

**A PRELIMINARY INVESTIGATION ON THE EFFECTS OF
TSUNAMI WAVE TURBULENCE ON THE COASTAL WATER
QUALITY ALONG THE MALABAT COAST.**

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8.1 Introduction

The impact of Tsunami resulted in a abnormal rise in the sea level and gave risk to strong waves along the Malabar Coast of peninsular India mainly on December 26, 2004. The present study, conducted along the Calicut coastal waters, indicates that there have been some mild but definite changes in the water quality profile of the coastal region. A comparison of the pre-tsunami and post-tsunami scenarios is made to estimate the changes occurred, in terms of Suspended matter and Chlorophyll contents of the coastal water. The changes in the chemical composition of the bottom mud were also examined. It is also observed that these characteristics have relapsed into their pre-tsunami state after a few days. The study was carried out based on the OCM sensor data obtained from Oceansat (IRS P4), supported by field investigations.

8.2 Study Area/ Geographical Location

The present study focuses on a typical coastal stretch ranging from Chaliyam near the discharge point of Chaliyar River on the south, to Mahe river on the north (Fig.1). This forms the coastline of the Kozhikode district also.

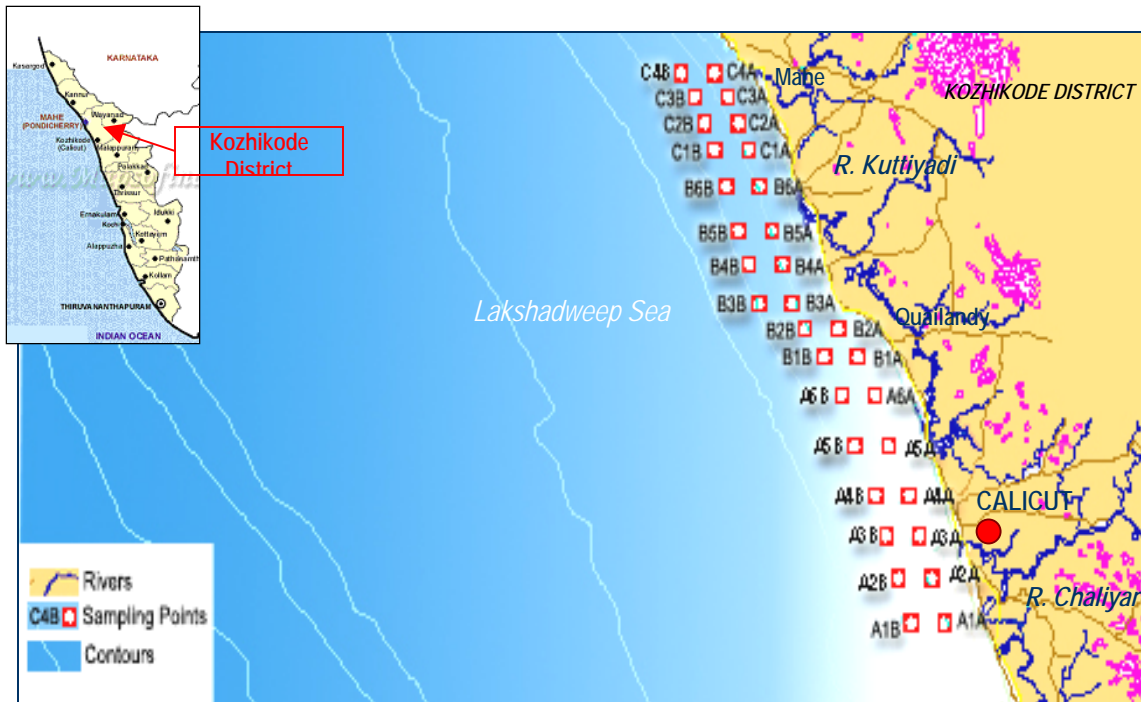


Fig.1. Calicut coast: Sampling Points (DCPs) established for the study

8.3 Methodology

1. A significant rise in the sea water level was reported along the Calicut region, during December 26, 2004. IRS P4 (Oceansat) OCM data (P9/R14) were procured for December 12, 18, 24, 30,, 2004 and January 5, 2005 from National Remote Sensing Agency, Hyderabad. The datasets were analysed using SEADAS software system (developed and customized for Lakshadweep Sea by the National Institute of Oceanography (CSIR), Goa). The results are given as Fig.2, 3, 4 &5.

2. Data Collection Points (DCPs) were established along coastal area on a 1Km X 4Km grid basis (see Fig.1). Mud samples were collected from the sea bottom using a Van Ween Grab and analysed for their textural characteristics using the Hydrometer method.

8.4 Results and Discussion

1. The Chlorophyll and Suspended solids along the study area were estimated using satellite data procured for different days (Fig.2 and Fig.4 respectively).

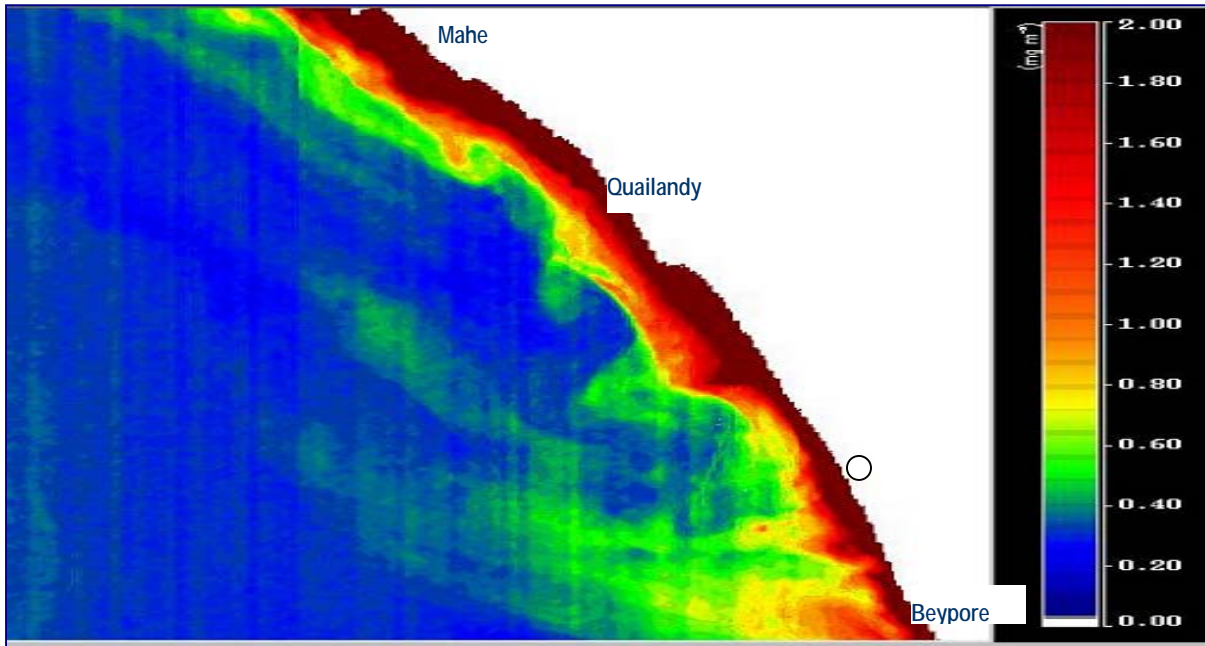


Fig.2. Estimation of Chlorophyll from OCM data: a typical scenario - analysis carried out by SEADAS software system

The chlorophyll in water indicates the presence of phytoplankton and in turn, the presence of different types of organic matter that serve as nutrients. Fig.3 and Table1 show the variations in this water quality characteristic with respect to chlorophyll before and after the incidence of tsunami, derived from OCM data. It is noted that the value of Chlorophyll content decreased from the pre-tsunami value and then relapsed into the original state. On December 24, the mean value of Chlorophyll content was 3.5 mgm/m^3 , which then dipped into 2.9 mgm/m^3 on 30 December 2004. The value increased to 3.0 mgm/m^3 by 5 January 2005.

Table 1

Chlorophyll content (mg/m^3) at different sampling locations and on different dates

DCPs	12-Dec-04	18-Dec-04	24-Dec-04	30-Dec-04	5-Jan-05
A1A	3.9	4.9	4.9	2.8	3.3
A1B	3.1	3.7	3.7	3.7	2.7
A2A	4.2	3.2	4.6	3.5	3.4
A2B	3.5	3.4	4.1	3.5	3.3
A3A	3.8	3.6	3.4	2.9	4.2

A4A	2.6	4.1	3.7	3.0	2.4
A4B	3.1	3.7	3.7	3.7	2.7
A5A	3.4	3.0	3.7	3.9	3.6
A5B	3.8	3.6	3.4	2.9	4.2
A6B	3.2	2.4	3.8	2.5	2.5
B2B	3.9	3.1	3.7	2.0	2.6
B3A	4.1	3.1	2.5	2.0	3.1
B3B	3.5	3.2	3.0	2.9	2.5
B4A	3.8	3.3	2.9	2.7	3.7
B4B	3.1	3.3	3.4	2.1	2.5
B5B	3.7	3.0	2.7	2.0	2.0
B6A	4.1	3.1	2.5	2.0	3.1
B6B	2.8	2.6	2.7	1.6	2.0
B3A	4.1	3.1	2.5	2.0	3.1
B3B	3.5	3.2	3.0	2.9	2.5
B4A	3.8	3.3	2.9	2.7	3.7
B4B	3.1	3.3	3.4	2.1	2.5
B5B	3.7	3.0	2.7	2.0	2.0
B6A	4.1	3.1	2.5	2.0	3.1
B6B	2.8	2.6	2.7	1.6	2.0
C1A	4.3	2.1	4.8	3.5	4.8
C1B	3.8	2.1	4.3	4.1	2.8
C2A	3.4	2.3	3.9	3.6	3.1
C2B	3.6	1.8	3.7	3.5	3.1
C3A	3.7	2.2	3.2	3.1	4.1
C3B	3.6	2.0	2.8	2.1	1.8
C4A	3.7	2.0	3.3	2.8	2.3
C4B	3.5	1.7	2.5	3.0	2.4

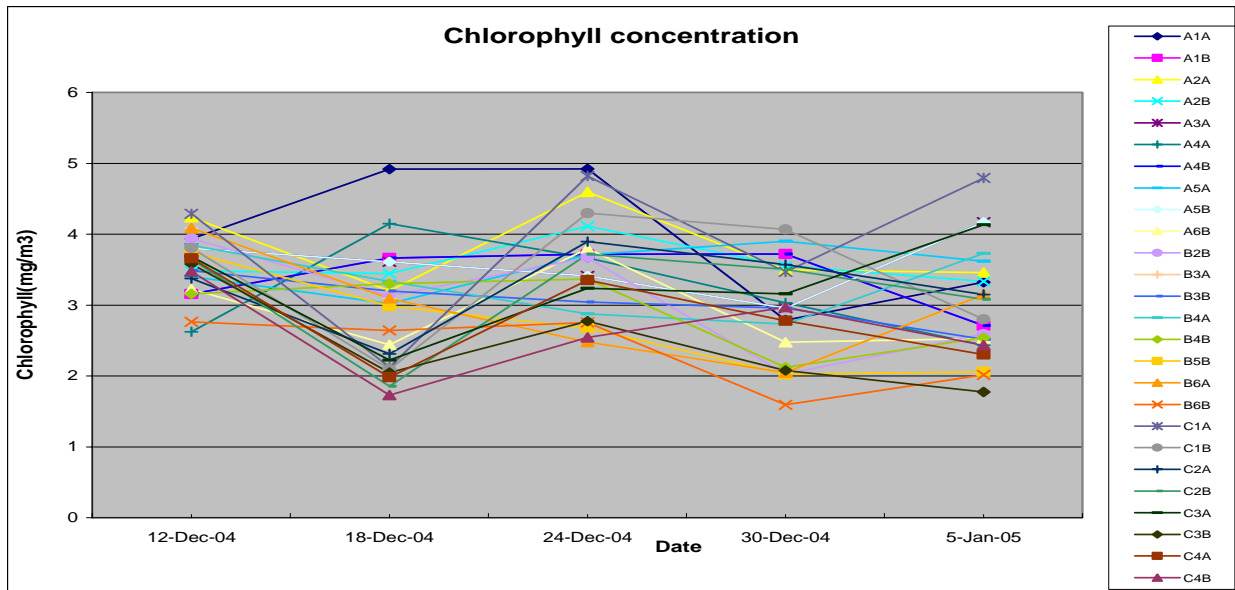


Fig.3. Variation of Chlorophyll content during the tsunami period (based on OCM data)

2. Fig.4 shows a typical scenario of Suspended Solids content along the Calicut coastal stretch, prepared from OCM data. Fig.5 and Table 2 depict the variation during the tsunami period.

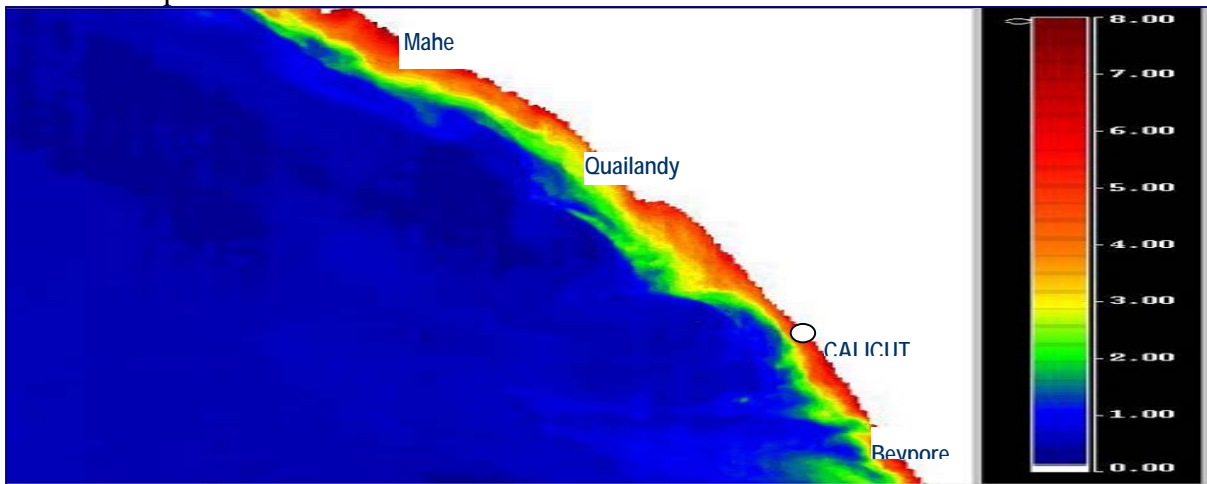


Fig.4. Estimation of Suspended Solids (mg/m³)M data: analysis carried out by SEADAS software system

Table 2. Suspended Solid content g/m³ at different sampling locations during various dates around the incidence of Tsunami

DCPs	12-Dec-04	18-Dec-04	24-Dec-04	30-Dec-04	5-Jan-05
A1A	5.2	5.7	5.0	5.1	4.2
A1B	4.3	4.2	4.0	5.3	3.8
A2A	5.6	3.7	4.5	4.9	3.8
A2B	4.5	4.0	4.6	5.1	3.7
A3A	5.6	4.1	4.3	5.2	5.1
A3B	5.3	3.9	4.2	4.5	7.0
A4A	3.6	4.8	4.3	3.6	4.0
A4B	4.3	4.2	4.0	5.3	3.8
A5A	4.6	3.6	4.4	4.1	4.0
A5B	5.6	4.1	4.3	5.2	5.1
A6A	5.3	3.9	4.2	4.5	7.0
A6B	4.2	3.1	4.2	5.9	3.2
B1A	5.0	3.6	3.4	3.3	5.0
B2B	4.8	3.2	4.4	2.6	3.6
B3A	5.0	3.4	3.7	2.4	4.0
B3B	4.3	3.6	4.1	2.9	3.4
B4A	5.0	4.0	3.5	4.9	4.9
B4B	4.6	3.8	4.1	4.1	3.7
B5B	4.8	3.4	3.9	2.6	3.2
B6A	5.0	3.4	3.7	2.4	4.0
B6B	3.6	3.2	3.8	2.1	3.0
C1A	5.0	2.4	5.1	3.4	4.5
C1B	4.7	2.4	4.4	3.2	3.2
C2A	4.4	2.5	4.2	3.3	3.5
C2B	4.6	2.1	4.1	3.2	3.2
C3A	4.5	2.5	3.8	3.3	4.3
C3B	4.6	2.7	3.5	2.5	2.6
C4A	4.4	2.3	3.9	3.1	3.0

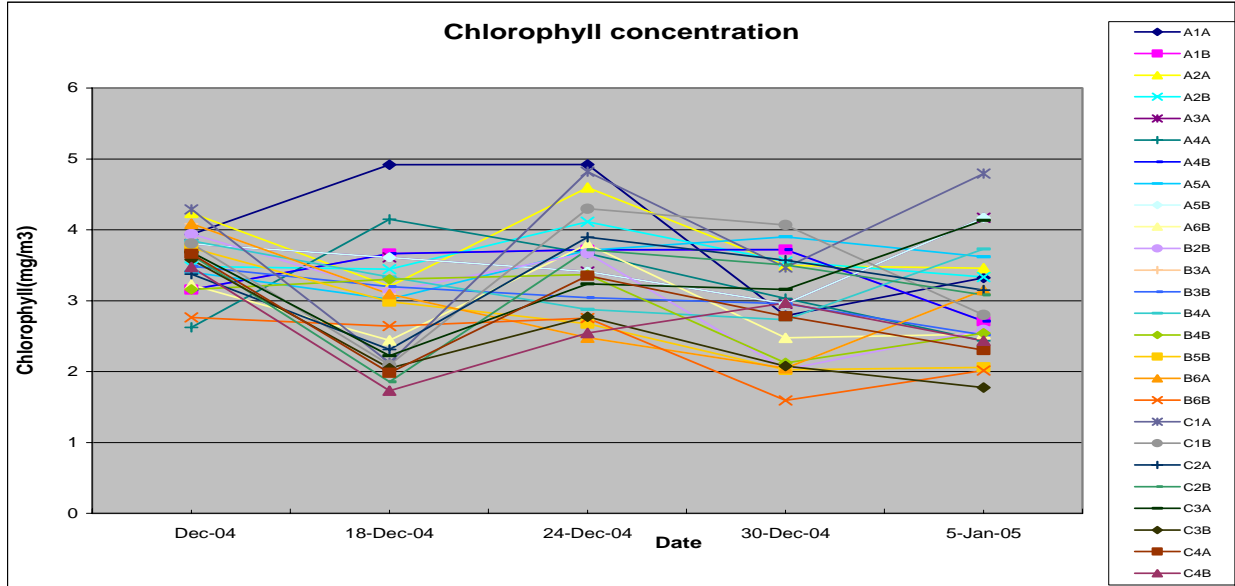


Fig.5. Variation of Suspended solids during the tsunami period (based on OCM data)

The mean value of suspended solids in samples collected from various DCPs was 4.1 g/m^3 on December 24, 2004. However the value showed a reduction to 3.8 g/m^3 by 30 December 2004. By January 5, 2005, the value recovered to attain 4.0 g/m^3 .

2. The bottom sediments were collected from the DCPs and were analysed to estimate their total organic carbon and organic matter contents. (Table 3 and Fig.6).

Table 3. Total Organic Matter and Total Organic Carbon in the bottom sediments

Date	% TOC	% TOM
8.09.04	2.0	3.4
15.09.04	2.8	4.8
20.11.04	2.5	4.2
14.12.04	2.2	3.8
19.01.05	3.4	5.9
2.02.05	2.6	4.6
10.02.05	1.8	3.1
3.03.05	1.5	2.7

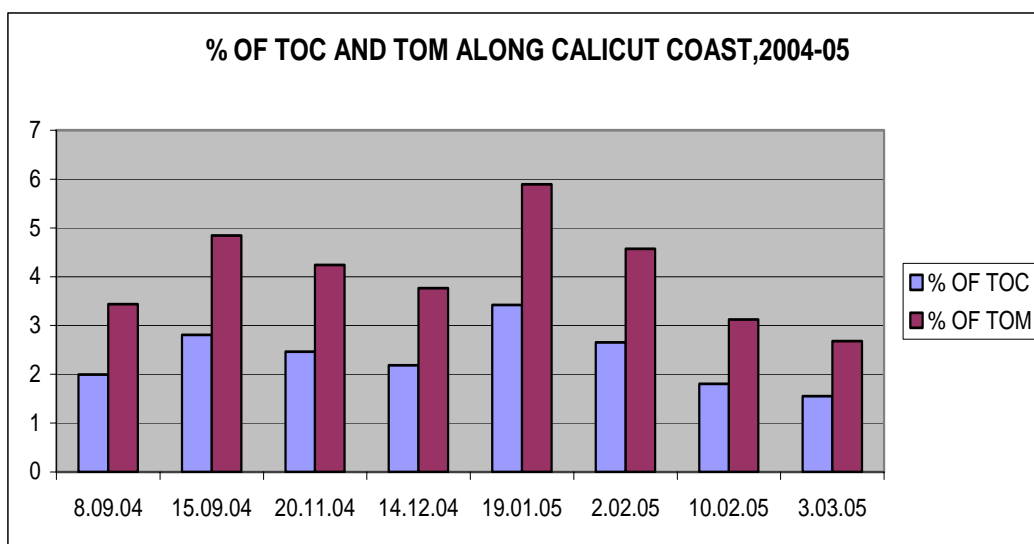


Fig.6. Estimation of Total Organic Matter and Total Organic Carbon in sediments

It was observed that there had been a definite increase in the contents of both Total Organic matter as well as the Total Organic Carbon in the sediments collected. However the values showed a trend of relapsing into the earlier values.

8.5 Conclusions

The results clearly indicate that there were mild but definite influences on the water quality as well as the characteristics of the sediments of the region. The water quality parameters (chlorophyte and suspended solids) showed definite changes, just after Tsunami which then slowly recovered over a period of time. This may be due to energetic mixing of coastal waters and the freshwater flown in from the rivers.

The bottom sediments have also undergone some amount of churning leading to the release of organic mater associated with the undisturbed bottom mud.

However, further work in relation to other aspects of water quality as well as the sediments is to be carried out to bring more light into these aspects.

8.6 Acknowledgement

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