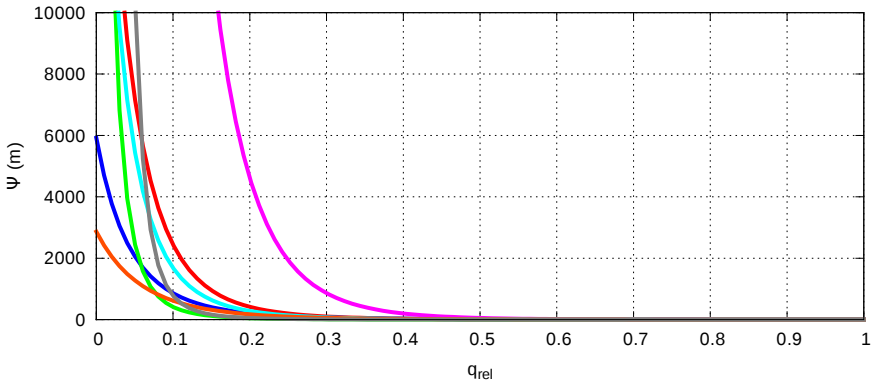


$$\Psi(q_{rel}) = \Psi_g * (q_{max}/q)^{**b}$$

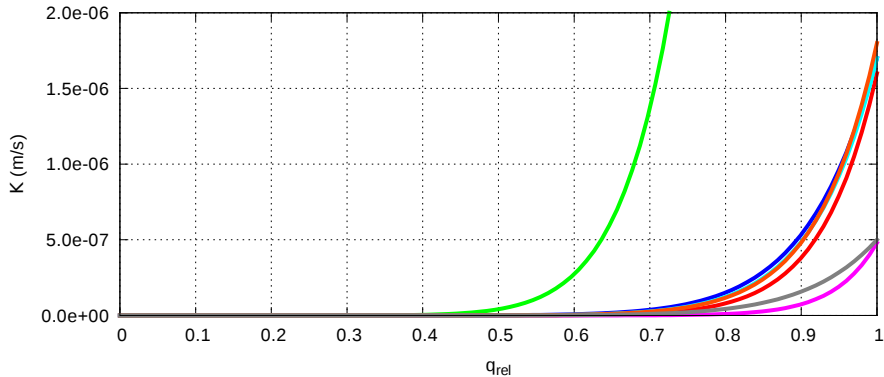


sandy clay loam
silty loam
sand

clay
loam
peat

rock

Hydraulic conductivity of soil $K(q, f_{ice}) = K_g * ((q - f_{ice}q) / (q_{max} - f_{ice}q))^{2b+3}$, $f_{ice}=0$

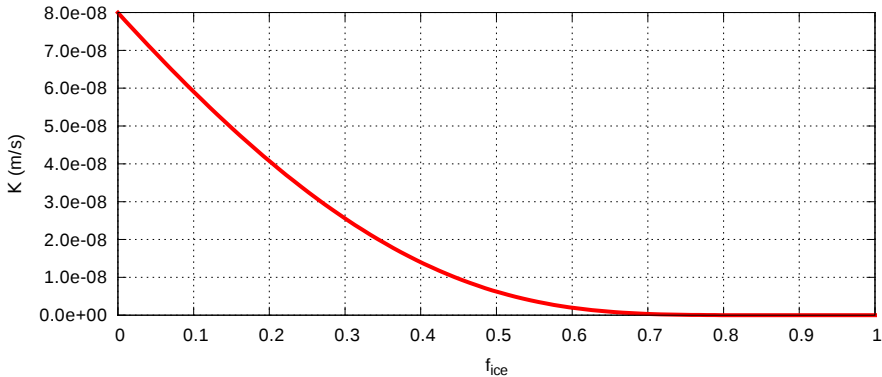


sandy clay loam
silty loam
sand

clay
loam
peat

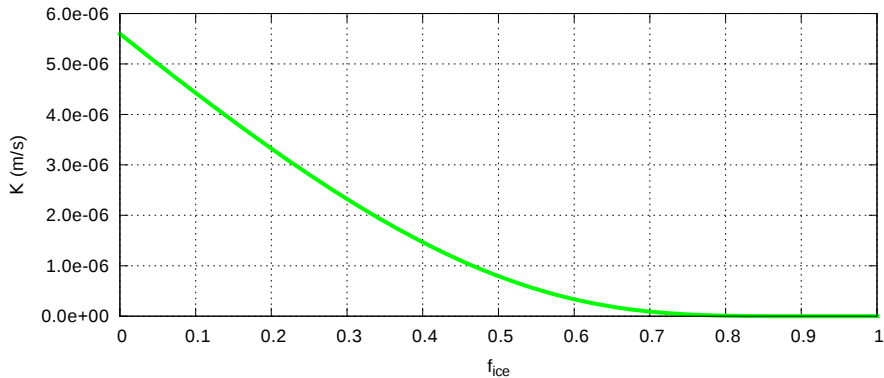
rock

Hydraulic conductivity of soil $K(q, f_{ice}) = K_g * ((q - f_{ice}q) / (q_{max} - f_{ice}q))^{2b+3}$, Sandy clay loam



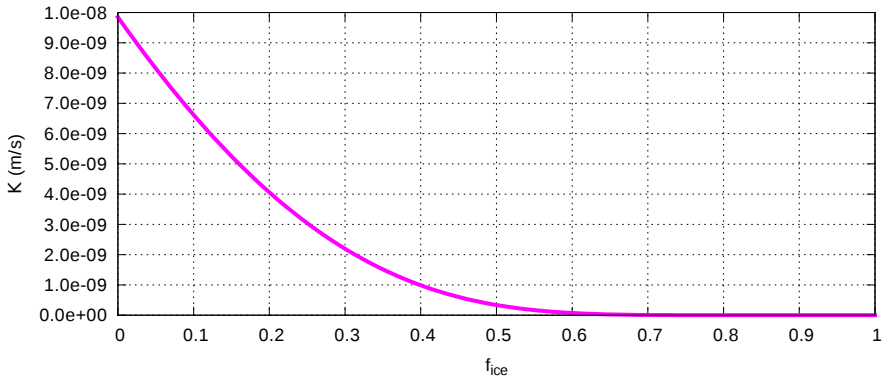
$q_{rel}=0.8$ —

Hydraulic conductivity of soil $K(q, f_{ice}) = K_g * ((q - f_{ice}q) / (q_{max} - f_{ice}q))^{2b+3}$, Sand



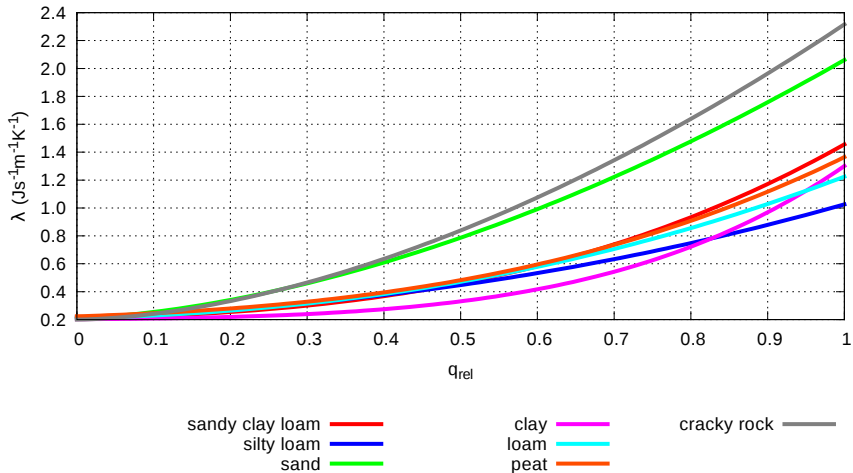
$q_{rel}=0.8$ —

Hydraulic conductivity of soil $K(q, f_{ice}) = K_g * ((q - f_{ice}q) / (q_{max} - f_{ice}q))^{2b+3}$, Clay

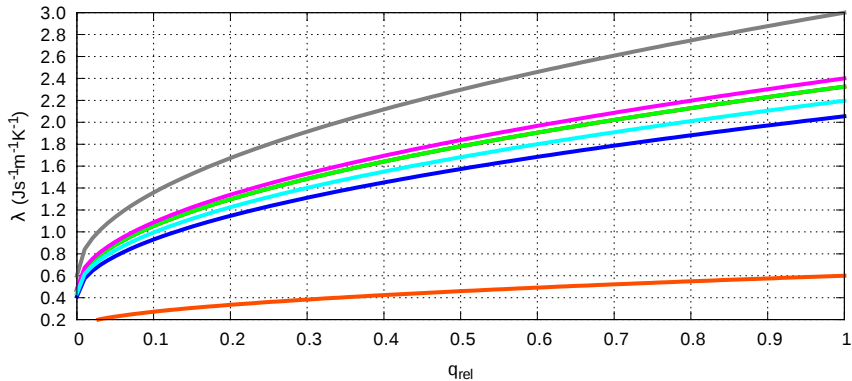


$q_{rel}=0.8$ —

Dynamic thermal conductivity of soil $\lambda(\Psi)=0.2+300\exp(-6\lg(\Psi))$



$$\text{Dynamic thermal conductivity of soil } \lambda(q_{\text{rel}}) = (\rho \cdot 1.e^{-3 \cdot 1.2}) \cdot (q_{\text{rel}})^{0.5} + \rho \cdot 1.e^{-3 \cdot 0.3}$$

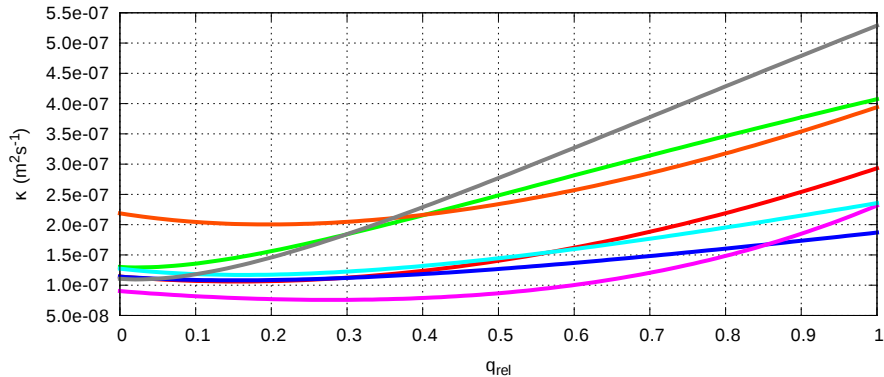


sandy clay loam
silty loam
sand

clay
loam
peat

cracky rock

Kinematic thermal conductivity of soil $\kappa(\Psi)=(0.2+300\exp(-6-\lg(\Psi)))/(C_g\rho_g)$

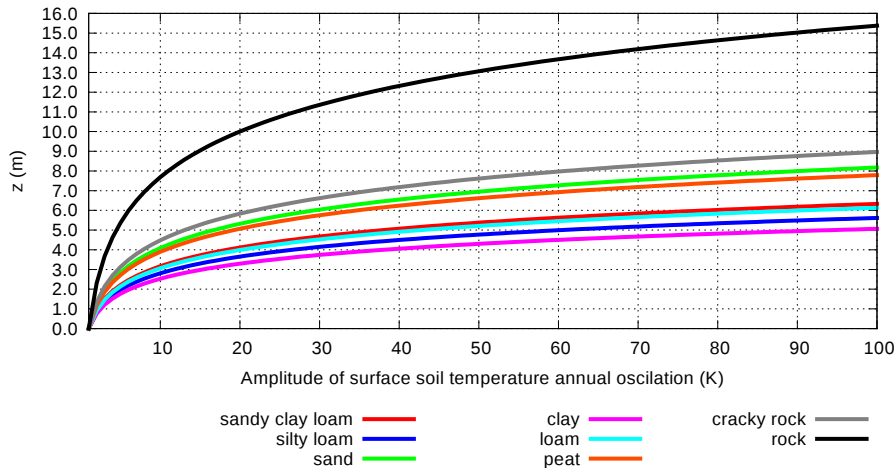


sandy clay loam
silty loam
sand

clay
loam
peat

cracky rock

Depth where amplitude of soil temperature annual oscillation equal 1 K: $z = -\ln((1/A_0)^2)/(2(\pi/\kappa/\Pi)^{0.5})$



Depth where amplitude of soil temperature annual oscillation equal 0.1 K: $z = -\ln((0.1/A_0)^2)/(2(\pi/\kappa/\Pi)^{0.5})$

