

concentration. Although the ocean is the receptacle of the drainage of all the land, it is by no means uniform in saltness; there are variations due to the different meteorological conditions which obtain in the different regions of the earth.

The causes which are effective in altering the specific gravity of the sea are those which influence the formation of vapour and of ice; and as these are found at the surface, it is there that the greatest variations in saltness are observed. The effect of freezing may be taken to apply only to the polar regions. Between these the globe may be divided, or that part of it covered by sea, into five zones, namely—two corresponding to the areas of prevalence of the northeast and the southeast trade winds, in which evaporation goes on actively, and a zone between them corresponding to the equatorial calms, where an immense amount of rain falls; and two to the north and the south of the trade wind districts, where on the whole there is a tolerable balance between rain and evaporation. At both poles there are areas of concentration due to the formation of ice.

But the salinity of the sea is affected by the removal of dissolved mineral matter as well as of water, whether in form of vapour or ice, and any agency which removes solid matter from the water will alter its density. Sea water contains much lime in solution. Immense numbers of animals living in it secrete calcareous coverings, drawing on the water for the lime and possibly for the carbonic acid necessary for the formation of their shells. Let it be assumed that the shell is formed by the direct transference of carbonate of lime from the water to the animals. When they die, their shells sink to the bottom, or are dissolved before they get to the bottom, thus returning either the whole or a part of the carbonate to the water from which it had been taken. Where the conditions are such that the shells reach the bottom, a deposit will be formed which will constitute a continual drain on the supply of carbonates in the water. In this way the composition of the water is altered by precipitation through organic agency. In the same way siliceous deposits are formed by animals secreting siliceous skeletons. But this cause, though it produces in the course of time very important effects, does not affect the composition of the water very sensibly, because the amount of earthy carbonate, or of silica, which is held in solution at any one time is, although sufficient for the support of this extensive process of transmigration of mineral matter, comparatively small; moreover, these very substances, silica and earthy carbonates, form important solid ingredients in solution in river water, and the supply is being continuously kept up, consequently variations in the amount of them would not be expected to produce a marked effect on the density of the water. It is not improbable that in the case of carbonate of lime the comparatively high density of bottom water as compared with intermediate water is due in part to the fact discovered by Professor Dittmar, that the amount of lime in bottom waters is distinctly though slightly greater than in intermediate waters, although this surplus in itself would not affect the most exact specific gravity determinations.

At the surface of the sea in all latitudes there is a constant exchange going on between