SALINITY OF OCEAN WATER

Dr. RITUPARNA GHOSH

ASSISTANT PROFESSOR OF GEOGRAPHY

RANIGANJ GIRLS' COLLEGE

INTRODUCTION

- The salinity of ocean waters is measured by the amount of dissolved solids present in a unit weight of ocean water, usually expressed in parts per thousand by weight or grams per kilogram. Salinity means the total content of dissolved salts in Sea or Ocean.
- It is generally expressed as ‘parts per thousand’ (ppt).
- Sodium chloride or the common salt is the most common among all the dissolved salts in the sea.
- The salinity of ocean water is usually around 35 parts per thousand on an average at zero degrees Celsius.

Dissolved Salts in Sea Water (gm of Salt per kg of Water)

Chlorine	18.97
Sodium	10.47
Sulphate	2.65
Magnesium	1.28
Calcium	0.41
Potassium	0.38
Bicarbonate	0.14
Bromine	0.06
Borate	0.02
Strontium	0.01

SOURCES OF OCEANIC SALINITY

- The salts dissolved in the ocean waters have their origin on the continental landmasses. They can be carried into the oceans by rain, rivers, groundwater table, sea-waves, winds, and glaciers. However, some of the dissolved salts have their origin from the ocean bottom. The layers of the earth beneath the crust contain minerals in a molten state which can reach the crust either due to volcanic activity or due to their outgassing (continuous emission in the form of gasses) from the fissures present at the bottom of the ocean. In addition, the dead and decomposing organic matter also adds to the salinity of the oceans.

FACTORS CONTROLLING SALINITY

- **Evaporation:** In general, salinity is higher at places with high rates of evaporation. The tropical seas such as the Red Sea, Persian Gulf etc., have the highest rates of evaporation. Consequently, the waters of these seas close to the Tropic of Cancer have some of the highest rates of ocean salinity.
- **Temperature:** Temperature and ocean salinity share a direct relationship. In general, regions with high temperatures are also the regions with high salinity. Also, the Torrid zone (hot, tropical regions) has higher salinity than the Frigid zone (cool, temperate regions).
- **Precipitation:** Precipitation and salinity share an inverse relationship. In general, regions with higher levels of precipitation have lower levels of salinity. This is the reason why though the equatorial region is as hot as the sub-tropics, it records lower salinity than the sub-tropics since the former receives heavy precipitation in a day.
- **Ocean Currents:** They play an important role in the spatial distribution of dissolved salts in ocean waters. The warm currents near the equatorial region push away the salts from the eastern margins of the oceans and accumulate them near the western margins. Similarly, ocean currents in the temperate regions increase the salinity of ocean waters near the eastern margins. For instance, Gulf Stream in the North Atlantic Ocean increases the salinity of ocean waters along the western margins of the Atlantic Ocean. The North Atlantic Drift, on the other hand, increases the salinity of waters in the North Sea.
- **The influx of Fresh Water:** Salinity is relatively lower in areas where major rivers meet the oceans. For instance, at the mouths of rivers such as Amazon, Congo, Ganga etc., the ocean surface salinity is found to be lower than the average surface salinity. Similarly, in the polar regions, when the glaciers melt during the summers, there is an influx of fresh water into the surrounding ocean which reduces the surface salinity.

HORIZONTAL DISTRIBUTION OF SALINITY

- **Seas with salinity levels below the normal:** They have a low salinity due to the influx of fresh water. They include the Arctic Ocean, Southern Ocean, Bering Sea, Sea of Japan, Baltic Sea etc. Their surface salinity can be as low as 21 ppt.
- **Seas with normal salinity levels**: These have a salinity in the range of 35 to 36 ppt. They include the Caribbean Sea, Gulf of Mexico, Gulf of California, Yellow Sea etc.
- **Seas with salinity levels above the normal:** They have higher levels of salinity because of their location in regions with higher temperatures leading to greater evaporation. They include the Red Sea (39 - 41 ppt), Persian Gulf (38 ppt), Mediterranean Sea (37 - 39 ppt) etc.

VERTICAL DISTRIBUTION OF SALINITY

- Salinity decreases with increasing depth at the equator as well as near the tropics.
- At higher latitudes, salinity is found to increase with increasing depth.

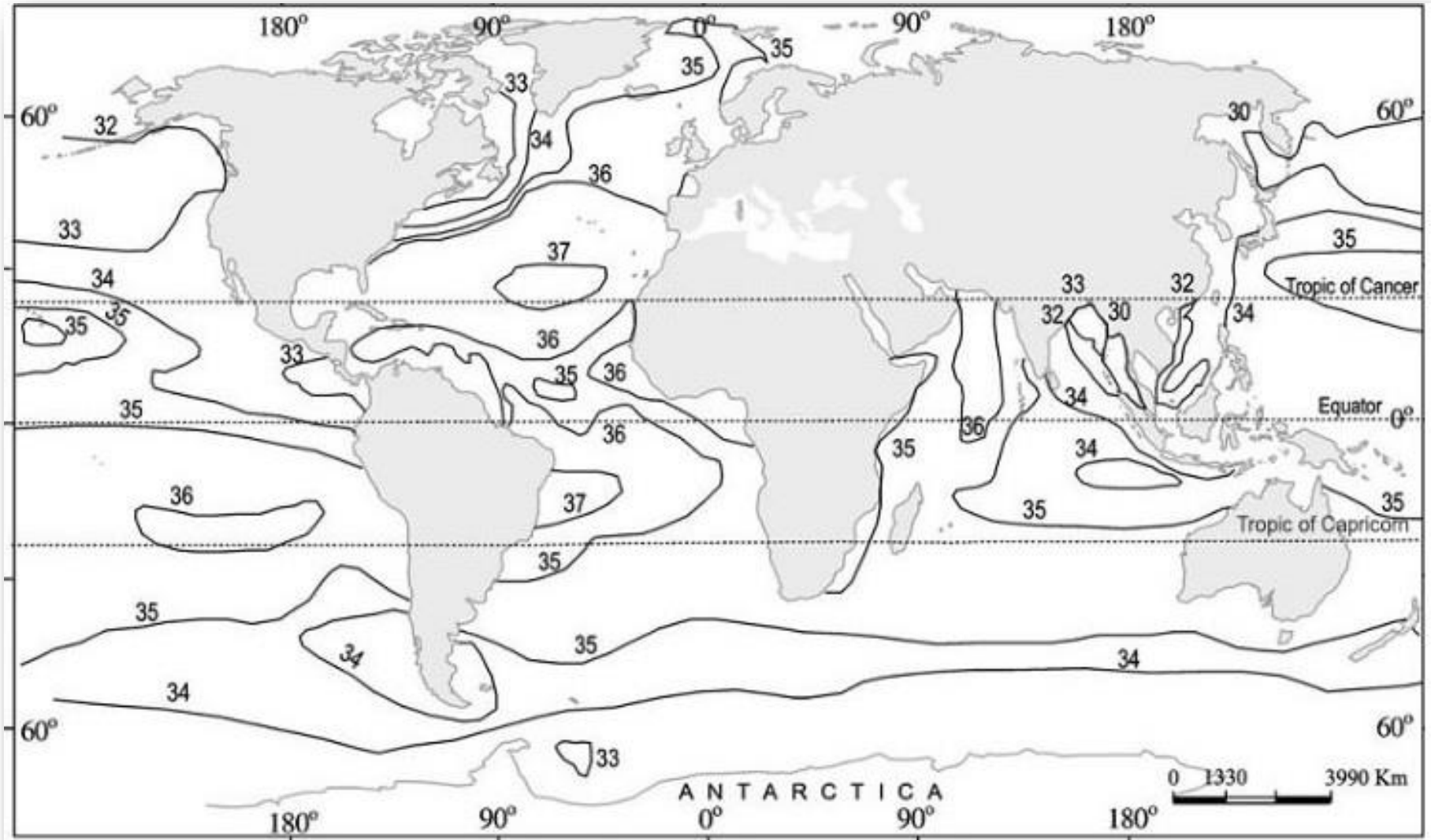
SALINITY IN ATLANTIC OCEAN

- The average salinity of the Atlantic Ocean is around 36-37.
- The equatorial region of the Atlantic Ocean has a salinity of about 35.
- Near the equator, there is heavy rainfall, high relative humidity, cloudiness and calm air of the doldrums.
- The polar areas experience very little evaporation and receive large amounts of fresh water from the melting of ice. This leads to low levels of salinity, ranging between 20 and 32.
- Maximum salinity (37) is observed between 20° N and 30° N and 20° W – 60° W. It gradually decreases towards the north.

SALINITY IN PACIFIC OCEAN

- The salinity patterns of the surface waters of the Pacific are influenced largely by wind and by precipitation and evaporation patterns.
- Salinity in the equatorial belt runs as low as 34 parts per thousand
- The highest surface salinities in the open Pacific occur in the south-eastern area, where they reach 37 parts per thousand; in the corresponding trade-wind belt in the North Pacific, the maximum salinity seldom reaches 36 parts per thousand. Pacific waters near Antarctica have salinities of less than about 34 parts; the lowest salinities—less than about 32 parts—occur in the extreme northern zone of the Pacific.

SURFACE SALINITY OF OCEANS IN THE WORLD



TEN MOST SALINE WATER BODIES IN THE WORLD

RANK	SALINITY	NAME	TYPE	LOCATION
1	44%	Don Juan Pond	Salt lake	Antarctica
2	40%	Lake Retba	Salt lake	Senegal
3	35%	Lake Vanda	Salt lake	Antarctica
4	35%	Garabogazköl	Lagoon	Turkmenistan
5	34.8%	Lake Assal	Salt lake	Djibouti
6	33.7%	Dead Sea	Salt lake	Israel, Jordan, Palestine
7	18%	Little Manitou Lake	Salt lake	Canada
8	8.5–28%	Lake Urmia	Salt lake	Iran
9	5–28%	Laguna Cejar	Salt lake	Chile
10	5–27%	Great Salt Lake	Salt lake	United States