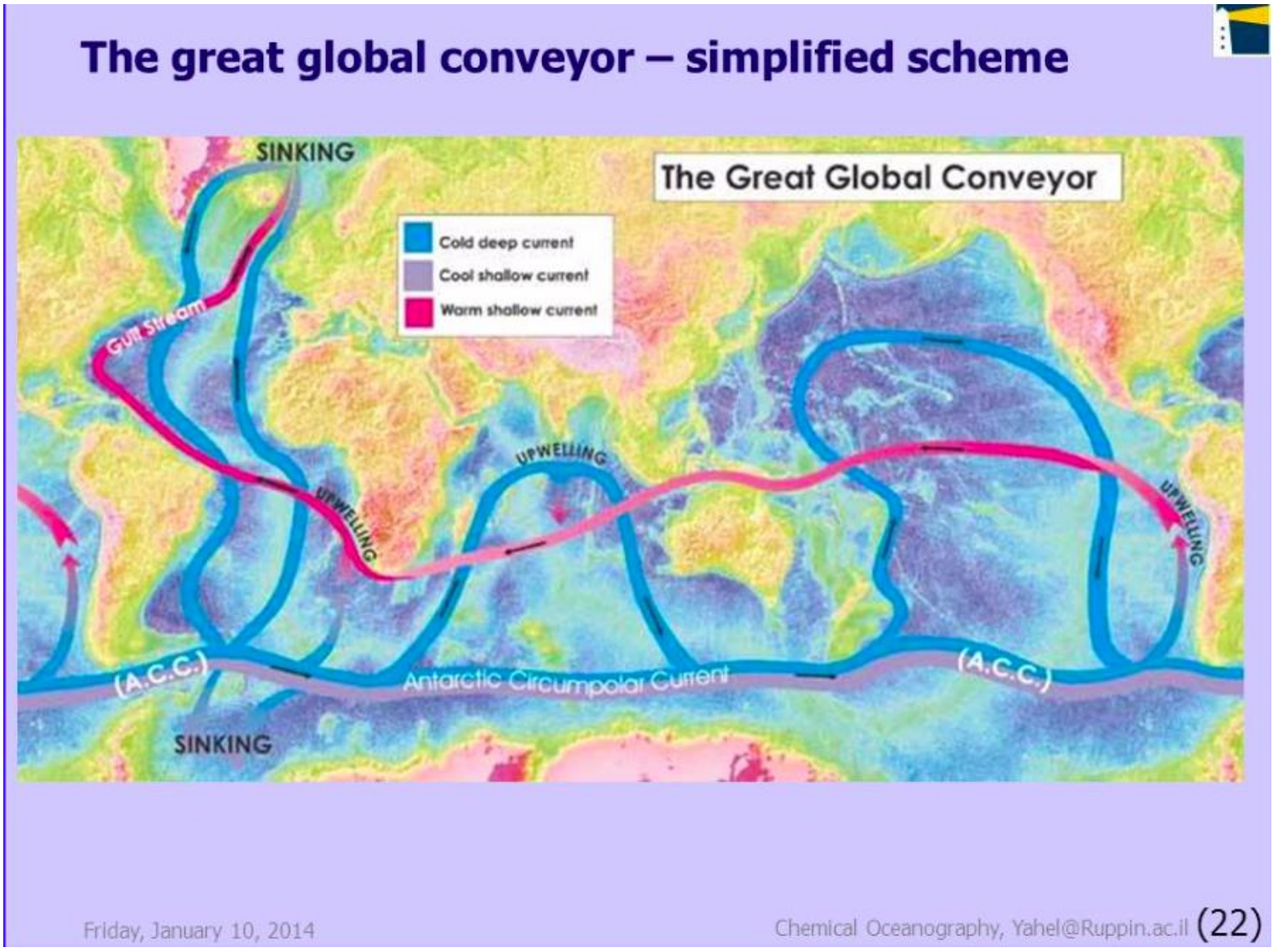
More on the Conveyor Belt 8-21-19

Thermohaline circulation drives a global-scale system of currents called the “global conveyor belt.” The conveyor belt begins on the surface of the ocean near the pole in the North Atlantic. Here, the water is chilled by arctic temperatures. It also gets saltier because when sea ice forms, the salt does not freeze and is left behind in the surrounding water. The cold water is now more dense, due to the added salts, and sinks toward the ocean bottom. Surface water moves in to replace the sinking water, thus creating a current. This deep water moves south, between the continents, past the



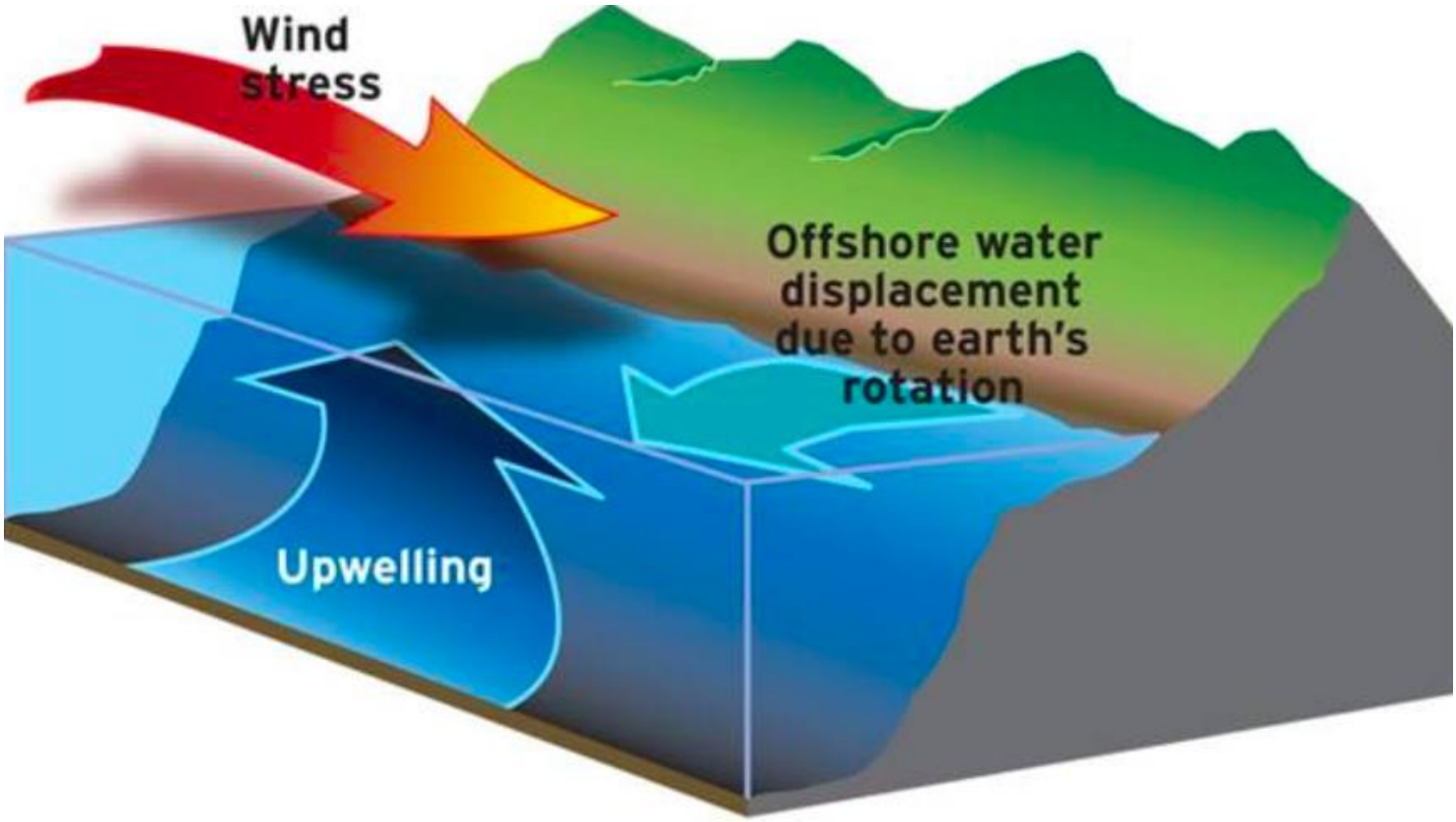
equator, and down to the ends of Africa and South America. The current travels around the edge of Antarctica, where the water cools and sinks again, as it does in the North Atlantic. Thus, the conveyor belt gets "recharged." As it moves around Antarctica, two sections split off the conveyor and turn northward. One section moves into the Indian Ocean, the other into the Pacific Ocean.
These two sections that split off warm up and become less dense as they travel northward toward the equator, so that they rise to the surface (upwelling). They then loop back southward and westward to the South Atlantic, eventually returning to the North Atlantic, where the cycle begins again.

The conveyor belt moves at much slower speeds (a few centimeters per second) than wind-driven or tidal currents (tens to hundreds of centimeters per second). It is estimated that any given cubic meter of water takes about 1,000 years to complete the journey along the global conveyor belt. In addition, the conveyor moves an immense volume of water—more than 100 times the flow of the Amazon River (Ross, 1995).

The conveyor belt is also a vital component of the global ocean nutrient and carbon dioxide cycles. Warm surface waters are depleted of nutrients and carbon dioxide, but they are enriched again as they travel through the conveyor belt as deep or bottom layers. The base of the world’s food chain depends on the cool, nutrient-rich waters that support the growth of algae and seaweed.

Mechanism of Upwelling

Winds blowing across the ocean surface push water away. Water then rises up from beneath the surface to replace the water that was pushed away. This process is known as “upwelling.”



Upwelling occurs in the open ocean and along coastlines. The reverse process, called “downwelling,” also occurs when wind causes surface water to build up along a coastline and the surface water eventually sinks toward the bottom.
Water that rises to the surface as a result of upwelling is typically colder and is rich in nutrients. These nutrients “fertilize” surface waters, meaning that these surface waters often have high biological productivity. Therefore, good fishing grounds typically are found where upwelling is common.

Note on the most recent picture of the Conveyor graphic above that upwelling does not occur in the northern realms as I noted yesterday but closer to the Equator and generally along west coasts of the continents. This mechanism is much more reasonable than what I thought yesterday. Also note the very slow speeds of the deep cold current (a few centimeters per second). And the huge volume of the flow (100 times the flow of a very mighty river flow - the Amazon).