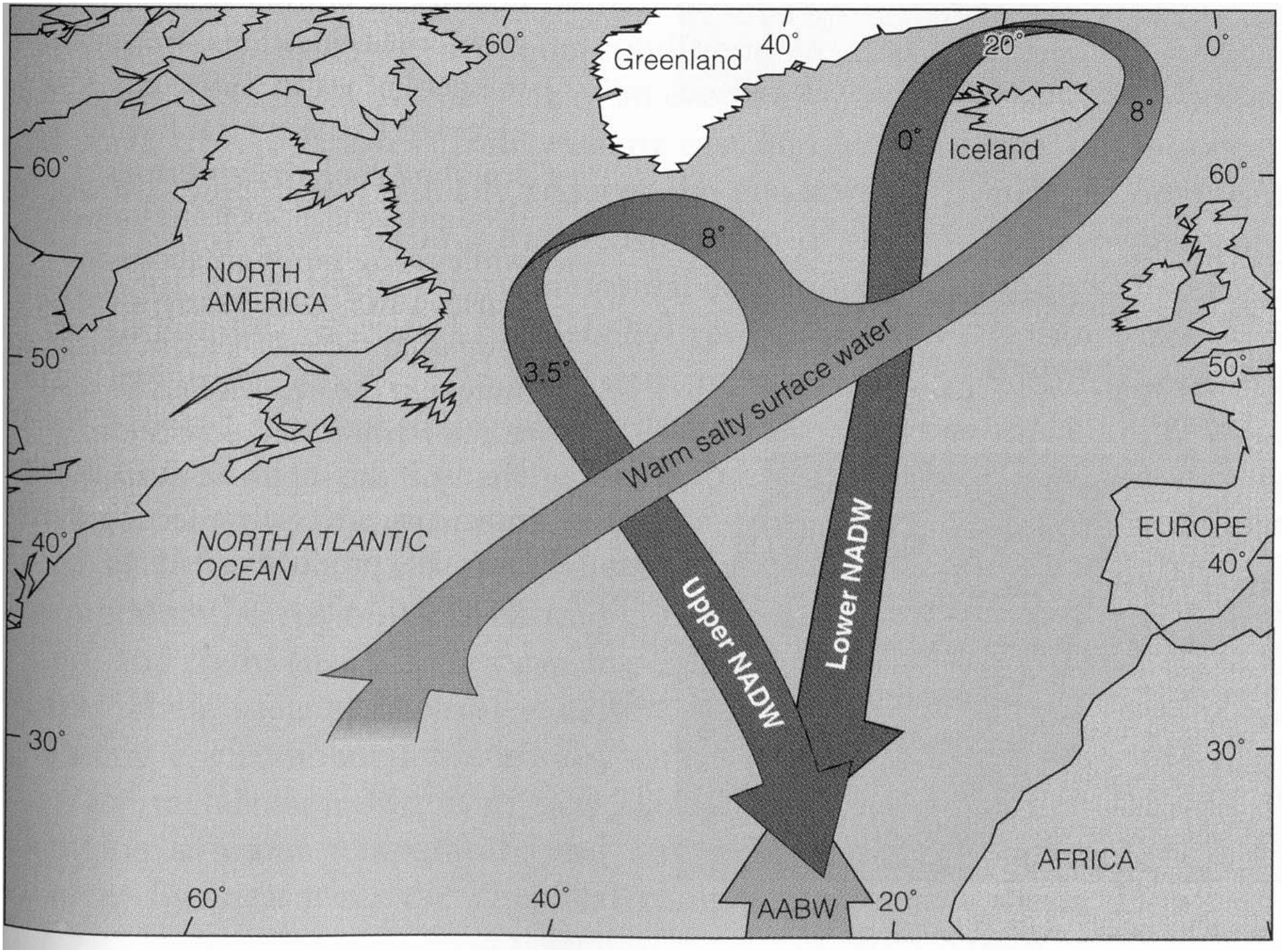
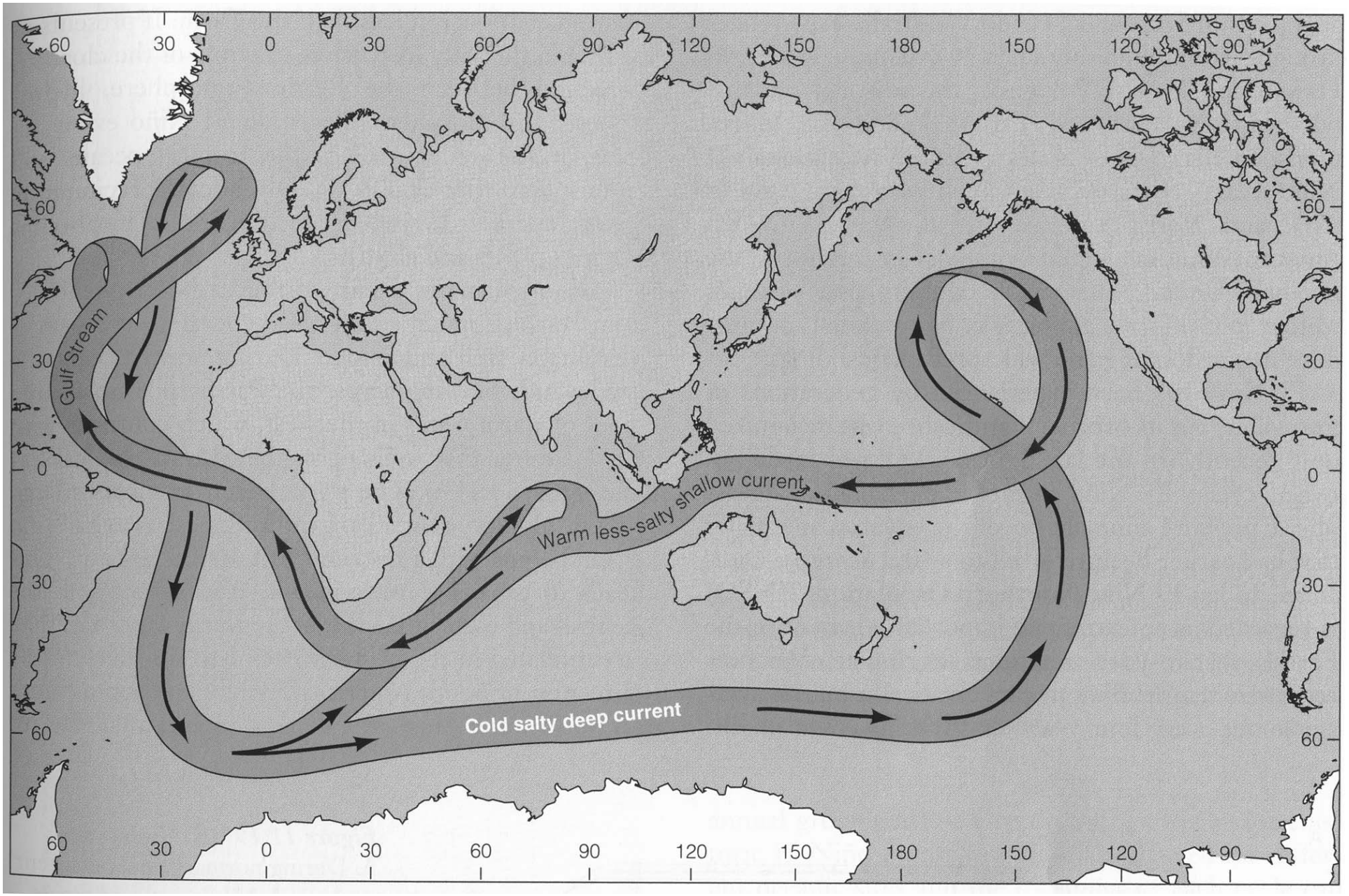
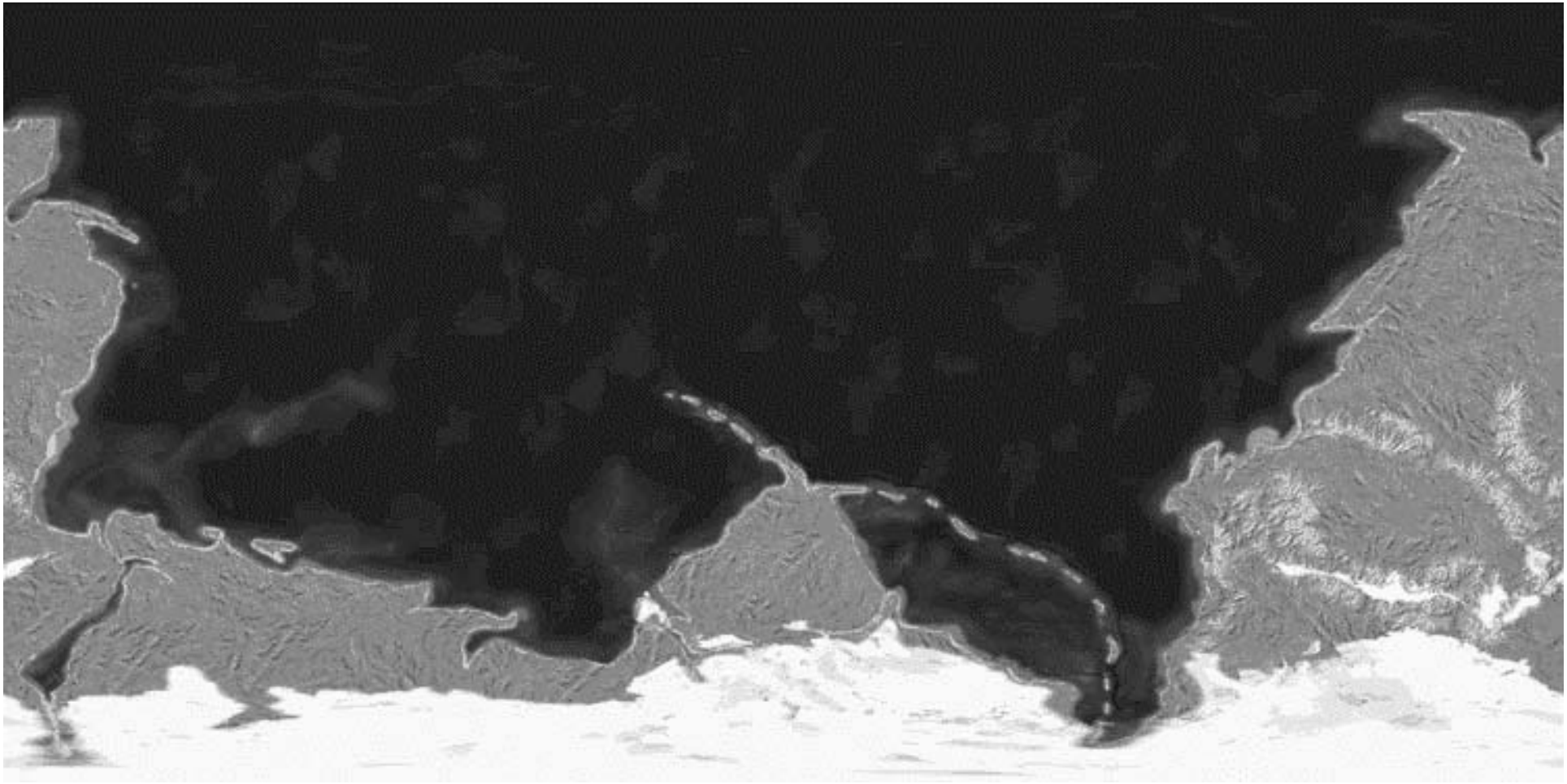
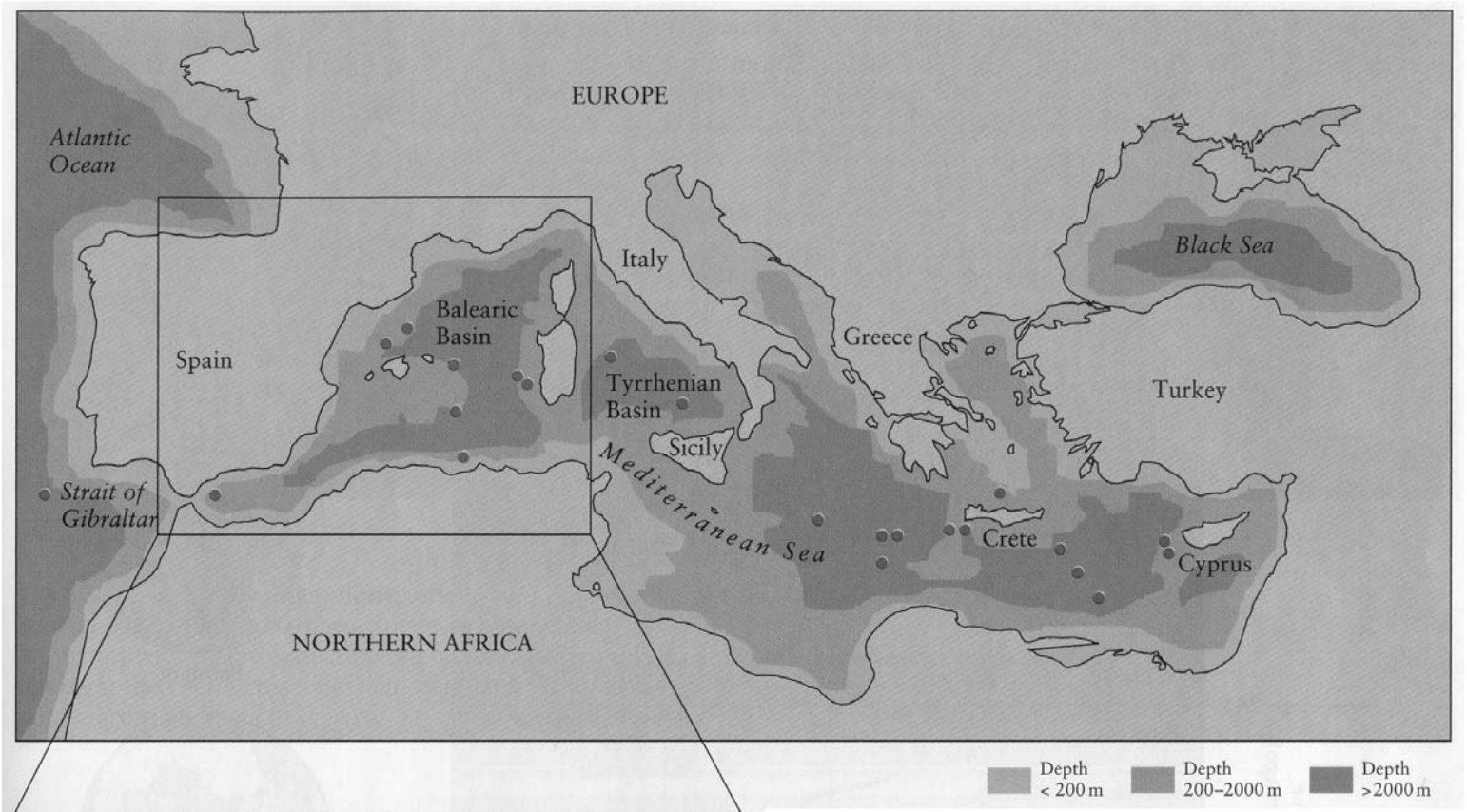
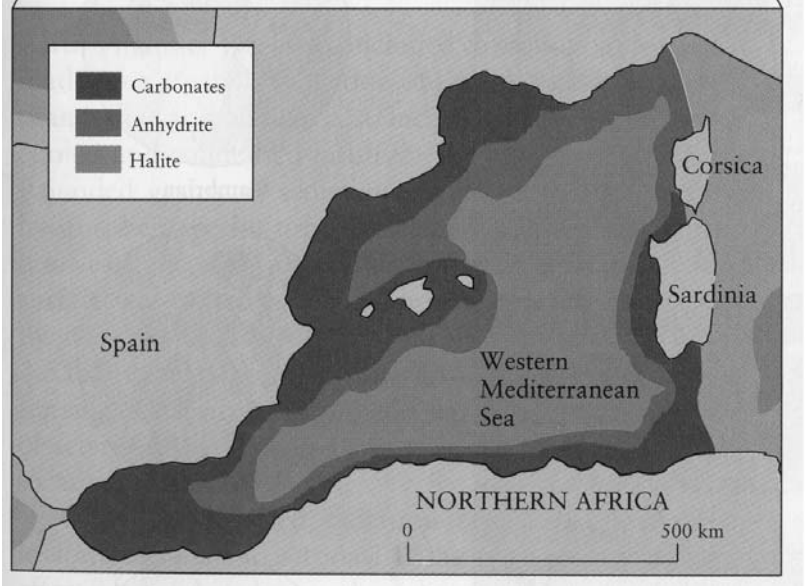

Greenland
Iceland
NORTH AMERICA
NORTH ATLANTIC OCEAN
EUROPE
AFRICA
AABW
Warm salty surface water
Upper NADW
Lower NADW
8°
3.5°
0°
8°
60°
40°
20°
0°
60°
50°
40°
30°
60°
40°
20°

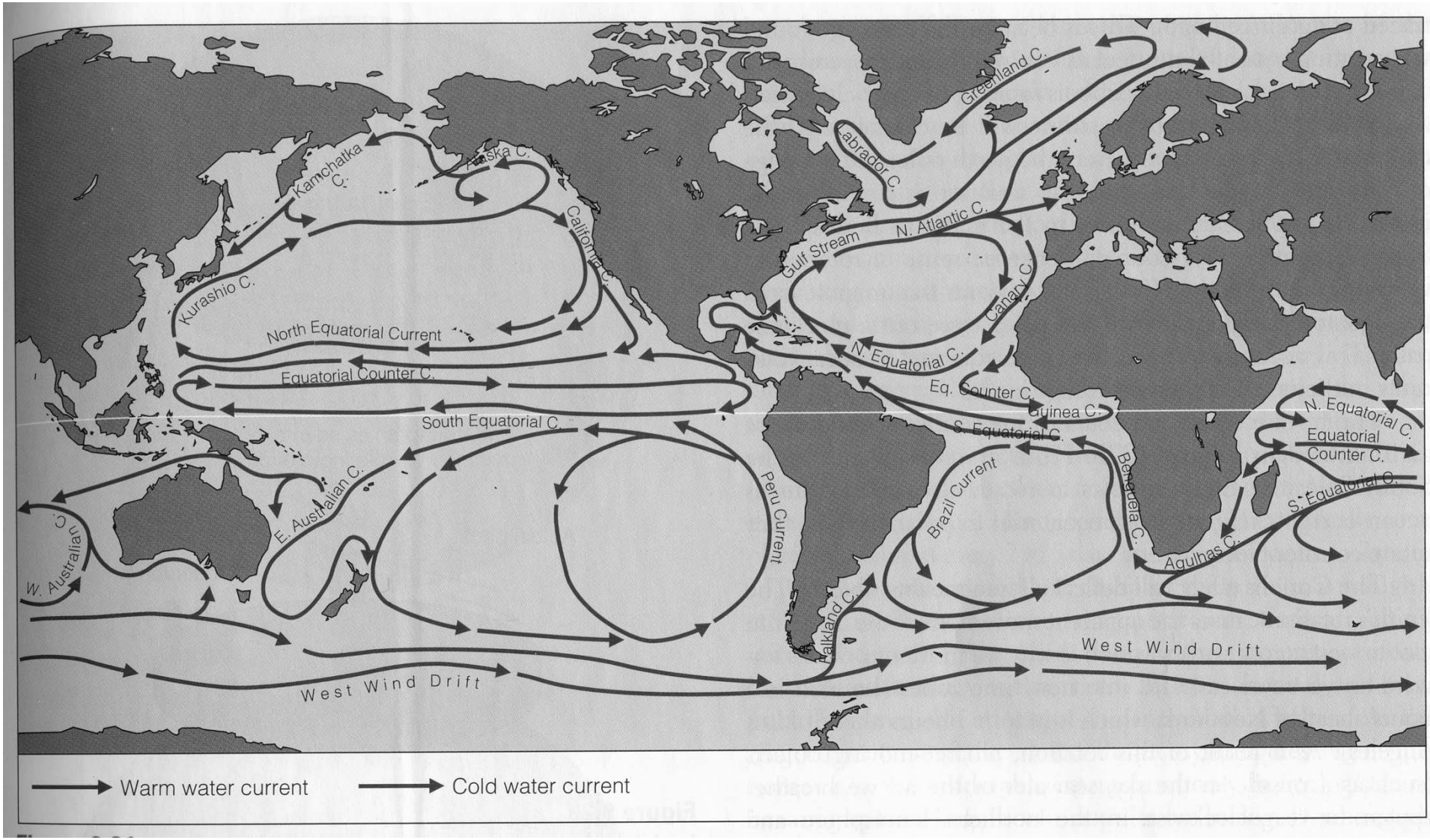

Gulf Stream
Warm less-salty shallow current
Cold salty deep current
60
30
0
30
60
90
120
150
180
150
120
90
60
30
0
30
60

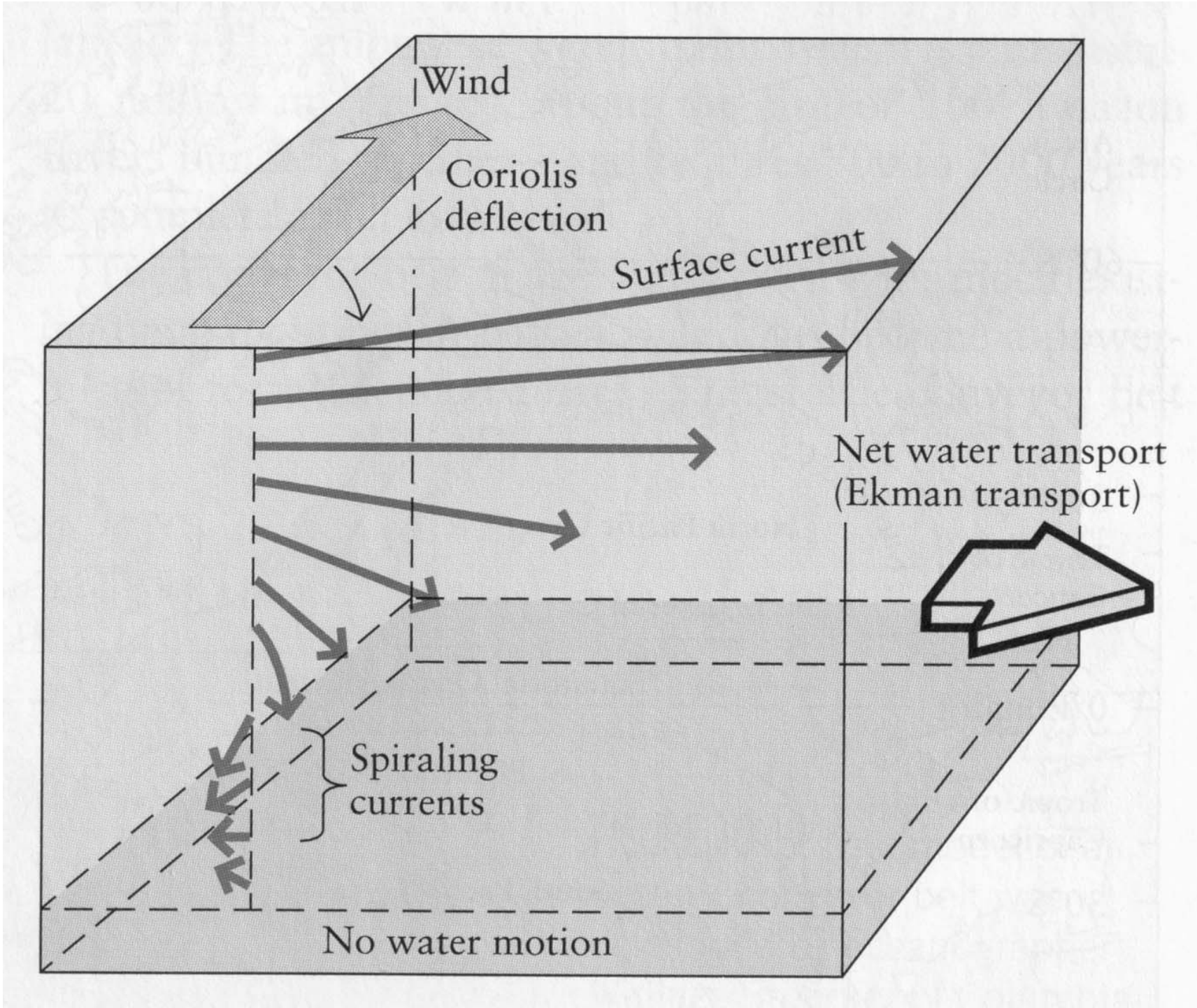


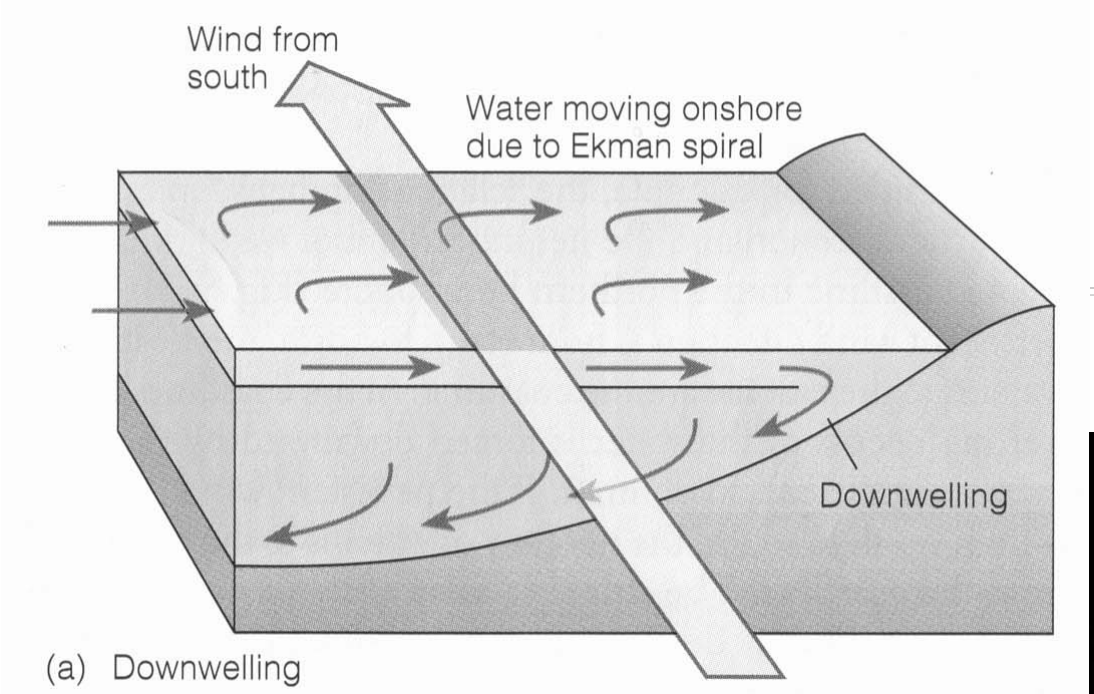
Images: R. Blakey


EUROPE
Atlantic Ocean
Italy
Black Sea
Balearic Basin
Spain
Greece
Tyrrhenian Basin
Turkey
Sicily
Strait of Gibraltar
Mediterranean Sea
Crete
Cyprus
NORTHERN AFRICA
Depth < 200 m
Depth 200–2000 m
Depth >2000 m

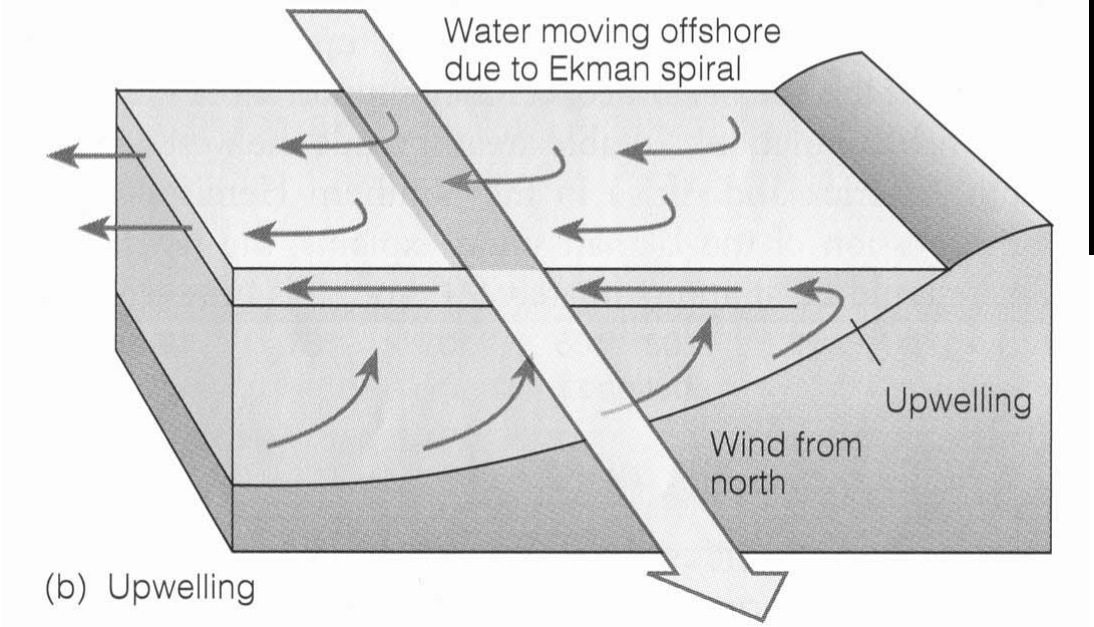

Carbonates
Anhydrite
Halite
Corsica
Sardinia
Spain
Western Mediterranean Sea
NORTHERN AFRICA
0
500 km


Greenland C.
Labrador C.
Kamchatka C.
Alaska C.
California C.
Kurashio C.
Gulf Stream
N. Atlantic C.
Canary C.
North Equatorial Current
N. Equatorial C.
Equatorial Counter C.
Eq. Counter C.
Guinea C.
South Equatorial C.
S. Equatorial C.
N. Equatorial C.
Equatorial Counter C.
S. Equatorial C.
E. Australian C.
W. Australian C.
Peru Current
Brazil Current
Benguela C.
Agulhas C.
Falkland C.
West Wind Drift
West Wind Drift
Warm water current
Cold water current

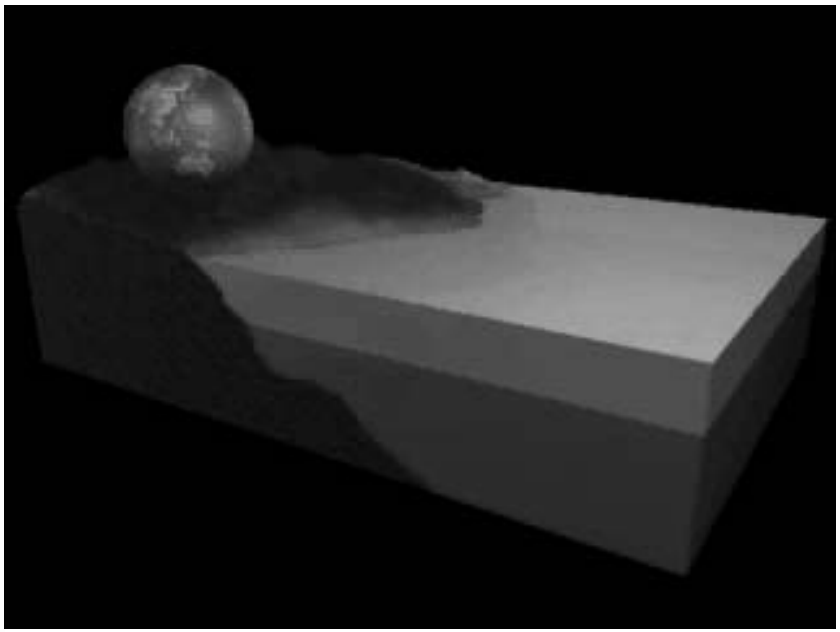

Wind
Coriolis
deflection
Surface current
Net water transport
(Ekman transport)
Spiraling
currents
No water motion



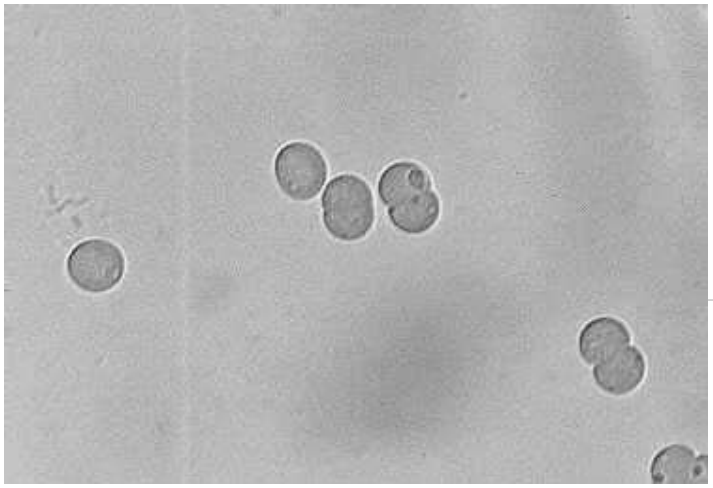
(a) Downwelling

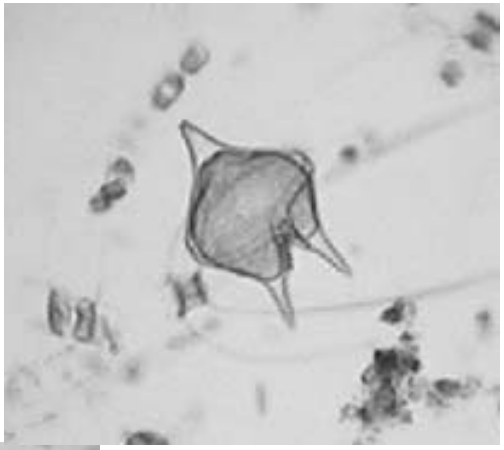


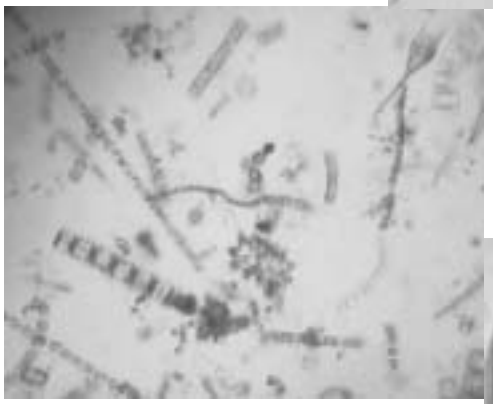
(b) Upwelling

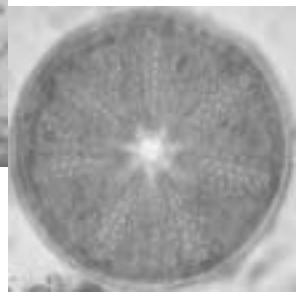


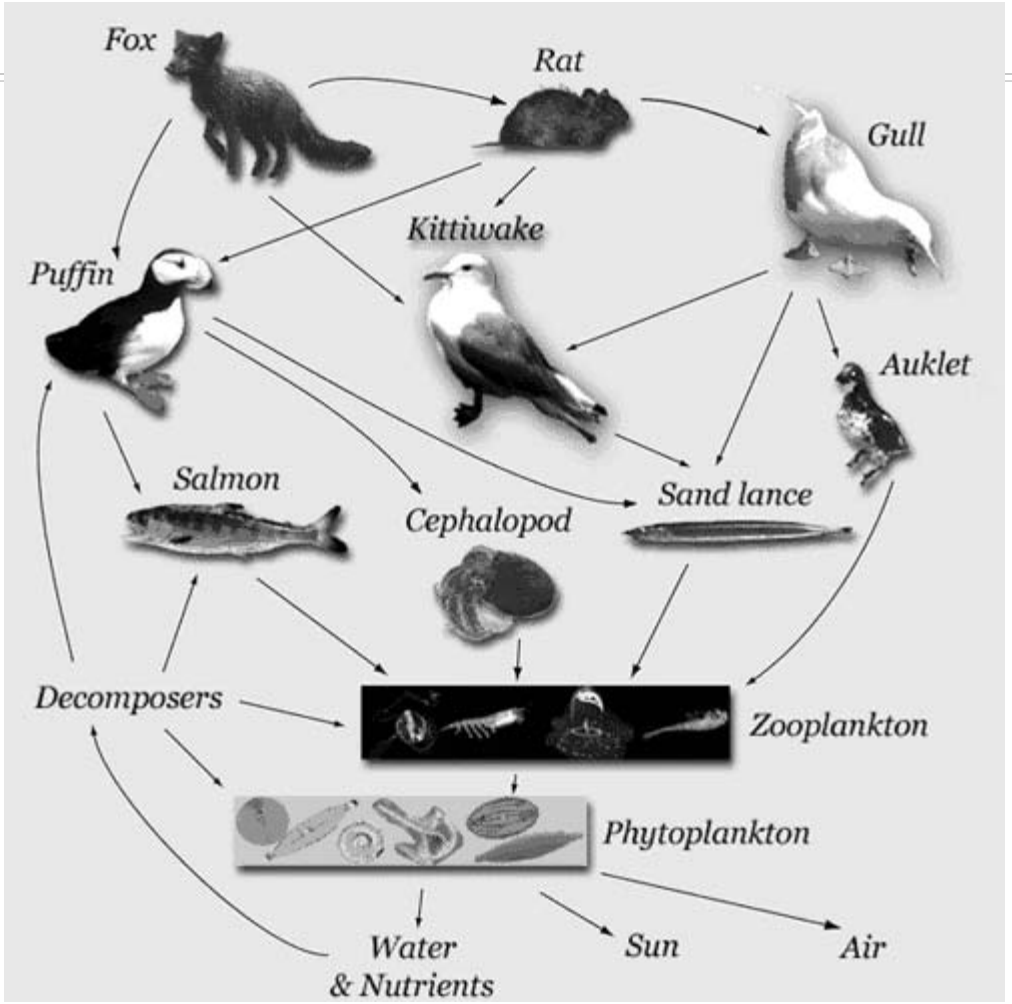
oceanusmag.whoi.edu/v43n1/brink-en2.html

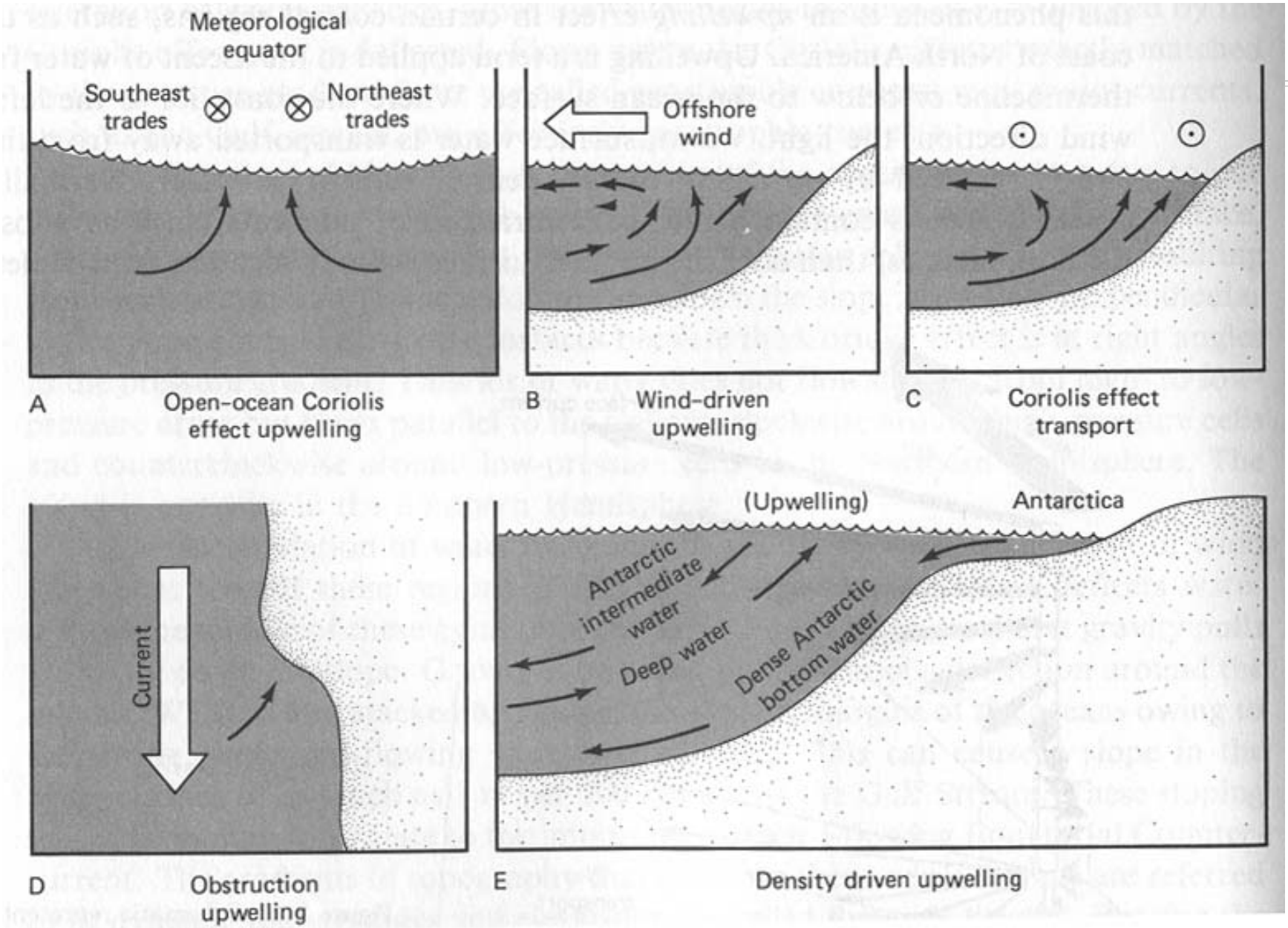


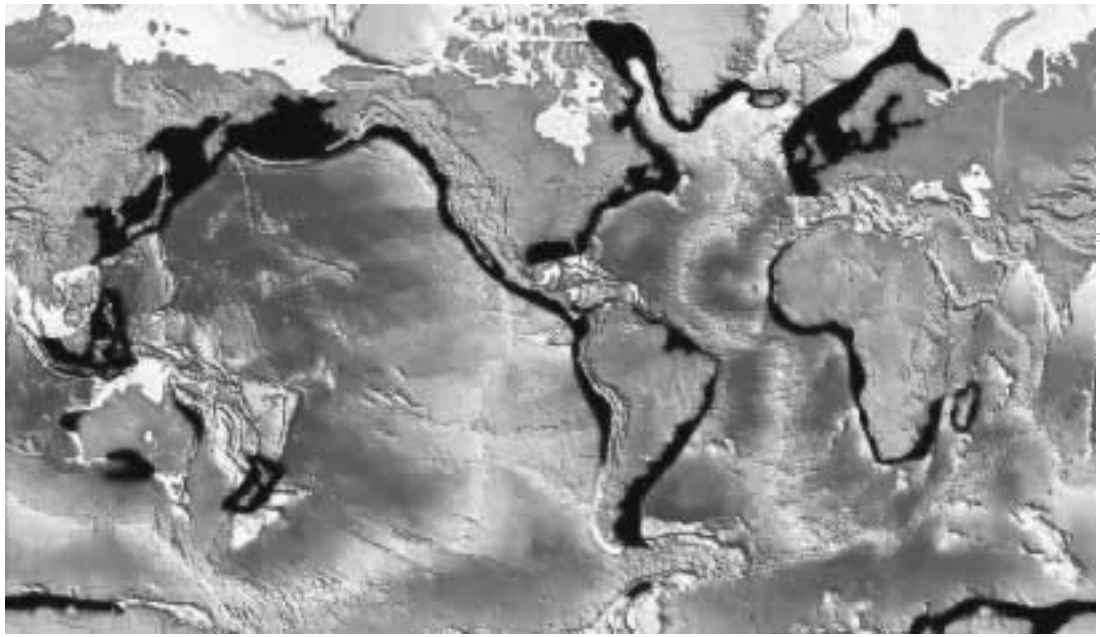


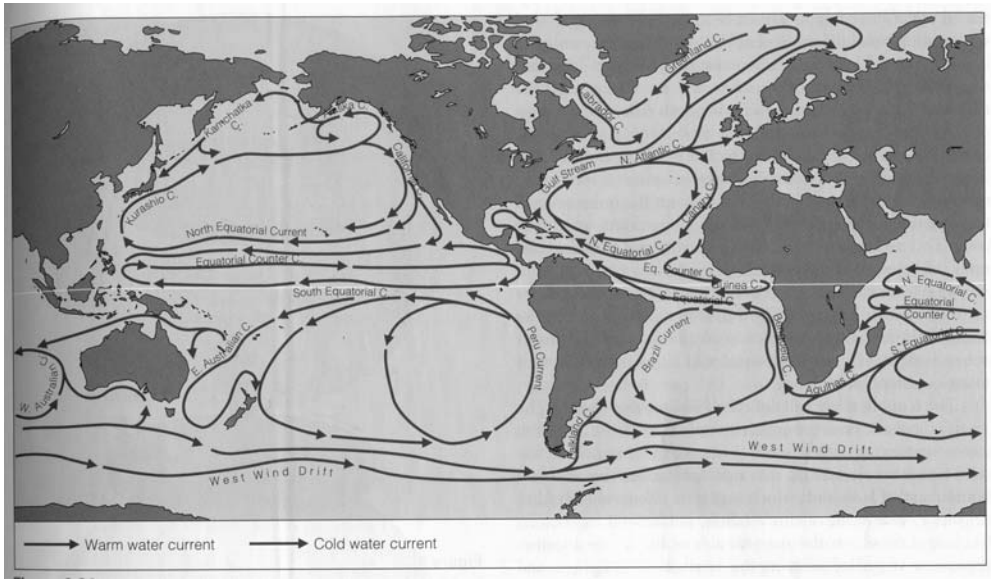


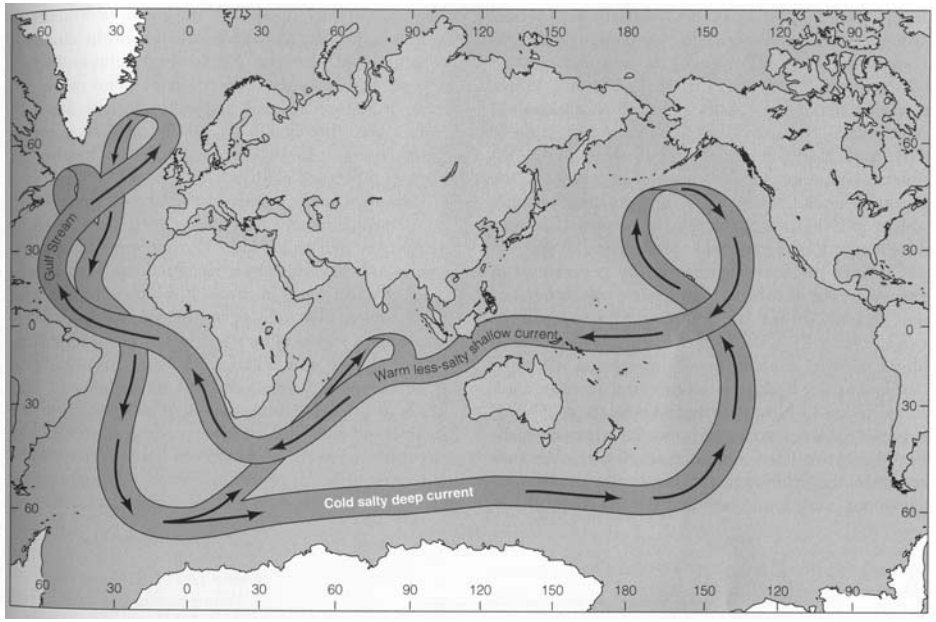



Fox
Rat
Gull
Kittiwake
Puffin
Auklet
Salmon
Cephalopod
Sand lance
Decomposers
Zooplankton
Phytoplankton
Water
& Nutrients
Sun
Air

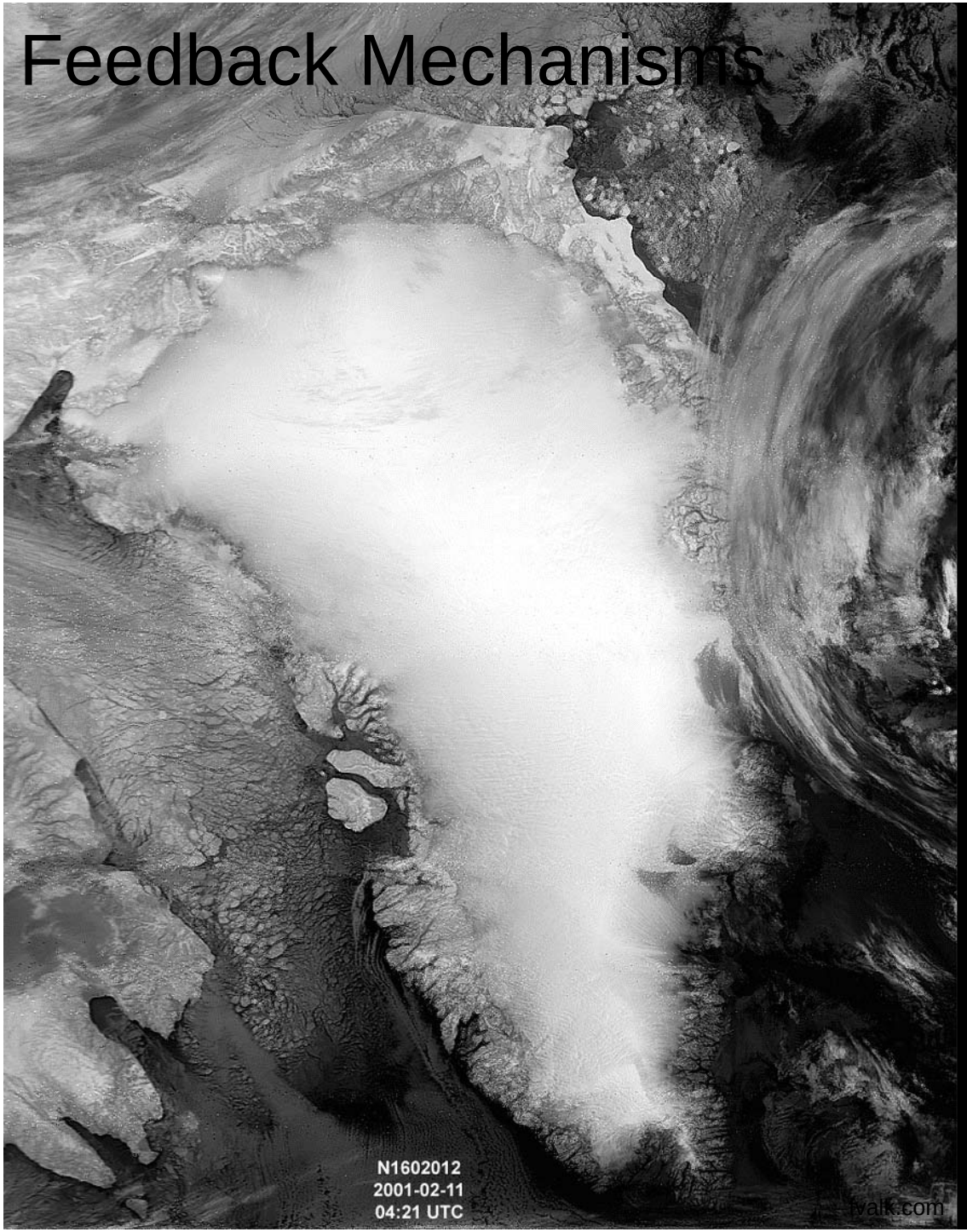

Meteorological equator
Southeast trades
Northeast trades
Offshore wind
A
Open-ocean Coriolis effect upwelling
B
Wind-driven upwelling
C
Coriolis effect transport
Current
D
Obstruction upwelling
(Upwelling)
Antarctica
Antarctic intermediate water
Deep water
Dense Antarctic bottom water
E
Density driven upwelling




Kuroshio C.
Kamchatka C.
California C.
Oyashio C.
Gulf Stream
N. Atlantic C.
Greenland C.
Canary C.
North Equatorial Current
Equatorial Counter C.
South Equatorial C.
E. Australian C.
W. Australian C.
Peru Current
Brazil Current
Benguela C.
Agulhas C.
Eq. Counter C.
Guinea C.
N. Equatorial C.
Equatorial Counter C.
S. Equatorial C.
West Wind Drift
West Wind Drift
Warm water current
Cold water current


Gulf Stream
Warm less-salty shallow current
Cold salty deep current

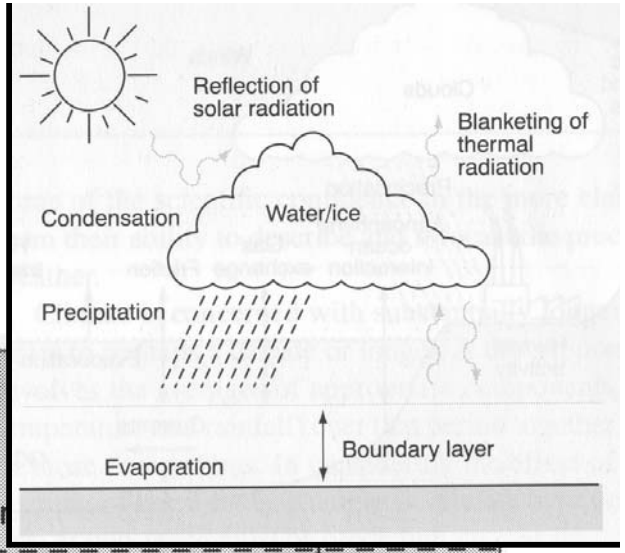
Feedback Mechanisms



Southwest Greenland
nationalgeographic.com

Ivalk.com

H_20 Vapor



Solar (short wave) radiation

ATMOSPHERE

Stratosphere

Troposphere

Volcanic gases and particles

Clouds

Winds

Atmosphere-land interaction

Run-off

Snow + ice

Precipitation

Atmosphere/ ocean interaction

Gas exchange

Friction

Heat transfer

Thermal radiation

Atmosphere Ice interaction

Human activity

Evaporation

Floating ice

Land

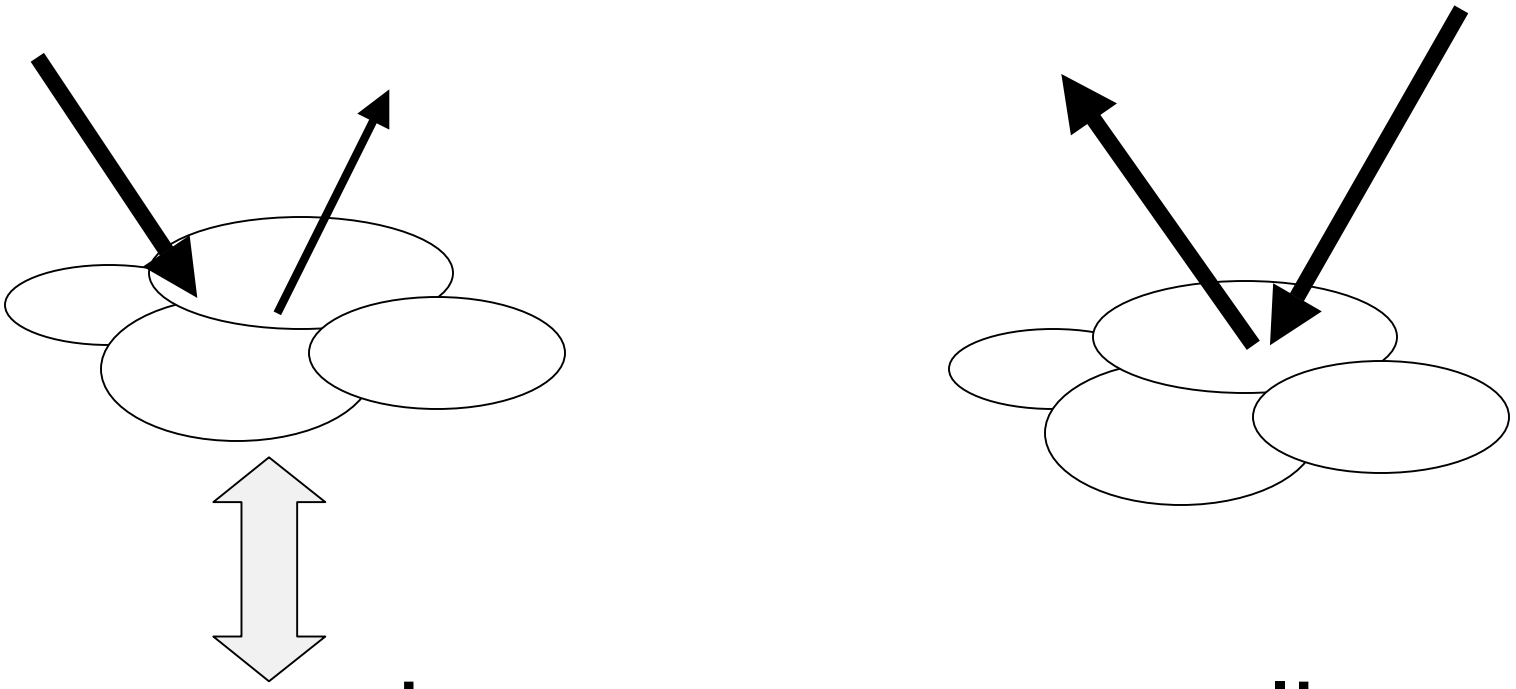
Currents

OCEAN

Ice-ocean interaction

Aerosols: Atmospheric turbidity

greenhouse gas / reflector



warming

cooling