Report on Primary Production Training Course, 21 October – 1 November, 2002, University of Concepción

by Dr. Trevor Platt

An advanced course on “Primary Production: Theory, Modelling and Estimation by Remote Sensing” was held from October 21 to 1 November, 2002 at the University of Concepción (UdeC), Chile. It was held under the auspices of IOC/UNESCO, the Chilean Ministry of Education (MECESUP), Minera Escondida, the DAAD, the UdeC's School of Graduate Studies and the Center for Oceanographic Research (COPAS), with additional funding from the International Ocean-Colour Coordinating Group (IOCCG) and from the Partnership for Observation of the Global Ocean (POGO) to facilitate participation by students from outside Chile. In all there were 26 students, of whom 8 were from Chile and 18 from elsewhere (7 other countries).

The additional funding from international committees also allowed the participation of more instructors than would otherwise have been the case. The list of instructors was: Dr. Trevor Platt (Bedford Institute of Oceanography, Canada); Dr. Shubha Sathyendranath, (Partnership for Observation of the Global Oceans); Dr. Vivian Lutz (Instituto Nacional de Investigación y Desarrollo Pesquero, Argentina); Dr. Cesar Fuentes-Yaco (Dalhousie University, Canada); Dr. Mark Dowell (University of New Hampshire, USA); and Dr. Osvaldo Ulloa (University of Concepción, Chile). In addition, Mr. Gabriel Yuras provided assistance in the practical demonstrations.

The course proceeded by lectures in the morning and by practical work in the computing laboratory in the afternoons. In addition students were encouraged to give short presentations on their own work, and most of them did so.

In the practical sessions, the students learned to use the software MATLAB, which is important in the image analysis field (and indeed in many other fields of science). Next, they learned to acquire and process ocean-colour data for regions of their interest. Then, they learned to apply MATLAB to the calculation of the submarine light field and of primary production. Finally, they processed an ocean-colour image from a region of their choice and used it to estimate primary production for the region concerned.

Many students took the course for credit, and an evaluation was therefore required. This took the form of a small research proposal. The students were required to state the objectives of the proposed research, the area of study, methods, and expected results. The context was an ocean-colour image that they had processed themselves and that they were required to interpret as part of the exercise. The proposal would illustrate an application of ocean-colour data according to the interests of the student.

The lectures covered the following material: Introduction to primary production; Survey of ocean-colour science; Photosynthetic response of phytoplankton to available light; Computation of primary production at discrete depths; Computation of daily, watercolumn
primary production (non-spectral, uniform biomass); Introduction to marine optics; The photosynthetic apparatus; Optical properties of seawater and constituents; Phytoplankton pigments and their absorption properties; Spectral and non spectral models of photosynthesis; Fluorescence of phytoplankton; Ocean-colour algorithms for Case-1 seawater; Implications of fluorescence for remote sensing; Dimensional analysis of primary production and reference horizons in the water column; Bio-optical variability, a case-study for Argentinian waters; Computation of watercolumn primary production in stratified water using a spectral model; Operational ocean colour in the Atlantic Zone of Canada; Ocean colour algorithms for case-2 waters; Development and validation of regional algorithms for biomass retrieval; Matching in situ and remotely-sensed data, time and space scales; Extrapolation protocols for use with remotely-sensed data; Fisheries applications of ocean colour; Impact of hurricane passage on phytoplankton as seen by ocean colour.

At the end of the course, the students were presented with a CD containing material from the course, including software, manuals and lecture notes in 30 chapters (some 234 pages). In addition, a website was established containing all this material and other logistic information relevant to the course. This website will continue to be available after the course is finished, for the benefit of the students. It will be protected by password and will include, for example, the projects submitted by them for the evaluation.

Various factors contributed to the undoubted success of this course. First was the selection of the participants: several really outstanding students were identified, and the average level of ability was very high. The extent of their motivation was most impressive. Second, the facilities provided by the university were excellent. A very fine computing laboratory, located adjacent to the lecture room, was provided for exclusive use every afternoon, and all day on weekends. This allowed the students to work individually or in pairs on their image analyses and facilitated practical demonstrations. Third, the magnificent support rendered by Mr. Gabriel Yuras ensured that the practical part of the course ran without difficulty.

Given all these favourable circumstances, the instructors were able to achieve everything they had intended to do. The additional financial support provided by the IOCCG and by POGO leveraged the Chilean funds to the maximum and enabled students from outside Chile to attend, and additional instructors to contribute, to the benefit of all concerned. The contacts developed between students and instructors, and between the students themselves, should be invaluable in the future. It is expected that they will lead to development of a multilateral joint research proposal in the subject area of the course,