

# Simulação numérica da erosão e sedimentação

Modelos quantitativos de bacias sedimentares

# Processos superficiais: qual é o problema?

*Overall, we have learned two things:*

*1 It is not hard to invent plausible stratigraphic models.*

*2 It is very hard to test them.*

*(Chris Paola, 2000)*



# Micro x Macro





# Micro x Macro

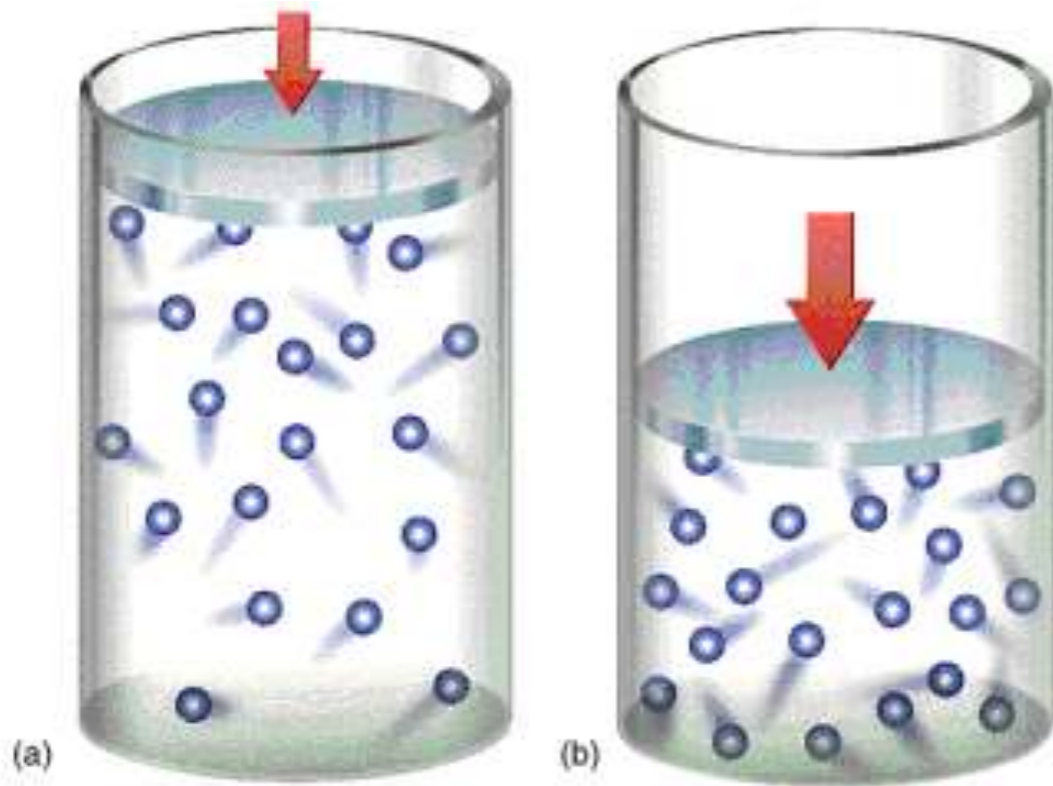


"As demonstrated in other sciences, a fruitful approach to such problems of scale is to set aside (for the time being) the small-scale, short-timescale picture and to explore simple relationships cast in terms of large-scale, long-timescale quantities."  
Kooi & Beaumont (1994)

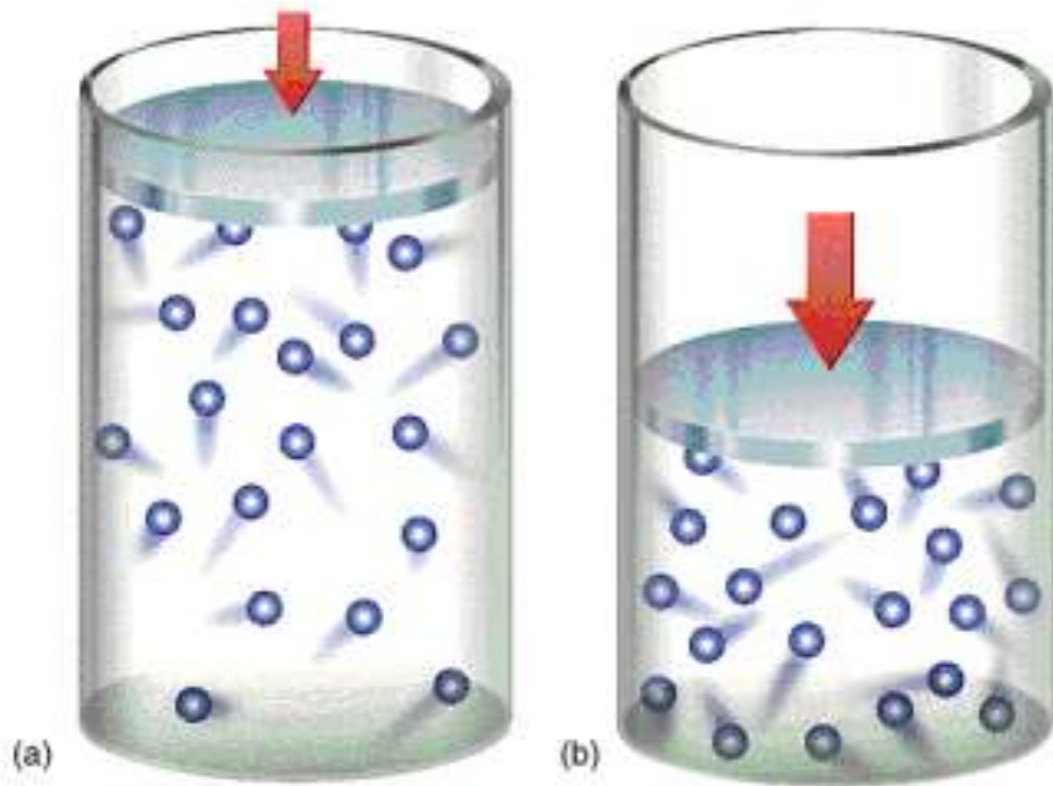


Analogia com mecânica  
estatística - (lei dos gases ideais)

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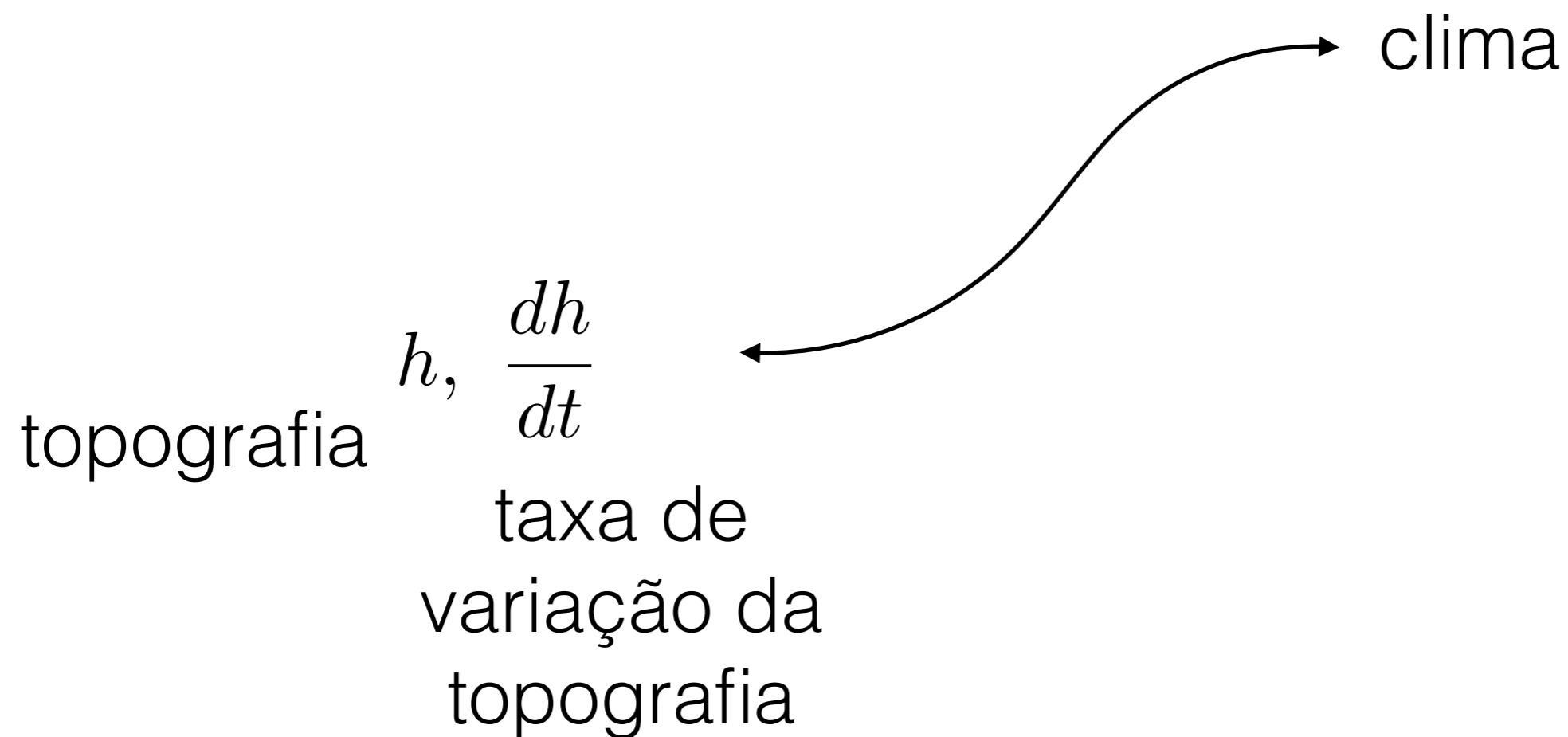
$$PV = nRT$$

# Processos superficiais de erosão e sedimentação

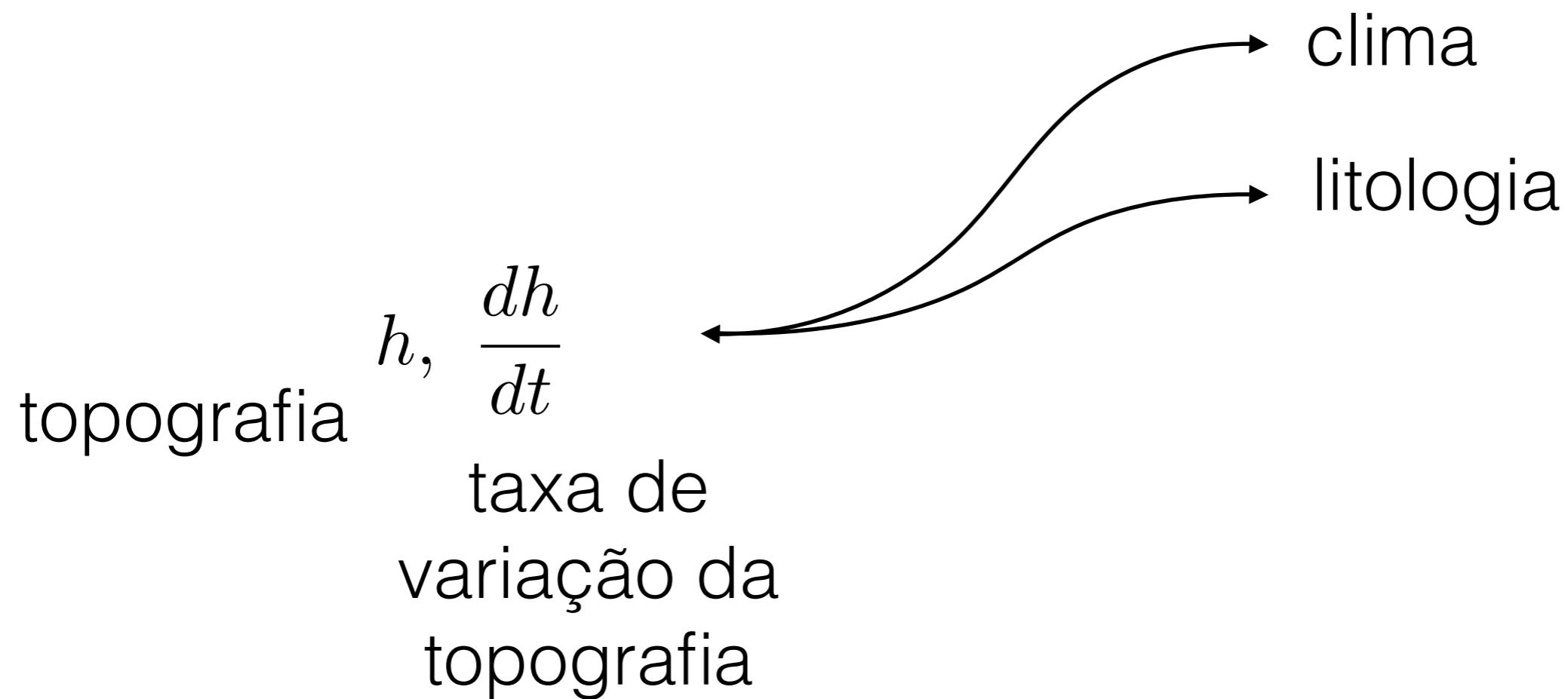
topografia  $h, \frac{dh}{dt}$   
taxa de  
variação da  
topografia



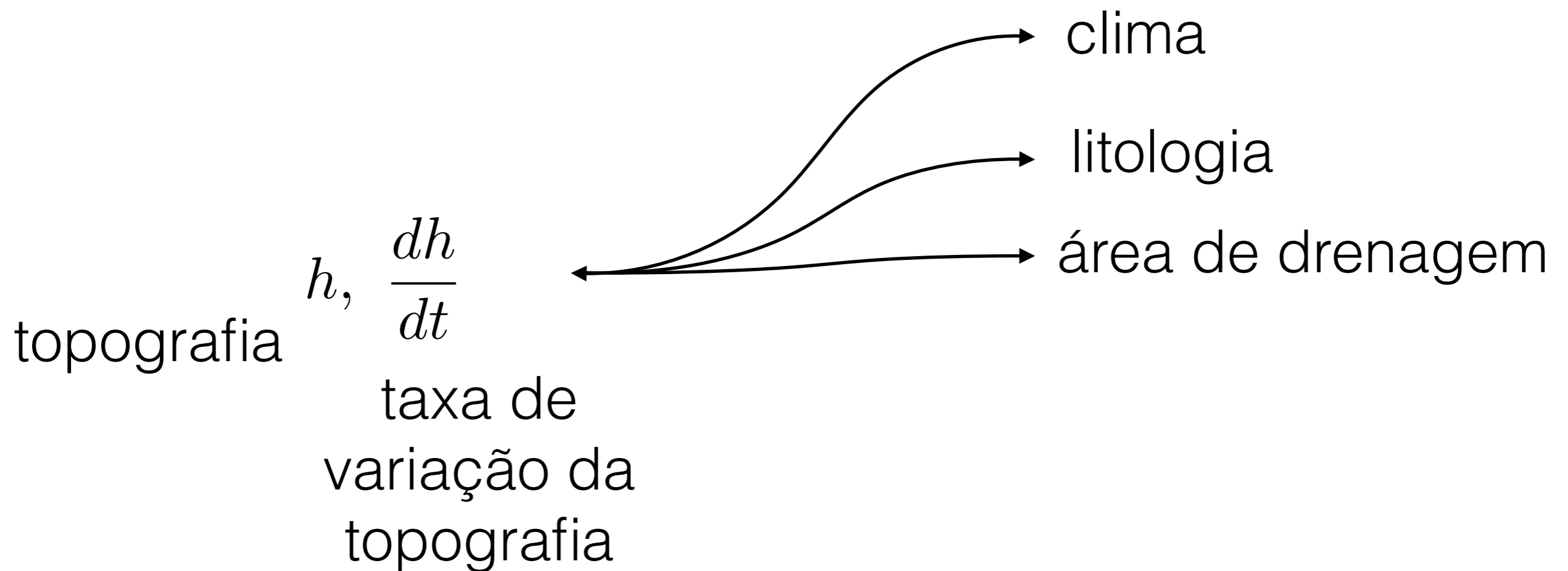
# Processos superficiais de erosão e sedimentação



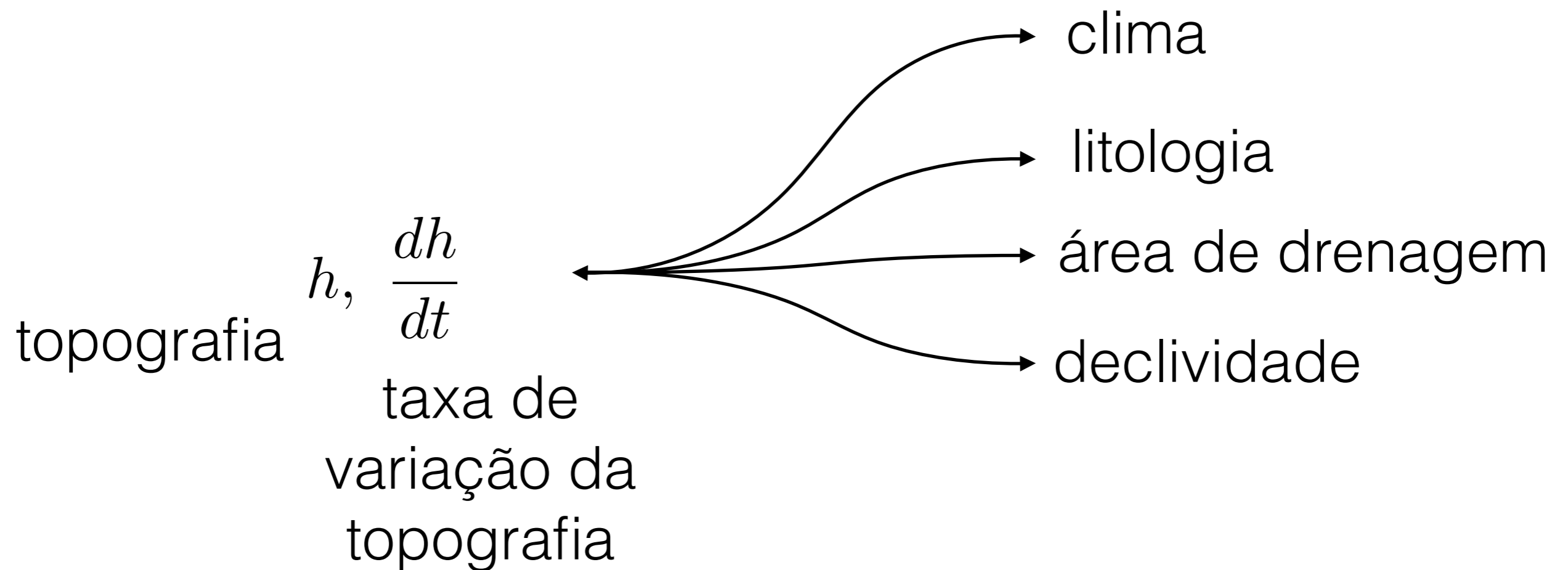
# Processos superficiais de erosão e sedimentação



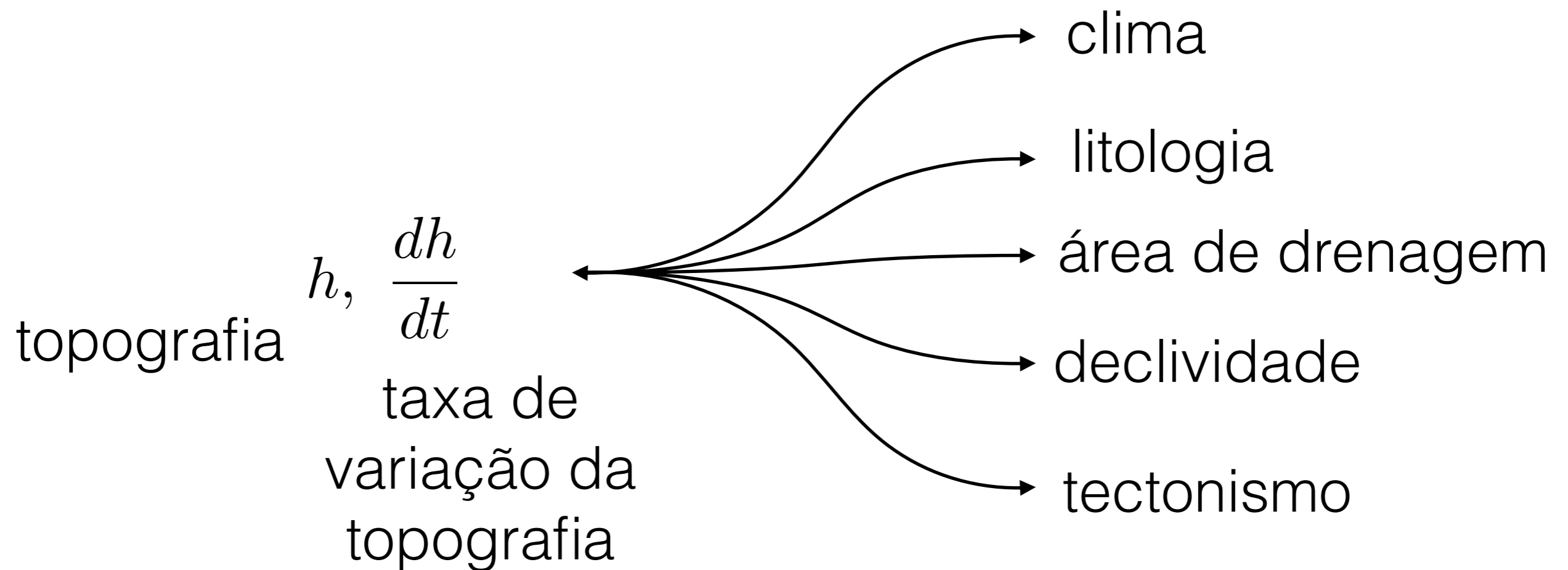
# Processos superficiais de erosão e sedimentação



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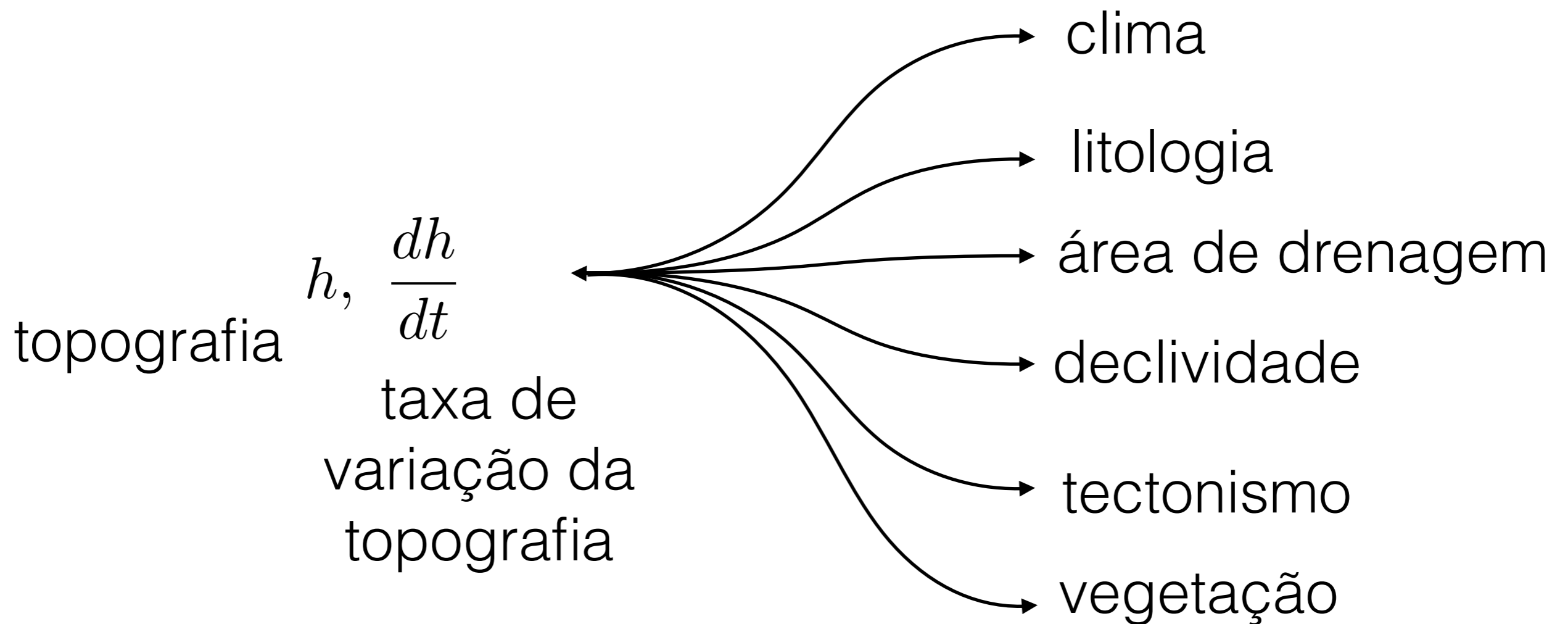


# Processos superficiais de erosão e sedimentação





# Processos superficiais de erosão e sedimentação



# Modelo 1-D

(caso mais simples)

$$\frac{dh}{dt} \propto h$$

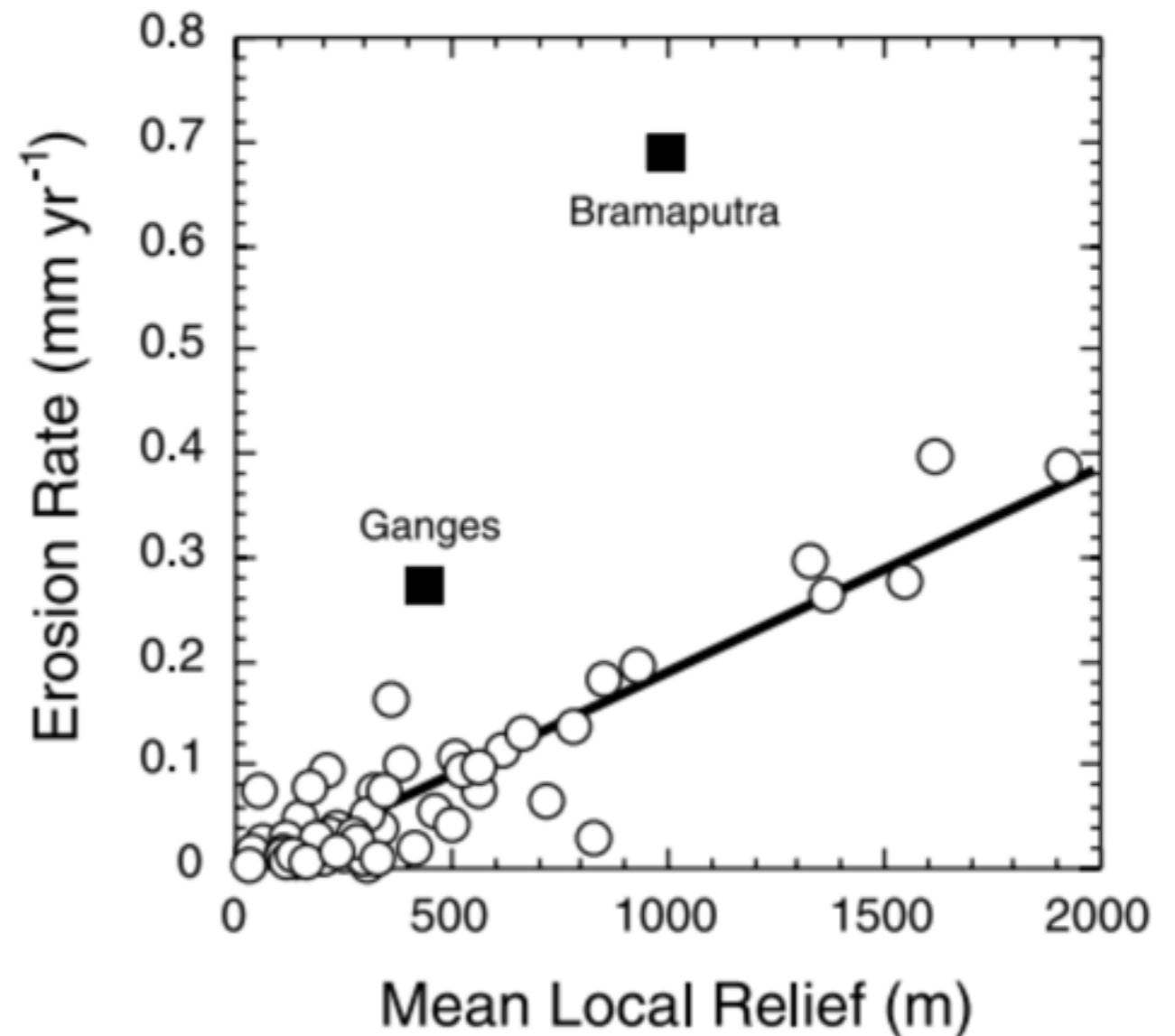
$$\frac{dh}{dt} = -\lambda h$$

# Modelo 1-D

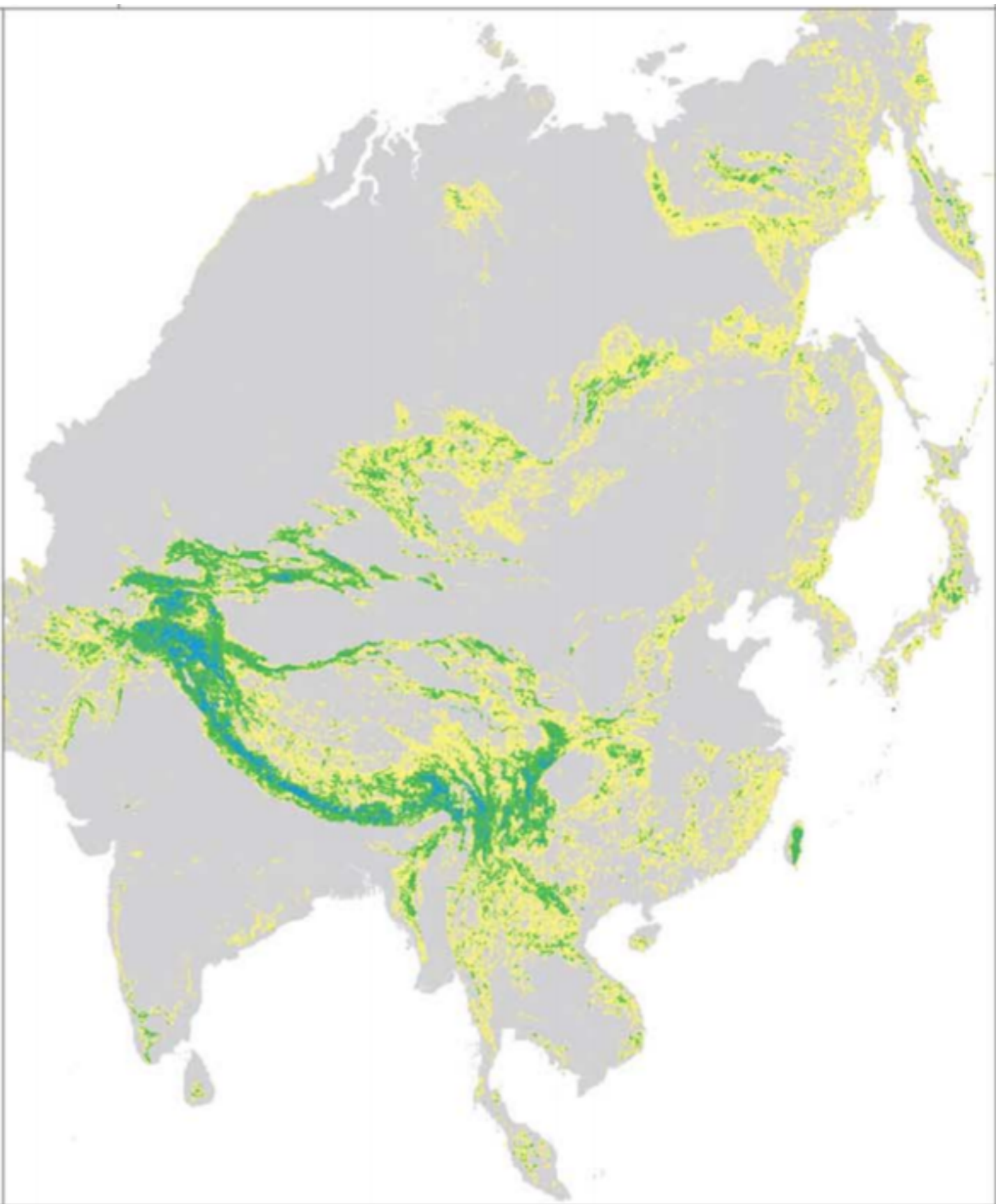
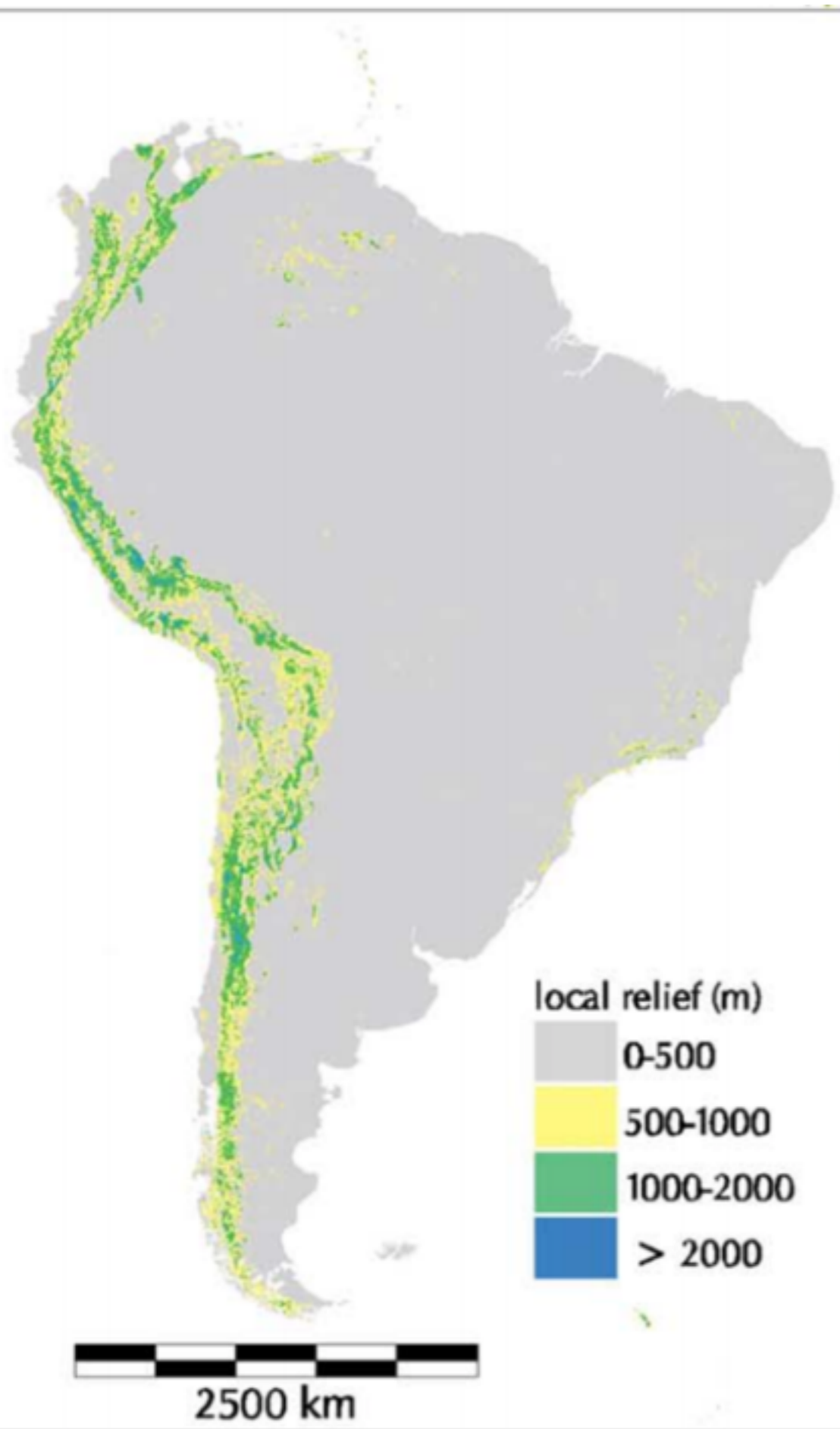
(caso mais simples)

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Montgomery & Brandon (2002)



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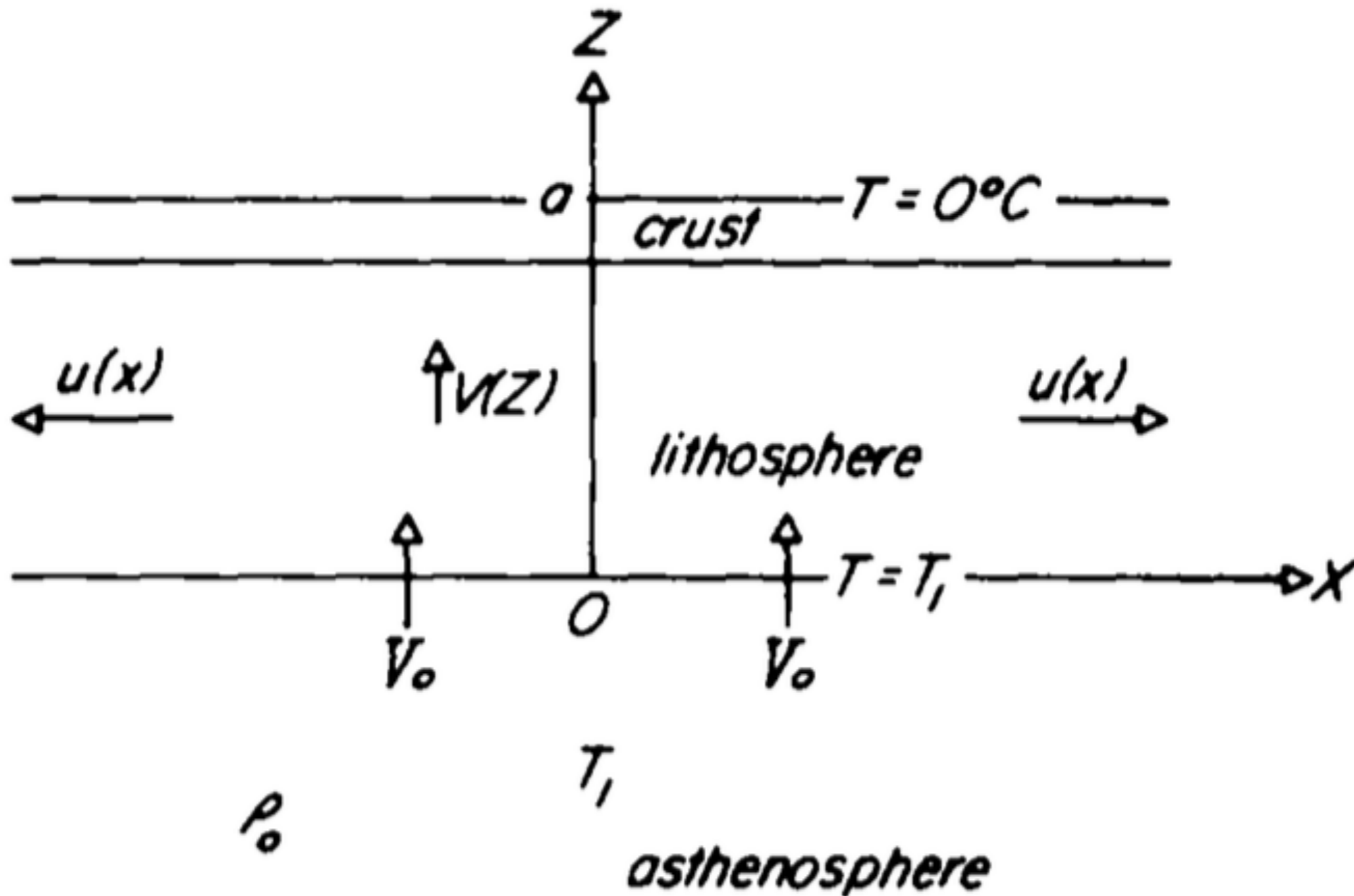
taxa de  
soerguimento

# Solução numérica

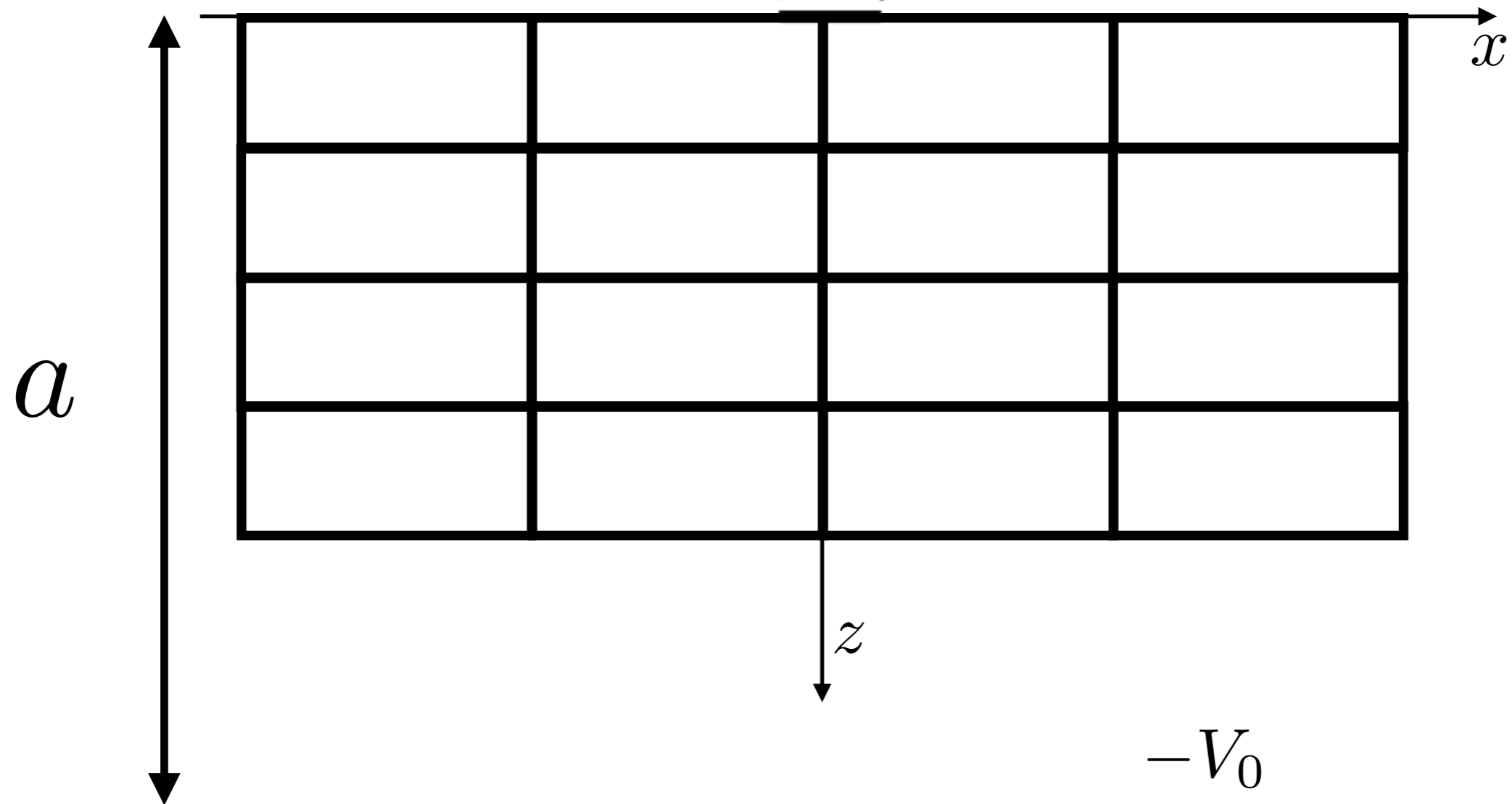
$$\frac{dh}{dt} = -\lambda h + U(t)$$

$$\Delta h = -\lambda h \Delta t + U(t) \Delta t$$

# Jarvis & McKenzie (1980) (ao contrário!)

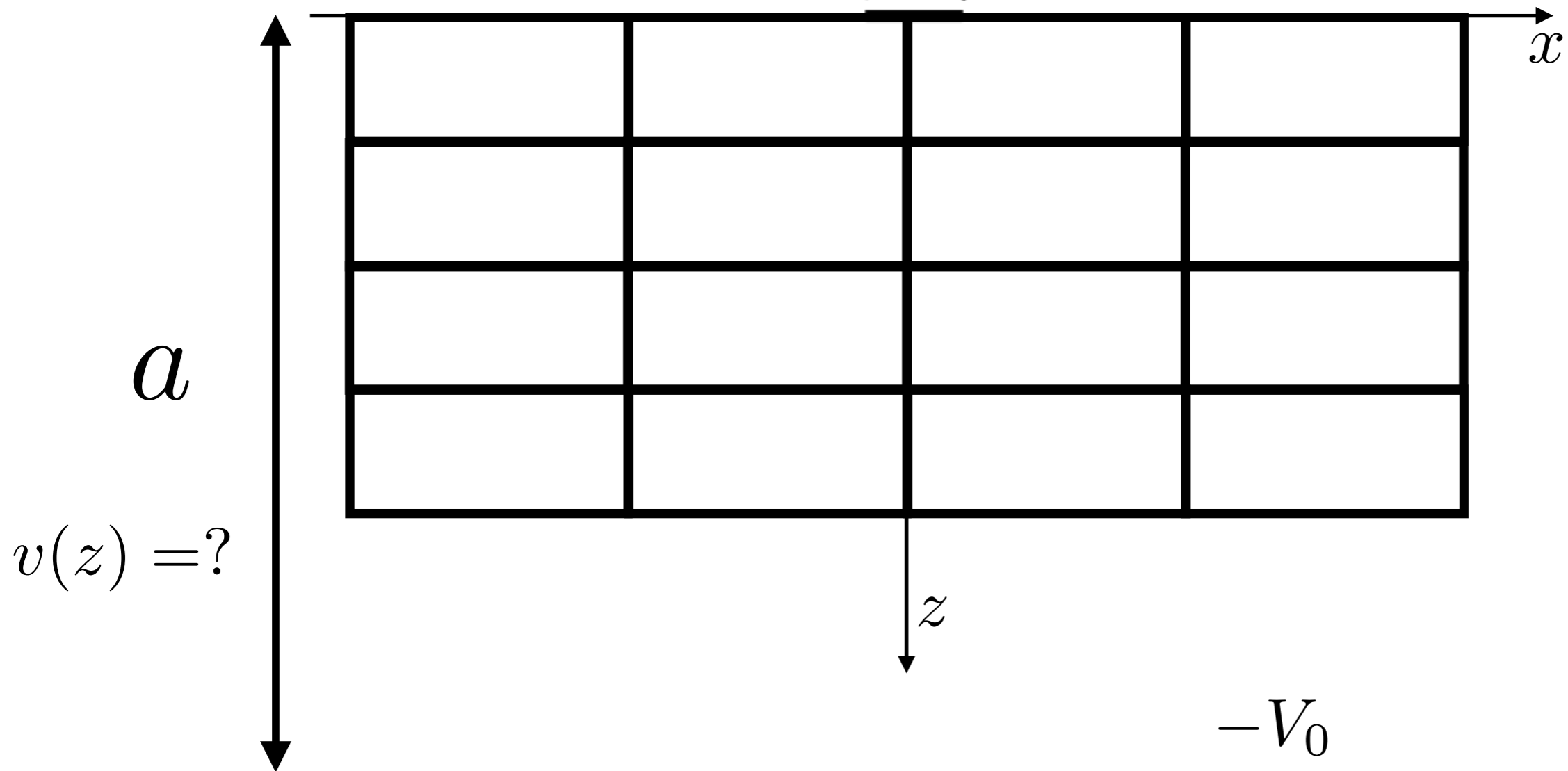


# Compressão uniforme

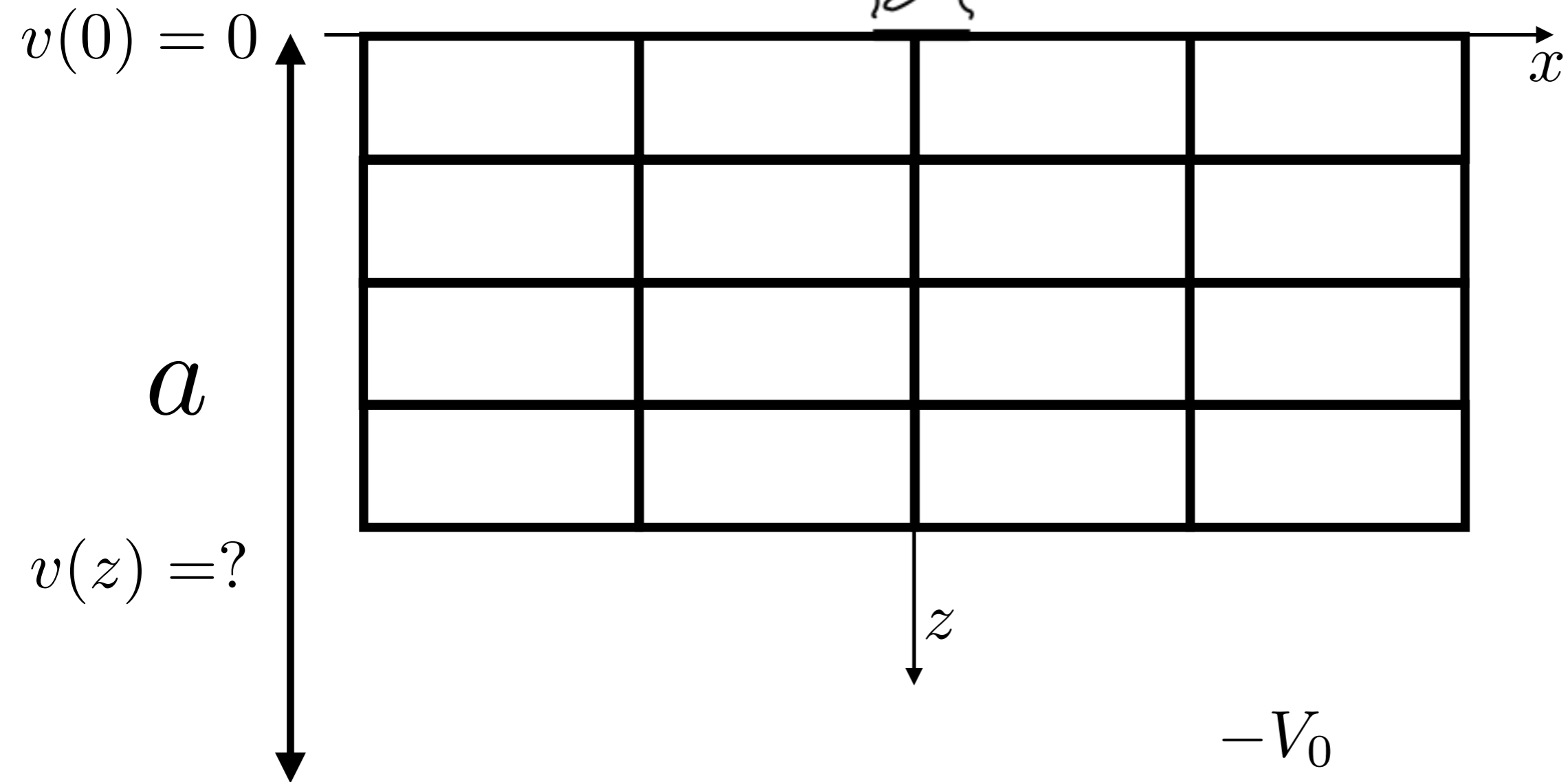




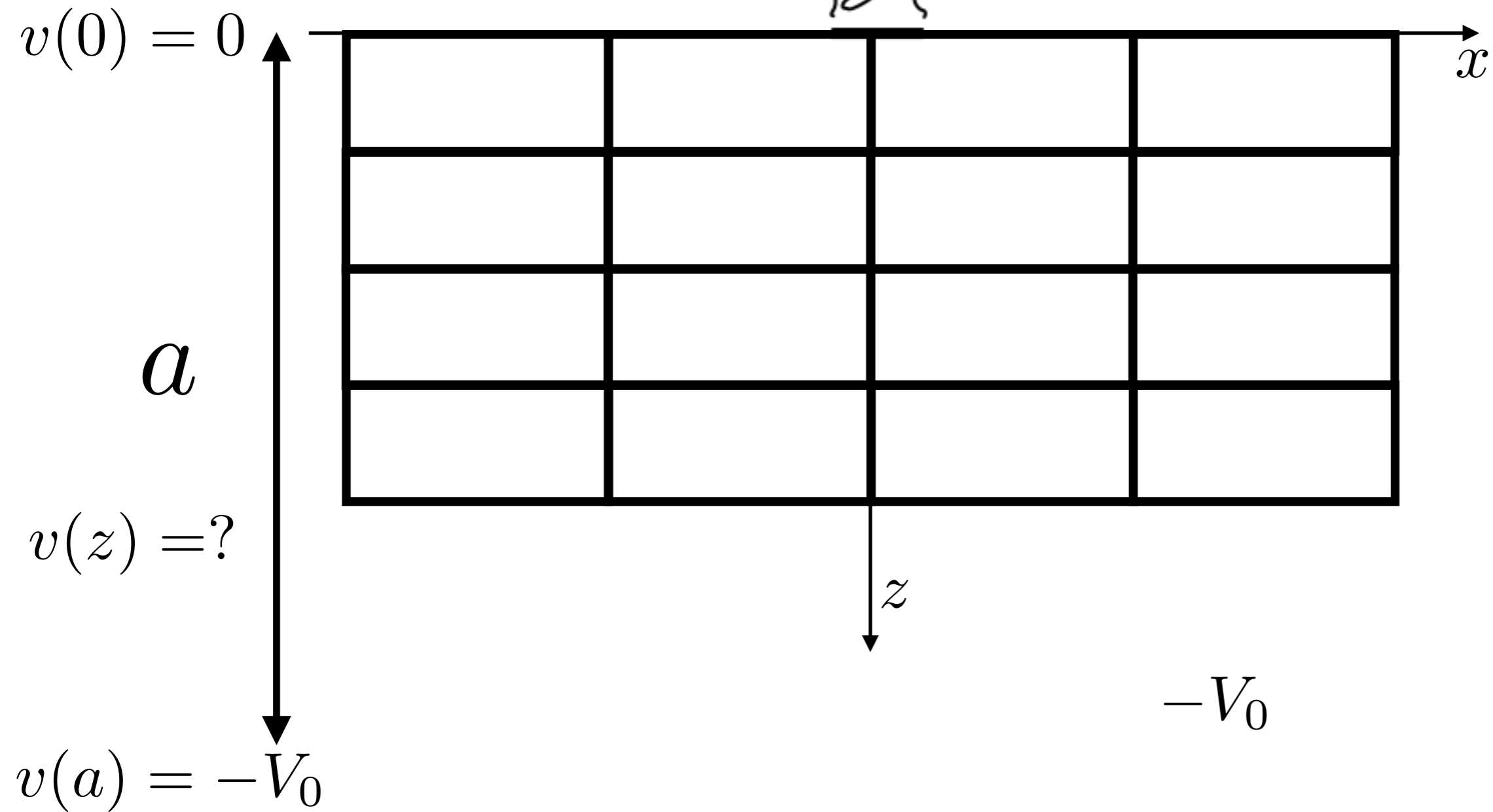
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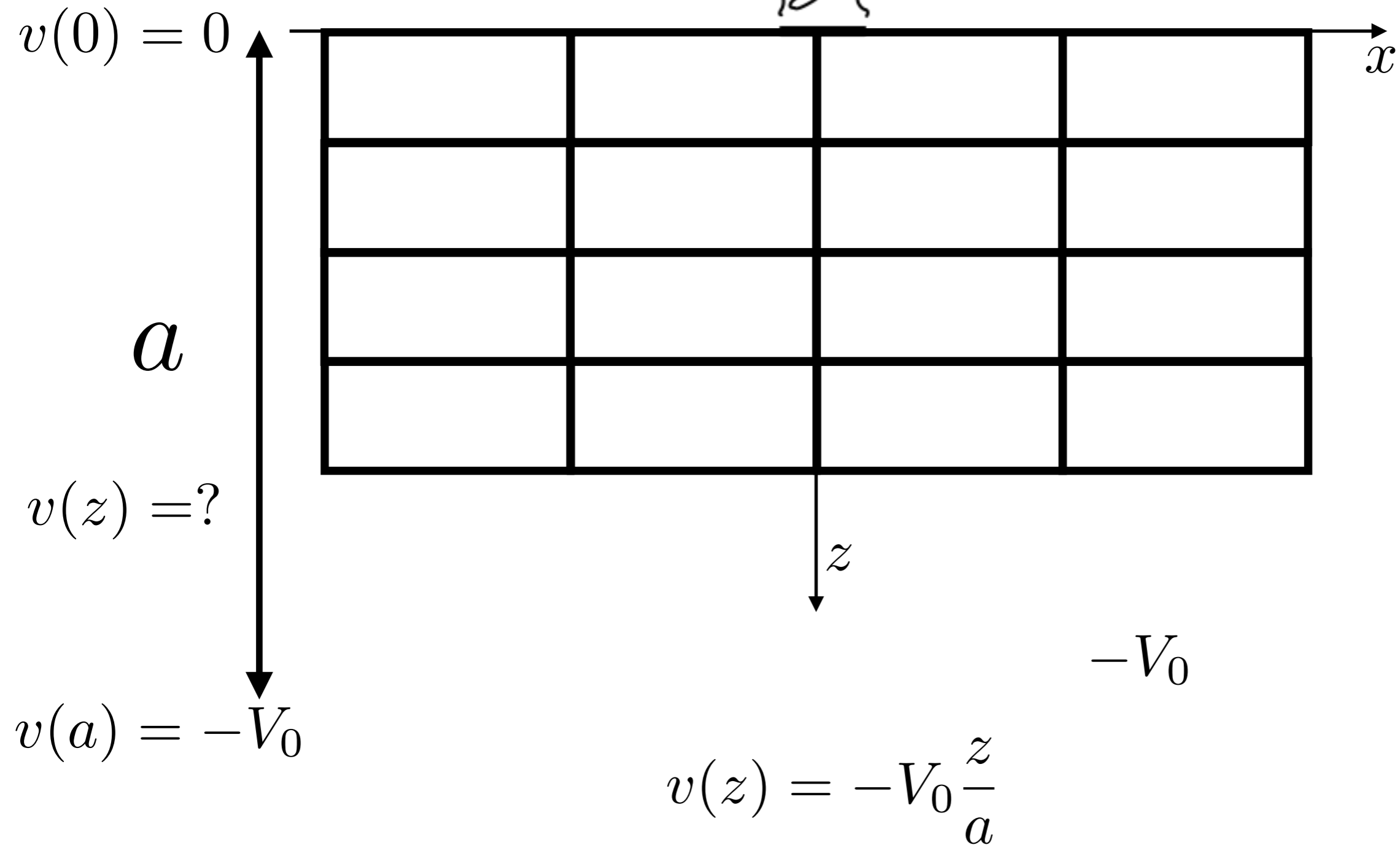
# Compressão uniforme



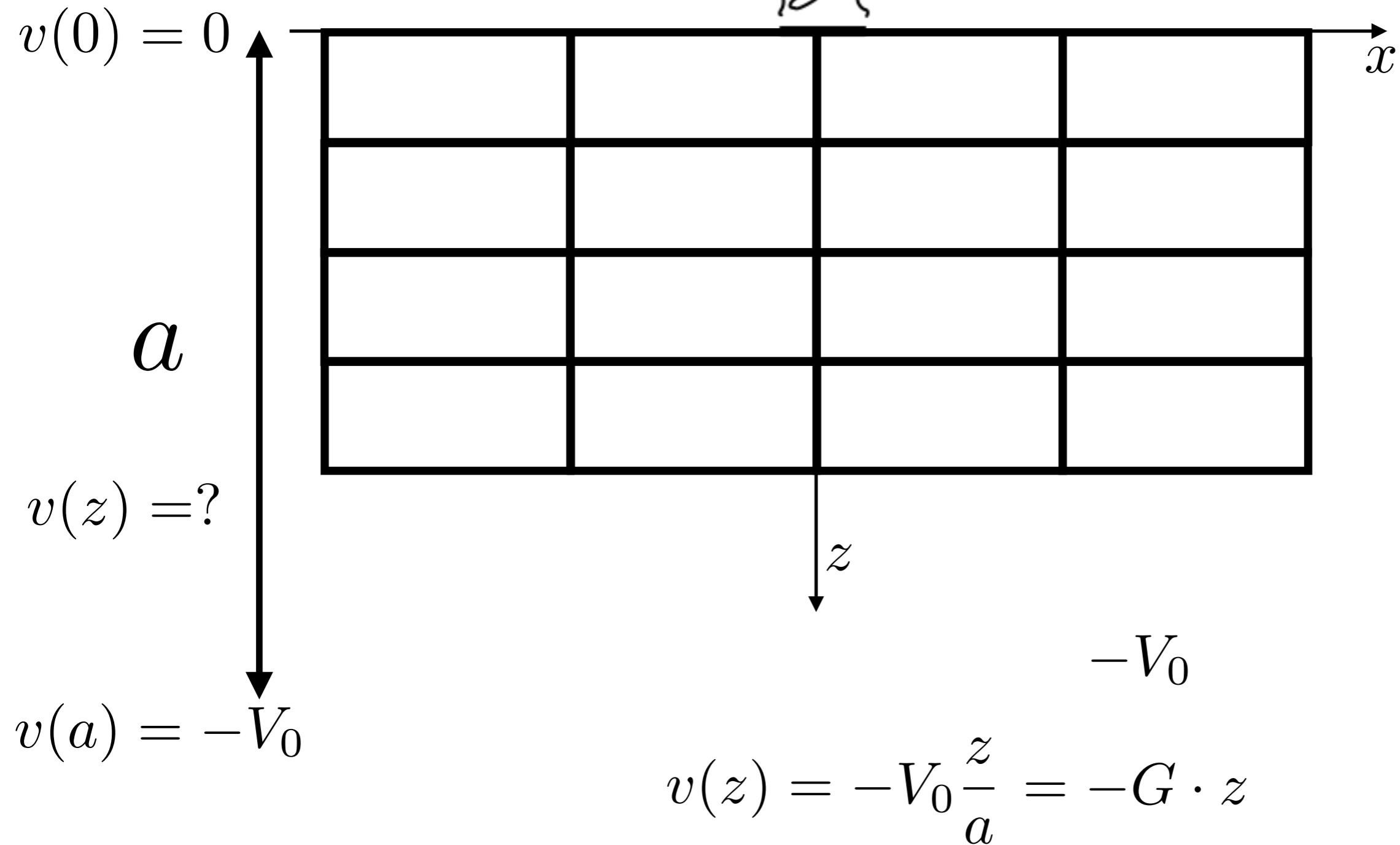
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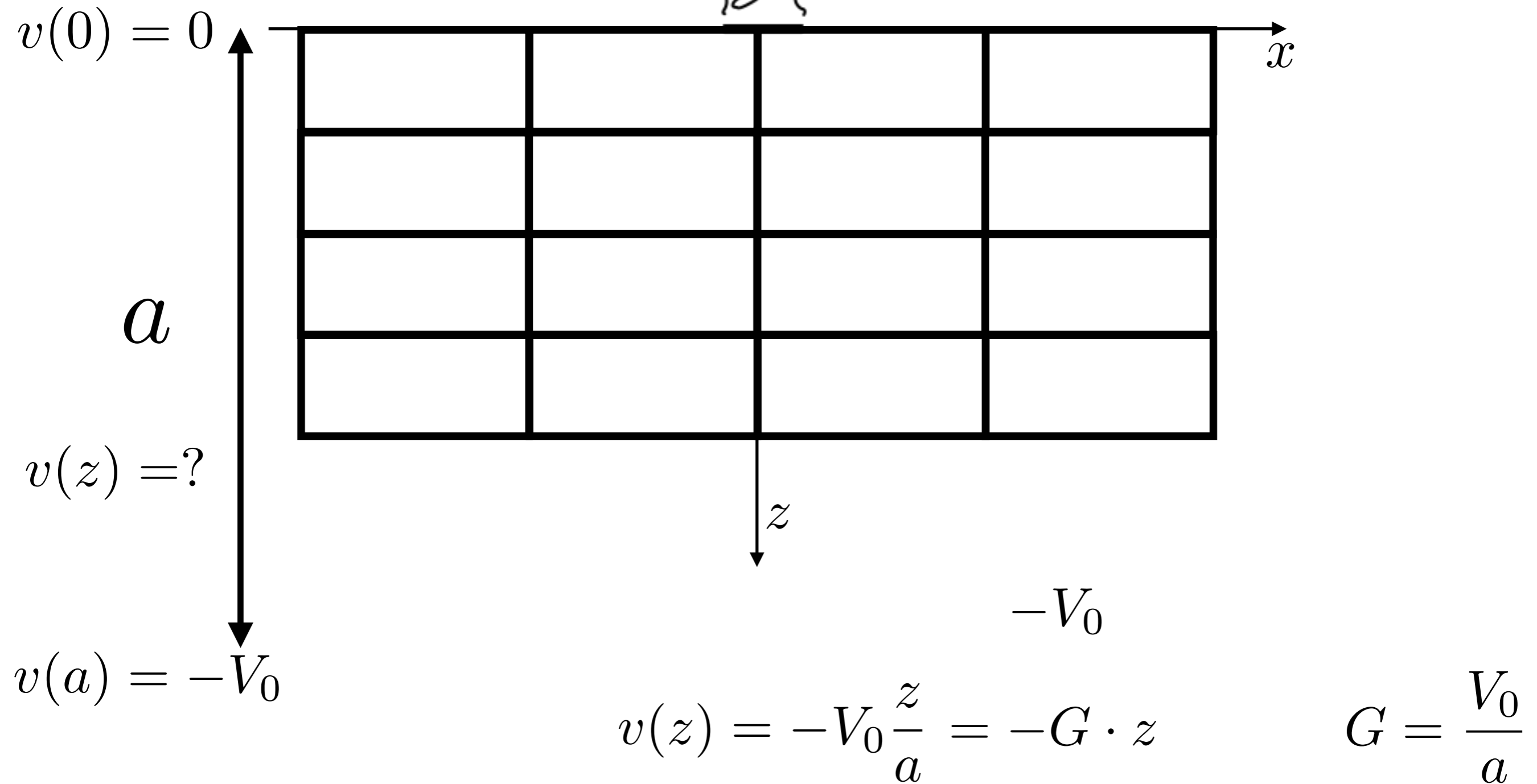
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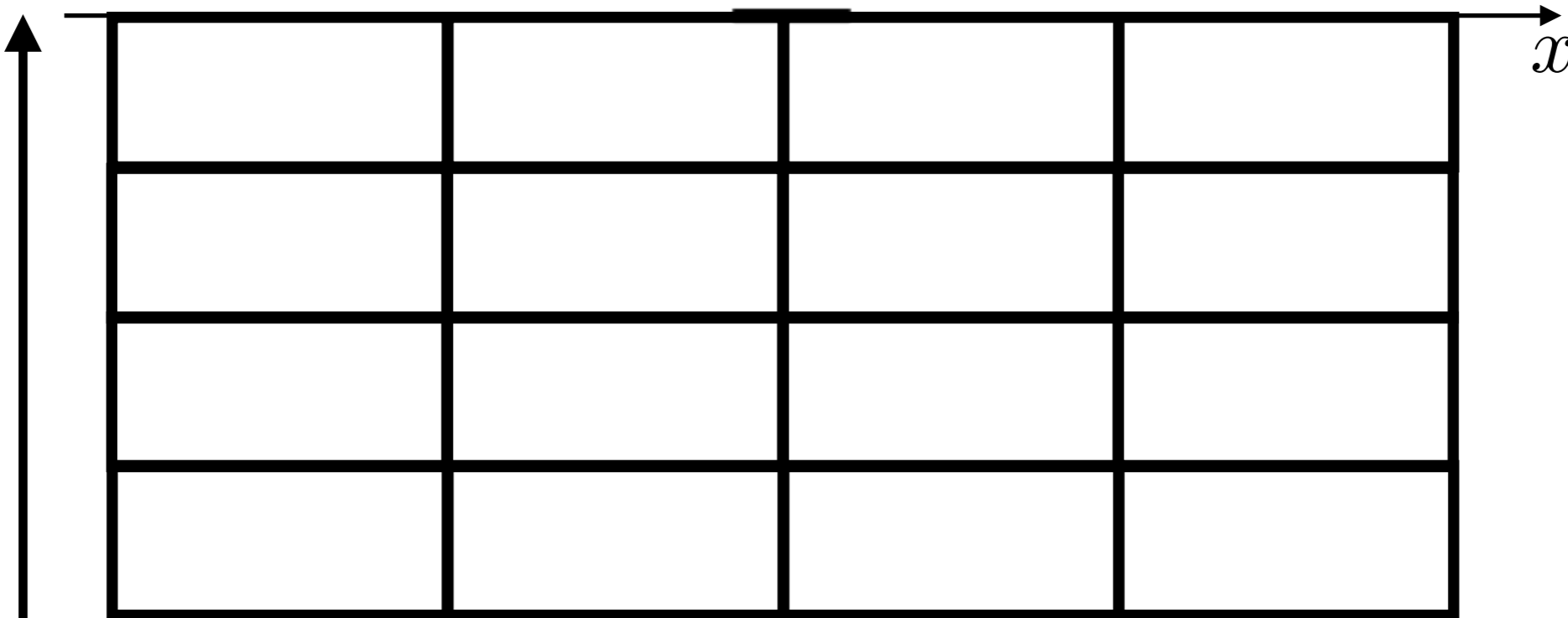


# Compressão uniforme



$$u(x) = G \cdot x$$

$$v(0) = 0$$



$$v(z) = ?$$

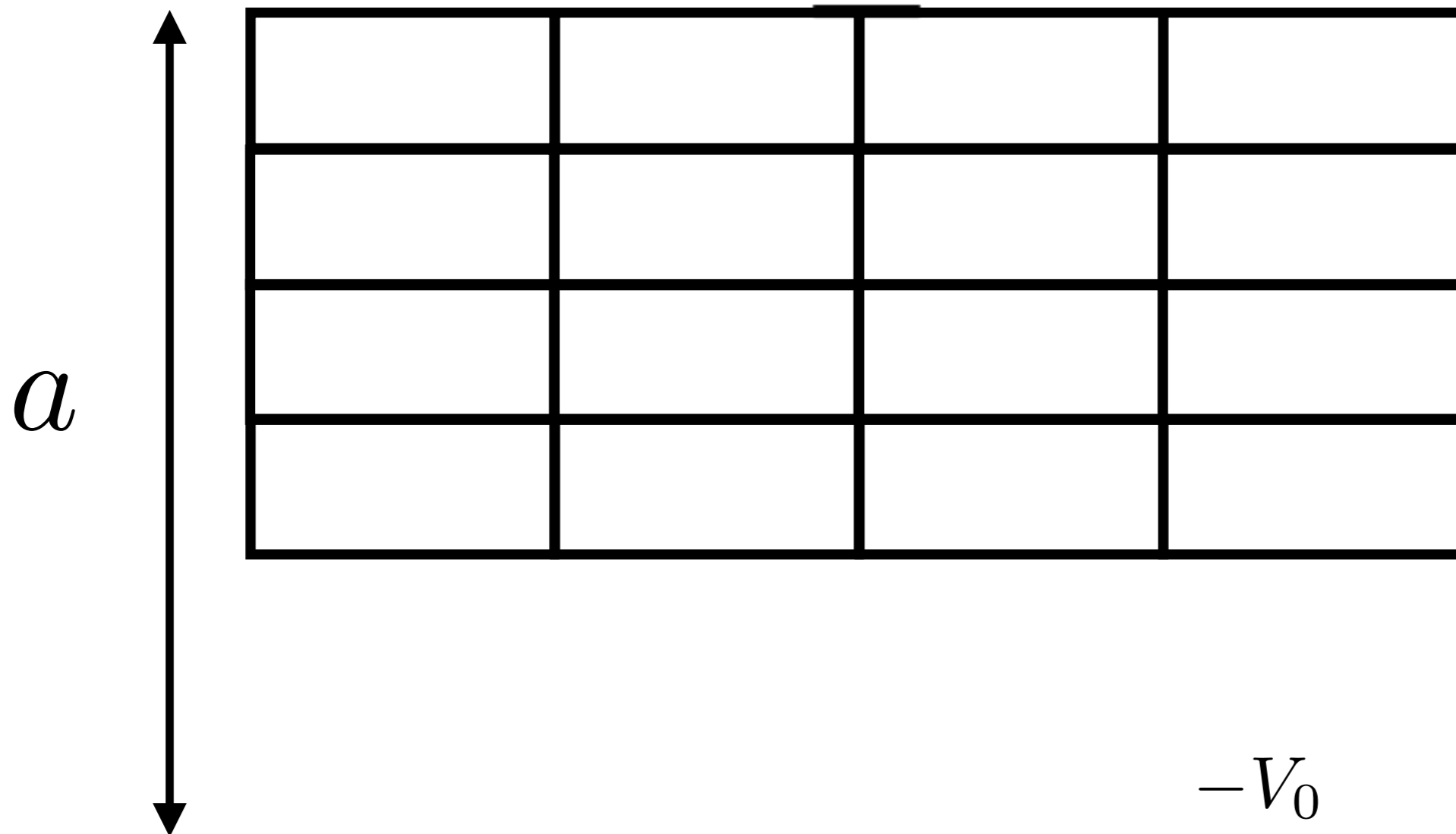
$$v(a) = -V_0$$

$$-V_0$$

$$v(z) = -V_0 \frac{z}{a} = -G \cdot z$$

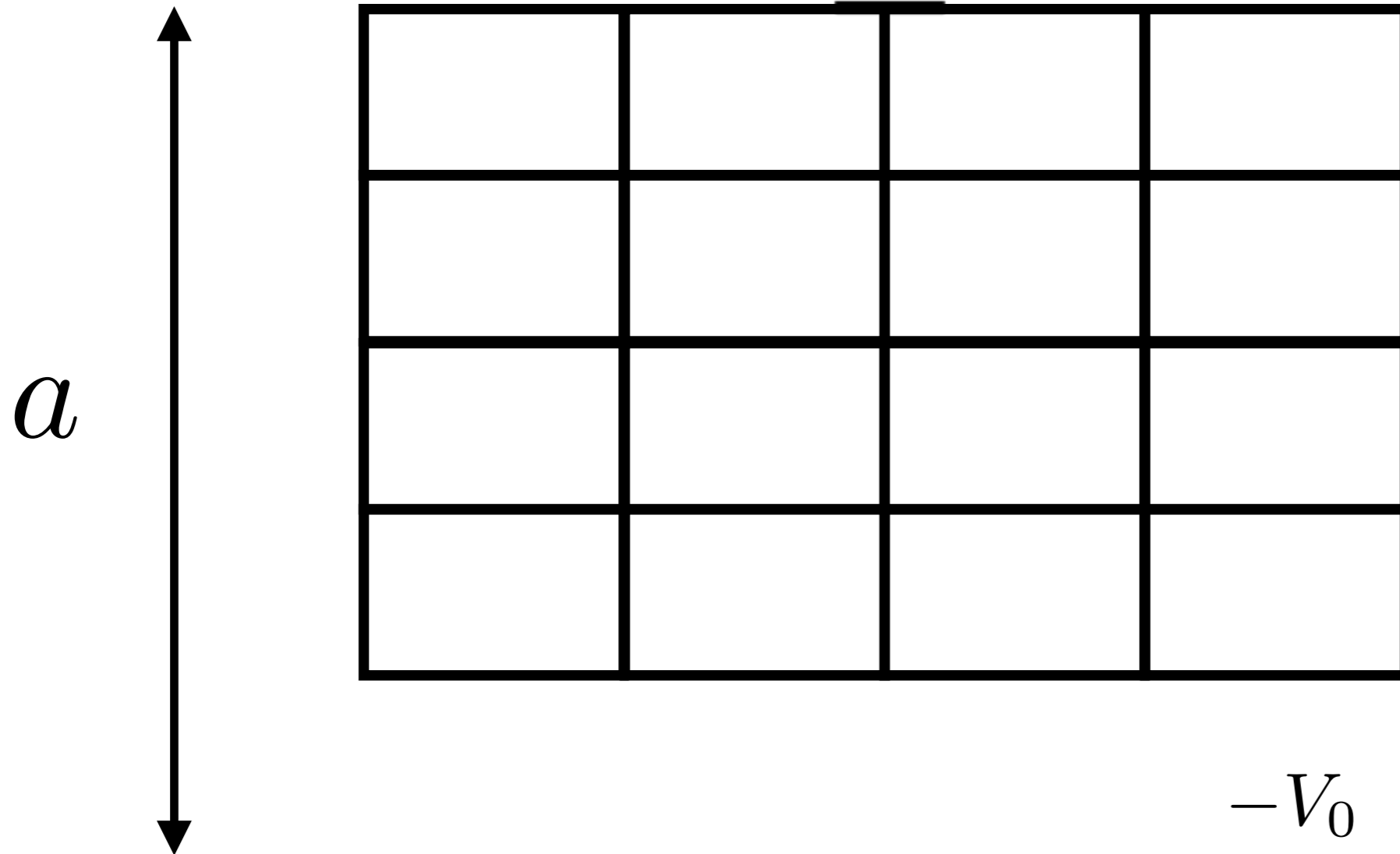
$$G = \frac{V_0}{a}$$

# Compressão uniforme





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