

ANOMALOUS CHANGES IN OCEAN PARAMETERS AFTER GUJARAT EARTHQUAKE OF JANUARY 26, 2001

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Abstract - An earthquake of magnitude 6.8 occurred in Gujarat province, which is lying in the west coast of India. Detailed analysis of optical and microwave sensors data prior and after the earthquake have been carried out. These data reveal a significant change in ocean and atmospheric parameters. The changes in ocean and atmospheric parameters are found with the intense shaking due to earthquake. The increase of the chlorophyll concentrations along the coast of Gujarat after the earthquake is retrieved by the IRS P4 OCM and SeaWiFS data which is found to be related with the anomalous increase in the fish catch along the coast. Further, the aerosol parameters (optical depth and angstrom coefficient) have also been retrieved prior and after the earthquake. The anomalous changes in aerosol parameters after the earthquake is attributed to the dust pollutants due to the total destruction of the buildings in numerous villages. The wind pattern derived from Quikscat data found to play an important role in the dispersion of the dust pollutants from the land towards the ocean.

Introduction

Gujarat earthquake of January 26, 2002 (Mw 6.8) occurred at 8 h 46 min has created intense shaking which affected the land and ocean adjacent to Gujarat state of India. The Gujarat province is surrounded by the Arabian ocean. Gujarat earthquake created intense shaking, the people living in 70% parts of Indian region felt this earthquake. About 20,000 people were killed, hundred thousands people became homeless. Numerous types of surface manifestations were found after the earthquake using remote sensing data [1-2]. The adjacent Arabian ocean also affected by the intense shaking due to small ocean depth. Figure 1 shows the map of Gujarat with the epicenter given by USGS alongwith isoseismal lines. The comparison of pre and post earthquake images shows the emergence of new land along the coast (red colour, Figure 1). Detailed analysis of IRS P4 Ocean Colour Monitor (OCM), SeaWiFS, IRS P4 Multi-Frequency Scanning Microwave Radiometer (MSMR) data prior and after the earthquake have been carried out. Following bio-optical and atmospheric parameters about the ocean and land have been deduced from multi sensors data, which are discussed in the following paragraphs.

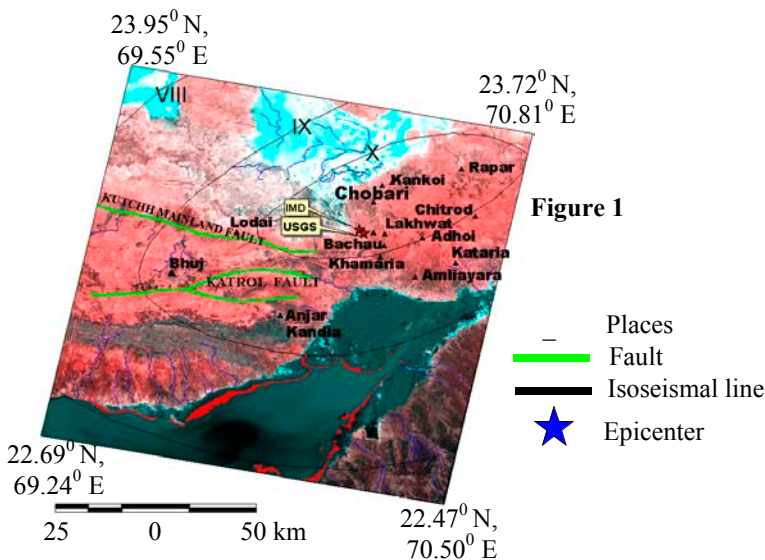


Figure 1

- Places
- Fault
- Isoseismal line
- ★ Epicenter

	December	January	February
1998-1999	407 × 10 ³	331 × 10 ³	290 × 10 ³
1999-2000	296 × 10 ³	157 × 10 ³	157 × 10 ³
2000-2001	80 × 10 ³	105 × 10 ³	218 × 10 ³

Monthly fish catch near Daman coast (in kg)

Table 1

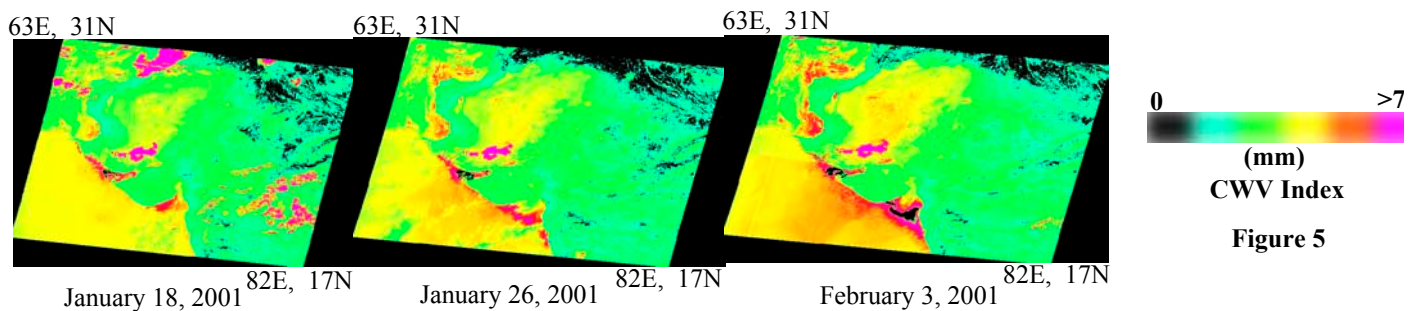
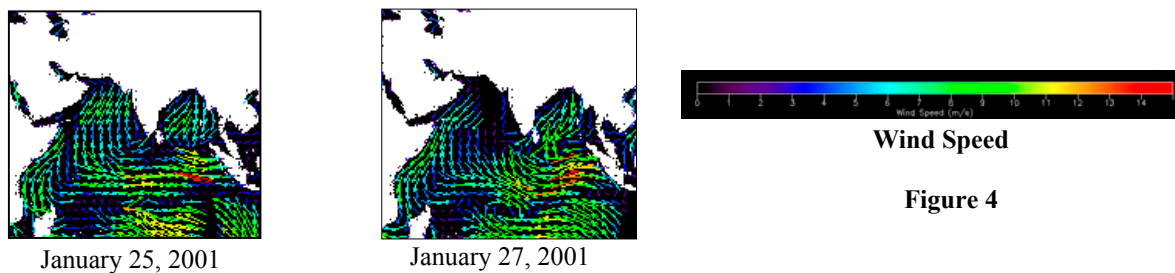
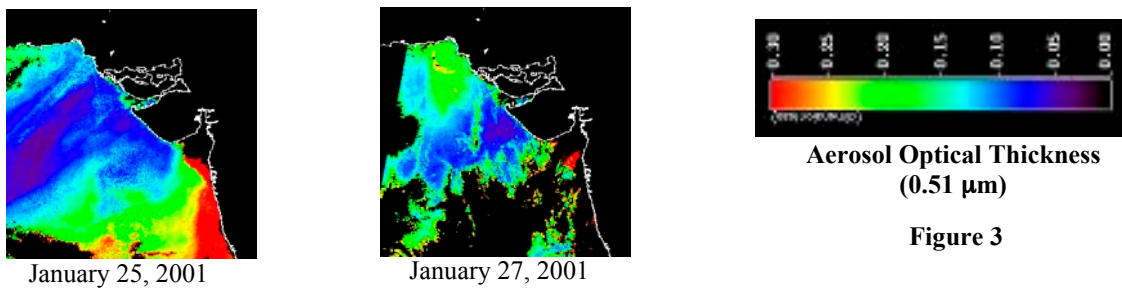
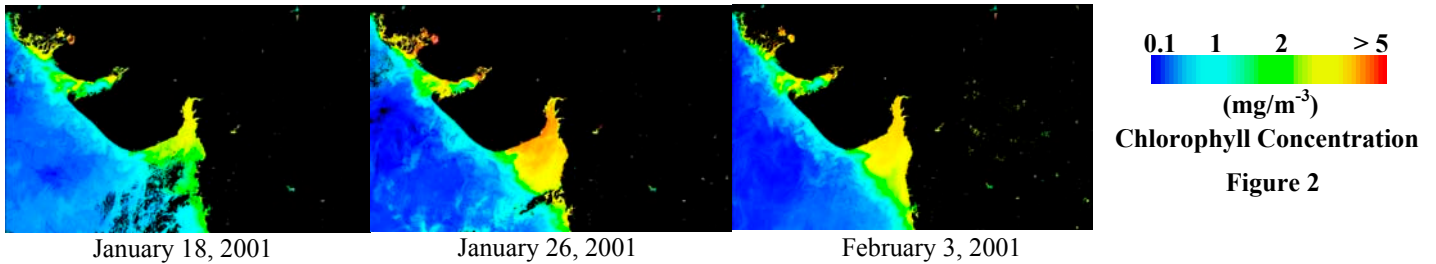
Ocean Parameters:

Using IRS P4 OCM data of January 18, 26 and February 3, 2001 after the correction of atmospheric effects, the chlorophyll concentration (Figure 2) has been retrieved. The significant changes in chlorophyll concentrations are found along the bay region of Gujarat coast soon after the earthquake. The increase of the chlorophyll concentrations is attributed to the upwelling in the ocean due to intense shaking [3]. The study of suspended sediment concentration also shows the similar results as those of the chlorophyll concentration. Along the Gujarat coast, the fish catch was also found to increase anomalously (Table 1). The fish catch data is from Daman coast which shows that the fish catch has been doubled during February 2001 after the earthquake.

Atmospheric Parameters:

Aerosol parameters (aerosol optical depths and angstrom coefficient) have been deduced after the Gujarat earthquake using OCM and SeaWiFS data. Figure 3 shows the increase of aerosol parameters one-day after the Gujarat earthquake. The increase of aerosol parameters is attributed to the significant amount of dust emitted as a result of total destruction of villages due to the earthquake. The wind speed derived from the Quikscat data shows that the wind was intense on January 27 (Figure 4) which brought the dust from the Gujarat land region over the ocean, which increased the aerosol parameters.

The column water vapor (CWV) has been deduced from IRS P4 OCM data over the land and ocean (Figure 5). Increase of CWV over the ocean as well as over the land is seen after the Gujarat earthquake. Due to upwelling in the ocean and due to intense liquefaction observed in the epicentral region after the Gujarat earthquake, it is expected that due to the evaporation, CWV must have significantly increased.



Conclusion

The present paper shows that the earthquake occurring near the coast of India can cause changes in ocean and atmospheric parameters which can be mapped using multi sensors remote sensing data.

References

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