Dissertations

Analysis of the influence of water components on the spectral characteristics of the upward light field in the Baltic

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The dissertation contains the results of investigations into the upward light field conducted over a period of several years in the southern Baltic. The objective was to find relationships between certain remote sensing functions of the upward radiance and a number of biophysical parameters of the marine environment. To achieve this objective, extensive field experiments for establishing the relevant statistical correlations, as well as a search for appropriate theoretical relations were carried out. These were intended to link the remote sensing functions indirectly to the environmental parameters through their relationships with the inherent optical properties of seawater. These correlations and relationships were found and, as a final result, several local in-water remote sensing algorithms were worked out. These allow the principal water components in the Baltic to be estimated quantitatively in that values of upward radiance are determined in the relevant spectral channels. The function measured is the remote sensing reflectance under water at a few spectral bands, and the parameters found from the algorithms are as follows:

- concentration of surface chlorophyll,
- concentration of total suspensions,
- absorption of light at 400 nm by yellow substance.

On the basis of thoroughly reviewed current knowledge, the author has developed the most important aspects of the methods for building up the

broad data base necessary in this particular research. The innovative aspect of this dissertation is the author's suggestion that upward radiance just below the sea surface be measured directly, as an alternative to earlier indirect measurements. The set of experimental data, gathered over 5 years of measurements, is clearly described and at the end, the algorithms are given in detailed form.

The particular formulas of the algorithms are important and useful, but the general recipe for constructing them is even more important. This is also given. The usefulness of some types of formulas and the inutility of others are discussed; the spectral bands most suitable under Baltic conditions are pointed out.

The conclusions are of some importance, too. The principal positive one confirms the present-day possibility of remote quantitative determination of concentrations of chlorophyll, suspensions and yellow substance in the surface layer of the Baltic. Another important conclusion, this time a negative one, precludes the practical possibility of remotely detecting the chlorophyll content with the aid of natural fluorescence, at least for the present.

The thesis is right up to date and contributes some new suggestions regarding the problem of local remote sensing. It is especially important for the Baltic region, where satellite methods are just being introduced for water quality control.

Jerzy Olszewski