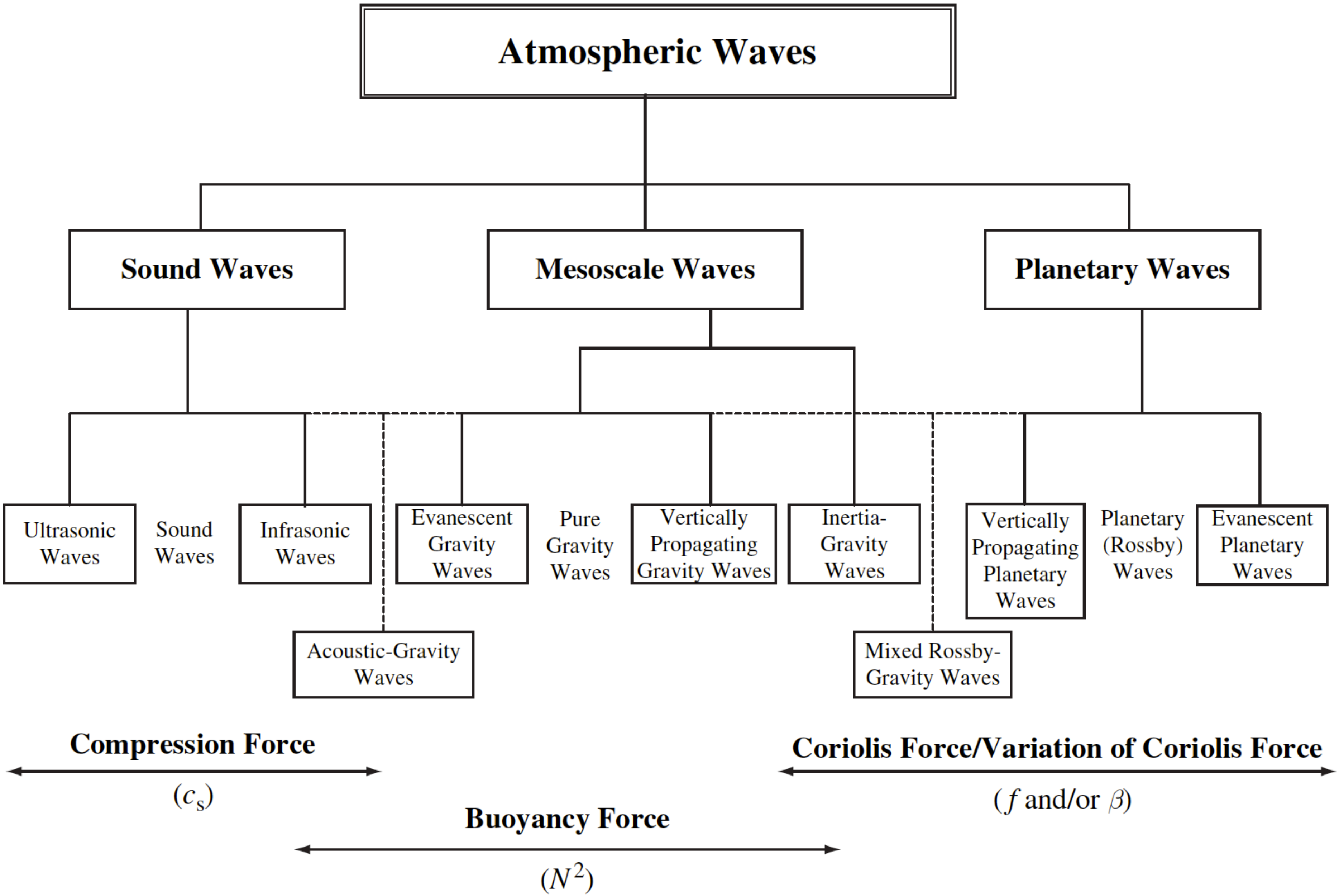
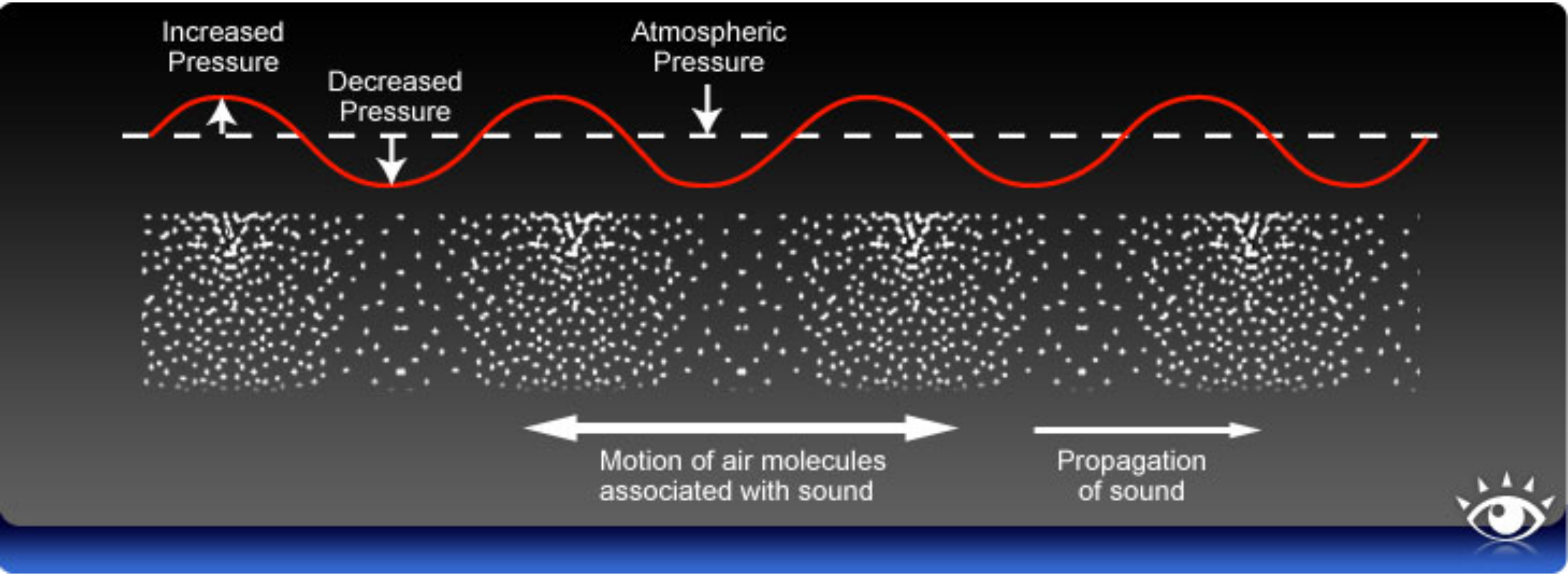
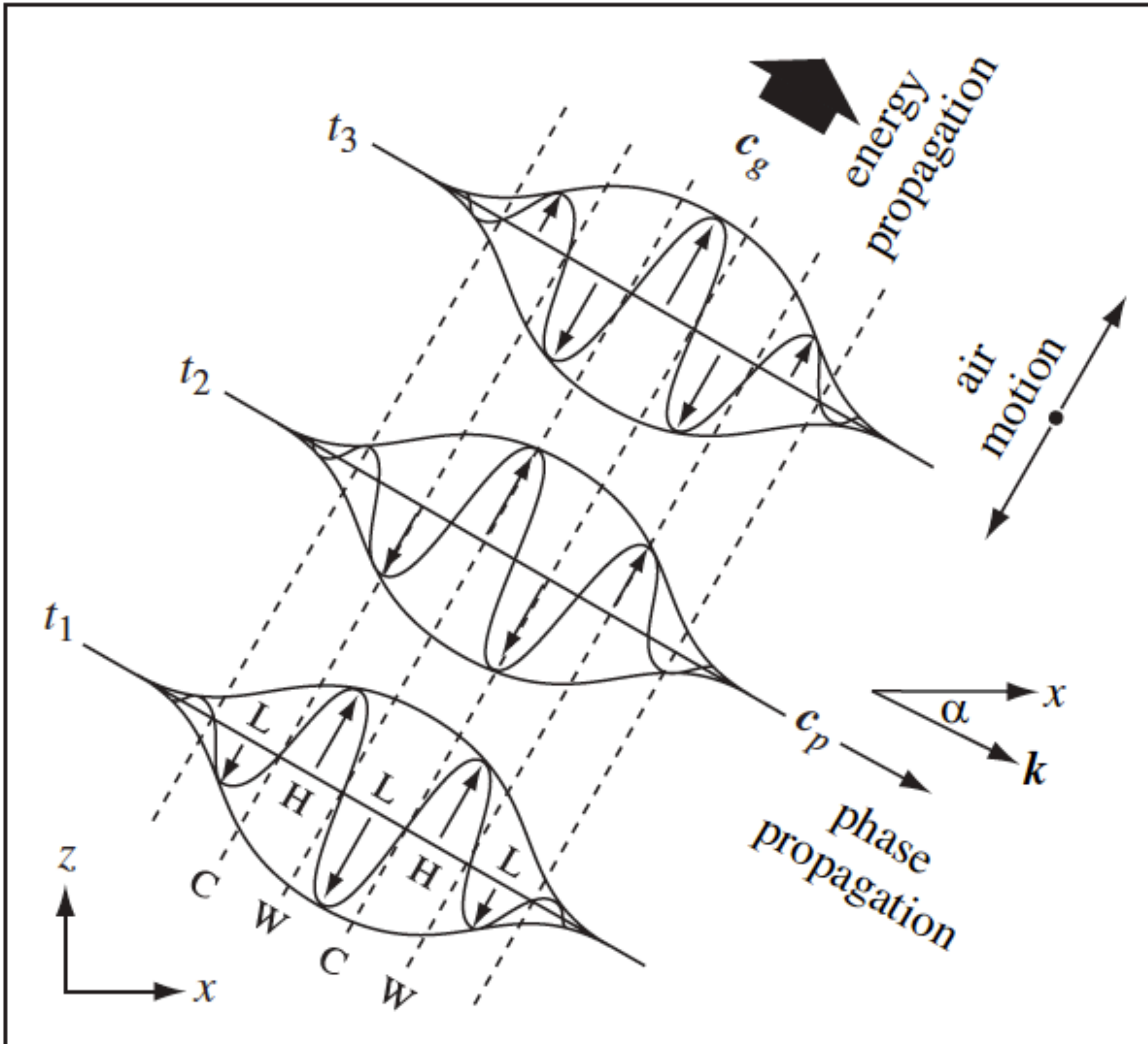
Oscilaciones atmosféricas

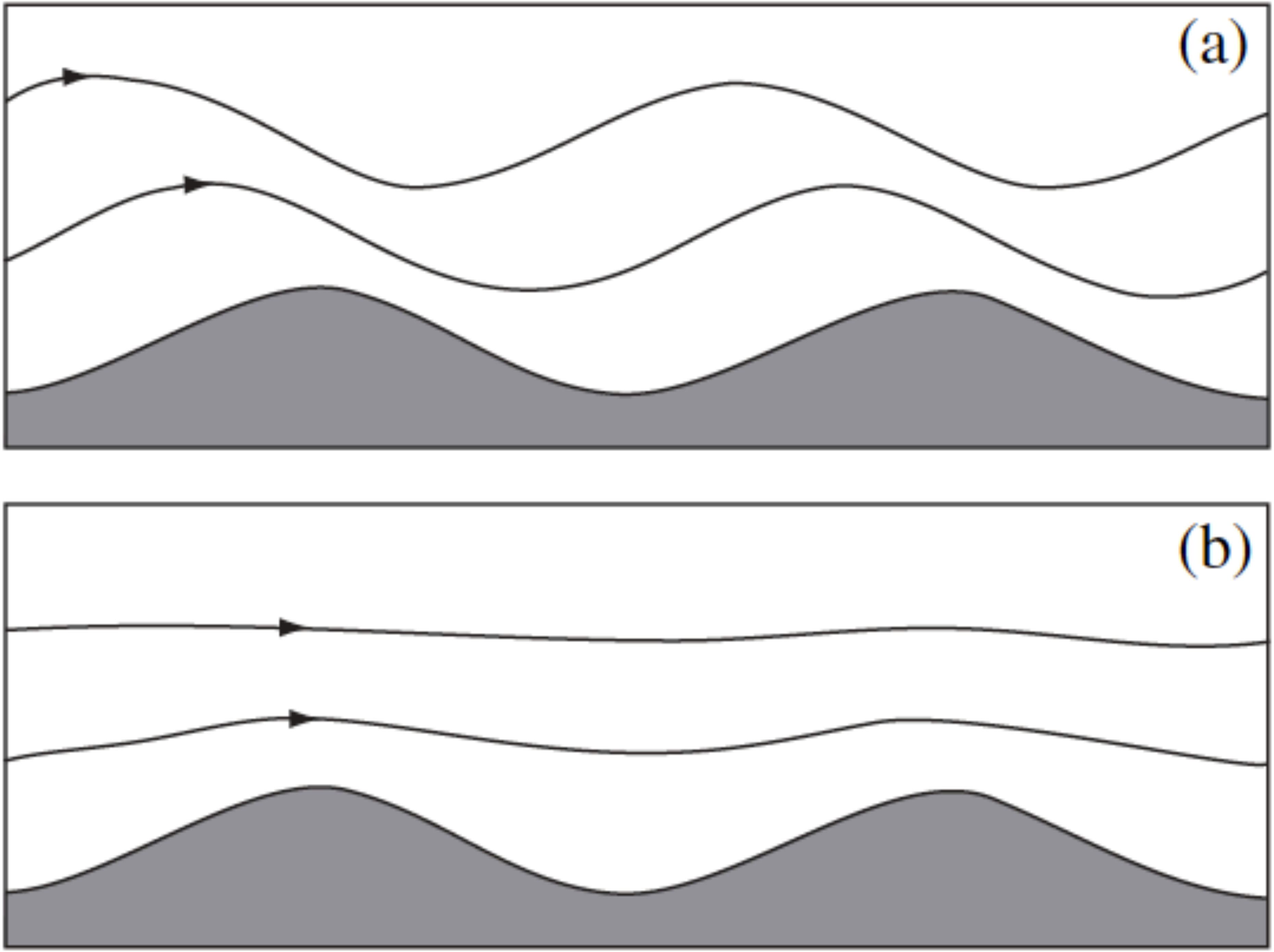

Atmospheric Waves
Sound Waves
Mesoscale Waves
Planetary Waves
Ultrasonic Waves
Sound Waves
Infrasonic Waves
Evanescent Gravity Waves
Pure Gravity Waves
Vertically Propagating Gravity Waves
Inertia-Gravity Waves
Vertically Propagating Planetary Waves
Planetary (Rossby) Waves
Evanescent Planetary Waves
Acoustic-Gravity Waves
Mixed Rossby-Gravity Waves
Compression Force
(c_s)
Coriolis Force/Variation of Coriolis Force
(f and/or β)
Buoyancy Force
(N^2)

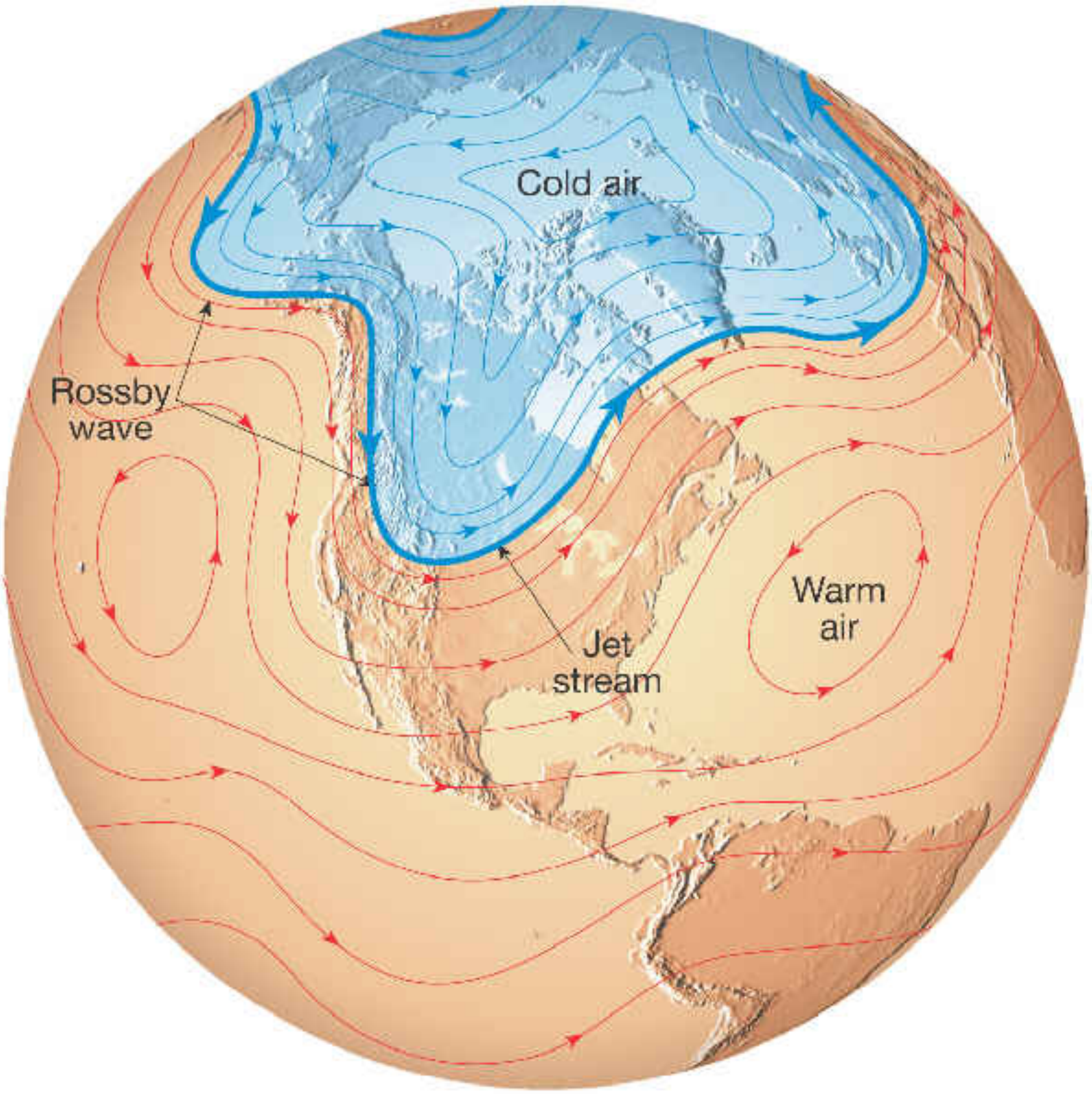


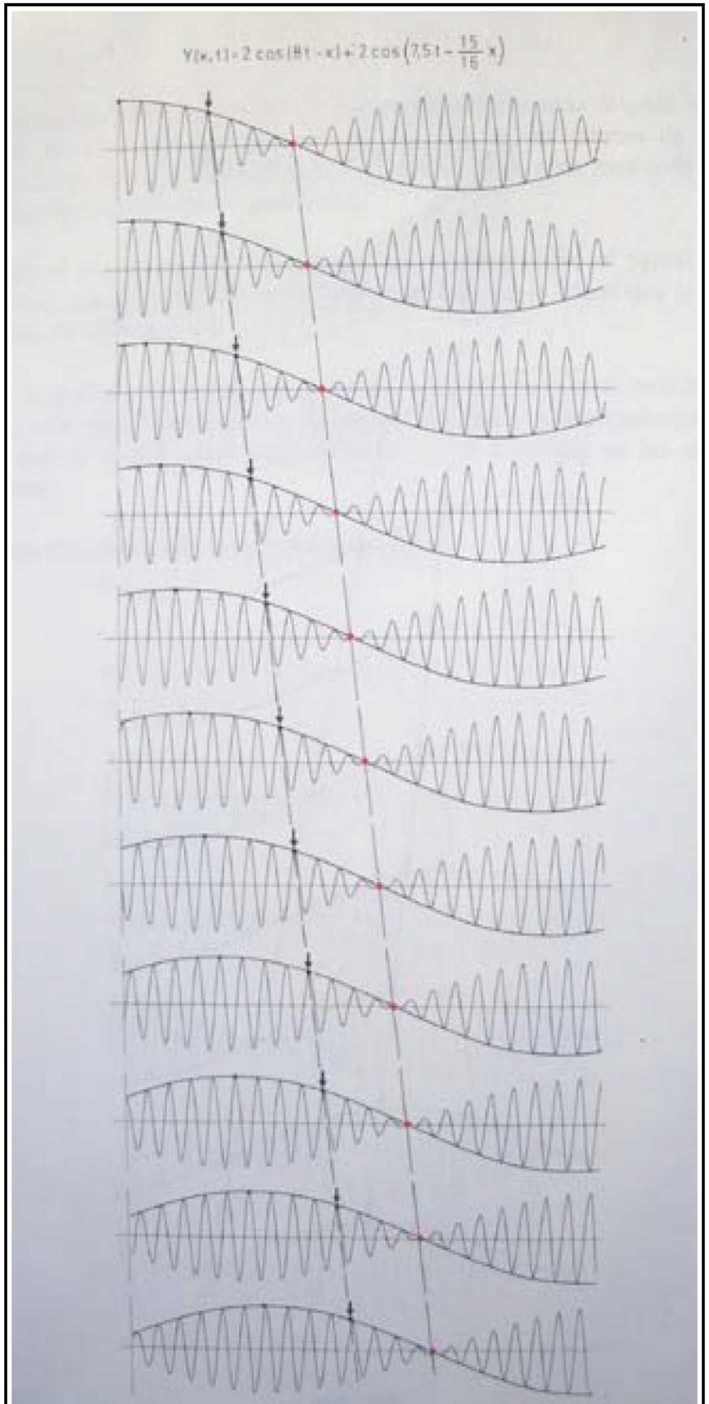
Increased Pressure
Decreased Pressure
Atmospheric Pressure
Motion of air molecules associated with sound
Propagation of sound



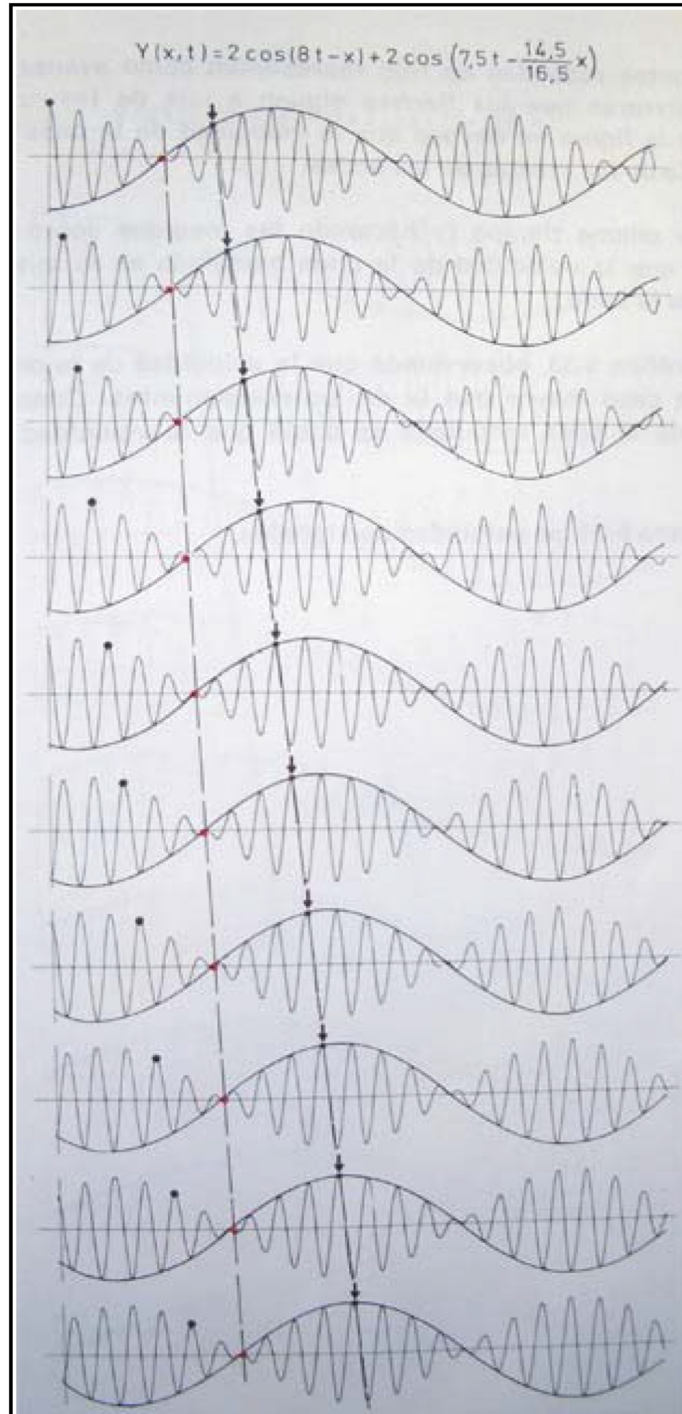
energy propagation
c_g
t_3
t_2
t_1
air motion
c_p
x
α
k
phase propagation
L
H
L
H
L
C
W
C
W
z
x


(a)
(b)


Cold air
Rossby wave
Jet stream
Warm air



Y(x,t)=2 cos(8t − x)+2 cos(7,5t − 15/16 x)



Y(x,t)=2 cos(8t − x)+2 cos(7,5t − 14,5/16,5 x)

Técnicas de las perturbaciones

- Determinar que términos son relevantes para el tipo de onda estudiada y seleccionar las ecuaciones
- Linealizar las ecuaciones
- Derivar la ecuación de la onda
- Reemplazar una solución armonica en la ecuación que contenga la amplitud, la frecuencia y el número de onda
- Derivar la relación de dispersión

Set de Ecuaciones para mesoescala

Sin coriolis, atmosfera incompresible, sin calentamiento diabatico, sin roce.

1) $\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + w\frac{\partial u}{\partial z} = -\frac{1}{\rho}\frac{\partial p}{\partial x}$

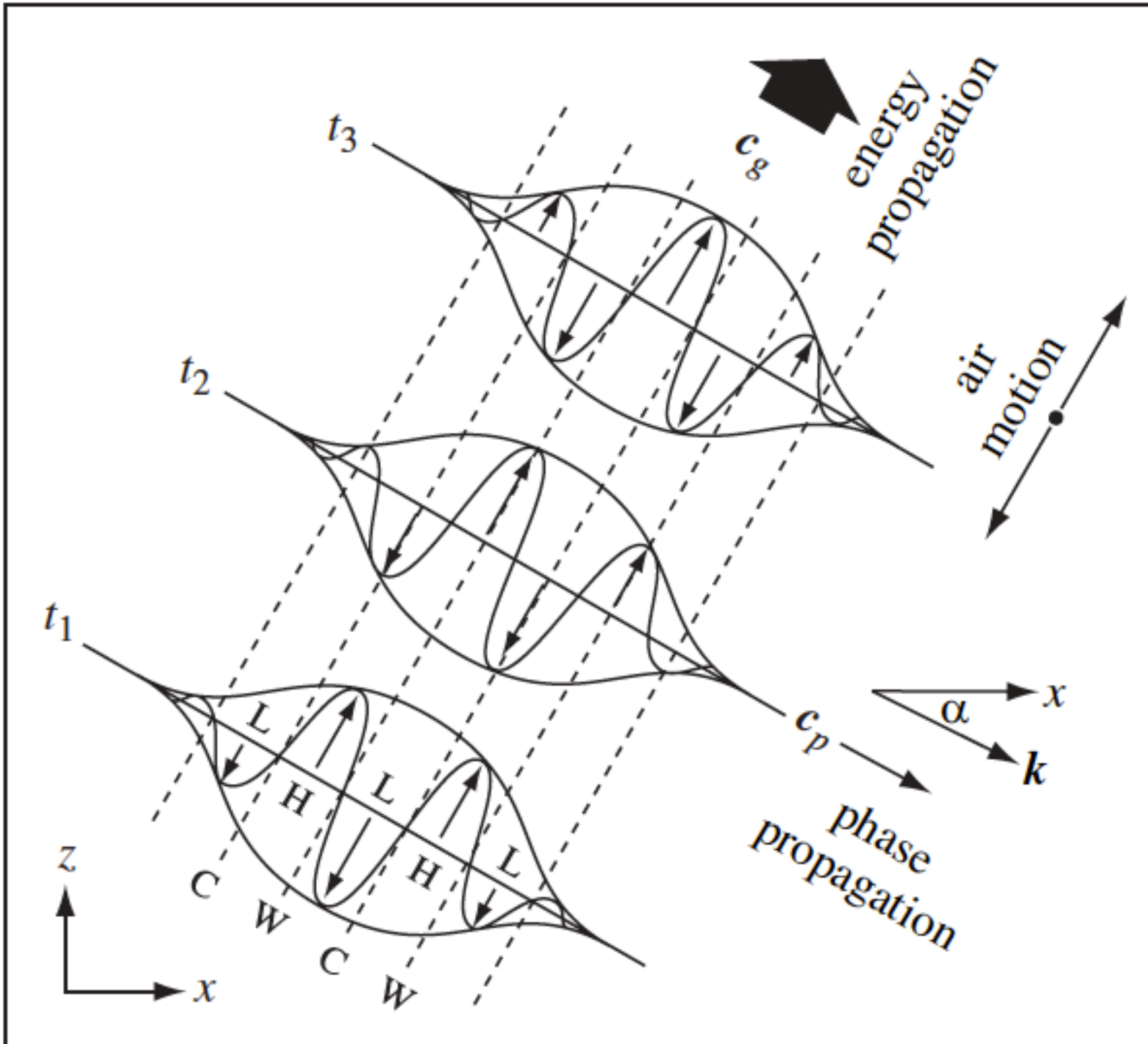
2) $\frac{\partial v}{\partial t} + u\frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} + w\frac{\partial v}{\partial z} = -\frac{1}{\rho}\frac{\partial p}{\partial y}$

$$\theta = \frac{p}{\rho R}\left[\frac{p_0}{p}\right]^{\kappa}$$

3) $\frac{\partial w}{\partial t} + u\frac{\partial w}{\partial x} + v\frac{\partial w}{\partial y} + w\frac{\partial w}{\partial z} + \frac{1}{\rho}\frac{\partial p}{\partial z} + g = 0$

4) $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$

5) $\frac{\partial \theta}{\partial t} + u\frac{\partial \theta}{\partial x} + v\frac{\partial \theta}{\partial y} + w\frac{\partial \theta}{\partial z} = 0$



t_3
t_2
t_1
c_g
energy propagation
air motion
c_p
phase propagation
x
α
k
L
H
L
H
L
C
W
C
W
z
x

$$w' = \mathrm{Re}\left(w_{\mathrm{o}} \mathrm{e}^{\mathrm{i}(kx+mz-\omega t)}\right) = w_{\mathrm{r}} \cos(kx + mz - \omega t) - w_{\mathrm{i}} \sin(kx + mz - \omega t), \quad (3.5.16)$$

Relaciones de polarización

$$u' = -(m/k)[w_{\mathrm{r}} \cos(kx + mz - \omega t) - w_{\mathrm{i}} \sin(kx + mz - \omega t)], \qquad (3.5.17a)$$

$$p' = -(\rho_{\mathrm{o}} \omega m/k^2)[w_{\mathrm{r}} \cos(kx + mz - \omega t) - w_{\mathrm{i}} \sin(kx + mz - \omega t)], \qquad (3.5.17b)$$

$$\theta' = (\theta_{\mathrm{o}} N^2/g\omega)[w_{\mathrm{r}} \sin(kx + mz - \omega t) + w_{\mathrm{i}} \cos(kx + mz - \omega t)]. \qquad (3.5.17c)$$