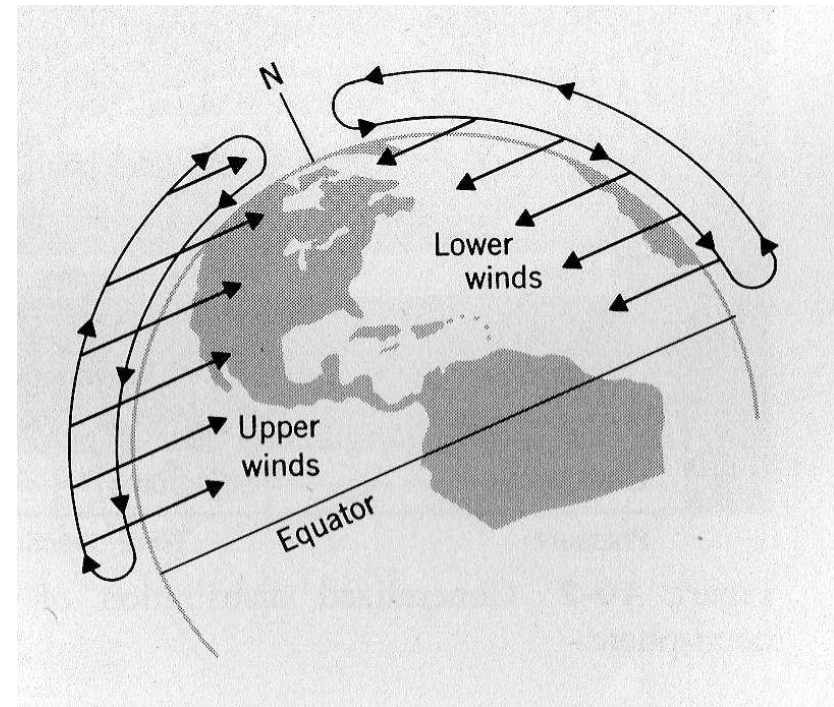
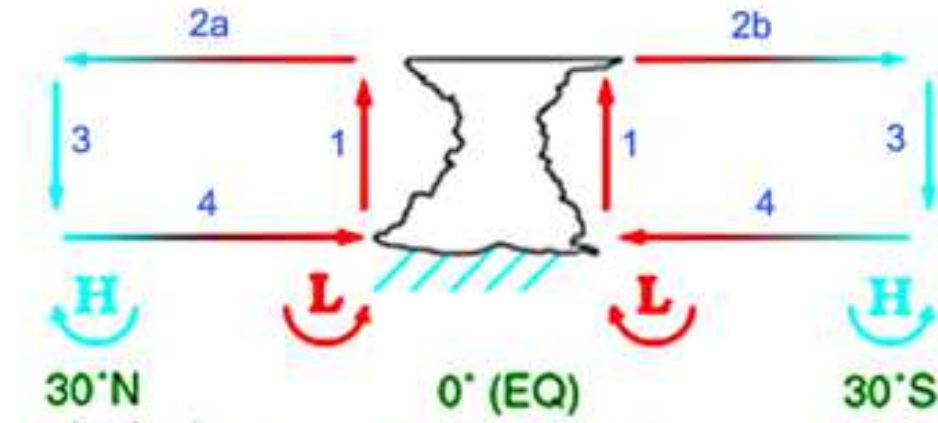


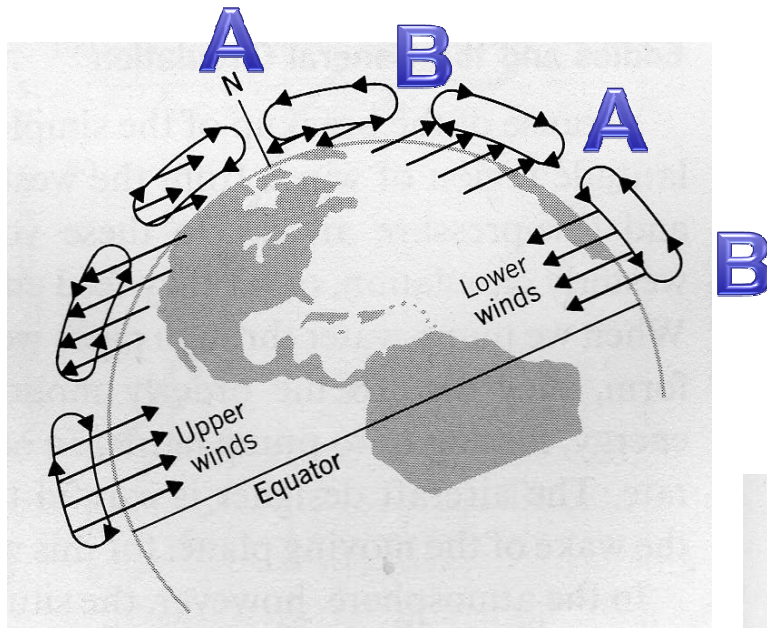
# La rotación y el viento de gran escala

George Hadley 1735



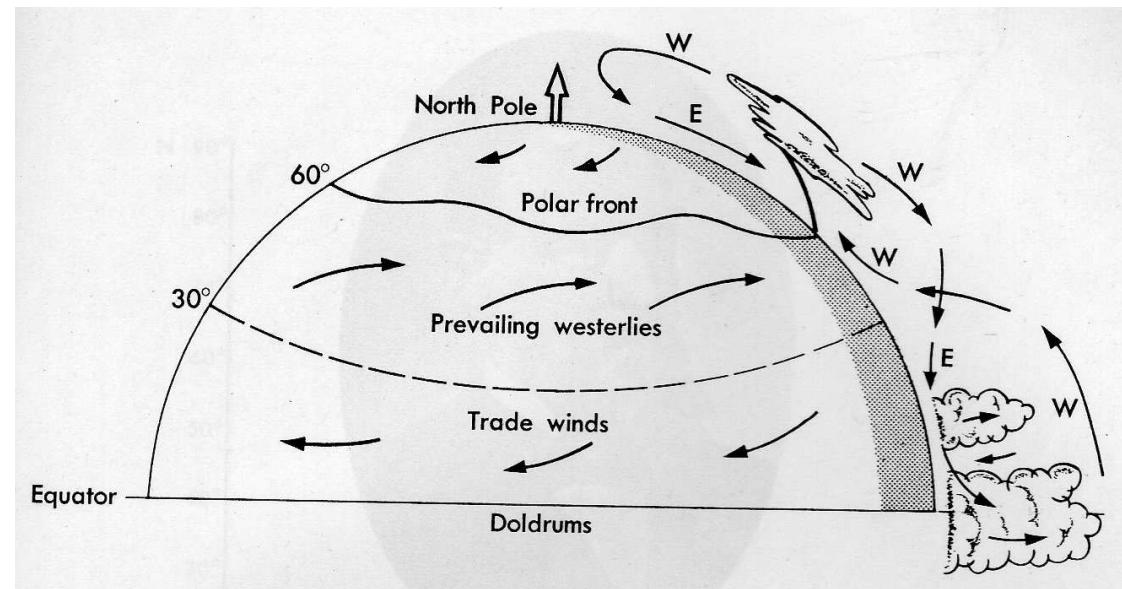
# La rotación y el viento de gran escala

modelo de 3 celdas

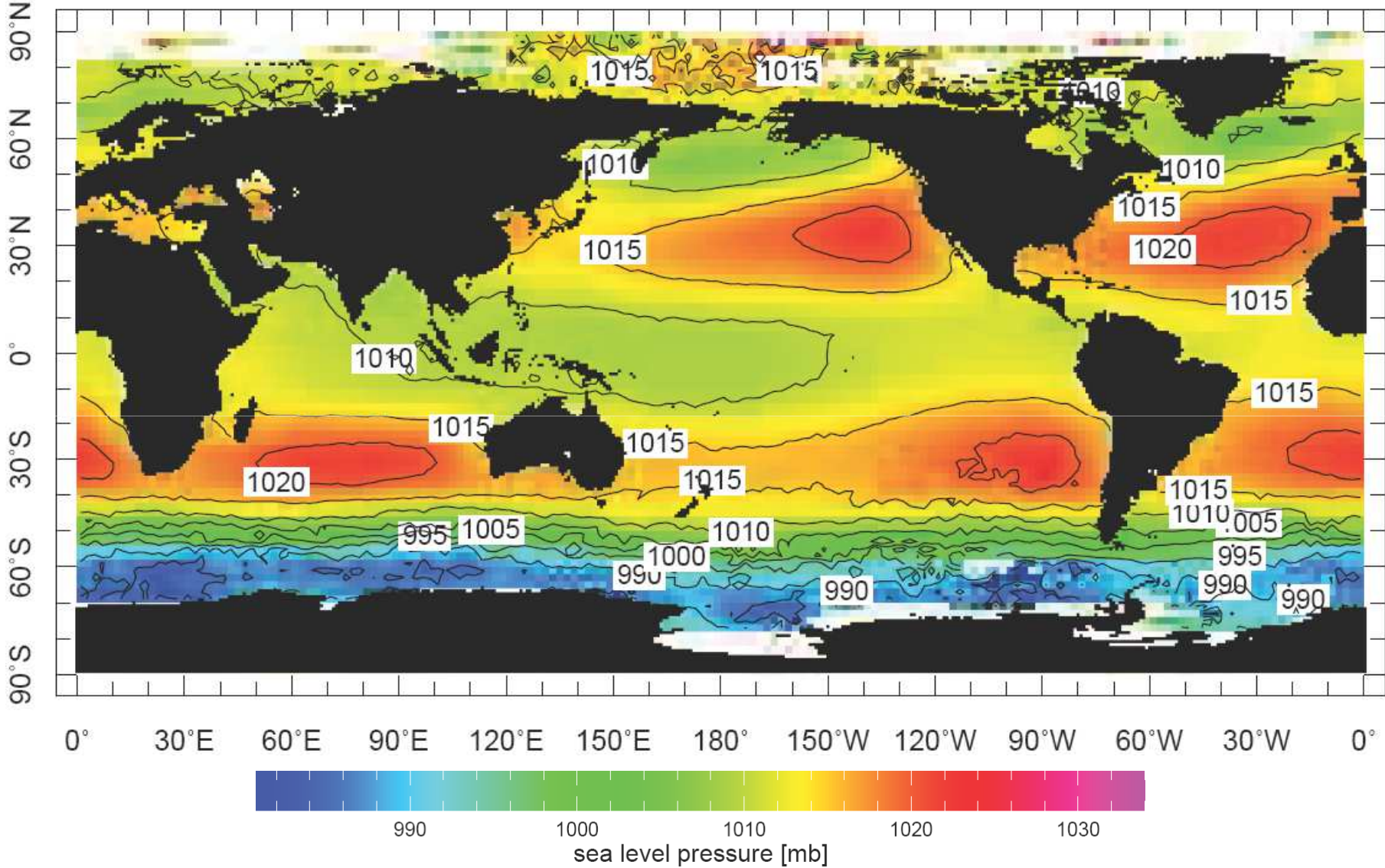


Permite explicar la generación de los vientos del Oeste y la distribución de presión atmosférica global

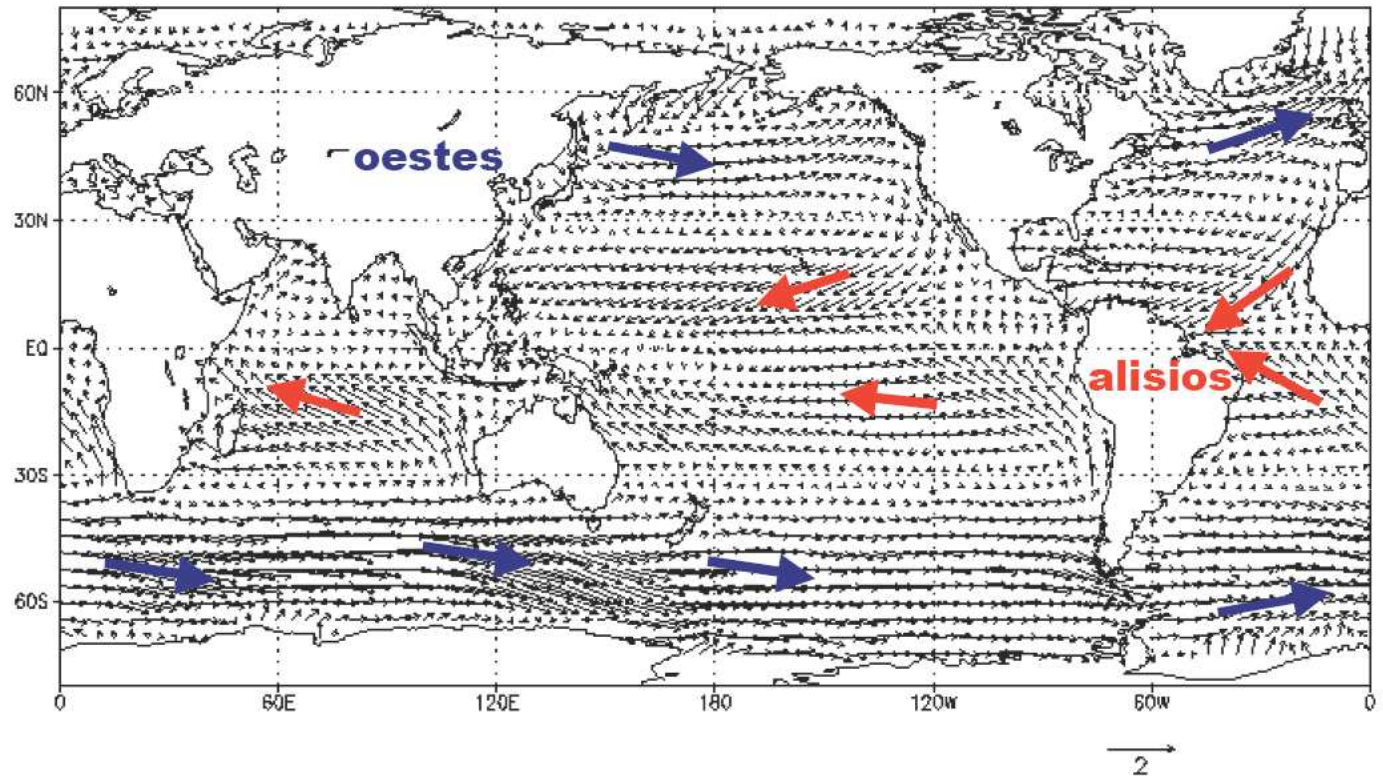
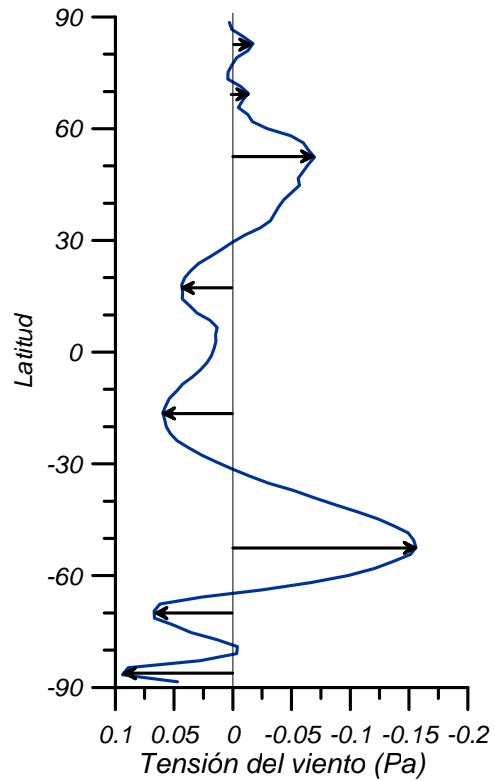
Una visión más realista



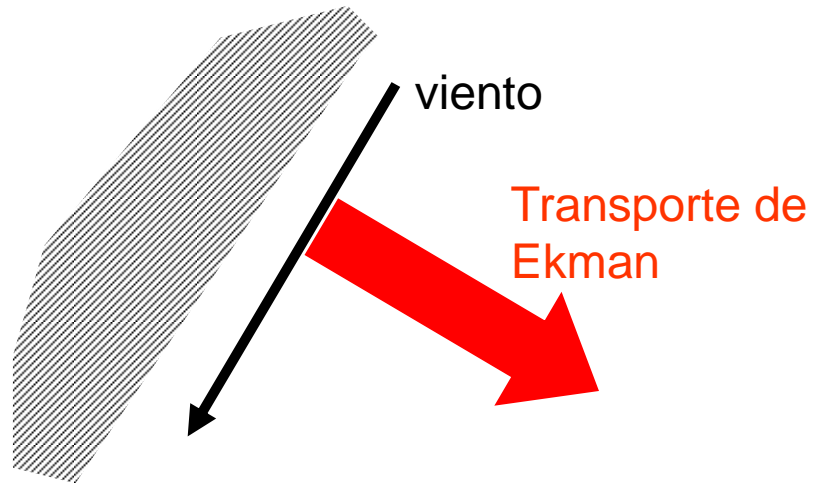
# El patrón de presión atmosférica observado



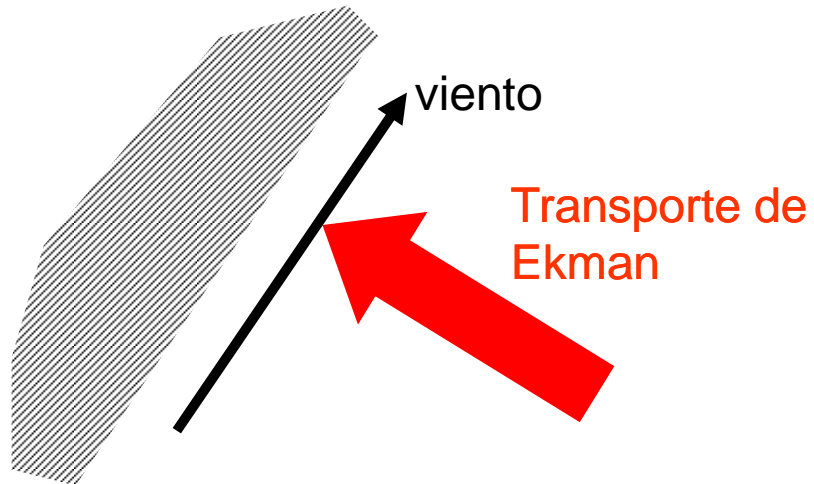
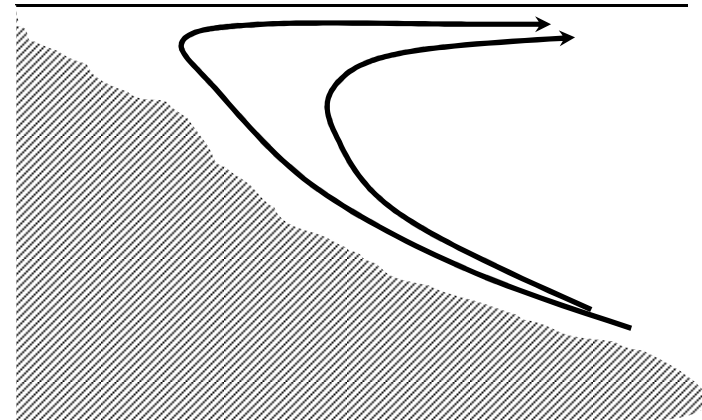
# El patrón de vientos observado



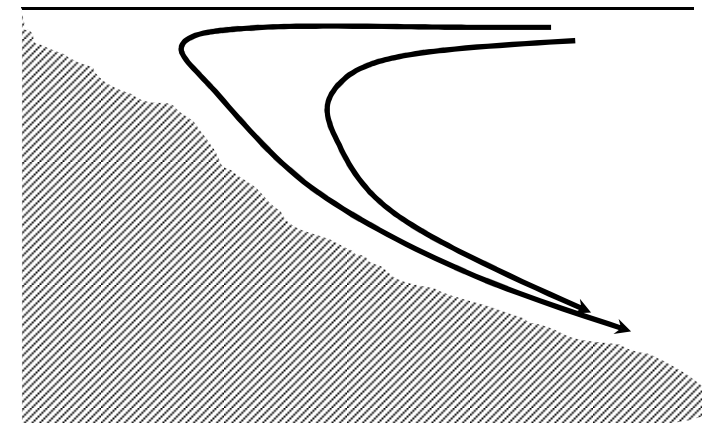
# El viento y la costa (HS), circulación “transversal”



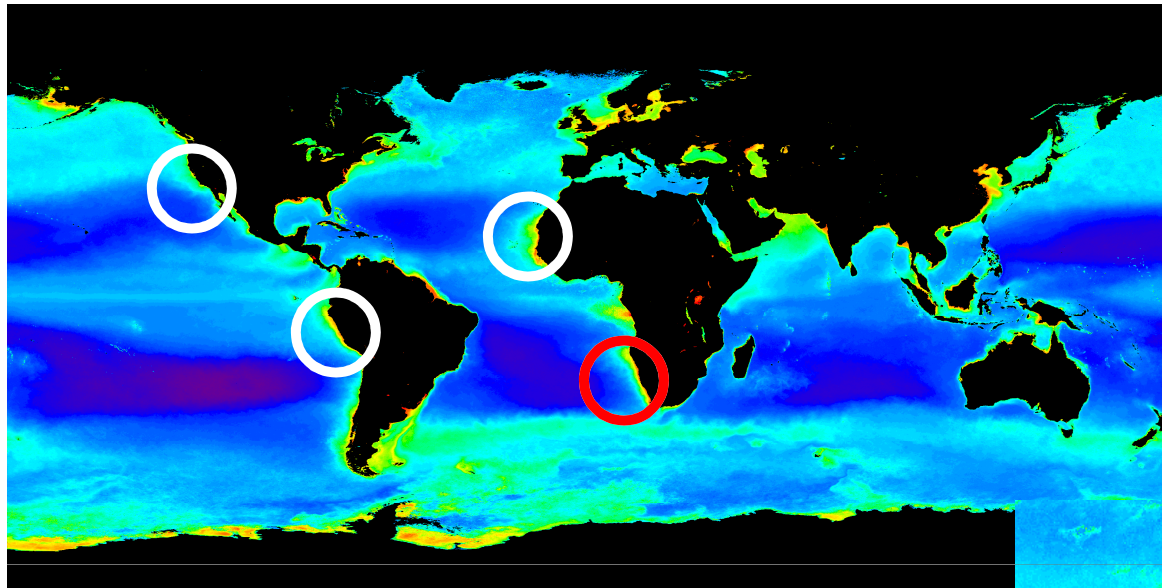
Surgencia *upwelling*



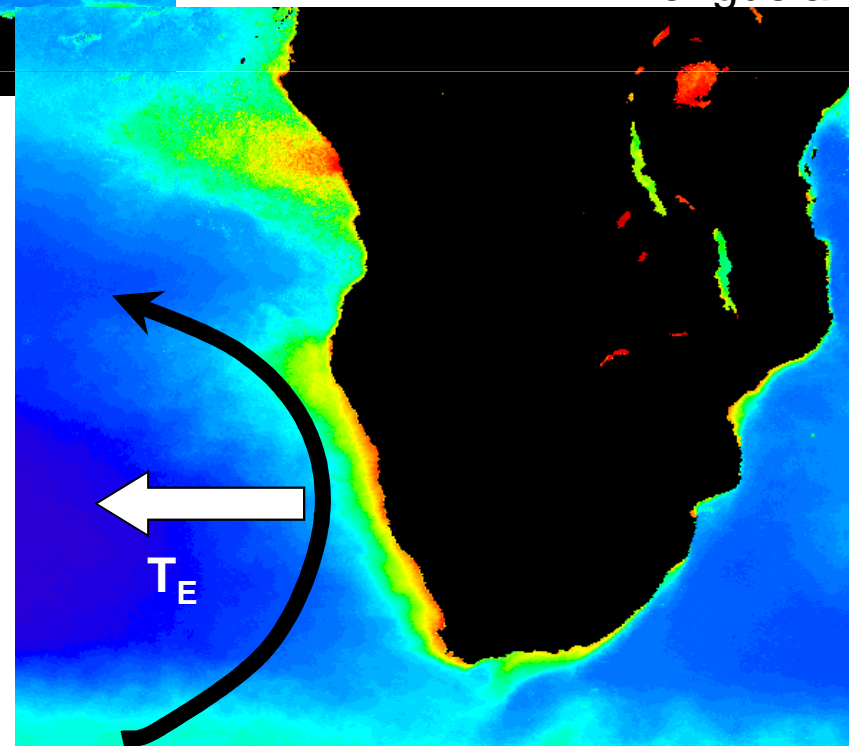
Hundimiento *downwelling*



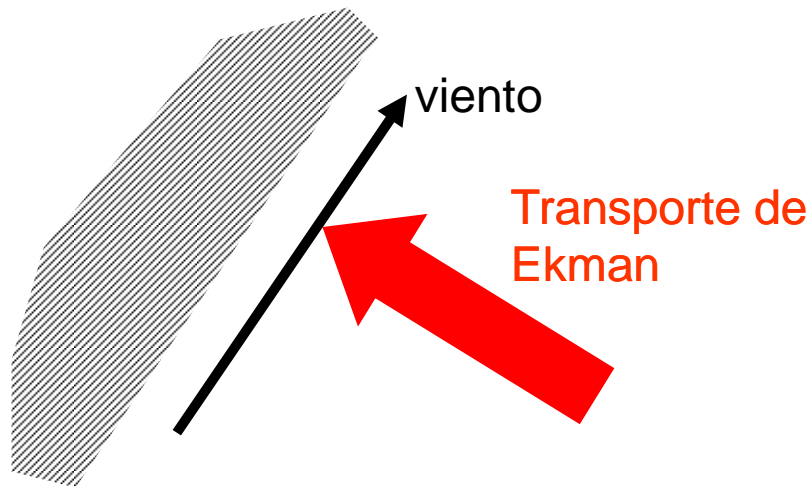
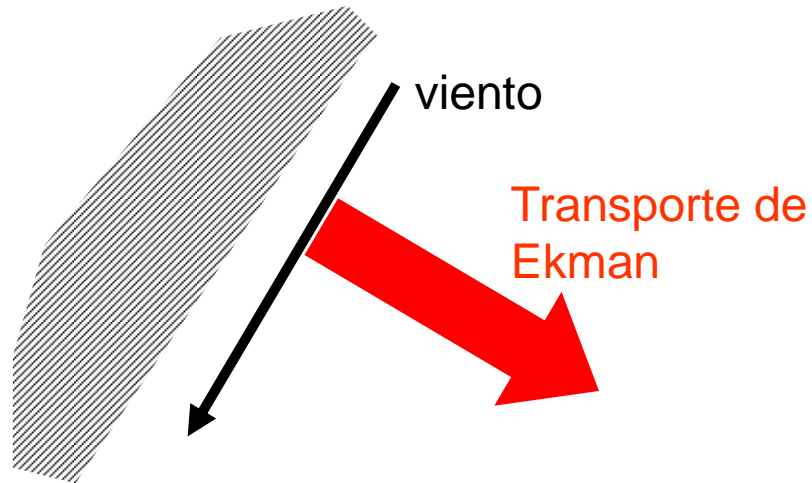
## Evidencias del upwelling “costero” (HS)



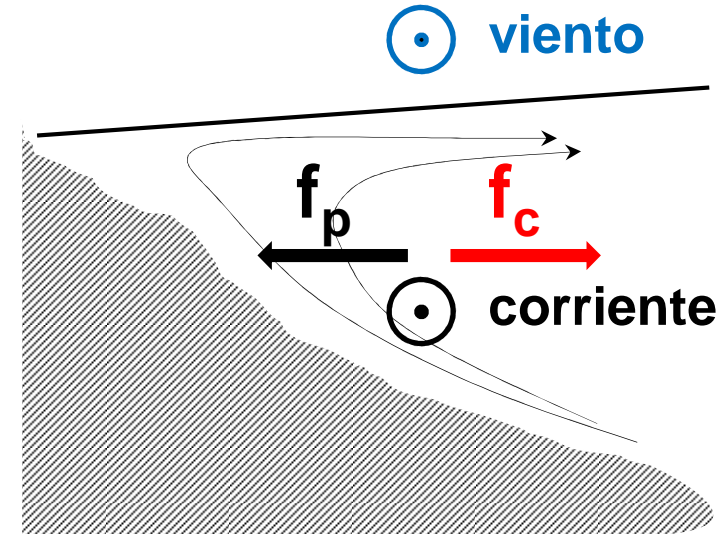
Benguela



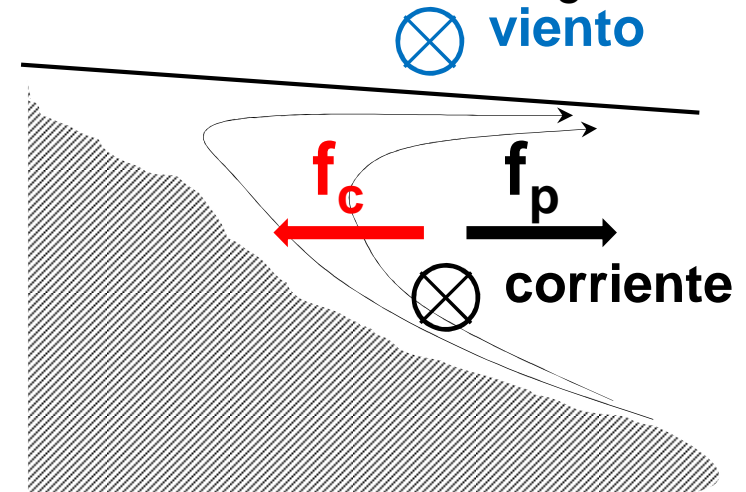
# El viento y la costa (HS), circulación “longitudinal”



Surgencia *upwelling*

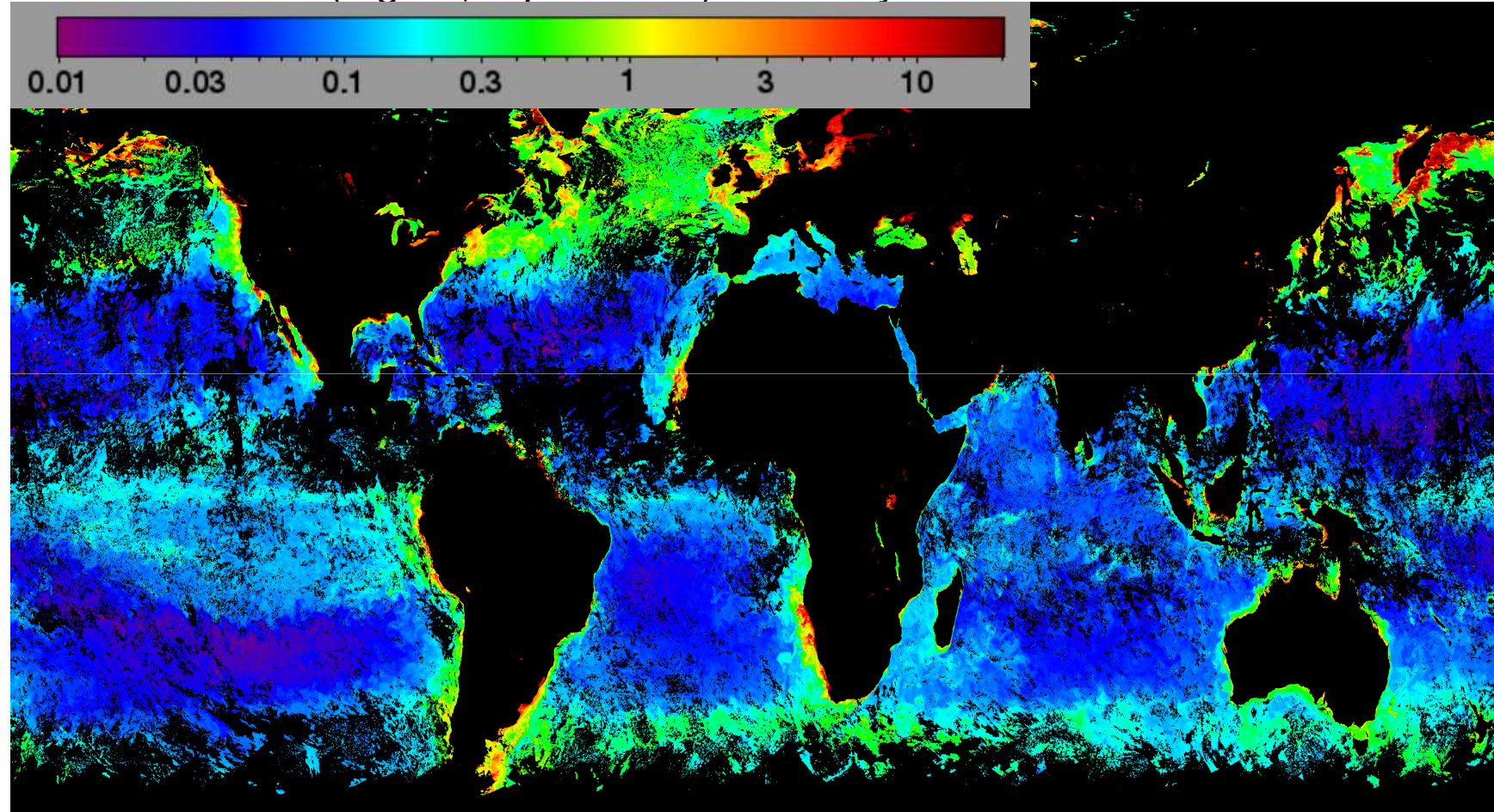


Hundimiento *downwelling*



# Evidencias del *upwelling* ecuatorial

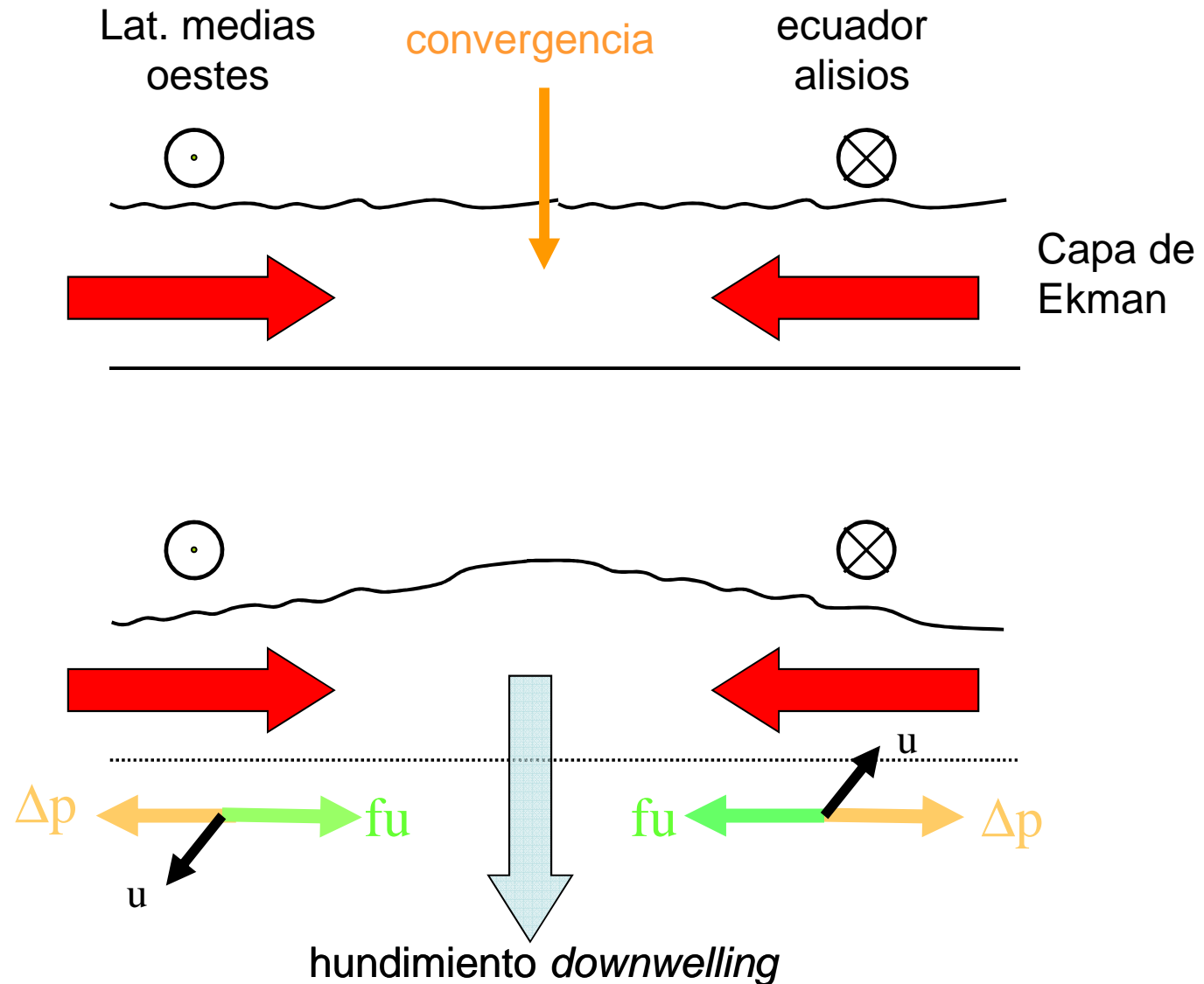
Clorofila satelital ( $\text{mg}/\text{m}^3$ , *Aqua Modis*) 8-15 mayo 2012



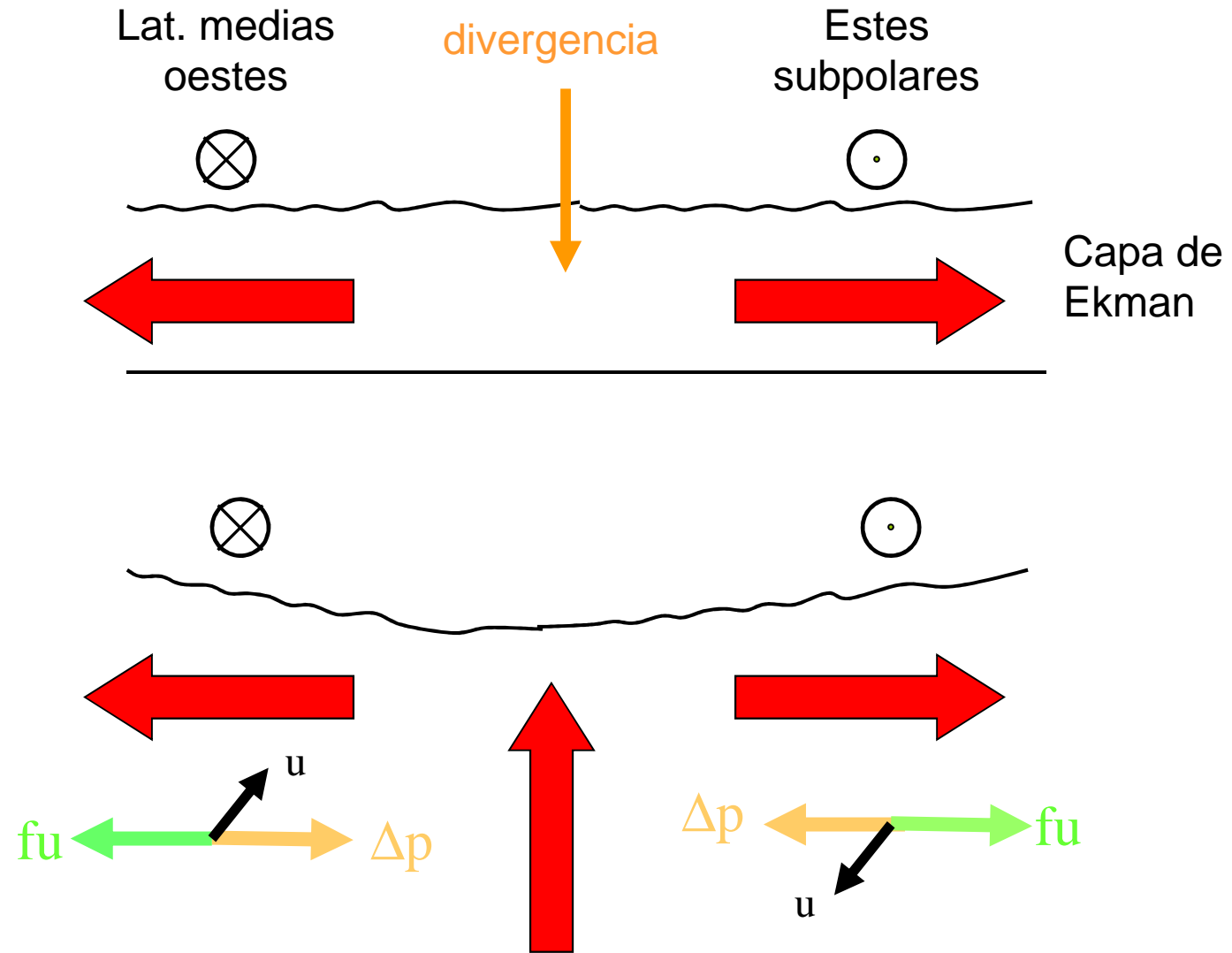
<http://oceancolor.gsfc.nasa.gov/cgi/l3>



# Convergencia en la capa de Ekman



# Divergencia en la capa de Ekman



# El modelo de Sverdrup (1947)

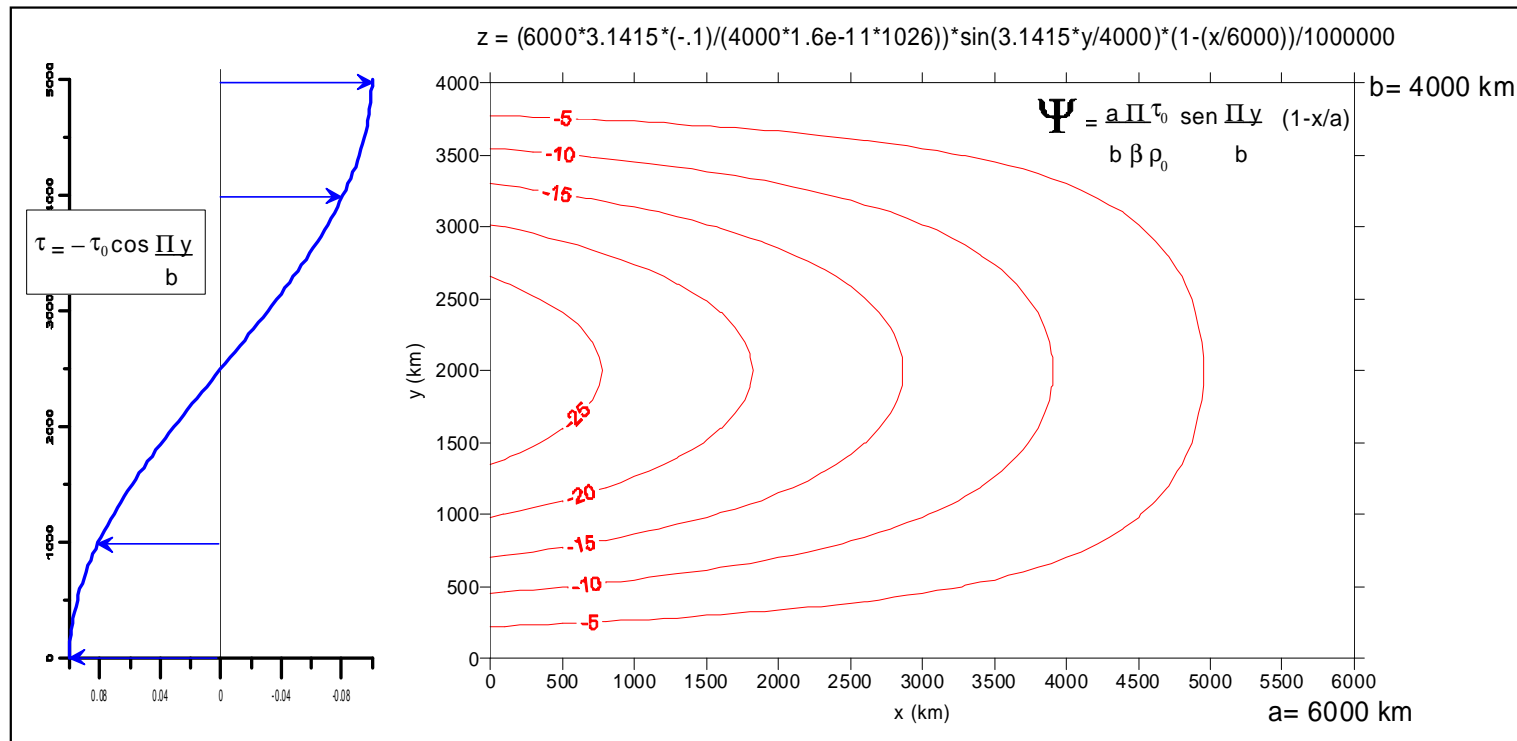


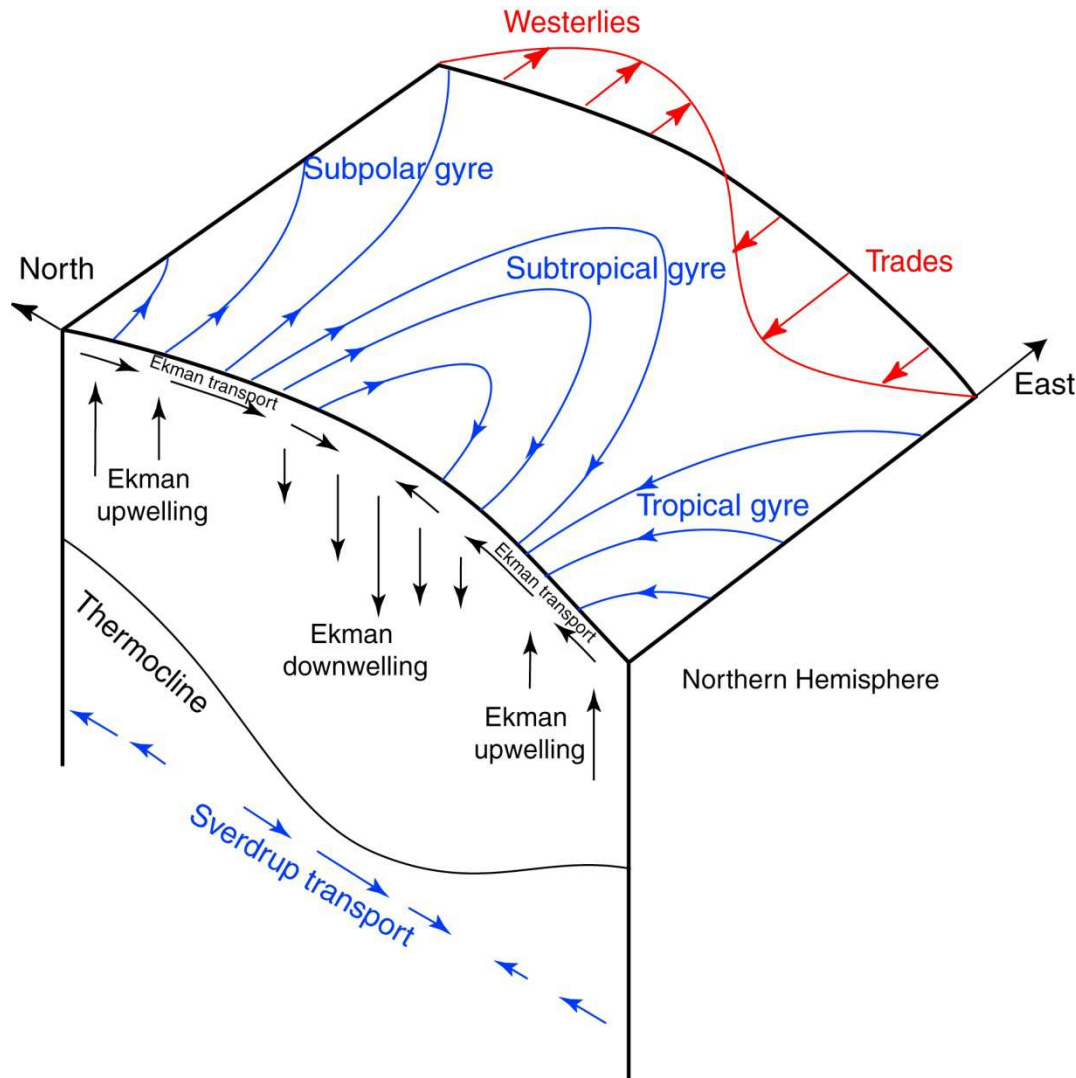
Presión:  $1 / \rho (\partial p / \partial x)$

Coriolis:  $f v$

Fricción:  $A_V \partial^2 u / \partial z^2$

$$\beta M_y = \text{rot}_z \tau_0$$

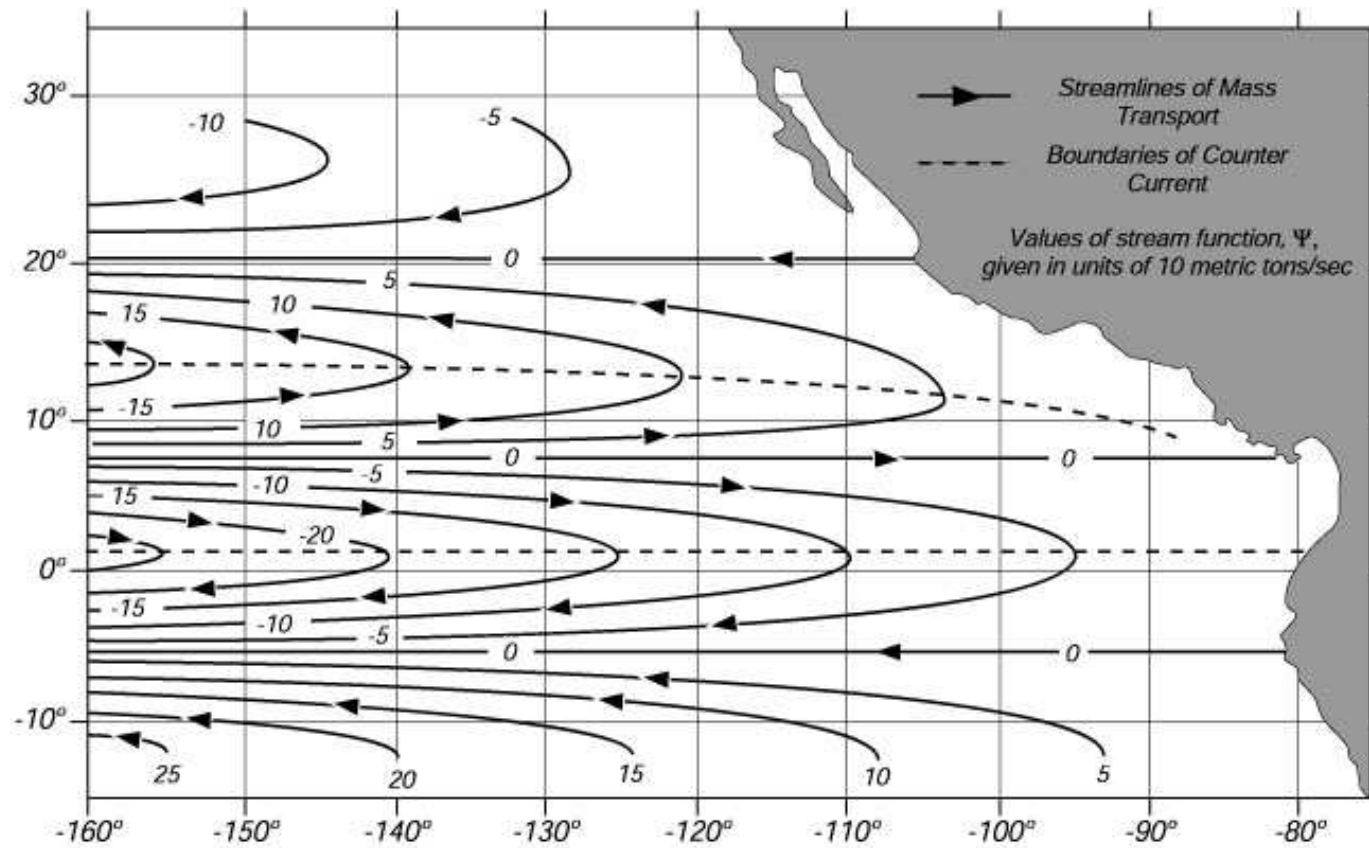




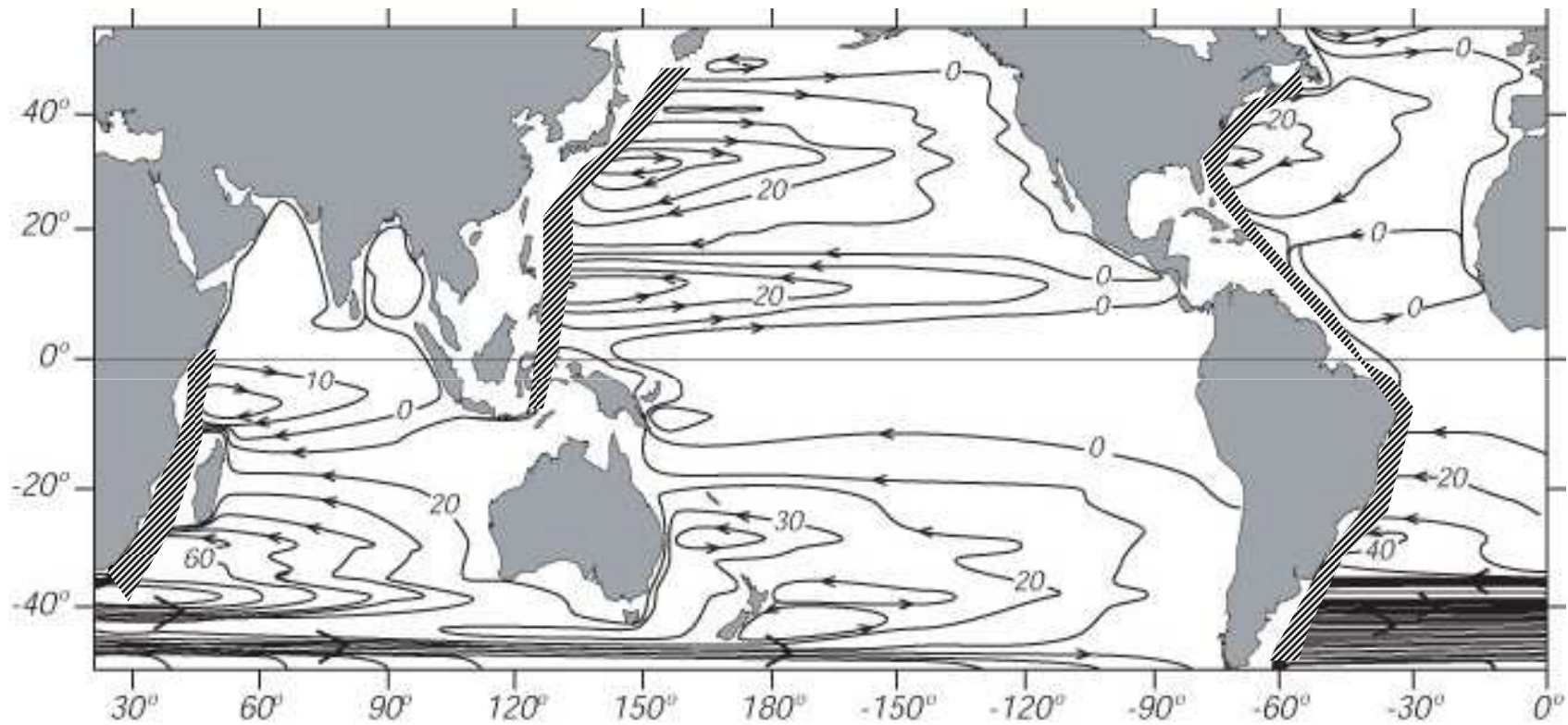
Circulación de Sverdrup en el Hemisferio Norte. Los alisios y los vientos del oeste establecen el transporte de Ekman, creando flujos verticales que compensan la divergencia en la capa de Ekman y por lo tanto el transporte de Sverdrup.

# Circulación en el Pacífico tropical

(Reid, 1947)



# La solución de Sverdrup



# Intensificación de las corrientes en el borde oeste (Stommel, 1948)



Presión:  $1 / \rho (\partial p / \partial x)$

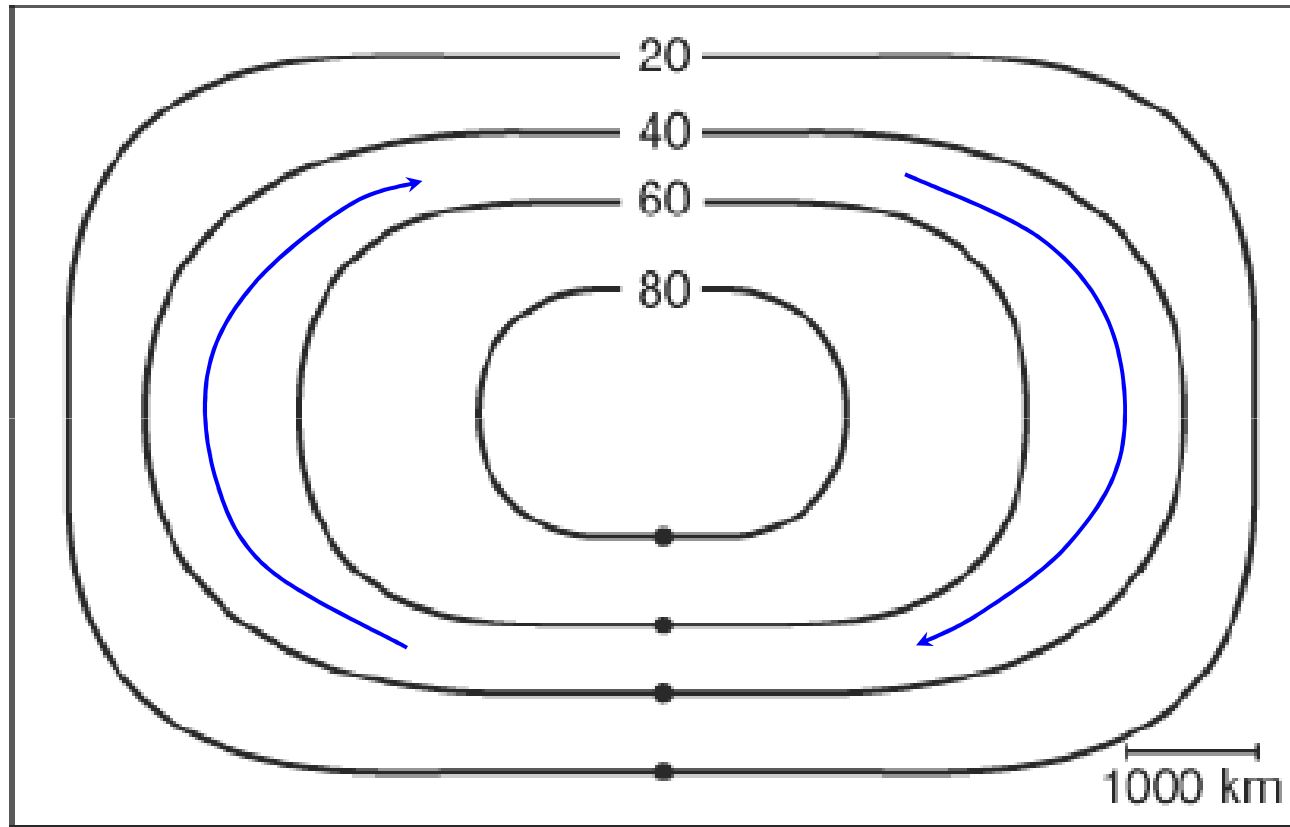
Coriolis:  $f v$

Fricción vert:  $A_H \partial^2 u / \partial z^2$

Fricción horiz:  $-Ru$

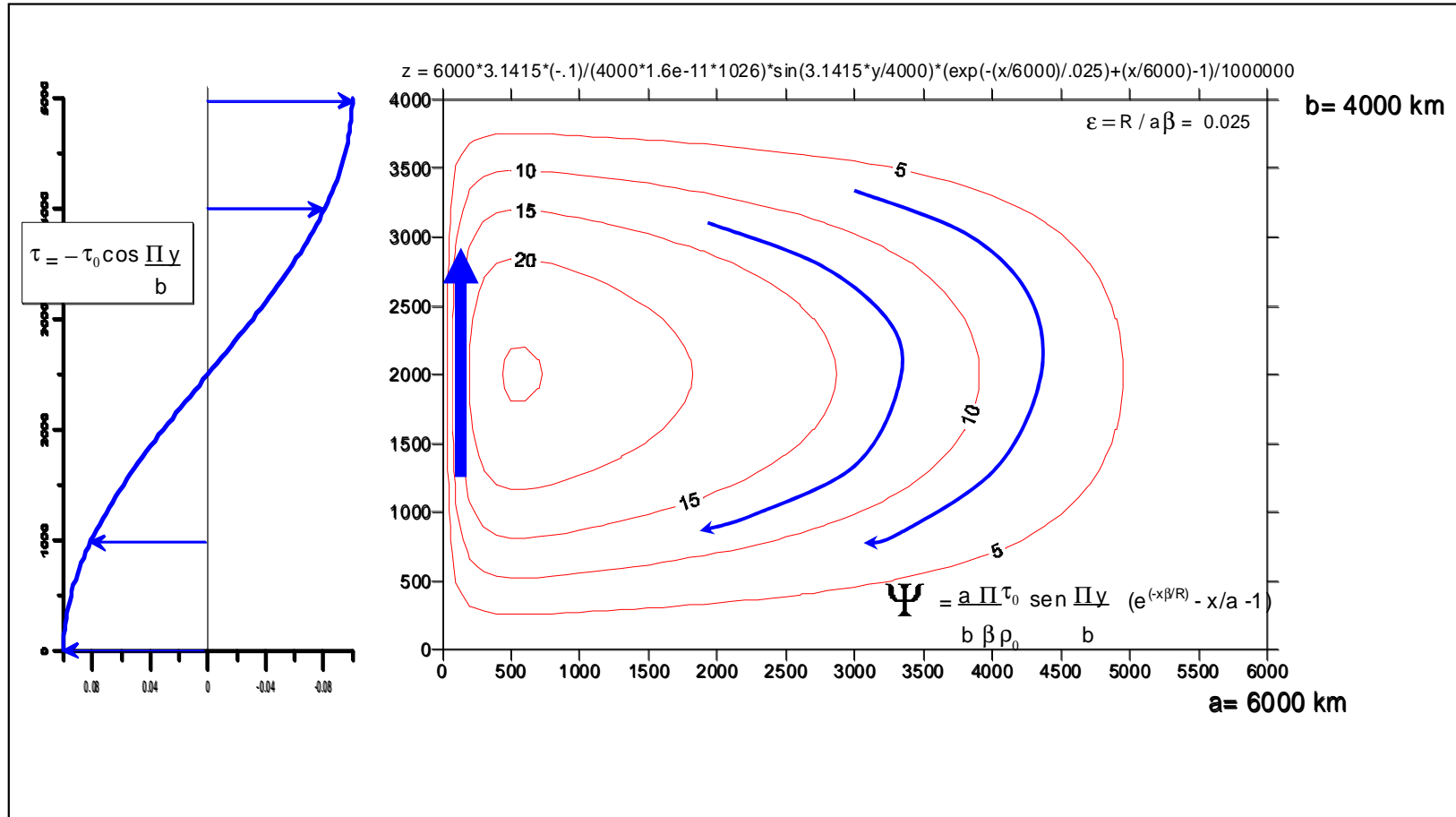
$$\Psi = \frac{a \Pi \tau_0}{b \beta \rho_0} \frac{\sin \frac{\Pi y}{b}}{b} (e^{(-x\beta/R)} - x/a - 1)$$

# Solución de Stommel tierra no rotante



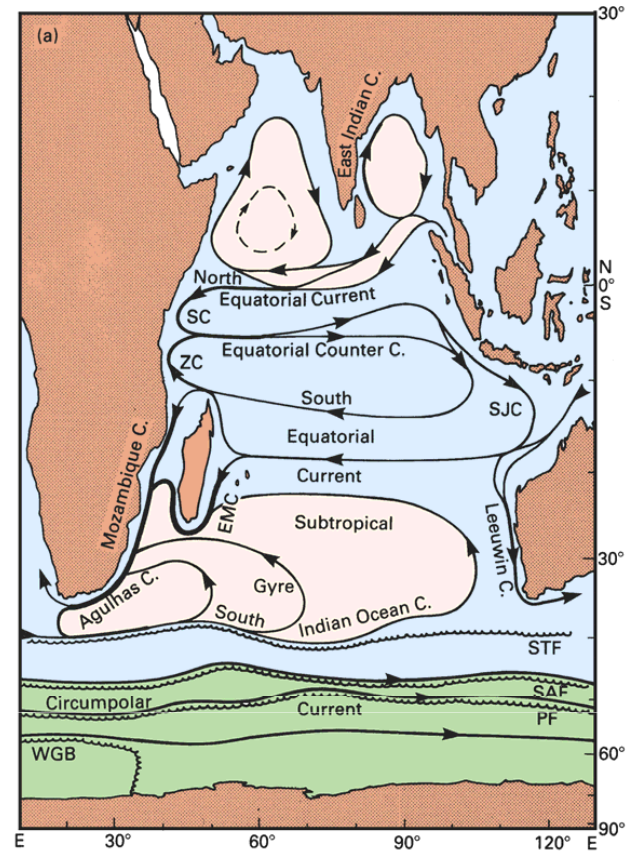
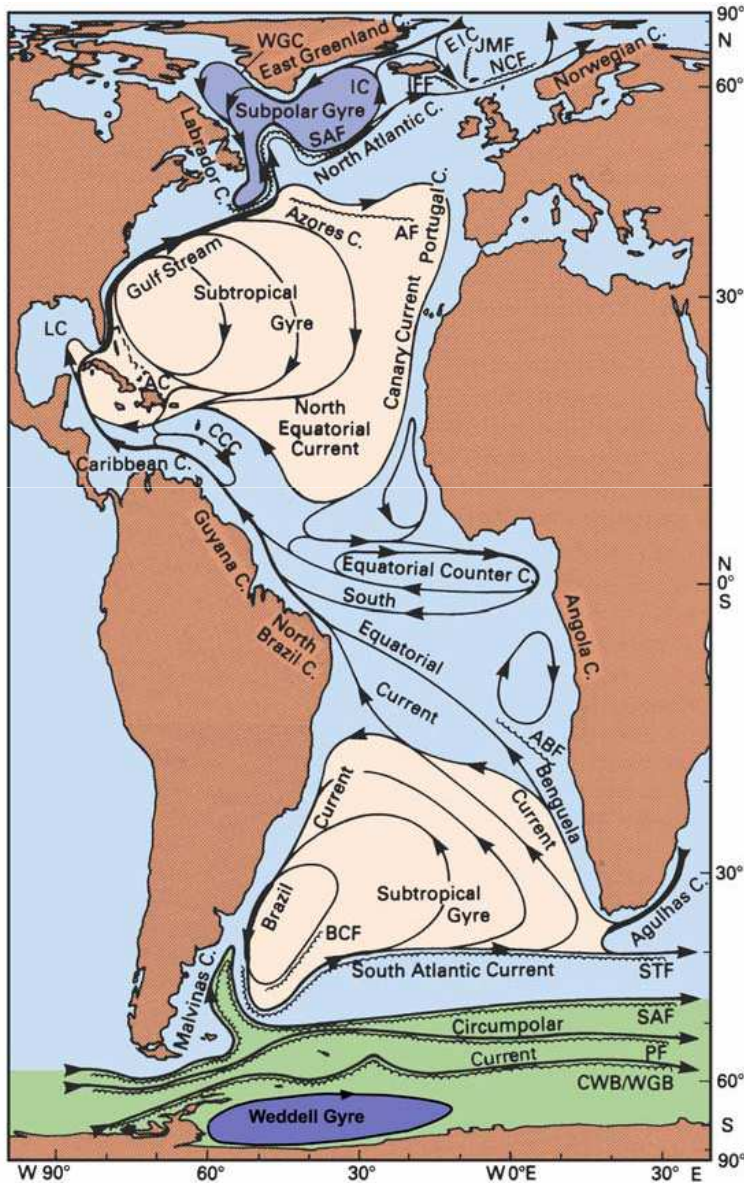


# Solución de Stommel tierra rotante “plano $\beta$ ”

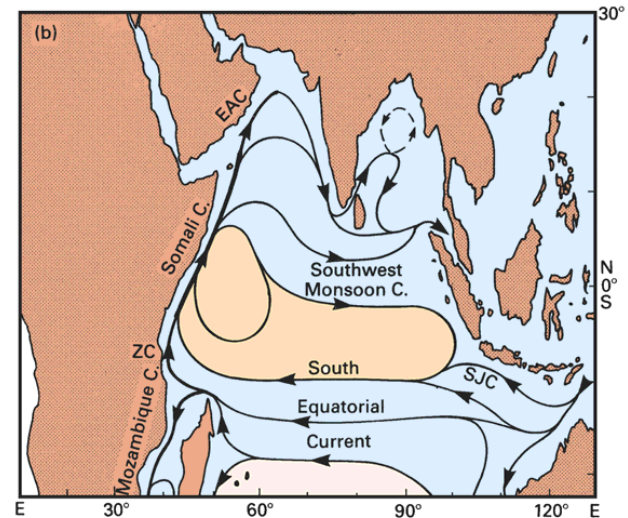


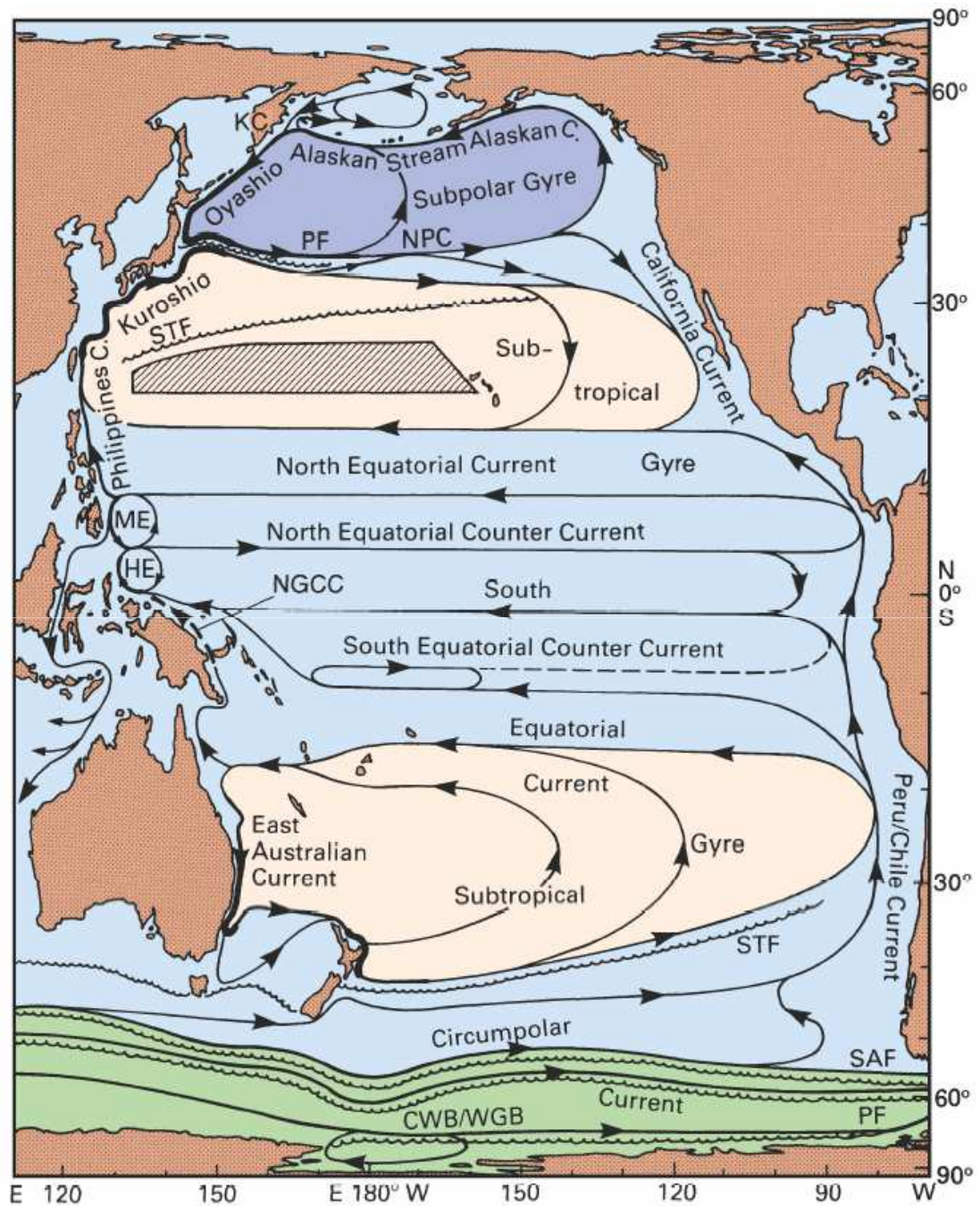
# Corrientes en la capa superior del océano

MAR-ABR



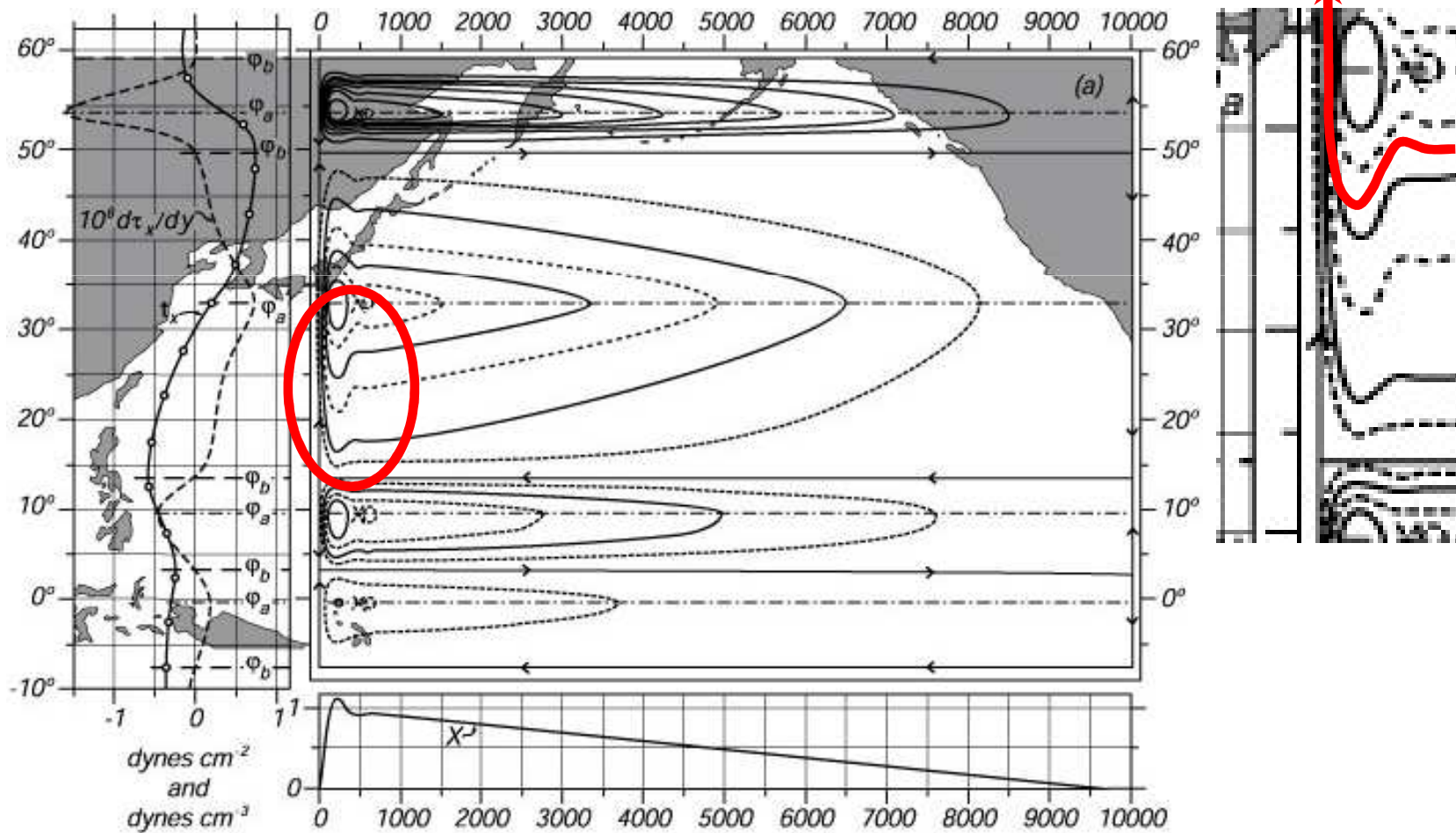
SEP-  
OCT





# Solución de Munk fricción turbulenta

$$A_H \partial^2 v / \partial y^2 \quad A_H \partial^2 v / \partial x^2$$



# El océano real

