The National Committee of Geodesy and Geophysics,
and
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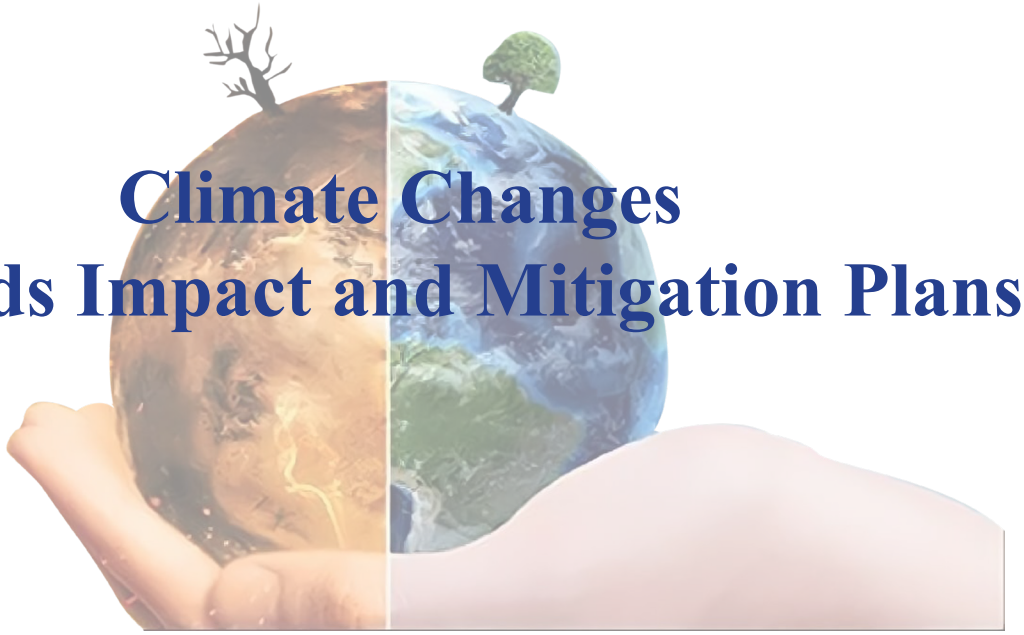

Climate Changes
Hazards Impact and Mitigation Plans

Abstract Book

10 August 2022

Name: Prof. Dr. Taha Rabeh
Affiliation: Professor and the head of Geomagnetic department -National Research Institute of Astronomy and Geophysics (NRIAG)
Paper Title: Climate changes associated with high-amplitude Sq geomagnetic variations

Abstract:

The Earth's climate has always been changing since the ancient geologic Epochs. When the solar irradiance propagates between of the outer magnetospheric regions and the ionosphere mediate dynamic processes of the magnetosphere-ionosphere-thermosphere system are affected at the lower end of their paths by the interaction of the radiations with the neutral atmosphere. The ionosphere-thermosphere interactions play important role for explaining the relationship between the magnetic field and the changes in the atmospheric temperature.

We are going to illustrate and investigate the relationship between the diurnal magnetic field variations resulted from solar activities and the variation in the Earth's temperature. The meteorological and geomagnetic data acquired from different observatories around the globe were analyzed. Three different locations only in Egypt, Portugal and Slovakia for long and daily terms were presented.

We are going to illustrate the results and showing the relationship between the Sq magnetic field and the atmospheric temperature for long periods and diurnal variations. These results are showing the rate of variations of the temperature at mid-latitude and the high-latitude areas and the role of the Sq geomagnetic as a factor of the weather variations process.

Name: Dr.Magda Moheb El-Din Hussien
Affiliation: Researcher in Solar and Space Department – National Research Institute of Astronomy and Geophysics
Paper Title: Solar activity contribution in climate change mechanism

Abstract:

The influence of the sun on the climate of our planet has recently been a hotly debated topic in the context of climate change. The controversy surrounding this issue has prompted scientists across Europe to dig deeper into the claim that solar activity could be a major cause of global warming. Research in the 1980's showed that levels of sunlight change, which naturally brings to mind the following question: Do solar activity fluctuations affect our climate? Although new evidence suggests that solar activity changes have a small effect, different scientific studies have not helped us improve how solar variability is assessed.

Starting from 2011, many researchers provide a better understanding of work aimed at assessing the various contributions of solar variability to Earth's climate. By studying different phenomena that show the solar influence on climate in general, they showed that many small phenomena can have a large often localized effect, for example; UV radiation is only 7% of solar energy, but its fluctuations result in changes in the stratosphere near the equator all the way to the polar regions, which govern the climate.

Accordingly, Europe will become wetter and cooler, or conversely, drier and colder, depending on the condition of the Sun. Currents of electrons and protons known as the solar wind affecting the Earth's electric field, lead to changes in the composition of aerosols (particles suspended in the air), which ultimately affect precipitation. These hitherto ignored effects will now be incorporated into several climate models in order to build a more complete picture.

Name: Dr. Tamer Ali Nada
Affiliation: Researcher at the Egyptian Meteorological Authority EMA, Koubry El-Quobba, Cairo, Egypt
Paper Title: Composite Relation Between El Nino-Southern Oscillation (ENSO) and the Nile Flood

Abstract:

CEl Ni˜no and La Ni˜na are opposite phases of what is known as the El Ni˜no Southern Oscillation (ENSO) cycle. The ENSO cycle is a scientifc term that describes the fluctuations in temperature between the ocean and atmosphere in the east central Equatorial Pacifc. La Ni˜na is sometimes referred to as the cold phase of ENSO and El Ni˜no as the warm phase of ENSO. These deviations from normal surface temperatures can have large scale impacts not only on ocean processes, but also on global weather and climate.El Ni˜no and La Ni˜na episodes typically last nine to 12 months, but some prolonged events may last for years. While their frequency can be quite irregular,El Ni˜no and La Ni˜na events occur on average every two to seven years.Typically,El Ni˜no occurs more frequently than La Ni˜na.

ENSO events are associated with those years when the flow of the Nile is low compared to the long-term average. This study analyzes Relation Between (ENSO) and the Nile Flood using Composite analysis technique.

Name: Prof. Dr. Fadi Morkos
Affiliation: Professor of Astronomy - National Research Institute of Astronomy and Geophysics (NRIAG)
Paper Title: Climate change history in our blue planet

Abstract:

Our blue planet is being affected by many climatic changes in our current era. We cannot understand, what changes are happening, without referring to the history, nature and quality of climatic changes that the globe has undergone in various modern, ancient and immemorial eras. Modern science has undoubtedly made it clear that, all these climatic changes occur on the surface of the globe according to specific time cycles. Certainly, these time cycles are related to the Earth's cycle around the sun and the cycle of solar activity itself. Perhaps the most important of these courses is what was discovered by the Serbian climatologist and engineer Milutin Malinkovitch, which was named after him later, and consider it as the focus point of this talk discussion in this meeting about climate change in the Blue Planet Earth

Name: Prof. Dr. Zakaria Hamimi
Affiliation: Geology Department, Faculty of Science, Benha University, Benha, Egypt
Paper Title: Volcanic Eruptions and Climate Changes

Abstract:

Volcanoes are traditionally subdivided into active and dormant. Active volcanoes are those erupting, or are likely to erupt in near future. Some 1.350 of these volcanoes are formed over hot spots and distributed in a continuous belt at subduction zones (like the Pacific Ring of Fire) and also at spreading centers. Volcanoes have directly influence the climate and can lead to long- and short-term changes, where numerous gases and dust particles rushes into the atmosphere. A number of historical catastrophic volcanic eruptions resulted in enormous loss of life and material damage, as well as in severe disturbances in the atmosphere. Besides the Ad 79 Vesuvius and the 1883 Krakatoa eruptions, the 1991 largest twentieth century's eruption of Mount Pinatubo injected the largest sulfur dioxide cloud that cause the gigantic aerosol disturbance ever noticed in the stratosphere. Major explosive volcanic gases include water vapor (harmless), carbon dioxide, sulfur dioxide, hydrogen sulfide and hydrogen halides, in addition to many other gases. Some gasses (e.g. sulphur dioxide or Sulfate aerosols) have a cooling effect, because they (or the substances they cause) reflect sunlight away from the earth. The average decline in Earth's surface temperature happened during the past century was attributed to the volcanic eruptions. Likewise, a significant amount of greenhouse gases (similar carbon dioxide and water vapor, methane, nitrous oxide, ozone, fluoroform or trifluoromethane, hexalfuoroethane, sulfur hexafluorid, trichlorofluoromethane) cause global warming.

Volcanologists are making great efforts to reduce the damage caused by volcanic emissions through raising awareness of the need to take volcanoes into consideration in sustainable development processes, particularly in regions juxtaposing the active volcanic belt

Name: Dr. Hany Hassan
Affiliation: Researcher at the National Data Center, National Research Institute of Astronomy and Geophysics (NRIAG)
Paper Title: Multi -Hazard assessment is necessary to mitigate the sustainable development in the Nile Delta Region

Abstract:

The coastal area of the Nile Delta of Egypt faces many risks that may challenge the stability of the related social, economic, and environmental systems; those risks can be mitigated if adequate preparedness actions are taken. The Nile Delta area, in particular, is facing natural hazards from both the sea and the land, as well as a combination of possible cascading hazards, so that a multi-risk approach is needed, which integrates data and methodologies from various disciplines, including exposure and vulnerability of community, physical system and environment. Accordingly, the current project aims to set up a knowledge and data framework for assessing and monitoring multiple geo-hazards and ecological risks, along the Nile Delta margin and surrounding coastal areas.

A comprehensive inventory of data (e.g., geological, seismological, geodetic, marine and environmental), existing tools and good practices, represent the first essential step to build models and scenarios for the area of interest. Based on the acquired information and selected methods for data analysis, possible gaps will be identified, that will guide future efforts for data acquisition. The outcomes will be visualized using a geographic information system, which will help in building integrated hazard/risk scenarios; the related uncertainties will be assessed as well, to facilitate the potential users drawing proper conclusions. Thus, the proposed system can substantially contribute to the sustainable development and preservation of tangible and non-tangible cultural heritage in Nile Delta coastal area, providing valuable information in view of the foreseen revision of the National Mitigation strategy for disaster in Egypt.

Name: Prof. Dr. Mohamed El Alfy
Affiliation: Professor of Hydrology, Mansoura University and Vice President of the Egyptian Geosciences National Committee
Paper Title: Climate Change and Water resources Sustainability in Egypt: challenges and solutions

Abstract:

Egypt is found in a severe waterless desert environment, in such arid areas, water is considered as a significant factor for economic growth and sustainable development. Egypt is under extreme water shortage conditions; it's share of water has not changed since the fifties despite a growing population. Climate change is predicted to add significant pressure on water resources. This is due to rising temperatures as well as changes in precipitation patterns, inland evaporation and salinization. Due to the shortage of water supplies in Egypt, many efforts should be directed using different approaches, such as the sustainability of water resources. This problem can be exaggerated due to Renaissance Dam challenge. The water share for each person in Egypt is continuously declining, however the population growth has increased from 24 to 104 million (1955–2022), and it is expected to grow to 153 million in the year 2050. The growing population rate result in the significant increase of water use related to industrial, agricultural and other activities, therefore the limited fresh water resources are under stress. In terms of water quality, there exists a rapid degradation in surface and groundwater quality. Egypt has three main water resources; they include River Nile, precipitation, and groundwater (renewable and non-renewable). There are other local water resources, they include the harvested water from rainfall and flash floods and the reuse of both drainage water and treated wastewater. Desalination also is being used to provide domestic water for some touristic a reason the coastal areas. The agriculture segment consumes 82-86% of the total water sources. This lecture reviews water scarcity in Egypt with climate change and its environmental impacts which will be discussed depending on a sharing approach between users, managers and decision makers.

Name: Prof. Dr. Khaled Zahran
Affiliation: Professor of Geodesy- Geodynamic Department- National Research Institute of Astronomy and Geophysics (NRIAG)
Paper Title: Freshwater Management in Context of Climate Change: Case Study Nile Basin

Abstract:

Water resources are important to both society and ecosystems. The main climate change consequences related to water resources are increases in temperature, shifts in precipitation patterns and snow cover, and a likely increase in the frequency of flooding and droughts. In many areas, climate change is likely to increase water demand while shrinking water supplies. This shifting balance would challenge water managers to simultaneously meet the needs of growing communities, sensitive ecosystems, farmers, ranchers, energy producers, and manufacturers.

The hydrology of the Nile is complex, as it is directly influenced by the land-use adjacent to the Nile and the hydrological regime of major tributaries. This irregularity suggests the importance of the management of its water income. On the other hand, significant part of the river flows into the sedimentary reservoirs adjacent to the river course. Added to this, the unusual climate events will affect the entire Nile Basin hydrological regime. Thus it is an urgent need to observe this yields irregularities of the river throughout the whole Nile basin and to evaluate the surrounding potential ground water reservoirs.

Nowadays, great development on satellite and remote sensing applications has opened new perspectives on hydrological monitoring. Satellite altimetry has been successfully used to derive water level data in lakes, reservoirs, rivers, floodplains and wetlands. Satellite altimeters intersect the Nile basin at six different paths, two of them at Egypt, which enable the estimation of the surface water storage along the whole basin. On the other hand, data from the Gravity Recovery and Climate Experiment (GRACE) satellite mission has the potential of determining the spatiotemporal variation of water mass storage. Total water mass storage from GRACE together with surface water variation from satellite altimeter would be a potential tool for hydrological monitoring and prediction.

Therefore, integrated satellite data together with a hydrological model would be a powerful tool for monitoring River Nile surface water and to evaluate the adjacent underground reservoirs for better water management on the Nile Basin.

Name: Prof. Dr. Fawzy Younis
Affiliation: Professor and head of the adaption Physiology Unit-Desert Research Center
Paper Title: Mitigation and adaptation in the agricultural sector to combat climate change

Abstract:

Climate change (CC) encompassing mostly meteorological hazards is a reality affecting the world in diverse ways. It is manifesting in various ways such as increases in frequency and intensity of floods, droughts, and extreme temperatures. In recent years, climate change has induced droughts, fires, other extreme weather events and meteorological disasters in all continents of the world.

Global warming during the 20th Century in Africa has been estimated at between 0.26 and 0.5°C per decade (IPCC, 2007,IPCC 2021). This trend is expected to continue and even to increase significantly, with a consequent impact on livelihoods. According to the Intergovernmental Panel on Climate Change (IPCC, 2007,IPCC 2021), a medium-high emission scenario would see an increase in annual mean surface air temperatures of between 3 and 4°C by 2080.

Agriculture might serve as a mitigation solution through carbon (C) sequestration in soil, in tree biomass and reducing greenhouse gas (GHG) emissions. Increased C is beneficial for some soil structures and functions, improving the use of water, in turn the crop adaptation and animal adaptation. The identified climate change adaptation strategies implemented in our studies included use of traditional grains and other drought resistant crops, early planting, multiple planting, barter trade and livelihood diversification. The mitigation strategies used included afforestation and reforestation programs, avoiding veld fires and precision agriculture and the internet things.

The challenges to climate change adaptation which include lack of markets to sell farming produce, inefficient institutions, poverty and high climate variability and increased uncertainty in the behavior of seasons. The challenges in the mitigation and adaptation to climate change are rampant and the coping methods are very limited because of the state of development and resource scarcity especially in Sub-Saharan Africa.

Name: Prof. Dr. Hesham M. El-Asmar
Affiliation: Professor of Quaternary Geology and Coastal Sedimentology, Damietta University
Paper Title: Coastal Erosion Problem along the Mediterranean Coast of Egypt: Is It a Natural or a Human Induced Phenomenon?

Abstract:

Forty years of observations and monitoring of the coastal erosion and shoreline changes allow the classification of the Mediterranean coast of Egypt to three sectors. The western sector extends from El-Salum to Alexandria with the characteristic calcarenite transverse dune ridges. The middle sector is the Nile Delta coast characterized with alluvial sediments of sand, silt and clay, and extends from East of Alexandria to the Tineh plain. The eastern sector is the dune sands at the northern coast of Sinai.

The conclusions revealed that some segments of the coast are suffering erosion. These are either protruding segments or those subjected to human impacts. This is also depending on the nature of sediments and the coastal orientation toward the waves and currents. Because of most of the hotspots are either coastal cities, resorts or economic projects, these attracted the spotlight and media noise because of their impact on the livelihood of thousands of peoples, or the impact on the sustainability of investment and development projects.

It is fair to mention here that the state efforts for over than 50 years of coastal protection, and the implementation of protection projects clearly controlled the effect of sea level rise even more land was regained. However, the coastal management is an important task that we should consider in all coastal projects. Conflict of interests and overlapping competencies among many state institutions is another factors impede the sustainable development of coastal regions

Name: Prof. Dr. Hamed Mira
Affiliation: Chairman of the Egyptian Nuclear Materials Authority
Paper Title: To the Way of Carbon Zero-Level, the Nuclear Energy is a Vital Player

Abstract:

With starting the second "Industrial Revolution" in 1870, the Earth's surface temperature gradually increased. At the beginning, this increasing was insensible and no serious environmental impacts were detected. Few decades ago and due to the rapid increasing of industrial activities, transportation and electric generation using fossil fuels, the global temperature increased decade after decade due to the gaseous emissions which resulted in what is known by "Global Warming" or in other words "Greenhouse Effect".

CO^2 gas is considered the key contributor in this undesirable phenomenon. All the published data and related studies pointed to that the traditional power plants is a main source of the CO^2 emission over the world. Consequently, the world society decided to depend on the clean energy production and several efforts were put in place to combat the environmental hazards raised due to the climatic changes.

One of the effective solutions is using the nuclear energy for electricity production as well as for treating and mitigating the disaster consequences. The most promising benefit could be gained from production of electricity using the nuclear power plants (NPPs) is reduction of carbon emission very close to zero-level that makes it in good competence with the wind farms and better than the solar plants. Additionally, nuclear energy is successfully utilized in water desalination, treatment of polluted water and sewage, supporting the food security, cleaning the polluted air which resulted from many industrial activities.... etc.

In opposite to some fears were adhered to nuclear energy, it is considered one of the most safe used energies particularly the new NPPs generations where the safety issues are the main concern of NPPs manufacturers and consume more than 60% of the total cost of NPPs. Also, at this point it is worth to mention that over 70 years of using the NPPs to produce the electricity with about 450 NPPs in operation, only four accidents were happened due to the human mistakes and led to limited and locally hazards with no negative impacts on the global climate.

Name: Prof. Dr. Ahmed El-Sayed Ghitas
Affiliation: Professor of solar energy physics - National Research Institute of Astronomy and Geophysics (NRIAG)
Paper Title: Solar Energy applications for Climate Change mitigation Strategies

Abstract:

Climate Solar energy is one of the most renewable energy applications. NRIAG has a strong track record in research on solar energy and environmental sciences and engineering with a large portfolio of grants from Egypt's public funder of research such as Science, Technology & Innovation Funding Authority (STDF), Academy of Scientific Research & Technology (ASRT) and industry in the area. To build on this success, NRIAG has established the interdisciplinary activities to develop multidisciplinary approaches to address both short term and longer-term challenges of solar energy generation, energy demand reduction, energy security and sustainability. Disseminating the ongoing and past research outputs to local stakeholders is key to identify best strategies and solutions to adapt against the impacts of climate change. This is particularly important in the current context when Egypt is scheduled to host the upcoming 27th United Nations Climate Change Conference of the Parties (COP27) in Sharm El Sheikh in November 2022.

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