QURANICA, International Journal of Quranic Research, Vol. 10, Issue. 1, June 2018, Pp. 01-14
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PHYSICAL SIGNIFICANCE OF THE BARRIER BETWEEN TWO SEAS AND THE DARKNESS IN DEEP SEA MENTIONED IN THE HOLY QURAN(*)

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ABSTRACT

This paper discerns key ideas and themes of the Quranic science. It investigates and analyzes some verses for example 55:19-20; 25:53; 24:40; 27:61; 35:12 relating to physical oceanography. These verses indicate barrier between seas and darkness in deep sea. By using physical science phenomena this paper analyzes the mechanism of formation of barrier between two seas, the barrier between sea and river at estuary and the causes of darkness in deep sea. Although the Quran is a guide for humanity but its miracle expressed in the mentioned verses also attracts nonbelievers to Islam. This paper helps us to improve physical understanding of barrier and realization the causes of darkness in the deep sea also it helps to increase spiritual belief of believers to Almighty Allah SWT.

Keywords: *Quranic Miracle, Quranic Oceanography, Quranic Science, Deep Sea.*

(*) This article was submitted on: 15/01/2018 and accepted for publication on: 06/05/2018.

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1. INTRODUCTION

Allah (SWT) says, "***By the Quran, this is full of wisdom***"[1]. This verse indicates that the Quran is full of science. Allah (SWT) says, "***We have omitted nothing in this book***"[2]. He also says, "***And we have revealed the book to you as an exposition of all things***"[3]. From these verses it indicates that Quran is a divine source of all branches of education. Here we study the concept of some topics under physical oceanography relating to physical science phenomena.

Although the Quran is a book of guidance for human being but it is a book of science. Every special knowledge is defined as science. The word in Quran is special so it is scientific in nature. The Quran is the collection of speeches of Allah. On the other hand special knowledge of investigation how to use the creation of Allah for betterment of the human being in a disciplined manner is defined as modern science. The source of Holy Quran and modern science is same. So, there is a compatibility of science with the Holy Quran.

2. Quranic verses to barrier and darkness

The Quran is the source of all science. The Holy Quran has about 750 verses about scientific phenomena[4,5]. Here we consider some verses relating to physical oceanography.

﴿مَرَجَ الْبَحْرَيْنِ يَلْتَقِيَانِ بَيْنَهُمَا بَرْزَخٌ لَّا يَبْغِيَانِ﴾

V1: *He has let loose the two seas meeting together; While there is a barrier between them, they do not encroach.*[6]

﴿أَمَّن جَعَلَ الْأَرْضَ قَرَارًا وَجَعَلَ خِلَالَهَا أَنْهَارًا وَجَعَلَ لَهَا رَوَاسِيَ وَجَعَلَ بَيْنَ الْبَحْرَيْنِ حَاجِزًا ۗ أَإِلَٰهٌ مَّعَ اللَّهِ ۚ بَلْ أَكْثَرُهُمْ لَا يَعْلَمُونَ﴾

V2: *And has set a barrier between the two seas.* [7]

﴿وَهُوَ الَّذِي مَرَجَ الْبَحْرَيْنِ هَٰذَا عَذْبٌ فُرَاتٌ وَهَٰذَا مِلْحٌ أُجَاجٌ وَجَعَلَ بَيْنَهُمَا بَرْزَخًا وَحِجْرًا مَّحْجُورًا﴾

V3: *And it is He who has let free the two seas: this is palatable and sweet; and that is salt and bitter; and He has set a barrier between them and a forbidden partition to be passed.*[8]

﴿وَمَا يَسْتَوِي الْبَحْرَانِ هَٰذَا عَذْبٌ فُرَاتٌ سَائِغٌ شَرَابُهُ وَهَٰذَا مِلْحٌ أُجَاجٌ﴾ الآية.

V4: *And the two seas are not alike: this is palatable, sweet and pleasant to drink; and that is salt and bitter.* [9]

﴿أَوْ كَظُلُمَاتٍ فِي بَحْرٍ لُّجِّيٍّ يَغْشَاهُ مَوْجٌ مِّن فَوْقِهِ مَوْجٌ مِّن فَوْقِهِ سَحَابٌ ۚ ظُلُمَاتٌ بَعْضُهَا فَوْقَ بَعْضٍ إِذَا أَخْرَجَ يَدَهُ لَمْ يَكَدْ يَرَاهَا ۗ وَمَن لَّمْ يَجْعَلِ اللَّهُ لَهُ نُورًا فَمَا لَهُ مِن نُّورٍ﴾

V5: *Or is like the darkness in a vast deep sea, overwhelmed with waves topped by waves, topped by dark clouds, darkness upon darkness: if a man stretches out his hand, he can hardly see it. And he for whom Allah has not appointed light, for him there is no light.* [10]

3. Barrier in solid materials

There are broadly two classes of materials: solid and fluid. Fluids are air and water. In solid material we can consider semiconducting materials as silicon and germanium. Pure semiconductor Si is doped with pentavalent impurity and it converts as N-type extrinsic semiconductor. On the other hand pure semiconductor Si is doped with trivalent impurity and it converts as P-type extrinsic semiconductor. When these two types of extrinsic semiconductors are joined together, at junction point a depletion layer is formed. This layer is defined as barrier potential. This barrier acts like a wall which prevents further propagation of electron and holes from one side to another. Barrier between two solid substances is shown in figure1.[11]

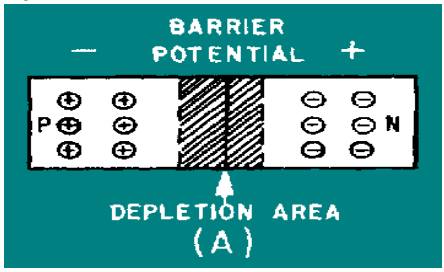

Figure1: Barrier between two solid semiconductor substances.

4. Water characteristics

To investigate the barrier between two seas and darkness in deep sea, we have to have the concepts of properties of water. Cohesion, adhesion and surface tension are water properties that affect every water molecules and the intermolecular force of water molecules with molecules of other substances.

Cohesion: The attractive force between water molecules are known as cohesion. Attractive force is considered as residual electrostatic force. It is shown in figure2. Essentially cohesion is the stickiness that water molecules have for each other. The water drop is an example of cohesion where water molecules like to stick together. Laplace(1806) and Gauss(1830) were the first to have evolved the theory of cohesion. [12]

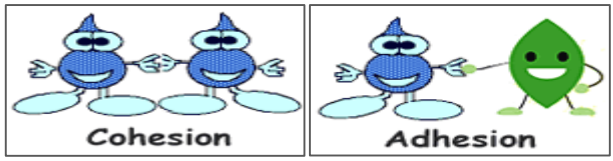

Figure2: Cohesion and adhesion

Adhesion: The attractive force between water molecules and other substances is known as adhesion. It is also shown in figure2. Essentially adhesion is the stickiness that water molecules have for other substances. The example of adhesion is that the water drop is stuck to the end of the pine needles. Another example: In a water tube, water touches the container at higher level. This is adhesion between the water molecules and the molecules of the tube.[13]

Surface tension: The tension or pull in the surface of a liquid is its surface tension. The force per unit length of a line drawn in the liquid surface, acting perpendicularly to it at every points and tending to pull the surface apart along the line is defined as surface tension. Also the force of a liquid surface which resist an external force is defined as surface tension. Actually surface tension is resultant effects of cohesive forces of its molecules.[14] It is shown in figure3. The molecules of the surface of liquid have only cohesion between next side molecules and molecules below them but no cohesion with above. So, they show more strongly cohesion to those molecules directly in touch with them. The stronger cohesion between the water molecules as opposed to the attraction of the water molecules to the air makes it more difficult to move an object through the surface than to move it when it is completely submersed. The surface molecules cohere more strongly than the internal molecules. Water has high surface tension as 75 dynes/cm .[15]

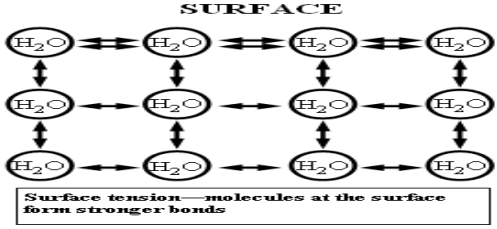

Figure3: Surface tension

5. Properties of sea water

There are six materials which are 99% of sea salts. These are: chlorine (Cl^-), sodium (Na^+), sulfur (SO_4^{-2}), magnesium (Mg^{+2}), calcium (Ca^{+2}), and potassium (K^+). It is highlighted in figure 4. These constituents of sea water are same all-over the ocean. Only quantity of water is different at different ocean basins due to regional differences of fresh water loss

and gain. The Cl^- ion is 55% of the salt in ocean. Typically, salinity of sea water is 35 ppt(parts per thousand).

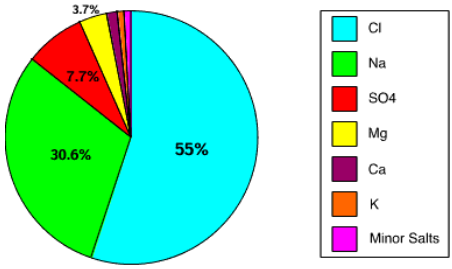

Figure 4: Relative proportions of dissolved salts in seawater.

Water can exist in all three forms of materials. At zero degree Celsius water forms ice and density is 917 kg/cm but at same temperature liquid water density is 1000kg/cm. The density of sea water depends on temperature, salinity, depth and oxygen dissolubility. The density of ocean-water increases with decreasing its temperature, increasing its salinity, and increasing the depth in the ocean. Generally density of pure water is 1000 kg/cm and seawater at the surface is 1020 to 1029 kg/cm. In the deep sea density of seawater is very high as 1050 kg/cm.

At different location properties of sea water is different. Density depends on temperature and salinity. Density increases when salinity increases and temperature decreases. Less dense water can float on top of more dense water. At same salinity, warmer water goes up and cold water goes down. Water of higher salinity can float on top of lesser salinity water if the temperature of higher saline water is warmer. Circulation of sea water is horizontal at same density layer.

Salinity at pole area is 33ppt and at basin area is 41ppt. Temperature at pole is 0^0c and at tropical region is 29 0^0C. 75% sea water temperature remains between -1^0c and 6^0c. At 4^0c temperature the density of pure water is maximum. Fresh water freezes at 0^0c and sea water freezes at -1.9^0C. Salt lowers the freezing point. Ice forms in salt water but no salt in ice. Salinity is different at different location as it is 40 ppt at Red sea, 38 at Mediterian, 18 at Black sea , 8 at Baltic sea and 34.7 at Average sea.[16]

Sea can be divided into three layers. First layer is surface zone which is only 2% of total volume. This layer is warmest zone. Second layer is pycnocline or transition zone which is 18% of volume. Third layer is deep zone which is 80% of total volume. This layer is static zone.[17]

6. Formation of barrier between two seas

In fluid materials like water; if different constituents are added with water, its properties may be changed. The properties of water depend on its temperature, impurities, salinity,

weights etc. Surface tension is a fundamental property of water. Surface tension arises from strong interaction between water molecules. Water has highest surface tension as 72.8 mN/m. Cohesive force between liquid molecules are responsible for surface tension. Surface tension decreases with heating shown in figure5. If there is temperature difference between two water; their surface tension will be different and they meet only but not intermix due to these difference surface tension.

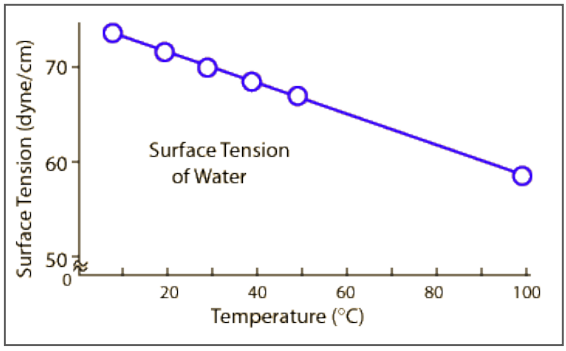

Figure5 : Surface tension varies on temperature.

Pure water density is 1000kg/m^3 and ocean surface water is 1027kg/m^3. Density depends on temperature and salinity. Density increases as temperature falls and density increases as salinity increases. Less dense water floats on top of more dense water. At same salinity, hot water goes up and cold water goes down. Water of higher salinity can float on top of lesser salinity in only top layer is hot. By using CTD(conductivity, temperature, depth) instrument we can measure temperature, salinity and pressure of sea water.

There are two types of barriers in sea water. The first barrier is between two adjacent seas and the second barrier is between a sea and a river. Modern physical oceanographic scientists have discovered barrier between two seas. This barrier divides two seas so that each sea has its own temperature, salinity and density.[18] In case of two types of waters in contact with each other and with air, three surface tensions are to be taken into consideration. These surface tensions in the equilibrium form a triangle and this triangle of force is known as Neumann's triangle.[19] The Quranic verses 55:19-20 indicate the barrier between two seas and the verse 27: 61 also indicates the same type invisible incredible barrier. This invisible barrier is confirmed by Dr. William Hay, a well known marine scientist and Professor of Geological Science of University of Coloroda USA.[20] Here two seas mean two distinct type of water flow. In above verses Allah(SWT) says that there is a barrier between two seas and they cannot encroach upon one another. We have to investigate why and how this barrier is formed between seas. At first we have to remember that Allah(SWT) does anything by miracle power but He does mostly in a system. In this research we are going to analyze the causes of barrier system.

In 1873 British Scientific Expedition identified 362 oceanographic locations to collect characteristics of sea water. The report was 29500 pages in 50 volumes and it took 23 years to complete the research. In 1933 American Expedition did the same in the Mexican Gulf and obtained similar information. Both the report said that the properties of water at different oceanographic stations are different in respect of salinity, density, temperature, marine organism and solubility of Oxygen in water. By using sophisticated instrument CTD it was investigated that there were two distinctive seas with different characteristics.

In 1942 oceanographic scientists investigated aquatic barrier separating adjacent seas and retaining the distinctive characteristics of each sea. In 1962 the role of barriers was investigated.[21]

Both water and air are fluids. From properties of water we know the cohesive force between water molecules and adhesive force between water and air. Due to cohesive force a strong surface tension is formed over water surface along horizontal direction. We observed a strong surface tension at interface between two distinct type fluid i.e. water and air. Same phenomena occur at pycnocline and thermocline interface between two distinct type water. But this interface acts along vertically with sea surface. As the density, salinity, temperature and solubility of water of one oceanographic location is different from neighboring water, at vertical interface two distinct surface tensions are formed due to each distinct water masses. Water has highest surface tension as 72.8 mN/m. This force is resultant effect of cohesive force of water molecules. This force acts in vertical and horizontal in backward direction shown in figure6. But no strong attractive force acts in forward direction. Only very weak adhesive force acts in forward direction which is negligible with respect to strong cohesive force in backward direction. As a result, as if, there is a thin wall or army front between two adjacent distinct water columns of different characteristics. Due to this incredible and invisible thin wall water meets only but does not mix although mixing agents like ebb, tide, strong current, turbulence, movement of internal waves in backward and forward direction are present.

Figure7 shows barrier between two distinct water masses of the Mediterranean sea and the Atlantic sea over the Gibraltar sill with its own warm, saline, and less dense characteristics, because of the barrier that distinguishes between them. It is observed that warm, saline, and less dense characteristics water of the Mediterranean meets only but does not mix at barrier with cold, less saline and high dense water of the Atlantic sea although warm water enters into cold water upto 100km at the depth of 1000m.[22]

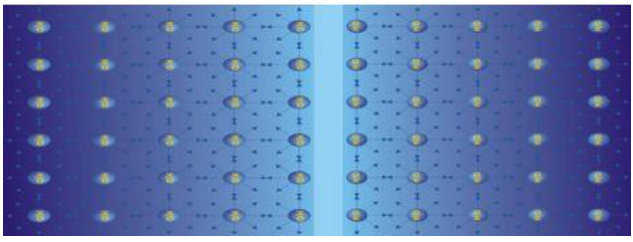

Figure6: Redistribution of cohesion at junction of two distinct fluids.

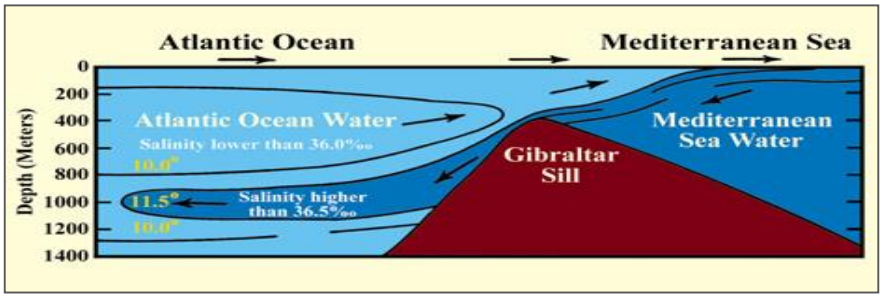

Figure 7: The Mediterranean sea water as it enters the Atlantic over the Gibraltar sill with its own warm, saline, and less dense characteristics, because of the barrier that distinguishes between them. Temperatures are in degrees Celsius

7. Formation of barrier between sea and river

The second type of barrier is between river and sea. Modern science says, in estuaries barrier is formed by pycnocline zone separating two layers.[23] The Quranic verse 25:53 indicates this type of barrier. The Quranic verse 55:19-20 indicates only barrier between two salt seas of different characteristics. On the other hand the Quranic verse 25:53 indicates not only barrier but also a forbidden partition between salt sea and fresh river. The cause and mechanism of formation of barrier between sea and river is same as one between two adjacent salt seas explained earlier. Here we investigate the physical formation of forbidden zone between sea water and river water.

Oceanographers studied a lot of samples of water of that area where a sea meets with a river. It is found that level of salinity, temperature, density and living organisms are different at different places of estuary. After investigating samples of water at estuaries, it was found that water is three classes. 1. Very fresh river water 2. Very salt sea water and 3. Mixture of fresh and salt water shown in figure8. [24]

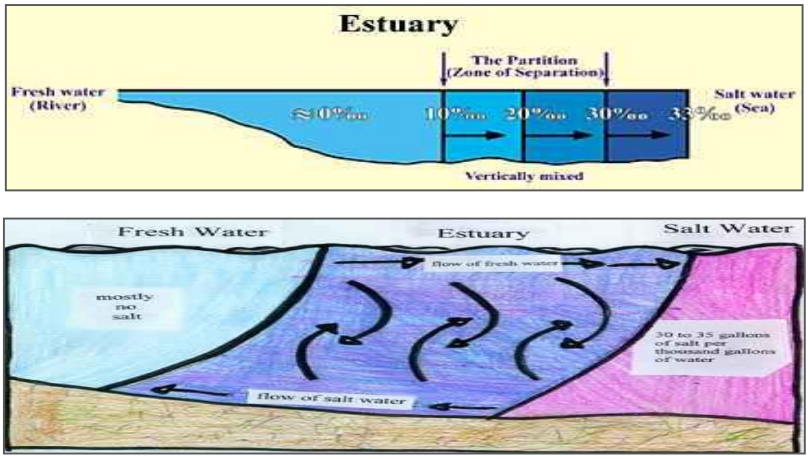

Figure8 : Three types of water at Estuary

The three water masses consist of different salinity shown in figure8. Marine and aquatic organisms are accustomed to their own environment. Outside of their own area they cannot live except a very few species. The meeting place of very fresh water of river and very salty water of sea is estuary. The water of estuary is mixture of salt and fresh water which is different from river and sea water.[25] In the estuary fresh water flows to salt water along surface and gradually goes downward on the other hand salt water flows towards fresh water along bottom and gradually goes upward. As a result it forms a whirlpool or vortex in the estuary which provides hindrance to further flow of water from river to sea and also from sea to river. The estuary is a confinement for organisms living in it and accustomed to its salinity and osmotic pressure. If organisms go outside of this confinement to another area of different osmotic pressure of sea and river they cannot live in safe. In the same way organisms from sea and river are not suitable in estuary. The organisms living in very fresh river water and in very salt sea water will die if they enter into estuary because of different osmotic pressure. So, the estuary is forbidden zone for outsiders organisms.

It is precisely and concisely investigated that the meeting of two salt seas forms barrier only but no forbidden partition because osmotic pressure between two salt seas are negligible. This allows movement of marine organisms between them. But in the case of estuary it has high osmotic pressure. As a result, the estuary becomes a zone of confinement or prison for organisms living here and prevent them from moving into sea or river.

8. Causes of darkness in deep sea

The Quranic verse 24:40 indicates the darkness in deep sea also the causes of this darkness precisely and concisely. In this verse Allah SWT the Creator of this universe describes not only the darkness in a sea but also different layers of cloud, water waves and the circumstances in the sea water very precisely. Here we investigate how the darkness is created in deep sea. Before going to investigate the causes of darkness we have to have the physical science concept of geometrical optics as refraction of light wave. Refraction is the change in direction of an electromagnetic wave due to a change in its transmission medium or the bending of light wave as it passes from one medium to another is called refraction. When sunlight falls on a glass prism it disperse into seven basic colors as VIBGYOR. The wavelength of red color is long so its bending is small. Dispersion of light is shown in figure9. Light energy is absorbed by sea water whether it is clear or polluted. Light absorption by wavelength is shown in figure10. It indicates that red light absorption is maximum and blue light absorption is minimum.[26]

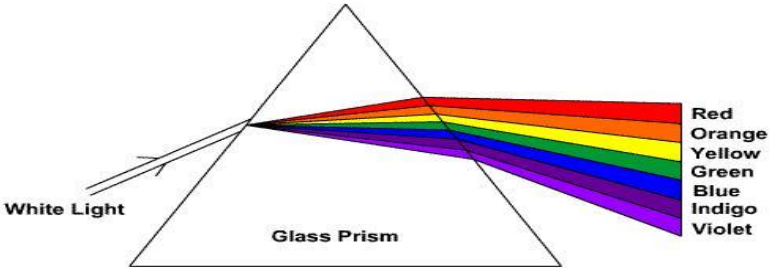

Figure9 : Refraction of light

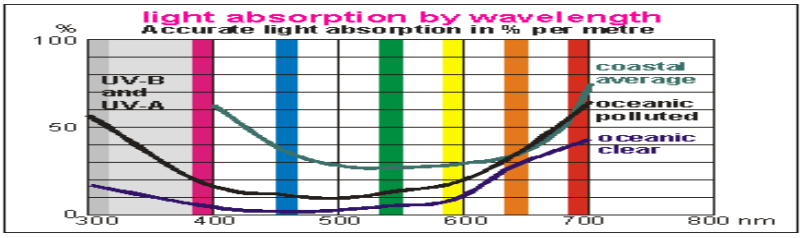

Figure10 : Light absorption by wavelength.

Light comes from the sun with UV and many other harmful cosmic rays for human being. By the grace of Almighty Allah all the harmful rays are deleted by absorption by Ozone layer and fresh white light transmits towards the earth. Scientists determined that

the light at first falls on cloud and 30% of light energy is absorbed. As a result, below this cloud the first cloud darkness is formed. The environmental absorbing and fading particles like dust absorbs about 19% of light energy. Then the light falls on upper surface wave of sea and 35% light energy is used for evaporation and photolysis of surface water into cloud.[27] Also 5% of light energy is reflected by surface wave which is 2% of the sea volume shown in figure11.[28] It is warmest zone of the ocean. Transition zone is 18% of total ocean volume and remaining 80% of ocean volume is Deep zone. Deep zone has no vibration. In the transition zone density changes rapidly with depth determined by measuring salinity and temperature changes.

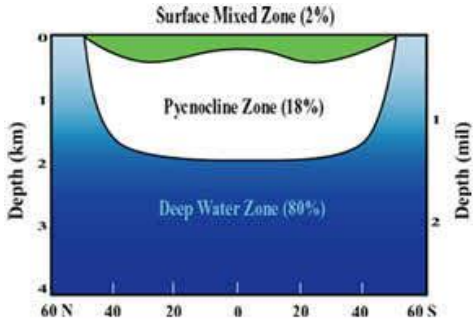

Figure11: Different zone of sea volume

Only 11% percent of light penetrates the surface zone. On the way of light transmission it faces reflection, multi refraction, photolysis, evaporation and absorption. As a result, at first red color is absorbed within 15m depth. This region is red darkness zone. In this zone if any diver is wounded with red blood none can detect it for red darkness. Orange is absorbed within 50m, yellow within 100m and green color is absorbed within 200m. Out of seven spectrum all are absorbed except blue color.[29] This is why if anybody looks at sea it looks bluish. Due to successive disappearance of light of VIBGYOR spectrum darkness increases layer by layer. Below a depth of 1000m there is complete darkness. The interfacing layer between low density water and high density water is defined as internal wave in sea.[30] This layer also absorbs light energy. In deep sea Allah SWT created living organism having bioluminescence. Fish converts its chemical energy into light energy through bioluminescence. But no sun light is reached to deep sea. So, 7 layers of VIBGYOR and 3 layers of cloud, surface wave and internal waves all are responsible to create darkness in deep sea.

9. Outcomes from scientific studies of verses

The main outcomes of this paper is not only to increase the existing spiritual belief of all believers by observing the miracle of Quran and all nonbelievers will embrace Islam but also to innovate physical science phenomena from the Quranic verses. So there are two types of outcomes from the study of the mentioned verses. One is spiritual influence and another is scientific improvement of knowledge. Prof. Durga Rao, a marine engineer of King Abdul Aziz University became astonished to realize this verse 2:40.[31] A world famous diver of France Mr. Jacqua Yves Costeau (1910-1997) observed fresh water in salty sea and he became astonished. Then he embraced Islam by realizing the barrier between two seas mentioned in the Holy Quran.[32] A man in Merchant Marine in Toronto living in sea had a Quran from Muslim and when he read the verse 24:40 became astonished and embraced Islam.[33] Before 1435 years ago modern knowledge and equipments were absent to measure characteristics of sea. So, the information expressed in the verse 24:40 is not from any human rather from the Greatest Creator Allah SWT. This scientific information leads to a deeper appreciation of the Wisdom and Power of Allah SWT. On the other hand, the research on the Quranic verses improves our scientific understanding of physical science phenomena.

10. CONCLUSIONS

Although the Quran is a book of guidance but also it hints indications of all branches of science. By following the commandments of the holy Quran from Allah SWT a man can be successful here and hereafter. In the same way by investigating an analyzing verses relating to physical science we will be able to improve our scientific knowledge. Also it will be possible to attract the nonbelievers towards the most authentic Holy Quran which is the words of Allah.

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