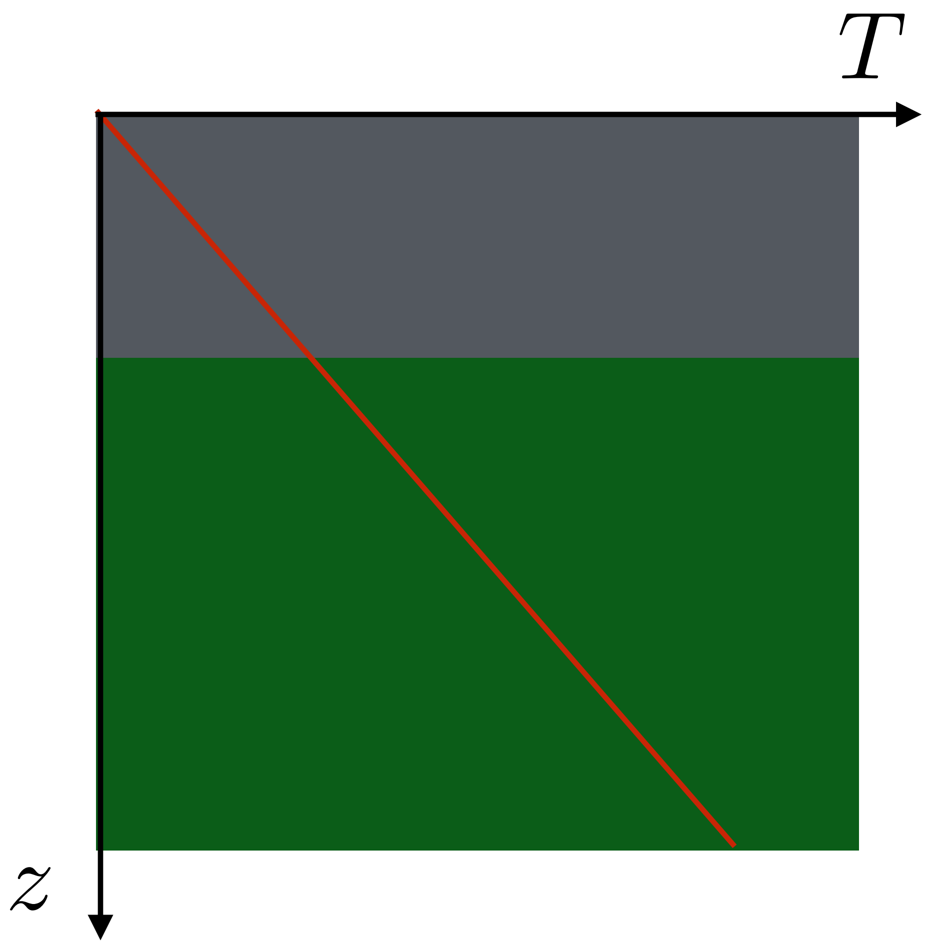
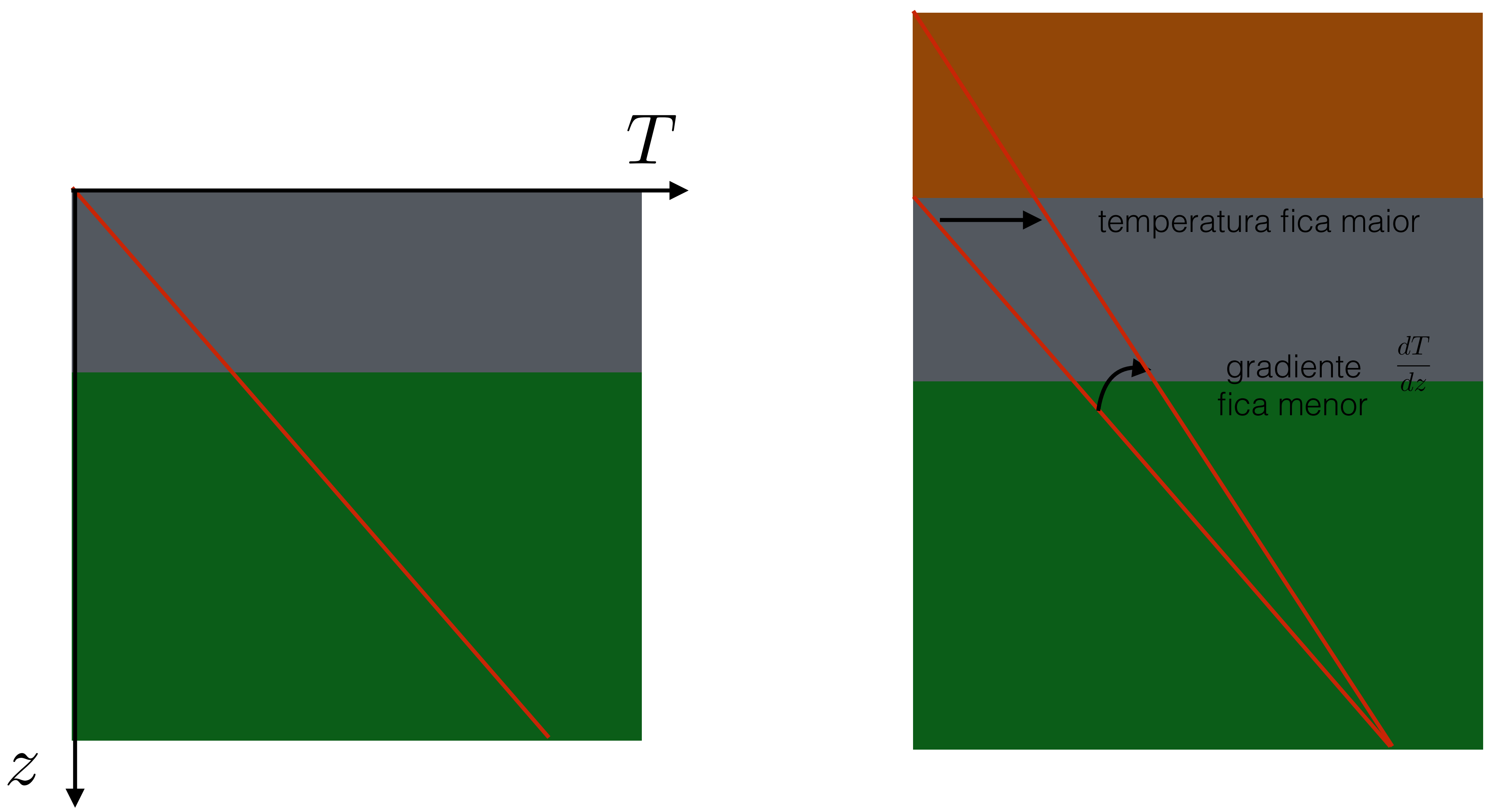
Estrutura térmica de bacias sedimentares e efeito “blanket”

Modelos quantitativos de bacias sedimentares

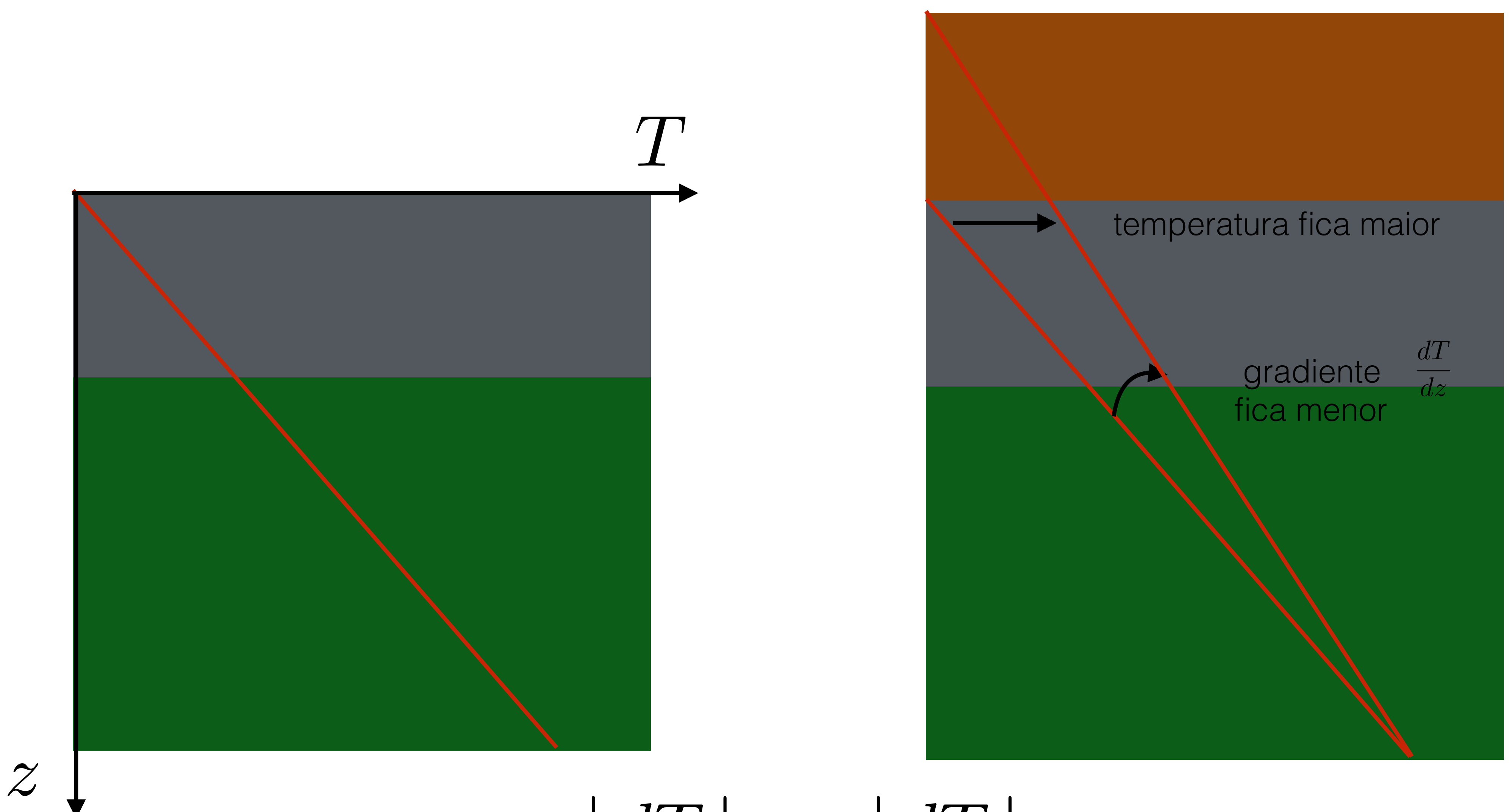
Estrutura térmica da litosfera antes e após o aporte sedimentar



Estrutura térmica da litosfera antes e após o aporte sedimentar

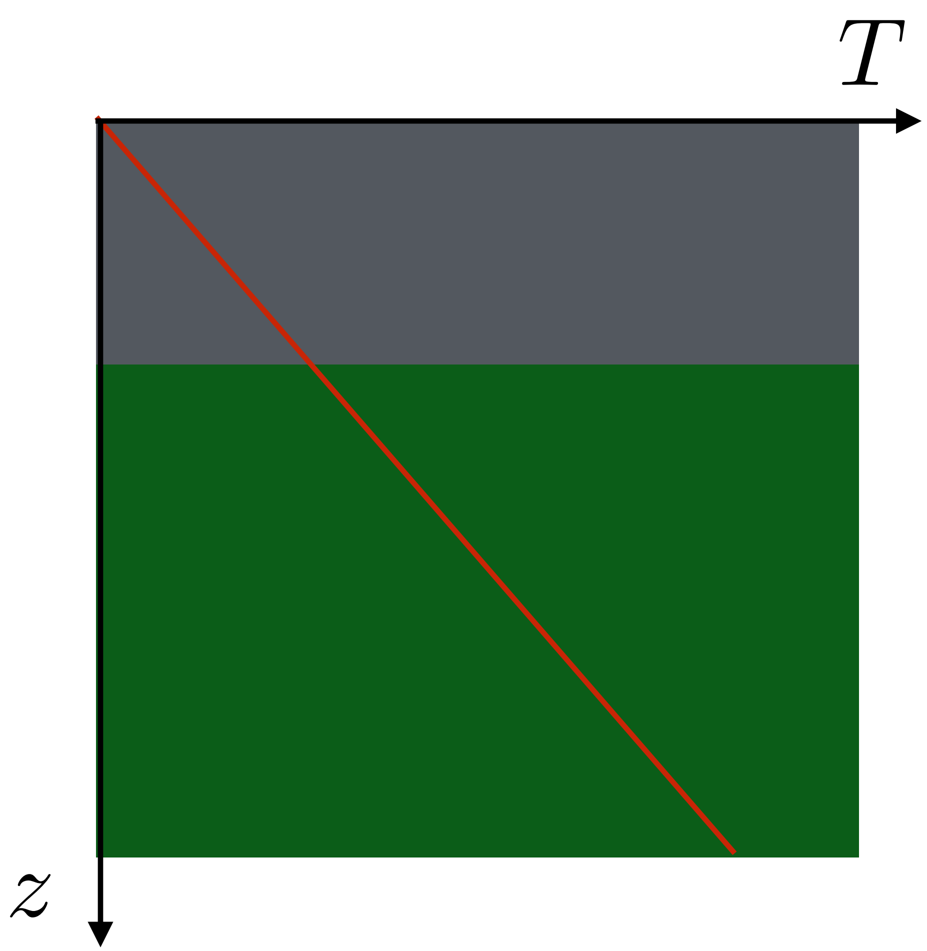


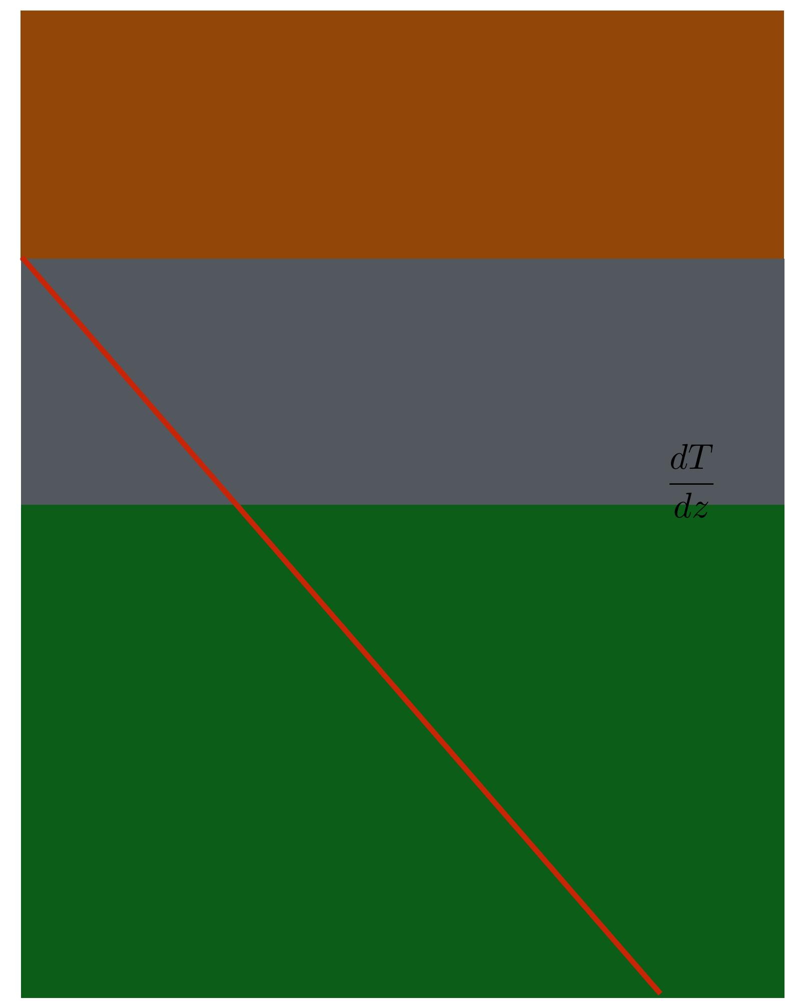
Estrutura térmica da litosfera antes e após o aporte sedimentar



$$\left|\frac{dT}{dz}\right|_0 > \left|\frac{dT}{dz}\right|_1$$

E se a condutividade térmica do sedimento for menor?





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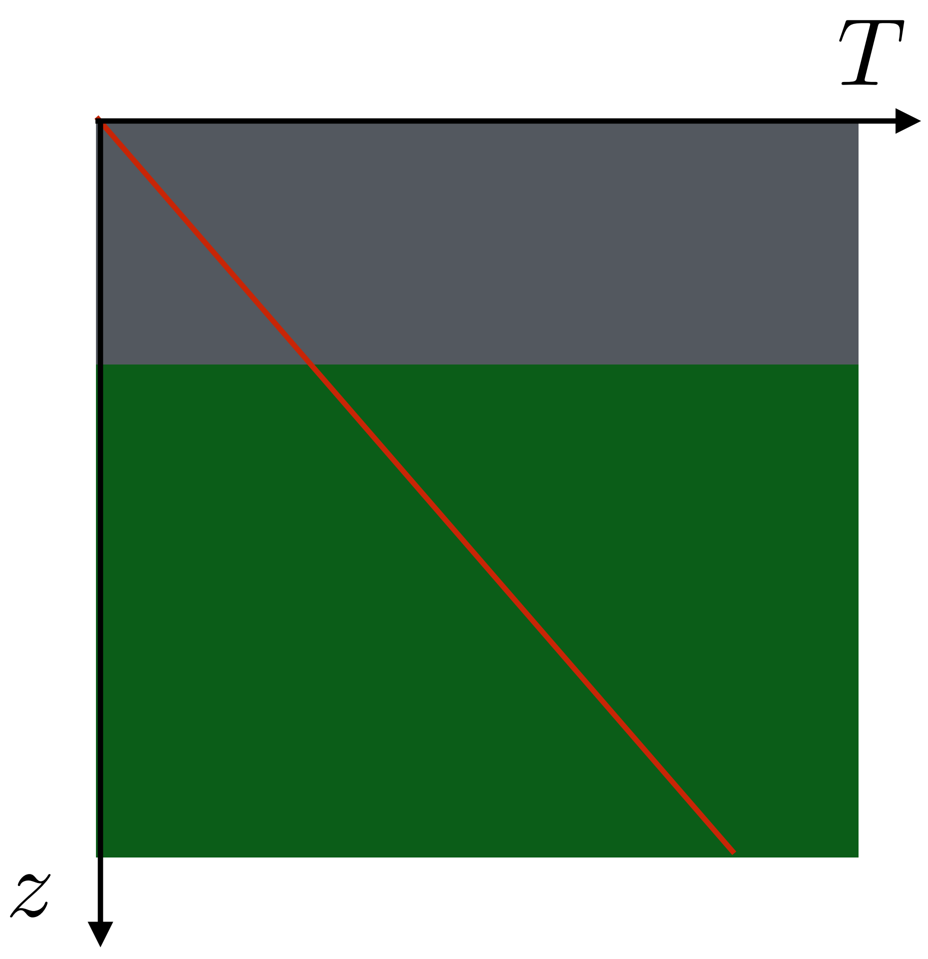
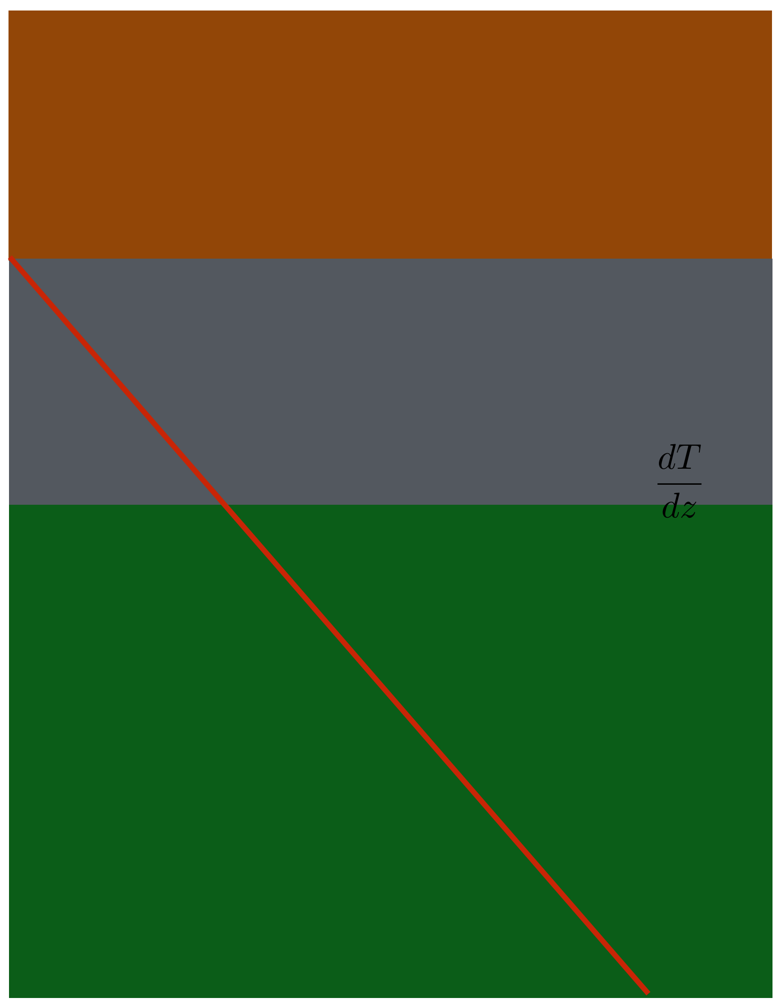


$k_1 < k_2$



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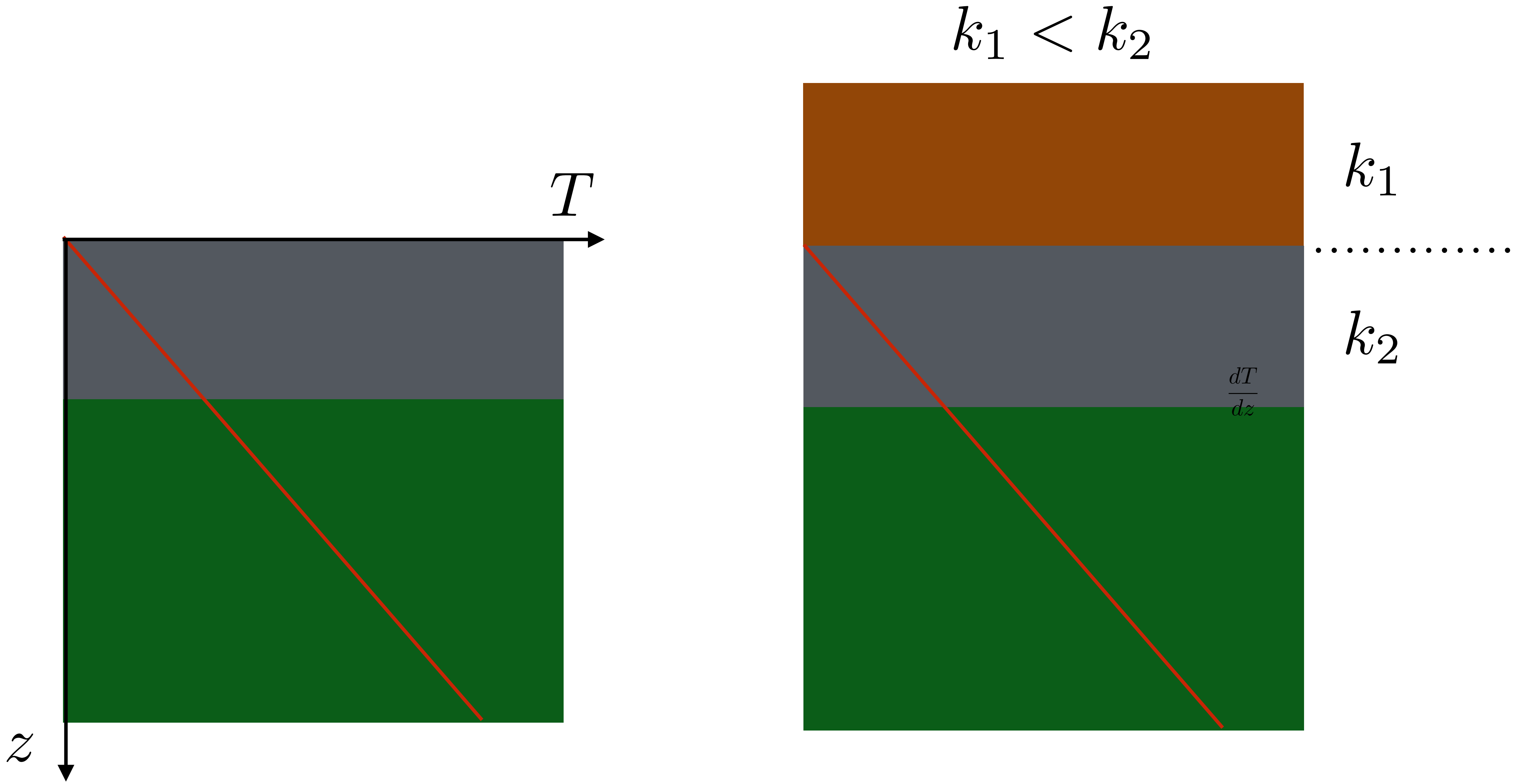

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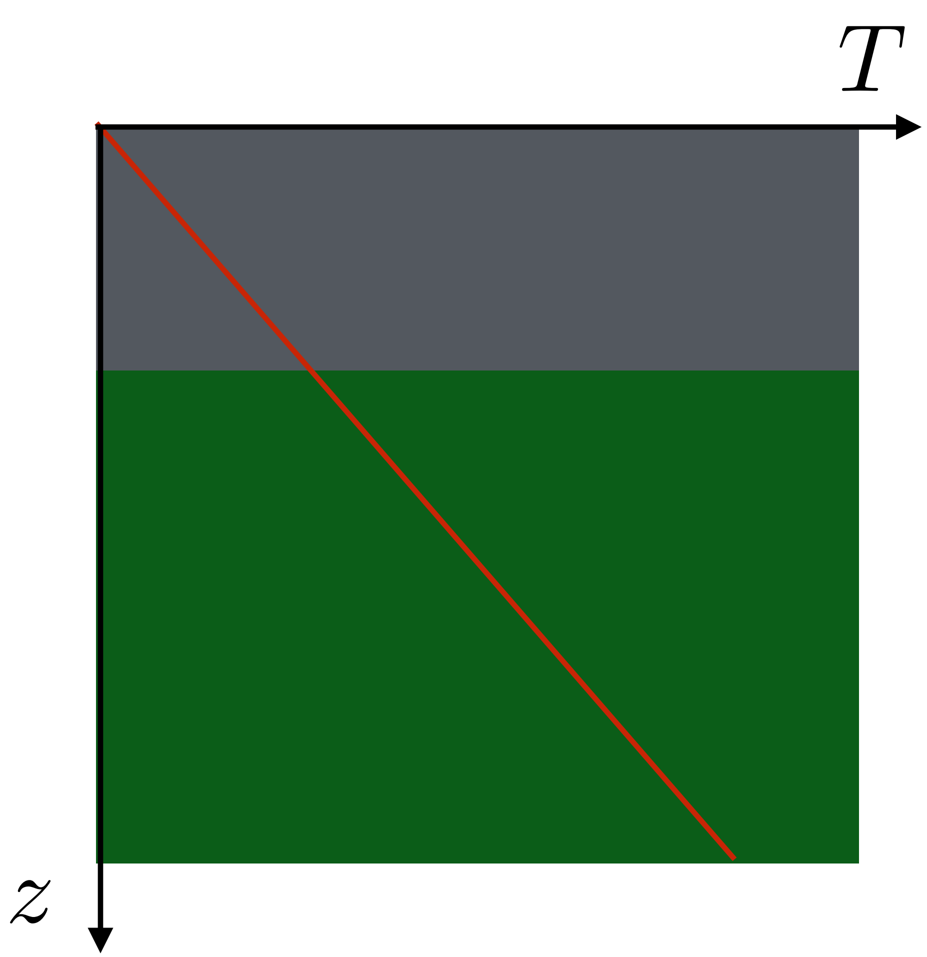
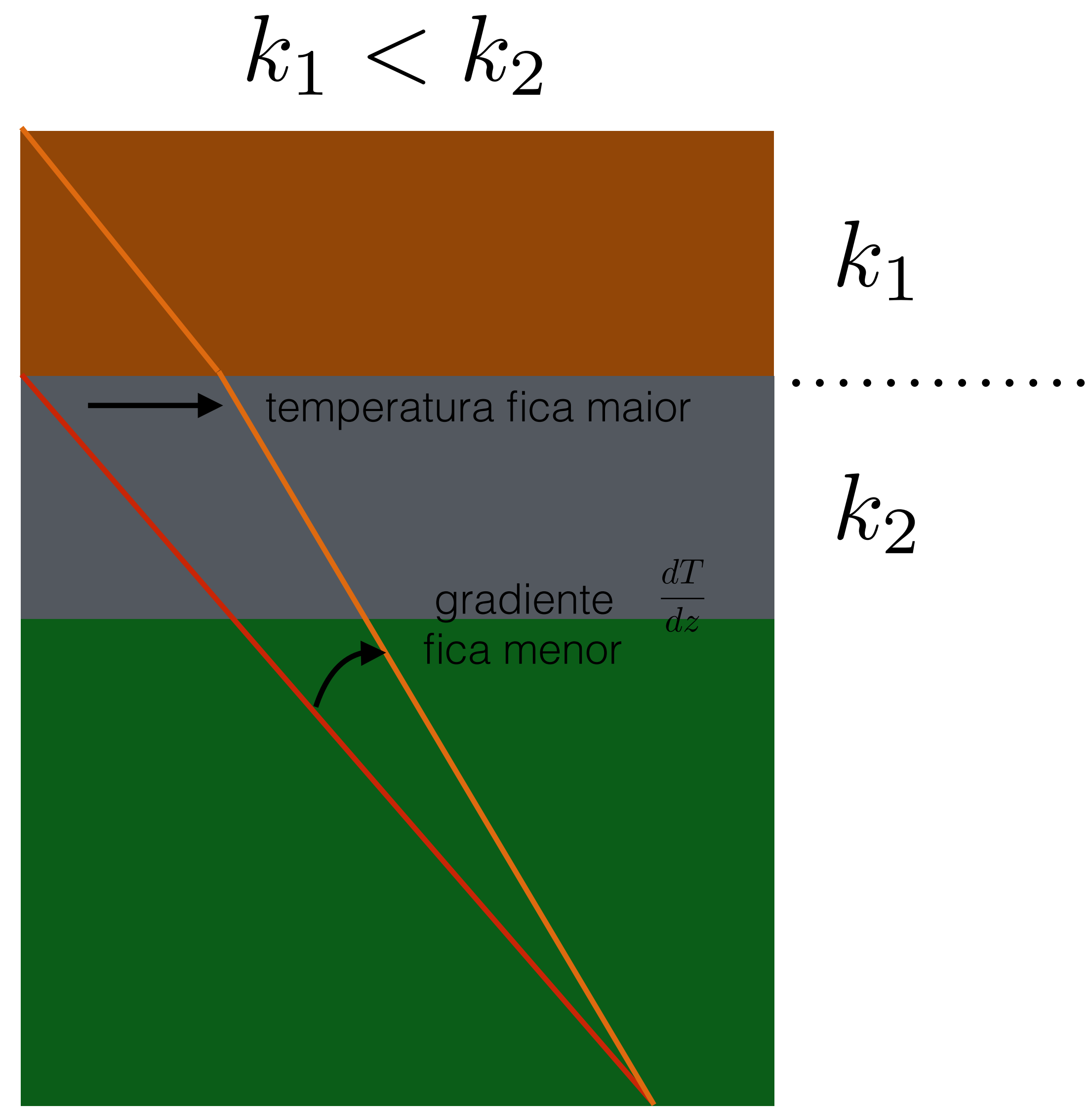
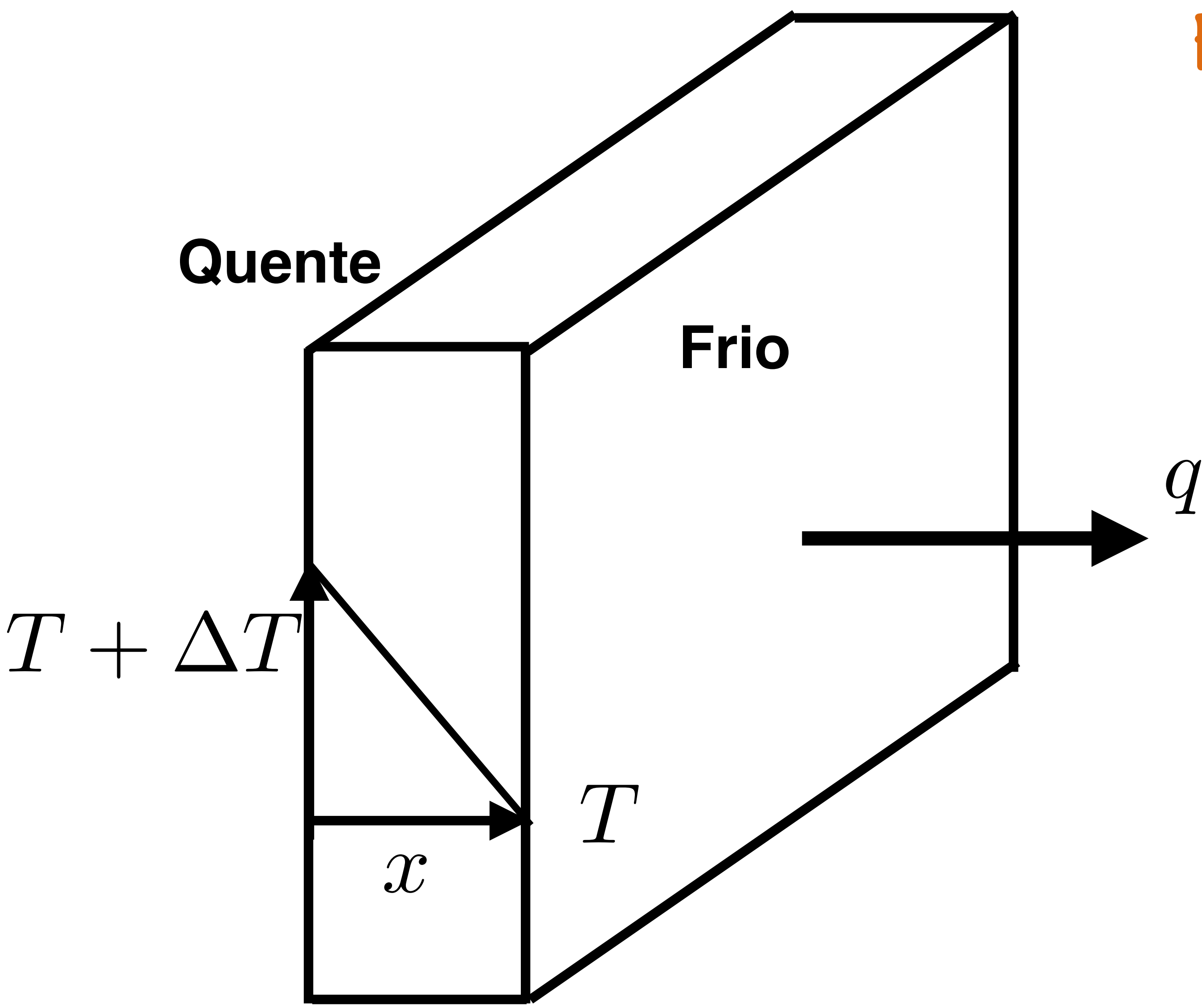




Condução de calor



Fluxo de calor

Temperatura

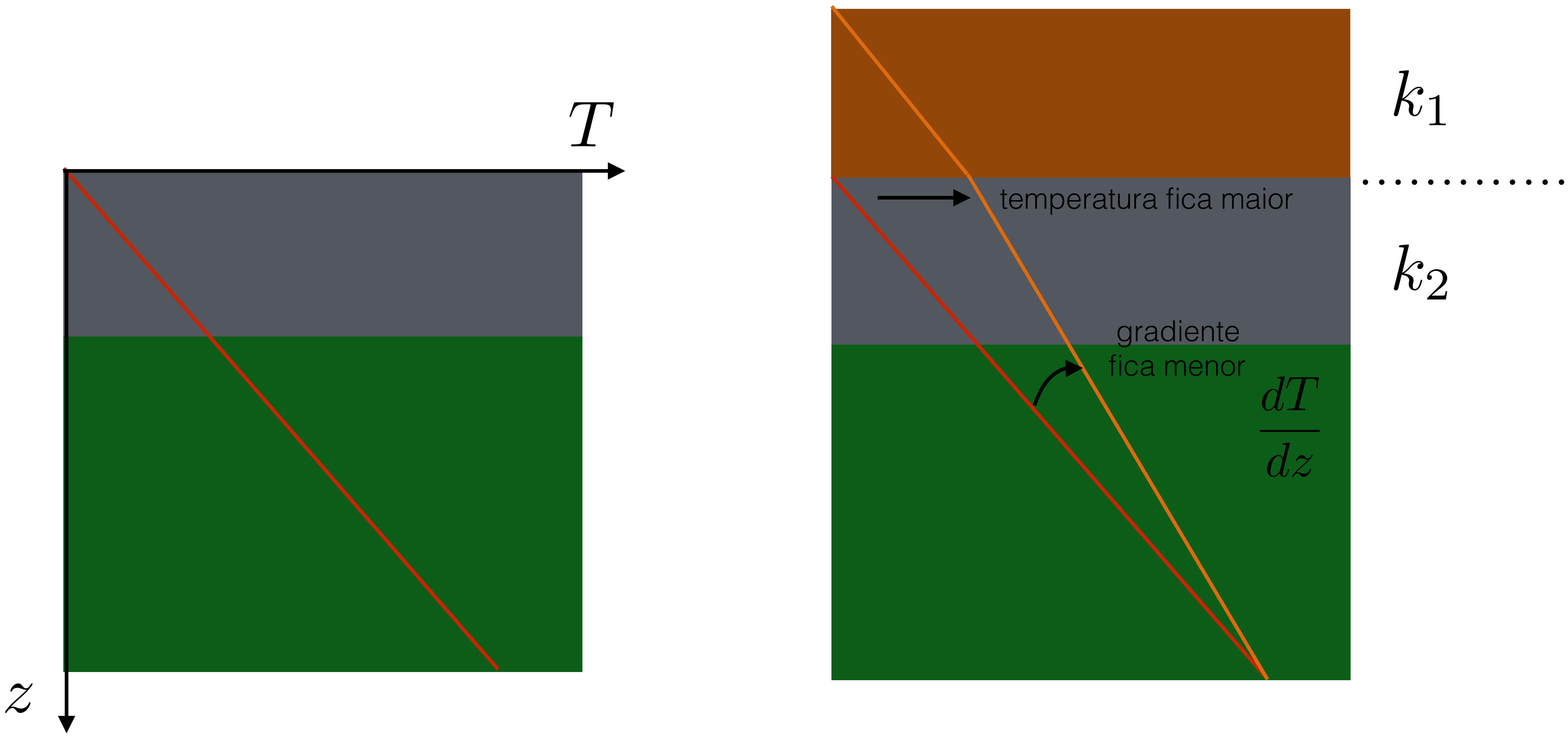
$$q = -k\frac{dT}{dx}$$

Condutividade

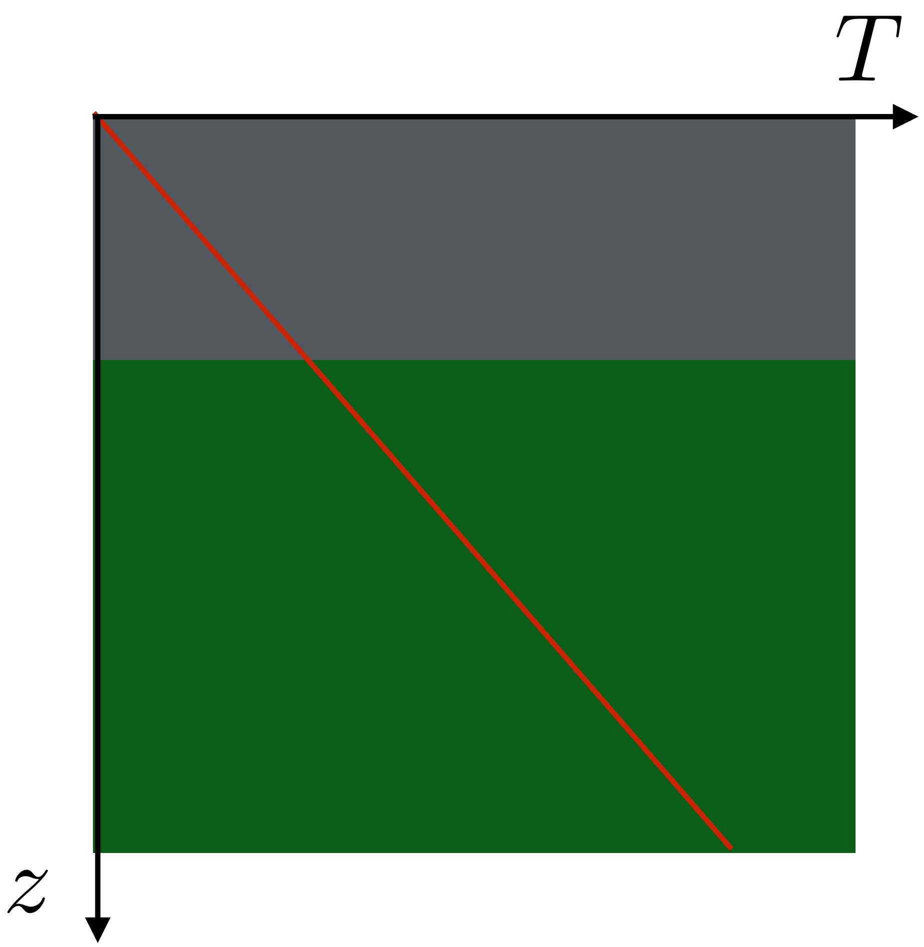
q	$[\mathrm{W/m^2}]$
T	$[\mathrm{K}]$
k	$[\mathrm{W \cdot m^{-1} \cdot K^{-1}}]$

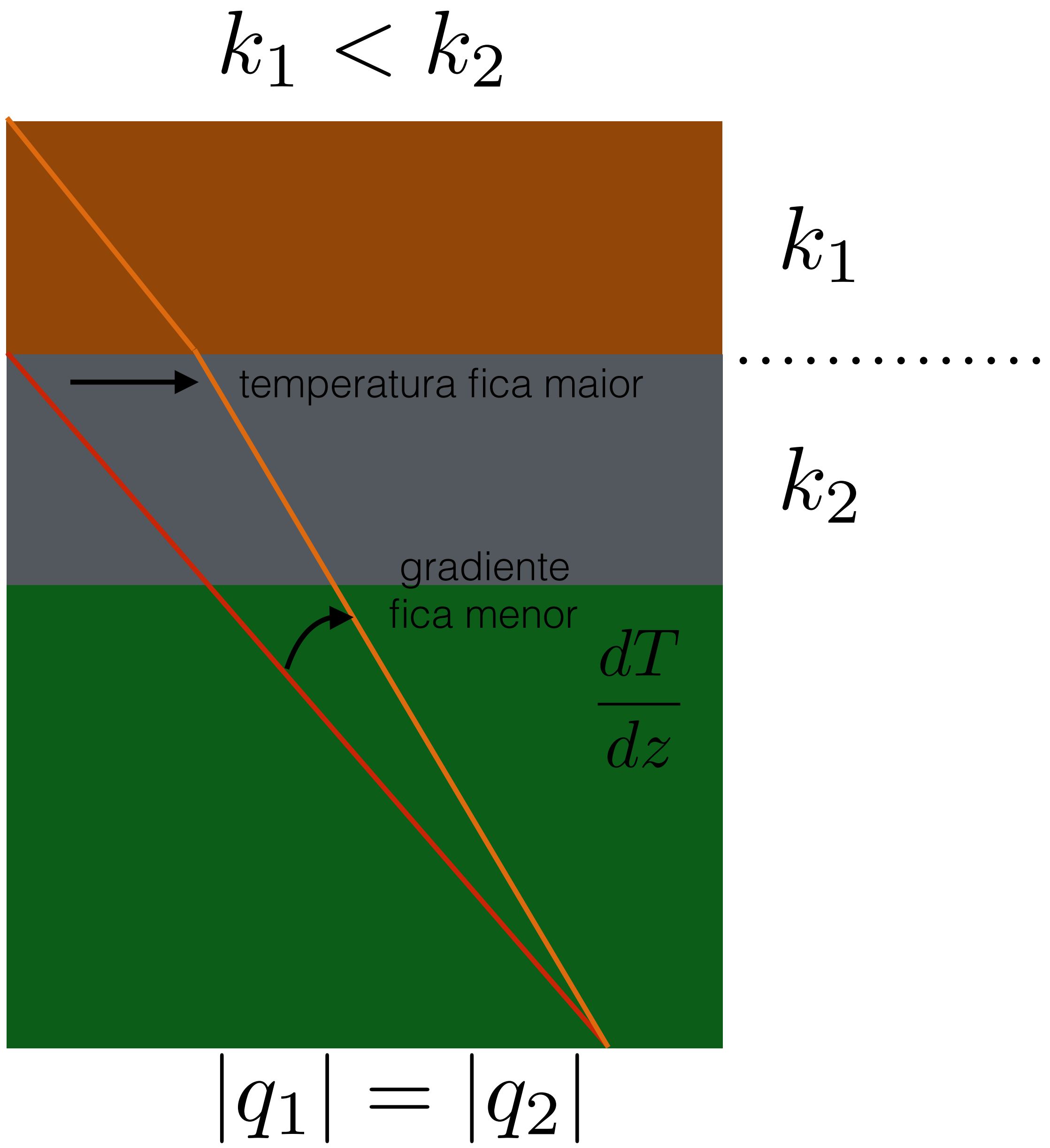
Como fica o fluxo de calor?

$k_1 < k_2$

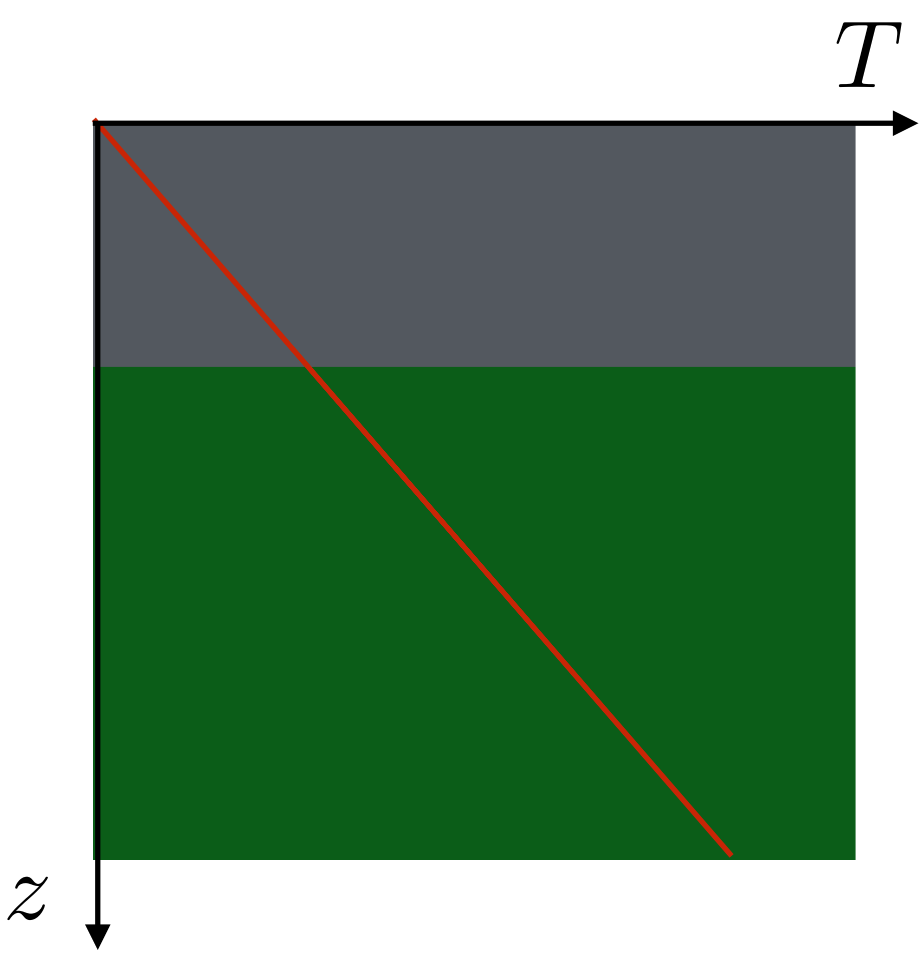


Como fica o fluxo de calor?

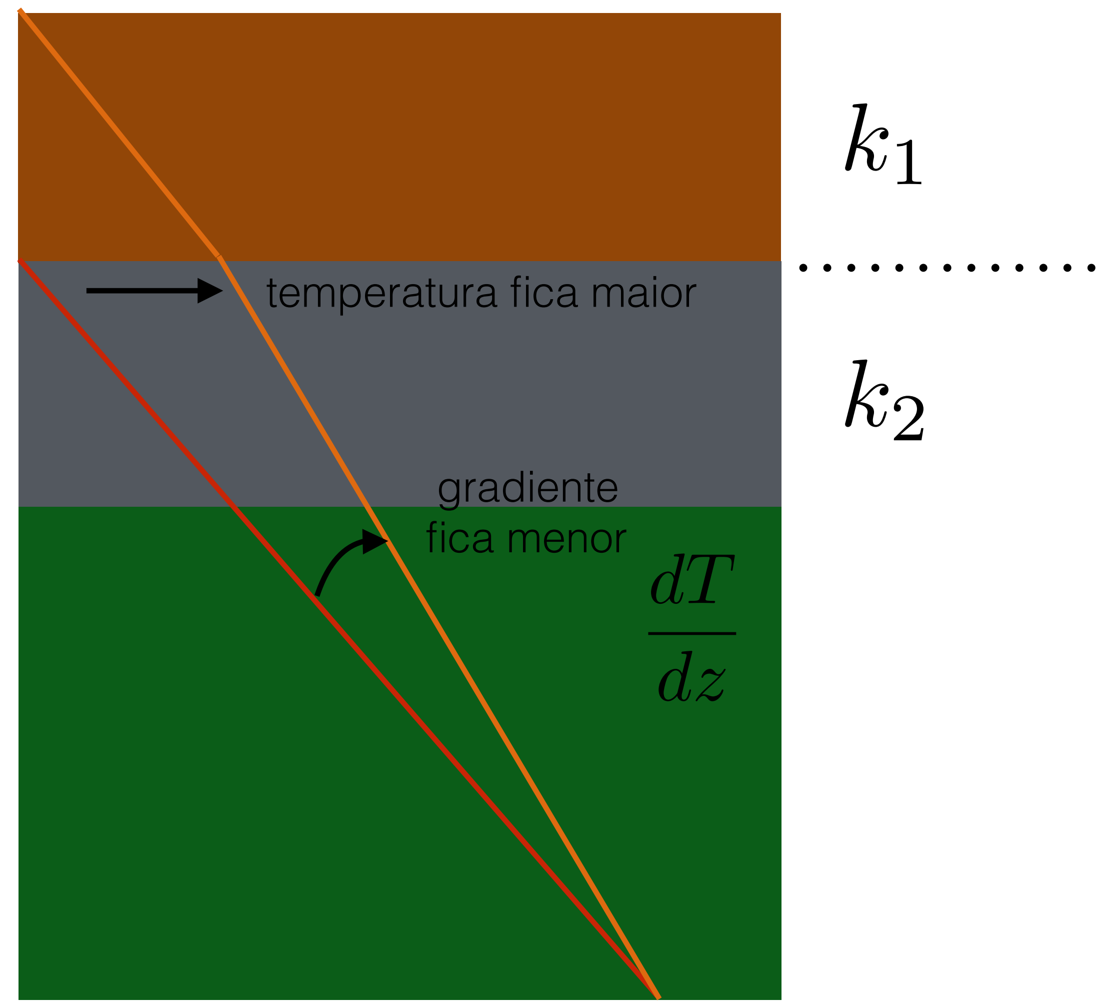




Como fica o fluxo de calor?



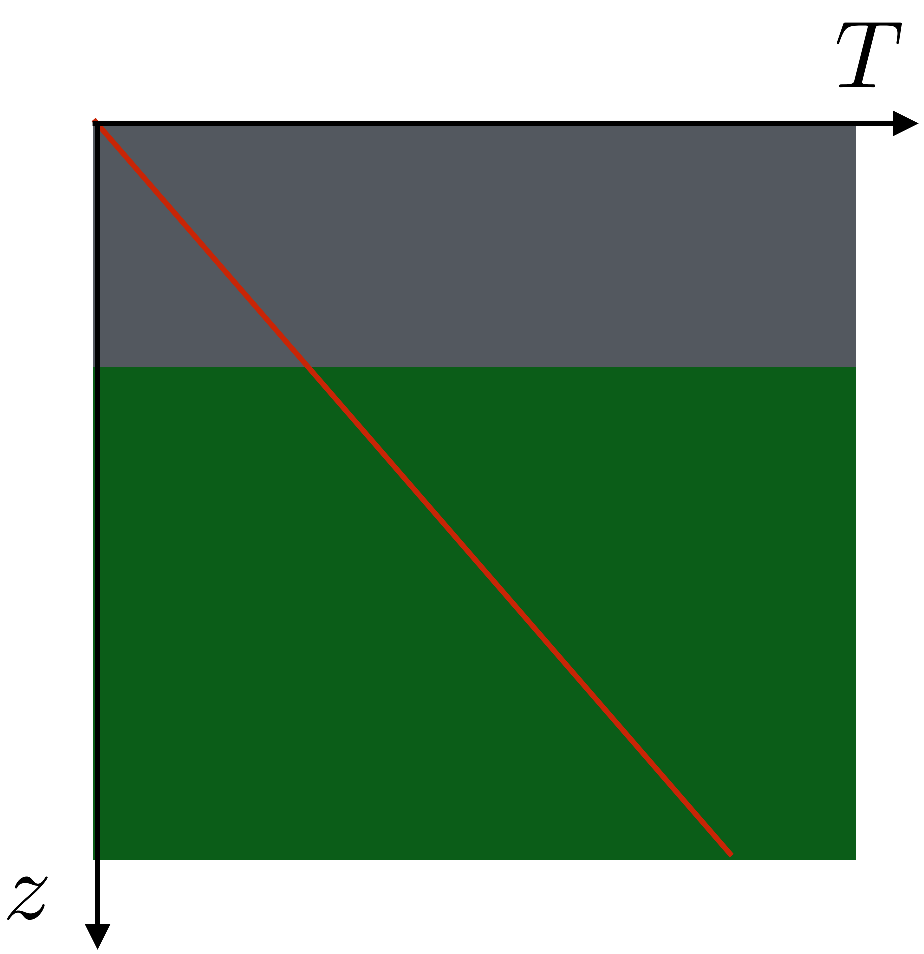
$$k_1 < k_2$$



$$|q_1| = |q_2|$$

$$k_1 \left|\frac{dT}{dz}\right|_1 = k_2 \left|\frac{dT}{dz}\right|_2$$

Como fica o fluxo de calor?



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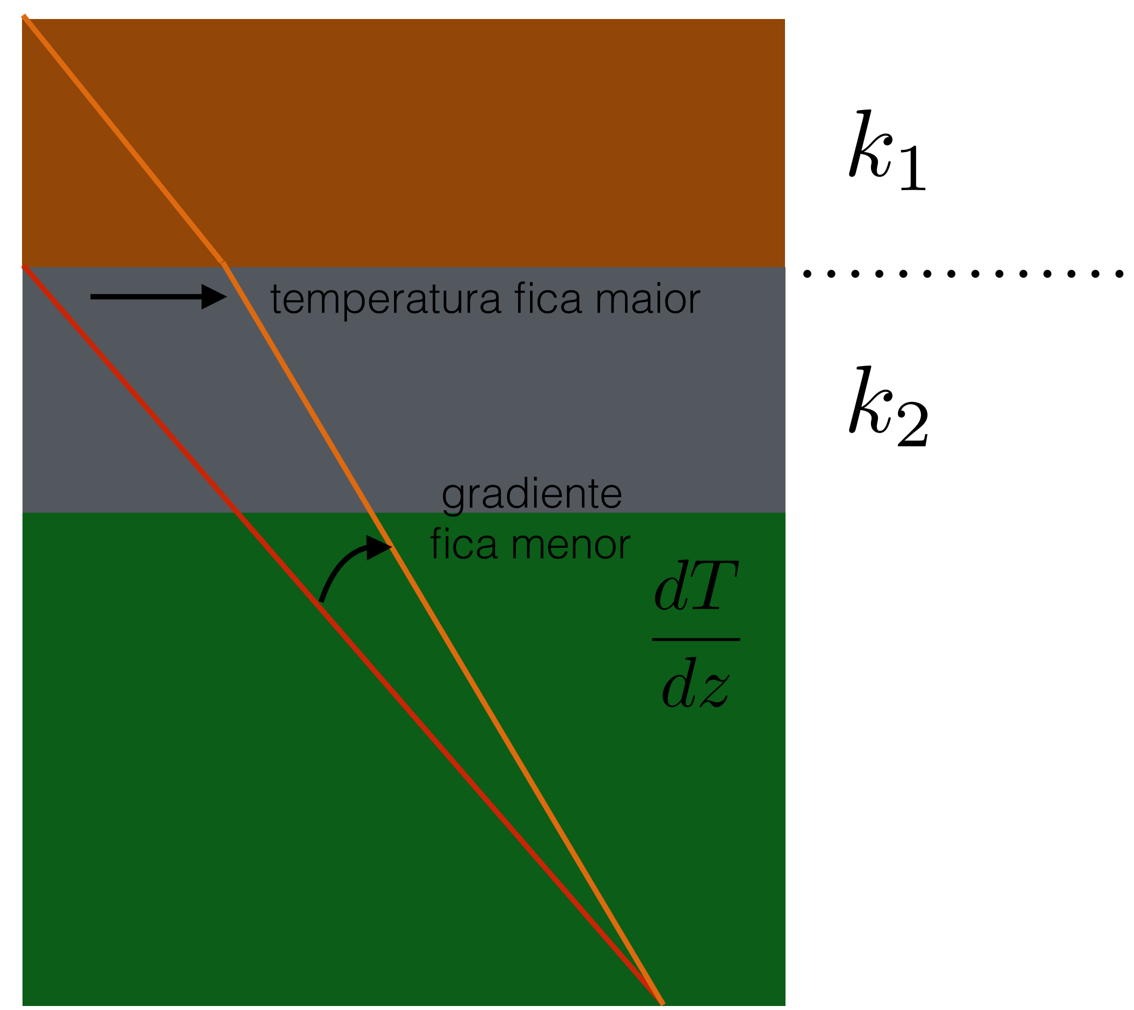
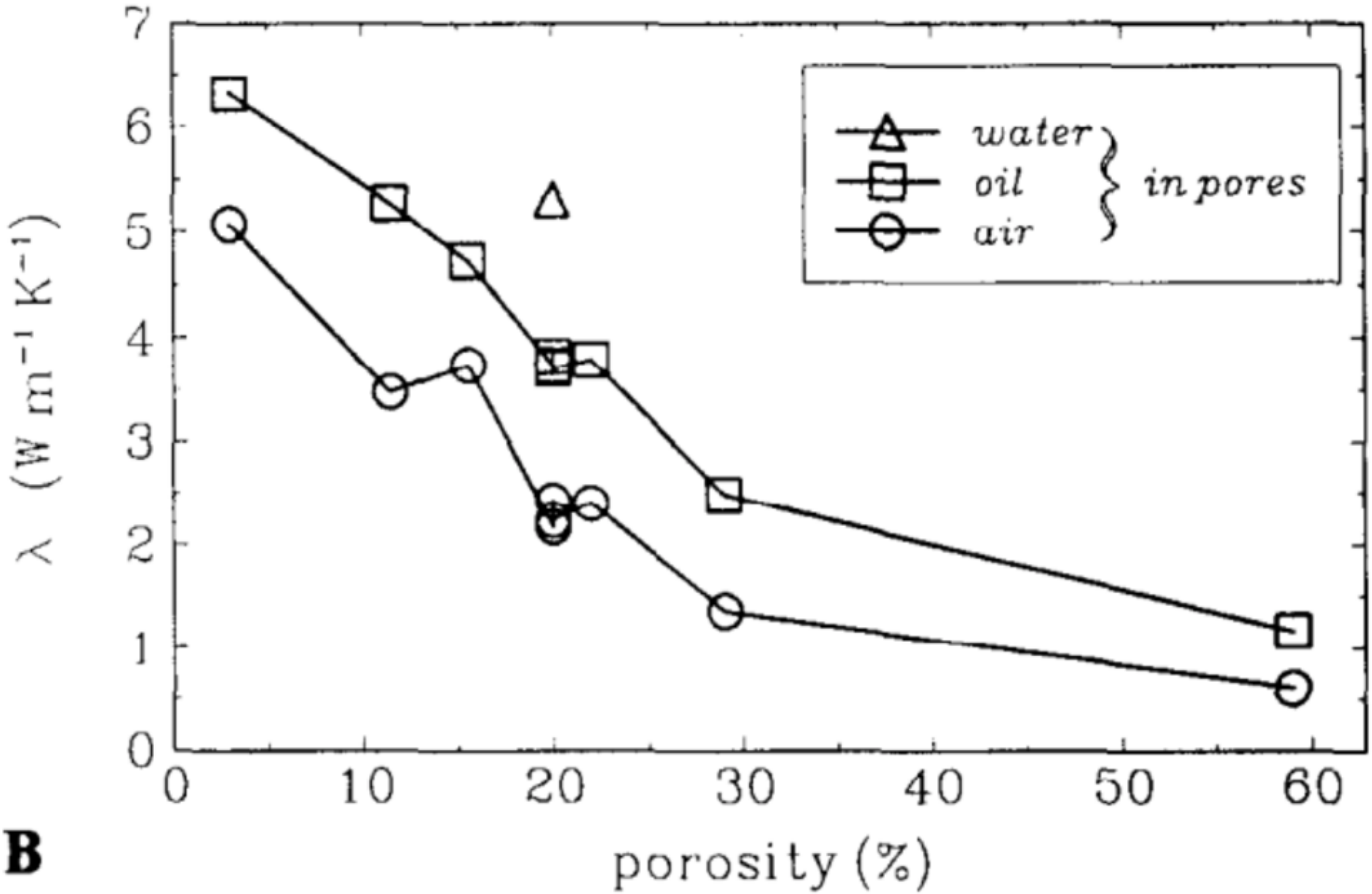


$$|q_1| = |q_2|$$

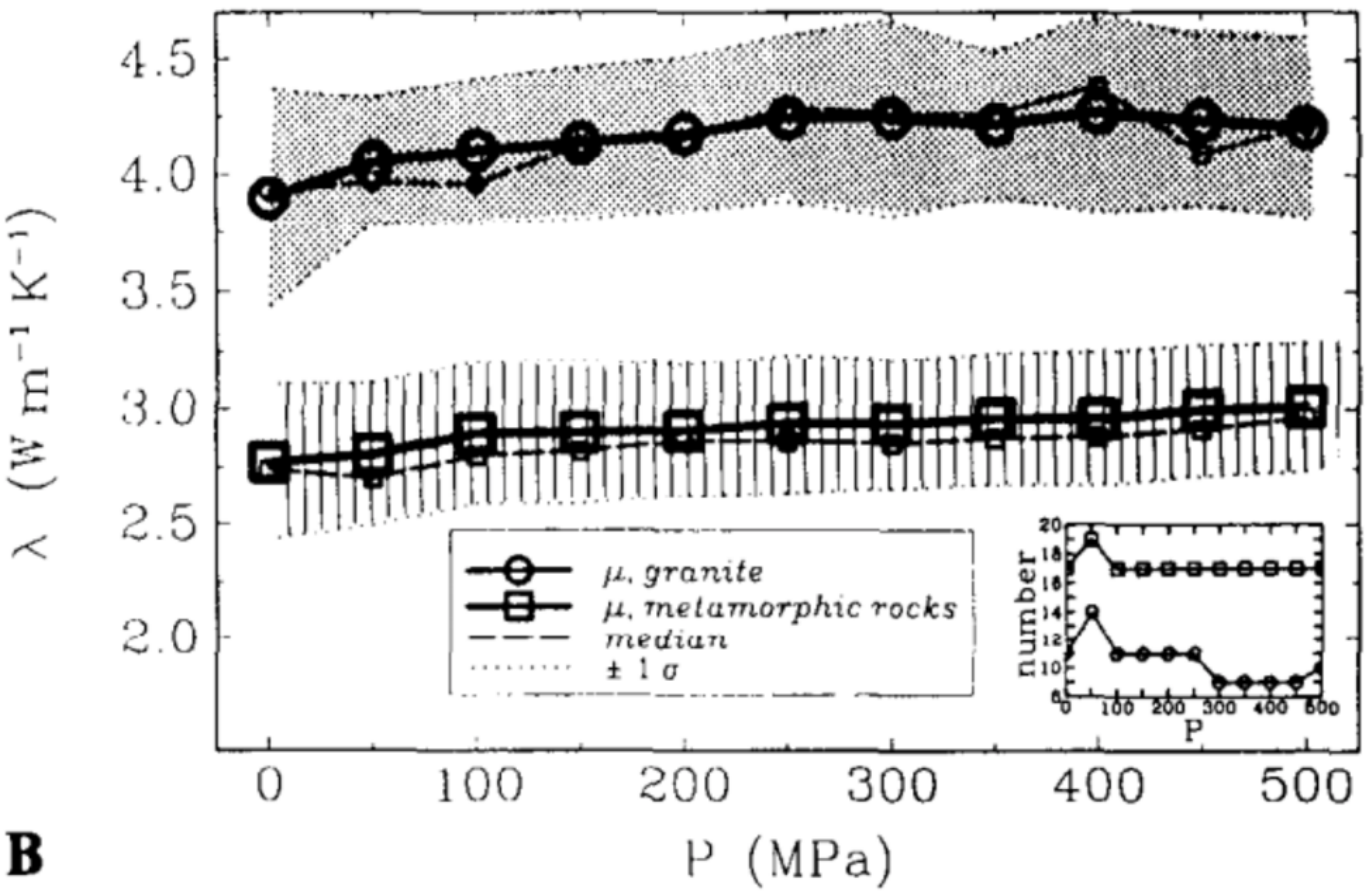
$$k_1 \left|\frac{dT}{dz}\right|_1 = k_2 \left|\frac{dT}{dz}\right|_2$$

$$\left|\frac{dT}{dz}\right|_1 > \left|\frac{dT}{dz}\right|_2$$

Arenito (quartzo) (Clauser & Huenges,1995)



Granito e rochas metamórficas (Clauser & Huenges,1995)



Como lidar com a condutividade variável espacialmente?

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \qquad \kappa = \frac{k}{\rho c}$$

Se κ é constante podemos reescrever…

$$\frac{dT}{dt} = \kappa \frac{d^2T}{dz^2}$$

Aproximação em diferenças finitas

$$\kappa_0 \qquad \kappa_1 \qquad \kappa_2 \qquad \kappa_3 \qquad \kappa_4 \qquad \kappa_5 \qquad \kappa_6$$

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \approx \frac{1}{\Delta x}\left(\kappa_{i+1}\frac{u_{i+1} - u_i}{\Delta x} - \kappa_i \frac{u_i - u_{i-1}}{\Delta x}\right)$$

Aproximação em diferenças finitas

$$\frac{\partial u}{\partial x} = \lim_{\Delta x \to 0} \frac{\Delta u}{\Delta x}$$

κ_0 κ_1 κ_2 κ_3 κ_4 κ_5 κ_6

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \approx \frac{1}{\Delta x}\left(\kappa_{i+1}\frac{u_{i+1} - u_i}{\Delta x} - \kappa_i \frac{u_i - u_{i-1}}{\Delta x}\right)$$

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Aproximação em diferenças finitas

$$\frac{\partial u}{\partial x} = \lim_{\Delta x \to 0} \frac{\Delta u}{\Delta x} \approx \frac{\Delta u}{\Delta x}$$

$u_0 \quad u_1 \quad u_2 \quad u_3 \quad u_4 \quad u_5 \quad u_6 \quad u_7$

$\kappa_0 \quad \kappa_1 \quad \kappa_2 \quad \kappa_3 \quad \kappa_4 \quad \kappa_5 \quad \kappa_6$

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \approx \frac{1}{\Delta x}\left(\kappa_{i+1}\frac{u_{i+1} - u_i}{\Delta x} - \kappa_i \frac{u_i - u_{i-1}}{\Delta x}\right)$$

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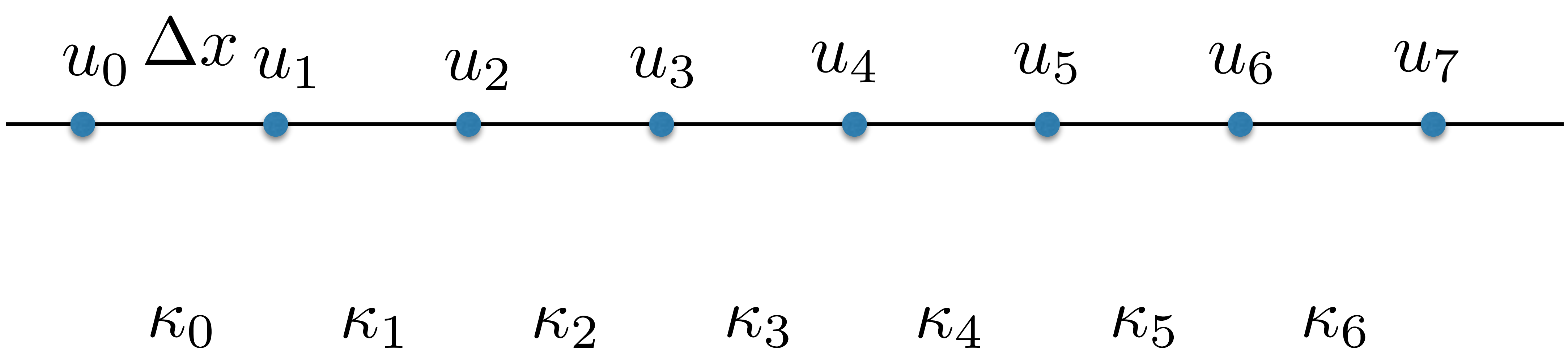

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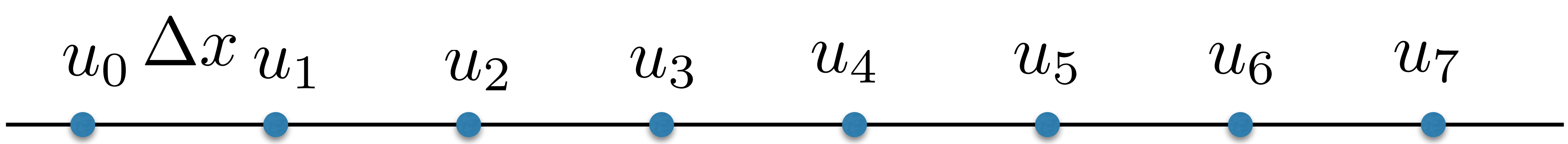

$\frac{\partial u}{\partial x} \approx$

κ_0 κ_1 κ_2 κ_3 κ_4 κ_5 κ_6

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \approx \frac{1}{\Delta x}\left(\kappa_{i+1}\frac{u_{i+1} - u_i}{\Delta x} - \kappa_i \frac{u_i - u_{i-1}}{\Delta x}\right)$$

Aproximação em diferenças finitas

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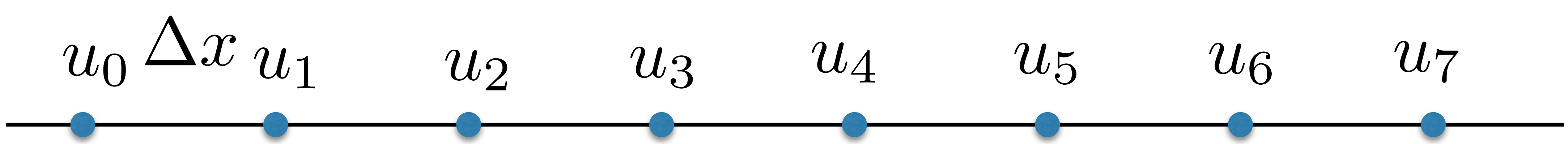

$$\frac{\partial u}{\partial x} \approx \quad \frac{u_1 - u_0}{\Delta x} \quad \frac{u_2 - u_1}{\Delta x} \quad \frac{u_3 - u_2}{\Delta x} \quad \frac{u_4 - u_3}{\Delta x} \quad \frac{u_5 - u_4}{\Delta x} \quad \frac{u_6 - u_5}{\Delta x} \quad \frac{u_7 - u_6}{\Delta x}$$

$$\kappa_0 \quad \kappa_1 \quad \kappa_2 \quad \kappa_3 \quad \kappa_4 \quad \kappa_5 \quad \kappa_6$$

$$\frac{dT}{dt} = \frac{d}{dz}\left(\kappa \frac{dT}{dz}\right) \approx \frac{1}{\Delta x}\left(\kappa_{i+1} \frac{u_{i+1} - u_i}{\Delta x} - \kappa_i \frac{u_i - u_{i-1}}{\Delta x}\right)$$

Aproximação em diferenças finitas

$$\frac{\partial u}{\partial x} = \lim_{\Delta x \to 0} \frac{\Delta u}{\Delta x} \approx \frac{\Delta u}{\Delta x}$$

$$\frac{\partial u}{\partial x} \approx \quad \frac{u_1 - u_0}{\Delta x} \quad \frac{u_2 - u_1}{\Delta x} \quad \frac{u_3 - u_2}{\Delta x} \quad \frac{u_4 - u_3}{\Delta x} \quad \frac{u_5 - u_4}{\Delta x} \quad \frac{u_6 - u_5}{\Delta x} \quad \frac{u_7 - u_6}{\Delta x}$$

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Letter

The effect of sedimentary cover on the flexural strength of continental lithosphere

Luc L. Lavier & Michael S. Steckler