

REDUCING GLOBAL SURFACE TEMPERATURE BELOW 15 DEGREE CENTIGRADE BY HARNESSING GEO THERMAL ENERGY FROM HYDROTHERMAL VENTS OF MID-OCEAN RIDGE AND SUBAERIAL ACTIVE VOLCANOES

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Abstract Presently, meteorologists are of the opinion that all weather is created by the sun alone. Warmth for the planets is provided primarily by the sun's energy. At an average distance from the Sun of nearly 150 million Km the Earth intercepts only a very small fraction of the Sun's total energy output. However, it is this radiant energy (or radiation) that drives the atmosphere into the pattern of everyday wind and weather and allows the earth to maintain an average surface temperature of about 15° Centigrade [1]. During last 150 years of industrial revolution this average surface temperature of the Earth has risen to 16.2° Celsius. A careful study and an in-depth analysis of the above statement has revealed that the contribution of the geothermal energy element spewed out by the active volcanoes both on the dry land and on the seabed (I.e., mid-ocean ridge about 80,000 Km long) has not been taken into account while attributing the entire credit to the solar incoming radiation alone. In view of this lapse, the problem of global warming deserves a reexamination. It is a common knowledge that heat radiations of 1100° Centigrade temperature are being pumped into the atmosphere from the caldera of every active volcano of dry land and 1200° Centigrade Magma surges up through fissures and floods rapidly across the sea floor. The volcanoes at the mid-ocean ridge alone account for the 75% Magma output on the Earth. It has been estimated that the sea floor rifts and the hydrothermal springs along the Mid-Ocean Ridge have been around for at least 2 to 3.5 Billion years. The hydrothermal vents having temperature of 600°C can be used to harness geothermal energy up to 60 Megawatt (electrical energy) per hydrothermal vent. Creare Turbo – Rankine Power System for Hydrothermal Vents [9] have already been developed. Obviously, the surface temperature of the Earth is jointly due to Geothermal Energy and Incoming Solar Radiation.

Keywords Hydro thermal vents, mid-ocean ridge, Creare Turbo - Rankine power system, Ring of Fire, Indo-Pacific Warm Water Pool, Geothermal Energy

Introduction

The oceans of the world cover 2/3rd of the Earth's surface area. The upper layer of the sea (Thermocline) popularly known as Sunlight Zone is mainly influenced by the solar radiation. Since the sun commutes between Tropics of Cancer and Capricorn, thereby crossing the Equator twice a year; the intensity of solar heat is highest in equatorial region when this solar heat is overlapped by western portion of the Ring of Fire (Fig. 1-3), gives rise to the Indo-Pacific Warm Water Pool (Fig. 4) the most important unique weather feature of the world [2].

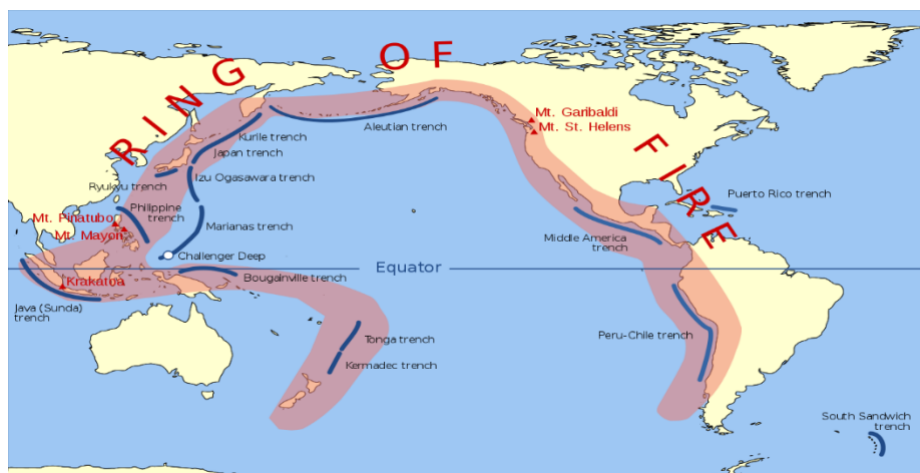


Fig.1. The Pacific Ring of Fire

The broad, shallow body of warm ($>29^{\circ}\text{C}$) water found in the western tropical Pacific Ocean plays an important role in the coupled ocean-atmosphere dynamics and thermodynamics associated with the El Niño-southern oscillation phenomenon. Its area is more than $30 \times 10^6 \text{sq Km}$. In addition, those waters maintain such temperatures down to approximately 200 m in most regions, and therefore the term “Warm Pool” has been coined [3]. This pool holds warmest sea waters in the world. It is considered as the “Heat Engine” of the globe. Since this area of warm water pushes western Pacific water into Indian Ocean it is also often referred to as the Indo-Pacific warm water pool. This region hosts the Indonesian through flow the network of the currents through which surface and thermocline waters are transported from the western equatorial Pacific Ocean into Indian Ocean [4]. The Pacific warm pool is characterized by a mean sea surface temperature of 29°C (exceeding 28°C , the minimum surface water temperature that supports deep convection), weak trade winds, and the resultant deep convections with thunderstorm tops exceeding 15 Km. It has been found that over a period of roughly two decades, the warm pool’s average annual temperature and dimensions increase and then decrease like a slowly pulsating beacon. Because these waters are hot enough to drive heat and moisture high into the atmosphere (by convection) the warm pool has a large effect on the climate of surrounding lands. It has been called the heat engine of the world and plays a key role in climate and monsoon variability for many nations throughout Asia & Africa, and also influences the remote regions and large-scale climate models variability. Furthermore, the size and intensity of the warm pool fluctuates with the El-Niño southern oscillation (ENSO). During El Niño events the pool expands horizontally but shrinks in vertical depth. The opposite occurs during La-Niña. Overall, in the recent years, the pool has increased in both horizontal coverage and vertical depth [5].

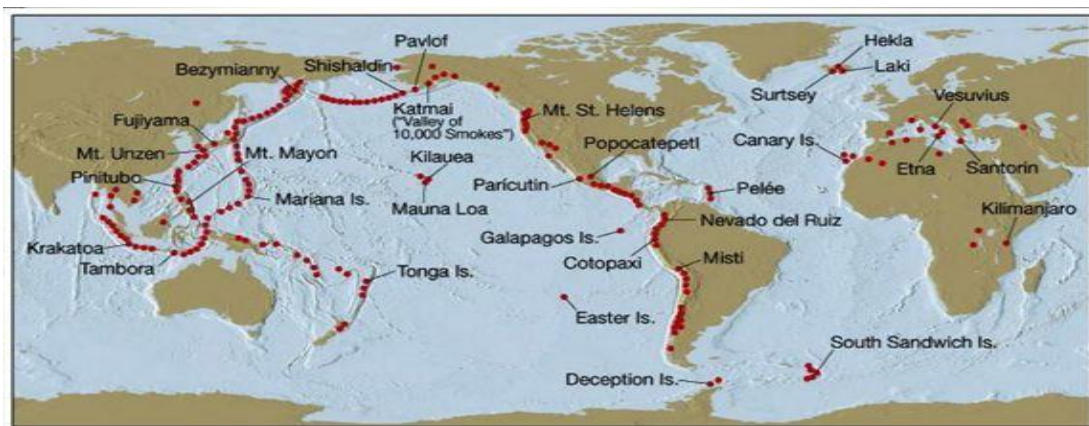


Fig.2. Location of earth’s major volcanoes

Warm Water Pool being the joint venture of Solar & Geothermal Energy frequently generates the most powerful tropical cyclones of the world. The sea surface temperature of this Warm Water Pool remains higher than 28°Celsius throughout the year. It may be recalled that the threshold sea surface temperature for genesis of Tropical Cyclone is $26.5^{\circ}\text{Celsius}$. For example, Average Annual Sea Surface Temperature (AASST) of Pacific Ocean is 29°Celsius , Atlantic Ocean 27°Celsius , Bay of Bengal 26°Celsius and Arabian Sea 25°Celsius , respectively. Coming to the frequency of the formation of Tropical Cyclones; Pacific Ocean spawns 65%, Atlantic Ocean 20%, Bay of Bengal 10% and Arabian Sea 5% only. Moreover, the diameter and maximum sustained surface wind speed also varies proportionately. For example, the diameter of Tropical Cyclone generated by this Warm Water Pool is double that of Tropical Cyclone generated in Arabian Sea. The maximum sustained surface wind speed in this variety of Tropical Cyclone is 450 Kms/hr in comparison to 150Kms/hr of that of Arabian Sea. Had the sun been the alone source of energy, AASST would have been uniform in the Equatorial / Tropical zones of all oceans. Evidently, the ring of fire incorporating therein the major chunk of active volcanoes of the world, accounts for the highest AASST value of Pacific, the largest ocean of the world. In Atlantic Ocean there are few active volcanoes thereby proportionately reducing the AASST to 27°Celsius . In the Bay of Bengal there is only one active Barren Island Volcano, further reducing AASST to 26°Celsius . Since there’s no active volcano in the Arabian Sea the AASST is the least 25°Celsius .

The Magma spewed out by mid ocean ridge heats up the water at the bottom of the ocean. The cold water at the ocean bed percolates into the ridge and comes in contact with $1200^{\circ}\text{Celsius}$ Magma. As a result, hydrothermal vents are developed, and long-term circulation (convection currents) are set up in the oceans of the world. Accordingly, the top layer of ocean water is jointly heated by Solar and Geothermal Energy, whereas the bottom is solely heated by Geothermal Energy.

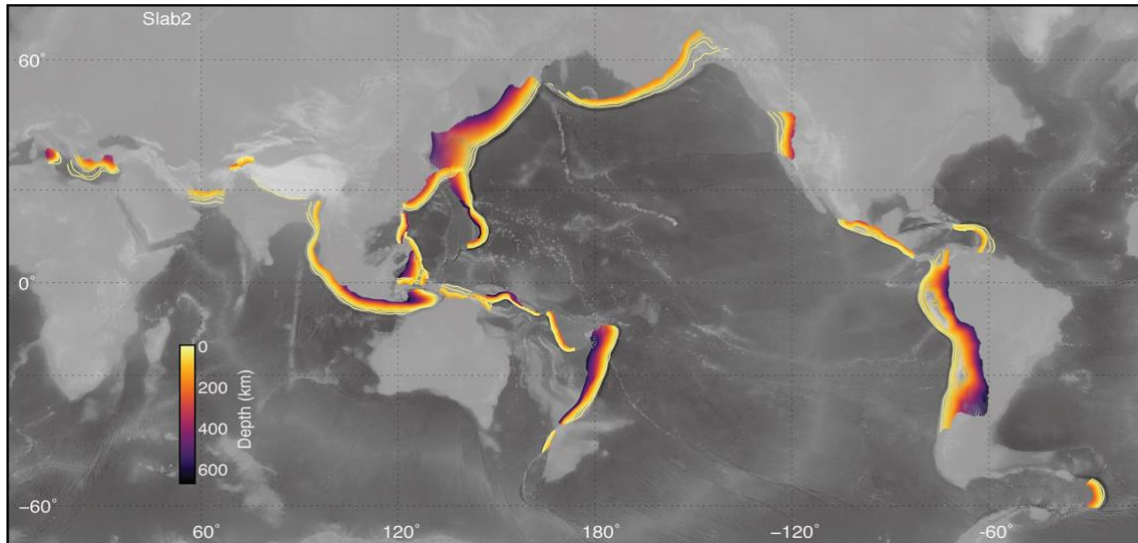


Fig.3. Global map of subduction zones, with subducted slabs contoured by depth

Due to the activities in the mid ocean ridge, 10 cubic Km of new crust is created every year. Accordingly, huge amount of Geothermal Energy is transferred to the cold sea water of the seabed. This amount of heat drastically changes the temperature profile of the seawater. Since, the phenomenon of sea spreading is faster (20 cm/year) in the East Pacific Rise of the Pacific Ocean as compared to that of Mid-Atlantic Ridge (1 cm/year) of Atlantic Ocean, therefore, much more heat is transferred to the Pacific Ocean Waters than that of Atlantic Ocean. Black Smokers (Hydrothermal Vents), the natural chimneys on the seabed, form along mid-ocean ridges where the tectonic plates are moving apart. The Black smokers begin when the seawater seeps through cracks in the sea floor. The water is heated by volcanic magma and it dissolves minerals from the rock. Once, the water is superheated, it spews from the vents in scalding, mineral-rich black plumes. Water jetting from Black Smokers can reach 662° Celsius. Each drop of seawater in the world circulates through a Black Smoker every 10 million years [6,7]. Since hydro thermal vents were recently discovered in year 1977 therefore the contribution of geo thermal energy element in the global surface temperature has not been included so far by the earth scientists of the world. The Empire of Geothermal Energy mainly dwell on 550 active volcanoes of Ring of Fire (dry land mass of earth) pumping out lava into the global atmosphere, hydrosphere & 1200°C magma being spewed out from 80,000 Km long mid-ocean ridge on the sea floor of the oceans.

Discussion & Conclusion

The climate is the average of the weather prevalent in an area over a period of time. Weather conditions include temperature, rainfall, geothermal energy element, sunshine, wind, humidity and cloudiness. The interaction of atmosphere and the ocean water is complex. In contrast to land, the ocean heats up and cools down more slowly. Since the overall effect of the oceans is to act as a heat reservoir, any land mass near large water body is protected from great swings of temperature. The role of smaller players like pollution contributed by consumption of fossil fuels, sunspot activity and orbital variation in the game of Climate Change have so far been over emphasized by the entire World Community of Meteorologists. Whereas the role of major player I.e., Geothermal Energy has been totally overlooked and the entire credit has been wrongly attributed to the Sunshine. Since the meteorologists failed to take cognizance of contribution of geothermal energy element in the formation of Indo-Pacific warm water pool, therefore, their understanding of its origin remained obscured. Likewise, there are many other serious implications of this lapse on their part. For example, wind energy which is again a joint enterprise of solar and geothermal energy is being incorrectly termed as indirect solar energy (alone).

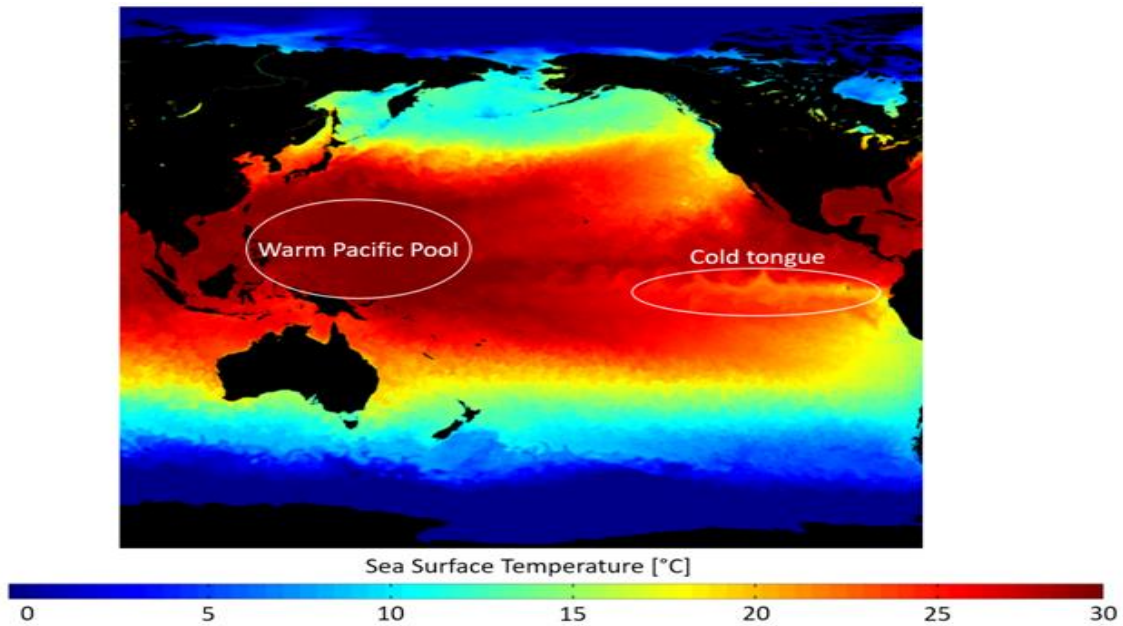


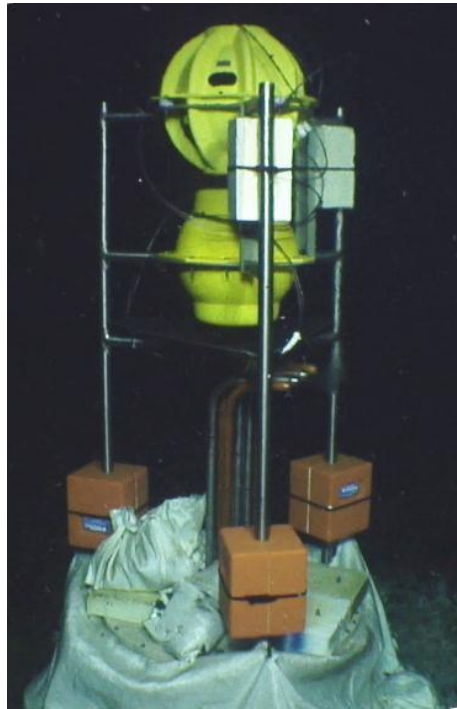
Fig.4. Heat distribution map

Water molecules of the oceans & air molecules of global atmosphere remain inert till solar or geothermal radiations agitate them; which implies that by favorably managing either or both of these sources of heat energy the atmosphere - ocean interactions and so on the global climate pattern will remain under human control.

The prevalent renewable energy sources viz. windmills, solar photovoltaic panels, geothermal power plants and gadgets for harnessing atmospheric electricity are quite efficient tools to realize this dream. Needless to say, all of these so-called global cooling machines, presently working worldwide have already reduced the global surface temperature to a fair extent. For experiment sake if these meritorious machines are switched off only for a period of six months, the global surface temperature will again shoot up noticeably. Going a step further, if geothermal power plants are installed on active volcanoes of Indonesia, The Philippines and Papua New Guinea which are encompassing the Indo-Pacific warm water pool; the alarming rate of its growth can be certainly checked because the warmth of this pool is jointly sponsored by geothermal energy (of neighbouring active volcanoes) and the solar energy of the Equatorial / Tropical region. As an extreme measure if geothermal power plants are installed on all active volcanoes of dry land mass of the earth along with Create Turbo-Rankine Power Systems on all hydrothermal vents present on 80,000 Km long mid-ocean ridge; the global surface temperature will miraculously dip below 15° Celsius. With the aid of coupled general circulation models an attempt can be made to simulate atmospheric and oceanic conditions to anticipate the post plant installation scenario. Instead of launching an impractical campaign for non-consumption of fossil fuels and also giving hot pursuit to weather / climate prediction programs like TOGA (Tropical Ocean and Global Atmosphere) and other components of World Climate Research Programs (WCRP) the resources should be more justifiably utilized for the eradication of problem of the global warming in mission mode manner.



Figure5. Hydrothermal Vents - Black Smokers



All images: Courtesy Google Images

Simultaneously, preference should also be given to the task of harnessing Fair Weather Electric Current from Gigantic Atmospheric Electric Generator (Atmospheric Electricity) under the banner of National Aeronautical Space Administration (NASA) & International Commission on Atmospheric Electricity (I.C.A.E). A concerted attempt, made in this regard, will surely yield cherished results [8].

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