

*Caratterizzazione delle rocce di copertura e completamento dell'analisi della
fratturazione nelle rocce del potenziale reservoir.*

Allegato 4

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RISULTATI DEI DFN DELLA MINIERA

Per la galleria afflusso sono state utilizzate le scan line con le fratture/faglie principali (scan line 2-3-4-5-6 del 2015 + scan line FRATTURE PRINCIPALI GAP e GAP300m del 2016) per una lunghezza totale di 483 metri. Sono stati quindi calcolati i set (senza la correzione di terzaghi) e il P32 prendendo come riferimento la lunghezza totale. Volume avente come dimensioni 500m x 10m x 5m e con celle di 1 m³. 2 prove con diversa apertura: una con 10 mm di apertura media e una con 50 mm.

DFN con aperture media di 10 mm

Session Summary

Fracture Modelling galleria afflusso - Set 1

Input Parameters:

Input Grid: afflusso

Intensity Value: 0.11

P32: true

Length Definition is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 62.27

Orientation Param1: 80.43

Orientation Param2: 325.49

Aspect Ratio: 0.5

Aperture: (Proportional to Length) - Coefficient used = 0.00247814

Number of Fractures: 299

Fracture Modelling galleria afflusso - Set 2

Input Parameters:

Input Grid: afflusso

Intensity Value: 0.04

P32: true

Length Definition is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 19.83

Orientation Param1: 78.77

Orientation Param2: 99.07

Aspect Ratio: 0.5

Aperture: (Proportional to Length) - Coefficient used = 0.00247814

Number of Fractures: 115

Fracture Modelling galleria afflusso - Set 3

Input Parameters:

Input Grid: afflusso

Intensity Value: 0.03

P32: true



Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 20.52
Orientation Param1: 76.88
Orientation Param2: 248.96
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 80
Fracture Modelling galleria afflusso - Set 4
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.08
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 31.89
Orientation Param1: 84.3
Orientation Param2: 138.5
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 222
Fracture Modelling galleria afflusso - Set 5
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.05
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 25.33
Orientation Param1: 79.33
Orientation Param2: 48.05
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 137
Fracture Modelling galleria afflusso - Set 6
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.07
P32: true

Length Definition is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 43.51
Orientation Param1: 80.6
Orientation Param2: 298.9
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 197
Output Grid: afflusso
Generated Properties: Min Value Max Value
Frac_Session1_Porosity 0 0.119595
Frac_Session1_Permeability 0 4.11224e+06
Frac_Session1_Perm_KXX 0 2.28126e+06
Frac_Session1_Perm_KYY 0 2.4571e+06
Frac_Session1_Perm_KZZ 0 4.03132e+06
Frac_Session1_Perm_KXY -925836 1.54435e+06
Frac_Session1_Perm_KXZ -427446 374324
Frac_Session1_Perm_KYZ -384151 248820
Frac_Session1_Anisotropy 1.943 100
Frac_Session1_Perm_KB_Max 0.0504929 1.02229e+07
Frac_Session1_Perm_KB_Min 0 1.29248e+06
Frac_Session1_2D_Anisotropy 1.6598 100
Frac_Session1_P32 0 8.91064
Total Fracture Area: 8022.73 (meter-squared)
Total Fracture Volume: 116.125 (meter-cubed)
Total Model Volume: 25000 (meter-cubed)
Average Fracture Porosity: 0.004645
Average Aperture: 0.0144745 (meter)
Average DFN P32: 0.320909 (1/meter)
Run Time : 6.247 (sec)

DFN con aperture media di 50 mm

Session Summary
Fracture Modelling galleria afflusso - Set 1
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.11
P32: true
Length Definition is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:

Fisher K Param: 62.27
Orientation Param1: 80.43
Orientation Param2: 325.49
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 299
Fracture Modelling galleria afflusso - Set 2
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.04
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 19.83
Orientation Param1: 78.77
Orientation Param2: 99.07
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 115
Fracture Modelling galleria afflusso - Set 3
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.03
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 20.52
Orientation Param1: 76.88
Orientation Param2: 248.96
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 80
Fracture Modelling galleria afflusso - Set 4
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.08
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:

Fisher K Param: 31.89
Orientation Param1: 84.3
Orientation Param2: 138.5
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 222
Fracture Modelling galleria afflusso - Set 5
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.05
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 25.33
Orientation Param1: 79.33
Orientation Param2: 48.05
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 137
Fracture Modelling galleria afflusso - Set 6
Input Parameters:
Input Grid: afflusso
Intensity Value: 0.07
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 43.51
Orientation Param1: 80.6
Orientation Param2: 298.9
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 197
Output Grid: afflusso
Generated Properties: Min Value Max Value
Frac_Session1_Porosity 0 0.597975
Frac_Session1_Permability 0 5.1403e+08
Frac_Session1_Perm_KXX 0 2.85158e+08
Frac_Session1_Perm_KYY 0 3.07137e+08
Frac_Session1_Perm_KZZ 0 5.03914e+08
Frac_Session1_Perm_KXY -1.1573e+08 1.93043e+08
Frac_Session1_Perm_KXZ -5.34307e+07 4.67905e+07
Frac_Session1_Perm_KYZ -4.80188e+07 3.11025e+07
Frac_Session1_Anisotropy 1.943 100



Frac_Session1_Perm_KB_Max 6.55188e-07 5.08298e+08
Frac_Session1_Perm_KB_Min 0 1.6156e+08
Frac_Session1_2D_Anisotropy 1.6598 100
Frac_Session1_P32 0 8.91064
Total Fracture Area: 8022.73 (meter-squared)
Total Fracture Volume: 580.626 (meter-cubed)
Total Model Volume: 25000 (meter-cubed)
Average Fracture Porosity: 0.023225
Average Aperture: 0.0723726 (meter)
Average DFN P32: 0.320909 (1/meter)
Run Time : 6.195 (sec)
Original Input File:

GALLERIA RIFLUSSO

Per la galleria riflusso sono state utilizzate le scan line con le fratture/faglie principali (scan line 7 del 2015 + scan line FRATTURE PRINCIPALI GPR del 2016) per una lunghezza totale di 193 metri. Sono stati calcolati quindi i set (senza la correzione di terzaghi) e il P32 prendendo come riferimento la lunghezza totale. Volume avente come dimensioni 200m x 10m x 5m e con celle di 1 m³. 2 prove con diversa apertura: una con 10 mm di apertura media e una con 50 mm.

DFN con apertura media di 10 mm

Session Summary

Fracture Modelling_riflusso - Set 1

Input Parameters:

Input Grid: riflusso

Intensity Value: 0.08

P32: true

Length Defintion is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 42.66

Orientation Param1: 80.28

Orientation Param2: 305.28

Aspect Ratio: 0.5

Aperture: (Proportional to Length) - Coefficient used = 0.00247814

Number of Fractures: 70

Fracture Modelling_riflusso - Set 2

Input Parameters:

Input Grid: riflusso

Intensity Value: 0.04

P32: true

Length Defintion is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 6.44
Orientation Param1: 74.39
Orientation Param2: 52.19
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 30
Fracture Modelling_riflusso - Set 3
Input Parameters:
Input Grid: riflusso
Intensity Value: 0.05
P32: true
Length Defintion is Power Law:
Length Param1: 2
Length Param2: 10
Length Param3: -2
Orientation is Defined:
Distribution Is Fisher:
Fisher K Param: 11.99
Orientation Param1: 83.34
Orientation Param2: 133.11
Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.00247814
Number of Fractures: 41
Output Grid: riflusso
Generated Properties: Min Value Max Value
Frac_Session1_Porosity 0 0.0645623
Frac_Session1_Permability 0 1.97363e+06
Frac_Session1_Perm_KXX 0 1.50232e+06
Frac_Session1_Perm_KYY 0 1.6024e+06
Frac_Session1_Perm_KZZ 0 1.91292e+06
Frac_Session1_Perm_KXY -340449 738502
Frac_Session1_Perm_KXZ -353192 799718
Frac_Session1_Perm_KYZ -666993 335270
Frac_Session1_Anisotropy 2.18073 100
Frac_Session1_Perm_KB_Max 0.0736288 1.90874e+06
Frac_Session1_Perm_KB_Min 0 580285
Frac_Session1_2D_Anisotropy 1.71389 100
Frac_Session1_P32 0 4.06244
Total Fracture Area: 1127.59 (meter-squared)
Total Fracture Volume: 16.854 (meter-cubed)
Total Model Volume: 10000 (meter-cubed)
Average Fracture Porosity: 0.0016854
Average Aperture: 0.0149469 (meter)
Average DFN P32: 0.112759 (1/meter)
Run Time : 0.797 (sec)
Original Input File:

DFN con apertura media di 50 mm

Session Summary

Fracture Modelling_riflusso - Set 1

Input Parameters:

Input Grid: riflusso

Intensity Value: 0.08

P32: true

Length Definition is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 42.66

Orientation Param1: 80.28

Orientation Param2: 305.28

Aspect Ratio: 0.5

Aperture: (Proportional to Length) - Coefficient used = 0.0123907

Number of Fractures: 70

Fracture Modelling_riflusso - Set 2

Input Parameters:

Input Grid: riflusso

Intensity Value: 0.04

P32: true

Length Definition is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 6.44

Orientation Param1: 74.39

Orientation Param2: 52.19

Aspect Ratio: 0.5

Aperture: (Proportional to Length) - Coefficient used = 0.0123907

Number of Fractures: 30

Fracture Modelling_riflusso - Set 3

Input Parameters:

Input Grid: riflusso

Intensity Value: 0.05

P32: true

Length Definition is Power Law:

Length Param1: 2

Length Param2: 10

Length Param3: -2

Orientation is Defined:

Distribution Is Fisher:

Fisher K Param: 11.99

Orientation Param1: 83.34

Orientation Param2: 133.11



Aspect Ratio: 0.5
Aperture: (Proportional to Length) - Coefficient used = 0.0123907
Number of Fractures: 41
Output Grid: riflusso
Generated Properties: Min Value Max Value
Frac_Session1_Porosity 0 0.322811
Frac_Session1_Perm_KXX 0 2.46703e+08
Frac_Session1_Perm_KYY 0 2.003e+08
Frac_Session1_Perm_KZZ 0 2.39115e+08
Frac_Session1_Perm_KXY -4.25561e+07 9.23128e+07
Frac_Session1_Perm_KXZ -4.4149e+07 9.99648e+07
Frac_Session1_Perm_KYZ -8.33741e+07 4.19088e+07
Frac_Session1_Anisotropy 2.18073 100
Frac_Session1_Perm_KB_Max 7.77454e-07 2.38592e+08
Frac_Session1_Perm_KB_Min 0 7.25356e+07
Frac_Session1_2D_Anisotropy 1.71389 100
Frac_Session1_P32 0 4.06244
Total Fracture Area: 1127.59 (meter-squared)
Total Fracture Volume: 84.27 (meter-cubed)
Total Model Volume: 10000 (meter-cubed)
Average Fracture Porosity: 0.008427
Average Aperture: 0.0747347 (meter)
Average DFN P32: 0.112759 (1/meter)
Run Time : 0.652 (sec)
Original Input File: