Sea-truthing course Askö Laboratory, Sweden, 25 -31 May 2014

The Sea-truthing course was aimed at PhD students, Master students and young researchers and professionals from Nordic and Baltic Sea countries. A group of 12 students from 6 countries (Estonia, Finland, Germany, Lithuania, Poland and Sweden) actively participated during the course. The training was provided by international experts in the field and included the following lectures:• Hydrography and circulation in the Baltic Sea, Dr Matti Leppäranta, Professor at
University of Helsinki, Finland

• Inherent optical properties of the Baltic Sea in relation to remote sensing, Dr Susanne Kratzer, Associate Professor, Stockholm University, Sweden

• Bio-optical properties of the Baltic Sea, Dr Piotr Kowalczuk, Associate Research Scientist, Institute of Oceanology PAN, Poland

• Deriving inherent optical properties & chlorophyll concentration from coastal ocean colour - A novel statistical approach, Dr Susanne Craig, Department of Oceanography, Dalhousie University, Nova Scotia, Canada

• Light and primary production in a water column: what can be estimated by remote sensing? Dr Stiig Markager, Department of Bioscience, Marine diversity and Experimental Ecology, Aarhus University, Denmark

• Optical remote sensing: bringing evidence of a 'hysteresis' nature of a large lake's coming back from a mesotrophic state, Dr Dmitry Pozdnyakov, Nansen International Environmental and Remote Sensing Centre (NIERSC), St. Petersburg, Russia.

Three seminars were given by invited PhDs:

• Case II waters and harmful algal blooms. Some approaches to algorithms

Development, Dr Evgeny Morozov (SU and NIERSC)

• Analysis of Apparent Optical Properties and ocean color algorithms in the

Beaufort Sea (Canadian Arctic, Dr Selima Ben Mustapha, SU)

• Investigation of cyanobacteria development in the continuum of the Curonian

Lagoon and Lithuanian Baltic Sea coast by applying different remote sensing techniques, Dr Diana Vaiciute (University of Klaipeda)

Course participants and lecturers, Askö course, 25 - 31 May 2014

Two seminars on how to plan sea-truthing campaign (Gerald Moore) and optical measurements in the lab (Therese Harvey) were presented.

All students presented their PhD or Masters projects in talks (15-20 min each). Their talks were interesting and they were all very motivated and enthusiastic.

Two films were shown during two evenings: 'The Science of Ocean Colour', a film by Roland Doerffer, BC, Germany, and Interview with André Morel, also by Roland Doerffer.

On Wednesday, we had a full day field-trip, and the students had the possibility to participate in practical work on two ships: (1) in R./V. Oceania of the Polish group from IOPAS with very detailed explanation on a whole range of optical measurements (2) R./V. Limanda of Stockholm University the students got hands-on training with TACCS, AC9plus, LI-COR, and Secchi depth measurements. Chlorophyll, SPM and CDOM samples were taken, and spectrophotometric measurements of pigments and CDOM were carried out in laboratory on Thursday. The data of optical parameters were analysed by the students, and the students derived G_{440} and chlorophyll-a concentrations and a report as part of their group assignment.

Taking participants to R/V Oceania (IOPAN)

Students on R/V Limanda

Students working in the lab

Students had a demonstration on how to take measuremenst with the Microtops. (We were waiting to have blue sky with sun and no clouds!). Then, Gerald Moore demonstrated how to download the data and how to screen the data for errors. Selima Ben Mustapha explained the use of the data: the aerosol optical thikness and how to calculate the Ångström exponent.

On Thuesday afternnon, Gerald Moore gave an exercise on how to derive reflectance from the TACCS. He also showed how to process data from AC9plus.

Microtops measurements with Gerald Moore

One day was devoted for modelling. Two lectures were given by Gerald Moore and Susanne Craig during the workshop. The workshop task was on modifying reflectance spectra by changing the input concentrations of chlorophyll, SPM and CDOM.

The two teachers gave practical exercises to students on forward modelling and how to derive inherent optical properties (IOPs) and/or chlorophyll concentration (Chl) from known reflectance spectra by using :

- band ratio algorithm for Chl,
- The Lee et al. quasi analytical algorithm (QAA)
- Craig et al. EOF algorithm (Empirical Orthogonal Function)

Outcome

The course seemed a succes, and all students and teachers were very positive about the outcome. The atmosphere among participants was good and may lead to future collaboration between students and lecturers. All presentations, assignments and papers were made available to participants in a shared dropbox folder. The students will have to submit I) an individual assignement (discussing an important concept in ocean science and how it relates to their own PhD project, and to reflect on what they have learnt in the course). II) A group assigment: protocol about field and lab measurements, and comparison to existing research and monitoring data.

List of training course participants

Students				
Family name	**First Name**	**e-mail**	**Country**	**Gender**
Jaatinen*	Elina	elina.jaatinen@su.se	Sweden	female
Junttila*	Sofia	sofia.junttila@ymparisto.fi	Finland	female
Wozniak	Monika	m.wozniak@ug.edu.pl	Sweden	female
Harvey*	Therese	therese.harvey@su.se	Sweden	female
Vaiciute	Diana	diana@corpi.ku.lt	Lithuania	female
Friedrichs	Anna	anna.friedrichs@uni-oldenburg.de	Germany	female
Beltran-Abaunza*	Jose M.	jose.beltran@su.se	Sweden	male
Luhtala	Hanna	hlluht@utu.fi	Finland	female
Konik	Marta	mk@iopan.gda.pl	Poland	female
Kyryliuk*	Dmytro	dkyryliuk@gmail.com	Sweden	male
Juva	Katriina	katriina.juva@helsinki.fi	Finland	female
Asuküll*	Elar	elar.asukyll@gmail.com	Estonia	male
Invited lecturers				
Namn	**Efternamn**	**e-mail**	**Country**	
Susanne	Craig	susanne.craig@dal.ca	Canada	female
Dmitry	Pozdniakov	dmitry.pozdnyakov@niersc.spb.ru	Russia	male
Piotr	Kowalczuk	piotr@iopan.gda.pl	Poland	male
Stiig	Markager	ssm@dmu.dk	Danmark	male
Matti	Leppäranta	matti.lepparanta@helsinki.fi	Finland	male
Gerald*	Moore	geraldfmoore@gmail.com	England	male
Selima*	Ben Mustapha	selima.benmustapha@su.se	Sweden	female
Evgeny*	Morozov	evgeny.morozov@su.se	Sweden	male
Susanne*	Kratzer	susanne.kratzer@su.se	Sweden	female
Sigrid	Ehrenberg	sze@bredband.net	Sweden	female

*Member of WaterS partner institute

Course schedule

Sea-truthing course Askö Laboratory, Sweden, 25 -31 May 2014

Arrival Sunday, 25 May 2014

We arranged a coach to pick participants up at Stockholm City terminal, which is the bus station next to Stockholm Central.

14:00 Coach from Stockholm Cityterminalen with destination "ASKÖ - Sea Truthing Course" (please check gate number)

16:00 Boat from Uttervik to Askö

16:25 Arrival at Askö/ introduction to Askö by staff from the field station; (find rooms)

17:30-19:30 ***Dinner and ice breaker***

Mon, 26 May 2014

8:00-8:45 ***Breakfast***

9:00-9:15 **Welcome to the course** (Susanne Kratzer)

9:15-10:00 Lecture **'Hydrography and circulation in the Baltic Sea'** (Matti Leppäranta)

5 min.

10:05-10:50 Lecture **'Inherent optical properties of the Baltic Sea in relation to remote sensing'** (Susanne Kratzer)

10:50-11:20 ***Coffee break***

11:20-12:05 Lecture **'Bio-optical properties of the Baltic Sea'** (Piotr Kowalczuk)

5 min.

12:10- 12:55 '**Deriving inherent optical properties & chlorophyll concentration from coastal ocean colour - A novel statistical approach'** (Susanne Craig)

13:00-14:00 ***Lunch***

14:00-14:45 Lecture **'Light and primary production in a water column: what can be estimated by remote sensing?'** (Stiig Markager)

5 min.

14:50-15:35 Lecture '**Optical remote sensing: bringing evidence of a 'hysteresis' nature of a large lake's coming back from a mesotrophic state**' (Dmitry Pozdnyakov)

15:35-16:05 ***Coffee Break***

16:05-16:35 Seminar '**How to plan a sea-truthing campaign'** (Gerald Moore)

16:35-17:05 Seminar '**Optical measurements in the lab'** (Therese Harvey)

18:00-19:00 ***Dinner***

19:00-19:45 **'The Science of Ocean Colour'**, Film by Roland Doerffer, BC, Germany.

Tuesday, 27 May 2014

8:00-8:45 ***Breakfast***

9:00-9:30 Seminar **'Case II waters and harmful algal blooms. Some approaches to algorithms development.'** (Evgeny Morozov)

9:30-10:00 Seminar **'Analysis of Apparent Optical Properties and ocean color algorithms in the Beaufort Sea (Canadian Arctic)'** (Selima Ben Mustapha)

10:00-10:20 ***Coffee Break***

10:20-10:50 Seminar **'Investigation of cyanobacteria development in the continuum of the Curonian Lagoon and Lithuanian Baltic Sea coast by applying different remote sensing techniques**' (Diana Vaiciute)

10:50-11:50 3 PhD student talks (20 min each = 15 min + 5 for discussion):

- 'Retrieval of the dominant cyanobacteria species from remote sensing reflectance inversion - A case study from the Gulf of Gdansk, southern Baltic sea' (Monika Wozniak)
- 'Relationships between coloured organic matter (CDOM) and dissolved organic matter (DOC) in different coastal gradients of the Baltic Sea' (Therese Harvey)
- 'Spatial-temporal distribution of optical water constituents within the Himmerfjärden Bay' (José Beltran)

10 min.

12:00-12:30 2 PhD student talks (15 min each):

- 'Seasonal sea ice effect on water quality –preliminary results of field studies during spring 2014' (Elina Jaatinen)
- 'Changes in the Baltic Sea hydrography' (Katriina Juva)

13:15-14:15 ***Lunch***

14:15-15:00 3 PhD student talks (15 min each)

- 'Developing phytoplankton spring bloom indicator in coastal WFD regions from MERIS data' (Sofia Junttila)
- 'Monitoring of chlorophyll fluorescence in the water body by means of smartphones' (Anna Friedrichs)
- 'Testing how well does a station represent its surroundings in archipelago waters' (Hanna Luhtala)

15:00-15:30 ***Coffee Break***

15:30 -16:15 3 PhD student talks (15 min each)

- 'CDOM estimation from MERIS images' (Elar Asuküll; 15 min)
- 'Object oriented feature characteristics of oil spills in the Baltic Sea area based on the archive ASAR data' (Marta Konik; 15 min)
- 'Using SPM derived from MERIS to define the extend of the coastal zone' (Kyryliuk Dmytro; 15 min)

18:00-19:00 ***Dinner***

19:00-19:45 **'The Science of Ocean Colour'**, Film by Roland Doerffer, GKSS, Germany or **Interview with Andre Morel** (video in common room, optional)

Wednesday, 28 May: sea-truthing on board ship: R/V Limanda (Stockholm University), and R/V Oceania (IOPAN, Poland); latter requires health certificate from GP.

(**Breakfast** and **dinner** at Askö)

Thursday, 29 May:

8:00-8:45	***Breakfast***
9:00-11:00	laboratory measurements (chlorophyll, SPM and CDOM)
11:00-12:00	Microtops measurements
12:00-13:00	Lunch
14:00-17:00	-demonstration how to derive chlorophyll, SPM and CDOM - demonstration of how to download Microtops data, TACCS data, AC9 Data
18:00-19:00	***Dinner***

Friday, 30 May 2014:

8:00-8:45	***Breakfast***
9:00-11:00	Modelling lectures by Gerald Moore and Susanne Craig the
11:00-11:30	Coffee break
11:00-12:00	Modelling exercises on modifying reflectance spectra by changing the input concentrations of chlorophyll, SPM and CDOM (Gerald Moore) and inverse modelling (Susanne Craig)
13:00-14:00	Lunch
14:00-16:00	Continuation of modelling workshop
18:00-19:00	***Dinner and course party***

Departure: Saturday, 31 May 2014

8:00-9:00 Breakfast

(The rooms and kitchen need to be cleaned before departure, and, equipment, food and other things transported to the boat.)

10-11:00 Boat to Uttervik in 3 groups

11:30 Coach to Stockholm Cityterminalen; 13:30 Arrival in Stockholm

Appendix 3: Organizer and Lecturers

Course organizer

Associate Professor Susanne Kratzer, Department of Ecology, Environment and Plant Sciences (DEEP), Stockholm University, SU; susanne.kratzer@su.se

Logistics manager:

Dr. Sigrid Ehrenberg: sze@bredband.net

Invited Lecturers:

- Dr. Susanne Craig, Department of Oceanography, Dalhousie University, Canada; susanne.craig@dal.ca
- Dr. Piotr Kowalczuk (Associate Research Scientist), Institute of Oceanology PAN, Poland; piotr@iopan.gda.pl
- Prof. Stiig Markager, Department of Bioscience - Marine Diversity and Experimental Ecology, Aarhus University, Denmark; ssm@dmu.dk
- Prof. Matti Leppäranta, University of Helsinki, matti.lepparanta@helsinki.fi
- Gerald Moore (Researcher), Bio-Optika, Gunnislake, UK, Member of MERIS Data Quality Working Group geraldfmoore@googlemail.com
- Prof. Dmitry Pozdnyakov, Nansen International Environmental and Remote Sensing Centre (NIERSC), St. Petersburg**;** dmitry.pozdnyakov@niersc.spb.ru