Ocean Sci. Discuss., 3, S665–S667, 2006
www.ocean-sci-discuss.net/3/S665/2006/

Ocean Science Discussions

Interactive comment on "Development of a new expendable probe for the study of pelagic ecosystems from Voluntary Observing Ships" *by* M. Marcelli et al.

Anonymous Referee #2

Received and published: 6 November 2006

The importance of profiling temperature in the upper ocean has been well documented by more than 45 years of usage of the expendable bathythermograph probe (XBT) developed by Sippican and used by all the navies and oceanographers of the world. The need of profiling, in parallel to temperature, chlorophyll a fluorescence with the same accuracy and resolution responds to a completely new idea beautifully implemented by the authors of this paper.

Chlorophyll a, like temperature, may be assessed by satellite-borne sensors. Since the launching of the first radiometers, development of sensors sensitive to the radiation emitted by the sea surface both in the infrared (temperature) and in the visible (chloro-

phyll) has been highly successful. However, remote sensors provide only (or mostly) the values of temperature and colour for a thin surface layer.

In the last decades, a full account of the vertical distribution has been obtained with very expensive fluorescence sensors generally mounted on CTD ensembles. Continuous profiling of fluorescence has allowed observations of previously unknown phytoplankton structures, particularly the deep chlorophyll maximum, typical of oligotrophic areas of the seas. These structures which cannot be seen by remote sensors may account for chlorophyll concentrations at depths of 50 to 150 m several times greater than those at the surface. Therefore, in situ observations become extremely important. In the last years operational oceanography has demanded in situ observations with great area coverage at low cost. Expendable sensors have become a strategic issue whether they are XBTs, ARGO floats or other similar devices.

Marcelli et al. describe the development of a new probe for continuously measuring temperature and chlorophyll a fluorescence in the upper 500 m of the ocean. This probe is based on an idea similar to that of the Sippican XBT probe but having a much better (modern) technology (digital) in mind and yet keeping the cost to a minimum in case it were to be mass produced.

The design of both the mechanical device and the electronic and optical elements seems to have been very well targeted. Respect for the original design of XBT assures proper behaviour as far as the descent conditions are concerned as well as the connection to the launching vessel via a twin copper wire coiled part in the probe and part in the on board canister.

The performance of both sensors on T-FLAP, according to the paper, is very good when compared to parallel measurements made with a CTD, similar to those made with XBT next to a CTD cast.

Although the use of the English language is rather poor, the paper is well written and can be followed both in its technical parts and in the oceanographic justification of

OSD

3, S665–S667, 2006

the new development. Some important aspects, however, do not appear clear in the manuscript. There is no description of the sensor used for the measurement of depth (pressure) which is mentioned in the relevant figure but not in the text; no discussion is made as why the authors kept the twin wire option instead of going to a single wire (it should be remembered that XBTs need the two wires in order to make the wire length correction to the resistance measurement, the other conductor being seawater); and there is no justification for the use of rechargeable batteries.

The paper would significantly improve if the authors would address these issues.

In particular, on page 1517, mention is made to the “remote sensing of primary production in the euphotic zone”. Primary production cannot be measured with remote sensors; it is the result of complex algorithms using the water leaving radiance as well as other empirical relationships between surface chlorophyll and depth-integrated chlorophyll distribution determined from other observations in various areas of the world’s ocean.

On page 1518, it is said that “deep observations of the water column are needed because of the typical distribution of phytoplankton biomass”. This refers probably to the deep chlorophyll maximum typical of oligotrophic areas where much of the chlorophyll is located at relatively great depths. These areas are more frequent at mid-low latitudes and not at mid-high latitudes as it is written in the paper.

The text is plagued with small spelling and syntactical errors and should be revised for English correction.

Interactive comment on Ocean Sci. Discuss., 3, 1515, 2006.