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on Earth and Environmental
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14-17 July 2014, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH



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Edited by Gregory T. Papanikos

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TABLE OF CONTENTS

(In Alphabetical Order by Author's Family name)

| | | |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Preface | | 7 |
| Conference Program | | 9 |
| 1. | Delineation of a Geothermal Reservoir Using 2d Seismic Interpretation and Electrical Resistivity Tomography Data Inversion at Hamam Sidi Maamar, Central Tunisia <i>Hajer Azaiez, Ghada Sayem, Hakim Gabtni & Mourad Bedir</i> | 13 |
| 2. | Generation of EPS Members by Means of an Analog Methodology: Application to Wind Speed Forecasting <i>Alvaro de Pascual Collar, Maria Luisa Martin, Francisco Valero, Daniel Santos & Álvaro Vicente-Retortillo</i> | 14 |
| 3. | Taphonomy and Paleoecology of Cenomanian Oysters from the Musabaa Salama Area, South Western Sinai, Egypt <i>Magdy El-Hedeny, Ahmed El-Sabbagh & Heba Mansour</i> | 15 |
| 4. | Micropalaeontological Investigations of Ocean Acidification and its Detection in the Geological Record <i>Malcolm Hart, Laura Pettit, Deborah Wall-Palmer, Christopher Smart & Jason Hall-Spencer</i> | 16 |
| 5. | Analyzing and Prediction of Flooding in Atoll Island Country <i>Chung-Ru Ho & Chen-Chih Lin</i> | 18 |
| 6. | A New Method for Tracking Meddies by Satellite Altimetry <i>Federico Ienna</i> | 19 |
| 7. | REE Content in Sewage Sludge from Selected Pulp - Paper Plants in Poland <i>Paulina Kostrz-Sikora, Izabela Bojakowska & Stanisław Wołkowicz</i> | 20 |
| 8. | Fossil Plant Taphonomic Evidence of Tectonic, Sea Level and Climatic Change <i>Valentin Krassilov & Sophia Barinova</i> | 21 |
| 9. | Metal Content in Sediments from Cooling Towers <i>Joanna Krasuska, Izabela Bojakowska, Stanisław Wołkowicz & Paulina Kostrz-Sikora</i> | 22 |
| 10. | Dynamic Hydrological Modelling of Water Quality Parameters in the Tota Lake in Colombia <i>Camilo Lesmes Fabian, Luis Felipe Gil, Jorge Luis Rincon, Julian David Segura & David Nuyttens</i> | 23 |
| 11. | Microtomography Characterization on Sediment Porous Space <i>Inaya Lima, Haimon Alves, Joaquim Assis, Mauro Geraldés & Ricardo Lopes</i> | 24 |
| 12. | Consensus Building and Environmental Conflict Mediation <i>Lilia Maia de Moraes Sales & Alessandro Wilckson Cabral Sales</i> | 25 |
| 13. | Farmland Merging in Poland-A Success or a Failure of Land Stewardship Policy in a Reshaping of a Traditional View of Rural Areas <i>Iwona Markuszczyńska</i> | 26 |

| | | |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 14. | Environmental Potential and Management on Granulates Exploration on the Ceara Continental Shelf <i>Jader Morais, Lidriana Pinheiro & Luciano Paula</i> | 27 |
| 15. | Tilapia Fish (<i>Oreochromis niloticus</i>) Waste for Biodiesel Production in Ceara State, Northeastern Brasil <i>Selene Morais, Cristiane Alexandrino & Joana Alexandre</i> | 28 |
| 16. | Microbial Mats Structures through Micro-Computed Tomography <i>Simone Pennafirme Ferreira, Alessandra Machado, Inaya Lima, Mirian Crapez & Ricardo Lopes</i> | 29 |
| 17. | Effects of Elastic Anisotropy in Shale Gas Exploitation: Study on Cambay, Cambay Basin, India <i>Anirbid Sircar</i> | 30 |
| 18. | Modelling of the Hydraulic Fracturing of Rocks: A Multi Scale and a Multiphase Approach <i>Marina Sousani</i> | 31 |
| 19. | Geological Mapping in the Taskent Area (SW Konya - Turkey) with Additional Remote Sensing Support <i>Kemal Zorlu, Ulas Inan Sevimli & Turgut Aksu</i> | 32 |

Preface

This abstract book includes all the abstracts of the papers presented at the Annual International Conference on Earth and Environmental Sciences, 14-17 July 2014, organized by the Athens Institute for Education and Research. In total there were 19 papers and presenters, coming from twelve different countries (Brazil, Colombia, India, Israel, Poland, Saudi Arabia, Spain, Taiwan, Tunisia, Turkey, UK, USA). The conference was organized into six sessions that included areas such as Environmental Pollution and Climate Change, Environmental Technology and Meteorology, Environmental Awareness and Protection, Technology and Rock Mechanics, Soil and Water and other related areas. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into six research divisions and twenty-seven research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
Annual International Conference on Earth and Environmental
Sciences, 14-17 July 2014, Athens, Greece
PROGRAM

Conference Venue: Titania Hotel (52 Panepistimiou Avenue)

ORGANIZING AND SCIENTIFIC COMMITTEE

1. Dr. Gregory T. Papanikos, President, ATINER.
2. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
3. Dr. Nicholas Pappas, Vice-President of Academic Affairs, ATINER & Professor, Sam Houston University, USA.
4. Dr. Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.
5. Dr. Chris Sakellariou, Vice President of Finance, ATINER & Associate Professor, Nanyang Technological University, Singapore.
6. Dr. Nicolas Abatzoglou, Head, Environment Research Unit, ATINER & Professor, Department of Chemical & Biotechnological Engineering, Université de Sherbrooke, Canada, Chair Pfizer, PAT in Pharmaceutical Engineering, Director GREEN-TPV and GRTP-C & P.
7. Dr. Iakovos Caravanos, Professor, Hunter College of the City University of New York, USA.
8. Dr. Keith Edmister, Professor, North Carolina University, USA.
9. Dr. Konstantinos Giannakas, Professor, University of Nebraska-Lincoln, USA.
10. Dr. Virginia Sisiopiku, Associate Professor, University of Alabama, USA.
11. Dr. Emie Yiannaka, Associate Professor, University of Nebraska-Lincoln, USA.
12. Dr. Salazar Raquel, Professor-Researcher, Autonomous University of Chapingo, Mexico.
13. Dr. Amit Sarin, Associate Professor, Amritsar College of Engineering and Technology, India.
14. Ms. Ditika Koplaku, Associate Professor, University of Shkodra Luigj Gurakuqi, Albania.
15. Ms. Anila Mesi-Dizdari, Associate Professor, University of Shkodra Luigj Gurakuqi, Albania.
16. Dr. Romana Elzbieta Pawlinska-Chmara, Assistant Professor, Opole University, Poland.
17. Dr. Behzad Sani, Assistance Professor, Islamic Azad University, Iran.
18. Dr. Xiaodong Zhang, Postdoctoral Fellow, University of Texas at Austin, USA.
19. Dr. Alice Merab Kagoda, Associate Professor, Makerere University, Uganda.

Administration

Fani Balaska, Stavroula Kiritsi, Eirini Lentzou, Konstantinos Manolidis, Katerina Maraki, Celia Sakka, Konstantinos Spiropoulos & Ioanna Trafali

C O N F E R E N C E P R O G R A M
(The time for each session includes at least 10 minutes coffee break)

Monday 14 July 2014

09:00-09:30 Registration

09:30-10:00 Welcome and Opening Remarks

- Dr. Gregory T. Papanikos, President, ATINER.
- Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
- Dr. Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.

10:00-12:00 Session I (Room D): Environmental Pollution and Climate Change

Chair: Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.

1. Malcolm Hart, Professor, Plymouth University, UK, Laura Pettit, Research Student, Plymouth University, UK, Deborah Wall-Palmer, Research Fellow, Plymouth University, UK, Christopher Smart, Senior Lecturer, Plymouth University, UK & Jason Hall-Spencer, Professor, Plymouth University, UK. Micropalaeontological Investigations of Ocean Acidification and its Detection in the Geological Record.
2. Chung-Ru Ho, Professor, National Taiwan Ocean University, Taiwan & Chen-Chih Lin, Ph.D. Candidate, National Taiwan Ocean University, Taiwan. Analyzing and Prediction of Flooding in Atoll Island Country.
3. Valentin Krassilov, Professor, University of Haifa, Israel & Sophia Barinova, Senior Researcher, University of Haifa, Israel. Fossil Plant Taphonomic Evidence of Tectonic, Sea Level and Climatic Change.
4. Joanna Krasuska, Specialist, National Research Institute, Poland, Izabela Bojakowska, Professor, Polish Geological Institute - National Research Institute, Poland, Stanislaw Wolkowicz, Professor, National Research Institute, Poland & Paulina Kostrz-Sikora, Specialist, National Research Institute, Poland. Metal Content in Sediments from Cooling Towers.

12:00-13:30 Session II (Room D): Environmental Technology and Meteorology

Chair: Malcolm Hart, Professor, Plymouth University, UK

1. Kemal Zorlu, Assistant Professor, Turkey, Ulas Inan Sevimli, Assistant Professor, University of Adiyaman, Turkey & Turgut Aksu, Assistant Professor, University of Adiyaman, Turkey. Geological Mapping in the Taskent Area (SW Konya - Turkey) with Additional Remote Sensing Support.
2. Federico Ienna, Doctoral Student, University of Delaware, USA. A New Method for Tracking Meddies by Satellite Altimetry.
3. Alvaro de Pascual Collar, Postdoctoral Researcher, Complutense University of Madrid, Spain, Maria Luisa Martin, Titular Professor, Escuela University of Informatics, Spain, Francisco Valero, Catedratico University, Spain, Daniel Santos, Postdoctoral Research, Agencia Estatal of Meteorologia, Spain & Alvaro Vicente-Retortillo, Predoctoral Grant, Complutense University of Madrid, Spain. Generation of EPS Members by Means of an Analog Methodology: Application to Wind Speed Forecasting.
4. Simone Pennafirme Ferreira, PhD Student, Federal Fluminense University, Brazil. Microbial Mats Structures through Micro-Computed Tomography.

13:30-14:30 Lunch

18:00-20:00 Session III (Room A): Round Table Discussion on *Global Environmental and Anthropogenic Challenges to Agro and Natural Ecosystems*

Chair: Dr. George Poulos, Vice President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

1. Dr. Constantine Hadjilambrinos, Associate Professor, University of New Mexico, USA.
2. Dr. Maria Christina Fragkou, Assistant Professor, University of Chile, Chile.
3. Mr. Spiro Adamopoulos, Chief Executive Office, Agricultural Levies Institute of Australia, Australia.
4. Arturo F. Castellanos-Ruelas, Professor and Researcher, Autonomous University of Yucatan, Mexico.
5. Marshaley Baquiano, Assistant Professor, University of the Philippines, Philippines.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 15 July 2014

10:00-12:00 Session IV (Room D): Environmental Awareness and Protection

Chair: *Anirbid Sircar, Associate Professor, Pandit Deendayal Petroleum University, India.

1. Lilia Maia de Morais Sales, Vice-President, University of Fortaleza, Brazil & Alessander Wilckson Cabral Sales, Professor, University of Fortaleza, Brazil. Consensus Building and Environmental Conflict Mediation.
2. Jader Morais, Full Professor, State University of Ceara, Brazil, Lidriana Pinheiro, Adjunct Professor, Federal University of Ceara, Brazil & Luciano Paula, Master Student, State University of Ceara, Brazil. Environmental Potential and Management on Granulates Exploration on the Ceará Continental Shelf.
3. Selene Morais, Full Professor, State University of Ceara, Brazil, Cristiane Alexandrino, Substitute Professor, Ceara State University, Brazil & Joana Alexandre, Student, Ceara State University, Brazil. Tilapia Fish (*Oreochromis niloticus*) Waste for Biodiesel Production in Ceara State, Northeastern Brasil.
4. Iwona Markuszewska, Assistant Professor, Adam Mickiewicz University, Poland. Farmland Merging in Poland - A Success or a Failure of Land Stewardship Policy?
5. Paulina Kostrz-Sikora, Specialist, Polish Geological Institute, Poland, Izabela Bojakowska, Professor, Polish Geological Institute - National Research Institute, Poland & Stanislaw Wolkowicz, Professor, National Research Institute, Poland. REE Content in Sewage Sludge from Selected Pulp - Paper Plants in Poland.

12:00-13:30 Session V (Room D): Technology and Rock Mechanics

Chair: Lilia Maia de Morais Sales, Vice-President, University of Fortaleza, Brazil

1. *Anirbid Sircar, Associate Professor, Pandit Deendayal Petroleum University, India. Effects of Elastic Anisotropy in Shale Gas Exploitation: Study on Cambay, Cambay Basin, India.
2. Marina Sousani, Ph.D. Student, University of Leeds, UK. Modelling of the Hydraulic Fracturing of Rocks: a Multi Scale and a Multiphase Approach.
3. Magdy El-Hedeny, Professor, King Saud University, Saudi Arabia, Ahmed El-Sabbagh, Doctor, Alexandria University, Egypt & Heba Mansour, Demonstrator, Alexandria University, Egypt. Taphonomy and Paleocology of Cenomanian

Oysters from the Musabaa Salama Area, South Western Sinai, Egypt.

13:30-14:30 Lunch

14:30-16:00 Session VI (Room D): Soil and Water

Chair: Kemal Zorlu, Assistant Professor, Turkey

1. Camilo Lesmes Fabian, Professor, Santo Tomas Tunja University, Colombia, Luis Felipe Gil, Research Assistant, Santo Tomas Tunja University, Colombia, Jorge Luis Rincon, Research Assistant, Santo Tomas Tunja University, Colombia, Julian David Segura, Professor, Santo Tomas Tunja University, Colombia & David Nuyttens, Professor, Agricultural Engineering, Belgium. Dynamic Hydrological Modelling of Water Quality Parameters in the Tota Lake in Colombia. (Tuesday, 15th of July, 2014)
2. Inaya Lima, Professor, Federal University of Rio de Janeiro, Brazil, Haimon Alves, Ph.D. Student, Federal University of Rio de Janeiro, Brazil, Joaquim Assistant Professor, State University of Rio de Janeiro, Brazil, Mauro Geraldles, Professor, State University of Rio de Janeiro, Brazil & Ricardo Lopes, Professor, Federal University of Rio de Janeiro, Brazil. Microtomography Characterization on Sediment Porous Space. (Tuesday, 15th of July, 2014)
3. Hajer Azaiez, Assistant Professor, CERTE, Tunisia, Ghada Sayem, Student-Researcher, CERTE, Tunisia, Hakim Gabtni, Associate Professor, CERTE, Tunisia & Mourad Bedir, Professor, CERTE, Tunisia. Delineation of a Geothermal Reservoir Using 2d Seismic Interpretation and Electrical Resistivity Tomography Data Inversion at Hamam Sidi Maamar, Central Tunisia.

17:30-20:30 Urban Walk (Details during registration) 21:00- 22:00 Dinner (Details during registration)

Wednesday 16 July 2013: Cruise: (Details during registration)

Thursday 17 July 2013: Delphi Visit: (Details during registration)

Hajer Azaiez

Assistant Professor, CERTE, Tunisia

Ghada Sayem

Student-Researcher, CERTE, Tunisia

Hakim Gabtni

Associate Professor, CERTE, Tunisia

&

Mourad Bedir

Professor, CERTE, Tunisia

Delineation of a Geothermal Reservoir Using 2d Seismic Interpretation and Electrical Resistivity Tomography Data Inversion at Hamam Sidi Maamar, Central Tunisia

The Hammam Sidi Maamar (HSM) is a well known thermal spring located in Central Tunisia. It is constituted by many minor springs that flow in the Oued El Hatob seasonal river along the Baten Damous Mountain flank. The main source flows in a rudimentary basin which is frequently visited by people looking for the multiple therapeutic benefits of the sulphur water. Unfortunately H. Sidi Maamar source is not exploited as a thermal spa because of its low flow (0,5 L/s) that makes any economic investment non prolific.

The aim of this study is to delineate and elucidate the geothermal reservoir at HSM surrounding and to identify a suitable location for the implementation of a well that would permit tapping and improving the flow of thermal water. For this, we performed an integrated geophysical study using 2D seismic cross section interpretation and ERT Data acquisition and inversion.

The seismic interpretation has enabled us to follow the geometry of the Early Cretaceous levels, main reservoir of the thermal water. Indeed, the thermal springs of this source are reloaded, starting from meteoric water that infiltrates, on the Hauterivian-Aptian outcrops of Jebel Mrhila. They are driven in depth, through the plain of Jelma and the Hajeb El Ayoun Graben and growing rich in salt and sulphides. Finally, these waters emerge at the source by vertical drainage through the network of NW-SE border faults of Hajeb Layoun Graben.

The interpretation of inverted ERT models has permitted the identification of sulphur water resurgence to the surface, along the NW-SE fault, soaking on its way the sand, silts and shale of the river filling. We also noted, 10m in-depth, the existence of a localized seep overhanging a subvertical fault. This could be interesting to establish a well that can provide a higher flow of water and contribute to the economic development of this rural area.

Alvaro de Pascual Collar

Postdoctoral Researcher, Universidad Complutense de Madrid, Spain

Maria Luisa Martin

Profesor Titular, Escuela Universitaria de Informatica, Universidad de Valladolid, Spain

Francisco Valero

Catedratico Universidad, Universidad Complutense de Madrid, Spain

Daniel Santos

Postdoctoral Research, Agencia Estatal de Meteorologia, Spain

&

Alvaro Vicente-Retortillo

Predocctoral Grant, Universidad Complutense de Madrid, Spain

Generation of EPS Members by Means of an Analog Methodology: Application to Wind Speed Forecasting

The short-range Ensemble Prediction Systems (EPS) play a major role in short-term predictions of atmospheric variables such as wind speeds. EPS can also provide probabilistic information and indications on the uncertainty and reliability of the forecast. This study presents results of 10m wind speed over the Iberian Peninsula obtained from two multi-physic EPSs. Both EPSs are based on the Weather Research and Forecasting (WRF) model version 3.3 using the Advanced Research WRF (ARW) dynamical solver. The EPS taken as reference, named EPS_{ref} , has 10 members, which are composed of two different sets of initial and boundary conditions, and 5 different sets of subgrid scale physics parameterizations. The initial conditions and boundary conditions are provided by NCEP (Global Forecast System) and ECMWF (Integrated Forecast System), with boundary conditions coming from the forecasts every 3 hours. The GFS system has a horizontal resolution of $1.0^{\circ} \times 1.0^{\circ}$, with 26 isobaric levels; the ECMWF system has a horizontal resolution of $0.5^{\circ} \times 0.5^{\circ}$ and 21 isobaric levels. The second EPS, named EPS_{anag} , used in this study is a similar system as the EPS_{ref} but the 5 members generated by NCEP-GFS are replaced by 5 members perturbed by an analog methodology. The wind speed forecast results obtained from the use of EPS_{ref} and EPS_{anag} are compared with the ECMWF analysis wind speed data. Deterministic (bias, spatial correlations and root mean squared errors) and probabilistic (rank histograms, reliability diagrams, Brier scores) results are shown, evaluating the EPS_{anag} skillful for predicting 10m wind speed over the Iberian Peninsula compared to the EPS_{ref} .

Magdy El-Hedeny

Professor, King Saud University, Saudi Arabia

Ahmed El-Sabbagh

Dr., Alexandria University, Egypt

&

Heba Mansour

Demonstrator, Alexandria University, Egypt

Taphonomy and Paleoecology of Cenomanian Oysters from the Musabaa Salama Area, South Western Sinai, Egypt

This study provided a taphonomic alteration and paleoecology of Cenomanian oysters from the Musabaa Salama area, south western Sinai, Egypt. Three oyster zones can be recognized in the studied area, a lower one of *Amphidonte (Cerastostreon) flabellatum* (lower-middle Cenomanian), a middle zone of *Ilymatogyra (Afrogyra) Africana* (upper Cenomanian) and an upper one of *Exogyra (Costagyra) olisiponensis* (upper Cenomanian). Taphonomic features including disarticulation, fragmentation, encrustation and bioerosion were subjected to multivariate statistical analyses. The analyses showed that the distributions of the identified ichnospecies were greatly similar within the identified oyster zones in the Musabaa Salama section. With rare exceptions, *Entobia cretacea*, *Gastrochaenolites torpedo* and *Maeandropolydora decipiens* are considered as common to abundant ichnospecies within the three recorded oyster zones. In contrast, and with some exceptions, *E. ovula*, *E. retiformis* and *Rogerella pattei* are considered as frequent to common ichnospecies within the identified oyster zones. Other ichnospecies, including *Caulostrepsis cretacea*, *G. orbicularis*, *Trypanites solitarius*, *E. geometrica* and *C. taeniola*, are mostly recorded in rare to frequent occurrences. Careful investigation of these host shells and the preserved encrusters and/or bioerosion sculptures provided data concerning: 1) the substrate characteristics, 2) time of encrustation and bioerosion, 3) rate of sedimentation, 4) the planktonic productivity level, and 5) the general bathymetry and the rate of transgression across the substrate.

Malcolm Hart

Professor, Plymouth University, UK

Laura Pettit

Research Student, Plymouth University, UK

Deborah Wall-Palmer

Post-Doctoral Research Fellow, Plymouth University, UK

Christopher Smart

Lecturer, Plymouth University, UK

&

Jason Hall-Spencer

Professor, Plymouth University, UK

Micropalaeontological Investigations of Ocean Acidification and its Detection in the Geological Record

With increasing atmospheric CO₂ the oceans are becoming increasingly acidic, with the lowered pH beginning to impact on the calcification of foraminifera, pteropods, calcareous nannoplankton and other invertebrate groups. Our work in the Mediterranean Sea, Gulf of California, Caribbean Sea and elsewhere has shown how modern assemblages are responding to acidification. Around Ischia (Italy) natural sea floor CO₂ vents are creating a low pH environment in which it is possible to determine the response of benthic foraminifera. At a pH of 7.8 the assemblage is already becoming less diverse and below pH 7.6 there are now calcite-secreting benthic foraminifera (Dias et al., 2010). In the Gulf of California, in a deeper-water setting, natural CO₂ (and methane) vents are, again, lowering sea floor pH. The foraminifera show the impact of this change, although the relatively high carbonate saturation ensures that calcite-secreting foraminifera are able to live and reproduce, only becoming impacted by dissolution effects once dead (Pettit et al., 2013).

In the Caribbean Sea and Mediterranean Sea the calcification of pteropods (at heteropods) in surface waters, and through the last few glacial/interglacial cycles is impacted at times of higher pCO₂. The poorest preservation in the last interglacial cycle is recorded in MIS 5e, where the highest CO₂ levels are recorded (Wall-Palmer et al., 2012). Planktic foraminifera show the same variation in the thickness of their tests or overall weight, with the lightest and thinnest forms being recorded in the interglacials.

Using data from a number of global bioevents (Triassic/Jurassic boundary, Cretaceous/Paleogene boundary and the Paleocene/Eocene boundary) it is now possible to determine the impact of acidification events, both near-surface and the deeper-water migration of the CCD.

Interpretation of changes in the biota is complicated by the changing nature of the oceans which have switched from aragonitic to calcitic a number of times during the Phanerozoic.

Chung-Ru Ho

Professor, National Taiwan Ocean University, Taiwan

&

Chen-Chih Lin

PhD Candidate, National Taiwan Ocean University, Taiwan

Analyzing and Prediction of Flooding in Atoll Island Country

Sea-level rise has been an important issue of global warming because it may cause regional flooding and severely effects on human activities and the natural environment. Tuvalu, an atoll country located in the southwest Pacific Ocean, has been inundated by this regional flooding for decades. Local people called it "King Tide". Before the research, we defined the threshold of King Tide first. Then we analyzed the factors of regional flooding and predict the regional flooding. The tide gauge and satellite altimeter data are employed in this study. The influential components of King Tide are sorted into two parts, dynamic response and thermal effects. Warm eddy, storm surge of tropical cycle, and tsunami response are interpreted and attributed to dynamic response. Referring to long term and large scale effects of the climate variation, such as Pacific Decadal Oscillation, El Niño-Southern Oscillation, and heat storage of sea water are discussed as thermal effects. The results of this study show that all King Tide cases were occurred with spring tide, 75% of that accompanied by warm eddies. Once warm eddy arise sea-level more than 13 cm, it strengthens the possibility of King Tide. Other factors may have contributions to the sea-level rise of King Tide but not significant. In order to reduce the damage of flooding, we took 90% of sea-level data to predict the possibility of regional flooding. The remaining 10% is used for testing the accuracy of prediction. The prediction value shows a correlation coefficient of 0.988 and a root-mean-square error of 7.6 cm on authentic and predicted result. It implies a considerable reliability for flooding prediction. The case study of flooding prediction in Tuvalu can offer a good example for atoll island countries.

Federico Ienna

Doctoral Student, University of Delaware, USA

A New Method for Tracking Meddies by Satellite Altimetry

Subsurface coherent vortices in the North Atlantic, commonly known as Mediterranean Eddies (“meddies”) and whose saline water originates from the Mediterranean Sea, have been of particular interest to physical oceanographers since their discovery, especially for their salt and heat transport properties into the North Atlantic Ocean. Meddies have been observed to occur regularly as Mediterranean Water exits through the Strait of Gibraltar into the Atlantic Ocean, and are believed to be a major mechanism for the dispersion of Mediterranean Water into the Atlantic. Many studies in the past have been successful in observing and studying meddies by probing them with in-situ techniques as opposed to remote sensing methods. The use of remote sensing techniques would offer a much lower-cost and easier alternative for studying these phenomena, and would allow for the possibility of regular observation of meddies, thus allowing for studies of the physical interactions between the Mediterranean Sea and the Atlantic Ocean. To date, only a few studies have been able to study meddies remotely due to their depth, which is typically 1000 meters beneath the surface, and thus a reliable method for observing them consistently remains elusive. This research presents a new method for locating and tracking meddies in the North Atlantic Ocean using satellite altimeter data. The method presented in this research makes use of Ensemble Empirical Mode Decomposition (EEMD) as a way to isolate the surface expressions of meddies at the ocean surface and separate them from any other surface constituents, allowing robust meddies to be consistently tracked by satellite over extensive periods. Several meddies are then tracked in this way to test the method. In particular, one such meddy is successfully tracked over a 6-month time period without interruption (2 November 2005 – 17 May 2006), confirmed using Expendable Bathythermographs (XBT’s). Such studies on meddies will allow for a better understanding of the impact of Mediterranean Water on the salinity and heat properties of the North Atlantic Ocean and on the importance of the Mediterranean on greater Ocean Systems.

Paulina Kostrz-Sikora

Specialist, Polish Geological Institute, National Research Institute,
Poland

Izabela Bojakowska

Professor, Polish Geological Institute – National Research Institute,
Poland

Stanisław Wołkowicz

Professor, Polish Geological Institute, National Research Institute,
Poland

REE Content in Sewage Sludge from Selected Pulp – Paper Plants in Poland

Volume reduction and proper treatment and use of sewage sludge are nowadays one of top priorities for environmental protection. This is especially the case of industrial sludges, which are characterized by highly diversified chemical, physical as well as sanitary properties. Therefore, potential use of these sludges has to match *regulatory* requirements. However, these legal requirements still do not cover a wide range of parameters, which can provide valuable information about sludge properties.

The present study covered samples of sewage sludge from four wastewater treatment plants of the pulp and paper plants in Poland. The samples were analysed for rare earth elements (REE) by *inductively coupled plasma mass spectroscopy* (ICP-MS).

The study showed concentrations of LREE (La, Ce, Nd) ranging from 0.8 to 4.1 ppm. The exception was here Pr with concentrations reaching lower limit detection of the applied analytical method (0.5 ppm) in one sample only. Concentrations of MREE were found to range from 0.X for Sm, Eu, Gd, Tb, Dy and Ho to less than 0.05 X ppm for Tb and Ho. In the case of the HREE group, concentrations of Er and Yb range from 0.24 to 0.08 ppm whereas those of Tm and Lu are below detection limit of applied method (0.05 ppm). LREE content in the studied sludge samples is about 2 to 6 times higher than that of chondrite (Figure 1a) (Schmidt R.A et al. 1963). The further course of graphs shows diminishing relative content of other REE, down to values significantly lower than in chondrite. Attention should be paid to fairly clear, positive anomaly of neodymium, recorded in two samples of the studied sewage sludges. The recorded REE distributions *normalized to Post-Archean Australian Shale (PAAS)* (PAAS) (fig.1b) (McLennan S.M., 2001) appeared to be at the level from 0.02 to 0.1 of REE content in PAAS standard. It may be concluded that the REE contents recorded in the studied sewage sludge from the pulp and paper industry are very low in comparison with those of fine-grained sedimentary rocks.

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Fossil Plant Taphonomic Evidence of Tectonic, Sea Level and Climatic Change

Tidal flats are a dynamic sedimentary environment usually containing dispersed allochthonous terrestrial plant remains. Large accumulations of plant material in such setting are evidence of episodic sedimentary events associated with storms or tsunamis. A repetitive occurrence of such events indicates tectonic/climatic instability heralding a major geological – biotic change. In the mid-Jurassic of Makhtesh Ramon depression, Negev, southern Israel, plant remains are confined to several ferruginous cap rock layers mantling the cross-bedded sandstones, traced for several kilometers over the questa relief. Spectrometric analysis of the sheet-like fossiliferous layers reveals a uniform ferrosilicate – aluminosilicate composition locally enriched with Sr and Ti. Plant remains are incrustated with calcium sulfate. Excavated bottom surfaces show drag traces. Both sedimentological and plant taphonomic characteristics indicate a tidal flat provenance of fossiliferous sheet-like layers, with the plant material instantaneously buried by a massive sand flow at the bottom and scattered as a backwash on top of the capping laminae interpreted as tsunami deposits (tsunamites). The plant assemblages of the lower sand lamella are composed of fern and bennettitalean leaves, with leafy and reproductive shoots amassed at autochthonous burial sites. The upper clayey lamella contains transported plant debris of araucarian and cheirolepidiacean scale-leafed shoots, representing inland vegetation. The fossil plant bearing horizon is overlain by marine deposits with ammonite fauna of the late Early - Middle Bajocian age, marking a widespread transgressive event. Non-marine sedimentation resumed in the Late Bajocian - Bathian contains fossil flora of a markedly different taxonomic composition and dominant forms of a more temperate aspect, suggesting a major climate change. Concomitant biotic turnovers at the level of tectonic and climatic instability are recorded in both Laurasian and Gondwana realms, apparently of global extent.

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Metal Content in Sediments from Cooling Towers

Due to physical limitations, all non-nuclear and nuclear thermal power plants can only convert a fraction of the heat produced into usable energy. The remaining energy escapes as waste heat which requires the use of cooling systems used to dissipate these large heat loads to the atmosphere. The system most widely used in Poland is that of wet cooling towers with natural air circulation. In that system the water to be cooled is injected above sprinkler to flow over cooling tower fill. On the way down it is cooled by air flowing up in the counterflow. Air movement is forced by draft originating in the part of cooling tower rising above the sprinkler. A large part of heat is dissipated by evaporation. This method of cooling leads to loss of about 1.5% of process water and accumulation of sediments at the bottom of the tower.

The sediments originating in the course of cooling processes were sampled for analysis of their composition. Five samples of bottom sediments from cooling towers of power plants from northern Poland were collected using Van Veen grab sampler. The samples were analysed for concentrations of Ag, Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sr, Ti, V and Zn by inductively coupled plasma atomic emission spectroscopy (ICP-AES).

The obtained results indicate advanced corrosion of heat exchangers and also inner surface of cooling towers. This is confirmed by concentrations of Cu up to 13,110 mg/kg (mean value for 5 samples - 4,503 mg/kg) as the majority of sprinklers are made of that metal. The sediments are also characterized by high concentrations of metals such as Ba (91-2798 mg/kg), Zn (1480-4311 mg/kg), Cd (1,2-41,6 mg/kg), Ni (16-121 mg/kg), Cr (11-501 mg/kg). These metals are components of resistant coatings (flexible epoxy and acrylic and polyurethane based water proofing coatings), used as sealers to protect reinforced concrete walls of the towers from action of moisture and aggressive agents.

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Dynamic Hydrological Modelling of Water Quality Parameters in the Tota Lake in Colombia

Tota Lake, the largest lake in Colombia with a surface of 55 km² and a hydrographic watershed of 20100 has, is an important natural resource located in the Boyacá Department at an altitude of 3015 m. A large population (25.000) lives in the watershed whose economy is based on agricultural, touristic, industrial and the related commercial activities in the urban areas. Because of these activities, there is a constant pollution of the water bodies like rivers and the lake with pesticides, fertilizers and industrial chemicals. Therefore, an environmental risk assessment is required in order to establish the status quo of the water quality in the watershed and to take the due decisions to decrease the pollution, making the watershed sustainable in the long term. This research proposes a dynamic hydrological model based on the system dynamic methodology to study the behavior of water quality parameters in both surface and groundwater. Firstly, this model studies the hydrological characteristics of the region and then it models the water quality parameters (i.e. alkalinity, coliforms, phosphorus, hardness and others) in the whole watershed. The model results are included in the program ArcGIS in order to establish the levels and zones of high pollution in the region and to determine their behavior in the long term according to a selected group of scenarios. This information is relevant for stakeholders to develop educational programs about the proper use of the water for agricultural and industrial activities and also to develop strategies to treat the water "in situ" before reaching the natural rivers and the lake. Even though, the model was developed in the watershed of Tota Lake, its applicability could be implemented in watersheds worldwide to model and estimate the water quality parameters. This research results from a cooperation between the Institute for Agricultural and Fisheries Research (ILVO) (Belgium), University of Santo Tomas Seccional Tunja (Colombia) and ETH Zürich (Switzerland).

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Microtomography Characterization on Sediment Porous Space

Microtomography images and thin section images were analyzed and compared against some parameters of geological interest such as porosity and its distribution along the samples. The results show that microtomography analysis, although limited by its resolution, have some interesting information about the distribution of porosity (homogeneous or not) and can also quantify the connected and non-connected pores, i.e., total porosity. Thin section have no limitations concerning resolution, but are limited by the experimental data available in regards to a few glass sheets for analysis and also can give only information about the connected pores, i.e., effective porosity. Those two methods have their own virtues and flaws but when paired together they are able to complement one another, making for a more reliable and complete analysis.

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Consensus Building and Environmental Conflict Mediation

Alternative Dispute Resolution ADR's are mechanisms of conflict resolution with special characteristics and techniques, to give appropriate approaches to different types of problems - the conflict's own nature will define which technique is the most appropriate for its resolution. Negotiation, mediation and arbitration are among the most referred and practiced ADR in Brazil. In recent studies, Professor Lawrence Suskind from Massachusetts Institute of Technology - MIT, presented a new concept and practice geared toward negotiated solution between conflicts involving multiple parties - the consensus building. This mechanism requires inclusive and collaborative dialogue, facilitated by a qualified and impartial third party who holds credibility and trust from the parties involved and assists them in examining their interests, positions and values, seeking convergent points and developing collaboration towards a consensual and peaceful solution. Environmental conflicts are pointed out as examples of issues that should be object of consensus building because they are conflicts that evolves interests of various institutions related to environmental Law and sustainable development. This study is aimed at analysing in what countries consensus building is already applied on environmental issues, how this activity is being implanted, and evaluate how it can be developed in Brazil. For the achievement of those goals, this study requires a bibliographic and documentary survey, along with interviews with professionals engaged in solving environmental issues. We hope to elaborate and outline the implementation of this practice in Brazil, presenting to the various sectors constantly involved in environmental debate (such as the Public Ministry, Judicial System, state and local executive authorities, private institutions and NGOs) an inclusive, participatory and peaceful possibility to manage the conflicts stemming from environmental issues - a balance between economic development and environmental protection.

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Farmland Merging in Poland- A Success or a Failure of Land Stewardship Policy in a Reshaping of a Traditional View of Rural Areas

Many rural areas of Eastern European countries suffer from land fragmentation, however, this problem is really acute in Poland. Thanks to grouping tiny fields the agriculture effectiveness can be enhanced, and on the other hand, new quality of life is achieved. For this reason land consolidation plays a useful tool in a comprehensive rural areas development. Although it already exists a broad range of research relating to this field, still not enough emphasis has been placed on this issue in Poland that with respect of farmland fragmentation, stands out from other European countries. In all probability it would not be a point for a broad discussion if this situation would related to a country, where agriculture is negligible. Nonetheless, in Poland agriculture plays a very important role in economy: it employs 17% of labour force and arable land covers about 60% of the total land. Although, land consolidation work has been carried out for years, the positive effects are still negligible, because of the cumbersome formal and legal policy, disapproval of officials and farmers as well as increasing funds.

This paper intends to make a contribution to the field of knowledge of farmland merging as a land stewardship policy in a creating of a new view of rural areas. The study brings a fresh view on examination of effectiveness of farmland merging work, based on two different formal procedures, on which land consolidation is carried out in Poland. In this context, selected examples of villages in two different provinces, Dolnośląskie and Wielkopolskie, has been compared and contrasted. In order to research framework, open-interviews among farmers as well as local and regional land consolidation authorities have been conducted.

Results revealed the main obstacles and weaknesses in legal regulation. On the basis of the acquired data, a number of new suggestions to more successful land consolidation policy, were put forward. Finally, possible solutions to perk up the land unification work were established.

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Environmental Potential and Management on Granulates Exploration on the Ceará Continental Shelf

This study aims to identify the potentialities and discuss the risks associated to marine granulates exploitation at Ceara's Continental Shelf, Northeastern Brazil. That is a tropical region, bordering the Atlantic ocean, with a warm water, high biodiversity and economic activities associated with fisheries, aquaculture and beach tourism. These granulates are non-metallic minerals, siliciclastic and bioclastic, with high economic value and wide application in construction, restoration of beaches, pharmaceutical industry and agribusiness. The relevance of the nature of the proposal is justified by the demands of the productive sector for new earth material deposits and minimize the environmental pressure on the coastal zone and river basins. Geophysical surveys defined the spaces of seaweed carbonates, simulation of sediment dispersion that together with hydrology and market research have performed results of this study. It was defined in the polygon internal shelf for analysis at the scale of 1:10,000, which required field and laboratory experiments, detailed analyzes and build the database for decision making and strategic zoning of areas, involving researchers and students at all levels of academic training. This continental shelf, up to 15 m isobath, is predominantly of siliciclastic sediments, with medium particle size. On the shelf break bioclastics sands occurs, derived from the fragmentation of algae (*Halimeda incrassata* and *Lithothamnium*). The carbonates seaweed fixed to the substrate are located principally between the isobaths of 18 and 19 meters, in an almost continuous framework. The diving team has found sedimentary environment which support real situation for exploitation. There were found calcium carbonate in the marine sediments ranging between 25% and 95%. About 50% of the samples the concentration of calcium carbonate was of 65%. The most important emphasis of this paper is to find the best methodology to protect the localities of benthonic organism, like lobsters, well spread in this area.

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Tilapia Fish (*Oreochromis niloticus*) Waste for Biodiesel Production in Ceara State, Northeastern Brasil

The replacement of petroleum-derived raw materials by renewable fish waste in production of biodiesel is quite significant from the societal and environmental viewpoints. Ceará State is inserted in the semi-arid region and government has been built many dams for fresh water capture to maintain water reservoirs. There are in Ceará State 132 dams where fishfarm was introduced with an annual production of 22 thousand tons. The main species used is *Oreochromis niloticus* (Tilapia of Nile). The fish is about 20 % to 25 % edible meat and 75% to 80 % of recoverable waste. However, most waste are discharged, which may result in environmental pollution. Therefore, the use of inexpensive renewable resources from the farming of tilapia must be supported. Oils and fats of animal origin are important renewable feedstocks of the chemical industry. Brazil has the potential to be the largest producer of tilapia in the world. It is currently the sixth most consumed fish in the U.S. The present work has the objective to demonstrate the viability of the recovery of waste generated by the fishing industry in the state of Ceará to obtain fish oil and its subsequent production of biodiesel via alkaline transesterification. The processes used in the production of tilapia fish oil, includes cooking, pressing and centrifugation. The biodiesel was prepared by transesterification under constant temperature of 60 °C, methanol at a concentration of 20 % by mass of oil, and alkaline catalyst sodium hydroxide at 0.5 %. Chemical and physicochemical parameters were evaluated in both oil and biodiesel. The study also assessed the biodiesel stability in the presence of natural and synthetic antioxidants using the Rancimat apparatus. Stability was low nevertheless the use of natural or synthetic antioxidants assure the necessary stability for general use, contributing for better environmental conditions in the Fishery industry.

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Microbial Mats Structures through Micro-Computed Tomography

Microbial mats are exceptional models organic-sedimentary structures and descend from the earliest biological community, the stromatolites, which dominated over 80% of the Earth's geological history. Microbial mats are complex structures that have several vertically stratified communities of microorganisms and metabolic association, allowing the precipitation of carbonates and clastic sediments. They continue to generate knowledge for geologists, microbiologists and chemists, especially when the production of oil in pre-salt occurs. Once the diagenesis of carbonates is linked to the formation of oil reservoir rocks, it is fundamental to understand the processes underlying the synthesis of precursors of biominerals, as well as the relations between the microbial zonation and the biominerals. The aim of this study was to evaluate the use of micro-computed tomography to produce 3D images with high resolution of the microbial mat.

Samples of microbial mats were collected at the hypersaline lakes of the State of Rio de Janeiro, kept at laboratory with filtered salt water and at room temperature (20-25°C). The samples were scanned using the scanner Skyscan 1173. After the acquisition, the images were processed using the software CTAn. The micro-computed tomography technique allowed the production of 3D images and the identification of material with distinct densities. Thus, the micro-computed tomography can be recommended to study microbial mats and further studies are in progress in order to characterize and related the biominerals with the microbial mat zonation.

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Effects of Elastic Anisotropy in Shale Gas Exploitation: Study on Cambay, Cambay Basin, India

The materials having different velocity properties in different direction are known as anisotropic materials. Sedimentary rocks are one of the anisotropic materials. In sedimentary rocks, the velocity difference are caused by typically a preferred alignment of anisotropic minerals such as clays, quartz and mica, fractures or micro fractures , stress induced layering etc. The velocity anisotropy parameters and elastic constants are required to estimate Young's modulus and Poisson's ratios accurately. Young's modulus and Poisson's ratios play very important role for geomechanics applications.

Four rock samples were collected from Cambay shale, Cambay basin, India from four different wells situated in the study area. The ultrasonic transmission method has been used to measure P - wave, Sh - wave and Sv - wave travel times as a function of orientation and confining pressure. The five independent stiffness constants, Young's moduli, Poisson's ratios and bulk moduli of the samples were estimated.

The velocity anisotropies, together with the behaviour of the elastic constant for all rock samples are observed. The elastic anisotropy of the siltstones and sandy shales is due to the combined effects of pores, cracks, minerals grain orientation, lamination and foliation. The highest P - wave anisotropy is exhibited by sandy shales. The effect of the same is studied for shale gas exploration and exploitation. The empirical relation between vertical P-wave and S wave velocities has been established for all rock samples and strong correlation were also observed. An empirical relation among the stiffness constants for all rock samples were established and found all of them are well correlated. The correlation among the Thomsen's parameters is also established. Through this study it has been observed that, there is a strong effect of anisotropy parameters on Young's modulus and Poisson's ratio. Thus for accurate hydrocarbon reservoir characterization in shale elastic anisotropy analysis plays very important role.

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Modelling of the Hydraulic Fracturing of Rocks: A Multi Scale and a Multiphase Approach

This work presents a series of solid and fluid coupled simulations of a limestone sample with induced fractures in order to investigate the effects of water injection on its mechanical behaviour, such as the influence of the fluid flow on the behaviour of the micro structure of the rock sample, including the material strength, the fracture initialisation and propagation, and also the interactions between the existing fracturing networks and new fractures by the fluid injection.

The rock model was represented as a collection of discrete interacting particles and bound by linear, spring-like contacts following the Discrete Element Methodology (DEM). The PFC3D software by Itasca was used along with its fluid coupling algorithm, based on the Navier-Stokes equations for porous media. The fluid function was used in order to investigate the fluid flow through the particle assembly (as the rock sample) and its mechanical behaviour in the micro-scale under high hydraulic pressure conditions.

The developed model proves that the micro-scale Discrete Element structure reproduces accurately the macroscopic mechanisms and helps identify those that govern fracture propagation in limestone. Observations from the numerical results provide insight of the development of small scale conductivity, fluid pressure built up in samples of different compressive strengths, the microscopic behaviour of the rock under a specific pressure regime, and finally the cracking initiation, propagation and interactions with existing cracks.

The outcome of this study can provide a valuable understanding and a computational tool for EOR and CO₂ storage applications, since it can lead to an estimation of safe injection. The investigation of the fracturing process could also be useful in preventing leakage failures as well as to control fracturing towards safer reservoir productivity.

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Geological Mapping in the Taskent Area (SW Konya - Turkey) with Additional Remote Sensing Support

Remote sensing techniques and satellite images widely used for lithological and structural maps. Aim of this study is preparing geological map of Taskent area (SW Konya - Turkey) with additional remote sensing support. Landsat 5 TM satellite images were used to geological mapping. Principal component analysis was applied to the images to choose suitable bands and to show spectral bands differences which is help to display the correlation of the spectral values between the n-channel. Single band Landsat 5 TM images and multi band RGB combinations was choosen for interpretation lithological units. The study area indicates that the geological properties, partly from the Central Taurus. All of units cropped out arround study area are bounded by a tectonic contact. Regarding the data obtained from the study area, 13 different lithological units ranging in age from the lower Paleozoic to Tertiary have been determined. These units are as follows; Upper Cambrian - Ordovician age Seydisehir formation, Middle Jurassic - Cretaceous age Polat formation, Upper Cretaceous - Middle Eosen age Cataloluk formation, Middle - Upper Eosen age Cobanagaci formation, Upper Devonian age Golbogazi formation, Carboniferous age Yaricak formation, Upper Carboniferous - Permian age Cekicdagi formation, Lower - Upper Carboniferous age Kongul formation, Permian age Taşkent formation, Triassic age Ekinlik formation, Upper Cretaceous age Sogut formation, Triassic age Kayabasi formation, Paleocene - Eocene age Dedemli formation and Quaternary age alluviums. The geological map that prepared by remote sensing compared with the one prepared in the field shows great compatibility each other.