

# Lecture 18 - oceans

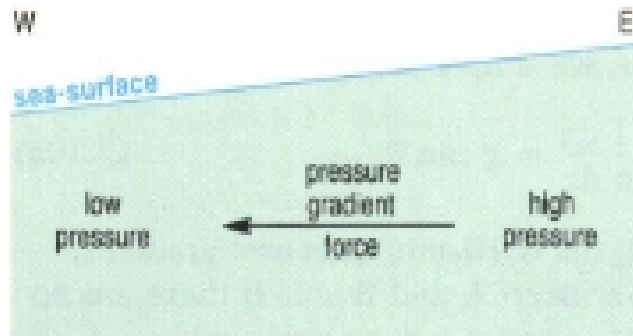
- Ocean gyres. Boundary currents (e.g. Gulf Stream)
- The thermohaline circulation

Textbook error : Fig.5-4(a) should be labeled “pressure gradient” where it incorrectly says “geostrophic current”

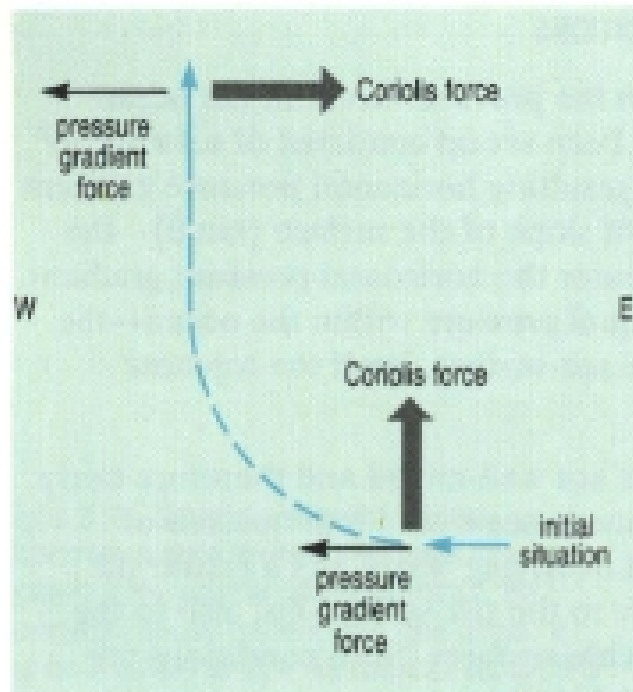
# Coriolis force, P gradient balance

## CONCEPT

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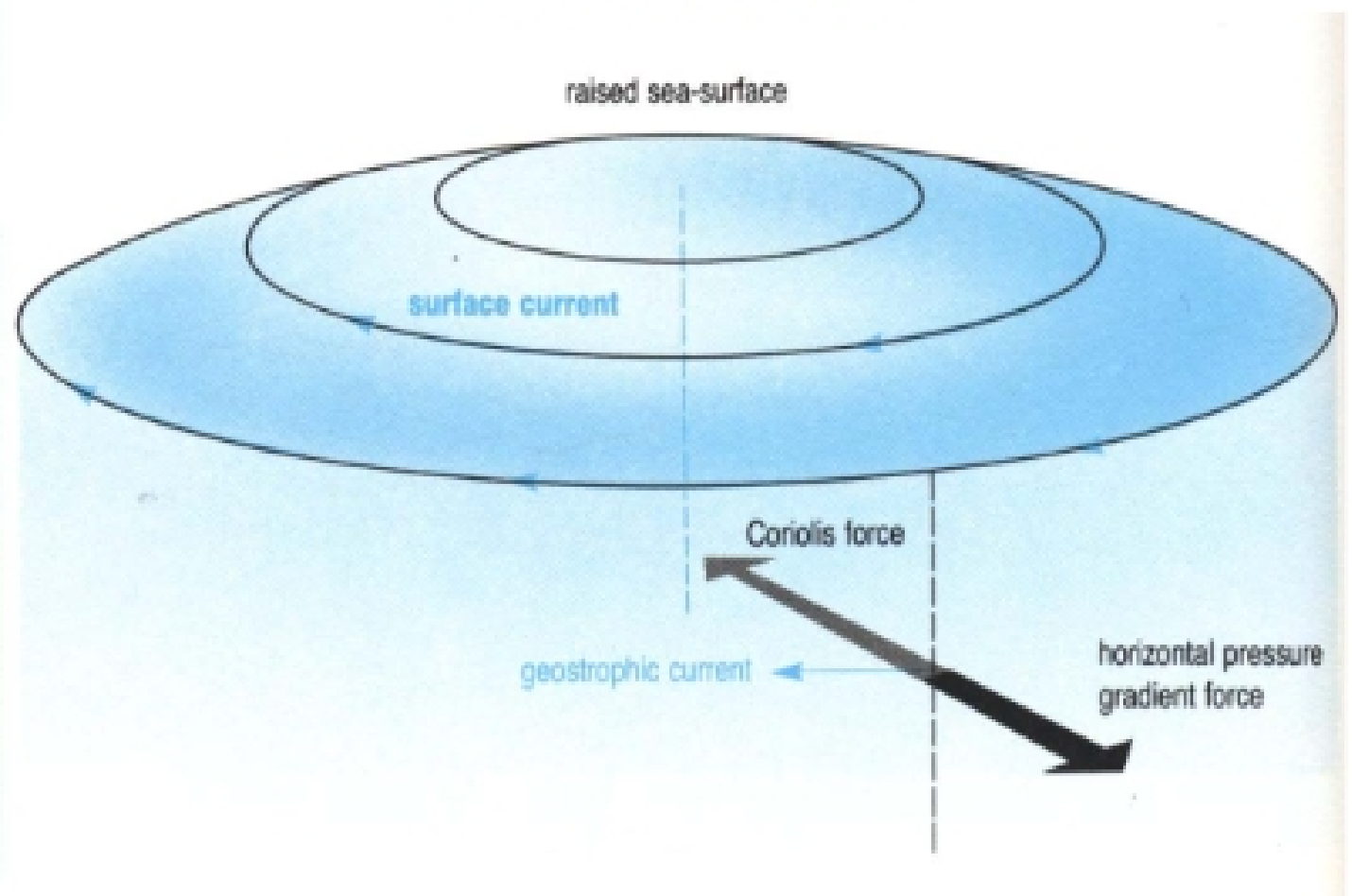


(a) CROSS-SECTION



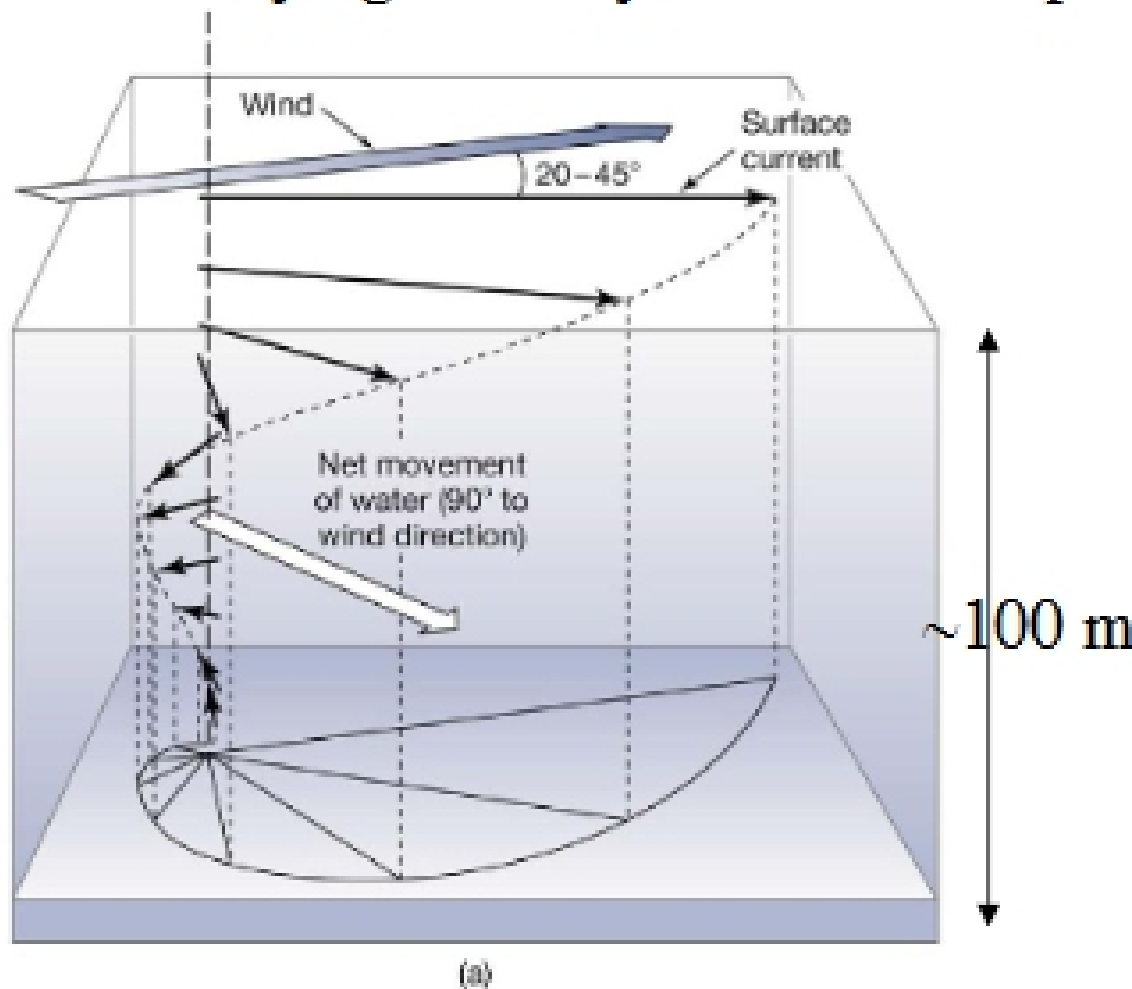
(b) PLAN

## RESULT in gyre:



# Flow at depth: Ekman spiral

Like a deck of cards: Touch the top and you can move underlying cards by frictional coupling.



Energy is used up by the water motion until none is left, so water speed gets smaller down the spiral

Water movement averaged over all layers is  $90^\circ$  to wind direction (this is NOT the direction of currents seen at the surface)