NAVARINO ENVIRONMENTAL OBSERVATORY

NEO Management Friday, 11 August 2017

NEO NEA #25 (April - June 2017)

NEO stands for Navarino Environmental Observatory. But NEO in Greek (νέο) means news as well and NEA is its plural. So this is our news!

Foreword

As always spring is a hectic but stimulating time at NEO. Several new promising academic flowers came into bloom this period. Six high quality master thesis were conducted and finalized at NEO. A couple of EU-proposals, related to NEO research, were selected to participate in the final calls. NEO organized an interactive seminar on “Bridging between science and business” at the Residence of the Swedish Ambassador, which initiated discussions on how to create “safe operating space” to foster innovative approaches for sustainable development.

Happy Reading!

Figure 1: Students’ experiment at NEO during the Eco-hydrology course ☺ (photo: Giulia Vico)

Activities

Research

- ***Research proposals***

The follow up of the NEO workshop, "Achievements and future perspectives", which was held at Stockholm University in November, 2016, resulted in the submission of several EU research proposals. All these proposals are joint initiatives between academy, NGOs, small-medium-size enterprises, farmer organizations etc., at local, regional and international levels.

- ***Maintenance at Methoni station***
  Methoni, (May 27 – June 1)

Radovan Krejci from Stockholm University visited NEO and Methoni atmospheric laboratory in order to conduct maintenance work on DMPS (Differential Mobility Particle Sizer) and Soot photometer. Together with Giorgos Maneas they also installed the rain-sampler, which will be used for isotope analysis.

- ***Paleoclimatology***
  Field-work, Peloponnese (April, June)

Martina Hättestrand visited Greece for some fieldwork at Gialova lagoon and other places in Peloponnese. Samples of aquatic plants from different environments were collected from the lagoon in order to study the present day reservoir and hard-water effects in the area. Surface sediment samples were also taken from the lagoon in order to study the relation between present day pollen deposition and present day vegetation. More samples were taken from Malthi and Agios Floros in Messinia as well as Nea Kios (paleolake Lerna) in Argolida, which will be studied during the coming year.

Related master thesis

✓ ***"The Land and the Sea: Final Neolithic to Early Roman Socio-environmental Interactions in Southwestern Messenia, Peloponnese, Greece".***
MSc thesis in the "Master's Programme in Quaternary Science and Climate",
Stockholm, June 7

(By Taariq Sheik, Supervisor: Martina Hättestrand)

Abstract

Intensive and extensive archaeological surveys in Messenia, have revealed the regions diverse cultural history. Efficient publication and cataloguing of the results of these surveys provides an ideal opportunity to investigate the socioenvironmental relationships in the region through comparison with palaeoenvironmental data. XRF core scanning and palynological analyses of a sediment core from Gialova Lagoon, on the southwest Messenian plain is here used to assess the interaction between human land use, climate change, seismic events, and socio-cultural change from the Final Neolithic to the Roman Era. Palynological evidence for the expansion of heliophile vegetation during the Final Neolithic-Early Bronze Age transition suggests that human land clearance occurred in Messenia broadly concomitantly with the rest of the Peloponnese. The pollen spectrum from the Late Helladic suggests a stable agricultural landscape. Post-Mycenaean palynological data poses the now familiar question of the timing of the re-intensification of land use and olive cultivation after the end of the Bronze Age. The XRF geochemical profiles (Ca/ttc, Ca/Sr, Ca/Sr and Si/ttc) suggest five distinct seismic events: 5300 cal. BP, 3800-3600 cal. BP, 3300 cal. BP, 3200 cal. BP and 2800-2400 cal. BP. These events are broadly concomitant with periods of social change and are discussed in the context of important socio-cultural transitions. Palaeoclimatic

proxies (Rb/Sr, PCA terrigenous indicators and K/Ti) suggest generally wet/cool conditions for the Final Neolithic, with a distinct trend to dryer/warmer conditions during the Bronze Age. Indications for aridiy peak during the so-called '4.2ka drought event,' while climate indices are variable during the 3.2ka 'Bronze Age Crisis.' Wetter/cooler conditions are interpreted for the Geometric and Archaic Periods, while a trend towards dryer/warmer conditions is exhibited into the Early Roman Era.

- ✓ ***"Reconstruction of past vegetational changes at Gialova lagoon – southern Peloponnese, Greece".***
  MSc thesis in the "Master's Programme in Quaternary Science and Climate",
  Stockholm, June 14

(By Erika Modig. Supervisor: Martina Hättestrand)

Abstract

Extensive archaeological studies have revealed that the land in the region of Messenia, Greece, has been intensely used through agricultural and pastoral activities since Neolithic times. This has opened for possibilities to correlate archaeological findings with palaeo-environmental data. In this project, a vegetation reconstruction is performed in order to correlate changes in vegetation and environment from the past 3600 years in Messenia with archaeological data. The changes in the pollen assemblage seem to coincide with socio-economical changes. There are however some contingencies regarding the timing of the peak of *Olea europaea*, which occurs directly after the end of the Bronze Age (c. 3000 cal. yrs BP), which indicates a resurrection of intense agriculture in the region despite the upcoming Dark Ages. This is discussed along with a theoretical 300-year ageing of the pollen spectra that possibly would align the *Olea europea* maximum with the Late Bronze Age. The study implies that human impact is the main factor to the vegetational change, but other parameters such as natural processes and climate change are also considered. Further research is needed to be able to distinguish these parameters from the human impact in the vegetation reconstruction.the .

- ✓ ***"A first step towards a Holocene Tephrochronology for the Peloponnesus peninsula, SW Greece".***
  MSc thesis in the "Master's Programme in Quaternary Science and Climate",
  Stockholm, June 14

(By Helene Sunmark. Supervisor: Stefan Wastegård)

Abstract

Dating and correlation of climate archives are essential for understanding climate development and paleoenvironments. Tephrochronology is a well established dating method which involves the use of widely dispersed volcanic glass for correlation and dating of climate archives. A tephrostratigraphical study has been carried out in cores from two sites called the Gialova lagoon and the Agios floros fen located in the SW Peloponnesus peninsula, SW mainland Greece, with the aim of creating a Holocene tephrochronology for the area. Attempts to geochemically analyse possible shards of tephra from depths in both cores were performed at the Grant Institute, School of GeoSciences at the University of Edinburgh and Geocentrum in Uppsala. The geochemical data from these analyses indicated presence of tephra in two depths from the Gialova lagoon. The results infer that these two tephras were deposited around 2500 cal yrs. BP and 3200 cal yrs. BP. However, confident identification of these tephras was not possible due to the insufficient number of analyses. The results from the Agios Floros fen indicate high concentrations of phytoliths in the peat, making the site unsuitable for tephra analysis because of the risk of misidentification. Despite low tephra concentrations, the results infer that tephra from Holocene volcanic eruptions have been deposited in the Peloponnesus, making this a first step towards a Holocene tephrochronology in the region..

- ***Environmental monitoring of Gialova Lagoon***

Bird monitoring, Water Quality Monitoring (April – June 2017)

Bird monitoring in the area was continued during this period on a scheduled monthly basis. Apart for bird species and numbers of birds visiting the lagoon during the spring migration, Giorgos Maneas and Dimitris Bousbouras focused also on identifying nesting areas for species such as the Black-winged Stilt (*Himantopus himantopus*), the Mallard (*Anas platyrhynchos*) and the Mute Swan (*Cygnus olor*) among others.

Water quality monitoring was continued on a daily basis. First results covering almost a year of monitoring were presented by Agnes Classon in her master thesis (see also below). Stefano Manzoni, together with Giulia Viggo (Uppsala University), Jason Kelly (Oregon State University) and Giorgos Maneas conducted maintenance work during June, in connection to the Eco-hydrology course which took place at NEO (see also below)

An attempt to fly drones over Gialova Lagoon took place in April. UCanDrone, a company from Athens, Greece, visited NEO in April in order to demonstrate a drone-plane flight over Gialova lagoon, aiming to provide detailed GIS data for the lagoon (NDVI, topography). Due to technical issues, the plane flight was impossible but nevertheless, the company managed to fly a helicopter, which covered a smaller area of the wetland creating a first example of how drones can provide useful data for the area.

Figure 2: Demonstration of the flight plan and the drone at NEO premises.

Related Internships

Two students, Bojing Hu and Eirini Makopoulou spent three weeks at NEO in April during their internship. The students, following the "Geomatics" Master course at Stockholm University helped to compile data about the region, and to produce maps with available data from the Gialova area (satellite images and aerial pictures). The students were also introduced to drone technology. Ian Brown, Hakan Berg and Giorgos Maneas were their supervisors.

Related Master thesis

- ✓ ***"Seasonal salinity variations and hydrological conditions of the Gialova Lagoon".***

MSc thesis in the Master's Program "Hydrology, Hydrogeology and Water Resources", Stockholm, April 9

(By Agnes Classon. Supervisor: Stefano Manzoni)

Abstract

Coastal lagoons are ecosystems being under constant natural, but also anthropogenic stress. Wind, tides, precipitation and evaporation, and salt-water inputs from the sea influence the lagoon system and cause very dynamic environments. Human activities such as agricultural production, fishing, swimming and hunting put additional pressure on these ecosystems, which, despite a very changing climate are highly productive and valuable for birds and animals, but also for the global fish and aquaculture industry. Especially important for fishing are the coastal lagoons in the Mediterranean, one of the most densely populated areas in the world and with an immense tourist industry. The human impact on the coastal lagoons in the Mediterranean is large, and eutrophication, over-fishing, and littering from tourists are very common issues resulting in a degradation of the water quality, and threatening of animal and plants species. Management plants are therefore highly needed, and to develop them, long-term monitoring to understand the hydrological settings are of importance. That was the main idea for this study, and Gialova lagoon, in the south-western Greece was chosen. Seasonal salinity changes, water temperatures, water levels and water flow direction were analyzed by installing electrical conductivity sensors. Evaporation and the lagoon water budget were calculated by installing climatic sensors. Also, the correlation between water levels, precipitation, evaporation and water temperature on salinity was analyzed. Water temperatures varied between 10°C in January to 30°C in July and salinity varied between 4 g L^{-1} to 40 g L^{-1}. Evaporation rates were very large in summer but low in the winter, and the opposite occurred for the rainfall. Water levels were the highest in December after several months of high rainfall. When evaporation rates were high in the summer, water losses were compensated for by large inputs of sea water, and when precipitation was high in the winter, the lagoon gained a lot of water from fresh-water channels in the north. Evaporation and temperatures had the strongest influence on salinity. During climate change, with less winter rain and higher temperatures in the summer, salinity could increase due to more inputs of sea water and less inputs of fresh-water. This could be a threat to the lagoon ecosystem and a management plan could assist in maintaining a good water quality and to preserve rare birds, animals and plant species.

✓ ***"A comparison of conventional and organic olive farming in the catchment area of Gialova Lagoon, south-west Greece"***
MSc thesis in the Master's Program Environment and Health Protection, Stockholm, June 01 2017

(By Amanda Salguero Engström. Supervisors: Hakan Berg and Giorgos Maneas)

Abstract

The intensification of the agriculture that has primarily taken place during the second half of the 20th century has led to environmental problems such as eutrophication, water contamination, soil degradation and biodiversity loss, as well as human health problems. Organic farming is less harmful for the environment, and its share of the world's total agricultural land is rising. Olive farming is one of the most important occupations in Messenia, Greece, but it is also one of the biggest threats to the persistence of coastal lagoons such as Gialova Lagoon. Studies from other Mediterranean countries have showed that organic olive farming can be equally or more profitable than conventional olive farming, but no such study has been made in Messenia. The aim of this study was to compare the organic and conventional olive farming in the catchment area of Gialova Lagoon, focusing on both environmental sustainability and financial viability. The aim was also to investigate how a more sustainable olive farming can be achieved in the region. Interviews were conducted with 15 olive farmers and five olive farmers answered an online questionnaire. In total, eleven conventional and nine organic olive farmers participated. The results showed

that organic farmers use less agrochemicals and water and more sustainable ground vegetation management techniques. The organic olive farming was also the most financially viable, i.e. their profit was significantly larger. There was a gap between the numbers resulting from this study and the conventional farmers' perception of the financial conditions of organic olive farming. The spread of information about the benefits of organic olive farming is required to achieve a conversion towards a more sustainable olive farming in this region.

- ✓ ***"An evaluation of Gialova lagoons importance as an stop-over area for spring migrating birds in relation to other wetlands along the west coast of Greece"***
  MSc thesis in the Master's Program Environment and Health Protection,
  Stockholm, June 01 2017

(By Viggo Norrby. Supervisors: Hakan Berg and Giorgos Maneas).

Abstract

Areas of wetland have for the last century declined globally, mostly as a cause of anthropogenic activitities. Since many bird species are depending on wetlands, this have affected their populations negatively, and today many of the remaining wetlands are protected. This study has investigated the status and trends of Gialova lagoon in Greece, both as a stopover for spring migrating birds and as a wetland for wintering waterbirds. This has been done by doing an own field inventory for two weeks in March, and by compiling and analysing data from winter censuses from the last thirty years. Results showed that Gialova supported many migrating birds during the inventory, and several of these are threatened in Europe. The eastern parts of the lagoon are the most important and sensitive areas, due to the suitable habitat for foraging and protection. The analysis of winter data showed that only one species was increasing, while the rest and the total amount of waterbirds were stable or decreased. The number of birds during winter did not reach thresholds for qualifying as a Ramsar-site of international importance. However, the wetland's geographical location and context makes it a important area to protect for migrating birds, and it also has values for the local community in terms of different ecosystem services.

Education

Summer Schools

- ***"Theory and practice of aerosol chemistry and engineering for climate, air quality, emissions and health effects, by means of In-Situ and Remote Sensing Observations "***
  1st HAAR Summer School, Hellenic Association of Aerosol Research (May 18-24)

The objective of the 1st HAAR international summer school, which took place at NEO in May, was to train young researchers on state-of-the-art instruments for determining the key properties of atmospheric aerosols, the tools for analyzing and interpreting the data, and the knowledge for putting those in the context of climate change.

Figure 3: Lecture by Dr. Spyros Lykoudis during the 1st HAAR summer school at NEO (photo: Katerina Bougiatioti).

Aerosol particles are key components of the atmosphere and thus strong determinants of the climate at local, regional, and global scales. To understand how emissions by a number of natural and anthropogenic sources contribute to the atmospheric aerosol and to climate change there is a need to combine both in-situ and remote sensing observations with model predictions.

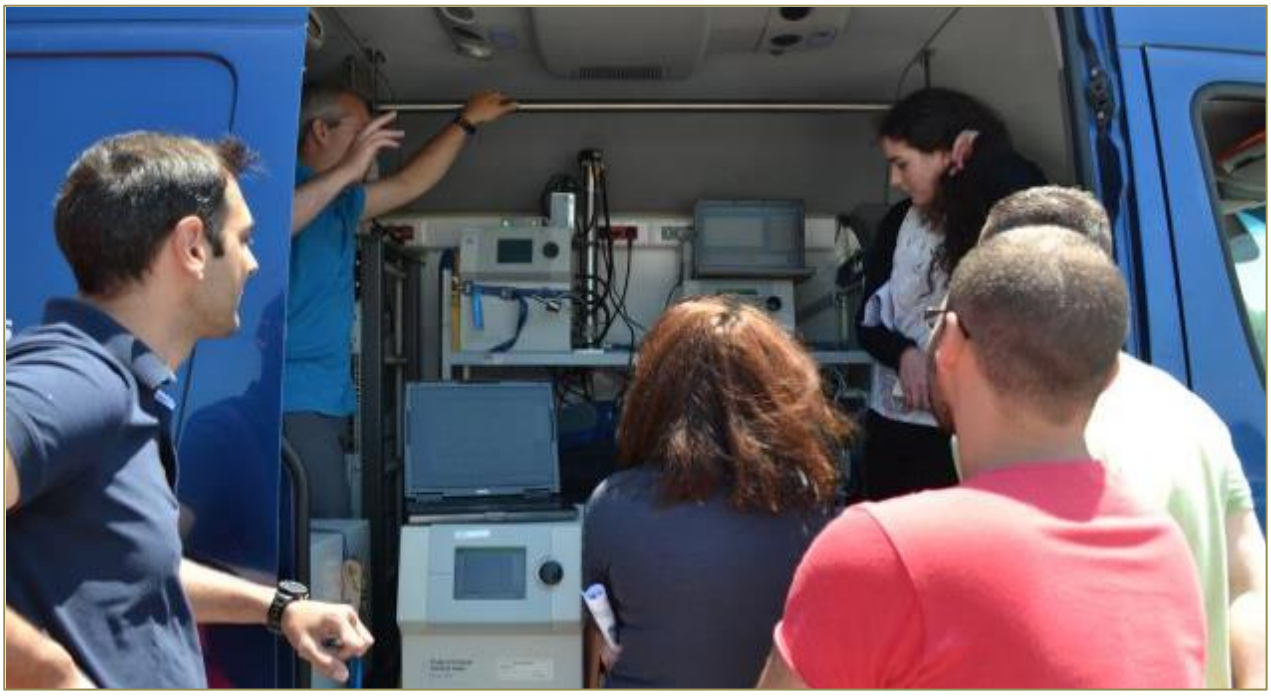

Figure 4: Hands on training during the 1st HAAR summer school at NEO (photo: Katerina Bougiatioti).

The summer school was organized around lectures that covered the basic theory followed by hands-on experience on:

1. in-situ instruments for measuring the concentration, size and chemical composition of atmospheric particles,
2. systems for probing the vertical distribution of the atmospheric aerosol, and
3. new integrative approaches using models and observations for impact assessment.

The lectures and practical applications were provided by a total number of 16 invited leading experts in the above 3 fields (table 1).

Table 1: Invited researchers at the 1st HAAR summer school at NEO

Name	Affiliation
Jean Sciare, M. Pikridas, G. Biskos	Cyprus Institute, Cyprus
A. Nenes	Georgia Institute of technology, USA
H.C. Hansson	Stockholm University, Sweden
K. Eleftheriadis, L. Diapouli	N.C.S.R. (National Centre for Scientific Research) Demokritos, Greece
A. Papayiannis	NTUA (National Technical University of Athens), Greece
N. Mihalopoulos, A. Bougiatioti, M. Kottas, E. Proestakis, S. Lykoudis	NOA (National Observatory of Athens), Greece
S. Pandis	University of Patras, Greece
A. Tsakis, L. Kasapidis	CERTH (Centre for Research and Technology Hellas), Greece

Field Courses

- ***"Cultural Heritage Materials and Technologies"***
  Masters' course, Department of History and Archaeology, University of Peloponnese (April 3-5)

The MSc Cultural Heritage Materials and Technologies CultTech from the Department of History and Archaeology, University of Peloponnese, including7 post graduates, the program secretary V. Valantou and the program director Assoc. Prof. N. Zacharias, visited the NEO in April.

Figure 5: Students, instructors and little Nikolas ☺ during the CultTech visit to NEO.

The CultTech students had a total of 2 days field work and lecturing within the frames of semester B Environmental, Remote and Field Prospection Studies in the nearby advanced cultural and environmental

landscape of Gialova and Koryfasio. A visit to Methoni Station took place where they had a lab introduction and practice given by Dr. E. Gerasopoulos from NOA (National Observatory of Athens).

- ***"Humans, environments and climate on the Peloponnese during 5000 years – an integrated history"***
  Master's course, Swedish Institute at Athens, Uppsala University and Domesticated Landscapes of the Peloponnese project (May 15-17)

The master level course "*Humans, environments and climate on the Peloponnese during 5000 years – an integrated history*" - arranged by the Swedish Institute at Athens in collaboration with the research project Domesticated Landscapes of the Peloponnese and Uppsala University - visited NEO between May 15 and 17. The visit was a part of an excursion around the Peloponnese. The course consisted of 10 students from different universities in Sweden and was led by Dr. Anton Bonnier, Dr. Martin Finné and Dr. Erika Weiberg from the Department of Archaeology and Ancient History, Uppsala University. The aim of the course was to discuss human-environmental dynamics on the Peloponnese in a long term perspective. Around NEO they visited: Paleocastro, Gialova Lagoon and the Mycenaean Palace at Pylos.

Figure 6: Visiting a cultural site at Kalavryta (NW Peloponnese).

- ***"Eco-hydrology: a Mediterranean perspective "***
  Summer course, part of the Hydrology and Water Resources MSc Programme at the Department of Physical Geography, Stockholm University
  NEO, June 9-15

The summer course GE7049 Ecohydrology: a Mediterranean perspective, like two years ago, focused on plant-water relations and evapotranspiration in the Mediterranean area. The course covered the basics of Mediterranean climate and the history of land and water management in the Peloponnese region. Field excursion to the Navarino Environmental Observatory allowed testing eco-hydrological theories with dedicated experiments designed by the students.

Figure 7: Fieldwork during the “Eco-hydrology course, a Mediterranean perspective”, at NEO (photo: Giulia Vico).

One group assessed the effect of saline water on plants, while a second group investigated the differences between olive trees and grapevines in terms of energy balance and evapotranspiration. Stefano Manzoni and Steve Lyon (SU) held introductory lectures at Stockholm University, while Jason R. Kelley (Oregon State University), Giulia Vico (SLU Uppsala), and Danielle Way (University of Western Ontario) gave lectures at NEO on more specific topics (respectively evapotranspiration, soil water balance, and plant physiology). Finally, Guiomar Ruiz-Pérez (SLU Uppsala) gave a guest lecture at SU on forest management in the Mediterranean area.

Dissemination

Seminars

- ***"Bridging between science and business"***
  Residence of the Ambassador of Sweden (April 27)

NEO organised a seminar on "Bridging between science and business" at the Residence of the Swedish Ambassador in April 27. The objective of the seminar was to provide an opportunity for participants to discuss ways science can be brought closer to business and vice versa.

Main speaker Mr. Kevin Noone, Professor of Stockholm University elaborated on ways business and science are connecting and creating safe, authorized and repeated spaces for collaboration. According to Professor Noone ""Broader and deeper collaboration between business and science is absolutely necessary if we are to find solutions to today's "wicked" problems. My experience working with a number of businesses and other organizations is that it takes time, effort, resources and repeated exposure on both sides to establish trust and develop a tradition of positive interaction. I have found that the returns on this kind of up-front investment can be tremendously valuable in terms of what can be accomplished when we work together."

Figure 8: Professor Kevin Noone, giving a presentation during the seminar.

Taking the stand, Ms. Karin Holmgren, Professor, Chairman of NEO Steering Committee presented the "NEO Journey", as an example of how the academic community and the private sector can work together to promote an ecologically, socially and economically sustainable development. "The mission of NEO is to develop the understanding and sustainable use and management of our natural resources. NEO research addresses several of the sustainable development goals of the United Nations Agenda 2030 as well as of the Paris Agreement. To push the boundaries of knowledge we need basic research. For society to benefit from our new insights we also need applied research. For research to lead to concrete actions, innovations and improvements in our use of the natural resources we need sound collaboration and dialogues between the

academy, the business sector and the public. As such, NEO is a role model.", emphasized Professor Holmgren.

Figure 9: From left to right: Ass. Professor Hakan Berg (NEO Director), Professor Kevin Noone, H.E. Ambassador of Sweden, Mrs. Charlotte Wrangberg and Professor Karin Holmgren, Deputy Vice-Chancellor at Swedish University of Agriculture Sciences and NEO Steering Committee Chairperson.

H.E. Ambassador of Sweden, Mrs. Charlotte Wrangberg, acknowledged the successful partnership between the Stockholm University, the Academy of Athens and TEMES S.A. The Greek-Swedish collaboration represents concrete example of creative synergy between the private sector and the scientific community, aiming at developing strategies that focus on the adaptation to climate change and sustainable development.

Workshops

- ### *ERD research group meeting*

The Environment, Resource Dynamics and management research unit (ERD), at the department of Physical Geograph, had a three day workshop at NEO in April. Long days of creative discussions around research, research proposals and joint planning was mixed with field visits and good food. It was proposed that the group should identify and develop some joint research and PhD education related to NEO.

Figure 10: Participants at the ERD workshop during a brainstorming session at the NEO veranda.

Events

- ### *Cafe-NEO*

'Atmosphere – Climate – Health: Invisible particles with visible impacts'

Kalamata, May 20

A 'cafe-NEO' meeting took place at Vino-banco Tapas bar in Kalamata in connection to the HAAR Summer School which took place at NEO.

The participants had the opportunity to discuss with Dr. Nikos Mihalopoulos, Director at the Institute of Environmental Research and Sustainable Development (National Observatory of Athens), the impacts of aerosol pollutants in human health and climate.

Figure 11: The café-NEO meeting with invited speaker Dr. Niko Mihalopoulo (left)

Conferences

- ***"Human-environment dynamics in the Peloponnese and beyond"***
  Athens (April 6-8)

Martina Hättestrand (researcher, SU), Elin Norström (researcher, SU), Christos Katrantsiotis (PhD student, SU) and Taariq Sheik (master student, SU) participated at the conference, which was arranged by the PELOPS (Past Environments and Landscapes of Peloponnesian Societies) group in cooperation with the Swedish Institute at Athens and the American School of Classical Studies at Athens.

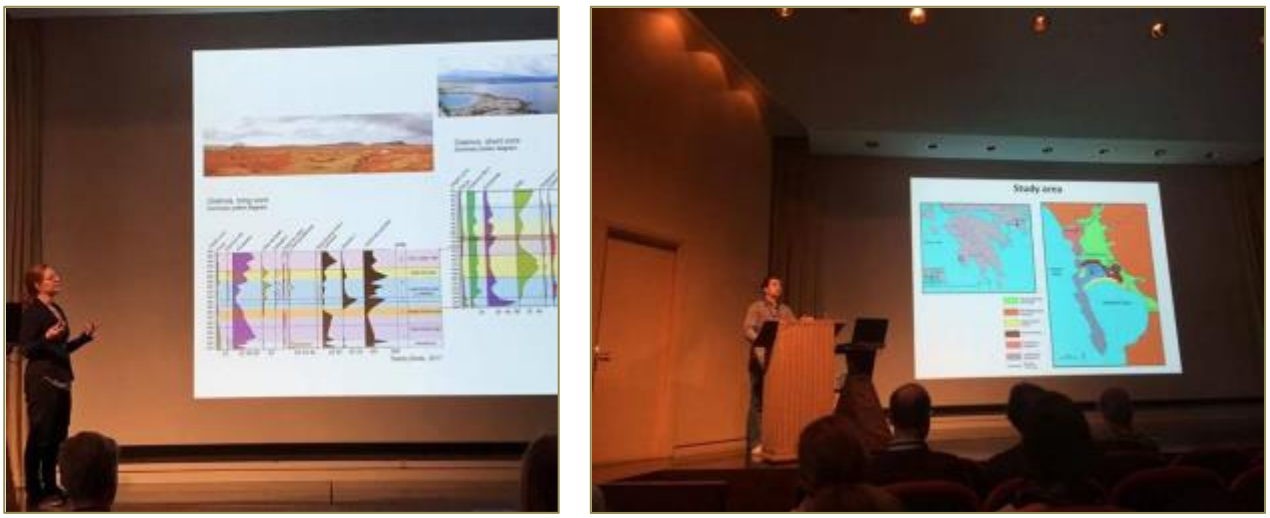

Figure 12: Martina Hättestrand (left) and Christos Katrantsiotis presenting their work at Gialova area.

During the conference the on-going research at Gialova lagoon was presented by the group together with the co-authors Erika Modig (master student, SU), Shari Stocker (University of Cincinnati), Calla McNamee (The American School of Classical Studies at Athens), Pavlos Avramidis (University of Patras). The presentation was titled "Environmental change and human activity since the Late Bronze Age in SW Peloponnese: interpretations of new multiproxy data from Gialova lagoon in relation to archaeological findings".

Visits @ NEO premises

Children visiting NEO atmospheric laboratory

A group of young children from the Methoni kindergarten visited NEO atmospheric laboratory at Methoni. The young students were well prepared for an interview with Giorgos Maneas, asking questions about the climate, the atmosphere and the environment. The young students gifted a nice collection of drawings to Giorgos, which are available at NEO station. ☺

Figure 13: Young students from the Methoni kindergarten together with their teachers outside the NEO atmospheric lab at Methoni ☺

NEO management

NEO Steering Committee meeting was held in Athens, in connection to the NEO seminar that took place at the Residence of the Swedish Ambassador in the end of April.

Giorgos Maneas, participated at the Blue-Med meeting of the National pivots, which was held in HCMR (Hellenic Center of Marine Research), on May24. The National pivots were appointed in a previous Blue-Med meeting.

Upcoming

Research

- Submission of several NEO related EU-proposals.
- An intern Gabriel Sainz will be at NEO for six weeks during the summer. Gabriel will assist in installing new sensors in Gialova Lagoon.
- Bird-monitoring in the Gialova lagoon area on a monthly basis. The aim of the monitoring is to record the bird species, their habitats and their behavior and produce a data base which will be used for scientific and popular publications.

Education

- As part of a one semester Natural Science Specialization course a group of students from the upper secondary school, Värmdö Gymnasium, will visit NEO in September.
- Students of the Justus-Liebig University of Giessen (a NEO Associated Member), Germany, will visit NEO in September as part of their-course "Climate, Climate Change Impacts: Greece".