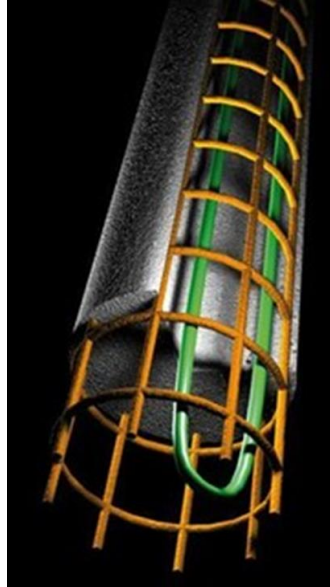


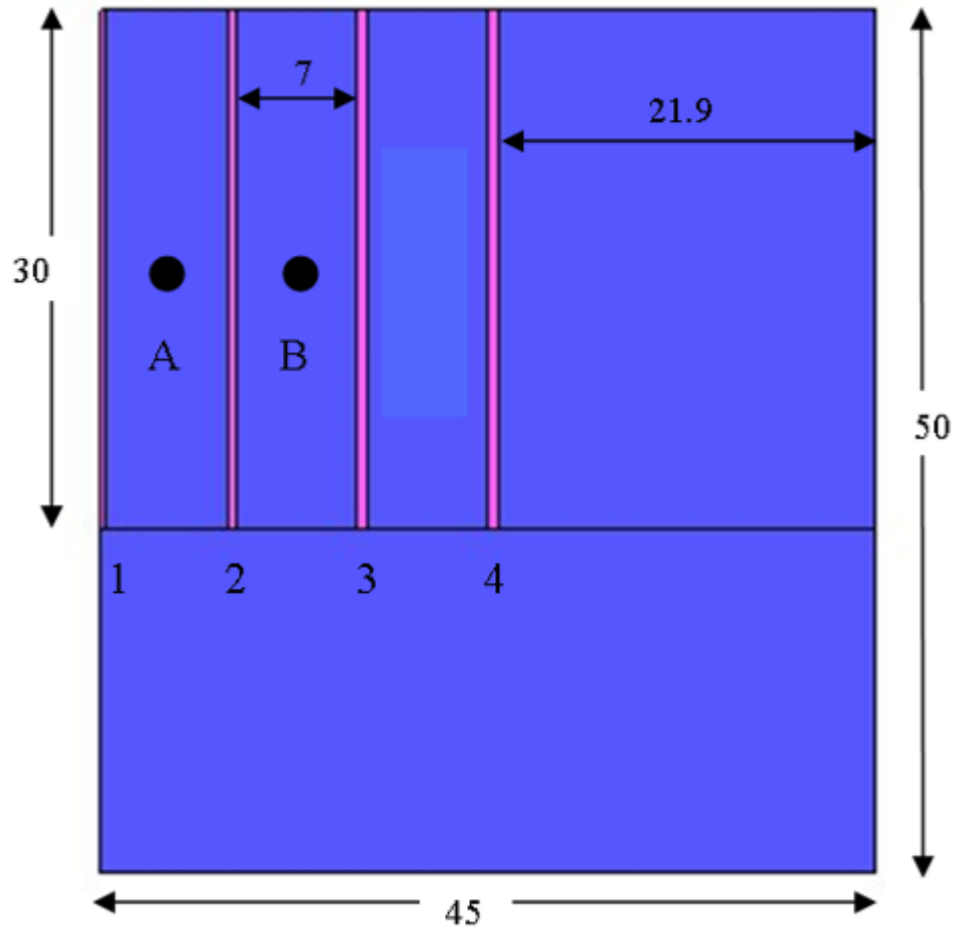
# Numerical investigation of the performance of geothermal energy piles under different soil moisture conditions

Sani A.K. & Singh R.M.

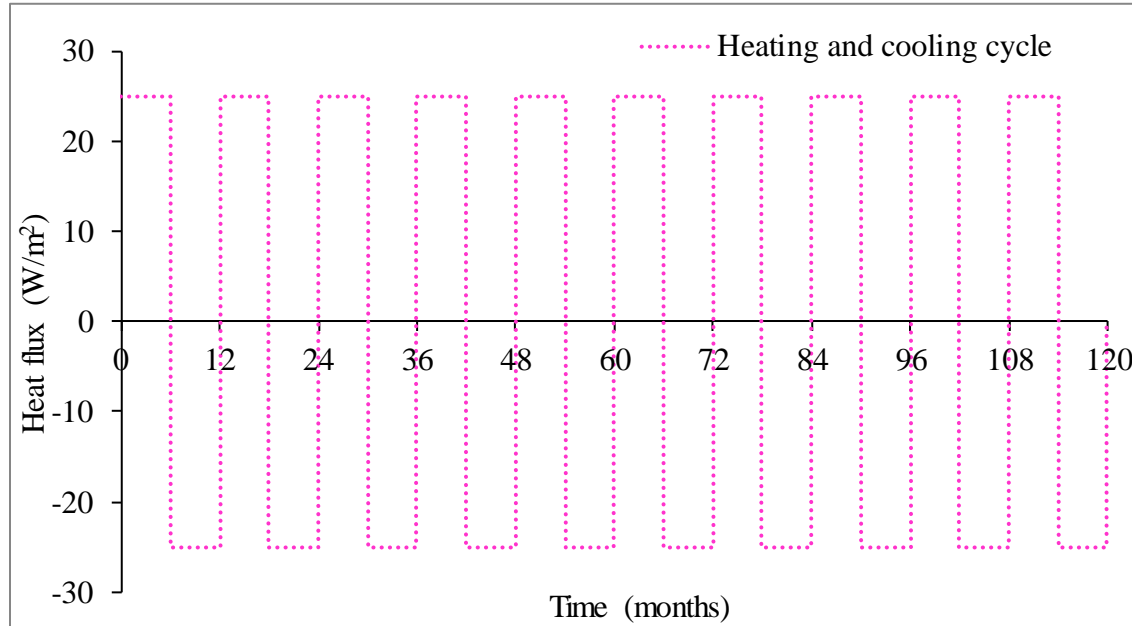
## *Definition:*

- Geothermal energy piles (GEPs) dualizes the role of foundation piles, firstly, for load support and in meeting the thermal energy demand of the overlying structure.
- They are also known as ground heat exchangers or energy piles.



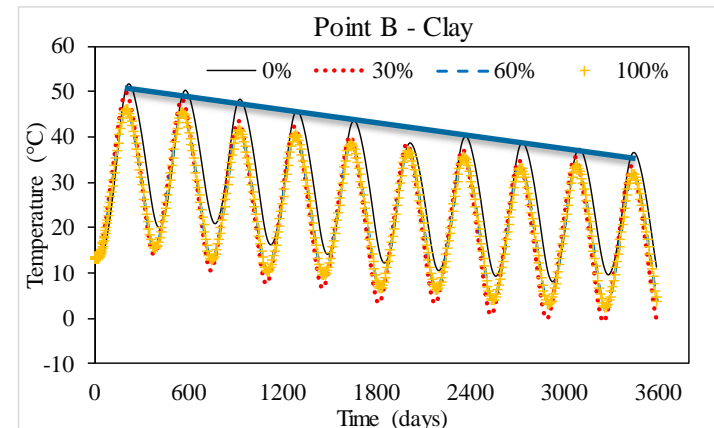
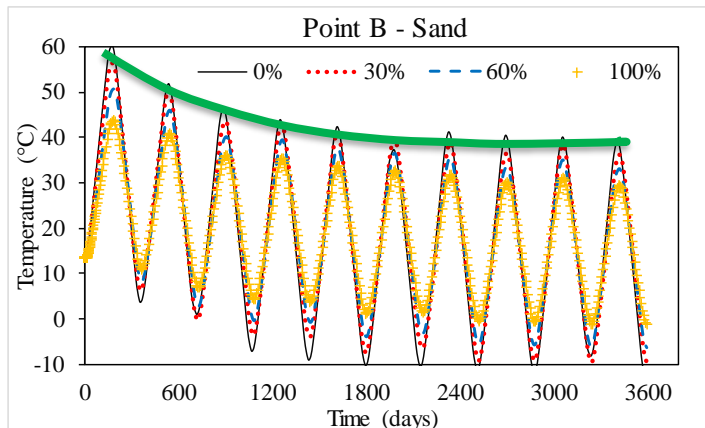
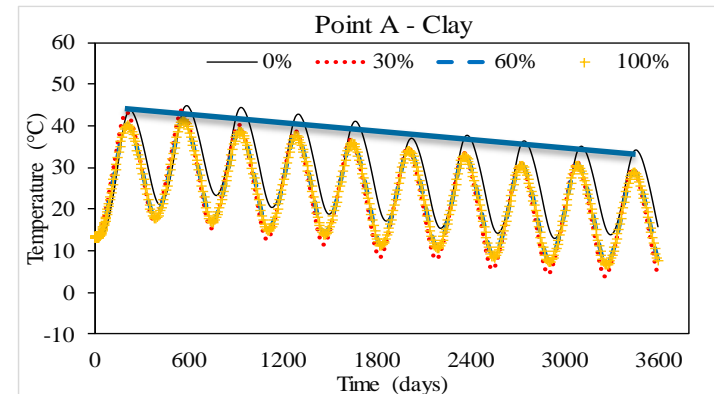
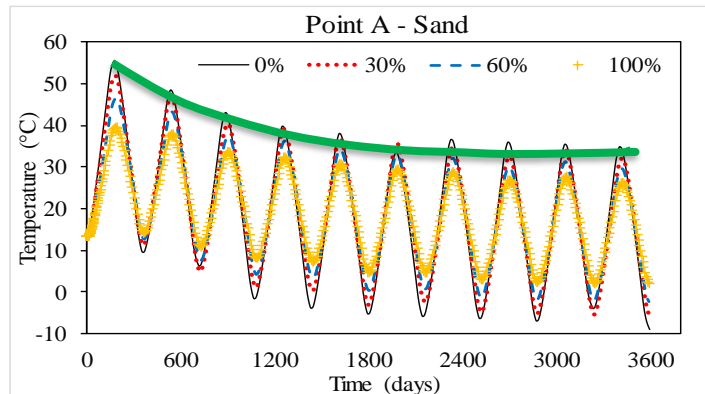


This study investigates the thermal performance of group of GEPs under the effects of different soil saturation



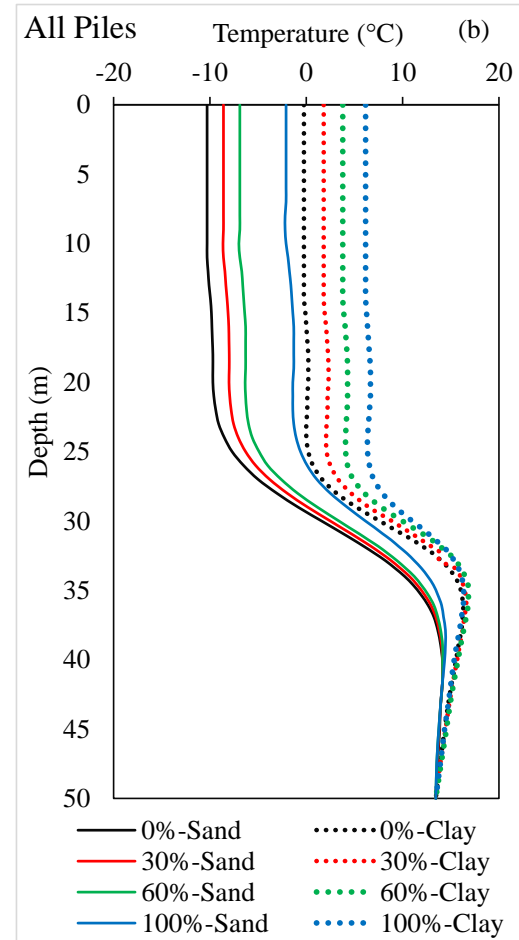
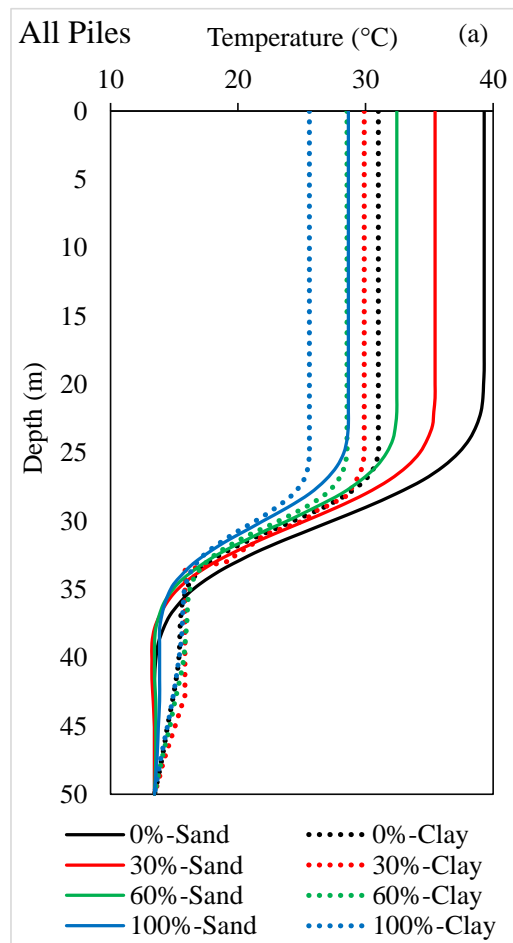
Cyclic heat injection and extraction load for 10 years duration

## The long-term performance of group of GEPs in unsaturated soil



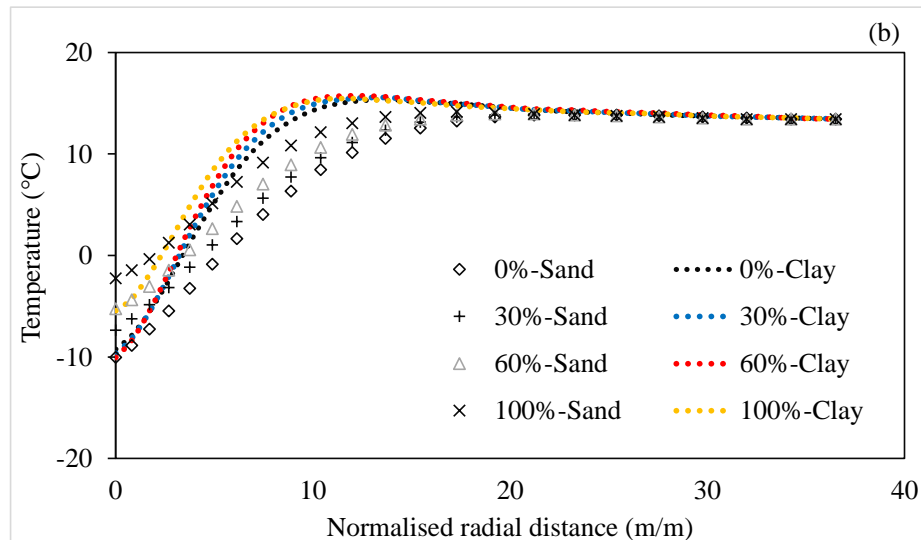
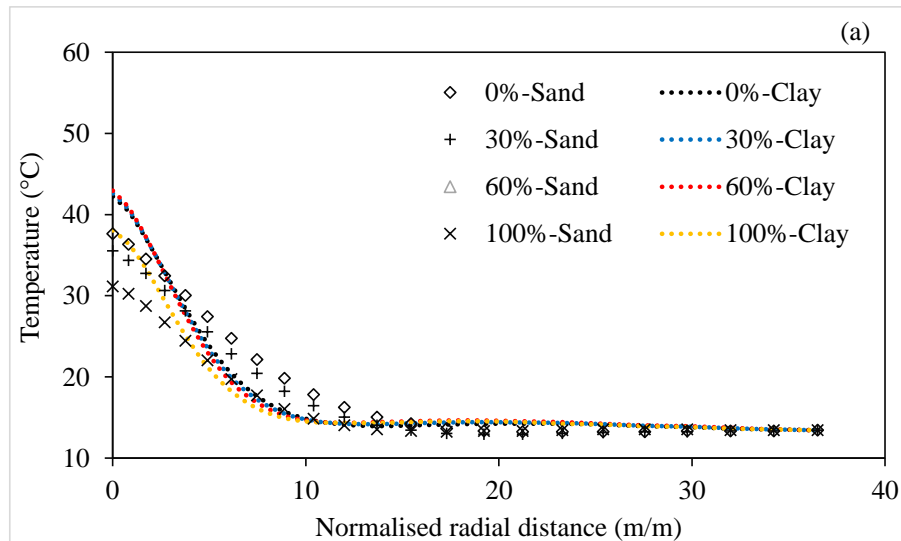
Results of temperature evolution with time

# Results of numerical study



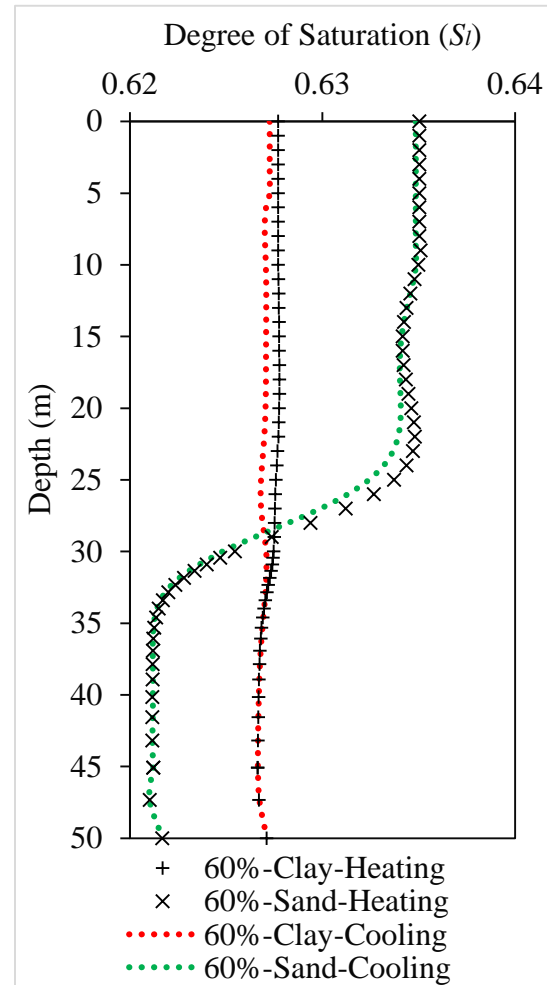
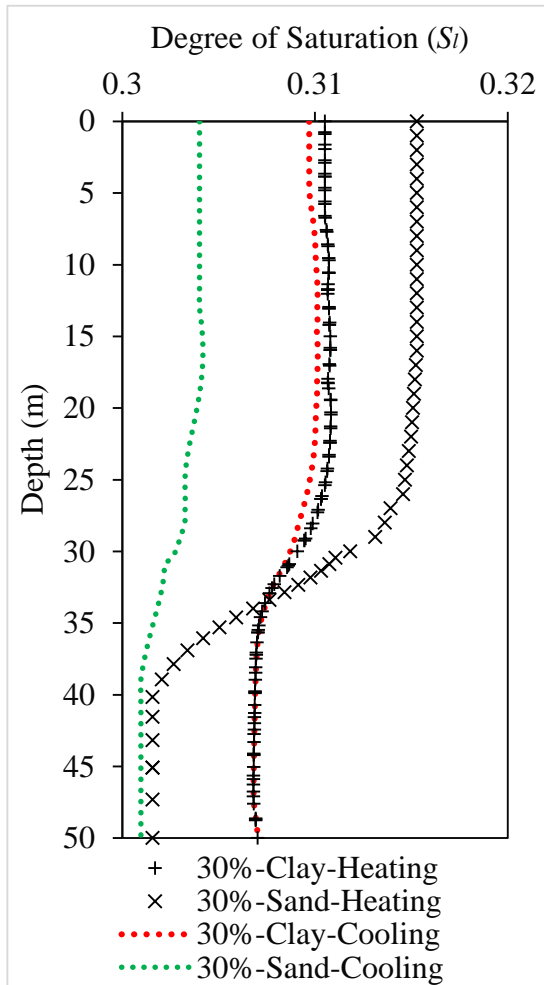
Radial temperature distribution with depth

# Results of numerical study



Radial temperature distribution with distance  
(a) Heat injection, (b) Heat extraction (cooling)

# Results of numerical study



Degree of saturation with depth for the  
(a) Heat injection, (b) Heat extraction  
(cooling)



- The temperature magnitude observed in the soil decreases annually over the 10 years period of the simulations.
- The annual temperature distribution decreases nonlinearly in the sand, whereas in the clay a linear trend was observed.
- The changes to the degree of saturation values was within 1.5% during the heating and cooling operations.

Thank  
you