

DETECTION OF “RED-TIDE” BY USING SATELLITE DATA

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ABSTRACT

The project of red tide detection tool using satellite data aims to design a detection tool that uses satellite data to detect the occurrence of red tide phenomenon (RTP) within in the Arabian Gulf region and especially in the United Arab of Emirates (UAE).

The red tide is a phenomenon that severely affects the marine life by killing tons of fish causing economic and environmental harm. The incidence of red tide also affects negatively the fisheries, public health and the tourism. In the UAE, RTP happens every year but, for a number of reasons, in (2009) it has been the worst for years. The size and spread of the occurrence has adversely affected fishing and tourism industries. Therefore, in order to protect the environment and the marine life, red tide detection project is planned to detect the occurrence of red tide within the UAE and the Arabian Gulf. An early detection will lead the country to take serious considerations and actions to control the affected area before it is been spread to other areas.

The project’s goals inspire us to face the challenges and accomplish a brilliant project that will help the country to protect the marine life and environment from the dangers of RTP. Furthermore, the project plan will encourage the student to study and analyse the characteristics and the operation of satellites in orbit. The system will be designed by using the data from the Tropical Rain Measuring Mission (TRMM) satellite.

1. INTRODUCTION

Red tide is a phenomenon that happens in the sea water caused by large concentrations of microorganisms known as algal bloom. These microorganisms cause the surface water to change its colour. During normal incidences, the water is discoloured to either green or red. Whereas, when there are high concentrations of algae, the water discolouration varies from purple to pink. In most cases, the discolouration changes to red and that is why the term 'red tide' is chosen. [1]

2. SYSTEM SPECIFICATIONS

The project consists of a software system that obtains data from TRMM satellite to detect the affected areas of red tide in the Arabian Gulf and especially in the UAE.

The system will use the reflectivity concept to detect the RTP. The detection tool will measure the reflectivity of the affected area and the unaffected areas using the TRMM satellite data. It detects the areas of red tide by detecting the changes of reflectivity between the two areas.

The main reason of choosing the TRMM for the project is that it covers the whole globe and has the facility of measuring the power reflected from precipitation and surface targets by using TRMM Precipitation Radar (PR) instrument. The TRMM satellite was created to be favourable in many researches related to agriculture, water resources and flood occurrence.

The TRMM satellite is 402 km above the earth, recording 120 samples at each ray using its PR instrument. The sampling begins 23 km above mean sea level and extends for a certain distance along the ray. The fixed distance between any two samples is 250 m. The satellite data will be obtained from these samples taken by the PR. For RTP, the samples that are just above the sea level will be appropriate to be used. Using image processing; the required data will be extracted to measure the difference in reflectivity between the areas. For TRMM satellite data, most products are programmed using the Hierarchical Data Format (HDF). This tool is used in MATLAB programming to read the required satellite images data and extract the needed information. There are five data products in PR which are the PR level-1B product (1B21), the PR level-1C product (1C21), The PR level-2A product (2A21), The PR level-2A product (2A23) and the PR level-2A product (2A25). The data product that will be used in the project is 1C21.

3. CONCLUSION

Most Previous red tide detection tools use chlorophyll concentration to detect the occurrence of the algal blooms. Since, the presence of high chlorophyll concentration does not always predict the existence of red tide; observers must take samples of water to confirm the presence of red tide blooms [2]. Using TRMM Satellite, red tide can be monitored automatically by the reflectivity concept. Since, the project research shows that the reflectivity concept is not used in any of the old detection tools; it will be a very exciting project and challenging experience.

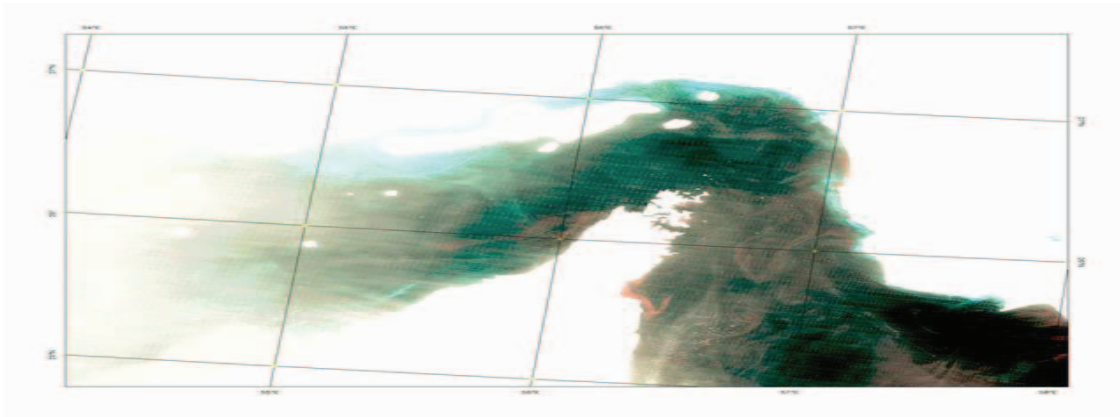


Figure (a): Satellite image by MODIS on the 3rd of November 2008 showing Chlorophyll concentration. [2]

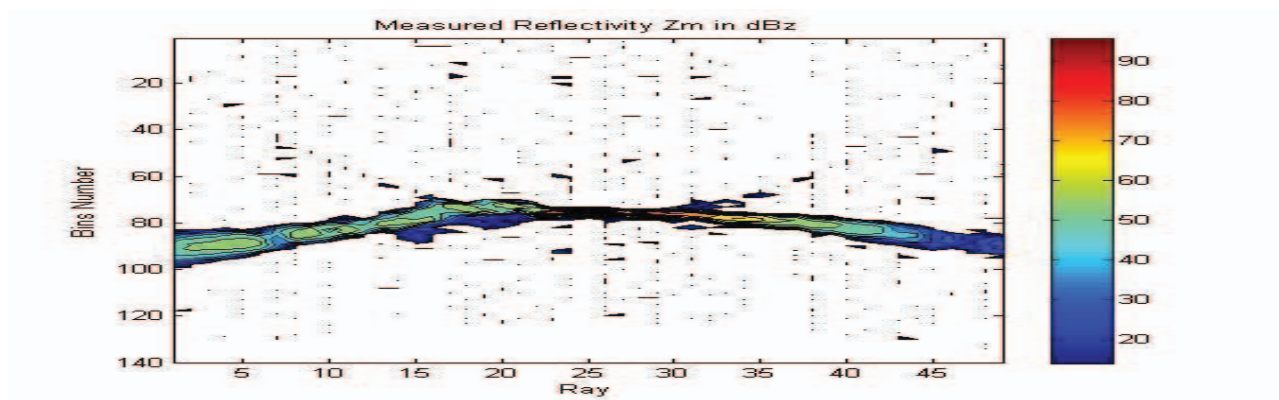


Figure (b): Measured reflectivity from TRMM Satellite illustrated by MATLAB Software.

4. REFERENCES

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