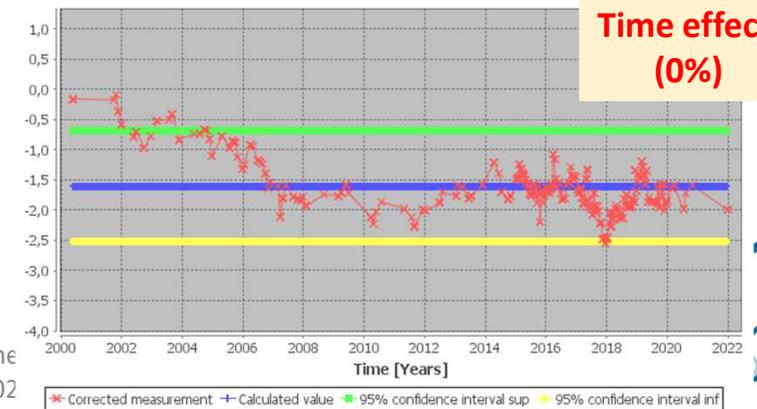
Analysis of the effects of the variation of the water body : CCF-1
R2 = 0.960 / Contribution to R2 (m%): 99.04



Seasonal Analysis : CCF-1
R2 = 0.960 / Contribution to R2 (m%): 0.95



Constant condition analysis : CCF-1
R2 = 0.960 / Contribution to R2 (m%): 0.00E+00



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Import data from a CSV file (EXCEL)

Importer les données d'un fichier CSV (EXCEL)

Import data from a CSV file (EXCEL)

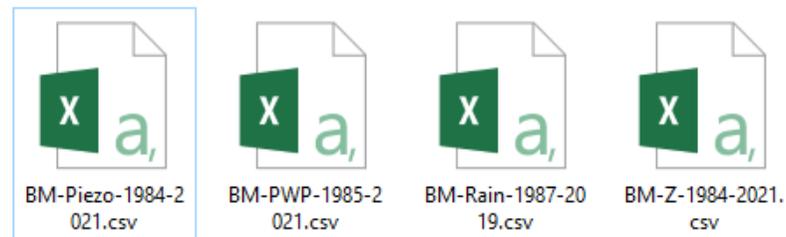
Importer les données d'un fichier CSV (EXCEL)

	A	B	C	D	E	F					
1	Identificateu	Titre	Zv	Zn	Zp		<div style="background-color: yellow; padding: 5px;"> First table for the Dam. 5 columns: Identifier, Title, Minimum, Nominal and Maximum water level </div>				
2	BM dam	BM dam	350	400	402						
3											
4	Identificateu	Titre	Vref				<div style="background-color: lightblue; padding: 5px;"> Second table for the monitoring Instruments. 3 columns: Identifier, Title, and Reference value </div>				
5	Piezo 1	Piezo D 1	392,5								
6	Piezo 2	Piezo D 2	378,59								
7	Piezo 4	Piezo D 4	371,89								
8	Piezo 5	Piezo D 5	366,5								
9	Piezo 16	Piezo D 16	369,74								
10	Piezo 19	Piezo D 19	390,07								
11	Piezo 21	Piezo D 21	379,28								
12	Piezo 22	Piezo D 22	375,57								
13											
14	DATE	Z	Piezo 1	Piezo 2	Piezo 4	Piezo 5	Piezo 16	Piezo 19	Piezo 21	Piezo 22	<div style="background-color: lightgreen; padding: 5px;"> Third table for the monitoring Data. N+2 columns: Date Z (reservoir water level) N instruments </div>
15	14/11/1984		392,5	378,59	371,89	366,5	369,74	390,07	379,28	375,57	
16	12/12/1984		392,76	378,58	371,89	365,98	369,7	389,86	379,3	375,63	
17	27/12/1984		392,51	378,55	371,89	367,3	368,65	389,52	379	374,52	
18	04/01/1985		392,5	378,63	371,89	367,32	368,52	389,29	377,09	374,31	
19	11/01/1985		392,46	378,69	371,89	367	368,36	389,03	376,83	374,06	
20	18/01/1985		392,58	378,68	371,89	367,05	368,38	389,08	376,99	373,93	
21	24/01/1985		392,63	379,24	371,89	367,15	371,94	389,39	376,83	373,95	
22	31/01/1985		392,56	379,16	374,05	367,28	371,89	389,28	376,74	374,01	
23	08/02/1985		392,5	379,22	371,89	367,3	370,87	389,43	377,35	374,16	
24	14/02/1985		392,59	379,2	372,63	367,32	370,84	389,56	377,66	374,41	
25	22/02/1985		392,58	379,19	371,9	367,28	370,75	389,75	378,14	375,23	

Import data from a CSV file (EXCEL)

Importer les données d'un fichier CSV (EXCEL)

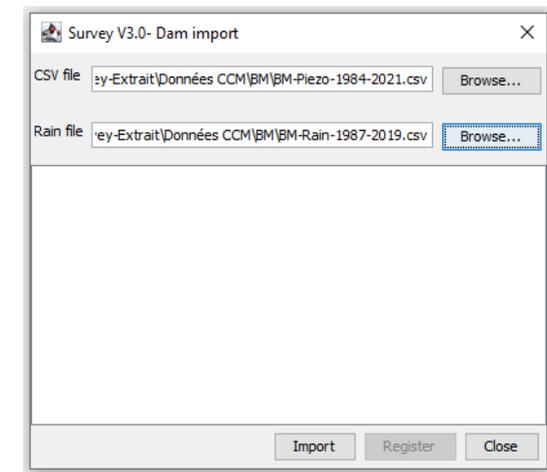
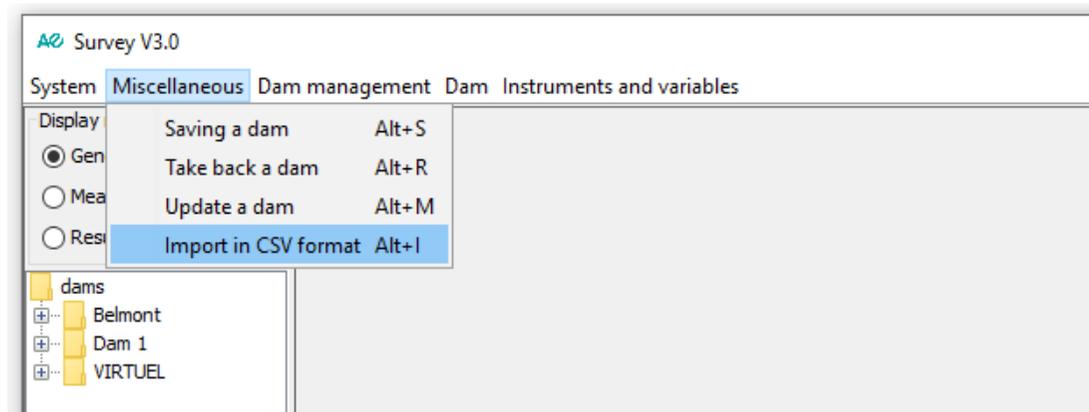
- More complex cases: different kind of instruments, rain, ...
 - Example: Piezometers; PWP cells; Rain; Z (water level)



Import data from a CSV file (EXCEL)

Importer les données d'un fichier CSV (EXCEL)

- Import an instrument set: Piezo and Rain



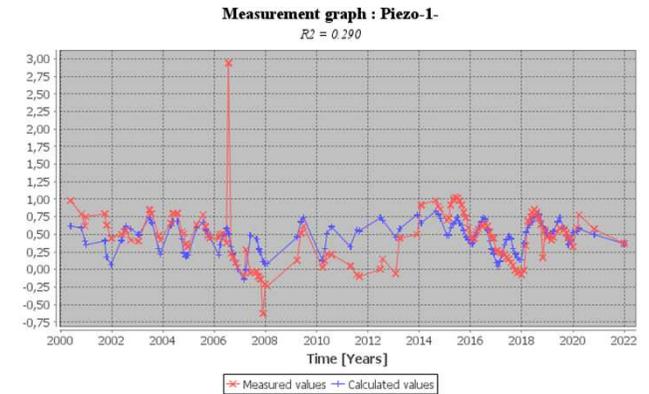
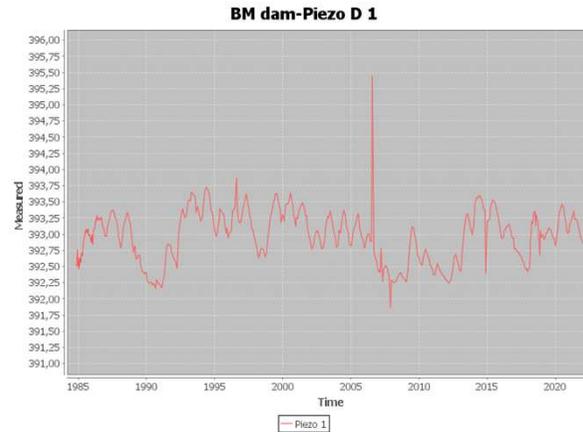
- Repeat for: PWP cells
- Repeat for: Z

HST analysis (with a wrong value)

Analyse HST (avec une valeur erronée)

R2: 0,29

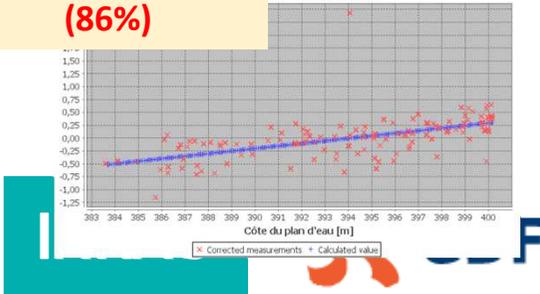
Choose Piezo 1



HST
Analysis period: From 01/01/2000
Ou 01/01/2010

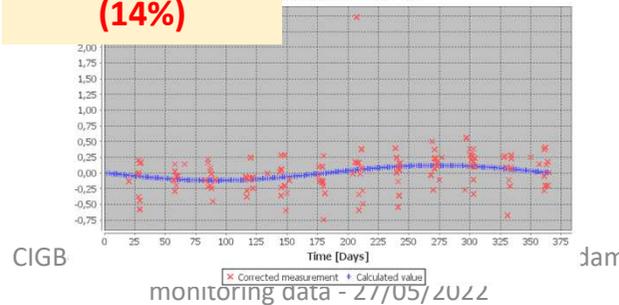
Hydrostatic effect (86%)

Variation of the water body : Piezo-1-
 Contribution to R2 (m%) 85.84



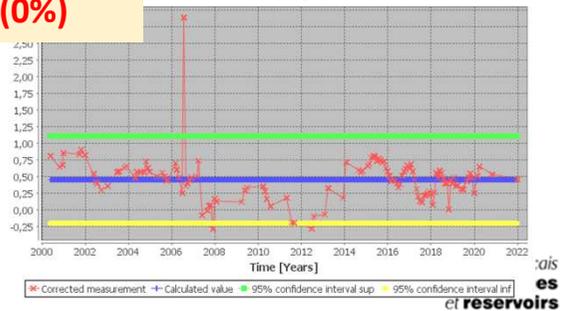
Seasonal effect (14%)

Seasonal Analysis : Piezo-1-
 Contribution to R2 (m%) 14.15



Time effect (0%)

Constant condition analysis : Piezo-1-
 R2 = 0.290 / Contribution to R2 (m%) 0.00E+00



Edition / correction of measurements

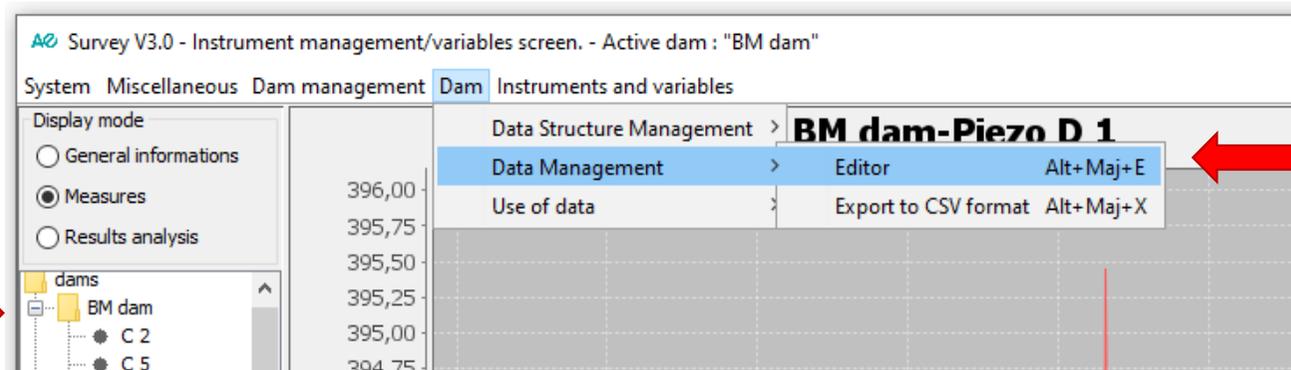
Edition / correction des mesures

CIGB-ICOLD Marseille 2022 - Analysis methods of dam
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Edition / correction of measurements

Edition / correction des mesures

1
Choose a dam



2
Dam /
Data
management /
Editor

3
Choose Piezo 1

Number	Identifier	Title	Nature	Type	Input group
13/26	Z	Water level	V		
24/26	RAIN	Daily rain	V		
6/26	Piezo 5	Piezo D 5	I		
8/26	Piezo 4	Piezo D 4	I		
4/26	Piezo 22	Piezo D 22	I		
7/26	Piezo 21	Piezo D 21	I		
9/26	Piezo 2	Piezo D 2	I		
2/26	Piezo 19	Piezo D 19	I		
3/26	Piezo 16	Piezo D 16	I		
10/26	Piezo 1	Piezo D 1	I		
14/26	CF 9	CAPCF 9	I		
15/26	CF 7		I		
16/26	CF 5		I		
17/26	CF 3	CAPCF 3	I		

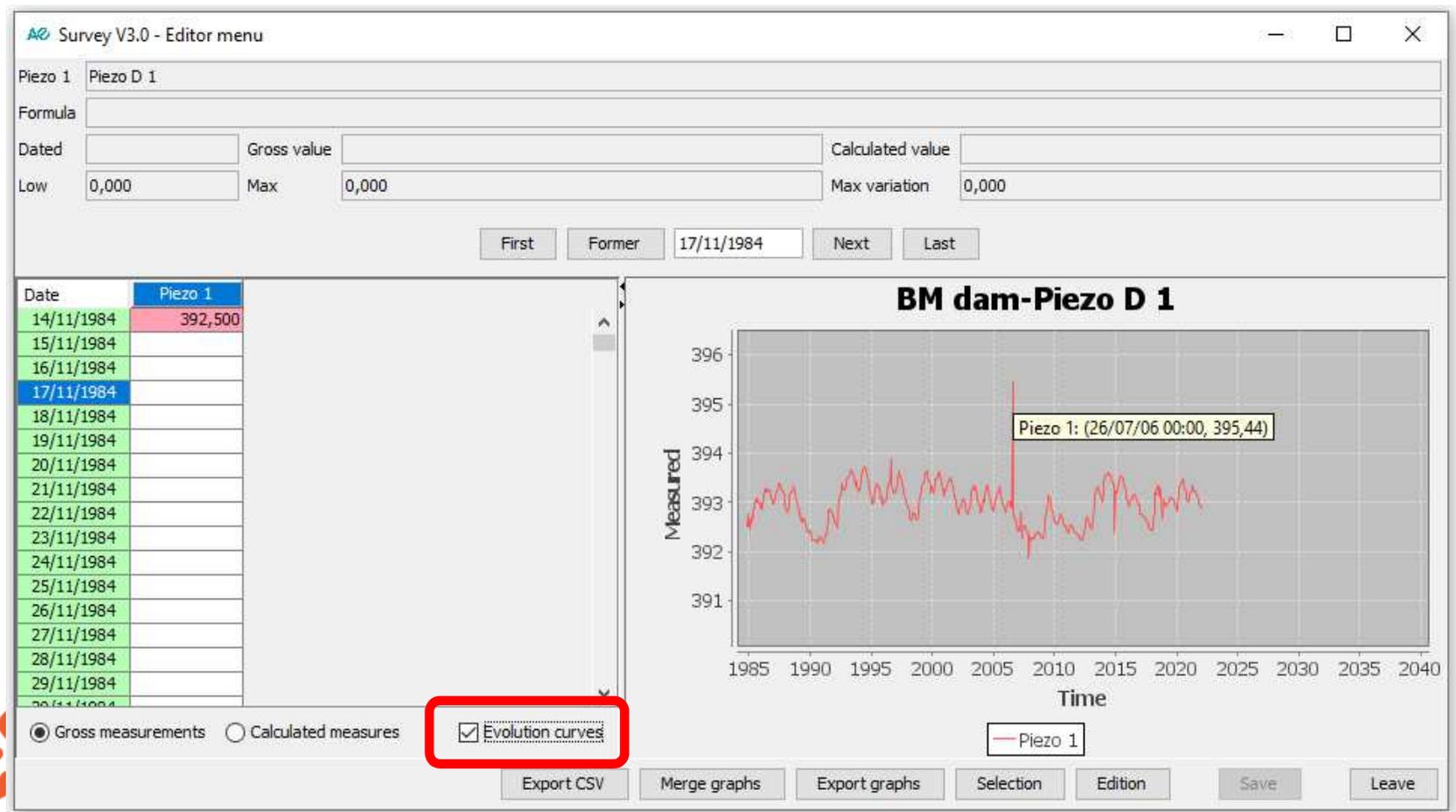


Edition / correction of measurements

Edition / correction des mesures

Click on
“Evolution
curves” to see
the graph

Find de
period/date on
the graph



Edition / correction of measurements

Edition / correction des mesures

Put 26/07/2006

and/or

Find and delete the erroneous measure in the table

The screenshot shows the 'Survey V3.0 - Editor menu' interface. At the top, the 'Piezo 1' section is set to 'Piezo D 1'. Below this, there are fields for 'Dated' (26/07/2006), 'Gross value' (395,440), 'Calculated value' (395,440), 'Low' (0,000), 'Max' (0,000), and 'Max variation' (0,000). A navigation bar includes buttons for 'First', 'Former', 'Next', and 'Last', with a date input field set to '26/07/2006'. Below the navigation bar is a table with columns 'Date' and 'Piezo 1'. The table contains dates from 15/07/2006 to 31/07/2006. The row for 26/07/2006 is highlighted in blue and contains the value 395,440. To the right of the table is a line graph titled 'BM dam-Piezo D 1' showing 'Measured' values over 'Time' from 1985 to 2040. A red line represents the data, with a specific point labeled 'Piezo 1: (26/07/06 00:00, 395,44)'. At the bottom, there are radio buttons for 'Gross measurements' (selected), 'Calculated measures', and a checked checkbox for 'Evolution curves'. Navigation buttons at the bottom include 'Export CSV', 'Merge graphs', 'Export graphs', 'Selection', 'Edition', 'Save', and 'Leave'.



Edition / correction of measurements

Edition / correction des mesures

Delete the erroneous measure in the table

Save and Leave

Survey V3.0 - Editor menu

Piezo 1 Piezo D 1

Formula

Dated

Gross value

Calculated value

Low 0,000 Max 0,000 Max variation 0,000

First Former 26/07/2006 Next Last

Date	Piezo 1
15/07/2006	
16/07/2006	
17/07/2006	
18/07/2006	
19/07/2006	
20/07/2006	
21/07/2006	
22/07/2006	
23/07/2006	
24/07/2006	
25/07/2006	
26/07/2006	
27/07/2006	
28/07/2006	
29/07/2006	
30/07/2006	
31/07/2006	

BM dam-Piezo D 1

Measured

Time

— Piezo 1

Gross measurements Calculated measures Evolution curves

Export CSV Merge graphs Export graphs Selection Edition Save Leave

INRAE

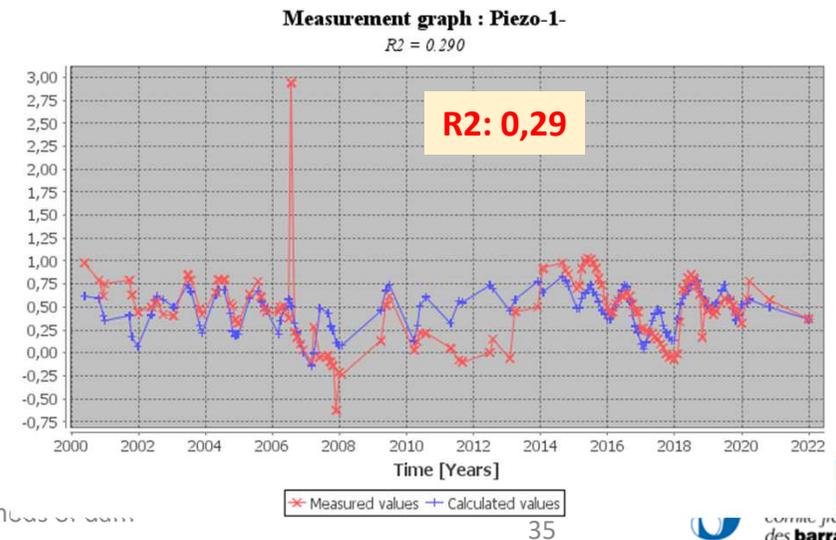
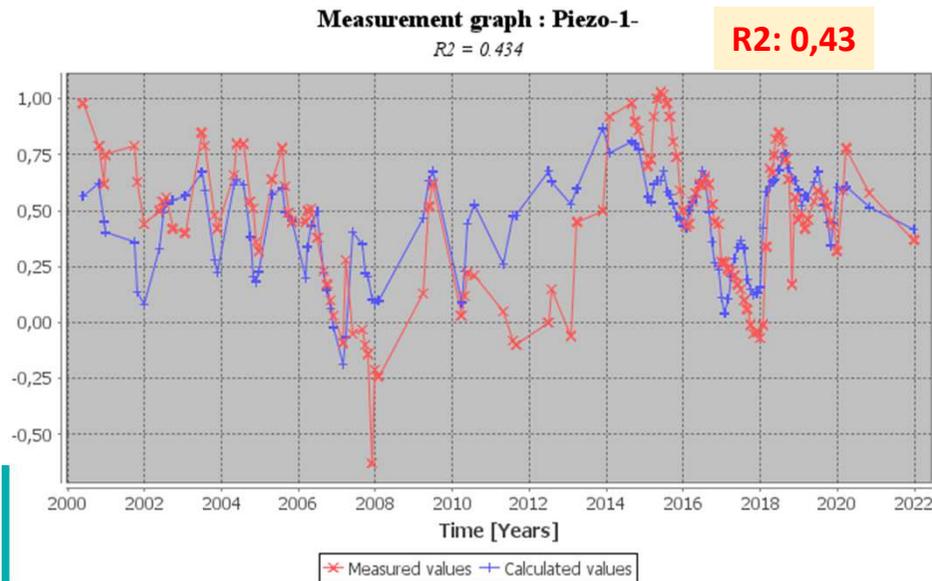
HST analysis (with corrected data)

Analyse HST (avec données corrigées)

Choose Piezo 1

HST

Analysis period: From 01/01/2000



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monitoring data - 27/05/2022

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HST-Rain analysis

Analyse HST-Pluie

French version

 SURVEY_V3.0_EN

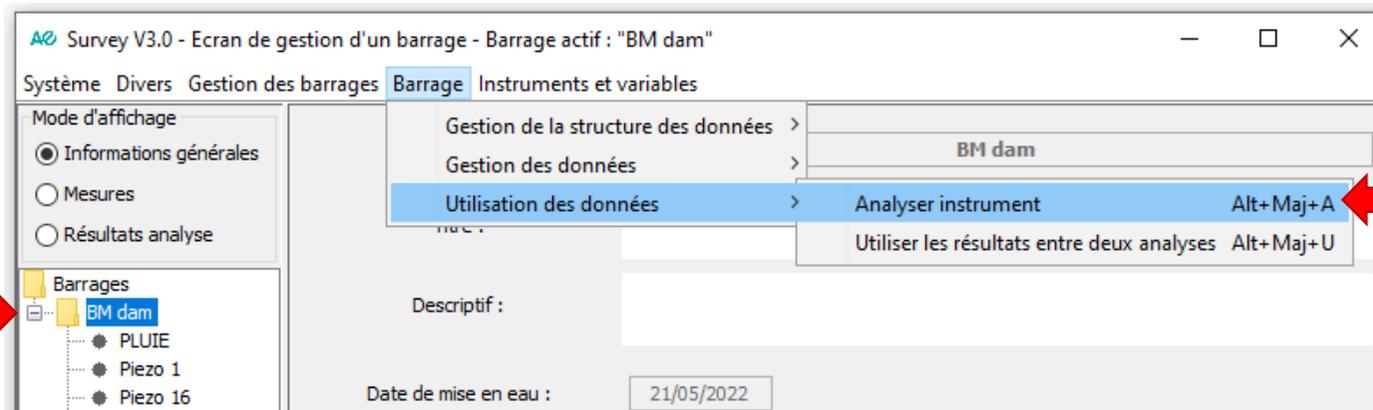
 SURVEY_V3.0_FR

HST-Rain analysis

French version

Analyse HST-Pluie

1
Choose a dam



2
Analyse
instrument

3
Choose Piezo 22

The screenshot shows the 'Calculs de régression : Sélection des instruments' dialog box. A table lists various instruments with their installation dates, regression status, and measurement counts. The 'Piezo 22' row is highlighted in blue. A red box highlights the 'Instrument(s)' label and the 'Identificateur' column header.

Instrument(s)	Identificateur	Installation	Regression	Première mesure	Dernière mesure	Nb mesures
	Piezo 1			14/11/1984	31/12/2021	504
	Piezo 16			14/11/1984	31/12/2021	503
	Piezo 19			14/11/1984	31/12/2021	501
	Piezo 2			14/11/1984	31/12/2021	504
	Piezo 21			14/11/1984	31/12/2021	503
	Piezo 22			14/11/1984	31/12/2021	502
	Piezo 4			14/11/1984	31/12/2021	463
	Piezo 5			14/11/1984	31/12/2021	455
	PLUIE			01/02/1987	13/04/2022	12668
	Z			11/12/1984	10/04/2022	3976



monitoring data - 27/05/2022



HST-Rain analysis

Analyse HST-Pluie

French version

Choose HST-P

Analysis period:
From 01/01/1985

Activate these
three options

Survey V3.0 - PANALYSISNAME - Barrage actif : "BM dam"

Calculs de régression : Paramètres de l'analyse (1/2)

Nature de l'ajustement désiré :

Date de début : Date de fin :

Sortie des résultats :

Editer le tableau des mesures effectives

Calculer et éditer l'intervalle de confiance à 95%

Tracer la courbe théorique $F(t)$ sur les graphes à conditions constantes

Try the default values

Survey V3.0 - PANALYSISNAME - Active dam : "BM dam"

Regression calculations : Parameters of the analysis (2/2)

Select the explanatory variables (according to the stepwise process)

Fisher-Snedecor entry threshold :

Fisher-Snedecor output threshold :

Pre-select drift terms

Fisher-Snedecor entry threshold :

Fisher-Snedecor output threshold :

Computations are finished

Survey V3.0 - PANALYSISNAME - Active dam : "BM dam"

Regression calculations : Execution of calculations

Piezo 19

Instruments	Nasous	Duration	Beginning	End	No. of values	R2
Instrument analysis-Piezo 19>						

... Generation GENERAL.PAR
... Generation REGRESSI.TXT
... Generation ANSWER.txt
... Regression calculation
... Reading RESULTAT.REG

INRAE



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comité français
des barrages
et réservoirs

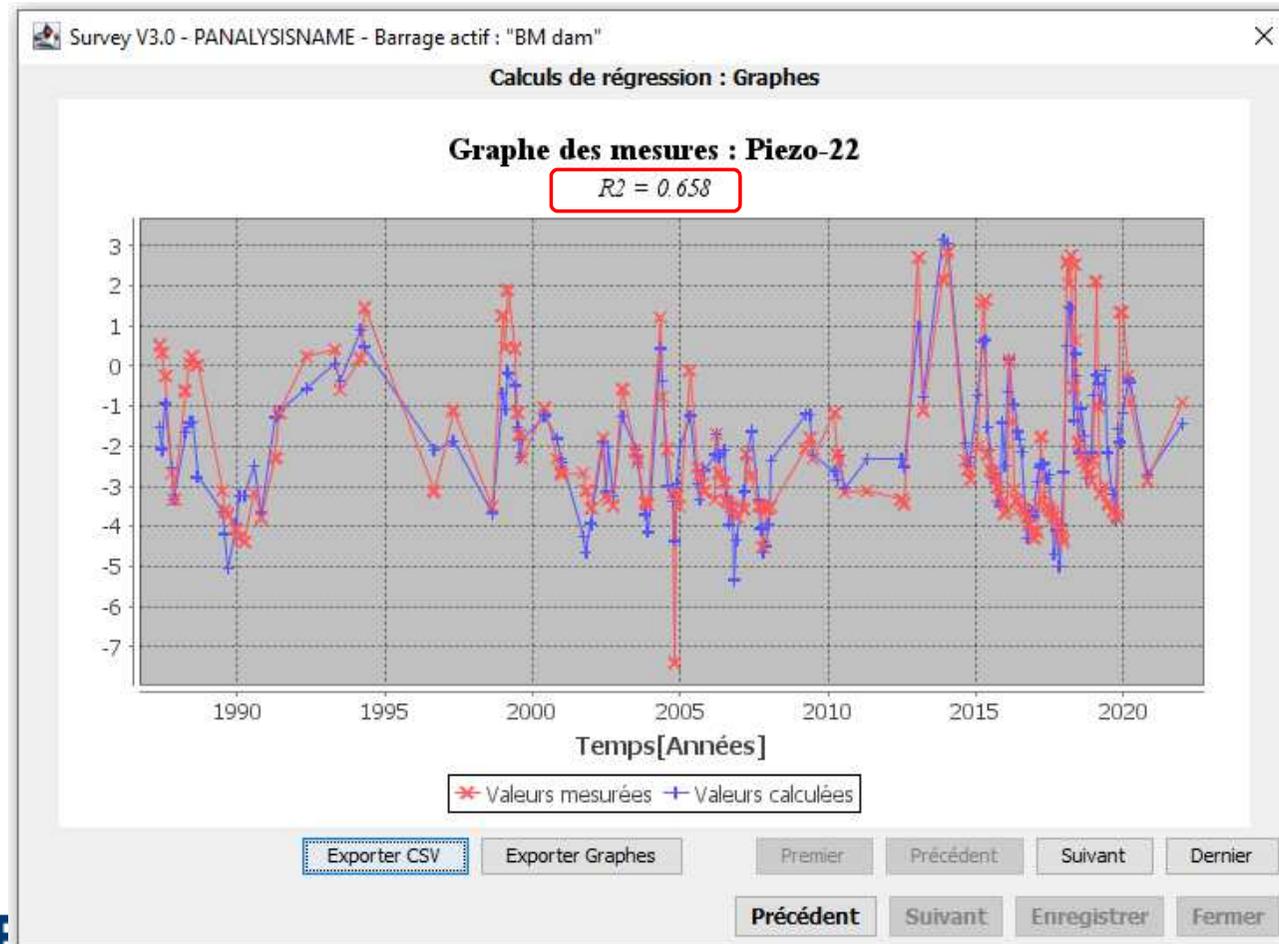
HST-Rain analysis

French version

Analyse HST-Pluie

Comparison graph
between:

- measured values
- calculated values



INRAE



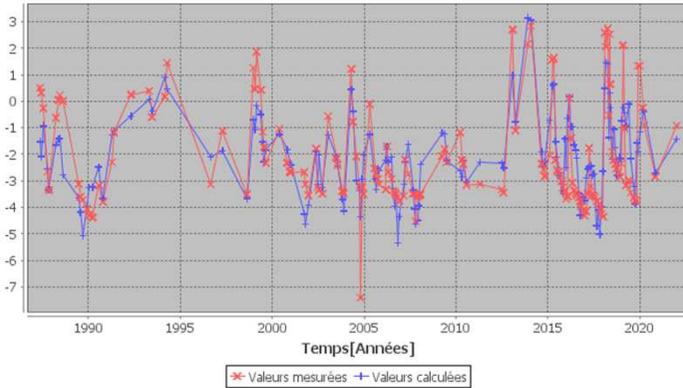
HST-Rain analysis

French version

Analyse HST-Pluie

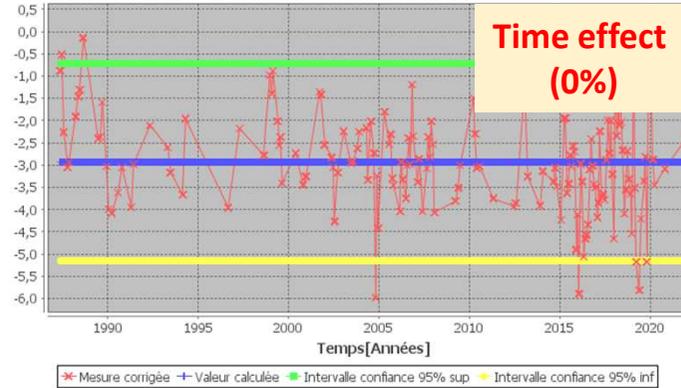
Graph des mesures : Piezo-22

$R^2 = 0.658$



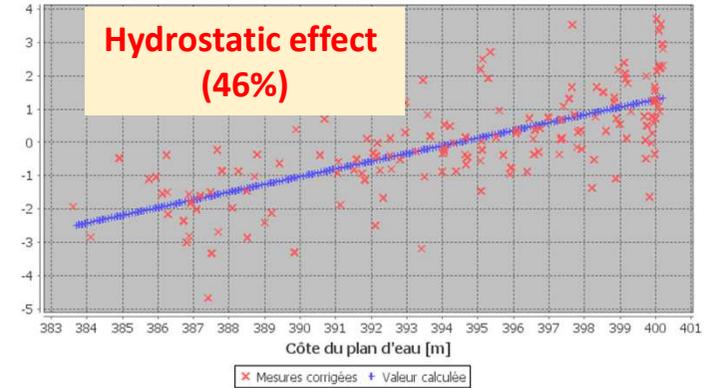
Analyse à conditions constantes : Piezo-22

$R^2 = 0.658$ / Contribution au R^2 (en %) : 0.00E+00



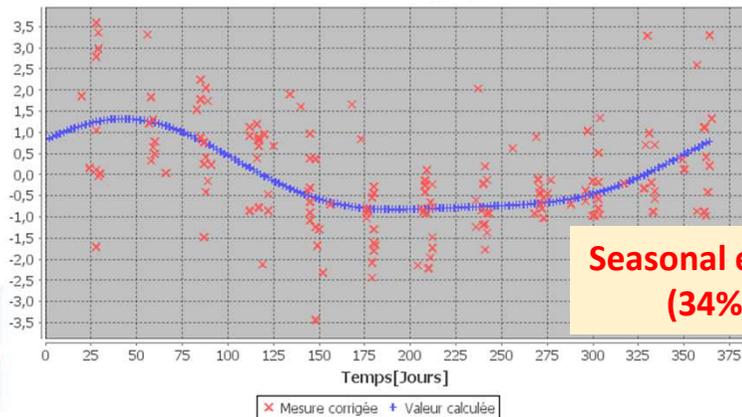
Analyse des effets de la variation du plan d'eau : Piezo-22

$R^2 = 0.658$ / Contribution au R^2 (en %) : 46.18



Analyse saisonnière : Piezo-22

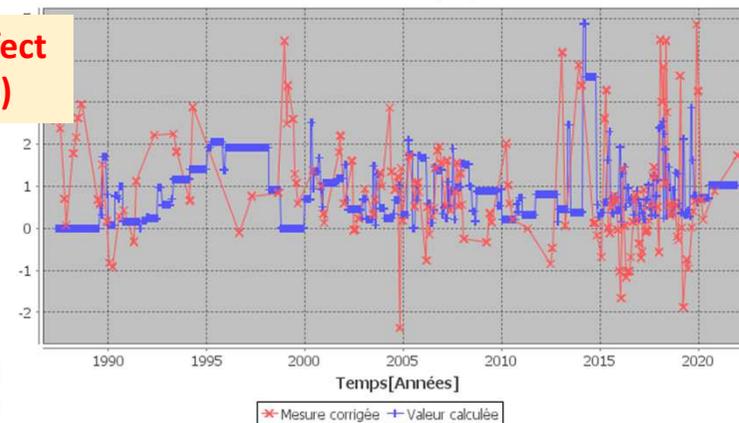
$R^2 = 0.658$ / Contribution au R^2 (en %) : 34.25



Analyse de la pluviométrie : Piezo-22

$R^2 = 0.658$ / Contribution au R^2 (en %) : 19.56

Rain effect (20%)



Marseille 2022 - Analysis monitoring data - 27/05/

