Study of physical parameters in Strait of Hormuz

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Abstract: In this research,physical parameters (temperature,salinity,density) and water dynamic in strait of hormuz were studied.Physical parameters were measured by CTD in six station (2 transect) from Bandarabbas to Qeshm Island and Lark Island in 29 November 2006 at once. In this area, thermoclain and pycnoclain were not seen and physical parameters had afew changes than the depth that seen compelete mixture of 5m depth.Also, correlation coefficient between salinity and density calculate in 0.967 to 0.999 in all stations that show direct relation of density to salinity and also correlation coefficient was calculate between tempereture and density in -0.900 to -0.987 that show reversed relation of density to temperature.it is noted that drawing of regression lines between density_temperature and density_salinity confirm direct relation density to salinity,too.
[M. Torabi Azad; A. Raeisi; H1. Mehrfar. **Study of physical parameters in Strait of Hormuz.** *Nat Sci* 2015;13(1):101-106]. (ISSN: 1545-0740). http://www.sciencepub.net/nature. 15

Key words: Persian Gul, Strait of Hormuz, physical parameters, temperature, salinity, density

Introduction

the studying of physical parameters that is the most important of oceanography and physical oceanography has an extreme importance in fishery,environmental biology problems and submarine relations (sound spreading).strait of hormuz is very important militarily, commercially, navigably strait of hormuz as one of world floodway, connects Persian Gulf to Gulf of Oman and Indian ocean. Persian Gulf is almost between 24°,30' northern and 48°,57' eastern and Gulf of Oman is between 22°,26' northern and 56°,62' eastern that strait of hormuz is between them and has 56 km width. The most important ocean circulation of area is including shallow entry circulation from Gulf of Oman and deep exiting circulation from Persian Gulf. The purpose of this research is the studying of physical parameters (temperature, salinity, density) and their changes to the depth in each station,the studying of their changes to the depth contemporary and far from the beach. Also, the other purpose of this research is the studying of thermoclain and pycnoclain (constantly)and investigation of the parameters changes factors and the studying of the strait of hormuz effect on physical parameters changes of area.

Research method

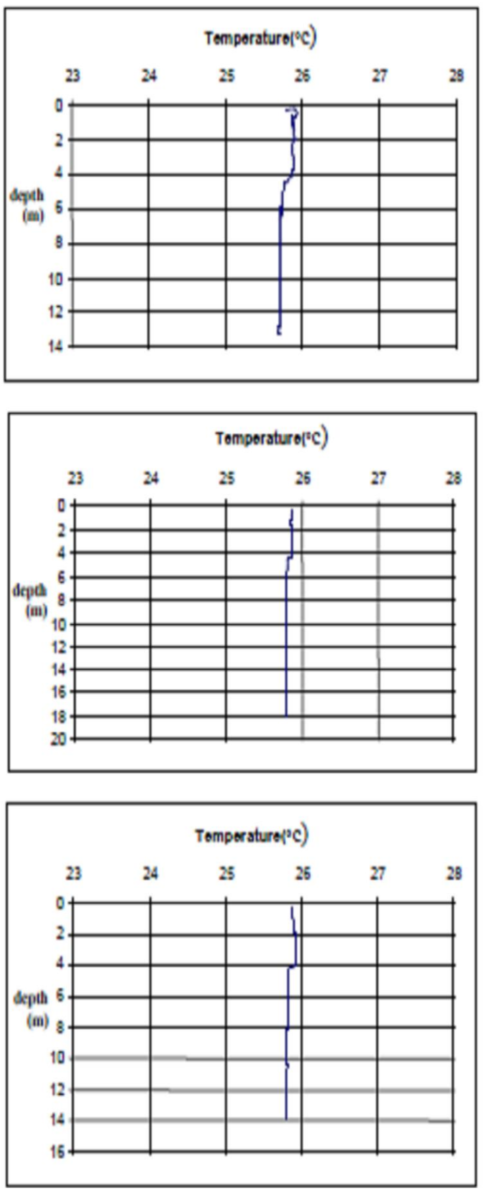
For this research,we measured and analysised physical parameters by CTD,utilized CTD is TERMI 120. This mechanism is including "Terminal and Trigger" that mechanism programming are done by the terminal and after the mechanism commission in the sea, terminal receives data from trigger. This mechanism has 9 probe for physical and chemical measurements. The measured physical parameters are temperature, salinity and density that were measured by CTD that accuracy of the mechanism for the measurement is 0.01(°c),0.01 ppt, 0.01 kg/ m^3. The measurement of physical parameters were done in 6 stations (2transect). These stations are in range of the shore of Hormuzagan to Lark Island as shape (1) that these stations'Geographical situation is in table(1) it is noted that we name a,b,c stations transect 2 and name f,e,d stations transect 1.

Fig 1: measurement of physical parameters stations in 29 oct 2006)

Table 1: the name and geographical situation of physical parameters' measurement stations (a,b,c,d,e,f)

Station	latitude	longitude
A	56º 12´	27º 3´
B	56º 21´	26º 58.5´
C	56º 23´	26º 54´
D	56º 35´	27º 3.5´
E	56º 28´	27º 1´
F	56º 24.5´	26º51´

Physical parameters measurement were done at 29 Nov 2006.daily, physical parameters of wind speed measurement was registered by metreology. organization in Bandarabbas and Qeshm stations that averagely the wind speed was 2.36m/s and the air pressure was 1015mbar between these two station that the pressure is high relatively and the temperature is 20°s averagely. In this research, Excel software was used for data process and profile drawing and Spps software was used for statistical operations.For the studying of physical parameters (tempreture,salinityand density) after measurement, we draw their profile in each station as following shapes.



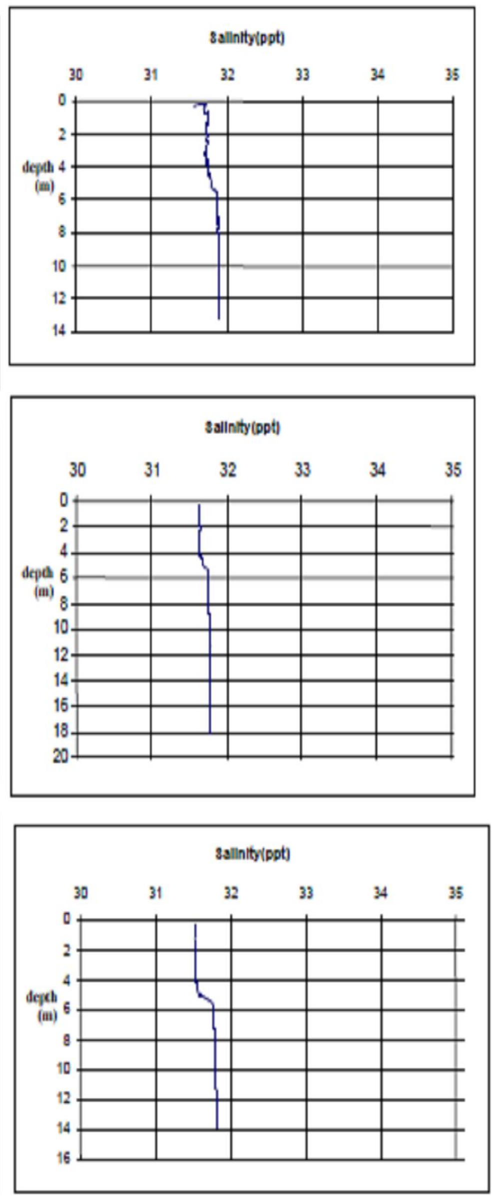


Fig 2: temperature profile in a,b,c stations sequentially (left)
Fig 3: salinity profile in a,b,c stations sequentially (right)

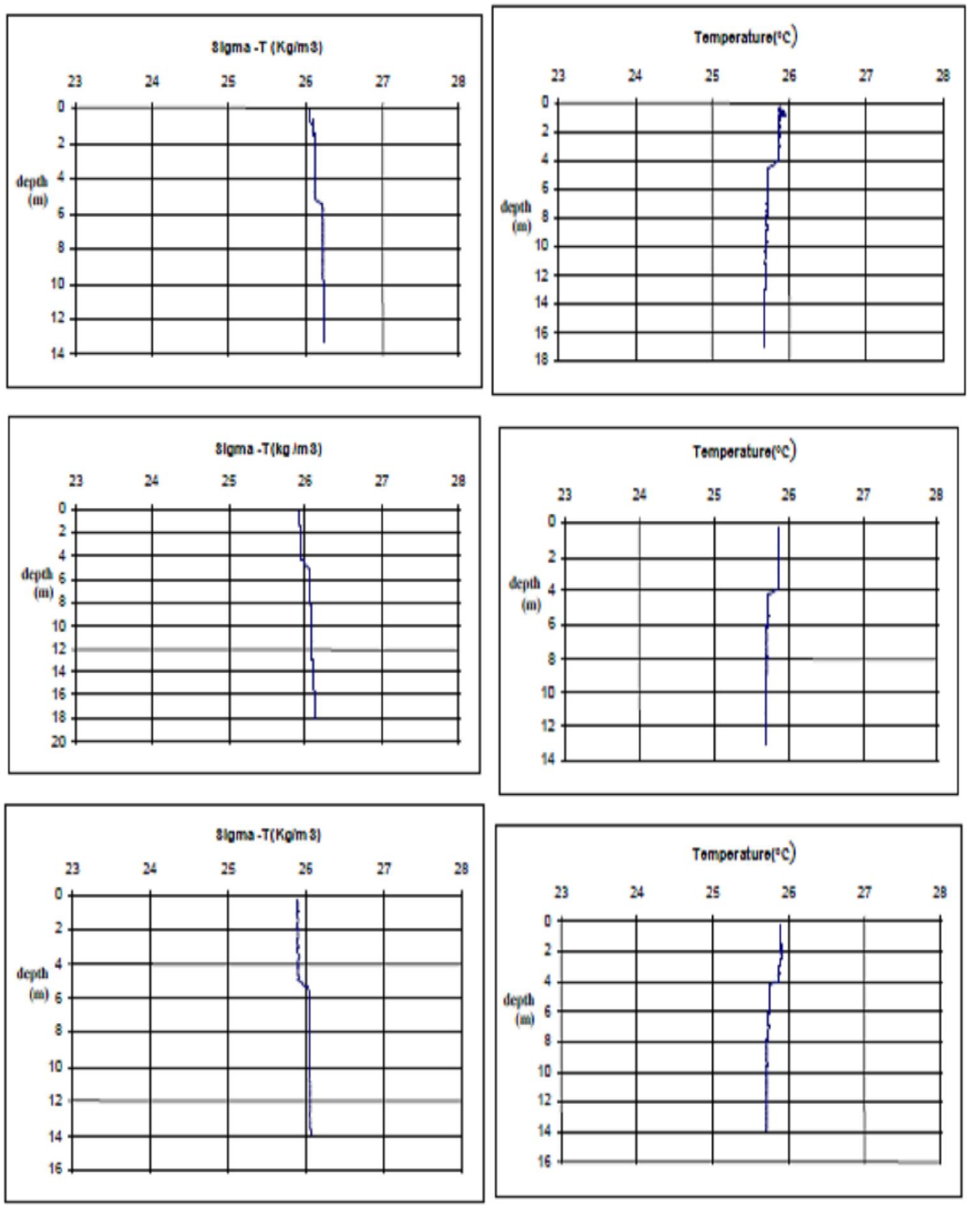
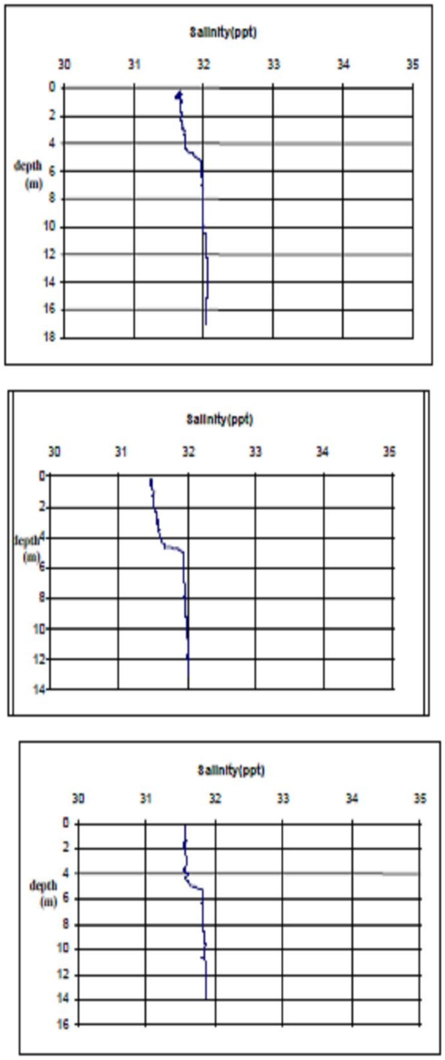


Fig 4: density profile in a,b,c stations sequentially (left)
Fig 5: temperature profile in d,e,f stations sequentially (right)

Discussion and conclusion

Shape(2)shows temperature profile in the first transect in the north of strait of Hormuz sequentially. In the station that is near the beach (a), the temperature is approximately fixed to 4th depth and has a falling in the temperature in 4th to fifth depth. And after that the temperature changes is according to the depth slowly. With due attention to the wind speed was 2.36 m/s on the average, penetration by wind (the depth of Ekman's layer) is 4 m approximately that we have mixture resulting wind to this depth. In the other measurement station, the first transect is almost fixed to this temperature with due attention to the measurement was at the beginning of November 2007,the superficial temperature should be a few but the measurement show 25.8°c approximately that is a high temperature relatively that can be almost 27° because of the sun and the existence of the strait in the latitude. And the other factors are proportional decrease of moisture and cloud, that the weather was sunny when was measured. With due attention to the temperature in the depth has not difference with the surface that is because of instability of water pillar and increase of buoyancy as the result of interchange of the Persian Gulf an Gulf of Oman.



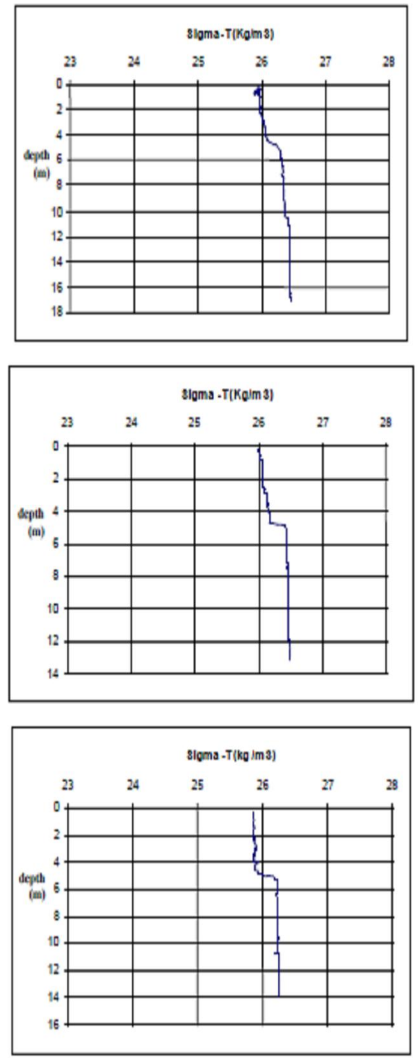


Fig 6: salinity profile in d,e,f stations sequentially (left)
Fig 7: density profile in d,e,f stations sequentially(right)

Tidal current can be another factor in the water mixture. In strait of Hormuz, tidal currents speed increase to 5 m/s. because its horizontal dimensions is 50 to 60 km, so can be important in instability and mixture of water pillar. With due to attention to have instability and mixture so finally Gulf of Oman can not has influence on this research, because the temperature has a few changes between surface and depth.Shape (3)shows the profile of salinity in(a,b,c) stations sequentially. Just as seen, the salinity is fixed to 4m depth and shows a little increase 5.5 to 6m.salinity in the surface and the depth have a few difference and approximately the salinity is fixed from surface to depth. Effective factors in salinity are evaporation, rainfall and river debby. Rainfall and evaporation were propounded with the depth in salinity changes because in the nearest of area, the river measurement is not directly the, the salinity in surface is a few worthlessly is because of that probably it was raining in November and evaporation was decreased or the difference between neighbouring weather was not enough that cause of increase salinity in the surface. Shape(4) shows the profile of density in(a,b,c) stations. Just as seen, the density increase to 5m depth worthlessly that seen in shape (3),(4) increase of temperature and decrease of salinity in this depth. These changes cause increase of density in the depth. The superficial density in the station near the beach is more than the superficial density in the station far from the beach because the temperature changes in each stations of transect in the near of surface is almost similar. In(a) station the density in depth is more than other stations because the salinity is more.So, in density changes with depth in all stations of this transect, the salinity changes in density distribution with depth is more than the temperature changes. In shape(5) has seen the temperature profile in second transect stations (d,e,f) sequentially in the north of the strait.In these stations, the temperature is fixed to 4m depth and from 4m to 5m has a temperature falling. And after that the temperature changes is according to the depth slowly. Exactly, the second transec condition is like the first transect condition. Shape (6)is the salinity profile in(d,e,f) stations. As just seen in these shapes, in these stations, the salinity has a few changes to 5m depth and after that it shows a few increase in 5 to 6m depth. The salinity difference in the surface and the depth is worthless and approximately the salinity is fixed from the surface to the depth.

We spoke about effective factors in salinity analysis of (a,b,c) stations that is also true about (d,e,f) stations of course the boundry of salinity changes in the second transect is more than the first transect and the salinity changes in stations of the second transect is more than the first transect.Shape(7) shows the density profile in (d,e,f) stations sequentially. Just as seen the density increases to 4.5m depth worthlessly that also seen in (5) and (6) shapes, the temperature increase and salinity decrease in this depth.

These changes cause the density increase in this depth. The density changes in these 3 stations is more than (a,b,c) stations and that is true about the salinity companion of two transect that is resulted by entering of Minab river fresh water tang to the neibouring water of these stations. It is noted that the stations is near the beach in (a,b) transect have a less temperature that is resulted by the increase of wind speed and to come near to the beach. The wind speed increase near of the beach that causes water temperature decrease, salinity increases and density increases in these two stations.

Conclusion

1. It is seen the worthless temperature decrease from the surface to 5m depth and complete mixture in all stations and there are worthless temperature changes from 5 to 6m depth and the temperature is fixed from 6m depth to seabed.
2. In this manner, the salinity has worthless changes to 5m depth and has a little increase from 5 to 6 m depth and the salinity is almost fixed from 6m depth to seabed in all stations.
3. The temperature in the area has a few changes range.
4. In all stations salinity and density have a few changes boundries.
5. There were not thermoclain and pycnoclain in the area.
6. The temperature in stations near the beach was lower than the temperature in stations far from the beach and it is resulted by wind speed increase in near the beach.
7. Salinity and density in coastal stations are more than the stations far from the beach.
8. The boundries of salinity and density changes in the second transect stations (d,e,f) are more than the first transect stations (a,b,c) that is because of fresh water tang in the area near the second transect.
9. In all stations, correlation coefficient between density and temperature are between -0.900 to -0.987 and also the drawn regression lines between density and temperature have a negative gradient that shows the reversed relation of density to temperature.
10. In all stations, correlation coefficient between density and salinity are between 0.967 and 0.999 that shows the direct relation of density to salinity and also the drawn regression lines between density and salinity have a positive gradient that confirm it.
11. In all stations, the drawn regression lines between density and temperature have a negative gradient that shows the reversed relation of density to temperature.
12. In all stations, we are seen the direct relation between density and salinity that is conforming of Ebrahimi (2001) and Dadallahi (1995) measurements.
13. correlation of temperature and density in(a)station was -0.923 that is more than the other stations. So correlation of salinity and density in this station is 0.967 that is less than the other stations.
14. According to the wrong calculations in all stations the most wrong was in (c) station. The mistake of density calculations was 0.2kg/m^3 the mistake of salinity calculations was 0.05ppt and the mistake of temperature calculation was 0.08°c.
15. According to the boundries of physical parameters changes in measured area and comparing of these parameters changes boundries with arrival circulation from Gulf of Oman to the strait of Hormuz, we can conclude that there are not arrival circulation from Gulf of Oman to the strait of Hormuz,of course there are circulation that resulting by the wind, tidal currents and the flowing that resulted by the wind breaking.

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1/16/2015