

# NAVARINO ENVIRONMENTAL OBSERVATORY

NEO Management

Monday, 25 February 2019

## **NEO NEA #31 (October - December 2018)**

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**

This autumn and winter has brought a lot of well needed rain to Greece. This has not stopped activities at NEO, as you will see in this newsletter. The workshops within the EU H2020 project COASTAL continued, with important stakeholder consultations and a field-trip was carried out in December to carry out measurements. The PANACEA project is starting up, which will develop a coordinated system for monitoring atmospheric composition, solar radiation variations, climate change and related natural hazards in Greece. Two new EU funded projects with NEO relevance also started up. In addition, NEO has hosted a number of visits by students, researchers and other groups, benefitting from the interesting environments in Messenia for various studies and research activities.



**Figure 1:** *A view of NEO wider area from the top of Chandrinos village hill.*

## Activities

### Research

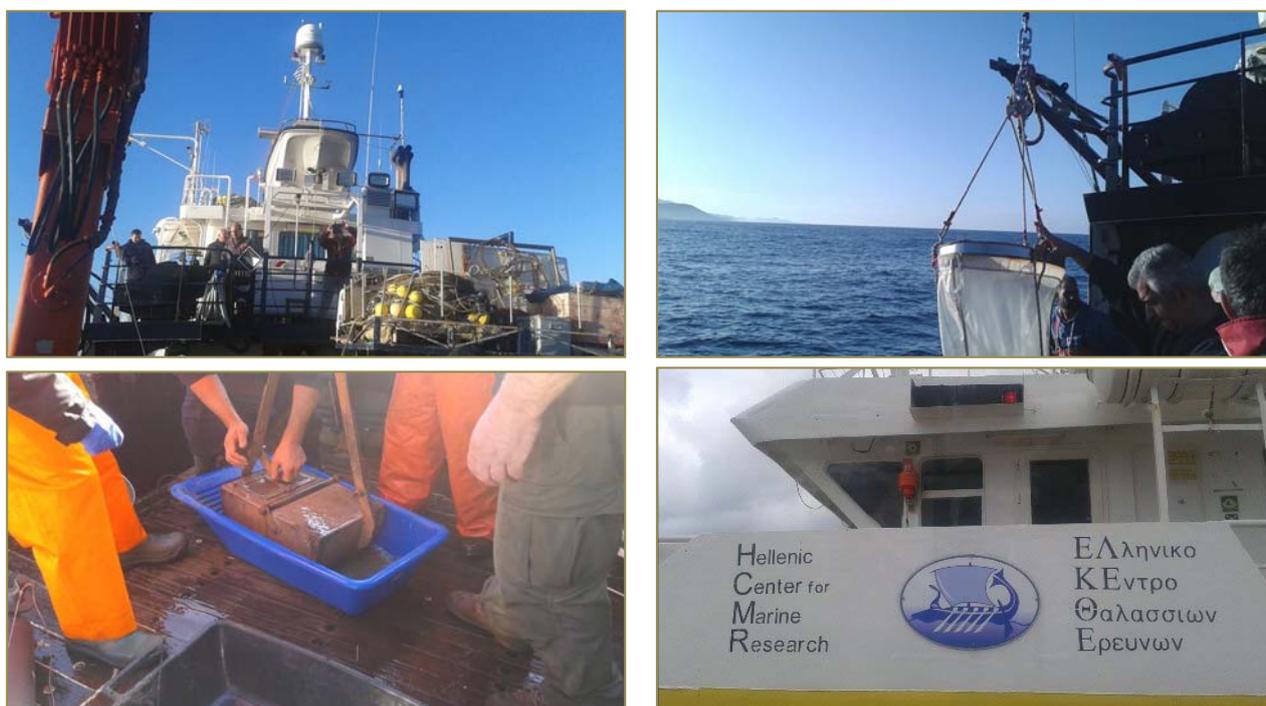
- *COASTAL EU project (No 773782)*

#### *Sectoral workshops*

Under the umbrella of COASTAL (Collaborative Land-Sea Integration Platform) project, in 2018, NEO hosted and facilitated 6 sectoral workshops bringing together more than **70 local stakeholders** from the sectors of agriculture, local industry, fishing, tourism as well as representatives from the public sector, universities, institutes and NGOs. The 6 sectoral workshops were co-organised by HCMR (Hellenic Centre of Marine Research) and NEO and were held at the premises of NEO, in Messinia Greece, from July to October 2018. During the workshops, the participants showed enthusiasm and were happy to be given the opportunity to meet and discuss about common issues within their sector. Similar discussions have never happened before (there is a need for discussion & debate), comprising, already at this stage, a key outcome from COASTAL project. The aim of these workshops was to gain local knowledge, which will be combined with other data from the area and generate inputs for modelling Land-Sea interactions. The “chaotic” mind-maps will be further analysed and translated to Causal Loop Diagrams (CLD) and Fuzzy Cognitive Maps (FCM).

#### *Field trip*

During mid-December 2018, a two-day field trip of F/R “PHILIA” of the Hellenic Centre for Marine Research ([www.hcmr.gr](http://www.hcmr.gr)), crewed by six naval officers and sailors, and 10 oceanographers, took place in the coastal zone between Pylos and Costa Navarino. This was the first of the three scientific samplings in the water column and the marine sediments of the area. In order to trace the impacts of agricultural activities, fishing and tourism in the coastal ecosystem, a suite of scientific parameters was studied, such as suspended particulate matter (SPM), major and trace elements, inorganic nutrients, total organic carbon (TOC), aliphatic and polycyclic aromatic hydrocarbons (PAHs), phenols and polychlorinated biphenyl’s (PCBs). Besides, selected parameters were studied in the Gialova Lagoon and the streams of the area. The next cruise of “PHILIA” is planned for March 2019.



**Figure 2:** Field trip of F/R “PHILIA”. Scientific samplings in the water column and the marine sediments of the area

- **PANACEA project**  
**Hellenic Research Infrastructures**

*“PANhellenic infrastructure for Atmospheric Composition and climate change (PANACEA)”, Ministry of Economy and Development (Operational Programme Competitiveness, Entrepreneurship and Innovation – EPAnEK 2014-2020), Coordinator N. Mihalopoulos, University of Crete, Greece, 2018–2021 (<http://panacea-ri.gr/>).*

In September 2018 PANACEA project, commenced. PANACEA, as part of the Hellenic Research Infrastructures (Ministry of Economy and Development - Operational Programme Competitiveness, Entrepreneurship and Innovation – EPAnEK, 2014-2020, <http://panacea-ri.gr/>), is actively linked with ACTRIS/ESFRI and ICOS/ERIC, to develop a coordinated system for monitoring of atmospheric composition, solar radiation variations, climate change and related natural hazards in Greece. This will be achieved through merging, enhancing, and coordinating all existing Greek ground-based stations and networks (e.g., in-situ gas and aerosol, LIDAR and AERONET stations, RADARs and solar radiation networks) under the umbrella of a single integrated RI, essential to achieve excellence in research and innovation. NEO as part of PANACEA, participates in the research contacted contributing with its station at Methoni, and one of the dedicated experimental campaigns scheduled in PANACEA will be fully hosted by NEO, which will provide access to several research groups thus implementing once more NEO’s mission to become a hub of edge atmospheric and climate research in the area.

#### *New NEO-relevant EU projects*

- **EU COST Action DAMOCLES**

*EU COST Action DAMOCLES - Understanding and modeling compound climate and weather events, 2018-2022, CA17109 - <https://www.cost.eu/actions/CA17109/#tabsName:overview>; Coordinator: Jakob Zscheischler, ETH, Zürich; NEO researchers from Stockholm University: Zahra Kalantari, Georgia Destouni; Greek researchers involved: Maria Tsakiri and Dimitra Teochari, National Technical University of Athens*

Hazards such as floods, wildfires, heatwaves, and droughts usually result from a combination of interacting physical processes that occur across multiple spatial and temporal scales. The combination of physical processes leading to an impact is referred to as a Compound Event. Examples of high-impact Compound Events include (i) droughts, heatwaves, wildfire and/or air pollution and their interactions involving a complex interplay between temperature, humidity and precipitation; (ii) extreme precipitation, river discharge and storm surge interactions, combining coastal storm processes with fluvial/pluvial and ocean dynamics; (iii) storms including clustering of major events leading to spatial and/or temporal dependence. Climate change alters many of these processes and their interaction, making projections of future hazards based on single driver analyses difficult. Impact studies considering only one driver usually fail to assess the extent of the impacts of Compound Events. It is thus not clear whether climate models can capture major changes in risk associated with Compound Events. Existing modelling approaches used to assess risk may therefore lead to serious mal-adaptation. **DAMOCLES** will (a) identify key process and variable combinations underpinning Compound Events; (b) describe the available statistical methods for modelling dependence in time, space, and between multiple variables; (c) identify data requirements needed to document, understand, and simulate Compound Events, and (d) propose an analysis framework to improve the assessment of Compound Events. **DAMOCLES** brings together climate scientists, impact modellers, statisticians, and stakeholders to better understand, describe and project Compound Events, and foresees a major breakthrough in future risk assessments.

- **EU COST Action FIRElinks**

**EU COST Action FIRElinks - Fire in the Earth System: Science and Society, 2018-2022; CA18135 - <https://www.cost.eu/actions/CA18135/#tabs\Name:overview>; Coordinator: Artemi Cerdá, University of Valencia; NEO researchers from Stockholm University: Zahra Kalantari, Georgia Destouni; Greek researchers involved: Ioannis Daliakopoulos, Technical Educational Institute of Crete, and Maria Papadopoulou, National Technical University of Athens.**

**FIRElinks** will develop the EU-spanning network of scientists and practitioners involved in forest fire research and land management with backgrounds such as fire dynamics, fire risk management, fire effects on vegetation, fauna, soil and water, and socio-economic, historical, geographical, political perception and land management approaches. It will connect communities from different scientific and geographic backgrounds, allowing the discussion of different experiences and the emergence of new approaches to fire research. The main aim of **FIRElinks** is to power synergistic collaborations between European research groups and stakeholders with the objective to synthesise the existing knowledge and expertise, and to define a concerted research agenda which promotes an integrated approach to create fire-resilient landscapes, taking into account biological, biochemical and-physical, but also socio-economic, historical, geographical, sociological, perception and policy constraints. This is an urgent societal need due to expected further intensification and geographical spreading of wildfire regimes under Global Change.

- **Environmental monitoring of Gialova Lagoon**

- **Bird monitoring, Water Quality Monitoring, Remote sensing (October – December)**

A second year of bird-monitoring in Gialova lagoon, covering the period October 2017 – November 2018, was completed in November. NEO researchers will continue with analysing the data aiming to gain a better understanding of birds' status, their habitats and their behaviour in order to produce a data base which will be used for scientific and popular publications.



**Figure 3:** Swans and flamingos in Gialova Lagoon wetland (photo: Giorgos Maneas)

The long-term monitoring of basic water parameters (temperature/conductivity/depth) as well as meteorological conditions (temperature, wind speed/direction, relative humidity, precipitation and solar radiation) in the area was continued on a daily basis (data logged at 5-minute resolution). The spectroradiometers, continued to measure the amount of radiation reflected from the water surface and upper water

column at specific wavelengths aiming to couple fluctuations in water leaving radiance to changes in the water quality of the lagoon, particularly fluctuations in chlorophyll and suspended organic matter.

### Related monitoring activities

In collaboration with the American College of Greece (Deree), a project on monitoring and identification of microplastic pollution was initiated in Fall 2019. The project aims to assess the extent of microplastic pollution of sediments on Voidokoilia beach, a popular tourist destination and at the same time a Natura 2000 protected area. In parallel, a water quality project has been initiated, to assess agricultural activity and its impact on the wetlands of the Gialova Lagoon region.



**Figure 4:** Sampling sediments from Voidokilia beach to assess the extent of microplastic pollution (left). Sampling water from Gialova lagoon wetland for nutrient analysis (photos: Michael Valahas).

### Related MSc thesis

Sofia Maniatakou, a master student at the program “Social-Ecological Resilience for Sustainable Development”, Stockholm Resilience Centre, visited the NEO station for 5 weeks during October/November 2018. There, she conducted fieldwork for her master thesis titled “Stakeholders’ perceptions on water-based ecosystem services; a Q-study in the surrounding region of Gialova wetland, Greece”. Sofia is expected to submit and present her thesis in June 2019 and is supervised by Håkan Berg, Giorgos Maneas and Tim Daw.

## Research publications

### *Scientific journals*

- Destouni G, Prieto C**, Robust Assessment of Uncertain Freshwater Changes: The Case of Greece with Large Irrigation—and Climate-Driven Runoff Decrease, *Water*, **10**(11), 1645, 2018. <https://www.mdpi.com/2073-4441/10/11/1645/pdf>. Journal cover and short story: <https://www.mdpi.com/2073-4441/10/11>.
- Zerefos, C. S.**, Kapsomenakis, J., Eleftheratos, K., Tourpali, K., Petropavlovskikh, I., Hubert, D., Godin-Beekmann, S., Steinbrecht, W., Frith, S., Sofieva, V., and Hassler, B.: Representativeness of single lidar stations for zonally averaged ozone profiles, their trends and attribution to proxies, *Atmospheric Chemistry and Physics*, **18**, 6427-6440, <https://doi.org/10.5194/acp-18-6427-2018>, 2018.
- Katrantsiotis, C., Norström, E., Smittenberg, R., Finné, M., Weiberg, W., Hättestrand, M., Avramidis, P., Wastegård S.**, 2019. Climate changes in the eastern Mediterranean over the last 5000 years and their links to the high-latitude atmospheric patterns and Asian monsoons. *Global and Planetary change*. <https://doi.org/10.1016/j.gloplacha.2019.02.001>.

### *NEO-relevant papers*

- Vigouroux G, Destouni G, Jönsson A, Cvetkovic V**, A scalable dynamic characterisation approach for water quality management in semi-enclosed seas and archipelagos, *Marine Pollution Bulletin*, **139**, 311–327, 2019. <https://authors.elsevier.com/sd/article/S0025326X18308737>.
- Khazaei B, Khatami S, Alemohammad SH, Rashidi L, Wu C, Madani K, **Kalantari Z, Destouni G**, Aghakouchak A, Climatic or regionally induced by humans? Tracing hydro-climatic and land-use changes to better understand the Lake Urmia tragedy, *Journal of Hydrology*, **569**, 203-217, 2019. <https://www.sciencedirect.com/science/article/pii/S002216941830934X>.
- Kalantari Z**, Ferreira CSS, Keesstra S, **Destouni G**, Nature-based solutions for flood-drought risk mitigation in vulnerable urbanizing parts of East-Africa, *Current Opinion in Environmental Science & Health*, **5**, 73-78, 2018. <https://doi.org/10.1016/j.coesh.2018.06.003>.
- Levi L, Cvetkovic V, **Destouni G**, Data-driven analysis of nutrient inputs and transfers through nested catchments, *Science of The Total Environment*, **610-611**, 482-494, 2018 <http://www.sciencedirect.com/science/article/pii/S0048969717320016>.
- Hamel P, Riveros-Iregui D, Ballari D, Browning T, Célleri R, Chandler D, Chun KP, **Destouni G**, Jacobs S, Jasechko S, Johnson M, Krishnaswamy J, Poca M, Pompeu PV, Rocha H, Watershed services in the humid tropics: Opportunities from recent advances in ecohydrology, *Ecohydrology*, **11**(3), e1921, 2018. <https://onlinelibrary.wiley.com/doi/abs/10.1002/eco.1921>.

### *Conferences*

- Zerefos, C. S.**, Kapsomenakis, J. N., Eleftheratos, K., Tourpali, K., Petropavlovskikh, I. V., Hubert, D., Godin-Beekmann, S., Steinbrecht, W., Frith S. M., and Sofieva, V.: The ranking of the effect of proxies on the space and time variability of stratospheric ozone profiles, EGU General Assembly 2018, Vienna, Austria, 8-13 April 2018, Session AS3.24/CL2.07 - Advances in estimating and attributing long-term ozone and temperature trends in the middle atmosphere, *Geophysical Research Abstracts*, Vol. 20, EGU2018-13062, 2018.
- Kapsomenakis, J., **Zerefos, C.**, Eleftheratos, K., Haslerud, A. S., Petropavlovskikh, I., and Frith, S.: Ozone trends from lidar, sonde, SBUV and chemical transport model data (dedicated to the memory of Ivar Isaksen), Second LOTUS (Long-term Ozone Trends and Uncertainties in the Stratosphere) workshop, 17–19 September 2018, WMO, Geneva, 2018.
- Zyrichidou, I., Balis, D., Tourpali, K., Eleftheratos, K., **Zerefos, C.**, and van der A., R.: Monitoring of long-term total ozone characteristics from space at the Northern polar and middle latitudes for the winter-spring period 1979-2018, 14th International Conference on Meteorology, Climatology and Atmospheric Physics (COMECAP 2018), Alexandroupolis, Greece, 15–17 October 2018, Paper number 157, 2018.
- Metaxatou A.**, Kouvarakis, G., Theodosi, C., **Maneas, G., Kalivitis, N., Stavroulas, I., Liakakou, E., Gerasopoulos, E., and Mihalopoulos, N.**: Navarino Environmental Observatory: Part I Long-term variability of aerosol optical properties, 14th International Conference on Meteorology, Climatology and Atmospheric Physics, COMECAP 2018, Alexandroupolis, Greece, 15-17 October 2018.
- Zerefos, C.**, Kapsomenakis, J. N., Eleftheratos, K., Haslerud, A. S., Petropavlovskikh, I. V., and Frith, S. M.: Vertical structure of ozone trends based on Oslo CTM3 runs, lidar and SBUV data (dedicated to the memory of Ivar Isaksen), AGU 2018 Fall Meeting, 10–14 December 2018, Washington, D.C, Session Number and Title: A34C: Atmospheric Trace Species Profiles from Long-Term and Campaign Sampling: Observations from Ground, Balloons, and Aircraft III, Abstract ID: 444449, Paper Number: A34C-01, 2018.

## Education

### *Field Courses @ NEO*

- *“Hersby Gymnasium”*

#### **Students’ course, Hersby Gymnasium, Stockholm (October 22-25)**

*A letter to NEO...*

*Our group, 20 students and 3 teachers from Hersby gymnasium, Lidingö Sweden visited NEO in October. The purpose of our visit was to make the students implement field studies for their diploma project. We also had a lecture from Giorgos Maneas about the research at NEO. A new for this year was the visit to Bougas school in Kalamata. We had a wonderful reception at the school and we all did some Greek traditional dancing. Thank you Giorgos Maneas and Eleni Lempesi for inviting us.*



**Figure 5:** A group picture from our visit to Bougas school in Kalamata. From left to right: Evi Loumproukou, Lars Magnusson, Hazha Mohammed Fadhil, Karolina Nylund, Eleni Lempesi, Giorgos Maneas and Evanthia Papanikolaou.

*Yet another aim for this trip was to experience the Greek food and culture. The students worked for three days on their projects at NEO. The subjects were:*

- 1. Plant adaptations in the Mediterranean region (e.g. problems with dehydration and protection against herbivory. Create a plant inventory.*
- 2. Garbage inventory on the beaches around Gialova.*
- 3. Nitrogen and phosphorus compounds in the Gialova lagoon compared to the sea and small rivers. How is the wetland affected? The oxygen levels in the Gialova lagoon*
- 4. Water hardness in the region.*
- 6. Olive oil and the fatty acid composition of the Kalamata olives.*
- 7. Biomass measurements and CO<sub>2</sub> uptake in the Gialova lagoon.*

*An overall question for all projects was to figure out how their studies could be linked together to ecosystem services. All projects are supposed to end up in a scientific report. The report is a requirement for their upper secondary school diploma (gymnasieexamen in Swedish) in June 2019.*

*We and our students are so grateful and pleased with our visit at NEO!*

*Hazha Mohammed Fadhil, Lars Magnusson, Karolina Nylund*

- **“Trans-Disciplinary Research (TDR) for Sustainability Sciences”**  
PhD course, Department of Physical Geography, Stockholm University

This PhD course is a real example of how a group of PhD students can work together to co-create and co-develop a tailor-made course adding to their knowledge and experience. From Alpha to Omega, the students organized lectures with researchers, group discussions for peer learning, and field work activities for learning by doing. The outline of this course, was set up in the fall of 2017, by the PhD-students of the ERD-research unit of the department of Physical Geography (NG) at Stockholm University, and Håkan Berg, Ass. Professor at the department and responsible for the course. Messinia region and NEO platform were selected as an ideal context for both theoretical and the applied studies.

In total, 12 students from NG and the Stockholm Resilience Centre (SRC) followed the course. Nineteen seminars were held during the spring semester (January-May 2018) comprising the theoretical part of this course. In the fall 2018, the second and applied part of the course took place at NEO premises. The aim of the field work was to identify TDR research opportunities in the Messinian area, by combining stakeholder analysis based on interviews in Messinia, and interviews with researchers that had already conducted research at NEO.



**Figure 6.** Field visit and interviews at the Olive farm cooperative (left). Summarizing the results after one of the fieldwork days (right).

During one week, Oct 27<sup>th</sup>–Nov 3<sup>rd</sup> 2018, the students (5 from NG and 2 from SRC) conducted interviews with 10 local stakeholders in order to understand their perspectives on the two most important socio-economic activities; tourism and agriculture. The gathered data, were visualized and analyzed in Causal Loop Diagrams (CLDs). Furthermore, the student combined the interviews with former and present NEO researchers, and those with the local stakeholders, to identify future TDR research opportunities in a “gap map”. The whole work is analysed in the students course report and was also presented at a Monday lunch seminar and the department (Dec 12<sup>th</sup> 2018).

All work was conducted jointly; truly 100 % of creative group work.

## Outreach

### *Events*

- ***Cafe-NEO***  
Patra, November and December

In collaboration with the Laboratory of Atmospheric Physics of the University of Patras ([LAPUP](#)), NEO has organised two café-NEO events in Patra (at *Gefyres* cafe). Both café-NEO meetings were well attended and the sessions will continue in 2019.

At the first meeting, in November 21<sup>st</sup>, the attendees had the chance to discuss with Professor Athanasios Argiriou, Department of Physics, University of Patras, topics related to past climate variability, future projections for climate change and ways to mitigate the impacts and adapt to future conditions.

During the second meeting, the focus was on “Plastics and microplastics and their impact on the environment and health”, with invited speaker Associate Professor Hrisi Karapanagioti, Department of Chemistry, University of Patras.



**Figure 7:** The café-NEO meetings in Patra. On top, the November meeting, and at the bottom the December meeting.

## *Upcoming*

### Conferences

- The work of the “Trans-disciplinary research for sustainability sciences” PhD course will be presented at the Bergen International Student Conference (BISC) "Towards sustainable futures: Facing global challenges today", which will take place on 28 – 29 March in Bergen, Norway.

### Education

- The Bsc course “Physical Geography”, organized by the Department of Physical Geography, Stockholm University, will visit NEO in March.
- The MSc course “Cultural Heritage Materials and Technology”, organized by the Department of Department of History, Archaeology and Cultural Resources Management, will visit NEO in March.
- A group of students from The American College of Greece (DEREE), will conduct monitoring activities at the Gialova Lagoon Natura 2000 area for the period January-June 2019.

### Events

- Several café-NEO events will take place in Pylos and Patra.
- A NEO open event will take place at Athens in May 2<sup>nd</sup>, entitled: “***Challenges and opportunities related to a new climate economy: driving innovation for sustainable development***”. More information will be sent out in due time.