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Remote Sensing as a Tool for Locating the Potential Fishing Zones (PFZ)

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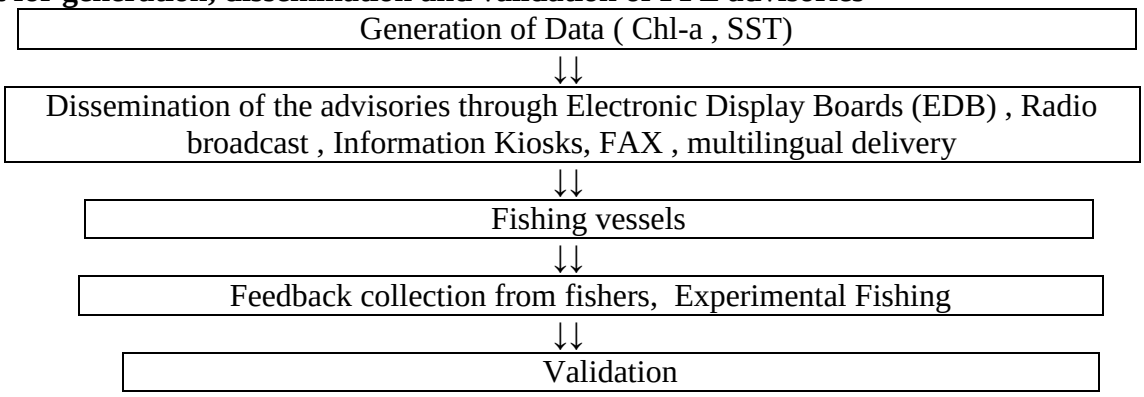
SUMMARY

India has an immense potential for marine fisheries due to its vast (8129Km) coastline and 2.02 million sq. km of Exclusive Economic Zone (EEZ). Recently, satellite remote sensing has emerged as an effective tool for identification of potential fishing zones (PFZ) through the measurement of sea surface parameters viz. Chlorophyll-a (Chl-a) concentration and Sea surface temperature (SST). In India, generation of PFZ advisories started in 1996-97 at National Remote Sensing Agency (NRSA), Hyderabad by using NOAA-AVHRR (National Oceanic and Atmospheric Administration - Advanced Very High Resolution Radiometer) derived sea surface temperature data. INCOIS, Hyderabad has played a pivotal role in the development, validation and popularization of remote sensing based PFZ advisories through various all India coordinated projects. In the perspective of the success of popularity of the technology, remote sensing based PFZ advisories can create a more profit to fishermen in near future.

INTRODUCTION

India has an immense potential for marine fisheries due to its vast (8129Km) coastline and 2.02 million sq. km of Exclusive Economic Zone (EEZ). There are 3202 fishing villages in the country with an estimated number of one millions of families depending directly or indirectly on the fishing sector of the country. The success of a fishing operation mainly depends on the concentration of the fish in the area selected for the fishing activity. The fisher-folk used various traditional methods for locating the fishing grounds which includes bird congregation, turbidity of water, bubbles collapsing on the surface of water, and muddy and oily water, etc. These traditional methods of locating the fishing grounds were merely a hit and trial approach and often, the fishing trips did not yield the desired catch in spite of spending a longer time and manpower during the fishing activity. Therefore, it is imperative to develop a scientific method which can pre-determine the location of fishing grounds with a higher potential for fish catch.

A flow chart for generation, dissemination and validation of PFZ advisories



In the beginning, a visual spotting of fish shoals by aircraft was demonstrated for finding the locations of pelagic fishes such as anchovies, swordfish, menhaden and tuna. An observer trained for the purpose spotted the school of fish and conveyed the information through radio-link to the vessels in the vicinity. This method of spotting the fish schools have limitations because use of aircraft on a regular basis lacked the feasibility and cost-effectiveness. Recently, satellite remote sensing has emerged as an effective tool for identification of potential fishing zones (PFZ) through the measurement of sea surface parameters viz. Chlorophyll-a (Chl-a) concentration and Sea surface temperature (SST). A higher concentration of Chlorophyll-a depicts the abundance of phytoplankton which are the primary producers in the marine environment, and they support the other trophic levels including fish.

OCEANSAT - 2

In India, generation of PFZ advisories started in 1996-97 at National Remote Sensing Agency (NRSA), Hyderabad by using NOAA- AVHRR (National Oceanic and Atmospheric Administration - Advanced Very High Resolution Radiometer) derived sea surface temperature data. These advisories were disseminated through state fisheries departments through FAX and TELEFAX. Since, the data acquisition about PFZ was through single satellite, at least three days data was required to generate PFZ maps for entire Indian coast. With the launch of Oceansat-2 equipped with an Ocean Colour Monitor (OCM), the PFZ advisories are created on the basis of the data acquired by OCM. OCEANSAT-2 is ISROs second in the series of IRS satellites dedicated to ocean research and will provide continuity to the applications of Ocean sat – 1 (launched in 1999). OCEANSAT-2 carries three payloads including an Ocean Colour Monitor (OCM-2). OCEANSAT-2 was launched on 23rd September 2009, with three payloads namely Ocean Color Monitor (OCM), Ku band Scatterometer and Radio Occultation Sounder for Atmospheric studies (ROSA). The Satellite will provide continuity of services for the operational users, as well as enhance application potential due to newer payloads. Oceansat-2 is a part of the global virtual constellation of satellites for Ocean Colour Radiometry (OCR) and Ocean Surface Vector Wind (OSVW). OCM – 2 is designed to provide one of the highest spatial resolutions among the contemporary ocean colour sensors with unique regional and global coverage.

Technical specifications of OCEANSAT-II

Structure: CFRP cylinder and Aluminum honeycomb panels
Thermal : Paints, MLI blankets, Optical solar reflectors, Heaters and Temperature Controllers
Mechanism: Solar panels deployment, OCM and Scatterometer hold on release and OCM tilt
Power: Solar panels of 15 sq. m area generating 1360W, two 24 Ah Ni-Cd batteries
TTC : S-band
P/I data transmission: X- band
On board storage : Solid state recorder of 64GB
Altitude and orbit control systems: Earth sensors and sun sensors, Magnetometer, Gyroscopes , Mono-propellant Hydrazine thrusters , Reaction wheels and magnetic torquers
Reaction Control Systems: 100Kg of Hydrazine
Ocean Colour Monitor (OCM): The Ocean Color Monitor on board Oceansat-2 has a swath (the strip of land that can be imaged) of 1420Km with a resolution of 360metre. It works in the visible and near infrared region of the electromagnetic spectrum. The Ku-band Scatterometer with a 1 metre antenna works at a frequency of 13.515 GHz.

Validation experiment

In Goa sector, four times higher catch was recorded in PFZ area compared to non-PFZ area. The approximate cost of fish doubled for the catch from PFZ area along with a considerable increase in the profit (Rs 6,73,950 for non-PFZ and 11,64,000 for PFZ). The usefulness of the PFZ advisories depends on increase in the accuracy through validation process. The data obtained so far indicates an encouraging result. There was a significant difference in total fish catch obtained from PFZ and non-PFZ areas along the Kerala coast. Four times higher catch (1800 in non-PFZ and 7200 Kg in PFZ area) was recorded during simultaneous fishing operations by the fishing vessels on 16th December, 2006. The net profit also increased more than four times for the fishing operations in PFZ area.

During 2007-12, 630 validations were accomplished by various scientific organizations. The cost-benefit analysis of PFZ advisories based fishing shows that on an average , there is a reduction of 50% search time which corresponds to saving on account of diesel consumption which amounts to 6.0 lacs for a mechanized vessel , 1.95 lacs for a motorized boat and 1.65 lacs for a small motorized boat. In Kerala alone, approximately 163 crores are saved by the boat owners who are using PFZ advisories for fishing operations. This figure stands for only 25% of the fishing boats, therefore, 3-4 folds increase in savings can be achieved by motivating the boat owners to adopt the PFZ advisories for planning their fishing activities. If 100% of the mechanized and motorized boats operating in Kerala use PFZ advisories, this will account for annual savings of about 600 crores on account of diesel savings, and a considerable extent of manpower. Extrapolation of the above results to the national scenario indicates a saving of 1351 crore INR for 25% usage and 5000 crore for 100% usage. A dedicated mobile service called m-KRISHI is an innovative approach for timely dissemination of PFZ advisories. In view of large scale

impact of m-KRISH on fishing community safety and livelihood, World Bank is supporting this technology for scale-up through a collaborative framework involving Central Marine Fisheries Research Institute (CMFRI), Mumbai Regional Centre.

Economic significance of PFZ technology

Identification of PFZs as well as Ocean state forecast by INCOIS are found to be both timely, accurate, and of a significant value for the fishing communities. The economic benefit resulting from the identification of PFZ is estimated to contribute to national GDP up to 0.81%. This can be increased to 1.47 % if both mechanized and motorized crafts adopt PFZ advisories. Further, the contribution to GDP can go to 1.58-2.00 % if all the mechanized crafts, motorized crafts and traditional crafts adopt the PFZ advisories for fishing trips. Presently, M.S.Swaminathan Research Foundation, Chennai, Village Research Centre and Village Knowledge Centres are facilitating the knowledge transfer about PFZ technology. INCOIS, Hyderabad has played a pivotal role in the development, validation and popularization of remote sensing based PFZ advisories through various all India coordinated projects. In the perspective of the success of popularity of the technology, remote sensing based PFZ advisories can create a net income of 34000 to 50000 crores in near future.

REFERENCES

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