



Final Report for the
Latin American Regional Project 2016-2017
April 2016-March 2017

"Bio-optical measurements at the Latin America ANTARES-ChloroGIN time series stations"

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General Introduction

The ANTARES network is composed of eight countries dedicated to study long-term changes in coastal areas around Latin America based on the observation of the temporal variability of eight coastal stations. The past four years seven countries have been working on strengthening the interaction among members focusing specially on pigment analysis using HPLC. Several benefits were attained and during the past year (2016-2017) we continued with the activities of synergy between NANO and ANTARES networks and we included the discussion about the importance and feasibility of measuring other important variables for Phytoplankton Functional Types (PFT) identification such as the light absorption coefficient of particles and phytoplankton. More specifically the objectives accomplished during this year can be resumed in:

(a) Survey the protocols used at the moment at the ANTARES stations already measuring phytoplankton light absorption properties, and promote the incorporation of these measurements in those that still do not do them.

(b) Organize a workshop in Lima (Peru) to teach and share experiences in the analysis of phytoplankton light absorption measurements.

(c) A protocol in Spanish was shared among participants and will be uploaded to NANO and ANTARES web pages.

(d) To put together developments of outreach in each one of the participating centers.

(e) A secchi disc will be made available for each country.

Finally, during this year we worked on the analysis and writing of the scientific article that resulted from the work done during the past years of the project. The article was submitted to a journal and we are waiting for the journal final decision.

1. Protocols for measuring the light absorption coefficient by particles.

A survey was done to determine the methodologies currently used for the light absorption coefficient by particles in the different Antares stations. In Table 1 it is indicated a resume of the information. Four stations are not working with these measurements and the main objective of the meeting in Lima (Peru) was to train people from these stations in the protocol. In addition, some aspects regarding the differences in the protocols used in the other stations were discussed (see Appendix 1).

Table 1. List of protocols used by Antares station for measuring the light absorption coefficient by particles.

ANTARES station	Protocol	Observation
INIDEP (Argentina)	Quantitative Filter Technique (Mitchell et al., 2000)	Methanol for pigment extraction.
USP (Brazil)	Quantitative Filter Technique (Mitchell et al., 2000)	Sodium hypochlorite for pigment extraction.
CARIACO (Venezuela)	Quantitative Filter Technique (Mitchell et al., 2000)	Adapted for using a Spectrascan radiometer instead of a spectrophotometer.
Cartagena (Colombia)	Not measuring	
IMARPE (Peru)	Not measuring	
Manta (Ecuador)	Not measuring	
Libertad (Ecuador)	Not measuring	
Ensenada (Mexico)	Quantitative Filter Technique (Mitchell et al., 2000)	Methanol for pigment extraction.

* Mitchell et al. (2000) Determination of spectral absorption coefficients of particles, dissolved material and phytoplankton for discrete water samples. In: *Ocean Optics Protocols for satellite ocean Color Sensor Validation, Revision 2*. NASA/TM-2000-209966. Ed. Fargion & Mueller.

2. Workshop in Lima (Peru)

A workshop was held in Lima (Peru) from February 6th to 10th named "*Measuring of the light absorption properties by particulate material in sea water*". The main objective of the workshop was the training of participants in the measurement of light absorption by particles. The workshop was attended by 19 participants (Table 1) who received the course provided by Dr. Adriana Gonzalez. The report of the activities during the workshop is included in Appendix 1.

Table 2. List of the participants of the workshop carried out in Lima (Peru).

Name	Antares Station	Country
Adriana Gonzalez Silvera	Ensenada	Mexico
Abraham Saavedra	Ensenada	Mexico
Mariana Larios	Ensenada	Mexico
Jaimie Rojas	CARIACO	Venezuela
Mayza Pompeu	Ubatuba	Brazil
Christian Naranjo	Manta	Ecuador
Maria Tapia	Libertad	Ecuador
Liseth Arregoces	Cartagena	Colombia
Guillermina Ruiz	EPEA	Argentina
Jesus Ledesma	IMARPE	Peru
Georgina Flores	IMARPE	Peru
Mario Polar	IMARPE	Peru
Sonia Sanchez	IMARPE	Peru
Luis Escudero	IMARPE	Peru
Aby Bernales	IMARPE	Peru
Wilson Carhuapoma	IMARPE	Peru
Elcira Delgado	IMARPE	Peru
Victor Aramayo	IMARPE	Peru
Michelle Graco	IMARPE	Peru
Jose Mendosa	IMARPE	Peru

Finally, other outcome of this workshop were the participation in the next issue of the NANO News where we had the opportunity of sharing some feelings about the project with the final conclusion being about the importance of maintaining the collaboration among members and at the same time building capacities that will result on a better comprehension of the functioning of our coastal waters not only with a local but also with a large scale view.

3. Outreach activities

Some outreach activities were carried out during the last year, and were described below.

3.a. Student Annual Congress of the Faculty of Marine Science (University of Baja California) - May 2016: It was given the presentation "Spatial and temporal variability of phytoplankton pigments in the Latin America ANTARES Network (2012-2014)" when it was mentioned the importance of the support given by POGO and the Nippon Foundation.



Presentation in the Student Congress

3.b. XI UABC EXPO EDUCATION - 24th to 28th October 2016: promoted by the University of Baja California in association to the Faculties of Sciences, Marine Sciences and Engineers. Activities were presented to students FROM elementary, middle and high school. It announced the general objectives of the NANO project and didactic and scientific material were distributed to emphasize the importance of the oceans to the life in our planet.



This activity included the use of the printed material indicated below specially prepared to give to society the awareness about the ocean, their study and conservation, and the role of organizations such as the Nippon Foundation and POGO.



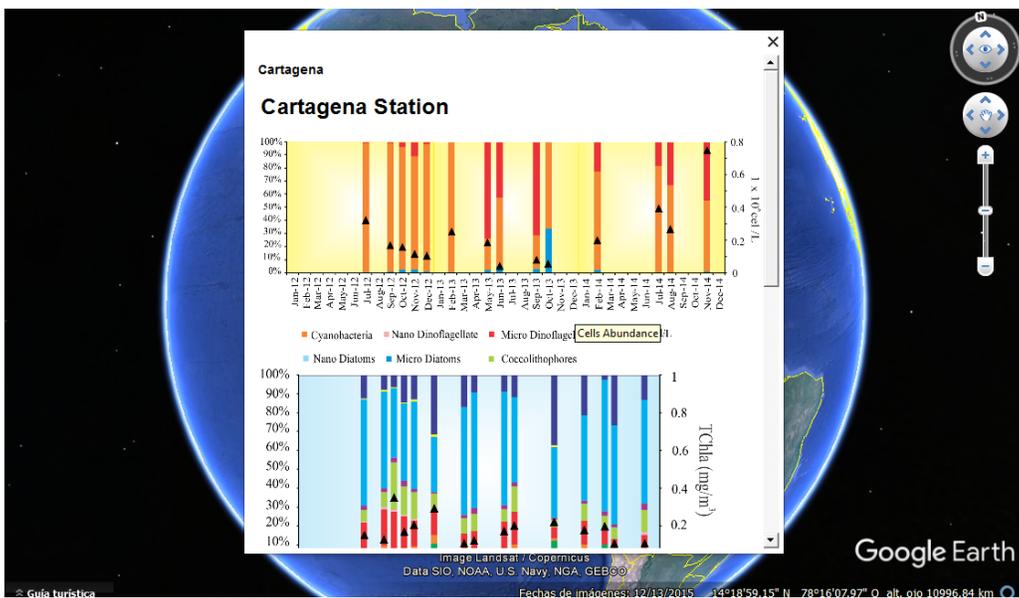
4. Publication of results

Results of the work done during the period from 2012 to 2014 were resumed in a manuscript submitted to Continental Shelf Research journal (Elsevier) in last February what represents one of the main outcomes of this project. The manuscript submitted is attached in Appendix 2.

On the other hand, a file was programmed in HTML language that could be opened with the Google Earth application (examples below). The produced file will be included in the online publication (once accepted) and will be uploaded to the NANO web page.



Visualization of the ANTARES stations in google earth.



Visualization of figures of the Cartagena station.

5. Secchi Disc manufacturing

The measurement of light penetration in the water column is an important information to understand some physiological responses of phytoplankton and the differences in their

distribution in the water column and in the oceans in general. A secchi disk is an easy to use and "low cost" instrument that can bring a valuable information, and for that reason it was decided to manufacture the disc in Ensenada (México) and distribute them among the project participants in order to include this measurement at all stations. In addition, it was elaborated a guide with the indications on how the secchi disc was elaborated (Appendix 3). The disc and the guide was given for all participants personally in Lima (Peru) and the later will be also available through the NANO webpage.



Giving the Secchi disk to Christian Naranjo (Ecuador)

Concluding Remarks

The Latin American NANO Regional Project was running since 2012. It begun with the participation of six countries (Argentina, Brazil, Colombia, Venezuela, Perú and México) and during 2014 Ecuador joined the group. The project included five years or phases with different coordination, but it always maintained both a strong communication among members and the search of a common objective. The support given by POGO and the Nippon Foundation have been essential to accomplish these goals.