

## The need for satellite ocean color measurements in fisheries research and related activities

R. Michael Laurs  
National Marine Fisheries Service  
P.O. Box 271, La Jolla, California 92038

### Abstract

Ocean color measurements from satellites have tremendous potential applications for use in fisheries research, and in the proper management of fishery resources.

### Introduction

Ocean color measurements from space platforms may be used in living marine resource applications for quantitative determinations of ocean color that are directly related to chlorophyll and sestonic concentrations, the location of ocean fronts, effluents and circulation features and the detection of water masses.

### Why ocean color is needed in fisheries

The application of satellite derived ocean color data in fisheries fall into categories related to fisheries research and management uses and the utilization in fisheries-aids products for use by commercial and recreational fishermen and other users in the fishing community.

Examples of the types of studies in the first category where satellite measurements of ocean color can be important include: 1) Year class strength and recruitment investigations where information is required on marine habitat characteristics, e.g., phytoplankton distribution, critical in the survival of early life stages of fishes. 2) Migration studies of highly mobile species such as tunas and billfishes and marine mammals where migration patterns are linked to ocean features, such as color boundaries which may be monitored over vast areas remotely from space. 3) Fishery forecasting efforts which utilize ocean color distribution to predict stock availability. 4) Fish stock assessment studies where models incorporate oceanographic/environmental conditions. 5) Fishery/pollution interaction and impact investigations showing waste disposal sites through color imagery. 6) Energy budget/ecosystems modelling approaches for estimating potential fish stock production. 7) Fisheries related habitat management where quantitative environmental information is required, e.g., changes in wetland use as detected and quantified by color imagery. 8) Marine mammal ecosystem studies. 9) Field studies where ocean color data are received in quasi-real time by scientists at sea for use in planning research operations and extrapolating in time and space the point source measurement made aboard ship.

In the second category the primary use of satellite ocean color measurements is to identify ocean areas where conditions may be favorable for concentrating fish. This can reduce search efforts to locate harvestable marine resources and thereby significantly reduce costs.

### What ocean color data are needed

In fisheries research and fisheries management applications several types of ocean color products are needed including quantitative information on the distribution of chlorophyll, and of other bands of color, on diffuse attenuation (turbidity) and on the distribution of ocean color boundaries based on the ratio of various combinations of the color bands. Ocean color information needed to produce fisheries-aids products includes the locations of color boundaries and distribution of ocean color signatures and the diffuse attenuation coefficient (turbidity).

### Preprocessing ocean color data

For fisheries research and fisheries management applications, in addition to removal of atmospheric contamination, ocean color data should be geographically rectified, cloud and land areas masked and areas of sun glint corrected and/or identified. To produce fisheries-aids charts interpretive symbols and/or narrative descriptions will be required. Also the ocean color information may be used in conjunction with other information, e.g., locations of thermal boundaries, sea surface temperature isotherm distribution, swell and wave information, etc.

#### Data format

For fisheries research and management applications, the data format will vary according to the specific requirements of individual experiments and investigations. The data may be required in computer compatible tapes, analog photographs or charts and in some cases may be received directly from the satellite at local receiving stations. In the latter case standard software packages for all preprocessing algorithms should be available for use at the receiving station or other processing facility. The data format for the fisheries-aids products will almost always be in chart form.

#### Spatial and Temporal Coverage

U.S. fishery needs for ocean color measurements are primarily in the coastal waters within the 200 mile economic zone surrounding the continental U.S., islands and territories; mid-ocean regions where important U.S. distant water fisheries are located; mid-ocean regions through which highly migratory fishes pass during migration to coastal waters where U.S. fisheries take place; and in mid-ocean regions important in marine mammal research and protection. There is also a lesser need for global coverage. The frequency of coverage will vary depending on location and perhaps to some extent on season. Generally 2-day coverage will be required in coastal/local waters and 3 to 5 day coverage for most mid-ocean applications. Global coverage may be needed on the order of every 15 to 30 days.

The acceptable time delay from the time of satellite overpass to delivery for fisheries applications will vary from near-real time to several days.