

New Analysis of all Seas Water Parameters for All January Months from 2005 to 2017 Using Real Time Data

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Abstract:

In this paper we used real time data of temperatures and salinity for all January months ranges from 2005 to 2017 this data is taken from National centers for environmental information also called National oceanic and atmospheric administration, in past decades scientists used data as a supposition to find sea water parameters which is not possible in real life, because the sea water parameters changed with each depth, latitude and longitude. At this data base the data is available at each depth, latitudes and longitudes of sea in analyzed and in statistical data form. In this paper we analyzed mean conductivity, mean permittivity, mean salinity and mean temperatures for all January months from 2005 to 2017, from surface of sea to depth of 5500 m using this real time data from National centers for environmental information. We used Mat lab as a simulation tool to find these sea water parameters from this real time data. We used 2 to 40 GHz frequency of electromagnetic waves to find these sea water parameters, we also used Ellison et al model 1998 and Debye interpolation function formula, as a reference formula to find these sea water parameters, by using real time data from National centers for environmental information

.Keywords:Mean salinity, mean temperature, mean conductivity, mean permittivity, ppt. s/m, F/m.

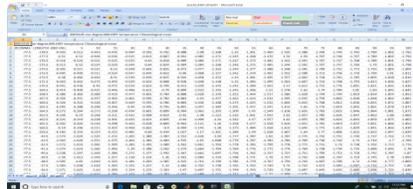
1. Introduction:

Sea water are a mixture of organic and inorganic compounds; organic compounds have no effect on sea water parameters because organic compounds consist of carbon, while inorganic compounds have no component of carbons these are the salts dissolved in sea water, the origin of inorganic compounds are volcanoes, rain which changed its concentrations in sea water. The sea water parameters are associated with this inorganic compound's, if the inorganic compounds' concentration are high the sea water parameters i.e. mean conductivity, mean permittivity, mean salinity and mean temperatures are high and if the inorganic compound's concentration are low, the sea water parameters i.e. mean conductivity, mean permittivity, mean salinity and mean temperatures are low. Which we discussed below, we used Debye model as a reference model to find the sea water parameters in past scientist used Debye model for fixed data and fixed frequency to find the sea water parameters which is not possible in real world.

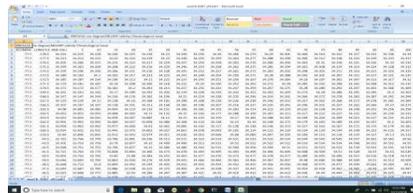
2. Real time data of salinity and temperatures of sea:

The real time data are taken from National centers for environmental information in form of salinity and temperature from different depths, latitudes, longitudes from all over the seas of the world, in form of analyzed mean data and statistical mean data as shown below.

a) Analyzed mean data

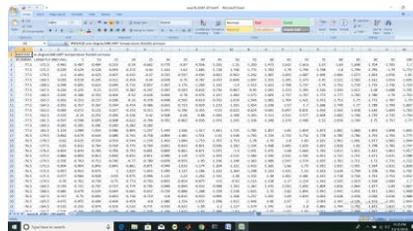


a) Fig 1 Temperature data.

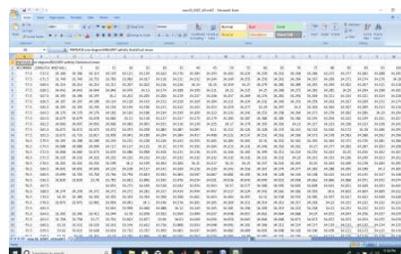


b) Fig2 salinity data.

b) Statistical mean data:



a) Fig 3 Temperature data.



b) Fig 4 salinity data.

3. Mean salinity of sea water :

The salinity means the salts solved in sea water, it is measured in parts per thousand denoted by ppt. The maximum salinity concentration consists of sodium chlorides; the other salts are calcium chlorides, magnesium chlorides, magnesium sulfate, and sodium bicarbonates. The origin of salinity is volcanoes they release different types of chemical gases, and form different types of salts which flow to sea water and form inorganic compounds, the other reason is rain, the rain falls on salty mountains and different salts flows to sea water. The mean salinity means that we take total numbers of data points from sea water and divide by total number of data points.[1,2,3,4,5,6].

Simulation results of Mean salinity using Analyzed mean data and statistical data of sea water:

3. a) Mean salinity using Analyzed mean data of sea water:

We took salinity real time data of sea water from surface of sea to depth of 5500 m from National centers for environmental information, and used Mat lab simulation code to create different results as shown in fig 5, fig 6, fig 7, and fig 8. This real time data are available in array forms 41089×2 , it shows that it's the data points of salinity all over the world of different seas from surface of sea to depth of 5500 m; it is only for January months from 2005 to 2017. In fig 5 from 2 to 8 ($^{\circ}$) the salinity concentrations varies from 30 to 32 ppt. It shows the depth and middle of sea water, it means that at this point the inorganic compounds are in minimum quantity, and temperatures of sea water are also minimum at depth of sea water, the salinity concentration are a function of temperatures of sea water, so as we move further from depth and middle of sea to surface of sea water, the inorganic compounds concentration and temperatures of sea water increases as in fig 5 from 8 to 15 ($^{\circ}$), the salinity concentrations vary from 32 to 34 ppt. The salinity concentrations are also a function of sea water conductivity as shown in fig 6 from 29.8 to 32 ppt. Approximately, The mean conductivity ranges from 2.5 to 3.3 s/m, it shows the depth and middle of sea water, and as we move from depth and middle of sea to surface of sea water as shown in fig 6 from 32 to 34.5 ppt. The sea water conductivity ranges from 3.3 to 4.3 s/m, it means at these points the sea water temperatures and salinity concentration are high. The fig 7 also shows that the sea water salinity are a function of sea water permittivity real part, the real part shows that how much energy stored by sea water, the fig 7 illustrates that from 28.8 to 32 ppt. Approximately, Salinity concentrations the permittivity real part have a minimum value of 17 to 21 F/m, and it shows the depth and middle of sea water, at this point the sea water temperatures, salinity concentrations and conductivity of sea water are minimum, but as we move from depth and middle of sea water to surface of sea water the permittivity real part and salinity concentrations increases linearly in fig 7 from 32 to 34.5 ppt. The real part of permittivity ranges from 21 to 27 F/m. It means that the energy stored by sea water is maximum, at this point the sea water temperatures, sea water salinity concentrations and conductivity of sea water are maximum, and it's the surface of sea water. The fig 8 shows the relationship of salinity concentrations and imaginary part of permittivity, in fig 8 from 29.5 to 33 ppt. Salinity

concentrations, the imaginary part of permittivity jumps from 9 to 13 F/m approximately it shows the depth and middle of sea water, it also shows that at this point the electric field release the energy in a minimum quantity, but as we move further from depth and middle of sea to surface of sea water as in fig 8 from 33 to 34.5 ppt. Salinity concentrations the energy release by electric field increases from 13 to 17 F/m. It also shows that energy release by electric field are inverselyproportionalto salinity concentrations, temperatures of sea water, conductivity of sea water at surface of sea water.

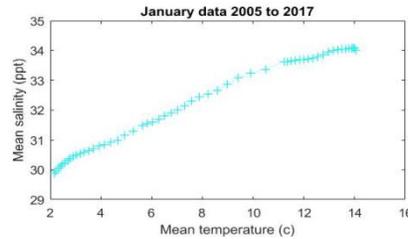


Fig 5 Mean salinity vs. mean temperature.

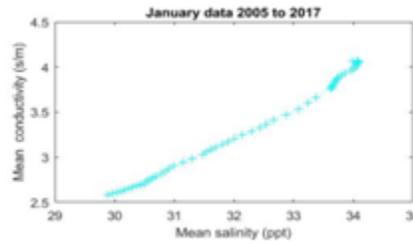


Fig 6 Mean salinity vs. mean conductivity

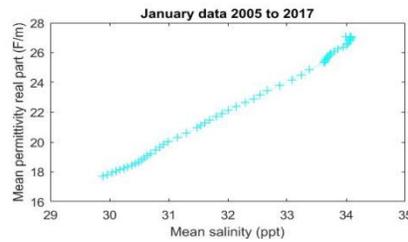


Fig 7 Mean salinity vs. Mean permittivity real part

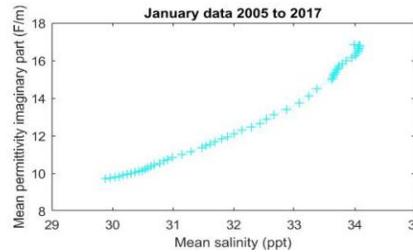


Fig 8 Mean salinity vs. mean permittivity imaginary part.

3. b) Mean salinity using Statistical mean data of sea water:

The statistical mean data means observe the data statistically, we took the salinity data array of 27547*59 from National centers for environmental information and used Mat lab simulation code to generate different results of salinity versus different parameters of sea water as shown in fig 9, fig 10, fig 11, fig 12. The fig 9 shows that as we move from depth of sea to surface of sea as in fig 9 from temperature 2 to 8 (c°), the salinity concentration jumps from 28 to 33 ppt. But as we move further from depth and middle of sea to surface of sea water as in fig 9 from 8 to 18 (c°), there are a slight increase in salinity concentrations and it almost looks constant and it ranges from 33 to 34.4 ppt. It means that the inorganic compound's concentrations increases slightly and at 18 (c°), it drops to 29 ppt. Approximately its means at this point the salinity concentrations minimizes it's a reality, that the sea water concentrations are not same on the whole surface of sea water, in past the scientists thought that the sea water temperatures, conductivity and salinity are same on every surface of sea, but it is not like that it is not same. In fig 10 the salinity concentrations varies linearly with sea water conductivity from 28.5 to 33 ppt. The sea water conductivity ranges from 2.5 to 3.1 s/m, it shows the depth and middle of sea water and at depth of sea water the salinity concentration, temperatures of sea water are minimum as we move further from 33 to 34.5 ppt. Salinity concentrations, the conductivity of sea water ranges from 3.1 to 4.5 s/m approximately but at 34.5 ppt. Salinity concentrations, it drops to 3.8 s/m conductivity it means at this point some surface of sea water have minimum value of salinity concentrations, because the sea water surfaces have not uniform salinity concentrations and temperatures. The conductivity is a function of salinity concentrations and temperatures of sea water. The salinity concentrations are also a function of permittivity real part as shown in fig 11 below from 28 to 33 ppt. Of salinity concentrations, the real part of permittivity jumps from 16 to 22 F/m its shows the depth and middle of sea water, and the energy stored in electric field in sea water are minimum at this point, and as we go further towards the surface of sea water the salinity concentration vary from 33 to 34.7 ppt. And the permittivity real part vary from 22 to 29.1 F/m approximately, and it's the surface of sea water and, it shows the energy liberate by electric field are maximum.

The salinity concentrations also affect the permittivity imaginary part as shown in fig 12 below from 28.5 to 33 ppt. Of salinity concentrations it has a minimum value of 8 to 12 F/m, it shows the depth and middle of sea water, so the energy release at this point is minimum as we move further from depth of sea to surface of sea water, the energy release by electric field increases as shown in fig 12 from 33 to 34.5 ppt. The energy release are from 12 to 18 F/m at this point, it also drops to 16 F/m its due to variations of sea water salinity concentrations, temperatures of sea water variations and conductivity of sea water variations, because sea water surface are not uniform as we have already discussed above.

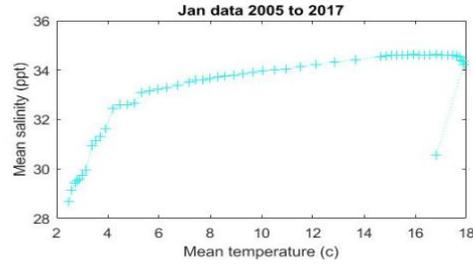


Fig 9 Mean salinity vs. mean temperature.

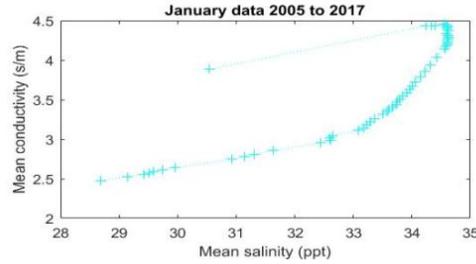


Fig 10 Mean salinity vs. mean conductivity

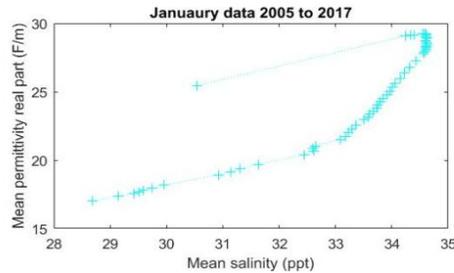


Fig 11 Mean salinity vs. mean permittivity real part

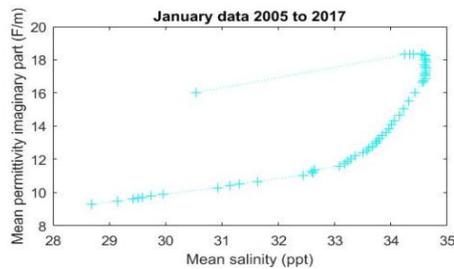


Fig 12 Mean salinity vs. mean permittivity imaginary part

4. Mean temperature of sea water:

The temperature shows the sea water hotness or coldness, it is measured in Celsius in system international denoted by (c°). The sea water temperature ranges from -2 to 30, and at different surfaces of sea water it varies. So the mean temperature means the total number of data points of sea water divide by the total number. We take data points 41089*59 from National centers for

environmental information, and used Mat lab simulation code to generate different results of temperatures versus different parameters of sea water as shown in fig 13, fig 14, fig 15, fig 16.[7,8,9]

Simulation results of Mean temperature using Analyzed mean data and statistical data of sea water:

4 a) Mean temperature using Analyzed mean data of sea water:

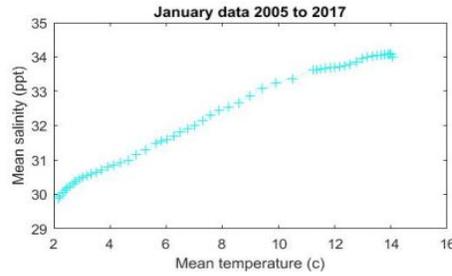


Fig 13 Mean temperature vs. mean salinity

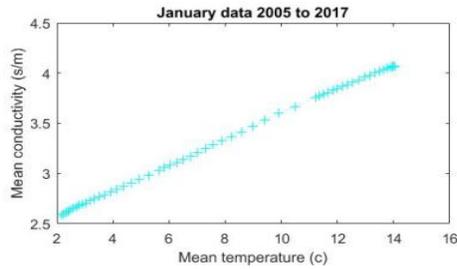


Fig 14 Mean temperature vs. mean conductivity

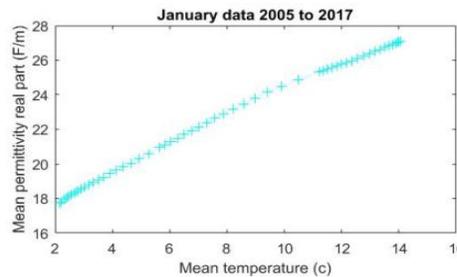


Fig 15 Mean temperature vs. mean permittivity real part

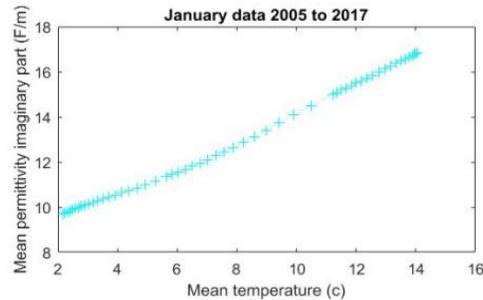


Fig 16 Mean temperature vs. mean permittivity imaginary part

The mean temperatures are also depended on salinity concentrations if the salinity concentrations are maximum, the temperatures of sea water are also maximum and if the temperatures of sea water are minimum the salinity concentrations are also minimum, as shown in fig 13 from 2 to 8 (c°), the salinity concentrations varies from 30 to 32 ppt. And it is the depth and middle of sea water, but as the temperatures of sea water increases from 8 to 15 (c°), the salinity concentrations jumps from 32 to 34.6 ppt. It shows that as we move from depth of sea to surface of sea water, the inorganic compound's concentrations ratio increases. The mean temperatures are also a function of mean conductivity as shown in fig 14 from 2 to 8 (c°), the mean conductivity ranges from 2.5 to 3.5 s/m approximately and it's the depth and middle of sea water, as the mean temperature increases from 8 to 15 (c°), the conductivity of sea water jumps from 3.5 to 4.3 s/m approximately, and it shows that we are moving from depth of sea to surface of sea water, at surface of sea water the conductivity of sea water are maximum and temperatures and salinity concentrations are also maximum, as we know salinity concentrations and temperatures of sea are the function of sea water conductivity. The mean temperatures are also dependent on permittivity real part as shown in fig 15 from 2 to 8 (c°), the real part of permittivity ranges from 17.5 to 21.5 F/m approximately as shown in fig 15, it shows the depth and middle of sea water, at this point the energy stored by electric field are minimum, because at this point the sea water temperatures, salinity concentrations and sea water conductivity are minimum, as we move further from depth of sea to surface of sea water, the mean temperature increases from 8 to 15 (c°), which yield to increase the sea water permittivity real part as shown in fig 15, the real part of permittivity increases from 21.5 to 26.5 F/m approximately. So the mean temperature are also affected the sea water permittivity imaginary part as shown in fig 16, from 2 to 8 (c°), it has the minimum value of 9.7 to 12 F/m and from 8 to 15 (c°), it has a maximum value of 12 to 16.7 F/m approximately, the imaginary part shows the electric field energy release at depth, they are minimum at depth of sea water and maximum at surface of sea as shown in fig 16 above.

4. b) Mean temperature using Statistical mean data of sea water:

This survey shows the mean temperature with different sea water parameters statistically as shown in below figures.

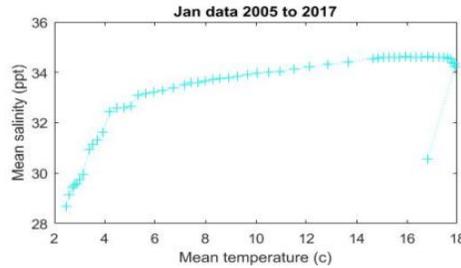


Fig 17 Mean temperature vs. Mean salinity.

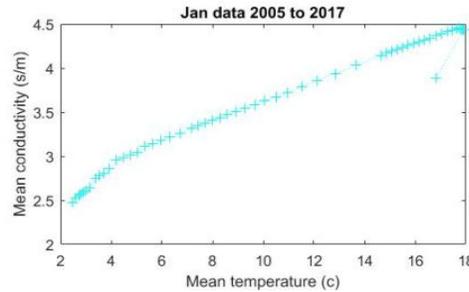


Fig 18 Mean temperature vs. mean conductivity.

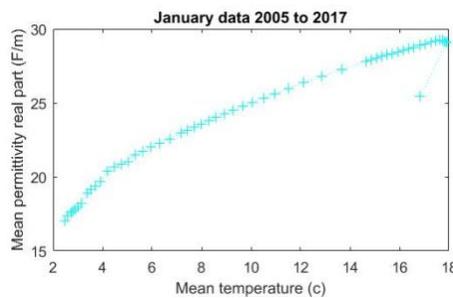


Fig 19 Mean temperature vs. mean permittivity real part

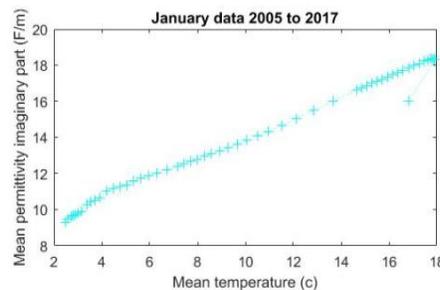


Fig 20 Mean temperature vs. mean permittivity imaginary part

The mean temperatures from 2 to 8 (c°), results in 28 to 33.3 ppt. Salinity concentrations approximately which is the depth of sea but as the temperature increases from 8 to 18 (c°), the salinity concentrations increases from 33.3 to 35 ppt. This shows we are moving toward the surface of sea water as shown in fig 17 above. The mean temperature are also affected with sea

water conductivity as shown in above fig 18 from 2 to 8 (c°), the sea water conductivity ranges from 2.5 to 3.3 s/m approximately, it's the depth and middle of sea water as we move from depth of sea to surface of sea, the sea water conductivity changes from 3.3 to 4.5 s/m approximately, at temperature range of 8 to 18 (c°), and it's the surface of sea water at this point the salinity concentrations and temperatures of sea are maximum and mean conductivity are also a function of salinity concentrations and temperatures of sea water. The mean temperature also affects the sea water permittivity real part as shown in fig 19 above, from temperatures range of 2 to 8 (c°), it has a minimum value of 16 to 23 F/m and it's the depth and middle of sea water, while at temperature 8 to 18 (c°),it has a maximum value of 16 to 29.5 F/m approximately, which is the surface of sea water at this point the sea water parameters are at maximum level. So the real part of permittivity shows us the energy absorbed by electric field. So the mean temperatures are also affects the imaginary part of sea water too as shown in fig 20 above, from 2 to 8 (c°),it has a minimum value of 8 to 11.4 F/m approximately, and it's the depth of sea water at this stage the sea water parameters have a minimum values, as we move from depth of sea to surface of sea water the mean temperature changes from 8 to 18 (c°), which change the imaginary part of sea water permittivity from 11.4 to 18 F/m approximately, as shown in above fig 20 the imaginary part of sea water permittivity shows the energy release by electric field

.5. Mean Conductivity of sea water:

The mean conductivity of water allows the current to flow through sea water, it is maximum at the surface of sea water, due to abundant amount of sea water salinity concentrations and sea water maximum temperatures, while it is minimum at the depth of sea water, it is measured in Siemens per meter (s/m) in system international, and its denoted by a Greek word sigma “σ”. [10,11,12].

Mathematically conductivity

$$\sigma(s, t) = h(t) + k(t) s \dots\dots\dots (1)$$

$$h(t)=0.086374+.030606 t-.0004121t^2 \quad k(t)=0.077454+.001687t+.00001937 t^2$$

Where in equation (1) “h(t)” is coefficient of time, and“k(t)” are coefficient of salinity.

Simulation results of Mean conductivity using Analyzed mean data and statistical data of sea water

5 a) Mean conductivity using Analyzed mean data of sea water:

In this section we compared the mean conductivity versus different sea water parameters as shown in fig 21, fig 22, fig 23, and fig 24 as shown below.

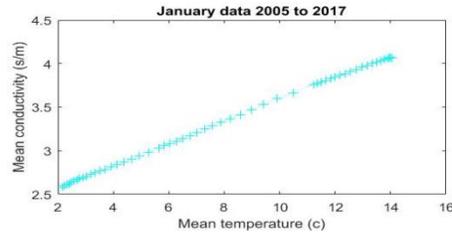


Fig 21 Mean temperature vs. mean conductivity

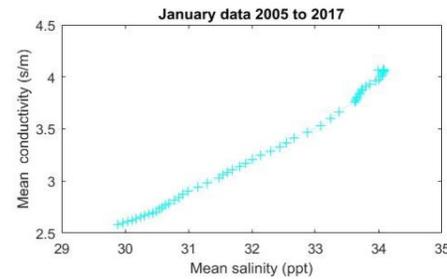


Fig 22 Mean conductivity vs. mean salinity

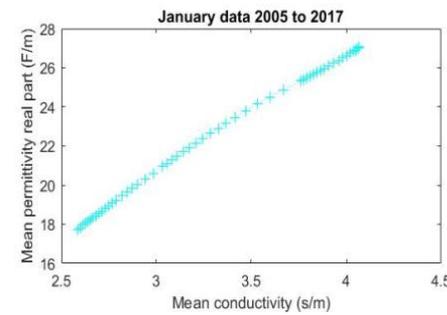


Fig 23 Mean conductivity vs. mean permittivity real part

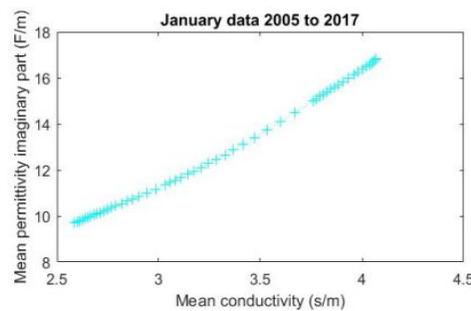


Fig 24 Mean conductivity vs. mean permittivity imaginary part

The mean conductivity are a function of mean temperatures as shown in fig 21 from 2 to 8 ($^{\circ}$ C), the mean conductivity ranges from 2.5 to 3.4 s/m approximately, as shown in fig 21 above and it's the depth and middle of sea water, at this stage the sea water temperatures and sea water salinity concentrations are minimum, but as we move from depth of sea to surface of sea water at mean temperature 8 to 18 ($^{\circ}$ C), the sea water mean conductivity changes from 3.4 to 4.2 s/m and

it's the surface of sea water, and at this stage the sea water temperatures and sea water salinity concentrations are maximum. The mean conductivity are also a function of mean salinity as shown in fig 22 above, from 29.8 to 32 ppt. Salinity concentrations, the mean conductivity has a minimum value of 2.7 to 3.3 s/m approximately as shown in above fig 22, and it's the depth and middle of sea water, as we know at this point the inorganic compounds and temperatures of sea have a minimum value, so the conductivity are also the function of sea water salinity concentrations and temperatures of sea water, it also affected but as we move further from depth of sea to surface of sea water the salinity concentrations changed to its maximum level as shown in fig 22 above, from 32 to 34.7 ppt. The mean conductivity vary from 3.3 to 4.3 s/m approximately, as shown in above fig 22. The mean conductivity are also affected the mean permittivity real part as shown in fig 23, from 2.5 to 3.5 s/m mean conductivity it has the minimum value of 17 to 24.2 F/m approximately, as shown in above fig 23 and it's the depth and middle of sea water, at this stage the sea water salinity concentrations, temperatures of sea, and conductivity of sea water have minimum values, so the real part of permittivity have also minimum values and the energy stored by electric field have minimum values as shown in above fig 23. But as we move further to surface of sea water the real part of permittivity of sea water have maximum values, and the mean conductivity values also varies as shown in fig 23 from 3.5 to 4.2 s/m, it's values varies to 24.2 to 26.9 F/m approximately, and it's the surface of sea water it shows that the electric field stored the energy at this point are maximum, and it also shows that salinity concentrations, sea water temperatures and sea water conductivity are also maximum at this point. The mean conductivity also affects the imaginary part of sea water permittivity as shown in fig 24, from 2.5 to 3.5 s/m, it has the minimum value of 9 to 13 F/m, and it the depth and middle of sea water, at this stage the energy release by electric field are minimum, as we move to surface of sea water the energy releases by electric field are maximum, and it's vary to 13 to 17 F/m at mean conductivity of 3.5 to 4.2 s/m, and it's the surface of sea water.

5. b) Mean conductivity using Statistical mean data of sea water:

In this analysis we calculated sea water parameters statistically as shown in below figures.

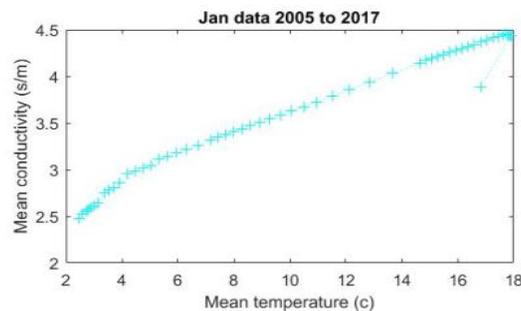


Fig 25 Mean temperature vs. mean conductivity

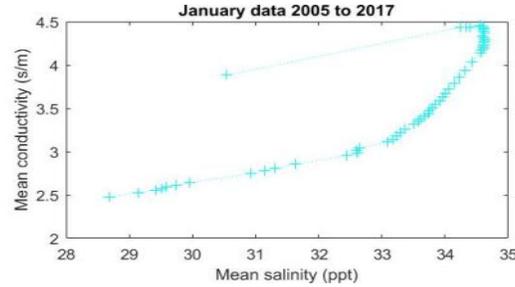


Fig 26 Mean conductivity vs. mean salinity

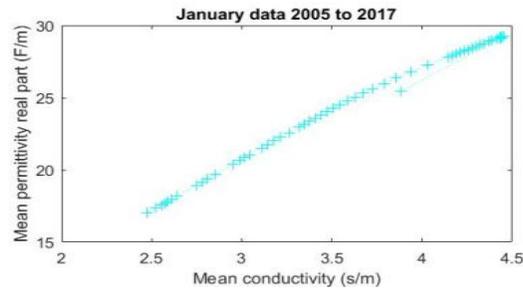


Fig 27 Mean conductivity vs. mean permittivity real part

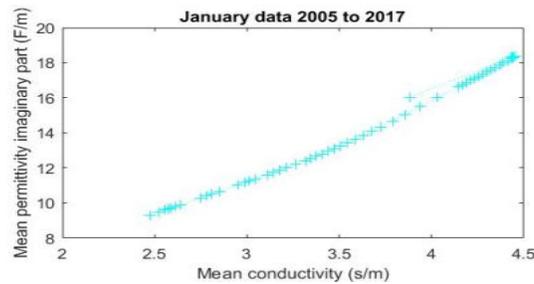


Fig 28 Mean conductivity vs. mean permittivity imaginary part

The mean conductivity affects the mean temperatures linearly as shown in fig 25 from 2 to 8 ($^{\circ}$), the mean conductivity ranges from 2.5 to 3.3 s/m approximately, and it's the depth and middle of sea water, and as we move to toward surface of sea water the conductivity jumps from 3.3 to 4.5 s/m approximately, at temperatures range of 8 to 18 ($^{\circ}$), as shown in fig 25, and it's the surface of sea water at surface of sea water the salinity concentrations and temperatures are maximum, that's why the mean conductivity are maximum as shown in fig 25. The mean conductivity also affects the mean salinity as shown in fig 26, from 28.5 to 32 ppt. It has the least value of 2.5 to 3 s/m, and it's the depth of sea water and it has the maximum value of 3 to 4.5 s/m approximately, at salinity concentrations of 32 to 34.7 ppt. As shown in fig 26 but it drops to 4 s/m mean conductivity at 34.7 ppt. Salinity concentrations, it shows that the sea water concentrations and mean temperatures are not uniform at some surfaces of sea water. The mean conductivity are also affected the mean permittivity real part in this survey as The mean conductivity affects the mean temperatures linearly as shown in fig 25 from 2 to 8 ($^{\circ}$), the mean conductivity ranges

from 2.5 to 3.3 s/m approximately, and it's the depth and middle of sea water, and as we move to toward surface of sea water the conductivity jumps from 3.3 to 4.5 s/m approximately, at temperatures range of 8 to 18 (c^o), as shown in fig 25, and it's the surface of sea water at surface of sea water the salinity concentrations and temperatures are maximum, that's why the mean conductivity are maximum as shown in fig 25. The mean conductivity also affects the mean salinity as shown in fig 26, from 28.5 to 32 ppt. It has the least value of 2.5 to 3 s/m, and it's the depth of sea water and it has the maximum value of 3 to 4.5 s/m approximately, at salinity concentrations of 32 to 34.7 ppt. As shown in fig 26 but it drops to 4 s/m mean conductivity at 34.7 ppt. Salinity concentrations, it shows that the sea water concentrations and mean temperatures are not uniform at some surfaces of sea water. The mean conductivity are also affected the mean permittivity real part in this survey as shown in fig 27, it is minimum at depth and middle of sea as shown in fig 27, from 2.4 to 3.5 s/m it has the minimum value of 16 to 24 F/m and it's the depth of sea water, at this stage energy stored by electric field are minimum and all the sea water parameters have a minimum values, and as we move from depth of sea to surface of sea water, the energy stored by electric field increase from 24 to 29.7 F/m approximately, at mean conductivity from 3.5 to 4.4 s/m approximately, as shown in fig 27 and it's the surface of sea water, at this stage the sea water parameters have a maximum values. In this survey the sea water mean conductivity are also affects the imaginary part of sea water permittivity as shown in fig 28, at depth of sea it has the minimum values from 8 to 14 F/m, at mean conductivity range of 2.4 to 3.5 s/m, and it has the maximum value of 14 to 19 F/m, at mean conductivity range of 3.5 to 4.5 s/m, and it's the surface of sea water as shown in fig 28, at this stage the energy released by electric field are maximum.

6. Mean Permittivity of sea water:

Mean permittivity of sea water is the ability of sea water to store energy in its electric field in system international it's represented by Farad per meter denoted by a symbol F/m.[13] Mathematically

$$\epsilon = \epsilon_r \epsilon_0 \dots\dots\dots(2)$$

Where “ ϵ_r ” is the relative permittivity of a substance and “ ϵ_0 ” is the vacuum permittivity of free space having a value of $8.85 \cdot 10^{-12}$ F/m.

We apply Debye interpolation function to find Mean permittivity from mean conductivity, mean temperatures and mean salinity using real time data, from National centers for environmental information in form of salinity and temperatures, and we put this data in interpolation function, and we can calculate different sea water parameters the equation is shown below. Debye interpolation function mathematically

$$\varepsilon(t, s, v) = \varepsilon_{\infty} + \varepsilon_0 - \varepsilon_{\infty} / (1 - j2\pi\tau v + j\sigma / 2\pi v \varepsilon^*) \quad (3)$$

Where in equation (3) “ ε ” is the permittivity of sea water, and “ $\varepsilon_{\infty}, \varepsilon_0$ ” are the static and frequency dielectric constants depends on temperatures of sea and salinity of sea water while “ σ, v ” are conductivity of sea water and angular frequency of sea water and “ τ, ε^* ” are the relaxation time and the permittivity of free space. We used Mat lab simulation tool and used equation (3) on real time data, we can calculate the mean permittivity of sea water as shown in above figures, on analyzed mean data and on statistical mean data.

Simulation results of Mean Permittivity using Analyzed mean data and statistical mean data of sea water.

7. Conclusion:

We concluded that the mean conductivity and mean permittivity of January months from 2005 to 2017 are the function of sea water salinity concentrations, and temperatures of sea water, if the salinity concentrations and temperatures of sea water are high, the mean conductivity and the mean permittivity of sea water are also high, and if the sea water temperatures and salinity concentrations are low, the mean conductivity and mean permittivity are low, which we identified in this paper.

8. Future work:

This method can also be used in the future, if we have real time data from National centers for environmental information available for more than 1500 m depths of sea, for all January months, and we can easily find sea water parameters

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10. References

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