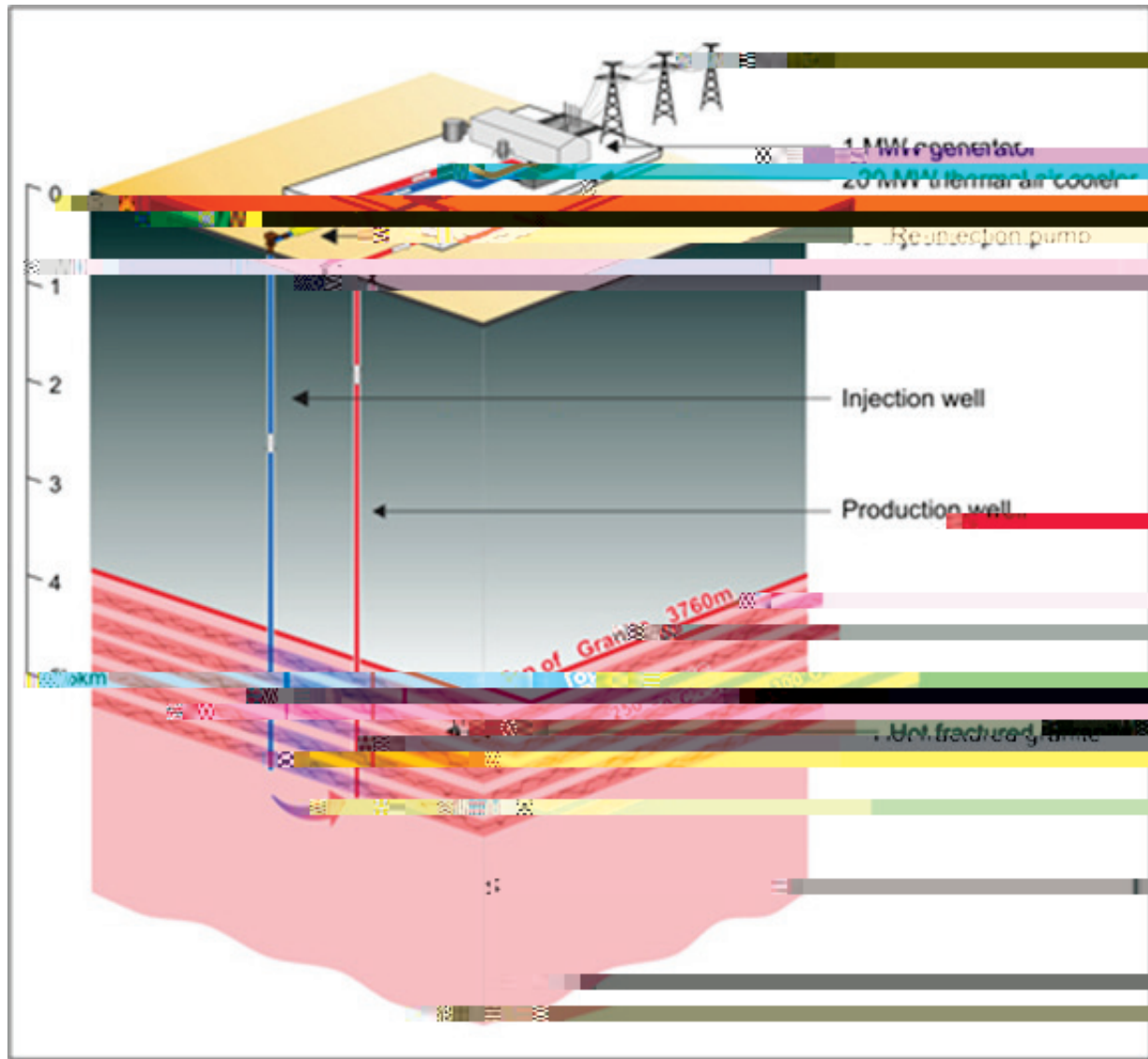


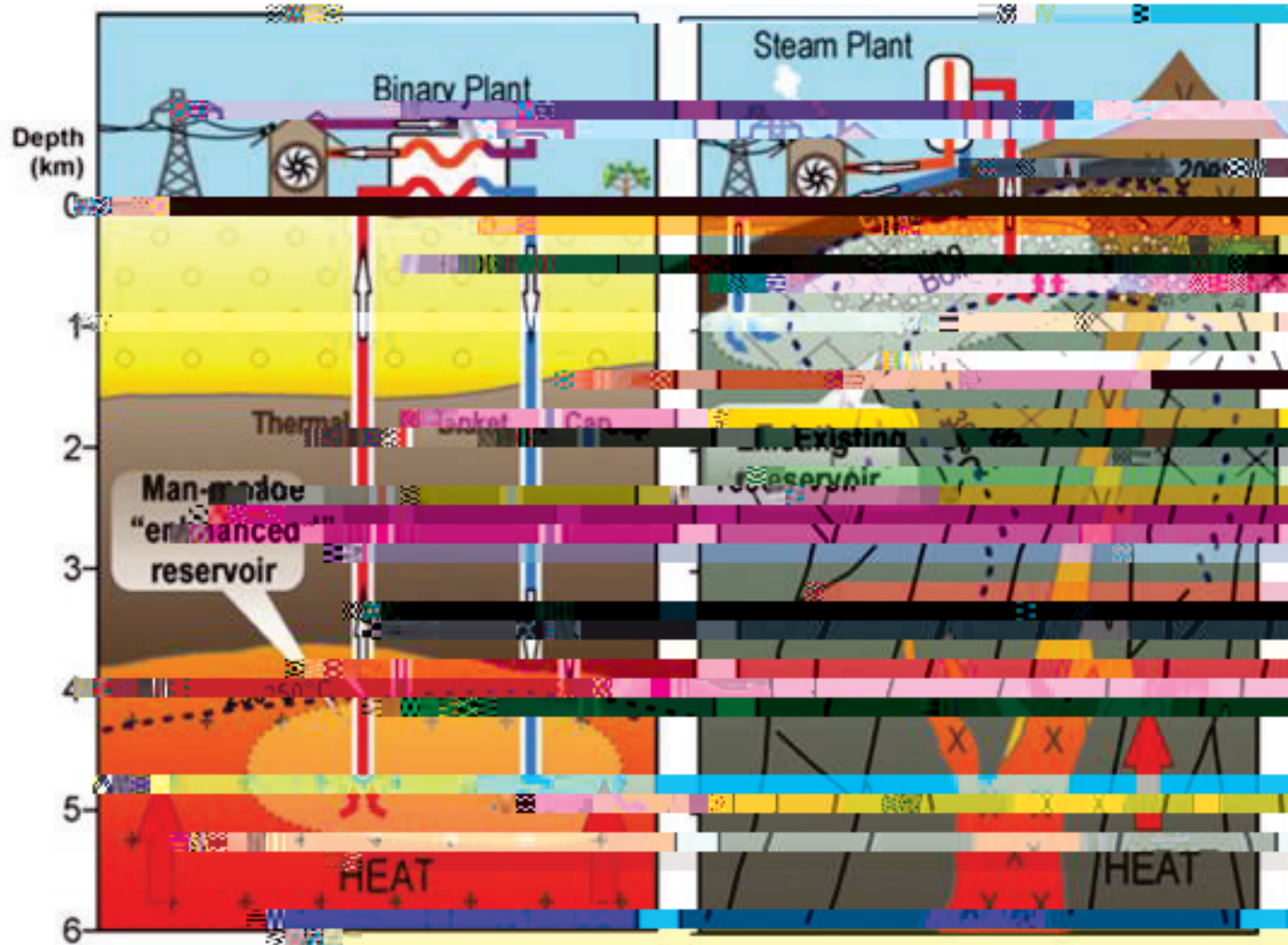
A RADIATOR – EGS SYSTEM: A NOVEL CONCEPT FOR GEOHERMAL ENERGY EXTRACTION

Bruce Marsh, Markus Hilpert, and Peter Geiser
Johns Hopkins University & Global Geophysical Services

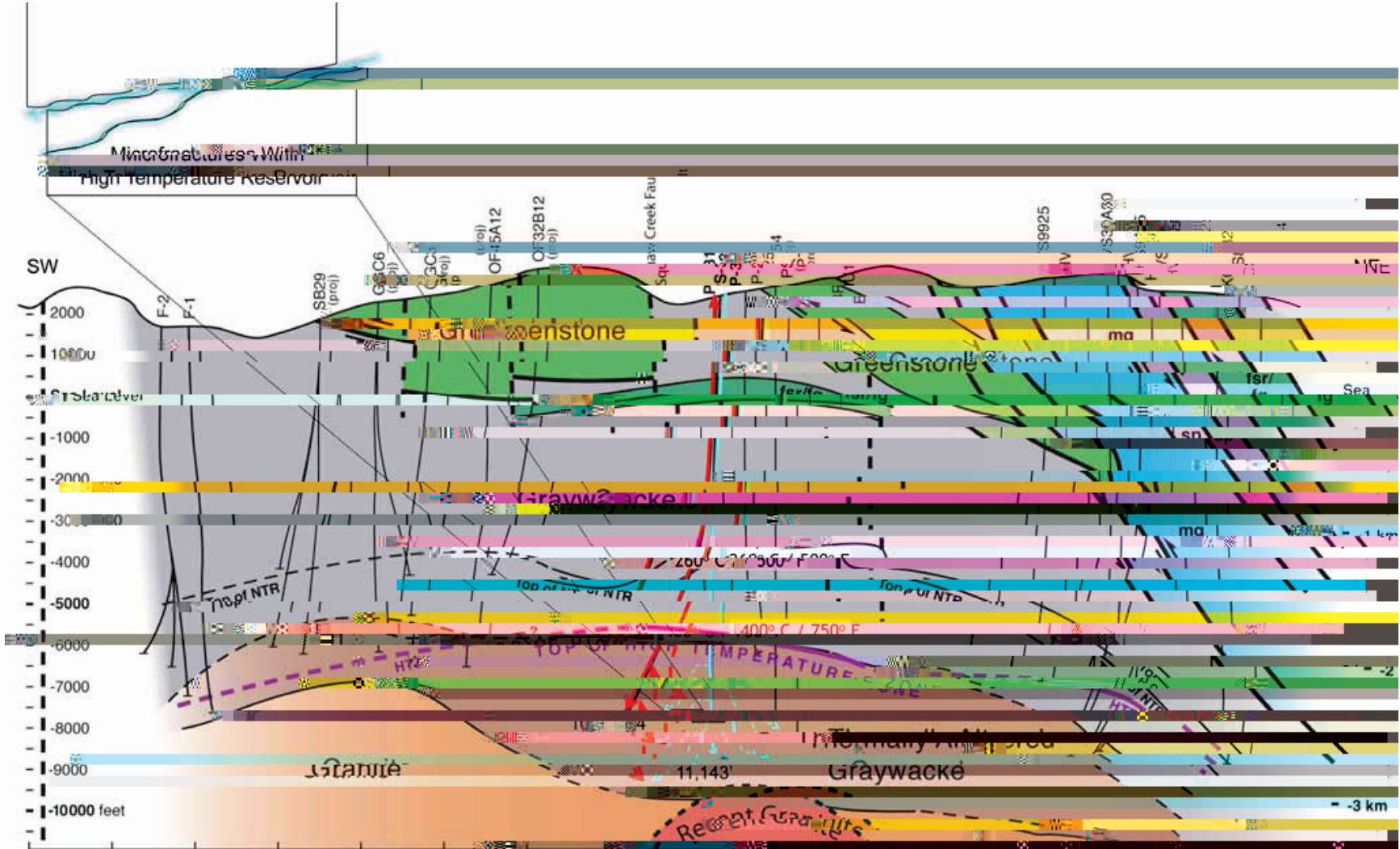
Enhanced Geothermal Systems -- EGS



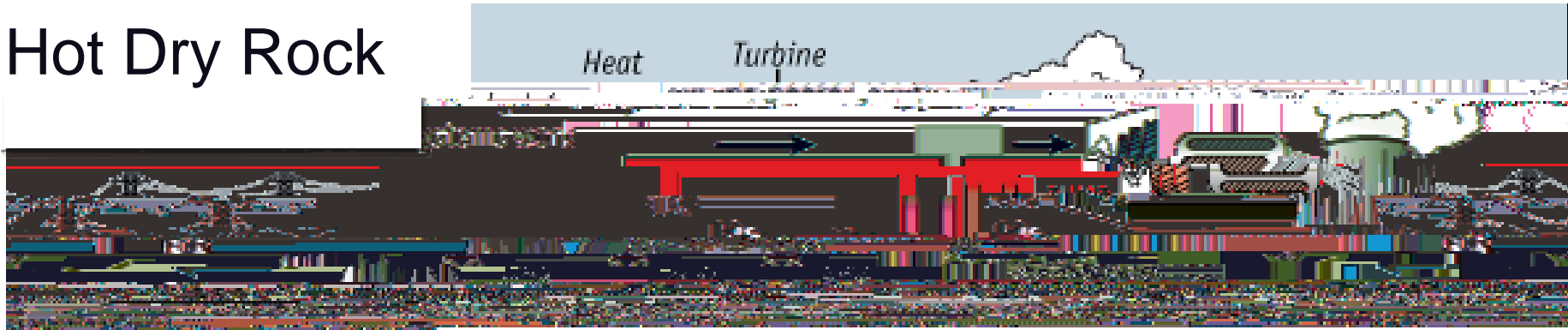
EGS Power Production by Geothermal Resource

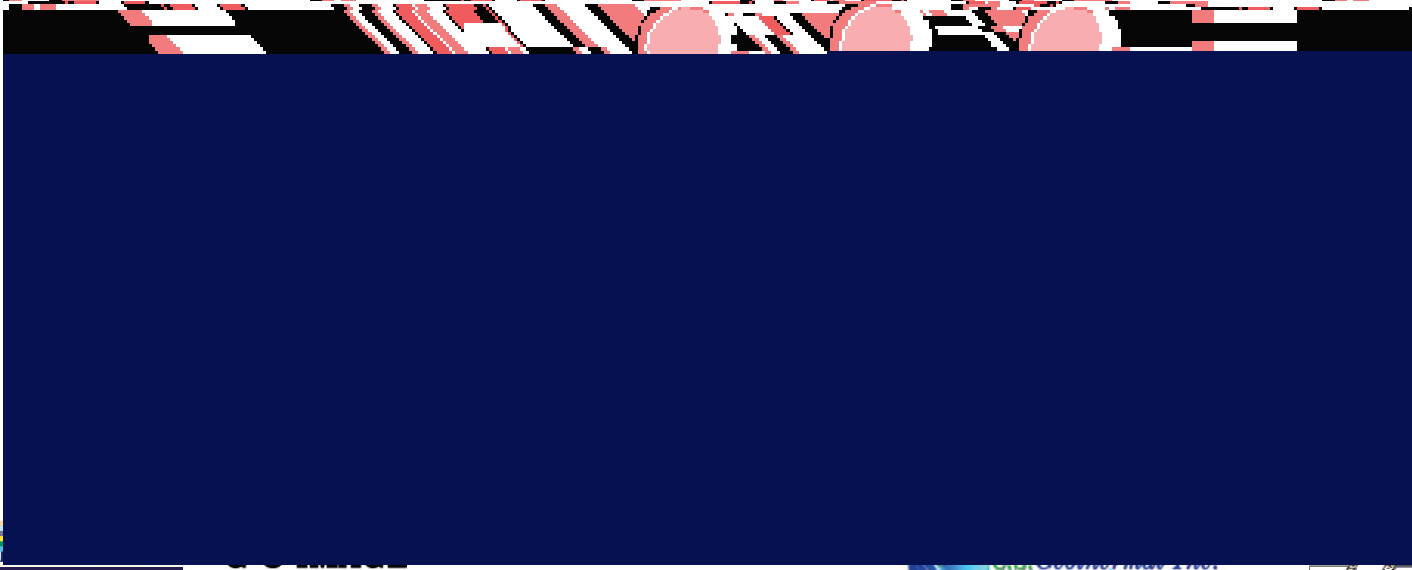
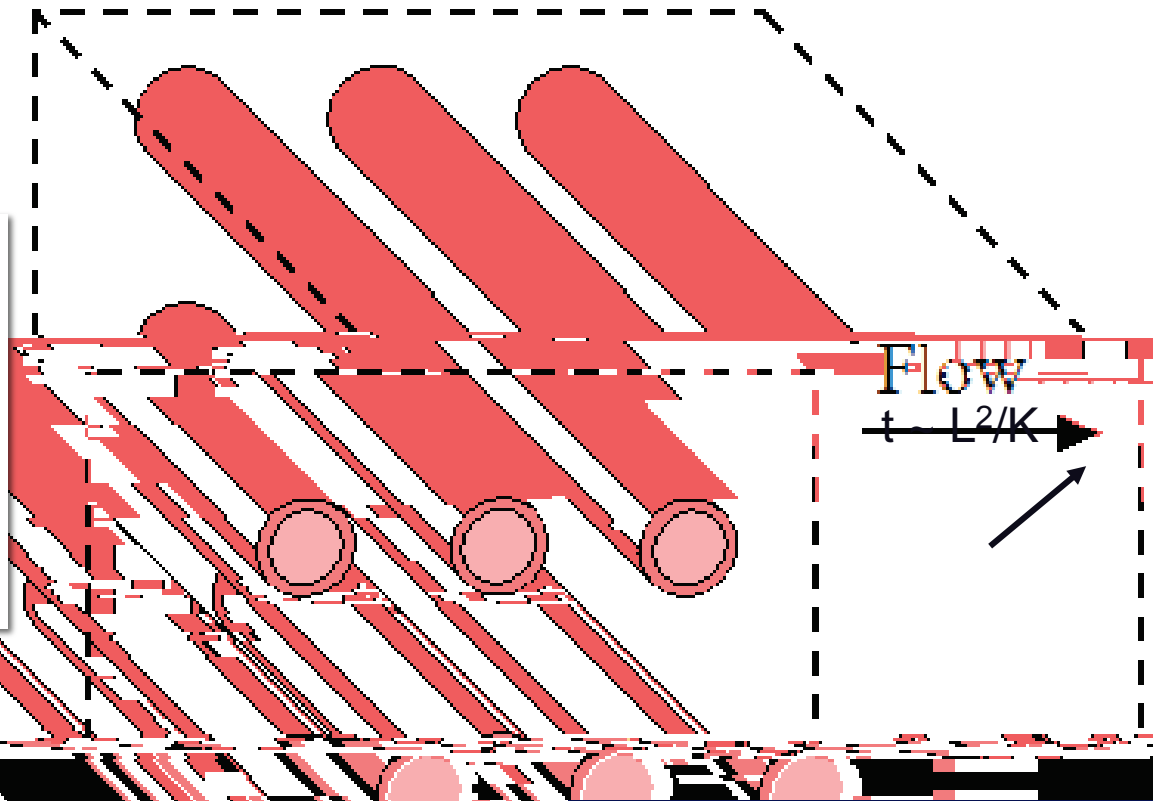
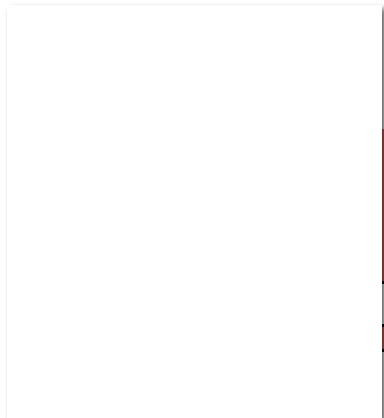


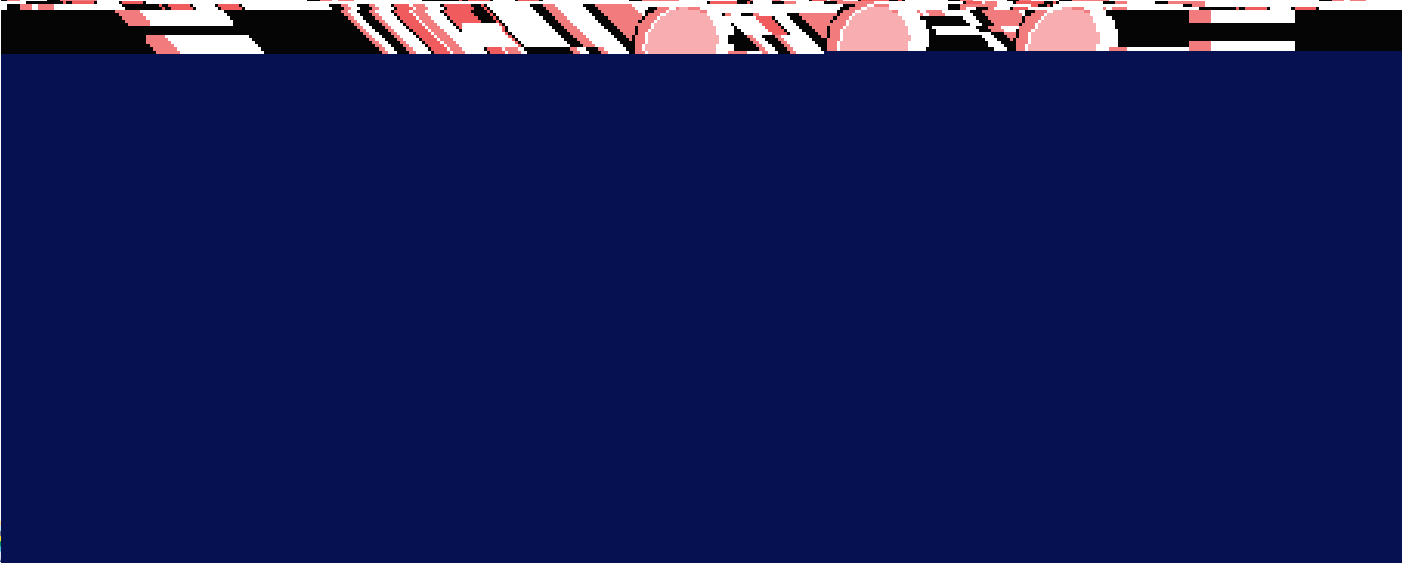
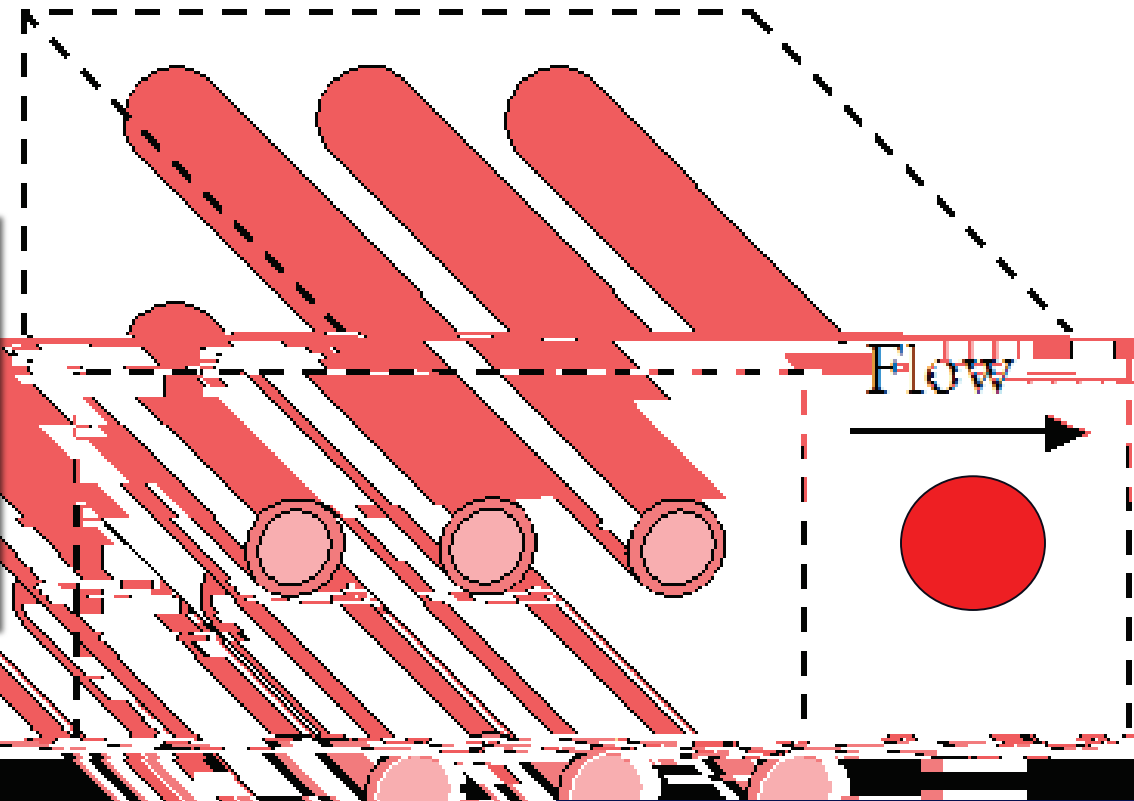
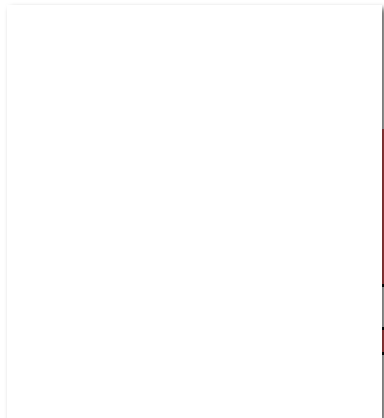
The Geysers, Northern California

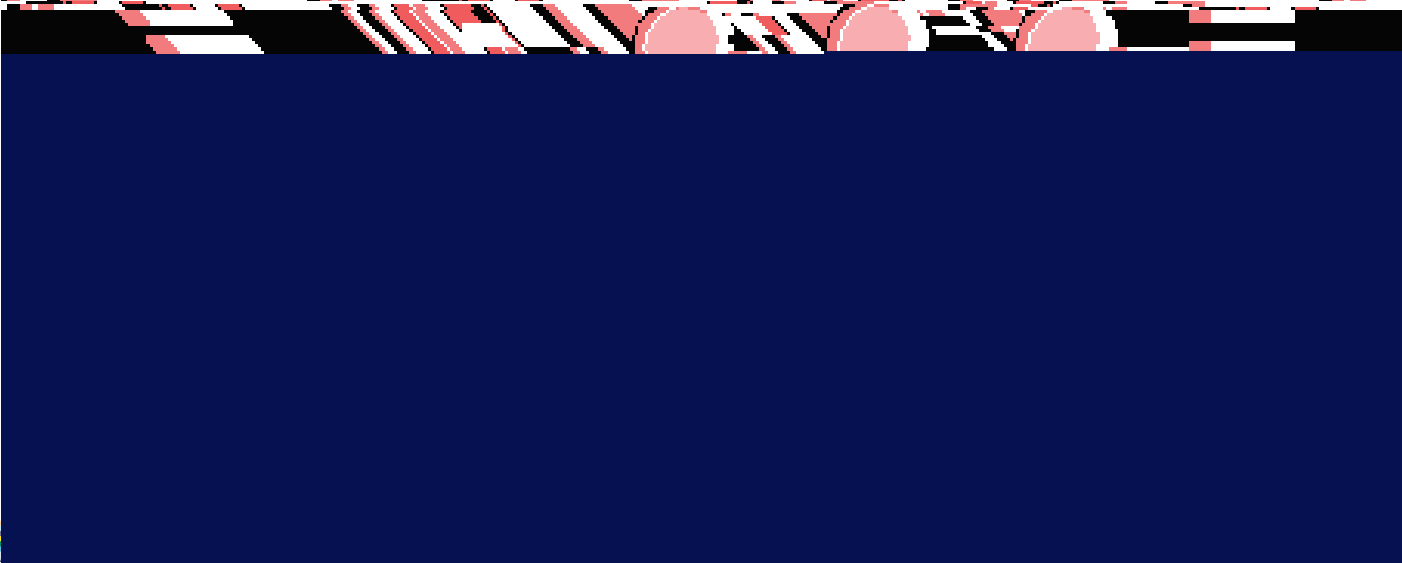
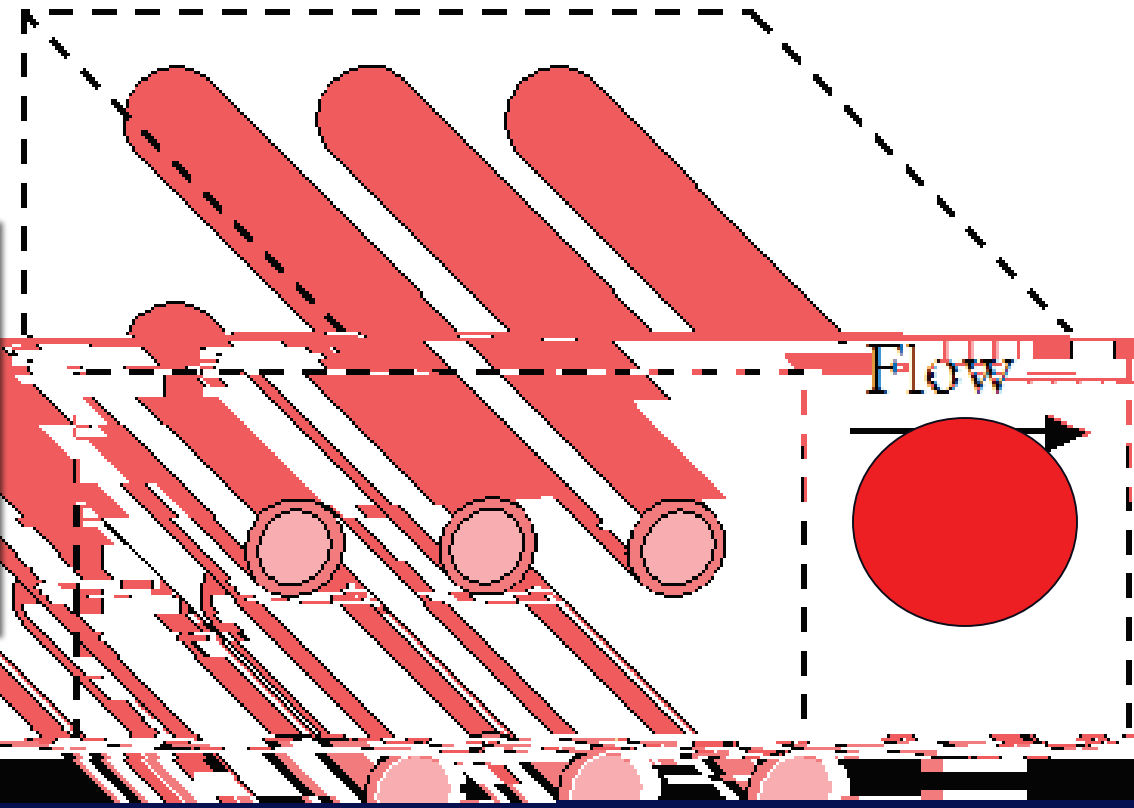
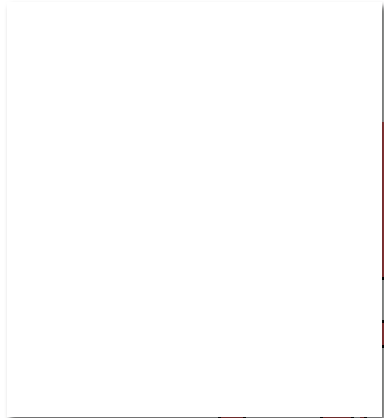


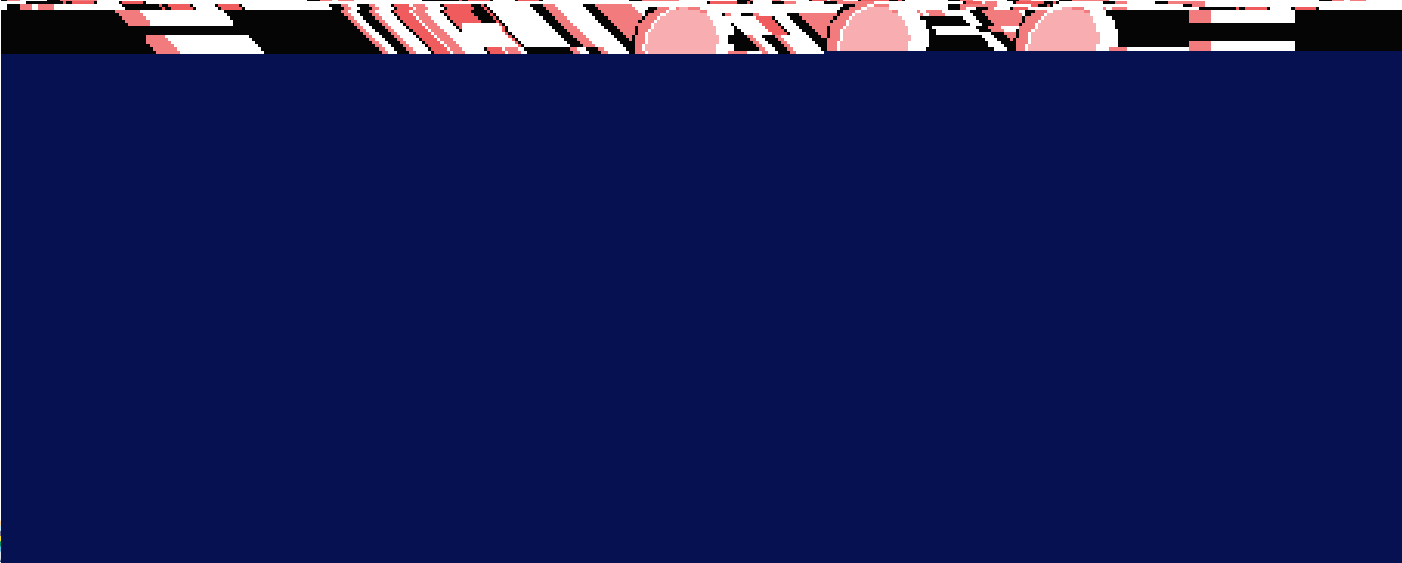
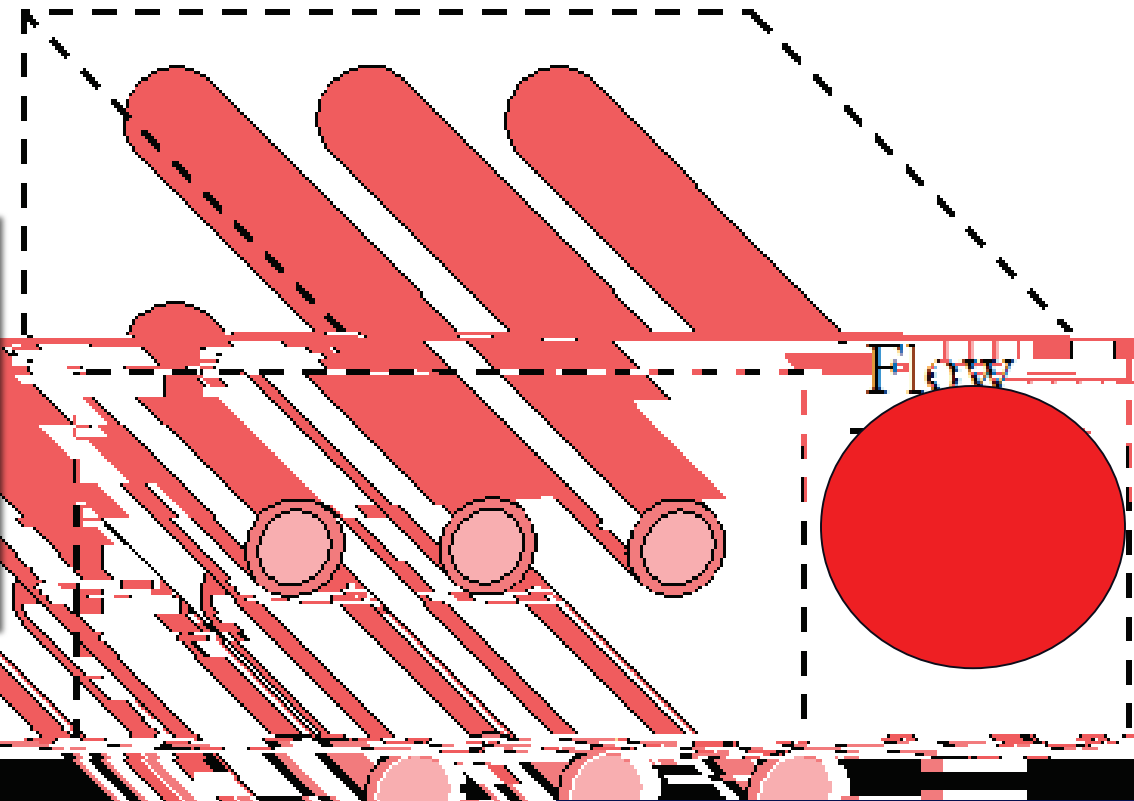
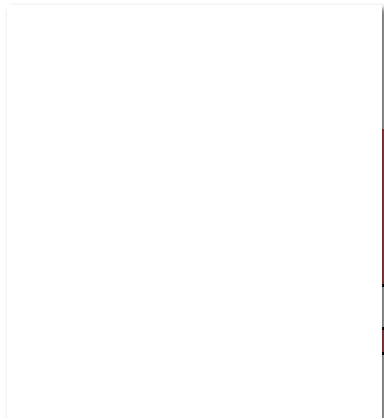
Hot Dry Rock

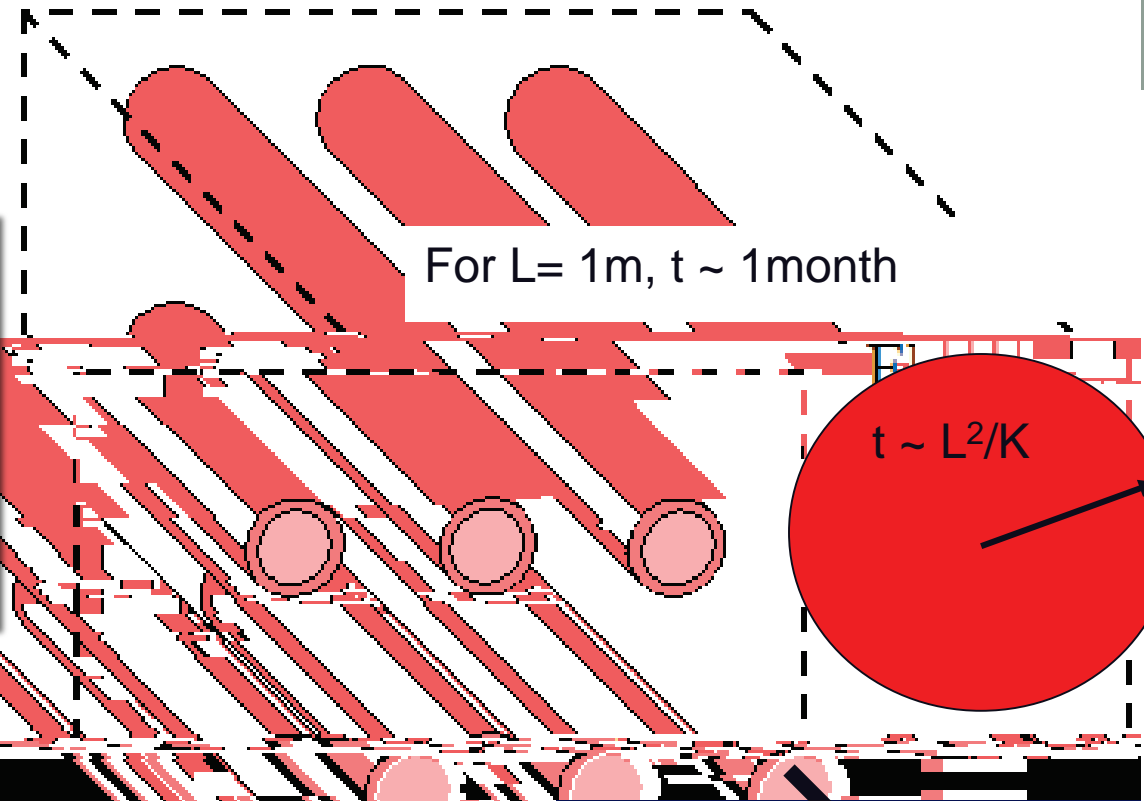
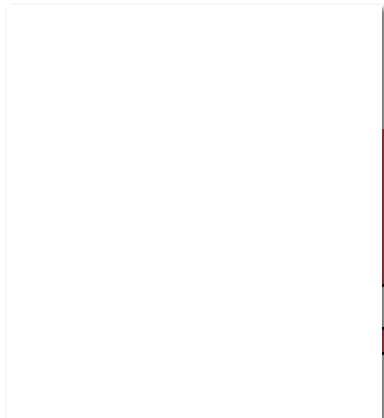






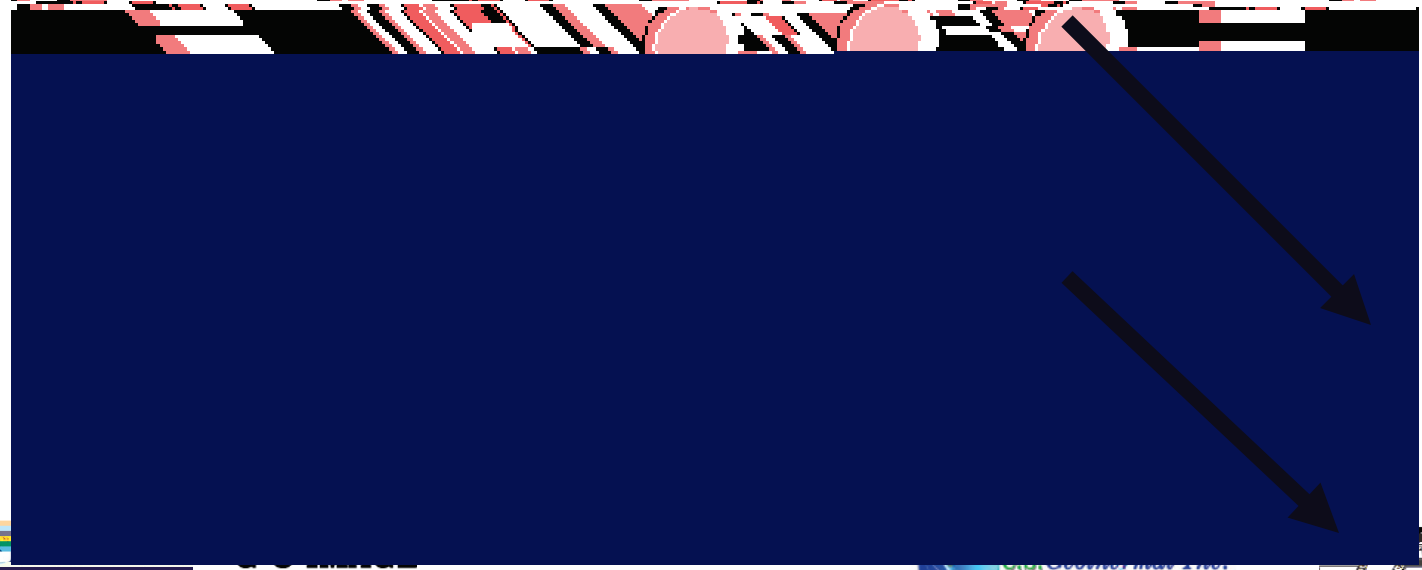




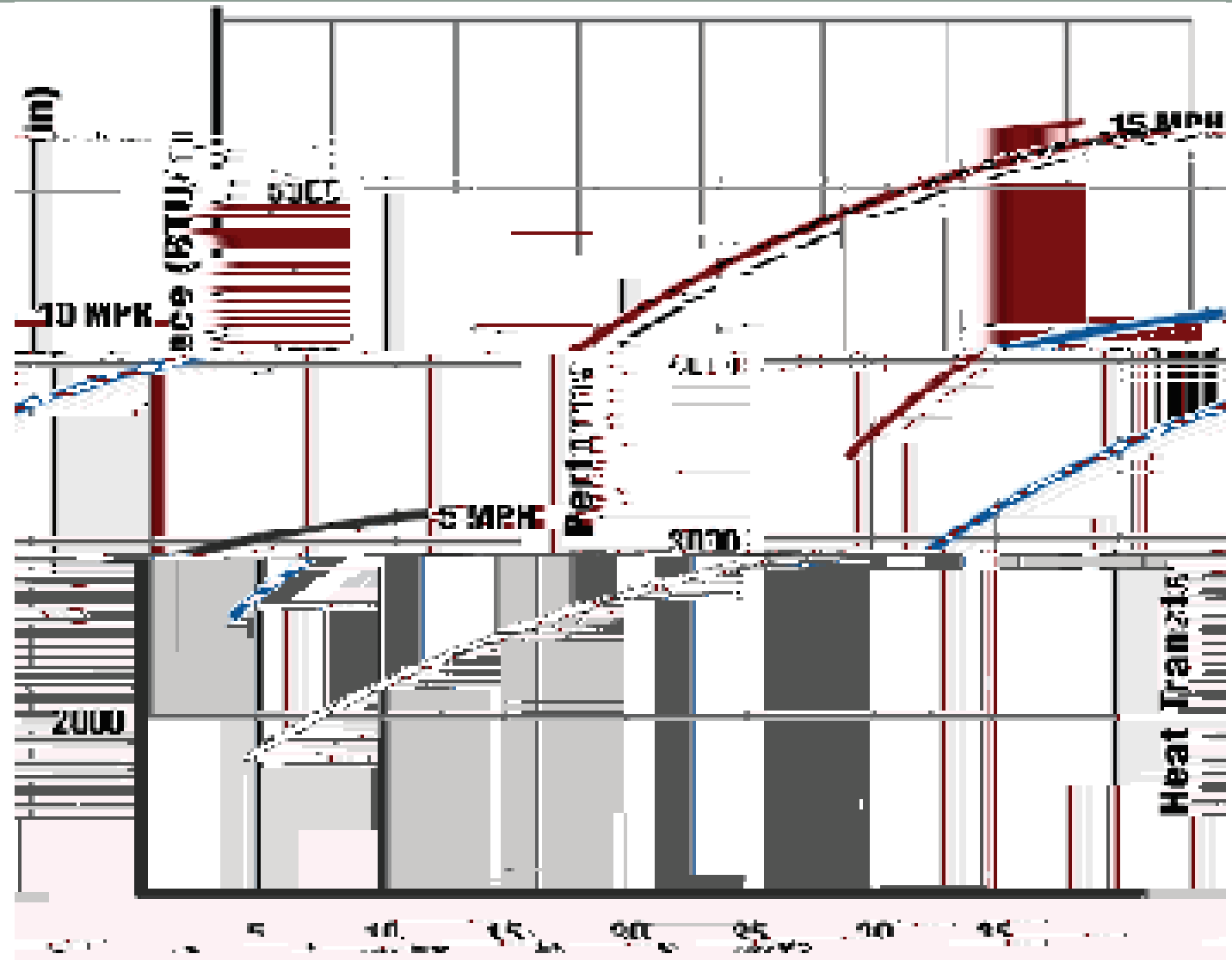


For $L = 1\text{m}$, $t \sim 1\text{month}$

$t \sim L^2/K$







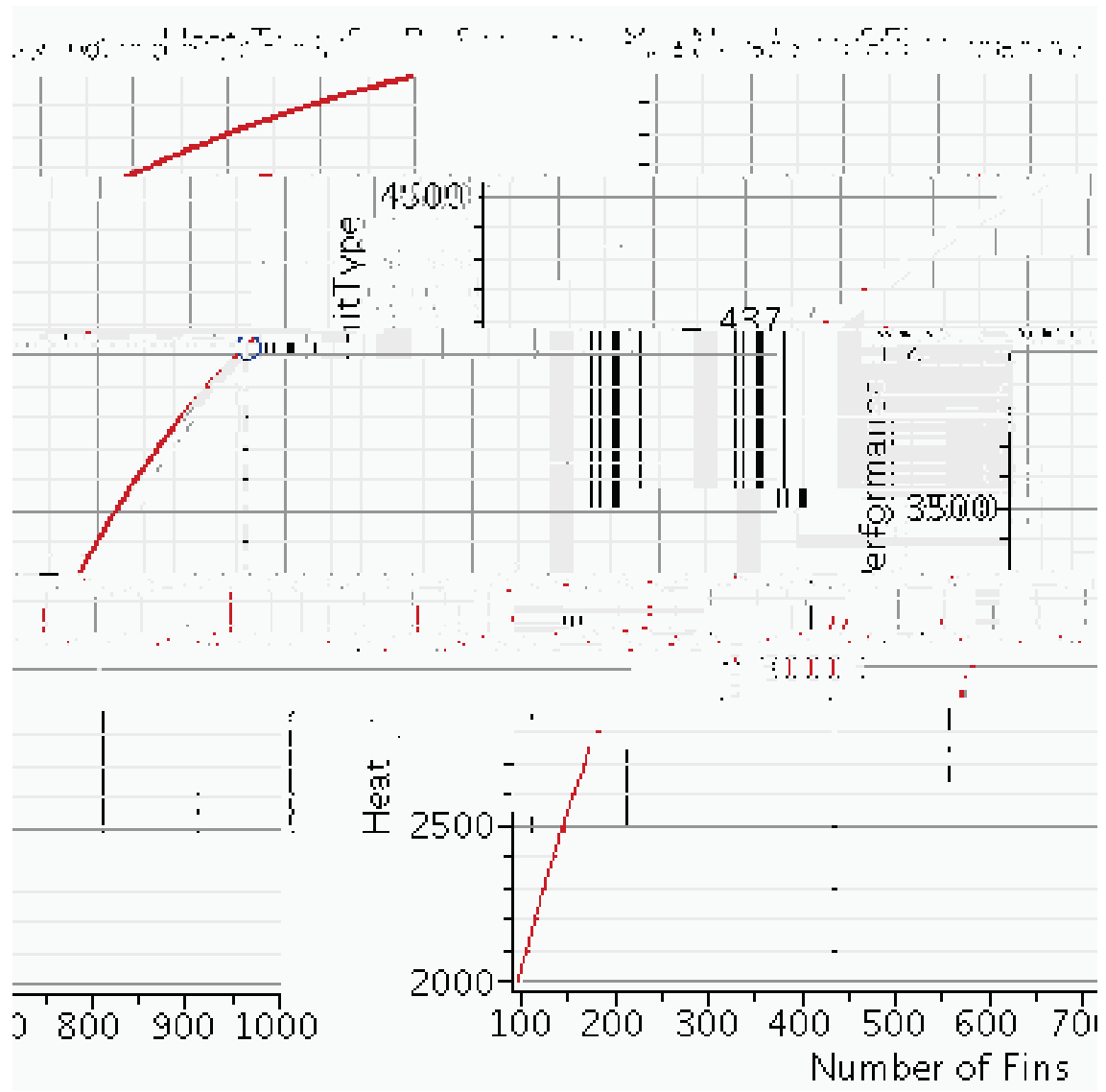
Coolant Flow (GPM)

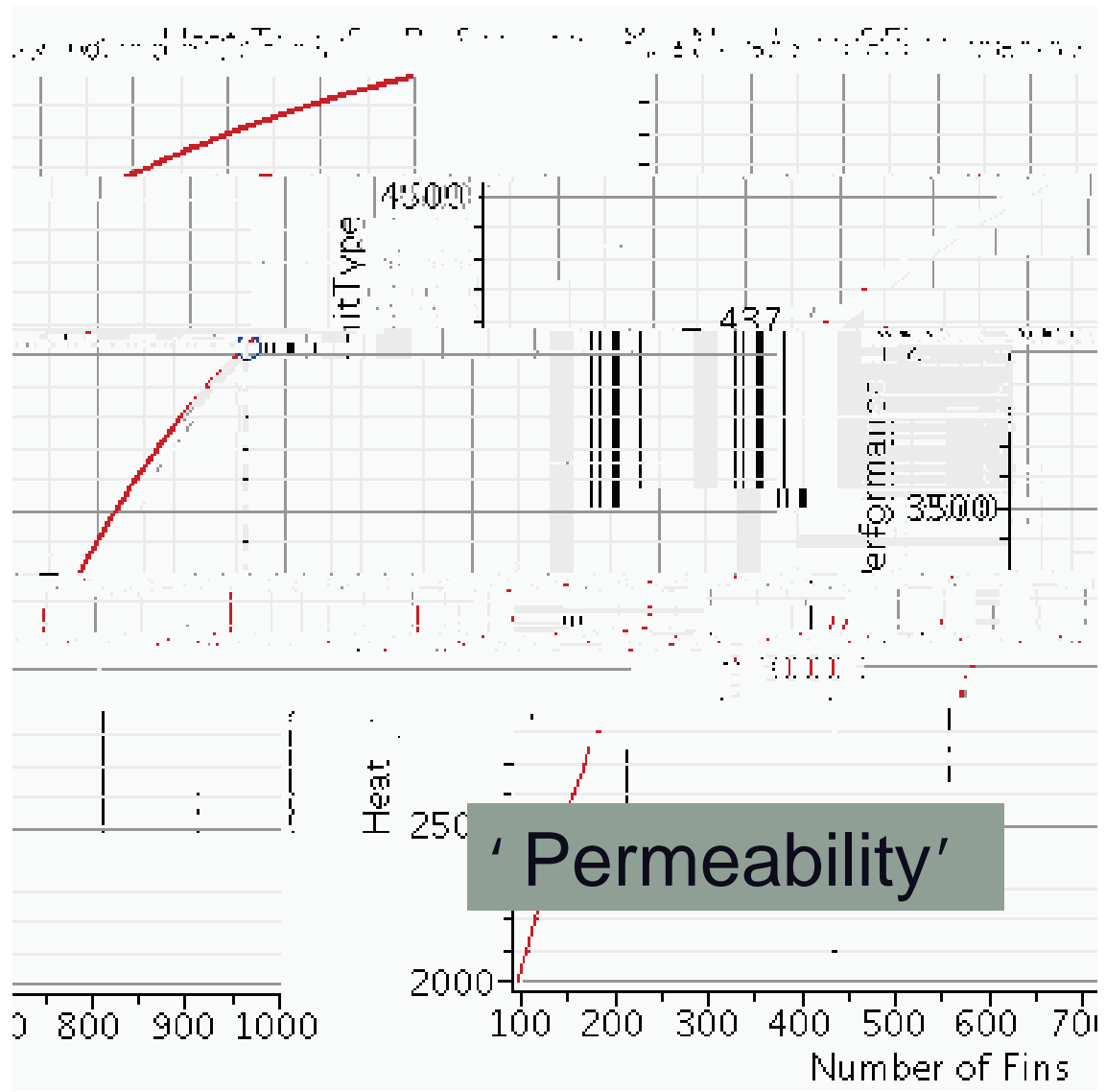
G-O IMAGE

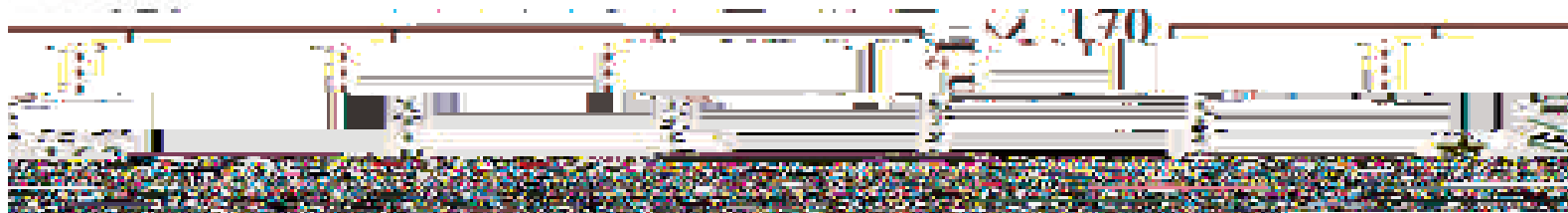


G-O IMAGE



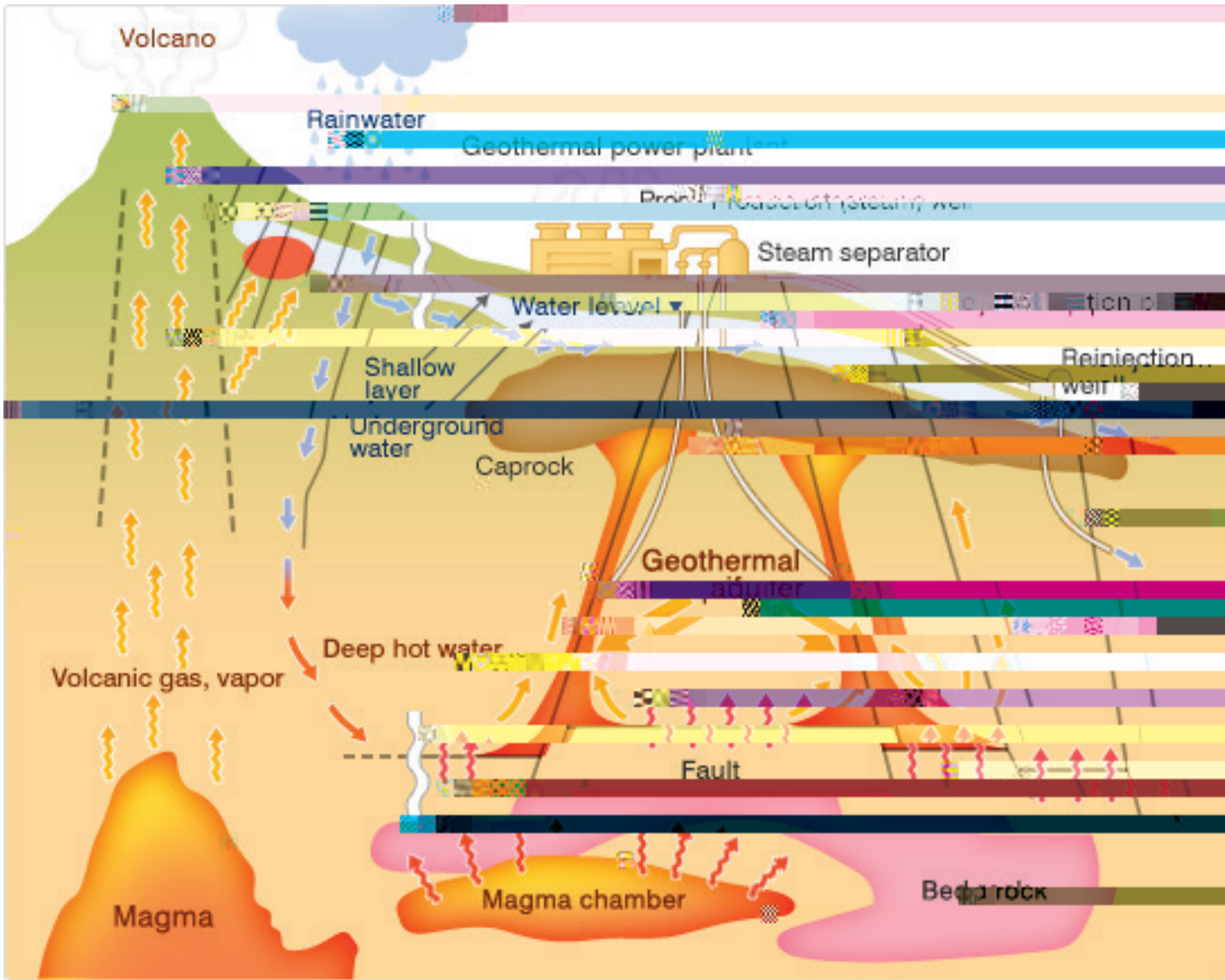




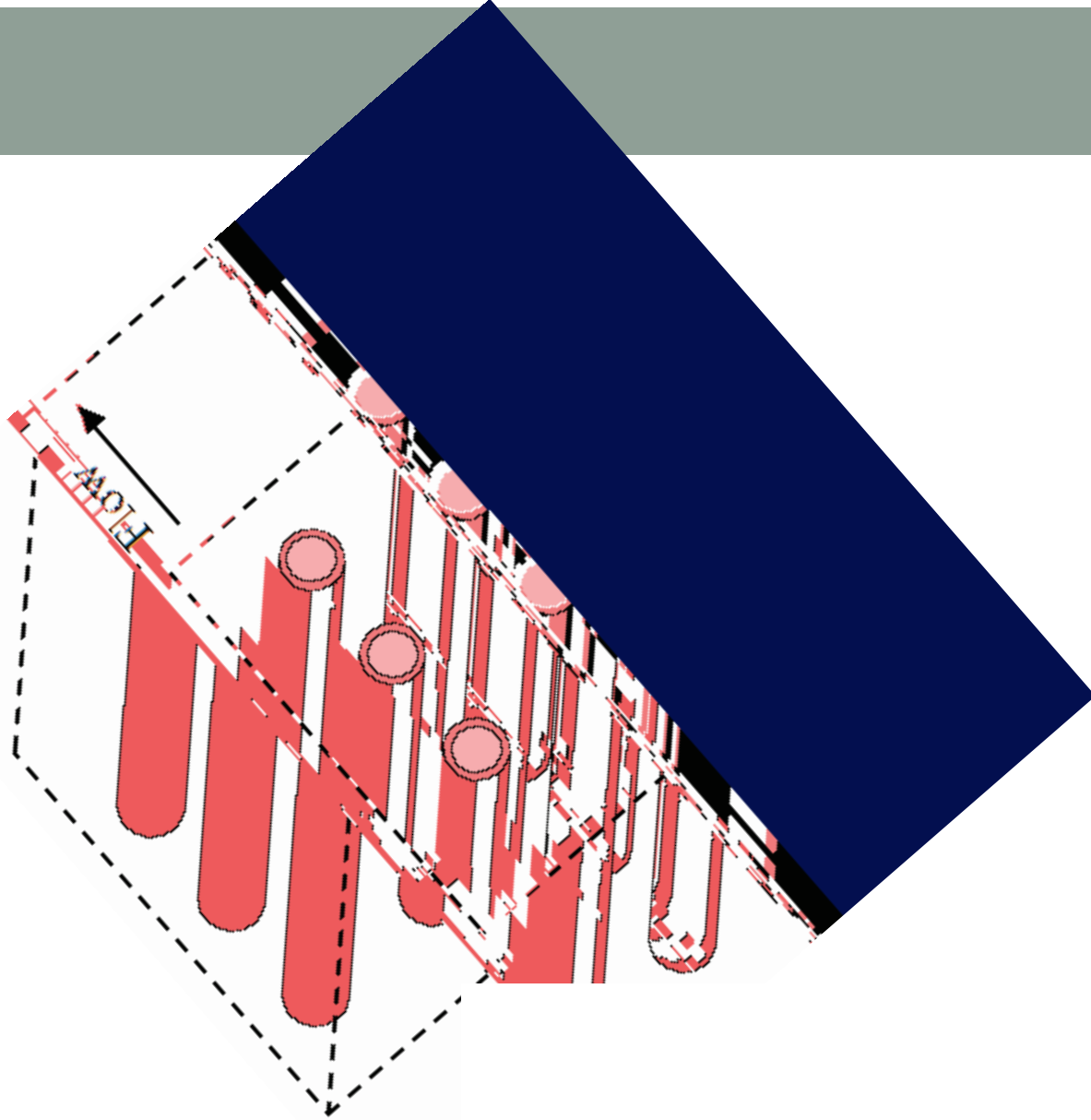


Recharge Rate

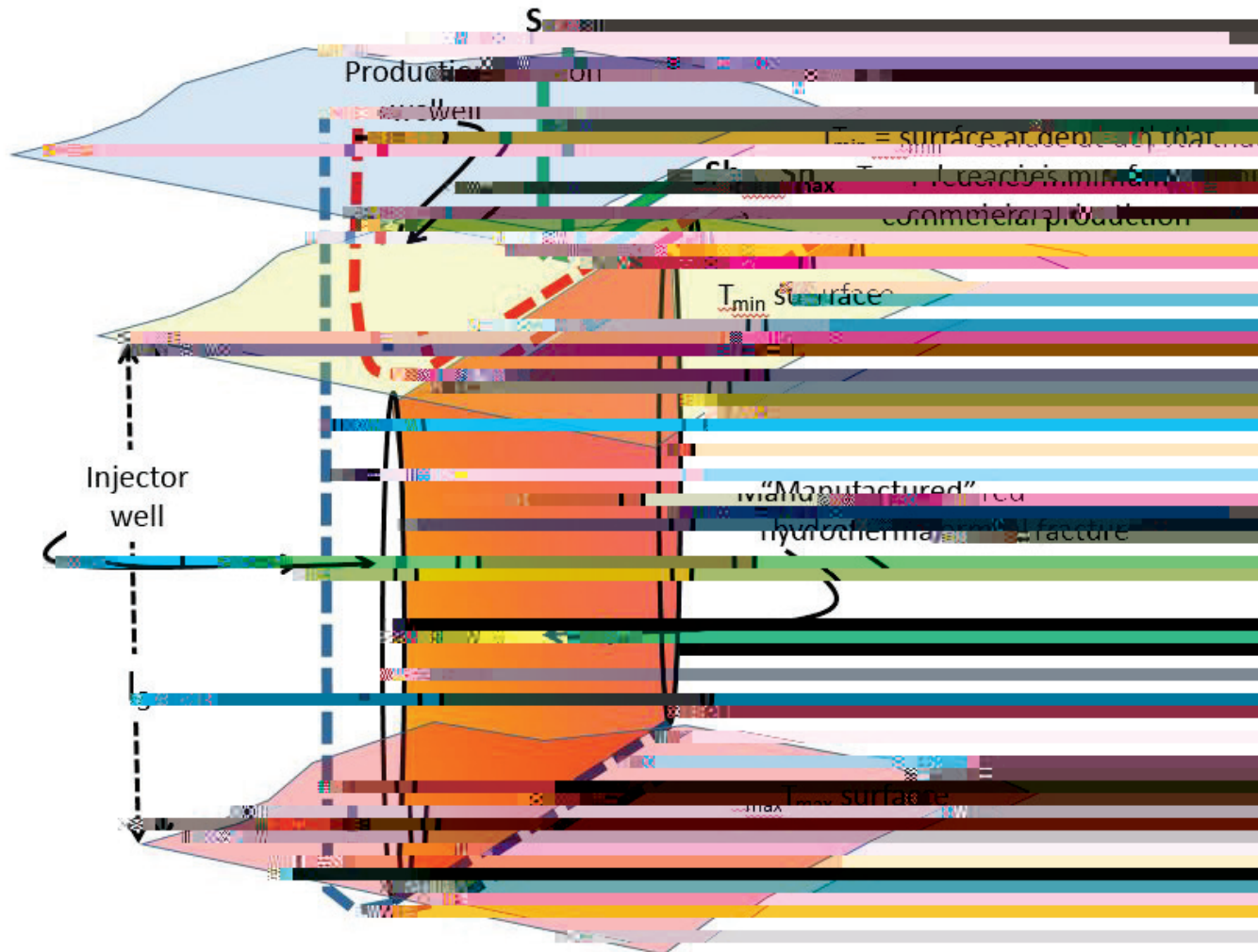
Geothermal Systems



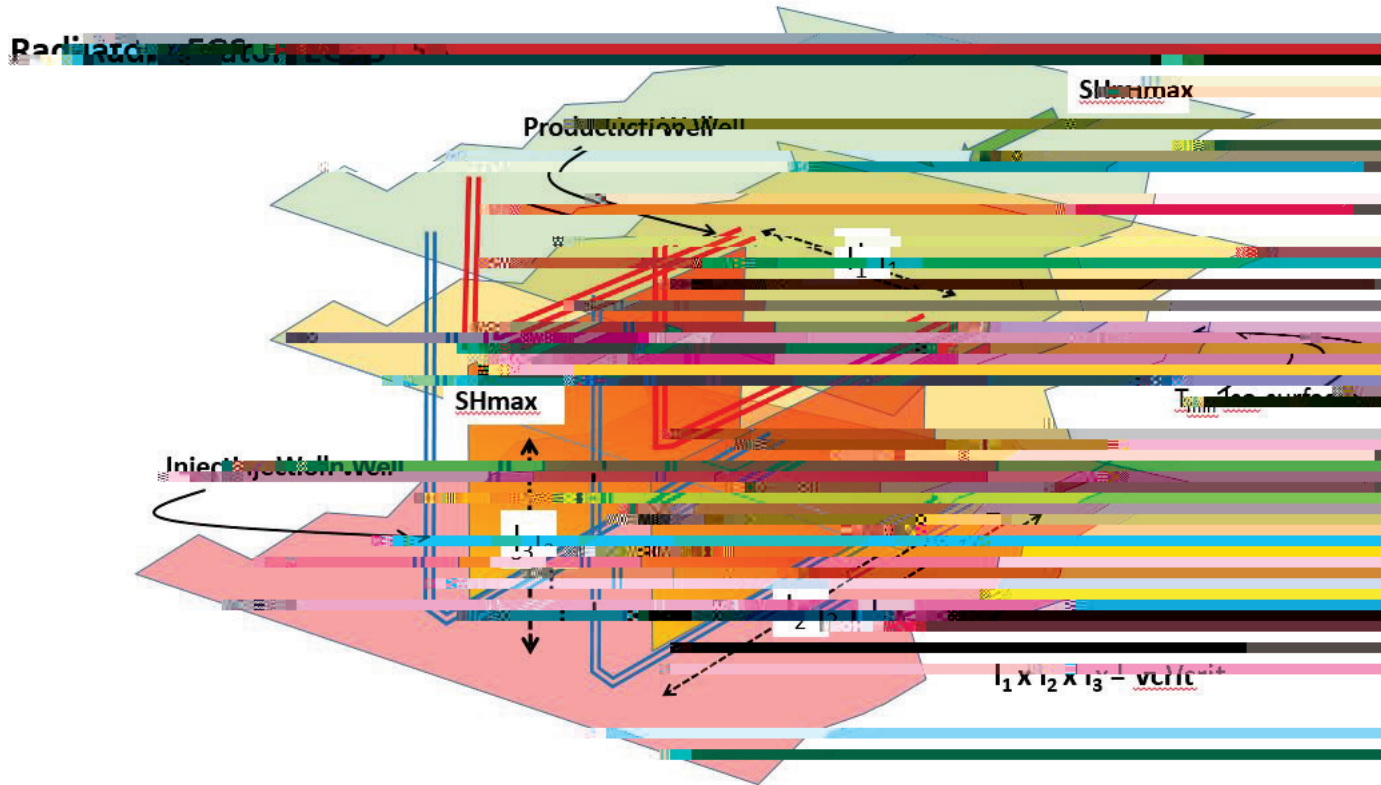




The RAD-EGS



The RAD-EGS

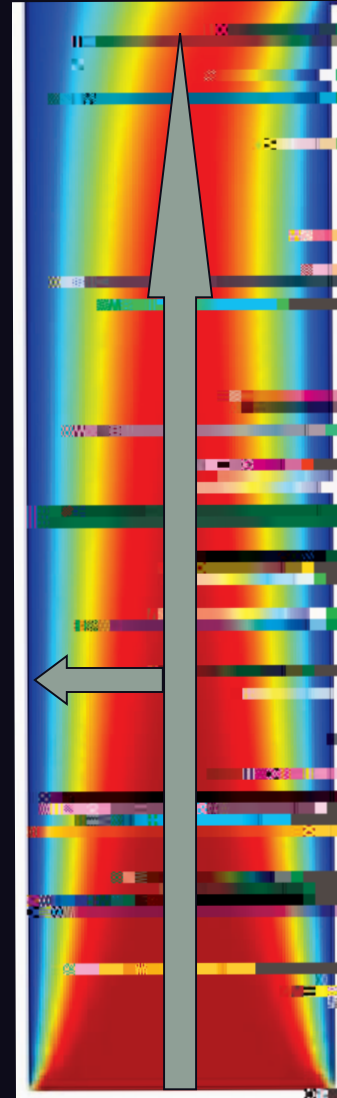


The RAD-EGS



The RAD-EGS





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

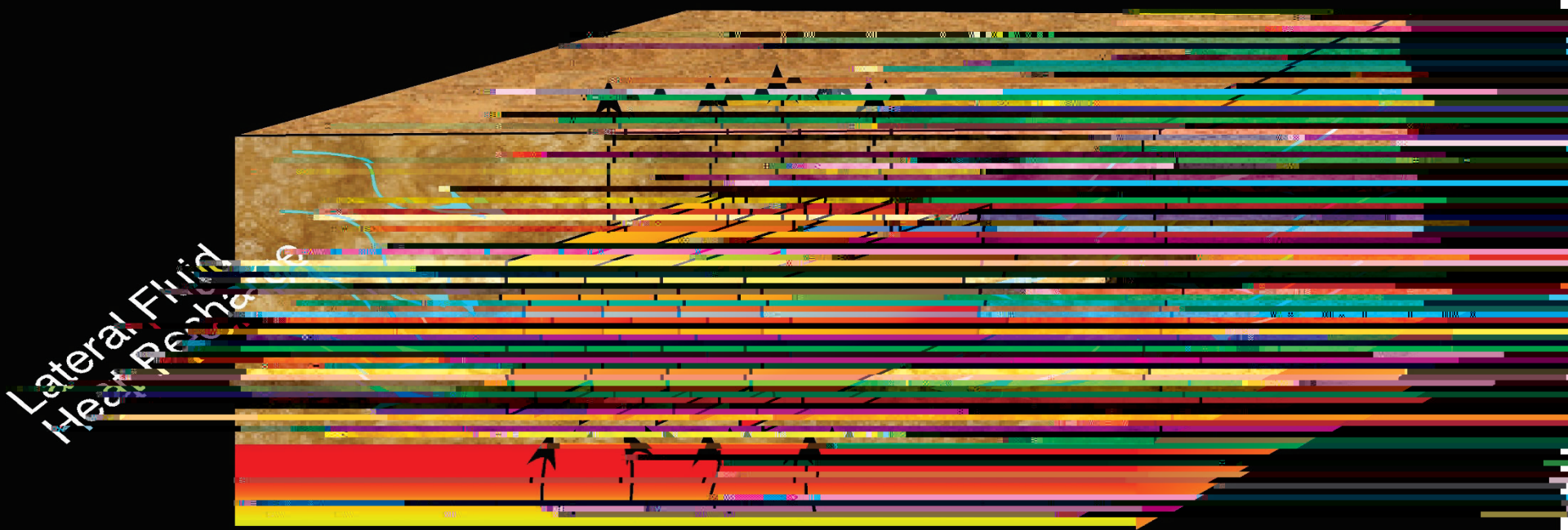
For $V \sim 1 \text{ km/year}$, $L \sim 1 \text{ km}$, and $K = 10^{-2} \text{ cm}^2/\text{sec}$

$$Pe \sim 100$$

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.



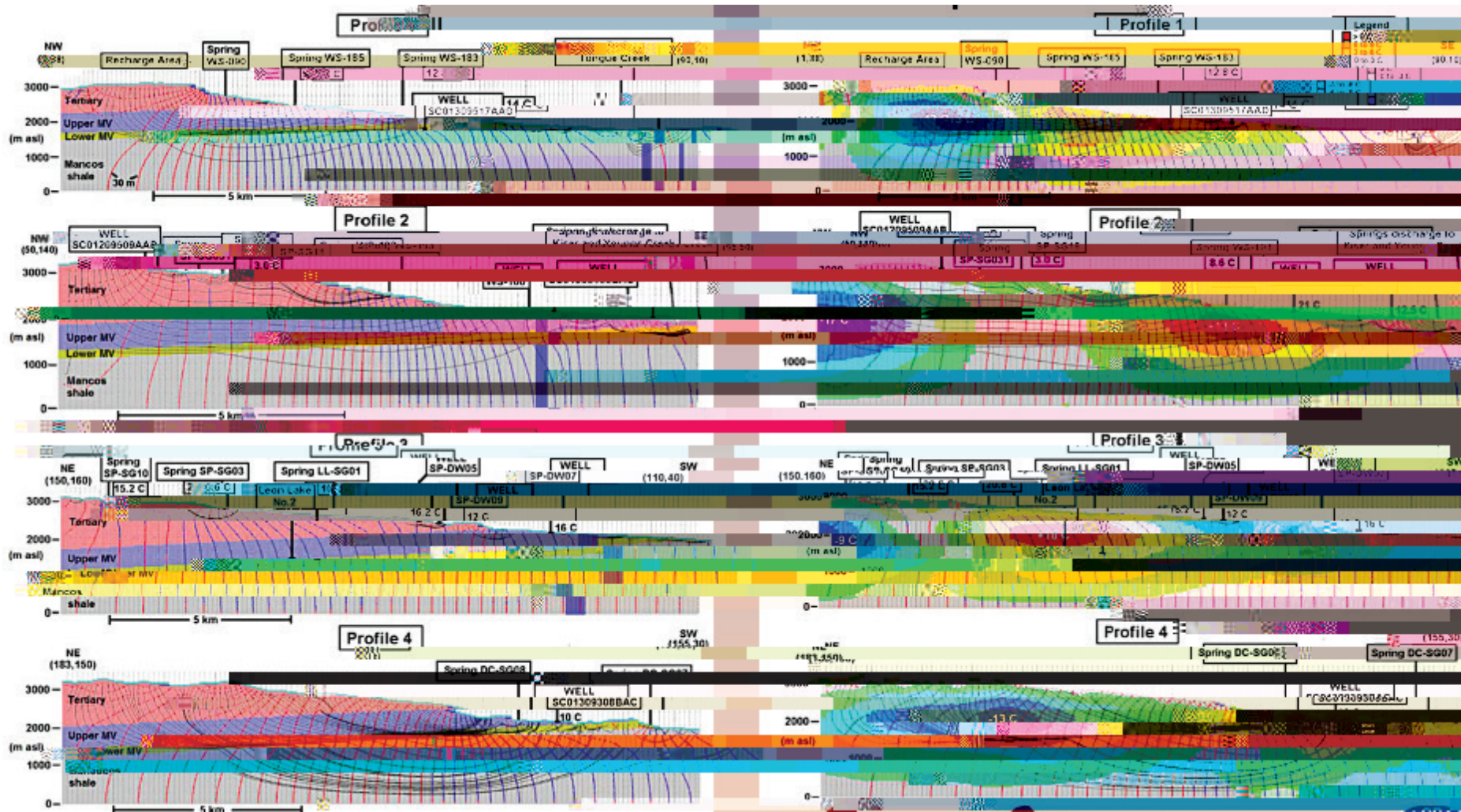
Creating a Massive Heat Sink Heat Extension



Deep (Magma) Heat Flow
By extracting heat in fracs a cool 'reservoir' is made that

Flow

Temperatures





G-O IMAGE



