

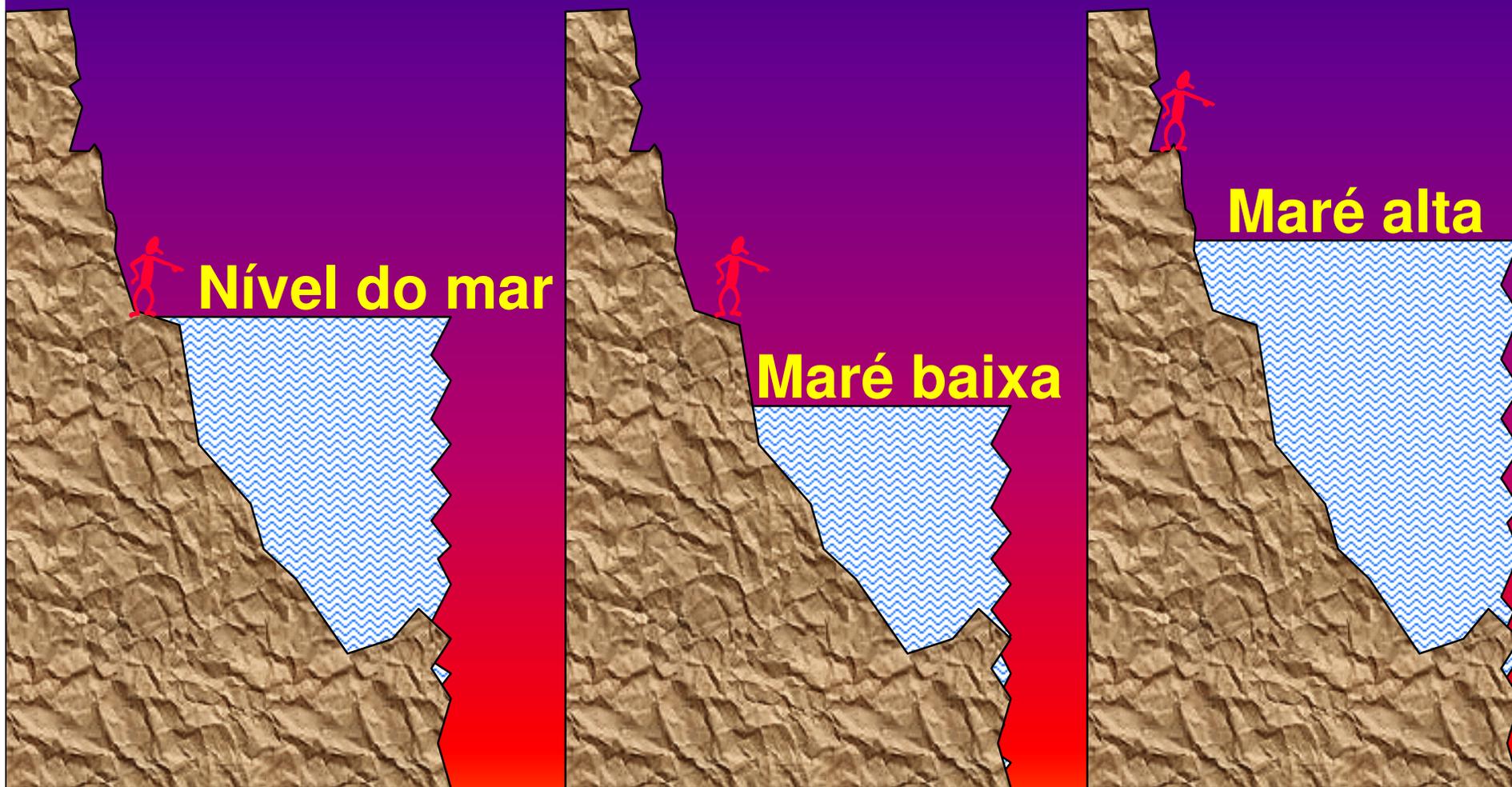
# Fenômeno das Marés

11  
01  
04

**R. Boczko**  
IAG-USP

# Observando a maré

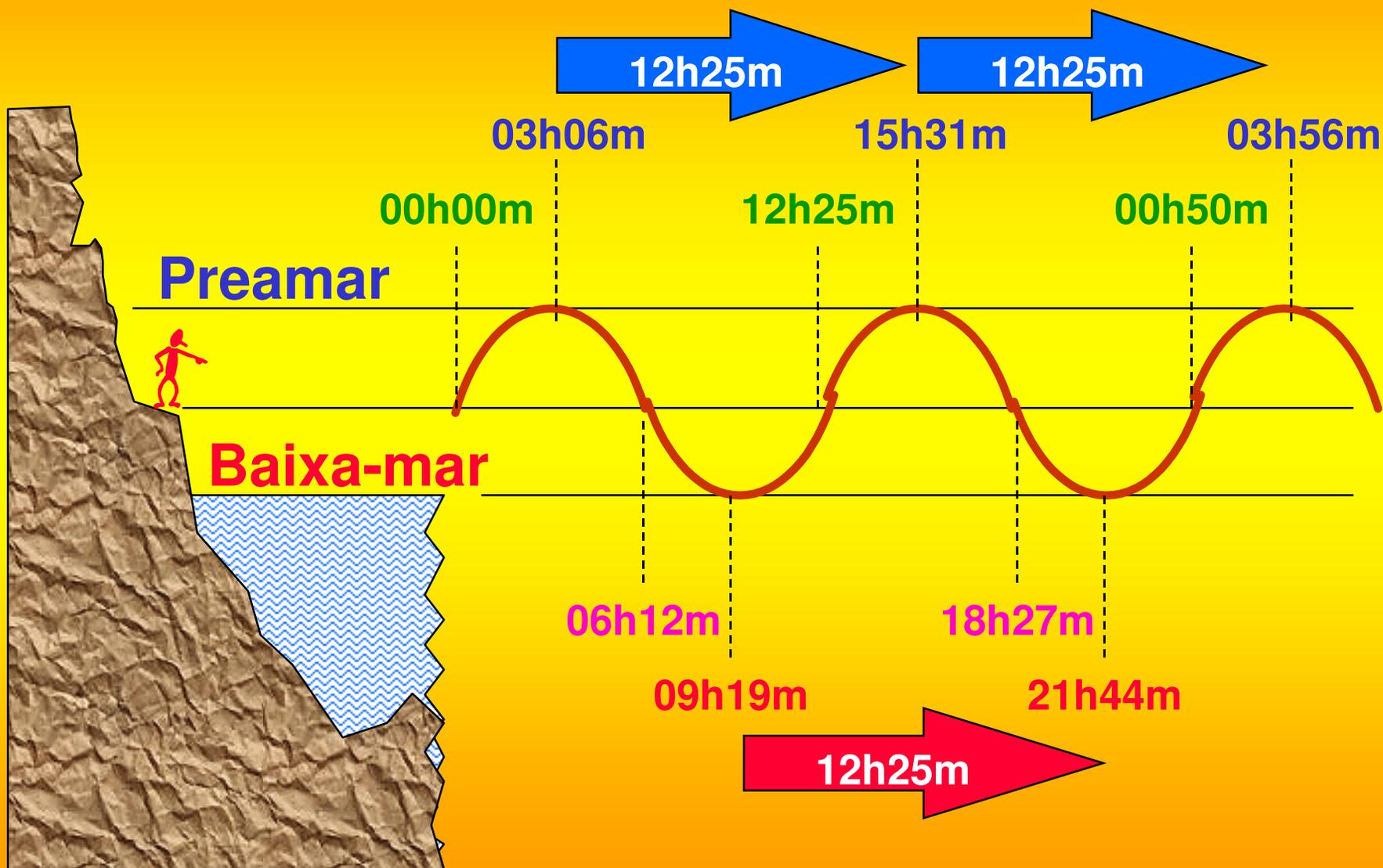
# Observando o nível do mar



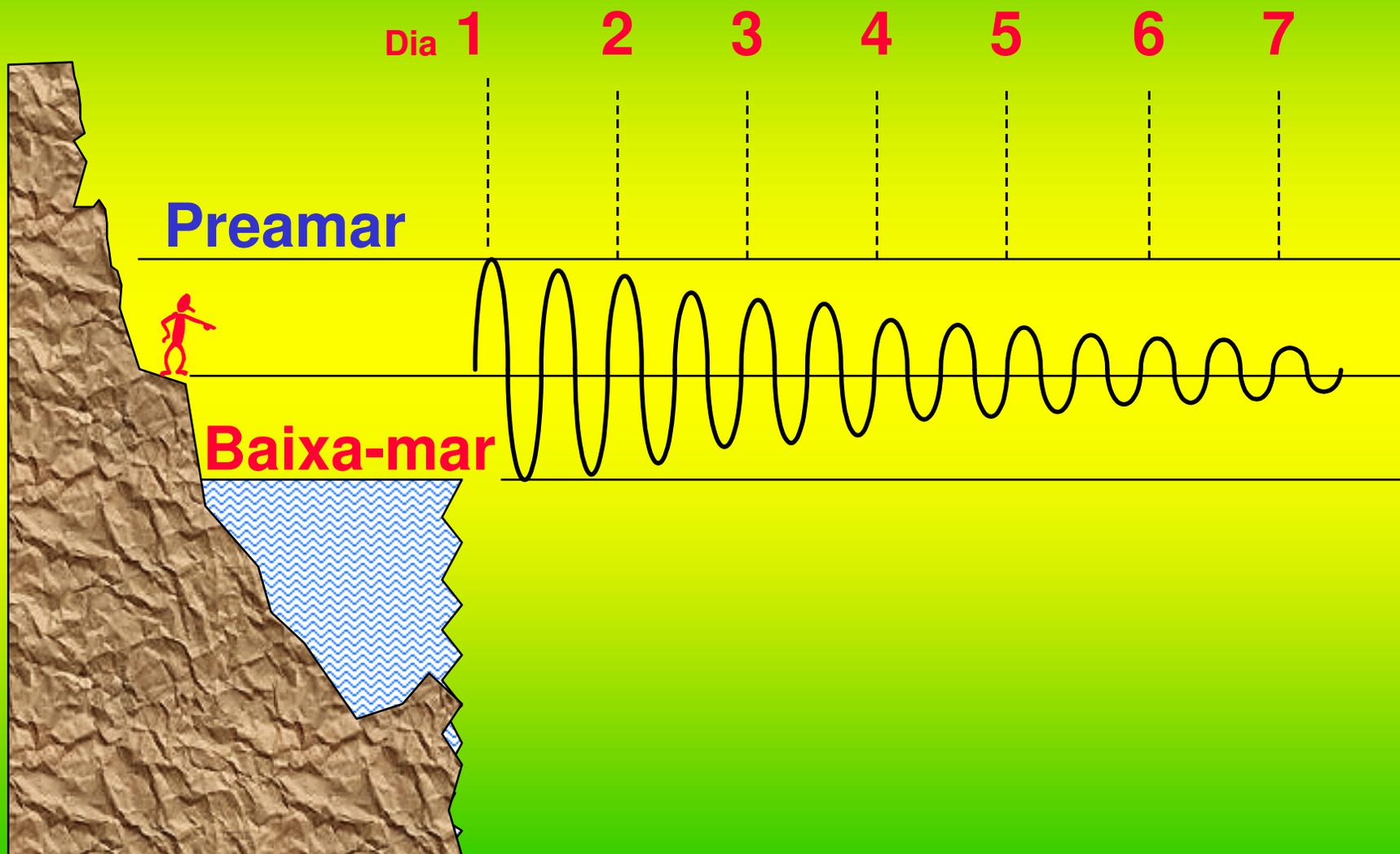
# Desnível entre as marés alta e baixa



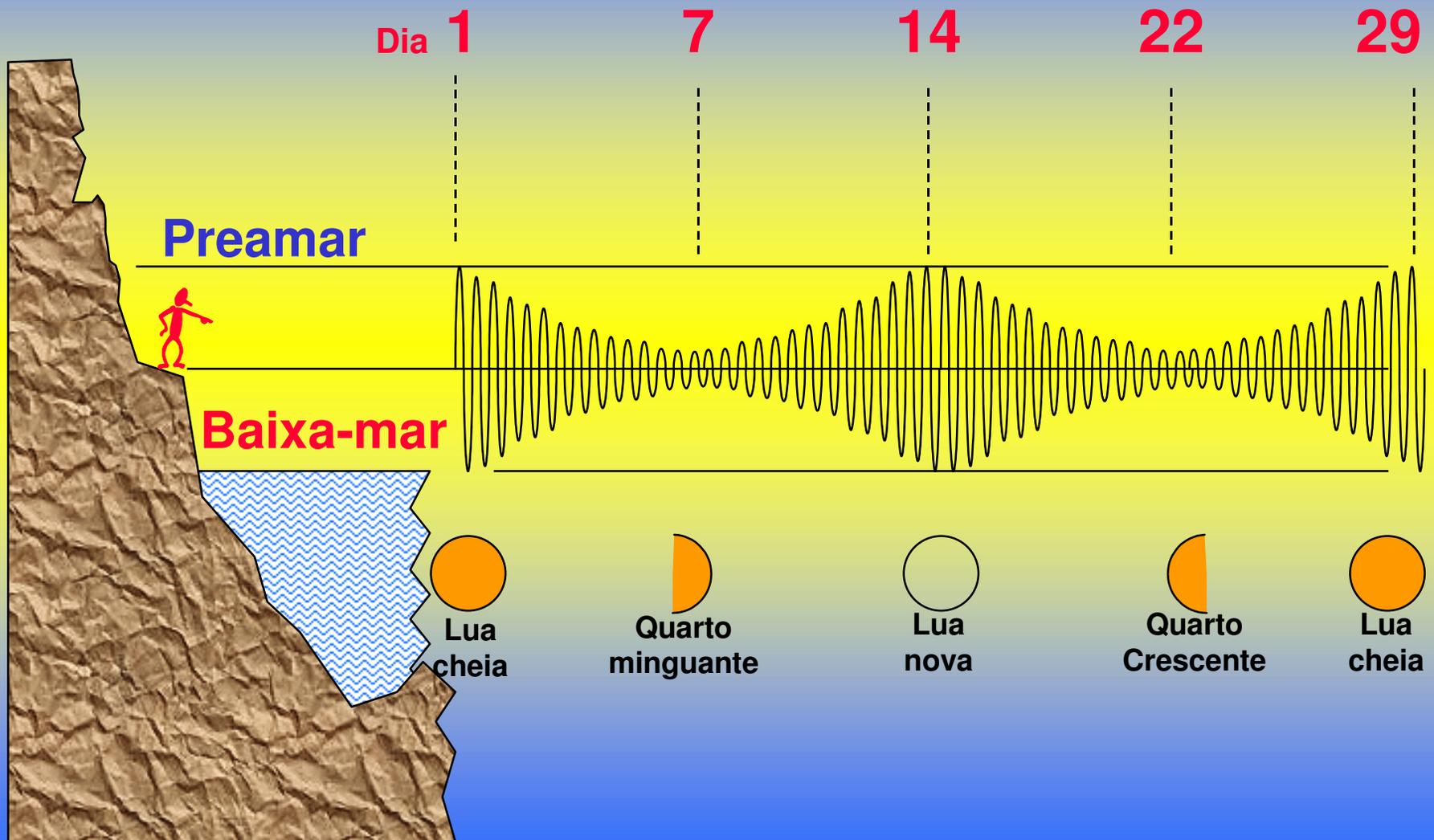
# Intervalo de tempo entre marés



# Mudança diária no nível da maré



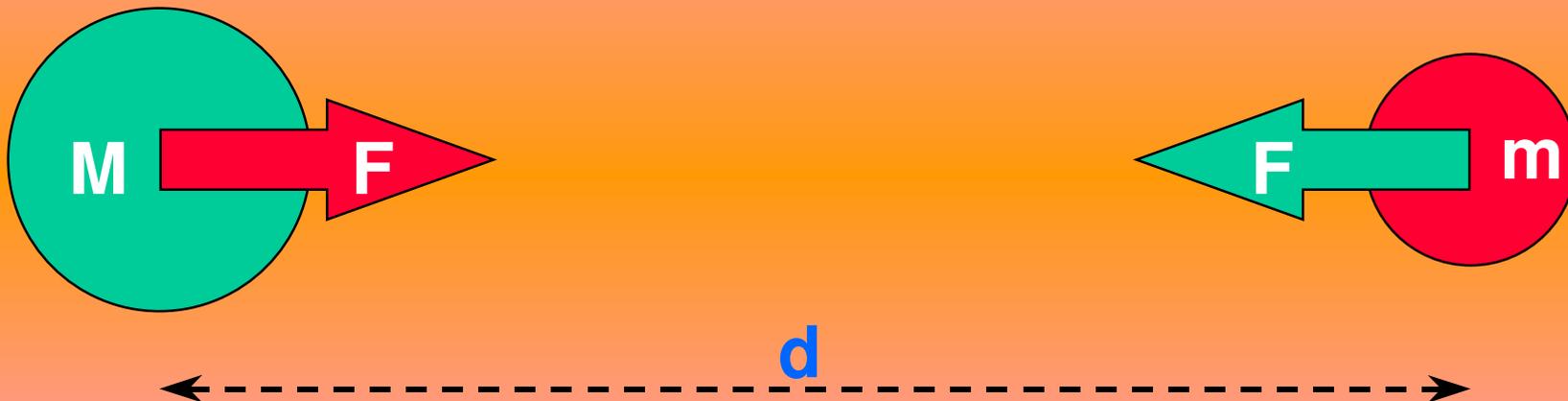
# Influência da fase da Lua sobre a altura da maré



**Causa da maré**

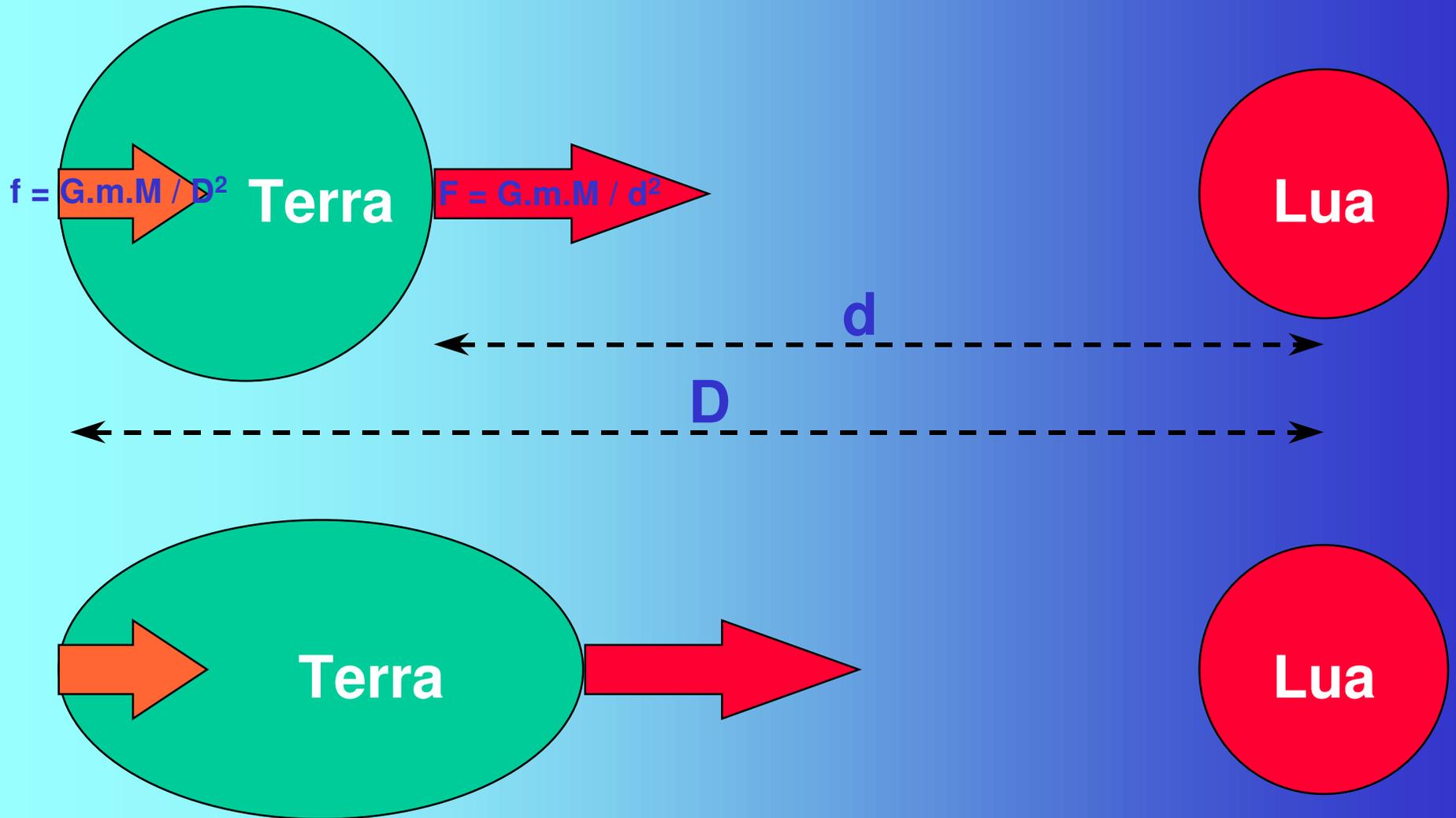
# Atração Gravitacional

( Newton )

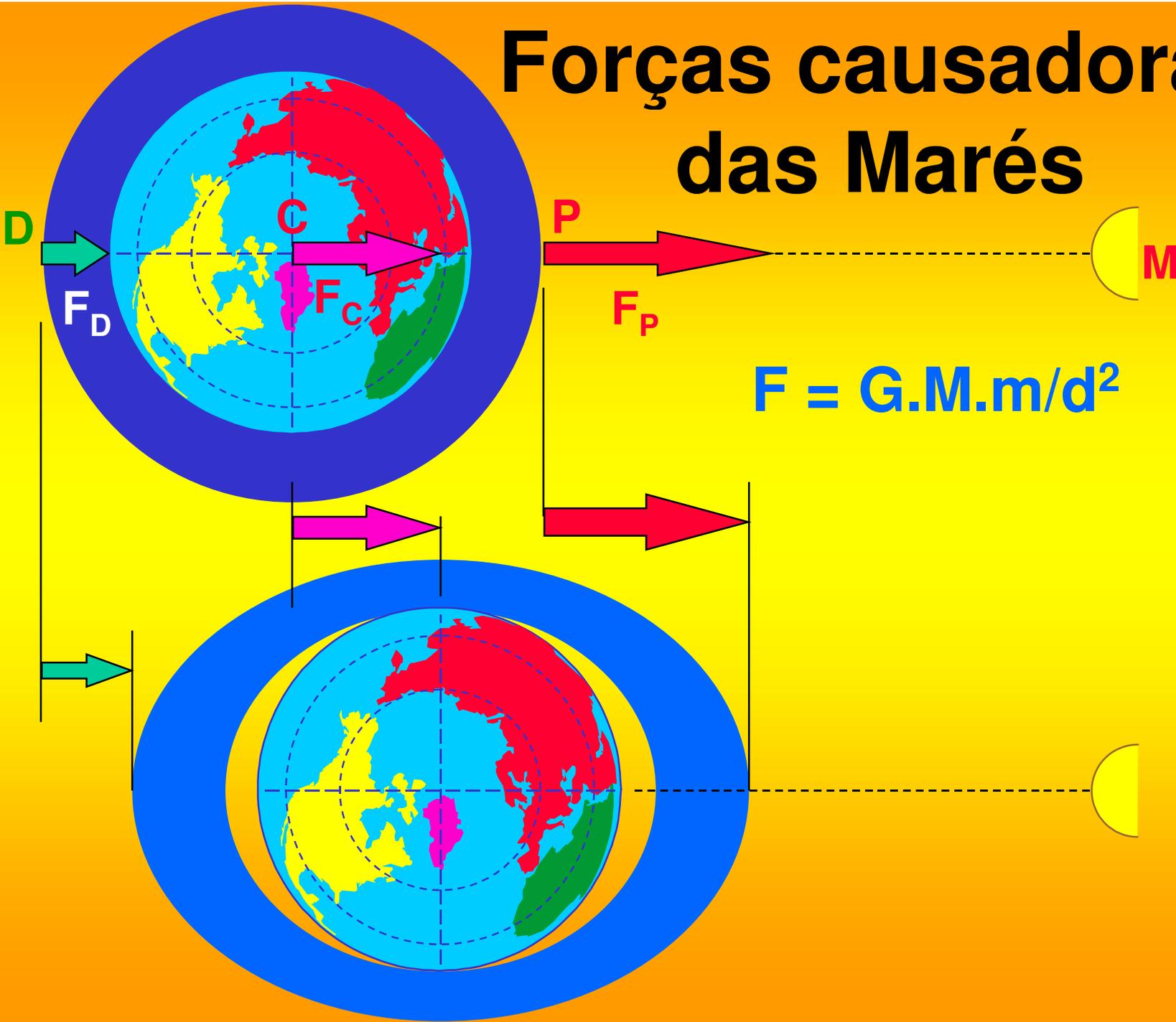


$$F = G.m.M / d^2$$

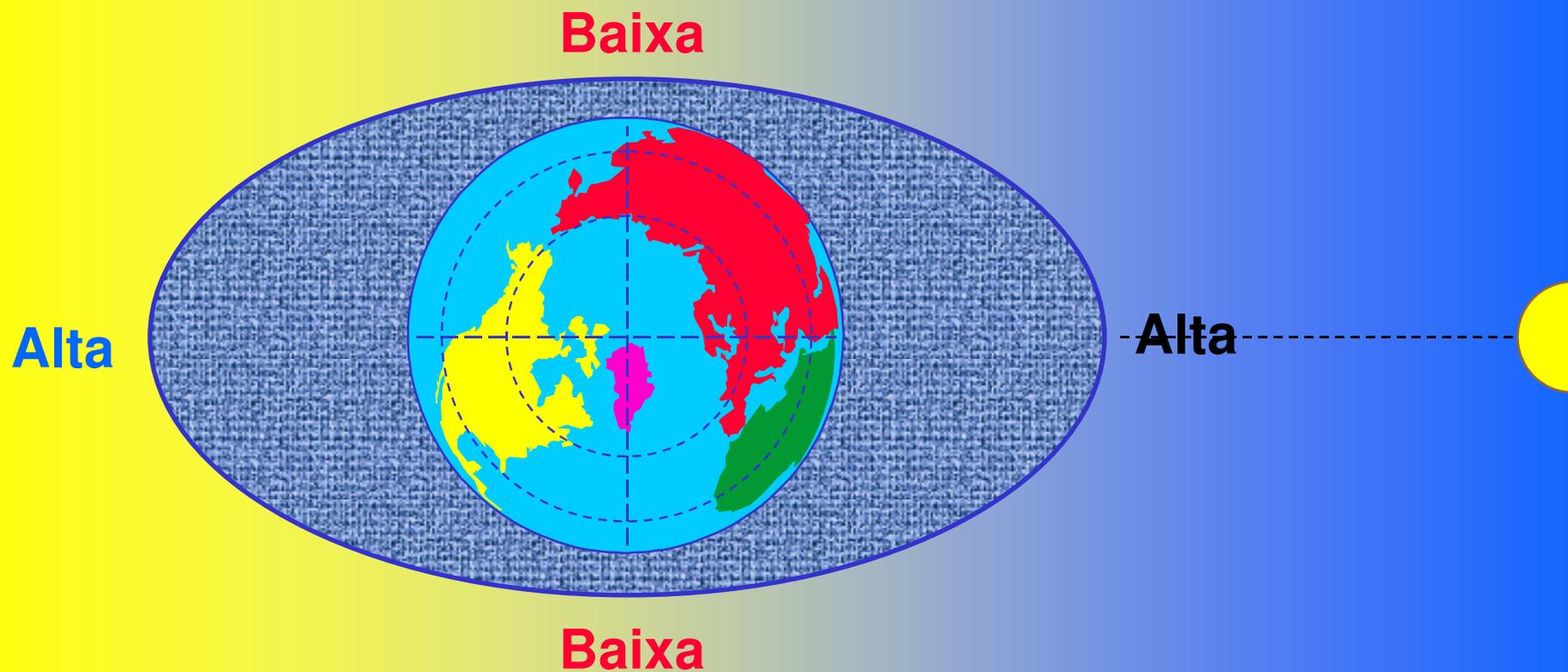
# Atração Gravitacional da Lua sobre a Terra elástica



# Forças causadoras das Marés



# Configuração instantânea das marés na superfície da Terra

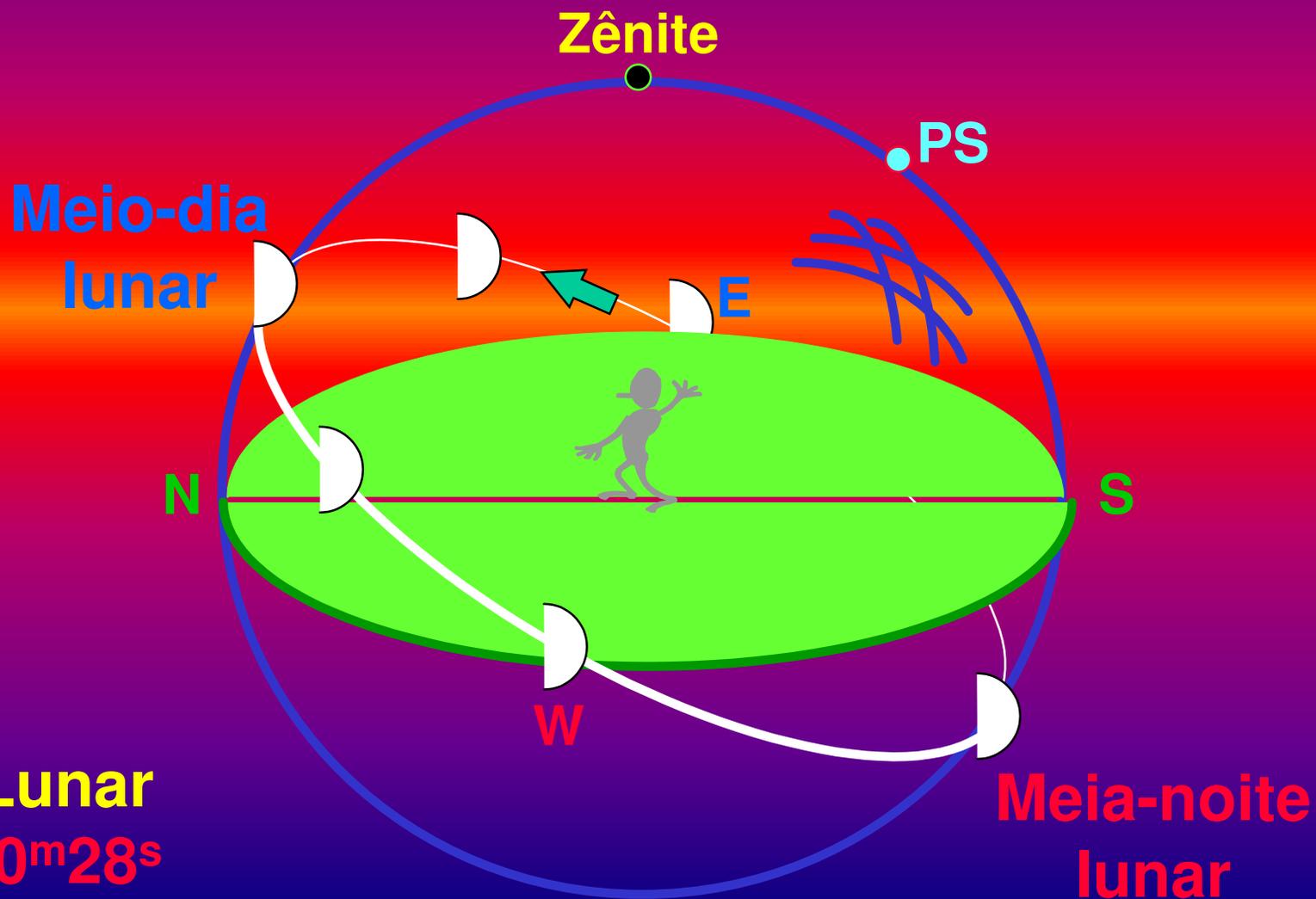


# Seqüência da Maré



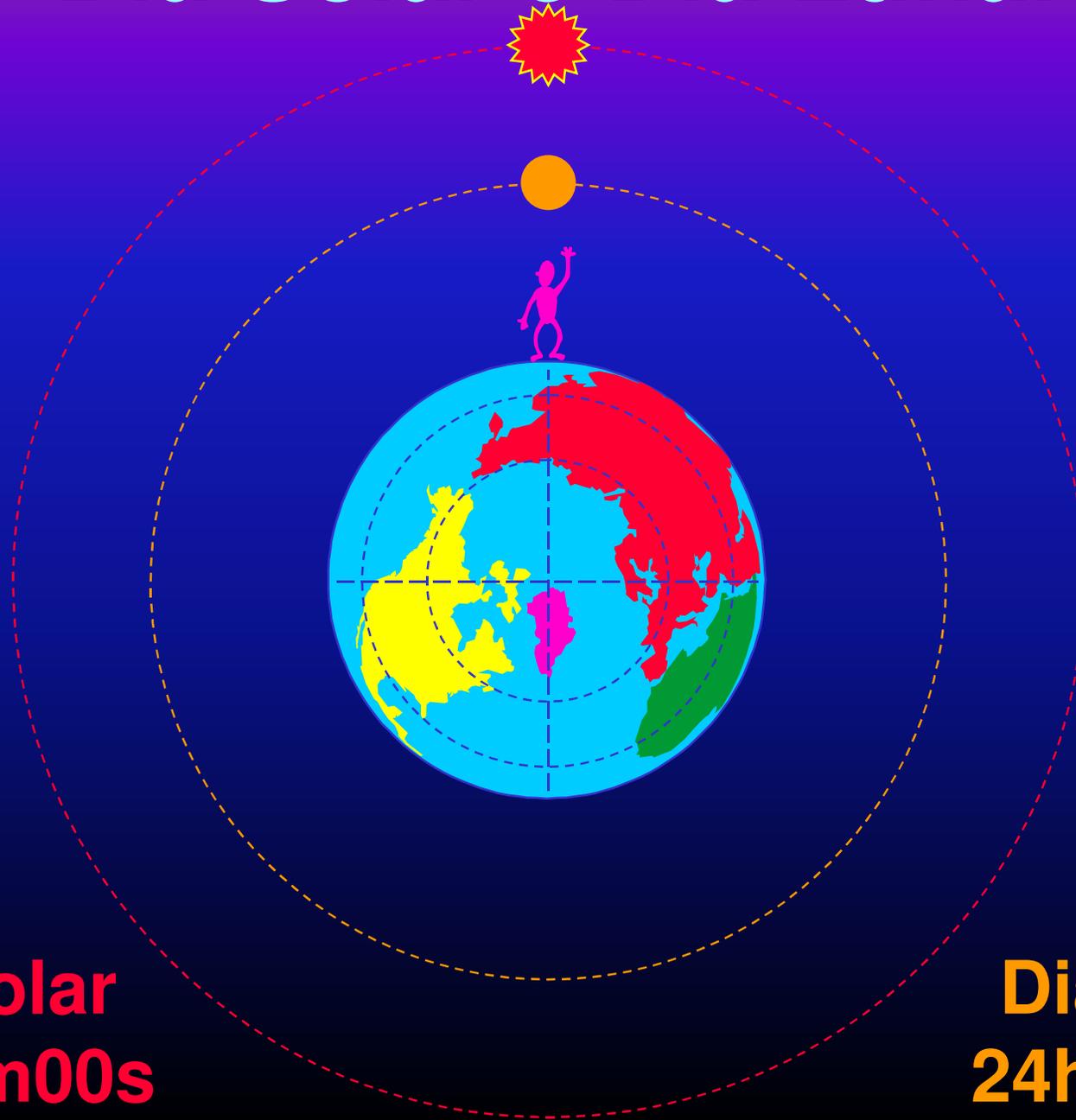
# **Períodos envolvidos com a maré**

# Movimento diurno aparente da Lua



**Dia Lunar**  
24<sup>h</sup>50<sup>m</sup>28<sup>s</sup>

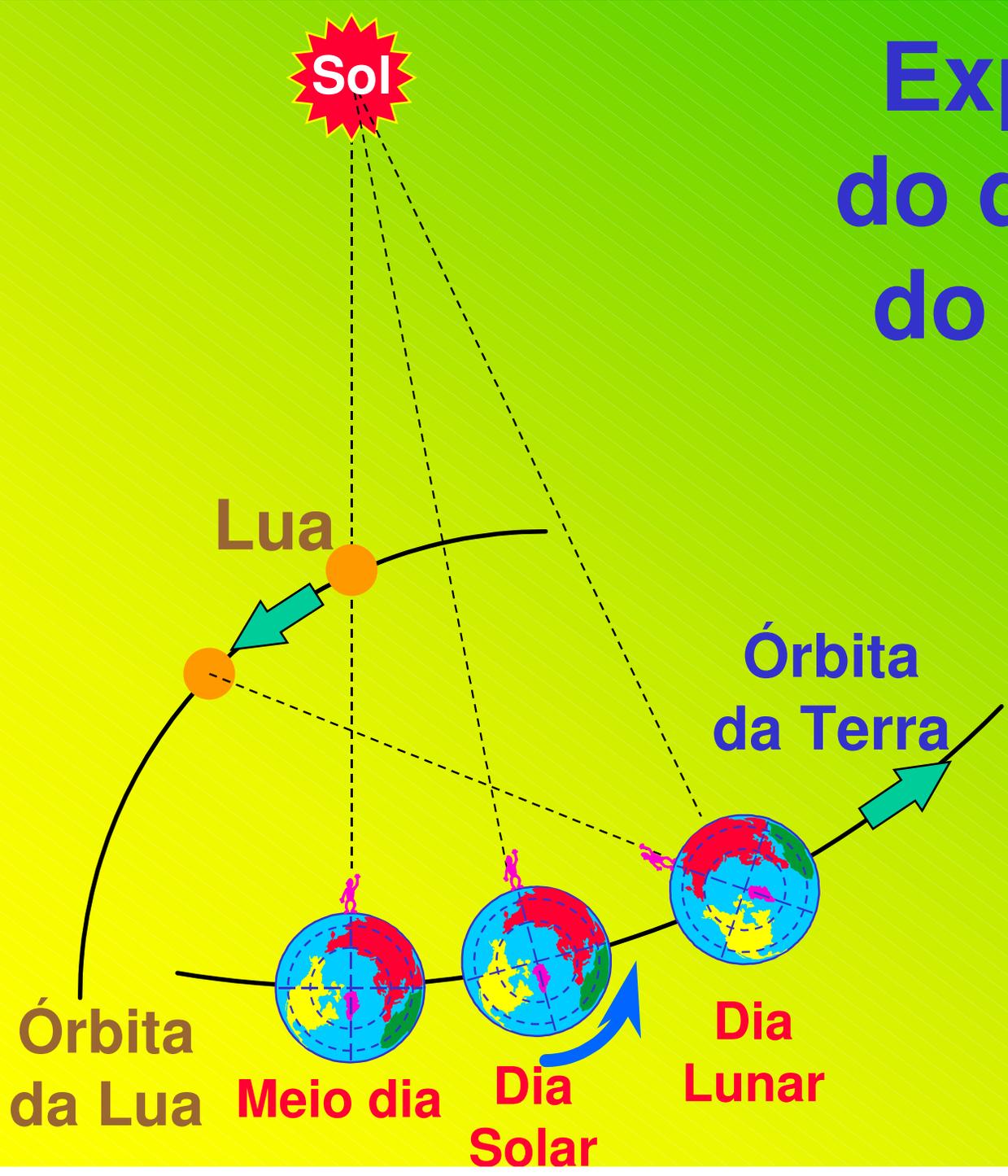
# Dia Solar e Dia Lunar



**Dia Solar**  
**24h00m00s**

**Dia Lunar**  
**24h50m28s**

# Explicação do dia solar e do dia lunar

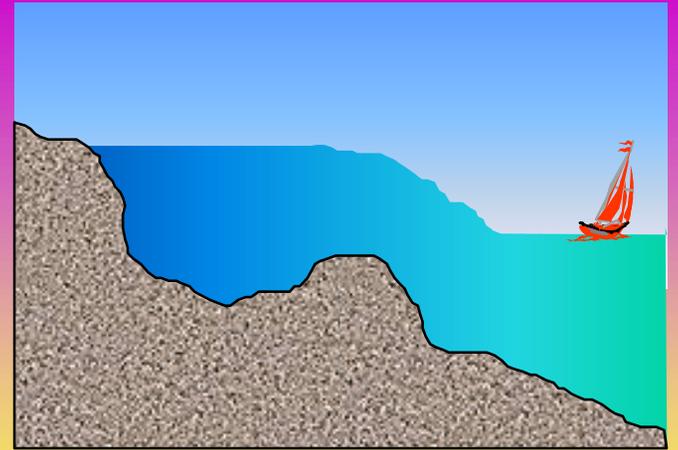
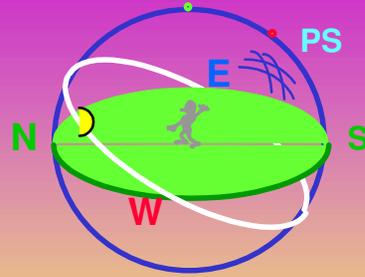
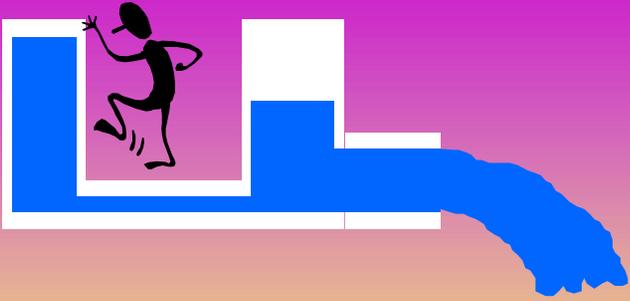


**Dia Solar**  
24h00m00s

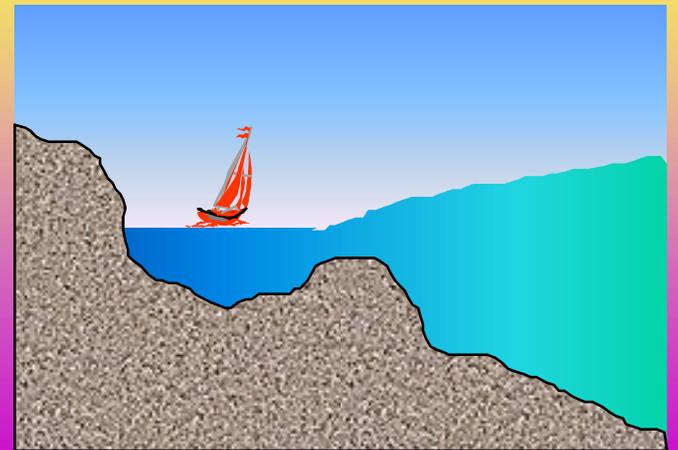
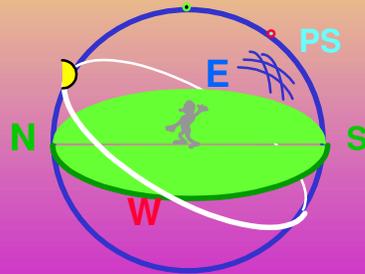
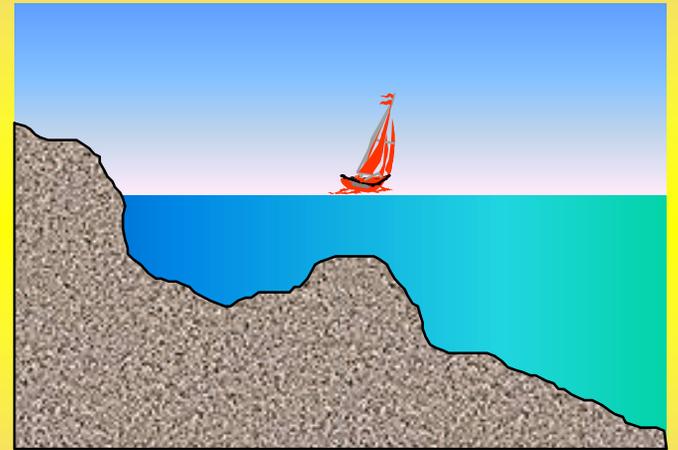
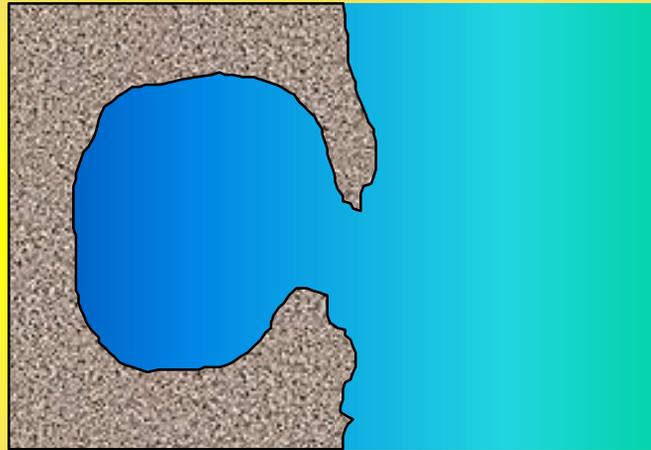
**Dia Lunar**  
24h50m28s

# Defasagem das marés



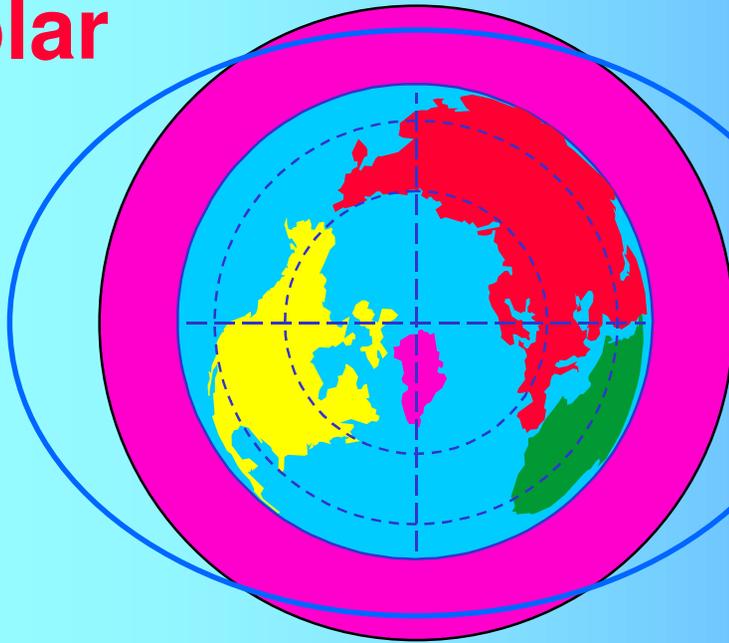


# Marés em bacias



# Componentes da maré

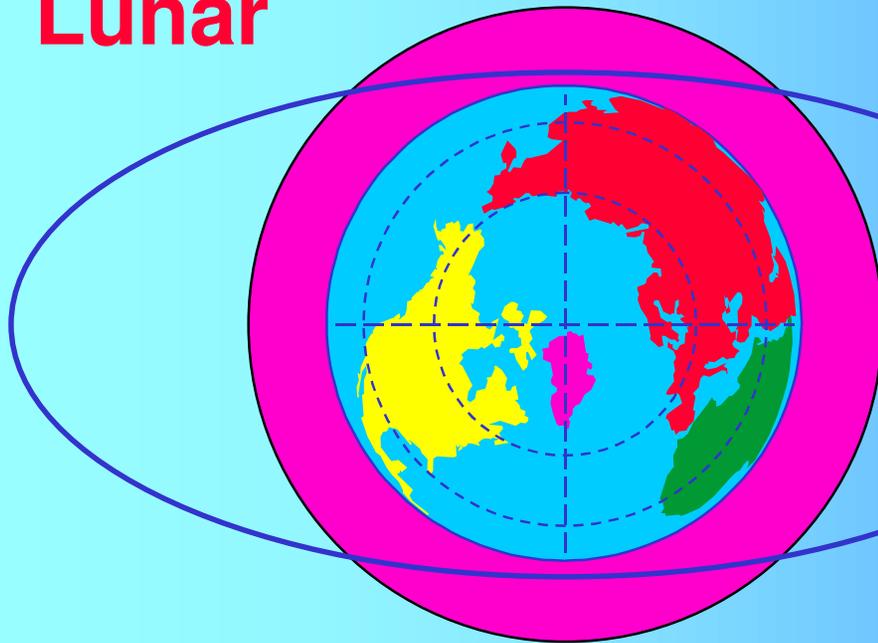
**Solar**



# Contribuição da maré solar e da maré lunar



**Lunar**

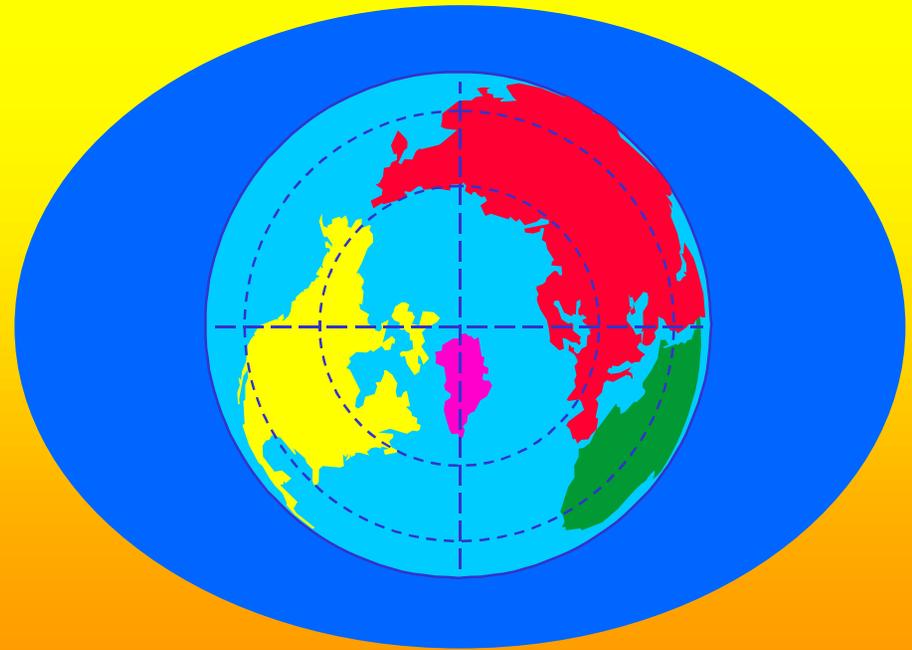
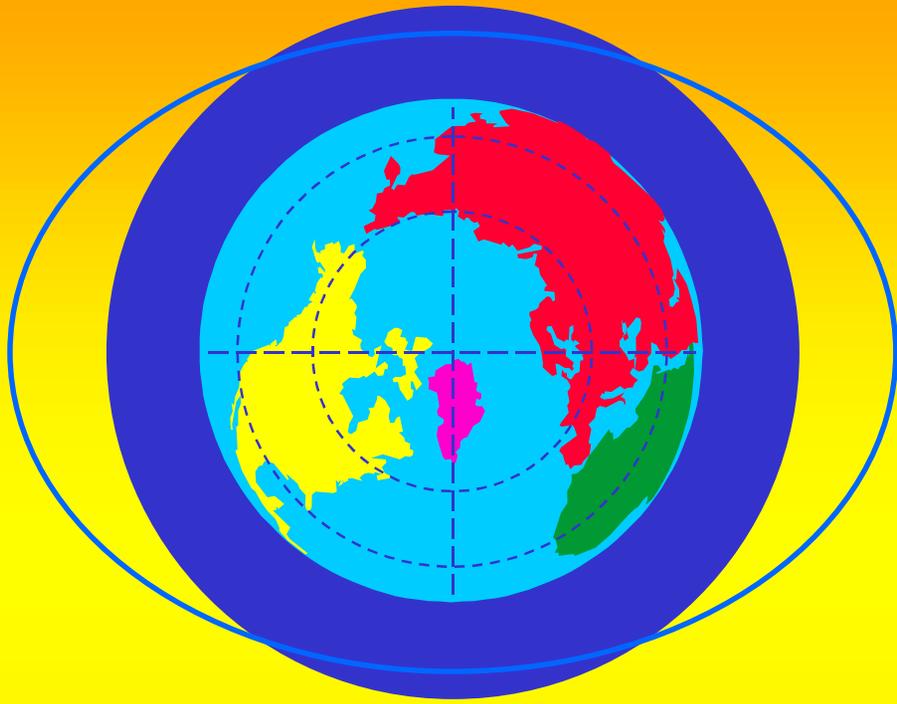


1

2,5

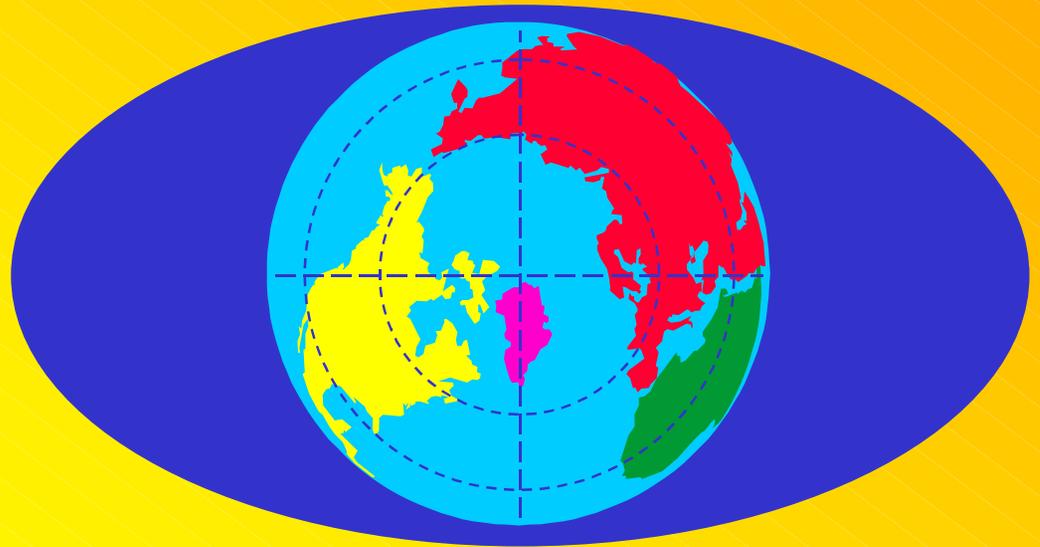
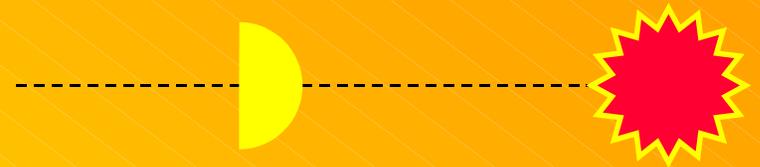
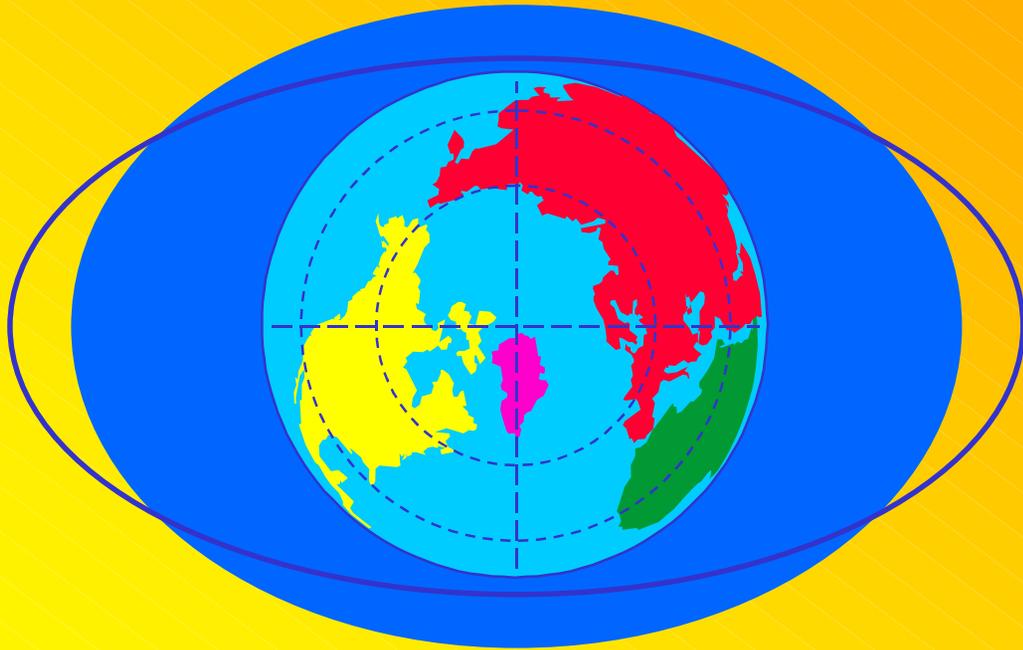


# Maré Solar

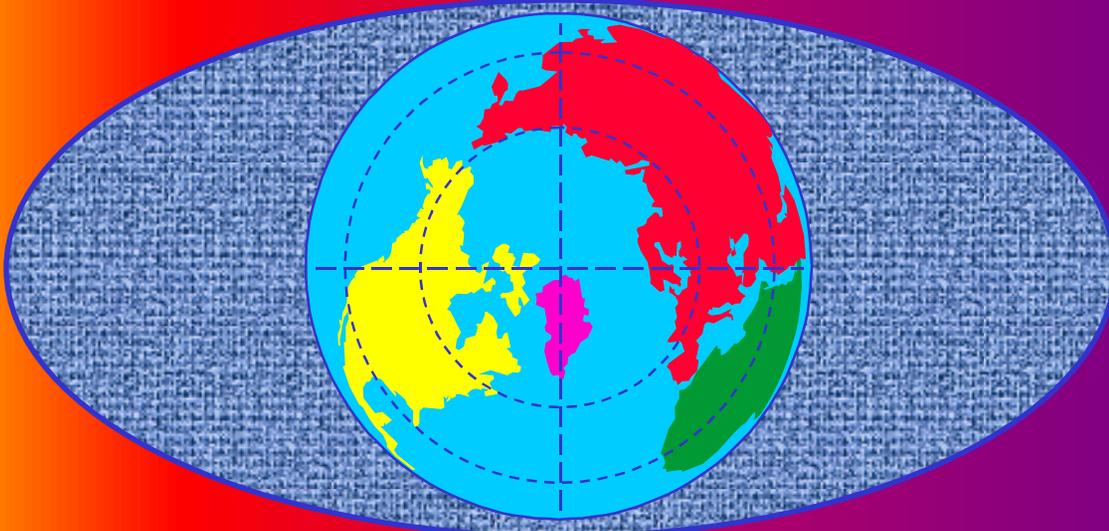
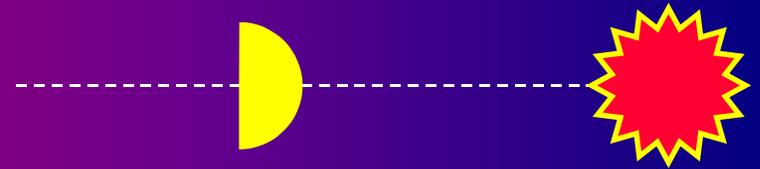
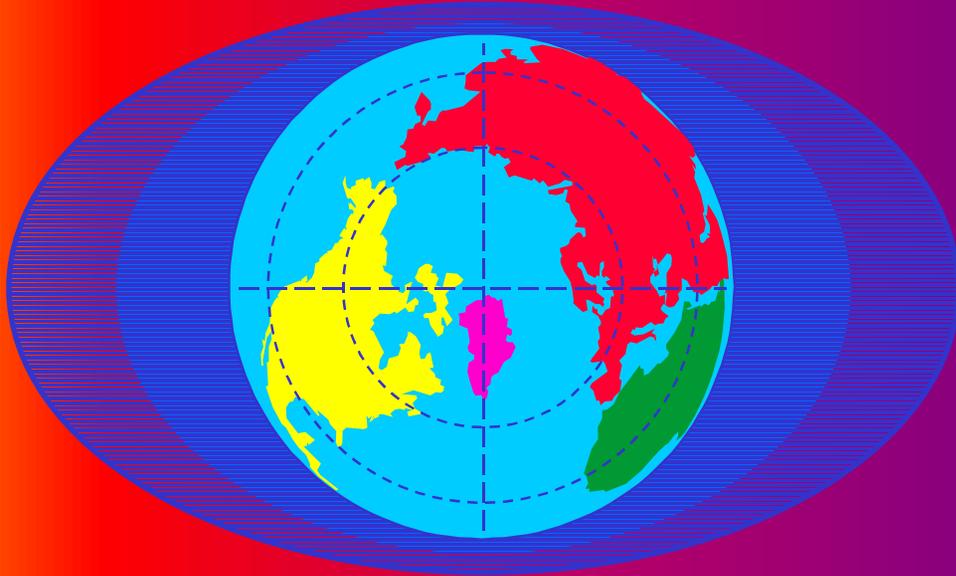


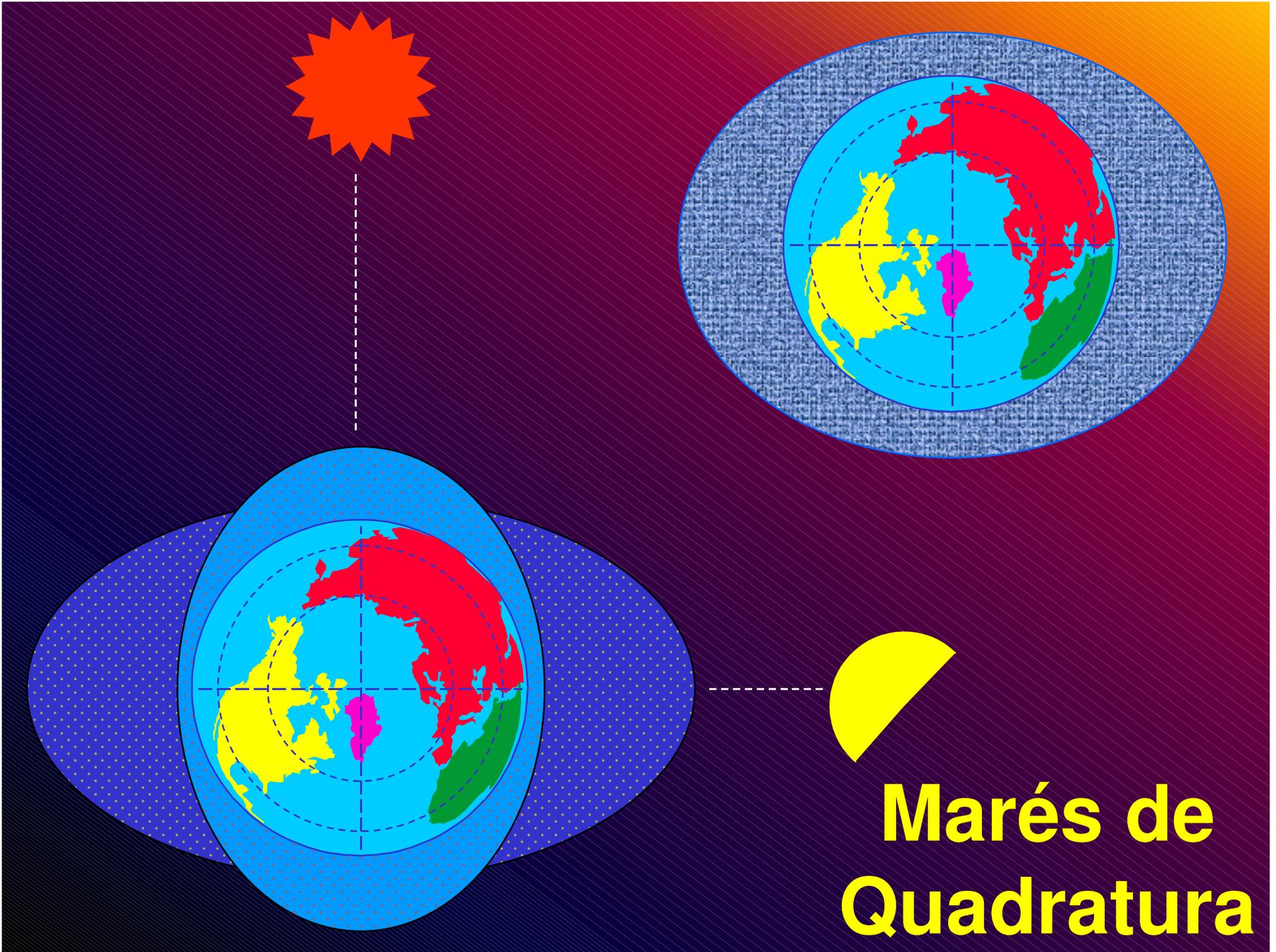
# Maré

## Solar + Lunar



# Maré de Sizígea





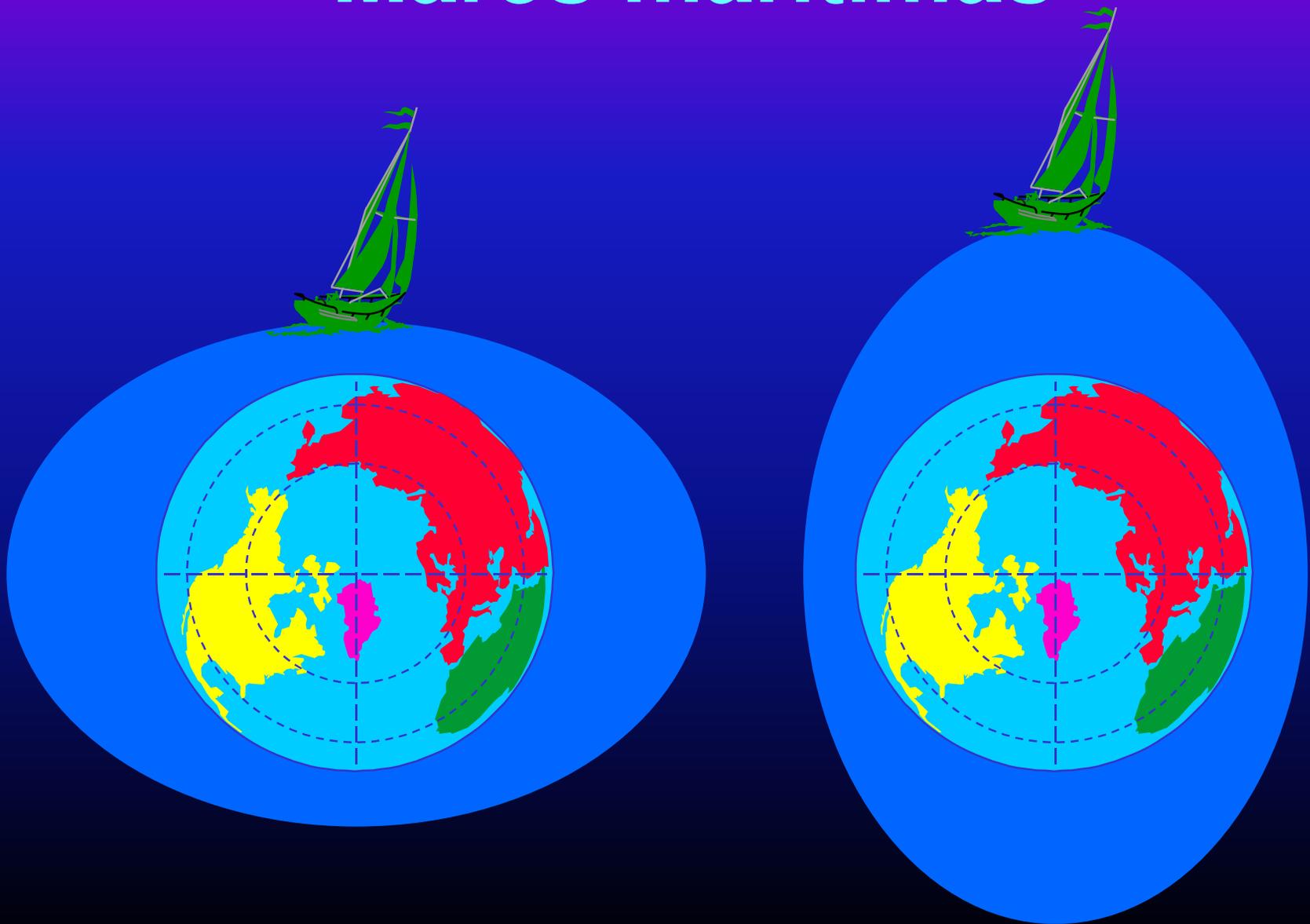
**Marés de  
Quadratura**

**Marés marítimas**

**e...**

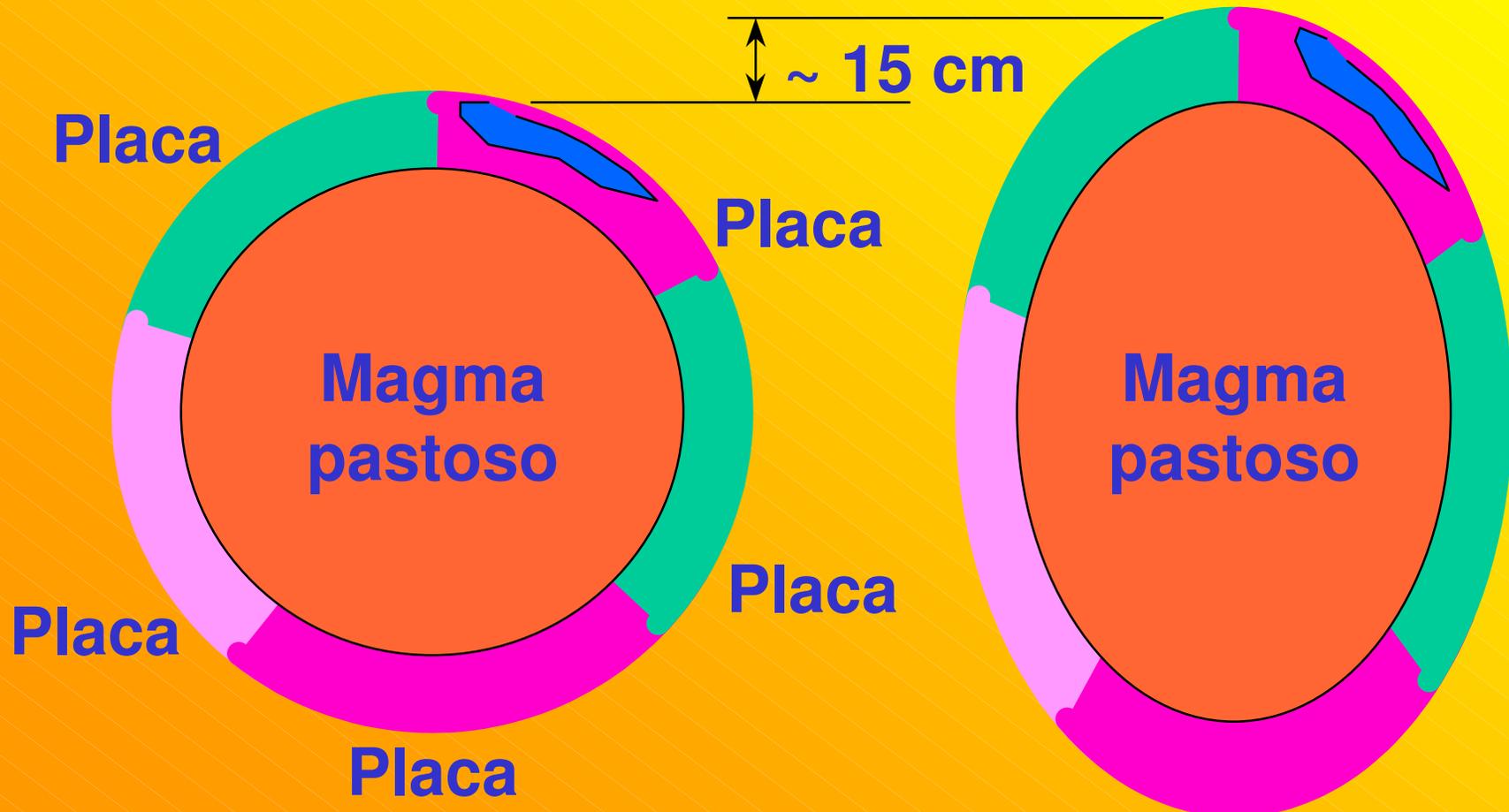
**Marés Terrestres !**

# Marés marítimas



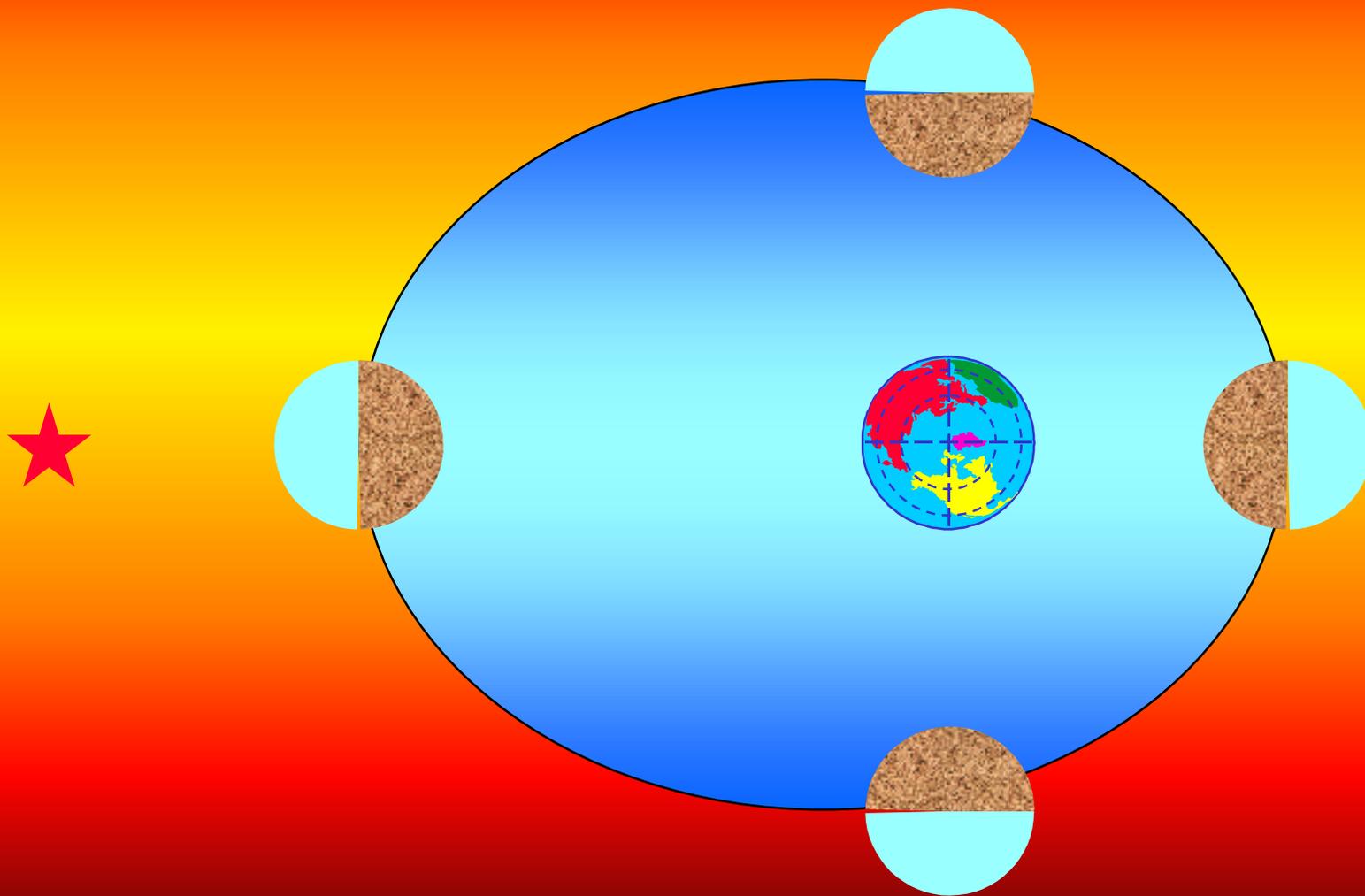
Lua 

# Marés Terrestres



# **Efeitos das marés a longo prazo**

# Translação atual da Lua



**Gravidade**

**Marés**

**Rotação  
da Terra**

**Ciclicidade  
das marés**

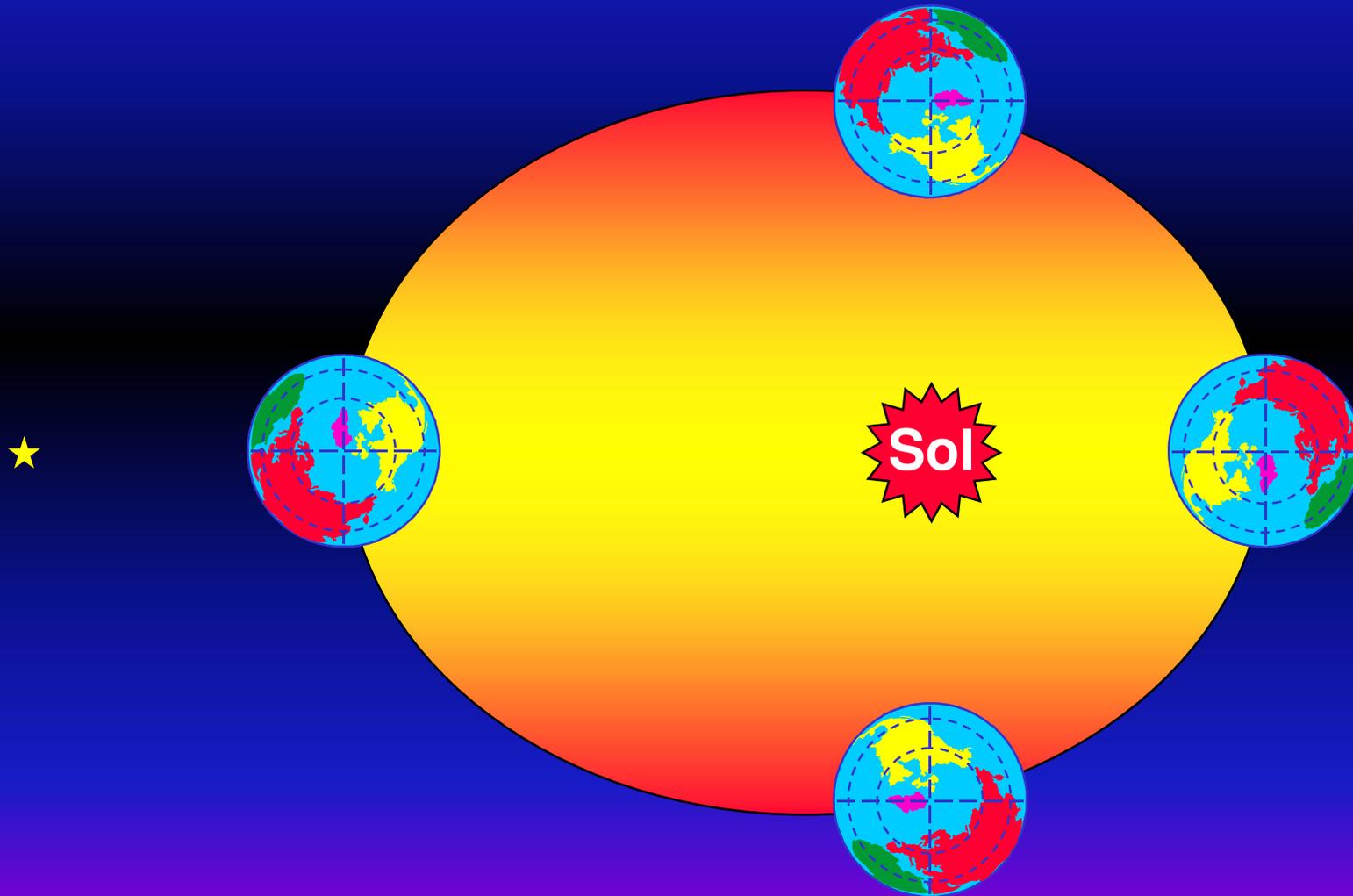
**Atrito**

**Calor**

**Perda de  
energia cinética  
de rotação**

**A Terra está  
parando  
de girar !**

# Translação da Terra daqui a ... muitos anos !

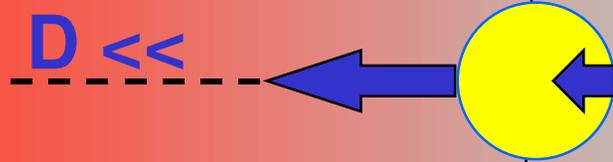


# **Quebra de satélites pelas marés**

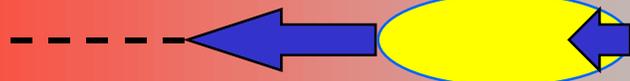
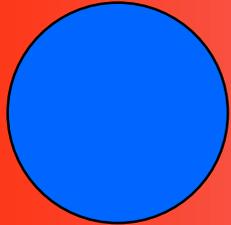
# Deformação e/ou desmembramento de Satélite



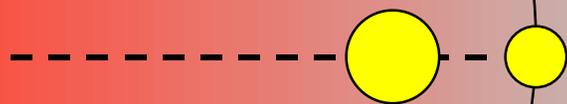
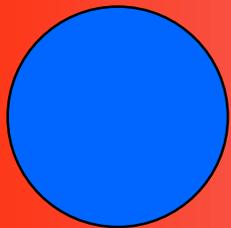
$D \ll$



Satélite



Satélite deformado  
pelas forças de  
marés



Satélite  
desmembrado

Fim