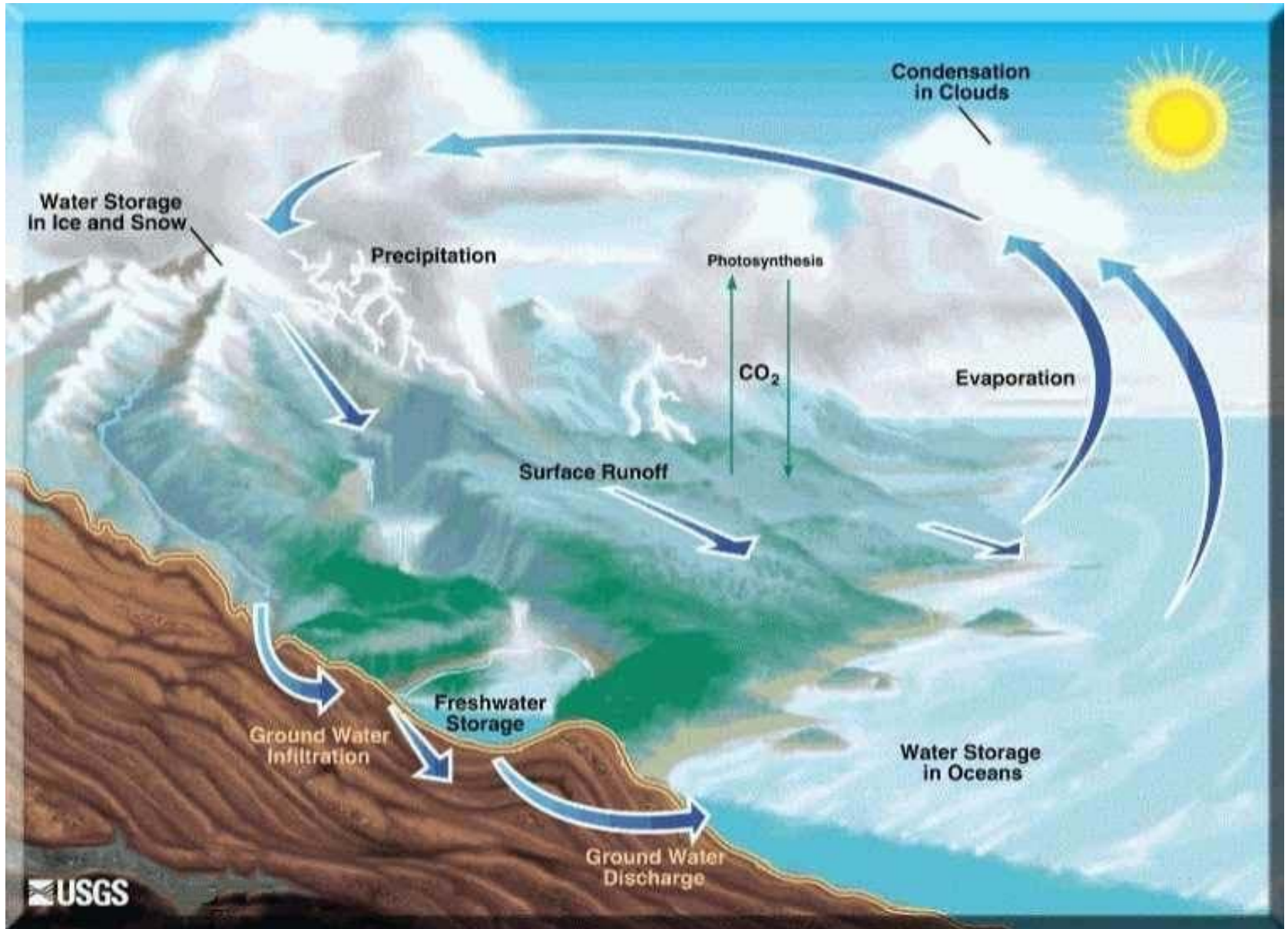


Water

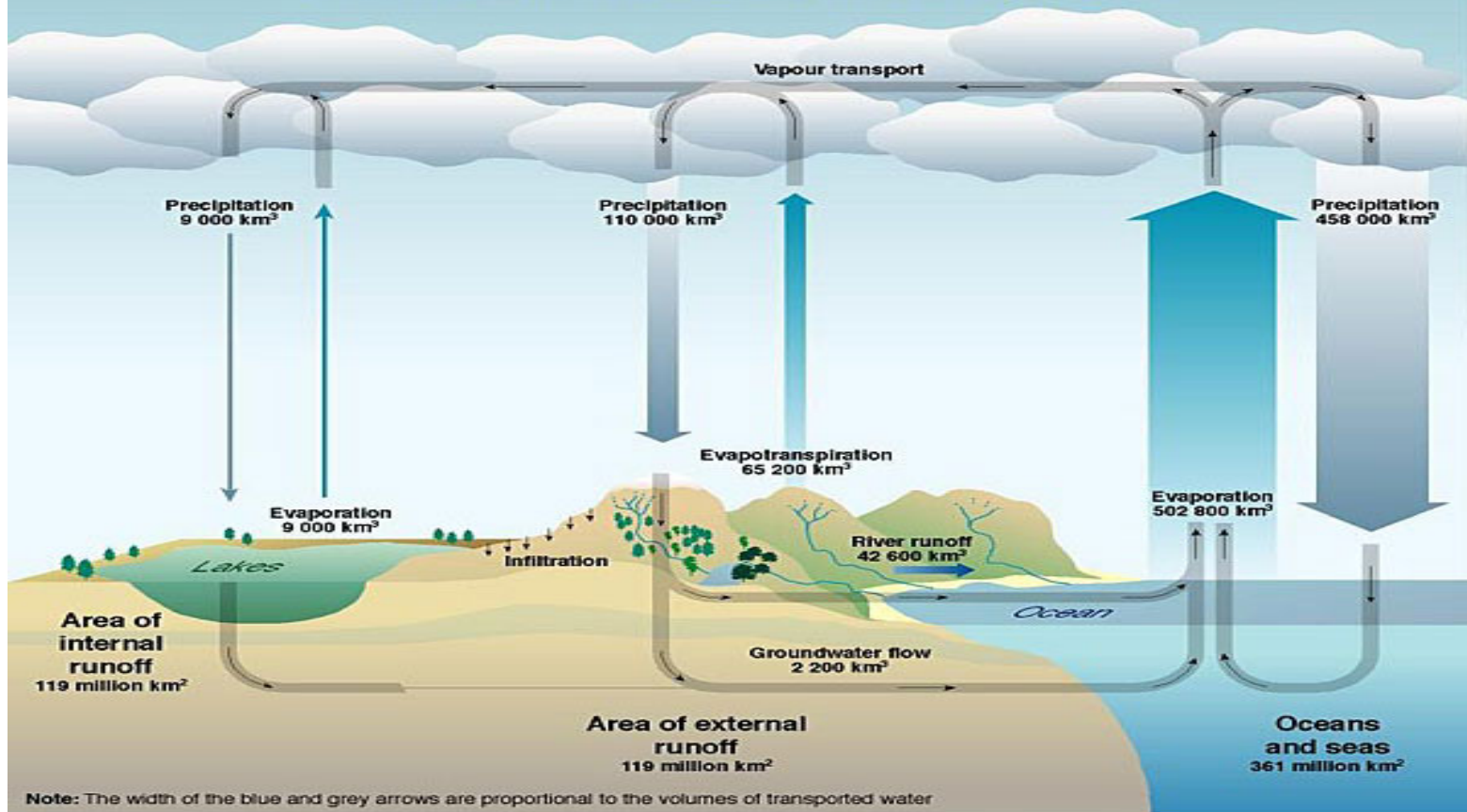
- Occurs on the surface and underground in liquid or frozen forms as well as gaseous states in the atmosphere
- Mainly found as saltwater in seas and oceans
- Freshwater found mainly in rivers, lakes, ice caps and underground aquifers

Water Cycle

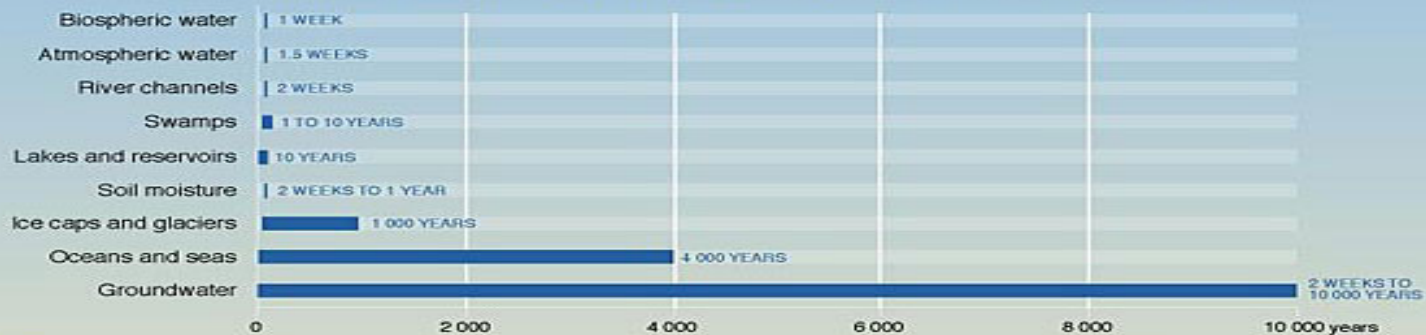


The World's Water Cycle

Global Precipitation, Evaporation, Evapotranspiration and Runoff



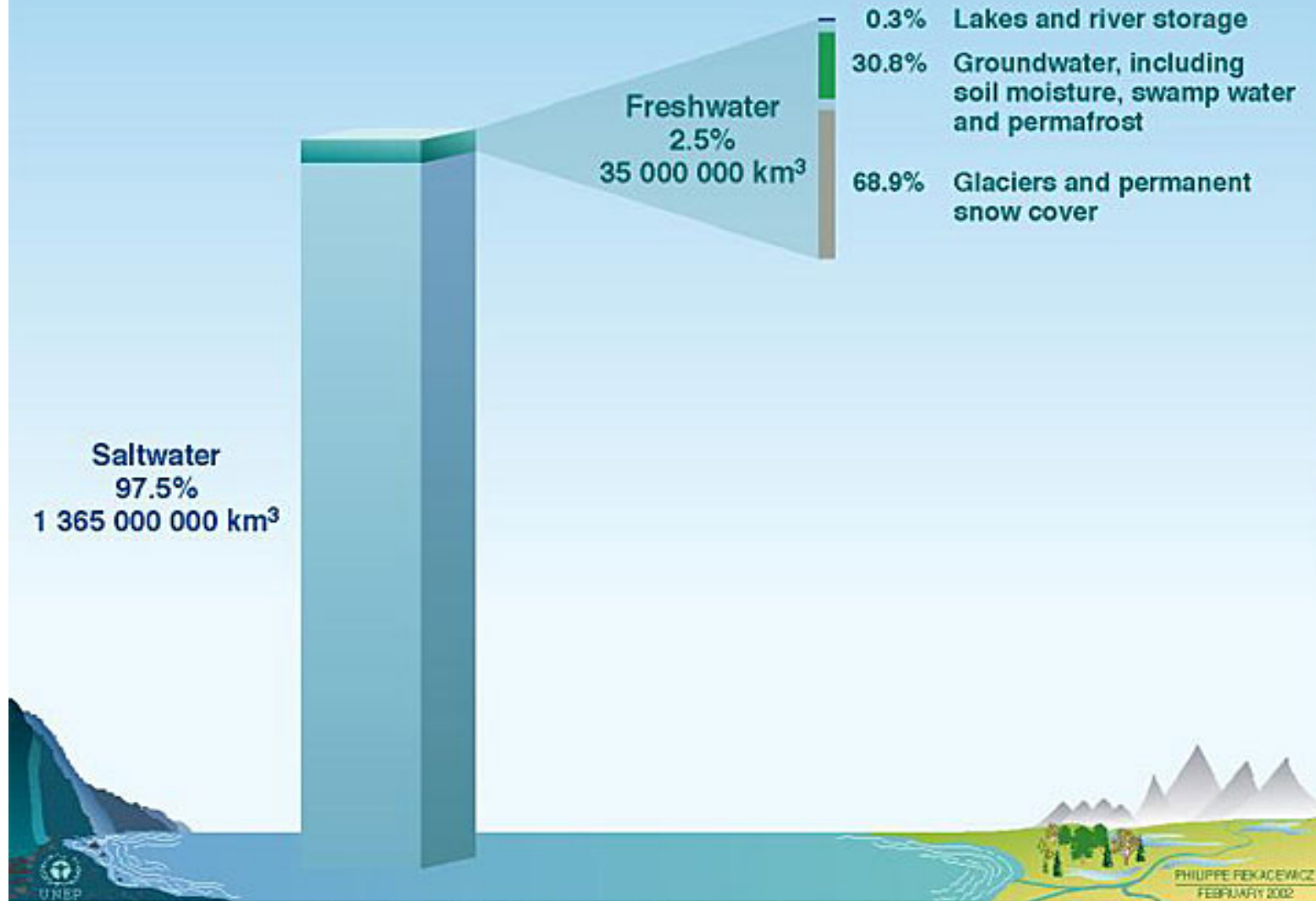
Estimated Residence Times of the World's Water Resources



PHILIPPE REKAJCWICZ
ARVILSOE

A World of Salt

Total Global Saltwater and Freshwater Estimates



Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999.

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FEBRUARY 2002

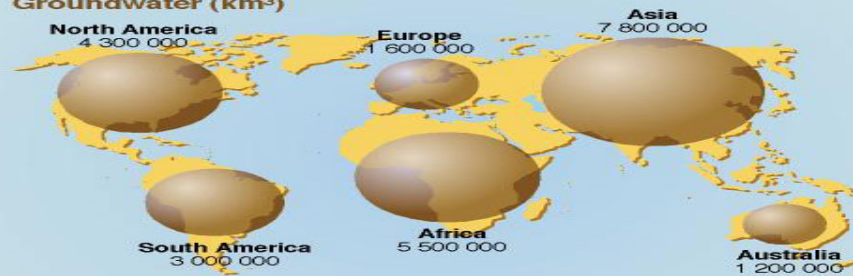
Global Freshwater Resources

Quantity and Distribution by Region

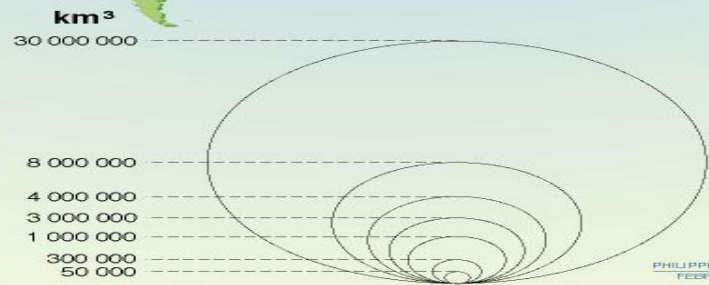
Glaciers and permanent ice caps (km³)



Groundwater (km³)



Wetlands, large lakes, reservoirs and rivers (km³)



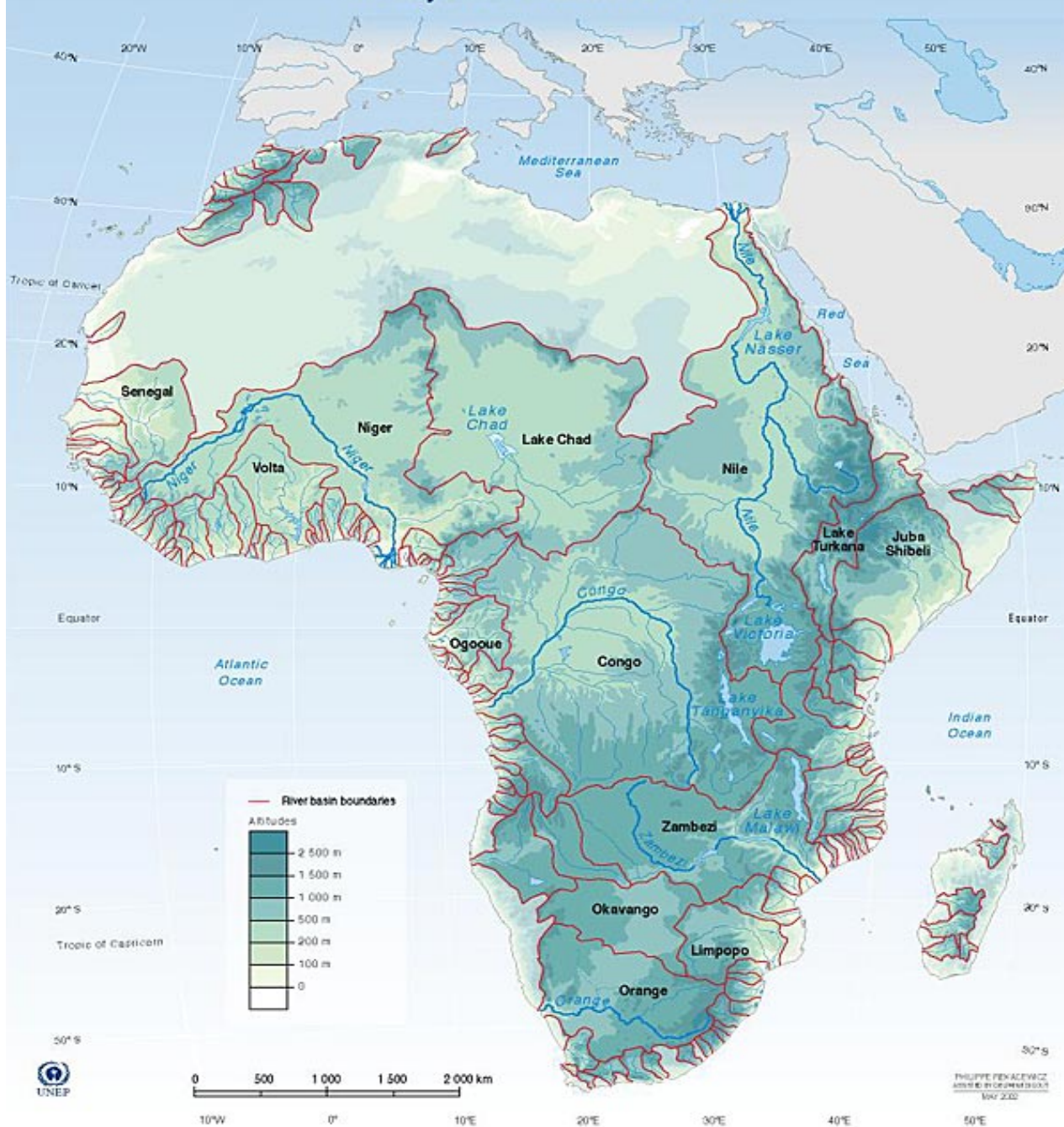
PHILIPPE PERKACIEWICZ
FEBRUARY 2002

Note: Estimates refer to standing volumes of freshwater.
 Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999; World Meteorological Organisation (WMO); International Council of Scientific Unions (ICSU); World Glacier Monitoring Service (WGMS); United States Geological Survey (USGS).

Major Watersheds

A watershed is an area that collects precipitation and feeds rivers, lakes, groundwater and wetlands

The Major River Basins of Africa



Source: Aaron T. Wolf et al., 1999; Revenga et al., *Watersheds of the World*, World Resources Institute (WRI), Washington DC, 1998; Philippe Rekacewicz, *Atlas de poche*, Livre de poche, Librairie générale française, Paris, 1996 (revised in 2001).

Freshwater lake and its major source

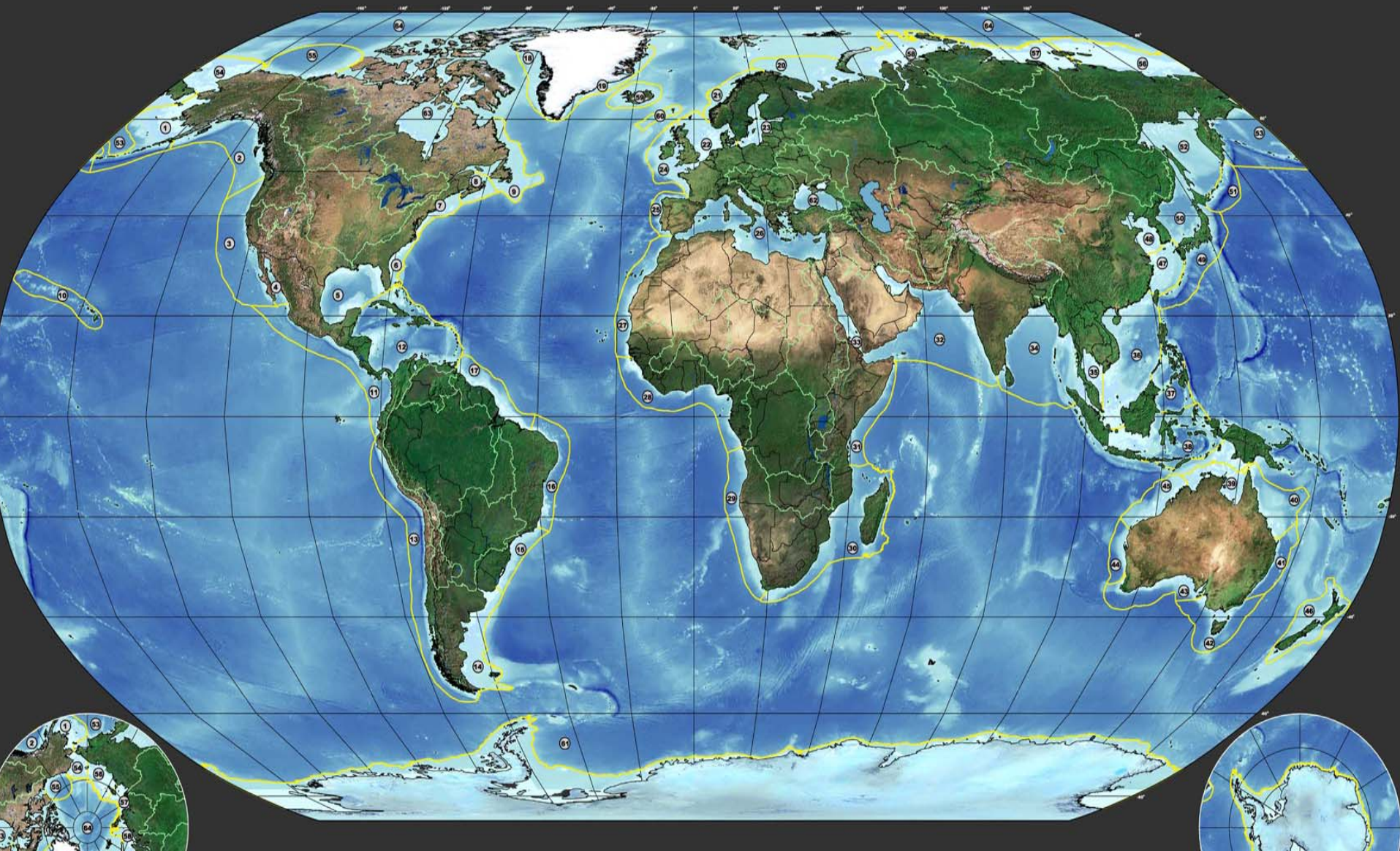


Seas and Oceans

Provides:

- medium for aquatic organisms to live
- important substances – salt, water, calcium, iodine, fluorine
- climate regulation – temperature, storms
- transportation links between land masses
- Food
- Energy
- Recreation
- Building materials
- Medicines

Large Marine Ecosystems of the World and Linked Watersheds

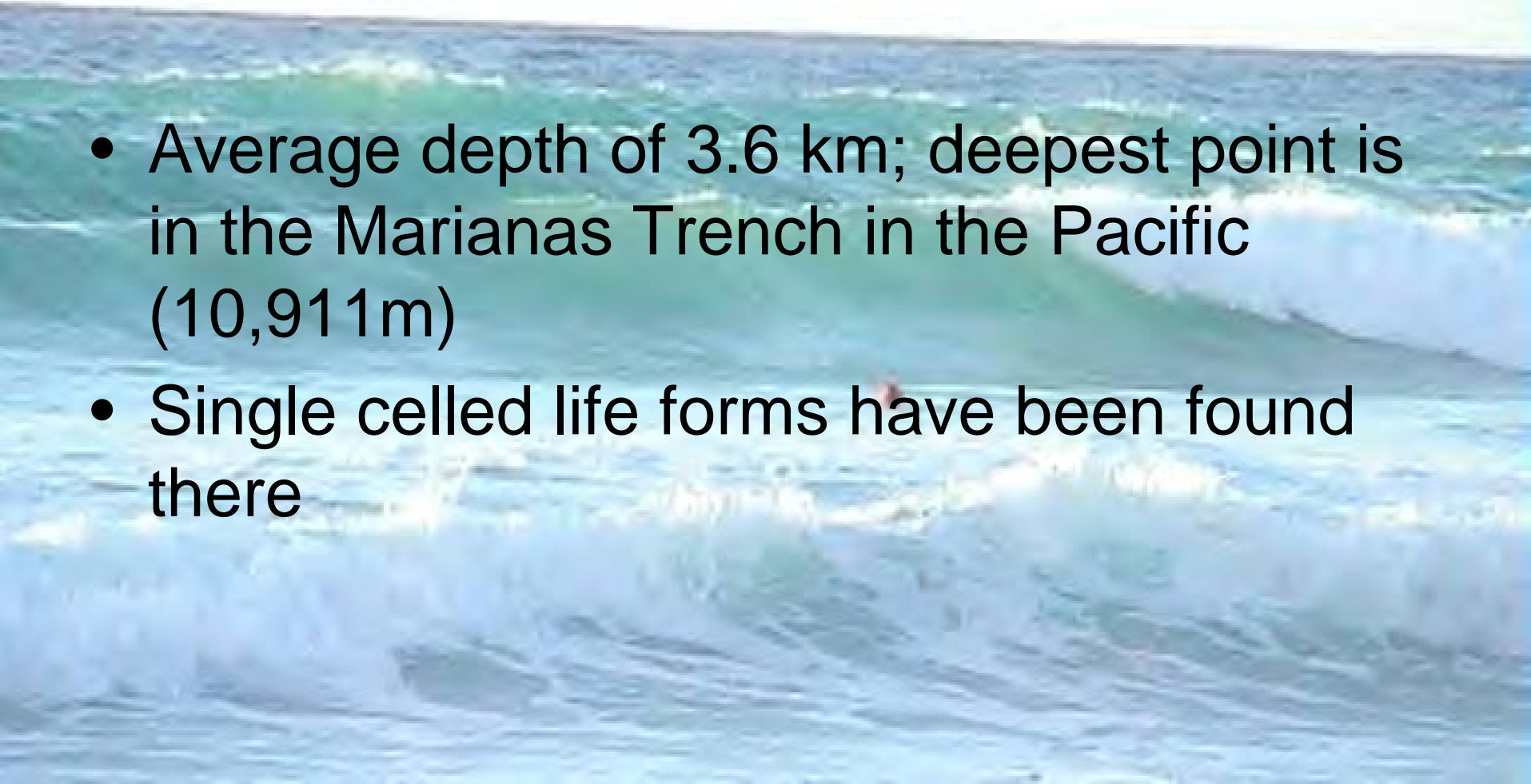


Seas



The Marine Environment

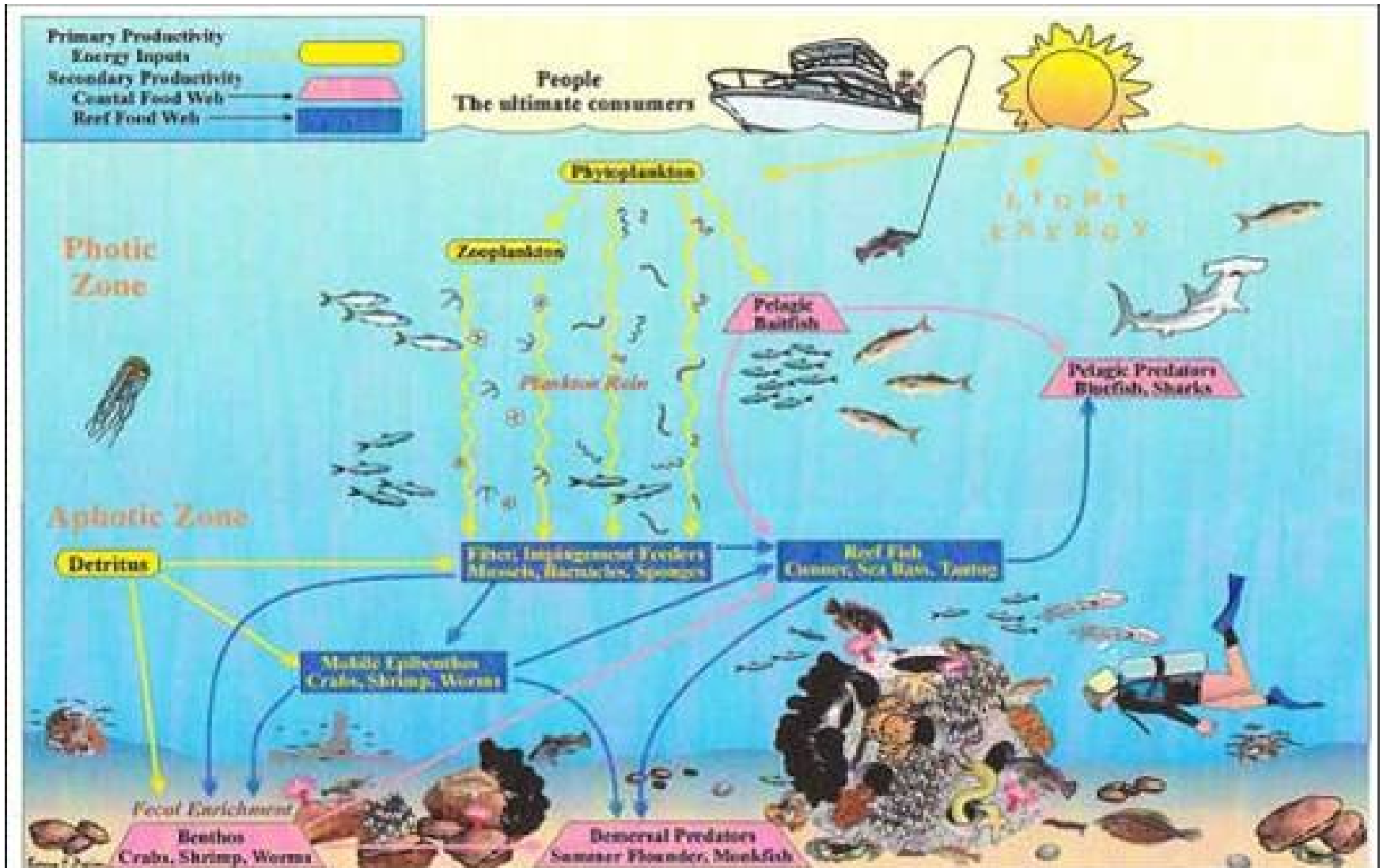
- Occupies over 70% of the earth's surface;
- Average depth of 3.6 km; deepest point is in the Marianas Trench in the Pacific (10,911m)
- Single celled life forms have been found there



- The Oceans form a global conveyor belt – warm surface waters flow from the tropics to the poles and deep cold water from the poles toward the tropics

El Niño –winds and ocean currents reverse causing devastating effects on weather and fisheries (Peru)

Marine Life Cycle



The basic components and pathways of energy transfer in a NJ reef food web.

Wetlands

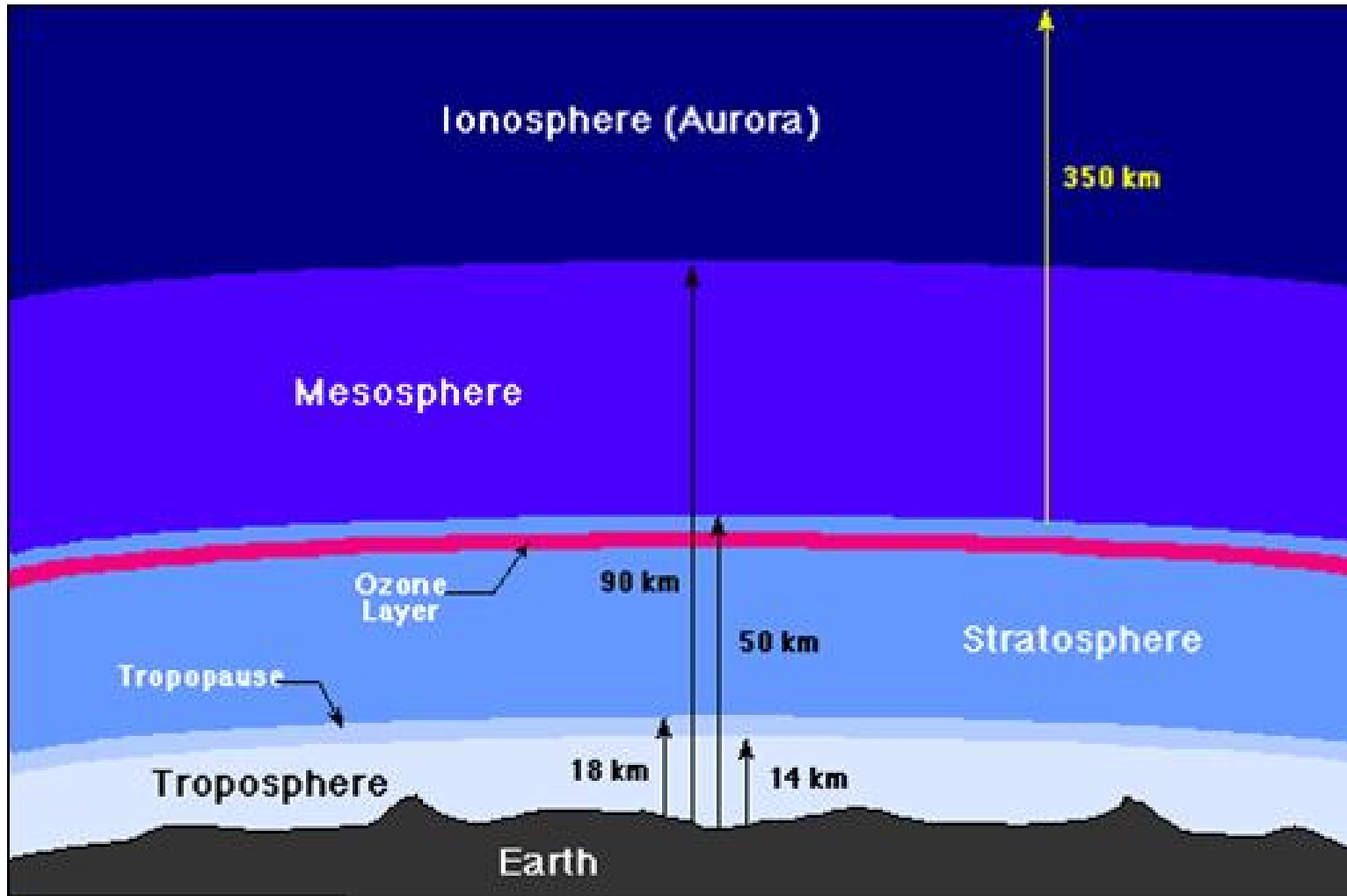
- Wide range of inland and coastal areas that include marshes, swamp forests, reed beds
- Characterised by high water table, water-loving plants (hydrophytes)
- High biodiversity
- Generate organic matter (important in food chain)
- Act as a water filter
- Breeding sites – birds, fish, aquatic animals
- Sponge – flood regulator

Air

Provides:

- mixture of gases that enables life – oxygen (20%), hydrogen, carbon dioxide, nitrogen (78%), etc.
- shields earth from ultraviolet radiation
- climate – temperature, weather

ATMOSPHERE



Air - Atmosphere covering the earth

The **atmosphere** consists of layers:

- **Trophosphere** – Life exists here; weather occurs here
- **Stratosphere** – ozone layer; air flows horizontally; absorbs ultraviolet radiation from the sun
- **Mesosphere** – temperature gradient
- **Thermosphere** (ionosphere) – Thin; Aurora occur here; Reflects radio waves makes long distance radio communication possible – affected by solar winds; outer layer warmed by sun

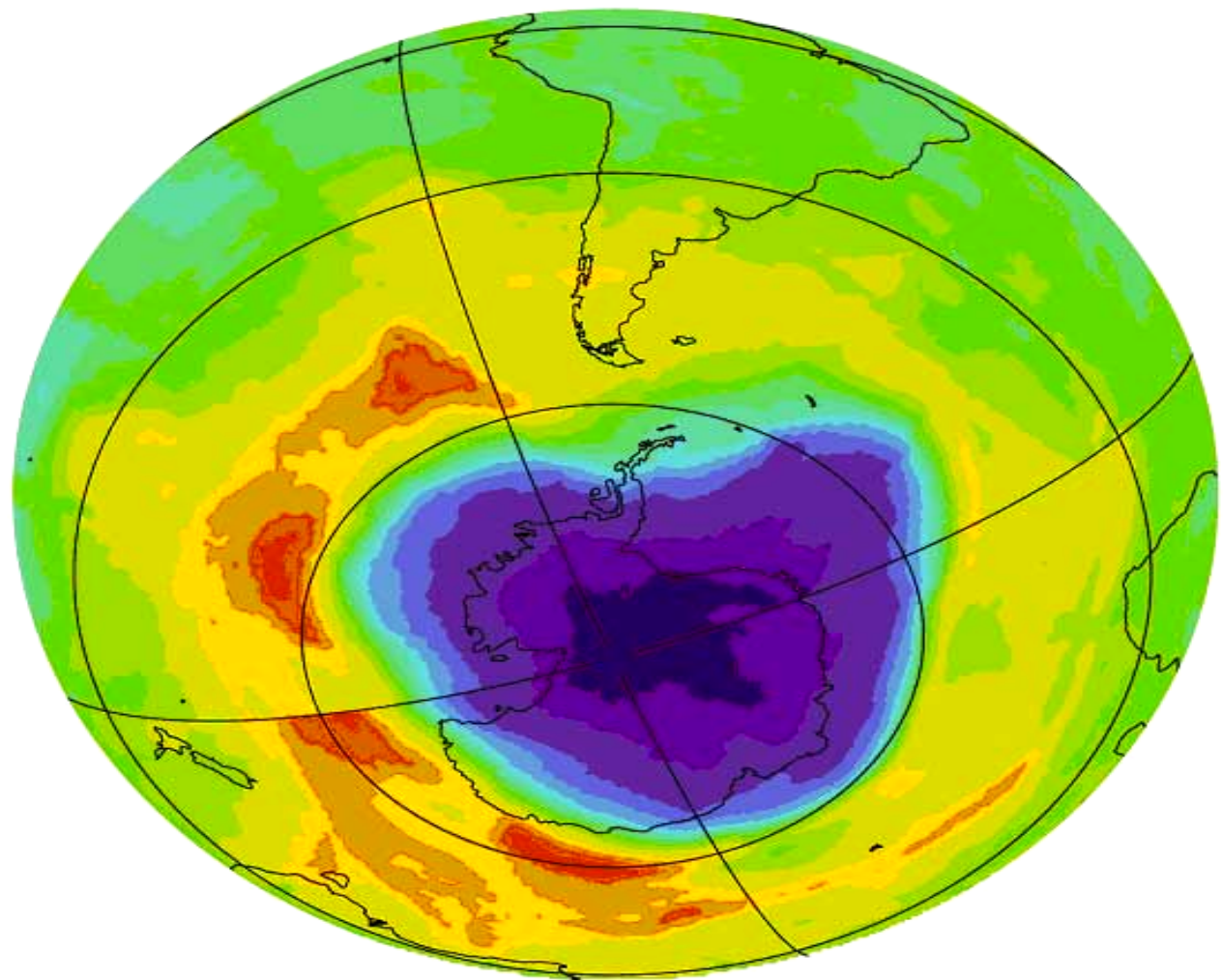
Aurora borealis



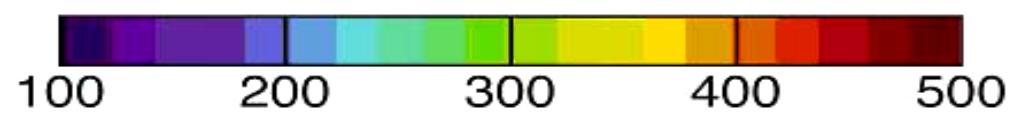
Stratospheric ozone depletion

- Observed since 1970s – first measured in 1985

Antarctic Ozone Hole



4 October 2001

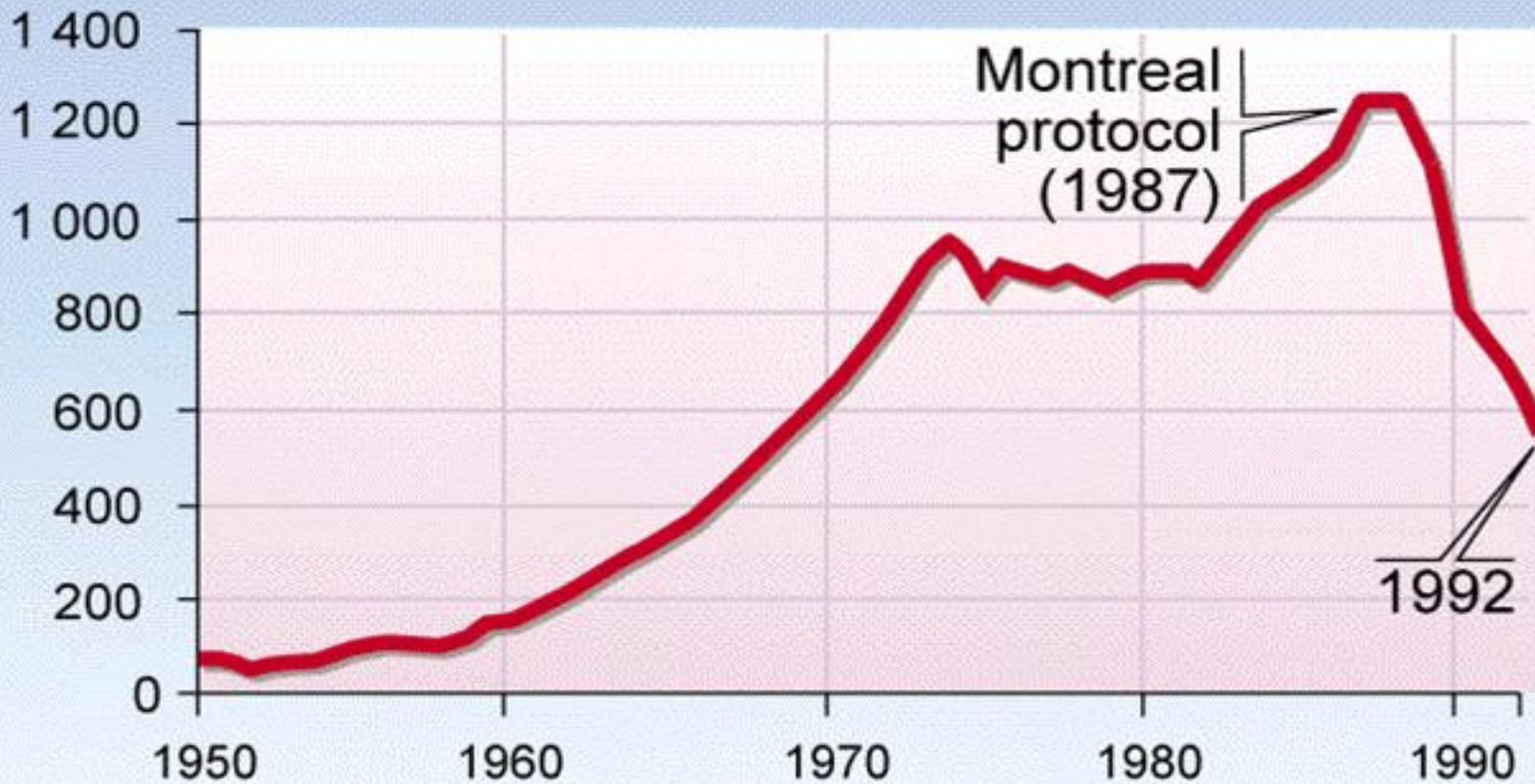


Total Ozone (Dobson units)

World Bank

Global CFC production

Thousand Tons



Backsliding: Halon Production Is Rising Again

Figure 2: Annual Production of Halons, 1986-95



Note: Ozone-depleting potential (ODP) tons is a measure by which ozone-depleting substances are weighted according to their ability to destroy ozone.

Source: Oberthür 1997.

Success Story: CFC Production Has Fallen Sharply

Figure 1: Annual Production of CFCs, 1986-95



Note: Ozone-depleting potential (ODP) tons is a measure by which ozone-depleting substances are weighted according to their ability to destroy ozone.

Source: Oberthür 1997.