A RADIATOR – EGS SYSTEM: A NOVEL CONCEPT FOR GEOTHERMAL ENERGY EXTRACTION

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Johns Hopkins University & Global Geophysical Services

Enhanced Geothermal Systems -- EGS

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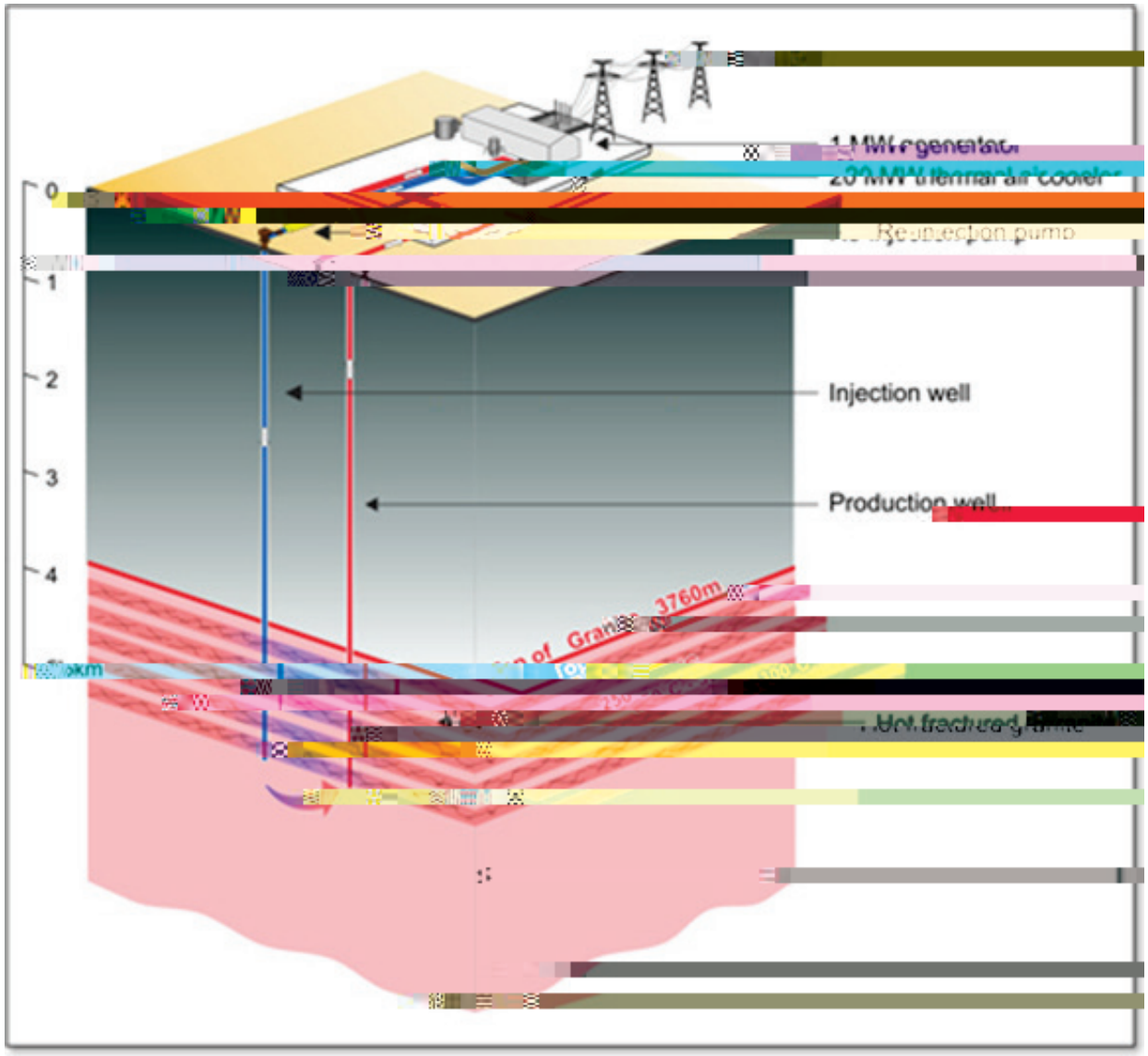

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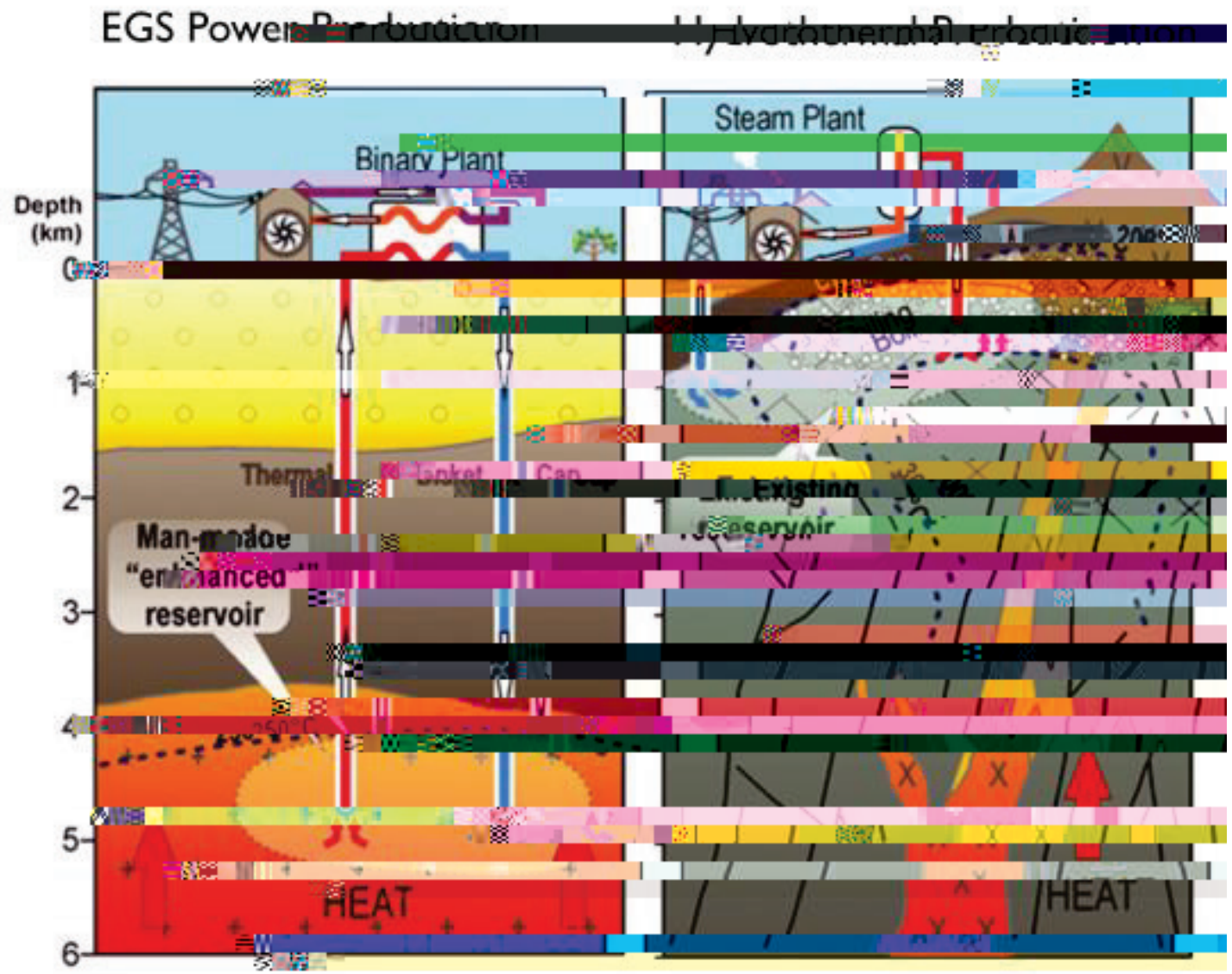
Steam Plant
Binary Plant
Depth (km)
0
1
2
3
4
5
6
Thermal
Cap
reservoir
HEAT
HEAT

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The Geysers, Northern Californian

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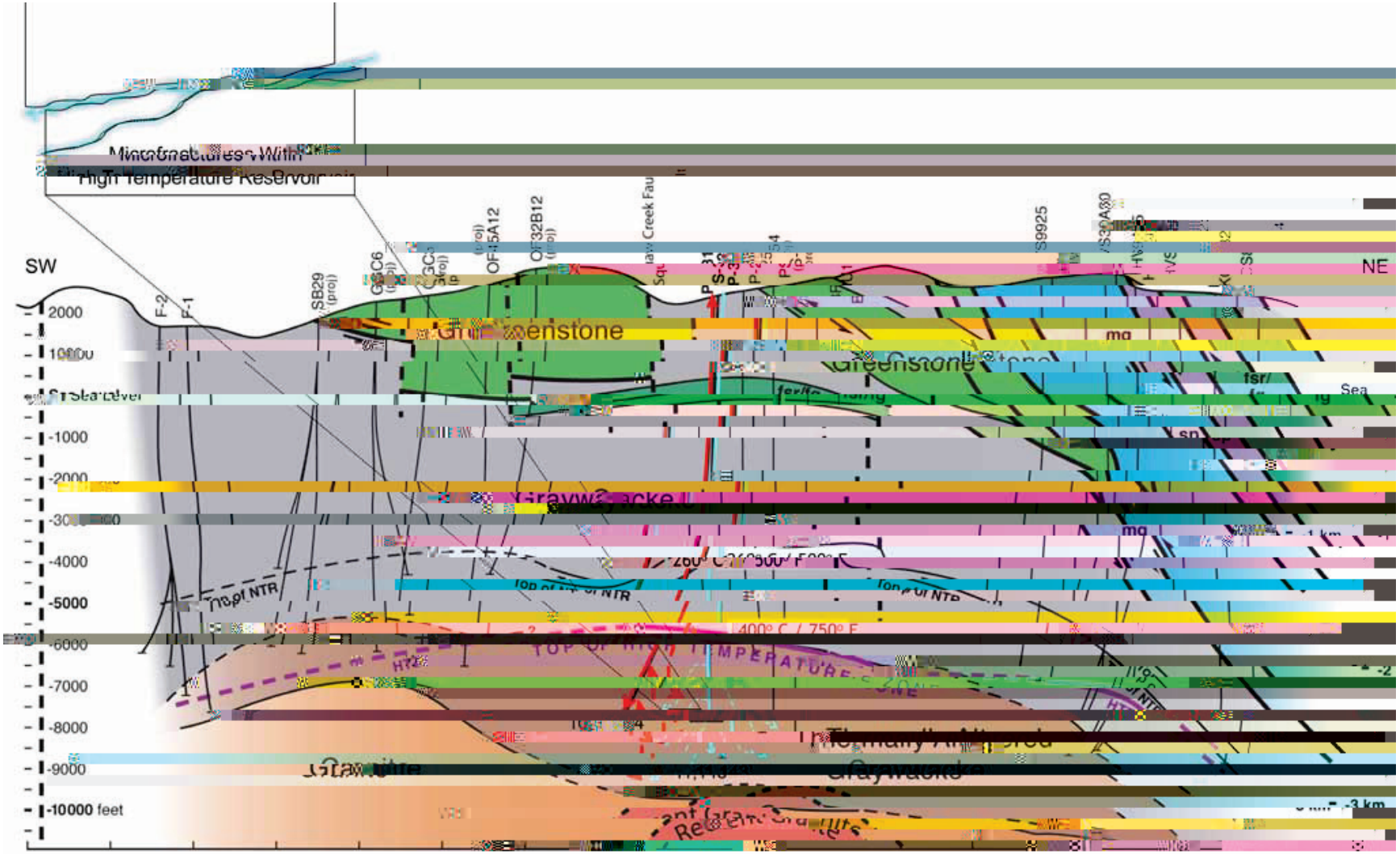

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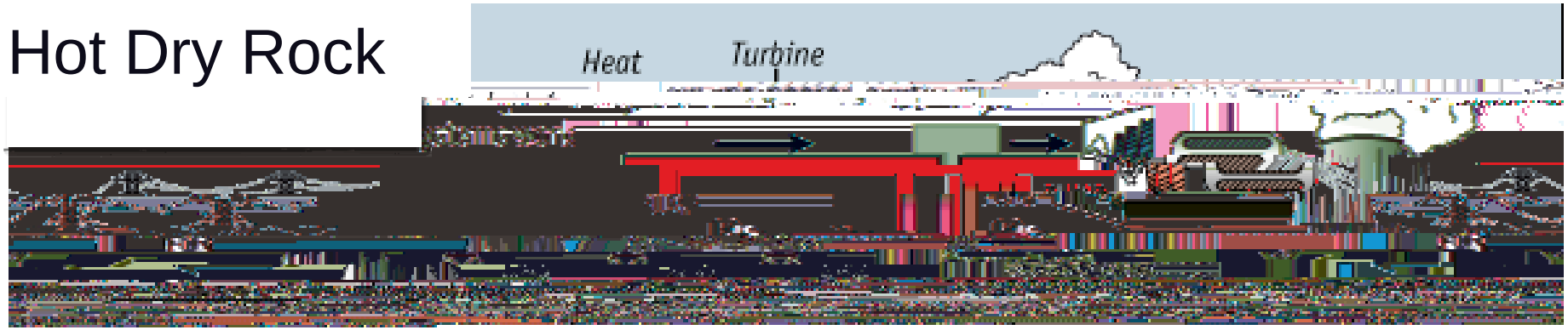
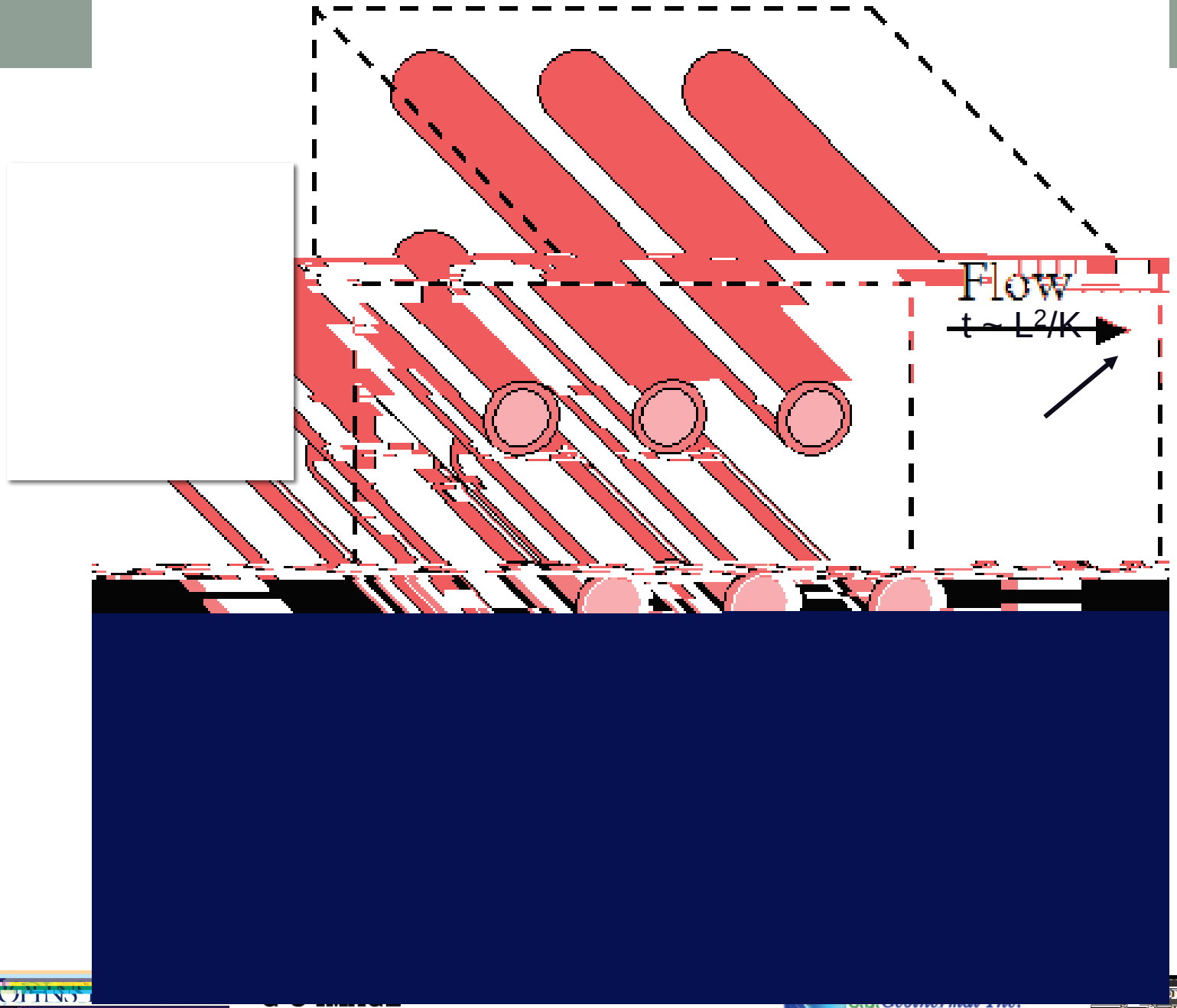
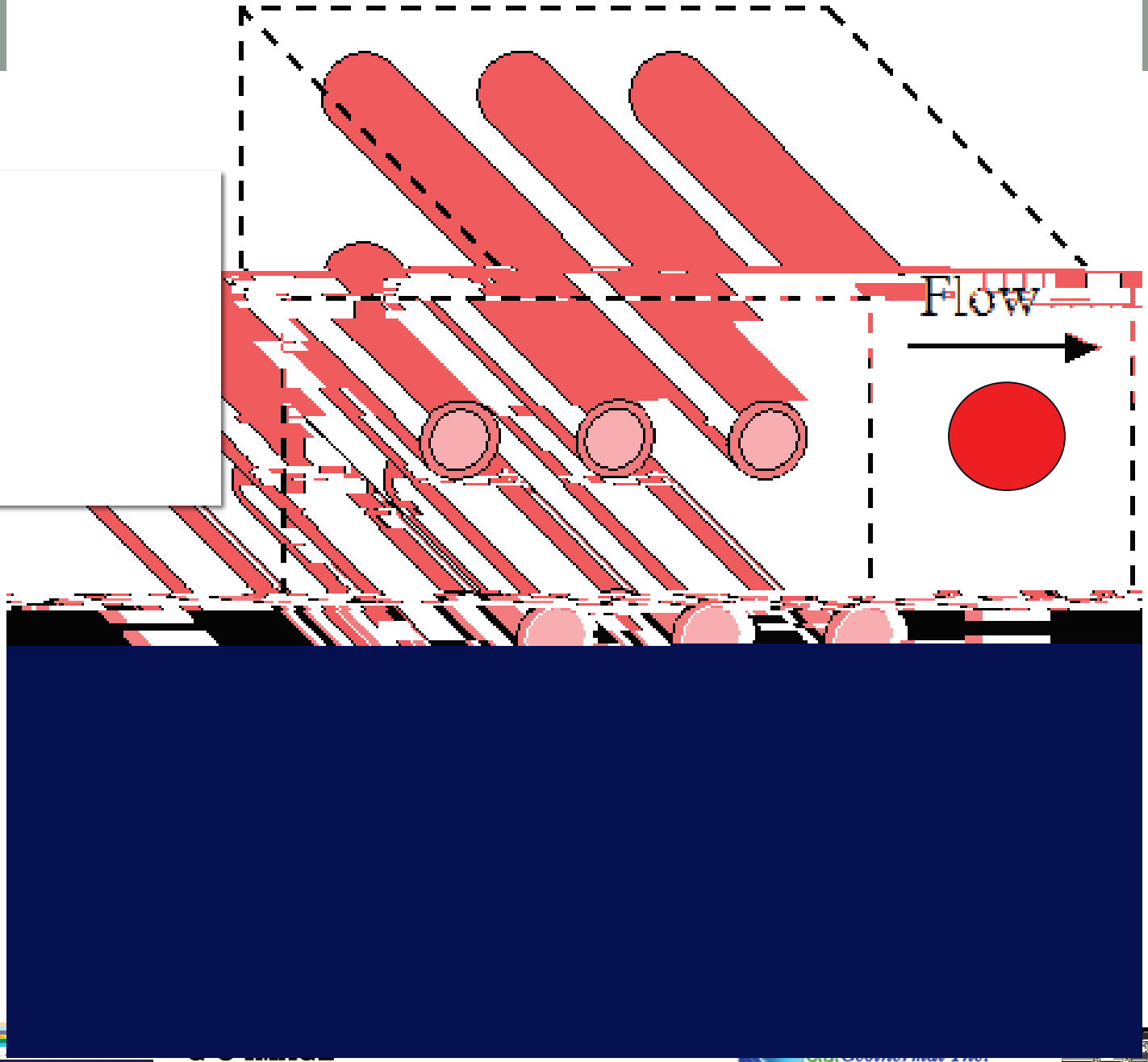
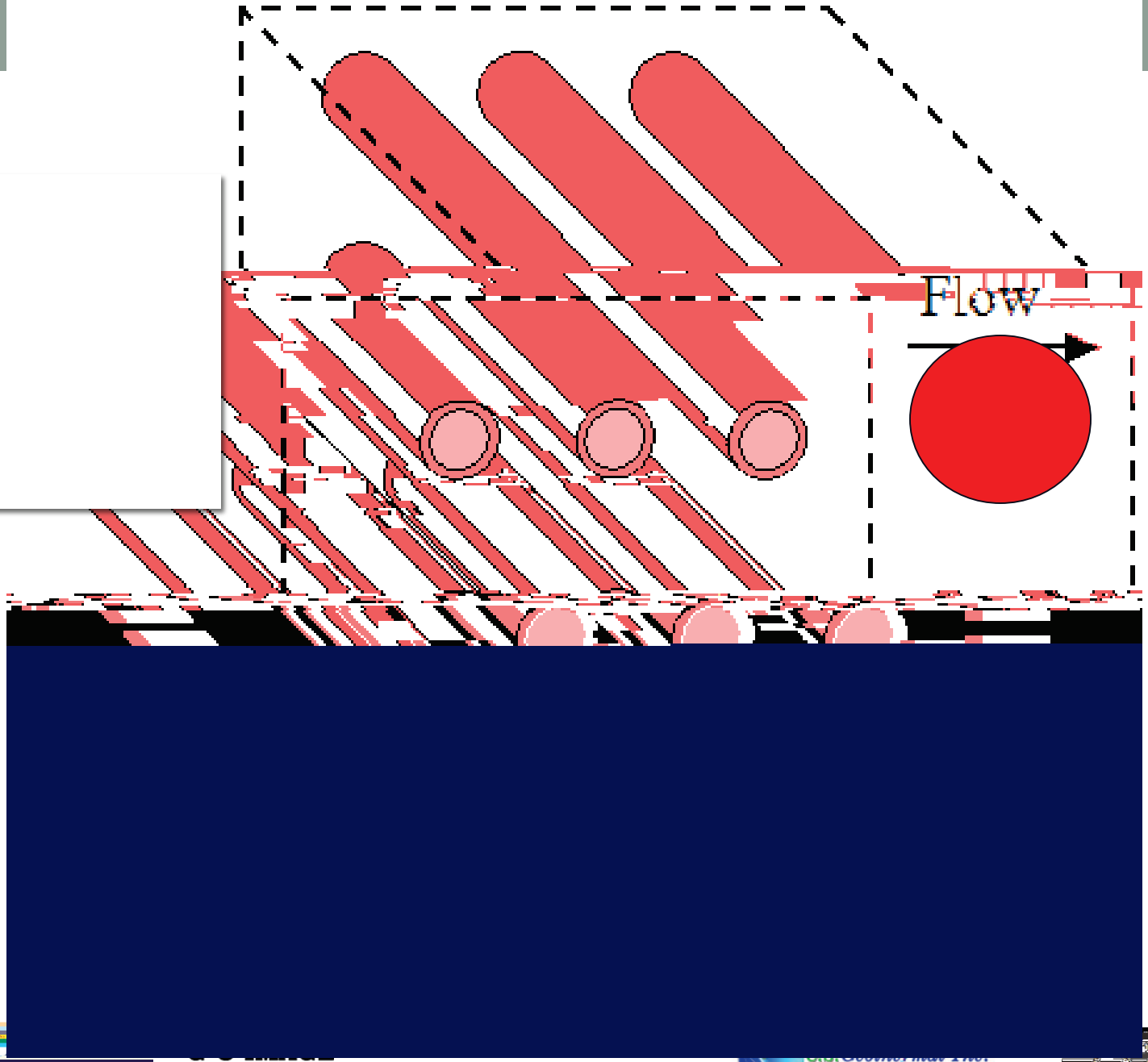
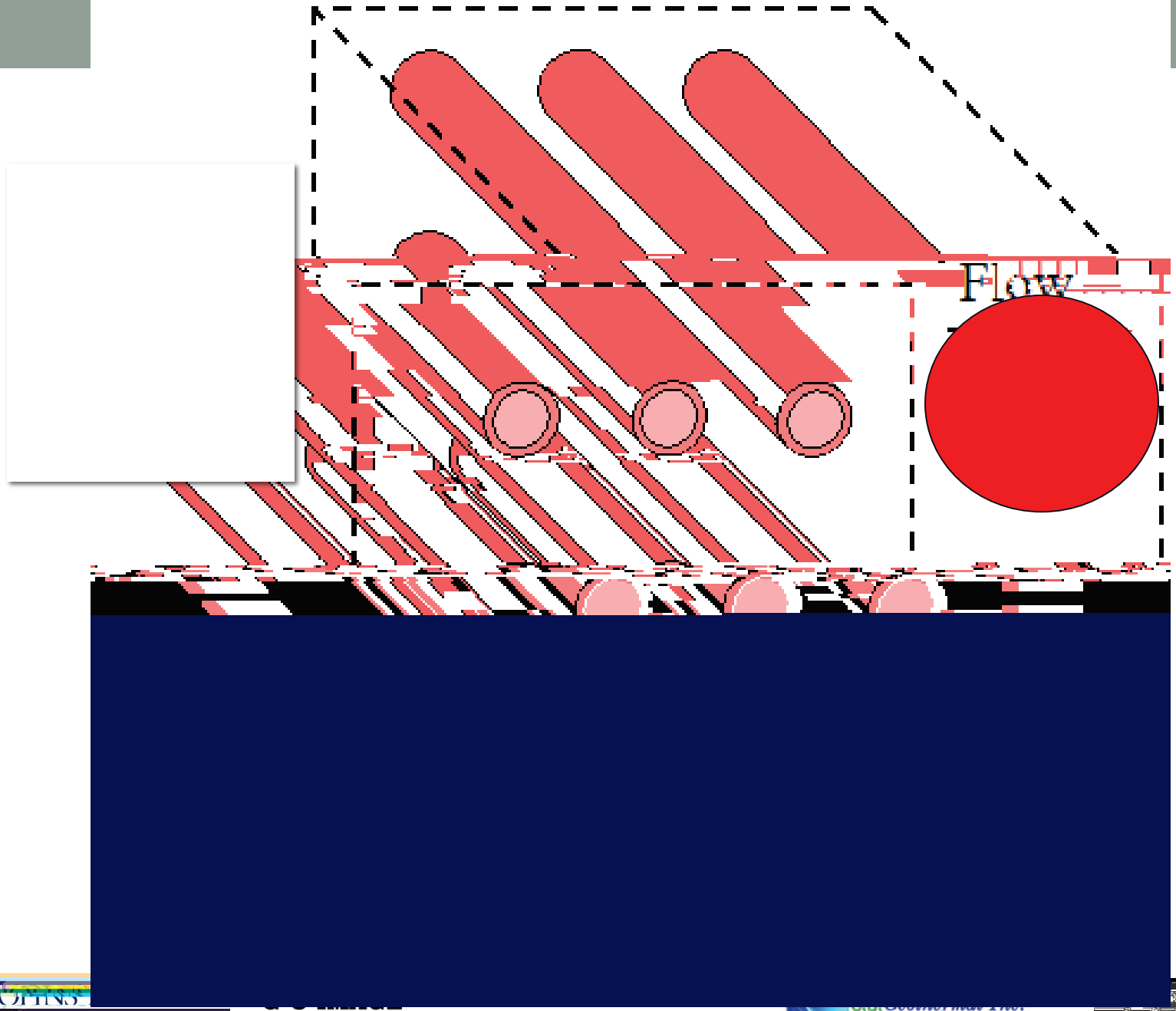
Hot Dry Rock

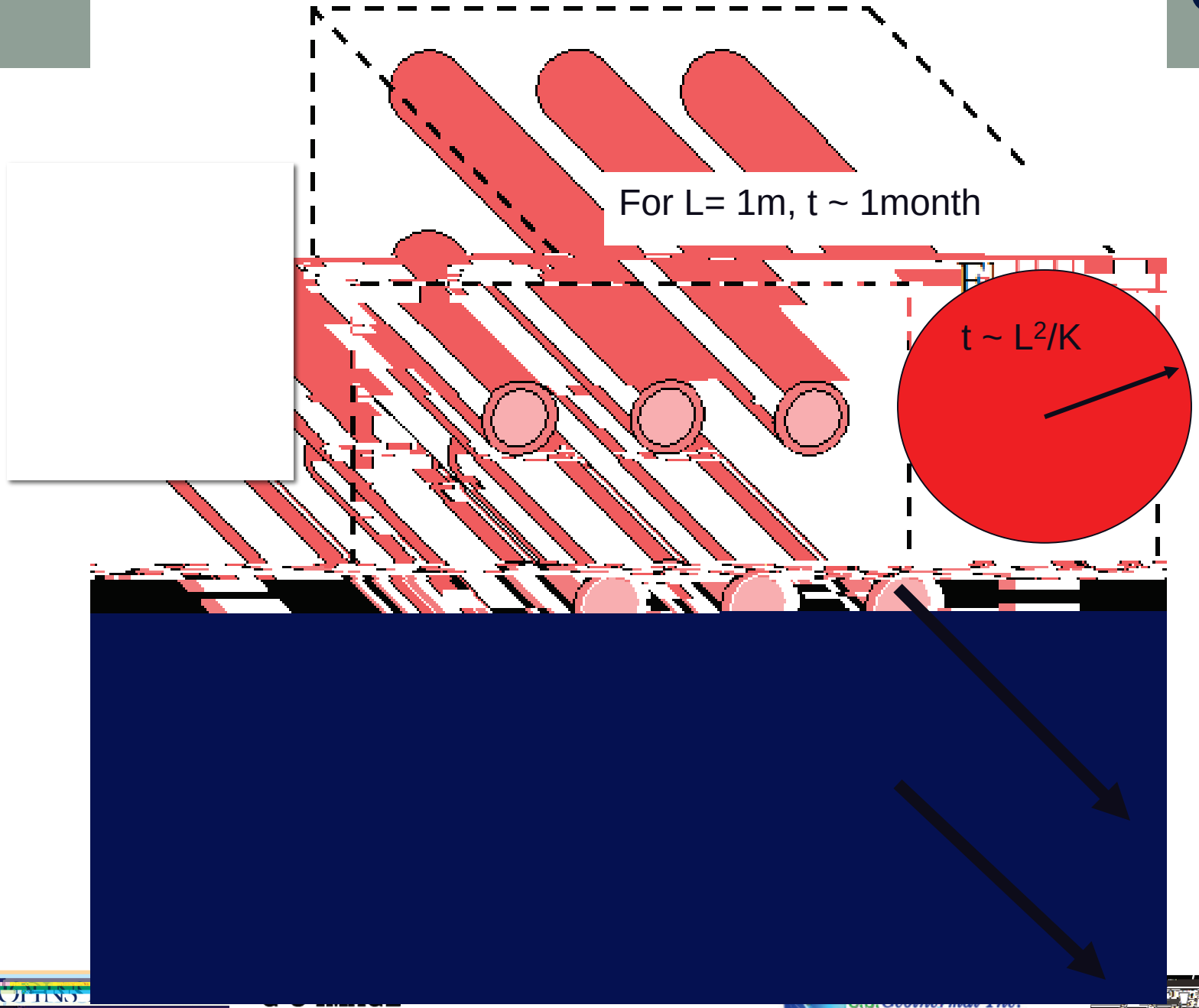



Flow
t ~ L²/K


Flow


Flow


Flow


For L= 1m, t ~ 1month
t ~ L²/K

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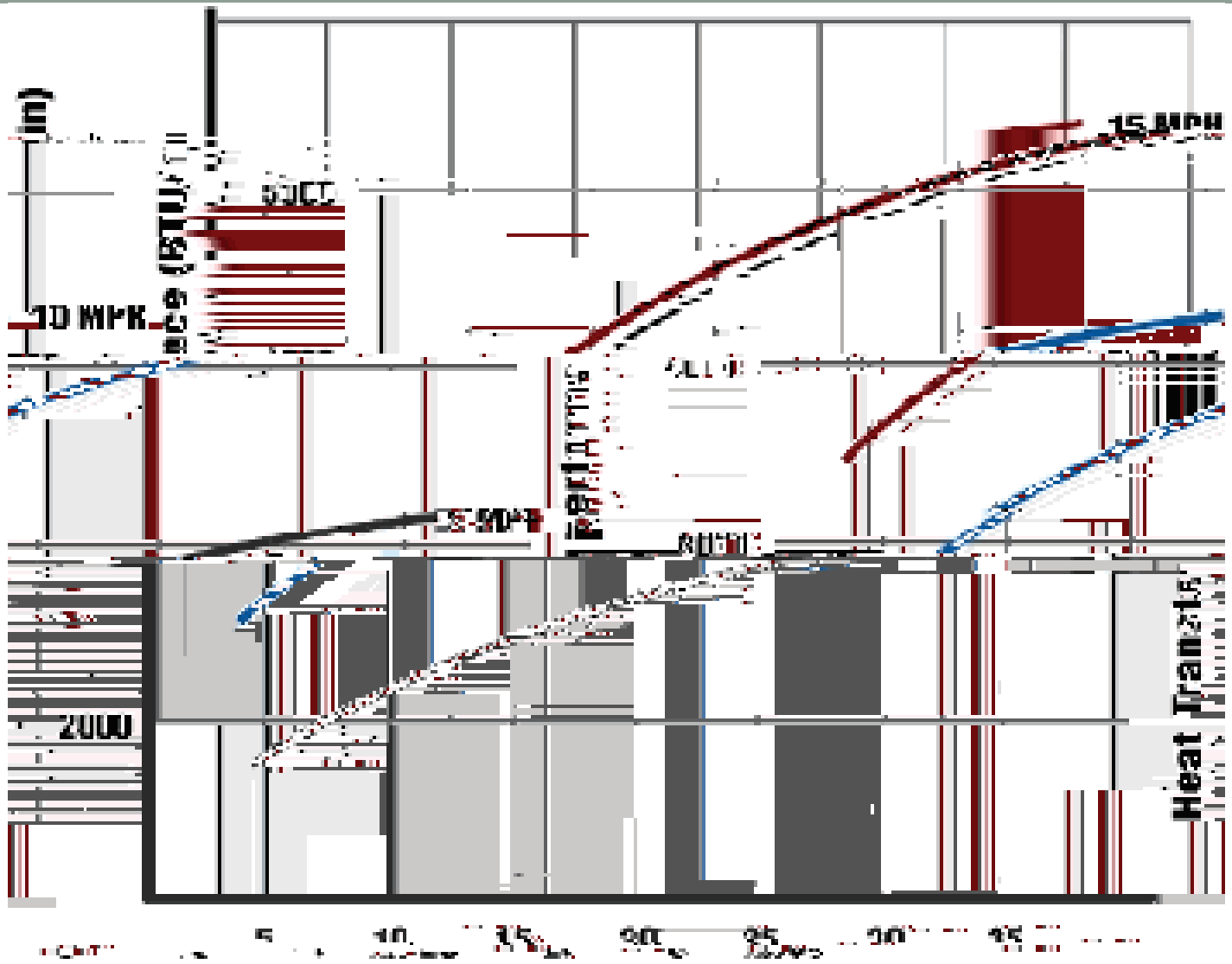

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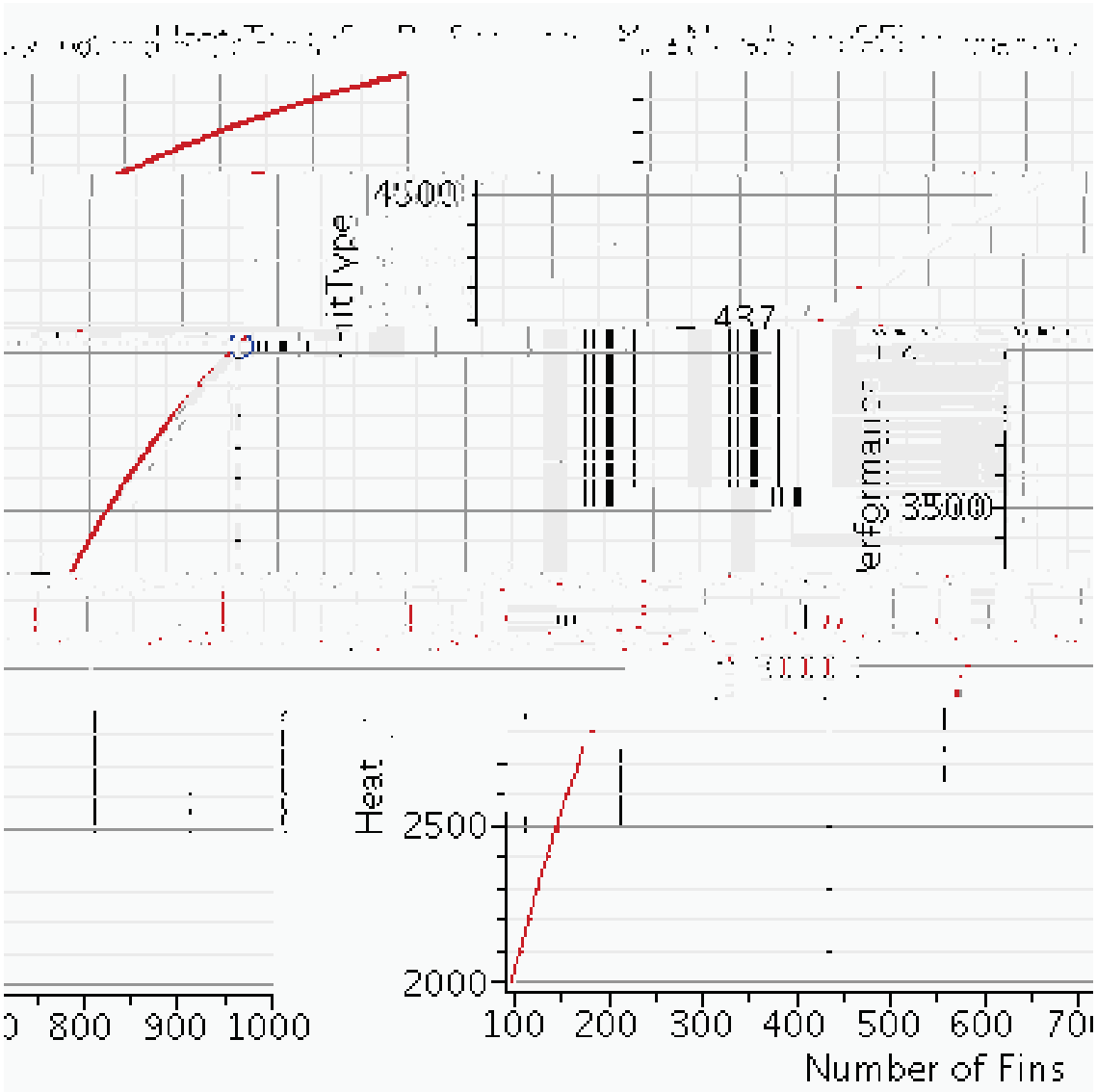
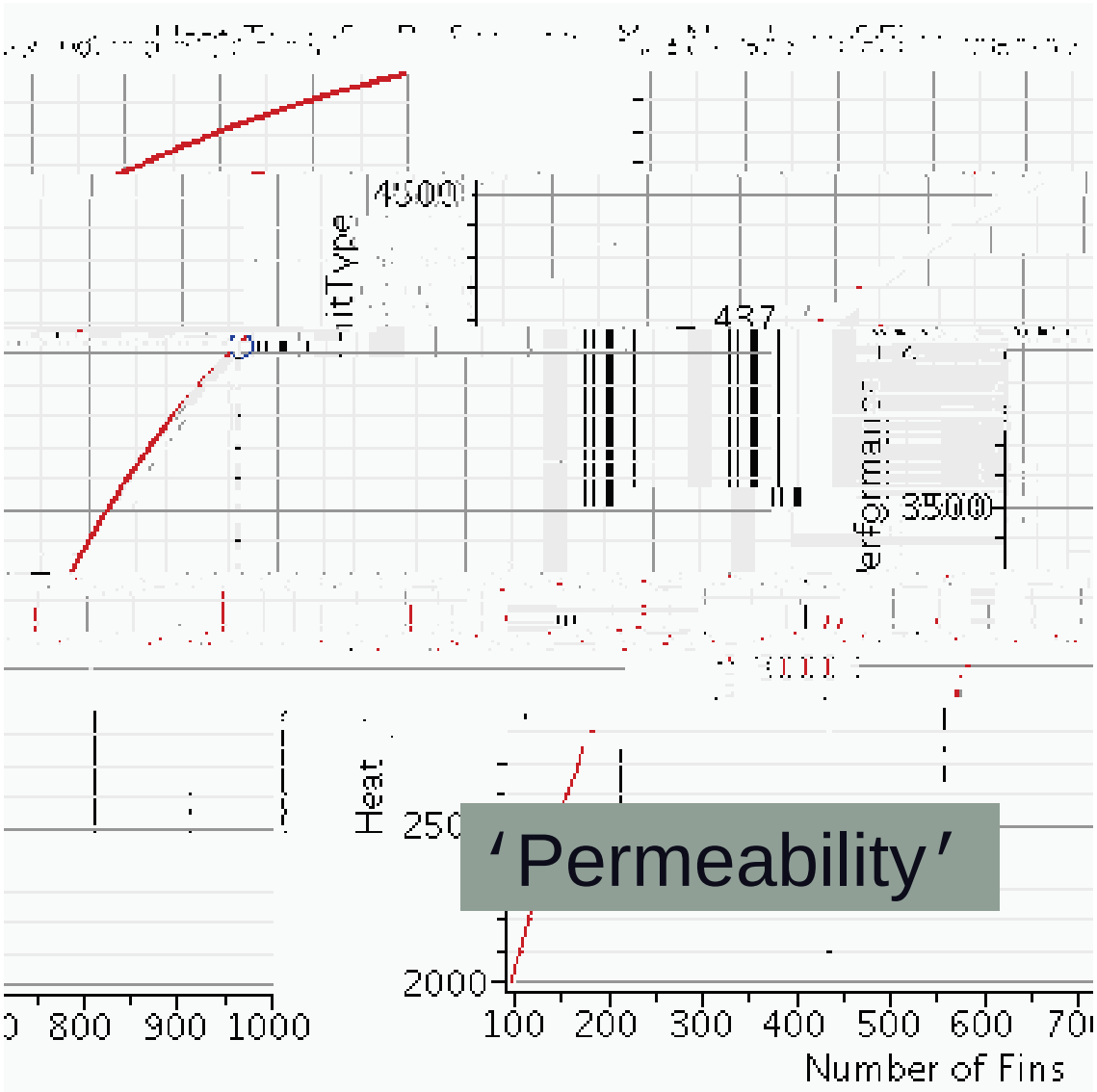

4500
437
3500
2500
2000
800
900
1000
100
200
300
400
500
600
Number of Fins


4500
437
3500
Heat
250
2000
800
900
1000
100
200
300
400
500
600
Number of Fins
'Permeability'

Recharge Rate

Geothermal Systems

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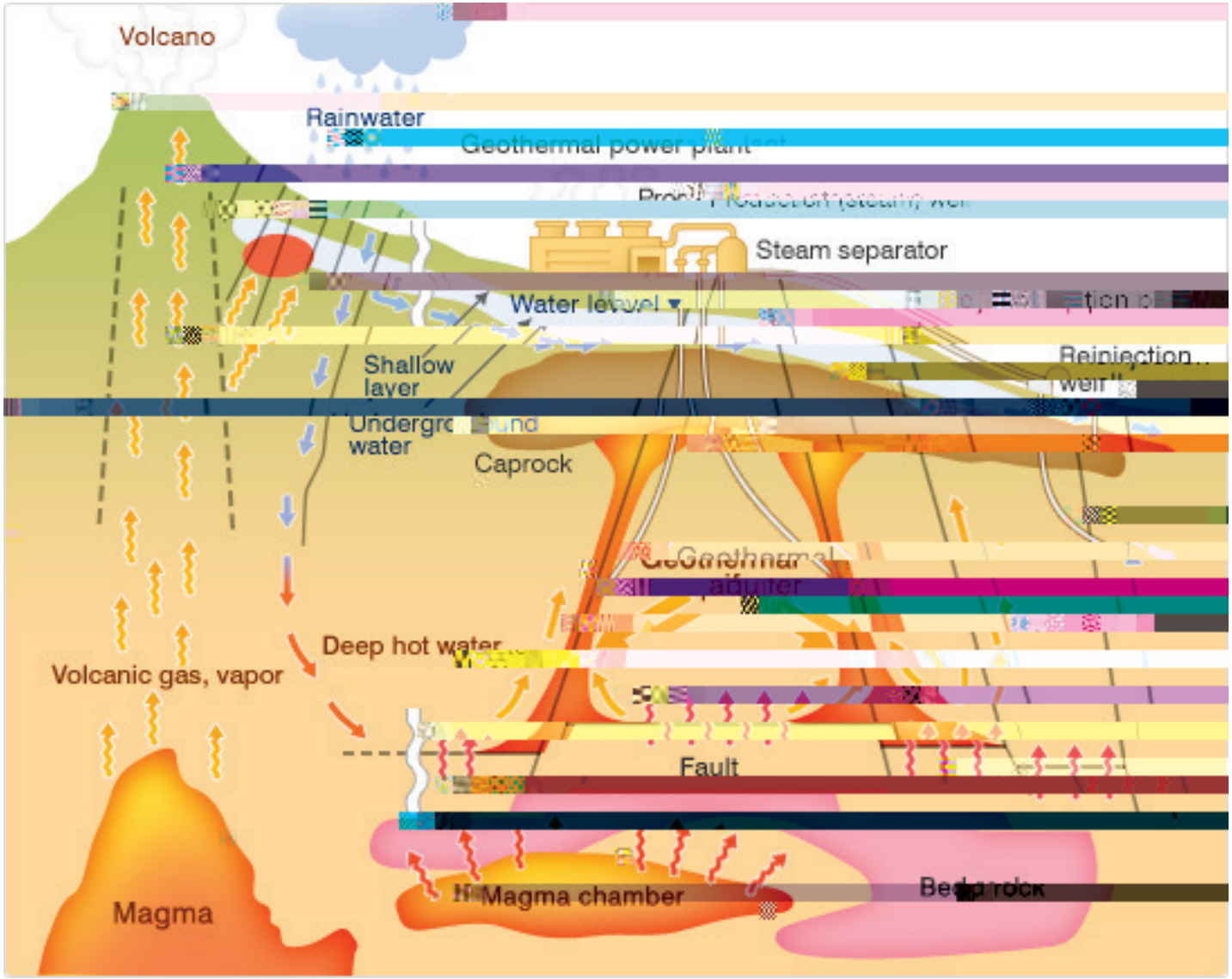

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erating


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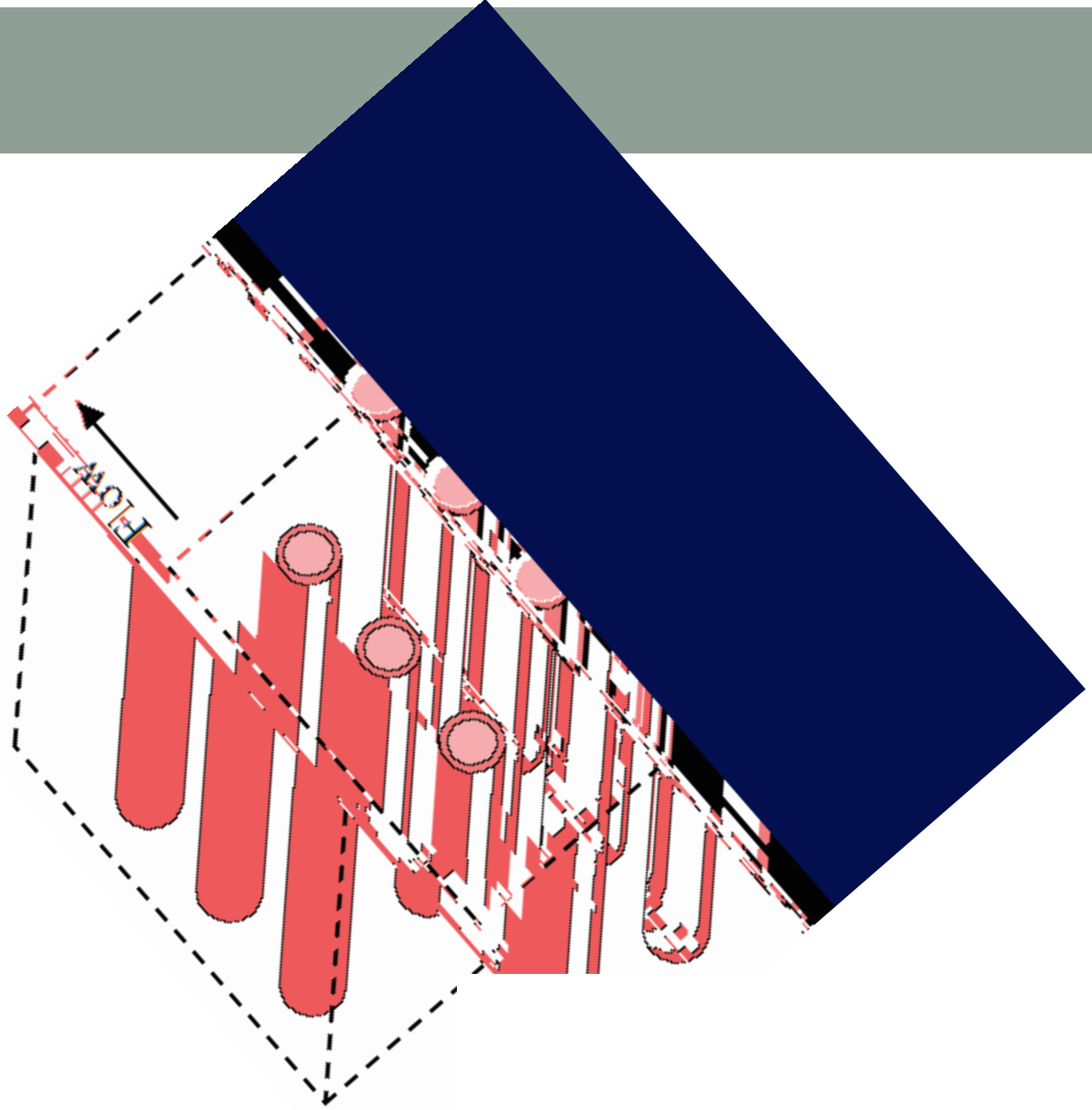

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Creating a Successful EGS: Proposed Solutions

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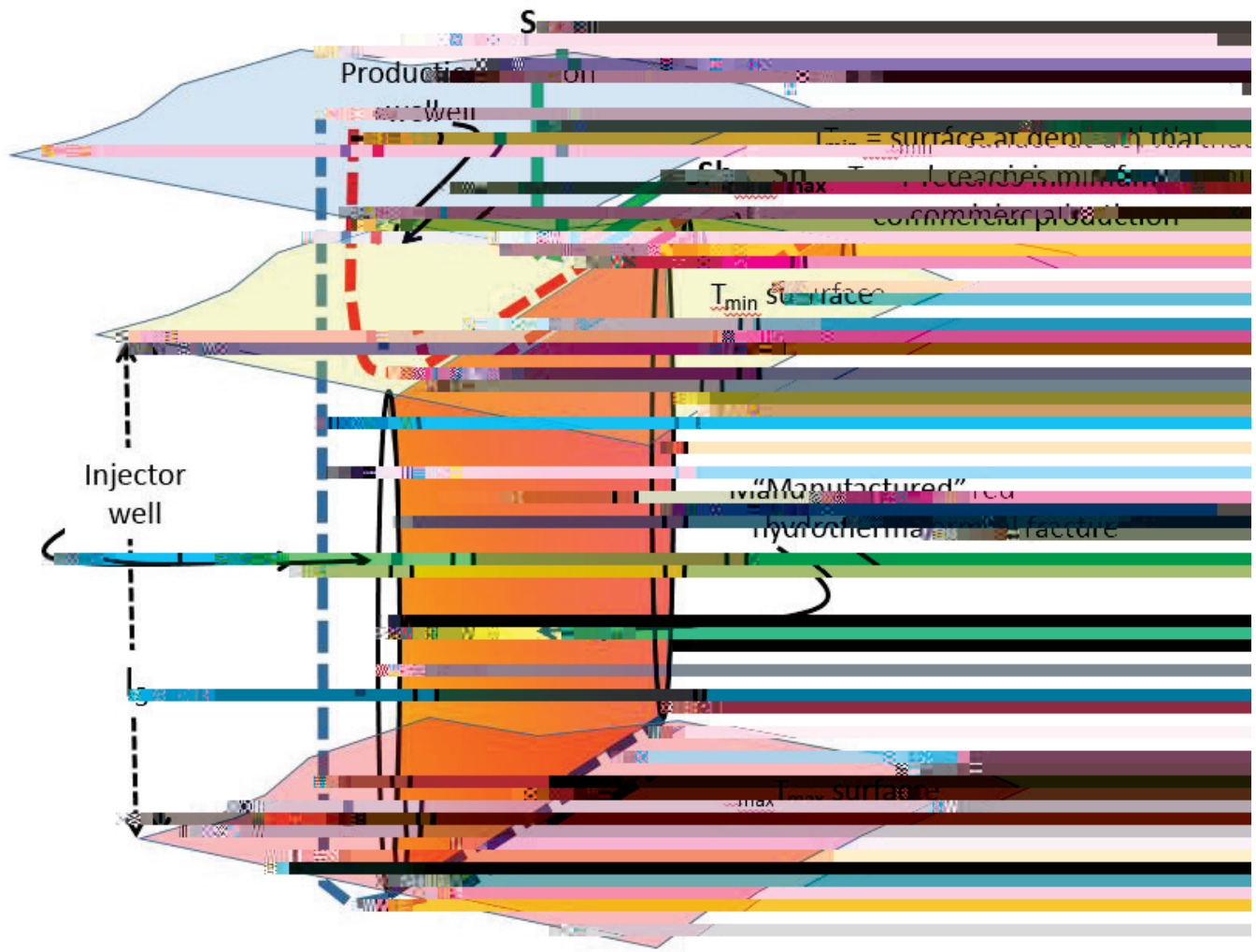
The RAD-EGS



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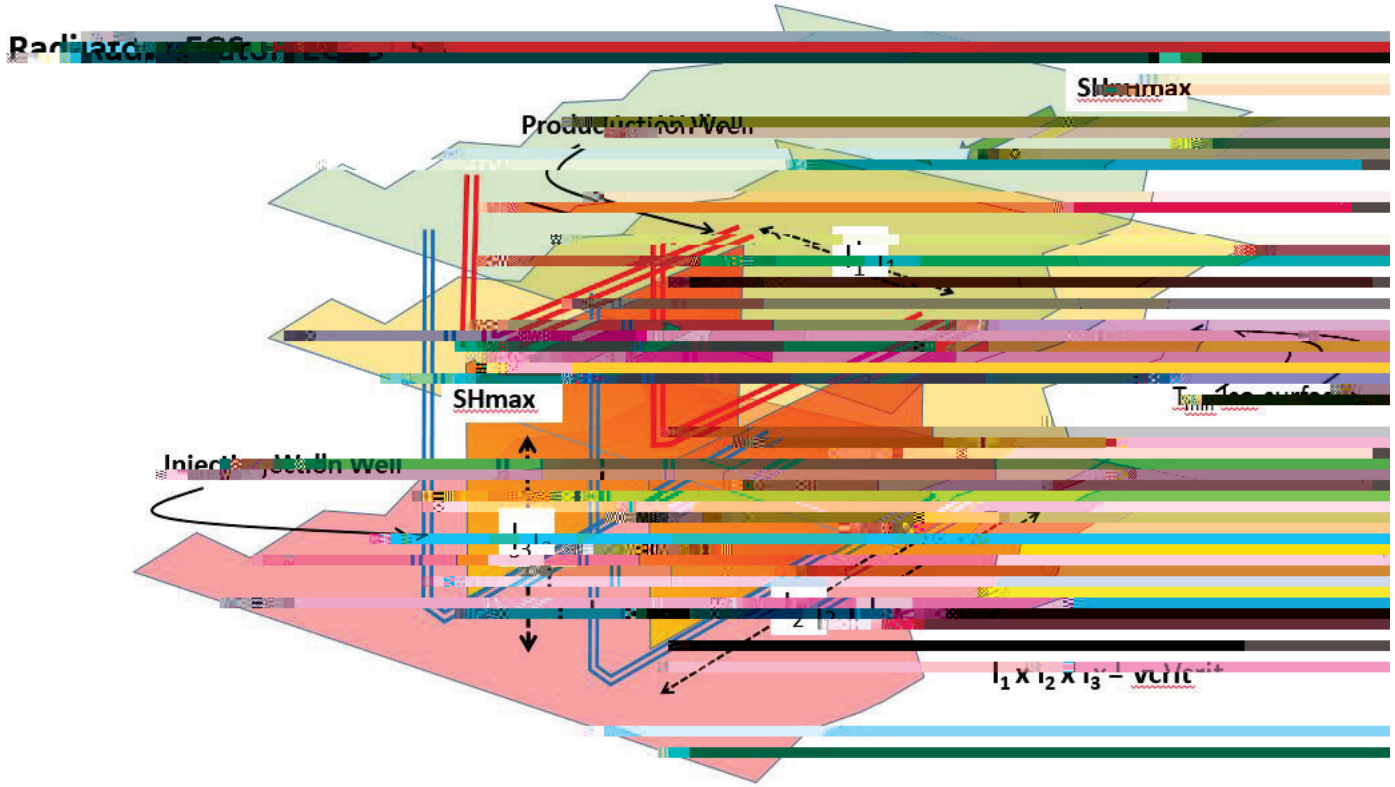
The RAD-EGS



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Creating a Successful EGS: Proposed Solutions

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The RAD-EGS

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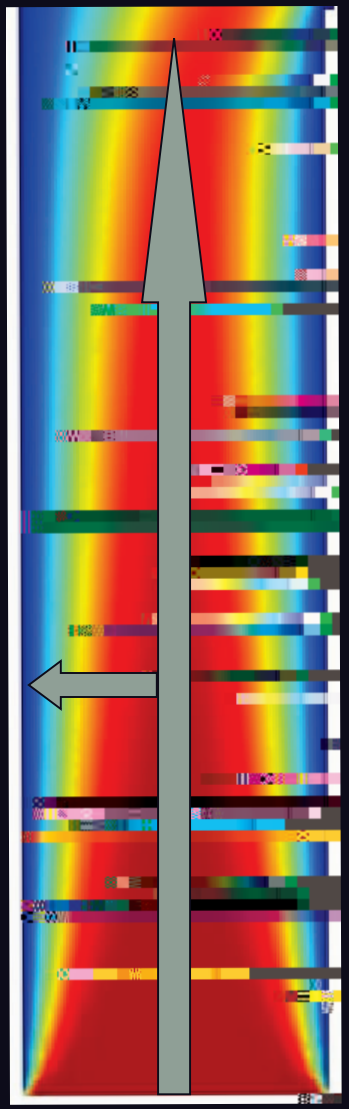


The ratio of heat transfer by fluid flow relative to
Conduction is measured by the Peclet Number

$$Pe = VL / K$$

Where:

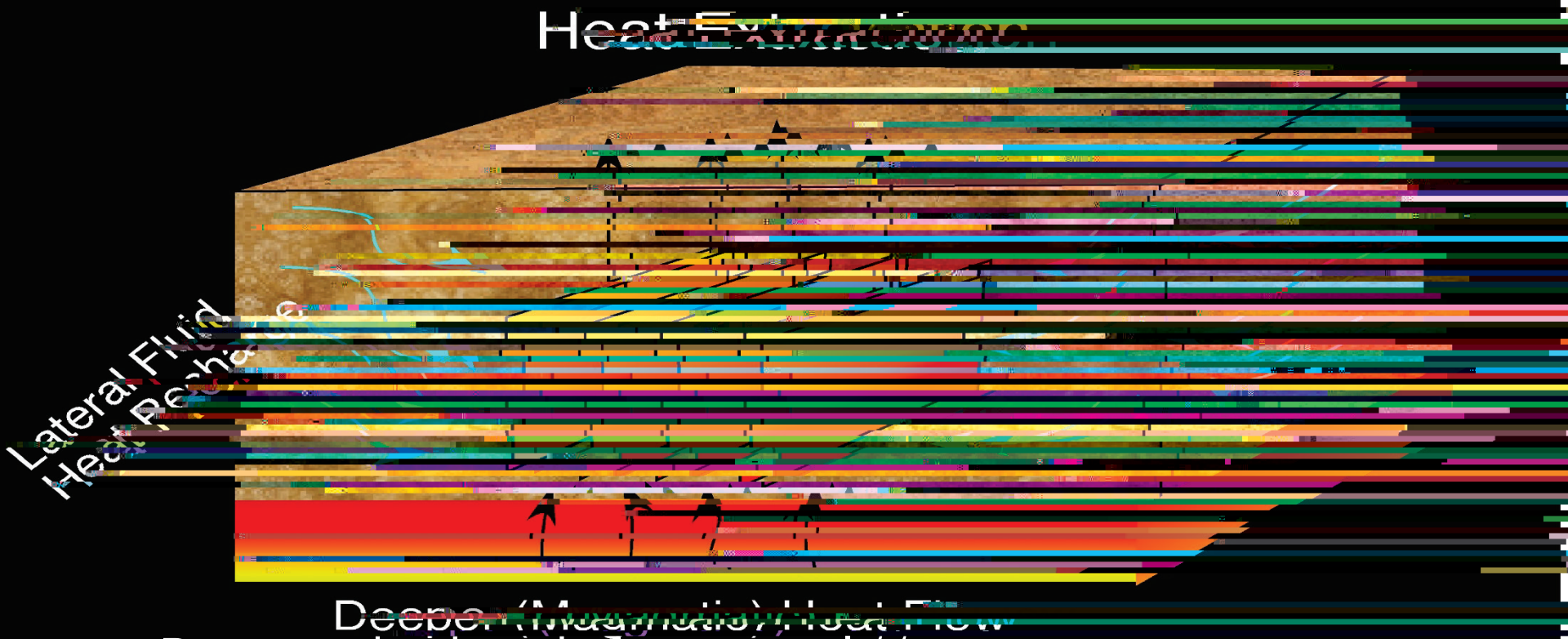
V = fluid velocity, L = length scale, K = thermal diffusivity

For V~1km/year, L~1 km, and K = 10^{-2} cm^2/sec

$$Pe \sim 100$$

So, inflowing crustal fluids (laterally) from all directions, even at a slow rate, can possibly offset the losses due
to conduction at the walls of the fracs.

Creating a Massive Heat Sink



By extracting heat in fracs a cool ‘’

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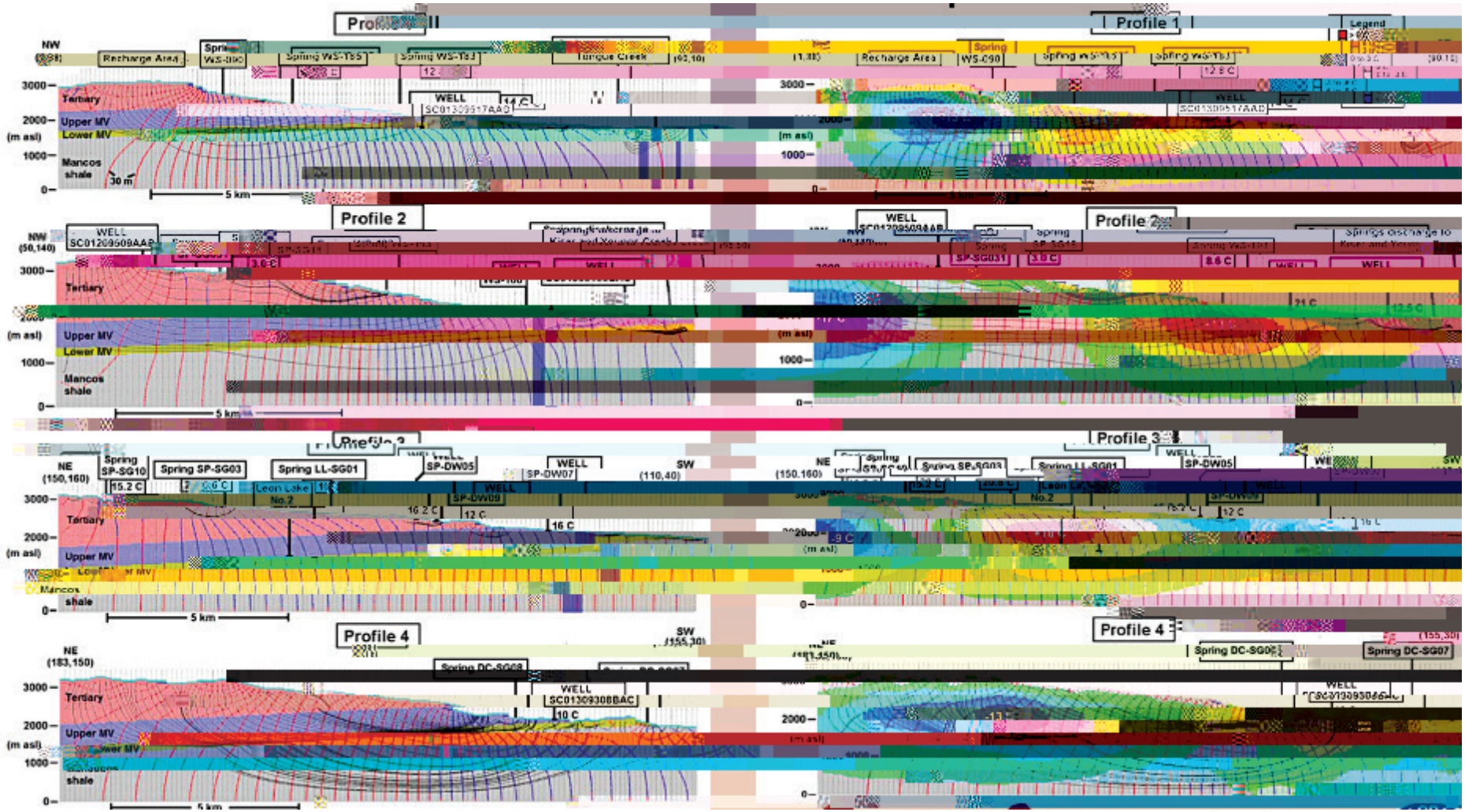
Flow

Temperatures



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