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Environmental Implication of Surface Temperature in Nigeria

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ABSTRACT: Ocean surface temperature is a critical parameter for weather and climate research as well as oceanography. Very useful measurements can now be made under clear sky conditions using infra red techniques. Microwaves sensors allow extension to virtually all weather conditions, including the cloud covered portion of the oceans. This paper will discuss the understanding of SST (sea surface temperature) change and climatic implications for detecting oil spills in the Niger Delta Area of Nigeria.. Moreso, there are some case studies and direct use of SST measurement applications.

KEY WORDS: Environmental implications, sea, surface temperature, Niger delta, Nigeria Weather and Climate.

INTRODUCTION

There has been a heightened interest in sea surface temperature (SST) measurements during the past two decades, particularly on a global scale, due largely to the advent of several El Nino episodes and increasing worldwide concern about global warming. Because of the continuous global measurements of SST that satellites can provide, they play a fundamental role in acquiring the data sets necessary for studies of such global processes (Grassl, H 1976). However, the satellite data still need to be validated against in-situ measurements in order to assess the accuracy of satellite SST retrieval algorithms. Since 1997 radiometric sea surface skin temperatures have been recorded monthly using a TASCO radiometer along a cross shelf transect extending 40 km offshore from a coastal location north of Perth, Western Australia. This SST measurement program is one component of the Hillarys Transect, an ongoing multidisciplinary oceanographic study which aims to quantify the seasonal variation of physical and biological variables in the coastal Indian Ocean. Validation of satellite SST retrieval algorithms is the primary aim of the SST measurement program component of the Hillarys Transect, which also aims to develop a data set which captures the seasonal variation of SST off the coast of southern Western Australia (WA).the aim and objectives of this work is to highlight the environmental implications of surface temperature and perhaps give a possible approach to the solutions.

Basically, sea surface temperature (SST) is the water temperature at 1 meter below the sea surface.

MEASUREMENT OF SST

The earliest technique for measuring SST was dipping a thermometer into a bucket of water manually drawn from the sea surface (Walton, C.C).,. The first automated technique for determining SST was accomplished by measuring the temperature of water in the intake port of large ships. This measurement is not always consistent, because the depth of the water intake as well as exactly where the temperature is taken can vary from vessel to vessel. Probably the most exact and repeatable measurements come from fixed buoys where the depth of water temperature measurement is always 1 meter and very robust electrical temperature probes are used. These measurements are usually beamed to satellites for automated and immediate data distribution.

Since the 1980's satellites have been increasingly utilized to measure SST and have provided an enormous leap in our ability to view the spatial and temporal variation in SST. The satellite measurement is made by sensing the ocean radiation in two or more wavelengths in the infrared part of the electromagnetic spectrum which can then be empirically related to SST. These wavelengths are chosen because they are

1) Within the peak of the blackbody radiation expected from the earth.
2) Transmit well through the atmosphere.

The satellite measured SST provides both a synoptic view of the ocean and a high frequency of repeat views, allowing the examination of basin-wide upper ocean dynamics not possible with ships or buoys (McClain et al). For example, a ship traveling at 10 knots would require 10 years to cover the same area a satellite covers in two minutes.

However, there are several difficulties with satellite based absolute SST measurements. First, because all the radiation emanates from the top "skin" of the ocean, approximately the top 0.1 mm or less, it may not represent the bulk temperature of the upper meter of ocean due primarily to effects of solar surface heating in the daytime, and back radiation and sensible heat loss at night as well as from the effects of surface evaporation. This makes it difficult to compare to measurements from buoys or shipboard methods, complicating ground truth efforts. Secondly, the satellite cannot look through clouds, creating a "fair weather bias" in the long term trends of SST. Nonetheless, these difficulties are small compared to the benefits in understanding gained from satellite SST estimates. Thin clouds such as cirrus and very low stratus cloud are a major source of error since they will lower the apparent sea surface temperature measured by the satellite but not so much that the temperature are obviously wrong (Strong, A.E. et al.)

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CLIMATIC IMPLICATIONS OF SST.

Oil spills may affect species through direct effects on population size and structure and direct and indirect (toxicological) effects on reproduction. Spill effects on the habitats these organisms occupy have received less attention, but they are no less important. (Minnett,P.J 1991) Following the Exxon oil spill in Bille, Degema LGA of river state, we studied the use of oil-affected habitats by 10 species of marine-oriented fish and birds. We surveyed bays that had received different levels of initial oiling. We related the abundance of individual species in the bays to the oiling gradient, using regression models that included habitat measures to control for variations among the sites in features other than oiling level. We defined a spill-induced impact as a statistically significant relationship between the abundance of a species and values along the oiling gradient, after accounting for the effects of variations in habitat features. We used among-year comparisons of regressions between oiling levels and abundance, controlled for season, to assess recovery. We concluded that recovery from a spill-induced impact had occurred when we no longer could detect a significant relationship between a species' abundance and oiling levels.

A principal component analysis revealed extensive ecological overlap between species that were negatively impacted in their use of oil-affected habitats and those that were not. We detected no obvious ecological differences between species that suffered spill impacts on habitat use and those that apparently were not affected, or between impacted species that later recovered in their use of habitats and species that had not yet recovered. These results indicated that the Exxon oil spill had clear initial negative impacts on habitat use by nearly half of the species examined, suggesting substantial initial effects on habitat suitability for these species (Maul, G.A.1985). These impacts persisted for couple of months for most affected species. This rate of recovery in habitat parallels the rapid recovery documented for other oil-affected communities (e.g., intertidal invertebrates, fishes, and birds) that have been studied in Rivers-state and elsewhere.

CONCLUSION.

SST is a powerful factor which affects the climate of the earth (Schluessel, et al), the change in SST should be studied for climatology reason and for other direct uses such as for marine biology and fishing. Other uses as detecting oil spill on the surface of the sea can as well be important. Since the albedo of the sea surface will change due to the layer of the oil on the surface, the area of oil-covered region can be easily detected. Further study on SST should be done in finding a way to increase the resolution of the data. AVHRR has the resolution of 1km, but this data might be trivial to other applications. Therefore high resolution and all weather sensors should be developed in the future. The government should initiate a general framework for monitoring and enforcement of regulations designed to reduce stochastic externalities, examples may include, many types of pollutions, such as nuclear power plants, accidents, oil spills, and leakages, from hazardous-waste dumps.

Many other health and safety issues may be thought of in this manner such as the regulation of the workplace place the occupational safety and health administration,(OSHA)and the regulation of prescription drug and food additives by the food and drug administration(FDA).

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