THE USE OF SATELLITE IMAGERY FOR THE STUDY OF SEA WATER PROPERTIES AND ITS COMPARISON WITH SEA TRUTH DATA: CHLOROPHYLL A DISTRIBUTIONS IN THE NORTHERN ADRIATIC

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The Northern Adriatic is one of the chosen test-sites in the EURASEP project. The group of ISDGM, Venice, has chosen 1979 as a test year during which to conduct regular sea truth expeditions. The shown example refers to the period June 11-15. Sea surface distribution of chlorophyll a in mg/m^3 have been inferred from the NIMBUS 7 imagery for June 15. Three different optical data packages have been used. The relative results are compared among themselves and with the corresponding distribution measured at sea.

L'Adriatique du nord est un des endroits choisis comme lieu de test du projet EURASEP. Le group de l'ISDGM de Venise à choisi 1979 comme année de test pour y exécuter des expéditions régulières de vérité mer.

L'exemple illustré se rapporte à la période du 11 au 15 juin. La distribution de chlorophylle a à la surface de la mer en mg/m^3 a été déduite des images du NIMBUS 7 du 15 juin. On a employé trois différents groups de programmes de traitement données optiques dont les résultats ont été comparés entre eux et avec les correspondentes distributions mesurées à la mer.

The Northern Adriatic is one of the chosen test-sites in the EURASEP project. The group of the ISDGM, Venice, in cooperation with the Joint Research Centre, Ispra, chose 1979 as a test year during wich to conduct regular sea-truth expeditions, about twice a month, starting April 1979. The major campaign was carried out during June 1979, and densely covered two successive sea areas: the first (June 11-15) was concentrated in the region in front of the Venice Lagoon, centered around the ISDGM shallow water oceanographic platform. The second (June 19-25) covered the area south of the Po River delta, where horizontal gradients of chlorophyll a, solid transport and temperature are particularly enhanced. The examples hereafter shown refer to the period June 11-15.

The criteria followed during the NIMBUS 7 passages were those recommended by the EURASEP workshops. Before every passage, two or three days of oceanographic pre-exploration allowed us to obtain a picture as exhaustive as possible of the hydrological and dynamical conditions of the considered water mass in the considered period.

Fig. 1 shows the sea sruface distribution of chlorphyll a in mg/m^3,

scaled by 10^4, applying in interpolating numerical routine (Surface II from SIO,USA) to experimental data obtained by spectrophotometric analysis of discrete samples. Fig. 2 shows the surface distribution of chlorophyll-like pigment concentrations in $\mu g\, L^{-1}$ obtained from the CZCS data. Since this concentration is strongly correlated with the ratio of the upwelling radiance in the blue and green spectral regions, a pattern distribution for this parameter was computed for comparison with the one derived from in-situ measurements. The numerical formula expressing this correlation and used in the present experience is:

$$C = 0.502\ (L_w(443)/L_w(550))^{-1.271}$$

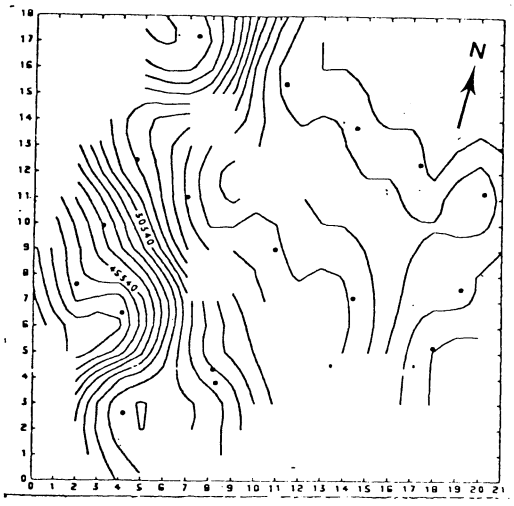

Fig. 1

where C is the desired concentration estimate in $\mu g\ L^{-1}$ and L_w is the water leaving radiance, respectively in the blue (m 443) and green (m 550) spectral bands. L_w has been computed utilizing three different optical data packages. The first used data package is that for the Gulf of Mexico; the second is that surveyed during the Adriatic Sea cruise and the last one is the Turner discrete ordinate method model. The distributions mapped are strongly correlated. Values obtained in a first instance for the Adriatic Sea cruise, and here used throughout, revealed afterwards to be affected by a systematic instrumental error. Successively computed values, corrected for the above mentioned effect, gave results not so different from those shown in Figure 2.

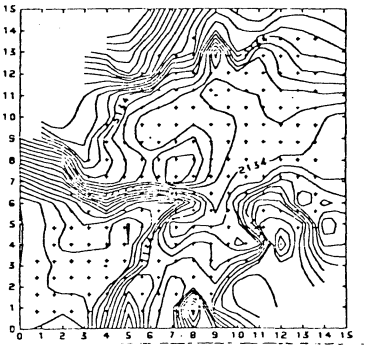

Fig. 2

This not withstanding, comparing with the experimental distributions in particular with the fluorescence distributions, it is evident that the satellite pigment distribution more strongly correlated with the experimental pattern. In fact, both Figs. 1 and 2 show the same intruding "tongue" in the southwest quadrant, the same isoline trends and concentration in the northern extremity as well as th same general tendency in the southeast quadrant. This exercise shows how difficult it is to obtain even a general, qualitative correlation between surface distributions of sea-truth measured data and satellite imagery treated through suitable algorithms. Only further steps towards developing numerical correlation algorithms will fill the gap of relating the two different sets of "sea level" parameter matrices according to objective criteria and not to subjective, visual interpretation.

Alberotanza,L. et al. 1980. Circulation modeling in the Northern Adriatic Sea and its comparison with NIMBUS 7 remotely sensed data,COSPAR Sym.

Gordon,H.R. et al.1980.Phytoplankton pigments derived from the NIMBUS 7 CZCS, Science, in press.