ES1201 Assignment - 2.

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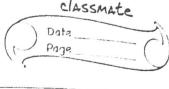
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Ekman transport play a vole in upwelling and deconveelling? Please explain.

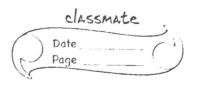
and Upwelling is a process in which currents bring deep, cold weater to the severace of the occan When met water column transport is away from land, subscurface water flows upweared to replace the weater that is moving away. This process is known as upwelling upwelling is most common along the west continents (Eastern sedes of Ocean Lossins). In the Northern Hemisphere, upwelling occurs along west Coasts wellen wounds below from the North cousing Ekman Transport of surface water away from the shore. Upwalling also occurs along west coasts in the Southbur Hemisphere when the would direction is from the South because the net transport of surface water

is idesturated away from the shoreline

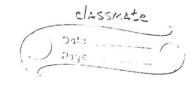
Ekman transport is the net menement of the water column at 90° to the wind div. This occures due to the formation of the Eleman Spiral where each successive layer of water is deflected more than its predecessor due to the larialis force Ekmen transport affects both upwelling and donenfelling eg. if we take a counterclockwise gyore in the Southern Hemisphere, Eleman transport will frush water to the centre (comergence) The creater flower at 90 to the cumule that are driving the gyre and hence couse Connergence et derenwelling Near coastal regions, Exmen transport can also cause water rolumn to move array from or tourards the landmass couring expuelling or downwelling respectively.



&2. Explain the physics of geostrophie environt Areas of connergence and divergence produce slight variations en sea-surjace elevation across the ocean baseus, so the sea surface actually slopes from one faint to another. This différence in elevation de very slight - on the oraler of a few metres over 102 to 105 km. Yet these slight elevation gradients are sufficient to could a douverelighe force on the water due to gravity. If we consider the subtrepied ocean in the Northern Homisphere, for example, use have already deen teat the North Escal trace counds produce a westwood-flowing cean current near the equator, wentreas the fraceordering Westerely whends in the middatitudes result in an Eastward - flowing current. The circulation is completed by the deflection of wester along the coastlines at the ocean margine Ekman Transport in the surface layers causes connergence and the file-up of water en the middle of



The sea surface is only about soom higher in the centre of the give than at the edges but gravely acting on this file of water results in a force that husber outwoord down the gradient from the center. As the water flower, however, et is deflected by the loviolis effect until that effect balances the pressure gradient force acting Decem the slope. The result of the two forces acting in epposition is to cause a flow of weater of to the side - to the right in the Northwen Hemisphere and the left en the Southern Hemesphore Thus we end up with a circular flow of water accound the give that is approximately parallel to the ocean slope. The resulting current is called a geostophie current



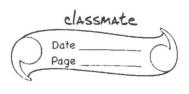
23. Explain the bottom- water formation and its importance for driving deep ocean eviculation.

ans. Near the poles, the surface materis are cooled below the normal freezeng fromt by coming in contact weeter the cold owerlying atmosphere. The freezing point is lower than that of priese weater due to the presence of salt when that water freezes, it forms a layer of sea ice several metres tuck that floats on the surface of the polar oceans. When the ocean surface forezes, most of the sea sallis excluded, because the salt does not fit into the crystal stoneture of ice. As a result, the creater just beneath the sea ice becomes saltier, and an underlæger of very cold, linghey soline wester forms. The combination of low temperatures and high salinity result in very deuse water that seile and floures documente slope of the basin and

spreads tourands the equator as the

loottom layer of acoler in the deep ocean

leasine this is how bottom water is formed. Deep ecean circulation is driven by differences in coater density. This difference in density is coursed by boottom water which has the highest density due to love temp. and high balinity while after regions were have less dense weater. Hence, bottom water is important for during deep ocean circulation trecause of its high density.



fraction of Earth waters seems to be from meteorites but not from comets.

aw. DIH ratio is the ratio of Deuterium to

Hydrogen. The DIH ratio for bulk earth is

estimated to be around (149 + 3)×10⁻⁶. The

DIH ratio for comets is (310 ± 40)×10⁻⁶

while the DIH ratio for combonaceous

meteoriles is about (160 × 10⁻⁶). From the

data, it seems that a major fraction

of Earth water must have been

contributed by meteorile impact.

Briefly explain the tole of greenhouse goses in early barth atmosphere when the luminosity of Sur was 30% les that that than that of today, (Faint Young sun). - Is we know that greenhouse gases absorbs some of the radiation which are radiated by sem. This is called grevenhouse effect. So when ; there was Fain Joung sum was era; 30% fainter than today; green house gases had a great effect on keeping larth's atmosphere at suitable temperature. There are some some evidences the liquid water indicating normal temperature at that time instead of ice-ball Earth andition