Temperature and Ocean Primary Productivity Correlation in the Indian Ocean (South Java Sea)

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Abstract

Temperature plays important issues in term of physical, biological and chemical processes in the ocean. Argo arrays deployment in the South Java of Indonesia provides a fascinating insight into this poorly understood, correlation between Temperature profile from deep sea and the upper layer. As already known, penetration of sunrays inside the water column will eventually heat the upper section of the ocean and used by phytoplankton for photosynthesis. In this paper, the Temperature profile and Ocean Primary Productivity Correlation in the Indian Ocean especially South Java Sea is identified and examined using Argo data and Seawifs Chlorophyll distribution data. Result shows there are similar pattern of annual water temperature in the 10 metres layer and the Ocean Primary Productivity (cor = 0.98).

Keywords: Temperature, Primary Productivity, and Phytoplankton

1. Introduction

The Indian Ocean part of South Java Sea is a tropical area that the upper layer water mass continuously receives enough sunshine all year around and this event happens mainly because of the Sun height above horizon is hardly change over the year. This part of Indian Ocean is also influenced by the Monsoon (Wyrtki, 1961) and inter-seasonally divided (McBride, 1992 *in* Ningsih, 2000).

Southern Sea of Java Bali are the potential upwelling location, which usually happens in East Monsoon in July, August and September (Purba, et al, 1993; Hendiarti, et al. 1995; Susanto, et al. 2001). According to Nybakken (1992), the average Primary Productivity of these upwelling locations are 300 grC/m^2/year and estimated to be potentially capable of producing 12 x 10^5 ton/year catch. In addition, Pond and Pickard (1995) also showed that around 90% of the world's catch location is occupied only about 2 - 3% of the entire ocean and mainly in the upwelling area.

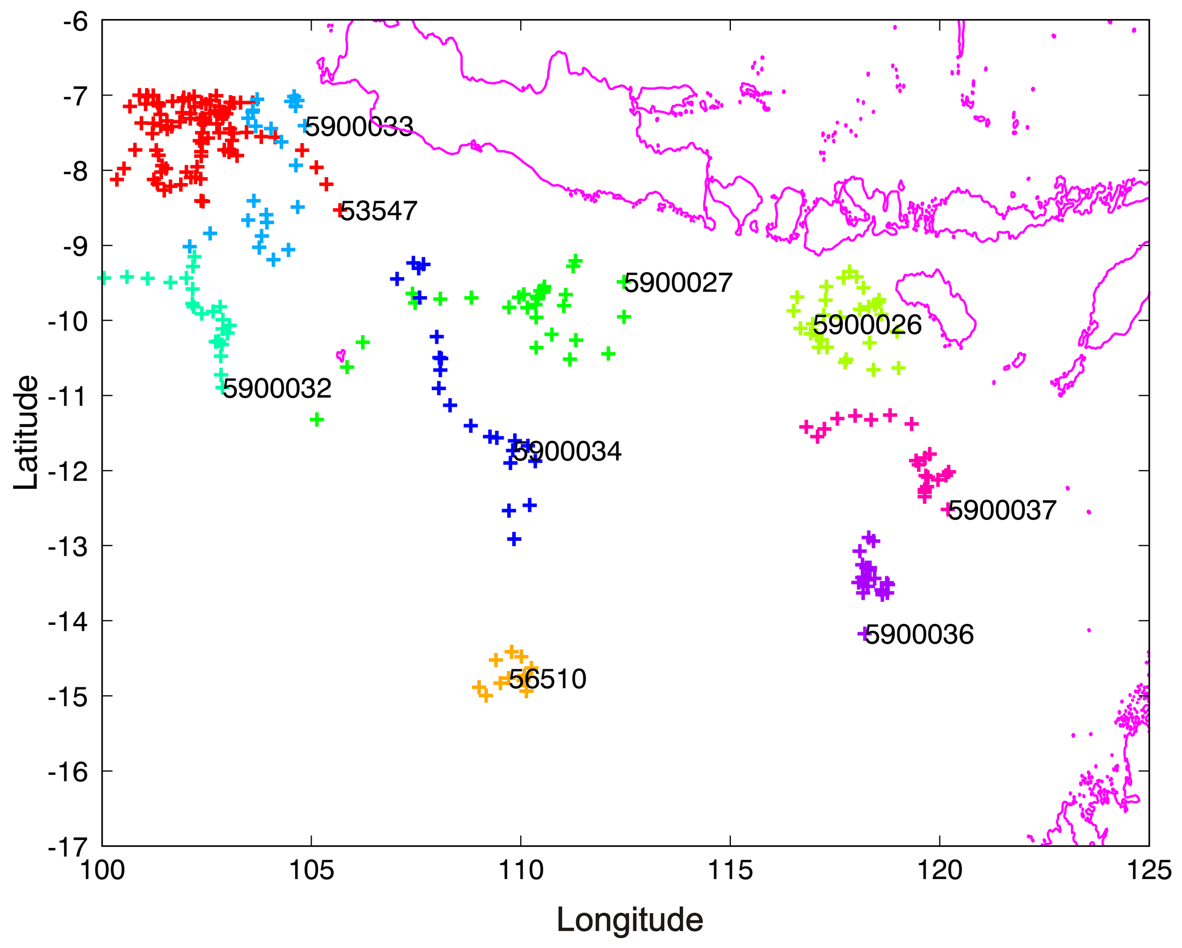

Figure 1. Floats position.

2. Materials & Methods

We have done some analysis to the data acquired from Argo profile (Temperature to the Depth) in the month of September 2002 up to June 2003. We then try to correlate the result with Chlorophyll Distribution image from Seawifs, in the period of July 2000 to January 2003.

In addition, the few floats in this study (South of Java) are shown in figure 1. Temperature profiles correlation to the Primary Productivity were recorded and downloaded from float number 5900027, 5900032, 5900033, 5900034, 53547.

Data Processing was done in September 2003 at the CSIRO Marine Research Laboratory in Hobart Australia.

3. Results and Discussion

In accordance to figure number 2 to number 6, the correlation between Temperatures at the depth of 10 metre (10 dbar) with Primary Productivity was shown. Highest value (cor = 0.98) was shown by float number 53547, lowest value (cor = 0.7) were shown by float number 5900033 and 5900034.

At the depth of 100 metre (100 dbar), Temperatures to the Primary Productivity correlation has the highest value from float number 5900033 (cor = 0.76) and the lowest was cor = -0.62 by float 5900032.

From these figures, we have shown that Temperature correlation to the Primary Productivity at the 10-metre (10 dbar) depth was higher than those at the depth of 100 metre (10 dbar). This was mainly caused by the sunrays which can penetrate up to 10 metre depth and will be usable for Phytoplankton production. However, if we look closely at figure number six, temperature profile at the depth of 100 metre (in the month of June up to December 2002) pattern was closely resemble Primary Productivity Profile. The Primary Productivity Profile in that period is increasing until the month of August which has its highest value. This event is caused by the level of "clearness" of water in that period which can compensate up to 100 metre.

The increased Primary Productivity Profile might have something to do with what Parsons, et al. (1984) says, "Primary Production is influenced by Periodicity of Phytoplankton Biomass population". For example; Phytoplankton Biomass population is higher than Zooplankton (July August), and then the population of Phytoplankton Biomass will decrease until December, and will be exchanged by the rise of Zooplankton population.

4. Acknowledgments

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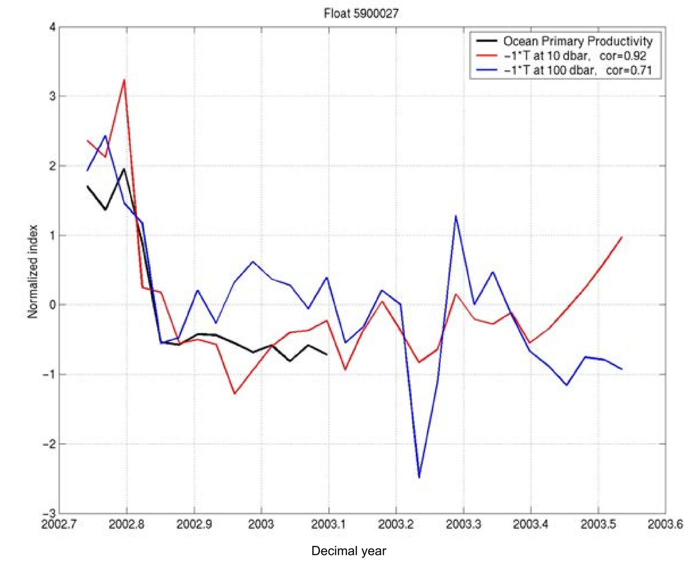
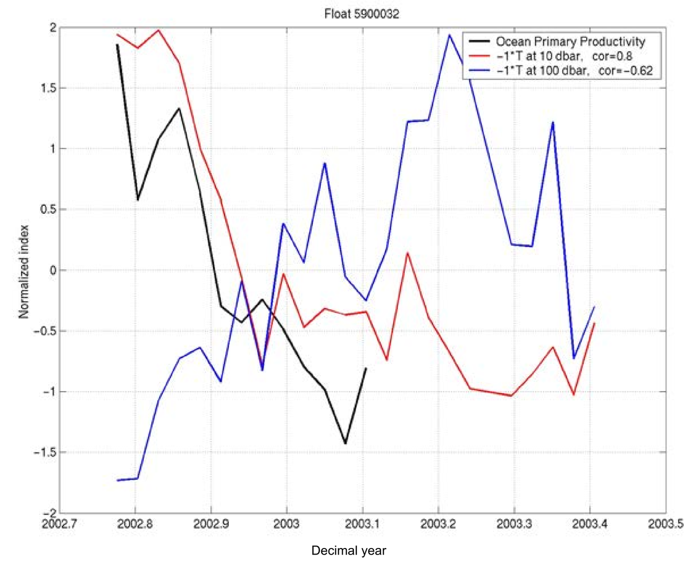


Figure 2.



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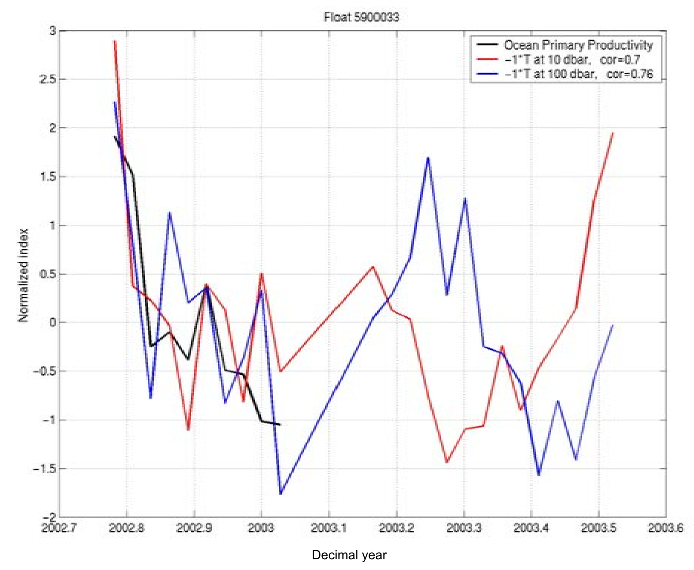

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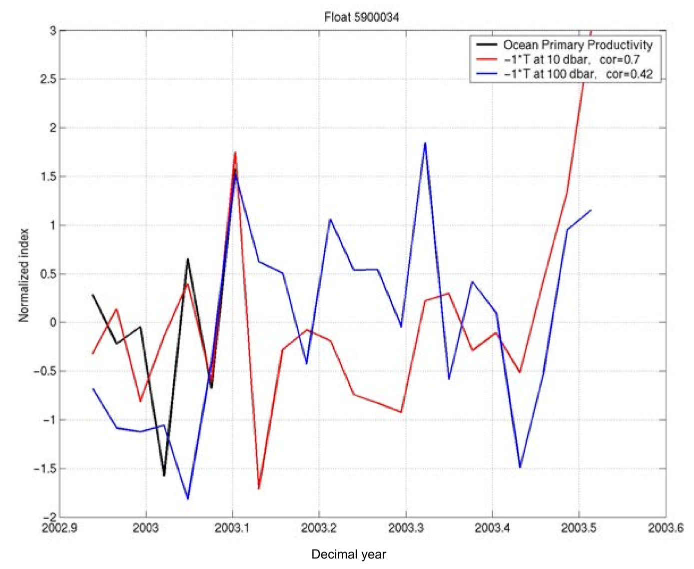

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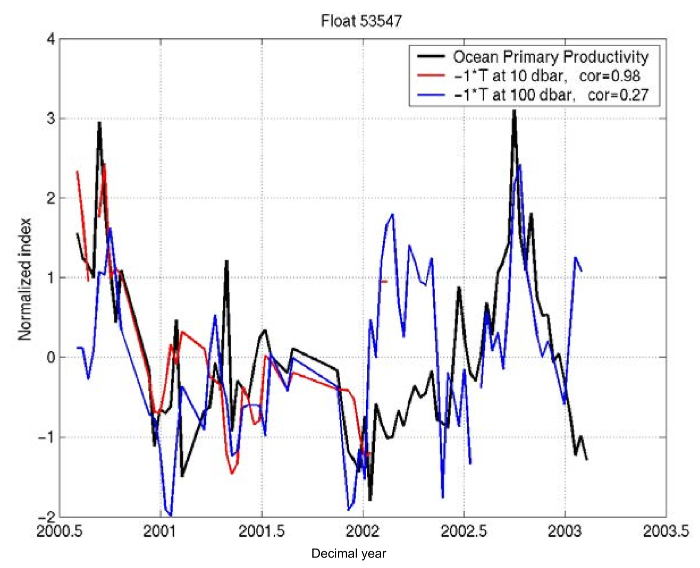

Figure 6.

Ocean Primary Productivity Correlation