St1 Deep Heat Oy

First deep geothermal project in Scandinavia

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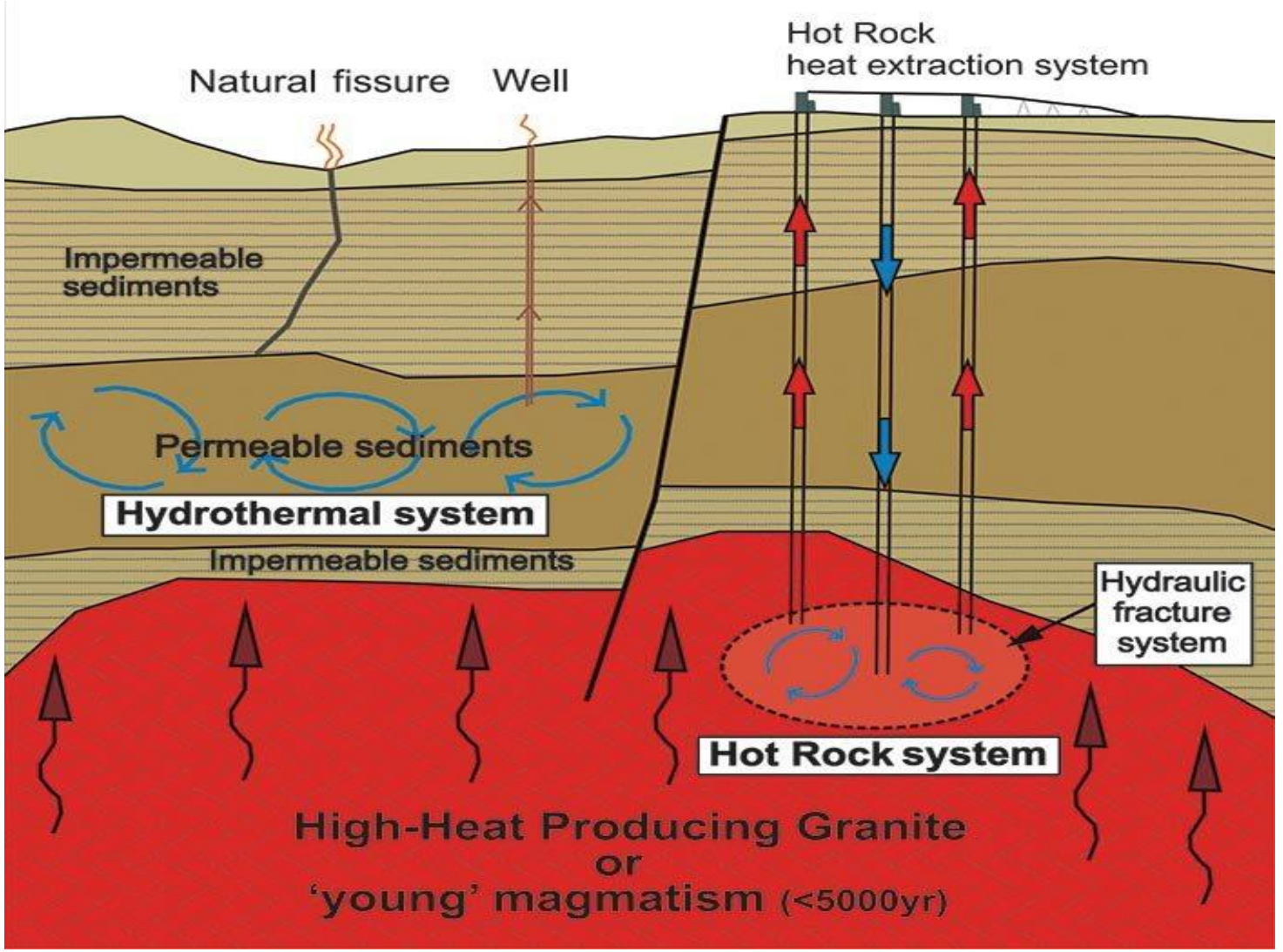
Engineered Geothermal System – EGS - Basics



Geoscience Australia

$$P \sim \eta * c * \Delta T * \dot{m}$$

Power ~ efficiency * specific heat capacity * temperature drop * mass flow

40 MW_T (> 80% Heat) (~ 100 C) (> 100 l/s)

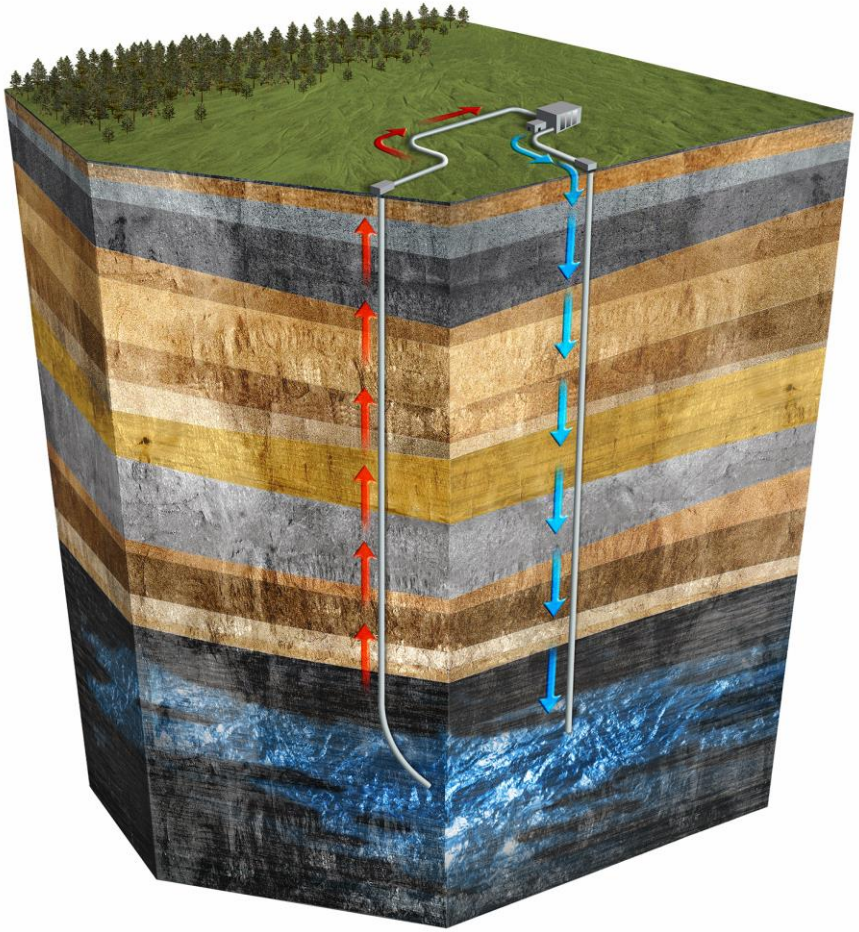
4 MW_E (<10% Electric) " "

1 liter of 100 ˚C water → 0.3 MJ

1 liter of crude oil → 30 MJ

Oil/Water = 100 / 1 (E are about the same)

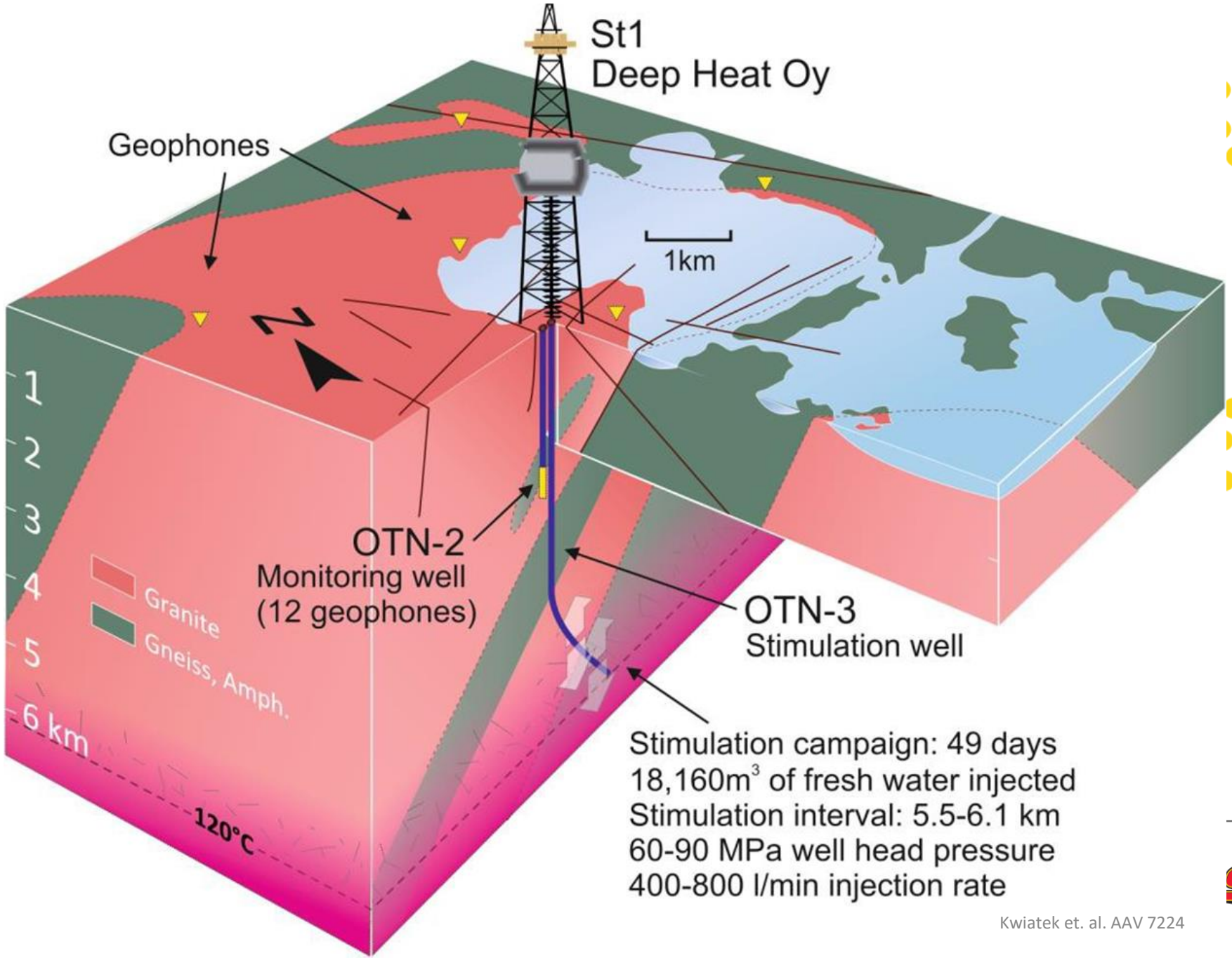
→ 100 l/s to match!



St1 Deep Heat project: plant concept

- St1 concept is basically an 40 MW EGS (Enhanced Geothermal System) heat plant
  - This gives better efficiency for the plant and allows more electricity to be used in pumping
- Finnish district heating networks are all designed with maximum temperature 120 °C and normal maximal operating temperature is around 115 °C.
  - Summer time minimum temperature is 75 °C
  - This causes the need to drill as far down as 6400 m in Southern Finland

YouTube: ”St1 Value Chain”

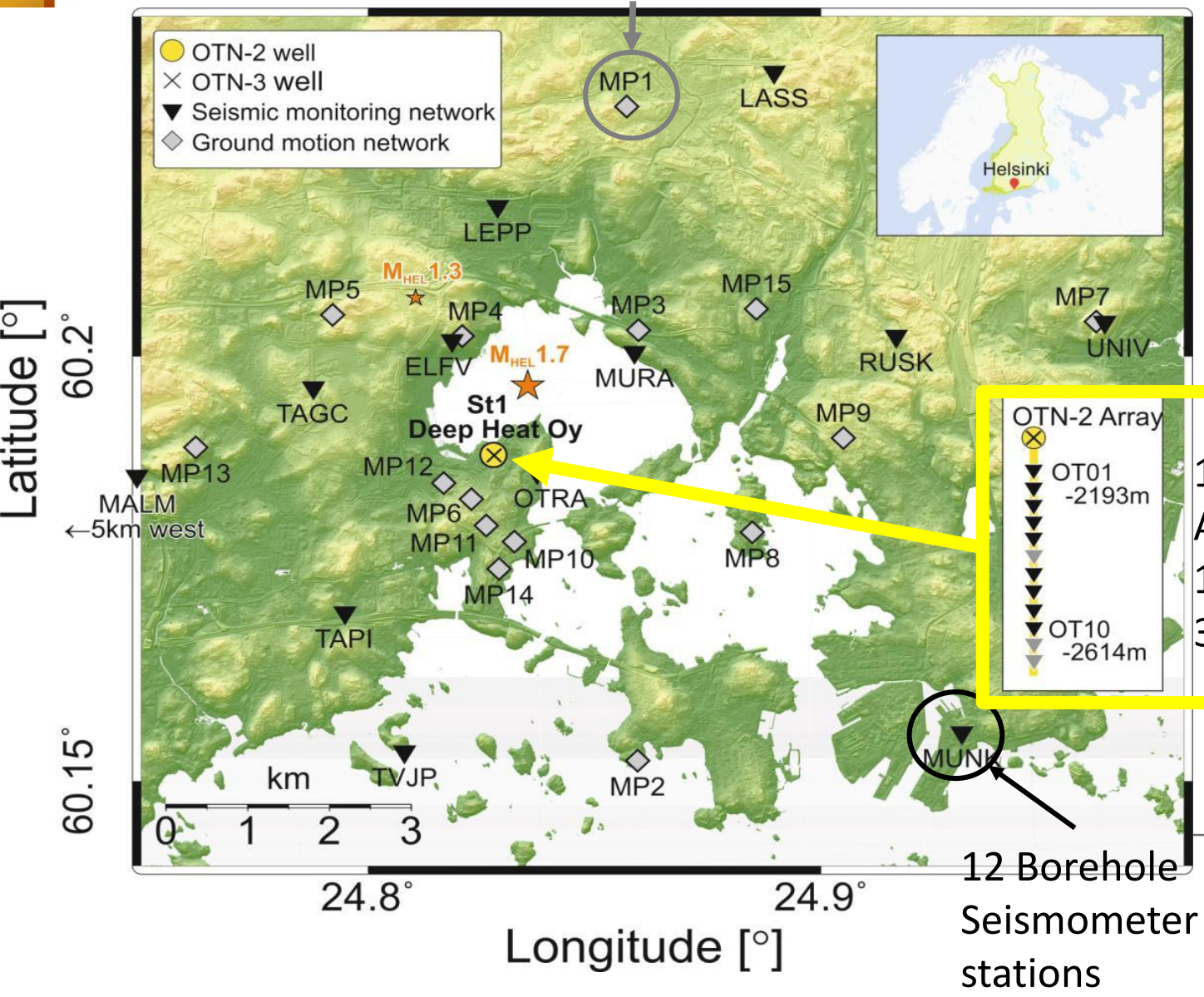


Kwiatek et. al. AAV 7224

Drilling Efficiency

Seismic Network

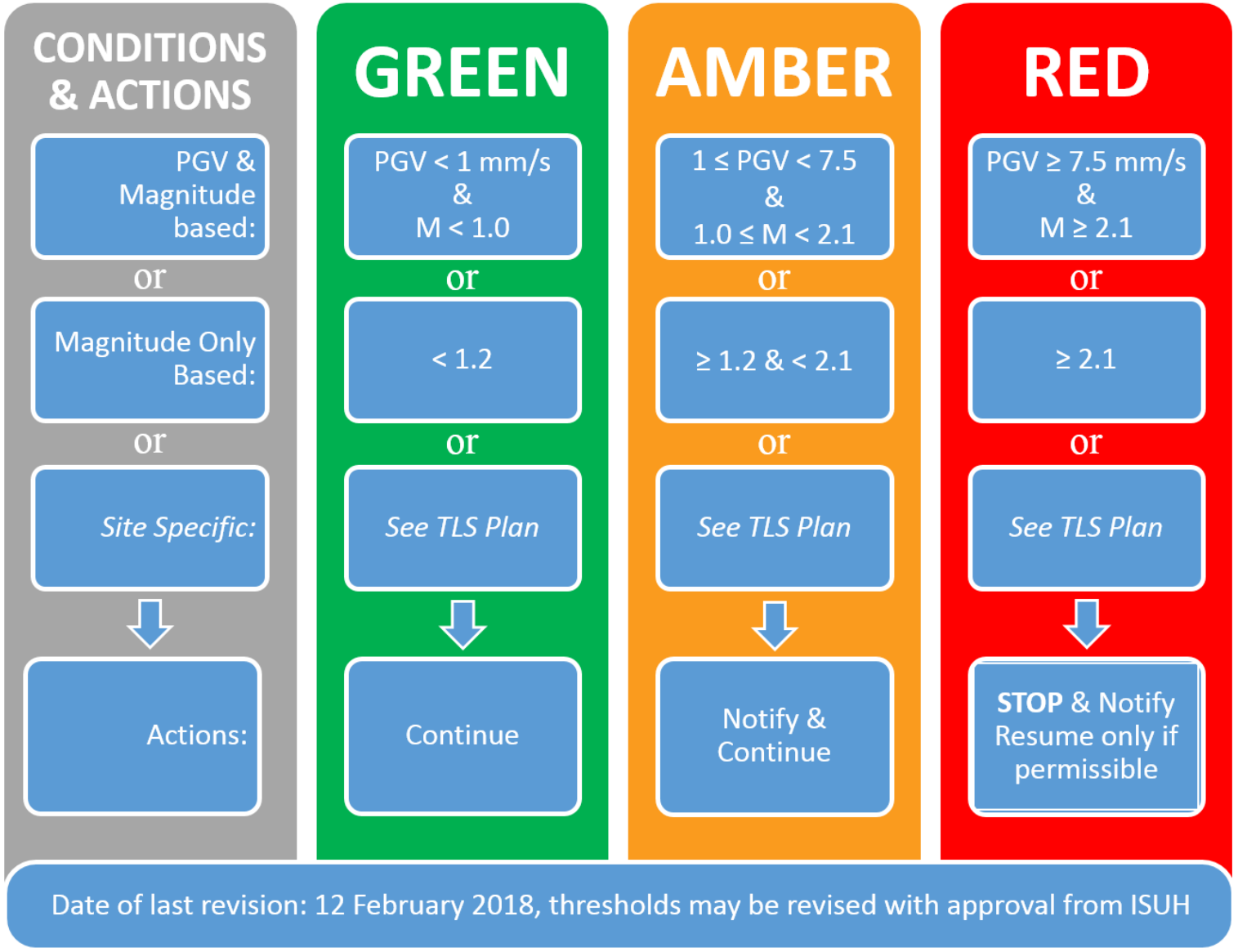
17 Surface PGV stations



1 Deep Array of 12 level 3C

12 Borehole Seismometer stations

Public Acceptance



Public Acceptance

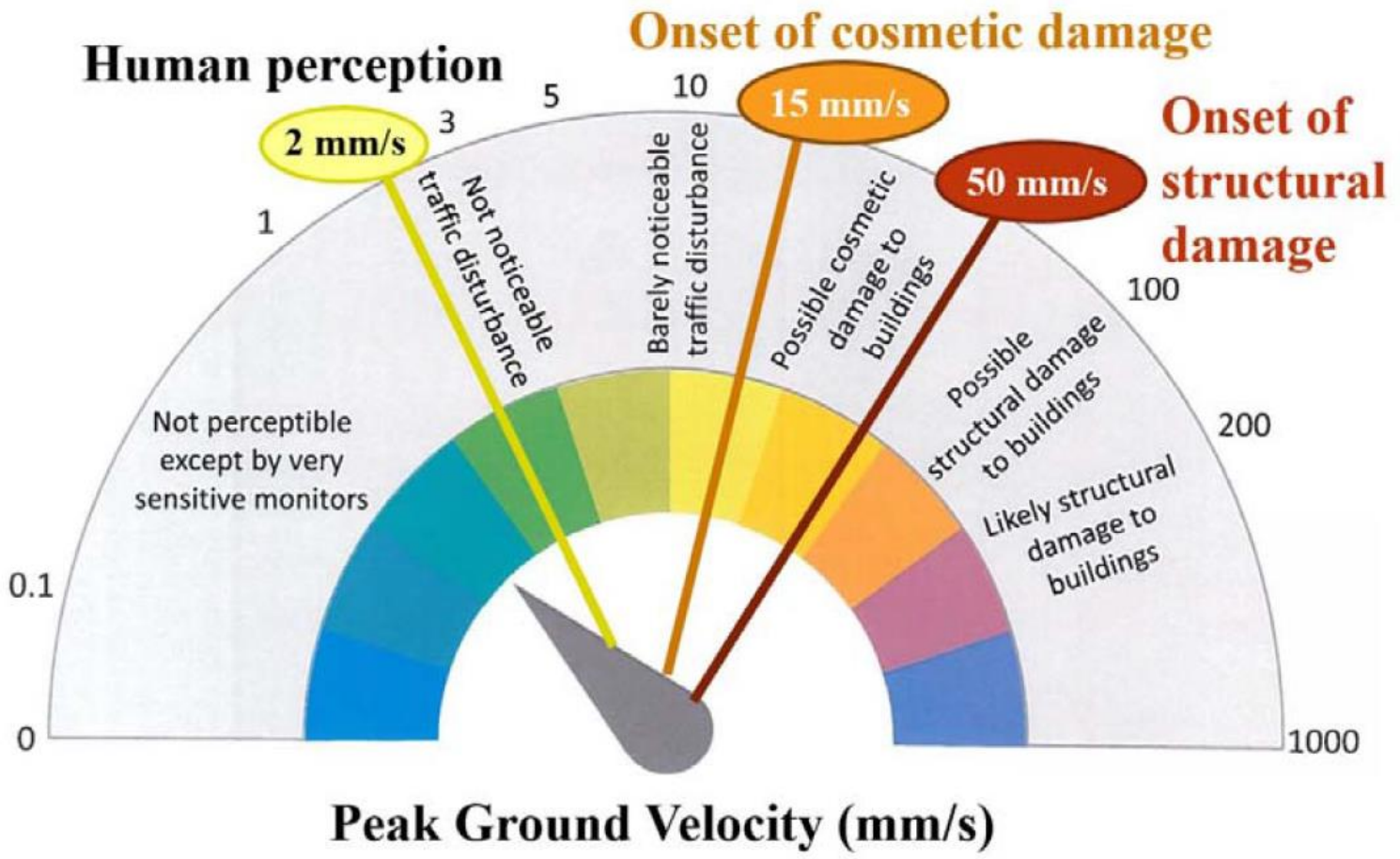
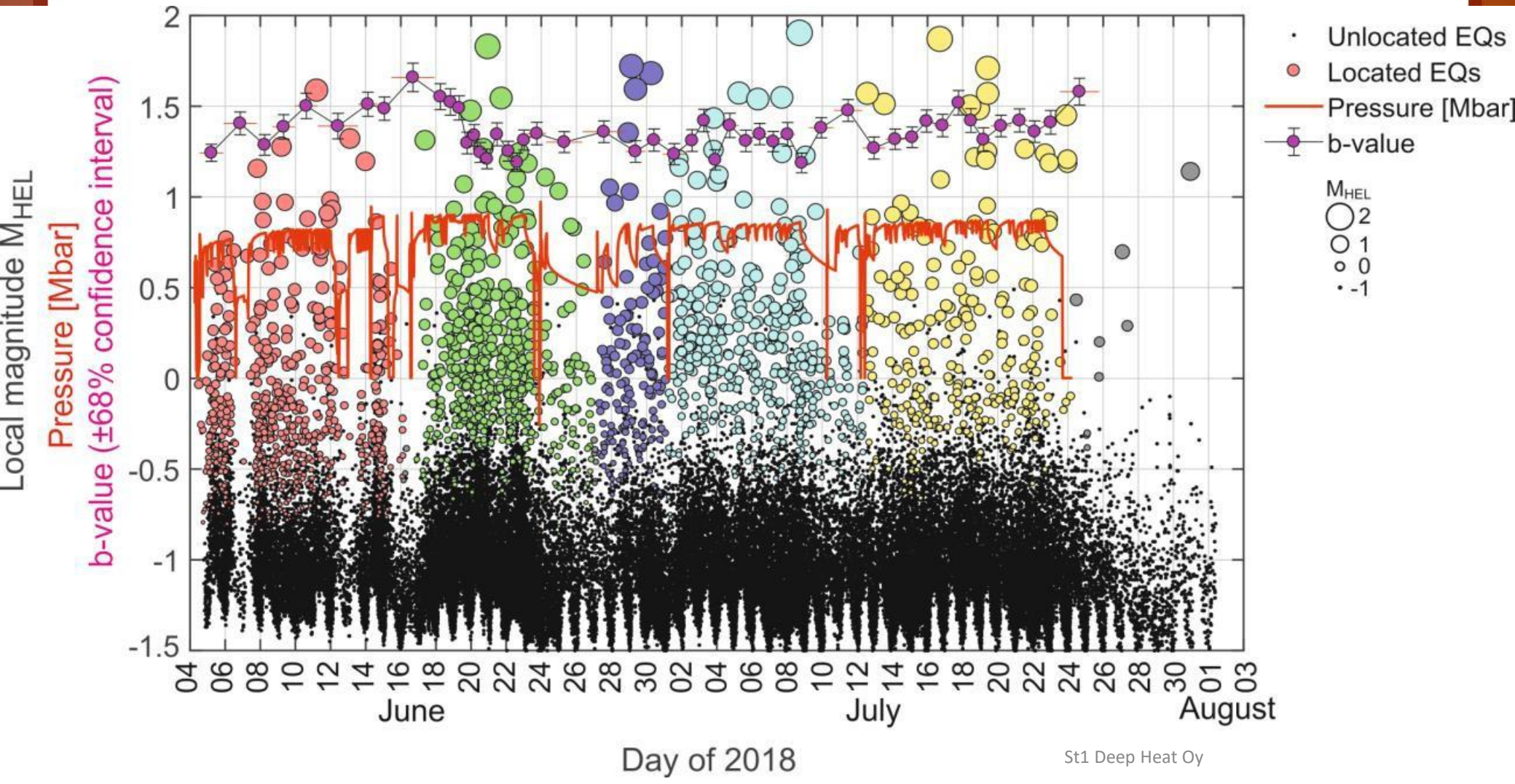


Figure 9. Relationship between PGV and impact (from Bommer, 2017).

Stimulation Control



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