

**XXV CURSO DE
USO ESCOLAR DE SENSORIAMENTO REMOTO
NO ESTUDO DO MEIO AMBIENTE**

**Fundamentos de Sensoriamento Remoto
e
Comportamento Espectral de Alvos**

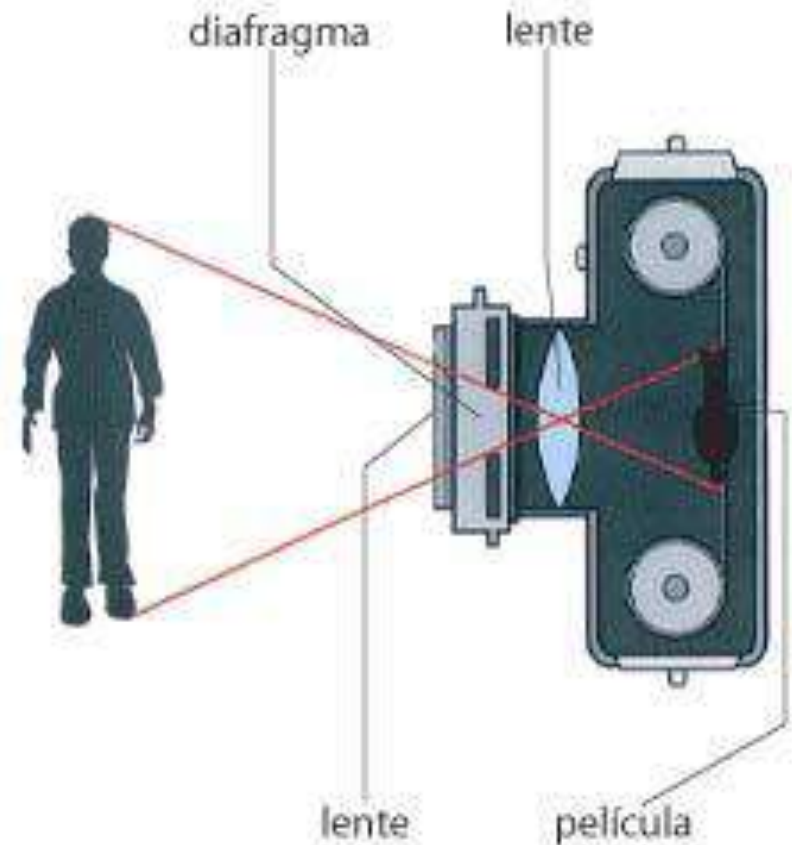
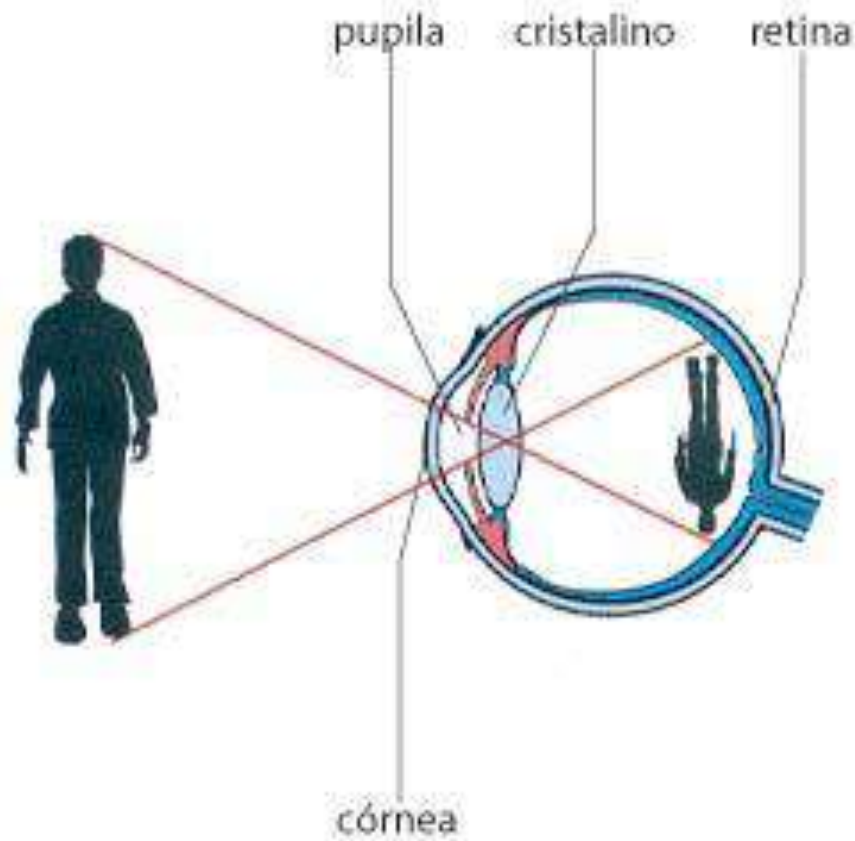
Elisabete Caria Moraes
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São José dos Campos - SP
11 de Julho de 2022

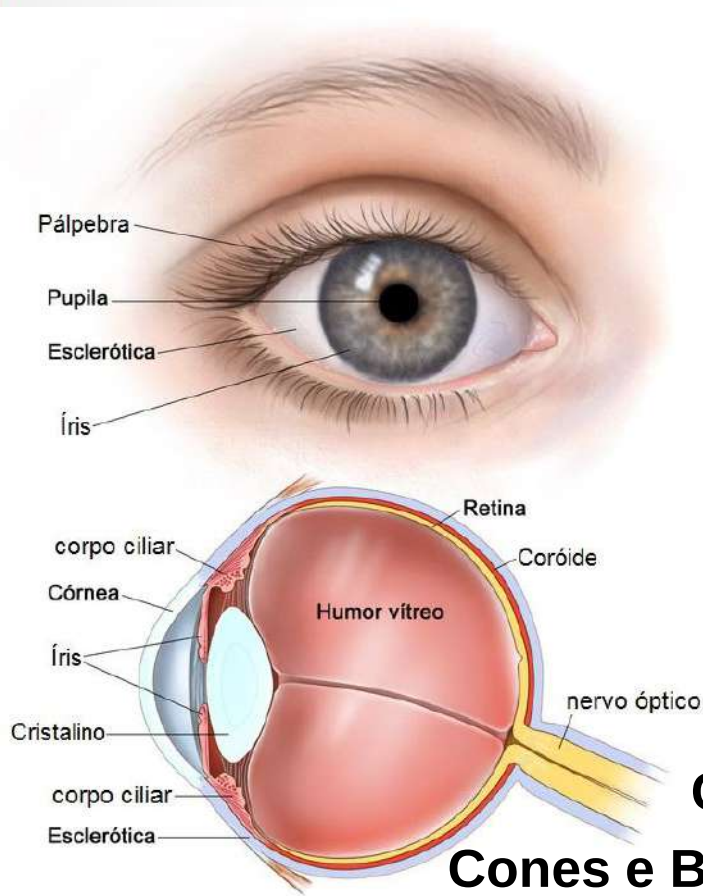
Sensoriamento Remoto



Olho humano x Máquina Fotográfica



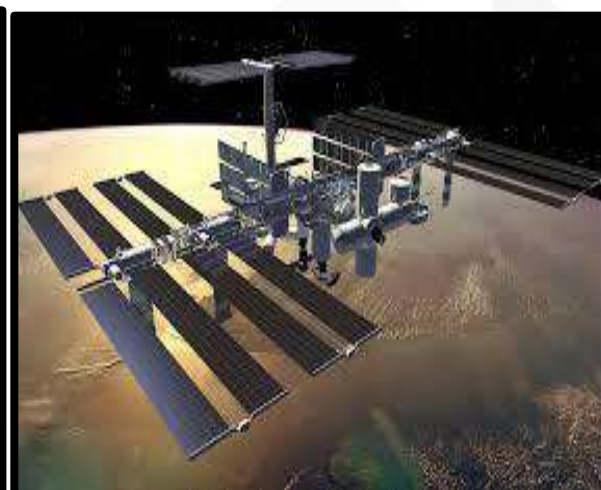
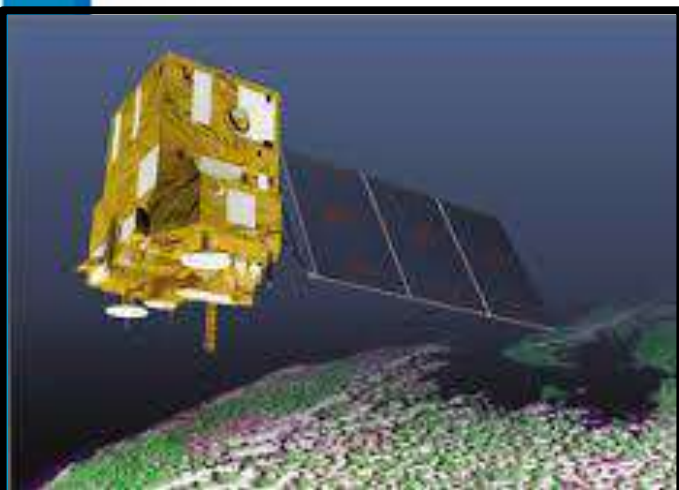
Olho humano x Sensor



Cristalino = Coletor
Cones e Bastonetes = Filtro e Detector
Nervo óptico = Processador
Cérebro = Unidade de saída



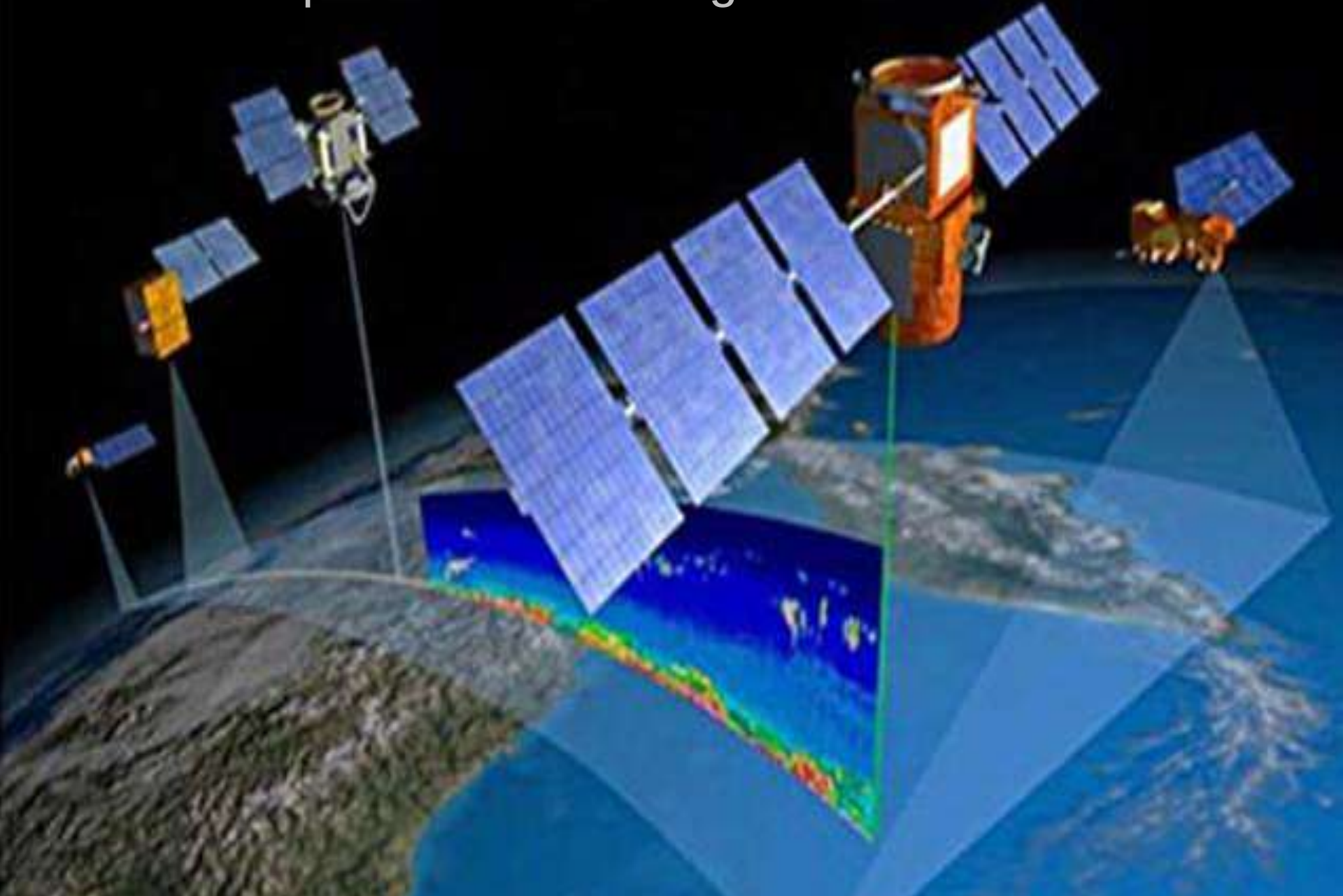
Origem

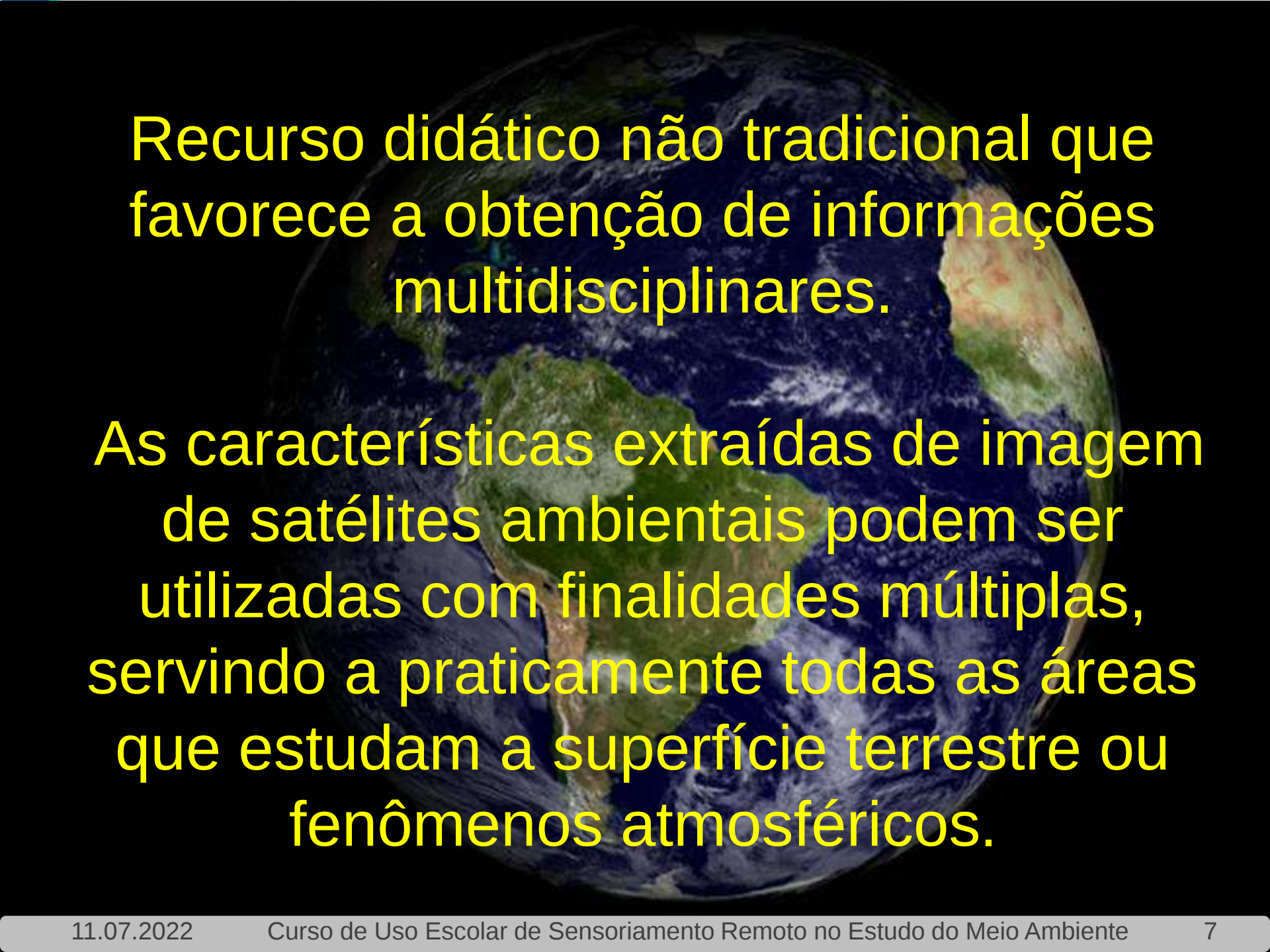


Sensoriamento Remoto

https://climate.nasa.gov/climate_resources/14/video-the-home-frontier/

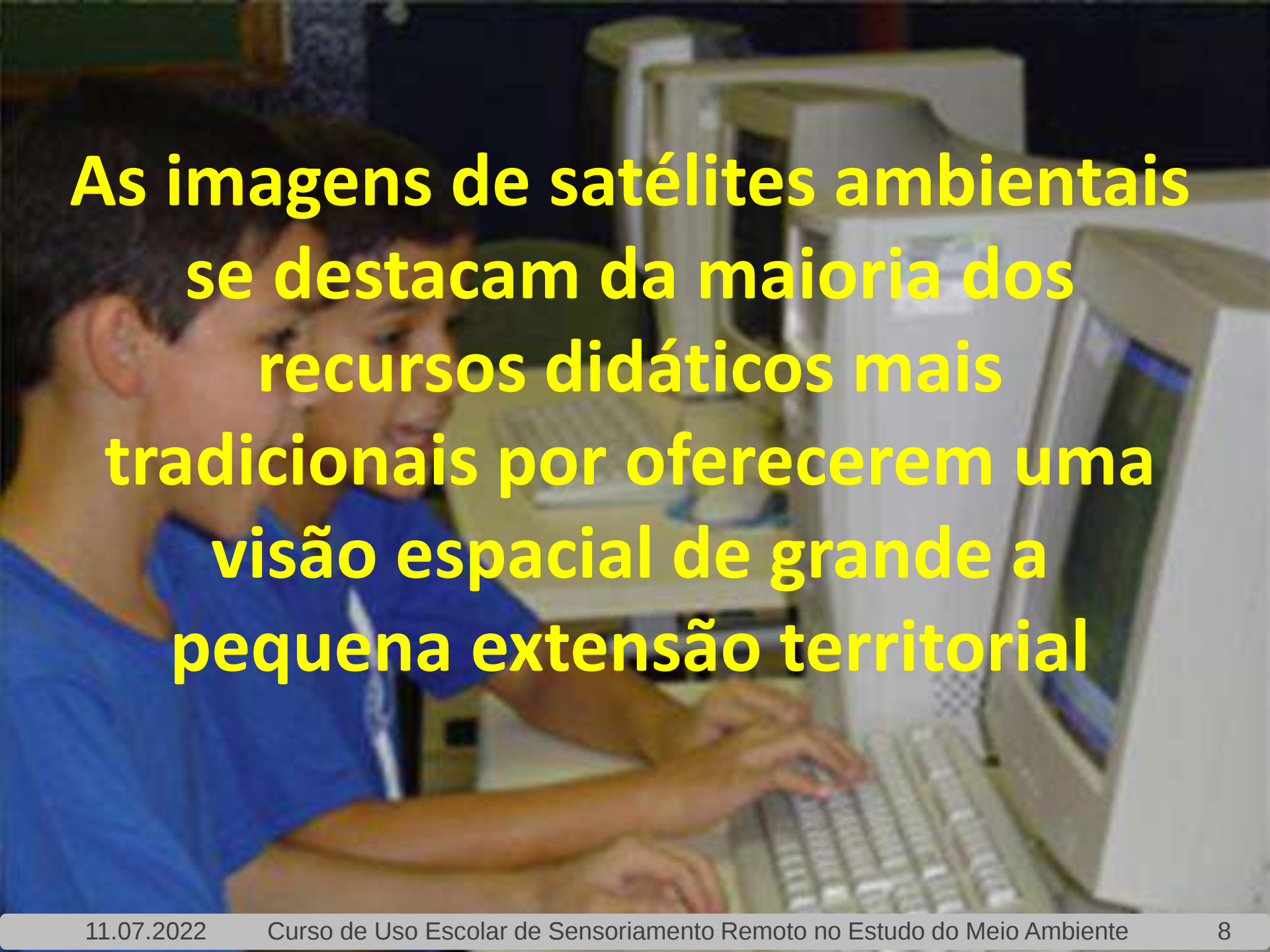




A satellite image of Earth, showing the continents of South America and Africa. The image is used as a background for the text.

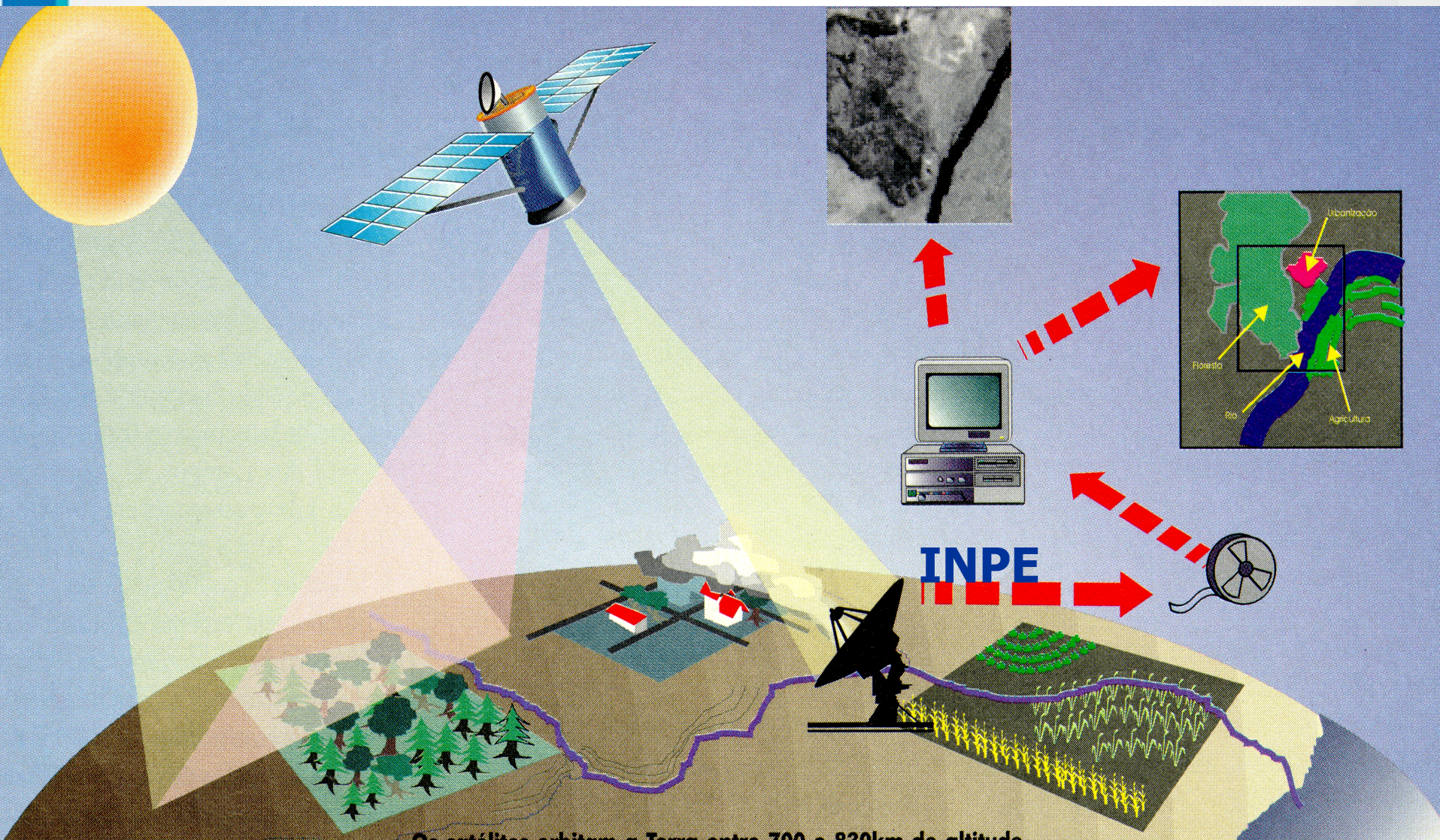
Recurso didático não tradicional que favorece a obtenção de informações multidisciplinares.

As características extraídas de imagem de satélites ambientais podem ser utilizadas com finalidades múltiplas, servindo a praticamente todas as áreas que estudam a superfície terrestre ou fenômenos atmosféricos.

A photograph of two young students, a boy and a girl, sitting at a desk in a classroom. They are both looking at a computer monitor. The boy is on the left, wearing a blue shirt, and the girl is on the right, also wearing a blue shirt. The computer is a desktop system with a CRT monitor. The background is slightly blurred, showing other computer monitors and classroom equipment. The text is overlaid in yellow on the image.

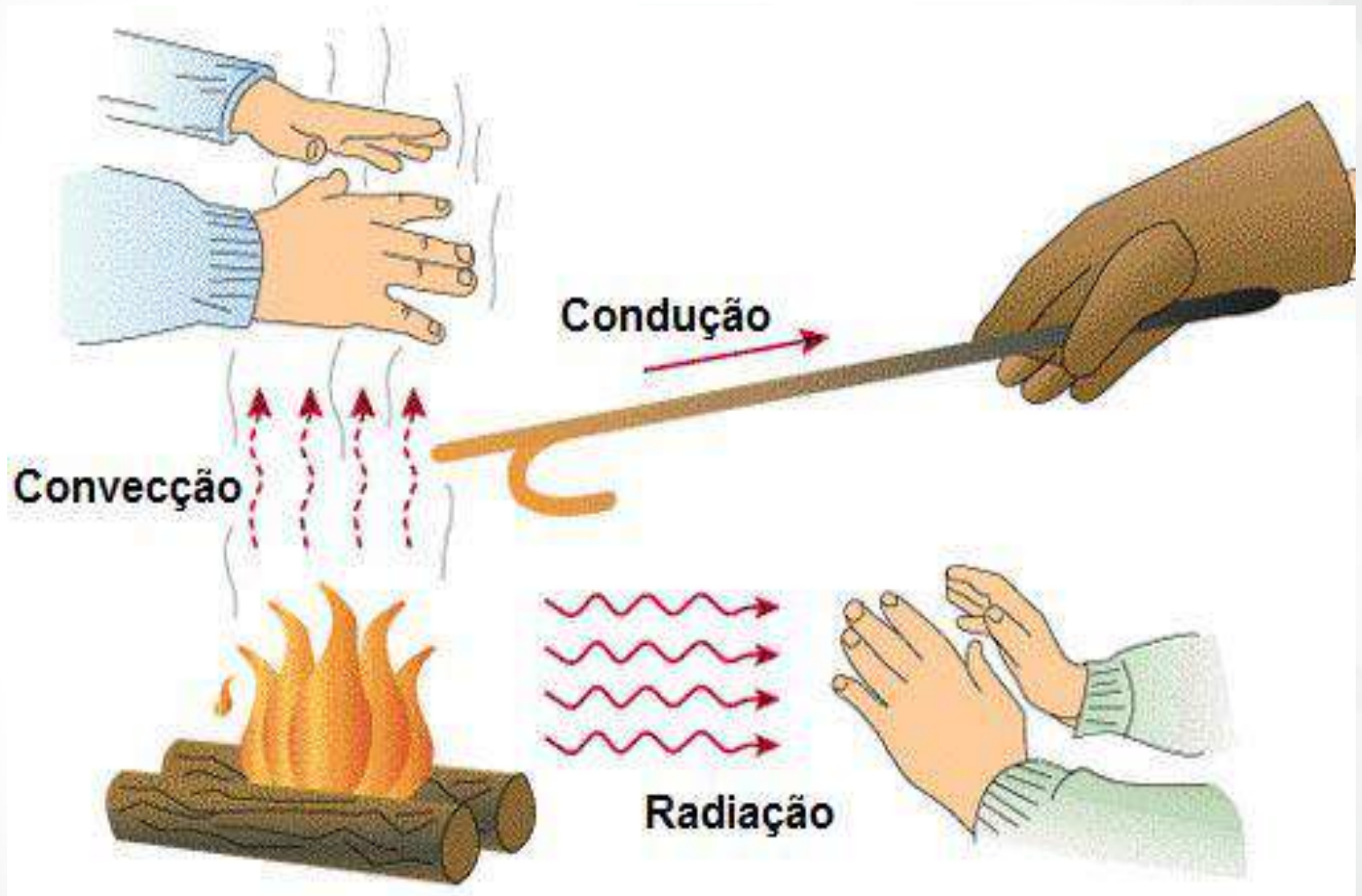
**As imagens de satélites ambientais
se destacam da maioria dos
recursos didáticos mais
tradicionais por oferecerem uma
visão espacial de grande a
pequena extensão territorial**

Sensoriamento Remoto

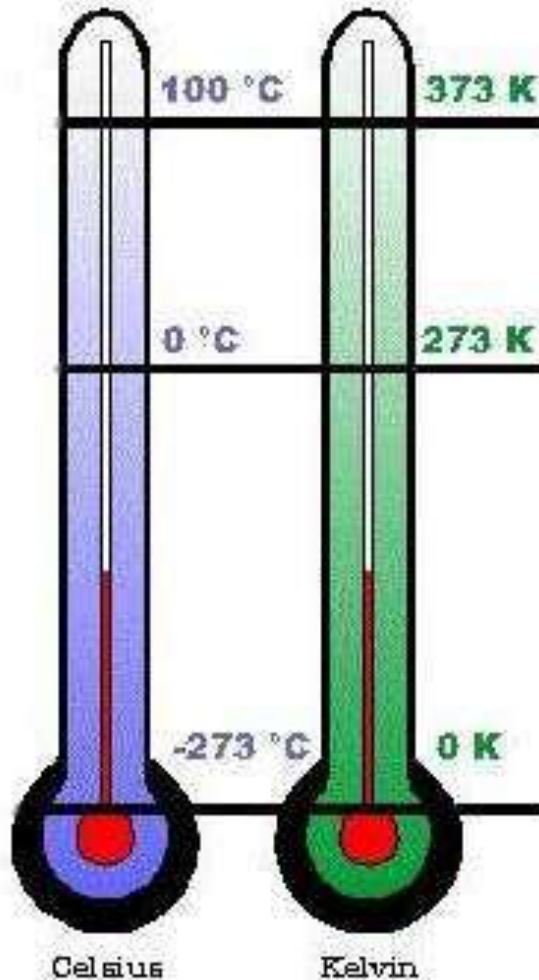


Os satélites orbitam a Terra entre 700 e 830km de altitude

Propagação de Energia



Relação entre as escalas Celsius e Kelvin



$$0 \text{ K} = - 273,16^{\circ}\text{C}$$

$$T_C = T_K - 273,16$$

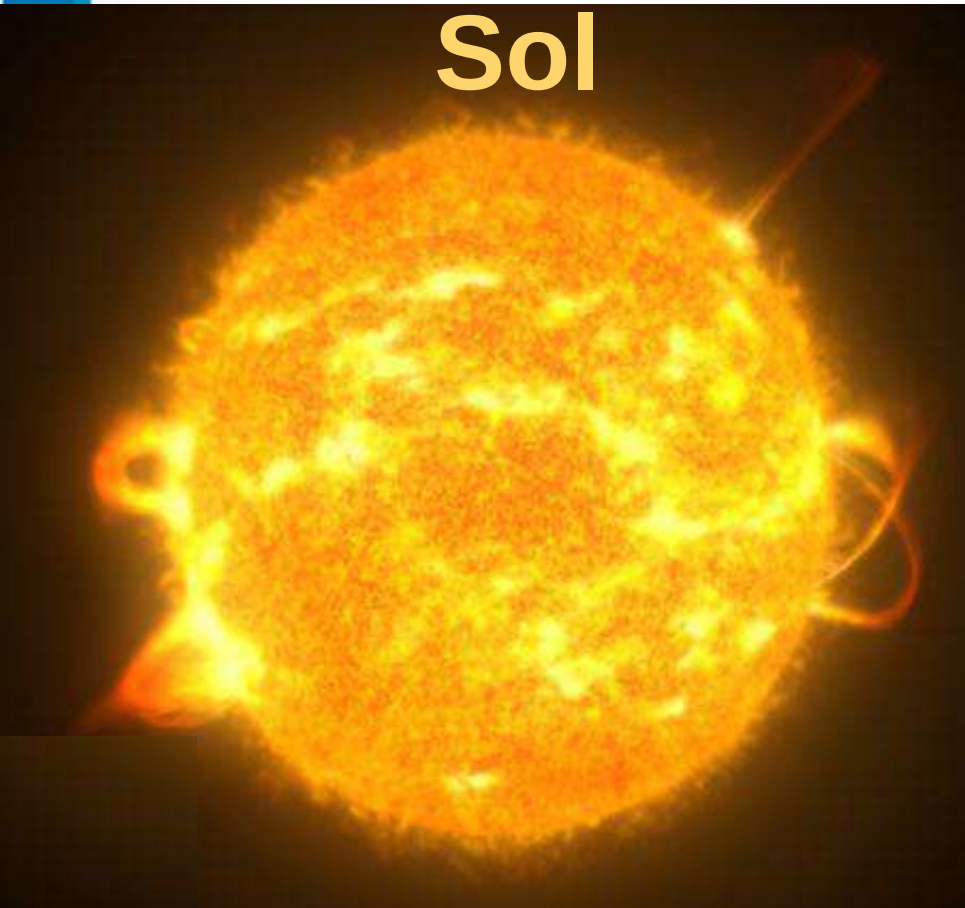
T_C = temperatura Celsius

T_K = temperatura Kelvin

Principais Fontes de Energia

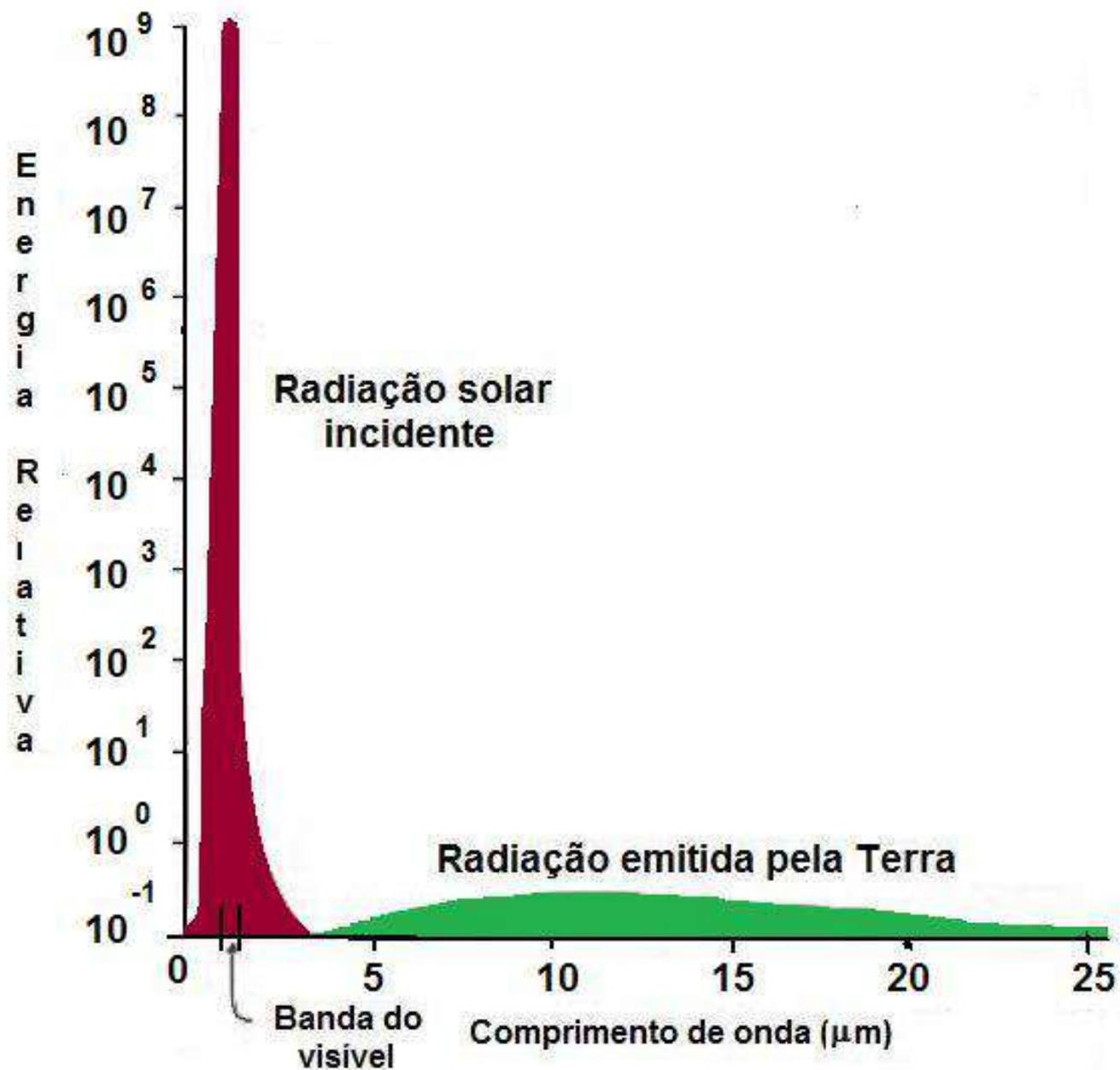
Todo corpo com temperatura acima de zero absoluto (0 K) emite energia eletromagnética

Sol

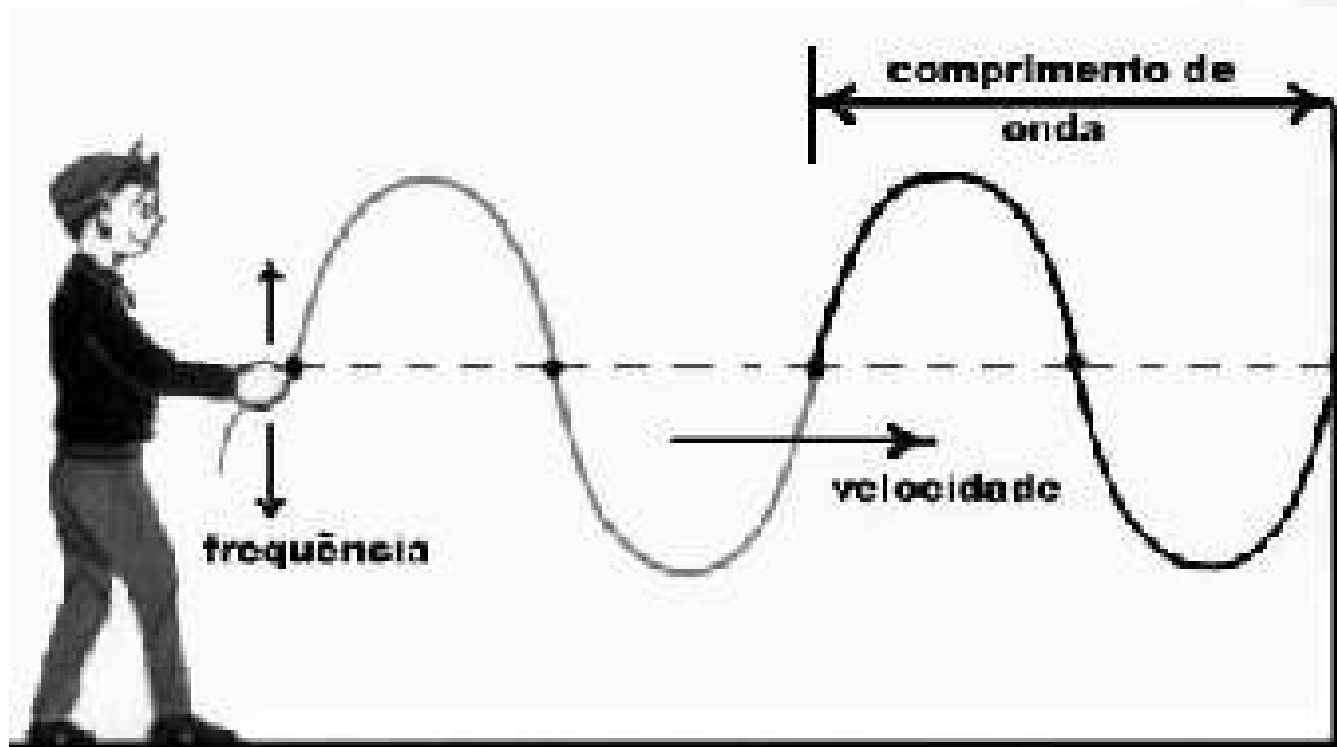


Terra



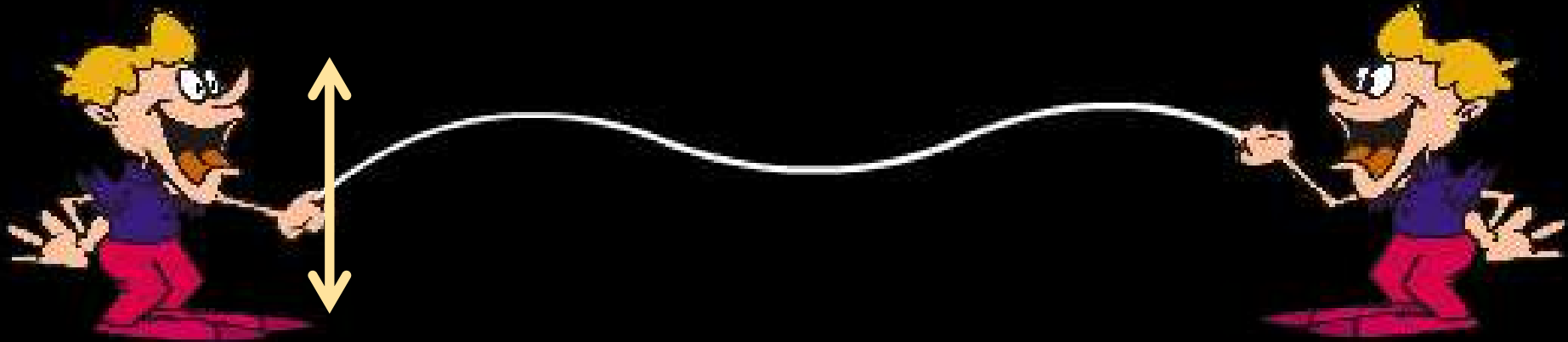


Características da onda

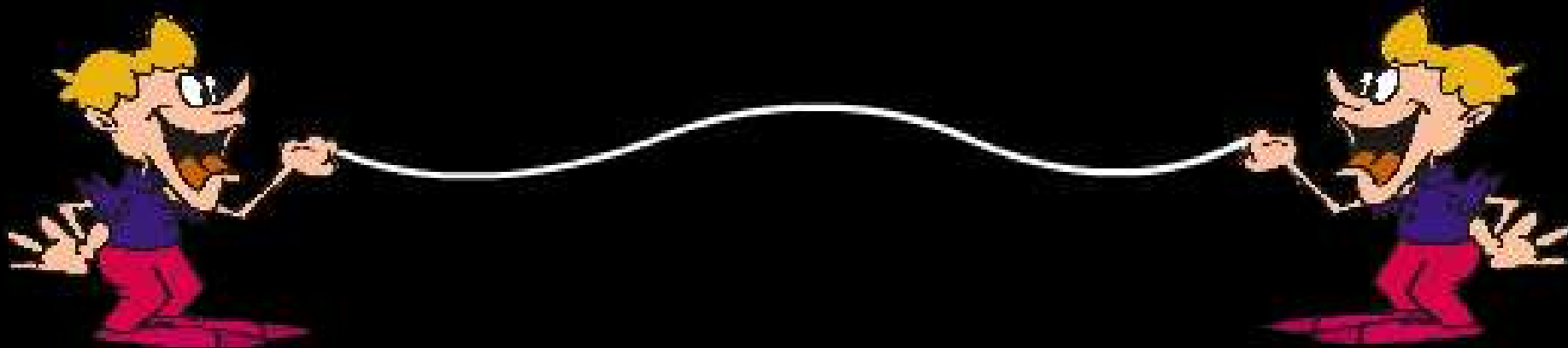


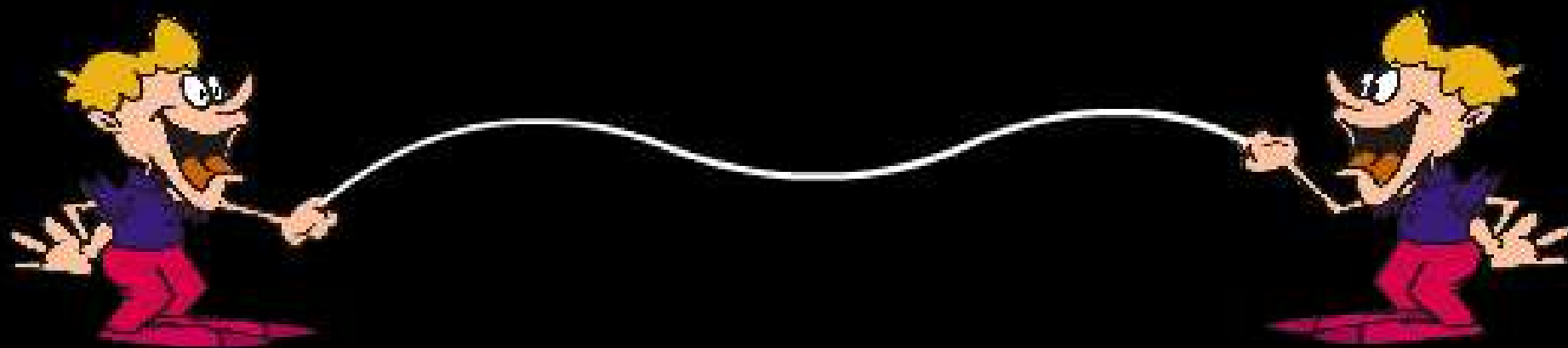
Observe o comprimento de onda

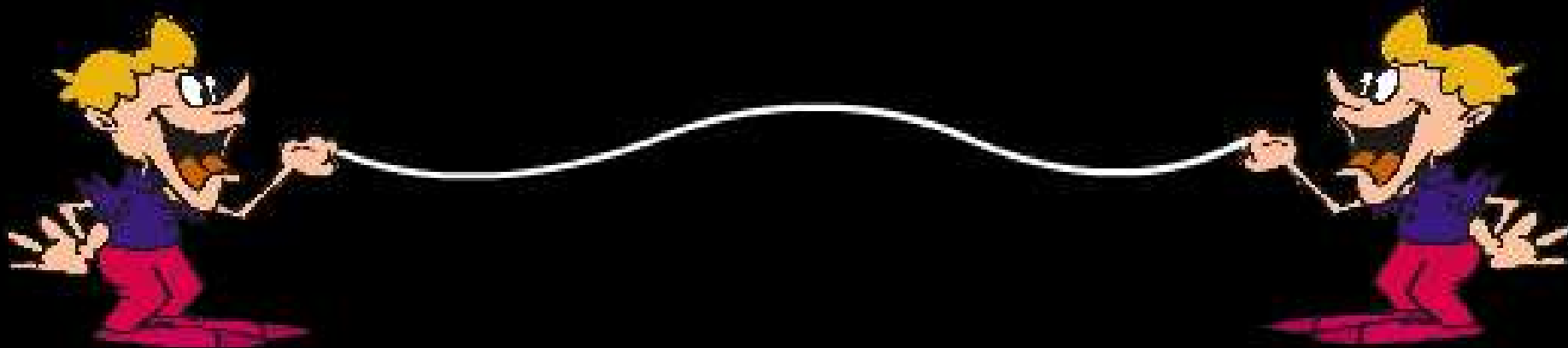
Movimento para
cima e para baixo

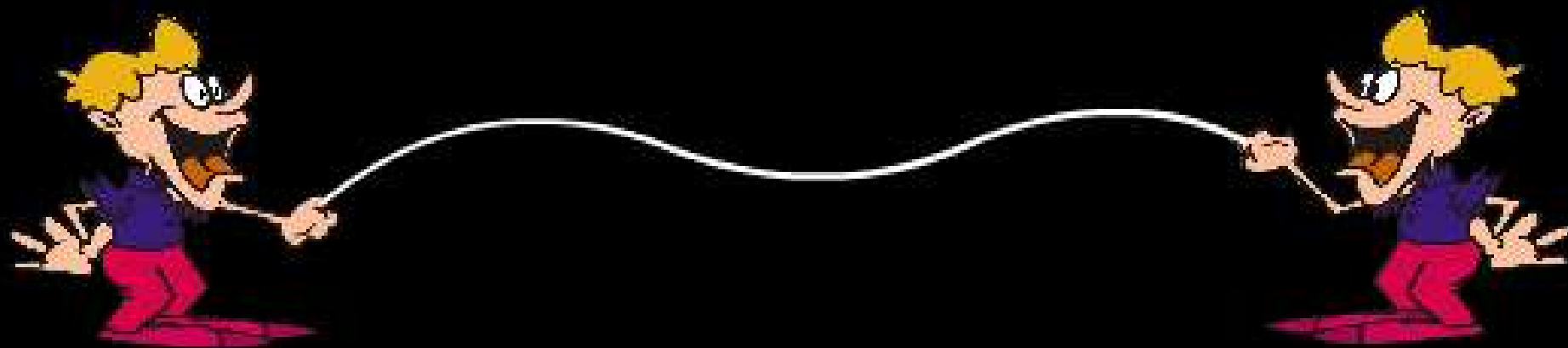


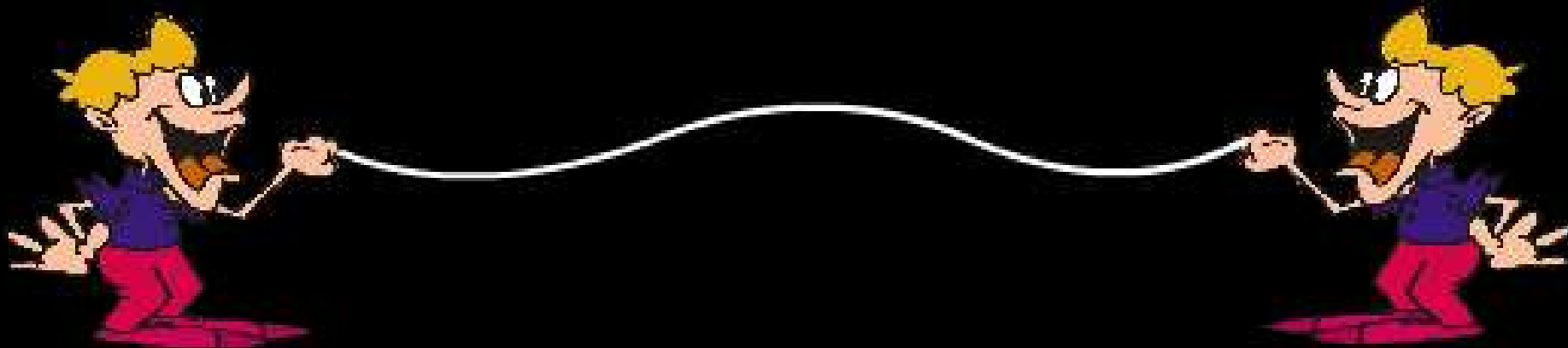
Movimento da onda

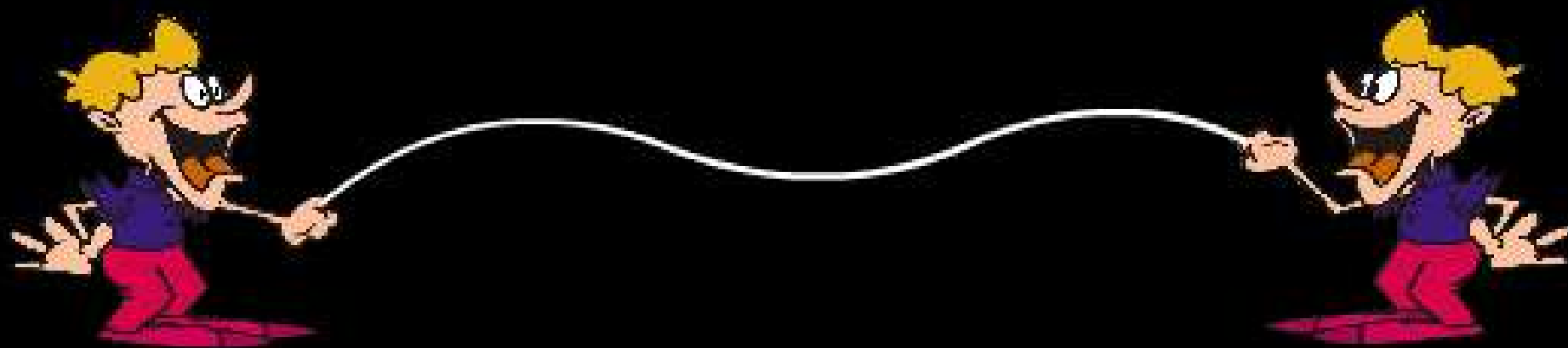


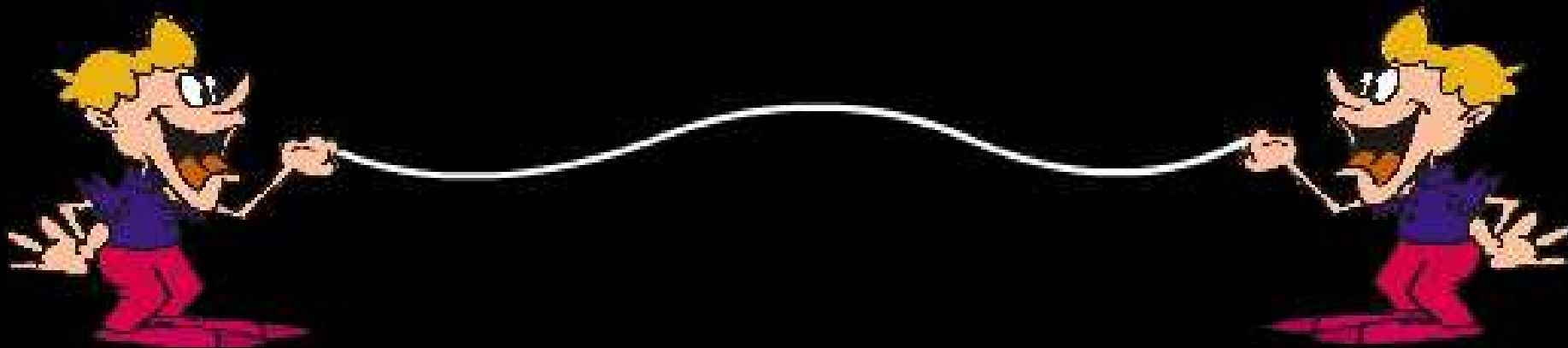






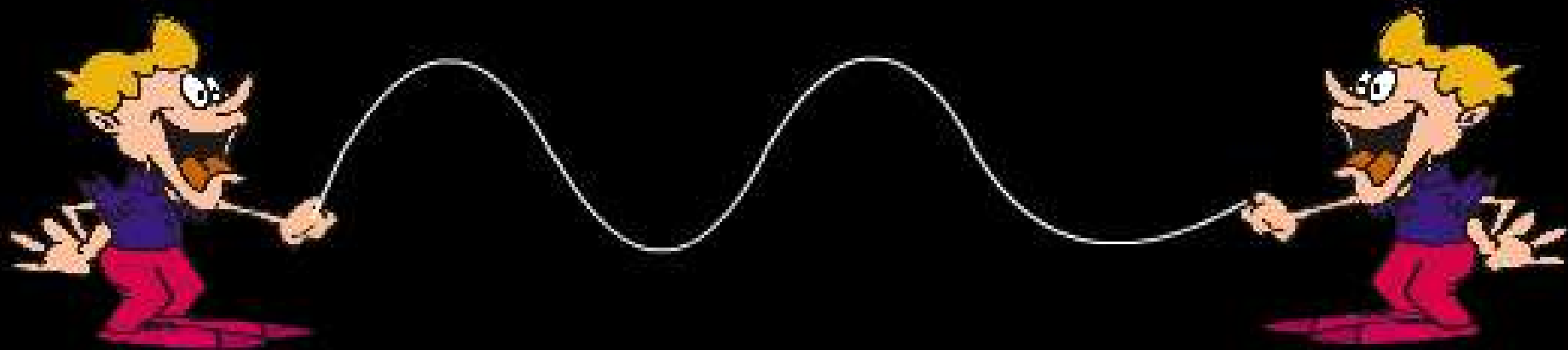


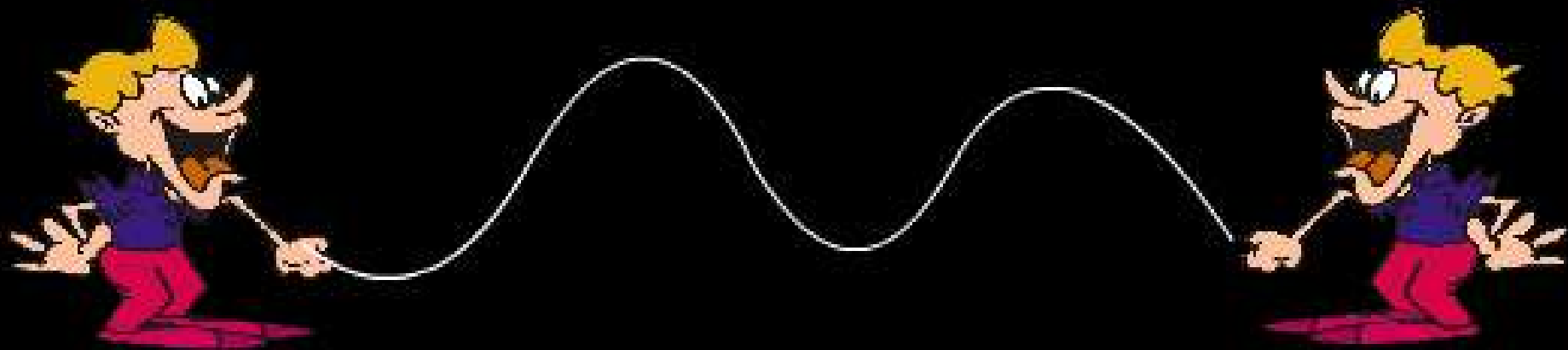


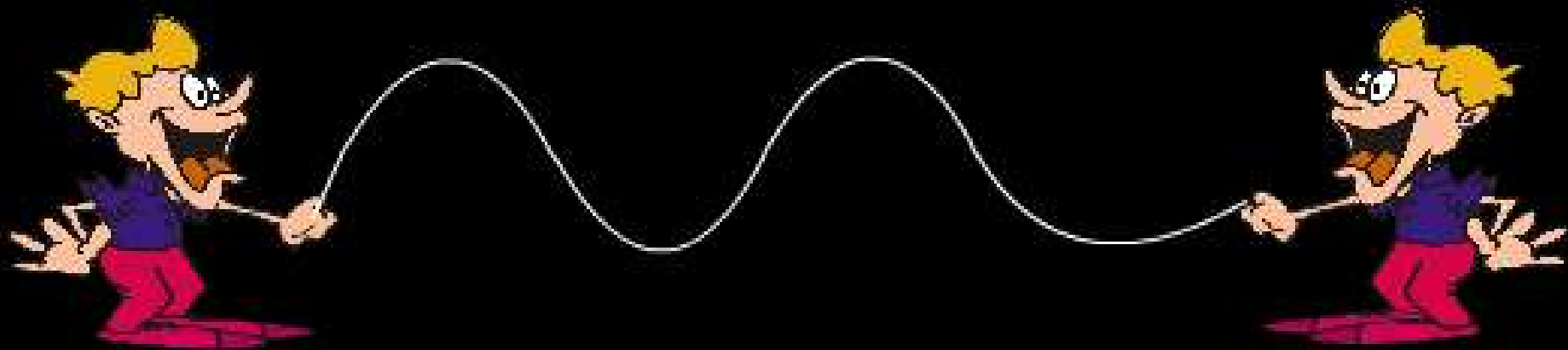


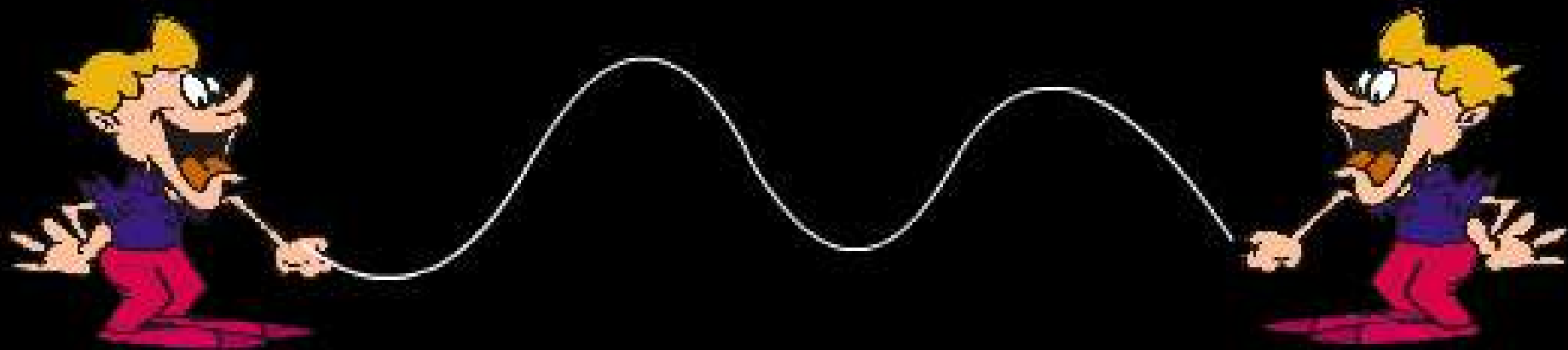
AUMENTANDO A ENERGIA NA CORDA

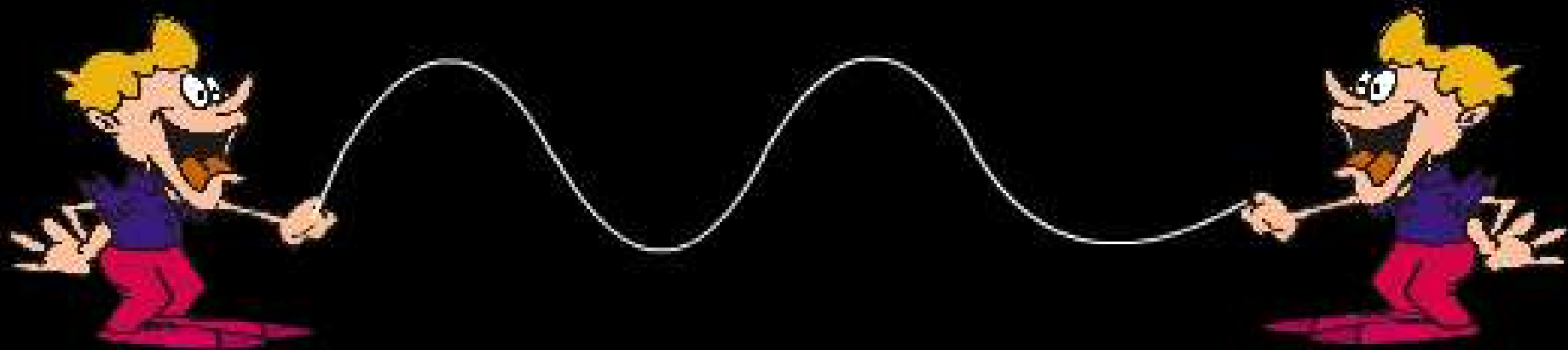
O QUE SE OBSERVA?

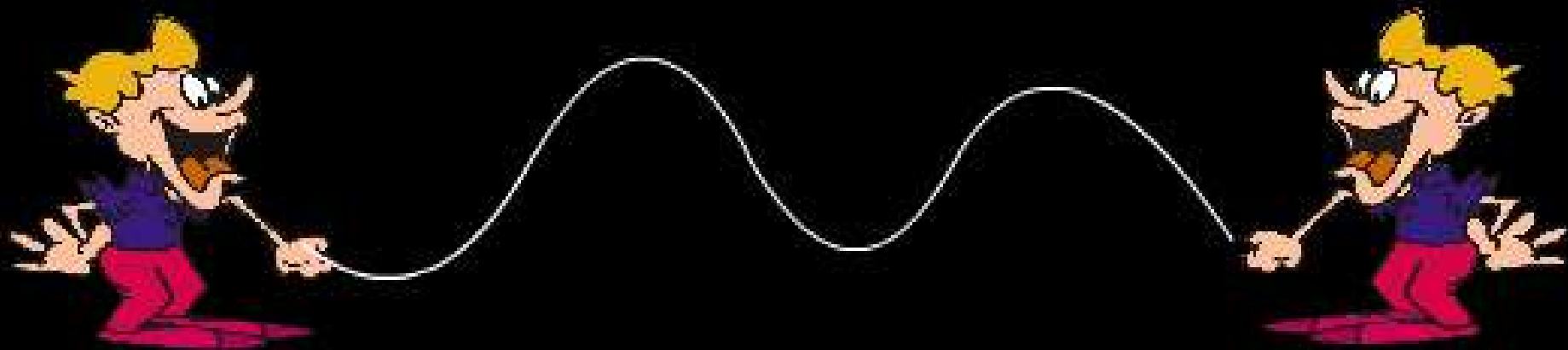


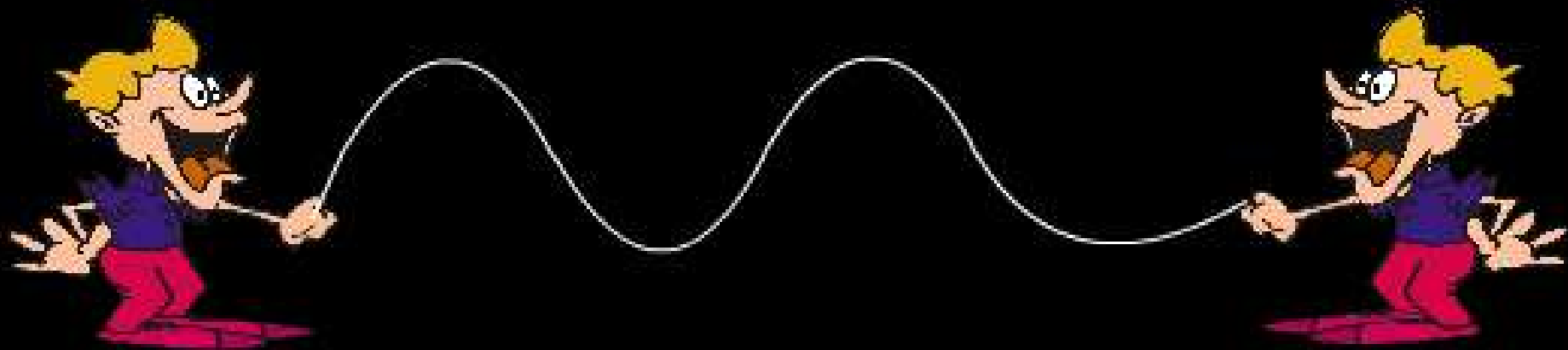


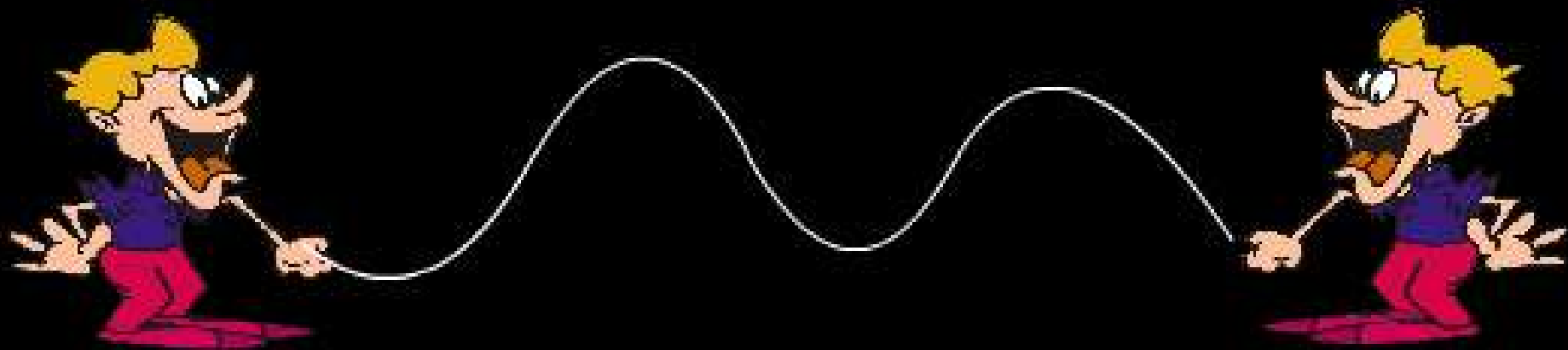


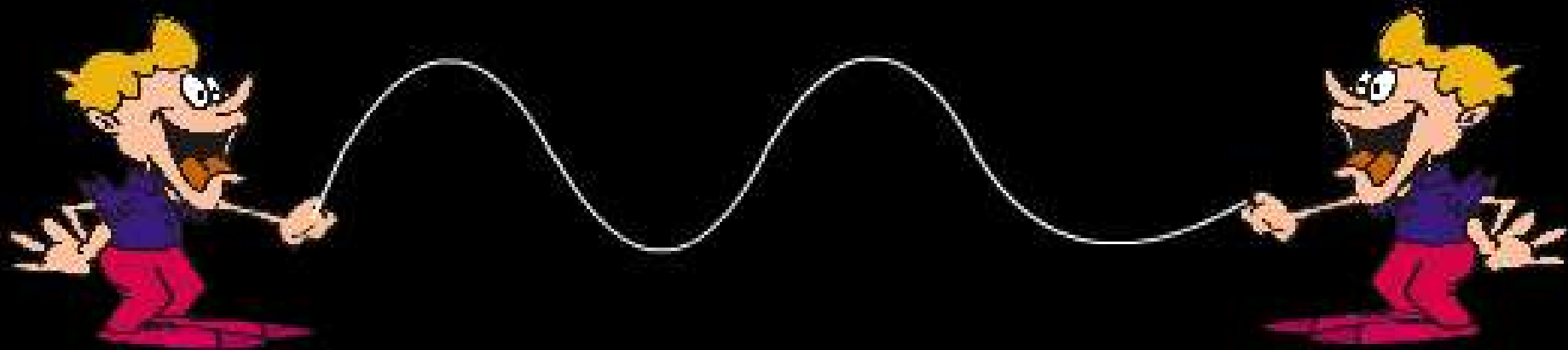


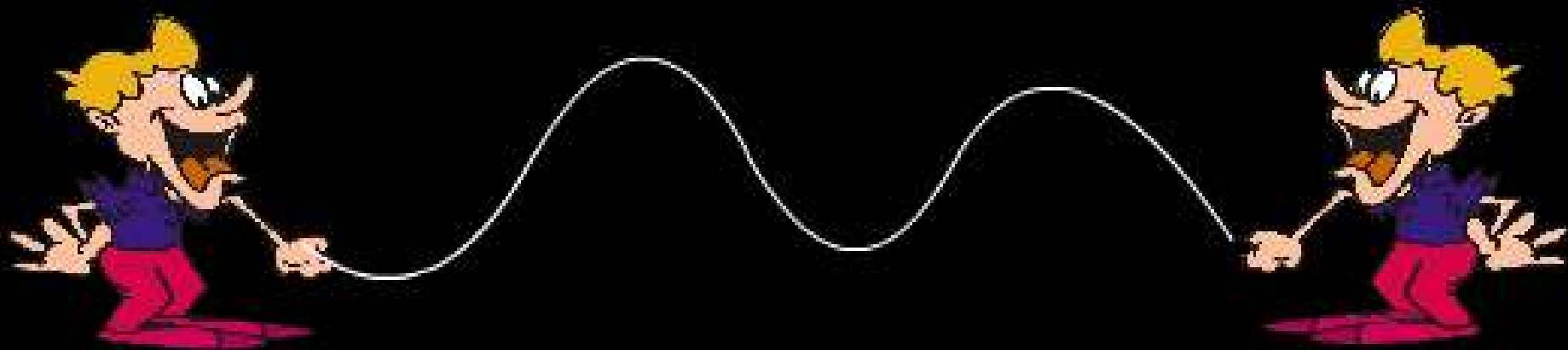


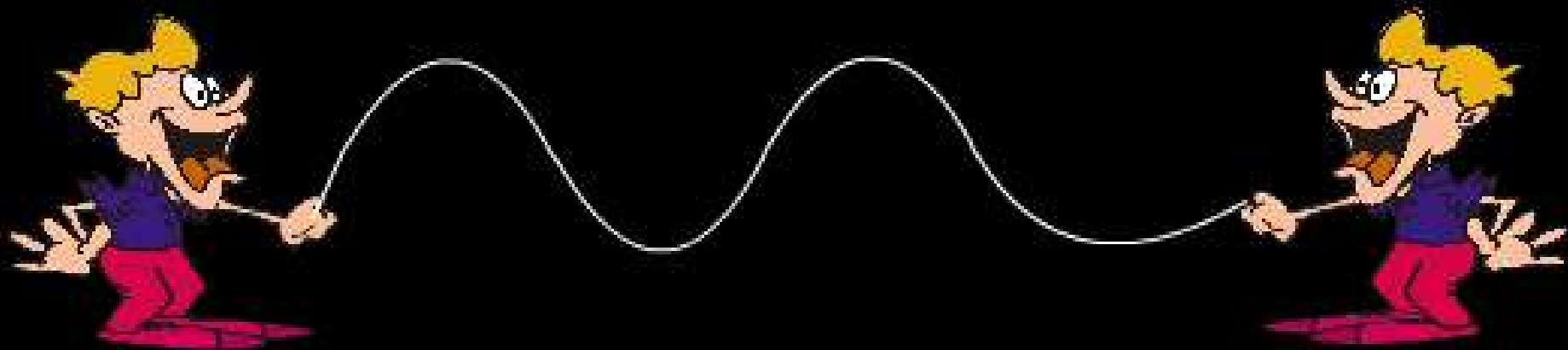


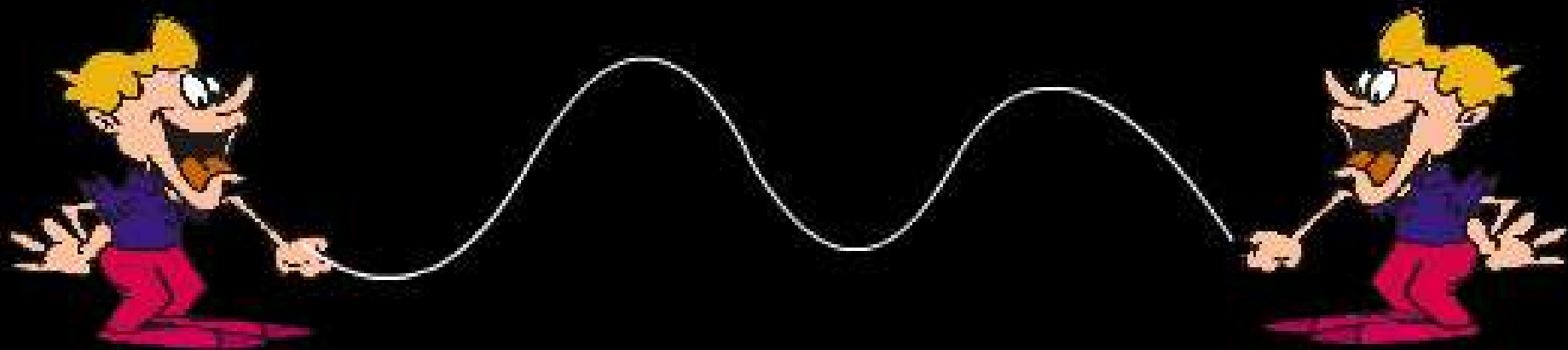












Qual a relação entre energia e frequência (f)?

$$E \propto f$$

Qual a relação entre energia e comprimento de onda (λ) ?

$$E \propto 1/\lambda$$

Qual a relação entre frequência e comprimento de onda (λ)?

$$f = c / \lambda$$

ou

$$c = f . \lambda$$

Energia da Onda Eletromagnética



$$E = \text{cte} \cdot f$$

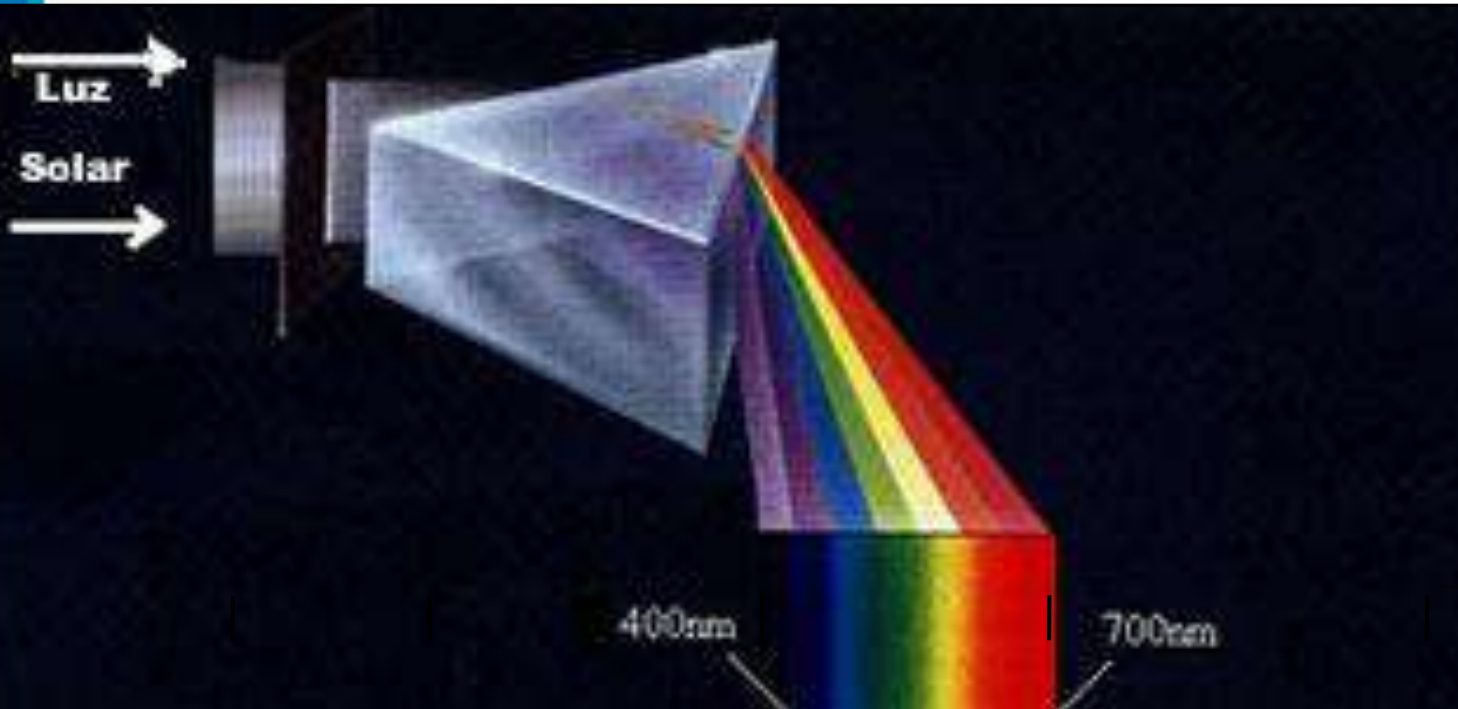
ou

$$E = \text{cte} \cdot c / \lambda$$

medida da capacidade da radiação de realizar
trabalho físico, de aquecer um objeto ou
causar mudança de estado da matéria

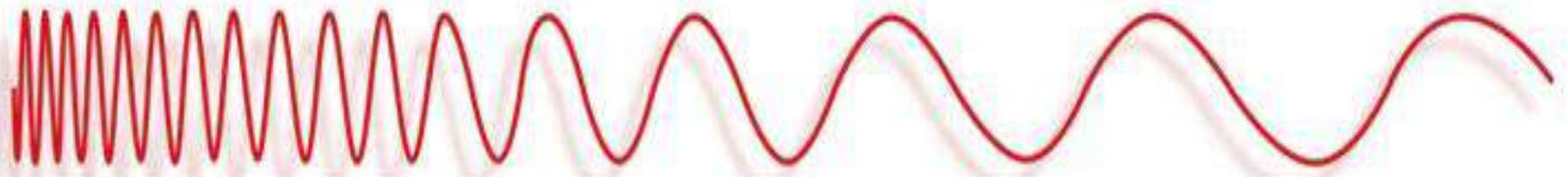
Espectro Eletromagnético

Ordenação contínua da energia eletromagnética em função do comprimento de onda ou da frequência



Espectro Eletromagnético

Raios Gama Raios X Ultra-Violeta Visível Infravermelho Microondas Rádio



Espectro Eletromagnético

Regiões espectrais de interesse do Sensoriamento Remoto: Ótico e Microondas

